

# NTMFS4825NFE

## Power MOSFET 30 V, 171 A, Single N-Channel, SO-8 FL

### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Includes Schottky Diode
- Optimized Gate Charge to Minimize Switching Losses
- Dual Sided Cooling Capability
- These are Pb-Free Device

### Applications

- CPU Power Delivery
- DC-DC Converters
- Low Side Switching

**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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	$I_D$	29	A
		21	
Power Dissipation $R_{\theta JA}$ (Note 1)	$P_D$	2.74	W
Continuous Drain Current $R_{\theta JA} \leq 10$ sec	$I_D$	47	A
		34	
Power Dissipation $R_{\theta JA}, t \leq 10$ sec	$P_D$	7.3	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)	$I_D$	17	A
		12	
Power Dissipation $R_{\theta JA}$ (Note 2)	$P_D$	0.95	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)	$I_D$	171	A
		123	
Power Dissipation $R_{\theta JC}$ (Note 1)	$P_D$	96.2	W
Pulsed Drain Current	$I_{DM}$	288	A
Current limited by package	$I_{Dmaxpkg}$	100	A
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-40 to +150	$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	120	A
Drain to Source dV/dt	dV/dt	6	V/ns
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 50$ V, $V_{GS} = 10$ V, $I_L = 50$ A <sub>pk</sub> , $L = 0.3$ mH, $R_G = 25$ $\Omega$ )	EAS	375	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.

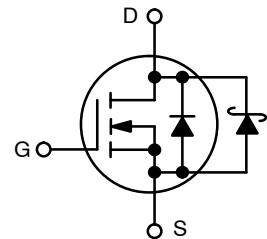


**ON Semiconductor®**

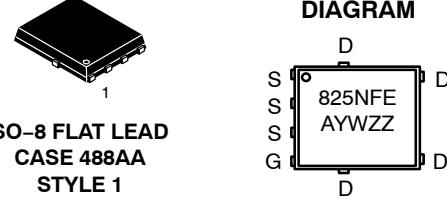
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON) \text{ MAX}}$	$I_D \text{ MAX}$
30 V	2.0 m $\Omega$ @ 10 V	171 A
	3.0 m $\Omega$ @ 4.5 V	140 A

### N-CHANNEL MOSFET



### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTMFS4825NFET1G	SO-8FL (Pb-Free)	1500 / Tape & Reel
NTMFS4825NFET3G	SO-8FL (Pb-Free)	5000 / Tape & Reel

<sup>†</sup>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)	$R_{\theta JC}$	1.3	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	45.7	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	132.1	
Junction-to-Ambient – $t \leq 10$ sec	$R_{\theta JA}$	17.2	
Junction-to-Top	$R_{\theta JT}$	7.0	

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.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>							
Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0$ V	$I_D = 1.0$ mA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$				28.5		$\text{mV}/^{\circ}\text{C}$
Zero Gate Voltage Drain Current	$I_{\text{DSS}}$	$V_{\text{GS}} = 0$ V	$T_J = 25$ $^{\circ}\text{C}$		60	500	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{\text{GSS}}$	$V_{\text{DS}} = 0$ V	$V_{\text{GS}} = \pm 20$ V			$\pm 100$	nA

## ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}$ , $I_D = 1.0$ mA	1.5	2.0	2.5	V	
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})}/T_J$			4		$\text{mV}/^{\circ}\text{C}$	
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10$ V	$I_D = 22$ A		1.3	2.0	$\text{m}\Omega$
			$I_D = 20$ A		1.3		
		$V_{\text{GS}} = 4.5$ V	$I_D = 20$ A		2.0	3.0	
			$I_D = 18$ A		2.0		
Forward Transconductance	$g_{\text{FS}}$	$V_{\text{DS}} = 15$ V	$I_D = 15$ A		90		S

## CHARGES AND CAPACITANCES

Input Capacitance	$C_{\text{ISS}}$	$V_{\text{GS}} = 0$ V, $f = 1$ MHz, $V_{\text{DS}} = 15$ V		5660		pF
Output Capacitance	$C_{\text{OSS}}$			1150		
Reverse Transfer Capacitance	$C_{\text{RSS}}$			495		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 4.5$ V, $V_{\text{DS}} = 15$ V; $I_D = 23$ A		40.2		nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			6.4		
Gate-to-Source Charge	$Q_{\text{GS}}$			15.3		
Gate-to-Drain Charge	$Q_{\text{GD}}$			13.4		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 10$ V, $V_{\text{DS}} = 15$ V, $I_D = 23$ A		83.6		nC

## SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 4.5$ V, $V_{\text{DS}} = 15$ V, $I_D = 15$ A, $R_{\text{G}} = 3.0$ $\Omega$		26		ns
Rise Time	$t_r$			24		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			36		
Fall Time	$t_f$			13		

3. Pulse Test: pulse width  $\leq 300$   $\mu\text{s}$ , duty cycle  $\leq 2\%$ .
4. Switching characteristics are independent of operating junction temperatures.

# NTMFS4825NFE

## 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 4)

Turn-On Delay Time	$t_{d(\text{ON})}$	$V_{GS} = 10 \text{ V}$ , $V_{DS} = 15 \text{ V}$ , $I_D = 15 \text{ A}$ , $R_G = 3.0 \Omega$	15.7		ns
Rise Time	$t_r$		21.2		
Turn-Off Delay Time	$t_{d(\text{OFF})}$		44.6		
Fall Time	$t_f$		14.5		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0 \text{ V}$ , $I_S = 2.0 \text{ A}$	$T_J = 25^\circ\text{C}$		0.35	0.70	V
			$T_J = 125^\circ\text{C}$		0.26		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0 \text{ V}$ , $dI_S/dt = 100 \text{ A}/\mu\text{s}$ , $I_S = 23 \text{ A}$		39.1		ns	
Charge Time	$t_a$			20.1			
Discharge Time	$t_b$			19			
Reverse Recovery Charge	$Q_{RR}$			34		nC	

### PACKAGE PARASITIC VALUES

Source Inductance	$L_S$	$T_A = 25^\circ\text{C}$		0.66		nH
Drain Inductance	$L_D$			0.20		
Gate Inductance	$L_G$			1.5		
Gate Resistance	$R_G$			0.7	2.0	$\Omega$

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

4. Switching characteristics are independent of operating junction temperatures.

## TYPICAL PERFORMANCE CURVES

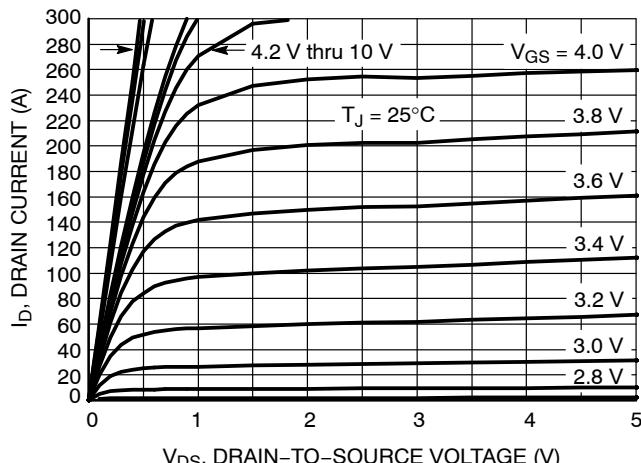


Figure 1. On-Region Characteristics

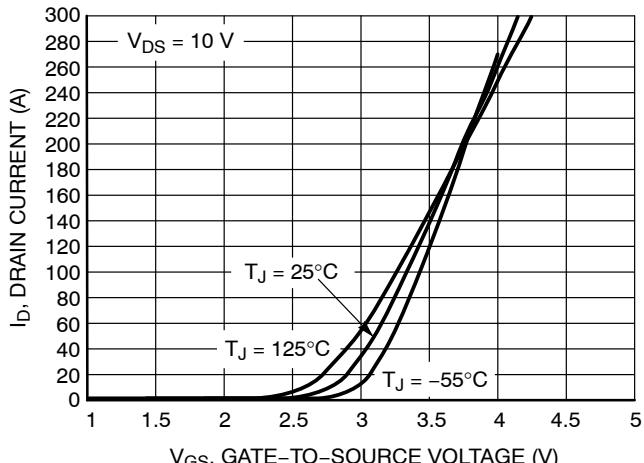


Figure 2. Transfer Characteristics

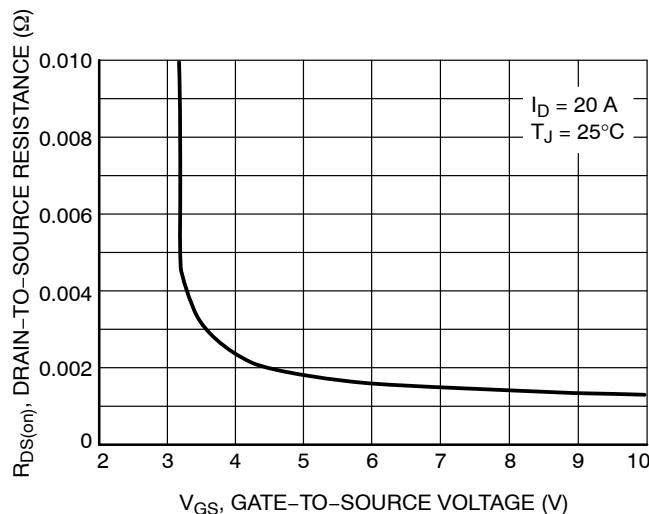


Figure 3. On-Resistance vs. Gate-to-Source Voltage

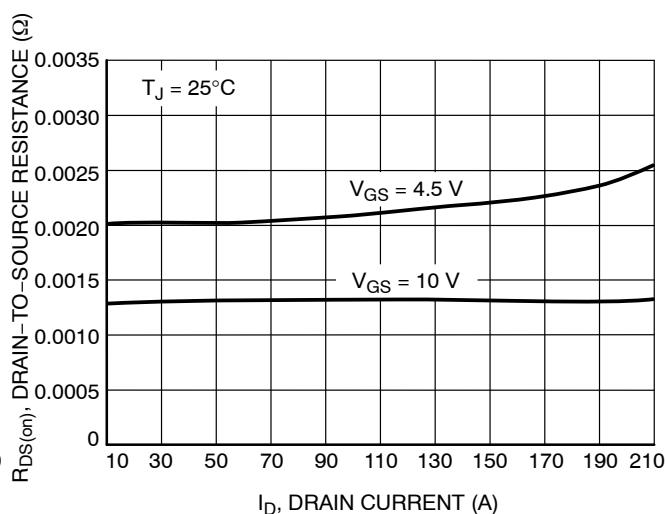


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

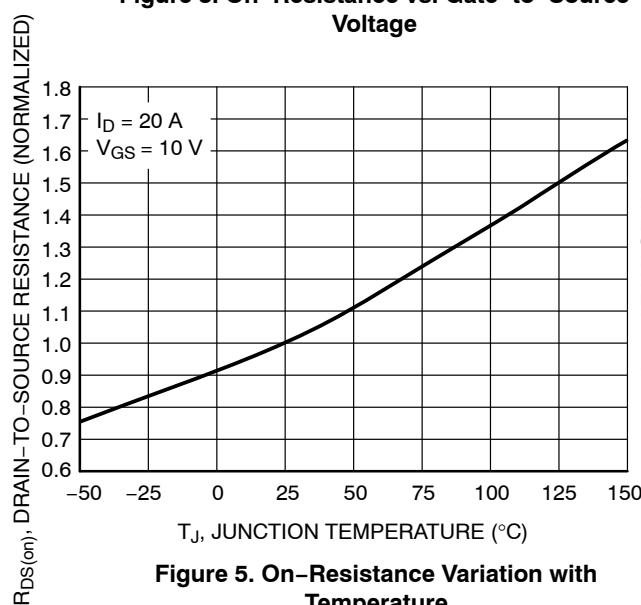


Figure 5. On-Resistance Variation with Temperature

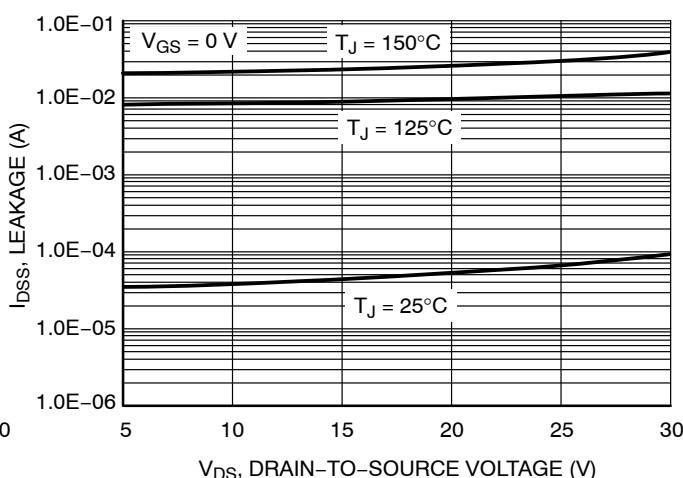


Figure 6. Drain-to-Source Leakage Current vs. Voltage

## TYPICAL PERFORMANCE CURVES

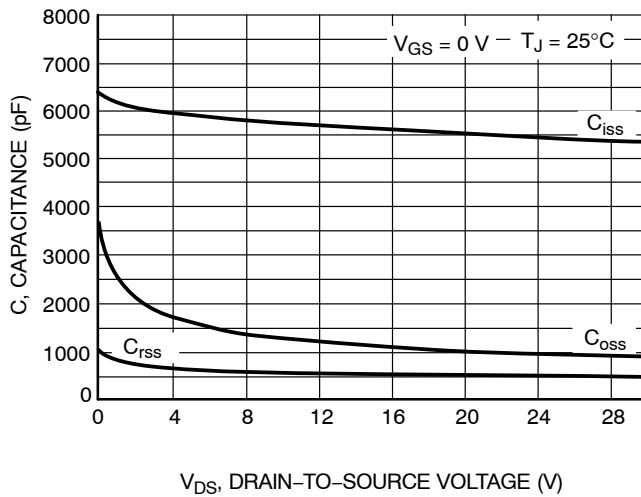


Figure 7. Capacitance Variation

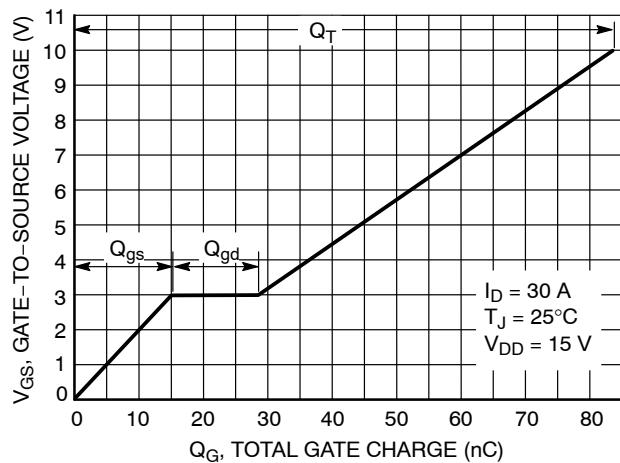


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

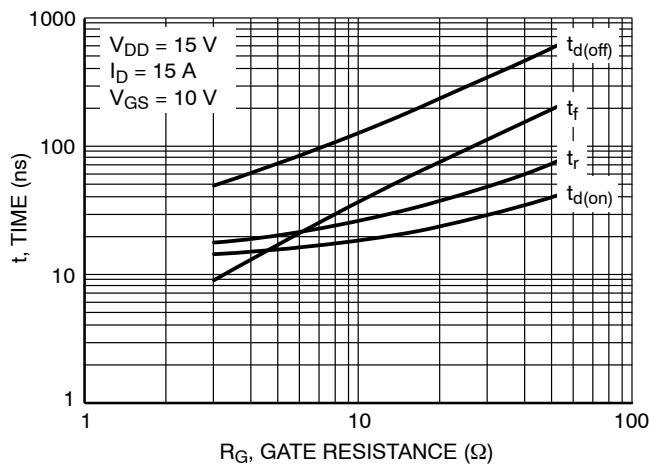


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

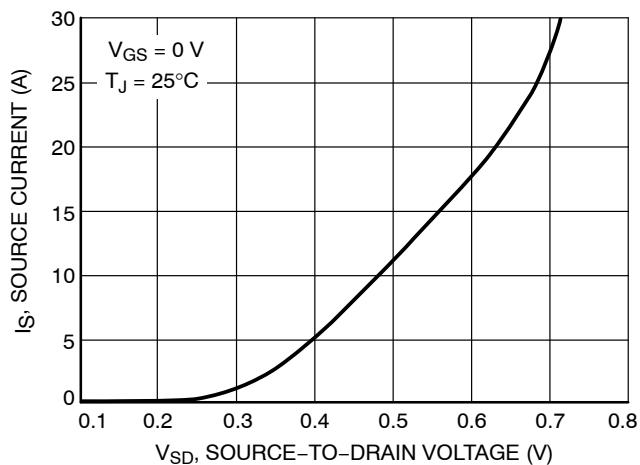


Figure 10. Diode Forward Voltage vs. Current

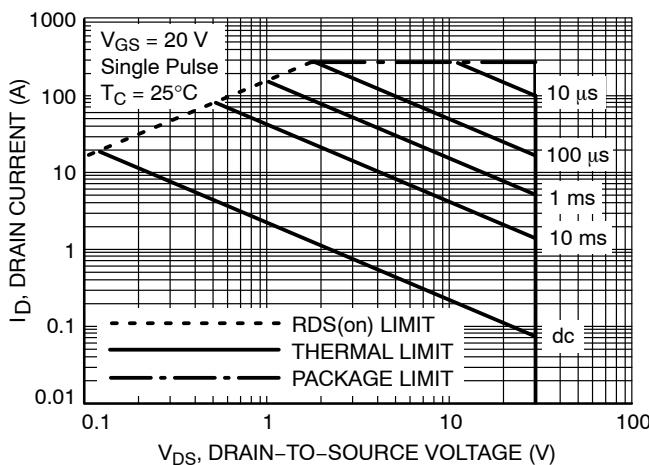


Figure 11. Maximum Rated Forward Biased Safe Operating Area

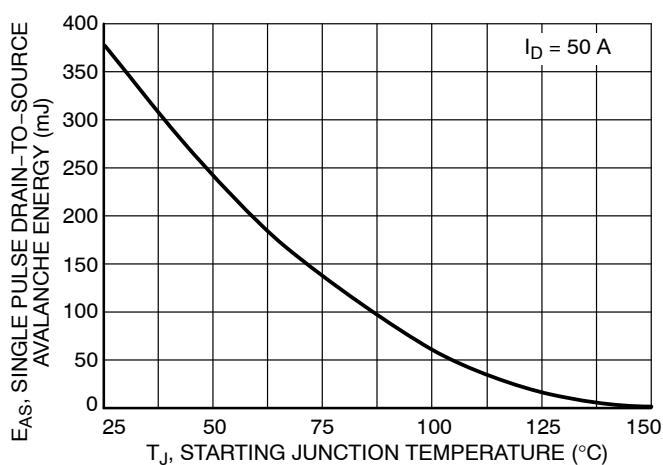
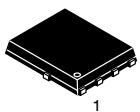


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature



SCALE 2:1

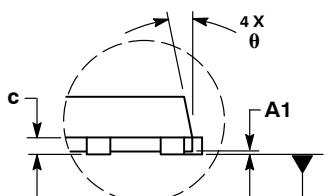
DFN5 5x6, 1.27P  
(SO-8FL)  
CASE 488AA  
ISSUE N

DATE 25 JUN 2018

## NOTES:

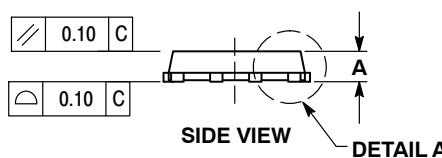
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

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 °

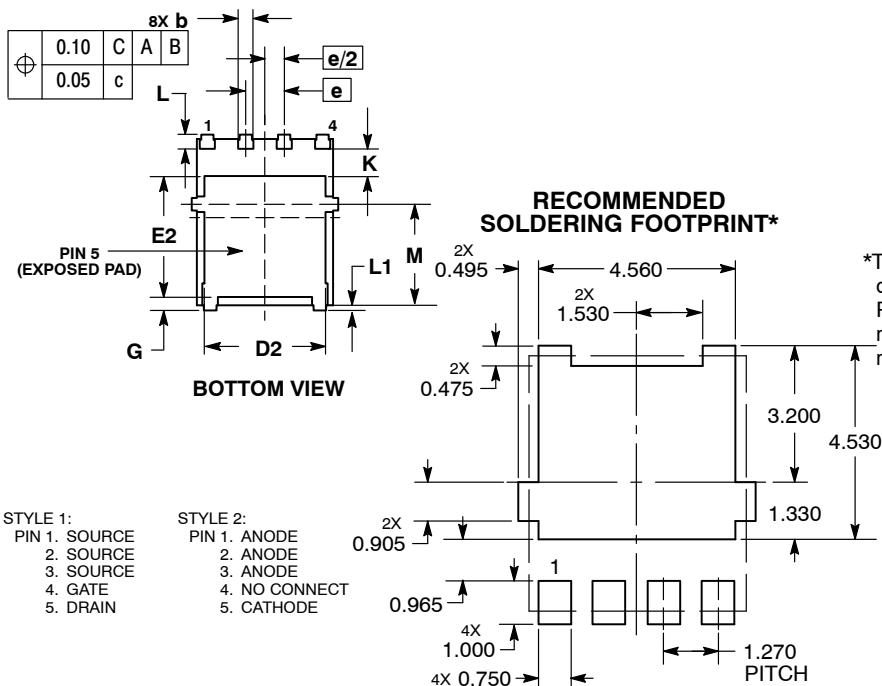


DETAIL A

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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