NTMFS4936N, NTMFS4936NC

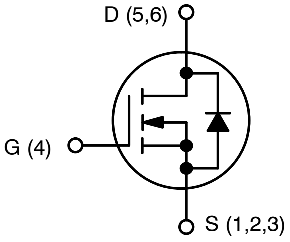
MOSFET – Power, Single, N-Channel, SO-8 FL

30 V, 79 A

ON Semiconductor®

http://onsemi.com

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



N−CHANNEL MOSFET

Features

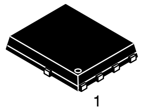
- Low $R_{DS(on)}$, Low Capacitance and Optimized Gate Charge to Minimize Conduction, Driver and Switching Losses
- Next Generation Enhanced Body Diode, Engineered for Soft Recovery, Provides Schottky−Like Performance
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- CPU Power Delivery
- DC−DC Converters

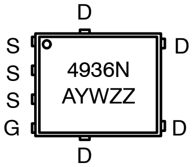
MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

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	19.5	A
		T_A = 100°C		12.3	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.62	W
Continuous Drain Current $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	I_D	35	A
		T_A = 100°C		22	
Power Dissipation $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	P_D	8.4	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	I_D	11.6	A
		T_A = 100°C		7.3	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.92	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	79	A
		T_C =100°C		50	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	43	W
Pulsed DrainCurrent	T_A = 25°C, t_p = 10 μs		I_{DM}	235	A
Current Limited by Package		T_A = 25°C	I_{Dmax}	100	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)			I_S	39.2	A
Drain to Source DV/DT			dV/d_t	6.0	V/ns



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.

May, 2019 − Rev. 9

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} = 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	°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.

THERMAL 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 ≤ 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°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 (transient)	$V_{(BR)DSSt}$	VGS = 0 V, $I_{D(aval)}$ = 18.5 A, T_{case} = 25°C, $t_{transient}$ = 100 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 V, V_{DS} = 24 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
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		2.9	3.8	mΩ
			I_D = 15 A		2.9		
		V_{GS} = 4.5 V	I_D = 30 A		3.9	4.8	
			I_D = 15 A		3.9		
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			50		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			3044		pF
Output Capacitance	C_{OSS}				1014		
Reverse Transfer Capacitance	C_{RSS}				39		
Capacitance Ratio	C_{RSS} / C_{ISS}	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz			0.013	0.026	

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
CHARGES, CAPACITANCES & GATE RESISTANCE						
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 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 V, V_{DS} = 15 V; I_D = 30 A		43		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		15.5		ns
Rise Time	t_r			20.6		
Turn−Off Delay Time	$t_{d(OFF)}$			24.6		
Fall Time	t_f			7.0		
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, dIS/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

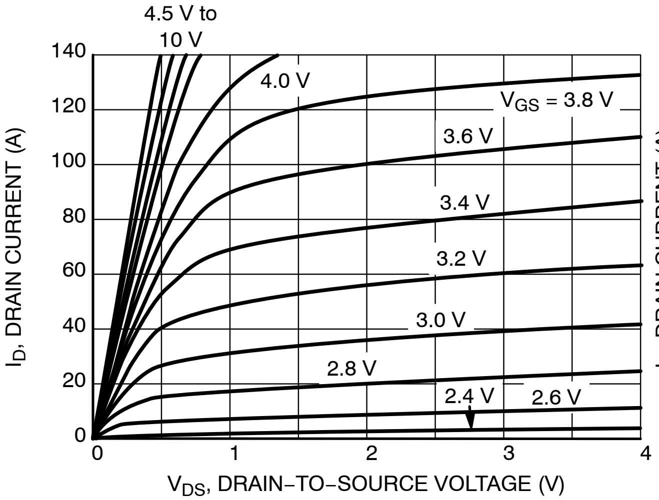


Figure 1. On−Region Characteristics

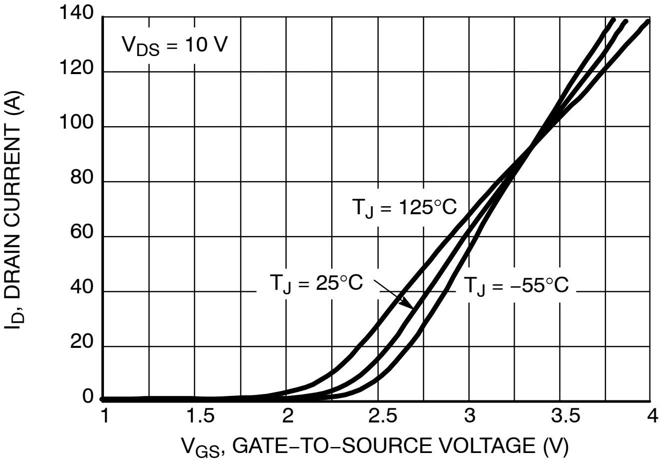


Figure 2. Transfer Characteristics

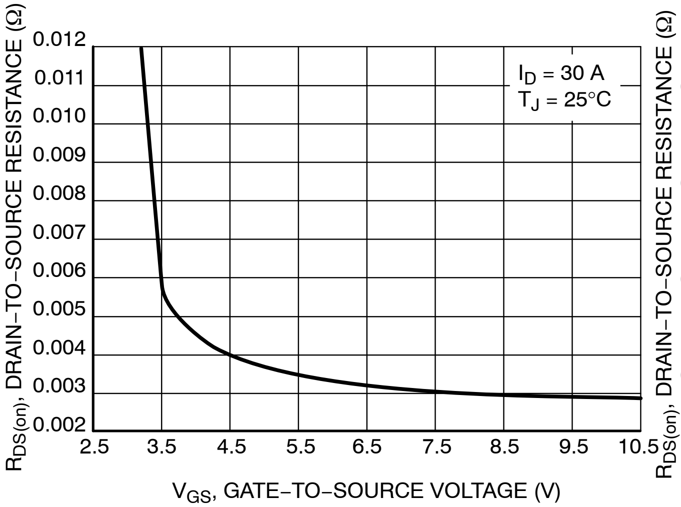


Figure 3. On−Resistance vs. Gate−to−Source Voltage

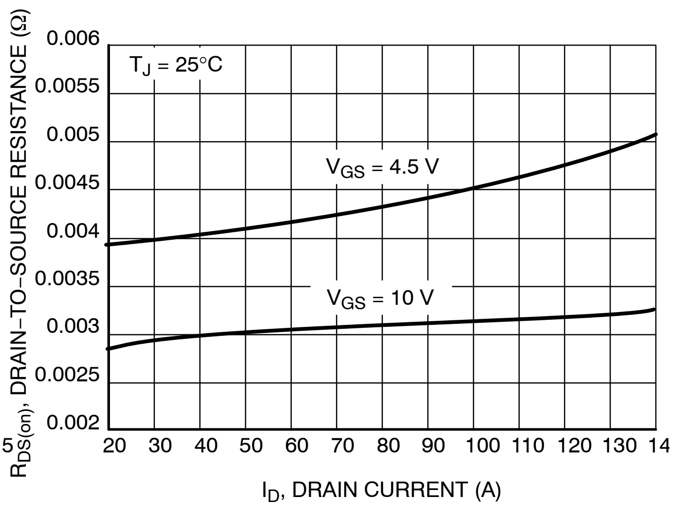


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

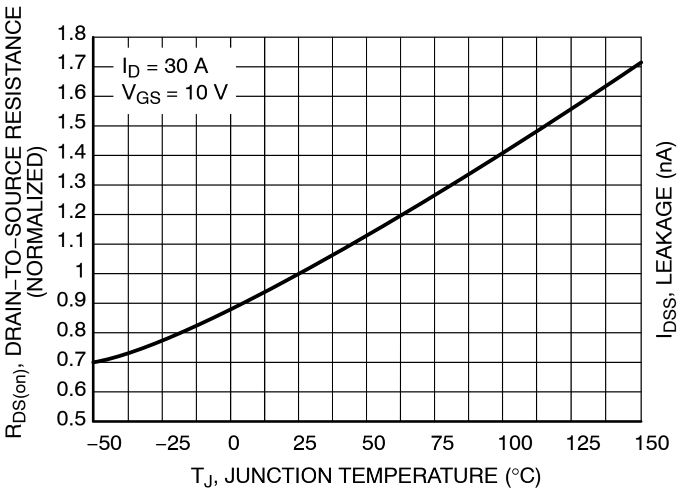


Figure 5. On−Resistance Variation with Temperature

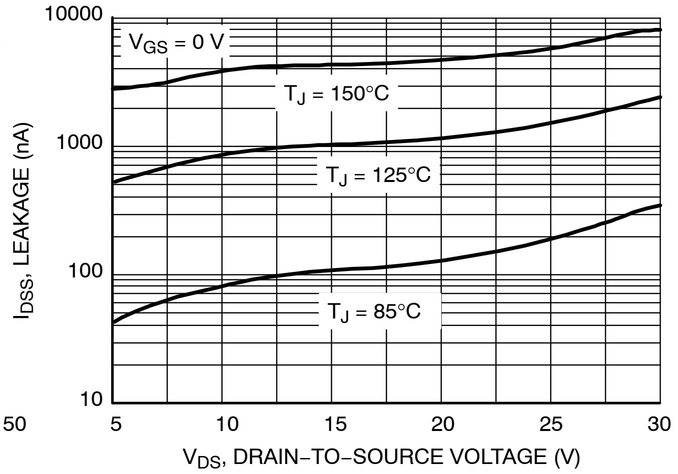


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

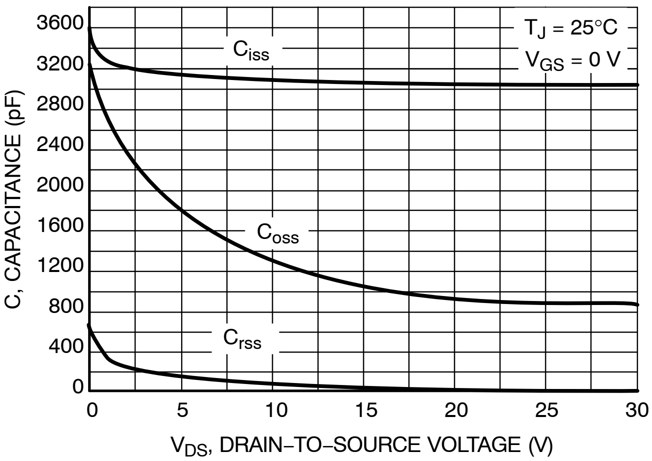


Figure 7. Capacitance Variation

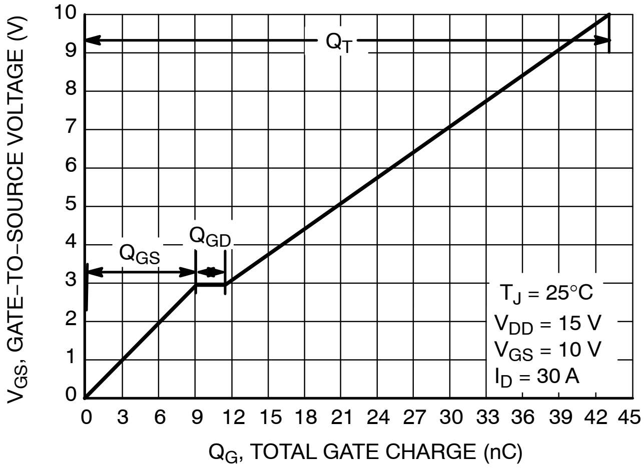


Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge

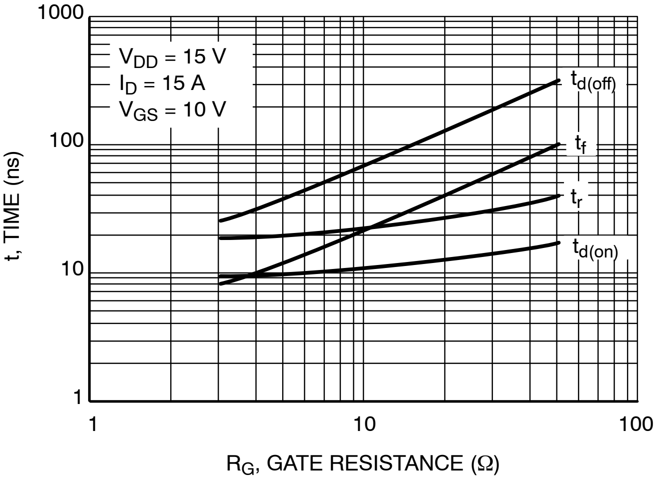


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

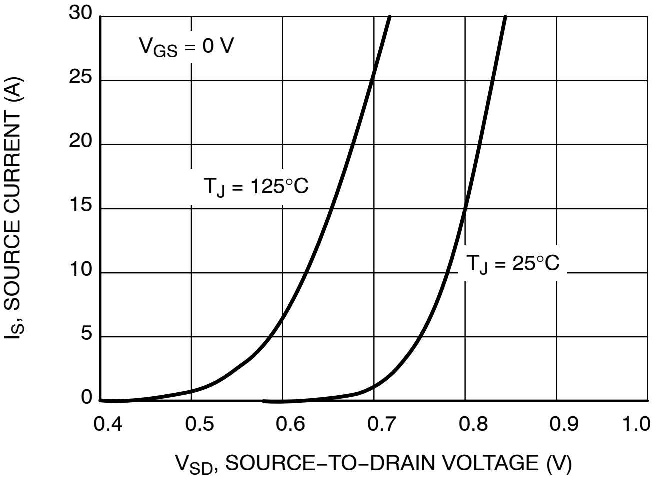


Figure 10. Diode Forward Voltage vs. Current

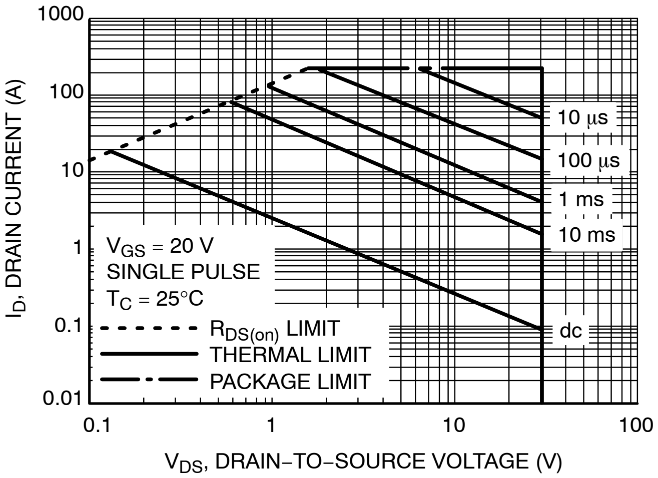


Figure 11. Maximum Rated Forward Biased Safe Operating Area

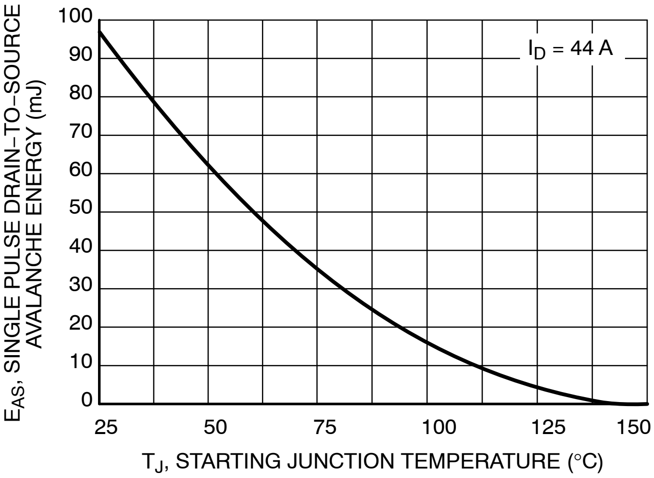


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

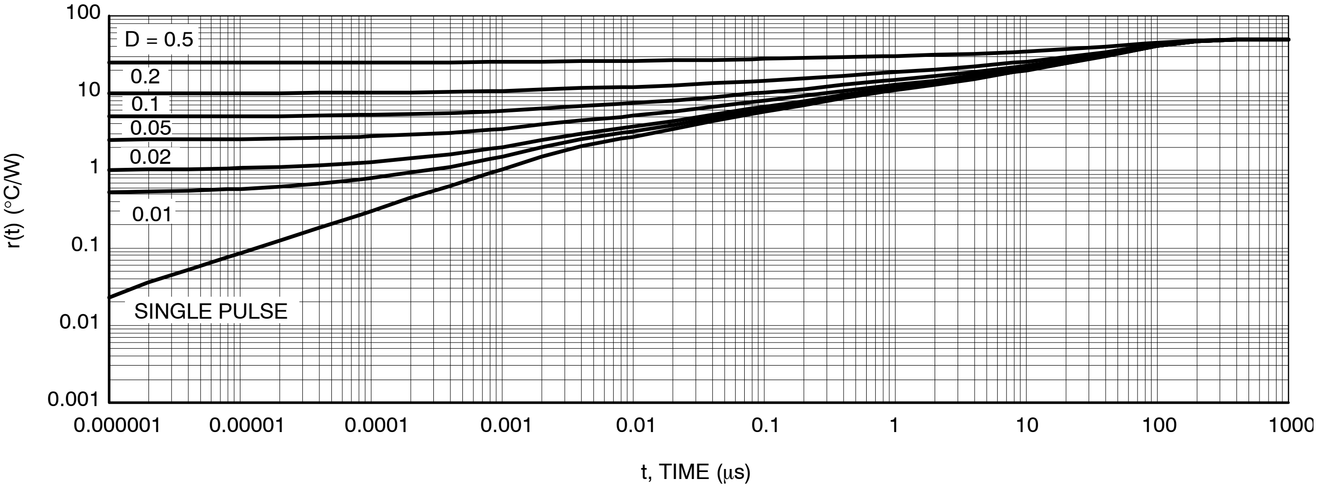


Figure 13. Thermal Response

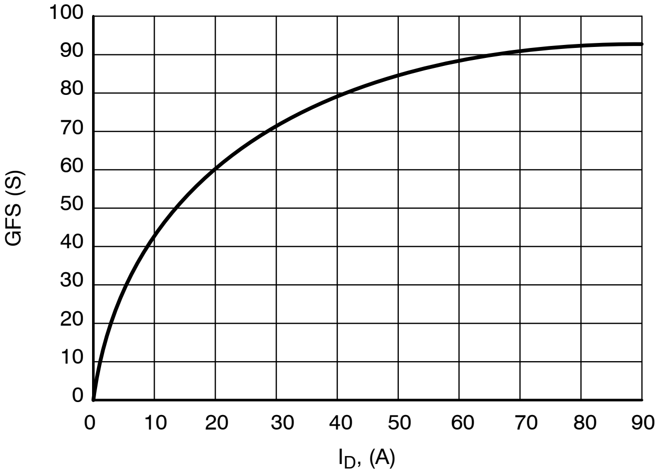
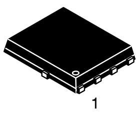


Figure 14. GFS vs. I_D

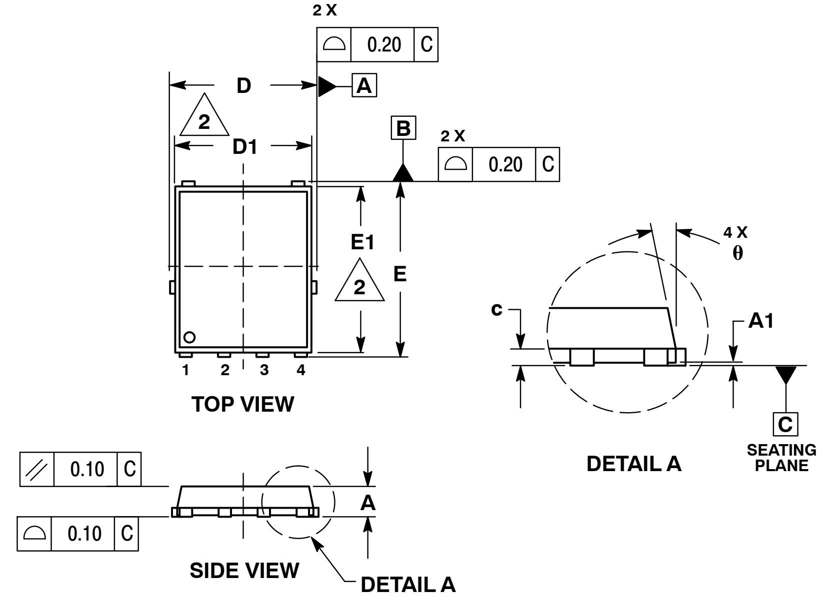


SCALE 2:1

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

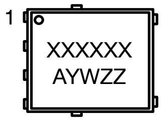
DATE 25 JUN 2018

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.



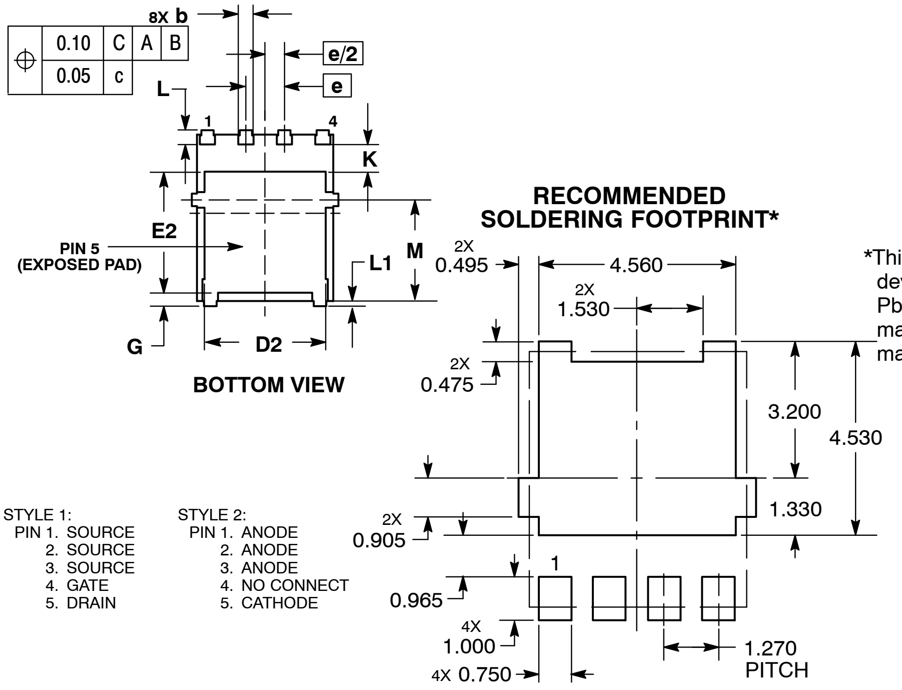
	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80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



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 **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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DESCRIPTION:	**DFN5 5x6, 1.27P (SO−8FL)**	**PAGE 1 OF 1**

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