

NTMFS4936N, NTMFS4936NC

Power MOSFET

30 V, 79 A, Single N-Channel, SO-8 FL

Features

- Low $R_{DS(on)}$, Low Capacitance and Optimized Gate Charge to Minimize Conduction, Driver and Switching Losses
- Next Generation Enhanced Body Diode, Engineered for Soft Recovery, Provides Schottky-Like Performance
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- CPU Power Delivery
- DC-DC Converters

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	$T_A = 25^\circ\text{C}$	19.5	A
		$T_A = 100^\circ\text{C}$	12.3	
Power Dissipation $R_{\theta JA}$ (Note 1)	P_D	2.62	W	
Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1)	I_D	$T_A = 25^\circ\text{C}$	35	A
		$T_A = 100^\circ\text{C}$	22	
Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)	P_D	8.4	W	
Continuous Drain Current $R_{\theta JA}$ (Note 2)	I_D	$T_A = 25^\circ\text{C}$	11.6	A
		$T_A = 100^\circ\text{C}$	7.3	
Power Dissipation $R_{\theta JA}$ (Note 2)	P_D	0.92	W	
Continuous Drain Current $R_{\theta JC}$ (Note 1)	I_D	$T_C = 25^\circ\text{C}$	79	A
		$T_C = 100^\circ\text{C}$	50	
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	43	W	
Pulsed Drain Current	I_{DM}	235	A	
Current Limited by Package	I_{Dmax}	100	A	
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	39.2	A	
Drain to Source DV/DT	dV/dt	6.0	V/ns	
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}$, $V_{DD} = 50$ V, $V_{GS} = 10$ V, $I_L = 44$ A _{pk} , $L = 0.1$ mH, $R_G = 25$ Ω)	E_{AS}	96.8	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.

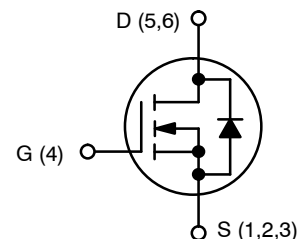
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.



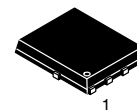
ON Semiconductor[®]

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	3.8 m Ω @ 10 V	79 A
	4.8 m Ω @ 4.5 V	

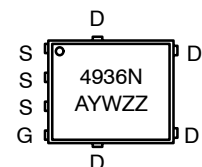


N-CHANNEL MOSFET



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

MARKING DIAGRAM



4936N = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMFS4936NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4936NT3G	SO-8 FL (Pb-Free)	5000 / Tape & Reel
NTMFS4936NCT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4936NCT3G	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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THEMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	2.9	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	47.7	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	135.2	
Junction-to-Ambient – ($t \leq 10$ s) (Note 3)	$R_{\theta JA}$	14.8	

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 (transient)	$V_{(BR)DSSst}$	$V_{GS} = 0\text{ V}, I_{D(aval)} = 18.5\text{ A}, T_{case} = 25^\circ\text{C}, t_{transient} = 100\text{ ns}$	34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			15		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
			$T_J = 125^\circ\text{C}$		10	
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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$	2.9	3.8	m Ω
			$I_D = 15\text{ A}$	2.9		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	3.9	4.8	
			$I_D = 15\text{ A}$	3.9		
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 15\text{ A}$		50		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		3044		pF
Output Capacitance	C_{OSS}			1014		
Reverse Transfer Capacitance	C_{RSS}			39		
Capacitance Ratio	C_{RSS}/C_{ISS}	$V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V}, f = 1\text{ MHz}$		0.013	0.026	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		19		nC
Threshold Gate Charge	$Q_{G(TH)}$			4.6		
Gate-to-Source Charge	Q_{GS}			9.2		
Gate-to-Drain Charge	Q_{GD}			2.4		
Total Gate Charge	$Q_{G(TOT)}$		$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		43	

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		15.5		ns
Rise Time	t_r			20.6		
Turn-Off Delay Time	$t_{d(OFF)}$			24.6		
Fall Time	t_f			7.0		

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°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		10.4		ns
Rise Time	t _r			19		
Turn-Off Delay Time	t _{d(OFF)}			29		
Fall Time	t _f			8.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 30 A	T _J = 25°C		0.8	1.1	V
			T _J = 125°C		0.65		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 30 A		39		ns	
Charge Time	t _a			21.5			
Discharge Time	t _b			17.5			
Reverse Recovery Charge	Q _{RR}			36		nC	

PACKAGE PARASITIC VALUES

Source Inductance	L _S	T _A = 25°C		0.65		nH
Drain Inductance	L _D			0.005		nH
Gate Inductance	L _G			1.84		nH
Gate Resistance	R _G			1.1	2.0	Ω

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

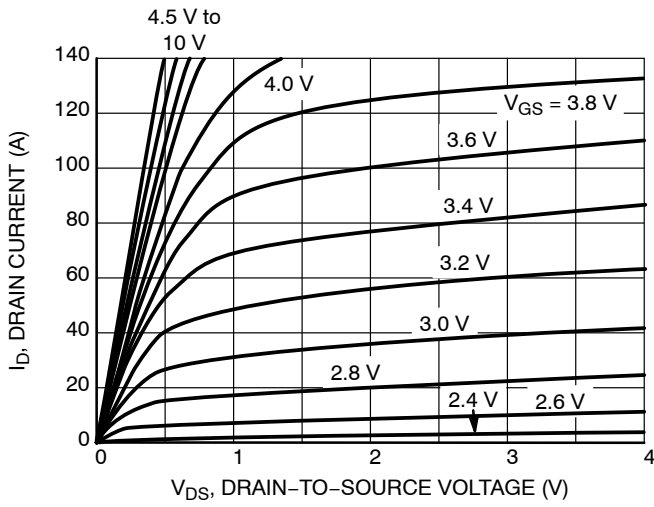


Figure 1. On-Region Characteristics

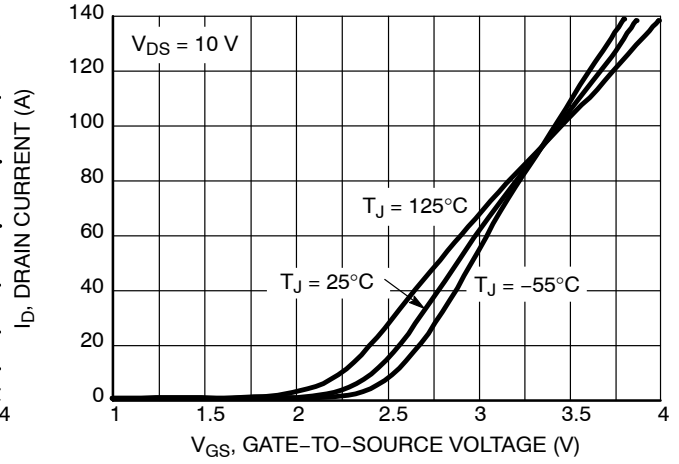


Figure 2. Transfer Characteristics

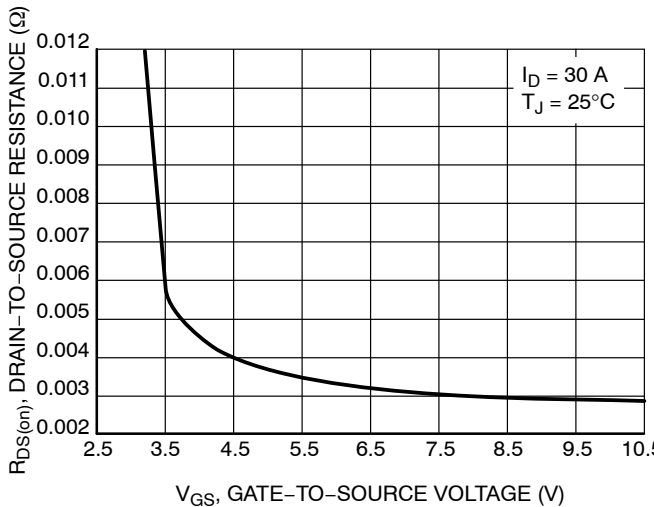


Figure 3. On-Resistance vs. Gate-to-Source Voltage

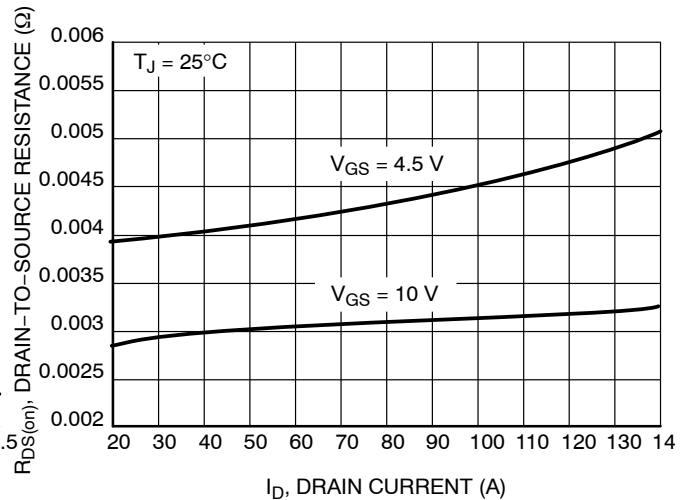


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

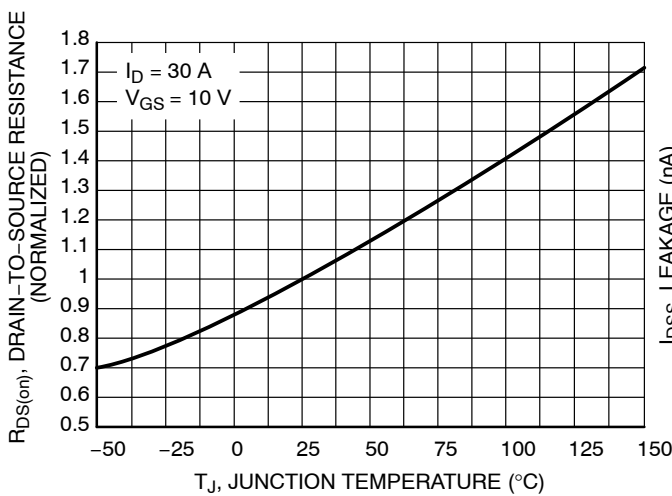


Figure 5. On-Resistance Variation with Temperature

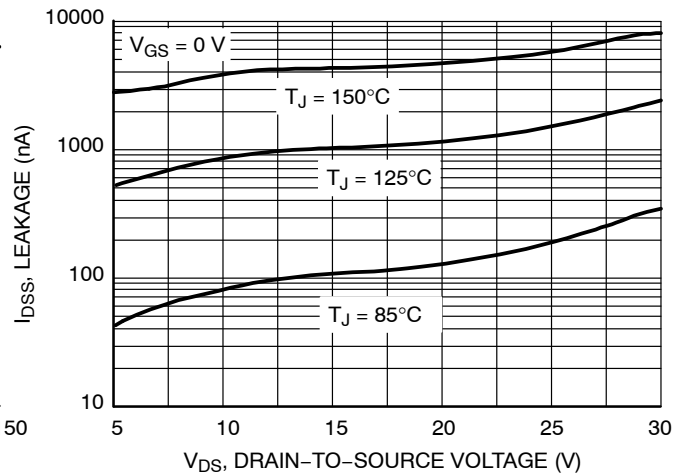


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

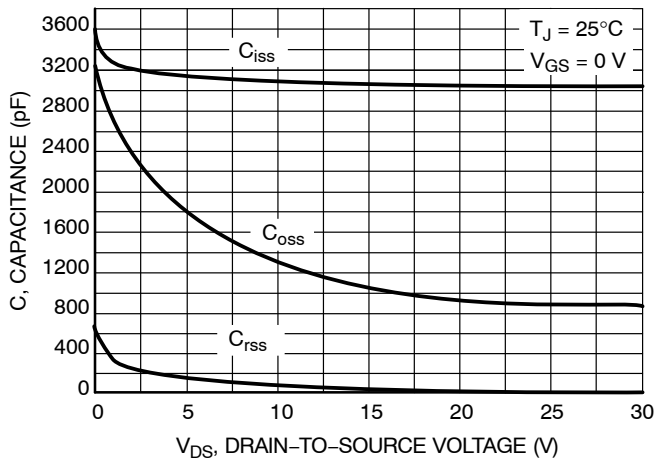


Figure 7. Capacitance Variation

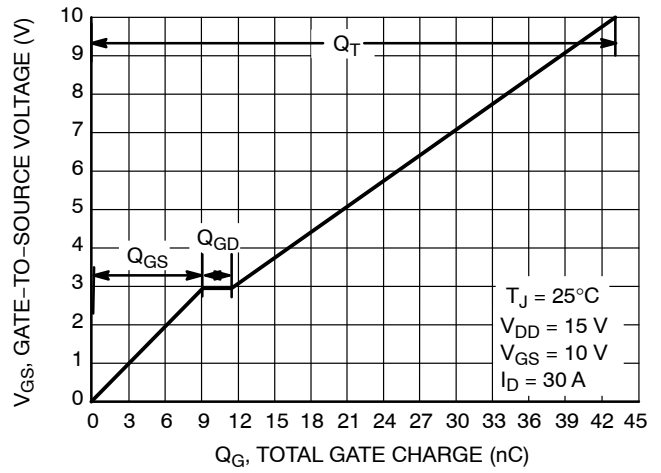


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

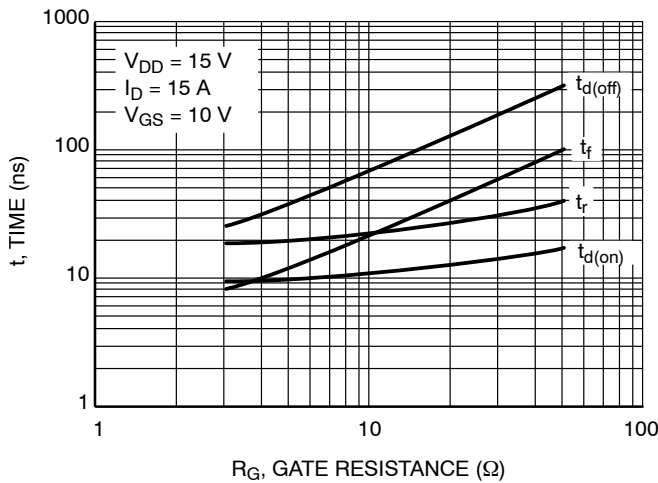


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

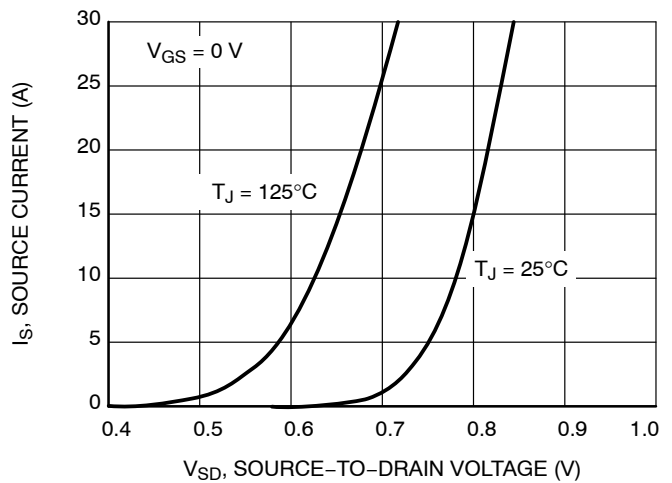


Figure 10. Diode Forward Voltage vs. Current

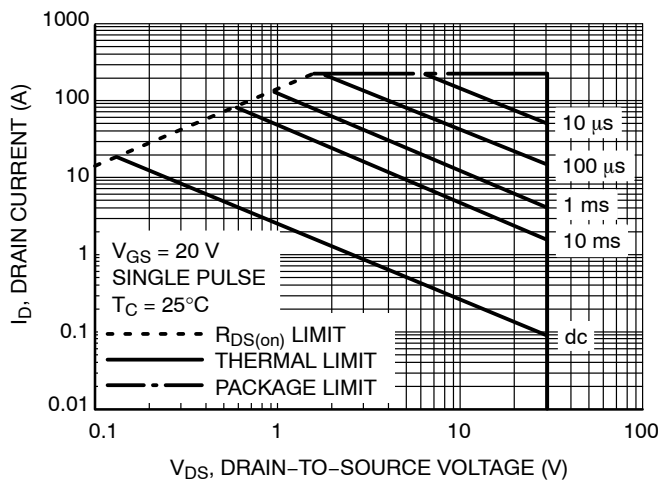


Figure 11. Maximum Rated Forward Biased Safe Operating Area

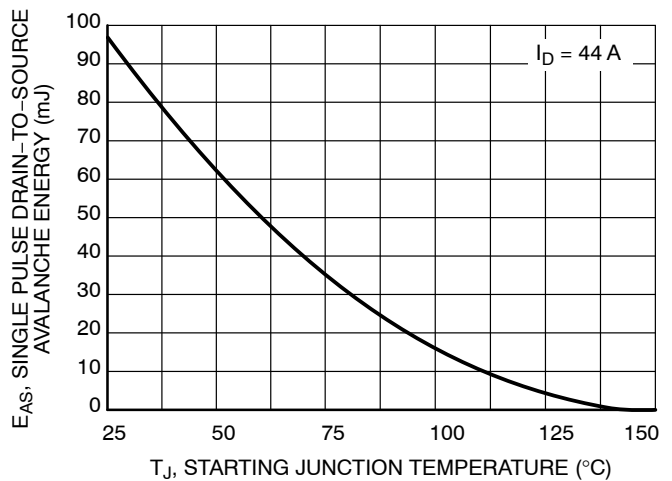


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

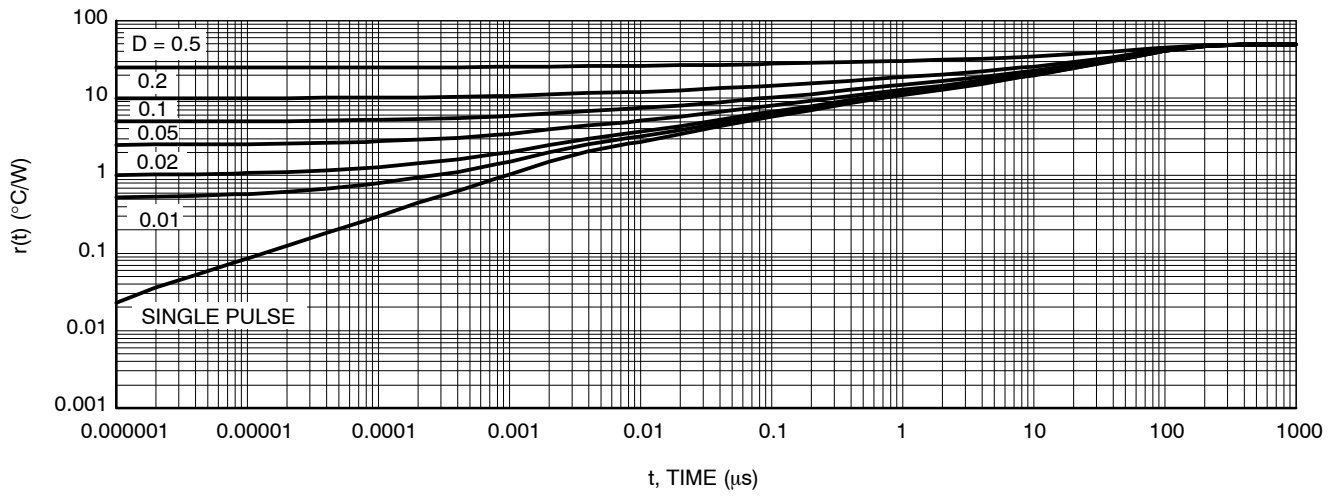


Figure 13. Thermal Response

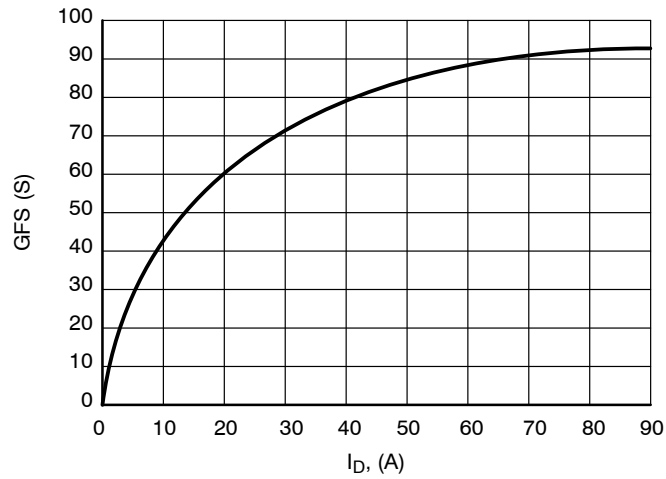
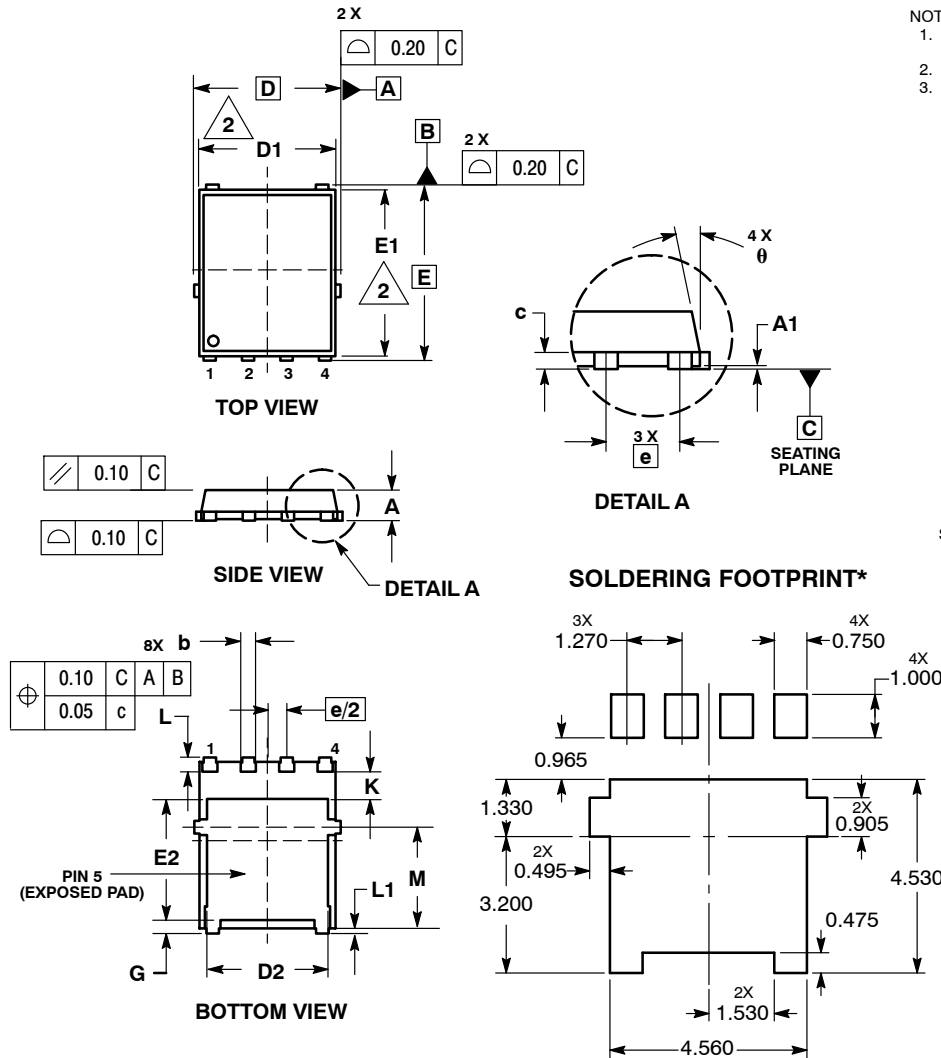


Figure 14. GFS vs. I_D

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PACKAGE DIMENSIONS

DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE G



- 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.

DIM	MILLIMETERS		
	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	1.20	1.35	1.50
L	0.51	0.61	0.71
L1	0.05	0.17	0.20
M	3.00	3.40	3.80
θ	0°	---	12°

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