



# Ultimate power – perfect control

Vehicle safety, body and powertrain applications

[www.infineon.com/automotivepower](http://www.infineon.com/automotivepower)





The ultimate power to control your applications including automotive, transportation, industrial, lighting and motor control.

For a comprehensive and reliable portfolio of products for automotive and other applications, look no further than the product range from Infineon. We have used our 40 years of experience of developing and producing products to meet the demands of the automotive market, and our innovative technologies to design and produce a large number of power products that meet all requirements of the automotive industry and also the transportation, lighting and motor-drive industries.

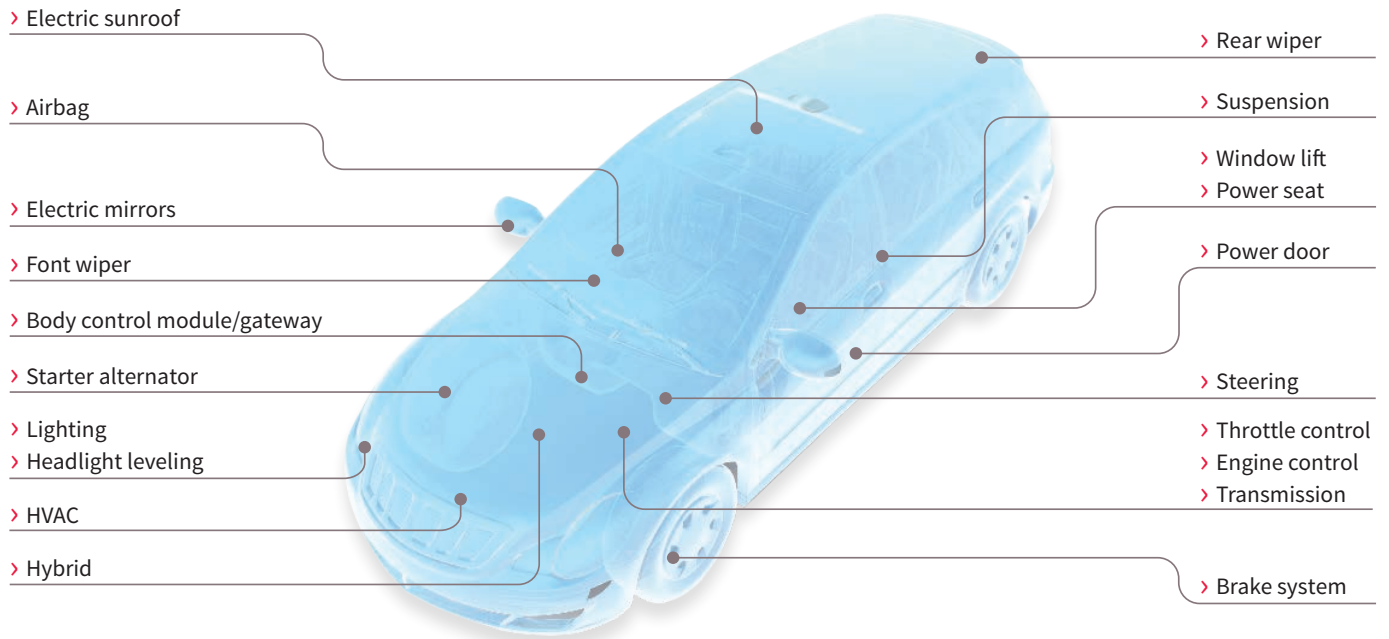
Our commitment to quality is demonstrated through our focus on automotive excellence, the most rigorous zero defect program in the industry.

This selection guide provides an overview of our ICs and their packages, which are automotive qualified and available for your current and future electronic system designs.

### Symbols

$I_D$	DC Drain Current	$R_{thJC}$	Thermal Resistance Junction to Case
$I_{GS(TH)}$	Gate Source Threshold Current	$V_{CE}$	Collector Emitter Voltage
$I_{IS}$	Current Sense Output Current	$V_{CE(sat)}$	Saturation Collector Emitter Voltage
$I_{L(lim)}$	Load Current Limit	$V_{DS}$	Drain Source Voltage
$I_{L(NOM)}$	Load Current ( $T_a = 85\text{ }^\circ\text{C}$ , specified PCB)	$V_{DS(AZ)}$	Drain Source Voltage (Active Zener)
$I_{L(sat)}$	Saturation Load Current	$V_{GS(th)}$	Gate Threshold Voltage
$I_q$	Quiescent Current	$V_Q$	Output Voltage
$I_Q$	Output Current	$V_S$	Supply Voltage
$Q_G$	Total Gate Charge	$V_{S(AZ)}$	Supply Voltage (Active Zener)
$R_{IS}$	Current Sense Resistor	$V_{S(op.)}$	Operation Supply Voltage
$R_{DS(on)}$	Typical Drain Source Resistance in ON-State @ 25 °C (multiply by 2 for Max @ 150 °C)	Inverse	Normal $V_S$ Polarity and Inverse Load Current
$R_{DS(on) path}$	Typical Drain Source Resistance in ON-State @ 25 °C of both High-Side and Low-Side	PWM	Pulse Width Modulation
		Reverse	Reverse $V_S$ Polarity and Reverse Load Current

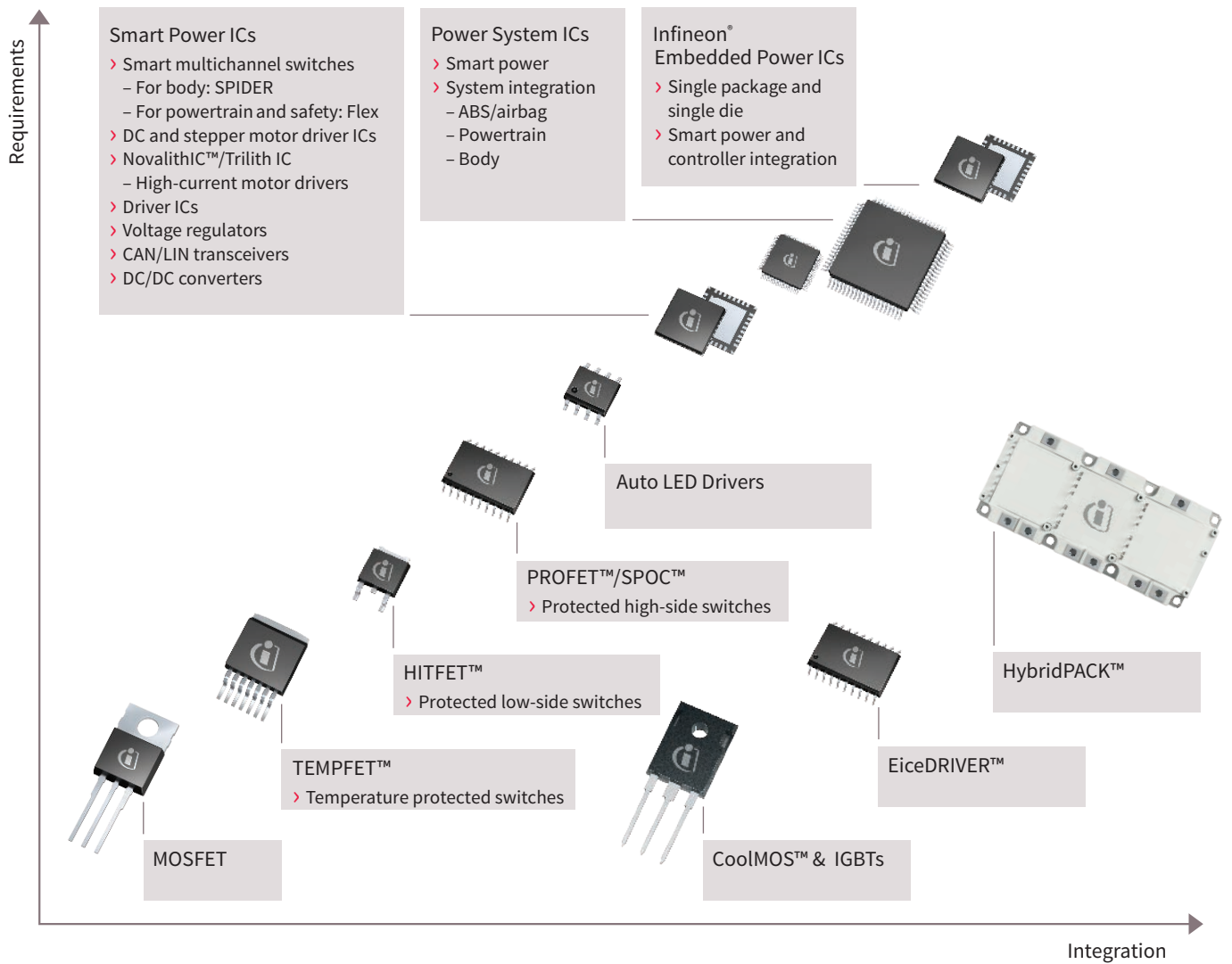
## Automotive applications



## Automotive power components used in other applications



# We meet all requirements for cost-effective application solutions

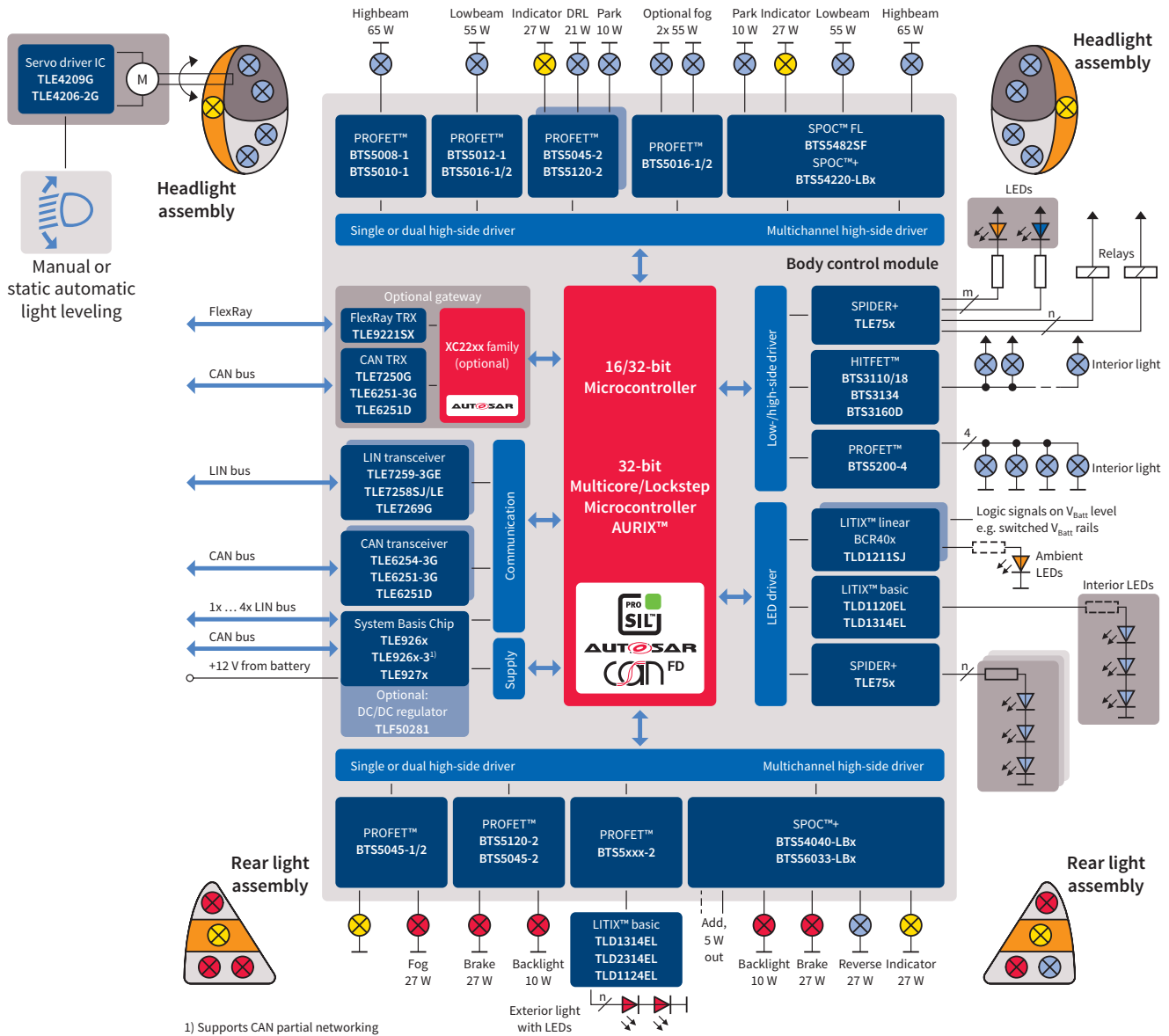


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# Body applications

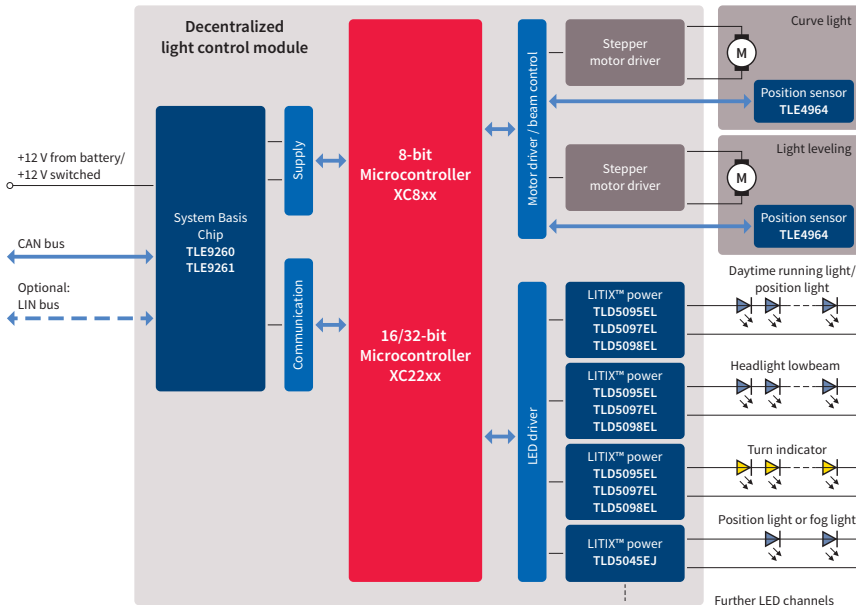
## Body control module



### System benefits

- Reduced board space due to integrated functionality
- Protected load control with sophisticated diagnostic features
- Supports the “Limp Home” functional safety concept
- High scalability and benchmark short-circuit robustness of power semiconductors (PROFET™)
- Supports a smooth transition to LEDs for interior and exterior lighting

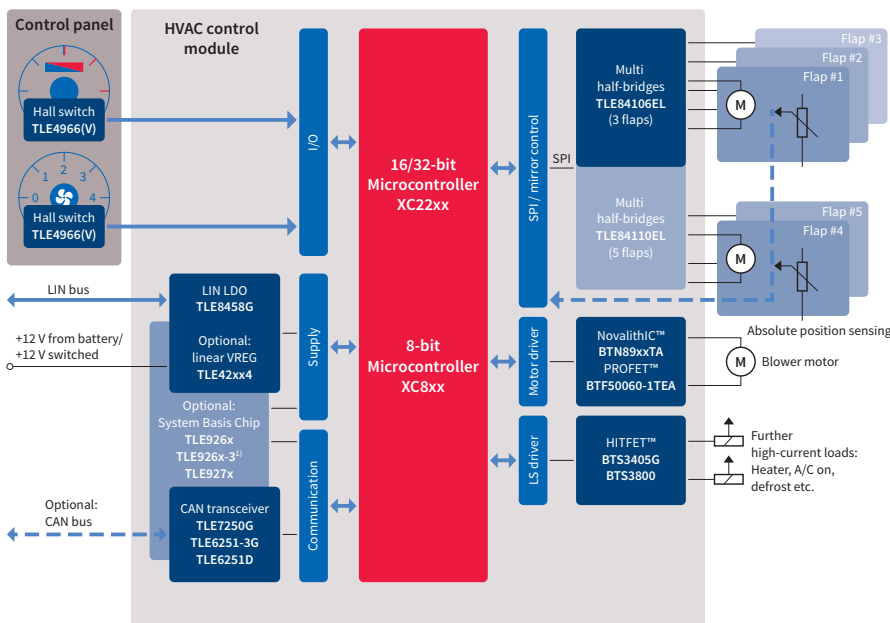
## Decentralized front light module



### System benefits

- › Automotive LED drivers for high-brightness LEDs
- › LED driver ICs supporting various DC/DC topologies (buck, boost, SEPIC, flyback)
- › Microcontroller peripherals enable light control with a low CPU load
- › System basis chips combine supply, network transceiver and supervision functions in a monolithic device

## HVAC control module low to mid-end/manual + semi-automatic



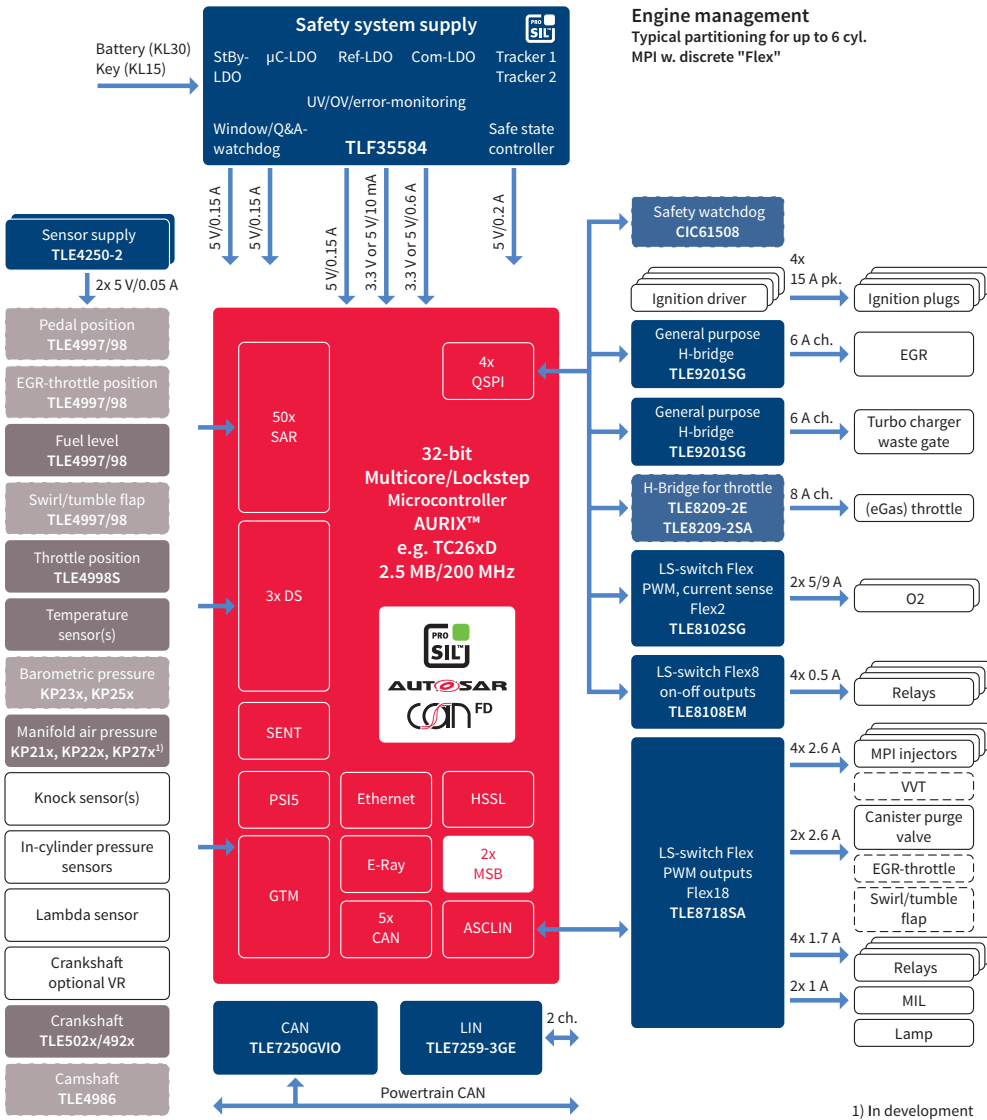
### System benefits

- › High-performance, scalable microcontroller family for various classes of HVAC control algorithms
- › Integrated motor control with diagnostics
- › Dedicated multi half-bridge devices for flap motor control with potentiometer feedback
- › Powerful half-bridge devices (NovalithIC™) with high-frequency PWM capability for the blower control

1) Supports CAN partial networking

# Powertrain applications

## Gasoline multi-port injection – discrete solution

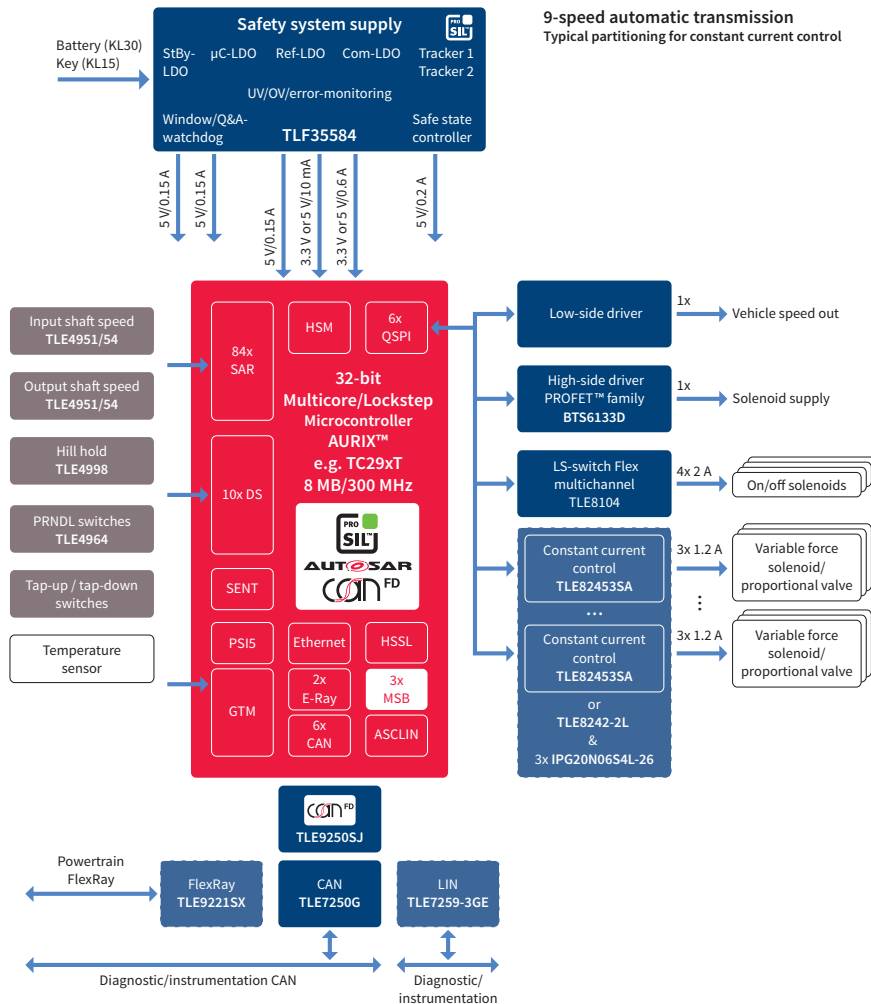


### System benefits

- > Flexible and scalable product portfolio tailored to the cost and performance needs of the mid-end and entry segments
- > Industry benchmark in embedded real-time performance facilitates pumping loss reduction, knock detection and efficient after-treatment
- > Conforming with upcoming emission legislation at maximized fuel efficiency and with even more driving pleasure, the new sensor families provide enhanced measurement precision (e.g. ignition control, misfire detection)



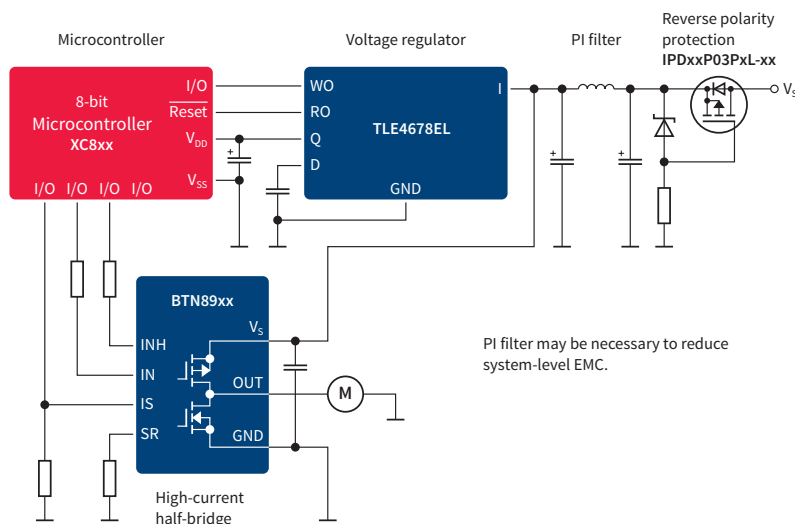
## Automatic transmission – hydraulic control



### System benefits

- › Full range of products ranging from voltage regulators, transceivers, sensors, microcontrollers and Smart Power drivers
- › Valve actuator ICs supporting highest precision current control
- › Optimized sensors providing enhanced disturbance immunity (e.g. vibration) and direction detection
- › High-temperature bare die IC supporting integrated transmission control up to the highest torque rate

## Fuel pump

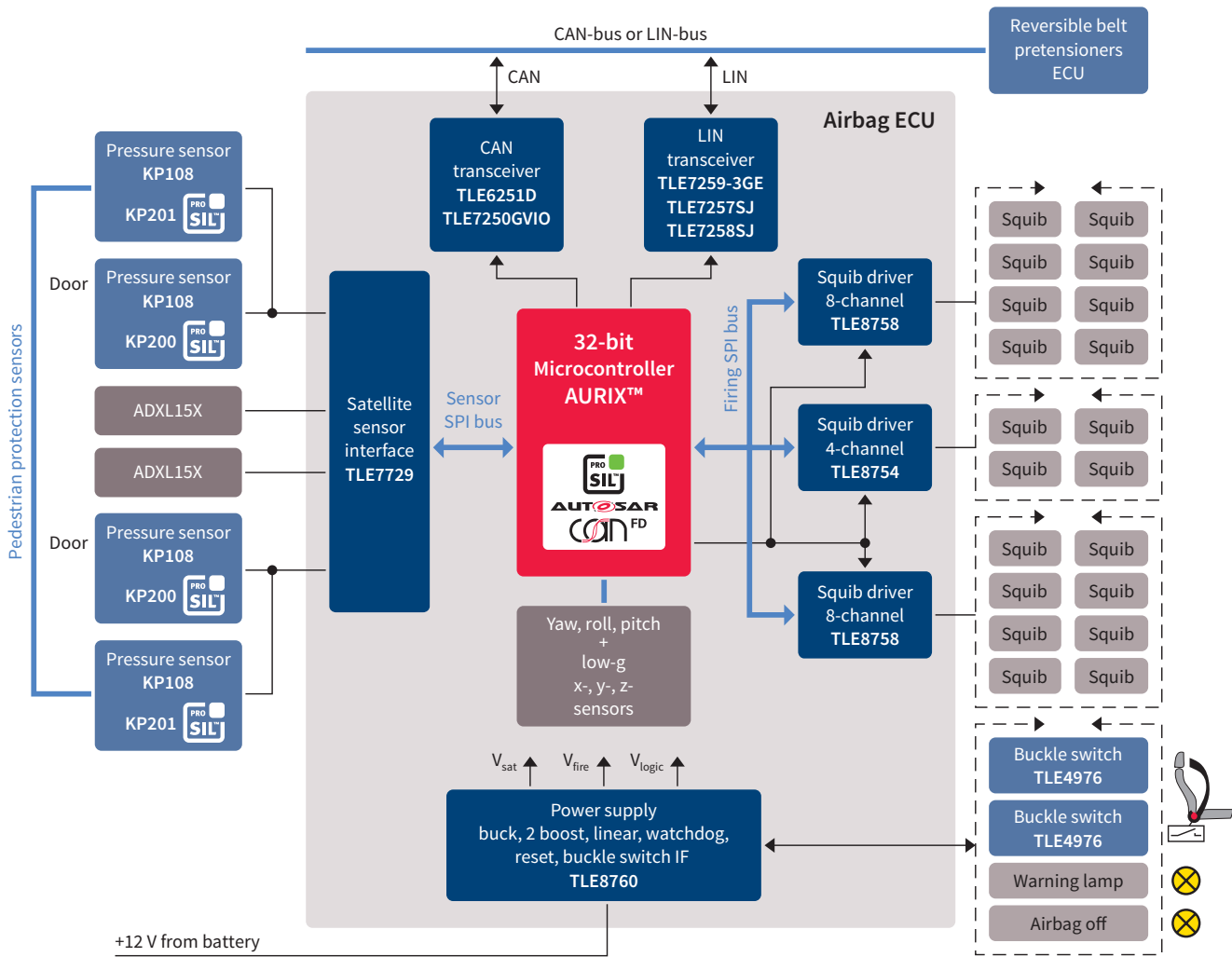


### System benefits

- › Large and scalable product portfolio tailored to performance & budget needs
- › Fuel saving of > 1% compared to mechanical solution
- › Lower hydrocarbon emissions
- › Increased lifetime

# Safety applications

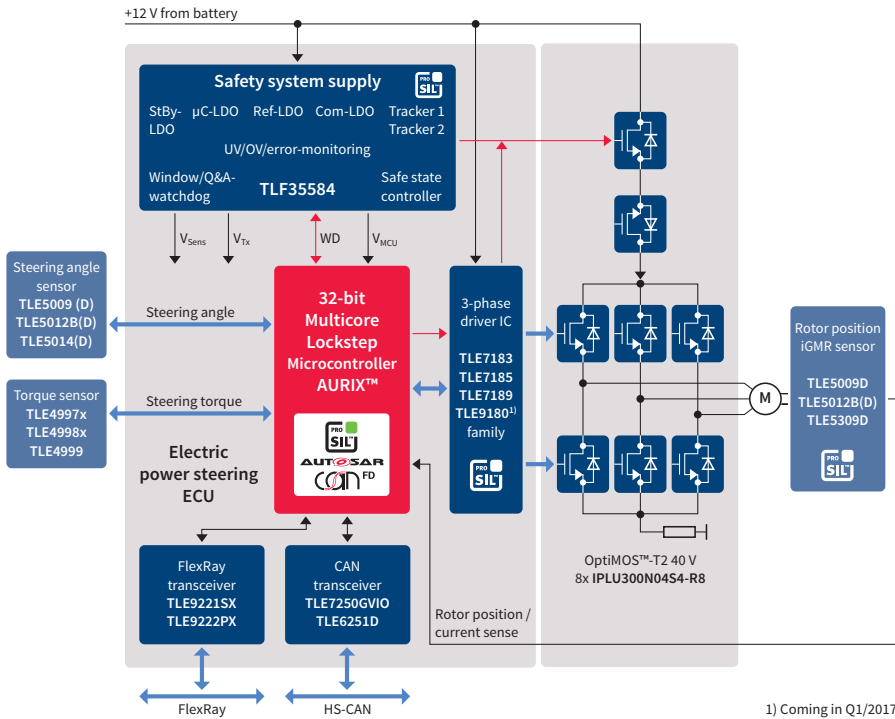
## Airbag system



### System benefits

- > Airbag systems are standard in most cars and are mandatory equipment in many countries, saving thousands of lives
- > Infineon’s broad product spectrum supports scalability and flexibility for building systems from 4 to over 20 firing loops
- > Full range of airbag ASSPs ranging from pressure sensors for side crash detection to driver and transceiver ICs
- > High-performance 32-bit AURIX™ MCU family with dedicated safety enables integration of multiple functions
- > The parts are optimized in terms of system interoperability as well as best price-performance ratio
- > This systems are mandatory to achieve highest possible scores in the various “New Car Assessment Programs” (NCAP) throughout the world and are even legislated in some countries

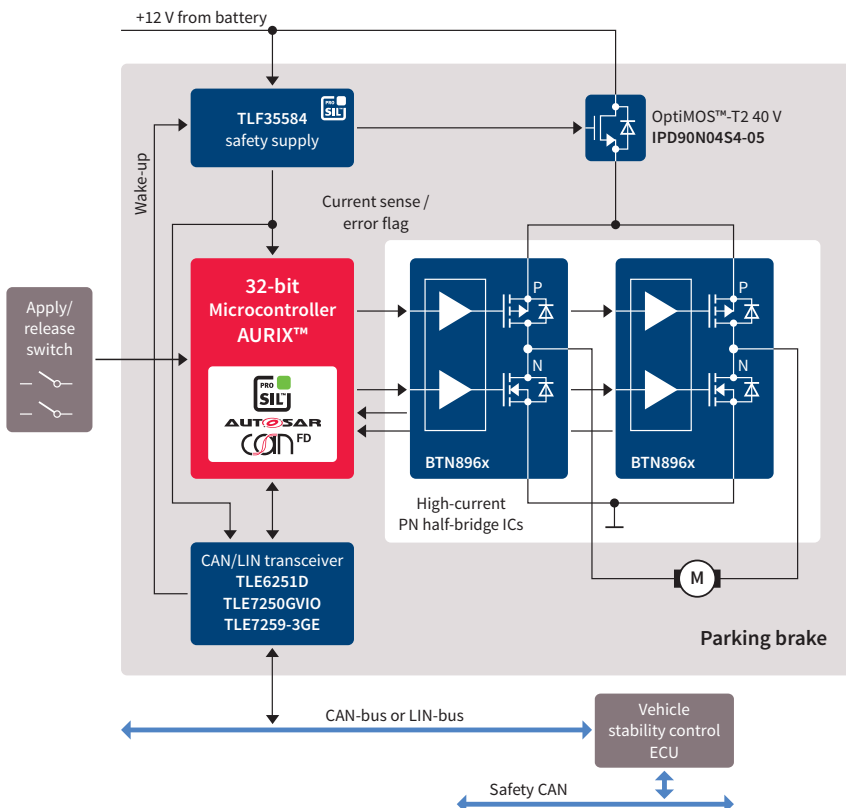
## Electric Power Steering (EPS)



### System benefits

- › Electric Power Steering (EPS) improves fuel efficiency by approximately 3% while having a positive effect on car handling, the overall driving experience and comfort
- › It combines a compact design with reduced mounting costs
- › EPS can be adapted via software to suit diverse car models as well as dedicated driving modes
- › EPS is the steering technology needed to enable advanced driver assistance systems such as side-wind compensation, lane assist/keeping and parking assistance systems
- › Infineon has over ten years of experience in this exciting application and provides the full range of ICs, from sensors to microcontrollers, and from bridge drivers to world-class MOSFETs

## Electric parking brake



### System benefits

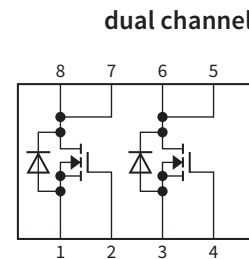
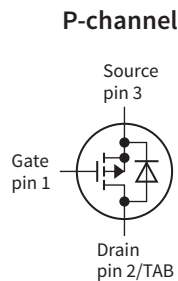
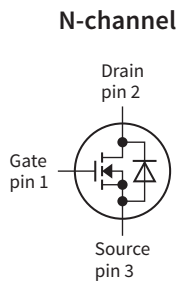
- › The electric parking brake provides drivers with many more comfort and convenience features than the standard mechanical system
- › Hill hold, launch control, roll-away prevention are possible
- › These convenience features are in many cases safety-relevant and therefore should be implemented using safety-compliant hardware (according to ISO 26262)



# Automotive MOSFETs

Infiniteon automotive MOSFET portfolio offers benchmark quality, wide voltage range and diversified package

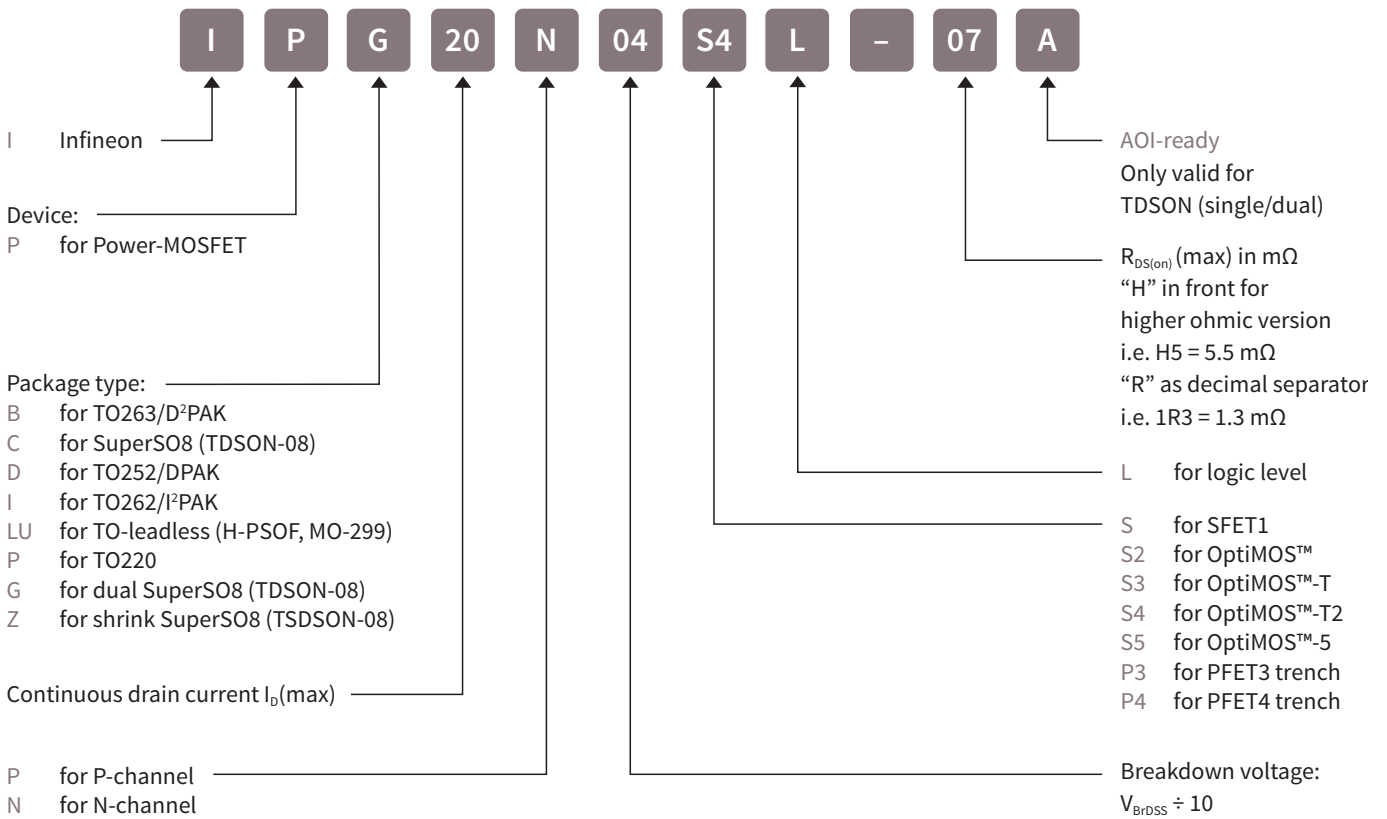
- › Best in class  $R_{DS(on)}$  performance for increased system efficiency
- › Lowest switching and conduction power losses for increased thermal system reliability
- › Benchmark for quality and reliability
- › Wide voltage range from 24 V to 300 V for N-channel FET, and from 20 V to 150 V for P-channel FET
- › Robust green package for easy process handling
- › Diversified package portfolio caters to customers' needs for
  - Package size minimization (down to 11 mm<sup>2</sup> in S308)
  - High current capability (up to 300 A in TOLL)



Polarity	Voltage class [V]	Trench MOSFET		Planar MOSFET	
		Infineon	Former IRF	Infineon	Former IRF
N-channel	24		•		
N-channel	30	•	•	•	•
N-channel	40	•	•	•	•
N-channel	55		•	•	•
N-channel	60	•	•		•
N-channel	75		•	•	•
N-channel	80	•			
N-channel	100	•	•		•
N-channel	150		•		•
N-channel	200		•		
N-channel	250	•	•		
N-channel	300		•		
P-channel	20				•
P-channel	30	•			•
P-channel	40	•			
P-channel	55				•
P-channel	100				•
P-channel	150				•
dual N-channel	2 x 30				•
dual N-channel	2 x 40	•	•		
dual N-channel	2 x 50				•
dual N-channel	2 x 55			•	•
dual N-channel	2 x 60	•			
dual N-channel	2 x 100	•			
dual P-channel	2 x 20				•
dual P-channel	2 x 30				•
dual P-channel	2 x 55				•
dual N+P channel	2 x 30				•
dual N+P channel	2 x 55				•

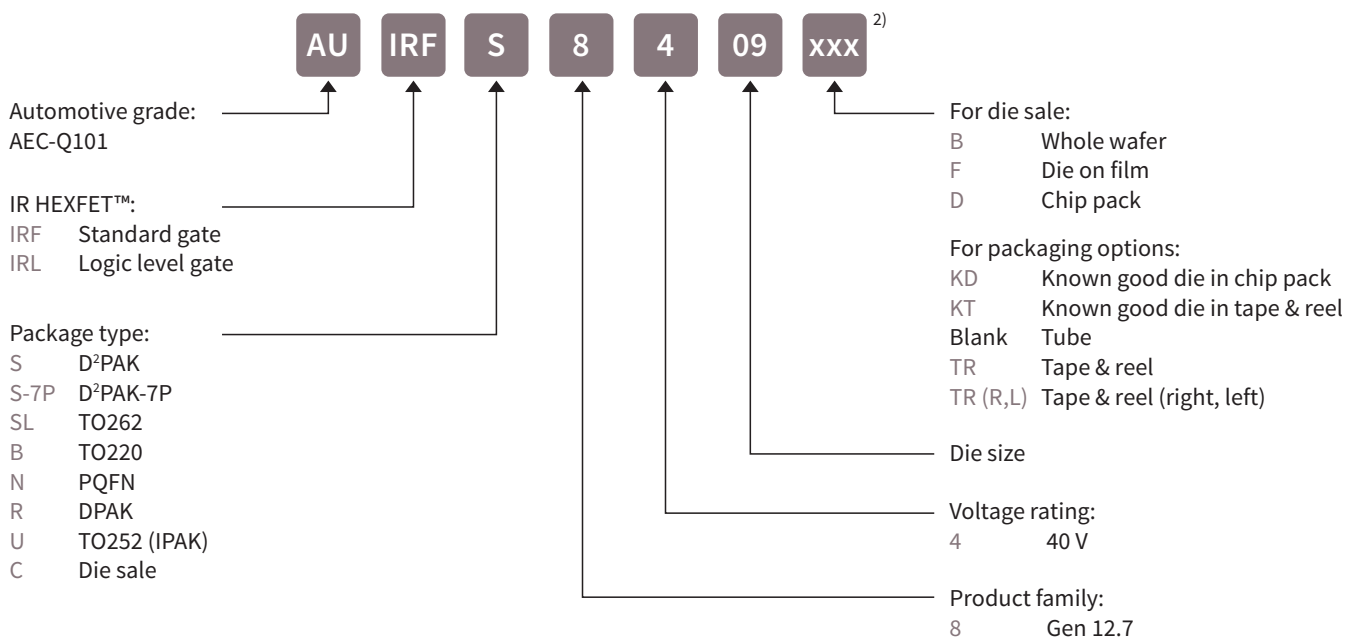


## Infineon automotive MOSFET naming system





### Former IRF COOLiRFET™ naming system<sup>1)</sup>



1) Only applicable to Gen 12.7 technology.  
 For all other former IR technologies, refer to the respective product tables.  
 2) WL (sufix) = TO262 wide lead

# Automotive N-channel MOSFETs

## 24 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF1324S-7P	1.00	240	0.50	2.00 ... 4.00	180	Normal	Gen 10.2	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRFP2602	1.25	180	0.40	2.00 ... 4.00	260	Normal	Gen 10.2	TO-247
AUIRF1324WL	1.30	240	0.50	2.00 ... 4.00	120	Normal	Gen 10.2	TO-262 WideLead
AUIRF1324	1.50	195	0.50	2.00 ... 4.00	160	Normal	Gen 10.2	TO-220
AUIRF1324S	1.65	195	0.50	2.00 ... 4.00	160	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)

## 30 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB240N03S4L-R8	0.76	240	0.50	1.00 ... 2.20	290	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB240N03S4L-R9	0.92	240	0.70	1.00 ... 2.20	230	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB180N03S4L-H0	0.95	180	0.60	1.00 ... 2.20	230	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB180N03S4L-01	1.05	180	0.80	1.00 ... 2.20	187	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPD90N03S4L-02	2.20	90	1.10	1.00 ... 2.20	110	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N03S4L-02	2.40	80	1.10	1.00 ... 2.20	110	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
AUIRF2903ZL	2.40	160	0.65	2.00 ... 4.00	160	Normal	Gen 10.2	TO-262
AUIRF2903ZS	2.40	160	0.65	2.00 ... 4.00	160	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPI80N03S4L-03	2.70	80	1.10	1.00 ... 2.20	110	Logic	OptiMOS™ -T2	TO262-3
IPP80N03S4L-03	2.70	80	1.10	1.00 ... 2.20	110	Logic	OptiMOS™ -T2	TO220-3
IPB120N03S4L-03	3.00	120	1.90	1.00 ... 2.20	55	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPD90N03S4L-03	3.30	90	1.60	1.00 ... 2.20	60	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N03S4L-03	3.40	80	1.60	1.00 ... 2.20	60	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPD70N03S4L-04	4.30	70	2.20	1.00 ... 2.20	37	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPD50N03S4L-06	5.50	50	2.70	1.00 ... 2.20	24	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPD40N03S4L-08	8.00	40	3.60	1.00 ... 2.20	15	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPD30N03S4L-09	9.00	30	3.60	1.00 ... 2.20	15	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPD30N03S4L-14	13.60	30	4.90	1.00 ... 2.20	11	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB22N03S4L-15	14.60	22	4.90	1.00 ... 2.20	11	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))

## 40 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF8739L2	0.60	375	0.44	2.20 ... 3.90	375	Normal	Gen 12.7	DirectFET™2 L8
AUIRFS8409-7P	0.75	240	0.40	2.20 ... 3.90	305	Normal	Gen 12.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)
IPLU300N04S4-R8	0.77	300	0.35	2.00 ... 4.00	221	Normal	OptiMOS™ -T2	HSOF-8-1 (H-PSOF)
IPB240N04S4-R9	0.87	240	0.50	2.00 ... 4.00	220	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB180N04S4-00	0.98	180	0.50	2.00 ... 4.00	220	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB240N04S4-1R0	1.00	240	0.65	2.00 ... 4.00	170	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB180N04S4L-H0	1.00	180	0.60	1.20 ... 2.20	239	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
AUIRF7739L2	1.00	270	1.20	2.00 ... 4.00	220	Normal	Gen 10.7	DirectFET™2 L8
AUIRFS8408-7P	1.00	240	0.51	2.20 ... 3.90	210	Normal	Gen 12.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)

1) See packages on page 140 and 141



## 40 V (Trench) (cont'd)



Product type	R <sub>DS(on)</sub> @ 10 V [mΩ]	I <sub>D</sub> [A]	R <sub>thJC</sub> (max) [K/W]	V <sub>GS(th)</sub> (min-max) [V]	Q <sub>G</sub> (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB180N04S4-H0	1.10	180	0.60	2.00 ... 4.00	173	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPLU300N04S4-1R1	1.15	300	0.50	2.00 ... 4.00	116	Normal	OptiMOS™ -T2	HSOF-8-1 (H-PSOF)
IPB180N04S4L-01	1.20	180	0.80	1.20 ... 2.20	188	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
AUIRFS8409	1.20	195	0.40	2.20 ... 3.90	300	Normal	Gen 12.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFSL8409	1.20	195	0.40	2.20 ... 3.90	300	Normal	Gen 12.7	TO-262
IPB180N04S4-01	1.30	180	0.80	2.00 ... 4.00	135	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
AUIRFB8409	1.30	195	0.40	2.20 ... 3.90	300	Normal	Gen 12.7	TO-220
AUIRFS8407-7P	1.30	240	0.65	2.20 ... 3.90	150	Normal	Gen 12.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF3004WL	1.40	240	0.40	2.00 ... 4.00	140	Normal	Gen 10.7	TO-262 WideLead
AUIRLS3034-7P	1.40	240	0.40	1.00 ... 2.50	120	Logic	Gen 10.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)
IPB160N04S4L-H1	1.50	160	0.90	1.20 ... 2.20	146	Logic	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPI120N04S4-01	1.50	120	0.80	2.00 ... 4.00	135	Normal	OptiMOS™ -T2	TO262-3
IPB120N04S4-01	1.50	120	0.80	2.00 ... 4.00	135	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPB160N04S4-H1	1.60	160	0.90	2.00 ... 4.00	105	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
AUIRF7738L2	1.60	184	1.60	2.00 ... 4.00	129	Normal	Gen 10.7	DirectFET™2 L6
IPLU250N04S4-1R7	1.70	250	0.80	2.00 ... 4.00	76	Normal	OptiMOS™ -T2	HSOF-8-1 (H-PSOF)
IPB120N04S4L-02	1.70	120	0.95	1.20 ... 2.20	143	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
AUIRFP4004	1.70	195	0.40	2.00 ... 4.00	220	Normal	Gen 10.2	TO-247
IPB120N04S4-02	1.80	120	0.95	2.00 ... 4.00	103	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
AUIRFS8407	1.80	195	0.65	2.20 ... 3.90	150	Normal	Gen 12.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFSL8407	1.80	195	0.65	2.20 ... 3.90	150	Normal	Gen 12.7	TO-262
IPI120N04S4-01	1.90	120	0.80	2.00 ... 4.00	135	Normal	OptiMOS™ -T2	TO262-3
IPP120N04S4-01	1.90	120	0.80	2.00 ... 4.00	135	Normal	OptiMOS™ -T2	TO220-3
AUIRF7737L2	1.90	156	1.80	2.00 ... 4.00	89	Normal	Gen 10.7	DirectFET™2 L6
AUIRF8736M2	1.90	137	2.40	2.20 ... 3.90	136	Normal	Gen 12.7	DirectFET™2 M4
AUIRFR8405	1.98	100	0.92	2.20 ... 3.90	103	Normal	Gen 12.7	TO-252 (DPAK 3-leg)
AUIRFU8405	1.98	100	0.92	2.20 ... 3.90	103	Normal	Gen 12.7	IPAK
IPD100N04S4-02	2.00	100	1.00	2.00 ... 4.00	91	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPD100N04S4L-02	1.90	100	1.00	1.20 ... 2.20	126	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRFB8407	2.00	195	0.65	2.20 ... 3.90	150	Normal	Gen 12.7	TO-220
IPB90N04S4-02	2.10	90	1.00	2.00 ... 4.00	91	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI120N04S4-02	2.10	120	0.95	2.00 ... 4.00	103	Normal	OptiMOS™ -T2	TO262-3
AUIRFN8405	2.20	95	1.10	2.20 ... 3.90	103	Normal	Gen 12.7	PQFN 5x6 mm
AUIRFS8405	2.30	120	0.92	2.20 ... 3.90	107	Normal	Gen 12.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFSL8405	2.30	120	0.92	2.20 ... 3.90	107	Normal	Gen 12.7	TO-262
IPD90N04S4-02	2.40	90	1.00	2.00 ... 4.00	91	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPB100N04S4-H2	2.40	100	1.30	2.00 ... 4.00	70	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPC100N04S4-02	2.40	100	1.00	2.00 ... 4.00	79	Normal	OptiMOS™ -T2	TDSO-8-23
IPI90N04S4-02	2.50	90	1.00	2.00 ... 4.00	91	Normal	OptiMOS™ -T2	TO262-3
AUIRFB8405	2.50	120	0.92	2.20 ... 3.90	107	Normal	Gen 12.7	TO-220
IPI100N04S4-H2	2.70	100	1.30	2.00 ... 4.00	70	Normal	OptiMOS™ -T2	TO262-3
IPP100N04S4-H2	2.70	100	1.30	2.00 ... 4.00	70	Normal	OptiMOS™ -T2	TO220-3
NEW! IPZ40N04S5L-2R8	2.80	40	2.10	1.20 ... 2.00	30	Logic	OptiMOS™ -5	TSDSON-8
AUIRF7736M2	3.00	108	2.40	2.00 ... 4.00	72	Normal	Gen 10.7	DirectFET™2 M4
AUIRL7736M2	3.00	112	2.40	1.00 ... 2.50	52	Logic	Gen 10.7	DirectFET™2 M4
NEW! IPZ40N04S5-3R1	3.10	40	2.10	2.20 ... 3.40	21	Normal	OptiMOS™ -5	TSDSON-8
AUIRFR8403	3.10	100	1.52	2.20 ... 3.90	66	Normal	Gen 12.7	TO-252 (DPAK 3-leg)
AUIRFU8403	3.10	100	1.52	2.20 ... 3.90	66	Normal	Gen 12.7	IPAK
AUIRL1404Z	3.10	160	0.75	1.40 ... 2.70	75	Logic	Gen 10.2	TO-220
AUIRL1404ZL	3.10	160	0.75	1.40 ... 2.70	75	Logic	Gen 10.2	TO-262
AUIRL1404ZS	3.10	160	0.75	1.40 ... 2.70	75	Logic	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD90N04S4-03	3.20	90	1.60	2.00 ... 4.00	51	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N04S4-03	3.30	80	1.60	2.00 ... 4.00	51	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))

1) See packages on page 140 and 141

# Automotive N-channel MOSFETs

40 V (Trench) (cont'd)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPC80N04S4-03	3.30	80	1.50	2.00 ... 4.00	55.00	Normal	OptiMOS™ -T2	TDSON-8-23
AUIRFN8403	3.30	95	1.60	2.20 ... 3.90	65.00	Normal	Gen 12.7	PQFN 5x6 mm
AUIRFS8403	3.30	100	1.52	2.20 ... 3.90	62.00	Normal	Gen 12.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFSL8403	3.30	100	1.52	2.20 ... 3.90	62.00	Normal	Gen 12.7	TO-262
IPB120N04S4-04	3.60	120	1.90	2.00 ... 4.00	42.00	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI80N04S4-03	3.70	80	1.60	2.00 ... 4.00	51.00	Normal	OptiMOS™ -T2	TO262-3
IPP80N04S4-03	3.70	80	1.60	2.00 ... 4.00	51.00	Normal	OptiMOS™ -T2	TO220-3
AUIRF1404Z	3.70	160	0.75	2.00 ... 4.00	100.00	Normal	Gen 10.2	TO-220
AUIRF1404ZL	3.70	160	0.75	2.00 ... 4.00	100.00	Normal	Gen 10.2	TO-262
AUIRF1404ZS	3.70	160	0.75	2.00 ... 4.00	100.00	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD90N04S4L-04	3.80	90	2.10	1.20 ... 2.00	46.00	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N04S4L-04	4.00	80	2.10	1.20 ... 2.00	46.00	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPD90N04S4-04	4.10	90	2.10	2.00 ... 4.00	33.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N04S4-04	4.20	80	2.10	2.00 ... 4.00	33.00	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
AUIRFR8401	4.25	100	1.90	2.20 ... 3.90	42.00	Normal	Gen 12.7	TO-252 (DPAK 3-leg)
AUIRFU8401	4.25	100	1.90	2.20 ... 3.90	42.00	Normal	Gen 12.7	IPAK
IPI80N04S4L-04	4.30	80	2.10	1.20 ... 2.00	46.00	Logic	OptiMOS™ -T2	TO262-3
IPP80N04S4L-04	4.30	80	2.10	1.20 ... 2.00	46.00	Logic	OptiMOS™ -T2	TO220-3
IPI80N04S4-04	4.60	80	2.10	2.00 ... 4.00	33.00	Normal	OptiMOS™ -T2	TO262-3
IPP80N04S4-04	4.60	80	2.10	2.00 ... 4.00	33.00	Normal	OptiMOS™ -T2	TO220-3
AUIRFN8401	4.60	84	2.40	2.20 ... 3.90	44.00	Normal	Gen 12.7	PQFN 5x6 mm
NEW! IPZ40N04S5L-4R8	4.80	40	3.50	1.20 ... 2.00	17.00	Logic	OptiMOS™ -5	TSDSON-8
AUIRF7734M2	4.90	72	3.30	2.00 ... 4.00	48.00	Normal	Gen 10.7	DirectFET™2 M2
IPD90N04S4-05	5.20	90	2.30	2.00 ... 4.00	33.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
NEW! IPZ40N04S5-5R4	5.40	40	3.50	2.20 ... 3.40	12.00	Normal	OptiMOS™ -5	TSDSON-8
AUIRF4104	5.50	75	1.05	2.00 ... 4.00	68.00	Normal	Gen 10.2	TO-220
IPC60N04S4L-06	5.60	60	2.40	1.20 ... 2.20	35.00	Logic	OptiMOS™ -T2	TDSON-8-23
IPD75N04S4-06	5.90	75	2.60	2.00 ... 4.00	24.50	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPC60N04S4-06	6.00	60	2.40	2.00 ... 4.00	25.00	Normal	OptiMOS™ -T2	TDSON-8-23
IPB70N04S4-06	6.20	70	2.60	2.00 ... 4.00	24.50	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI70N04S4-06	6.50	70	2.60	2.00 ... 4.00	24.50	Normal	OptiMOS™ -T2	TO262-3
IPP70N04S4-06	6.50	70	2.60	2.00 ... 4.00	24.50	Normal	OptiMOS™ -T2	TO220-3
AUIRL7732S2	6.60	58	3.50	1.00 ... 2.50	24.00	Logic	Gen 10.7	DirectFET™2 SC
AUIRF7732S2	6.95	55	3.70	2.00 ... 4.00	30.00	Normal	Gen 10.7	DirectFET™2 SC
IPD50N04S4L-08	7.30	50	3.30	1.20 ... 2.00	23.00	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
NEW! IPZ40N04S5L-7R4	7.40	40	4.40	1.20 ... 2.00	10.00	Logic	OptiMOS™ -5	TSDSON-8
IPI45N04S4L-08	7.60	45	3.30	1.20 ... 2.00	23.00	Logic	OptiMOS™ -T2	TO262-3
IPP45N04S4L-08	7.60	45	3.30	1.20 ... 2.00	23.00	Logic	OptiMOS™ -T2	TO220-3
IPD50N04S4-08	7.90	50	3.30	2.00 ... 4.00	17.20	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
NEW! IPZ40N04S5-8R4	8.40	40	4.40	2.20 ... 3.40	6.90	Normal	OptiMOS™ -5	TSDSON-8
IPD50N04S4-10	9.30	50	3.70	2.00 ... 4.00	14.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRFN8459	2 x 5.90	50	3.00	2.20 ... 3.90	40.00	Normal	Gen 12.7	PQFN 5x6 dual
IPG20N04S4L-07	2 x 7.20	20	2.30	1.20 ... 2.20	39.00	Logic	OptiMOS™	TDSON-8-4 dual
IPG20N04S4L-07A	2 x 7.20	20	2.30	1.20 ... 2.20	39.00	Logic	OptiMOS™	TDSON-8-10
IPG20N04S4-08	2 x 7.50	20	2.30	2.00 ... 4.00	28.00	Normal	OptiMOS™	TDSON-8-4 dual
IPG20N04S4-08A	2 x 7.50	20	2.30	2.00 ... 4.00	28.00	Normal	OptiMOS™	TDSON-8-10
IPG20N04S4L-08	2 x 8.10	20	2.80	1.20 ... 2.20	30.00	Logic	OptiMOS™	TDSON-8-4 dual
IPG20N04S4L-08A	2 x 8.10	20	2.80	1.20 ... 2.20	30.00	Logic	OptiMOS™	TDSON-8-10
IPG20N04S4L-11	2 x 11.60	20	3.70	1.20 ... 2.20	20.00	Logic	OptiMOS™	TDSON-8-4 dual
IPG20N04S4L-11A	2 x 11.60	20	3.70	1.20 ... 2.20	20.00	Logic	OptiMOS™	TDSON-8-10
IPG20N04S4-12	2 x 12.20	20	3.70	2.00 ... 4.00	14.00	Normal	OptiMOS™	TDSON-8-4 dual
IPG20N04S4-12A	2 x 12.20	20	3.70	2.00 ... 4.00	14.00	Normal	OptiMOS™	TDSON-8-10

1) See packages on page 140 and 141

## 55 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF3805L-7P	2.60	240	0.40	2.00 ... 4.00	130	Normal	Gen 10.2	TO-263CA 7 pin
AUIRF3805S-7P	2.60	240	0.40	2.00 ... 4.00	130	Normal	Gen 10.2	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF3805	3.30	160	0.50	2.00 ... 4.00	190	Normal	Gen 10.2	TO-220
AUIRF3805L	3.30	160	0.50	2.00 ... 4.00	190	Normal	Gen 10.2	TO-262
AUIRF1405ZL	4.90	150	0.65	2.00 ... 4.00	120	Normal	Gen 10.2	TO-262
AUIRF1405ZS	4.90	150	0.65	2.00 ... 4.00	120	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRF1405ZS-7P	4.90	150	0.65	2.00 ... 4.00	120	Normal	Gen 10.2	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF3205Z	6.50	75	0.90	2.00 ... 4.00	76	Normal	Gen 10.2	TO-220
AUIRF1010Z	7.50	75	1.11	2.00 ... 4.00	63	Normal	Gen 10.2	TO-220
AUIRL3705Z	8.00	75	1.14	1.00 ... 3.00	40	Logic	Gen 10.2	TO-220
AUIRFR48Z	11.00	42	1.64	2.00 ... 4.00	40	Normal	Gen 10.2	TO-252 (DPAK 3-leg)
AUIRFZ48Z	11.00	61	1.64	2.00 ... 4.00	43	Normal	Gen 10.2	TO-220
AUIRLZ44Z	13.50	51	1.87	1.00 ... 3.00	24	Logic	Gen 10.2	TO-220
AUIRLZ44ZL	13.50	51	1.87	1.00 ... 3.00	24	Logic	Gen 10.2	TO-262
AUIRLZ44ZS	13.50	51	1.87	1.00 ... 3.00	24	Logic	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFZ44ZS	13.90	51	1.87	2.00 ... 4.00	29	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFZ44Z	13.90	51	1.87	2.00 ... 4.00	29	Normal	Gen 10.2	TO-220
AUIRFR2905Z	14.50	42	1.38	2.00 ... 4.00	29	Normal	Gen 10.2	TO-252 (DPAK 3-leg)
AUIRFR4105Z	24.50	30	3.12	2.00 ... 4.00	18	Normal	Gen 10.2	TO-252 (DPAK 3-leg)
AUIRLR024Z	58.00	16	4.28	1.00 ... 3.00	7	Logic	Gen 10.2	TO-252 (DPAK 3-leg)
AUIRLU024Z	58.00	16	4.28	1.00 ... 3.00	7	Logic	Gen 10.2	IPAK
AUIRL024Z	60.00	5	n/a	2.00 ... 4.00	7	Normal	Gen 10.2	SOT-223

## 60 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7749L2	1.60	200	1.50	2.00 ... 4.00	200	Normal	Gen 10.7	DirectFET™2 L8
IPB180N06S4-H1	1.70	180	0.60	2.00 ... 4.00	208	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
AUIRLS3036-7P	1.90	240	0.40	1.00 ... 2.50	110	Logic	Gen 10.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)
IPB120N06S4-H1	2.00	120	0.60	2.00 ... 4.00	208	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPB120N06S4-02	2.40	120	0.80	2.00 ... 4.00	150	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPP120N06S4-H1	2.40	120	0.60	2.00 ... 4.00	208	Normal	OptiMOS™ -T2	TO220-3
AUIRLS3036	2.40	195	0.40	1.00 ... 2.50	91	Logic	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPB120N06S4-03	2.80	120	0.90	2.00 ... 4.00	125	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI120N06S4-02	2.80	120	0.80	2.00 ... 4.00	150	Normal	OptiMOS™ -T2	TO262-3
IPB90N06S4L-04	3.40	90	1.00	1.20 ... 2.00	133	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI90N06S4L-04	3.40	90	1.00	1.20 ... 2.00	133	Logic	OptiMOS™ -T2	TO262-3
IPD100N06S4-03	3.50	100	1.00	2.00 ... 4.00	99	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPD90N06S4L-03	3.50	90	1.00	1.20 ... 2.00	133	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB90N06S4-04	3.70	90	1.00	2.00 ... 4.00	99	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPD90N06S4-04	3.80	90	1.00	2.00 ... 4.00	99	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPI90N06S4-04	4.00	90	1.00	2.00 ... 4.00	99	Normal	OptiMOS™ -T2	TO262-3
AUIRFS3306	4.20	120	0.65	2.00 ... 4.00	85	Normal	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD90N06S4L-05	4.60	90	1.40	1.20 ... 2.00	83	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N06S4L-05	4.80	80	1.40	1.20 ... 2.00	83	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))

1) See packages on page 140 and 141

# Automotive N-channel MOSFETs

## 60 V (Trench) (cont'd)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPD90N06S4-05	5.10	90	1.40	2.00 ... 4.00	62.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N06S4-05	5.40	80	1.40	2.00 ... 4.00	62.00	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPB80N06S4-07	7.10	80	1.90	2.00 ... 4.00	43.00	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI80N06S4-05	5.40	80	1.40	2.00 ... 4.00	62.00	Normal	OptiMOS™ -T2	TO262-3
IPD90N06S4L-06	6.30	90	1.90	1.20 ... 2.00	58.00	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB80N06S4L-07	6.40	80	1.90	1.20 ... 2.00	58.00	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI80N06S4L-07	6.40	80	1.90	1.20 ... 2.00	58.00	Logic	OptiMOS™ -T2	TO262-3
IPD90N06S4-07	6.90	90	1.90	2.00 ... 4.00	43.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRF7648M2	7.00	68	2.40	3.00 ... 4.90	35.00	Normal	Gen 10.7	DirectFET™2 M4
IPI80N06S4-07	7.40	80	1.90	2.00 ... 4.00	43.00	Normal	OptiMOS™ -T2	TO262-3
IPD50N06S4L-08	7.80	50	2.10	1.20 ... 2.00	49.00	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPB45N06S4L-08	7.90	45	2.10	1.20 ... 2.00	49.00	Logic	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI45N06S4L-08	8.20	45	2.10	1.20 ... 2.00	49.00	Logic	OptiMOS™ -T2	TO262-3
AUIRF1010EZS	8.50	75	1.11	2.00 ... 4.00	58.00	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD50N06S4-09	9.00	50	2.10	2.00 ... 4.00	36.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
IPI45N06S4-09	9.40	45	2.10	2.00 ... 4.00	36.00	Normal	OptiMOS™ -T2	TO262-3
IPP45N06S4-09	9.40	45	2.10	2.00 ... 4.00	36.00	Normal	OptiMOS™ -T2	TO220-3
IPD50N06S4L-12	12.00	50	3.00	1.20 ... 2.00	30.00	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRFZ44VZS	12.00	57	1.64	2.00 ... 4.00	43.00	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFR3806	15.80	43	2.12	2.00 ... 4.00	22.00	Normal	Gen 10.7	TO-252 (DPAK 3-leg)
AUIRFS3806	15.80	43	2.12	2.00 ... 4.00	22.00	Normal	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD30N06S4L-23	23.00	30	4.20	1.20 ... 2.00	16.10	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPD25N06S4L-30	30.00	25	5.10	1.20 ... 2.00	12.50	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRF7640S2	36.00	21	5.00	3.00 ... 5.00	7.00	Normal	Gen 10.7	DirectFET™2 SB
IPG20N06S4L-11	2 x 11.10	20	2.30	1.20 ... 2.20	41.00	Logic	OptiMOS™ T2	TDSON-8-4 dual
IPG20N06S4L-11A	2 x 11.10	20	2.30	1.20 ... 2.20	41.00	Logic	OptiMOS™ T2	TDSON-8-10
IPG20N06S4L-14	2 x 13.70	20	3.00	1.20 ... 2.20	30.00	Logic	OptiMOS™ T2	TDSON-8-4 dual
IPG20N06S4L-14A	2 x 13.70	20	3.00	1.20 ... 2.20	30.00	Logic	OptiMOS™ T2	TDSON-8-10
IPG20N06S4-15	2 x 15.50	20	3.00	2.00 ... 4.00	22.00	Normal	OptiMOS™ T2	TDSON-8-4 dual
IPG20N06S4-15A	2 x 15.50	20	3.00	2.00 ... 4.00	22.00	Normal	OptiMOS™ T2	TDSON-8-10
IPG20N06S4L-26	2 x 26.00	20	4.50	1.20 ... 2.20	20.00	Logic	OptiMOS™ T2	TDSON-8-4 dual
IPG20N06S4L-26A	2 x 26.00	20	4.50	1.20 ... 2.20	20.00	Logic	OptiMOS™ T2	TDSON-8-10

## 75 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7759L2	2.30	160	1.20	2.00 ... 4.00	200	Normal	Gen 10.7	DirectFET™2 L8
AUIRFS3107	3.00	195	0.40	2.00 ... 4.00	160	Normal	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPB80N07S4-05	5.20	80	1.00	2.00 ... 4.00	69	Normal	OptiMOS™ T2	TO263-3-2 (TO220-3 (SMD))
IPI80N07S4-05	5.20	80	1.00	2.00 ... 4.00	69	Normal	OptiMOS™ T2	TO262-3
IPP80N08S4-06	5.50	80	1.00	2.00 ... 4.00	70	Normal	OptiMOS™ T2	TO220-3
AUIRF2907Z	4.50	75	0.50	2.00 ... 4.00	180	Normal	Gen 10.2	TO-220
AUIRFB3207	4.50	75	0.50	2.00 ... 4.00	180	Normal	Gen 10.2	TO-220
AUIRFP2907Z	4.50	75	0.50	2.00 ... 4.00	180	Normal	Gen 10.2	TO-247
AUIRFN7107	8.50	76	1.20	2.00 ... 4.00	52	Normal	Gen 10.7	PQFN 5x6 mm
AUIRFR2607Z	22.00	42	1.38	2.00 ... 4.00	34	Normal	Gen 10.2	TO-252 (DPAK 3-leg)

1) See packages on page 140 and 141

## 80 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB180N08S4-02	2.20	180	0.54	2.00 ... 4.00	167	Normal	OptiMOS™ T2	TO263-7-3 (TO220-7 (SMD))
IPB120N08S4-03	2.50	120	0.54	2.00 ... 4.00	167	Normal	OptiMOS™ T2	TO263-3-2 (TO220-3 (SMD))
IPI120N08S4-03	2.50	120	0.54	2.00 ... 4.00	167	Normal	OptiMOS™ T2	TO262-3
IPP120N08S4-03	2.50	120	0.54	2.00 ... 4.00	167	Normal	OptiMOS™ T2	TO220-3
IPB160N08S4-03	3.20	160	0.72	2.00 ... 4.00	112	Normal	OptiMOS™ T2	TO263-7-3 (TO220-7 (SMD))
IPB120N08S4-04	4.10	120	0.84	2.00 ... 4.00	95	Normal	OptiMOS™ T2	TO263-3-2 (TO220-3 (SMD))
IPI120N08S4-04	4.10	120	0.84	2.00 ... 4.00	95	Normal	OptiMOS™ T2	TO262-3
IPP120N08S4-04	4.10	120	0.84	2.00 ... 4.00	95	Normal	OptiMOS™ T2	TO220-3
IPB140N08S4-04	4.20	140	0.90	2.00 ... 4.00	80	Normal	OptiMOS™ T2	TO263-7-3 (TO220-7 (SMD))
IPP80N07S4-05	5.20	80	1.00	2.00 ... 4.00	69	Normal	OptiMOS™ T2	TO220-3
IPD90N08S4-05	5.30	90	1.00	2.00 ... 4.00	68	Normal	OptiMOS™ T2	TO252-3 (DPAK)
IPB80N08S4-06	5.50	80	1.00	2.00 ... 4.00	70	Normal	OptiMOS™ T2	TO263-3-2 (TO220-3 (SMD))
IPI80N08S4-06	5.50	80	1.00	2.00 ... 4.00	70	Normal	OptiMOS™ T2	TO262-3
IPD50N08S4-13	13.20	50	2.10	2.00 ... 4.00	30	Normal	OptiMOS™ T2	TO252-3 (DPAK)

## 100 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB180N10S4-02	2.50	180	0.50	2.00 ... 3.50	156	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB180N10S4-03	3.30	180	0.60	2.00 ... 3.50	108	Normal	OptiMOS™ -T2	TO263-7-3 (TO220-7 (SMD))
IPB120N10S4-03	3.50	120	0.60	2.00 ... 3.50	108	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI120N10S4-03	3.50	120	0.60	2.00 ... 3.50	108	Normal	OptiMOS™ -T2	TO262-3
IPP120N10S4-03	3.50	120	0.60	2.00 ... 3.50	108	Normal	OptiMOS™ -T2	TO220-3
AUIRF7769L2	3.50	124	1.20	2.00 ... 4.00	200	Normal	Gen 10.7	DirectFET™2 L8
AUIRLS4030-7P	3.90	190	0.40	1.00 ... 2.50	93	Logic	Gen 10.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRLS4030	4.30	180	0.40	1.00 ... 2.50	87	Logic	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRF7669L2	4.40	114	1.20	3.00 ... 5.00	81	Normal	Gen 10.7	DirectFET™2 L8
AUIRFP4110	4.50	120	0.40	2.00 ... 4.00	150	Normal	Gen 10.7	TO-247
IPB100N10S3-05	4.80	100	0.50	2.00 ... 4.00	135	Normal	OptiMOS™ T	TO263-3-2 (TO220-3 (SMD))
IPB120N10S4-05	5.00	120	0.80	2.00 ... 3.50	70	Normal	OptiMOS™ -T2	TO263-3-2 (TO220-3 (SMD))
IPI120N10S4-05	5.00	120	0.80	2.00 ... 3.50	70	Normal	OptiMOS™ -T2	TO262-3
IPP120N10S4-05	5.00	120	0.80	2.00 ... 3.50	70	Normal	OptiMOS™ -T2	TO220-3
IPI100N10S3-05	5.10	100	0.50	2.00 ... 4.00	135	Normal	OptiMOS™ T	TO262-3
IPP100N10S3-05	5.10	100	0.50	2.00 ... 4.00	135	Normal	OptiMOS™ T	TO220-3
AUIRFS4310Z	6.00	120	0.60	2.00 ... 4.00	120	Normal	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD90N10S4L-06	6.60	90	1.10	1.10 ... 2.10	75	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPD90N10S4-06	6.70	90	1.10	2.00 ... 3.50	52	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRFS4310	7.00	75	0.50	2.00 ... 4.00	170	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFB4410	10.00	75	0.61	2.00 ... 4.00	120	Normal	Gen 10.2	TO-220

1) See packages on page 140 and 141

# Automotive N-channel MOSFETs

100 V (Trench) (cont'd)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_b$ [A]	$R_{th,jc}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_g$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRL7766M2	10.00	51	2.40	1.00 ... 2.50	44.00	Logic	Gen 10.7	DirectFET™2 M4
IPD70N10S3-12	11.10	70	1.20	2.00 ... 4.00	51.00	Normal	OptiMOS™ T	TO252-3 (DPAK)
IPB70N10S3-12	11.30	70	1.20	2.00 ... 4.00	51.00	Normal	OptiMOS™ T	TO263-3-2 (TO220-3 (SMD))
IPD70N10S3L-12	11.50	70	1.20	1.20 ... 2.40	60.00	Logic	OptiMOS™ T	TO252-3 (DPAK)
IPI70N10S3-12	11.60	70	1.20	2.00 ... 4.00	51.00	Normal	OptiMOS™ T	TO262-3
IPB70N10S3L-12	11.80	70	1.20	1.20 ... 2.40	60.00	Logic	OptiMOS™ T	TO263-3-2 (TO220-3 (SMD))
IPD60N10S4L-12	12.00	60	1.60	1.10 ... 2.10	38.00	Logic	OptiMOS™ -T2	TO252-3 (DPAK)
IPI70N10S3L-12	12.10	70	1.20	1.20 ... 2.40	60.00	Logic	OptiMOS™ T	TO262-3
IPP70N10S3L-12	12.10	70	1.20	1.20 ... 2.40	60.00	Logic	OptiMOS™ T	TO220-3
IPD60N10S4-12	12.20	60	1.60	2.00 ... 3.50	26.00	Normal	OptiMOS™ -T2	TO252-3 (DPAK)
AUIRFB4610	14.00	73	0.77	2.00 ... 4.00	90.00	Normal	Gen 10.2	TO-220
IPD50N10S3L-16	15.00	50	1.50	1.20 ... 2.40	49.00	Logic	OptiMOS™ T	TO252-3 (DPAK)
IPB50N10S3L-16	15.40	70	1.50	1.20 ... 2.40	49.00	Logic	OptiMOS™ T	TO263-3-2 (TO220-3 (SMD))
IPI50N10S3L-16	15.70	50	1.50	1.20 ... 2.40	49.00	Logic	OptiMOS™ T	TO262-3
IPP50N10S3L-16	15.70	50	1.50	1.20 ... 2.40	49.00	Logic	OptiMOS™ T	TO220-3
AUIRF3710Z	18.00	59	0.92	2.00 ... 4.00	82.00	Normal	Gen 10.2	TO-220
AUIRF3710ZS	18.00	59	0.92	2.00 ... 4.00	82.00	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD35N10S3L-26	24.00	35	2.10	1.20 ... 2.40	39.00	Logic	OptiMOS™ T	TO252-3 (DPAK)
AUIRF540ZS	26.50	36	1.64	2.00 ... 4.00	42.00	Normal	Gen 10.2	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFR540Z	26.50	36	1.64	2.00 ... 4.00	42.00	Normal	Gen 10.2	TO-252 (DPAK 3-leg)
AUIRF540Z	26.50	36	1.64	2.00 ... 4.00	43.00	Normal	Gen 10.2	TO-220
IPD30N10S3L-34	31.00	30	2.60	1.20 ... 2.40	24.00	Logic	OptiMOS™ T	TO252-3 (DPAK)
AUIRF7647S2	31.00	24	3.70	3.00 ... 5.00	14.00	Normal	Gen 10.7	DirectFET™2 SC
AUIRF7665S2	62.00	14	5.00	3.00 ... 5.00	8.00	Normal	Gen 10.7	DirectFET™2 SB
AUIRFR120Z	190.00	9	4.28	2.00 ... 4.00	7.00	Normal	Gen 10.2	TO-252 (DPAK 3-leg)
AUIRFU120Z	190.00	9	4.28	2.00 ... 4.00	7.00	Normal	Gen 10.2	IPAK
IPG20N10S4L-22	2 x 22.00	20	2.50	1.10 ... 2.10	21.00	Logic	OptiMOS™ T2	TDSON-8-4 dual
IPG20N10S4L-22A	2 x 22.00	20	2.50	1.10 ... 2.10	21.00	Logic	OptiMOS™ T2	TDSON-8-10
IPG20N10S4L-35	2 x 35.00	20	3.50	1.10 ... 2.10	13.40	Logic	OptiMOS™ T2	TDSON-8-4 dual
IPG20N10S4L-35A	2 x 35.00	20	3.50	1.10 ... 2.10	13.40	Logic	OptiMOS™ T2	TDSON-8-10
IPG20N10S4-36A	2 x 36.00	20	3.50	2.00 ... 3.50	9.40	Normal	OptiMOS™ T2	TDSON-8-10
IPG16N10S4-61	2 x 61.00	16	5.20	2.00 ... 3.50	5.40	Normal	OptiMOS™ T2	TDSON-8-4 dual
IPG16N10S4-61A	2 x 61.00	16	5.20	2.00 ... 3.50	5.40	Normal	OptiMOS™ T2	TDSON-8-10
IPG16N10S4L-61A	2 x 61.00	16	5.20	1.10 ... 2.10	8.50	Logic	OptiMOS™ T2	TDSON-8-10

1) See packages on page 140 and 141

## 150 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRFP4568	5.90	171	0.29	3.00 ... 5.00	151	Normal	Gen 10.7	TO-247
AUIRFS4115-7P	11.80	105	0.40	3.00 ... 5.00	73	Normal	Gen 10.7	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRFS4115	12.10	99	0.40	3.00 ... 5.00	77	Normal	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFR4615	42.00	33	1.05	3.00 ... 5.00	26	Normal	Gen 10.7	TO-252 (DPAK 3-leg)
AUIRF7675M2	56.00	18	3.30	3.00 ... 5.00	21	Normal	Gen 10.7	DirectFET™2 M2

## 200 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRFR4620	78	24	1.05	3.00 ... 5.00	25	Normal	Gen 10.7	TO-252 (DPAK 3-leg)

## 250 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB64N25S3-20	20	64.00	0.50	2.00 ... 4.00	67	Normal	OptiMOS™ T	TO263-3-2 (TO220-3 (SMD))
AUIRF7799L2	32	35.00	1.20	3.00 ... 5.00	110	Normal	Gen 10.7	DirectFET™2 L8
IPB17N25S3-100	100	17.00	1.40	2.00 ... 4.00	14	Normal	OptiMOS™ T	TO263-3-2 (TO220-3 (SMD))
IPP17N25S3-100	100	17.00	1.40	2.00 ... 4.00	14	Normal	OptiMOS™ T	TO220-3
AUIRFR4292	345	9.30	1.50	3.00 ... 5.00	13	Normal	Gen 10.7	TO-252 (DPAK 3-leg)
IPD5N25S3-430	430	5.00	3.70	2.00 ... 4.00	5	Normal	OptiMOS™ T	TO252-3 (DPAK)

## 300 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRFP4409	69	38	0.44	3.00 ... 5.00	83	Normal	Gen 10.7	TO-247
AUIRFS6535	185	19	0.71	3.00 ... 5.00	38	Normal	Gen 10.7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFS6535	185	19	0.71	3.00 ... 5.00	38	Normal	Gen 10.7	TO-262

1) See packages on page 140 and 141

# Automotive N-channel MOSFETs

## 30 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPD50N03S2L-06	6.40	50.00	1.10	1.20 ... 2.00	50	Logic	OptiMOS™	TO252-3 (DPAK)
AUIRL2203N	7.00	75.00	0.85	1.00 ... 3.00	60	Logic	Gen 7	TO-220
IPD50N03S2-07	7.30	50.00	1.10	2.10 ... 4.00	52	Normal	OptiMOS™	TO252-3 (DPAK)
IPD30N03S2L-10	10.00	30.00	1.50	1.20 ... 2.00	31	Logic	OptiMOS™	TO252-3 (DPAK)
AUIRF7805Q	11.00	13.00	20.00	1.00 ... 3.00	11	Logic	Gen 5	SO-8 (DSO-8)
IPD30N03S2L-20	20.00	30.00	2.50	1.20 ... 2.00	14	Logic	OptiMOS™	TO252-3 (DPAK)
AUIRF7313Q	2 x 29.00	7.00	20.00	1.00 ... 3.00	22	Logic	Gen 5	SO-8 (DSO-8)
AUIRF7303Q	2 x 50.00	4.90	20.00	1.00 ... 3.00	14	Logic	Gen 5	SO-8 (DSO-8)

## 40 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB160N04S2L-03	2.70	160	0.50	1.20 ... 2.00	230	Logic	OptiMOS™	TO263-7-3 (TO220-7 (SMD))
IPB160N04S2-03	2.90	160	0.50	2.10 ... 4.00	123	Normal	OptiMOS™	TO263-7-3 (TO220-7 (SMD))
AUIRL1404S	3.10	75	0.75	1.00 ... 3.00	93	Logic	Gen 7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPB100N04S2-04	3.30	100	0.50	2.10 ... 4.00	172	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB80N04S2-04	3.40	80	0.50	2.10 ... 4.00	127	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB80N04S2-H4	3.70	80	0.50	1.20 ... 2.00	103	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPI80N04S2-04	3.70	80	0.50	2.10 ... 4.00	170	Normal	OptiMOS™	TO262-3
IPI80N04S2-H4	4.00	80	0.50	2.10 ... 4.00	148	Normal	OptiMOS™	TO262-3
AUIRF1404S	4.00	75	0.75	2.00 ... 4.00	131	Normal	Gen 7	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRF1404	4.00	75	0.75	2.00 ... 4.00	131	Normal	Gen 7	TO-220
AUIRF3504	9.20	87	1.09	2.00 ... 4.00	48	Normal	Gen 7	TO-252 (DPAK 3-leg)
AUIRF3504	9.20	87	1.09	2.00 ... 4.00	48	Normal	Gen 7	TO-220
AUIRF7484Q	10.00	14	20.00	1.00 ... 2.00	69	Logic	Gen 7	SO-8 (DSO-8)

## 50 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7103Q	2 x 130	3	20.00	1.00 ... 3.00	10	Logic	Gen 5	SO-8 (DSO-8)

## 55 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB80N06S2L-07	3.70	80	0.70	1.20 ... 2.00	95	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB100N06S2L-05	4.40	100	0.50	1.20 ... 2.00	170	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB80N06S2L-05	4.50	80	0.50	1.20 ... 2.00	170	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB100N06S2-05	4.70	100	0.50	2.10 ... 4.00	130	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB80N06S2L-H5	4.70	80	0.50	1.20 ... 2.00	145	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPP100N06S2L-05	4.70	100	0.50	1.20 ... 2.00	170	Logic	OptiMOS™	TO220-3
AUIRF2805	4.70	75	0.45	2.00 ... 4.00	150	Normal	Gen 7	TO-220
IPB80N06S2-05	4.80	80	0.50	2.10 ... 4.00	130	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPI80N06S2L-05	4.80	80	0.50	1.20 ... 2.00	170	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPP80N06S2L-H5	5.00	80.00	0.50	1.20 ... 2.00	145.00	Logic	OptiMOS™	TO220-3

1) See packages on page 140 and 141



## 55 V (Planar) (cont'd)



Product type	R <sub>DS(on)</sub> @ 10 V [mΩ]	I <sub>b</sub> [A]	R <sub>th,jc</sub> (max) [K/W]	V <sub>GS(th)</sub> (min-max) [V]	Q <sub>c</sub> (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRFBA1405	5.00	174.00	0.45	2.00 ... 4.00	170.00	Normal	Gen 5	TO-220
IPB80N06S2-H5	5.20	80.00	0.50	2.10 ... 4.00	116.00	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
AUIRF1405	5.30	75.00	0.45	2.00 ... 4.00	170.00	Normal	Gen 7	TO-220
AUIRFP1405	5.30	95.00	0.49	2.00 ... 4.00	120.00	Normal	Gen 7	TO-247
IPP80N06S2-H5	5.50	80.00	0.50	2.10 ... 4.00	116.00	Normal	OptiMOS™	TO220-3
IPB80N06S2L-06	6.00	80.00	0.60	1.20 ... 2.00	114.00	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB80N06S2-07	6.30	80.00	0.60	2.10 ... 4.00	86.00	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPI80N06S2-07	6.60	80.00	0.60	2.10 ... 4.00	86.00	Normal	OptiMOS™	TO262-3
IPP80N06S2-07	6.60	80.00	0.60	2.10 ... 4.00	86.00	Normal	OptiMOS™	TO220-3
IPP80N06S2L-07	7.00	80.00	0.70	1.20 ... 2.00	95.00	Logic	OptiMOS™	TO220-3
IPB80N06S2-08	7.70	80.00	0.70	2.10 ... 4.00	72.00	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPI80N06S2-08	8.00	80.00	0.70	2.10 ... 4.00	72.00	Normal	OptiMOS™	TO262-3
AUIRF3205	8.00	75.00	0.75	2.00 ... 4.00	97.00	Normal	Gen 5	TO-220
AUIRF3305	8.00	140.00	0.45	2.00 ... 4.00	100.00	Normal	Gen 5	TO-220
AUIRFI3205	8.00	64.00	2.40	2.00 ... 4.00	113.00	Normal	Gen 5	TO-220 FullPak
AUIRFP064N	8.00	110.00	0.75	2.00 ... 4.00	113.00	Normal	Gen 5	TO-247
AUIRLI2505	8.00	58.00	2.40	1.00 ... 3.00	87.00	Logic	Gen 5	TO-220 FullPak
IPB80N06S2L-09	8.20	80.00	0.80	1.20 ... 2.00	82.00	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPP80N06S2L-09	8.50	80.00	0.80	1.20 ... 2.00	82.00	Logic	OptiMOS™	TO220-3
IPB80N06S2-09	8.80	80.00	0.80	2.10 ... 4.00	60.00	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPP80N06S2-09	9.10	80.00	0.80	2.10 ... 4.00	60.00	Normal	OptiMOS™	TO220-3
IPP80N06S2L-09	11.00	80.00	0.95	1.20 ... 2.00	62.00	Logic	OptiMOS™	TO220-3
IPB77N06S2-12	11.70	77.00	0.95	2.10 ... 4.00	45.00	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPP77N06S2-12	12.00	77.00	0.95	2.10 ... 4.00	45.00	Normal	OptiMOS™	TO220-3
IPD50N06S2L-13	12.70	50.00	1.10	1.20 ... 2.00	52.00	Logic	OptiMOS™	TO252-3 (DPAK)
IPD30N06S2L-13	13.00	30.00	1.10	1.20 ... 2.00	52.00	Logic	OptiMOS™	TO252-3 (DPAK)
AUIRFZ48N	14.00	64.00	0.95	2.00 ... 4.00	54.00	Normal	Gen 7	TO-220
IPD50N06S2-14	14.40	50.00	1.10	2.10 ... 4.00	39.00	Normal	OptiMOS™	TO252-3 (DPAK)
IPD30N06S2-15	14.70	30.00	1.10	1.20 ... 2.00	39.00	Normal	OptiMOS™	TO252-3 (DPAK)
AUIRFZ46NL	16.50	39.00	1.40	2.00 ... 4.00	48.00	Normal	Gen 7	TO-262
AUIRFZ44N	17.50	49.00	1.50	2.00 ... 4.00	42.00	Normal	Gen 7	TO-220
IPD30N06S2L-23	23.00	30.00	1.50	1.20 ... 2.00	33.00	Logic	OptiMOS™	TO252-3 (DPAK)
IPD30N06S2-23	23.00	30.00	1.50	2.10 ... 4.00	25.00	Normal	OptiMOS™	TO252-3 (DPAK)
AUIRFIZ44N	24.00	31.00	3.30	2.00 ... 4.00	43.00	Normal	Gen 5	TO-220 FullPak
AUIRLR2905	27.00	42.00	1.40	1.00 ... 2.00	36.00	Logic	Gen 5	TO-252 (DPAK 3-leg)
BSP603S2L	33.00	5.20	20.00	1.20 ... 2.00	31.00	Logic	OptiMOS™	SOT223
IPD26N06S2L-35	35.00	30.00	2.20	1.20 ... 2.00	10.00	Logic	OptiMOS™	TO252-3 (DPAK)
IPD25N06S2-40	40.00	29.00	2.20	2.10 ... 4.00	14.00	Normal	OptiMOS™	TO252-3 (DPAK)
AUIRFIZ34N	40.00	21.00	4.10	2.00 ... 4.00	23.00	Normal	Gen 5	TO-220 FullPak
AUIRFZ34N	40.00	29.00	2.20	2.00 ... 4.00	23.00	Normal	Gen 5	TO-220
AUIRLL2705	40.00	5.00	120.00	1.00 ... 3.00	32.00	Logic	Gen 5	SOT-223
AUIRLZ24NS	60.00	18.00	3.30	1.00 ... 2.00	7.00	Logic	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)
IPD15N06S2L-64	64.00	19.00	3.20	1.20 ... 2.00	11.00	Logic	OptiMOS™	TO252-3 (DPAK)
AUIRLL024N	65.00	4.00	120.00	1.00 ... 2.00	7.00	Logic	Gen 5	SOT-223
AUIRLR024N	65.00	17.00	3.30	1.00 ... 2.00	10.00	Logic	Gen 5	TO-252 (DPAK 3-leg)
AUIRFZ24NS	70.00	17.00	3.30	2.00 ... 4.00	13.00	Normal	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFL024N	75.00	3.00	120.00	2.00 ... 4.00	12.00	Normal	Gen 5	SOT-223
IPD14N06S2-80	80.00	17.00	3.20	2.10 ... 4.00	8.00	Normal	OptiMOS™	TO252-3 (DPAK)
AUIRLL014N	140.00	3.00	120.00	1.00 ... 2.00	10.00	Logic	Gen 5	SOT-223
AUIRLR014N	140.00	10.00	5.30	1.00 ... 3.00	5.00	Logic	Gen 5	TO-252 (DPAK 3-leg)
AUIRFL014N	160.00	2.00	120.00	2.00 ... 4.00	7.00	Normal	Gen 5	SOT-223
IPG20N06S2L-35	2 x 35.00	20.00	2.30	1.20 ... 2.20	18.00	Logic	OptiMOS™	TDSON-8-4 dual
IPG20N06S2L-35A	2 x 35.00	20.00	2.30	1.20 ... 2.20	18.00	Logic	OptiMOS™	TDSON-8-4 dual
AUIRF7341Q	2 x 50.00	5.10	20.00	1.00 ... 3.00	29.00	Logic	Gen 5	SO-8 (DSO-8)
IPG20N06S2L-50	2 x 50.00	20.00	2.90	1.20 ... 2.20	12.40	Logic	OptiMOS™	TDSON-8-4 dual
IPG20N06S2L-50A	2 x 50.00	20.00	2.90	1.20 ... 2.20	12.40	Logic	OptiMOS™	TDSON-8-10
IPG20N06S2L-65	2 x 65.00	20.00	3.50	1.20 ... 2.20	10.00	Logic	OptiMOS™	TDSON-8-4 dual
IPG20N06S2L-65A	2 x 65.00	20.00	3.50	1.20 ... 2.20	10.00	Logic	OptiMOS™	TDSON-8-10

1) See packages on page 140 and 141

# Automotive N-channel MOSFETs

## 60 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7478Q	26	7	20	1.00 ... 3.00	21	Logic	Gen 7	SO-8 (DSO-8)

## 75 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRFP2907	4.50	90	0.32	2.00 ... 4.00	410	Normal	Gen 7	TO-247
IPB100N08S2L-07	6.50	100	0.50	1.20 ... 2.00	185	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB100N08S2-07	6.80	100	0.50	2.10 ... 4.00	153	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPB80N08S2L-07	6.80	80	0.50	1.20 ... 2.00	186	Logic	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPP100N08S2L-07	6.80	100	0.50	1.20 ... 2.00	182	Logic	OptiMOS™	TO220-3
IPB80N08S2-07	7.10	80	0.50	2.10 ... 4.00	182	Normal	OptiMOS™	TO263-3-2 (TO220-3 (SMD))
IPI100N08S2-07	7.10	100	0.50	2.10 ... 4.00	144	Normal	OptiMOS™	TO262-3
IPP80N08S2L-07	7.10	80	0.50	1.20 ... 2.00	183	Logic	OptiMOS™	TO220-3
IPI80N08S2-07	7.40	80	0.50	2.10 ... 4.00	144	Normal	OptiMOS™	TO262-3
AUIRF3007	12.60	75	0.74	2.00 ... 4.00	89	Normal	Gen 7	TO-220
AUIRF2807	13.00	75	0.65	2.00 ... 4.00	107	Normal	Gen 7	TO-220
IPD30N08S2L-21	20.50	30	1.10	1.20 ... 2.00	43	Logic	OptiMOS™	TO252-3 (DPAK)
IPD30N08S2-22	21.50	30	1.10	2.10 ... 4.00	44	Normal	OptiMOS™	TO252-3 (DPAK)
IPD22N08S2L-50	50.00	22	2.00	1.20 ... 2.00	21	Logic	OptiMOS™	TO252-3 (DPAK)

## 100 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRLR3410	105	15	1.90	1.00 ... 2.00	23	Logic	Gen 5	TO-252 (DPAK 3-leg)
AUIRLR120N	185	11	3.10	1.00 ... 2.00	13	Logic	Gen 5	TO-252 (DPAK 3-leg)

## 150 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF3415	42	43	0.75	2.00 ... 4.00	133	Normal	Gen 5	TO-220
AUIRF3315S	82	21	1.60	2.00 ... 4.00	63	Normal	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)

1) See packages on page 140 and 141

# Automotive P-channel MOSFETs

## 30 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB80P03P4L-04	4.10	-80	1.10	-2.00 ... -1.00	125	Logic	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPI80P03P4L-04	4.40	-80	1.10	-2.00 ... -1.00	125	Logic	OptiMOS™-P2	TO262-3
IPP80P03P4L-04	4.40	-80	1.10	-2.00 ... -1.00	125	Logic	OptiMOS™-P2	TO220-3
IPD90P03P4L-04	4.50	-90	1.10	-2.00 ... -1.00	100	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPD90P03P4-04	4.50	-90	1.10	-4.00 ... -2.00	100	Normal	OptiMOS™-P2	TO252-3 (DPAK)
IPB80P03P4-05	4.70	-80	1.10	-4.00 ... -2.00	100	Normal	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPI80P03P4-05	5.00	-80	1.10	-4.00 ... -2.00	100	Normal	OptiMOS™-P2	TO262-3
IPP80P03P4-05	5.00	-80	1.10	-4.00 ... -2.00	100	Normal	OptiMOS™-P2	TO220-3
IPD80P03P4L-07	6.80	-80	1.70	-2.00 ... -1.00	80	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPB80P03P4L-07	6.90	-80	1.70	-2.00 ... -1.00	63	Logic	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPI80P03P4L-07	7.20	-80	1.70	-2.00 ... -1.00	63	Logic	OptiMOS™-P2	TO262-3
IPP80P03P4L-07	7.20	-80	1.70	-2.00 ... -1.00	63	Logic	OptiMOS™-P2	TO220-3
IPD50P03P4L-11	10.50	-50	2.60	-2.00 ... -1.00	42	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPB45P03P4L-11	10.80	-45	2.60	-2.00 ... -1.00	42	Logic	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPP45P03P4L-11	11.10	-45	2.60	-2.00 ... -1.00	42	Logic	OptiMOS™-P2	TO220-3

## 40 V (Trench)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPB180P04P4L-02	2.40	-100	1.00	-2.20 ... -1.70	220	Logic	OptiMOS™-P2	TO263-7-3 (TO220-7 (SMD))
IPB180P04P4-03	2.80	-100	1.00	-4.00 ... -2.00	190	Normal	OptiMOS™-P2	TO263-7-3 (TO220-7 (SMD))
IPB120P04P4L-03	3.00	-120	1.10	-2.20 ... -1.70	180	Logic	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPP120P04P4L-03	3.40	-120	1.10	-2.20 ... -1.70	180	Logic	OptiMOS™-P2	TO220-3
IPI120P04P4L-03	3.40	-120	1.10	-2.20 ... -1.70	180	Logic	OptiMOS™-P2	TO262-3
IPB120P04P4-04	3.60	-120	1.10	-4.00 ... -2.00	158	Normal	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPP120P04P4-04	3.90	-120	1.10	-4.00 ... -2.00	158	Normal	OptiMOS™-P2	TO220-3
IPI120P04P4-04	3.90	-120	1.10	-4.00 ... -2.00	135	Normal	OptiMOS™-P2	TO262-3
IPB80P04P4L-04	4.20	-90	1.20	-2.20 ... -1.70	135	Logic	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPD90P04P4L-04	4.30	-90	1.20	-2.20 ... -1.70	135	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPD90P04P4-05	4.70	-90	1.20	-4.00 ... -2.00	118	Normal	OptiMOS™-P2	TO252-3 (DPAK)
IPP80P04P4L-04	4.70	-80	1.20	-2.20 ... -1.70	16	Logic	OptiMOS™-P2	TO220-3
IPI80P04P4L-04	4.70	-80	1.20	-2.20 ... -1.70	16	Logic	OptiMOS™-P2	TO262-3
IPB80P04P4-05	4.90	-80	1.20	-4.00 ... -2.00	118	Normal	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPI80P04P4-05	5.20	-80	1.20	-4.00 ... -2.00	14	Normal	OptiMOS™-P2	TO262-3
IPB80P04P4L-06	6.40	-80	1.70	-2.20 ... -1.70	71	Logic	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPD85P04P4L-06	6.40	-85	1.70	-2.20 ... -1.70	80	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPP80P04P4L-06	6.70	-80	1.70	-2.20 ... -1.70	71	Logic	OptiMOS™-P2	TO220-3
IPI80P04P4L-06	6.70	-80	1.70	-2.20 ... -1.70	71	Logic	OptiMOS™-P2	TO262-3
IPB80P04P4-07	7.30	-80	1.70	-4.00 ... -2.00	71	Normal	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPD85P04P4-07	7.30	-85	1.70	-4.00 ... -2.00	69	Normal	OptiMOS™-P2	TO252-3 (DPAK)
IPP80P04P4-07	7.60	-80	1.70	-4.00 ... -2.00	71	Normal	OptiMOS™-P2	TO220-3
IPI80P04P4-07	7.60	-80	1.70	-4.00 ... -2.00	71	Normal	OptiMOS™-P2	TO262-3
IPD70P04P4L-08	7.80	-70	2.00	-2.20 ... -1.70	63	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPP80P04P4L-08	7.90	-80	2.00	-1.20 ... -2.20	71	Logic	OptiMOS™-P2	TO220-3
IPD70P04P4-09	8.90	-70	2.00	-4.00 ... -2.00	54	Normal	OptiMOS™-P2	TO252-3 (DPAK)
IPB70P04P4-09	9.30	-70	2.00	-4.00 ... -2.00	54	Normal	OptiMOS™-P2	TO263-3-2 (TO220-3 (SMD))
IPI70P04P4-09	9.40	-70	2.00	-4.00 ... -2.00	54	Normal	OptiMOS™-P2	TO262-3
IPD50P04P4L-11	10.60	-50	2.60	-2.20 ... -1.70	45	Logic	OptiMOS™-P2	TO252-3 (DPAK)
IPD50P04P4-13	12.70	-50	2.60	-4.00 ... -2.00	39	Normal	OptiMOS™-P2	TO252-3 (DPAK)

1) See packages on page 140 and 141

MOSFETs  
TEMPFET™  
HITFET™  
Smart multichannel switches  
PROFET™  
SPOC™  
LITIX™  
Motor drivers  
Power supply  
Automotive transceivers  
Automotive system ICs  
Glossary

# Automotive P-channel MOSFETs

## 20 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7207Q	60	-5.00	n/a	-1.60 ... -0.70	15	Logic	Gen 5	SO-8 (DSO-8)
AUIRF7304Q	2 x 90	-4.30	n/a	-1.60 ... -0.70	15	Logic	Gen 5	SO-8 (DSO-8)

## 30 V (Planar)



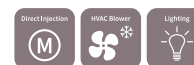
Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7416Q	20	-10.00	n/a	-2.00 ... -1.00	61	Logic	Gen 5	SO-8 (DSO-8)
AUIRF7316Q	2 x 58	-4.90	n/a	-3.00 ... -1.00	23	Logic	Gen 5	SO-8 (DSO-8)

## 55 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF4905	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	Gen 5	TO-220
AUIRF4905L	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	Gen 5	TO-262
AUIRF4905S	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFI4905	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	Gen 5	TO-220 FullPak
AUIRFR5305	65	-28.00	1.40	-4.00 ... -2.00	42	Normal	Gen 5	TO-252 (DPAK 3-leg)
AUIRF9Z34N	100	-17.00	2.20	-4.00 ... -2.00	23	Normal	Gen 5	TO-220
AUIRFR5505	110	-18.00	2.20	-4.00 ... -2.00	21	Normal	Gen 5	TO-252 (DPAK 3-leg)
AUIRFR9024N	175	-11.00	3.30	-4.00 ... -2.00	13	Normal	Gen 5	TO-252 (DPAK 3-leg)
AUIRF7342Q	2 x 105	-3.40	n/a	-3.00 ... -1.00	26	Logic	Gen 5	SO-8 (DSO-8)

## 100 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF5210S	60	-38	0.75	-4.00 ... -2.00	150	Normal	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRF9540N	117	-23	1.10	-4.00 ... -2.00	65	Normal	Gen 5	TO-220
AUIRFR5410	205	-13	1.90	-4.00 ... -2.00	39	Normal	Gen 5	TO-252 (DPAK 3-leg)

## 150 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF6218S	150	-27	0.61	-5.00 ... -3.00	71	Normal	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRF6215S	295	-13	1.40	-4.00 ... -2.00	44	Normal	Gen 5	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRFR6215	295	-13	1.40	-4.00 ... -2.00	44	Normal	Gen 5	TO-252 (DPAK 3-leg)
AUIRF6215	295	-13	1.40	-4.00 ... -2.00	44	Normal	Gen 5	TO-220

1) See packages on page 140 and 141

# Automotive N+P-channel MOSFETs

## 30 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7319Q	29/58	5.80/-4.90	1.00 ... 3.00	22.00/23.00	Logic	Gen 5	SO-8 (DSO-8)
AUIRF7379Q	45/90	5.80/-4.30	1.00 ... 3.00	25.00/25.00	Logic	Gen 5	SO-8 (DSO-8)
AUIRF7309Q	50/100	4.70/-3.50	1.00 ... 3.00	25.00/25.00	Logic	Gen 5	SO-8 (DSO-8)
AUIRF9952Q	100/250	3.50/-2.30	1.00 ... 3.00	6.90/6.10	Logic	Gen 5	SO-8 (DSO-8)

## 55 V (Planar)



Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
AUIRF7343Q	50/105	4.70/-3.40	1.00 ... 3.00	24/26	Logic	Gen 5	SO-8 (DSO-8)

1) See packages on page 140 and 141

# Small signal MOSFETs

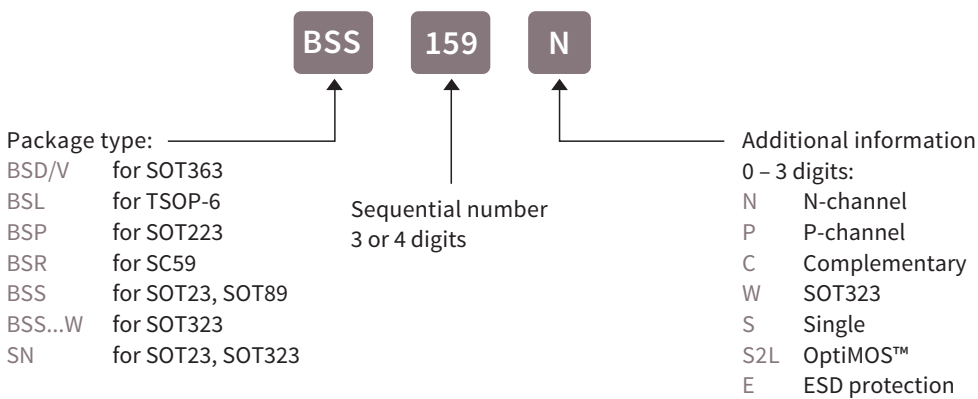
Infineon offers a full range of small signal MOSFETs qualified according AEC-Q101.

## The portfolio includes

- > Polarity: N-channel enhancement, N-channel depletion and P-channel MOSFETs
- > Voltage classes: -250 ... 800 V
- >  $V_{GS}$  rating: 10 V (normal level), 4.5 V (logic level), 2.5 V (super logic level), 1.8 V (ultra logic level)
- > Packages: SOT223, SOT89, TSOP-6 (single and dual), SC59, SOT23, SOT323, SOT363 (single and dual)
- > Configuration: single, dual, complementary (n+p pairs)
- > Additional features: the products with names ending with "E" have an Integrated ESD protection

SC59 is an enhanced version of the SOT23: it's footprint compatible with SOT23, but allows a bigger chip inside, therefore a lower  $R_{DS(on)}$ .

## Naming system



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[www.infineon.com/complementary](http://www.infineon.com/complementary)  
[www.infineon.com/pchannel](http://www.infineon.com/pchannel)  
[www.infineon.com/depletion](http://www.infineon.com/depletion)

## N-channel MOSFETs

Voltage	Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>	
20 V	BSL802SN	–	7.50	0.30 ... 0.75	4.70	OptiMOS™2	TSOP-6/6 dual	
	BSL202SN	–	7.50	0.70 ... 1.20	5.80	OptiMOS™2	TSOP-6/6 dual	
	BSL205N	–	2.50	0.70 ... 1.20	2.10	OptiMOS™2	TSOP-6/6 dual	
	BSL214N	–	1.50	0.70 ... 1.20	0.80	OptiMOS™2	TSOP-6/6 dual	
	BSL207N	–	2.10	0.70 ... 1.20	2.10	OptiMOS™2	TSOP-6/6 dual	
	BSL806N	–	2.30	0.30 ... 0.75	1.70	OptiMOS™2	TSOP-6/6 dual	
	BSR202N	–	3.80	0.70 ... 1.20	5.80	OptiMOS™2	SC59	
	BSR802N	–	3.70	0.30 ... 0.75	4.70	OptiMOS™2	SC59	
	BSS205N	–	2.50	0.70 ... 1.20	2.10	OptiMOS™2	SOT23	
	BSS214N	–	1.50	0.70 ... 1.20	0.80	OptiMOS™2	SOT23	
	BSS806N	–	2.30	0.30 ... 0.75	1.70	OptiMOS™2	SOT23	
	BSS816NW	–	1.40	0.30 ... 0.75	0.60	OptiMOS™2	SOT323	
	BSS214NW	–	1.50	0.70 ... 1.20	0.80	OptiMOS™2	SOT323	
	BSD214NW	–	1.50	0.70 ... 1.20	0.80	OptiMOS™2	SOT363	
	BSD816SN	–	1.40	0.30 ... 0.75	0.60	OptiMOS™2	SOT363	
30 V	BSD235N	–	0.95	0.70 ... 1.20	0.32	OptiMOS™2	SOT363	
	BSD840N	–	0.88	0.30 ... 0.75	0.26	OptiMOS™2	SOT363	
	BSR302N	23	3.70	1.20 ... 2.00	4.40	OptiMOS™2	SC59	
	BSL302SN	25	7.10	1.20 ... 2.00	4.40	OptiMOS™2	TSOP-6/6 dual	
	BSL306N	57	2.30	1.20 ... 2.00	1.60	OptiMOS™2	TSOP-6/6 dual	
	BSS306	57	2.30	1.20 ... 2.00	1.50	OptiMOS™2	SOT23	
	BSS316N	160	1.40	1.20 ... 2.00	0.60	OptiMOS™2	SOT23	
	BSD316SN	160	1.40	1.20 ... 2.00	0.60	OptiMOS™2	SOT363	
	55 V	BSS670S2L	650	0.54	1.20 ... 2.00	1.70	OptiMOS™	SOT23
	60 V	BSS606N	60	3.20	1.30 ... 2.30	6.10	OptiMOS™3	SOT89
		BSL606SN	60	4.50	1.30 ... 2.30	6.10	OptiMOS™3	TSOP-6/6 dual
		BSR606N	60	2.40	1.30 ... 2.30	6.10	OptiMOS™3	SC59
		BSP318S	90	2.60	1.20 ... 2.00	14.00	SIPMOS™	SOT223
		BSP320S	120	2.90	2.10 ... 4.00	9.70	SIPMOS™	SOT223
		BSP295	300	1.80	0.80 ... 1.80	14.00	SIPMOS™	SOT223
2N7002DW		3000	0.30	1.50 ... 2.50	0.40	OptiMOS™	SOT363	
BSS138N		3500	0.23	0.60 ... 1.40	1.00	SIPMOS™	SOT23	
BSS138W		3500	0.28	0.60 ... 1.40	1.00	SIPMOS™	SOT223	
SN7002N		5000	0.20	0.80 ... 1.80	1.00	SIPMOS™	SOT23	
BSS7728N		5000	0.20	1.30 ... 2.30	1.00	SIPMOS™	SOT23	
SN7002W		5000	0.23	0.80 ... 1.80	1.00	SIPMOS™	SOT323	
100 V		BSL372SN	220	2.00	4.50	9.50	SIPMOS™	TSOP-6/6 dual
		BSP372N	230	1.80	0.80 ... 2.00	9.50	SIPMOS™	SOT223
		BSL373SN	230	2.00	10.00	6.20	SIPMOS™	TSOP-6/6 dual
	BSP373N	240	1.80	2.10 ... 4.00	6.20	SIPMOS™	SOT223	
	BSL296SN	460	1.40	4.50	4.50	SIPMOS™	TSOP-6/6 dual	
	BSP296N	600	1.20	0.80 ... 1.80	4.50	SIPMOS™	SOT223	
	BSS123N	6000	0.19	0.80 ... 1.80	0.60	SIPMOS™	SOT23	
	BSS119N	6000	0.19	1.80 ... 2.30	0.60	SIPMOS™	SOT23	
200 V	BSP297	1800	0.66	0.80 ... 1.80	12.90	SIPMOS™	SOT223	
240 V	BSP89	6000	0.35	0.80 ... 1.80	4.30	SIPMOS™	SOT223	
	BSP88	6000	0.35	0.60 ... 1.40	4.50	SIPMOS™	SOT223	
	BSS87	6000	0.26	0.80 ... 1.80	3.70	SIPMOS™	SOT89	
	BSS131	14,000	0.11	0.80 ... 1.80	2.10	SIPMOS™	SOT23	
400 V	BSP298	3000	0.50	2.10 ... 4.00	–	SIPMOS™	SOT223	
	BSP324	25,000	0.17	1.30 ... 2.30	4.50	SIPMOS™	SOT223	

1) See packages on page 140 and 141

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# Small signal MOSFETs

## N-channel MOSFETs (cont'd)

Voltage	Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
500 V	BSP299	4000	0.400	2.10 ... 4.00	-	SIPMOS™	SOT223
600 V	BSP125	45,000	0.120	1.30 ... 2.30	4.40	SIPMOS™	SOT223
	BSS225	45,000	0.090	1.30 ... 2.30	3.90	SIPMOS™	SOT89
	BSS127	500,000	0.023	1.40 ... 2.60	1.40	SIPMOS™	SOT23
800 V	BSP300	20	0.190	2.10 ... 4.00	-	SIPMOS™	SOT223

## P-channel MOSFETs

Voltage	Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
-20 V	BSL207SP	-	-6.00	-1.20 ... -0.60	-13.30	OptiMOS™2 P	TSOP-6/6 dual
	BSL211SP	-	-4.70	-1.20 ... -0.60	-8.30	OptiMOS™2 P	TSOP-6/6 dual
	BSL215P	-	-1.50	-1.20 ... -0.60	-3.55	OptiMOS™2 P	TSOP-6/6 dual
	BSS215P	-	-1.50	-1.20 ... -0.50	-3.60	OptiMOS™2 P	SOT23
	BSS209PW	-	-0.58	-1.20 ... -0.60	-0.92	OptiMOS™2 P	SOT323
	BSS223PW	-	-0.39	-1.20 ... -0.60	-0.50	OptiMOS™2 P	SOT323
	BSV236SP	-	-1.50	-1.20 ... -0.60	-3.80	OptiMOS™ P	SOT363
	BSD223P	-	-0.39	-1.20 ... -0.60	-0.50	OptiMOS™2 P	SOT363
-30 V	BSL307SP	43	-5.50	-2.00 ... -1.00	-23.40	OptiMOS™2 P	TSOP-6/6 dual
	BSL308PE	80	-2.10	-2.00 ... -1.00	-2.90	OptiMOS™3 P + integrated ESD diode	TSOP-6/6 dual
	BSL314PE	140	-1.50	-2.00 ... -1.00	-2.30	OptiMOS™3 P + integrated ESD diode	TSOP-6/6 dual
	BSL315P	150	-1.50	-2.00 ... -1.00	-2.30	OptiMOS™2 P	TSOP-6/6 dual
	BSS308PE	80	-2.10	-2.00 ... -1.00	-5.20	OptiMOS™3 P + integrated ESD diode	SOT23
	BSS314PE	140	-1.50	-2.00 ... -1.00	-2.90	OptiMOS™3 P + integrated ESD diode	SOT23
	BSS315P	150	-1.50	-2.00 ... -1.00	-2.30	OptiMOS™2 P	SOT23
	BSD314SPE	140	-1.50	-2.00 ... -1.00	-2.90	OptiMOS™3 P + integrated ESD diode	SOT363
	BSL303SPE	30	-6.60	4.50	-	OptiMOS™ P + integrated ESD diode	TSOP-6/6 dual
	BSL305SPE	50	-5.30	4.50	-		TSOP-6/6 dual
	BSS356PWE <sup>2)</sup>	560	-0.73	4.50	-		SOT323
	BSD356PE <sup>2)</sup>	560	-0.73	4.50	-		SOT363
-60 V	BSP613P	130	-2.90	-4.00 ... -2.10	-22.00	SIPMOS™	SOT223
	BSP170P	300	-1.90	-4.00 ... -2.10	-10.00	SIPMOS™	SOT223
-60 V	BSP171P	300	-1.90	-2.00 ... -1.00	-13.00	SIPMOS™	SOT223
	BSP315P	800	-1.17	-2.00 ... -1.00	-5.20	SIPMOS™	SOT223
	BSR315P	800	-0.62	-2.00 ... -1.00	-4.00	SIPMOS™	SC59
	BSS83P	2000	-0.33	-2.00 ... -1.00	-2.38	SIPMOS™	SOT23
	BSS84P	8000	-0.17	-2.00 ... -1.00	-1.00	SIPMOS™	SOT23
	BSS84PW	8000	-0.15	-2.00 ... -1.00	-1.00	SIPMOS™	SOT323
-100 V	BSP322P	800	-1.00	-2.00 ... -1.00	-12.40	SIPMOS™	SOT223
	BSP321P	900	-0.98	-4.00 ... -2.10	-9.00	SIPMOS™	SOT223
	BSP316P	1800	-0.68	-2.00 ... -1.00	-5.10	SIPMOS™	SOT223
	BSR316P	1800	-0.36	-2.00 ... -1.00	-3.00	SIPMOS™	SC59

1) See packages on page 140 and 141

2) Coming Q1/2016

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## P-channel MOSFETs (cont'd)

Voltage	Product type	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
-250 V	BSP317P	4000	-0.43	-2.00 ... -1.00	-11.60	SIPMOS™	SOT223
	BSP92P	12,000	-0.26	-2.00 ... -1.00	-4.30	SIPMOS™	SOT223
	BSS192P	12,000	-0.19	-2.00 ... -1.00	-4.90	SIPMOS™	SOT89
	BSR92P	11,000	-0.14	-2.00 ... -1.00	-3.60	SIPMOS™	SC59

## Complementary MOSFETs

Voltage	Product type	$R_{DS(on)}$ (max) @ $V_{GS} = -10$ V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
20 V	BSL215C/n-ch	-	1.50	0.70 ... 1.20	0.73	OptiMOS™2	TSOP-6/6 dual
-20 V	BSL215C/p-ch	-	-1.50	-1.20 ... -0.60	-3.00	OptiMOS™2 P	TSOP-6/6 dual
20 V	BSD235C/n-ch	-	0.95	-1.20 ... -0.60	0.34	OptiMOS™2	SOT363
-20 V	BSD235C/p-ch	-	-0.53	0.70 ... 1.20	-0.40	OptiMOS™2 P	SOT363
20 V	BSZ15DC02KD/n-ch	-	5.10	0.80 ... 1.40	2.10	OptiMOS™2	TSDSON-8 dual
-20 V	BSZ15DC02KD/p-ch	-	-3.20	-1.40 ... -0.70	-3.00	OptiMOS™2 P	TSDSON-8 dual
30 V	BSL316C/n-ch	160	1.40	-2.00 ... -1.00	0.60	OptiMOS™2	TSOP-6/6 dual
-30 V	BSL316C/p-ch	150	-1.50	1.20 ... 2.00	-2.40	OptiMOS™2 P	TSOP-6/6 dual
30 V	BSL308C/n-ch	57	2.30	1.20 ... 2.00	1.50	OptiMOS™2	TSOP-6/6 dual
-30 V	BSL308C/p-ch	80	-2.10	-2.00 ... -1.00	-2.90	OptiMOS™3 P	TSOP-6/6 dual
30 V	BSD356C/n-ch <sup>2)</sup>	350	0.95	4.50	-	OptiMOS™2	SOT363
-30 V	BSD356C/p-ch <sup>2)</sup>	560	-0.73	4.50	-	OptiMOS™2 P	SOT363

## Depletion MOSFETs

Voltage	Product type	$R_{DS(on)}$ (max) @ $V_{GS} = 0$ V [mΩ]	$I_D$ [A]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
60 V	BSS159N	8.00	0.130	2.20	SIPMOS™	SOT23
100 V	BSS169	12.00	0.090	2.10	SIPMOS™	SOT23
200 V	BSP149	3.50	0.140	11.00	SIPMOS™	SOT223
240 V	BSP129	20.00	0.050	3.80	SIPMOS™	SOT223
250 V	BSS139	30.00	0.030	2.30	SIPMOS™	SOT23
600 V	BSP135	60.00	0.020	3.70	SIPMOS™	SOT223
	BSS126	700.00	0.007	1.40	SIPMOS™	SOT23

1) See packages on page 140 and 141

2) Coming Q1/2016

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# Power MOSFETs

## 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA

Following the release of the first series of high-voltage automotive MOSFETs – the 600 V CoolMOS™ CPA series – Infineon has launched its second generation of market-leading, automotive-qualified, high-voltage MOSFETs, the 650 V CoolMOS™ CFDA series. Whereas the first generation of 600 V CoolMOS™ CPA series addresses the well-known attributes of high quality and reliability required by the automotive industry, the new 650 V CoolMOS™ CFDA series also caters to special application needs with its integrated fast body diode. This fast body diode is the key for addressing resonant switching topologies, resulting in lower switching losses due to the low gate charge. The softer commutation behavior and consequent reduced EMI appearance gives the 650 V CoolMOS™ CFDA series a clear advantage in comparison with competitor parts. Furthermore, limited voltage overshoot during hard commutation

of the body diode enables easier implementation of layout and design.

The basic 600 V CoolMOS™ CPA portfolio is now complemented with the broad 650 V CoolMOS™ CFDA portfolio which provides all the benefits of a fast-switching Super-Junction MOSFET fulfilling the enhanced reliability requirements for automotive applications realized with special screening measures in front end and back end as well as the qualification compliant to AEC-Q100.

Therefore, the combination of both technologies – the 600 V CoolMOS™ CPA and the new 650 V CoolMOS™ CFDA technology – is the best choice for switching topologies in automotive applications.

### Common key features CoolMOS™ “A”

- > First 600 V/650 V automotive-qualified high-voltage technologies for the automotive market
- > Compliant to AEC-Q101 standard

### Key features 600 V CoolMOS™ CPA

- > Lowest  $R_{DS(on)}$  per package
- > Lowest gate charge value  $Q_g$

### Key feature 650 V CoolMOS™ CFDA

- > Limited voltage overshoot during hard commutation – self-limiting  $di/dt$  and  $dv/dt$
- > Low  $Q_{rr}$  at repetitive commutation on body diode & low  $Q_{oss}$

### Applications 600 V CoolMOS™ CPA

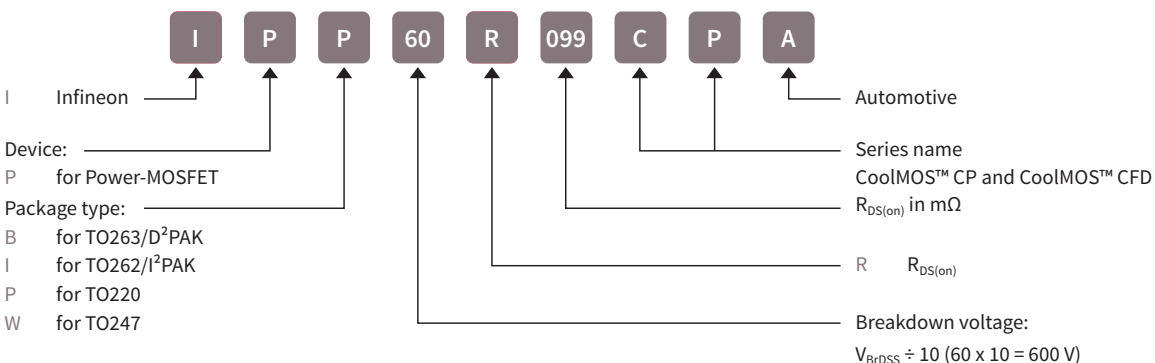
- > Hard switching topologies
- > PFC boost stages in on-board charger
- > Active clamp or 2-transistor forward in DC/DC converter

### Application 650 V CoolMOS™ CFDA

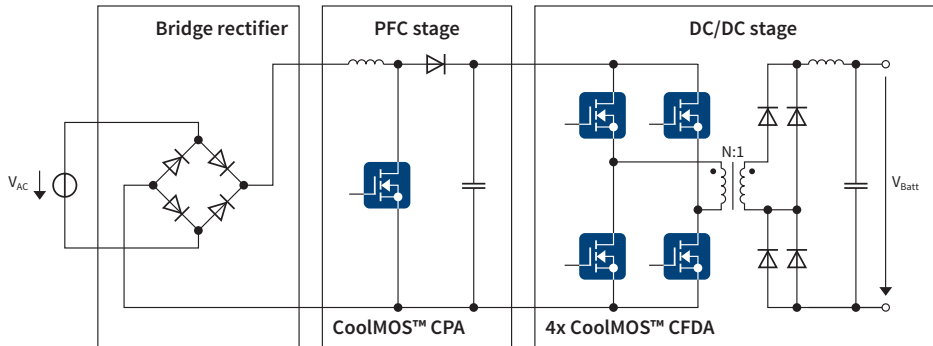
- > Resonant switching topologies
- > LLC or full-bridge ZVS in DC/DC converter
- > HID lamp



## Naming system



## Example for automotive topology using CoolMOS™ CFDA



On-board battery charger with ZVS phase shifted topology

### 600 V CoolMOS™ CPA product portfolio

Product type	$R_{DS(on)}$ @ $T_J = 25\text{ °C}$ $V_{GS} = 10\text{ V}$ [mΩ]	$I_D$ (max) @ $T_J = 25\text{ °C}$ [A]	$I_{Dpuls}$ (max) [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	$R_{thJC}$ (max) [K/W]	Package <sup>1)</sup>
IPB60R099CPA	105	31	93	-20 ... 20	60	0.50	TO263-3-2 (TO220-3 (SMD))
IPB60R199CPA	199	16	51	-20 ... 20	32	0.90	TO263-3-2 (TO220-3 (SMD))
IPB60R299CPA	299	11	34	-20 ... 20	22	1.30	TO263-3-2 (TO220-3 (SMD))
IPP60R099CPA	105	31	93	-20 ... 20	60	0.50	TO220-3
IPW60R045CPA	45	60	230	-20 ... 10	150	0.29	TO247-3
IPW60R075CPA	75	39	130	-20 ... 20	87	0.40	TO247-3
IPW60R099CPA	105	31	93	-20 ... 20	60	0.50	TO247-3
IPI60R099CPA	105	31	93	-20 ... 20	60	0.50	TO262-3

### 650 V CoolMOS™ CFDA product portfolio

Product type	$R_{DS(on)}$ @ $T_J = 25\text{ °C}$ $V_{GS} = 10\text{ V}$ [mΩ]	$I_D$ (max) @ $T_J = 25\text{ °C}$ [A]	$I_{Dpuls}$ (max) [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	$R_{thJC}$ (max) [K/W]	Package <sup>1)</sup>
IPD65R420CFDA	420	8.70	27.00	3.50 ... 4.50	32	1.50	TO252-3 (DPAK)
IPD65R660CFDA	660	6.00	17.00	3.50 ... 4.50	20	2.00	TO252-3 (DPAK)
IPB65R110CFDA	110	31.20	99.60	3.50 ... 4.50	118	0.45	TO263-3-2 (TO220-3 (SMD))
IPB65R150CFDA	150	22.40	72.00	3.50 ... 4.50	86	0.64	TO263-3-2 (TO220-3 (SMD))
IPB65R190CFDA	190	17.50	57.20	3.50 ... 4.50	68	0.83	TO263-3-2 (TO220-3 (SMD))
IPB65R310CFDA	310	11.40	34.40	3.50 ... 4.50	41	1.20	TO263-3-2 (TO220-3 (SMD))
IPB65R660CFDA	660	6.00	17.00	3.50 ... 4.50	20	2.00	TO263-3-2 (TO220-3 (SMD))
IPP65R110CFDA	110	31.20	99.60	3.50 ... 4.50	118	0.45	TO220-3
IPP65R150CFDA	150	22.40	72.00	3.50 ... 4.50	86	0.64	TO220-3
IPP65R190CFDA	190	17.50	57.20	3.50 ... 4.50	68	0.83	TO220-3
IPP65R310CFDA	310	11.40	34.40	3.50 ... 4.50	41	1.20	TO220-3
IPP65R660CFDA	660	6.00	17.00	3.50 ... 4.50	20	2.00	TO220-3
IPW65R048CFDA	48	63.30	228.00	3.50 ... 4.50	270	0.25	TO247-3
IPW65R080CFDA	80	43.30	127.00	3.50 ... 4.50	161	0.32	TO247-3
IPW65R110CFDA	110	31.20	99.60	3.50 ... 4.50	118	0.45	TO247-3
IPW65R150CFDA	150	22.40	72.00	3.50 ... 4.50	86	0.64	TO247-3
IPW65R190CFDA	190	17.50	57.20	3.50 ... 4.50	68	0.83	TO247-3

1) See packages on page 140 and 141

# IGBTs: discretes and modules

## IGBT discrete

Infineon offers an extensive and dedicated range of automotive AEC-Q101-qualified IGBTs from 600 V to 1200 V and up to 120 A. Specially designed for hybrid and electric vehicles, both the IGBT and diode are optimized to provide the best performance by application from low to ultra-high switching frequencies. Available in a wide variety of packages from D<sup>2</sup>Pak and TO247 through to high-performance packages such as Super TO220 and Super TO247, the catalog has suitable packaging solutions to enable higher current handling or the realization of creepage requirements, as well as benchmark system level performance.

### Key applications

- > Main and auxiliary inverters
- > PFC
- > DC/DC
- > PTC heater

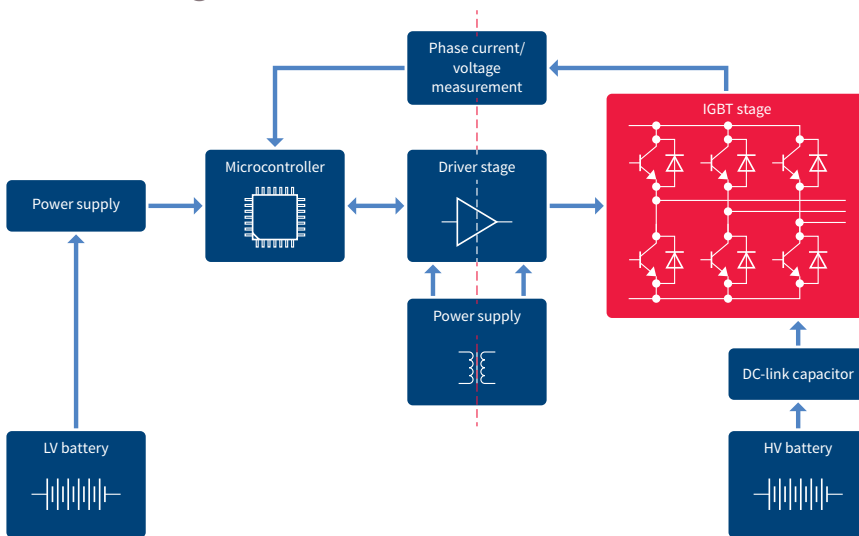
### Key features

- > 600 to 1200 V up to 120 A
- > SMD and through-hole packages
- > AEC-Q101 qualified
- > Thorough final test routine implemented with dynamic testing

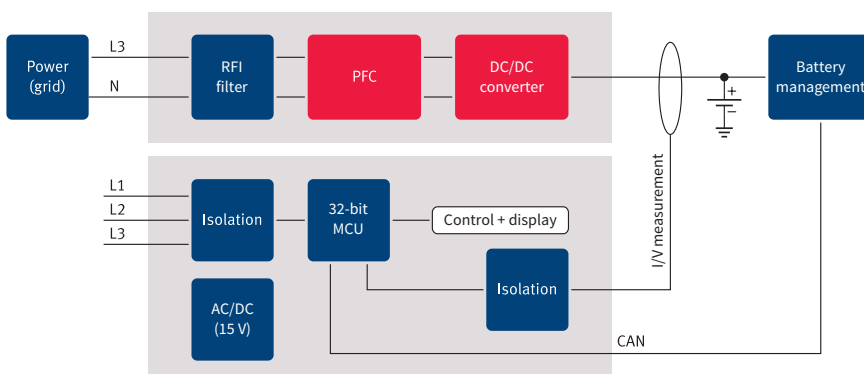
### Key benefits

- > Performance optimized by application
- > Benchmark performance giving high system level efficiency
- > Robust and reliable design

## Inverter diagram



## On-board charger



## IGBT discretetes

IGBT								
Product type	V <sub>ces</sub> [V]	I <sub>c</sub> @ 100 °C [A]	V <sub>ce(on)</sub> [V]	T <sub>sc</sub> @ 150 °C [μs]	E <sub>on</sub> @ 25 °C [μJ]	E <sub>off</sub> @ 25 °C [μJ]	V <sub>f</sub> (typ) @ 25 °C [V]	Package <sup>1)</sup>
AIKD03N60RF <sup>3)</sup>	600	2.5	2.20	5	50	40	2.10	TO252-3 (DPAK)
AIKD04N60R <sup>3)</sup>	600	4.0	1.65	5	90	150	1.70	TO252-3 (DPAK)
AIKD04N60RF <sup>3)</sup>	600	4.0	2.20	5	60	50	2.10	TO252-3 (DPAK)
AIKD06N60R <sup>3)</sup>	600	6.0	1.65	5	110	220	1.70	TO252-3 (DPAK)
AIKD06N60RF <sup>3)</sup>	600	6.0	2.20	5	90	90	2.10	TO252-3 (DPAK)
AIKD10N60R <sup>3)</sup>	600	10.0	1.65	5	210	380	1.70	TO252-3 (DPAK)
AIKD10N60RF <sup>3)</sup>	600	10.0	2.20	5	190	160	2.10	TO252-3 (DPAK)
AUIRG4BC30U-S	600	12.0	1.95	-	160	200	-	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AIKD15N60R <sup>3)</sup>	600	15.0	1.65	5	370	530	1.70	TO252-3 (DPAK)
AIKD15N60RF <sup>3)</sup>	600	15.0	2.20	5	270	250	2.10	TO252-3 (DPAK)
AUIRG4BC30S-S	600	18.0	1.40	-	260	3450	-	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AIKB20N60T <sup>3)</sup>	600	20.0	1.50	5	310	460	1.65	TO263-3-2 (TO220-3 (SMD))
AIKP20N60T <sup>3)</sup>	600	20.0	1.50	5	310	460	1.65	TO220-3
AIKW20N60T <sup>3)</sup>	600	20.0	1.50	5	310	460	1.65	TO247-3
AUIRGP4062D-E	600	24.0	1.60	5 <sup>2)</sup>	115	600	1.80	TO-247
AUIRG4PC40S-E	600	31.0	1.32	-	450	6500	-	TO-247
AIKW30N60T <sup>3)</sup>	600	32.5	1.50	5	690	770	1.65	TO247-3
AUIRGP35B60PD-E	600	34.0	1.85	-	220	215	1.30	TO-247
AUIRGS4062D1	600	39.0	1.57	5 <sup>2)</sup>	532	311	1.57	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRGS4062D1	600	39.0	1.57	5 <sup>2)</sup>	532	311	1.57	TO-262
AUIRGF65G40D0	600	41.0	1.80	5	298	147	1.70	TO-247
AUIRGP50B60PD1E	600	45.0	2.00	-	255	375	1.30	TO-247
AUIRGS30B60K	600	50.0	1.95	10	350	825	-	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRGS30B60K	600	50.0	1.95	10	350	825	-	TO-262
AIKW50N60T <sup>3)</sup>	600	57.5	1.50	5	1200	1400	1.65	TO247-3
AUIRGP4063D-E	600	60.0	1.60	5 <sup>2)</sup>	625	1275	1.95	TO-247
AIKW75N60T <sup>3)</sup>	600	80.0	1.50	5	2000	2500	1.65	TO247-3
AIKQ100N60T <sup>3)</sup>	600	145.0	1.50	5	3100	2500	1.65	TO247 PLUS
AIKQ120N60T <sup>3)</sup>	600	155.0	1.50	5	4100	2800	1.65	TO247 PLUS
AUIRGPS4067D1	600	160.0	1.70	6 <sup>2)</sup>	8200	2900	1.90	Super TO-247
AIGW40N65F5 <sup>3)</sup>	650	46.0	1.60	-	350	100	-	TO247-3
AIGW40N65H5 <sup>3)</sup>	650	46.0	1.66	-	360	110	-	TO247-3
AIKW40N65F5 <sup>3)</sup>	650	46.0	1.60	-	350	100	1.55	TO247-3
AIKW40N65H5 <sup>3)</sup>	650	46.0	1.66	-	380	120	1.55	TO247-3
AIGW50N65F5 <sup>3)</sup>	650	53.5	1.66	-	490	140	-	TO247-3
AIGW50N65H5 <sup>3)</sup>	650	53.5	1.66	-	450	160	-	TO247-3
AIKW50N65F5 <sup>3)</sup>	650	53.5	1.66	-	490	140	1.54	TO247-3
AIKW50N65H5 <sup>3)</sup>	650	53.5	1.66	-	450	160	1.54	TO247-3
AUIRGDC0250	1200	81.0	1.37	-	-	29000	-	Super TO-220
AUIRG4PH50S	1200	81.0	1.47	-	-	29000	-	TO-247

1) See packages on page 140 and 141

2) T<sub>sc</sub> at 25 °C

3) Product in development, release due by Q2/2016, legacy products also available. Please contact your Infineon representative for further details.

# IGBTs: discretes and modules

## IGBT modules

Infiniteon's HybridPACK™ family extends across the full power spectrum required by IGBT modules in hybrid and electric vehicles. Various product versions in three different packages enable maximum scalability across voltage and power classes, from 200 A/650 V through 800 A/680 V to 400 A/1200 V (nominal chip values). All HybridPACK™ modules feature three IGBT H-bridges and are specially designed and qualified for automotive applications. Enhanced versions of these power modules support a maximum junction temperature of

175 °C for power peaks in excess of 160 kW.

The automotive Easy 1B and Easy 2B modules provide a platform for flexible topologies for applications with a power range of up to 6 kW. The automotive Easy module series is based on the well-established industrial Easy module version. The availability of a high-voltage battery system in both HEVs and EVs facilitates increasing the efficiency and reducing the cost of some applications that are currently supplied by the low-voltage board-net (14 V) in IC engine vehicles.

## Hybrid power modules

### HybridPACK™ 1, HybridPACK™ light – power module for hybrid electric vehicle applications for a power range up to 20 kW

Sales name	I <sub>c</sub> [A]	V <sub>CES</sub> [V]	Application	Product status	Packages
FS400R07A1E3	400	650	Inverter	Released	HybridPACK™ 1
FS400R07A1E3_S7	400	705	Inverter	Released	HybridPACK™ 1
FS200R07A1E3	200	650	Inverter	Released	HybridPACK™ 1
FS215R04A1E3D	215	400	Inverter	Released	HybridPACK™ 1
FS200R07A5E3_S6	200	705	Inverter	Released	HybridPACK™ light

### HybridPACK™ 1 pin-fin – power module for hybrid electric vehicle applications for a power range from 20 kW to 50 kW

Sales name	I <sub>c</sub> [A]	V <sub>CES</sub> [V]	Application	Product status	Packages
FS400R07A1E3_H5	400	650	Inverter	Released	HybridPACK™ 1 pin-fin
FS200R12A1E3_H5	200	1200	Inverter	Released	HybridPACK™ 1 pin-fin

### Hybrid PACK™ 2 – power module for hybrid electric vehicle applications for a power range up to 100 kW

Sales name	I <sub>c</sub> [A]	V <sub>CES</sub> [V]	Application	Product status	Packages
FS400R12A2T4	400	1200	Inverter	Released	HybridPACK™ 2
FS600R07A2E3_B31	600	680	Inverter	Released	HybridPACK™ 2 enhanced
FS600R07A2E3_B32	600	680	Inverter	Released	HybridPACK™ 2 enhanced
FS800R07A2E3_B31	800	680	Inverter	Released	HybridPACK™ 2 enhanced
FS800R07A2E3_B32	800	680	Inverter	Released	HybridPACK™ 2 enhanced

### Automotive Easy modules – power modules for auxiliaries and charger up to 10 kW

Sales name	I <sub>c</sub> [A]	V <sub>CES</sub> [V]	Application	Product status	Packages
FS75R07W2E3_B11A	75	650	Inverter	Released	Automotive Easy 2B
FS50R07W1E3_B11A	50	650	Inverter	Released	Automotive Easy 1B
FS30R07W1E3_B11A	30	650	Inverter	On request	Automotive Easy 1B
F4-50R07W1H3_B11A	50	650	DC/DC converter	Released	Automotive Easy 1B
F4-75R07W1H3_B11A	75	650	DC/DC converter	Released	Automotive Easy 1B
FZ30R07W1E3_B31A	30	650	PTC-heater	Released	Automotive Easy 1B

www.infineon.com/hybridpack  
 www.infineon.com/autoeasy  
 www.infineon.com/automotive-igbt



Glossary

Automotive system ICs

Automotive transceivers

Power supply

Motor drivers

LITIX™

SPOC™

PROFET™

Smart multichannel switches

TEMPET™  
HITFET™

MOSFETs

# TEMPFET™: temperature protected switches

TEMPFET™ provides the first level of temperature and current protection via its temperature sensor.

The temperature sensor is available on external pins and enables direct gate access and flexible temperature response control.

## Features

- > Logic level input
- > Analog driving capability
- > Potential-free temperature sensor
- > High-speed switching (100 kHz)
- > Overload protection and thermal shutdown with external circuit
- > Avalanche rated

Product table TEMPFET™: temperature protected switches

Product type	$V_{DS}$ [V]	$R_{DS(on)}$ [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Package <sup>1)</sup>
BTS282Z	49	6.50	80	1.20 ... 2.00	155	TO263-7-1 (TO220-7 (SMD)), TO220-7-12
BTS244Z	55	12.00	35	1.20 ... 2.00	85	TO263-5-2 (TO220-5 (SMD)), TO220-5-12
BTS247Z	55	18.00	33	1.20 ... 2.00	60	TO263-5-2 (TO220-5 (SMD))

1) See packages on page 140 and 141





# HITFET™: protected low-side switches

HITFET™ provides a high level of protection for overtemperature, short-circuit, overcurrent, overvoltage, open-load and ESD-sensitive circuits.

HITFET™ combines all these protection features in one easy-to-use device. Infineon has recently expanded its HITFET™ portfolio with the new product BTF3050TE.

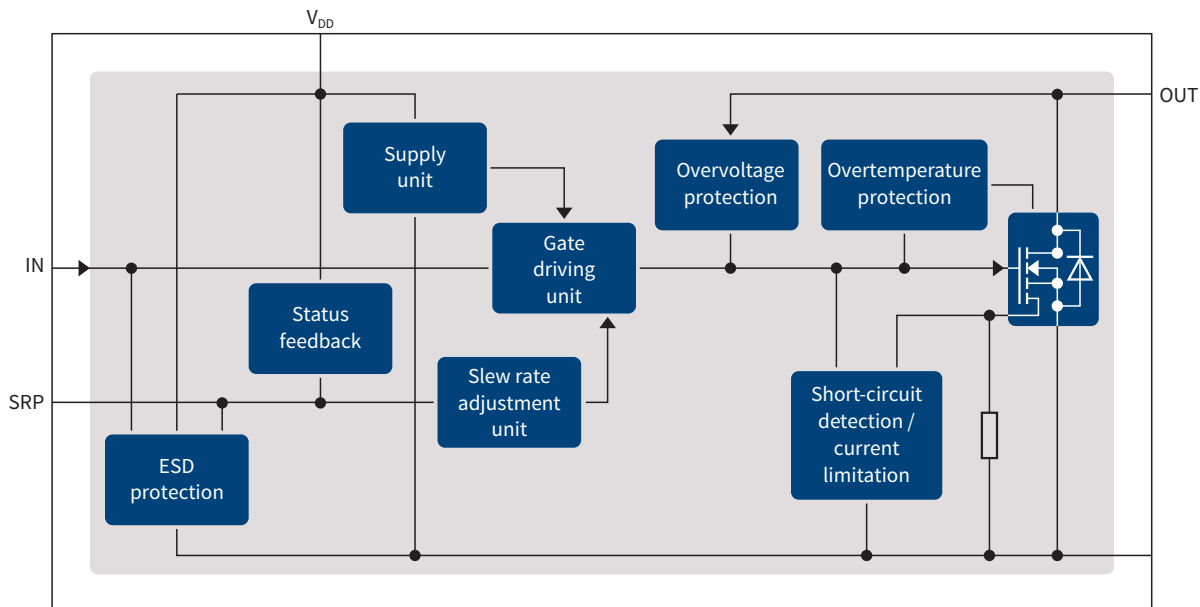
## Features

- › Overtemperature protection
- › Overload protection
- › Current limitation
- › Short-circuit protection
- › Open-load detection (only on BTS3408G)
- › Thermal shutdown with auto-restart or latch behavior
- › Overvoltage protection
- › Logic level input
- › Electrostatic Discharge (ESD) protection
- › Linear drive capability
- › Status feedback
  - Digital flag or with external resistor
  - Analogous with external resistor at input
- › Adjustable slew rate (only on BTF3050TE)

## Automotive and industrial applications

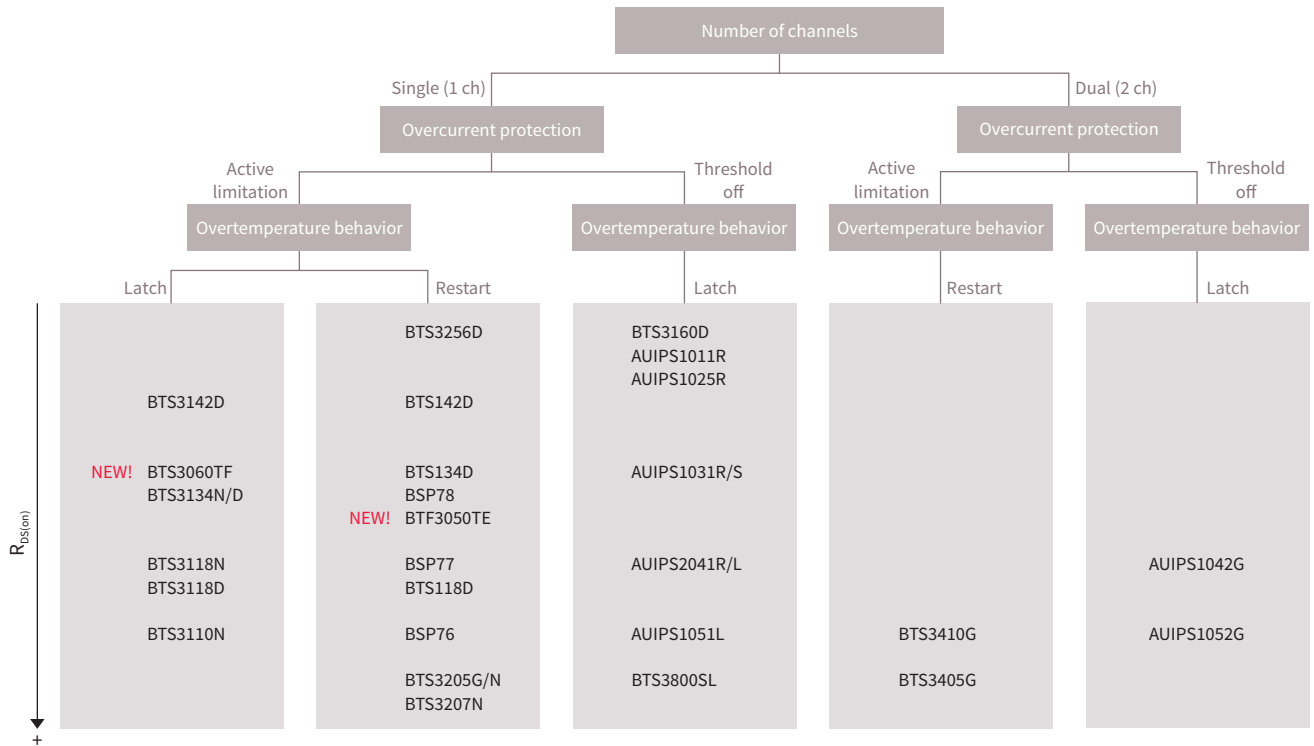
- › Relays
- › Fans and pumps
- › Solenoids
- › Valves
- › Heating element
- › Bulbs and LEDs
- › Fuses
- › Line drivers and supply switches

## Block diagram HITFET™+ BTF3050TE

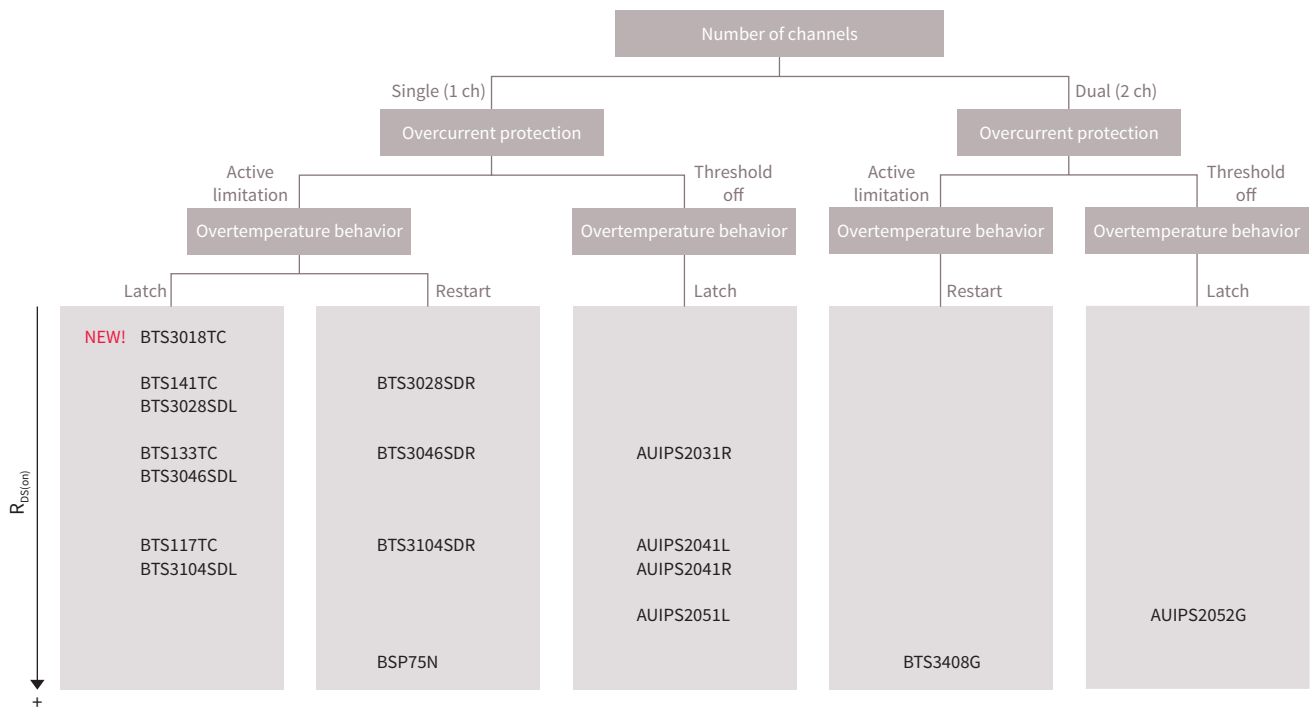


# HITFET™: protected low-side switches

Selection tree – protected low-side switches (12 V voltage class)



Selection tree – protected low-side switches (24 V and 12 V voltage class)



## Product table HITFET™: protected low-side switches

Product type	R <sub>DS(on)</sub> [mΩ]	R <sub>DS(on)</sub> (typ) @ 25 °C [mΩ]	R <sub>DS(on)</sub> (max) @ 150 °C [mΩ]	Channels	V <sub>DS(AZ)</sub> [V]	I <sub>L(nom)</sub> [A]	I <sub>L(lim)</sub> [A]	I <sub>L</sub> (LIM)-Trigger [A]	PWM [kHz]	Diagnostic	Package <sup>1)</sup>
BTS3160D	10	8	18	1	40	7.80	–	70.00	1	digital	TO252-5 (DPAK 5-leg)
BTS3256D	10	10	20	1	40	7.50	42.00	–	10	digital	TO252-5 (DPAK 5-leg)
AUIPS1011R	13	10	25	1	36	6.50 (@ 40 K/W Rth)	–	85.00	< 1	–	TO-252 (DPAK 3-leg) TO-263-3 (D <sup>2</sup> PAK 3-leg) TO-220
BTS3142D	28	23	68	1	42	4.60	30.00	–	1	through input pin	TO252-3 (DPAK)
BTS142D	28	23	68	1	42	4.60	30.00	–	1	through input pin	TO252-3 (DPAK)
NEW! AUIPS1025R	28	28	55	1	36	4.90	–	15.00	50	–	TO-252 (DPAK 3-leg)
BTS3134N	50	35	100	1	42	3.00	18.00	–	1	through input pin	SOT223
BTS3134D	50	35	100	1	42	3.50	18.00	–	1	through input pin	TO252-3 (DPAK)
AUIPS1031R	50	40	95	1	39	3.30 (@ 40 K/W Rth)	–	18.00	< 1	–	TO-252 (DPAK 3-leg) TO-263-3 (D <sup>2</sup> PAK 3-leg) TO-220
BSP78	50	35	100	1	42	3.00	18.00	–	1	through input pin	SOT223
NEW! BTF3050TE	50	40	100	1	40	3.00	30 (8)	–	10	through SRP pin	TO252-5 (DPAK 5-leg)
BTS134D	50	35	100	1	42	3.50	18.00	–	1	through input pin	TO220-3
NEW! BTS3060TF	60	50	135	1	42	3.00	10.50	–	1	–	TO252-3 (DPAK)
BTS3118D	100	70	240	1	42	2.40	10.00	–	1	through input pin	TO252-3 (DPAK)
BTS3118N	100	70	240	1	42	2.20	10.00	–	1	through input pin	SOT223
BSP77	100	70	240	1	42	2.20	10.00	–	1	through input pin	SOT223
BTS118D	100	70	240	1	42	2.40	10.00	–	1	through input pin	TO252-3 (DPAK)
AUIPS1041R	100	80	175	1	39	2.20 (@ 50 K/W Rth)	–	4.50	1	–	TO-252 (DPAK 3-leg)
AUIPS1041L	100	80	175	1	39	1.95 (@ 60 K/W Rth)	–	4.50	1	–	SOT-223
AUIPS1042G	100	80	175	2	39	0.70 (@ 130 K/W Rth)	–	4.50	1	–	SO-8 (DSO-8)
BSP76	200	150	480	1	42	1.40	5.00	–	1	through input pin	SOT223
BTS3410G	200	150	480	2	42	1.30	5.00	–	1	through input pin	DSO-8
BTS3110N	200	150	480	1	42	1.40	5.00	–	1	through input pin	SOT223
AUIPS1051L	250	160	450	1	39	1.40 (@ 60 K/W Rth)	–	2.80	10	–	SOT-223
AUIPS1052G	250	160	450	2	39	0.50 (@ 130 K/W Rth)	–	2.80	10	–	SO-8 (DSO-8)
BTS3207N	500	500	1200	1	42	0.70	5.00	–	1	through input pin	SOT223
BTS3205G	700	700	2400	1	42	0.35	0.60	–	1	through input pin	DSO-8
BTS3405G	700	700	2400	2	42	0.35	0.60	–	1	through input pin	DSO-8
BTS3205N	700	700	2400	1	42	0.35	0.60	–	1	through input pin	SOT223
BTS3800SL	800	800	1600	1	42	0.35	0.60	–	10	–	SCT595
NEW! BTS3018TC	18	14	44	1	60	6.00	30.00	–	1	through input pin	TO263-3-2 (TO220-3 (SMD))
BTS141TC	30	25	68	1	60	5.10	25.00	–	1	through input pin	TO263-3-2 (TO220-3 (SMD))
BTS3028SDL	30	28	91	1	60	5.00	18.00	–	1	through input pin	TO252-3 (DPAK)
BTS3028SDR	30	28	91	1	60	5.00	18.00	–	1	through input pin	TO252-3 (DPAK)
BTS133TC	50	40	120	1	60	3.80	21.00	–	1	through input pin	TO263-3-2 (TO220-3 (SMD))
BTS3046SDL	50	46	134	1	60	3.60	10.00	–	1	through input pin	TO252-3 (DPAK)
BTS3046SDR	50	46	134	1	60	3.60	10.00	–	1	through input pin	TO252-3 (DPAK)
AUIPS2031R	60	45	110	1	68	2.30 (@ 70 K/W Rth)	–	10.00	20	–	TO-252 (DPAK 3-leg)
BTS117TC	100	80	240	1	60	3.50	7.00	–	1	through input pin	TO263-3-2 (TO220-3 (SMD))
BTS3104SDL	104	104	323	1	60	2.00	6.00	–	1	through input pin	TO252-3 (DPAK)
BTS3104SDR	104	104	323	1	60	2.00	6.00	–	1	through input pin	TO252-3 (DPAK)
AUIPS2041R	130	100	240	1	68	1.40 (@ 100 K/W Rth)	–	5.00	25	–	TO-252 (DPAK 3-leg)
AUIPS2041L	130	100	240	1	68	1.40 (@ 100 K/W Rth)	–	5.00	25	–	SOT-223
AUIPS2051L	300	250	520	1	70	0.90 (@ 100 K/W Rth)	–	1.80	35	–	SOT-223
AUIPS2052G	300	250	520	2	70	0.90 (@ 100 K/W Rth)	–	1.80	35	–	SO-8 (DSO-8)
BSP75N	550	490	1350	1	60	0.70	1.00	–	5	through input pin	SOT223
BTS3408G	550	480	1000	2	60	0.55	1.00	–	1	through input pin	DSO-8

1) See packages on page 140 and 141.

# Smart multichannel switches for body applications: SPIDER – SPI Driver for small BCM loads

Infineon's SPIDER family has enjoyed market success for many years as a way of controlling small BCM loads, such as relays, LEDs and small motors.

The family consists of 4 and 8-channel low-side devices, as well as 8-channel high-side/low-side devices with 2 configurable, 4 high-side and 2 low-side channels.

Thanks to its number of PWM inputs, current capability and additional functionality – such as limp home and cranking – the SPIDER family offers great scalability.

To satisfy future trends and requirements, Infineon has developed a new SPI Driver family, called SPIDER+.

The new modular family offers increased flexibility (up to 6 configurable channels), a dedicated 8-channel high-side device, along with improved and added functionality compared to SPIDER.

All new SPIDER+ devices come with a limp home and cranking (down to 3 V battery) function. Enhanced diagnosis features support ISO 26262 requirements. Outputs can also be driven in parallel. A unique LED pack available for high-side and flexible devices provides additional features for LED and small bulb drives. All devices have small 150 mil packages.

## Applications

- › Relays
- › LEDs and small bulbs
- › Solenoids
- › Unipolar stepper and DC motors

## General features (SPIDER and SPIDER+)

- › SPI (Serial Peripheral Interface)
- › Diagnosis via SPI
- › Daisy-chain capability
- › Short-circuit, overload, overtemperature and ESD protection
- › Open-load detection in OFF state
- › Undervoltage shutdown
- › AEC-qualified green product (RoHS compliant)
- › Small packages

## Specific features SPIDER

- › Scalability for nominal load current
- › Scalability for direct inputs (PWM)
- › Fail-safe mode (limp home), partly
- › Cranking function, partly

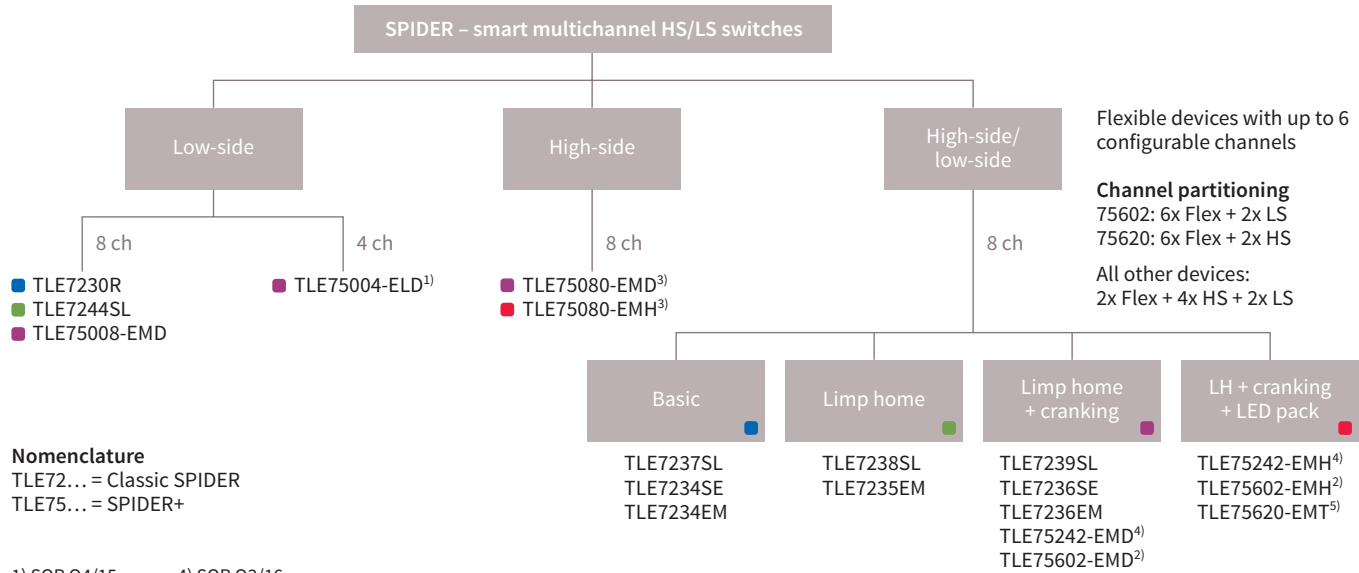
## Specific features SPIDER+

- › Limp home and cranking functionality
- › 2 PWM inputs
- › Input mapping functionality
- › Enhanced diagnosis features
- › Lowest current consumption
- › Improved thermal performance
- › Paralleling of outputs
- › Family design (compatibility)
- › Expanded but simplified portfolio

## Features LED pack (optional for SPIDER+)

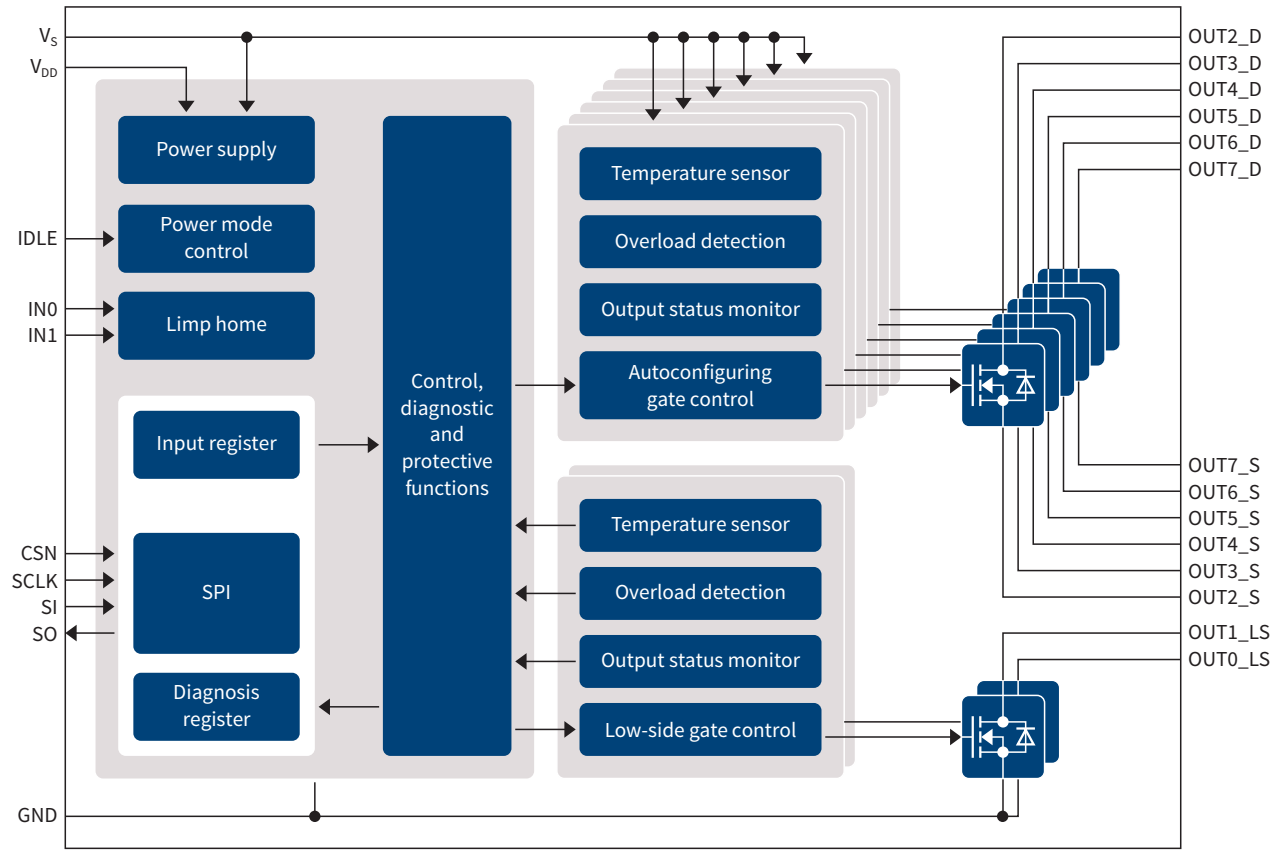
- › Open-load detection in ON state
- › 2 internal PWM generators
- › Bulb inrush mode

## SPIDER whole family overview/selection tree



- 1) SOP Q4/15
- 2) SOP Q1/16
- 3) SOP Q3/16
- 4) SOP Q3/16
- 5) SOP Q4/16

## Block diagram TLE75602-EMD





## Smart multichannel switches for body applications: SPIDER – SPI Driver for small BCM loads

SPIDER/SPIDER+ product table

	Product type	Configurable	High side	Small high side	Low side	Cranking mode [V]
SPIDER	TLE7230R	–	–	–	8	–
	TLE7244SL	–	–	–	8	–
	TLE7237SL	2	2	2	2	–
	TLE7238SL	2	2	2	2	–
	TLE7239SL	2	2	2	2	4
	TLE7234SE	2	2	2	2	–
	TLE7236SE	2	2	2	2	4
	TLE7234EM	2	2	2	2	–
	TLE7235EM	2	2	2	2	–
	TLE7236EM	2	2	2	2	4
SPIDER+	TLE75004-ELD	–	–	–	4	3
	TLE75008-EMD	–	–	–	8	3
	TLE75602-EMD	6	–	–	2	3
	TLE75602-EMH	6	–	–	2	3
	TLE75080-EMD	–	8	–	–	3
	TLE75080-EMH	–	8	–	–	3
	TLE75242-EMD	2	4	–	2	3
	TLE75242-EMH	2	4	–	2	3
	TLE75620-EMT	6	2	–	–	3

1) See packages on page 140 and 141



MOSFETS

TEMPFET™  
HITFET™

Smart  
multichannel  
switches

PROFET™

SPOC™

LITIX™

Motor drivers

Power supply

Automotive  
transceivers

Automotive  
system ICs

Glossary

Limp Home	LED pack	$R_{DS(on)}$ (typ) @ 25 °C [mΩ]	$V_{DS(AZ)}$ (min) [V]	$I_{L(nom)}$ [mA]	Number of direct inputs	Package <sup>1)</sup>
		0.80	48	500	4	DSO-36 (Power-SO)
•		0.80	41	290	4	SSOP-24
		6 x 0.90; 2 x 1.60	41	6 x 260; 2 x 120	3	SSOP-24
•		6 x 0.90; 2 x 1.60	41	6 x 260; 2 x 120	2	SSOP-24
•		6 x 0.90; 2 x 1.60	41	6 x 260; 2 x 120	2	SSOP-24 EP
		6 x 0.85; 2 x 1.60	41	6 x 280; 2 x 140	3	DSO-20
•		6 x 0.85; 2 x 1.60	41	6 x 280; 2 x 140	2	DSO-20
		6 x 0.90; 2 x 1.60	41	6 x 350; 2 x 175	3	SSOP-24 EP
•		6 x 0.90; 2 x 1.60	41	6 x 350; 2 x 175	2	SSOP-24 EP
•		6 x 0.90; 2 x 1.60	41	6 x 350; 2 x 175	2	SSOP-24 EP
•		1.00	42	470	2	SSOP-14EP
•		1.00	42	330	2	SSOP-24 EP
•		1.00	42	330	2	SSOP-24 EP
•	•	1.00	42	330	2	SSOP-24 EP
•	•	1.00	42	330	2	SSOP-24 EP
•	•	1.00	42	330	2	SSOP-24 EP
•	•	1.00	42	330	2	SSOP-24 EP
•	•	1.00	42	330	2	SSOP-24 EP
•	•	1.00	42	330	2	SSOP-24 EP

# Smart multichannel switches for powertrain and safety: Flex

The Flex multichannel low-side switches family for powertrain, safety and industrial applications is specially designed to drive a various range of loads from relays, injector valves, oxygen probe heaters and general purpose solenoids, through to unipolar stepper motors.

## Applications

- › Engine management systems
- › Diesel direct injection
- › Gasoline direct injection
- › Multi-port injection
- › Industrial applications

## Features

- › Overvoltage protection
  - Active clamping for inductive loads
- › Undervoltage protection
  - Power-on reset
  - Undervoltage shutdown
- › Overcurrent protection
  - Current limitation
  - Overcurrent switch-off
- › Overtemperature protection
  - Thermal shutdown
- › Electrostatic Discharge (ESD) protection
- › Direct input control (for PWM)
- › Communication interface (control/diagnosis)
  - Serial Peripheral Interface (SPI)
  - Micro Second Channel (MSC)
- › 5 V and 3.3 V  $\mu$ C compatibility
- › Status flag
- › 2-bit diagnosis feedback for:
  - Short-to-GND
  - Open-load
  - Short-to-battery
  - Normal operation

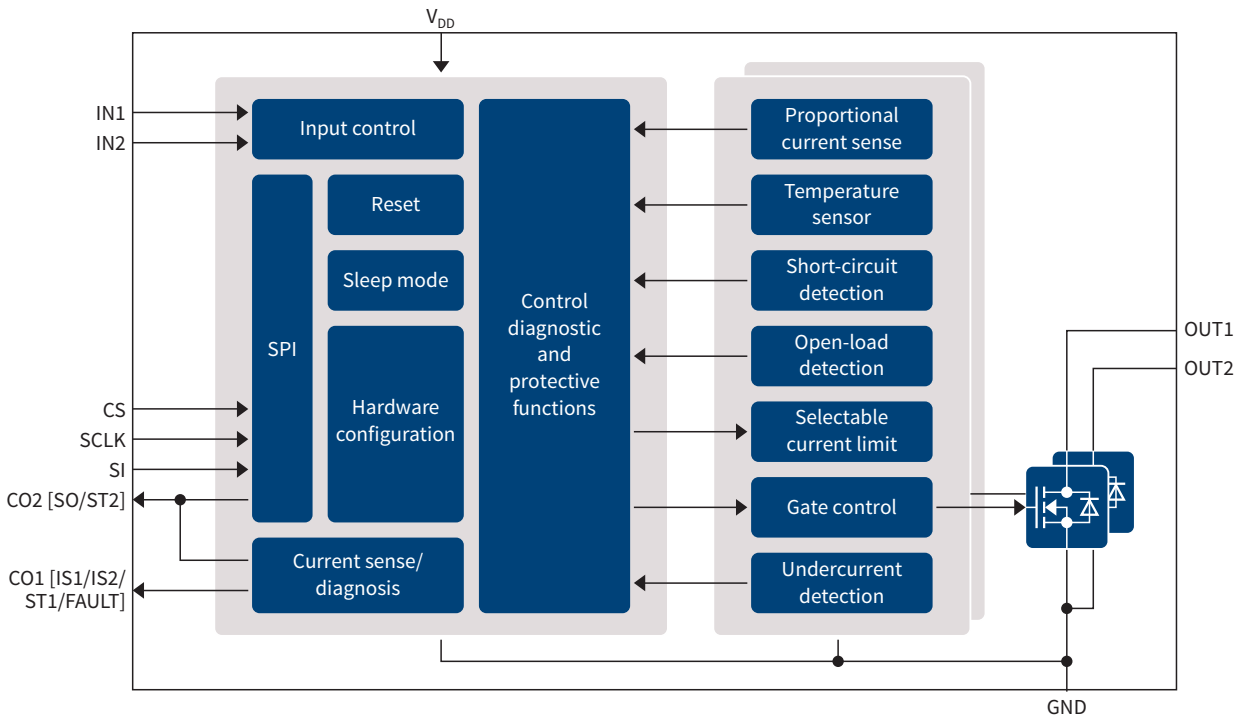
We offer a complete family concept with full scalability from 2 to 18 channels and leading-edge technology. All Flex multichannel switches have full certification and are equipped with embedded protection functions and enhanced diagnosis which are used in numerous industry platforms.

## Benefits

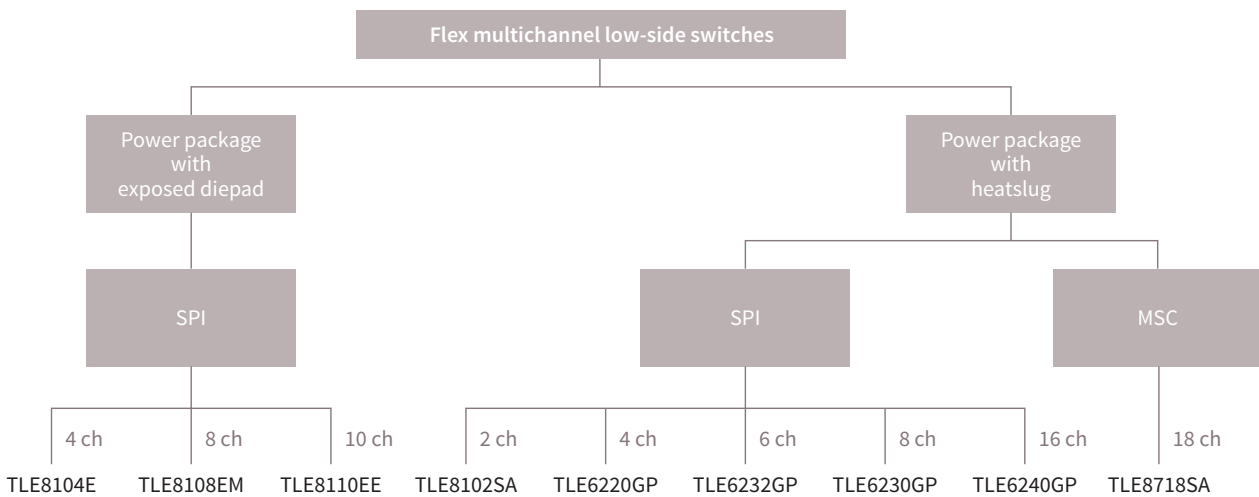
- › One family concept
- › Designed for dedicated applications, but also available for off-the-shelf use as standard products
- › Integrated self-protection and diagnosis
- › Enhanced error detection for improved system reliability
- › Control via standard SPI Bus or MicroSecond channel (TLE8718SA) or direct inputs
- › Suitable for daisy-chain configuration to save I/O ports
- › Support of safety-critical applications by overvoltage protection on all pins (TLE8718SA)
- › High quality ensured with automotive excellence program on Zero Defect strategy



### Block diagram Flex (TLE8102SG)



### Selection tree – Flex multichannel low-side switches





## Smart multichannel switches for powertrain and safety: Flex

Product table

	Target loads <sup>2)</sup>	Channels	Electrical specification			
			#	$R_{DS(on)}$ (max) @ 25 °C [mΩ]	$I_{L(lim)}$ (max) [A]	$V_{CL}$ (typ) [V]
TLE8102SG	High-current solenoids, O2-heater	2	2x	0.18	5.00 (9.00)	54
TLE8104E	Injectors, high-current solenoids, stepper-motor	4	4x	0.32	3.00	53
TLE6232GP	High-current relays, injectors, high-current solenoids	6	4x 2x	0.25 0.45	3.00 1.50	53
TLE6230GP	Relays, high-current relays	8	8x	0.80	1.00	43
TLE8108EM	LEDs, relays	8	8x	0.80	0.50	45
TLE8110EE	LEDs, high-current relays, injectors, high-current solenoids, stepper-motor	10	4x 2x 4x	0.30 0.25 0.60	2.60 3.70 1.70	55
TLE6240GP	High-current relays, injectors, high-current solenoids	16	8x 4x 4x	1.00 0.35 0.30	1.00 3.00 3.00	50 53 53
TLE8718SA	LEDs, relays, injectors, high-current solenoids, O2-heater	18	2x 2x 8x 2x 2x 2x	0.15 0.26 0.53 0.35 1.78 0.96	8.00 3.00 2.20 2.20 0.60 0.60	55

1) See packages on page 140 and 141

2) Indication only. Devices can drive any kind of inductive/resistive load according to spec

3) Refer to Application Note: TLE8110 – SPI and daisy-chain



MOSFETS

TEMPFET™  
HITFET™

Smart  
multichannel  
switches

PROFET™

SPOC™

LITIX™

Motor drivers

Power supply

Automotive  
transceivers

Automotive  
system ICs

Glossary

Interface				Overcurrent protection		Status flag	Package <sup>1)</sup>
Direct input pins	SPI	MSC	Daisy-chain	I-limit	Switch-Off		
2	8-bit		•	•	•	•	DSO-12
4	8-bit		•	•		•	DSO-20
6	16-bit			•		•	DSO-36 (Power-SO)
4	16-bit			•		•	DSO-36 (Power-SO)
4	16-bit		•		•		SSOP-24 EP
10	16-bit		• <sup>3)</sup>		•		DSO-36 EP
8	16-bit		•	•		•	DSO-36 (Power-SO)
		LVDS + LVTTTL		•	•		DSO-36 (Power-SO)



# PROFET™: smart high-side switches

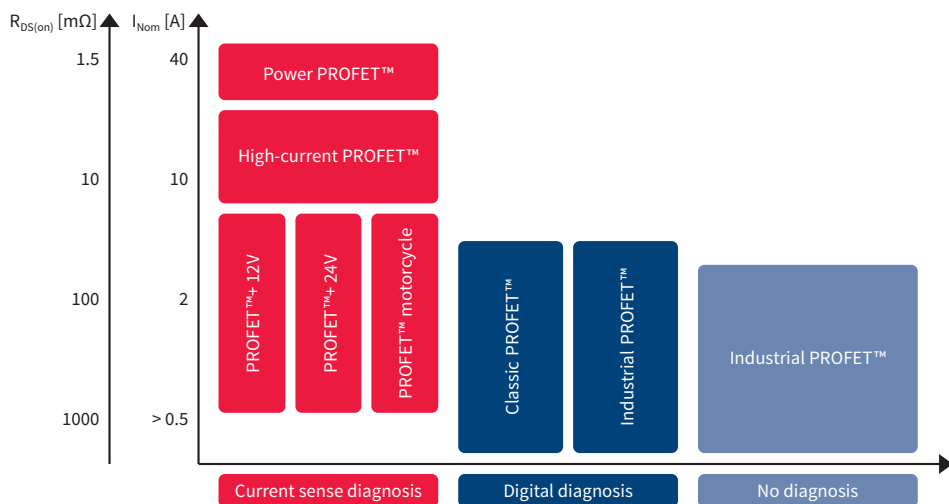
The highly integrated PROFET™ family (PROtected FET) incorporates a broad range of smart features, like diagnosis and protection. PROFET™ intelligent power switches consist of DMOS power transistor and CMOS logic circuitry for complete built-in protection.

The PROFET™ family offers protection against overload, overvoltage, short-circuit, excessive temperature, loss of ground, power supply loss and Electrostatic Discharge (ESD). The PROFET™ family products are also capable of protecting against dynamic overvoltage such as load dump and inductive load turn-off.

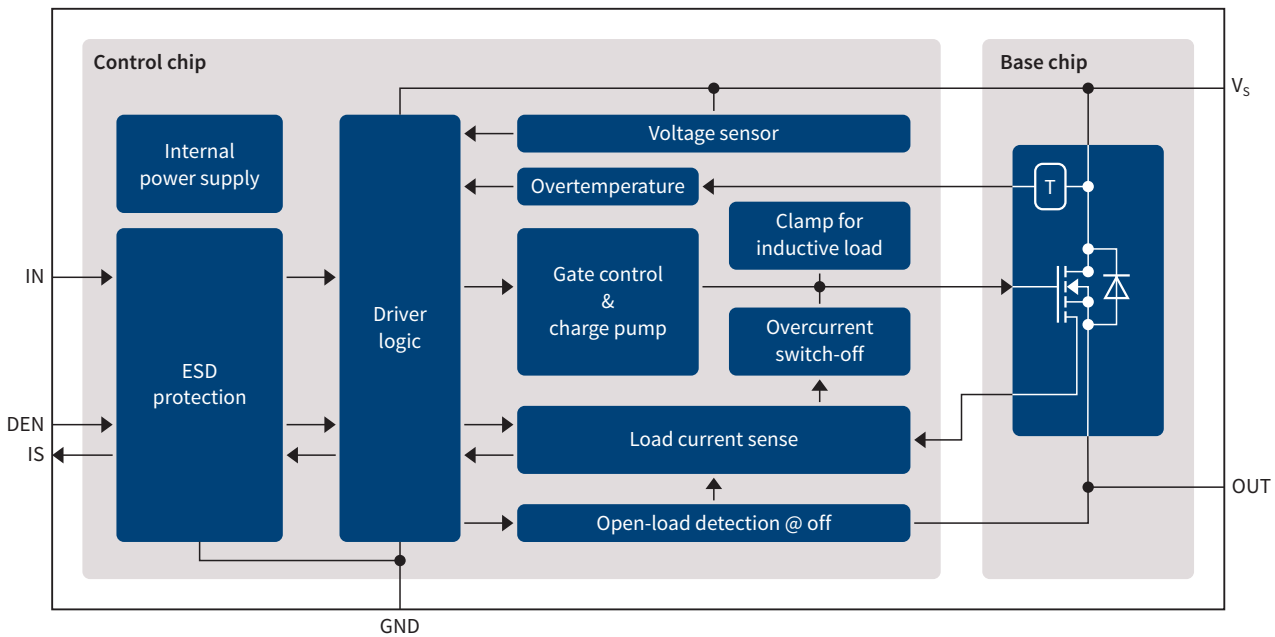
The PROFET™ diagnostics offer the choice of either status or current sense features, or a combination of both. In the event of a malfunction, the status feature is able to diagnose overtemperature or open-load. The PROFET™ diagnostic features also provide the user with precise information about switch and load. Diagnostic feedback and load current sensing minimize risks by eliminating the need for additional discrete circuitry and assembly.

This vast range of smart features makes the PROFET™ ideal for a variety of automotive (12 V), trucks & agriculture (24 V) and industrial applications.

## PROFET™ family



## Block diagram BTS500x0-1EGA



### Application examples

- > Lighting
- > Heating
- > Power distribution
- > Motor control

### Application ranges

- > Automotive (12 V)
- > Transportation (24 V)
- > Industrial

### Load

- > Capacitive, such as lamps and glow plugs
- > Resistive, such as seat heating
- > Inductive, such as solenoids
- > Electronic, such as ECU

### Basic features

- > High-side switches (0.5 ... 45 A load current)
- > RoHS compliant & AEC qualified
- > Very low stand-by current
- > ESD protection, optimized EMC
- > PWM capability
- > Very low power DMOS leakage current in OFF
- > 3.3 V and 5 V compatible logic inputs

### Protection features

- > Load dump
- > Current limitation
- > Thermal shutdown
- > Loss of ground/battery protection
- > Stable behavior at undervoltage
- > Overvoltage protection (ext. components)
- > Reverse polarity compliant

### Diagnostic features

- > Proportional load current sense
- > Open-load in ON- and OFF-state
- > Short-circuit to battery and ground
- > Overtemperature sense

# PROFET™: smart high-side switches

No diagnosis

## Basic features

- > 12 V or 24 V capable
- > Single channel

## Protection features

- > Short-circuit protection
- > Current limitation
- > Overvoltage protection
- > Overtemperature protection

Product type	Product family	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max) @ $T_j = 150$ °C [mΩ]	Nominal load current [A]
<b>Automotive grade</b>				
BTS4140N <sup>2)</sup>	Classic PROFET™	1000	3000	0.20
BSP742T	Classic PROFET™	260	700	1.10
BSP452	Classic PROFET™	160	400	0.70
BTS452T	Classic PROFET™	150	380	2.20
BSP752T	Classic PROFET™	150	380	1.70
BTS4141N	Classic PROFET™	150	320	0.70
BTS4142N	Classic PROFET™	150	320	1.40
BSP762T	Classic PROFET™	70	200	2.40
BTS462T	Classic PROFET™	70	200	4.40
BTS730	Classic PROFET™	70	140	3.00
BSP772T	Classic PROFET™	50	120	3.10
BTS441TG	Classic PROFET™	15	37	21.00

1) See packages on page 140 and 141

2) Current controlled input at  $T_j = 125$  °C

$E_{AS}$ [mJ]	Operating voltage range [V]	$I_{L(SC)}$ (typ) [A]	24 V capable	Package <sup>1)</sup>
1000 @ 0.15 A	4.90 ... 60.00	0.70	●	SOT223
100 @ 0.50 A	5.00 ... 34.00	3.00		DSO-8
500 @ 0.50 A	5.00 ... 34.00	1.50		SOT223
150 @ 1.00 A	6.00 ... 52.00	6.00	●	TO252-5 (DPAK 5-leg)
125 @ 1.00 A	6.00 ... 52.00	6.00	●	DSO-8
700 @ 0.70 A	12.00 ... 45.00	1.10	●	SOT223
160 @ 1.00 A	12.00 ... 45.00	2.20	●	SOT223
870 @ 1.00 A	5.00 ... 34.00	7.00		DSO-8
4400 @ 1.00 A	5.00 ... 34.00	10.00		TO252-5 (DPAK 5-leg)
n/a	5.90 ... 16.90	20.00		DSO-20
900 @ 1.50 A	5.00 ... 34.00	12.00		DSO-8
700 @ 21.00 A	4.75 ... 41.00	65.00	●	TO263-5-2 (TO220-5 (SMD))

# PROFET™: smart high-side switches

## Digital diagnosis

### Basic features

- > 12 V or 24 V capable
- > Single or multichannel

### Protection features

- > Overload protection
- > Loss of battery/GND
- > Short-circuit protection
- > Overvoltage protection

### Diagnosis features

- > Open drain status feedback
- > Overtemperature
- > Open-load
- > Current limitation

Product type	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150 °C [mΩ]	Nominal load current [A]	E <sub>AS</sub> [mJ]	Operating voltage range [V]	I <sub>L(SC)</sub> (typ) [A]
<b>Automotive grade</b>							
BTS4300SGA	Classic PROFET™	300	600	0.40	800 @ 0.300 A	5.00 ... 34.00	1.00
BSP742R	Classic PROFET™	250	700	0.40	800 @ 0.300 A	5.00 ... 34.00	1.00
BSP742RI <sup>2)</sup>	Classic PROFET™	250	700	0.40	800 @ 0.300 A	5.00 ... 34.00	1.00
BTS4175SGA	Classic PROFET™	175	350	1.30	125 @ 1.000 A	6.00 ... 52.00	6.50
BTS712N1	Classic PROFET™	165	400	1.10	150 @ 1.900 A	5.00 ... 34.00	4.00
BTS711L1	Classic PROFET™	165	400	1.10	150 @ 1.900 A	5.00 ... 35.00	4.00
BTS4160DGA	Classic PROFET™	160	320	1.20	65 @ 2.900 A	5.50 ... 20.00	6.50
BSP752R	Classic PROFET™	150	380	1.70	125 @ 1.000 A	6.00 ... 52.00	6.00
BTS452R	Classic PROFET™	150	380	2.20	150 @ 1.000 A	6.00 ... 52.00	6.00
BTS4880R	Classic PROFET™	150	320	0.60	10,000 @ 0.625 A	11.00 ... 45.00	1.10
BTS716GB	Classic PROFET™	140	280	1.30	76 @ 2.300 A	5.50 ... 40.00	6.50
BTS4130QGA	Classic PROFET™	130	260	1.10	76 @ 2.300 A	5.50 ... 20.00	6.50
BTS5210G	Classic PROFET™	110	280	1.90	65 @ 2.900 A	5.50 ... 40.00	6.50
BTS5210L	Classic PROFET™	110	280	1.90	84 @ 2.900 A	5.50 ... 40.00	6.50
BTS716G	Classic PROFET™	110	280	1.30	76 @ 2.300 A	5.50 ... 40.00	6.50
BTS723GW	Classic PROFET™	95	210	2.10	110 @ 2.500 A	7.00 ... 58.00	8.00
BTS721L1	Classic PROFET™	85	200	1.60	300 @ 2.900 A	5.00 ... 34.00	8.00
AUIPS7091G	Classic PROFET™	80	230	2.00	–	6.00 ... 35.00	5.00
BTS5215L	Classic PROFET™	70	180	4.80	178 @ 3.500 A	5.50 ... 40.00	12.00
BTS724G	Classic PROFET™	70	180	1.80	120 @ 3.300 A	5.50 ... 40.00	12.00
BTS428L2	Classic PROFET™	50	120	7.00	190 @ 7.000 A	4.75 ... 41.00	17.00
BTS432E2	High-Current PROFET™	38	70	11.00	1700 @ 20.000 A	4.50 ... 42.00	44.00
BTS432E2 E3062A	High-Current PROFET™	38	70	11.00	1700 @ 20.000 A	4.50 ... 42.00	44.00
AUIPS7221R	Classic PROFET™	30	70	6.00	–	6.00 ... 60.00	30.00
AUIPS72211R	Classic PROFET™	30	70	6.00	–	6.00 ... 60.00	30.00
AUIPS6021R	Classic PROFET™	24	52	8.00	–	6.00 ... 28.00	32.00
BTS442E2	High-Current PROFET™	18	35	21.00	2100 @ 20.000 A	4.50 ... 42.00	95.00
BTS442E2 E3062A	High-Current PROFET™	18	35	21.00	2100 @ 20.000 A	4.50 ... 42.00	95.00
BTS441RG	Classic PROFET™	15	37	21.00	700 @ 21.000 A	4.75 ... 41.00	55.00

1) See packages on page 140 and 141

2) Inversed logic for diagnosis



Number of channels	24 V capable	High current limit	Low current limit	Overvoltage shutdown	Short-circuit diagnosis			Package <sup>1)</sup>
					to GND	to battery	Open-load in ON-state	
1			•		•	•		DSO-8
1			•		•	•		DSO-8
1			•		•	•		DSO-8
1	•	•			•	•		DSO-8
4		•		•		•		DSO-20
4		•		•	•		•	DSO-20
2		•				•		DSO-14
1	•	•			•	•		DSO-8
1	•		•		•	•		TO252-5 (DPAK 5-leg)
8	•				•			DSO-36 (Power-SO)
4		•				•		DSO-20
4		•				•		DSO-20
2		•				•		DSO-14
2		•				•		DSO-12
4		•				•		DSO-20
2	•		•		•	•		DSO-14
4		•		•		•		DSO-20
1			•		•			SO-8 (DSO-8)
2		•				•		DSO-12
4		•				•		DSO-20
1		•			•		•	TO252-5 (DPAK 5-leg)
1	•	•		•	•		•	TO220-5-11
1	•	•		•	•		•	TO263-5-2 (TO220-5 (SMD))
1	•	•			•			TO-252 (DPAK 5-leg)
1	•	•			•			TO-252 (DPAK 5-leg)
1		•			•		•	TO-252 (DPAK 5-leg)
1	•	•		•	•		•	TO220-5-11
1	•	•		•	•		•	TO263-5-2 (TO220-5 (SMD))
1		•				•		TO263-5-2 (TO220-5 (SMD))

# PROFET™: smart high-side switches

## Current sense, current input

### Basic features

- > 12 V or 24 V capable
- > Single channel

### Protection features

- > Current limitation
- > Overload protection
- > Short-circuit shutdown
- > ReverSave™
- > Loss of GND

### Diagnosis features

- > Analog signal proportional to load current
- > Overload detection
- > Short-circuit detection

Product type	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150 °C [mΩ]	Nominal load current [A]	E <sub>AS</sub> @ 20 A [mJ]	Operating voltage range [V]	I <sub>L(sc)</sub> (typ) [A]
BTS6163D	High-Current PROFET™	20.00	40.00	6.50	250	5.50 ... 62.00	70
BTS443P	High-Current PROFET™	16.00	32.00	6.50	150	5.00 ... 36.00	65
BTS5016SDA	High-Current PROFET™	16.00	32.00	6.50	120	5.50 ... 20.00	75
BTS5014SDA	High-Current PROFET™	14.00	28.00	7.00	150	5.50 ... 20.00	80
BTS5012SDA	High-Current PROFET™	12.00	24.00	8.00	200	5.50 ... 20.00	90
BTS6142D	High-Current PROFET™	12.00	22.00	8.00	250	5.50 ... 24.00	100
BTS6143D	High-Current PROFET™	10.00	18.00	10.00	300	5.50 ... 38.00	105
BTS6133D	High-Current PROFET™	10.00	18.00	10.00	300	5.50 ... 38.00	105
BTS50085-1TMA	High-Current PROFET™	9.00	17.00	11.00	1200	5.50 ... 58.00	90
BTS50085-1TMB	High-Current PROFET™	9.00	17.00	11.00	1200	5.00 ... 58.00	90
BTS50080-1TMA	High-Current PROFET™	8.00	16.00	12.00	400	5.50 ... 38.00	130
BTS50080-1TMB	High-Current PROFET™	8.00	16.00	12.00	400	5.50 ... 38.00	130
BTS50080-1TMC	High-Current PROFET™	8.00	16.00	12.00	400	5.50 ... 38.00	130
BTS50080-1TEA	High-Current PROFET™	8.00	16.00	10.00	300	5.50 ... 30.00	125
BTS50080-1TEB	High-Current PROFET™	8.00	16.00	10.00	300	5.50 ... 30.00	125
AUIPS7111S	High-Current PROFET™	6.00	15.00	15.00	–	8.00 ... 50.00	45
BTS50055-1TMA	High-Current PROFET™	6.00	11.00	17.00	1500	5.00 ... 34.00	130
BTS50055-1TMB	High-Current PROFET™	6.00	11.00	17.00	1500	5.00 ... 34.00	130
BTS50055-1TMC	High-Current PROFET™	6.00	11.00	17.00	1500	5.50 ... 34.00	130
AUIR3316S	High-Current PROFET™	5.50	13.50	16.00	–	6.00 ... 26.00	120
AUIPS6121R	High-Current PROFET™	4.80	9.00	18.00	–	5.50 ... 35.00	90
BTS550P	High-Current PROFET™	3.50	6.50	35.00	3000	5.00 ... 34.00	220
AUIR3320S	High-Current PROFET™	3.30	6.50	22.00	–	6.00 ... 26.00	75
BTS555	High-Current PROFET™	2.50	4.00	45.00	3000	5.00 ... 34.00	400

1) See packages on page 140 and 141

24 V capable	Short-circuit to GND protection		Overtemperature protection		Inverse current operation capability	Open-load in ON detection	Package <sup>1)</sup>
	Latch	Restart	Latch	Restart			
•	•			•		•	TO252-5 (DPAK 5-leg)
		•		•		•	TO252-5 (DPAK 5-leg)
	•			•		•	TO252-5 (DPAK 5-leg)
	•			•		•	TO252-5 (DPAK 5-leg)
	•			•		•	TO252-5 (DPAK 5-leg)
	•			•		•	TO252-5 (DPAK 5-leg)
	•			•	•	•	TO252-5 (DPAK 5-leg)
•	•			•	•		TO263-7-1 (TO220-7 (SMD))
•	•			•	•		TO220-7-11
	•			•		•	TO263-7-1 (TO220-7 (SMD))
	•			•		•	TO220-7-12
	•			•		•	TO263-7-1 (TO220-7 (SMD))
	•			•		•	TO252-5 (DPAK 5-leg)
	•			•	•	•	TO252-5 (DPAK 5-leg)
•	•		•		•	•	TO-263-5 (D <sup>2</sup> PAK 5-leg)
	•			•	•		TO263-7-1 (TO220-7 (SMD))
	•			•	•		TO220-7-11
		•		•	•		TO263-7-1 (TO220-7 (SMD))
	•		•		•		TO-263-5 (D <sup>2</sup> PAK 5-leg)
	•		•		•		TO-252 (DPAK 5-leg)
	•			•	•		TO218-5
	•		•		•		TO-263-5 (D <sup>2</sup> PAK 5-leg)
	•		•		•		TO218-5

# PROFET™: smart high-side switches

Current sense, voltage input

## Basic features

- › 12 V or 24 V capable
- › Single or multichannel

## Protection features

- › Short-circuit shutdown with auto-restart or latch
- › Overtemperature shutdown with auto-restart or latch
- › Reverse polarity protection by ReverSave™ for high-current PROFET™ or with external components for PROFET™+ 12/24 V
- › Loss of GND

## Diagnosis features

- › Analog signal proportional to load current
- › Overload
- › Open-load in ON
- › Overtemperature
- › Short-circuit to GND

Product type	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150 °C [mΩ]	Nominal load current [A]	E <sub>AS</sub> [mJ]	Operating voltage range [V]	I <sub>L(sc)</sub> (typ) [A]
<b>Automotive grade</b>							
BTS5200-4EKA	PROFET™+ 12 V	200.00	400.00	4 x 0.80	50 @ 0.50 A	5.00 ... 28.00	7.30
BTS40k2-1EJC	Classic PROFET™	200.00	400.00	1.50	20 @ 1.00 A	5.00 ... 36.00	5.00
BTT6200-4EMA	PROFET™+ 24 V	200.00	400.00	4 x 1.00	20 @ 1.00 A	5.00 ... 48.00	11.00
BTT6200-1EJA	PROFET™+ 24 V	200.00	400.00	1.50	20 @ 1.00 A	5.00 ... 48.00	11.00
BTS5200-1EJA	PROFET™+ 12 V	200.00	400.00	1.50	40 @ 1.00 A	5.00 ... 48.00	11.00
BTS5180-2EKA	PROFET™+ 12 V	180.00	360.00	2 x 1.00	30 @ 1.00 A	5.00 ... 48.00	12.00
BTS5120-2EKA	PROFET™+ 12 V	120.00	240.00	2 x 1.00	15 @ 2.00 A	5.00 ... 48.00	12.00
BTT6100-2EKA	PROFET™+ 24 V	100.00	200.00	2 x 2.20	36 @ 1.50 A	5.00 ... 48.00	25.00
BTS5090-2EKA	PROFET™+ 12 V	90.00	180.00	2 x 2.00	42 @ 3.00 A	5.00 ... 28.00	32.00
BTS5090-1EJA	PROFET™+ 12 V	90.00	180.00	2.50	42 @ 3.00 A	5.00 ... 28.00	32.00
BTS6110-1SJA	PROFET™ Motorcycle	80.00	200.00	2.00	n/a	8.00 ... 24.00	27.00
BTT6050-1EKA	PROFET™+ 24 V	50.00	100.00	4.50	55 @ 4.00 A	5.00 ... 48.00	47.00
BTT6050-2EKA	PROFET™+ 24 V	50.00	100.00	2 x 3.00	55 @ 4.00 A	5.00 ... 48.00	47.00
BTS5045-2EKA	PROFET™+ 12 V	45.00	90.00	2 x 2.50	35 @ 4.00 A	5.00 ... 28.00	32.00
BTS5045-1EJA	PROFET™+ 12 V	45.00	90.00	3.00	35 @ 4.00 A	5.00 ... 28.00	32.00
BTT6030-2EKA	PROFET™+ 24 V	30.00	64.00	2 x 4.00	50 @ 4.00 A	5.00 ... 48.00	70.00
BTT6030-1EKA	PROFET™+ 24 V	30.00	64.00	6.00	50 @ 6.00 A	5.00 ... 48.00	70.00
BTS5030-2EKA	PROFET™+ 12 V	30.00	60.00	2 x 3.00	50 @ 6.00 A	5.00 ... 28.00	47.00
BTS5030-1EJA	PROFET™+ 12 V	30.00	60.00	4.00	50 @ 6.00 A	5.00 ... 28.00	47.00
BTS740S2	Classic PROFET™	27.00	60.00	4.30	370 @ 5.50 A	5.00 ... 34.00	50.00
BTS640S2G	Classic PROFET™	27.00	60.00	4.50	410 @ 12.60 A	5.00 ... 34.00	50.00
BTT6020-1EKA	PROFET™+ 24 V	20.00	42.00	7.00	100 @ 7.00 A	5.00 ... 48.00	74.00
BTS5020-2EKA	PROFET™+ 12 V	20.00	40.00	2 x 4.00	75 @ 6.00 A	5.00 ... 28.00	65.00
BTS5020-1EKA	PROFET™+ 12 V	20.00	40.00	5.00	74 @ 6.00 A	5.00 ... 28.00	65.00
BTS5016-2EKA	PROFET™+ 12 V	16.00	32.00	2 x 5.00	95 @ 7.00 A	5.00 ... 28.00	65.00
BTS5016-1EKB	PROFET™+ 12 V	16.00	32.00	6.00	95 @ 7.00 A	5.00 ... 28.00	65.00
BTS5012-1EKB	PROFET™+ 12 V	12.00	24.00	8.00	110 @ 10.00 A	5.00 ... 28.00	65.00
BTS5010-1EKB	PROFET™+ 12 V	10.00	20.00	9.00	155 @ 10.00 A	5.00 ... 28.00	65.00
BTT6010-1EKA	PROFET™+ 24 V	10.00	22.00	9.00	100 @ 8.00 A	5.00 ... 48.00	115.00
BTT6010-1EKB	PROFET™+ 24 V	10.00	22.00	9.00	100 @ 8.00 A	5.00 ... 48.00	86.00
BTS5008-1EKB	PROFET™+ 12 V	8.00	16.00	10.00	160 @ 11.00 A	5.00 ... 48.00	65.00
BTS50080-1EGA	High-Current PROFET™	8.00	16.00	13.00	125 @ 50.00 A	5.00 ... 48.00	150.00
BTS50070-1EGA	High-Current PROFET™	7.00	14.00	14.00	145 @ 50.00 A	5.00 ... 48.00	150.00
BTS50060-1EGA	High-Current PROFET™	6.00	12.00	15.00	170 @ 50.00 A	5.00 ... 48.00	150.00
BTS50060-1TEA	High-Current PROFET™	6.00	12.00	13.50	280 @ 20.00 A	5.00 ... 48.00	75.00
BTF50060-1TEA <sup>2)</sup>	High-Current PROFET™	6.00	12.00	13.50	280 @ 20.00 A	5.00 ... 48.00	75.00
BTS50050-1EGA	High-Current PROFET™	5.00	10.00	16.00	200 @ 50.00 A	5.00 ... 48.00	150.00
BTS50040-2SFA	High-Current PROFET™	4.00	8.20	2 x 11.00	411 @ 20.00 A	5.00 ... 48.00	160.00
AUIR3330S	High-Current PROFET™	3.00	6.20	23.00	n/a	5.00 ... 48.00	70.00
AUIR33402S	High-Current PROFET™	3.00	6.20	23.00	n/a	5.00 ... 48.00	70.00
BTS50015-1TAD <sup>3)</sup>	Power PROFET™	1.50	3.00	39.00	550 @ 33.00 A	5.00 ... 48.00	135.00

1) See packages on page 140 and 141

2) Speed PROFET™, capable for PWM up to 25 kHz

3) Available in Q2/2016

Number of channels	Load current		Overvoltage shutdown	Sense enable	Open-load in OFF	Latch	24 V	ReverSave™	Package <sup>1)</sup>
	Limit	Trip							
4	•			•	•				DSO-14 EP
1	•			•	•				DSO-8
4	•			•	•	•	•		SSOP-24
1	•			•	•	•	•		DSO-8 EP
1	•			•	•				DSO-8
2	•			•	•				DSO-14 EP
2	•			•	•				DSO-14 EP
2	•			•	•	•	•		DSO-14 EP
2	•			•	•				DSO-14 EP
1	•			•	•				DSO-8 EP
1	•					•			DSO-8
1	•			•	•	•	•		DSO-14 EP
2	•			•	•	•	•		DSO-14 EP
2	•			•	•				DSO-14 EP
1	•			•	•				DSO-8 EP
2	•			•	•				DSO-14 EP
2	•			•	•				DSO-14 EP
1	•			•	•				DSO-8 EP
2	•			•	•				DSO-14 EP
1	•			•	•				DSO-8 EP
2	•		•						DSO-20
1	•		•						TO263-7-1 (TO220-7 (SMD))
1	•			•	•	•	•		DSO-14 EP
2	•			•	•				DSO-14 EP
1	•			•	•				DSO-14 EP
2	•			•	•				DSO-14 EP
1	•			•	•				DSO-14 EP
1	•			•	•				DSO-14 EP
1	•			•	•				DSO-14 EP
1	•			•	•	•	•		DSO-14 EP
1	•			•	•				DSO-14 EP
1		•		•	•			•	DSO-12
1		•		•	•			•	DSO-12
1		•		•	•			•	DSO-12
1		•			•				TO252-5 (DPAK 5-leg)
1		•			•				TO252-5 (DPAK 5-leg)
1		•		•	•			•	DSO-12
2		•		•				•	DSO-36
1		•				•			TO-263-7 (D <sup>2</sup> PAK 7-leg)
1		•				•			TO-263-7 (D <sup>2</sup> PAK 7-leg)
1		•				•		•	TO263-7-8 (TO220-7 (SMD))



## SPOC™: SPI power controller

SPOC™ devices are high-side Smart Power multichannel switches providing embedded protection diagnosis and intelligence. They are specially designed for standard exterior lighting in automotive applications, but can be used for further automotive and industrial applications such as heating, motor driving or power distribution.

Integration helps reducing the complexity of the electronics, allowing board space reduction and decreasing the need for external components. Control, configuration and

diagnosis are carried out via a Serial Peripheral Interface (SPI), which saves I/Os on the microcontroller and provides flexibility for the solution. Furthermore, fail-safe modes are supported, which enhances safety in operation.

Re-use and design flexibility is supported through the pin, function and package compatibility of the devices within each SPOC™ family.

SPOC™ provides decisive advantages on system level and for a wide range of applications.

### Basic features

- › Serial Peripheral Interface (SPI) (daisy-chain capable) for control and diagnosis
- › CMOS-compatible parallel input pins provide straight-forward PWM operation
- › Very low stand-by current
- › Optimized electromagnetic compatibility
- › Suitable for bulbs as well as LEDs

### Diagnosis functions

- › Multiplexed proportional load current sense signals
- › High accuracy of current sense signal at wide load current range
- › Latching feedback on overtemperature and overload via SPI
- › Diagnosis PWM with small duty cycle possible
- › LED mode
- › Fail-safe activation via LHI pin and configuration via input pins

### Protective functions

- › Reverse battery protection
- › Short-circuit and overload protection
- › Multistep current or tripping (SPOC™ FL)
- › Thermal shutdown with latch
- › Overvoltage protection
- › Reverse polarity protection (SPOC™ FL)
- › Loss of ground protection

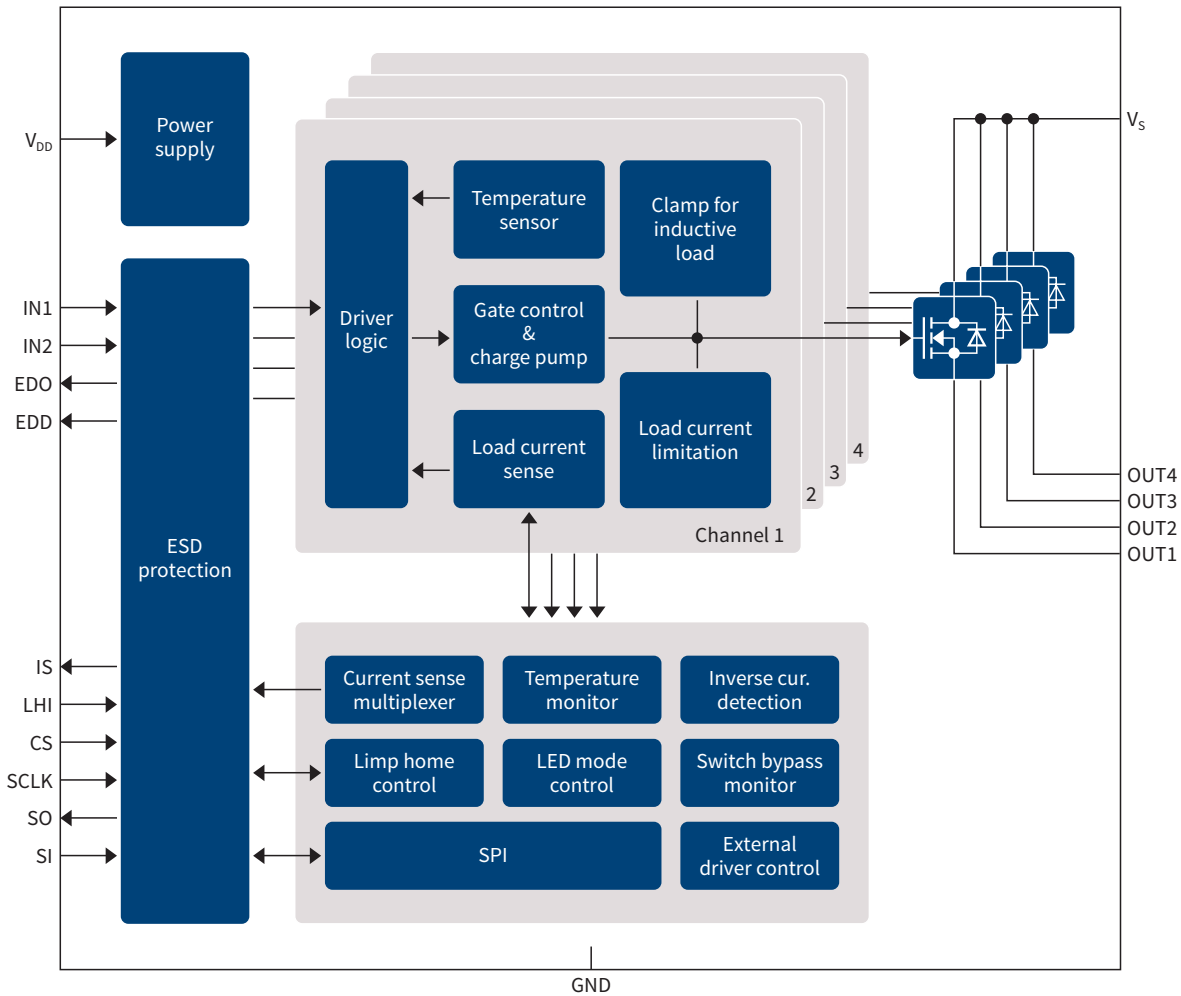
### Options

- › **LED mode (SPOC™+, SPOC™ FL):** Load type configuration between bulbs and LEDs for products featuring the LED mode option (current sense ratio configurable, very fast diagnosis in LED mode)
- › **PWM engine (SPOC™ FL):** autonomous PWM generator to reduce micro controller loading
- › **External drive capability (SPOC™+, SPOC™ FL):** ability to control one or two Smart Power drivers to reduce the I/O usage of the micro controller
- › **Lead tip inspection (SPOC™+):** LTI package version in order to process TSON-24 leadless package with standard optical inspection (AOI)





Block diagram SPOC™+: BTS54220-LBE

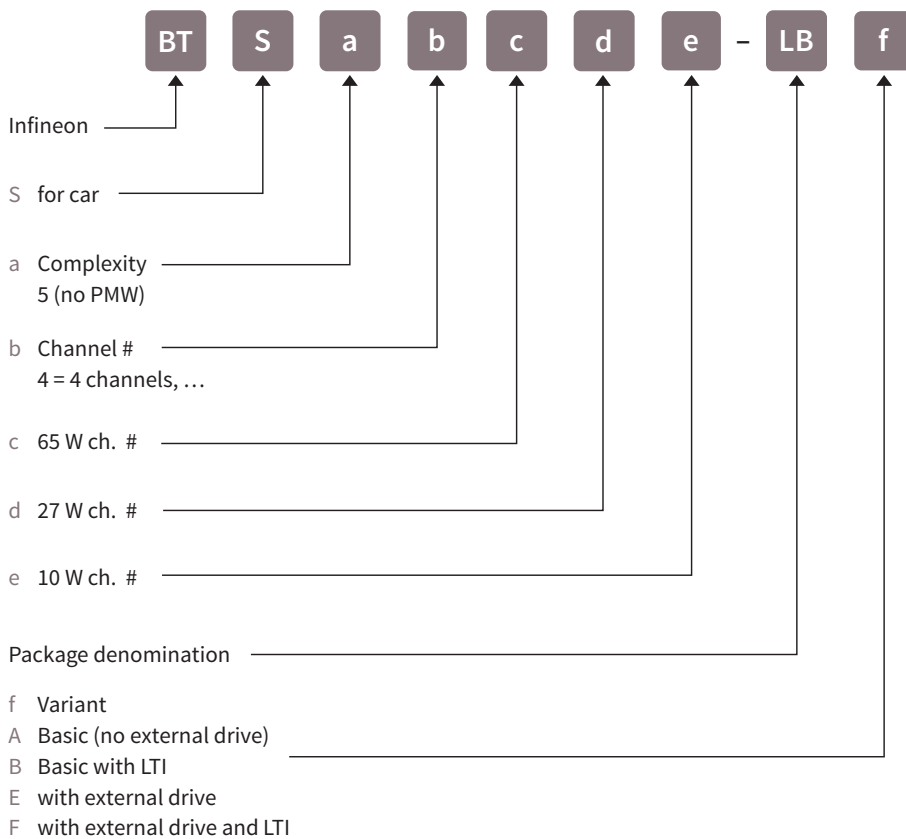






# SPOC™ – SPI Controller for advanced light control

## SPOC™+ family naming system



## Product table

Product type	Channel mix [mΩ]			LED mode (27 W channels)	PWM engine integrated	External drive capability	LTI package option	Package <sup>1)</sup>
	65 W	27 W	10 W					
<b>SPOC™FL (Front Light)</b>								
BTS5482SF	2 x 4.50	2 x 14	-	●		●	n/a	DSO-36
BTS6480SF	2 x 4.50	2 x 14	-	●	●	●	n/a	DSO-36
<b>SPOC™+</b>								
BTS54220-LBA	2 x 9.00	2 x 27	-	●				TSON-24
BTS54220-LBB	2 x 9.00	2 x 27	-	●			●	TSON-24
BTS54220-LBE	2 x 9.00	2 x 27	-	●		●		TSON-24
BTS54220-LBF	2 x 9.00	2 x 27	-	●		●	●	TSON-24
BTS54040-LBA	-	4 x 39	-	●				TSON-24
BTS54040-LBB	-	4 x 39	-	●			●	TSON-24
BTS54040-LBE	-	4 x 39	-	●		●		TSON-24
BTS54040-LBF	-	4 x 39	-	●		●	●	TSON-24
BTS56033-LBA	-	3 x 39	3 x 110	●				TSON-24
BTS56033-LBB	-	3 x 39	3 x 110	●			●	TSON-24

1) See packages on page 140 and 141



## LITIX™ – Infineon® Auto LED Driver

The LITIX™ – Infineon® Auto LED Driver is an enabler of protected and high-performing lighting applications in the automotive industry. In particular, the constant current regulation secures the stable brightness of the LED over the whole automotive temperature and voltage range.

### Features

- › Constant output current, therefore constant brightness and extended LED lifetime
- › Wide input voltage range
- › Low drop voltage
- › Open-load detection
- › Overtemperature protection
- › Short-circuit proof
- › Reverse polarity proof
- › Wide temperature range
- › Very small SMD packages
- › Automotive qualified

LITIX™ – Infineon® Auto LED Driver consists of 4 sub-families

### LITIX™ Basic

- › Flexible linear current source family with scalable feature set

### LITIX™ Linear

- › BCR400 series is the most cost effective solution to drive low-power LED
- › Linear current sources for low, medium and low-cost high-power applications

Both the driver and LED are protected against overstress e.g. caused by voltage spikes or overtemperature.

All kinds of load conditions are detected by its diagnostic features, such as open-load or shorted LED.

All features are required to drive LEDs in harsh automotive environment conditions.

### Applications

The Infineon automotive-optimized LED drivers address interior and exterior, low to high-power automotive LED applications such as: high and low beam, fog, DRL, position, tail, stop, CHMSL, RCL, reverse, turn indicator, dome, ambient lighting, status lamps etc.

### LITIX™ Power

- › DC/DC converter & controller for medium to high-power applications

### LITIX™ Power Flex

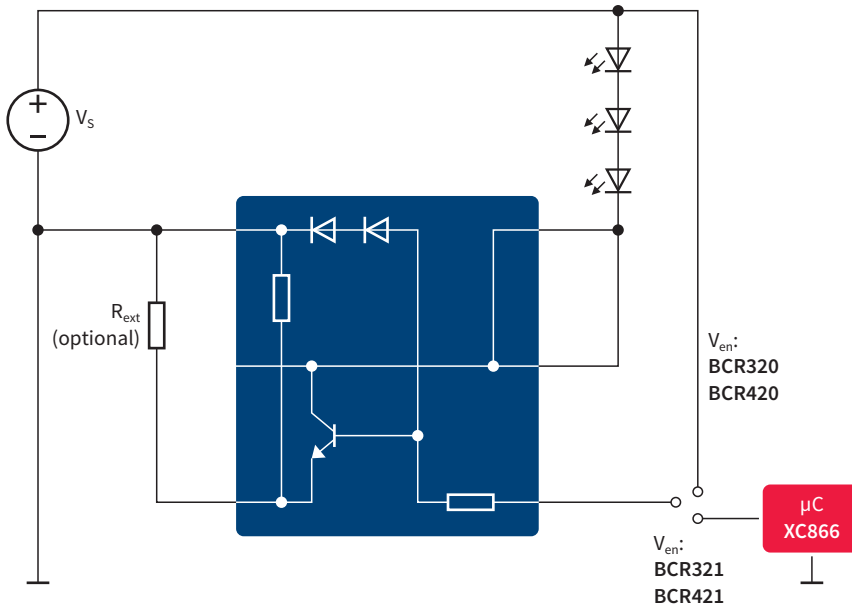
- › Multitopology DC/DC controller for highest flexibility/power applications



# LITIX™ Linear

BCR400 series is the most cost effective solution to drive low power LED

Block diagram BCR42x-U



Product table

Product type	Output current (max) [mA]	Adjustable output current	Supply voltage (max) [V]	Inhibit	PWM enable	P <sub>tot</sub> [mW]	Package <sup>1)</sup>
BCR401U	65	●	40			750	SC74
BCR401W	65	●	18			500	SOT343
BCR402U	65	●	40			750	SC74
BCR402W	65	●	18			500	SOT343
BCR405U	65	●	40			750	SC74
BCR320U	250	●	27			1000	SC74
BCR321U	250	●	27	●	●	1000	SC74
BCR420U	150	●	40			1000	SC74
BCR421U	150	●	40	●	●	1000	SC74

1) See packages on page 140 and 141

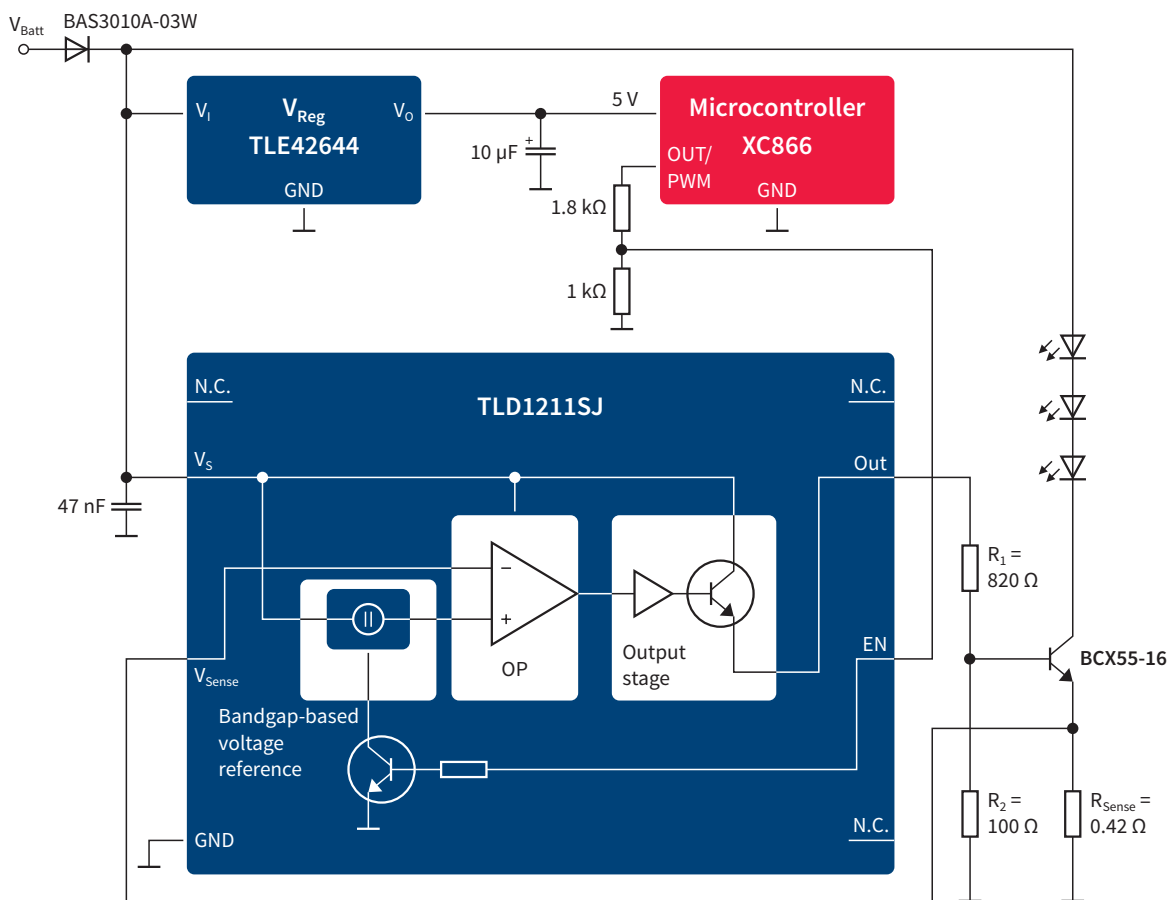
# LITIX™ Linear

## Linear current sources for low to medium power applications

LED drivers designed to supply constant current up to 500 mA and with an external transistor of up to 2.5 A. This enables constant LED brightness and ensures extended

LED lifetime, regardless of the supply voltage or LED forward voltage class.

### Block diagram TLD1211SJ



### Product table

Product type	Output current (max) [mA]	Adjustable	Driver for external transistor	Open-load detection	PWM/enable input	Adjustable high/low current switch	Package <sup>1)</sup>
TLD1211SJ	85	•	•		•		DSO-8
TLE4241GM	60	•		•	•	•	DSO-8
TLE4242EJ	250	•		•	•		DSO-8 EP
TLE4242G	450	•		•	•		TO263-7-1 (TO220-7 (SMD))

1) See packages on page 140 and 141

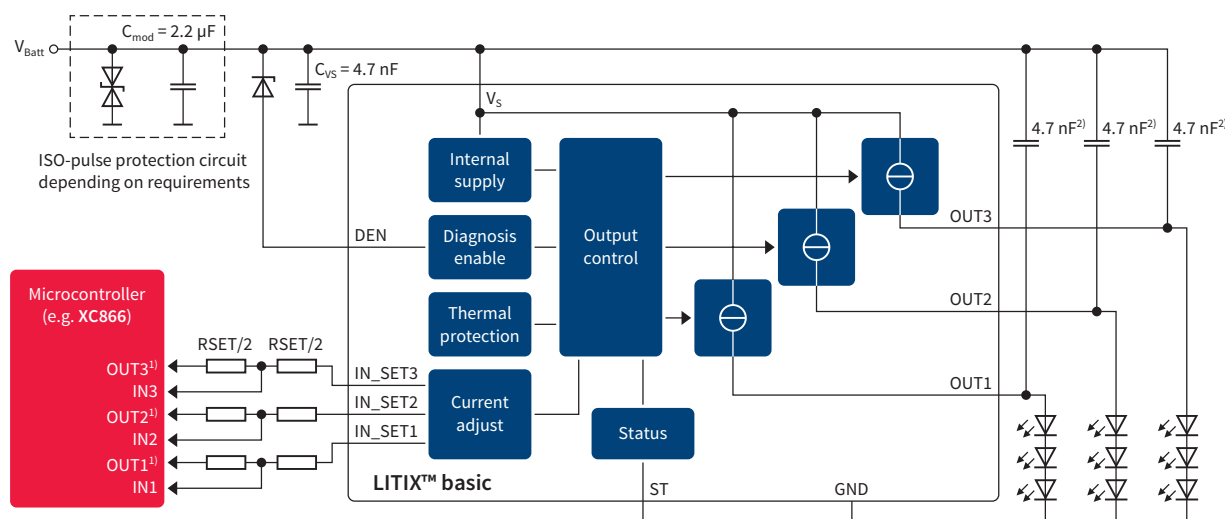
# LITIX™ Basic

Flexible linear current source family with scalable feature set

Infinion LITIX™ Basic LED drivers are optimized for the control of low to medium power LEDs in automotive applications. The whole family of linear constant current sources offers footprint compatibility ranging from 1 to 3 output channels and 60–180 mA and enables stable and reliable LED brightness by precise current control.

Its diagnostics and logic feature set enables improved system reliability by significant component reduction on board level, improved system protection (e.g. against ISO pulses), as well as an energy optimized system solution (DC/DC control).

## Application diagram TLD2314EL



- 1) Open drain
- 2) For EMI improvement, if required

### Product table

Product type	1 IN 1 OUT	1 IN 3 OUT	3 IN 3 OUT	Output current (typ) mA per channel	PWMI	N - 1	OL & SC detection	OL & SC with double fault detection	DEN	Matrix	Package <sup>1)</sup>
TLD1120EL	•			180							SSOP-14EP
TLD1310EL		•		60							SSOP-14EP
TLD2310EL			•	60							SSOP-14EP
TLD1312EL		•		60	•						SSOP-14EP
TLD1311EL		•		60		•					SSOP-14EP
TLD1121EL	•			180			•				SSOP-14EP
TLD2311EL			•	60			•				SSOP-14EP
TLD1313EL		•		60				•			SSOP-14EP
TLD1124EL	•			180			•		•		SSOP-14EP
TLD1314EL		•		60			•		•		SSOP-14EP
TLD2314EL			•	60			•		•		SSOP-14EP
TLD1125EL	•			180	•		•				SSOP-14EP
TLD1315EL		•		60	•	•	•				SSOP-14EP
TLD1326EL		•		60	•	•				•	SSOP-14EP
TLD2326EL			•	60			•			•	SSOP-14EP

1) See packages on page 140 and 141

PWMI = Internal PWM dimming engine  
 N - 1 = Complete device deactivation during open-load  
 OL = Open-load diagnosis

SC = Short-circuit diagnosis  
 DEN = Diagnosis Enable input  
 Matrix = Feedback to DC/DC to optimize efficiency

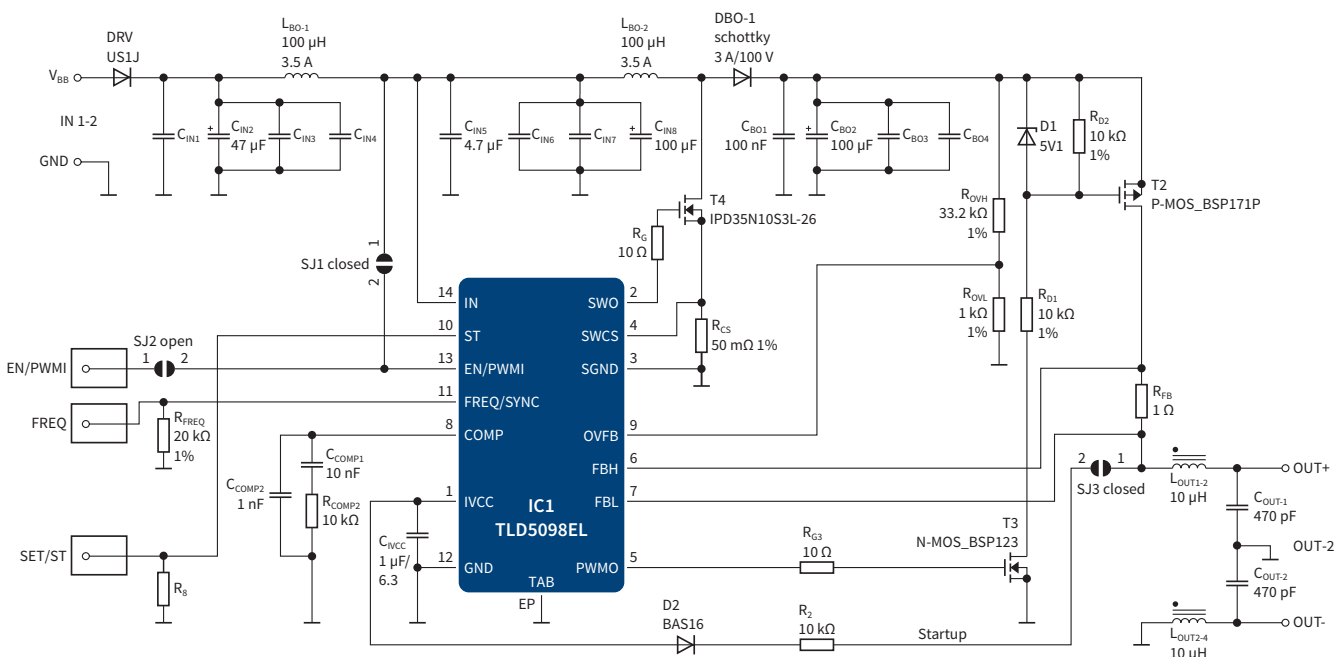
# LITIX™ Power

## DC/DC converter & controller for medium and high-power applications

Increasingly, LED lighting solutions are used in the front area of the car, especially in the premium segment of the market. LED frontlight solutions are usually implemented using several discrete LEDs in one chain which leads to a string voltage of up to 60 V, or using fewer LEDs with a high

forward current up to 1.5 A. Both implementations require DC/DC solutions – either boost, buck or buck-boost architectures are needed. The LITIX™ Power family consists of DC/DC devices which perfectly fulfill these requirements.

### Application diagram TLD5098EL in boost mode with short-to-ground protection



### Product table

Product type	Topology	Power stage	Current (max) [A]	V <sub>IN</sub> range [V]	V <sub>OUT</sub> (max) [V]	LED current dimming		Package <sup>1)</sup>
						Digital (PWM)	Analog	
TLD5045EJ	Buck converter	Internal	0.70	5.00 ... 40.00	40	Yes	Yes	DSO-8 EP
TLD5095EL	Multitopology controller IC buck, boost, buck-boost, SEPIC, flyback	External	Dependent on external MOSFET	4.75 ... 45.00	45	Yes	No	SSOP-14EP
TLD5097EL	Multitopology controller IC buck, boost, buck-boost, SEPIC, flyback	External	Dependent on external MOSFET	4.50 ... 45.00	60	Yes <sup>2)</sup>	Yes	SSOP-14EP
TLD5098EL	Multitopology controller IC buck, boost, buck-boost, SEPIC, flyback	External	Dependent on external MOSFET	4.50 ... 45.00	60	Yes	Yes	SSOP-14EP
TLD5190QV <sup>3)</sup>	Synchronous H-bridge	External	Dependent on external MOSFET	4.50 ... 55.00	52	Yes	Yes	VQFN-48

1) See packages on page 140 and 141

2) No dedicated Gate driver. Digital dimming done via main switch.

3) Available in Q2/2016

# LITIX™ Power Flex

Synchronous DC/DC H-bridge controller for high-current and high-power applications

LEDs are the big enabler in automotive front lighting, supporting new design possibilities, energy savings and new applications like matrix or laser high beam. These trends come with the demand for flexible DC/DC driver solutions for driving LED systems up to 50 W and more – or LEDs in configurations with currents of even more than 3 A – with high efficiency.

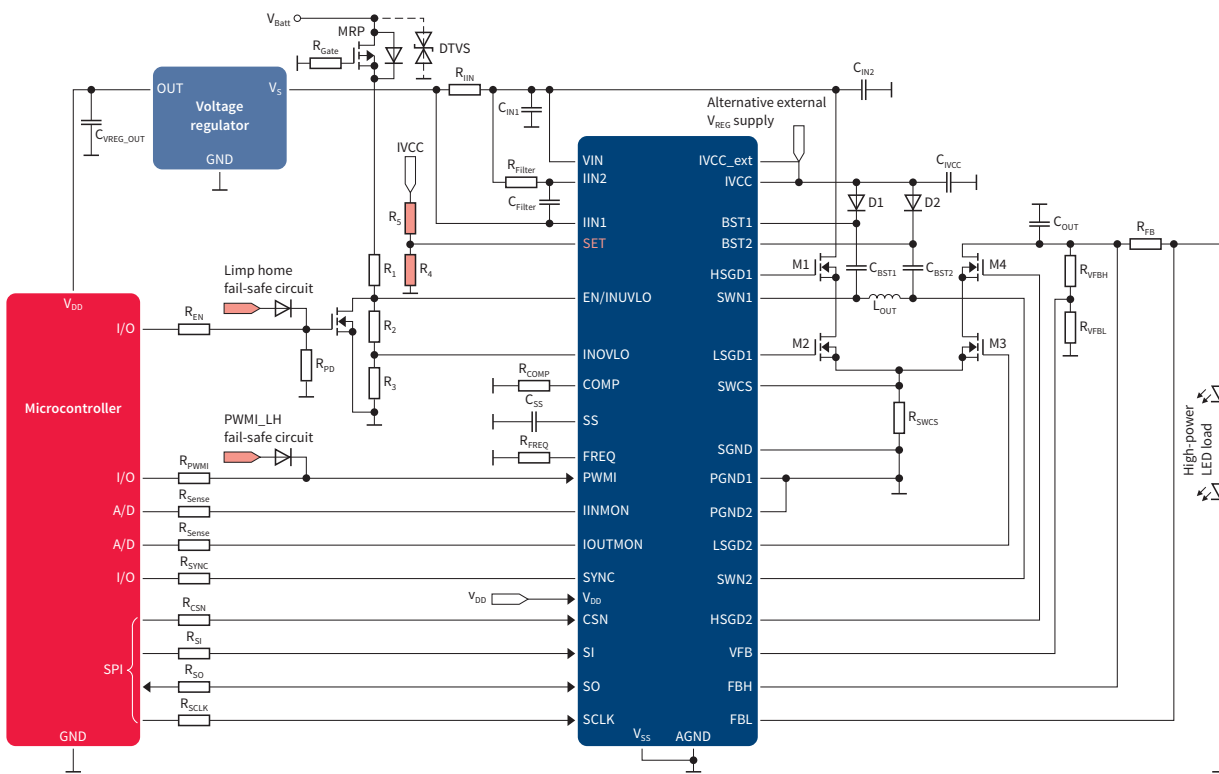
The TLD5541-1QV is the first member of Infineon’s new multitopology DC/DC controller family LITIX™ Power Flex. Its synchronous DC/DC H-bridge topology is beneficial for driving high-power LEDs with maximum system efficien-

cy (well above 90%), and a minimum number of external components.

Furthermore, reduced EMC emissions are achieved thanks to the optimized spread spectrum switching frequency.

With its seamless buck-boost regulation and fast dynamic load jump behavior, it is also an innovative solution for realizing cost-optimized LED headlamps with complete protection and diagnosis features – e.g. by driving two, three or more separately switched LED loads in one string, with up-to 52 V string voltage, with just one TLD5541-1QV.

## Application diagram TLD5541-1QV synchronous H-bridge controller with SPI



### Product table

Product type	Topology	Power stage	Current (max) [A]	V <sub>IN</sub> range [V]	V <sub>OUT</sub> (max) [V]	Package <sup>1)</sup>
TLD5541-1QV <sup>2)</sup>	Synchronous H-bridge w/ SPI	External	Depending on external MOSFET	4.50 ... 55.00	52	VQFN-48

1) See packages on page 140 and 141  
2) Coming Q2/2016

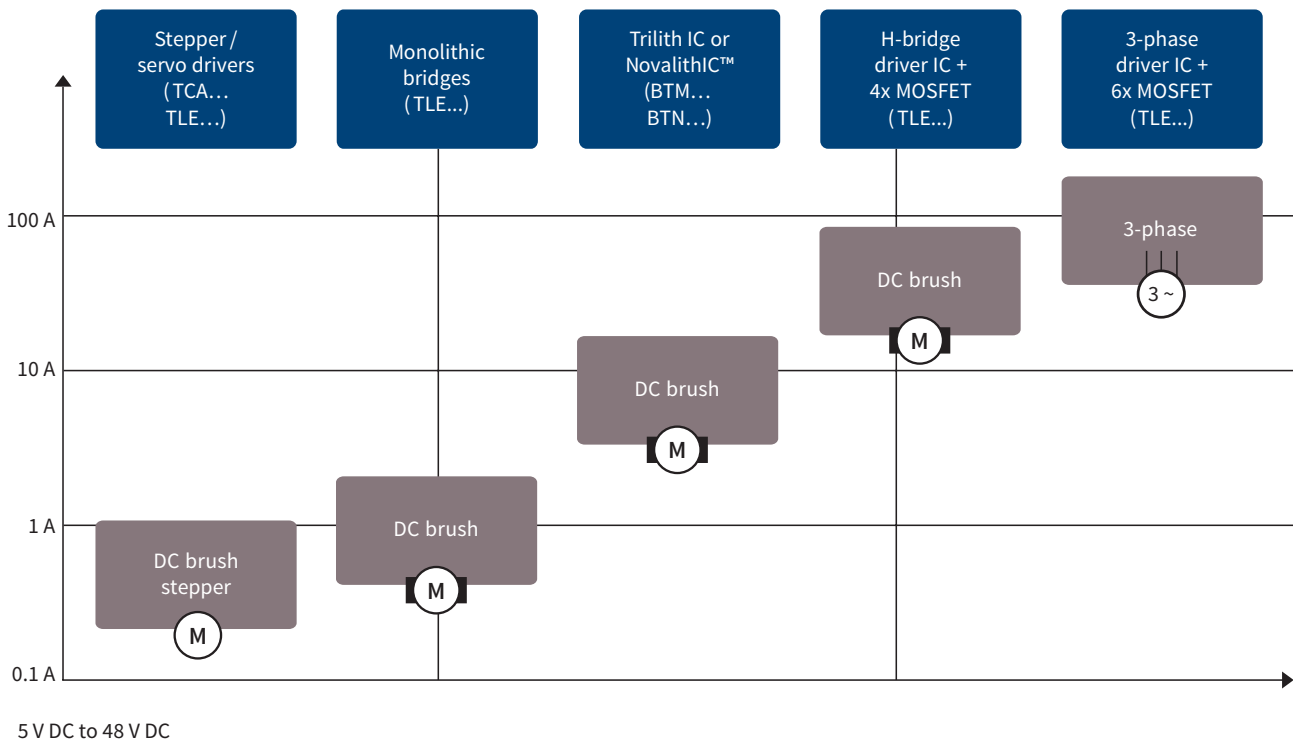


# Motor drivers

## The right driver for every motor

The search for a solution to drive applications powered by low-voltage motors ends with Infineon. From 0.1 to 100 A,

and from steppers to 3-phase drivers, we offer the right solution for every current range and application requirement.





# Integrated low-current motor drivers

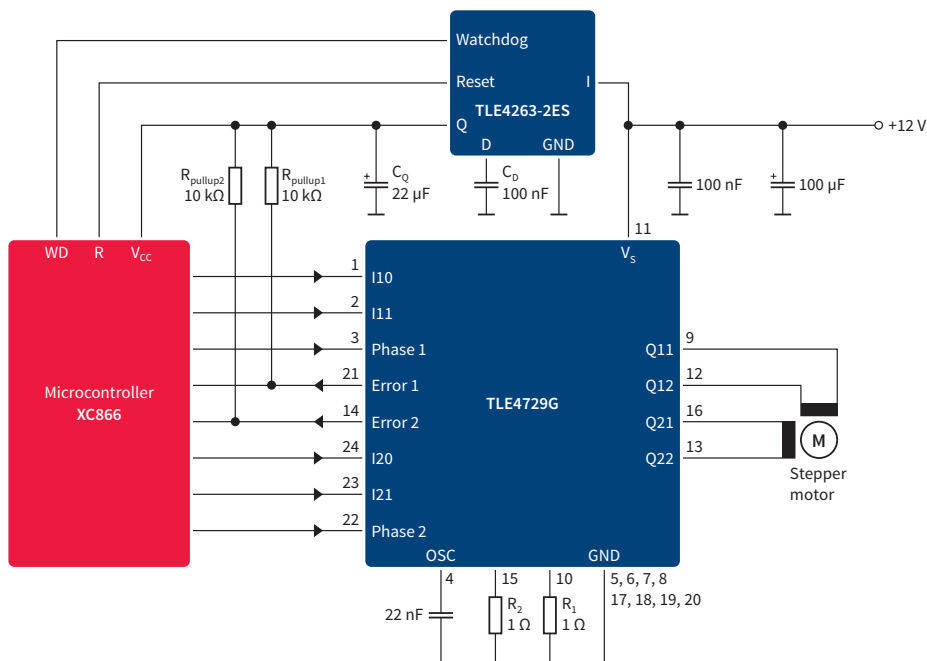
The Infineon low-current DC motor bridge family consists of a broad variety of bridges for stepper and DC brush motors including servo motors. They are designed for use in automotive and industrial applications. Typical applications are light leveling, HVAC flap control, and mirror adjustment.

The products are offered with protection features as well as diagnosis. Depending on the product type the protection ranges from basic protection against overtemperature to a full set of protection against open-load, overvoltage, undervoltage, overtemperature and short-circuit. The diagnosis capabilities range from a simple status flag to communication via a 16-bit SPI.

## Stepper motor drivers

The TCA3727 and TLE4726 et seqq. cover a broad range of applications from automotive to industry. The TLE4726

can be used in 24 V applications. The products are either produced in DOPL, Infineon's robust bipolar technology, or SPT, a technology combining bipolar CMOS and DMOS cells.



## Product table

Product type	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	$I_q$ [μA]	$V_{S(op)}$ [V]	Step operations	Protection	Diagnostic interface	Highlights	Package <sup>1)</sup>
<b>Current controlled</b>									
TCA3727G	2 x 0.75	2 x 1.50	200	5–50	Full to mini step	OT	–	High operating voltage, low quiescent current with inhibit	DSO-24
TLE4726G	2 x 0.75	2 x 1.50	200	5–50	Full to mini step	OT	–		DSO-24
TLE4729G	2 x 0.70	2 x 1.50	50	6–16	Full to mini step	OL, OT, SC	Status flag	Very low quiescent current with inhibit	DSO-24
<b>Voltage controlled</b>									
TLE4208G	4 x 0.80	4 x 1.50	20	8–18	Full to half-step	SC, OT, OV, UV	Status flag	Dual full bridge	DSO-28
TLE8444SL	4 x 0.50	4 x 0.90	1	8–18	Full to half-step	SC, OT, OV, UV, OL	Status flag	Open-load detection in ON-state	SSOP-24

1) See packages on page 140 and 141

LO = Lockout  
OL = Open-Load

OV = Overvoltage  
UV = Undervoltage

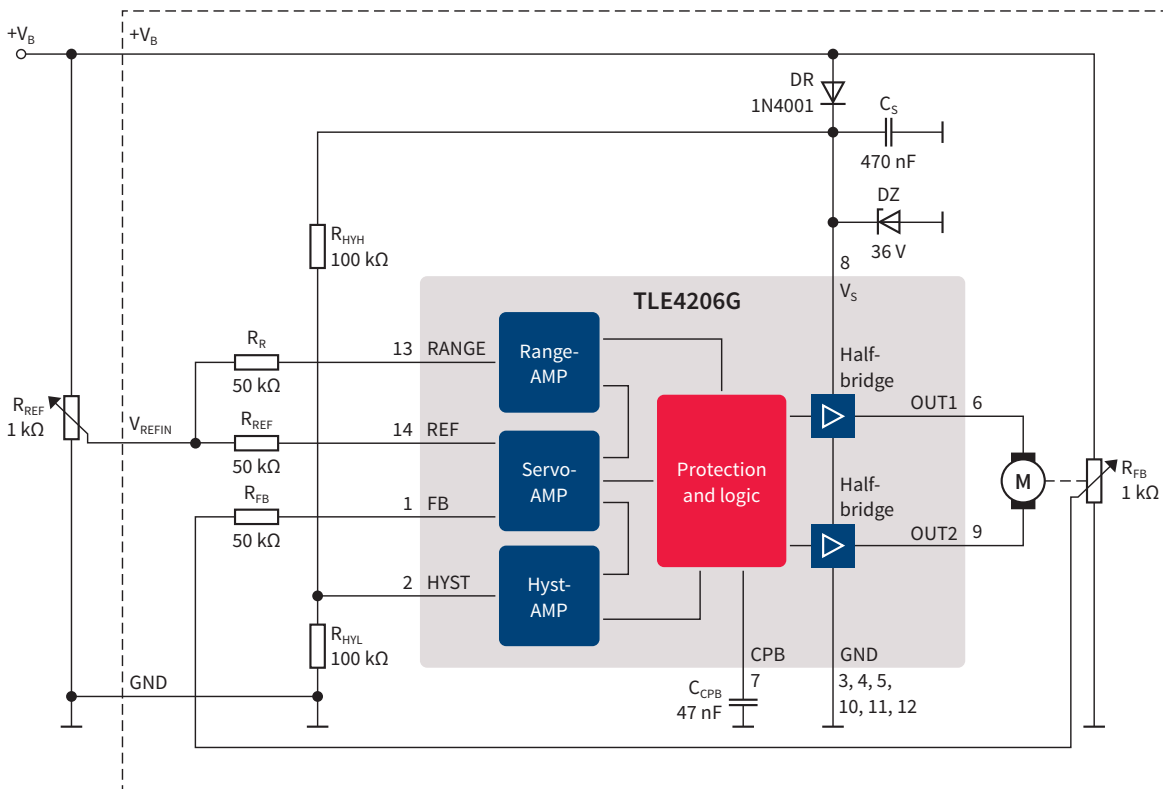
OT = Overtemperature  
SC = Short-Circuit

# Integrated low-current motor drivers

## Servo drivers

The TLE4205, TLE4206 and TLE4209 are protected H-bridge drivers for automotive applications like headlight beam control and industrial servo control applications.

The devices are built using DOPL, Infineon's robust bipolar technology.



Product type	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	$I_q$ [ $\mu$ A]	$V_{S(op)}$ [V]	Protection	Inhibit	Highlights	$V_{sat path}$	Package <sup>1)</sup>
TLE4205G	0.60	1.00	0.01	6 ... 32	SC	•	Dual power comparator for higher voltage	2.1 V at 0.6 A <sup>2)</sup> supply voltage	DSO-20
TLE4206G	0.80	1.50	12.00	8 ... 18	OT, OV, UV, LO, SC		Servo driver with current peak blanking	1.2 V at 0.4 A <sup>2)</sup>	DSO-14
TLE4206-2G	0.80	1.50	12.00	8 ... 18			Switching hysteresis on range input	1.2 V at 0.4 A <sup>2)</sup>	DSO-14
TLE4206-4G	0.90	1.60	12.00	8 ... 18			Adapted range input	1.2 V at 0.4 A <sup>2)</sup>	DSO-14
TLE4209G	0.80	1.50	12.00	8 ... 18			Servo driver	1.2 V at 0.3 A <sup>2)</sup>	DSO-14

1) See packages on page 140 and 141

2) Total drop saturation voltage typ. value @ 25 °C and 0.4 A

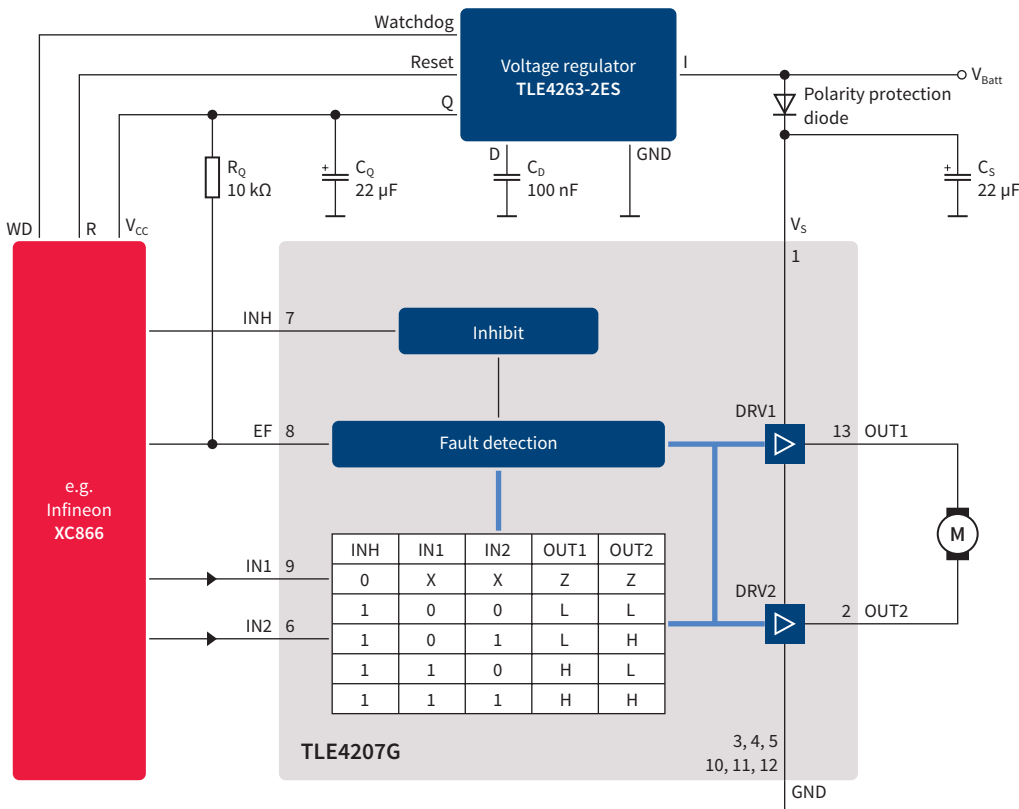
LO = Lockout  
OL = Open-Load  
OV = Overvoltage

UV = Undervoltage  
OT = Overtemperature  
SC = Short-Circuit

## Multi half-bridge driver ICs

The TLE4207, TLE4208, TLE6208-3/-6 and TLE841xxEL are multipurpose bridges designed to drive DC brush motors with nominal load currents < 1 A for automotive and industrial applications.

The TLE4207 and TLE4208 parts are built using Infineon's robust bipolar technology DOPL. TLE6208-3/-6 and TLE84xxx use SPT, a technology combining bipolar, CMOS and DMOS cells.



### Basic features

- > OV = Overvoltage
- > UV = Undervoltage
- > OT = Overtemperature
- > SC = Short-Circuit

Product type	Config.	$I_{L(NOM)}$ [A]	$I_{L(LIM)}$ [A]	$I_q$	$V_{S(op)}$ [V]	Protection	Diagnostic interface	Highlights	$V_{CE(sat)}/R_{DS(on)}$	Package <sup>1)</sup>
TLE4207G	2x half-bridge	2 x 0.80	2 x 1.50	20	8 ... 18	LO	Status flag	Error det.	1.2 V <sup>2)</sup>	DSO-14
TLE4208G	4x half-bridge	4 x 0.80	4 x 1.50	20	8 ... 18	LO	Status flag	Error det.	1.2 V <sup>2)</sup>	DSO-28
TLE8444SL	4x half-bridge	4 x 0.50	4 x 0.90	1	8 ... 18	OL	Status flag	Open-load detection in ON-state	600 mΩ/switch	SSOP-24
TLE6208-3G	3x half-bridge	3 x 0.80	3 x 1.00	10	8 ... 40	LO	16-bit SPI	Detailed diagnosis via SPI	800 mΩ <sup>3)</sup> /switch	DSO-14
TLE6208-6G	6x half-bridge	6 x 0.80	6 x 1.00	12	8 ... 40	LO	16-bit SPI	Single switch usage possible	800 mΩ <sup>3)</sup> /switch	DSO-28
TLE84106EL	6x half-bridge	6 x 0.30	6 x 0.50	2	7 ... 18	OL	16-bit SPI	Pin compatible to TLE84110EL	800 mΩ <sup>3)</sup> /switch	SSOP-24 EP
TLE84110EL	10x half-bridge	10 x 0.30	10 x 0.50	2	7 ... 18	OL	16-bit SPI	Pin compatible to TLE84106EL	800 mΩ <sup>3)</sup> /switch	SSOP-24 EP

1) See packages on page 140 and 141

2) Total drop saturation voltage typ. value @ 25 °C and 0.4 A

3)  $R_{DS(on)}$  is typical and specified @  $T_j = 25 °C$

LO = Lockout

OL = Open-Load

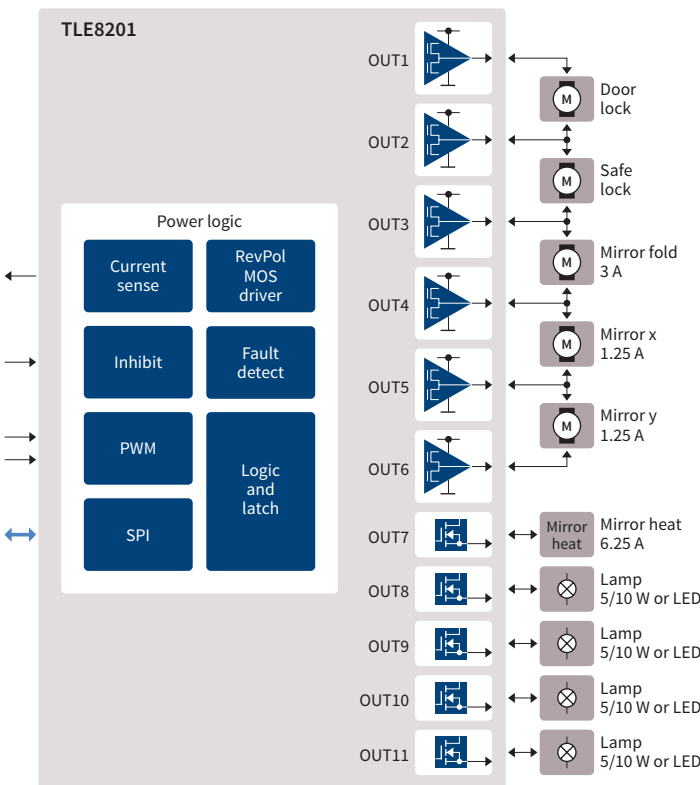
# Integrated low-current motor drivers

## Door module ICs

The TLE8201R is an ASSP for door-module applications. It includes those power stages necessary to drive the following loads in a typical front door: Central lock, mirror fold, mirror position, mirror defrost plus 5 and 10 W lamps. It is designed as a monolithic circuit in a SPT technology which combines bipolar and CMOS control circuit with

DMOS power devices.

The TLE8203E is a derivative of the TLE8201R for automotive mirror control applications. The following output stages are included in this monolithic device, mirror position, mirror defrost and one lamp driver for 5 or 10 W.



### Standard features

- > SPI interface
- >  $I_Q = 3 \mu A$
- > Operating range: 8–20 VS

Product type	Outputs	$I_{L(lim)}$ [A]	$R_{DS(on)}$ [mΩ]	Driver Stage	Operating range [V]	Protect	Diagnosis	Target load	Package <sup>1)</sup>
TLE8201R <sup>2)</sup>	1, 2	8.00	120	Half-bridge	8–20	OC, OT, OV, UV	CS	Central lock	DSO-36 (Power-SO)
	3, 4	3.00	350	Half-bridge				Mirror folding	
	5, 6	1.25	650	Half-bridge				Mirror X-Y	
	7	6.25	85	High-side switch (mirror defrost)				Mirror de-frost	
	8–11	1.80	400	Lamp driver				Repeater	
TLE8203E	4	3.00	350	Half-bridge	8–20	OC, OT, OV, UV	CS	Mirror folding	DSO-36 EP
	5, 6	1.25	650	Half-bridge				Mirror X-Y	
	7	6.25	85	High-side switch (mirror defrost)				Mirror de-frost	
	8, 10	1.80	400	Lamp driver				Repeater	

1) See packages on page 140 and 141  
 2) Product not intended for new design

LO = Lockout  
 OL = Open-Load  
 OV = Overvoltage  
 OC = Overcurrent  
 UV = Undervoltage  
 OT = Overtemperature  
 SC = Short-Circuit

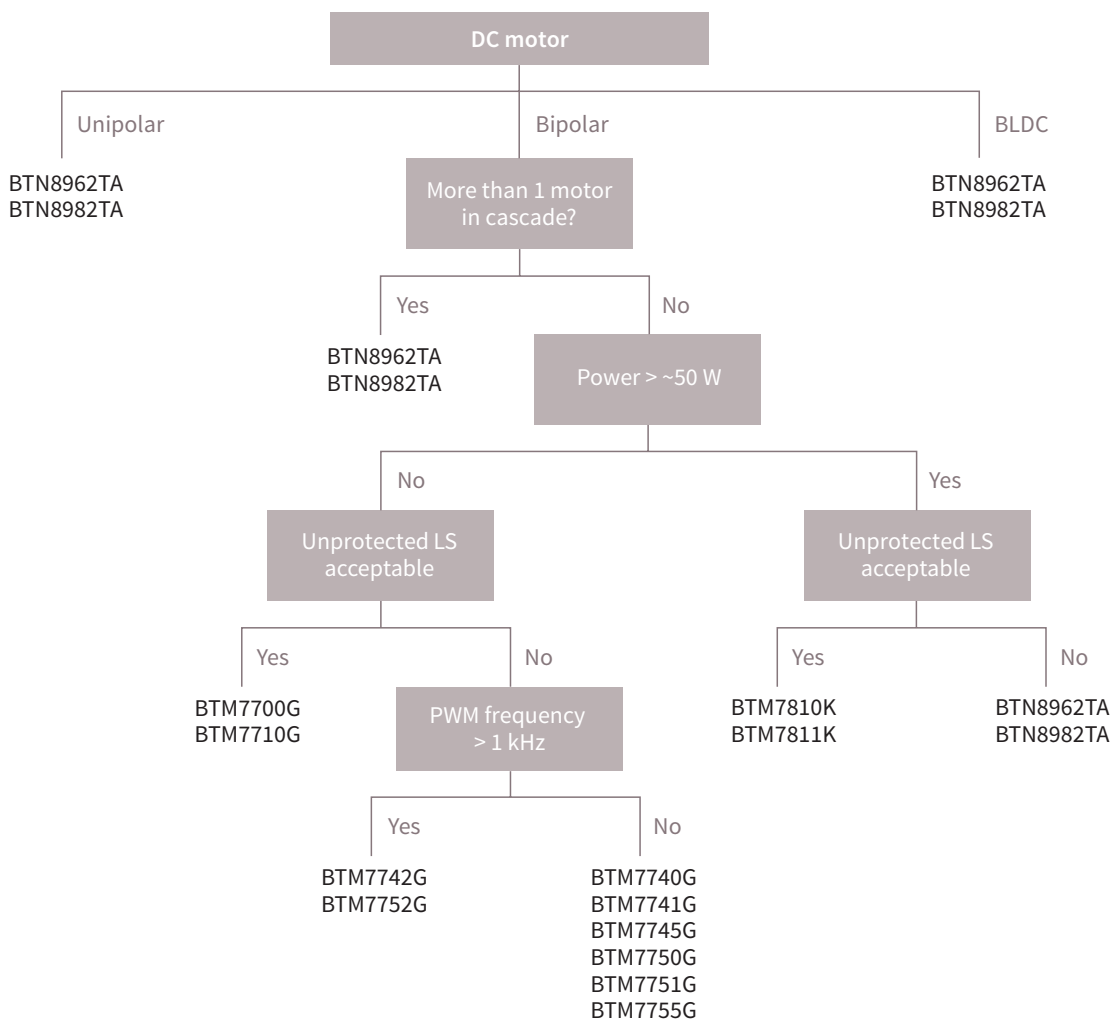
# Integrated high-current motor drivers

## NovalithIC™/Trilith IC

A NovalithIC™ provides a complete low-ohmic-protected half-bridge in a single package. It can be combined with an additional NovalithIC™ to create an H-bridge or 3-phase bridge as well. The NovalithIC™ family has the capability to switch fast PWM signals while providing overcurrent, undervoltage and overtemperature protection. Current sense is available to monitor load current. The NovalithIC™ family offers cost-optimized solutions for protected high-current PWM motor drives with very low board-space consumption—scaled to your needs.

The Trilith IC family members combine two high-side and two low-side switches in one package. They are geared to driving high-current DC motors in an H-bridge configuration but can also be used as single independent switches. All Trilith ICs include overcurrent and overtemperature protection for the high-side switches. For the low-side switches the user can choose between unprotected switches as well as protected switches.

## Selection tree – NovalithIC™ (BTNxxxx)/Trilith IC (BTMxxxx)



# Integrated high-current motor drivers

## Trilith IC – integrated H-bridge

### Basic features

- > Low quiescent current
- > Capable for high PWM frequency

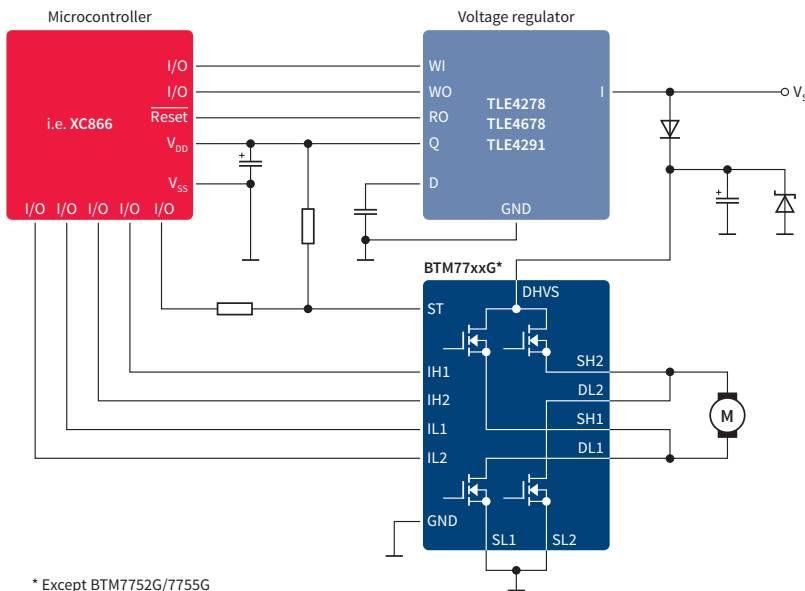
### Diagnostic features

- > Overvoltage
- > Overtemperature
- > Short-circuit/overcurrent
- > Current sense/status
- > Open-load

### Protection features

- > Overvoltage
- > Undervoltage
- > Overtemperature
- > Short-circuit/overcurrent

## Application example Trilith IC



\* Except BTM7752G/7755G

## Trilith IC product overview

Product type	Operating range [V]	R <sub>DS(on)</sub> path (typ) @ 25 °C [mΩ]	I <sub>D(lim)</sub> (typ) [A]	I <sub>q</sub> (typ) [μA]	Switch freq. (typ) [kHz]	Diagnosis	Protect	Package <sup>1)</sup>
BTM7740G	4.80 ... 42.00	210	8.00	5	1	OT	OT, SC	DSO-28
BTM7741G	4.80 ... 42.00	210	8.00	5	1	OT, OL	OT, SC	DSO-28
BTM7700G	4.80 ... 42.00	190	9.50	5	1	OT	OT, SC	DSO-28
BTM7750G	4.80 ... 42.00	115	12.00	5	1	OT	OT, SC	DSO-28
BTM7751G	4.80 ... 42.00	115	14.00	5	1	OT, OL	OT, SC	DSO-28
BTM7710G	4.80 ... 42.00	110	15.00	5	1	OT	OT, SC	DSO-28
BTM7810K <sup>2)</sup>	5.00 ... 42.00	40	42.00	4	1	OT, OL	OT, SC	TO263-15
BTM7811K <sup>2)</sup>	5.00 ... 42.00	40	42.00	4	20	OT, OL	OT, SC	TO263-15
BTM7742G	5.50 ... 28.00	250	12.00	5	25	OV, OT, SC/OC, CS	OV, UV, OT, SC/OC	DSO-36
BTM7745G	5.50 ... 28.00	250	12.00	5	1	OV, OT, SC/OC	OV, UV, OT, SC/OC	DSO-36
BTM7752G	5.50 ... 28.00	150	12.00	5	25	OV, OT, SC/OC, CS	OV, UV, OT, SC/OC	DSO-36
BTM7755G	5.50 ... 28.00	150	12.00	5	1	OV, OT, SC/OC	OV, UV, OT, SC/OC	DSO-36

1) See packages on page 140 and 141

2) AEC std. grade 3, T<sub>J(max)</sub> = 110 °C

CS = Current Sense

OL = Open-Load

OV = Overvoltage

UV = Undervoltage

OT = Overtemperature

SC = Short-Circuit

OC = Overcurrent

## NovalithIC™ – integrated half-bridge

### Basic features

- > Low quiescent current
- > Capable for high PWM frequency
- > Logic level input
- > Adjustable slew rate
- > Cross current protection

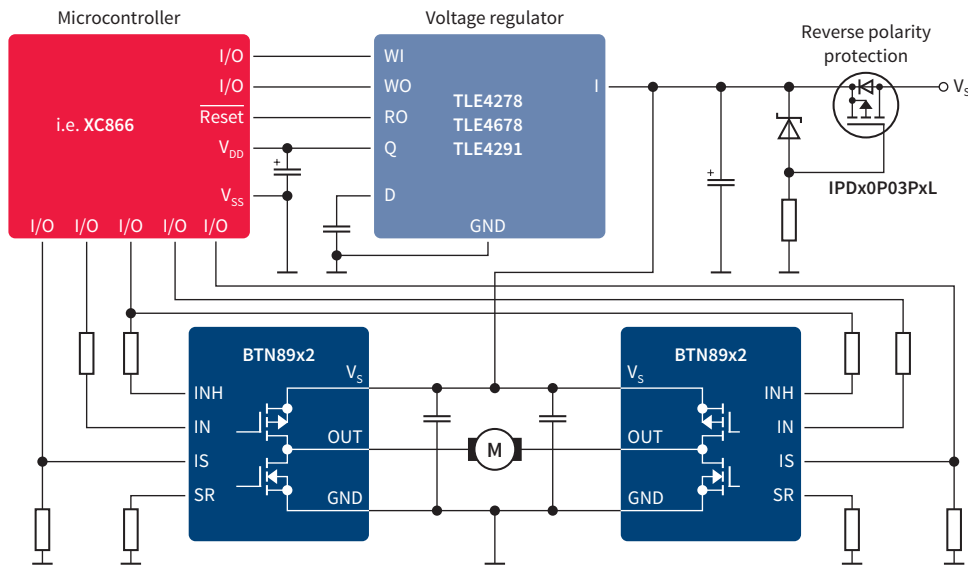
### Diagnostic features

- > Overtemperature
- > Undervoltage
- > Overcurrent
- > Current sense and status

### Protection features

- > Overtemperature shutdown
- > Undervoltage
- > Overcurrent

## Application example NovalithIC™



## NovalithIC™ product overview

Product type	Operating range [V]	$R_{DS(on)}$ path (typ) [mΩ]	$I_{D(lim)}$ [A]	$I_q$ (typ) [μA]	Switch time (typ) [μs]	Diagnosis	Protect	Package <sup>1)</sup>
BTN8962TA	5.50 ... 40.00	14.20	42	7	0.25	OT, OC, CS	UV, OT, OC	TO263-7-1 (TO220-7 (SMD))
BTN8982TA	5.50 ... 40.00	10.00	70	7	0.25	OT, OC, CS	UV, OT, OC	TO263-7-1 (TO220-7 (SMD))

1) See packages on page 140 and 141

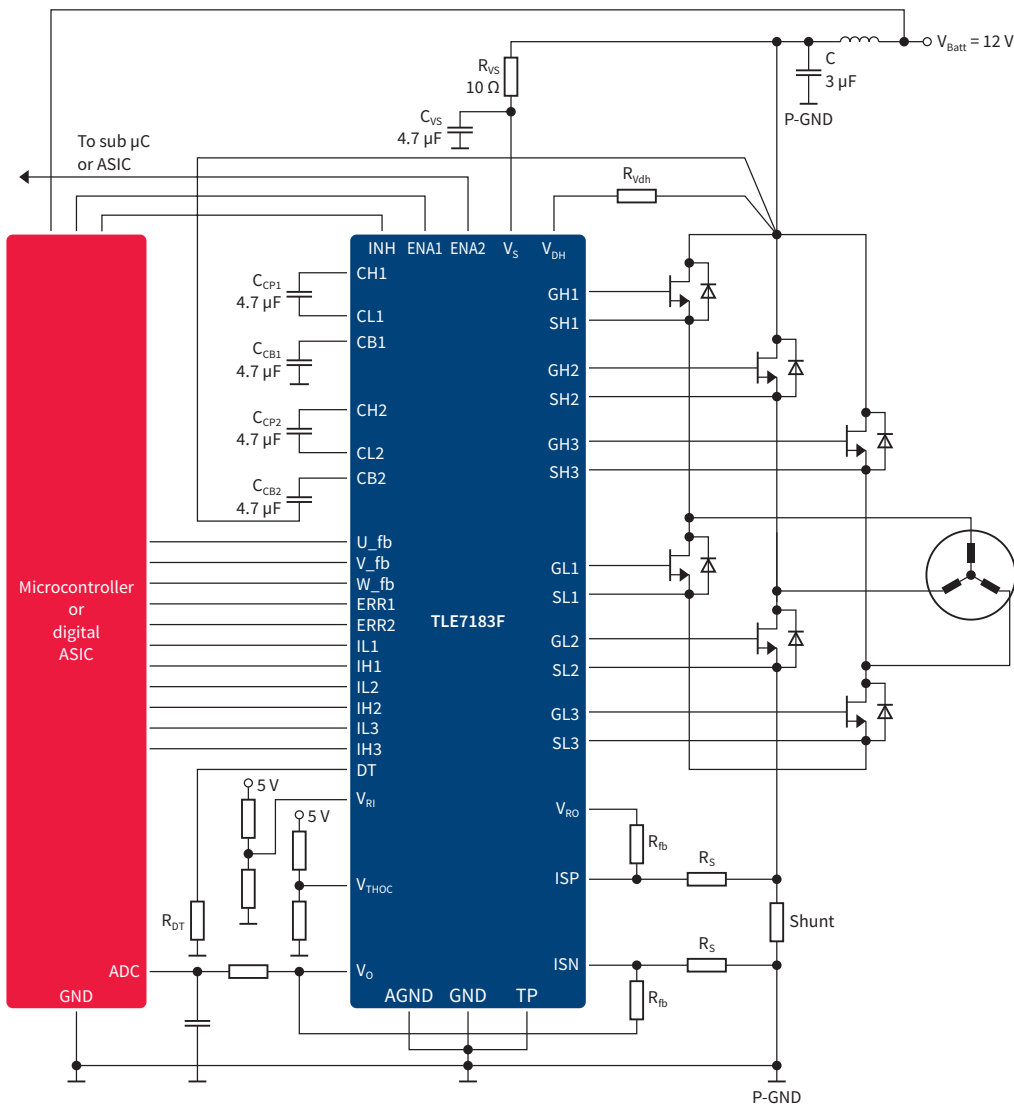
OC = Overcurrent  
CS = Current Sense

UV = Undervoltage  
OT = Overtemperature

# Gate driver ICs for external MOSFETs

The trend towards greater efficiency in automotive applications also applies to electric motors. Applications such as power steering, HVAC compressors and engine cooling fans will be controlled by electronic motors in the future.

Infinion's family of configurable, H-bridge and 3-phase gate driver ICs can be combined with MOSFETs to provide the power and efficiency these systems demand.



## Applications

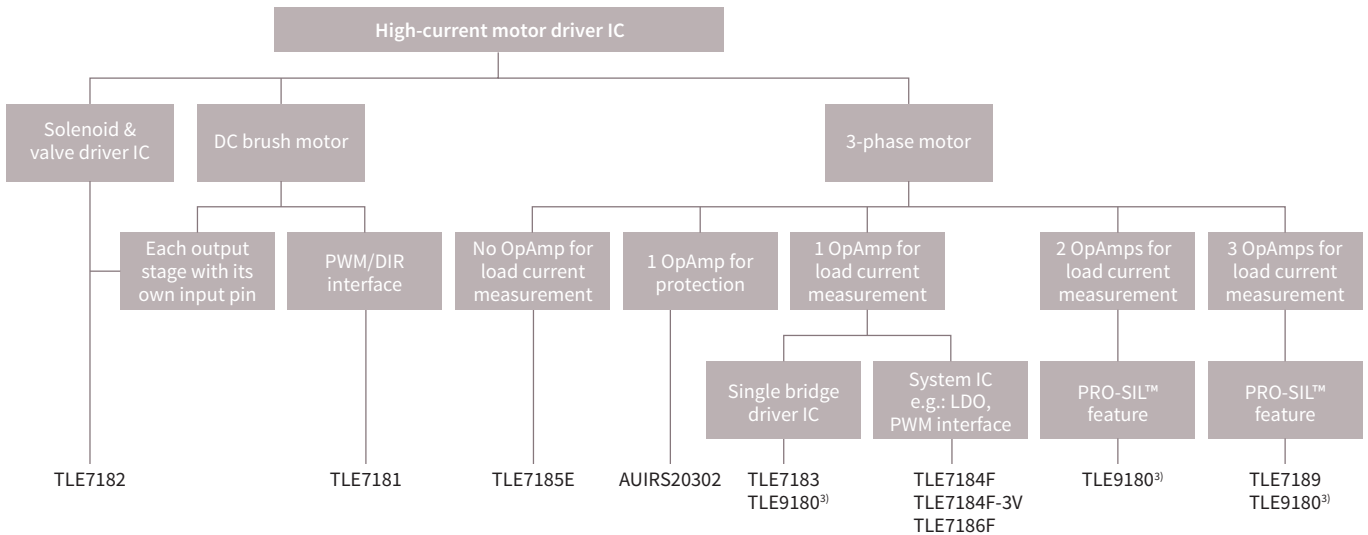
- > Power steering
- > Fan and pump control
- > Starter alternator
- > Seat belt pretensioner
- > VVT
- > Electric park brake
- > ECMT
- > E-turbo

## Basic features

- > Strong output stage up to 1.5 A
- > Precise OpAmp for current shut monitoring
- > Operation down to 5.5 V
- > Duty cycle adjustable



## Selection tree – Gate drivers



## H-bridge/dual half-bridge drivers family

Product type	Operating range [V]	OpAmp	PWM/DIR input	Reverse polarity protection	Diagnosis	Package <sup>1)</sup>
TLE7181EM	7 ... 34	1	●	●	UV, OV, OC, SCD, OT	SSOP-24
TLE7182EM	7 ... 34	1		●	UV, OV, OC, SCD, OT	SSOP-24

## 3-phase bridge driver IC

Product type	Operating range [V]	Drives stage	D.C.-range @ 20 kHz [%]	Numbers of integrated OpAmps for load current measurement	Adjustable dead time	SIL3 features	Diagnosis	Package <sup>1)</sup>
TLE7183F	5.50 ... 28.00	1.50/1.50 A	0 ... 100	1	●		OT, UV, OV, OC, OCD	VQFN-48
TLE7183QU	5.50 ... 28.00	1.50/1.50 A	0 ... 100	1	●		OT, UV, OV, OC, SCD	TQFP-48 EP
TLE7184F TLE7184F-3V <sup>2)</sup> TLE7186F	7.00 ... 32.00	12.50/9.00 Ω 12.50 Ω	0 ... 95	1	●		UV, OV, OC, SCD, OT, VDD supervision	VQFN-48
TLE7185E	5.50 ... 32.00	12.50/9.00 Ω	0 ... 95	0	●		UV, OV, SCD, OT	DSO-36 EP
TLE7188F	5.50 ... 28.00	1.50/1.50 A	0 ... 100	3			UV, OV, OC, SCD, OT	VQFN-48
TLE7189F	5.50 ... 28.00	1.50/1.50 A	0 ... 100	3		●	UV, OV, SCD, OT, VDD supervision	VQFN-48
TLE7189QK	5.50 ... 28.00	1.50/1.50 A	0 ... 100	3		●	UV, OV, SCD, OT, VDD supervision	LQFP-64
TLE9180-xxQK <sup>3)</sup>	5.50 ... 60.00	2.00/2.00 A	0 ... 100	1, 2 or 3	SPI	●	UV, OV, OC, SCD OT + others	LQFP-64
AUIRS20302	8.00 ... 17.00 Output offset 200 V	0.20/0.35 A	0 ... 95	1 (SC protection)			One error flag for OTW, UV, SC	DSO-28 (28 lead SOIC)

1) See packages on page 140 and 141

2) System IC for fans and pumps with integrated LDO and PWM interface

3) Coming in Q1/2017

LO = Lockout

OL = Open-Load

OV = Overvoltage

OC = Overcurrent

UV = Undervoltage

OT = Overtemperature

SCD = Short-Circuit Detection

# Gate driver ICs for external MOSFETs

## PN driver IC

In addition to the well-established H-bridge and 3-phase gate driver ICs, Infineon recently released a PN driver IC. It is designed to drive one high-side p-channel MOSFET and

one low-side n-channel MOSFET. This approach facilitates the implementation of new cost-optimized drive solutions.

### Applications

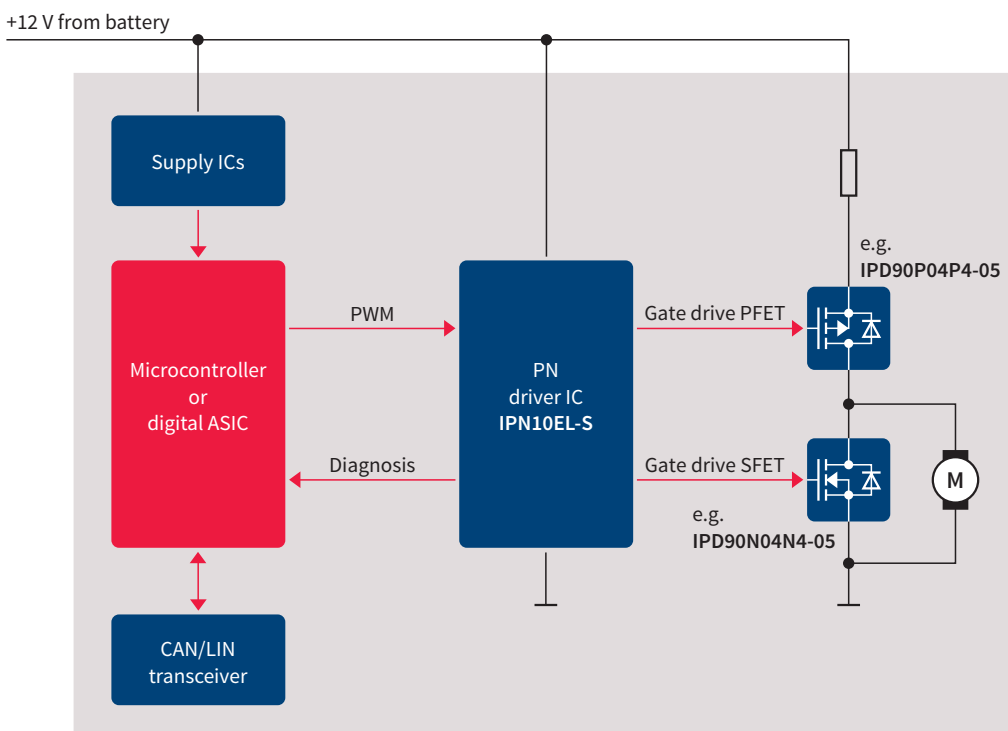
- > Fan and pump control
- > Wiper
- > Electric park brake

### Basic features

- > PWM interface drives 1P and 1N channel Power MOSFETs
- > Separate control input for each MOSFET
- > 0 ... 100% duty cycle of high- and low-side MOSFETs
- > Adjustable dead time

### Diagnostic features

- > One error output to  $\mu\text{C}$
- > Overtemperature protection
- > Undervoltage lockout
- > Short-circuit protection



Product type	$R_{DS(on)}$ @ 10 V [m $\Omega$ ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Technology	Package <sup>1)</sup>
IPN10EL-S	4 ... 40	3	0.40/0.40	0 ... 100	50	10	SSOP-14EP

1) See packages on page 140 and 141

# Gate driver ICs for high voltage

Infiniteon's next-generation EiceDRIVER™ family builds on our Coreless Transformer Technologies (CLT). EiceDRIVER™ SIL comes with a rich safety feature set. Using a thermally optimized exposed pad package, EiceDRIVER™ boost can

drive and sink peak currents of up to 15 A. Implemented as a chipset, the two devices are ideal for most inverter systems in automotive applications where space savings, cost efficiency and ASIL C/D certification are priorities.

## Automotive gate driver ICs

Product type	$I_D$ [A]	$V_{BR}^{2)}$ [V]	Package <sup>1)</sup>
1ED020I12FTA	2	400–1200	DSO-20
2ED020I12FA	2	400–1200	DSO-36
1ED020I12FA2	2	400–1200	DSO-20
1EDI2001AS	1	400–1200	DSO-36
1EDI2002AS	1	400–1200	DSO-36
1EBN1001AS	15	400–1200	DSO-14

1) See packages on page 140 and 141

2) Supported IGBT technologies

# Gate drivers for power distribution

The Infineon AUIR32xx family offers the capability of addressing high-current applications where a power switch of less than 1 mΩ is required. The AUIR3200S is a general purpose driver for use in various applications where a

high-current (< 10 A) protected switch is required. The AUIR3240S can be used in any application to achieve a low quiescent current when on, such as the battery switch in a stop&start system.

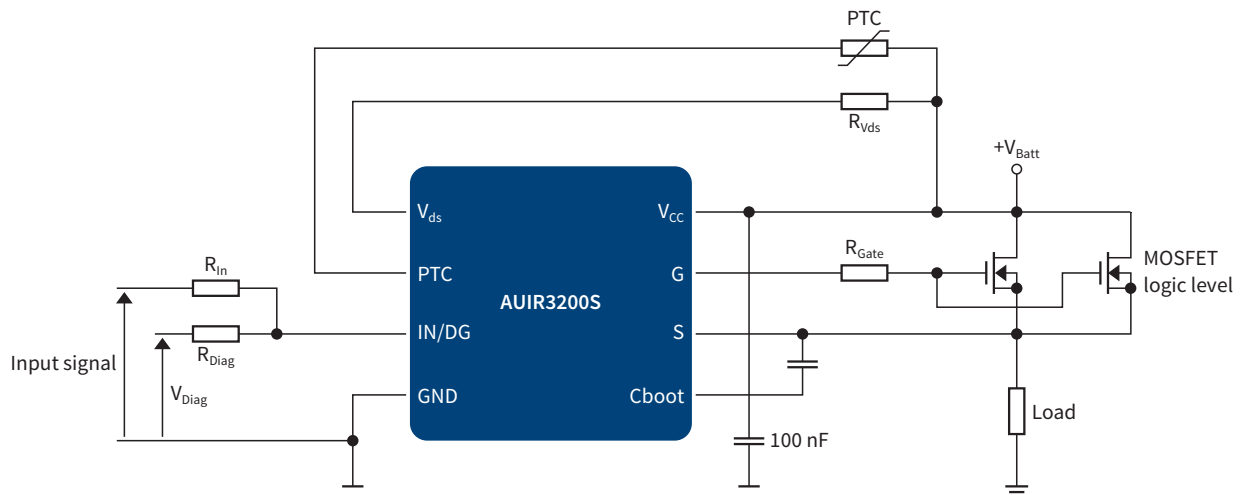
## AUIR3200S: MOSFET gate driver with protection and diagnostic features

### Applications

- > Battery switch
- > Relay replacement
- > Motor control

### Key features

- > Operating range: 6 to 36 V
- > Programmable overcurrent protection
- > Programmable overtemperature shutdown
- > Latched protection
- > Diagnostics
- > Reverse battery protection (turn on the MOSFET)
- > Smart undervoltage protection
- > Loss of ground protection
- > PWM capability
- > Very low stand-by current



## AUIR3240S: MOSFET gate drivers with very low current consumption

### Applications

- > Stop & start applications
- > Q\_diode
- > Battery switch

### Key features

- > Operating range: 4 to 36 V
- > Very low quiescent current when the part is On < 50 μA
- > Output gate voltage: 13 V
- > Gate current monitoring
- > DSO-8

Product type	Topology	Min supply voltage [V]	Max supply voltage [V]	Output gate voltage [V]	Special features	Package <sup>1)</sup>
AUIR3200S	Single high-side driver	6	36	6	Overcurrent and overtemperature protection, diagnostics	SO-8 (DSO-8)
AUIR3240S	Single high-side driver	4	36	13	Very low operating current	SO-8 (DSO-8)

1) See packages on page 140 and 141



Glossary

Automotive system ICs

Automotive transceivers

Power supply

Motor drivers

LITIX™

SPOC™

PROFET™

Smart multichannel switches

TEMPET™  
HITFET™

MOSFETs

# Infineon® Embedded Power ICs

## System-on-chip motor control

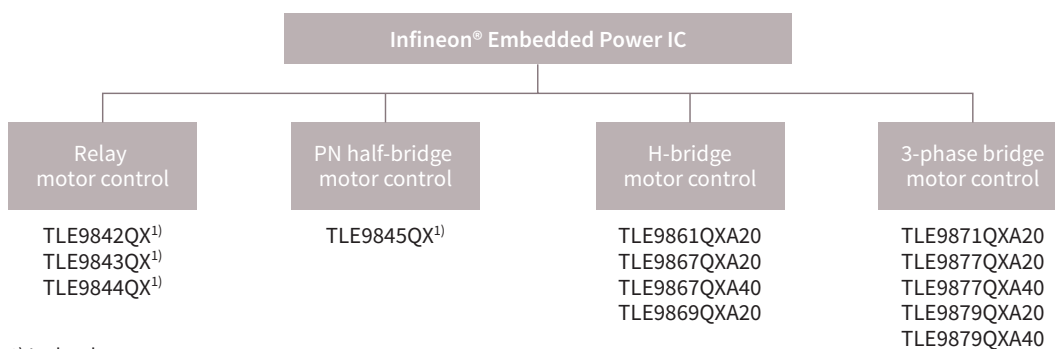
Infineon® Embedded Power ICs are specifically designed to enable mechatronic motor control solutions for a range of motor control applications, where a small package form factor and a minimum number of external components are essential. Such applications include window lift, sunroof, wiper, fuel pump, HVAC fans, engine cooling fan and water pumps, to name but a few.

Produced on Infineon's first-in-industry automotive-qualified Smart Power technologies, the Infineon Embedded

Power system-on-chip solutions offer an unmatched level of integration of all functions required to sense, control and actuate a motor.

The Infineon® Embedded Power ICs integrate on single die the microcontroller, the non-volatile flash memory, the analog and mixed signal peripherals, the communication interfaces along with the driving stages needed for either relay, half-bridge or full-bridge DC and BLDC motor applications.

## Selection tree – Infineon Embedded Power IC motor control



1) In development

## 3<sup>rd</sup> generation: relay driver IC with integrated microcontroller

The TLE984x product family brings together the ARM® Cortex®-M0 core and the market proven peripherals of its predecessor TLE983x (XC800 based relay driver). It integrates on a single die all the necessary functions to sense, control and actuate a motor via a relay or via a PN MOSFET half-bridge.

Produced on Infineon's first-in-industry automotive-qualified 130 nm Smart Power technology, the Infineon Embedded Power system-on-chip solution offers an unmatched level of integration as well as system cost to performance optimization for the target application segments.

### TLE984x family offers

- › Two protected low-side switches (min. 270 mA)
- › Up to two protected high-side switches (min. 150 mA)
- › Up to five high-voltage inputs with wake-up functionality
- › Integrated LIN transceiver compatible with LIN 2.2 and SAEJ2602
- › Two full duplex serial interface (UART) with LIN support
- › Two Synchronous Serial Channel (SSC), compatible with SPI
- › On-chip oscillator and PLL for clock generation
- › Measurement unit:
  - 8-bit ADC module with 7 multiplexed inputs for system supervision
  - 10-bit ADC module with 13 multiplexed inputs
  - On chip temperature and battery voltage measurement
- › Independent programmable window watchdog
- › 5 V/1.5 V internal supplies
- › External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% @ 20 mA
- › Power saving modes
  - MCU slow-down mode
  - Sleep mode
  - Stop mode
  - Cyclic wake-up from sleep mode or stop mode

The TLE984x family concept offers scalability in terms of flash memory sizes ranging from 36 kB to 64 kB with pin-compatible devices.

The TLE984x family is the successor of the TLE983x product family and specifically designed to fit to a wide range of LIN-slave motor control applications such as window lifts, wipers, sun roofs, fans and blowers to name a few.

The TLE984x product family is offered in a space saving VQFN-48 package.

### Features of the microcontroller and its peripherals

- › 32-bit ARM® Cortex®-M0 Core, up to 25 MHz clock frequency
- › 36 KB to 64 KB flash memory for code and data
- › Boot ROM for startup firmware and flash routines
- › Up to 4 kByte RAM memory
- › Thumb® + Thumb-2® Instruction Set
- › Nine 16-bit timers
- › Capture/compare unit for PWM signal generation (CCU6) with 2 x 16-bit timers

### General characteristics

- › Operating supply voltage  $V_S = 5.5$  to 28 V, maximum rating 40 V
- › Extended operating range  $V_S = 3.0$  to 28 V, MCU/flash fully functional
- › Wide operating temperature range:
  - $T_j$ : -40 °C up to 150 °C

### Applications

- › Window lift
- › Sun roof
- › Wiper
- › Fan/blower control
- › Relay motor via relay
- › Switch panel interface

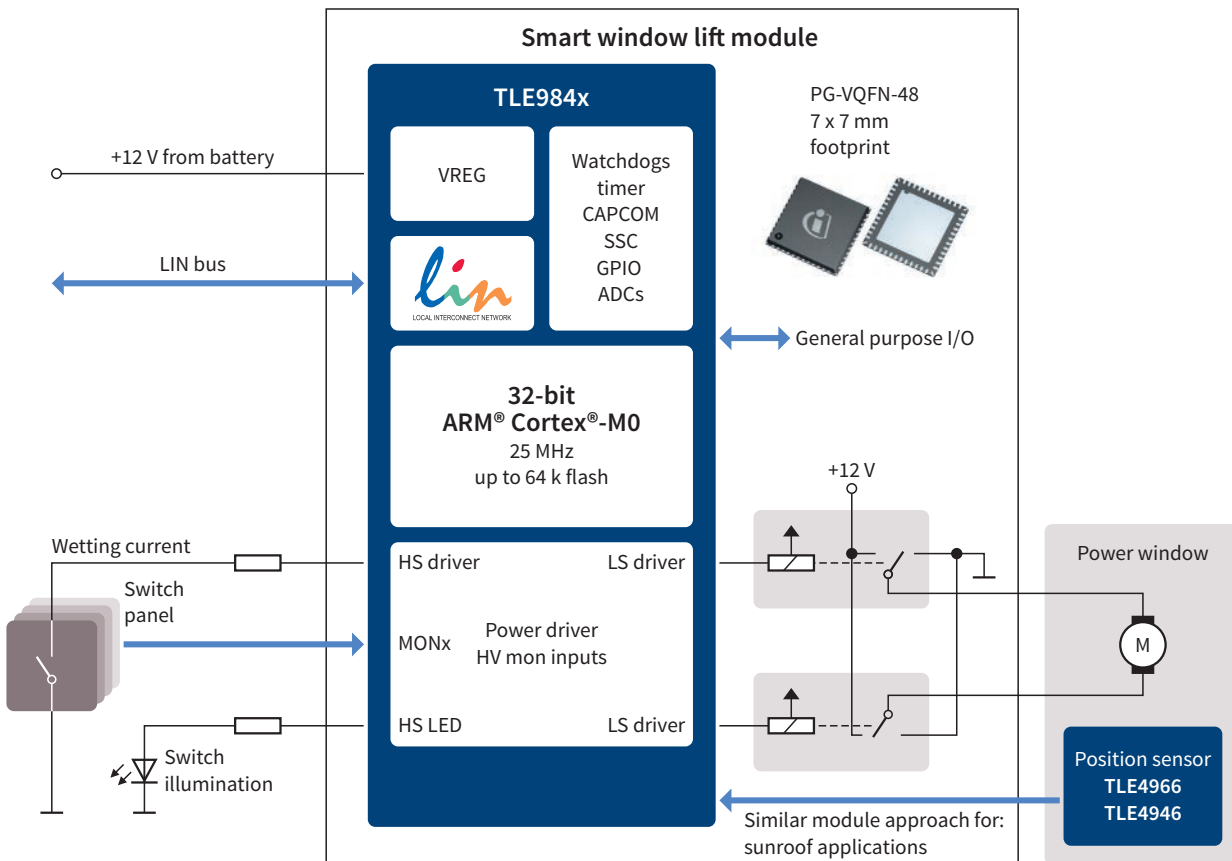
# Infineon® Embedded Power ICs

## TLE984x product family: relay driver IC with integrated microcontroller

Product name	Core	Flash [kB]	RAM [kB]	EEPROM in flash included [kB]	Freq [MHz]	High-side switch	High-voltage monitor input	GPIO	Analog inputs	Interface	Package <sup>1)</sup>
TLE9842QX	Cortex®-M0	36	2	4	25	1	4	10	6	PWM + LIN	VQFN-48
TLE9843QX	Cortex®-M0	48	4	4	25	1	4	10	6	PWM + LIN	VQFN-48
TLE9844QX	Cortex®-M0	64	4	4	25	1	4	10	6	PWM + LIN	VQFN-48
TLE9845QX	Cortex®-M0	48	4	4	40	2	5	10	6	PWM + LIN	VQFN-48

1) See packages on page 140 and 141

## Embedded Power ICs TLE984xQX: smart window lift application diagram





## 3<sup>rd</sup> generation: 2-phase bridge driver IC with integrated ARM® Cortex®-M3 core

Infineon has combined its wealth of experience in motor control drivers for automotive applications with an industry-standard core. The unique result, our 3<sup>rd</sup> generation Embedded Power IC based on ARM® Cortex®-M cores, addresses a wide range of smart 2-phase DC motor control applications like, sunroof, power window lift, electrical pumps, electrical fans.

Produced on Infineon's first-in-industry automotive-qualified 130 nm Smart Power technology, the Infineon Embedded

Power system-on-chip solutions offer an unmatched level of integration and system cost to performance to optimization for the target application segments.

The TLE986x family offers scalability in terms of flash memory sizes and MCU system clock frequency supporting a wide range of motor control algorithms. It uses the same MCU and peripherals as the TLE987x family, 3-phase driver, enabling design synergies between DC and BLDC motor control applications

### TLE986x family offers

- › Four current programmable drivers with charge pump for N-channel MOSFET
- › Integrated LIN transceiver compatible with LIN 2.2 and SAE J2602
- › Two full duplex serial interface (UART) with LIN support
- › Two Synchronous Serial Channel (SSC)
- › On-chip OSC and PLL for clock generation
- › One high-voltage monitoring input with wake-up functionality
- › High speed operational amplifier for motor current sensing via shunt
- › Measurement unit:
  - 8-bit ADC module with 10 multiplexed inputs
  - 10-bit ADC module with 8 multiplexed inputs, 5 external analog inputs
  - On chip temperature and battery voltage measurement unit
- › Independent programmable window watchdog
- › 5 V/1.5 V Internal supplies
- › External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% @ 20 mA
- › Power saving modes
  - MCU slow-down mode
  - Sleep mode
  - Stop mode
  - Cyclic wake-up sleep mode

### Features of the microcontroller

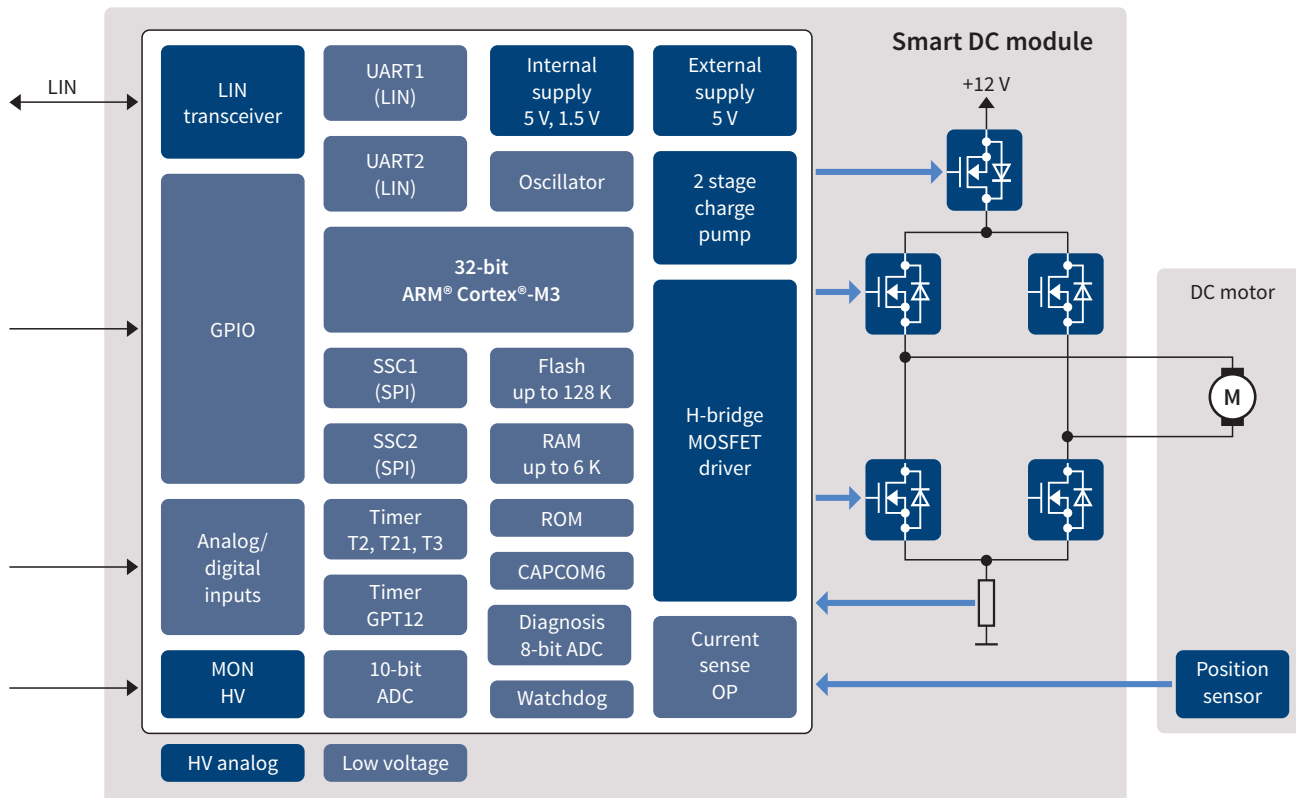
- › 32-bit ARM® Cortex®-M3 Core, up to 40 MHz clock frequency
- › 36 KB to 128 KB flash memory
- › Up to 6 KB RAM memory
- › Harvard architecture
- › Thumb®-2 Instruction Set and hardware divide and multiplication unit
- › Four 16-bit timers
- › Capture/compare unit for PWM signal generation (CCU6) with 2x 16-bits timers

### General characteristics

- › Operating supply voltage  $V_S = 5.5$  to 28 V, maximum rating 40 V
- › Extended operating range  $V_S = 3.0$  to 28 V, MCU/flash fully functional
- › ESD performance :
  - up to 2 kV / handling on all pins
  - 4 kV @ HV inputs
  - 6 kV @ LIN pin
- › Overvoltage device clamp (load dump ruggedness) up to 40 V
- › Wide operating temperature range:
  - $T_j$ : -40 °C up to 150 °C

# Infineon® Embedded Power ICs

## Block diagram



## TLE986x 32-bit µC with 2-phase MOSFET Gate Driver for DC motors

Product name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM emulation [KB]	OP-AMP	Low-side MOSFET drivers	High-side MOSFET drivers	Package <sup>1)</sup>
TLE9861QXA20	24	PWM	3	36	4	y	2	2	VQFN-48
TLE9867QXA20	24	PWM + LIN	6	64	4	y	2	2	VQFN-48
TLE9867QXA40	40	PWM + LIN	6	64	4	y	2	2	VQFN-48
TLE9869QXA20	24	PWM + LIN	6	128	4	y	2	2	VQFN-48

1) See packages on page 140 and 141

## 3<sup>rd</sup> generation: 3-phase bridge driver IC with integrated ARM® Cortex®-M3 core

Infineon has combined its wealth of experience in motor control drivers for automotive applications with all the benefits of an industry-standard core. The unique result, our 3<sup>rd</sup> generation Embedded Power IC based on ARM® Cortex®-M cores, addresses a wide range of smart 3-phase brushless DC motor control applications like, fuel pumps, HVAC fans, engine cooling fans, electrical water pumps. Produced on Infineon's first-in-industry automotive-qualified 130 nm Smart Power technology, the Infineon Embedded Power system-on-chip solutions offer

an unmatched level integration and system cost to performance to optimization for the target application segments.

The TLE987x family offers scalability in terms of flash memory sizes and MCU system clock frequency supporting a wide range of motor control algorithms, either sensor-based or sensor-less. It uses the same MCU and peripherals as the TLE986x family, 2-phase driver, enabling design synergies between DC and BLDC motor control applications.

### TLE987x family offers

- › Six current programmable drivers with charge pump for N-channel MOSFET
- › Integrated LIN transceiver compatible with LIN 2.2 and SAE J2602
- › Two full duplex serial interface (UART) with LIN support
- › Two Synchronous Serial Channel (SSC)
- › On-chip OSC and PLL for clock generation
- › One high-voltage monitoring input with wake-up functionality
- › High-speed operational amplifier for motor current sensing via shunt
- › Measurement unit:
  - 8-bit ADC module with 10 multiplexed inputs
  - 10-bit ADC module with 8 multiplexed inputs, 5 external analog inputs
  - On chip temperature and battery voltage measurement unit
- › Independent programmable window watchdog
- › 5 V/1.5 V internal supplies
- › External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% @ 20 mA
- › Power saving modes
  - MCU slow-down mode
  - Sleep mode
  - Stop mode
  - Cyclic wake-up sleep mode

### Features of the microcontroller

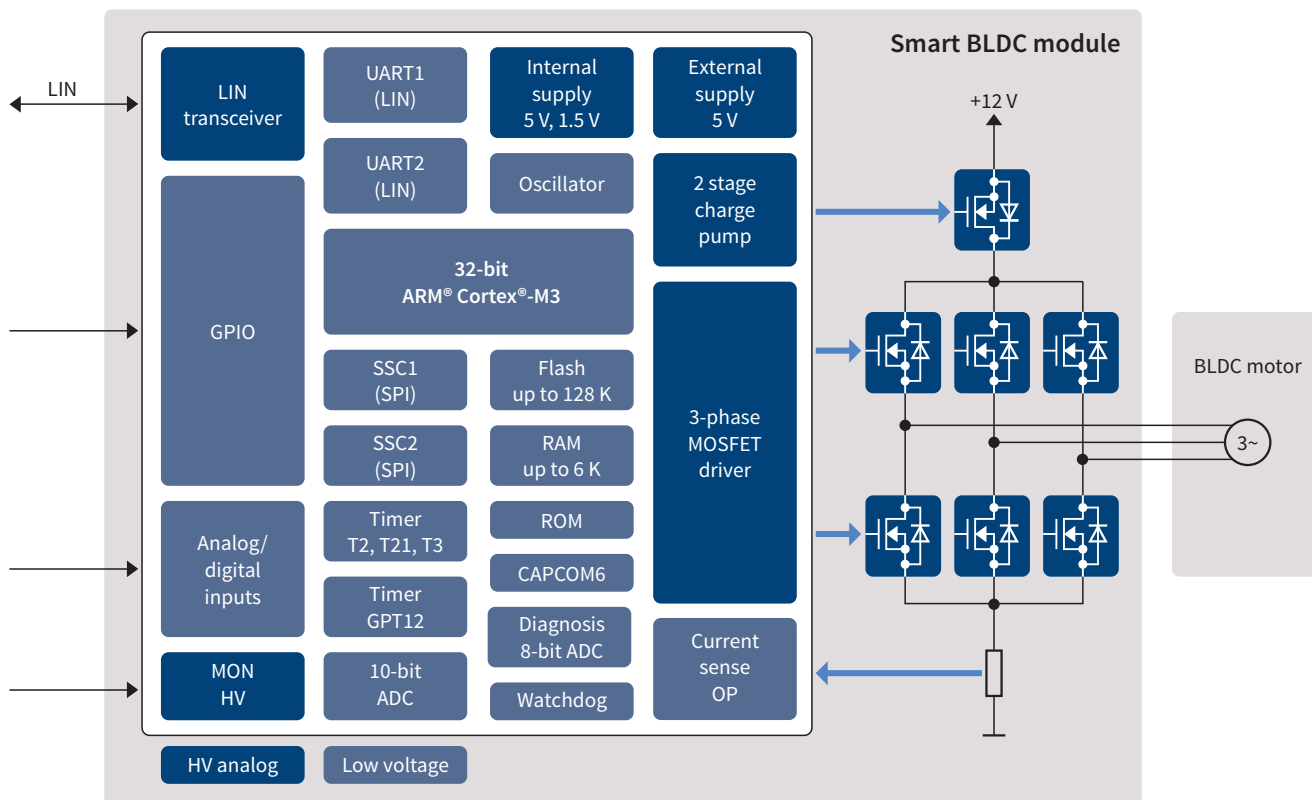
- › 32-bit ARM® Cortex®-M3 Core, up to 40 MHz clock frequency
- › 36 KB to 128 KB flash memory
- › Up to 6 KB RAM memory
- › Harvard architecture
- › Thumb®-2 Instruction Set and hardware divide and multiplication unit
- › Four 16-bit timers
- › Capture/compare unit for PWM signal generation (CCU6) with 2x 16-bits timers

### General characteristics

- › Operating supply voltage  $V_S = 5.5$  to 28 V, maximum rating 40 V
- › Extended operating range  $V_S = 3.0$  to 28 V, MCU/flash fully functional
- › ESD performance :
  - up to 2 kV / handling on all pins
  - 4 kV @ HV inputs
  - 6 kV @ LIN pin
- › Overvoltage device clamp (load dump ruggedness) up to 40 V
- › Wide operating temperature range:
  - $T_j$ : -40 °C up to 150 °C

# Infineon® Embedded Power ICs

## Block diagram



## TLE987x 32-bit $\mu$ C with 3-phase MOSFET Gate Driver for BLDC motors

Product name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM emulation [KB]	OP-AMP	Low-side MOSFET drivers	High-side MOSFET drivers	Package <sup>1)</sup>
TLE9871QXA20	24	PWM	3	36	4	y	3	3	VQFN-48
TLE9877QXA20	24	PWM + LIN	6	64	4	y	3	3	VQFN-48
TLE9877QXA40	40	PWM + LIN	6	64	4	y	3	3	VQFN-48
TLE9879QXA20	24	PWM + LIN	6	128	4	y	3	3	VQFN-48
TLE9879QXA40	40	PWM + LIN	6	128	4	y	3	3	VQFN-48

1) See packages on page 140 and 141

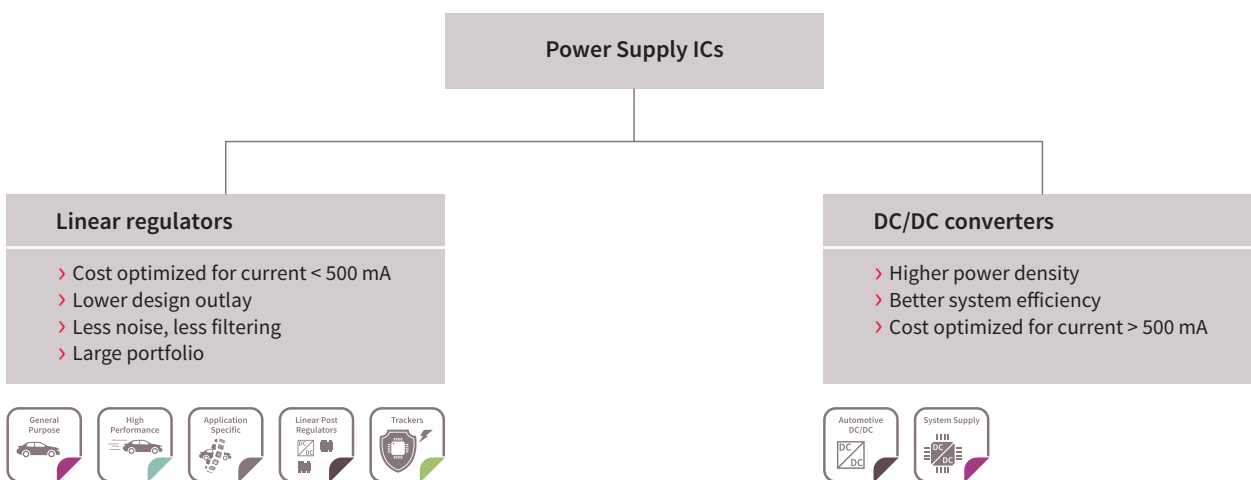


# Power Supply ICs

## Linear voltage regulators & DC/DC converters

In automotive ECUs, microcontrollers and other electronic system components have to be supplied by a stable and reliable voltage that is lower than the battery voltage (e.g. 3.3 V or 5 V) and works over the entire temperature range (from -40 °C to 150 °C).






Depending on the application – i.e. the output current and the requested system efficiency – linear voltage regulators or DC/DC converters are ideal for use in the automotive world.







# Linear voltage regulators



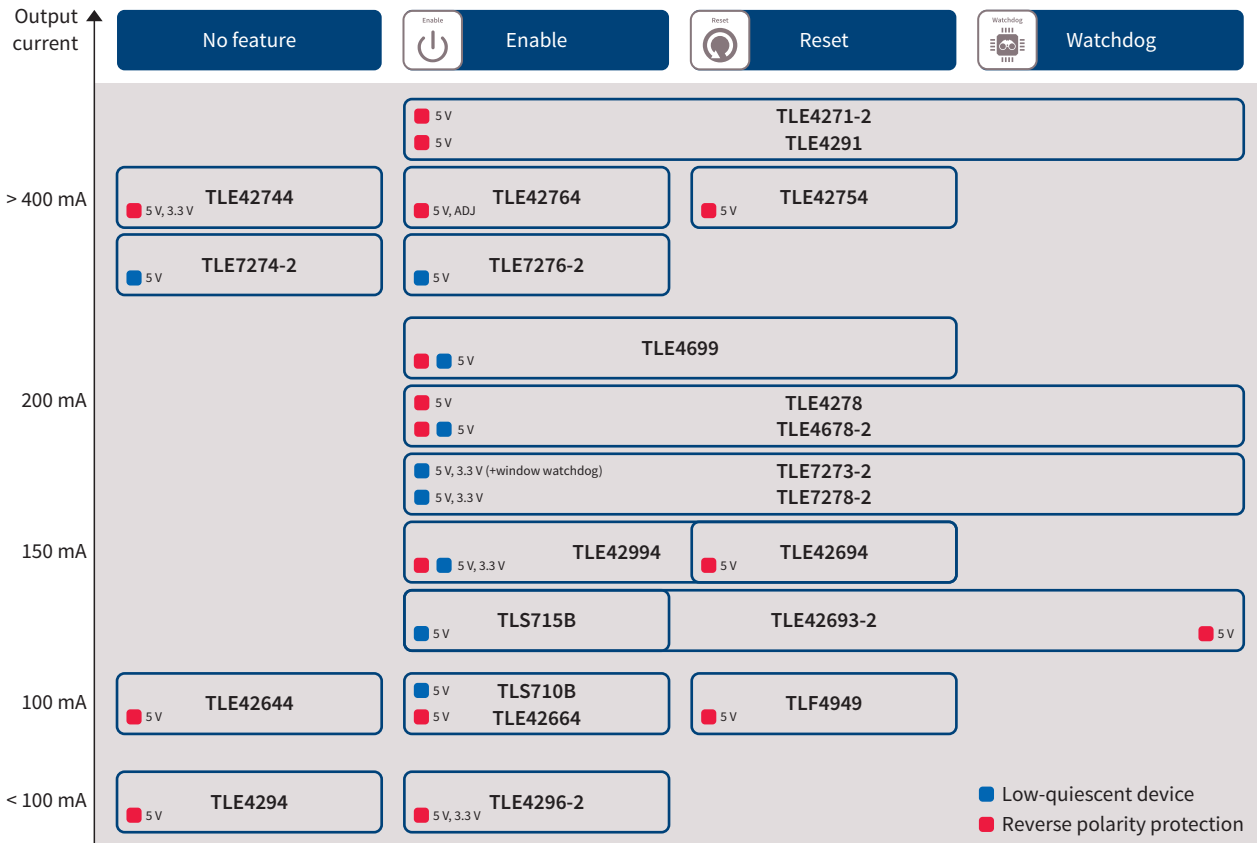
## Linear voltage regulator families

-  **General Purpose**  
Standard solution of linear voltage regulators, suitable for almost all automotive applications due to a wide range portfolio
-  **High Performance**  
Best-in-class linear voltage regulators in relation to energy savings and stop&start systems (e.g. for cold cranking conditions)
-  **Trackers**  
Supply ICs for sensor applications: robust and accurate voltage distribution
-  **Linear Post Regulators**  
Linear voltage regulators not directly connected to the battery line (e.g. used after a DC/DC converter)
-  **Application Specific**  
Linear voltage regulators for application-specific solutions (e.g. active antenna)

## Main features

-  **Enable**  
Enable function for main output. Low current consumption in stand-by.
-  **Reset**  
Power-on reset sensing output voltage
-  **Watchdog**  
Standard and window watchdog
-  **Early Warning**  
Early warning comparator for sensing input undervoltage

## Selection table



### Key features

- > Standard features
  - Wide operation range up to 45 V
  - Low dropout voltage
  - Wide temperature range: -40 °C up to +150 °C
- > Standard protection
  - Short-circuit protection
  - Reverse polarity protection as option
  - Overload protection
  - Overtemperature protection

### Key benefits

- > Broad portfolio: devices available for all types of applications
- > Best-in-class quality
- > Full 150 °C automotive qualification
- > Long-term availability

# Linear voltage regulators

## General purpose voltage regulators by output current

Product type	$I_Q$ [mA]	$I_q$ [μA]	$V_S$ range [V]	$V_O$ [V]	Drop voltage [V]	Accuracy [%]
TLE4294	30	120	5.50–45.00	5.00	0.25	4
TLE4295	30	120	3.50–45.00	3.30; 5.00	0.25	4
TLE4296-2	30	130	4.00–45.00	3.30; 5.00	0.25	4
TLF4949	100	180	3.50–40.00	5.00	0.30	2
TLE42344	120	300	5.50–45.00	5.00	0.25	2
TLE42364	120	300	5.50–45.00	5.00	0.25	2
TLE42644	150	40	5.50–45.00	5.00	0.22	2
TLE42664	150	40	5.50–45.00	5.00	0.25	2
TLE42694	150	210	5.50–45.00	5.00	0.25	2
TLE42694-2	150	210	5.50–45.00	5.00	0.25	2
TLE42794	150	150	5.50–45.00	5.00	0.25	2
TLE42994	150	65	4.40–45.00	3.30; 5.00	0.25	2
TLE4268	180	300	5.50–45.00	5.00	0.25	2
TLE7273-2	180	28	4.20–45.00	2.60; 3.30; 5.00	0.25	2
TLE7278-2	180	28	4.20–45.00	5.00	0.25	2
TLE7279-2	180	28	4.20–45.00	2.60; 3.30; 5.00	0.25	2
TLE4263/-2	200	900	5.50–45.00	5.00	0.35	2
TLE4278	200	180	5.50–45.00	5.00	0.25	2
TLE4678/-2	200	60	3.30–45.00	5.00	0.25	2
TLE4699	200	70	3.30–45.00	5.00	0.16	2
TLE7270-2	300	20	5.50–42.00	5.00	0.20	2
TLE7272-2	300	20	5.50–42.00	5.00	0.25	2
TLE7274-2	300	20	5.50–42.00	5.00	0.25	2
TLE7276-2	300	20	5.50–42.00	5.00	0.25	2
TLE4267-2	400	1300	5.50–40.00 (60.00)	5.00	0.30	2
TLE42744	400	100	3.30–40.00	3.30; 5.00	0.25	2
TLE42754	400	150	5.50–42.00	3.30; 5.00	0.25	2
TLE42764	400	100	4.50–40.00	adj.; 5.00	0.25	2
TLE4675	400	65	3.30–45.00	5.00	0.25	2
TLE4291	450	220	3.30–42.00	5.00	0.25	2
TLE4271-2	550	800	6.00–42.00 (60.00)	5.00	0.35	2
TLE4284	1000	1000	2.90–40.00	adj.; 1.50; 1.80; 2.60; 3.30; 5.00	1.00	3

## Power supply multiple output regulators

Product type	$I_Q$ 1 [mA]	$I_Q$ 2/3 [mA]	$I_q$ [mA]	$V_S$ range [V]	$V_O$ 1 [V]	$V_O$ 2/3 [V]	Drop voltage [V]
TLE4470	350	180	180	5.60–45.00	5	adj.	0.30
TLE4471	450	100/50	1100	5.50–40.00 (60.00)	5	5.00 and 5.00	0.25
TLE4473/-2	300	180	200	5.60–42.00	5	3.30 or 5.00	0.30
TLE4476	430	350	300	5.70–42.00 (60.00)	5	3.30	0.30
TLE7469G	215	200	55	4.20–45.00	5	2.60 or 3.30	0.30

- 1) See packages on page 140 and 141
- 2) Power good
- 3) Power fail
- 4) LDO with current monitor and status output
- 5) Window watchdog





Output capacitance (min) [μF]	Reset	Adjustable reset threshold	Enable	Watchdog	Early warning	Package <sup>1)</sup>
2.20						SCT595
2.20	● <sup>2) 3)</sup>					SCT595
3.30			●			SCT595
4.70	● <sup>3)</sup>				●	DSO-8, DSO-8 EP
10.00						SOT223
10.00			●			SOT223
10.00						SOT223
10.00			●			SOT223
10.00	●	●			●	DSO-8, DSO-14, SSOP-14 EP
4.70	●	●				SSOP-14 EP
10.00	●	●			●	DSO-8, DSO-14, SSOP-14 EP
22.00	●	●	●		●	DSO-8, DSO-14, SSOP-14 EP
22.00	●	●		●		DSO-8, DSO-20
0.50	●		●	● <sup>5)</sup>		DSO-14, SSOP-14 EP
0.50	●		●	●		DSO-14, SSOP-14 EP
0.50	●		●		●	DSO-14, SSOP-14 EP
22.00	●	●	●	●		DSO-8, DSO-8 EP, DSO-14, DSO-20
10.00	●	●		●		DSO-14
10.00	●	●		●		DSO-14, SSOP-14
10.00	●	●	●		●	DSO-14, SSOP-14
0.50	●					SSOP-14 EP, TO252-5 (DPAK 5-leg), TO263-5-1 (TO220-5 (SMD))
0.50	●		●			SSOP-14 EP, TO252-5 (DPAK 5-leg)
0.50						SSOP-14 EP, TO252-3 (DPAK), TO263-3-2 (TO220-3 (SMD))
0.50			●			SSOP-14 EP, TO252-5 (DPAK 5-leg)
22.00	●		●			TO263-7-1 (TO220-7 (SMD))
22.00						SOT223, SSOP-14 EP, TO252-3 (DPAK), TO263-3-1 (TO220-3 (SMD))
22.00	●					SSOP-14 EP, TO252-5 (DPAK 5-leg), TO263-5-1 (TO220-5 (SMD))
22.00			●			SSOP-14 EP, TO252-5 (DPAK 5-leg), TO263-5-1 (TO220-5 (SMD))
22.00	●					TO252-5 (DPAK 5-leg), TO263-5-1 (TO220-5 (SMD))
22.00	●	●	●	●		SSOP-14 EP
22.00	●		●	●		TO263-7-1 (TO220-7 (SMD)), TO220-7-11, TO220-7-12
10.00						TO252-3 (DPAK)

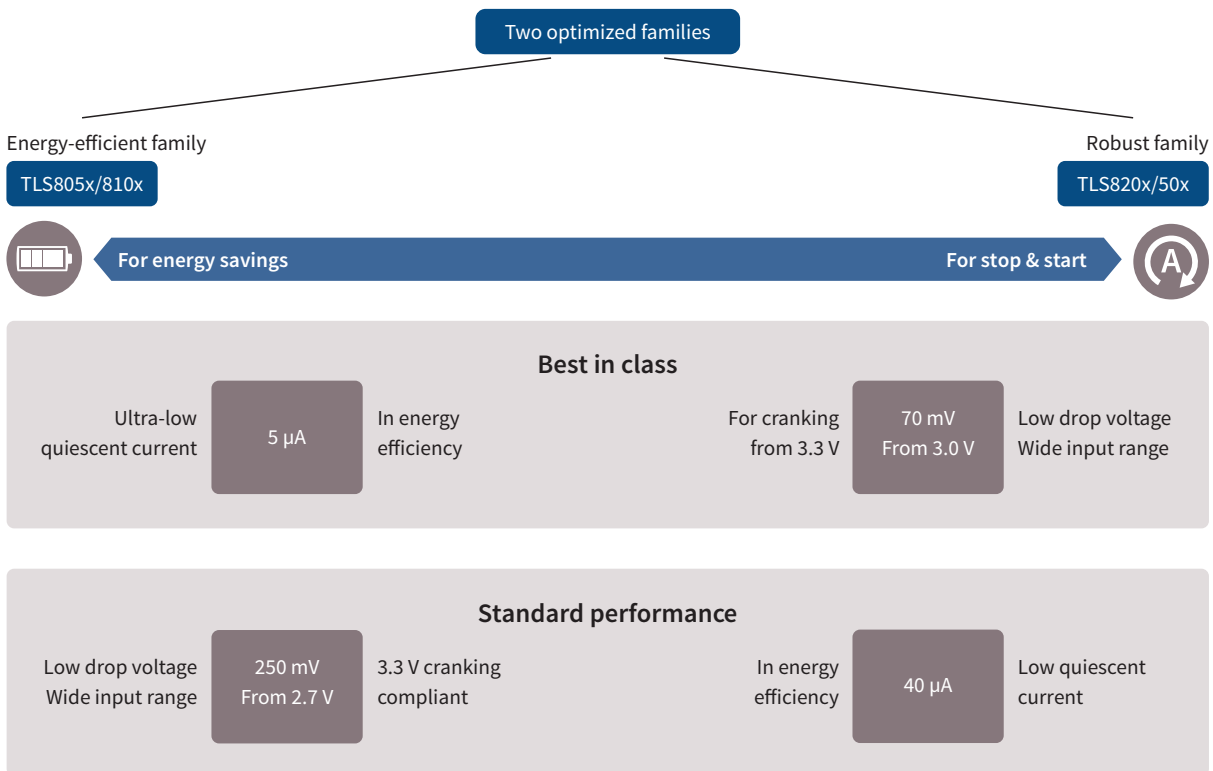
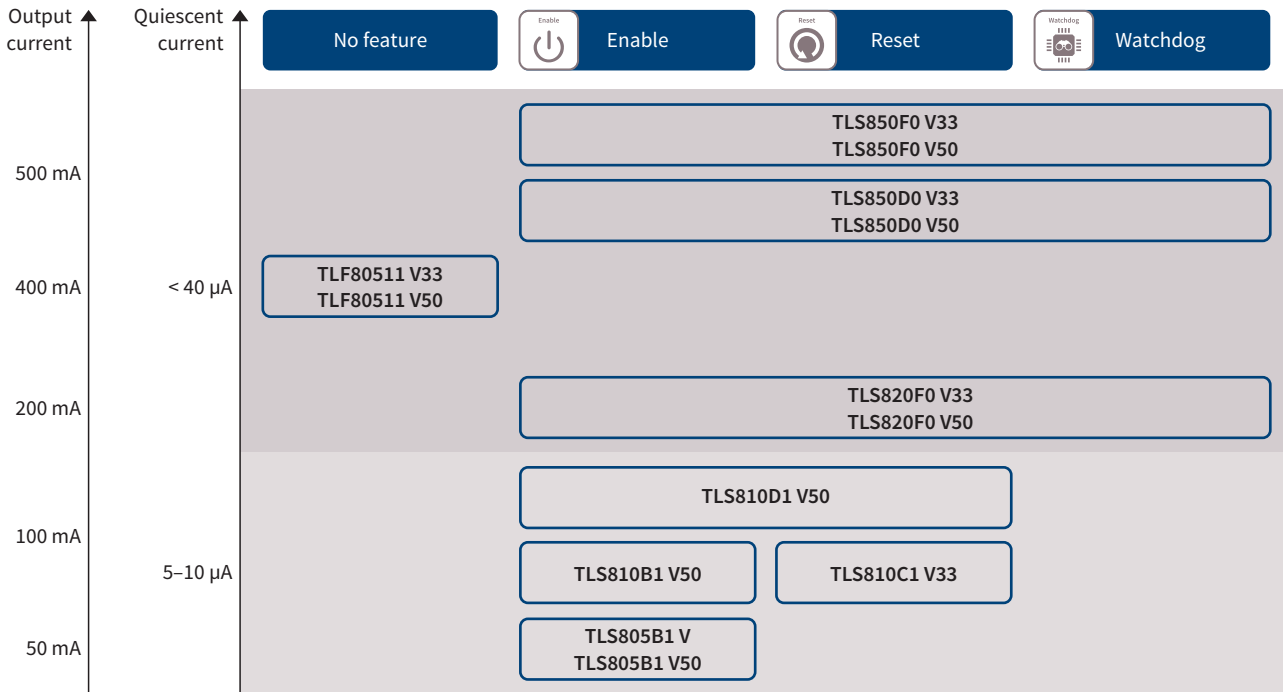
Accuracy [%]	Output capacitance (min) [μF]	Overvoltage protection	Reset output	Adjustable reset threshold	Watchdog	Early warning	Package <sup>1)</sup>
2	6/10		●	●		●	DSO-14, DSO-20
2	22/10/10	●	●	●	●		DSO-20 (Power-SO)
2	10/22		●		●		DSO-12
4	10/10	●					TO252-5 (DPAK 5-leg)
3	1/1	●	●		●	●	DSO-12

MOSFETS  
TEMPFET™  
HITFET™  
Smart multichannel switches  
PROFET™  
SPOC™  
LITIX™  
Motor drivers  
Power supply  
Automotive transceivers  
Automotive system ICs  
Glossary

# High-performance linear voltage regulators



## Selection table



# Key features & benefits

The diagram illustrates the key features and benefits of the Infineon TSON-10 voltage regulator, centered around a '0 defect target & no quality events' goal. The features are arranged in a circular pattern around a central hub.

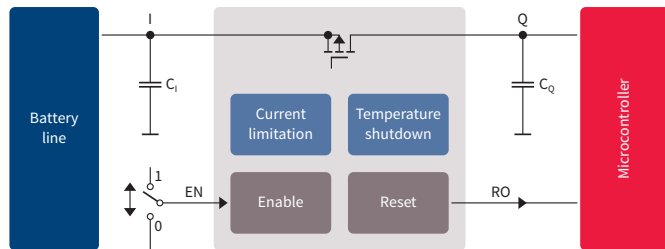
- Ultra-low quiescent current:** A graph shows a current of 5-30  $\mu\text{A}$  at 85  $^{\circ}\text{C}$ .
- Lowest dpm rate:** A graph shows the defect per million (dpm) rate starting at 0.1 and decreasing towards a 'Target 0 dpm'.
- Excellent line transient robustness:** A graph shows the output voltage ( $V_{\text{OUT}}$ ) and output current ( $I_{\text{OUT}}$ ) during a transient event.
- Energy efficiency: save battery in on-state:** Represented by a battery icon.
- Design for harsh automotive environment:** Represented by a car icon.
- Output voltage soft start:** A graph shows the enable signal (EN) and output current ( $I_{\text{OUT}}$ ) during soft start, with 'No overshoot' indicated.
- Small output capacitor for stability 1  $\mu\text{F}$ :** Two small capacitors are shown.
- Very low drop < 70 mV @ 100 mA:** A graph shows the input voltage ( $V_{\text{IN}}$ ) and output voltage ( $V_{\text{OUT}}$ ) during a load regulation test, highlighting 'Low drop out'.
- Extended operating range starting at 3.0 V:** A graph shows the output voltage during 'LV124 severe cranking' starting at 3.0 V.
- Board space savings:** Represented by a gear icon.
- Small packages:** Two TSON-10 packages are shown.
- Suitable for very low cranking (stop&start):** Represented by a car with a stop sign icon.
- High Performances:** Represented by a car icon.
- 0 defect target & no quality events:** Represented by a 'ZERO DEFECT' target icon.

# High-performance linear voltage regulators



## Applications

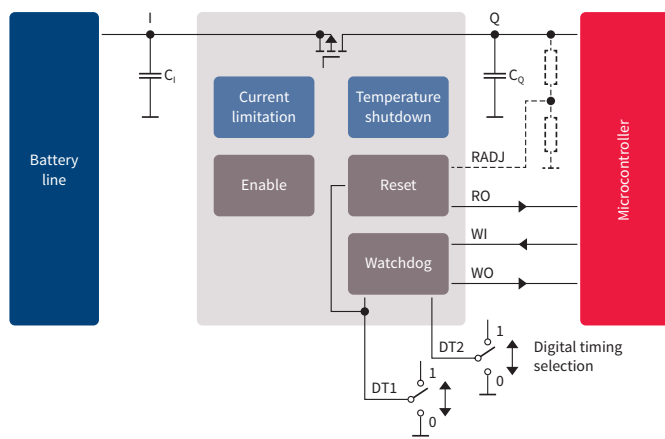
### Energy-efficient family



### Applications

- > Application with direct battery connection
  - RKE, immobilizer, gateway
  - Infotainment, alarm, dashboard
- > General automotive ECUs

### Robust family



### Applications

- > BCM, RKE, trunk, dashboard, HVAC
- > Brake, EPS, TPMS, BMS
- > Transmission
- > General automotive ECUs

## High-performance voltage regulators by output current

	Product type	$I_Q$ (max) [mA]	$I_q$ [ $\mu$ A]	$V_S$ range [V]	$V_Q$ [V]	Drop voltage [mV]	Accuracy [%]	$C_Q$ [ $\mu$ F]	Reset	Enable (= Inhibit)	Watchdog	Package <sup>1)</sup>
NEW!	TLF80511EJ V33	400	38.0	3.3 – 45.0	3.3	130	2	1				DSO-8 EP
NEW!	TLF80511EJ V50	400	38.0	3.3 – 45.0	5.0	100	2	1				DSO-8 EP
NEW!	TLF80511TC	400	38.0	3.3 – 45.0	5.0	100	2	1				TO263-3-1 (TO220-3 (SMD))
NEW!	TLF80511TF V33	400	38.0	3.3 – 45.0	3.3	130	2	1				TO252-3 (DPAK)
NEW!	TLF80511TF V50	400	38.0	3.3 – 45.0	5.0	100	2	1				TO252-3 (DPAK)
NEW!	TLS805B1SJV	50	5.0	2.7 – 40.0	ADJ	100	2	1		•		DSO-8
NEW!	TLS810B1LD V50	100	5.0	2.75 – 42.0	5.0	100	2	1		•		TSON-10
NEW!	TLS810C1EJ V33	100	8.5	2.7 – 40.0	3.3	250	2	1	•			DSO-8 EP
NEW!	TLS810D1EJ V50	100	9.5	2.7 – 40.0	5.0	250	2	1	•	•		DSO-8 EP
NEW!	TLS810D1LD V50	100	9.5	2.75 – 42.0	5.0	250	2	1	•	•		TSON-10
NEW!	TLS820F0EL V33	200	40.0	3.0 – 40.0	3.3	70	2	1	•	•	•	SSOP-14 EP
NEW!	TLS820F0EL V50	200	40.0	3.0 – 40.0	5.0	70	2	1	•	•	•	SSOP-14 EP
NEW!	TLS850F0TA V50	500	40.0	3.0 – 40.0	5.0	–	2	1	•	•	•	TO263-7-1 (TO220-7 (SMD))

1) See packages on page 140 and 141



RoHS





Glossary

Automotive system ICs

Automotive transceivers

Power supply

Motor drivers

LITIX™

SPOC™

PROFET™

Smart multichannel switches

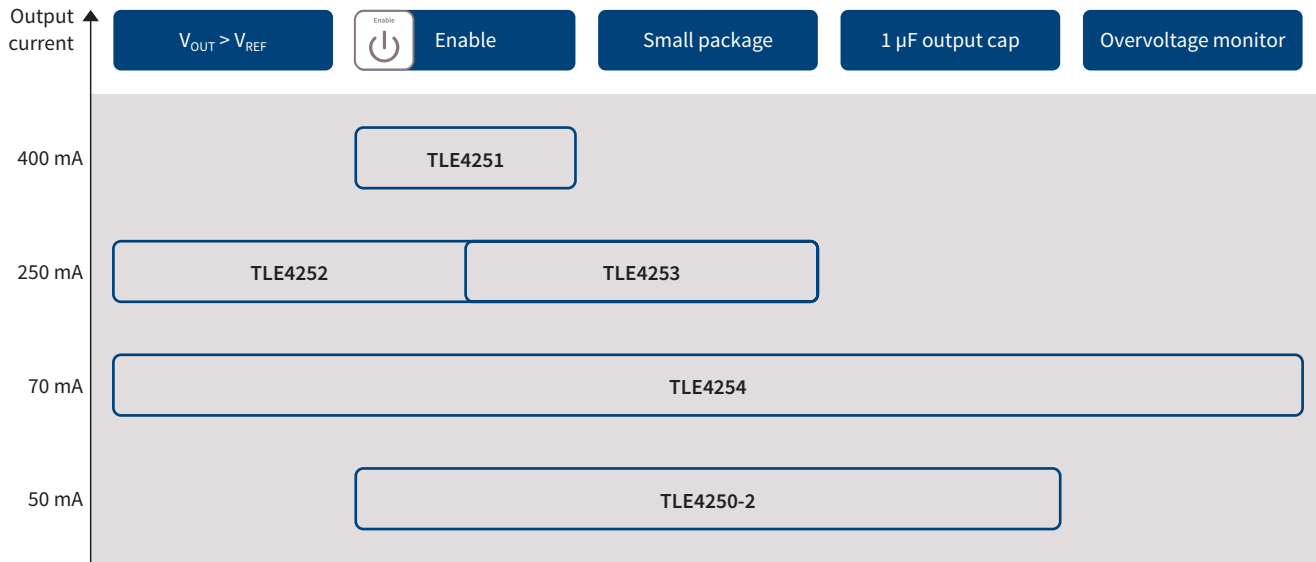
TEMPET™  
HITFET™

MOSFETS

# Trackers



## Selection table



### Challenges of powering sensors

- > Sensor supply requires various protection features due to the harsh environment
  - Overvoltage (typ. ~26 V)
  - Overcurrent
  - Reverse polarity
  - Supply accuracy

### Key features

- > Designed for automotive @ 150 °C
- > Short-to-GND and BAT protected
- > Accurate current limitation
- > High accuracy
- > Advanced feature set

### Key benefits

- > Reliable protection for ECU/sensor
- > Easy and accurate voltage replication
- > High flexibility/scalability
- > Lower design outlay → design cost savings



- > Enable function to main output
- > Low quiescent current consumption in stand-by mode



- > Indicates an error condition at the tracker's output

## Trackers by output current

Product type	$I_Q$ [mA]	$I_q$ [mA]	$V_S$ range [V]	$V_Q$ [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [ $\mu$ F]	$V_Q > V_{ref}$ possible	Package <sup>1)</sup>
TLE4250-2	50	140	4.00–40.00	adj.	0.10	0.50	1		SCT595
TLE4251	400	230	4.00–40.00	adj.	0.28	0.20	22		TO252-5 (DPAK 5-leg), TO263-5-1 (TO220-5 (SMD))
TLE4252	250	100	3.50–40.00	adj.	0.28	0.20	10		TO252-5 (DPAK 5-leg), TO263-5-1 (TO220-5 (SMD))
TLE4253	250	100	3.50–40.00	adj. <sup>2)</sup>	0.28	0.10	10	●	DSO-8, DSO-8 EP
TLE4254	70	50	4.00–45.00	adj. <sup>2)</sup>	0.28	0.10	1	●	DSO-8, DSO-8 EP

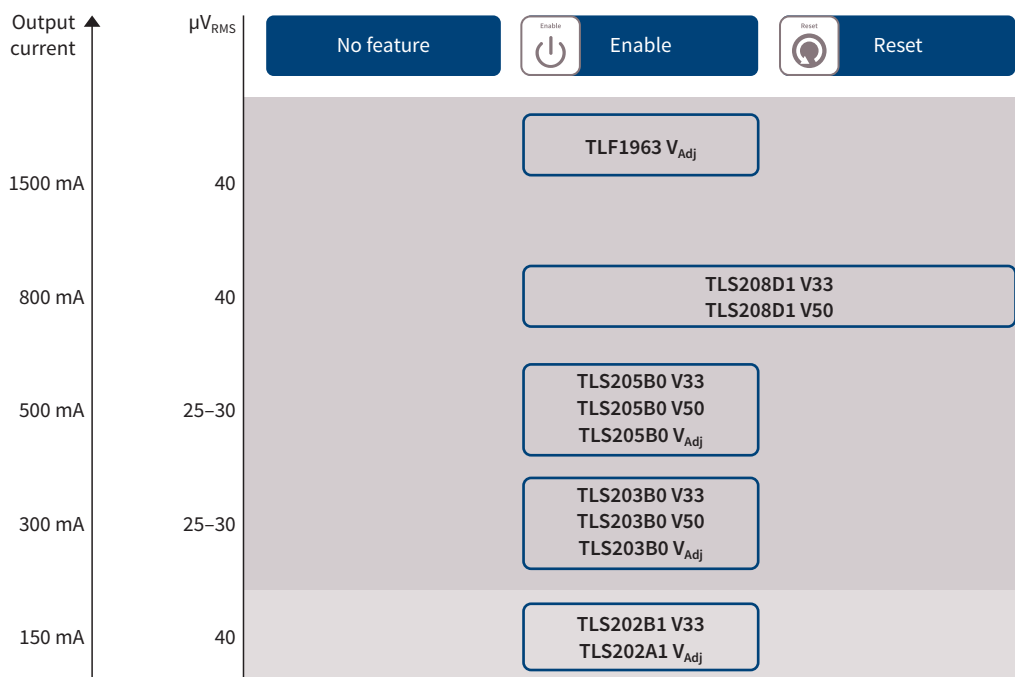
1) See packages on page 140 and 141

2)  $V_Q > V_{ref}$  possible

## Linear post regulators



## Selection table



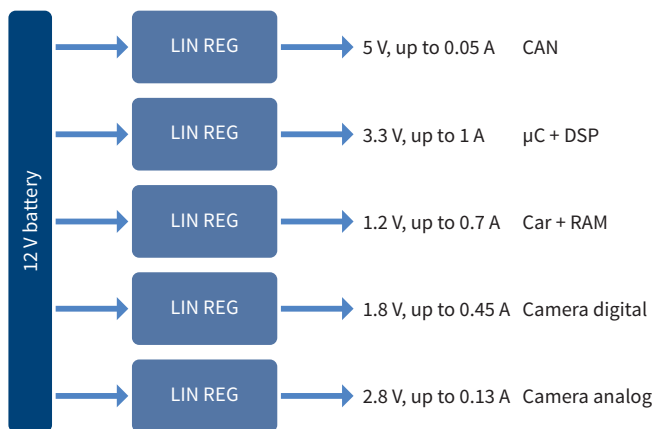
# Linear post regulators



## Applications

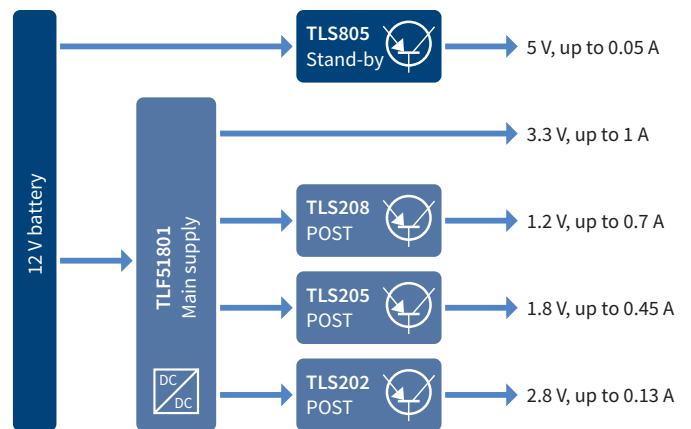
- > ADAS: radars & cameras
- > ADAS: MMIC (low noise)
- > Infotainment, displays, cluster
- > CPU supplies (FPGA, DSP), memory
- > Post regulation after DCDC converter
- > EMS

## Linear solution



Low system efficiency  
High power losses

## Post regulation DC/DC & linear



High efficiency-cost ratio

## Maximum efficiency & optimal flexibility

System benefits	TLF51801 controller	Linear post regulator
<ul style="list-style-type: none"> <li>&gt; Higher efficiency</li> <li>&gt; Higher flexibility</li> <li>&gt; Lower system cost</li> <li>&gt; Higher reliability</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Adjustable voltage</li> <li>&gt; Max current up to 10 A</li> <li>&gt; Current limitation</li> <li>&gt; Advanced feature set</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Higher <math>V_{in}</math> range than CMOS (<math>V_{in} = 20</math> V max)</li> <li>&gt; Adjustable voltage</li> <li>&gt; Max current up to 1.5 A</li> <li>&gt; Low noise</li> </ul>
Automotive-qualified $T_j$ up to 150 °C		

## Linear post regulators by output current

Product type	$I_Q$ [mA]	$I_q$ [μA]	$V_S$ range [V]	$V_Q$ [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Reset	Adjustable reset threshold	Enable	Watchdog	Early warning	Package <sup>1)</sup>
<b>NEW!</b> TLS202B1	150	50	2.70–18.00	3.30	0.50	3	1.00			●			SCT595
<b>NEW!</b> TLS202A1	150	50	2.70–18.00	adj.	0.50	3	1.00						SCT595
<b>NEW!</b> TLS203B0	300	30	2.30–20.00	adj.; 3.30	0.30	3	3.30			●			DSO-8 EP, TSON-10
<b>NEW!</b> TLS205B0	500	30	2.30–20.00	adj.; 3.30	0.30	3	3.30			●			DSO-8 EP, TSON-10
<b>NEW!</b> TLS208D1	800	90	–	adj.; 3.30	–	2	–	●	●				DSO-8 EP, TSON-10
TLF1963	1500	1100	2.50–20.00	adj.	0.34	3	10.00			●			TO263-5-1 (TO220-5 (SMD)), TO252-5 (DPAK 5-leg)

1) See packages on page 140 and 141





# Application specific

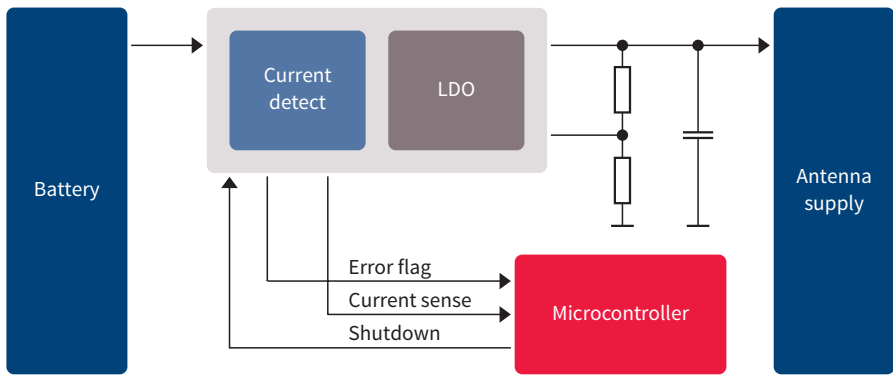
## TLF4277-2: active antenna driver

### Key features

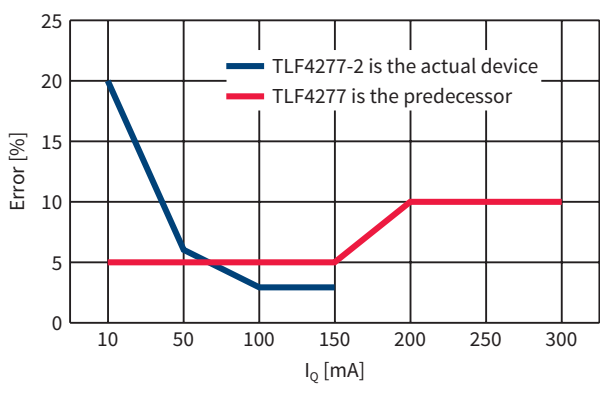
- > Current monitor functionality
- > Adjustable current limitation
- > Adjustable output voltage
- > Short-circuit detection to GND and battery voltage level
- > SSOP-14EP package
- > Overtemperature detection/protection

### Key benefits

- > Diagnosis of antenna system status (linear current detection)
- > Flexible protection of sensitive components
- > Easy adjustment to the application requirements
- > Fast identification of short-circuit failures
- > Enhances thermal characteristics



### Current sense performance



### Active antenna family

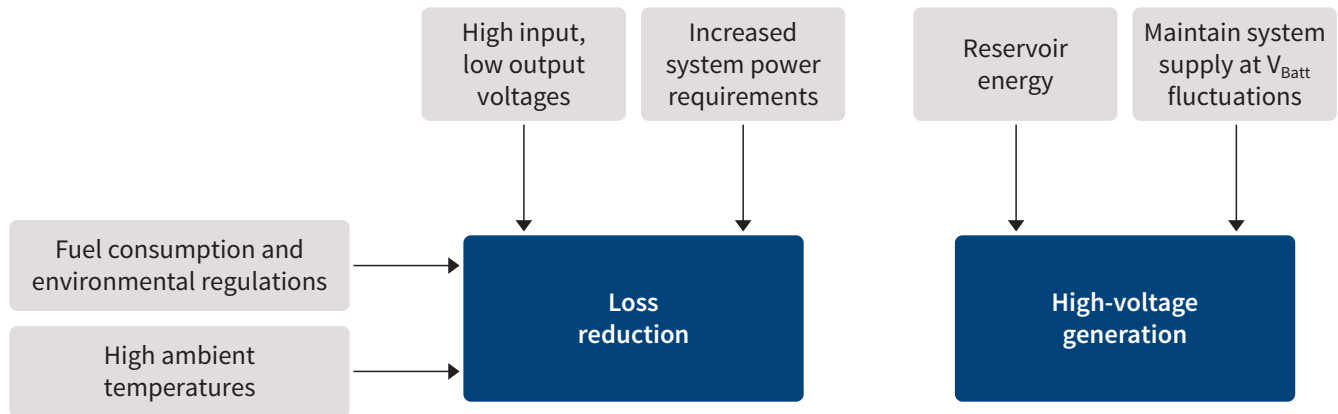
Product type	I <sub>q</sub> [mA]	I <sub>q</sub> [μA]	V <sub>s</sub> range [V]	V <sub>o</sub> [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Reset	Adjustable reset threshold	Enable	Watchdog	Early warning	Package <sup>1)</sup>
TLF4277 <sup>2)</sup>	200	140	5.00–40.00	adj.	0.25	2	10			•			SSOP-14 EP
TLF4277-2 <sup>2)</sup>	300	150	5.00–45.00	adj.	0.20	2	1			•			SSOP-14 EP

1) See packages on page 140 and 141  
 2) LDO with current monitor and status output

# DC/DC converters



## Where to use DC/DC vs. LDO



## Applications

### TLE6365

- > General purpose

### TLE6389-2GV/-3GV

- > Cluster
- > Body
- > Truck

### TLE8366

- > General purpose
- > Pre-regulator

### TLE8386-2

- > Cranking (SEPIC or flyback-configuration)
- > GDI
- > Piezo injection

### TLE51801ELV

- > Pre-regulator
- > Infotainment
- > Cluster
- > General purpose

### TLF520x1 family

- > Cluster
- > Body ECUs
- > Infotainment
- > Sensor cluster

## Example: TLF520x1 family

### Key features

- › High input voltage range up to 45 V
- › Output: 500 mA/5 V ( $\pm 2\%$ )
- › Low quiescent current  $< 45 \mu\text{A}$
- › High operating frequency: up to 2.2 MHz
- › Synch-in and adjust. switching frequency
- › Integrated compensation and soft-start
- › Family approach with dedicated feature set
  - Enable: ultra-low shutdown current
  - Reset with adjust. RES-thresholds
  - Watchdog with adjust. timing
- › SSOP-14EP (thermally enhanced)

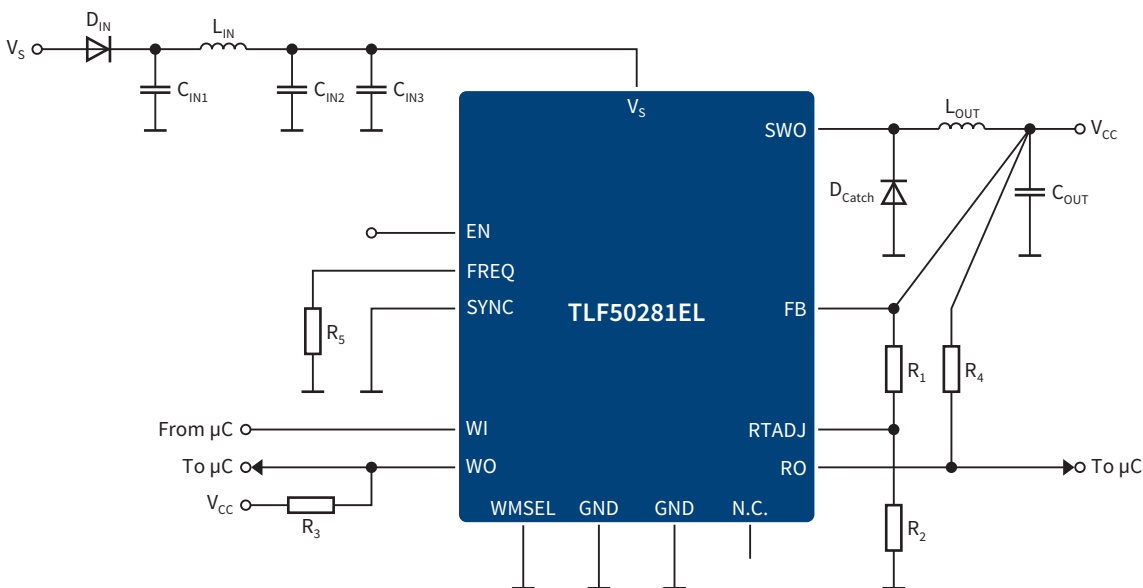
### Key benefits

- › Suitable for permanently  $V_{\text{Batt}}$ -connected ECUs
- › Optimized costs and board space
  - Smaller coils and caps
  - No external components needed for compensation and soft-start
- › Flexibility
  - Reset management
  - $\mu\text{C}$ -supervision
- › Ultra-low shutdown current
- › Reduced design outlay

### Family members

	EN	RES	WD
TLF52021			
TLF520211	•		
TLF520241		•	
TLF520251	•	•	
TLF520281	•	•	•

### Application diagram



$L_{IN}$ ,  $C_{IN1}$  and  $C_{IN3}$  recommended for suppression of EME  
 $D_{IN}$  depending on application

# DC/DC converters

## Single-rail DC/DC converters

Product type	$V_{S(op)}$ [V]	$V_Q$ [V]	$V_{Q2}$ [V]	$V_{Q3}$ [V]	$V_{Q4}$ [V]	$V_Q$ additional [V]	Accuracy 1 [%]	Accuracy 2 [%]	Accuracy 3 [%]	Accuracy 4 [%]	Additional output accuracy	$I_Q$ [mA]
<b>Buck</b>												
TLE6365	8.00 ... 40.00	5.00					2					400
TLE6389-2GV	5.00 ... 60.00	adj.					3					2300
TLE6389-2GV50	5.00 ... 60.00	5.00					3					2300
TLE6389-3GV50	5.00 ... 60.00	5.00					3					2300
TLE8366	4.75 ... 45.00	adj., 3.30, 5.00					2(4)					1800
TLF50281	4.75 ... 45.00	5.00					2					500
TLF50251	4.75 ... 45.00	5.00					2					500
TLF50241	4.75 ... 45.00	5.00					2					500
TLF50211	4.75 ... 45.00	5.00					2					500
TLF50201	4.75 ... 45.00	5.00					2					500
TLF51801	4.75 ... 45.00	$1.20 - D_{max} * V_S$					2					adj. max 10,000
<b>Boost</b>												
TLE8386 <sup>3)</sup>	4.75 ... 45.00	adj. (max 9-times of $V_Q$ )					4					dep.on $V_Q$
TLE8386-2 <sup>4)</sup>	4.75 ... 45.00	adj. (max 9-times of $V_Q$ )					4					

1) See packages on page 140 and 141

2) Different voltage reset hysteresis

3) HS-sense-booster (preferably as current source)

4) LS-sense-booster



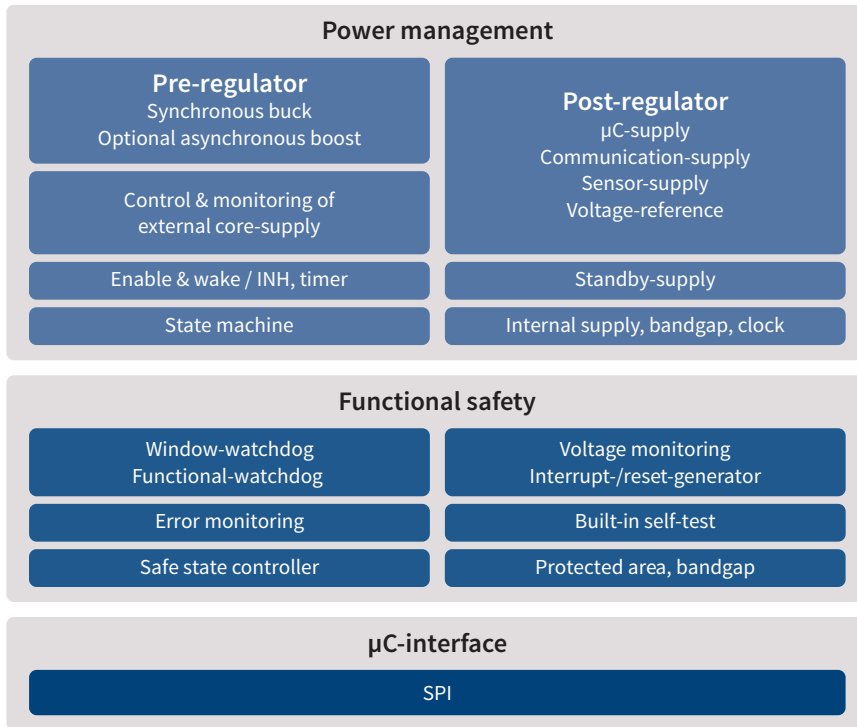
$I_{Q2}$ [mA]	$I_{Q3}$ [mA]	$I_{Q4}$ [mA]	$I_{Q}$ additional [mA]	$I_{Q}$ [mA]	$f_{sw}$ [kHz]	Stand-by regulator [V-mA]	PFM operation	Reset	Watchdog	SPI and add. logic	Enable/ disable possibility	Early warning	Package <sup>1)</sup>
				1.500	100			•					DSO-8
				0.120	250 ... 530		•	•			•	•	DSO-14
				0.120	250 ... 530		•	•			•	•	DSO-14
				0.120	250 ... 530		•	• <sup>2)</sup>			•	•	DSO-14
				7.000	200 ... 530						•		DSO-8 EP
				0.045	800 ... 2200		•	•	STD		•		SSOP-14EP
				0.045	800 ... 2200		•	•			•		SSOP-14EP
				0.045	800 ... 2200		•	•					SSOP-14EP
				0.045	800 ... 2200		•				•		SSOP-14EP
				0.045	800 ... 2200		•						SSOP-14EP
				< 2.000 $\mu$ A	100 ... 700						•		SSOP-14EP
				7000	100 ... 500						•		SSOP-14EP
				7000	100 ... 500						•		SSOP-14EP

# System supply



TLF35584 – system supply for safety-relevant applications

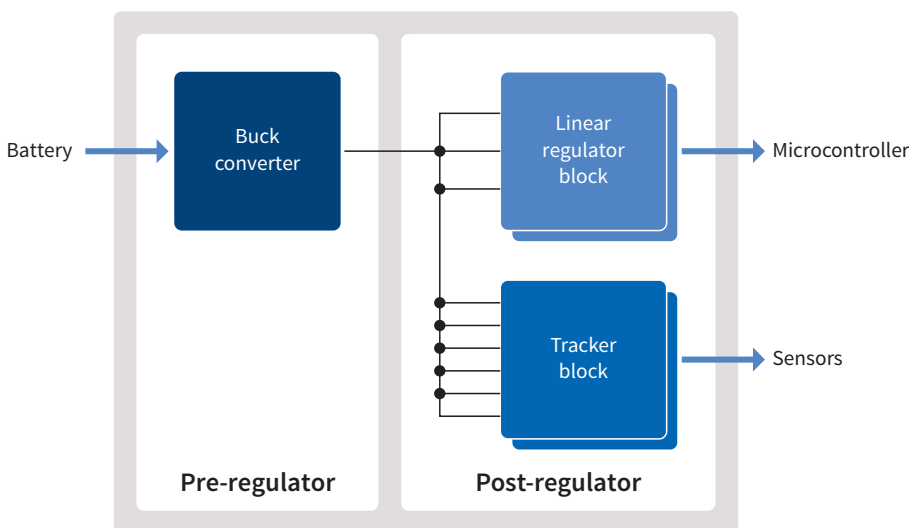
## Functional block diagram



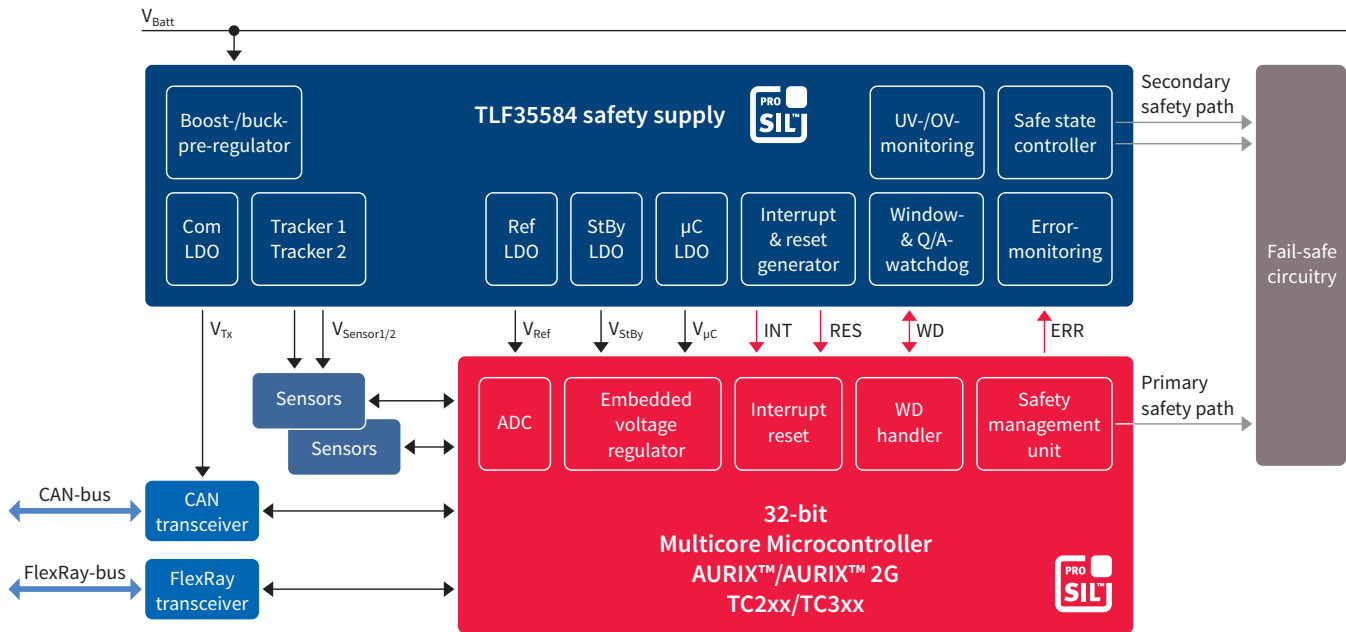
### Applications

- > Safety: EPS, braking, suspension, domain control, ADAS fusion box
- > Powertrain: engine management, transmission
- > Electrical drive train: battery management, inverter, DC/DC, charger

## Pre-/post-regulator architecture for high efficiency



## Application schematic



### Key features

- >  $V_{IN}$ : 3 V ... 40 V
- > Buck/boost-pre-regulator
  - $I_Q = 1.3$  A; f: 300 kHz – 2.5 MHz
- > Post-regulators
  - $\mu C$ -supply: 3.3 V/5 V @ 600 mA
  - Reference-LDO: 5 V @ 150 mA ( $\pm 1\%$ )
  - 2x tracker: 5 V @ 150 mA
  - Communication-supply: 5 V @ 200 mA
- > Standby-LDO: 3.3 V/5 V @ 10 mA
- > EN/wake (T15 and CAN/FlexRay)
- > Extended state machine
- > SPI
- > Safety features
  - Development acc. to ISO 26262
  - Multiple bandgap (supply versus V-monitoring)
  - UV/OV-monitoring of all rails
  - ERR-monitoring of  $\mu C$ 's safety management unit
  - Functional-WD & window-WD with dedicated error-counters
  - Safe state control/secondary safety paths
  - Protected safety area/HV interconnects
  - Built-in self-test
- > VQFN-48 EP & LQFP-64 EP (both thermally enhanced)

### Key benefits

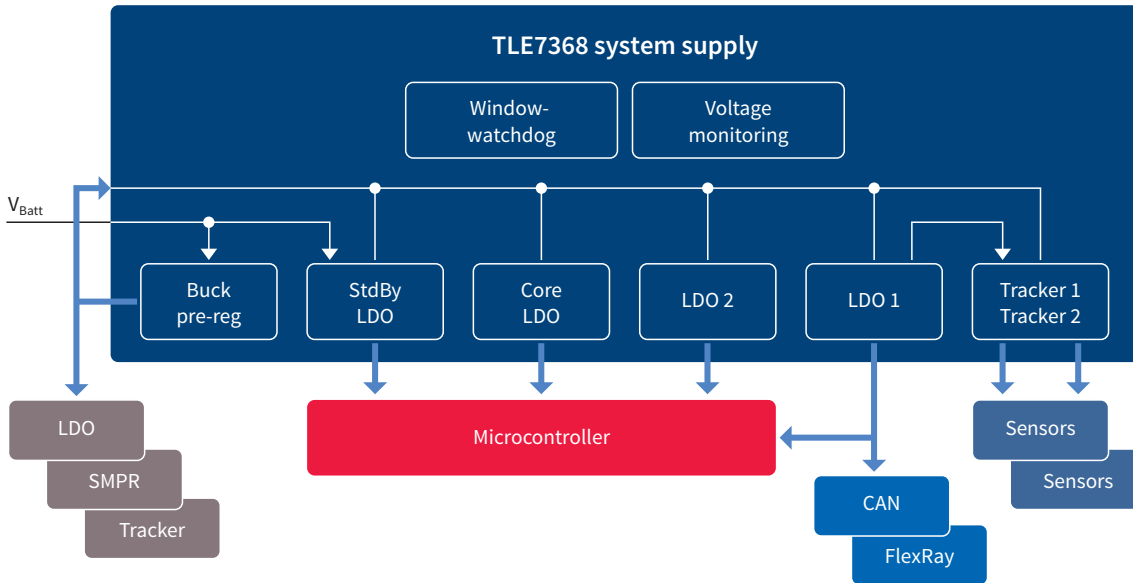
- > Ensures operation during cold cranking
- > High efficiency
- > ADC-supply regardless of  $\mu C$ -load
- > Precise sensor supply
- > Flexible wake-up management
- > Usage in applications with ASIL-requirements (up to ASIL-D)
- > Avoids common cause failures thanks to independence and protection
- > Application adaptable
  - Flexible monitoring concept
  - Flexible watchdog concept
  - Flexible safe state control & safety paths
- > All safety features testable on demand
- > Small footprint package (VQFN-48)
- > Good thermal behavior

# System supply



TLE7368/-2/-3 – optimized system supply for 32-bit  $\mu\text{C}$

Application diagram



## DC/DC system supplies

Product type	$V_{S(op)}$ [V]	$V_Q$ [V]	$V_{Q\ 2}$ [V]	$V_{Q\ 3}$ [V]	$V_{Q\ 4}$ [V]	$V_Q$ additional [V]	Accuracy 1 [%]	Accuracy 2 [%]	Accuracy 3 [%]	Accuracy 4 [%]	Additional output accuracy	$I_Q$ [mA]
<b>Buck plus linear</b>												
TLE7368	4.50 ... 45.00	5.50	5.00	2.60 or 3.30	1.50	2 x 5	-2.00 ... +9.00	2	2	2	1.50	2500
TLE7368-2	4.50 ... 45.00	5.50	5.00	2.60 or 3.30	1.20	2 x 5	-2.00 ... +9.00	2	2	2	1.50	2500
TLE7368-3	4.50 ... 45.00	5.50	5.00	2.60 or 3.30	1.30	2 x 5	-2.00 ... +9.00	2	2	2	1.50	2500
TLE6368	5.50 ... 60.00	5.50	5.00	2.60 or 3.30	2.60 or 3.30	6 x 5	10.00	5	5	5	1.00	1500
TLF35584	3.00 ... 40.00	5.80	5.00 or 3.30	5.00	5.00	2 x 5	2.50	2	2	1	-	1300
<b>Boost plus buck</b>												
TLE6711	4.50 ... 45.00	27.50	5.00	-	-	-	12.00	2	-	-	-	1000

1) See packages on page 140 and 141



**Key features**

- › Input voltage range from 4.5 V to 45 V
- › DC/DC buck pre-regulator to 5.5 V/2.5 A
  - Integrated slew-rate control
- › Post-regulators for  $\mu$ C & on-board
  - LDO1: 5 V ( $\pm 2\%$ ), 700 mA
  - LDO2: 3.3 V or 2.6 V ( $\pm 2\%$ ), 500 mA
  - LDO3: control for ext. NPN
  - LDO3: 1.5 V, 1.2 V and 1.3 V ( $\pm 2\%$ )
  - 2 trackers for off-board supply: 5 V, 105 mA/50 mA
- › Stand-by regulator for lowest current consumption
- › 2 enable inputs
- › Reset for all LDOs with adj. reset delay time
- › Window watchdog with adj. timing
- › Monitoring circuit for stand-by supply
- › Power sequencing on contributing supplies
- › Overcurrent protection for all regulators
- › Overtemperature shutdown
- › DSO-36 EP (thermally enhanced)

**Key benefits**

- › Maintains operation under sensor short-circuit condition
- › EME reduction (high frequency content)
- › Power sequencing for proper start-up/ramp-down

**Applications**

- › Powertrain: transmission, engine management
- › Safety: EPS

$I_{Q2}$ [mA]	$I_{Q3}$ [mA]	$I_{Q4}$ [mA]	$I_{Q}$ additional [mA]	$I_{q}$ [mA]	$f_{sw}$ [kHz]	Stand-by regulator [V–mA]	PFM operation	Reset	Watchdog	SPI and add. logic	Enable/ disable possibility	Early warning	Package <sup>1)</sup>
800	700	adj.	105 and 50	120	280 ... 425	1.00/2.60–30.00		●	WWD		●		DSO-36 EP, DSO-36 (Power-SO)
800	700	adj.	105 and 50	120	280 ... 425	1.00/2.60–30.00		●	WWD		●		DSO-36 EP
800	700	adj.	105 and 50	120	280 ... 425	1.00/2.60–30.00		●	WWD		●		DSO-36 EP
800	500	350	6 x 17	30	280 ... 425	2.40–1.00		●	WWD	●	●		DSO-36 (Power-SO)
600	200	150	2 x 150	50	400 ... 2500	5.00 or 3.30/10.00	●	●	WWD/FWD	●	●		LQFP-64, VQFN-48
700	–	–	–	4	95			●	WWD				DSO-14, DSO-20

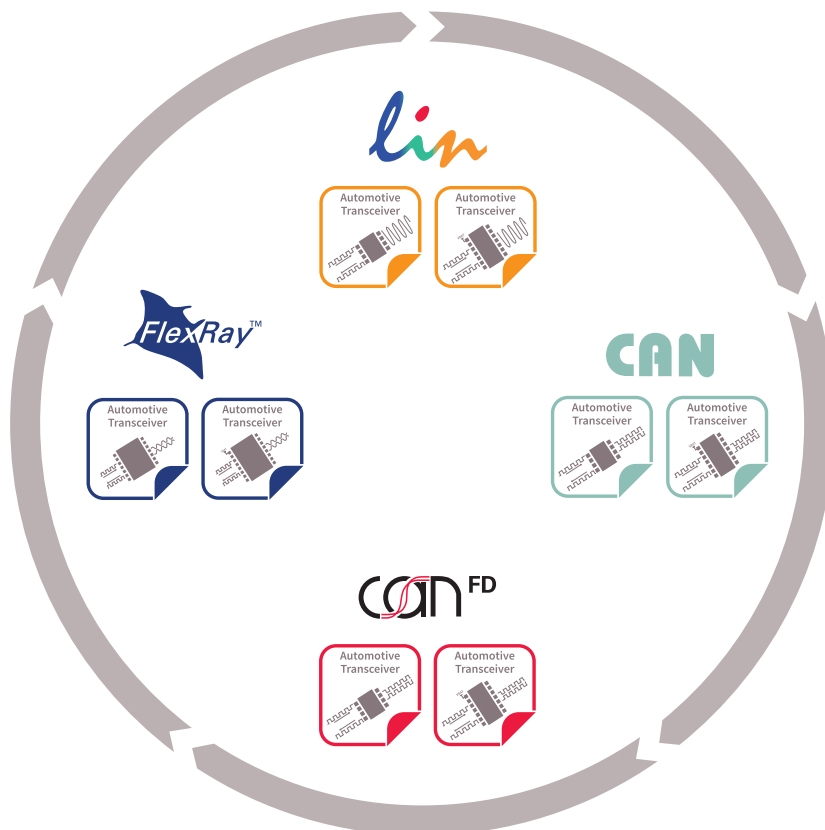


## Automotive transceivers

Due to the ever-increasing demand for data exchange in modern vehicles, the automotive industry implemented networks such as CAN (Controller Area Network), LIN (Local Interconnect Network) and FlexRay protocol-based bus systems.

Infinion offers a broad product portfolio of automotive transceivers – all of which are perfectly suited and designed to withstand the harsh automotive environment – for the various automotive bus segments.

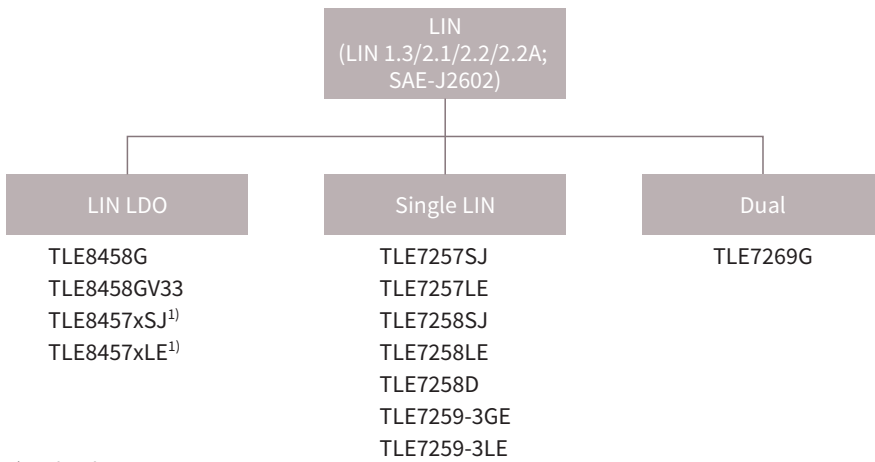
Different transceiver types are used in accordance with the respective vehicle network architecture and the related ECU supply path. Infineon transceivers ensure reliable communication and help minimize the current consumption and associated CO<sub>2</sub> emissions at the vehicle level. Thanks to their high performance, ruggedness and reliable communication, Infineon's transceiver products offer the ultimate in value.





Infineon offers a complete LIN transceiver family and introduces new LIN LDO devices in DSO-8 and tiny TSON-8 packages

## Selection tree – Automotive LIN transceivers



1) In development

Product table								
Product type	Transmission rate (max)	I <sub>q</sub> [μA]	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	CAN FD	Package <sup>1)</sup>
<b>LIN LDO</b>								
TLE8458G	20 kbit/s	< 10 sleep mode	●	●	1	●		DSO-8
TLE8458GV33	20 kbit/s	< 10 sleep mode	●	●	1	●		DSO-8
TLE8457xSJ <sup>2)</sup>	20 kbit/s	< 18 sleep mode	●	●	1	●		DSO-8
TLE8457xLE <sup>2)</sup>	20 kbit/s	< 18 sleep mode	●	●	1	●		TSON-8
<b>Single LIN</b>								
TLE6258-2G	20 kbit/s	< 40 sleep mode	●		1			DSO-8
TLE7257SJ	20 kbit/s	< 10 sleep mode	●		1	●		DSO-8
TLE7257LE	20 kbit/s	< 10 sleep mode	●		1	●		TSON-8
TLE7258SJ	20 kbit/s	< 10 sleep mode	●		1	●		DSO-8
TLE7258LE	20 kbit/s	< 10 sleep mode	●		1	●		TSON-8
TLE7258D	20 kbit/s	< 10 sleep mode	●		1	●		TSON-8
TLE7259-3GE	20 kbit/s	< 10 sleep mode	●	●	1	●		DSO-8
TLE7259-3LE	20 kbit/s	< 10 sleep mode	●	●	1	●		TSON-8
<b>Dual LIN</b>								
TLE7269G	20 kbit/s	< 10 sleep mode	●	●	2	●		DSO-14

1) See packages on page 140 and 141

2) In development

# Automotive transceivers

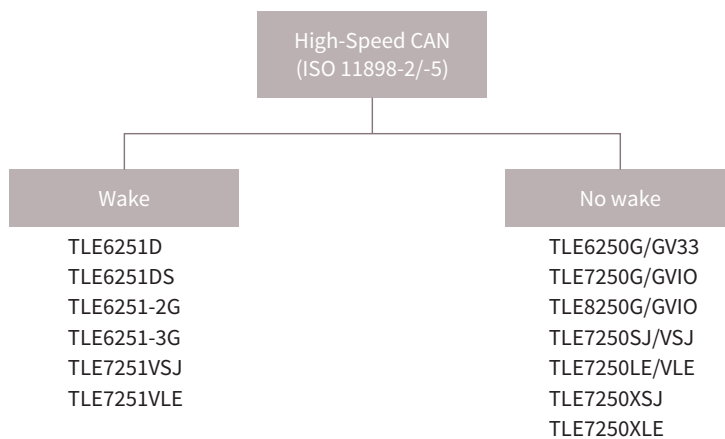


Classical CAN transceivers are available in standard DSO-8 and DSO-14 packages, along with tiny leadless TSON-8 packages.



CAN transceivers for flexible data-rate are making CAN faster and do support data-rates up to 2 Mbits/s.

## Selection tree – Automotive CAN and CAN FD transceivers



### Product table

Product type	Transmission rate (max)	$I_q$ [ $\mu$ A]	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	CAN FD	Package <sup>1)</sup>
High-Speed CAN ISO 11898-2								
TLE6250G	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE6250GV33	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE7250G	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE7250GVIO	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE8250G	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE8250GVIO	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
<b>NEW!</b> TLE7250SJ	2 Mbit/s	n/a			1		●	DSO-8
<b>NEW!</b> TLE7250LE	2 Mbit/s	n/a			1		●	TSON-8
<b>NEW!</b> TLE7250VSJ	2 Mbit/s	n/a			1		●	DSO-8
<b>NEW!</b> TLE7250VLE	2 Mbit/s	n/a			1		●	TSON-8
<b>NEW!</b> TLE7250XSJ	2 Mbit/s	n/a			1		●	DSO-8
<b>NEW!</b> TLE7250XLE	2 Mbit/s	n/a			1		●	TSON-8
High-Speed CAN ISO 11898-5								
TLE6251D	1 Mbit/s	< 30 @ 5 V stand-by	●		1			DSO-8
TLE6251DS	1 Mbit/s	< 30 @ 5 V stand-by	●		1			DSO-8
TLE6251-2G	1 Mbit/s	< 30 sleep mode	●	●	1	●		DSO-14
TLE6251-3G	1 Mbit/s	< 30 sleep mode	●	●	1	●		DSO-14
<b>NEW!</b> TLE7251VSJ	2 Mbit/s	< 10 $\mu$ A @ 5 V stand-by	●		1		●	DSO-8
<b>NEW!</b> TLE7251VLE	2 Mbit/s	< 10 $\mu$ A @ 5 V stand-by	●		1		●	TSON-8
Fault-tolerant CAN ISO 11898-3								
TLE6254-3G	125 kbit/s	< 65 sleep mode	●	●	1	●		DSO-14

1) See packages on page 140 and 141



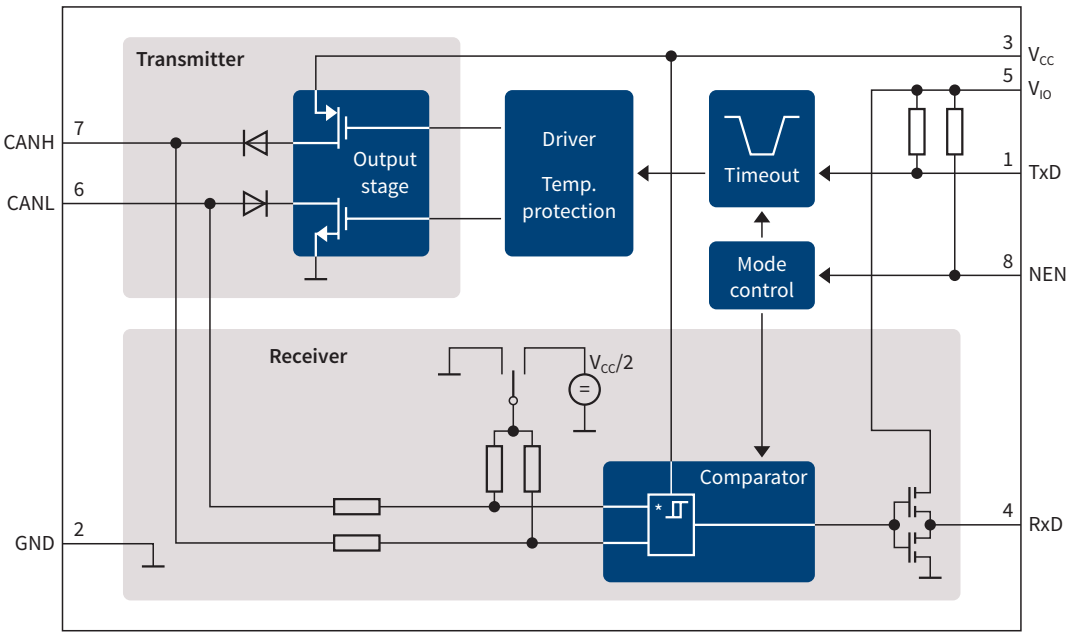
Infinion provides FlexRay transceivers in SSOP-16 and TSSOP-14 for reliable communication in safety-related applications.

Product table

Product type	Transmission rate (max)	I <sub>q</sub> [μA]	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	CAN FD	Package <sup>1)</sup>
FLexRay								
TLE9221SX	10 Mbit/s	< 45 sleep mode	•	•	1	•		SSOP-16
NEW! TLE9222PX	10 Mbit/s	< 45 stand-by mode	•		1	•		TSSOP-14

1) See packages on page 140 and 141

Block diagram example of High-Speed CAN: TLE7250V



# System Basis Chips (SBCs)

## Mid-Range SBC family supporting CAN Flexible Data-rate (FD)

The Mid-Range SBC family offers a high level of integration, performance and scalability. Up to three low-drop voltage regulators with 5 V or 3.3 V output voltage, one High-Speed CAN (including partial networking and flexible data-rate support) and up to two LIN transceivers complying with the latest automotive standards and OEM requirements are integrated.

The devices include fail-safe features for supporting ECU functional safety concepts such as undervoltage monitoring, window watchdog with reset, fail-safe operating mode

and fail-safe outputs. There are also four high-side switches for driving external loads, three wake-inputs and two general purpose input-outputs (GPIOs) for monitoring inputs or activating the available loads. Mid-Range SBCs offer low-power modes in order to support applications that are permanently connected to the battery. All devices feature an exposed pad VQFN-48 (7 mm x 7 mm) power package (supporting automatic optical inspection). The entire family is pin-to-pin and software compatible and is designed to withstand the severe conditions of automotive applications.

### Features

- › Low-drop voltage regulator (5 V or 3.3 V up to 250 mA)
- › Low-drop voltage regulator (5 V up to 100 mA), robust against short-to- $V_{\text{Bat}}$
- › Voltage regulator (5 V, 3.3 V or 1.8 V) with external PNP transistor, robust against short-to- $V_{\text{Bat}}$
- › High-Speed CAN transceiver ISO 11898-2/-5/-6: suitable for chokeless operation up to 500 kbit/s
- › ISO 11898-2:201x (upcoming merged ISO 11898-2/5/6) compliant 1 Mbit/s High-Speed CAN transceiver supporting CAN FD active communication up to 2 Mbit/s in the CAN FD data field
- › CAN partial networking incl. CAN FD tolerant mode<sup>1)</sup>
- › Up to two LIN transceivers LIN2.2/J2602
- › Fully compliant with “Hardware Requirements for LIN, CAN and FlexRay Interfaces in Automotive Applications” Revision 1.3, 2012-05-04
- › Four high-side outputs 7  $\Omega$  typ., two HV GPIOs and three HV wake inputs
- › Watchdog, cyclic sensing, cyclic wake, interrupt and reset output
- › Integrated fail-safe functions: 3 fail-safe outputs, watchdog, fail-safe operating mode, VCC1 undervoltage reset
- › Voltage, current and temperature protection and monitoring
- › 16-bit SPI for configuration and diagnostics (compatible with all new-generation SBC TLE926x and TLE927x)

### Applications

- › Body control modules
- › Gateway
- › Climate control
- › Seat control
- › Door control and closures
- › Light control modules
- › Steering column control
- › Park assistant
- › Control panels (center stack, radio control, roof)
- › Gearshift selection module

<sup>1)</sup> The CAN FD requirements for transceivers are not finalized. All statements regarding CAN FD are therefore based on Infineon's current knowledge and expectations of the future CAN FD standard currently being compiled.



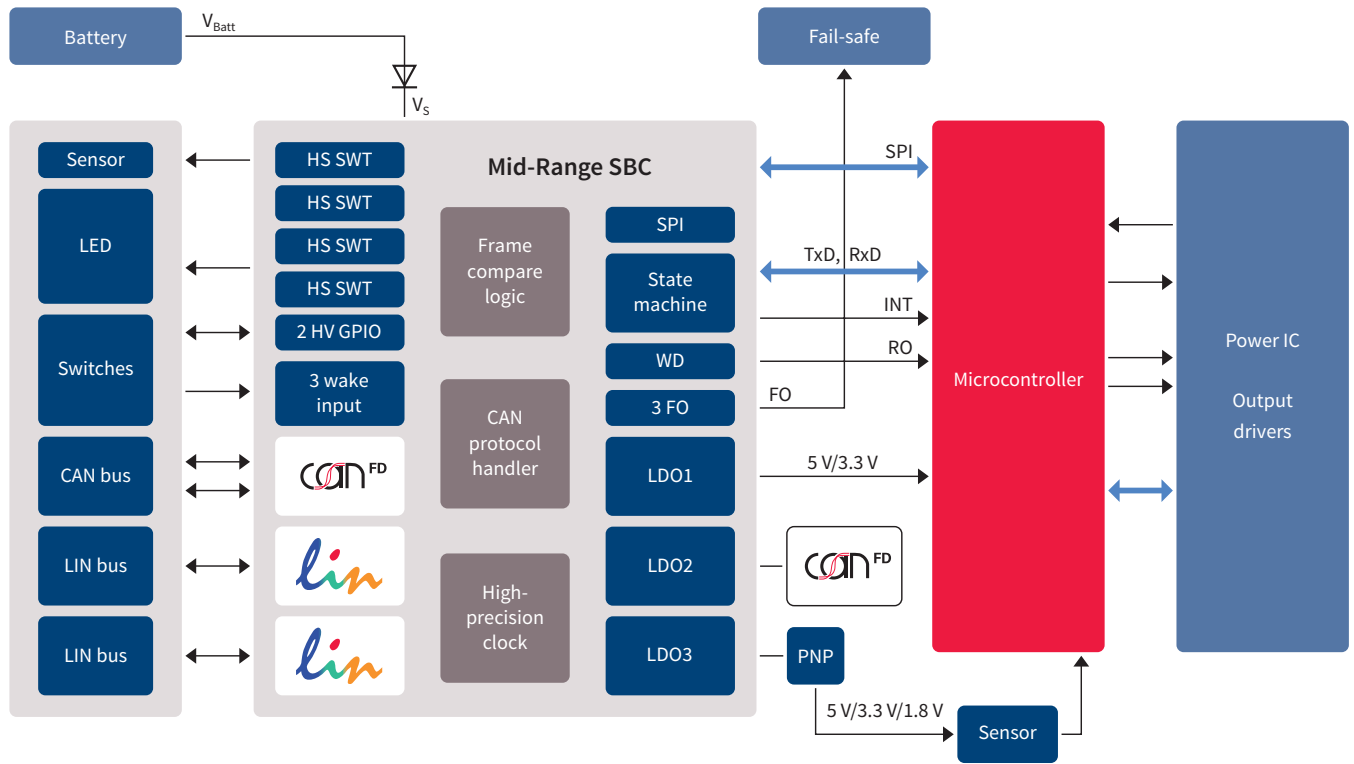
OEM



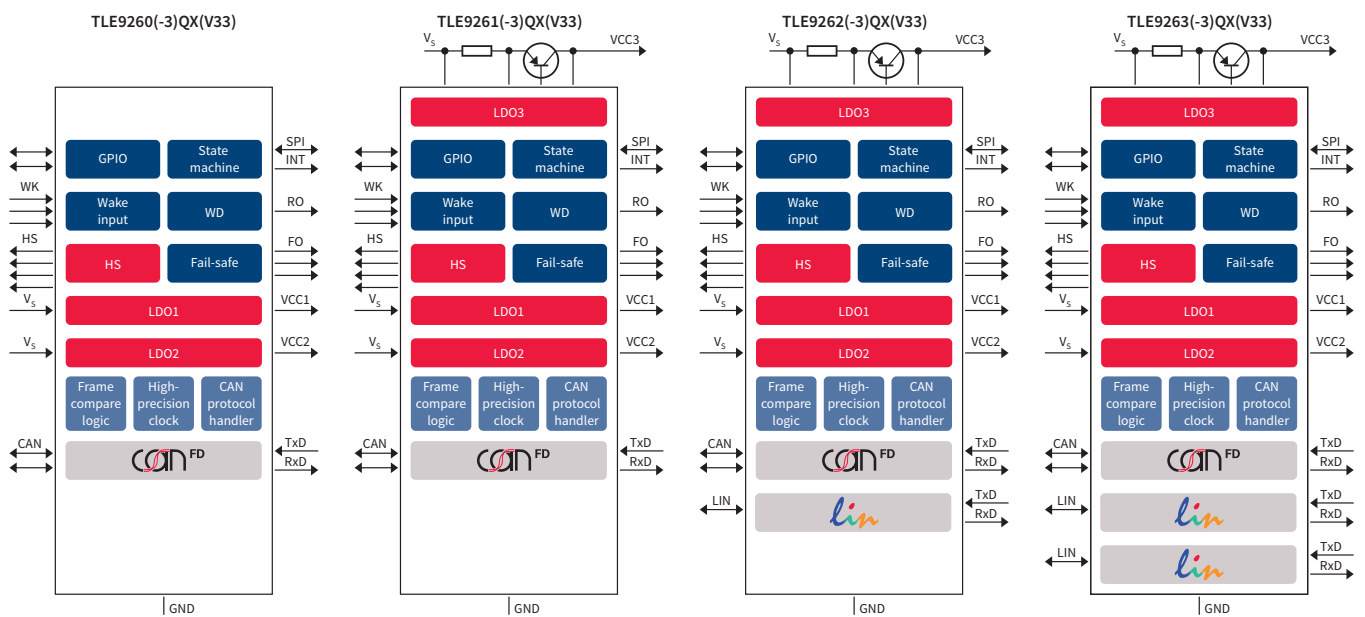
RoHS



## Application diagram



## The Mid-Range SBC family



# System Basis Chips (SBCs)

## DC/DC SBC family supporting CAN Flexible Data-rate (FD)

Infineon's highly integrated DC/DC System Basis Chip (SBC) family TLE927xQX offers optimal performance and scalability for various automotive applications. DC/DC SBC features a switch mode power supply voltage regulator (SMPS) with 5 V or 3.3 V output voltage, one 5 V low-drop voltage regulator, one HS CAN and up to four LIN transceivers complying with the latest automotive standards and OEM requirements. The devices include fail-safe features for supporting ECU functional safety concepts, high-voltage

wake-input for monitoring inputs, along with a very low quiescent current in low-power modes with full wake-up capability. All devices feature an exposed pad VQFN-48 (7 mm x 7 mm) power package (supporting AOI). The entire family is not only pin-to-pin and software compatible, but also compatible with other Infineon SBC families, and is designed to withstand the severe conditions of automotive applications.

### Main features

- › Integrated high-efficiency SMPS buck converter with edge shaping for an optimized EMC performance (5 V or 3.3 V up to 750 mA)
- › The SMPS boost controller with edge shaping for an optimized EMC performance enables functionality at a low supply voltage ( $V_{SUP} > 3 V$ ) with external power switching
- › Integrated low-drop voltage regulator (5 V up to 100 mA) protected for off-board usage
- › 1 High-Speed CAN transceiver ISO 11898-2/-5 supporting CAN Flexible Data-rate (CAN FD) up to 2 Mbps<sup>1)</sup> and suitable for chokeless operation at up to 500 kbps
- › Up to 4 LIN transceivers LIN2.2/J2602
- › Fully compliant with "Hardware Requirements for LIN, CAN and FlexRay Interfaces in Automotive Applications" Revision 1.3, 2012-05-04
- › 1 HV wake input for switch status monitoring
- › Interrupt, reset output
- › Integrated fail-safe functions:  
3 fail-safe outputs, 1 fail-safe input, watchdog, fail-safe operating modes
- › 16-bit SPI for configuration and diagnostics (compatible with all new-generation SBC TLE926x and TLE927x)
- › Voltage, current and temperature protection and monitoring

<sup>1)</sup> The CAN FD requirements for transceivers are not finalized. All statements regarding CAN FD are therefore based on Infineon's current knowledge and expectations of the future CAN FD standard currently being compiled.

### Key benefits

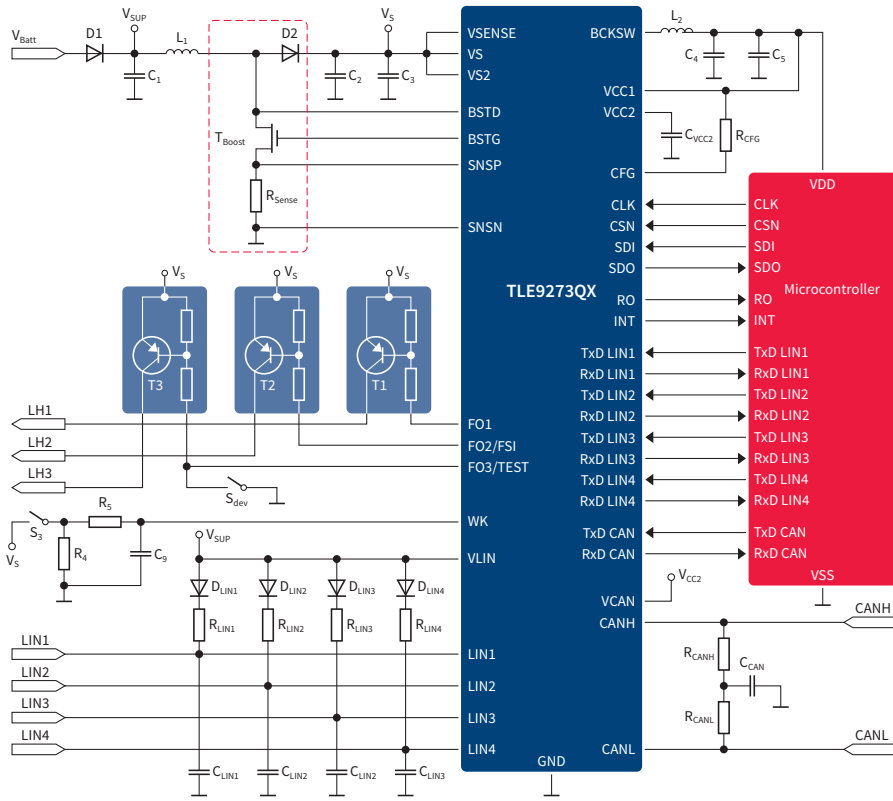
- › High-efficiency SMPS buck and boost for supplying high current even at low battery voltage
- › Low-drop voltage regulator for on- and off-board supply
- › CAN FD transceiver suitable for chokeless operation
- › Flexible number of integrated LIN transceivers
- › Very low quiescent current
- › Very small leadless package supporting AOI
- › Pin compatibility among all family members
- › Wide supply input voltage and temperature range
- › Reduced system cost thanks to a low component count and less PCB space
- › Excellent EMC and ESD performance meeting major automotive OEM requirements

### Target applications

- › Body control modules
- › Gateway
- › Climate control



## TLE9273QX application diagram

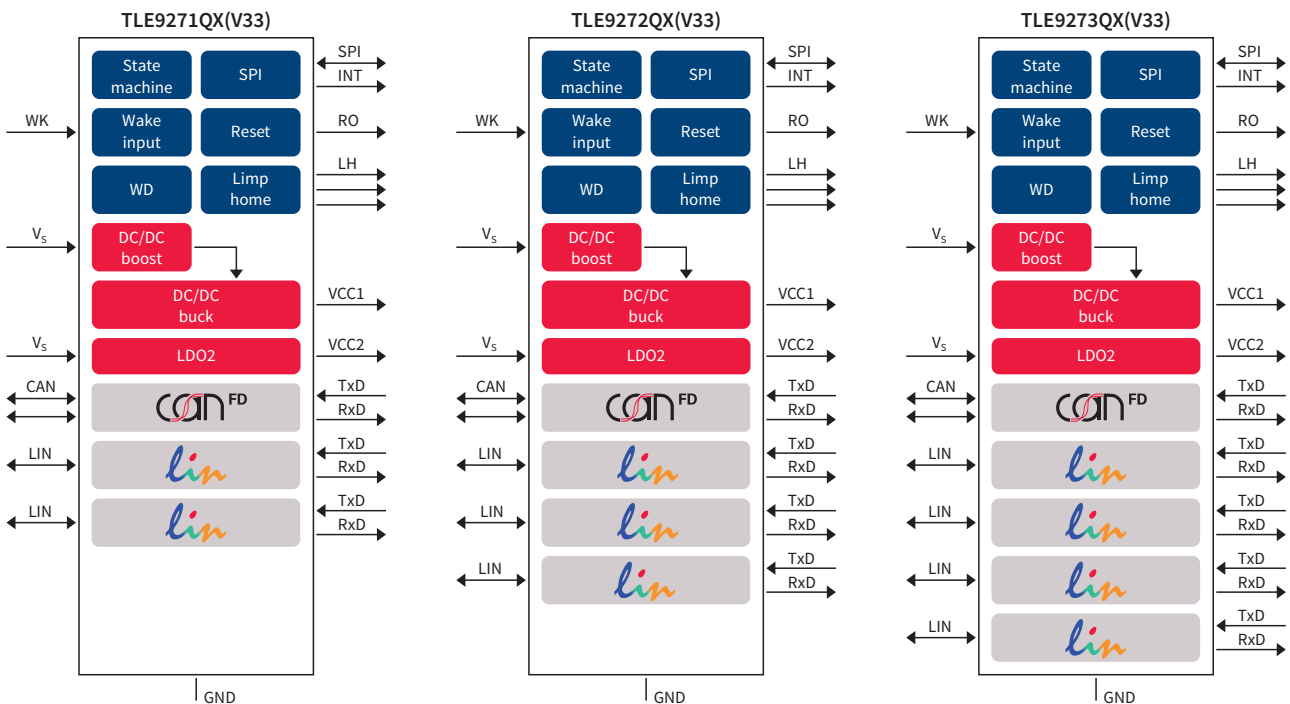


### In this example:

- > VCC1 to supply  $\mu$ C
- > VCC2 to supply CAN transceiver
- > Wake inputs to monitor the status of switches or of external signals (e.g. battery voltage)
- > Fail outputs to drive loads in fail-safe mode conditions
- > 1 HS CAN and 4 LIN transceivers

--- Optional external components needed if SMPS boost is required

## TLE927xQX family overview



# System Basis Chips (SBCs)

## Body System ICs – System Basis Chips product overview

Product type	Family name	Transmission rate	$I_q$ [ $\mu$ A]	$I_o$ [ $\mu$ A]	$V_{reg\ 1}$ [V]	$V_{reg\ 2}$ [V]
High-Speed CAN ISO 11898-2 /-5 / LIN 2.2A						
TLE9260QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9261QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9262QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9263QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9271QX <sup>4)</sup>	DC/DC SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 2}$ off)	55 (typ) stop mode ( $V_{reg\ 2}$ off)	750 mA @ 5 V	100 mA @ 5 V
TLE9272QX <sup>4)</sup>	DC/DC SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 2}$ off)	55 (typ) stop mode ( $V_{reg\ 2}$ off)	750 mA @ 5 V	100 mA @ 5 V
TLE9273QX <sup>4)</sup>	DC/DC SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 2}$ off)	55 (typ) stop mode ( $V_{reg\ 2}$ off)	750 mA @ 5 V	100 mA @ 5 V
High-Speed CAN ISO 11898-2/ -5/ -6 / LIN 2.2A						
TLE9260-3QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9261-3QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9262-3QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V
TLE9263-3QX(V33)	Mid-Range SBC	2 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30 (typ) sleep mode ( $V_{reg\ 1}$ off)	50 (typ) stop mode ( $V_{reg\ 1}$ on)	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V

1) See packages on page 140 and 141

2) CAN FD up to 2 Mbit/s

3) CAN PN FD tolerant

4) In development, coming in Q4/2016

$V_{reg}$ 3 [V]	CAN	LIN	Wake-up inputs	Watchdog	Output drivers	Package <sup>1)</sup>
-	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	-	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	-	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	1x LIN 2.x and SAE J2602	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	2x LIN 2.x and SAE J2602	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
-	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	2x LIN 2.x and SAE J2602	1 high-voltage	Yes (window watchdog)	3 fail-safe outputs	VQFN-48
-	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	3x LIN 2.x and SAE J2602	1 high-voltage	Yes (window watchdog)	3 fail-safe outputs	VQFN-48
-	1x High-Speed CAN <sup>2)</sup> ISO 11898-5	4x LIN 2.x and SAE J2602	1 high-voltage	Yes (window watchdog)	3 fail-safe outputs	VQFN-48
-	1x High-Speed CAN <sup>2)3)</sup> ISO 11898-6	-	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x High-Speed CAN <sup>2)3)</sup> ISO 11898-6	-	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x High-Speed CAN <sup>2)3)</sup> ISO 11898-6	1x LIN 2.x and SAE J2602	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x High-Speed CAN <sup>2)3)</sup> ISO 11898-6	2x LIN 2.x and SAE J2602	3 high-voltage (cyclic sense)	Yes (window watchdog)	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48

# Powertrain system ICs

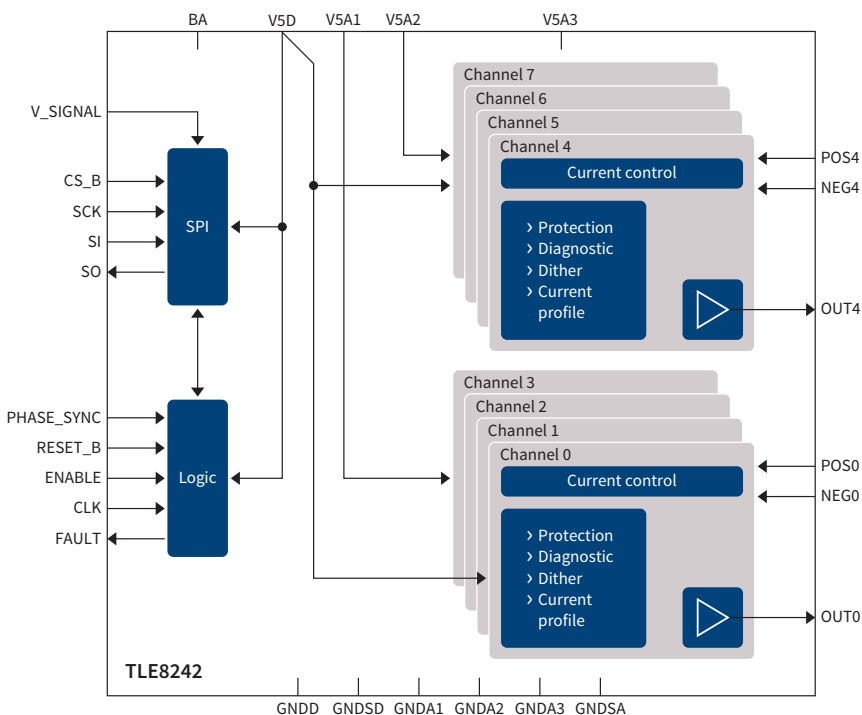
## Constant current control ICs

Infinion's solution for variable force or constant current controlled solenoids typically used in automatic transmissions, idle speed-/valve-/suspension control or Exhaust Gas Recirculation (EGR) applications

### Features

- > Four integrated low-side switches, control logic and outputs for external high-side switches
- > Shorted-load detection
- > Open-load detection in ON-/OFF-state
- > Short-to-ground detection
- > Max. output average current approx. 1.2 A

## Block diagram TLE8242L



Product type	Number of channels	Output current [A]	$R_{DS(on)}$ [mΩ]	Quiescent current [mA]	Operational range $V_s$ [V]	SPI	Comment	Package <sup>1)</sup>
TLE6288R	6	2.00	150	0.050	6.00 ... 16.00	16-bit	Smart 6 channel peak & hold switch	DSO-36 (Power-SO)
TLE7241E	2	1.20	240	1.000	9.00 ... 18.00	16-bit	Dual channel constant current control solenoid driver	DSO-20
TLE7242-2G	4	n/a	n/a	0.005	5.50 ... 42.00	32-bit	4-channel fixed frequency constant current control IC	DSO-28
TLE8242-2L	8	n/a	n/a	0.005	5.50 ... 42.00	32-bit	8-channel fixed frequency Constant current control IC	LQFP-64
TLE82543	3	1.60	250 (max)	0.010	5.50 ... 17.00	32-bit	3-channel constant current control IC	DSO-36 EP

1) See packages on page 140 and 141

## H-bridges for powertrain applications

The Infineon H-bridge portfolio addresses a broad range of DC brush motor applications. Originally designed and optimized for Electronic Throttle Control (ETC), the H-bridges can also be used for applications like Exhaust

Gas Recirculation (EGR) valve control, idle control, swirl and tumble flaps, variable intake manifold, turbo charger waste gate, variable turbo geometry or industrial DC brush motor applications.

Product type	R <sub>DS(on)</sub> HS [mΩ]	R <sub>DS(on)</sub> LS [mΩ]	I <sub>LIM</sub> min. [A]	I <sub>Q</sub> max. [mA]	V <sub>S(OP)</sub> [V]	Diagnostic IF	V <sub>DD</sub> mon.	Package <sup>1)</sup>
TLE5205-2G	220	220	6.00	10.00	6.00 ... 40.00	Status Flag		TO263-7-1 (TO220-7 (SMD))
TLE5206-2S	220	220	6.00	10.00	6.00 ... 40.00	Status Flag		TO220-7-12
TLE6209R	140	130	3.40 ... 5.95	0.05	5.20 ... 40.00	SPI		DSO-20 (Power-SO)
TLE7209-2R	150	150	5.50	20.00	5.00 ... 28.00	SPI & Status Flag		DSO-20 (Power-SO)
TLE7209-3R	150	150	5.50	20.00	5.00 ... 28.00	SPI & Status Flag		DSO-20 (Power-SO)
TLE8209-2SA	115	125	1.00 ... 7.70	0.02	4.50 ... 28.00	SPI & Status Flag	●	DSO-20 (Power-SO)
TLE8209-2E	115	125	1.00 ... 7.70	0.02	4.50 ... 28.00	SPI & Status Flag	●	DSO-20 EP
TLE8209-4SA	115	125	1.00 ... 9.00	0.02	4.50 ... 28.00	SPI & Status Flag	●	DSO-20 (Power-SO)
TLE9201SG	100	100	5.00	0.03	5.00 ... 28.00	SPI & Status Flag		DSO-12

1) See packages on page 140 and 141

## Flex multichannel low-side switches (powertrain & safety)

Multichannel low-side switches are designed for multi-purpose loads (solenoids, relays and resistive loads). The so-called Flex products serve in a flexible way the engine requirements with a different number of low-side drivers.

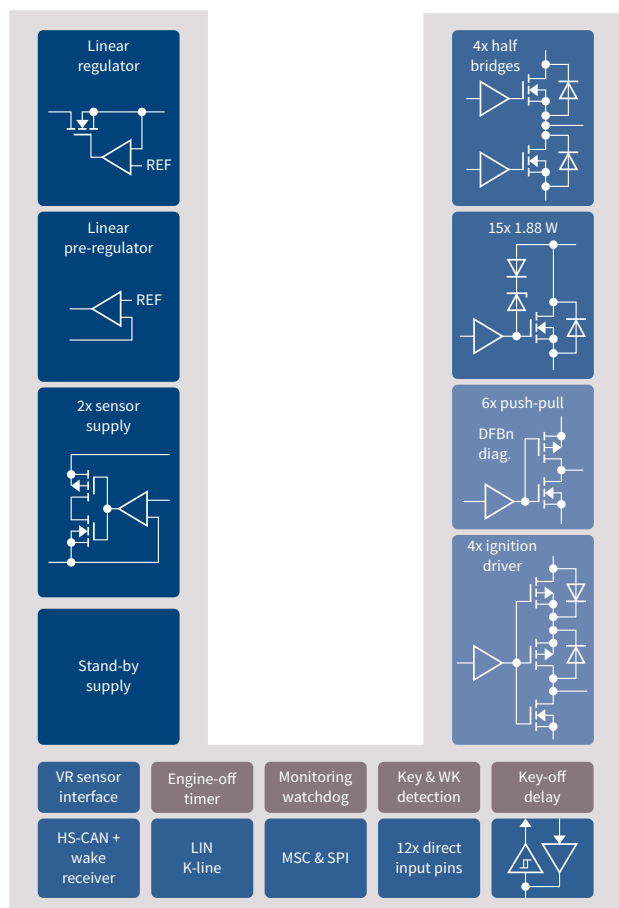
Please refer to page 50 for the product table.

# Engine management system ICs

The TLE8888QK is the optimum ‘all-in-one-device’ solution in the field of automotive engine management systems. It contains the necessary output stages to drive the actuators attached to an electronic control unit of 4-cylinder automotive engine management systems, such as solenoids, injectors, relays and stepper motors. A special edge-shaping slew-rate control is implemented in the output stages to ensure electromagnetic conformance optimization. The TLE8888 also includes state-of-the-art communication interfaces, as well as ECU and sensor supply functions.

The protection and safety features of the TLE8888 include diagnosis detection (SCG, OL, SCB), overtemperature and current protection, active clamping, under- and overvoltage monitoring, internal and ECU power-on reset, bidirectional disable pin, safety watchdog, enable inputs for injectors and ignition and key-off delay output.

The TLE8888 also includes a variable reluctance sensor interface, a key input detection and delayed key-out, wake-up input detection, engine-off timer, after-run mode and a delay timer, as well as two delayed outputs.



## Features

- › Supply system with  $\mu$ C, sensor supplies and stand-by regulator
- › 29 power outputs for inductive loads, half bridges and ignition
- › Communication I/F: Direct Inputs,  $\mu$  second bus, CAN H and LIN I/F
- › Protection and safety features: diagnosis, active clamping, UV/OV detection, safety watchdog
- › Advanced features: VRS I/F, key input detection, engine-off timer, after-run mode and delay timer
- › Package: LQFP-100

## Applications

- › 4-cylinder automotive engine management systems
- › MPI and GDI systems
- › All-in-one chip solution for small engine applications

Product type	Description	Ordering code	Package <sup>1)</sup>
TLE8888QK	Fixed parameter setting for the watchdog	SP000921534	LQFP-100
TLE8888-1QK	Configurable parameter setting for the watchdog	SP001279928	LQFP-100
TLE8888-2QK	Watchdog function is disabled	SP001279926	LQFP-100

1) See packages on page 140 and 141

# Small engine management ICs

The TLE8080EM and TLE8088EM are engine management system ICs for small engines which include basic functionality for supporting 1-cylinder combustion engines with a focus on the state-of-the-art Electronic Fuel Injection (EFI) technology, but can also be easily deployed in electronic e-carburetor or enhanced Capacitor Discharge Ignition (CDI) systems.

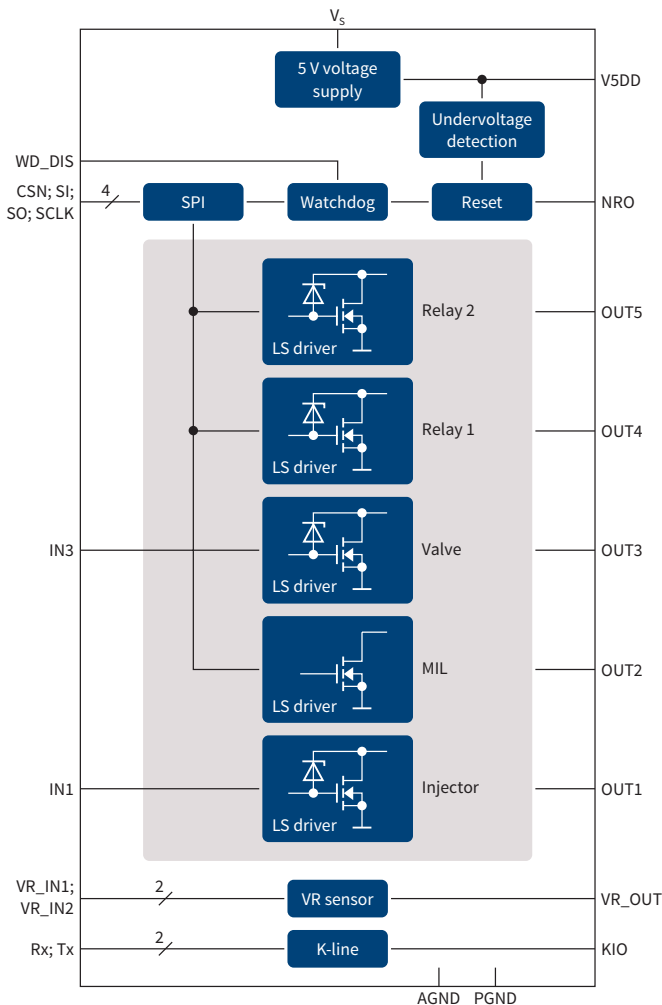
The TLE8080EM contains a 5 V power supply with current of up to 250 mA, a K-line transceiver (ISO 9141) and 5 power

stages, a Variable Reluctance Sensor (VRS) interface and features an SPI for control and diagnosis.

The TLE8088EM contains a 5 V power supply, a K-line transceiver and 2 power stages.

Basic protection and diagnosis features are included in both devices: overtemperature, overcurrent protection, undervoltage reset and open-load in Off.

## Block diagram TLE8080EM

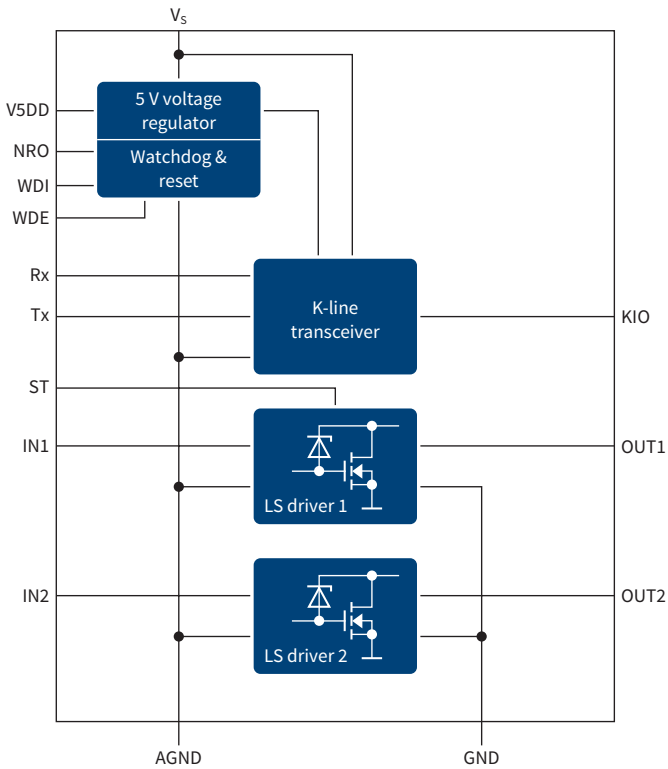


### Features of the TLE8080EM

- > 5 V supply including watchdog and reset
- > 2 low-side drivers for fuel injector and valves
- > 1 low-side driver for malfunction indicator lamp
- > 2 relay drivers
- > K-line transceiver (ISO 9141)
- > Variable reluctance sensor interface
- > SPI control
- > Package: SSOP-24 (150 mil)

# Small engine management ICs

Block diagram TLE8088EM



### Features of the TLE8088EM

- > 5 V supply including watchdog and reset
- > 1 low-side driver for fuel injector
- > 1 low-side driver for malfunction indicator lamp
- > K-line transceiver (ISO 9141)
- > Package: SSOP-24 (150 mil)

### Applications

4-stroke small combustion engine for:

- > Motorcycles, 2- and 3-wheelers and scooters
- > Motorized watercrafts, e.g. motor boats or jet-skis
- > Snow mobiles, lawn-tractors or -mowers
- > Small gasoline power generating sets

Product	Supply voltage funct. range [V]	5 V supply $I_{V5DD}$ (max) [mA]	Injector $I_{OUT}$ max < 2.6 A (nom = 1.3 A)	Valve $I_{OUT}$ max < 2.6 A (nom = 1.3 A)	MIL <sup>2)</sup> $I_{OUT}$ max < 3 A (nom = 300 mA)	Relay driver max < 350 mA (nom = 300 mA)	VRS I/F variable reluctance interface	K-Line acc. ISO 9141	SPI I/F diagnosis/control I/F	Package <sup>1)</sup>
TLE8080EM	6–18	250	•	•	•	2x •	•	•	•	SSOP-24 EP
TLE8088EM	6–18	150	•		•			•		SSOP-24 EP

1) See packages on page 140 and 141

2) Malfunction Indicator Lamp (MIL)



# Restraint system ICs

Infineon, a world leading supplier of airbag ICs with more than 15 years experience, offers several complete solutions, enabling cost efficiency over the entire range from basic up to high-end airbag systems. With a product portfolio ranging from high content integrated system ICs, over smart

firing ICs and power supplies to satellite receiver ICs, Infineon is well positioned to meet the market's requirements for cost efficiency, high quality and flexibility.

## Features

- > 16-bit Serial Peripheral Interface (SPI)
- > Squib diagnosis via resistance measurement

### Airbag firing ICs

Product type	Channels	Warning lamp output driver	Digital output for firing current detection	3.3 V compatible I/O	Buckle switch detection	Number of analog output for signal monitoring	Firing loop enable inputs	Firing current (max) [A]	Programmable deployment firing timer	Buck/boost	Package <sup>1)</sup>
TLE6710 <sup>2)</sup>	4	2	●		●	1	0	1.75	0	●	MQFP-64 (Power)
TLE7714	4	0				1	4 + SPI	1.75	4		DSO-52
TLE7718	8	0		●		1	4 + SPI	1.75	8		DSO-52
TLE7734	4	0		●		1	4 + SPI	1.20	4		DSO-52
TLE7738	8	0		●		1	4 + SPI	1.20	8		DSO-52
TLE8754	4	0	●	●		SPI	4 + SPI	1.20/1.75	4		VQFN-48
TLE8758	8	0	●	●		SPI	4 + SPI	1.20/1.75	8		VQFN-48

### Satellite receiver IC

Product type	Channels	Supported protocol	Microcontroller data transfer	3.3 V compatible I/O	Data-rate	Number of supply	Package <sup>1)</sup>
TLE7729	4	PAS3, PAS4, ADIFX, PSIS	SPI	●	125 kbit/s	4	TSSOP-28

1) See packages on page 140 and 141

2) Non green

# Glossary

Type list	Product family	
1EBN1001AS	Automotive Gate Driver ICs	83
1ED020112FTA	Automotive Gate Driver ICs	83
1ED020112FA2	Automotive Gate Driver ICs	83
1EDI2001AS	Automotive Gate Driver ICs	83
1EDI2002AS	Automotive Gate Driver ICs	83
2ED020112FA	Automotive Gate Driver ICs	83
2N7002DW	Small Signal OptiMOS™ N-Channel 60V	31
AIGW40N65F5	IGBT	37
AIGW40N65H5	IGBT	37
AIGW50N65F5	IGBT	37
AIGW50N65H5	IGBT	37
AIKB20N60T	IGBT	37
AIKD03N60RF	IGBT	37
AIKD04N60R	IGBT	37
AIKD04N60RF	IGBT	37
AIKD06N60R	IGBT	37
AIKD06N60RF	IGBT	37
AIKD10N60R	IGBT	37
AIKD10N60RF	IGBT	37
AIKD15N60R	IGBT	37
AIKD15N60RF	IGBT	37
AIKP20N60T	IGBT	37
AIKQ100N60T	IGBT	37
AIKQ120N60T	IGBT	37
AIKW20N60T	IGBT	37
AIKW30N60T	IGBT	37
AIKW40N65F5	IGBT	37
AIKW40N65H5	IGBT	37
AIKW50N60T	IGBT	37
AIKW50N65F5	IGBT	37
AIKW50N65H5	IGBT	37
AIKW75N60T	IGBT	37
AUIPS1011R	HITFET™: Low-Side Protected Switches	43
AUIPS1025R	HITFET™: Low-Side Protected Switches	43
AUIPS1031R	HITFET™: Low-Side Protected Switches	43
AUIPS1041L	HITFET™: Low-Side Protected Switches	43
AUIPS1041R	HITFET™: Low-Side Protected Switches	43
AUIPS1042G	HITFET™: Low-Side Protected Switches	43
AUIPS1051L	HITFET™: Low-Side Protected Switches	43
AUIPS1052G	HITFET™: Low-Side Protected Switches	43
AUIPS2031R	HITFET™: Low-Side Protected Switches	43
AUIPS2041L	HITFET™: Low-Side Protected Switches	43
AUIPS2041R	HITFET™: Low-Side Protected Switches	43
AUIPS2051L	HITFET™: Low-Side Protected Switches	43
AUIPS2052G	HITFET™: Low-Side Protected Switches	43
AUIPS6021R	Classic PROFET™	56
AUIPS6121R	High-Current PROFET™	58
AUIPS7091G	Classic PROFET™	56
AUIPS7111S	High-Current PROFET™	58
AUIPS72211R	Classic PROFET™	56
AUIPS7221R	Classic PROFET™	56
AUIR3200S	Single High-Side Driver	84
AUIR3240S	Single High-Side Driver	84
AUIR3316S	High-Current PROFET™	58
AUIR3320S	High-Current PROFET™	58
AUIR3330S	High-Current PROFET™	60
AUIR33402S	High-Current PROFET™	60
AUIRF1010EZS	Automotive N-Channel MOSFETs 60 V (Trench)	20
AUIRF1010Z	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF1324	Automotive N-Channel MOSFETs 24 V (Trench)	16
AUIRF1324S	Automotive N-Channel MOSFETs 24 V (Trench)	16
AUIRF1324S-7P	Automotive N-Channel MOSFETs 24 V (Trench)	16
AUIRF1324WL	Automotive N-Channel MOSFETs 24 V (Trench)	16
AUIRF1404	Automotive N-Channel MOSFETs 40 V (Planar)	24
AUIRF1404S	Automotive N-Channel MOSFETs 40 V (Planar)	24
AUIRF1404Z	Automotive N-Channel MOSFETs 40 V (Trench)	18
AUIRF1404ZL	Automotive N-Channel MOSFETs 40 V (Trench)	18
AUIRF1404ZS	Automotive N-Channel MOSFETs 40 V (Trench)	18
AUIRF1405	Automotive N-Channel MOSFETs 55 V (Planar)	25
AUIRF1405ZL	Automotive N-Channel MOSFETs 55 V (Trench)	19

Type list	Product family	
AUIRF1405ZS	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF1405ZS-7P	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF2805	Automotive N-Channel MOSFETs 55 V (Planar)	24
AUIRF2807	Automotive N-Channel MOSFETs 75 V (Planar)	26
AUIRF2903ZL	Automotive N-Channel MOSFETs 30 V (Trench)	16
AUIRF2903ZS	Automotive N-Channel MOSFETs 30 V (Trench)	16
AUIRF2907Z	Automotive N-Channel MOSFETs 75 V (Trench)	20
AUIRF3004WL	Automotive N-Channel MOSFETs 40 V (Trench)	17
AUIRF3007	Automotive N-Channel MOSFETs 75 V (Planar)	26
AUIRF3205	Automotive N-Channel MOSFETs 55 V (Planar)	25
AUIRF3205Z	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF3305	Automotive N-Channel MOSFETs 55 V (Planar)	25
AUIRF3315S	Automotive N-Channel MOSFETs 150 V (Planar)	26
AUIRF3415	Automotive N-Channel MOSFETs 150 V (Planar)	26
AUIRF3504	Automotive N-Channel MOSFETs 40 V (Planar)	24
AUIRF3710Z	Automotive N-Channel MOSFETs 100 V (Trench)	22
AUIRF3710ZS	Automotive N-Channel MOSFETs 100 V (Trench)	22
AUIRF3805	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF3805L	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF3805L-7P	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF3805S-7P	Automotive N-Channel MOSFETs 55 V (Trench)	19
AUIRF4104	Automotive N-Channel MOSFETs 55 V (Trench)	18
AUIRF4905	Automotive P-Channel MOSFETs 55 V (Planar)	28
AUIRF4905L	Automotive P-Channel MOSFETs 55 V (Planar)	28
AUIRF4905S	Automotive P-Channel MOSFETs 55 V (Planar)	28
AUIRF5210S	Automotive P-Channel MOSFETs 100 V (Planar)	28
AUIRF540Z	Automotive N-Channel MOSFETs 100 V (Trench)	22
AUIRF540ZS	Automotive N-Channel MOSFETs 100 V (Trench)	22
AUIRF6215	Automotive P-Channel MOSFETs 150 V (Planar)	28
AUIRF6215S	Automotive P-Channel MOSFETs 150 V (Planar)	28
AUIRF6218S	Automotive P-Channel MOSFETs 150 V (Planar)	28
AUIRF7103Q	Automotive N-Channel MOSFETs 50 V (Planar)	24
AUIRF7207Q	Automotive P-Channel MOSFETs 20 V (Planar)	28
AUIRF7303Q	Automotive N-Channel MOSFETs 30 V (Planar)	24
AUIRF7304Q	Automotive P-Channel MOSFETs 20 V (Planar)	28
AUIRF7309Q	Automotive N+P-Channel MOSFETs 30 V (Planar)	29
AUIRF7313Q	Automotive N+P-Channel MOSFETs 30 V (Planar)	24
AUIRF7316Q	Automotive P-Channel MOSFETs 30 V (Planar)	28
AUIRF7319Q	Automotive N+P-Channel MOSFETs 30 V (Planar)	29
AUIRF7341Q	Automotive N-Channel MOSFETs 55 V (Planar)	25
AUIRF7342Q	Automotive P-Channel MOSFETs 55 V (Planar)	28
AUIRF7343Q	Automotive N+P-Channel MOSFETs 55 V (Planar)	29
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AUIRF7665S2	Automotive N-Channel MOSFETs 100 V (Trench)	22
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AUIRF7736M2	Automotive N-Channel MOSFETs 40 V (Trench)	17
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AUIRFR120Z	Automotive N-Channel MOSFETs 100 V (Trench)	22
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AUIRFSL8407	Automotive N-Channel MOSFETs 40 V (Trench)	17
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AUIRFU120Z	Automotive N-Channel MOSFETs 100 V (Trench)	22
AUIRFU8401	Automotive N-Channel MOSFETs 40 V (Trench)	18
AUIRFU8403	Automotive N-Channel MOSFETs 40 V (Trench)	17
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AUIRL7736M2	Automotive N-Channel MOSFETs 40 V (Trench)	17
AUIRL7766M2	Automotive N-Channel MOSFETs 100 V (Trench)	22
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AUIRLR014N	Automotive N-Channel MOSFETs 55 V (Planar)	25
AUIRLR024N	Automotive N-Channel MOSFETs 55 V (Planar)	25
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MOSFETS

TEMPFET™  
HITFET™Smart  
multichannel  
switches

PROFET™

SPOC™

LITIX™

Motor drivers

Power supply

Automotive  
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IPB80N06S2L-06	OptiMOS™ 55 V (Planar)	25
IPB80N06S2L-07	OptiMOS™ 55 V (Planar)	24
IPB80N06S2L-09	OptiMOS™ 55 V (Planar)	25
IPB80N06S2L-H5	OptiMOS™ 55 V (Planar)	24
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IPB80N06S4-07	OptiMOS™-T2 60 V (Trench)	20
IPB80N06S4L-05	OptiMOS™-T2 60 V (Trench)	19
IPB80N06S4L-07	OptiMOS™-T2 60 V (Trench)	20
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IPB80P04P4-05	OptiMOS™-P2 40 V P-Channel (Trench)	27
IPB80P04P4-07	OptiMOS™-P2 40 V P-Channel (Trench)	27
IPB80P04P4L-04	OptiMOS™-P2 40 V P-Channel (Trench)	27
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IPI80N04S4-04	OptiMOS™-T2 40 V (Trench)	18
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IPP80P04P4L-04	OptiMOS™-P2 40 V P-Channel (Trench)	27
IPP80P04P4L-06	OptiMOS™-P2 40 V P-Channel (Trench)	27
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TLE8209-2SA	Powertrain H-Bridges for Electronic Throttle Controls	125
TLE8209-4SA	Powertrain H-Bridges for Electronic Throttle Controls	125
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TLE8250G	CAN Transceivers	116
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TLE8366	DC/DC Converters	108
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TLE84106EL	Motor Control IC (Integrated Low-Current Motor Drivers)	75
TLE84110EL	Motor Control IC (Integrated Low-Current Motor Drivers)	75
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TLE9262-3QX(V33)	System Basis Chip (SBC)	122
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TLE9842QX	Relay Driver IC with Integrated Microcontroller	88
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TLF50201	DC/DC Converters	108
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TLF50241	DC/DC Converters	108
TLF50251	DC/DC Converters	108
TLF50281	DC/DC Converters	108
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TLS203B0	Power Supply Linear Voltage Regulators; Post Regulators	104
TLS205B0	Power Supply Linear Voltage Regulators; Post Regulators	104
TLS208D1	Power Supply Linear Post Regulators	104
TLS805B1	Power Supply Linear Voltage Regulators	100
TLS810C1	Power Supply Linear Voltage Regulators	100
TLS810D1	Power Supply Linear Voltage Regulators	100
TLS820F0	Power Supply Linear Voltage Regulators	100
TLS850F0	Power Supply Linear Voltage Regulators	100

MOSFETS  
TEMPFET™  
HITFET™  
Smart multichannel switches  
PROFET™  
SPOC™  
LITIX™  
Motor drivers  
Power supply  
Automotive transceivers  
Automotive system ICs  
Glossary

# Infineon's next level of Zero Defect program

## On the way to Zero Defect products and services

The most valuable aspect of cars is the people they carry. Therefore, safety should never be compromised. This is the most important consideration for everybody involved in making automobiles – from the smallest suppliers to the manufacturers themselves. As car components become more and more complex, and as the number of control units in vehicles increases, the likelihood of a product failure becomes bigger. Quality performance is a key differentiator for automotive market success. Our target of Zero Defect means:

- › No quality events and no deviations
- › Defect-free product launches
- › All processes are under control
- › Highest quality image in the market and more business due to satisfied customers

### **No compromise when it comes to quality**

Infineon established the most comprehensive quality program called “AUTOMOTIVE EXCELLENCE” in the semiconductor industry in 2003. The continuation of the successful “Automotive Excellence” program is “NEXT LEVEL of ZERO DEFECT” started in 2011. The program is founded on four pillars: people, products, processes and production. Due to our “no compromise” policy in all four pillars our program really works. Our employees truly live the credos of Zero Defect, considering the highest quality requirements and understanding the importance of prevention. They are trained to deeply understand the tools and methods used to avoid deviations and to solve problems by addressing both technical and systemic root causes.

### **On the way to zero defect products**

On the way to zero defect products, some examples:

- › The ‘Green Line’ project focuses on highest stability in assembly fabs
- › Zero Defect Culture initiatives intensify the Zero Defect mindset of both staff and management
- › Quality firewall project “ensures highest outgoing product quality by intelligent outlier screening”
- › Extend “Next level of Zero Defect” into supplier base

### **“Next level of Zero Defect” is your competitive advantage**

Many of our partners have expressed their satisfaction with the quality of our products and the way we execute “Next level of Zero Defect”.

- › “Honor Quality Award Toyota Hirose” received in 2010 for zero defect quality for last four years. Infineon is the First non- Japanese company that received this honour in this highest level category.
- › Quality Awards from Toyota’s Hirose plant in 2004, 2006, 2007, 2008, 2009, 2010, 2011 and 2015
- › “Supplier Performance Award” for the year 2008 and “Automotive Supplier of the Year 2009, 2010 and 2011” from Continental
- › “Technical Development Award 2011” from Denso for quality, pricing, technical development and global collaboration. Infineon is the first non-Japanese component supplier that received this award.
- › In 2015 Delphi Supplier Quality Award


















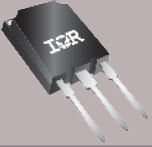






# Infineon packages<sup>1)</sup>

DSO-8	DSO-8 EP	DSO-12	DSO-14	DSO-14 EP	DSO-20	DSO-20 EP
DSO-20 (Power-SO)	DSO-24	DSO-28	DSO-36	DSO-36 EP	DSO-36 (Power-SO)	DSO-52
HSOF-8-1 (H-PSOF)	LQFP-64	LQFP-100	MQFP-64 (Power)	SC59	SC74 TSOP-6/6 dual	SCT595
SOT23	SOT89	SOT223	SOT323	SOT343	SOT363	SSOP-14 EP
SSOP-16	SSOP-24	SSOP-24 EP	TDSON-8-4 dual	TDSON-8-10	TDSON-8-23	TO252-3 (DPAK)
TO252-5 (DPAK 5-leg)	TO263-3-1 (TO220-3 (SMD))	TO263-3-2 (TO220-3 (SMD))	TO263-5-1 (TO220-5 (SMD))	TO263-5-2 (TO220-5 (SMD))	TO263-7-1 (TO220-7 (SMD))	TO263-7-3 TO263-7-8 (TO220-7 (SMD))
TO263-15	TQFP-48 EP	TSDSON-8 dual	TSDSON-8	TSOP-8	TSOP-10	TSOP-24
TSSOP-14	TSSOP-28	VQFN-48	DIP-8	TO218-5	TO220-3	TO220-5-11
TO220-5-12	TO220-7-11	TO220-7-12	TO220-7-230	TO247-3	TO247 PLUS	TO262-3

1) For further information on Infineon packages, please visit our internet site at [www.infineon.com/packages](http://www.infineon.com/packages)

# Former IR packages<sup>1)</sup>

Valid for former IR products and product types starting with AU... or AI...

DirectFET™2 L6 	DirectFET™2 L8 	DirectFET™2 M2 
DirectFET™2 M4 	DirectFET™2 SB 	DirectFET™2 SC 
DSO-28 (28 lead SOIC) 	PQFN 5x6 mm 	PQFN 5x6 dual 
SO-8 (DSO-8) 	SOT-223 	TO-252 (DPAK 3-leg) 
TO-252 (DPAK 5-leg) 	TO-263-3 (D <sup>2</sup> PAK 3-leg) 	TO-263-5 (D <sup>2</sup> PAK 5-leg) 
TO-263-7 (D <sup>2</sup> PAK 7-leg) 	IPAK 	Super TO-220 
Super TO-247 	TO-220 	TO-220 FullPak 
TO-247 	TO-262 	TO-262 WideLead 
TO-263CA 7 pin 		

<sup>1)</sup> For further information, please visit our internet site at [www.irf.com/packaging](http://www.irf.com/packaging)

# Where to Buy

Infineon Distribution Partners and Sales Offices:

[www.infineon.com/WhereToBuy](http://www.infineon.com/WhereToBuy)

## Service Hotline

Infineon offers its toll-free 0800/4001 service hotline as one central number, available 24/7 in English, Mandarin and German.

- > Germany ..... 0800 951 951 951 (German/English)
- > China, mainland ..... 4001 200 951 (Mandarin/English)
- > India ..... 000 800 4402 951 (English)
- > USA ..... 1-866 951 9519 (English/German)
- > Other countries ..... 00\* 800 951 951 951 (English/German)
- > Direct access ..... +49 89 234-0 (interconnection fee, German/English)

\* Please note: Some countries may require you to dial a code other than "00" to access this international number, please visit [www.infineon.com/service](http://www.infineon.com/service) for your country!



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