NTMFS4C10N

MOSFET – Power, Single, N-Channel, SO-8 FL
30 V, 46 A

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- 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	15.0	A
		T_A = 80°C		11.2	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.49	W
Continuous Drain Current $R_{\theta JA} \leq$ 10 s (Note 1)		T_A = 25°C	I_D	22.5	A
		T_A = 80°C		16.8	
Power Dissipation $R_{\theta JA} \leq$ 10 s (Note 1)		T_A = 25°C	P_D	5.6	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	I_D	8.2	A
		T_A = 80°C		6.2	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.75	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	46	A
		T_C = 80°C		34	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	23.6	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	132	A
Current Limited by Package	T_A = 25°C		I_{Dmax}	80	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)			I_S	21	A
Drain to Source dV/dt			dV/d_t	7.0	V/ns
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{GS} = 10 V, I_L = 25 A_{pk}, L = 0.1 mH, R_{GS} = 25 Ω) (Note 3)			E_{AS}	31	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.
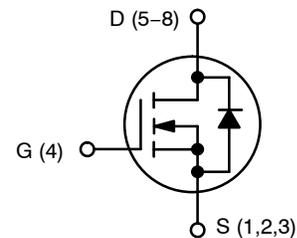1. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
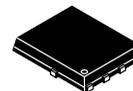
ON Semiconductor®

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	6.95 mΩ @ 10 V	46 A
	10.8 mΩ @ 4.5 V	

D (5−8)

G (4)

S (1,2,3)

N−CHANNEL MOSFET

MARKING DIAGRAMS

SO−8 FLAT LEAD CASE 488AA STYLE 1

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S       D
S  4C10N  D
S  AYWZZ
G       D
     D
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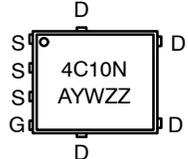
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceabililty

ORDERING INFORMATION

Device	Package	Shipping[†]
NTMFS4C10NT1G	SO−8 FL (Pb−Free)	1500 / 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.

2. Surface−mounted on FR4 board using the minimum recommended pad size.
3. This is the absolute maximum rating. Parts are 100% tested at T_J = 25°C,
   V_{GS} = 10 V, I_L = 17 Apk, E_{AS} = 14 mJ.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	5.3	°C/W
Junction−to−Ambient − Steady State (Note 4)	$R_{\theta JA}$	50.3	
Junction−to−Ambient − Steady State (Note 5)	$R_{\theta JA}$	165.9	
Junction−to−Ambient − (t ≤ 10 s) (Note 4)	$R_{\theta JA}$	22.2	

4. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
5. 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)	$V_{(BR)DSSt}$	V_{GS} = 0 V, $I_{D(aval)}$ = 7.1 A, T_{case} = 25°C, $t_{transient}$ = 100 ns		34			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				14.5		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 6)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.3		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				4.7		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 30 A		5.8	6.95	mΩ
		V_{GS} = 4.5 V	I_D = 15 A		8.9	10.8	
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			43		S
Gate Resistance	R_G	T_A = 25°C		0.3	1.0	2.0	Ω
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			987		pF
Output Capacitance	C_{OSS}				574		
Reverse Transfer Capacitance	C_{RSS}				162		
Capacitance Ratio	C_{RSS}/C_{ISS}	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz			0.165		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A			9.7		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.5		
Gate−to−Source Charge	Q_{GS}				2.8		
Gate−to−Drain Charge	Q_{GD}				4.8		
Gate Plateau Voltage	V_{GP}				3.2		V
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 30 A			18.6		nC
SWITCHING CHARACTERISTICS (Note 7)							
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			9.0		ns
Rise Time	t_r				34		
Turn−Off Delay Time	$t_{d(OFF)}$				14		
Fall Time	t_f				7.0		

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 7)							
Turn−On Delay Time	$t_{d(ON)}$	$V_{GS} = 10$ V, $V_{DS} = 15$ V, $I_D = 15$ A, $R_G = 3.0$ Ω			7.0		ns
Rise Time	t_r				26		
Turn−Off Delay Time	$t_{d(OFF)}$				18		
Fall Time	t_f				4.0		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	$V_{GS} = 0$ V, $I_S = 10$ A	$T_J = 25°C$		0.80	1.1	V
			$T_J = 125°C$		0.67		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0$ V, $dI_S/dt = 100$ A/μs, $I_S = 30$ A			26.7		ns
Charge Time	t_a				14.1		
Discharge Time	t_b				12.6		
Reverse Recovery Charge	Q_{RR}				13.7		nC

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.
6. Pulse Test: pulse width $\leq$ 300 μs, duty cycle $\leq$ 2%.
7. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS
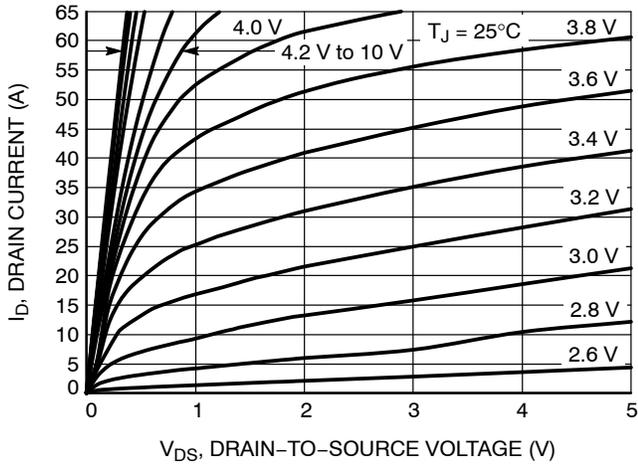
Figure 1. On−Region Characteristics
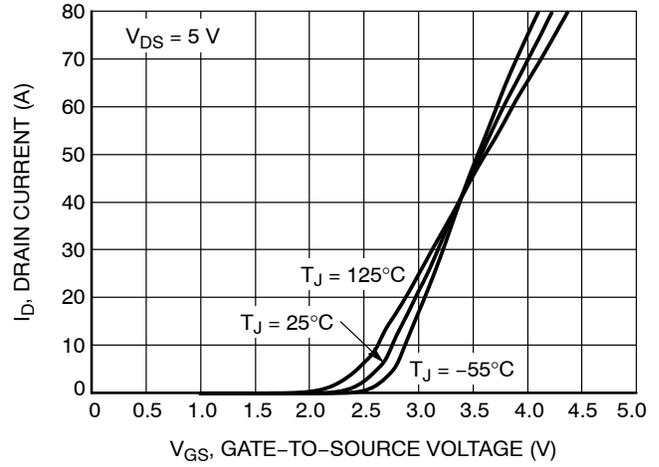
Figure 2. Transfer Characteristics
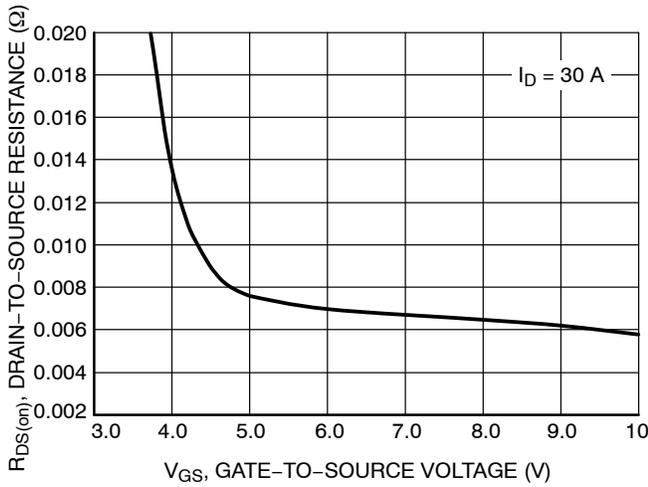
Figure 3. On−Resistance vs. V_{GS}
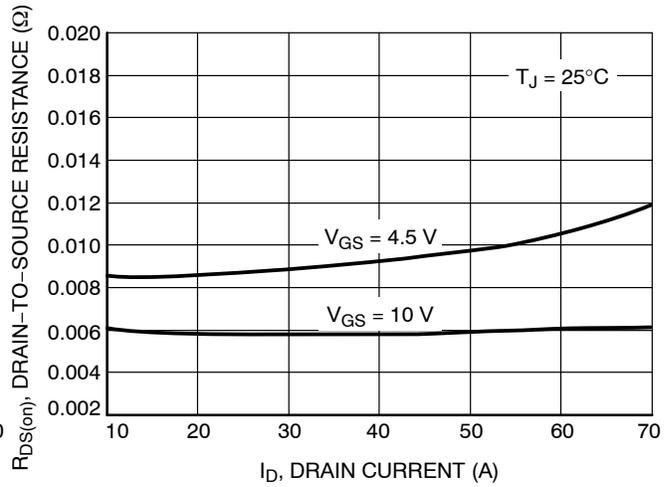
Figure 4. On−Resistance vs. Drain Current and Gate Voltage
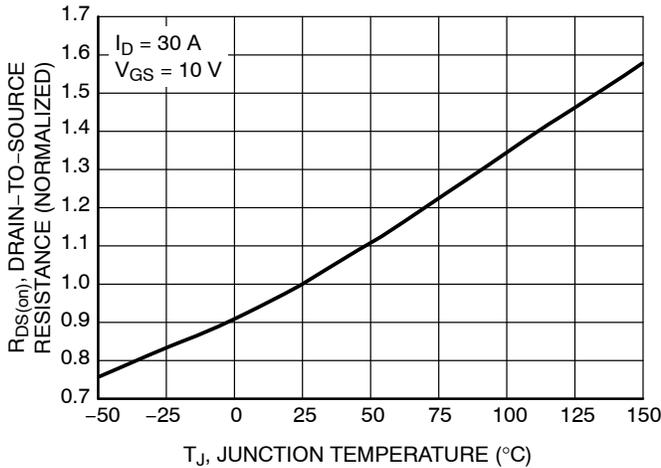
Figure 5. On−Resistance Variation with Temperature
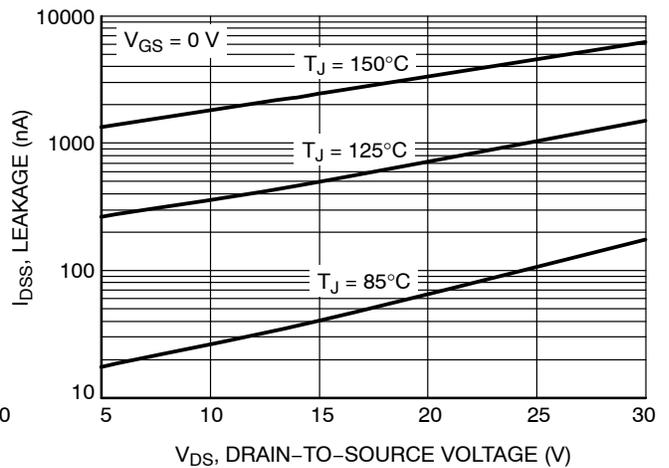
Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS
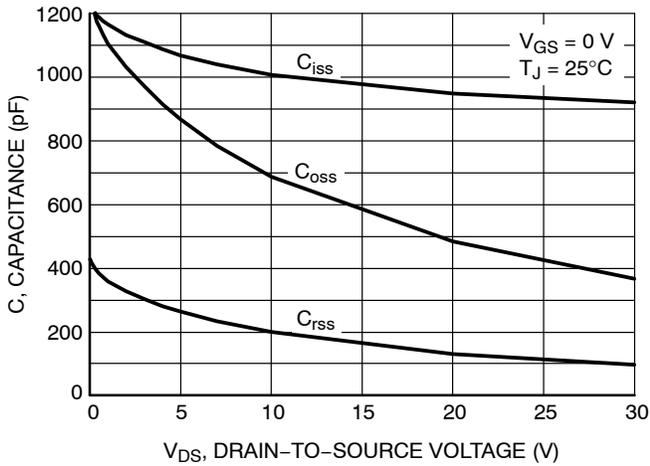
Figure 7. Capacitance Variation
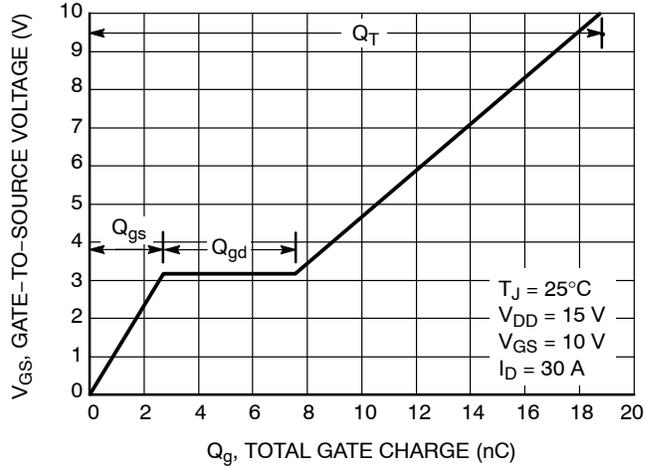
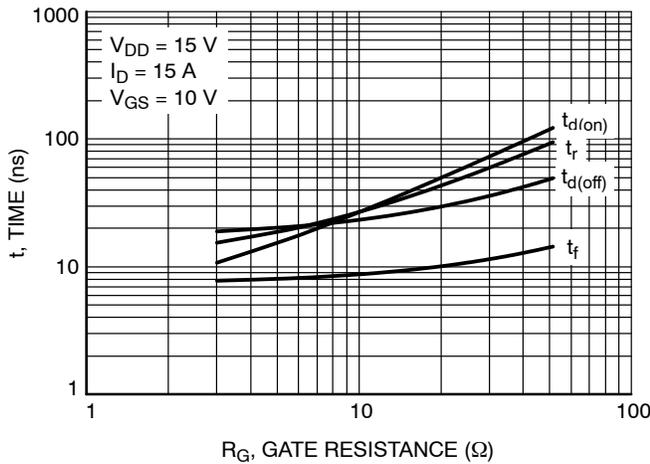**Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge**

Figure 9. Resistive Switching Time Variation vs. Gate Resistance
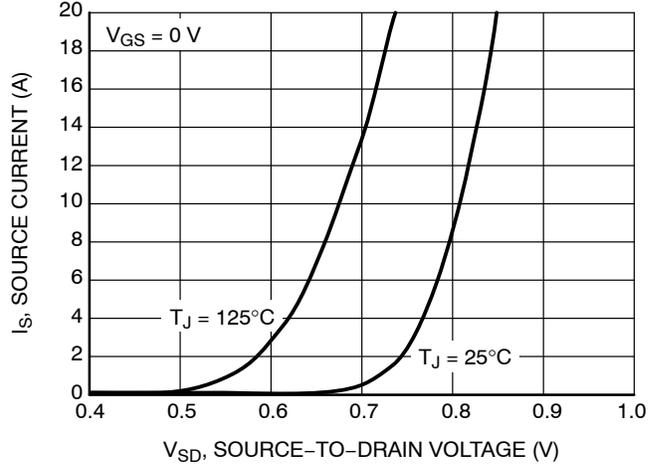
Figure 10. Diode Forward Voltage vs. Current
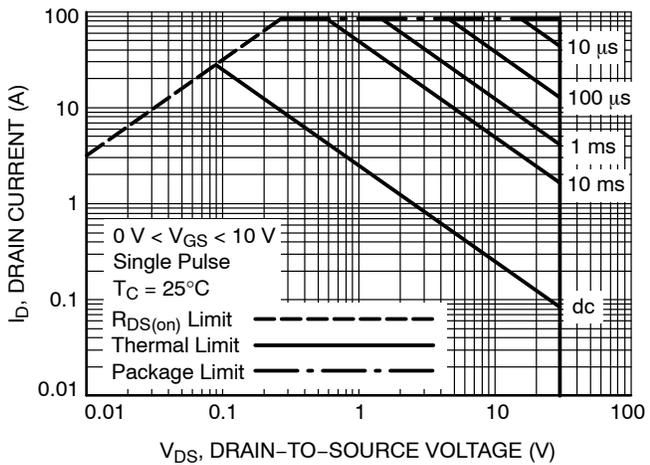
Figure 11. Maximum Rated Forward Biased Safe Operating Area
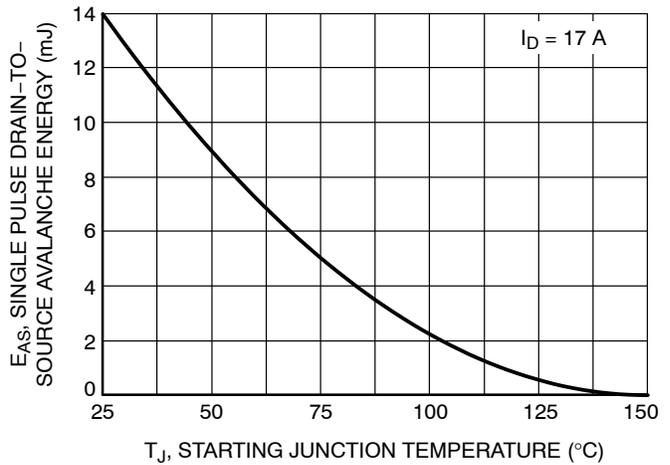
Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS
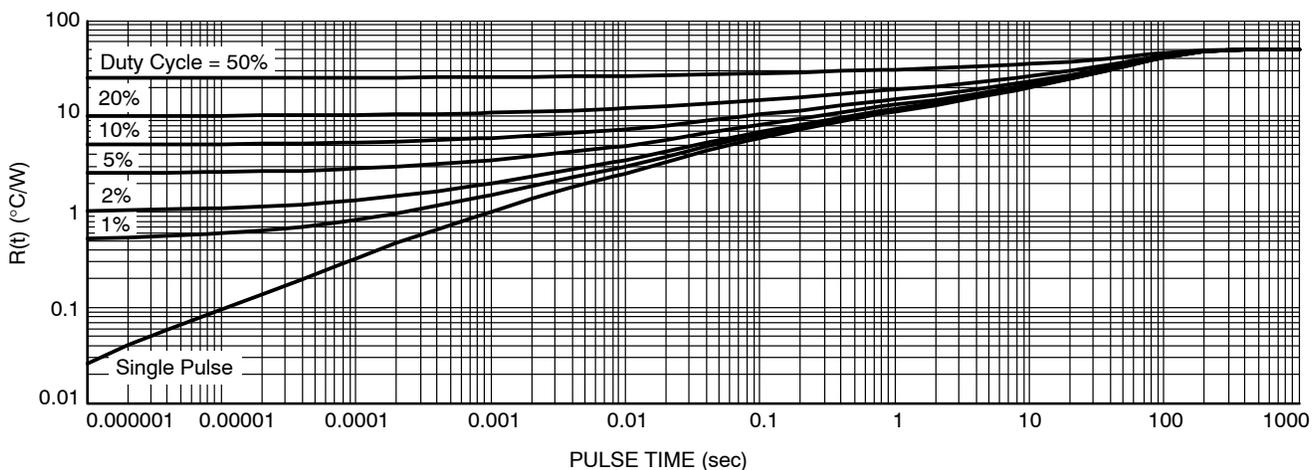
Figure 13. Thermal Response
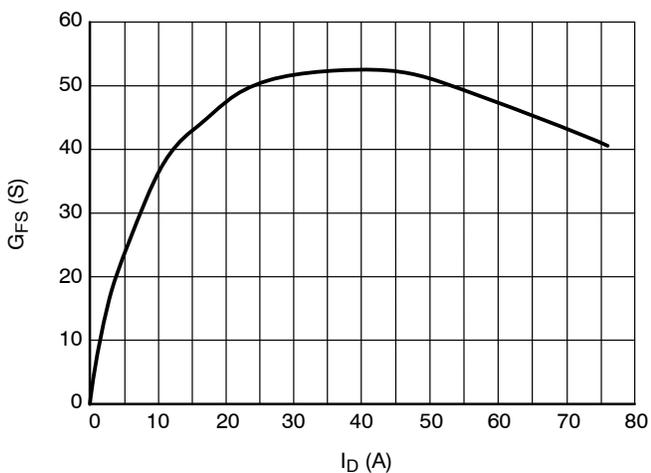
Figure 14. G$_{FS}$ vs. I$_D$
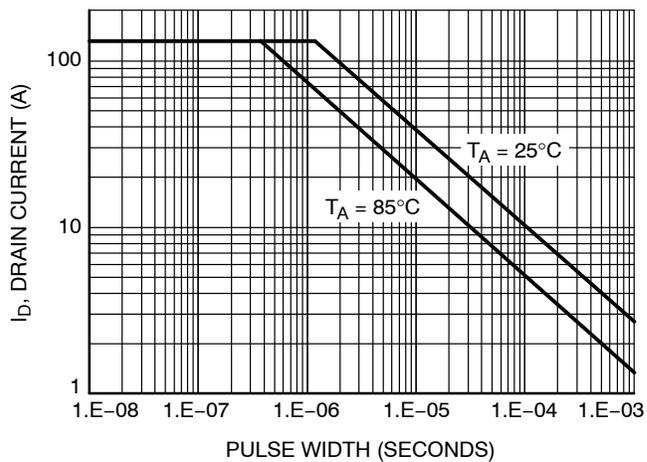
Figure 15. Avalanche Characteristics

NTMFS4C10N

PACKAGE DIMENSIONS

DFN5 5x6, 1.27P
(SO−8FL)
CASE 488AA
ISSUE M
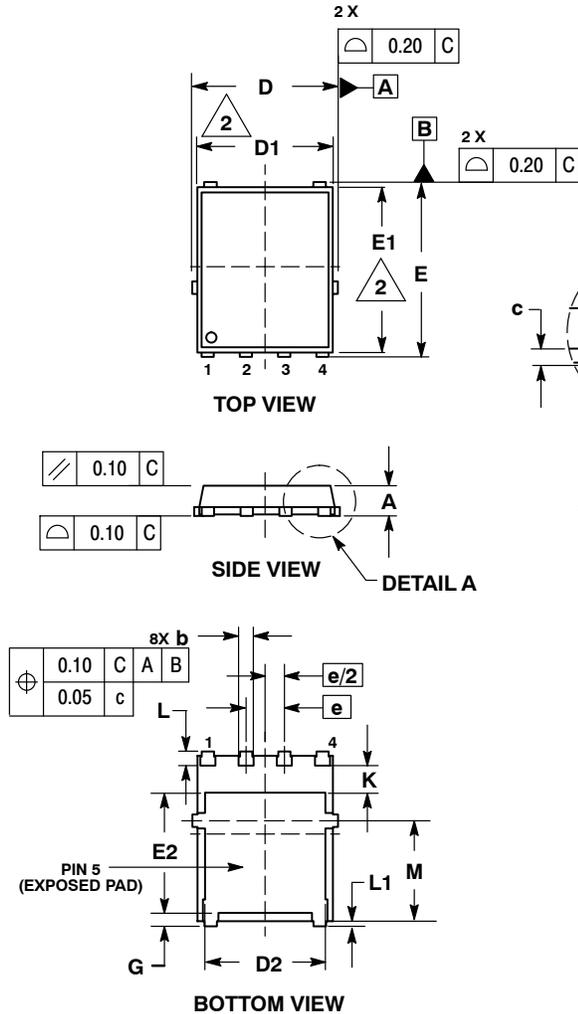
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

TOP VIEW

SIDE VIEW

DETAIL A

SEATING PLANE

BOTTOM VIEW

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	5.00	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 °

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

PIN 5 (EXPOSED PAD)

RECOMMENDED SOLDERING FOOTPRINT*

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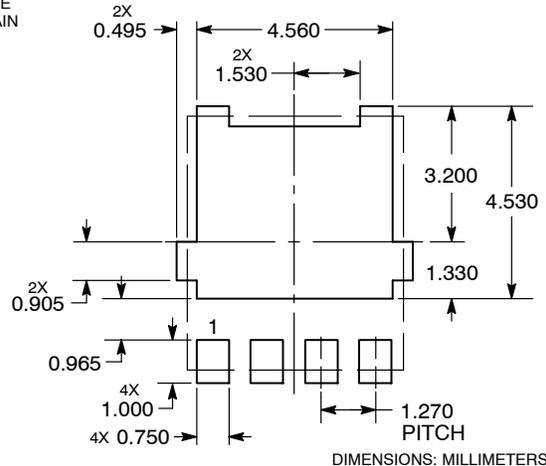
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

Mouser Electronics

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