

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

30 V, 80 A

NTMFS4C054N

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

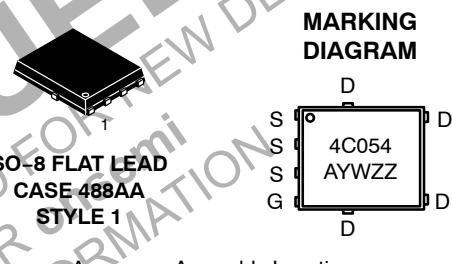
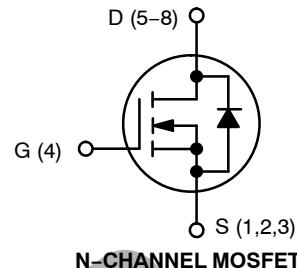
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	30	V
Gate-to-Source Voltage		V_{GS}	± 20	V
Steady State	$T_A = 25^\circ\text{C}$	I_D	22.5	A
	$T_A = 80^\circ\text{C}$	I_D	16.8	
	$T_A = 25^\circ\text{C}$	P_D	2.59	W
	$T_A = 25^\circ\text{C}$	I_D	36	A
	$T_A = 80^\circ\text{C}$	I_D	27	
	$T_A = 25^\circ\text{C}$	P_D	6.65	W
	$T_A = 25^\circ\text{C}$	I_D	12.4	A
	$T_A = 80^\circ\text{C}$	I_D	9.3	
	$T_A = 25^\circ\text{C}$	P_D	0.78	W
	$T_C = 25^\circ\text{C}$	I_D	80	A
Pulsed Drain Current	$T_C = 80^\circ\text{C}$	I_D	60	
	$T_C = 25^\circ\text{C}$	P_D	33	W
	$T_A = 25^\circ\text{C}$, $t_p = 10 \mu\text{s}$	I_{DM}	180	A
Current Limited by Package	$T_A = 25^\circ\text{C}$	I_{Dmax}	80	A
Operating Junction and Storage Temperature Range		T_J , T_{STG}	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)		I_S	30	A
Drain to Source dV/dt		dV/dt	7.0	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$, $I_L = 48 \text{ A}_{pk}$, $L = 0.1 \text{ mH}$, $R_{GS} = 25 \Omega$) (Note 3)		E_{AS}	115	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^\circ\text{C}$

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.
3. This is the absolute maximum ratings. Parts are 100% tested at $T_J = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$, $I_L = 29 \text{ A}$, $E_{AS} = 42 \text{ mJ}$.

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	2.54 m Ω @ 10 V	80 A
	3.56 m Ω @ 4.5 V	

**ORDERING INFORMATION**

Device	Package	Shipping [†]
NTMFS4C054NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4C054NT3G	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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3.8	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	48.3	
Junction-to-Ambient – Steady State (Note 5)	$R_{\theta JA}$	159.3	
Junction-to-Ambient – (t ≤ 10 s) (Note 4)	$R_{\theta JA}$	18.8	

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
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_{\text{D}} = 250 \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage (transient)	$V_{(\text{BR})\text{DSS}t}$	$V_{\text{GS}} = 0 \text{ V}, I_{\text{D}}(\text{aval}) = 13.2 \text{ A}, T_{\text{case}} = 25^{\circ}\text{C}, t_{\text{transient}} = 100 \text{ ns}$	34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$			12		$\text{mV}/^{\circ}\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 24 \text{ V}$	$T_J = 25^{\circ}\text{C}$		1.0	μA
			$T_J = 125^{\circ}\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 20 \text{ V}$			±100	nA

ON CHARACTERISTICS (Note 6)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_{\text{D}} = 250 \mu\text{A}$	1.3		2.2	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})}/T_J$			5.0		$\text{mV}/^{\circ}\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$	$I_{\text{D}} = 30 \text{ A}$		2.12	2.54
		$V_{\text{GS}} = 4.5 \text{ V}$	$I_{\text{D}} = 30 \text{ A}$		2.97	3.56
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 15 \text{ V}, I_{\text{D}} = 15 \text{ A}$		50		S
Gate Resistance	R_G	$T_A = 25^{\circ}\text{C}$		1.0		Ω

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{\text{GS}} = 0 \text{ V}, f = 1 \text{ MHz}, V_{\text{DS}} = 15 \text{ V}$		2300		pF
Output Capacitance	C_{OSS}			1097		
Reverse Transfer Capacitance	C_{RSS}			46		
Capacitance Ratio	$C_{\text{RSS}}/C_{\text{ISS}}$	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 15 \text{ V}, f = 1 \text{ MHz}$		0.02		nC
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$			15		
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			3.3		
Gate-to-Source Charge	Q_{GS}			6.5		
Gate-to-Drain Charge	Q_{GD}			5.5		
Gate Plateau Voltage	V_{GP}			3.1		V
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 15 \text{ V}; I_{\text{D}} = 30 \text{ A}$		32.5		nC

SWITCHING CHARACTERISTICS (Note 7)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 4.5 \text{ V}, V_{\text{DS}} = 15 \text{ V}, I_{\text{D}} = 15 \text{ A}, R_G = 3.0 \Omega$		12.6		ns
Rise Time	t_r			33		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			21.4		
Fall Time	t_f			6.7		

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

NTMFS4C054N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS (Note 7)

Turn-On Delay Time	$t_{d(\text{ON})}$	$V_{GS} = 10 \text{ V}, V_{DS} = 15 \text{ V}, I_D = 15 \text{ A}, R_G = 3.0 \Omega$	8.7		ns
Rise Time	t_r		26		
Turn-Off Delay Time	$t_{d(\text{OFF})}$		28		
Fall Time	t_f		4.4		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0 \text{ V}, I_S = 10 \text{ A}$	$T_J = 25^\circ\text{C}$	0.8	1.1	V
			$T_J = 125^\circ\text{C}$	0.62		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0 \text{ V}, dI_S/dt = 100 \text{ A}/\mu\text{s}, I_S = 30 \text{ A}$		41		ns
Charge Time	t_a			21		
Discharge Time	t_b			20		
Reverse Recovery Charge	Q_{RR}			30		nC

6. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

7. 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.

DISCONTINUED
 THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN
 PLEASE CONTACT YOUR onsemi
 REPRESENTATIVE FOR INFORMATION

TYPICAL CHARACTERISTICS

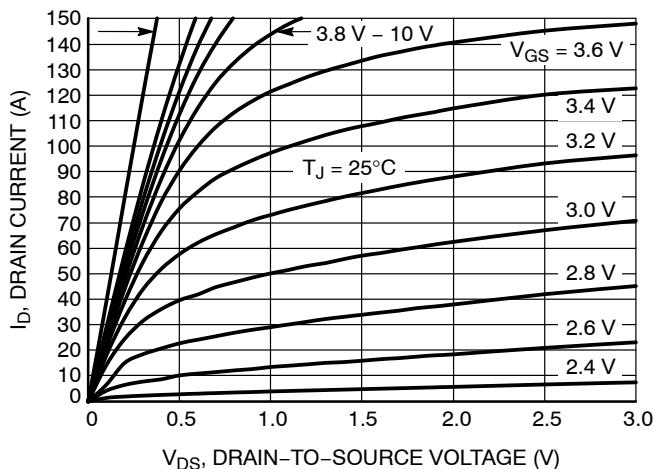


Figure 1. On-Region Characteristics

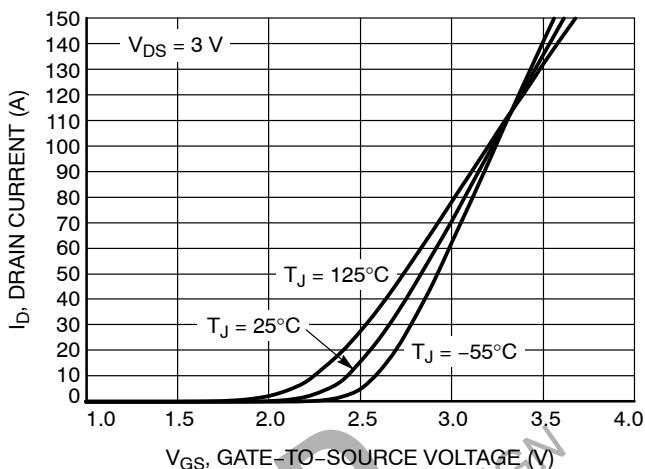


Figure 2. Transfer Characteristics

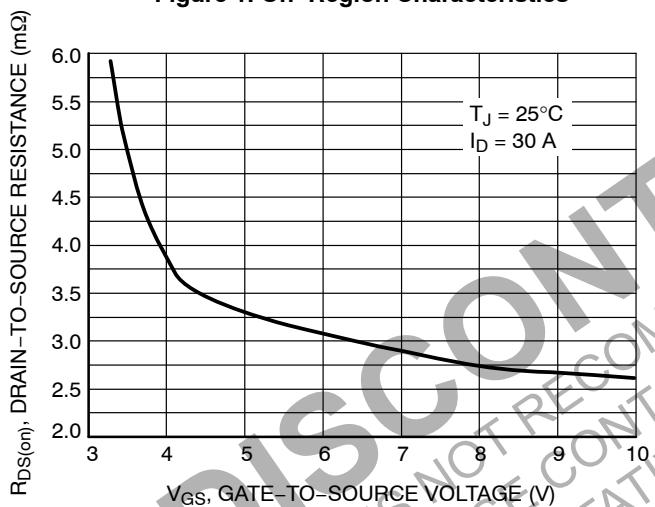
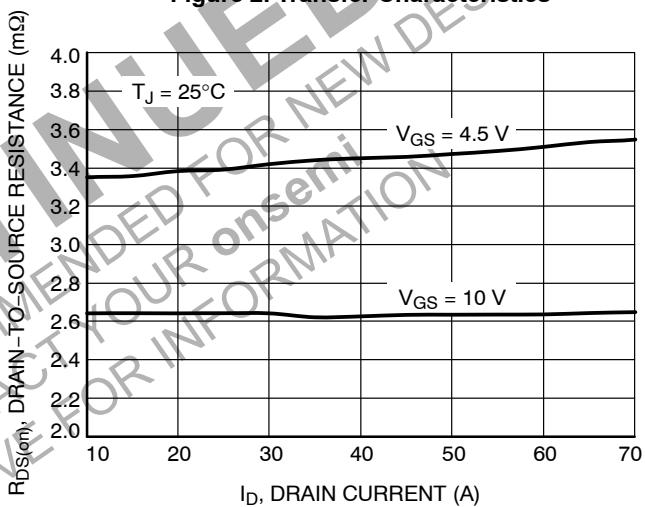
Figure 3. On-Resistance vs. V_{GS}

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

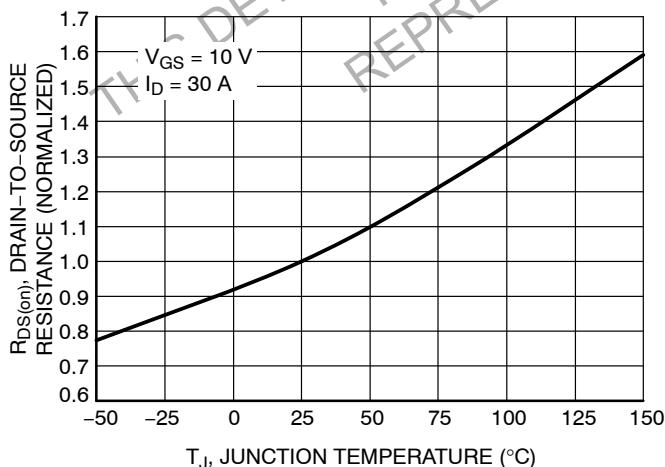


Figure 5. On-Resistance Variation with Temperature

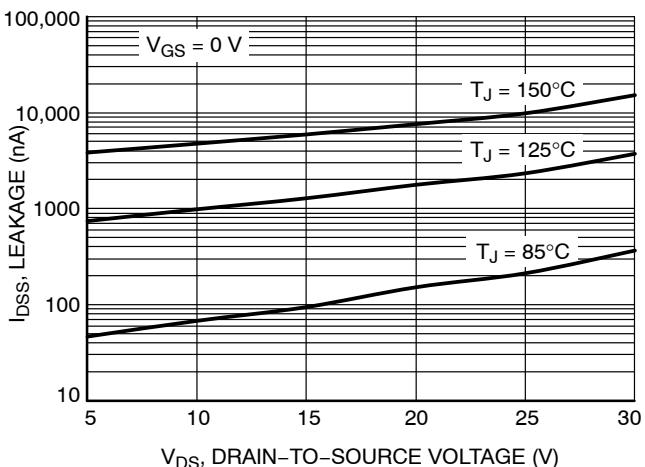


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

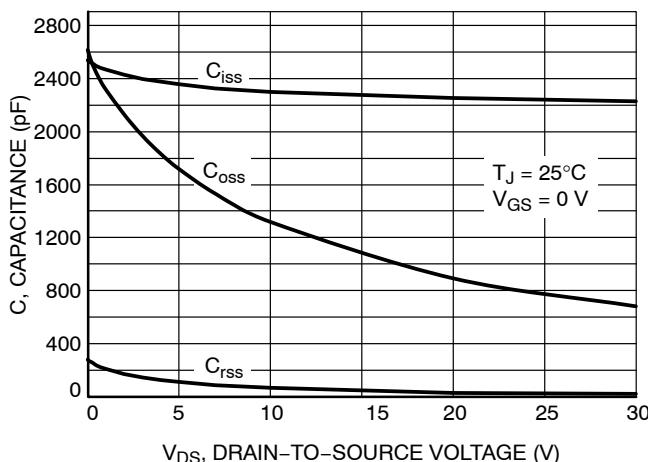


Figure 7. Capacitance Variation

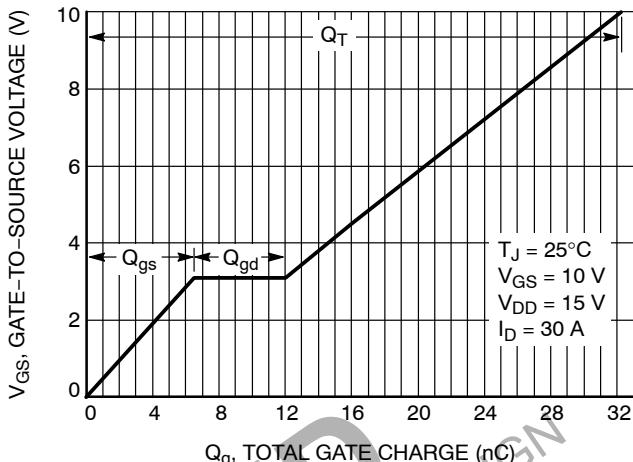


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

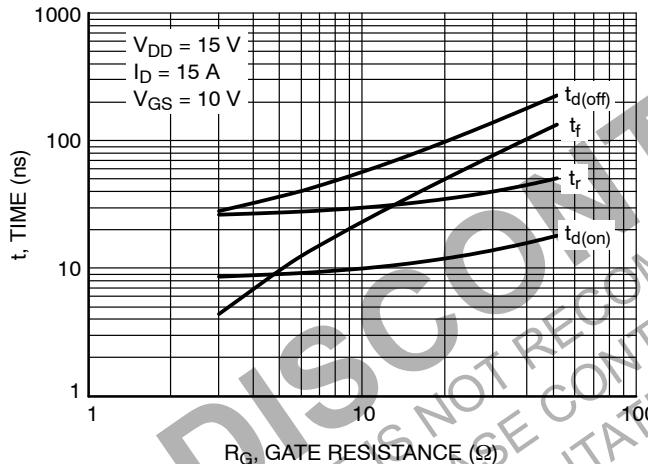


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

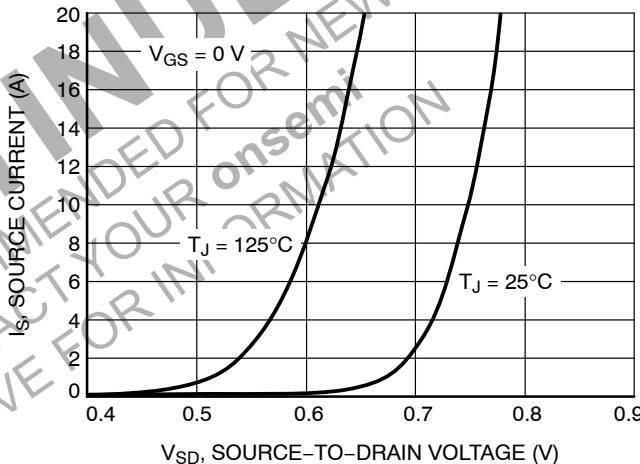


Figure 10. Diode Forward Voltage vs. Current

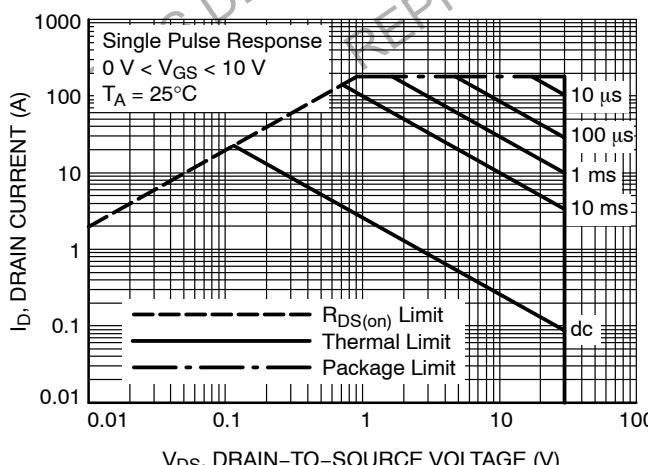


Figure 11. Maximum Rated Forward Biased Safe Operating Area

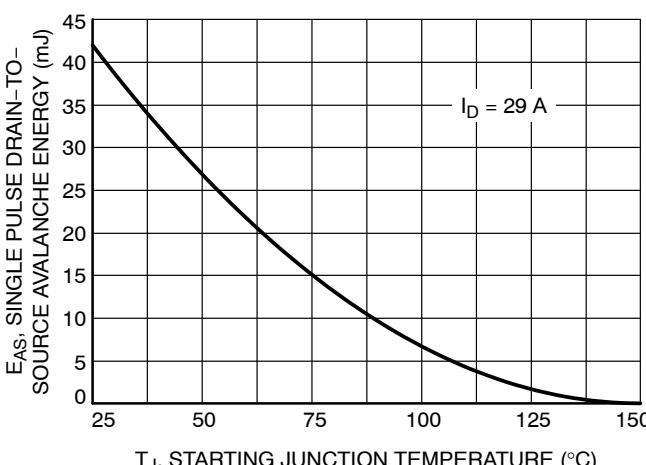
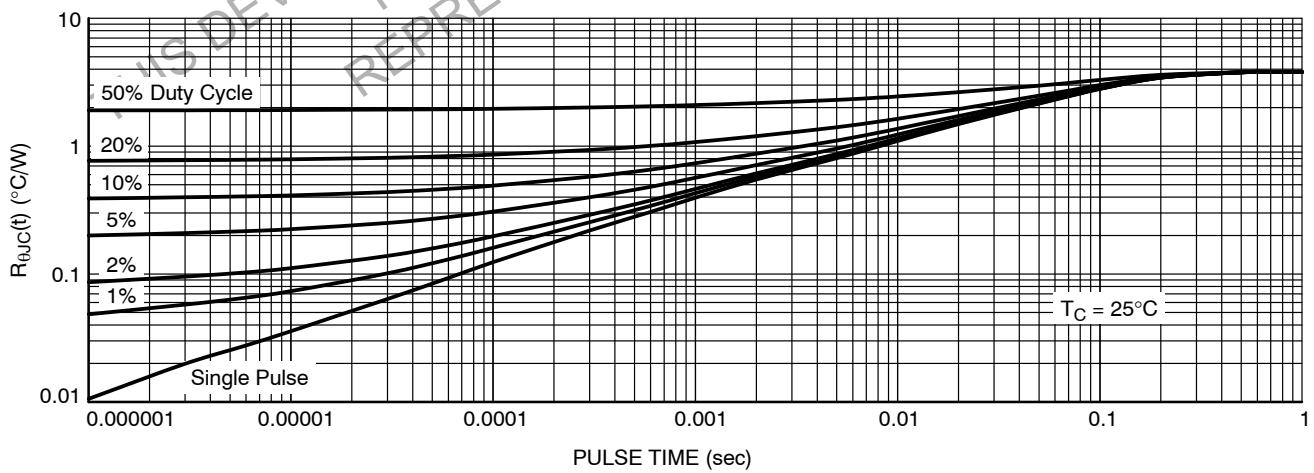
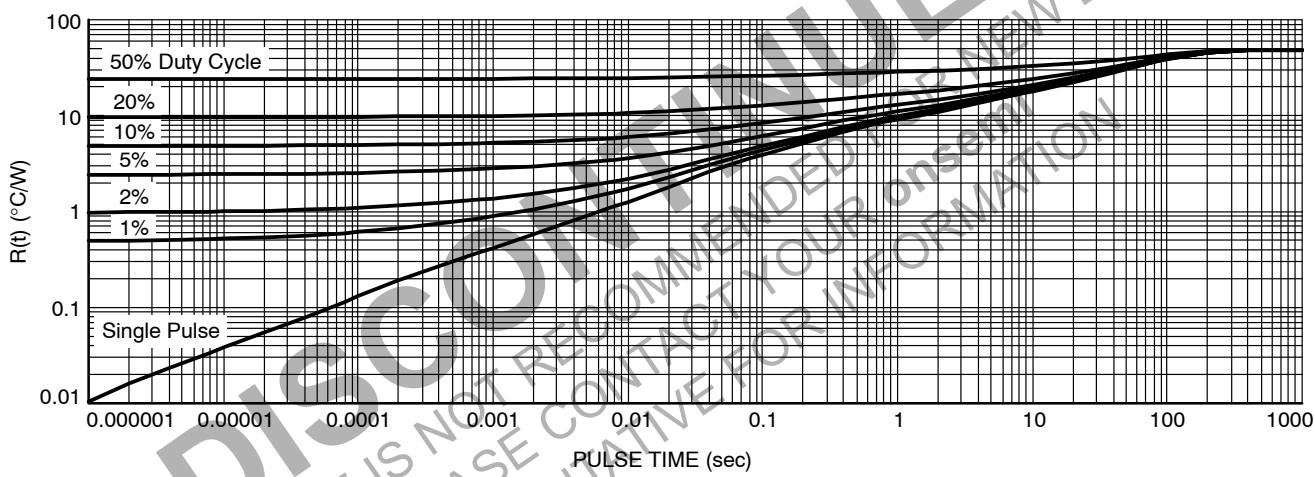
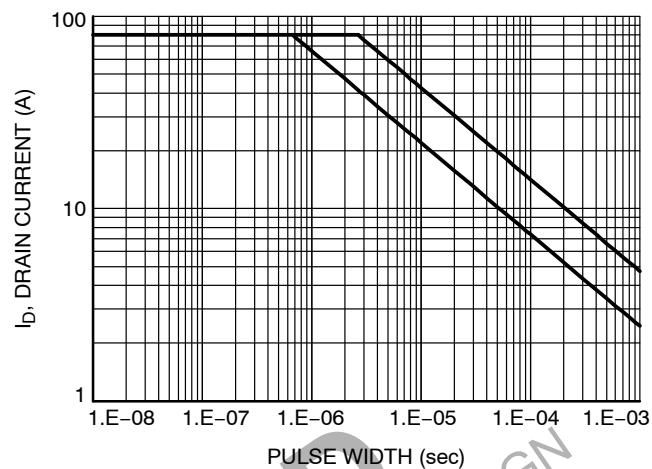
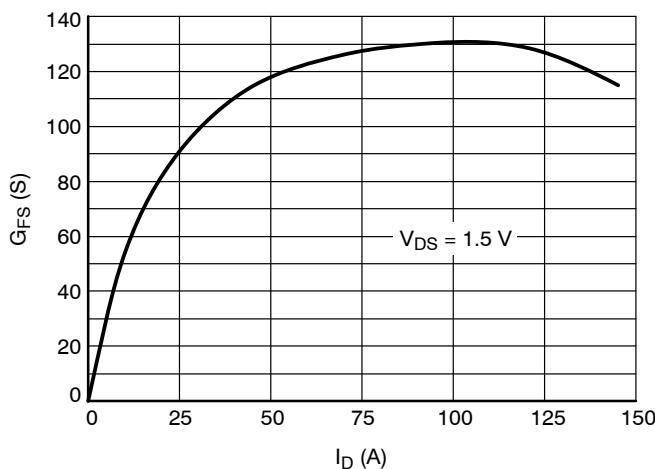
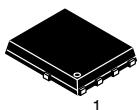


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS





SCALE 2:1

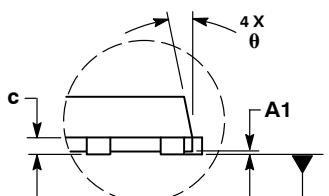
DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE N

DATE 25 JUN 2018

NOTES:

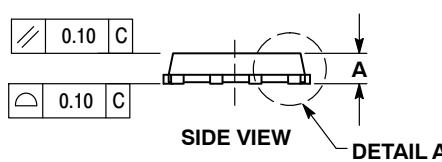
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

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 °

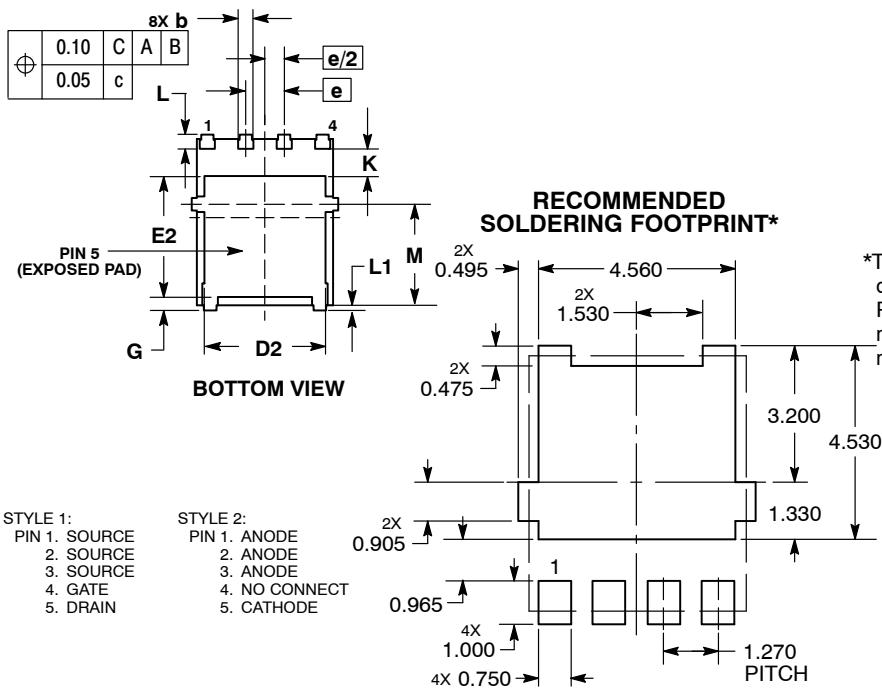


DETAIL A

SEATING PLANE



DETAIL A



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

DIMENSIONS: MILLIMETERS

*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.

*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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