

NTMFS4931N

Power MOSFET

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

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 ($T_J = 25^\circ\text{C}$ 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)	I_D	$T_A = 25^\circ\text{C}$	40
		$T_A = 100^\circ\text{C}$	25
Power Dissipation $R_{\theta JA}$ (Note 1)	P_D	$T_A = 25^\circ\text{C}$	2.74
		$T_A = 100^\circ\text{C}$	0.95
Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1)	I_D	$T_A = 25^\circ\text{C}$	77
		$T_A = 100^\circ\text{C}$	48
Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)	P_D	$T_A = 25^\circ\text{C}$	10.2
		$T_A = 100^\circ\text{C}$	0.95
Continuous Drain Current $R_{\theta JA}$ (Note 2)	I_D	$T_A = 25^\circ\text{C}$	23
		$T_A = 100^\circ\text{C}$	15
Power Dissipation $R_{\theta JA}$ (Note 2)	P_D	$T_A = 25^\circ\text{C}$	0.95
		$T_A = 100^\circ\text{C}$	0.95
Continuous Drain Current $R_{\theta JC}$ (Note 1)	I_D	$T_C = 25^\circ\text{C}$	246
		$T_C = 100^\circ\text{C}$	156
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	$T_C = 25^\circ\text{C}$	104
		$T_C = 100^\circ\text{C}$	104
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	490
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)	I_S	100	A
Drain to Source DV/DT	dV/dt	4.4	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}, V_{DD} = 24$ V, $V_{GS} = 10$ V, $I_L = 41$ A _{pk} , $L = 0.3$ mH, $R_G = 25 \Omega$)	E_{AS}	252	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

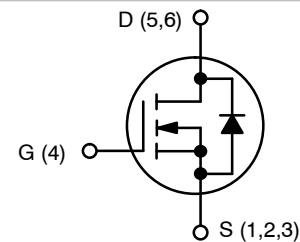
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.



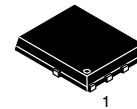
ON Semiconductor[®]

<http://onsemi.com>

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

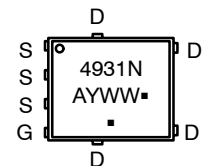


N-CHANNEL MOSFET



**SO-8 FLAT LEAD
CASE 488AA
STYLE 1**

MARKING DIAGRAM



- A = Assembly Location
 - Y = Year
 - WW = Work Week
 - = Pb-Free Package
- (Note: Microdot may be in either location)

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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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 – ($t \leq 10$ 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 ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			18		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		15	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$		0.85	1.1	m Ω
			$I_D = 15\text{ A}$		0.82		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$		1.2	1.5	
			$I_D = 15\text{ A}$		1.2		
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 15\text{ A}$		86		S	

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		9821		pF
Output Capacitance	C_{OSS}			2720		
Reverse Transfer Capacitance	C_{RSS}			234		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		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	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		128		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		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 $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

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ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		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}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.8	1.0	V
			$T_J = 125^\circ\text{C}$		0.62		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$		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	$T_A = 25^\circ\text{C}$		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 $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
6. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

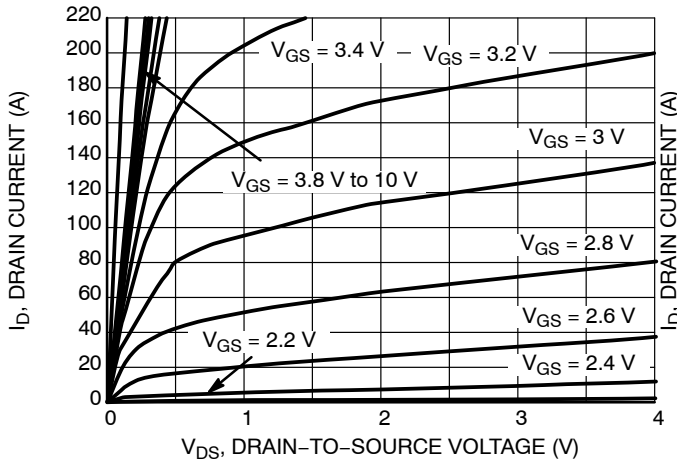


Figure 1. On-Region Characteristics

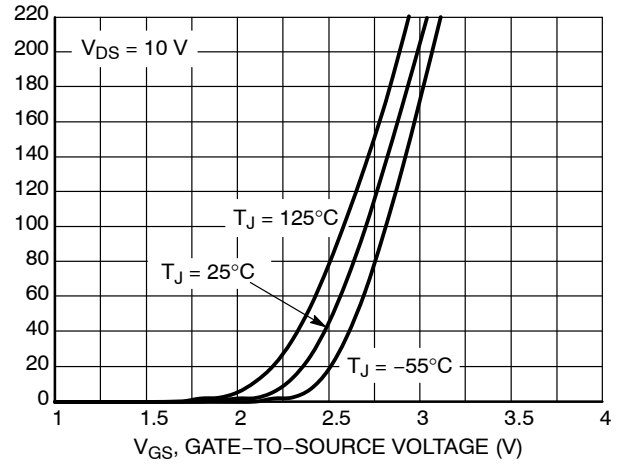


Figure 2. Transfer Characteristics

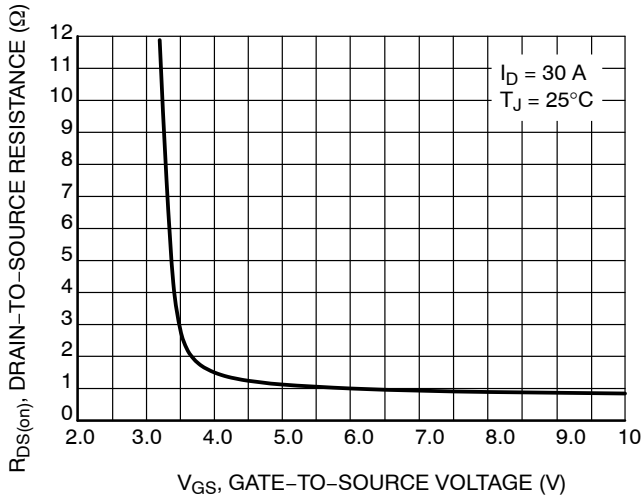


Figure 3. On-Resistance vs. Gate-to-Source Voltage

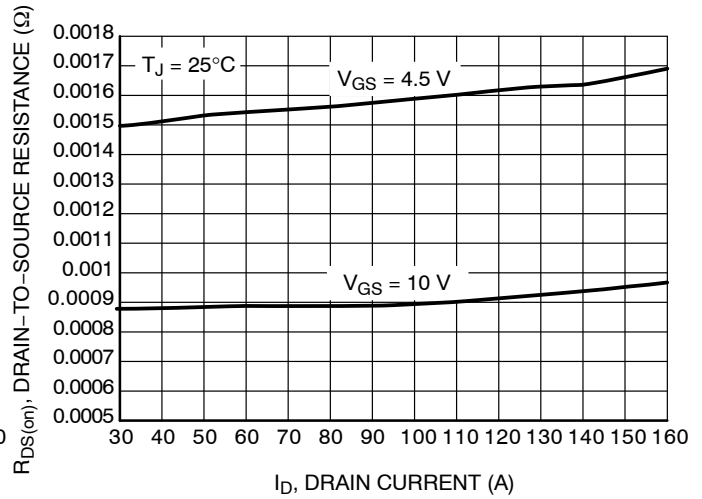


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

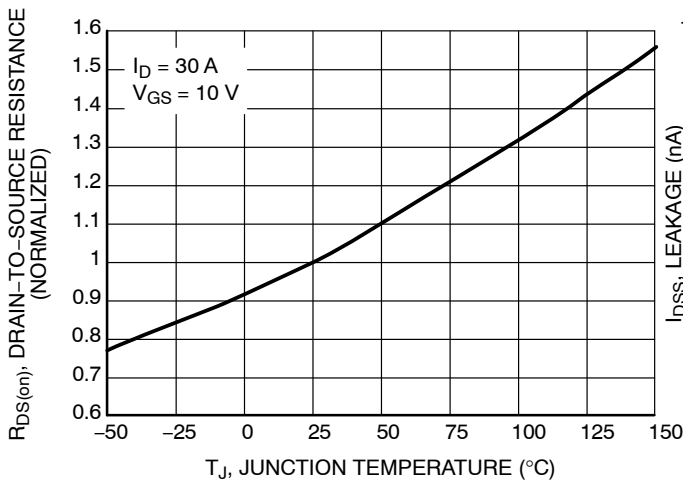


Figure 5. On-Resistance Variation with Temperature

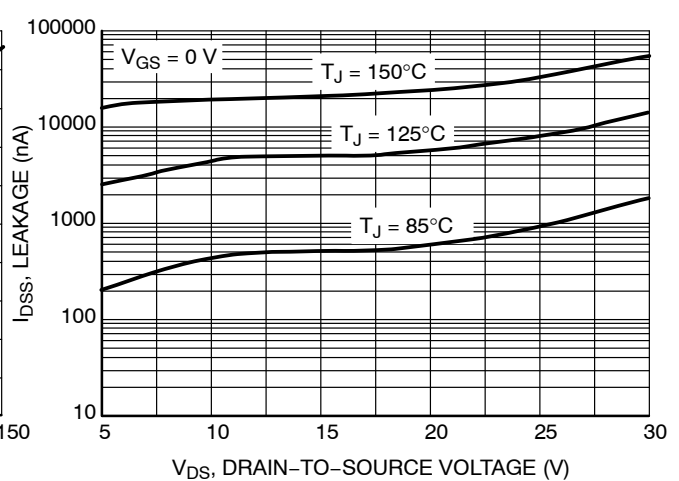


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

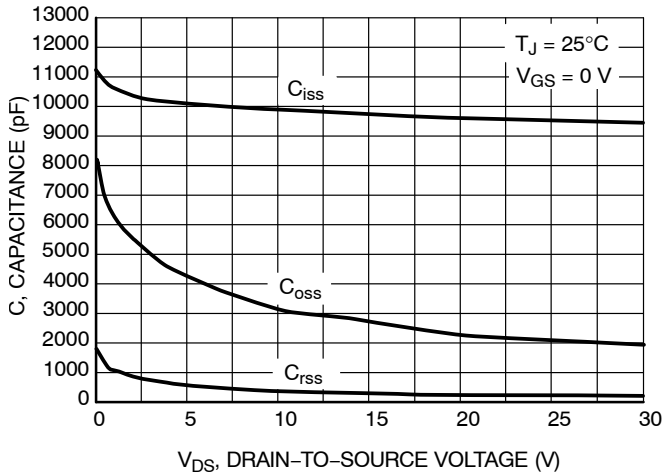


Figure 7. Capacitance Variation

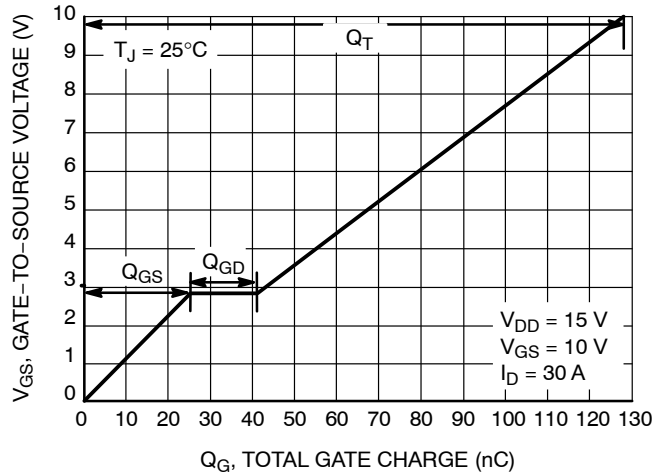


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

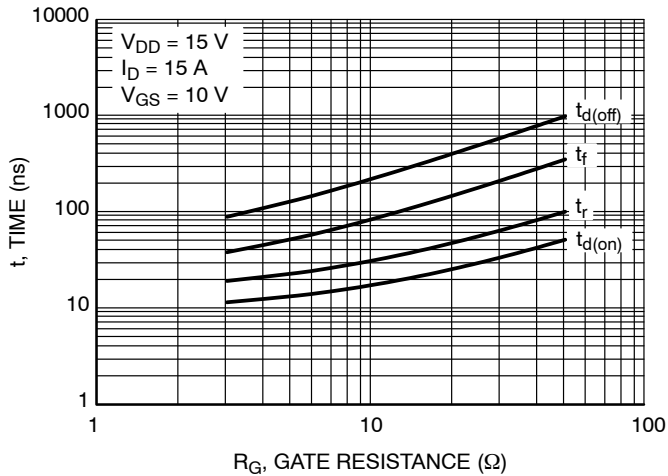


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

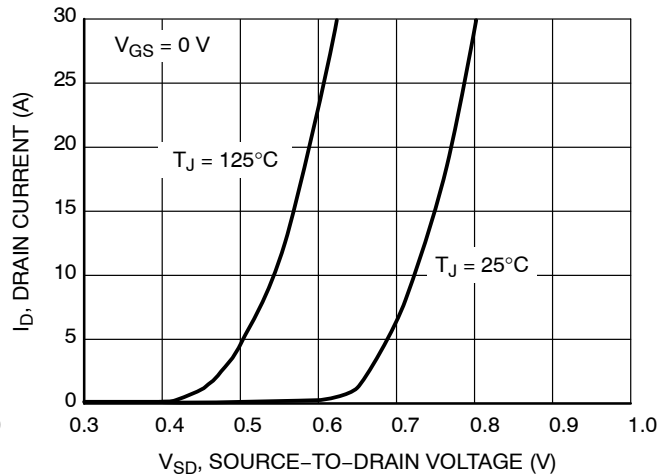


Figure 10. Diode Forward Voltage vs. Current

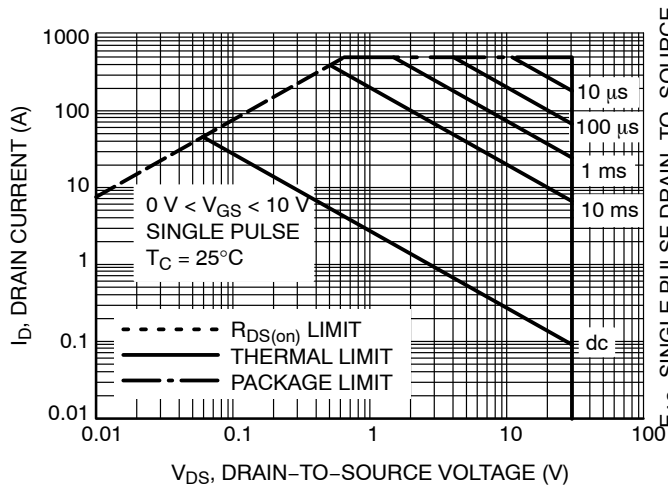


Figure 11. Maximum Rated Forward Biased Safe Operating Area

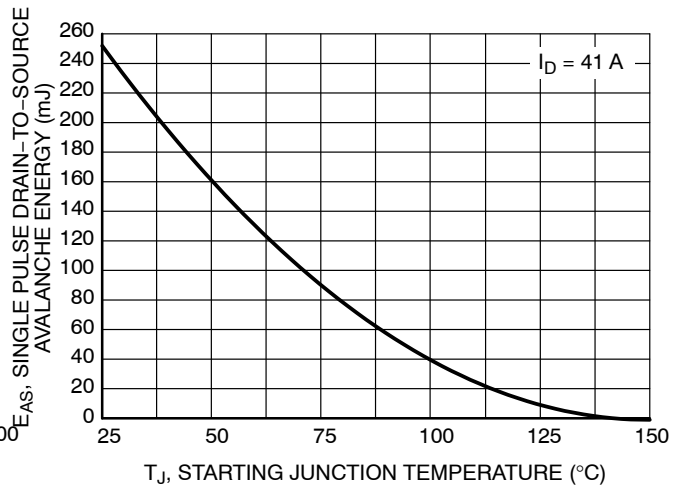


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

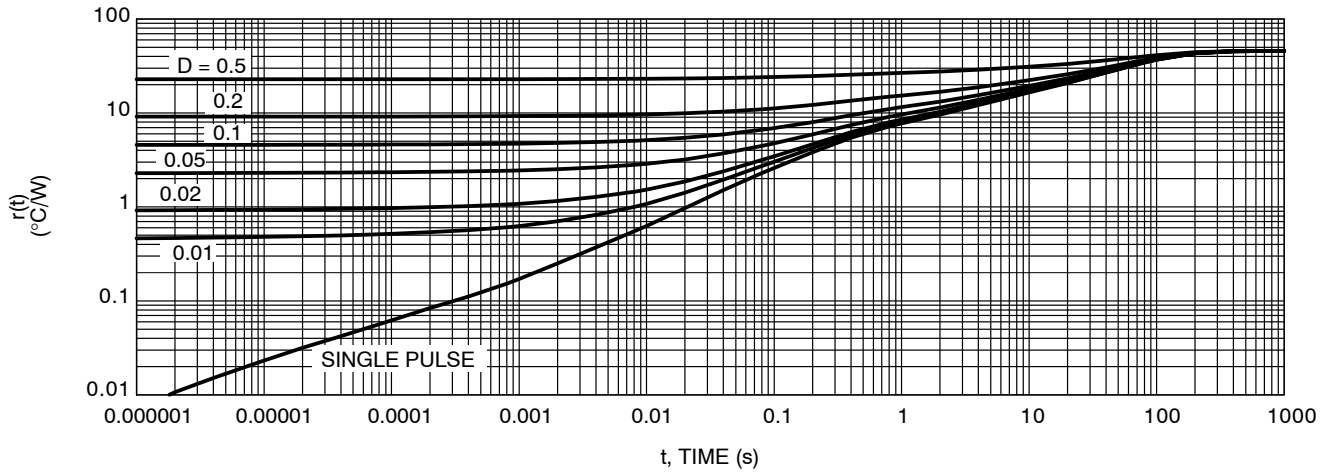


Figure 13. Thermal Response

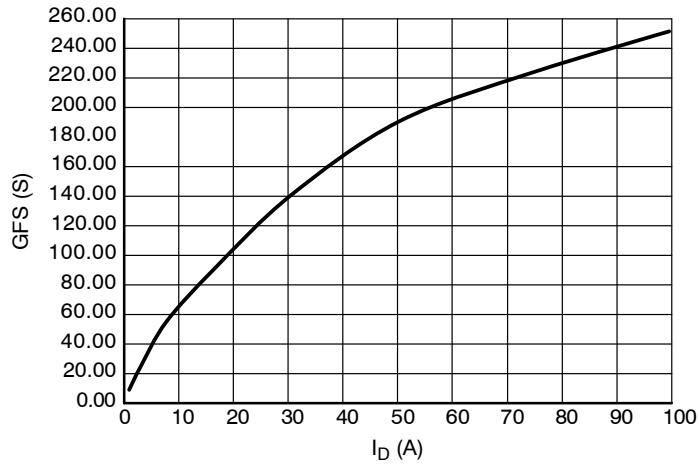
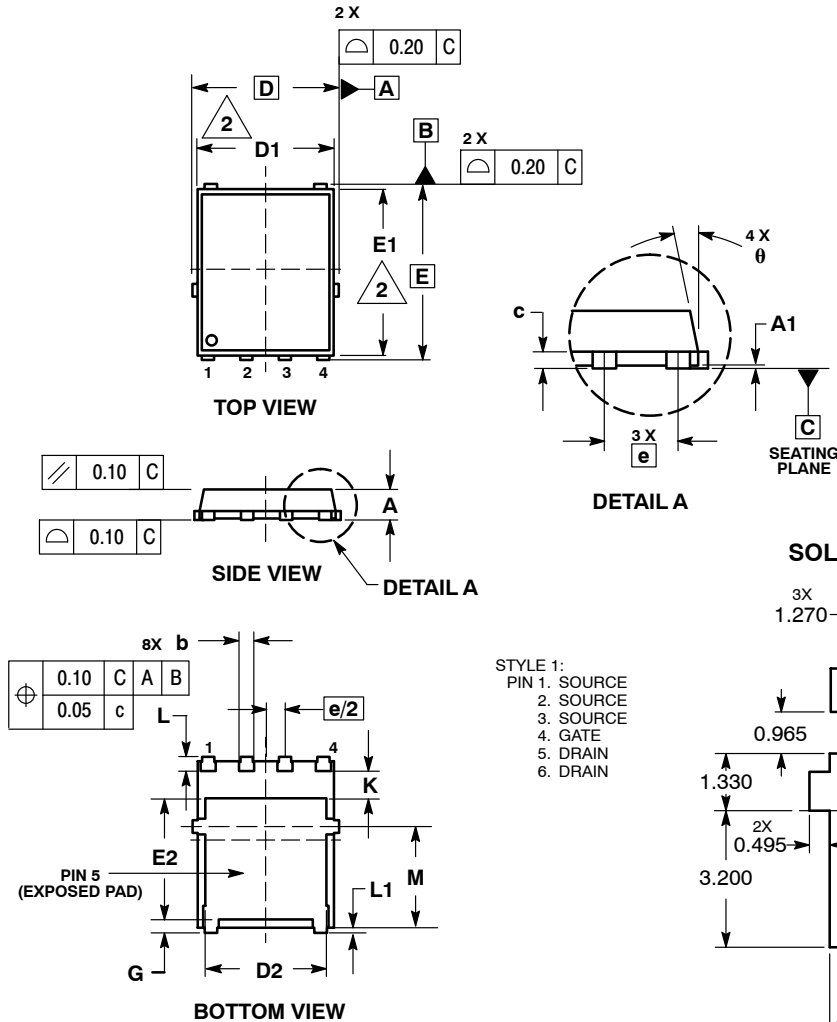


Figure 14. GFS vs. I_D

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PACKAGE DIMENSIONS

DFN5 5x6, 1.27P (S08 FL)
CASE 488AA
ISSUE E

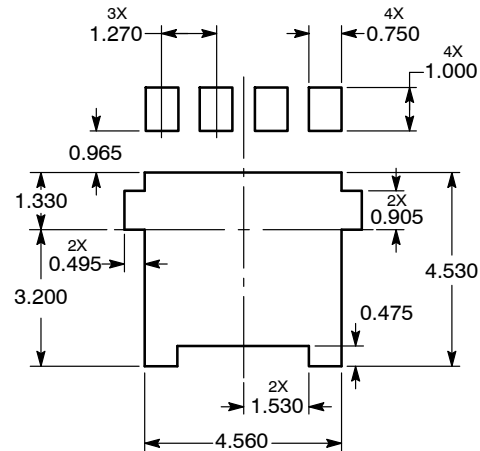


NOTES:

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	5.15 BSC		
D1	4.50	4.90	5.10
D2	3.50	---	4.22
E	6.15 BSC		
E1	5.50	5.80	6.10
E2	3.45	---	4.30
e	1.27 BSC		
G	0.51	0.61	0.71
K	0.51	---	---
L	0.51	0.61	0.71
L1	0.05	0.17	0.20
M	3.00	3.40	3.80
θ	0°	---	12°

SOLDERING FOOTPRINT*



STYLE 1:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN

*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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