

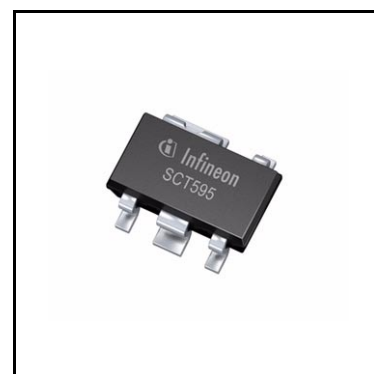
OPTIREG™ linear TLE4294GV50

Low dropout voltage regulator



Features

- Output voltage tolerance $\leq \pm 4\%$
- Very low drop out voltage
- Output current: 30 mA
- Low quiescent current consumption
- Wide operating range up to 45 V
- Wide temperature range: $T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$
- Output protected against short circuit
- Overtemperature protection
- Reverse polarity protection
- Very small SMD package PG-SCT595-5
- Green Product (RoHS compliant)



Potential applications

General automotive applications.

Product validation

Qualified for automotive applications. Product validation according to AEC-Q100.

Description

The OPTIREG™ linear TLE4294GV50 is a monolithic integrated low drop out voltage regulator in a very small SMD package PG-SCT595-5. It is designed to supply e.g. microcontroller systems under severe conditions. Therefore the device is equipped with additional protection functions against overload, short circuit and reverse polarity. In case of an overtemperature condition the regulator is automatically turned off by the integrated thermal protection circuit.

Input voltages up to 40 V are regulated to $V_{Q,nom} = 5.0\text{ V}$. The output is able to drive a load of more than 30 mA, while it regulates the output voltage within a 4% accuracy.

Type	Package	Marking
TLE4294GV50	PG-SCT595-5	F1

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Block diagram

1 Block diagram

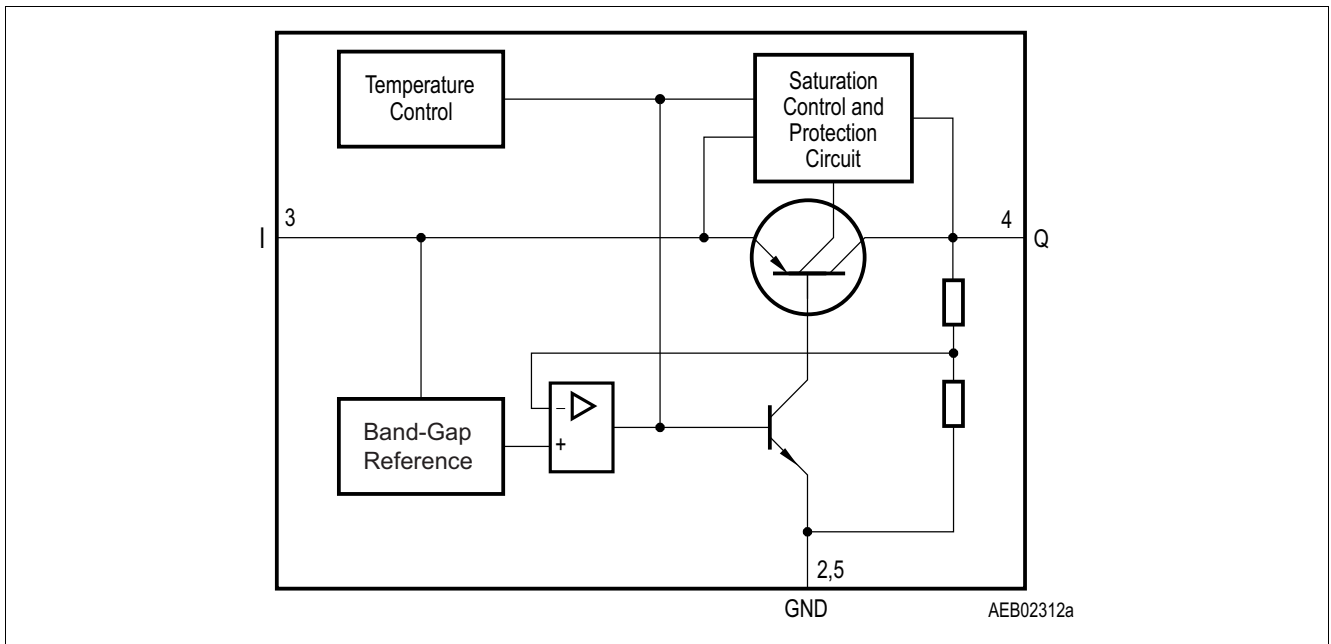


Figure 1 Block diagram

Pin configuration

2 Pin configuration

2.1 Pin assignment

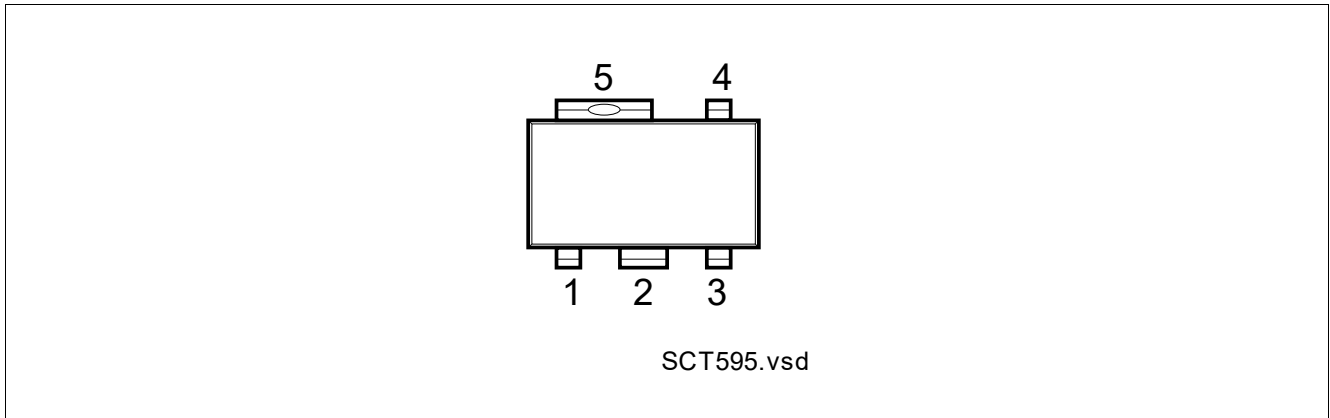


Figure 2 Pin configuration (top view)

2.2 Pin definitions and functions

Table 1 Pin definitions and functions

Pin	Symbol	Function
1	N.C.	Not connected Internally not connected. Connect to GND.
2	GND	Ground Connected to pin 5.
3	I	Input voltage For compensating line influences, a capacitor to GND close to the IC terminals is recommended.
4	Q	Output voltage Block to GND with a capacitor close to the IC terminals, respecting the values given for its capacitance C _Q and ESR in the Table 3 “Functional range” on Page 6 (Tantalum capacitor recommended as output capacitor).
5	GND	Ground Connect to heatsink area; Connected to pin 2.

General product characteristics

3 General product characteristics

3.1 Absolute maximum ratings

Table 2 Absolute maximum ratings¹⁾

$T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$; all voltages with respect to ground, direction of currents as shown in **Figure 3** (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Input							
Voltage	V_I	-42	–	45	V	–	P_3.1.1
Current	I_I	–	–	–	mA	²⁾	P_3.1.2
Output							
Voltage	V_Q	-6	–	30	V	–	P_3.1.3
Current	I_Q	–	–	–	mA	²⁾	P_3.1.4
Temperatures							
Junction temperature	T_j	-40	–	150	°C	–	P_3.1.5
Storage temperature	T_{stg}	-50	–	150	°C	–	P_3.1.6
ESD susceptibility							
ESD resistivity	V_{ESD}	-2	–	2	kV	HBM ³⁾	P_3.1.7
ESD resistivity to GND	V_{ESD}	-750	–	750	V	CDM ⁴⁾	P_3.1.8

1) Not subject to production test, specified by design.

2) Internally limited.

3) ESD susceptibility, Human Body Model “HBM” according to EIA/JESD 22-A114B.

4) ESD susceptibility, Charged Device Model “CDM” according to EIA/JESD22-C101 or ESDA STM5.3.1.

Notes

1. Stresses above the ones listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. Integrated protection functions are designed to prevent IC destruction under fault conditions described in the data sheet. Fault conditions are considered as “outside” normal operating range. Protection functions are not designed for continuous repetitive operation.

General product characteristics

3.2 Functional range

Table 3 Functional range

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Inhibit voltage	V_I	5.5	–	45	V	–	P_3.2.1
Output capacitor requirements	C_Q	2.2	–	–	μF	–	P_3.2.2
	ESR_{CQ}	1.5	–	8	Ω	1)	P_3.2.3
Junction temperature	T_j	-40	–	150	$^{\circ}\text{C}$	–	P_3.2.4

1) Equivalent series resistance measured at a frequency of 10 kHz.

Note: Within the functional or operating range, the IC operates as described in the circuit description. The electrical characteristics are specified within the conditions given in the electrical characteristics table.

3.3 Thermal resistance

Note: This thermal data was generated in accordance with JEDEC JESD51 standards. For more information, go to www.jedec.org.

Table 4 Thermal resistance

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Junction to ambient ¹⁾	R_{thJA}	–	179	–	K/W	Footprint only ²⁾	P_3.3.1
		–	99	–	K/W	300 mm ² heat sink area on PCB ²⁾	P_3.3.2
		–	87	–	K/W	600 mm ² heat sink area on PCB ²⁾	P_3.3.3
		–	80	–	K/W	2s2p PCB ³⁾	P_3.3.4
Junction to soldering point	R_{thJSP}	–	26	–	K/W	Measured to pin 5	P_3.3.5

1) Not subject to production test, specified by design.

2) EIA/JESD 52_2, FR4, 80 x 80 x 1.5 mm; 35 μ Cu, 5 μ Sn.

3) Specified R_{thJA} value is according to JEDEC JESD51-2,-5,-7 at natural convection on FR4 2s2p board. The product (chip + package) was simulated on a 76.2 x 114.3 x 1.5 mm board with 2 inner copper layers (2 x 70 μm Cu, 2 x 35 μm Cu).

Electrical characteristics

4 Electrical characteristics

4.1 Electrical characteristics

Table 5 Electrical characteristics

$V_I = 13.5\text{ V}$; $T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$; all voltages with respect to ground, direction of currents as shown in **Figure 3** (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Output							
Output voltage	V_Q	4.80	5.00	5.20	V	$1\text{ mA} \leq I_Q < 30\text{ mA}$; $V_I < 13.5\text{ V}$	P_4.1.1
Output voltage	V_Q	4.80	5.00	5.20	V	$I_Q = 10\text{ mA}$; $6\text{ V} < V_I < 40\text{ V}$	P_4.1.2
Output current limitation	I_Q	30	–	–	mA	¹⁾	P_4.1.3
Drop out voltage	V_{dr}	–	0.25	0.40	V	$I_Q = 20\text{ mA}^{1)}$	P_4.1.4
Current consumption							
Current consumption $I_q = I_I - I_Q$	I_q	–	2	4	mA	$I_Q < 30\text{ mA}$	P_4.1.5
Current consumption $I_q = I_I - I_Q$	I_q	–	120	200	μA	$I_Q < 1\text{ mA}$	P_4.1.6
Regulator performance							
Load regulation	$ \Delta V_Q $	–	10	25	mV	$1\text{ mA} < I_Q < 25\text{ mA}$; $T_j = 25^\circ\text{C}$;	P_4.1.7
Load regulation	$ \Delta V_Q $	–	10	30	mV	$1\text{ mA} < I_Q < 25\text{ mA}$;	P_4.1.8
Line regulation	$ \Delta V_Q $	–	5	25	mV	$\Delta V_I = V_{I,\text{min}}$ to 36 V ; $I_Q = 5\text{ mA}$; $T_j = 25^\circ\text{C}$	P_4.1.9
Line regulation	$ \Delta V_Q $	–	10	30	mV	$\Delta V_I = V_{I,\text{min}}$ to 36 V ; $I_Q = 5\text{ mA}$;	P_4.1.10
Power supply ripple rejection	$PSRR$	–	60	–	dB	$f_r = 100\text{ Hz}$; $V_r = 0.5\text{ Vpp}$	P_4.1.11

1) Measured when the output voltage V_Q has dropped 100 mV from the nominal value.

Application information

5 Application information

Note: The following information is given as a hint for the implementation of the device only and shall not be regarded as a description or warranty of a certain functionality, condition or quality of the device.

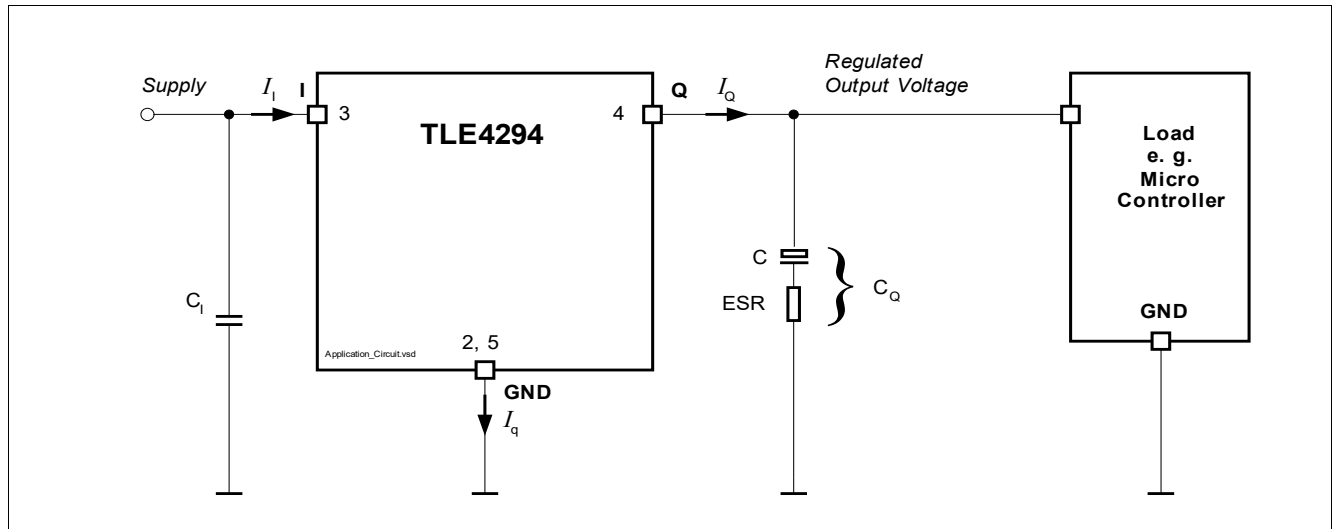


Figure 3 Application diagram

6 Package information

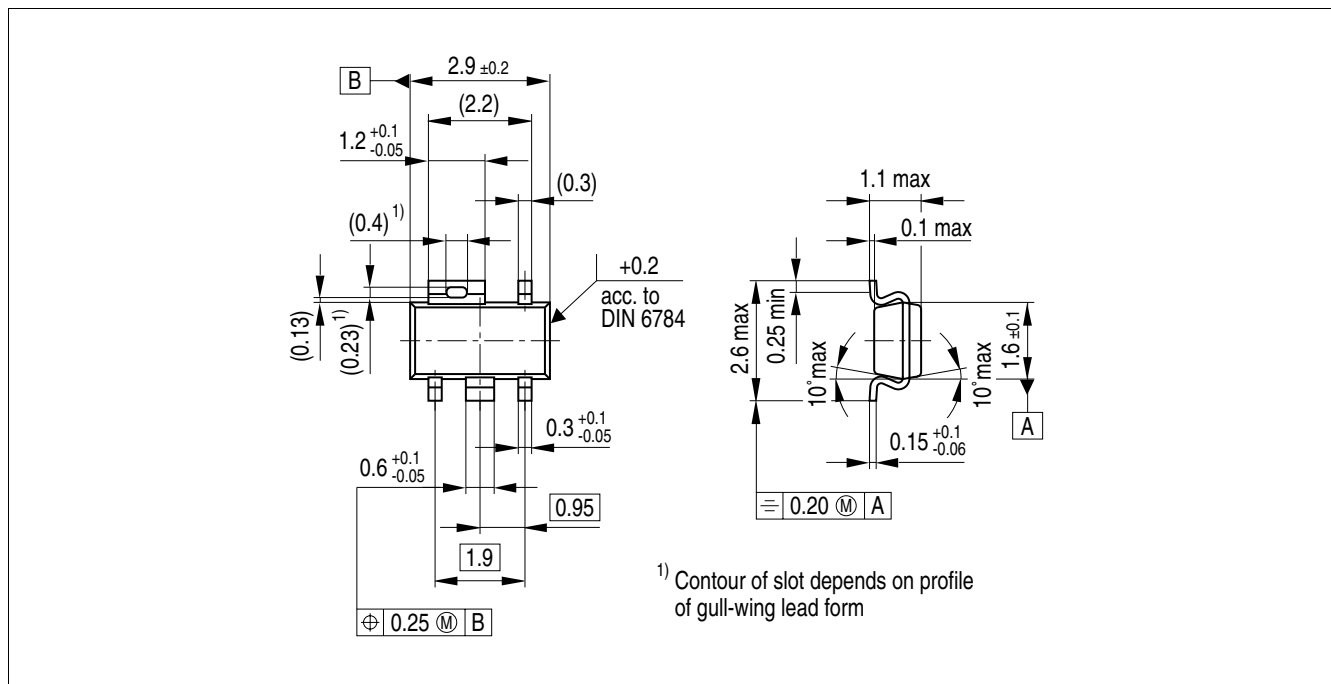


Figure 4 PG-SCT595-5¹⁾

Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-compliant (i.e. Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

Further information on packages

<https://www.infineon.com/packages>

1) Dimensions in mm

Revision history

7 Revision history

Revision	Date	Changes
1.2	2021-04-28	Updated layout and structure Editorial changes added TOC
1.1	2008-02-26	Device marking changed to F1
1.0	2004-01-01	Initial release

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