NTMFS4931N

MOSFET – Power, Single, N-Channel, SO-8 FL
30 V, 246 A

Features
- Low $R_{DS(on)}$ to Improve Conduction and Overall Efficiency
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

Applications
- OR–ing FET, Power Load Switch, Motor Control
- Refer to Application Note AND8195/D for Mounting Information

End Products
- Motor Control, UPS, Fault–Tolerant Power Systems, Hot Swap

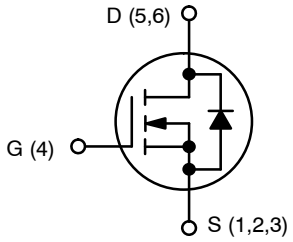
MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain–to–Source Voltage			V_{DSS}	30	V
Gate–to–Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	I_D	40	A
		T_A = 100°C		25	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.74	W
Continuous Drain Current $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	I_D	77	A
		T_A = 100°C		48	
Power Dissipation $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	P_D	10.2	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	I_D	23	A
		T_A = 100°C		15	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.95	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	246	A
		T_C =100°C		156	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	104	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	490	A
Operating Junction and Storage Temperature			T_J, T_{STG}	–55 to +150	°C
Source Current (Body Diode)			I_S	100	A
Drain to Source DV/DT			dV/d_t	4.4	V/ns

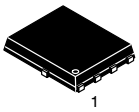
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$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	1.1 mΩ @ 10 V	246 A
	1.5 mΩ @ 4.5 V	

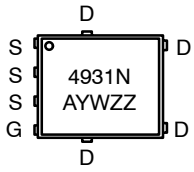


N–CHANNEL MOSFET



SO–8 FLAT LEAD CASE 488AA STYLE 1

MARKING DIAGRAM



A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4931NT1G	SO–8 FL (Pb–Free)	1500 / Tape & Reel
NTMFS4931NT3G	SO–8 FL (Pb–Free)	5000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Value	Unit
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{DD} = 24 V, V_{GS} = 10 V, I_L = 41 A_{pk}, L = 0.3 mH, R_G = 25 Ω)	E_{AS}	252	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)	T_L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	1.2	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	45.7	
Junction−to−Ambient − Steady State (Note 4)	$R_{\theta JA}$	132	
Junction−to−Ambient − (t ≤ 10 s) (Note 3)	$R_{\theta JA}$	12.3	

3. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
4. Surface−mounted on FR4 board using the minimum recommended pad size.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		30			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				18		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			1.0	μA
			T_J = 125°C			15	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.2	1.6	2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				4.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 30 A		0.85	1.1	mΩ
			I_D = 15 A		0.82		
		V_{GS} = 4.5 V	I_D = 30 A		1.2	1.5	
			I_D = 15 A		1.2		
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			86		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			9821		pF
Output Capacitance	C_{OSS}				2720		
Reverse Transfer Capacitance	C_{RSS}				234		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A			61.5		nC
Threshold Gate Charge	$Q_{G(TH)}$				14.2		
Gate−to−Source Charge	Q_{GS}				25.2		
Gate−to−Drain Charge	Q_{GD}				15.9		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 30 A			128		nC
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			27		ns
Rise Time	t_r				29		
Turn−Off Delay Time	$t_{d(OFF)}$				36		
Fall Time	t_f				24		

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			15		ns
Rise Time	t_r				17		
Turn−Off Delay Time	$t_{d(OFF)}$				80		
Fall Time	t_f				22		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 30 A	T_J = 25°C		0.8	1.0	V
			T_J = 125°C		0.62		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIS/dt = 100 A/μs, I_S = 30 A			64		ns
Charge Time	t_a				33		
Discharge Time	t_b				31		
Reverse Recovery Charge	Q_{RR}				100		nC
PACKAGE PARASITIC VALUES							
Source Inductance	L_S	T_A = 25°C			0.50		nH
Drain Inductance	L_D				0.005		nH
Gate Inductance	L_G				1.84		nH
Gate Resistance	R_G				0.7	1.8	Ω

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

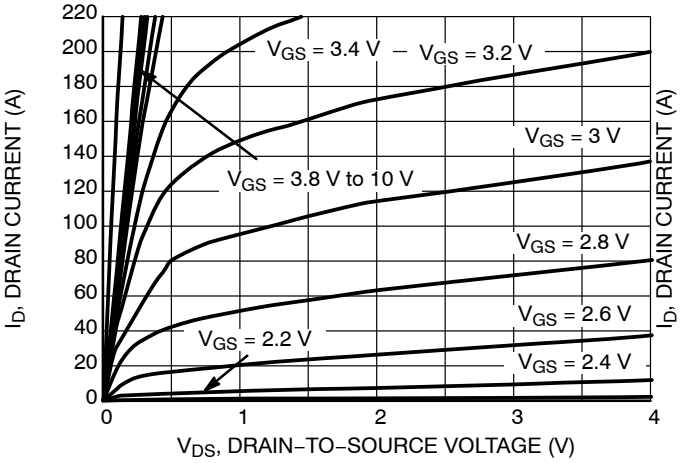


Figure 1. On−Region Characteristics

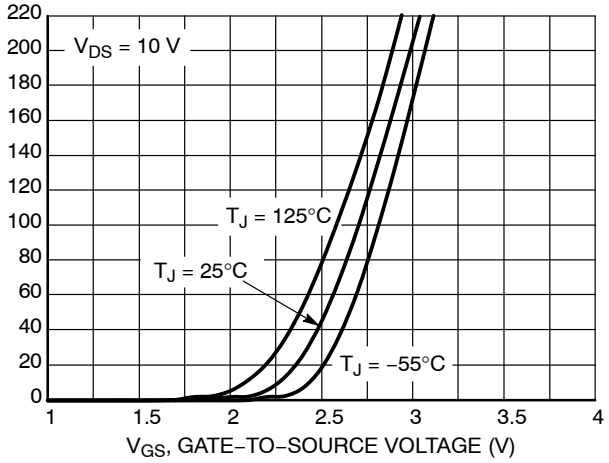


Figure 2. Transfer Characteristics

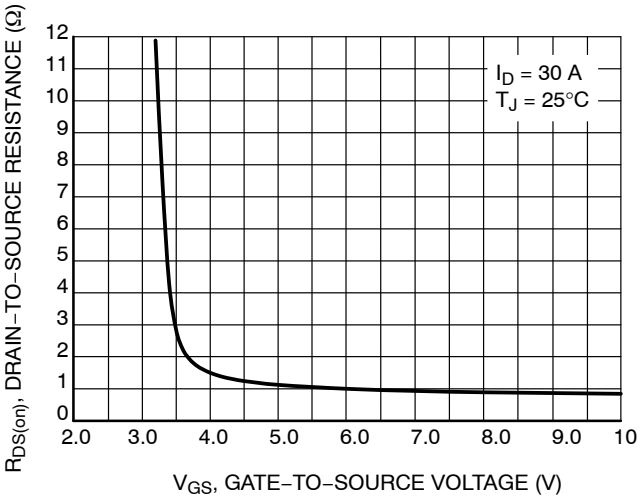


Figure 3. On−Resistance vs. Gate−to−Source Voltage

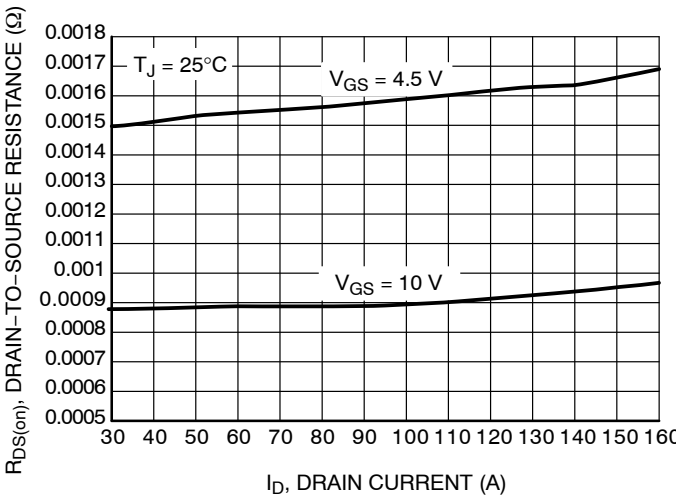


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

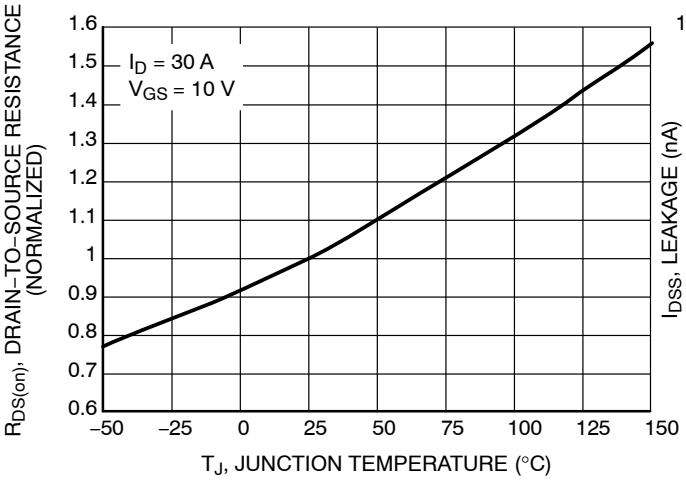


Figure 5. On−Resistance Variation with Temperature

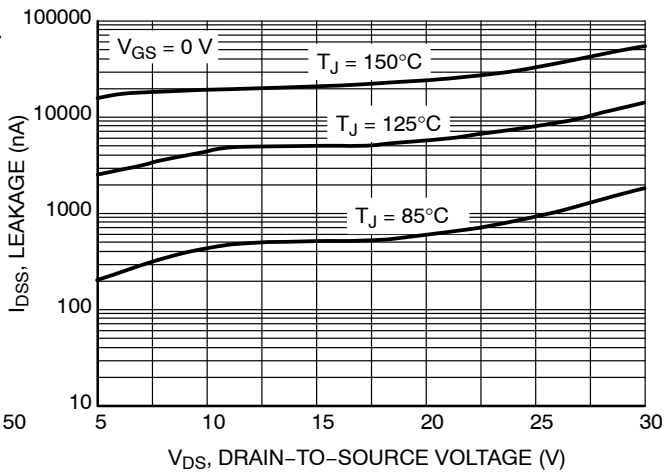


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

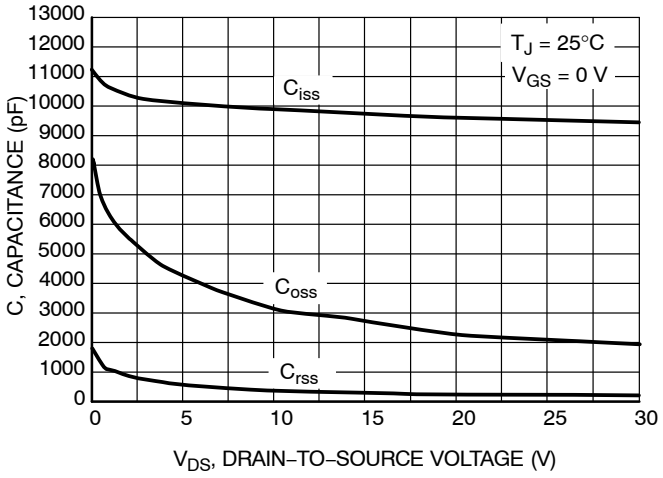


Figure 7. Capacitance Variation

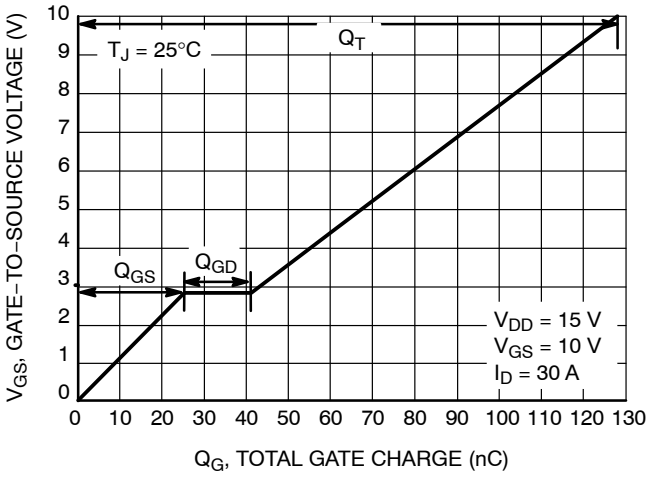


Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge

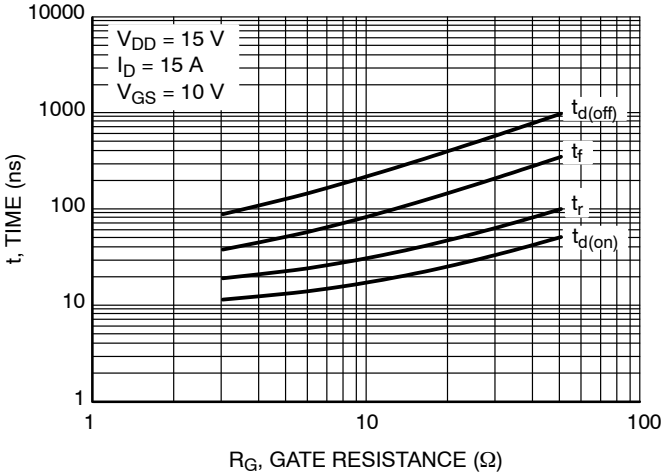


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

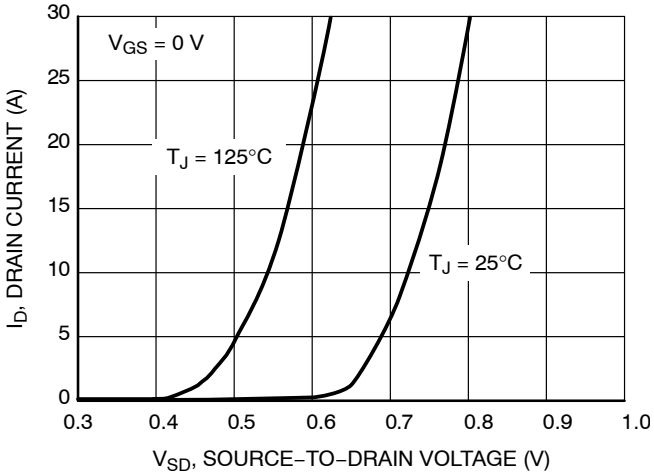


Figure 10. Diode Forward Voltage vs. Current

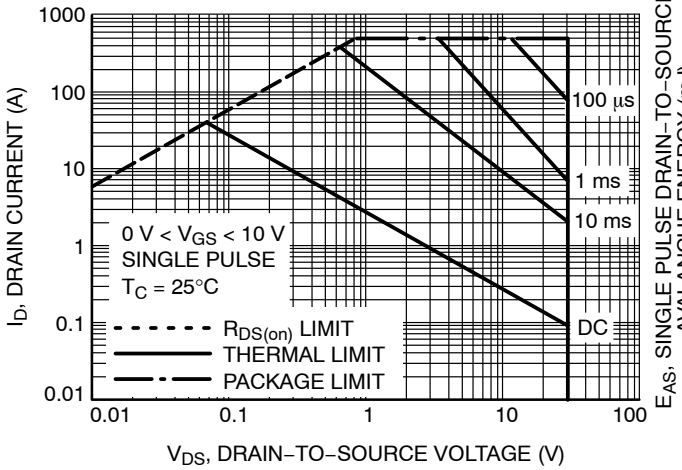


Figure 11. Maximum Rated Forward Biased Safe Operating Area

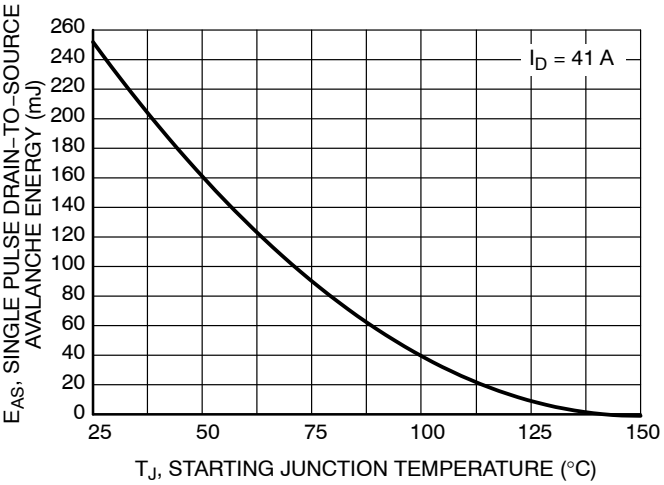


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

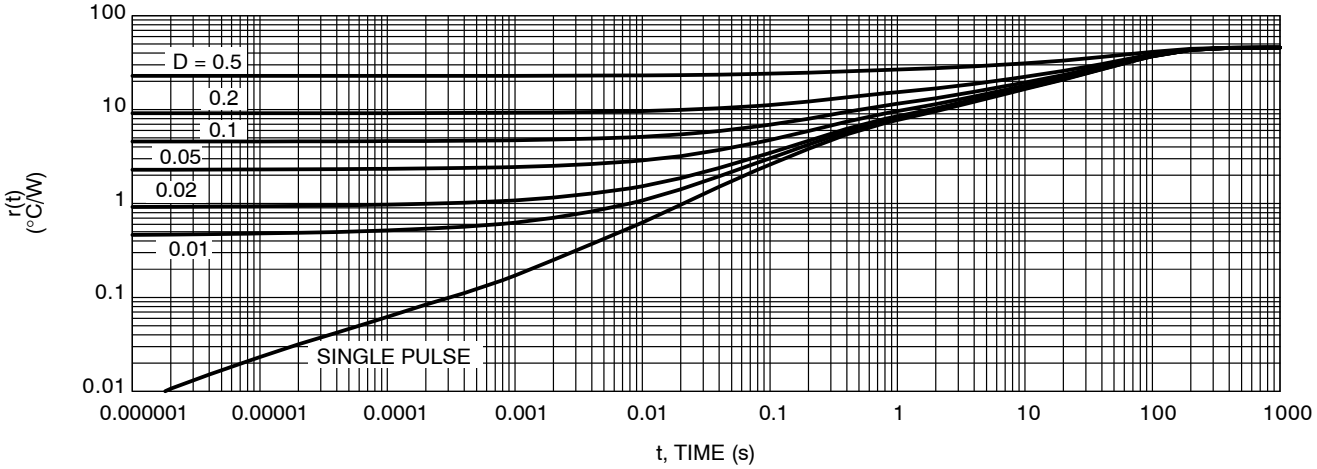


Figure 13. Thermal Response

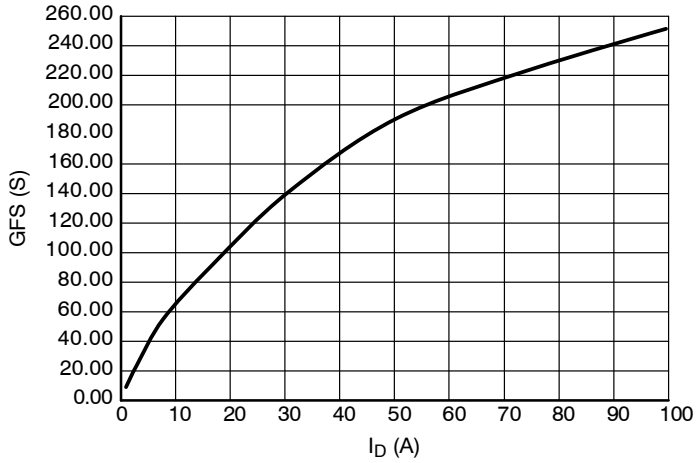
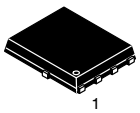


Figure 14. GFS vs. I_D

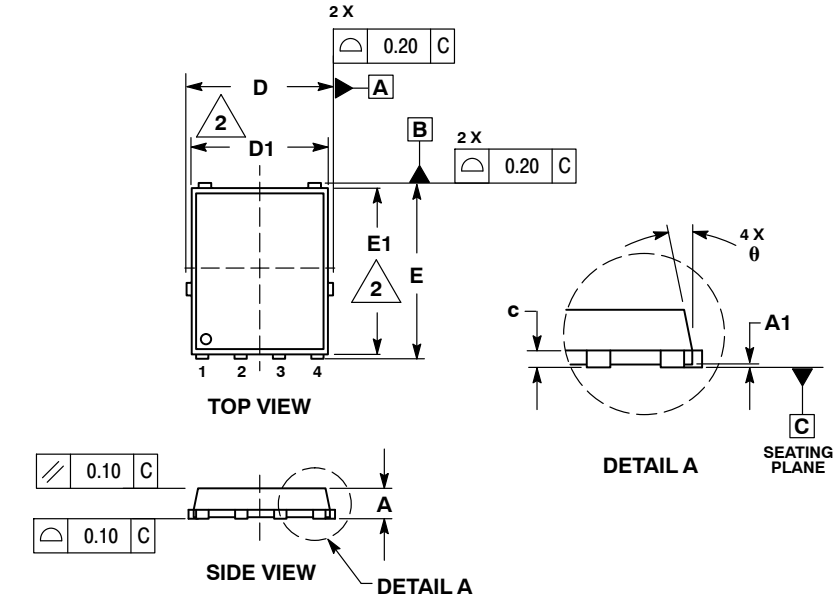
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



SCALE 2:1

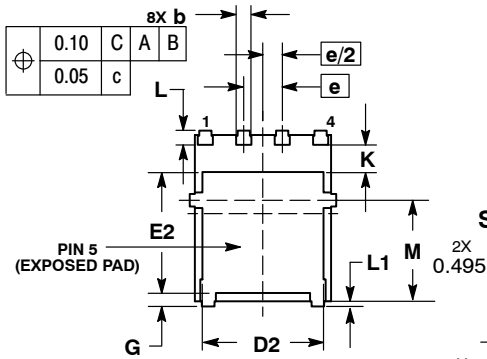
DFN5 5x6, 1.27P
(SO−8FL)
CASE 488AA
ISSUE N

DATE 25 JUN 2018

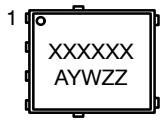


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	–––	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ	0 °	–––	12 °



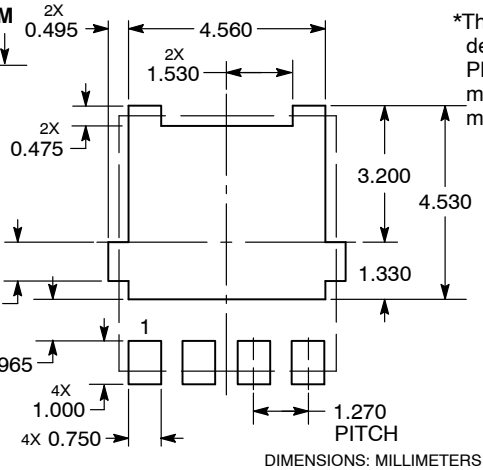
GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

STYLE 2:
PIN 1. ANODE
2. ANODE
3. ANODE
4. NO CONNECT
5. CATHODE

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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