

# NVMFD5875NL

## Product Preview

### Power MOSFET

60 V, 33 mΩ, 22 A, Dual N-Channel, Logic Level, Dual SO8FL

#### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVMFD5875NLWF – Wettable Flanks Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	60	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V	
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3, 4)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$ 22	A
		$T_C = 100^\circ\text{C}$	15	
Power Dissipation $R_{\theta JC}$ (Notes 1, 2, 3)	Steady State	$T_C = 25^\circ\text{C}$	$P_D$ 32	W
		$T_C = 100^\circ\text{C}$	16	
Continuous Drain Current $R_{\theta JA}$ (Notes 1 & 3, 4)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$ 7	A
		$T_A = 100^\circ\text{C}$	5.8	
Power Dissipation $R_{\theta JA}$ (Notes 1, 3)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$ 3.2	W
		$T_A = 100^\circ\text{C}$	2.2	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$ 80	A	
Operating Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)	$I_S$	19	A	
Single Pulse Drain-to-Source Avalanche Energy ( $T_J = 25^\circ\text{C}$ , $V_{DD} = 24 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 25 \Omega$ )		$(I_{L(pk)} = 14.5 \text{ A}, L = 0.1 \text{ mH})$	$E_{AS}$ 10.5	mJ
		$(I_{L(pk)} = 6.3 \text{ A}, L = 2 \text{ mH})$	40	
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.

#### THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 2, 3)	$R_{\theta JC}$	4.65	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	47	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Psi ( $\Psi$ ) is used as required per JESD51-12 for packages in which substantially less than 100% of the heat flows to single case surface.
3. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.
4. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

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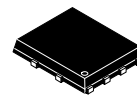
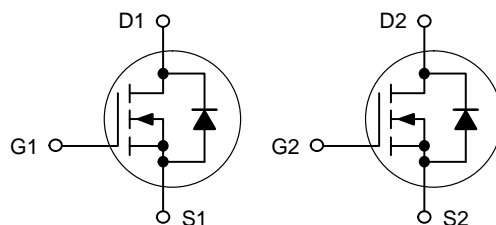


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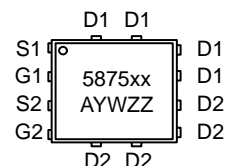
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
60 V	33 mΩ @ 10 V	22 A
	45 mΩ @ 4.5 V	

#### Dual N-Channel



DFN8 5x6 (SO8FL) CASE 506BT

#### MARKING DIAGRAM



5875NL = Specific Device Code for NVMFD5875NL

5875LW = Specific Device Code for NVMFD5875NLWF

A = Assembly Location

Y = Year

W = Work Week

ZZ = Lot Traceability

#### ORDERING INFORMATION

Device	Package	Shipping†
NVMFD5875NLT1G	DFN8 (Pb-Free)	1500 / Tape & Reel
NVMFD5875NLWFT1G	DFN8 (Pb-Free)	1500 / Tape & Reel
NVMFD5875NLT3G	DFN8 (Pb-Free)	5000 / Tape & Reel
NVMFD5875NLWFT3G	DFN8 (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 Specification Brochure, BRD8011/D.

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			53		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 60 V			1.0	μA
					10	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

## ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.0		3.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			3.5		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 7.5 A		27	33	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 7.5 A		37	45	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 5.0 A		7.0		S

## CHARGES AND CAPACITANCES

Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 25 V		540		pF
Output Capacitance	C <sub>oss</sub>			55		
Reverse Transfer Capacitance	C <sub>rss</sub>			36		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 48 V, I <sub>D</sub> = 5.0 A		5.9		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.62		
Gate-to-Source Charge	Q <sub>GS</sub>			1.64		
Gate-to-Drain Charge	Q <sub>GD</sub>			2.80		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 48V, I <sub>D</sub> = 5.0A		11	20	nC

## SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 48 V, I <sub>D</sub> = 5.0 A, R <sub>G</sub> = 2.5 Ω		8.1		ns
Rise Time	t <sub>r</sub>			15.8		
Turn-Off Delay Time	t <sub>d(off)</sub>			11.8		
Fall Time	t <sub>f</sub>			3.9		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 48 V, I <sub>D</sub> = 5.0 A, R <sub>G</sub> = 2.5 Ω		4.9		ns
Rise Time	t <sub>r</sub>			6.4		
Turn-Off Delay Time	t <sub>d(off)</sub>			14.5		
Fall Time	t <sub>f</sub>			2.4		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 5.0 A	T <sub>J</sub> = 25°C	0.8	1.2	V
			T <sub>J</sub> = 125°C	0.7		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 5.0 A		14.5		ns
Charge Time	t <sub>a</sub>			11.5		
Discharge Time	t <sub>b</sub>			3.1		
Reverse Recovery Charge	Q <sub>RR</sub>			11		

## PACKAGE PARASITIC VALUES

Source Inductance	L <sub>S</sub>	T <sub>A</sub> = 25°C		0.93		nH
Drain Inductance	L <sub>D</sub>			0.005		
Gate Inductance	L <sub>G</sub>			1.84		
Gate Resistance	R <sub>G</sub>			1.5		

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

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

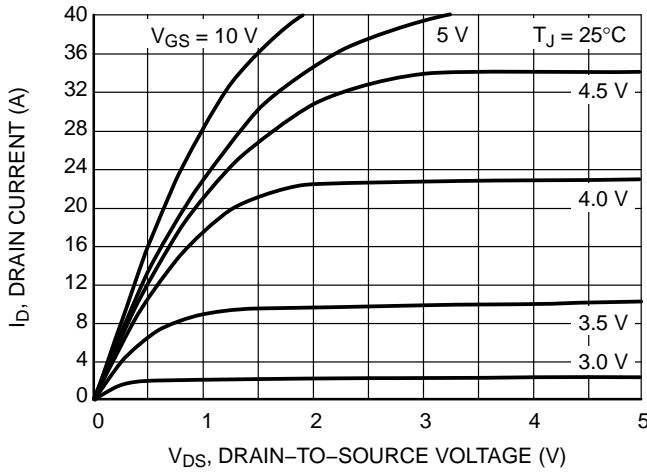


Figure 1. On-Region Characteristics

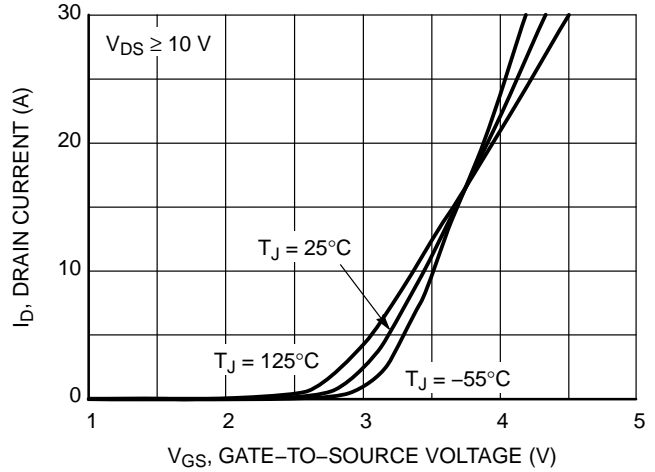


Figure 2. Transfer Characteristics

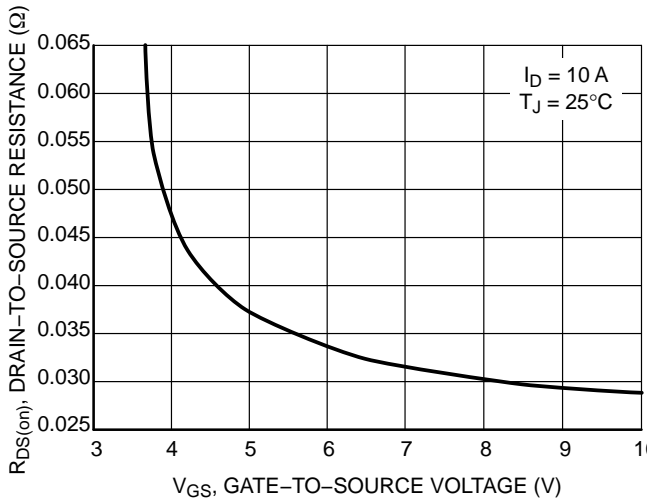


Figure 3. On-Resistance vs. Gate-to-Source Voltage

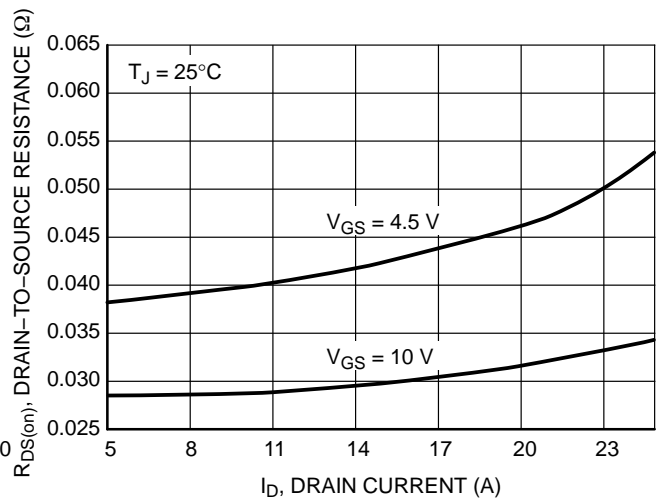


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

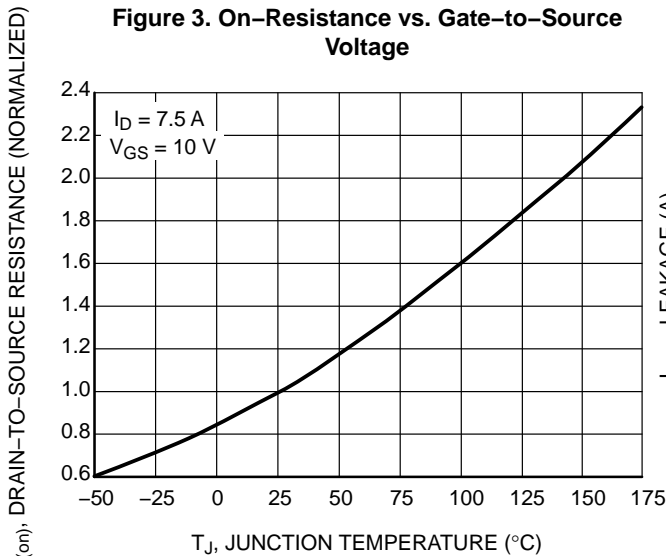


Figure 5. On-Resistance Variation with Temperature

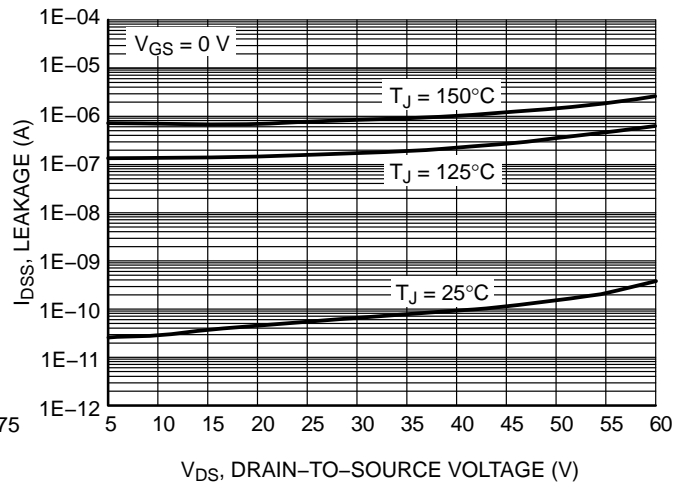


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

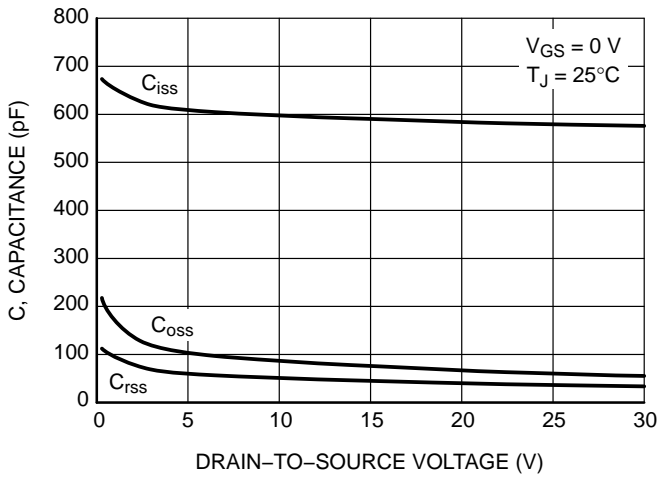


Figure 7. Capacitance Variation

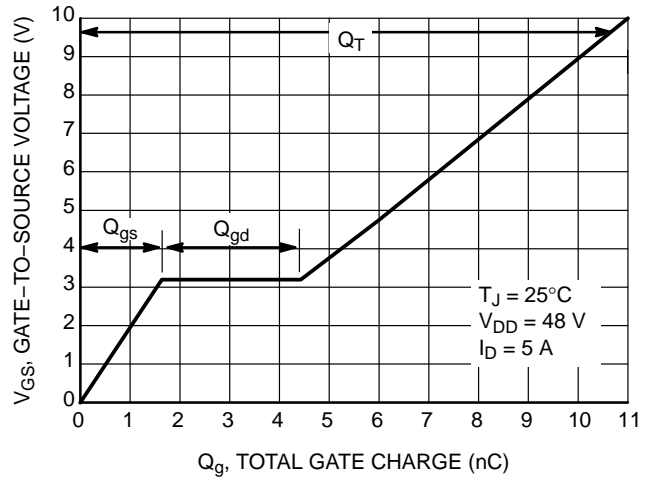


Figure 8. Gate-to-Source vs. Gate Charge

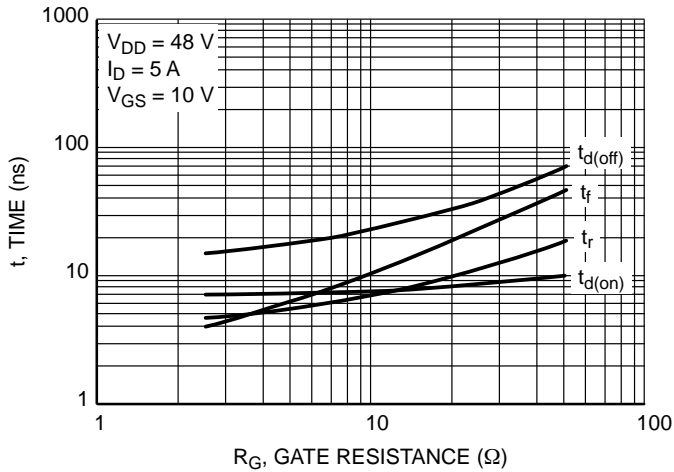


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

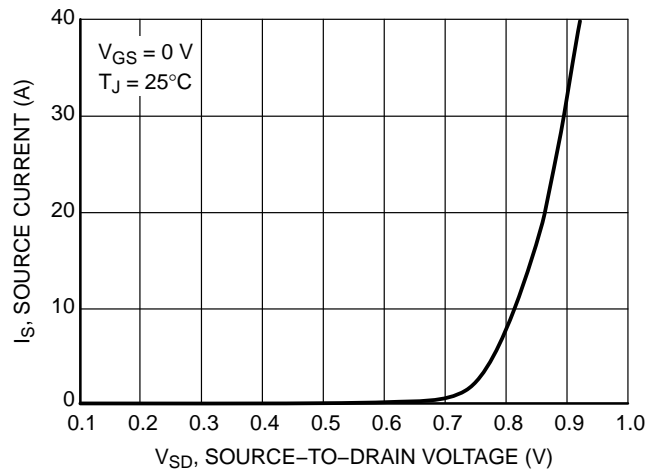


Figure 10. Diode Forward Voltage

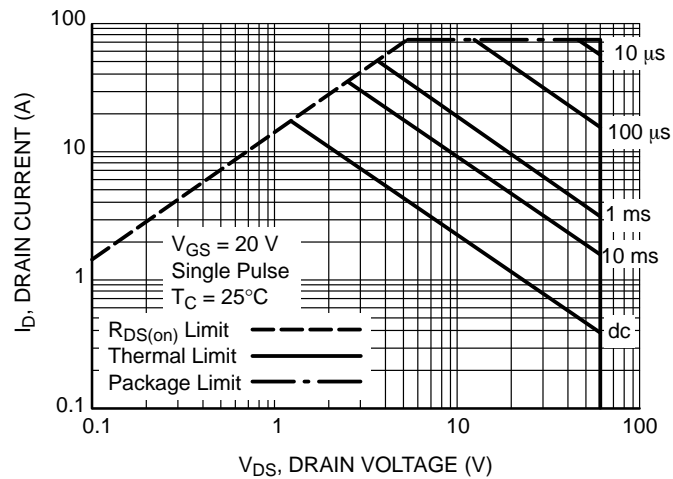


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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## TYPICAL CHARACTERISTICS

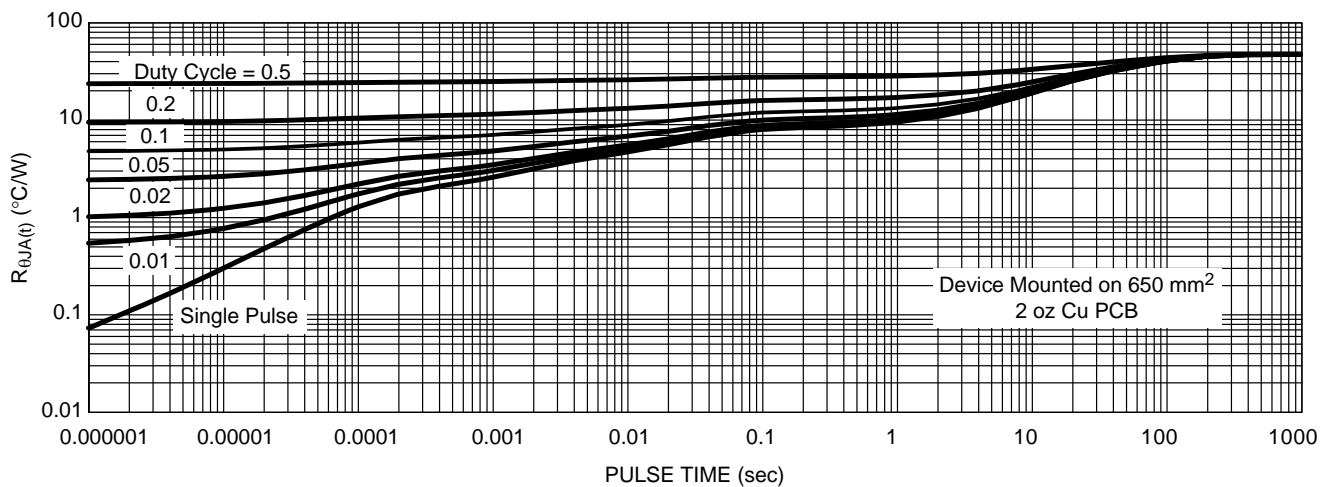
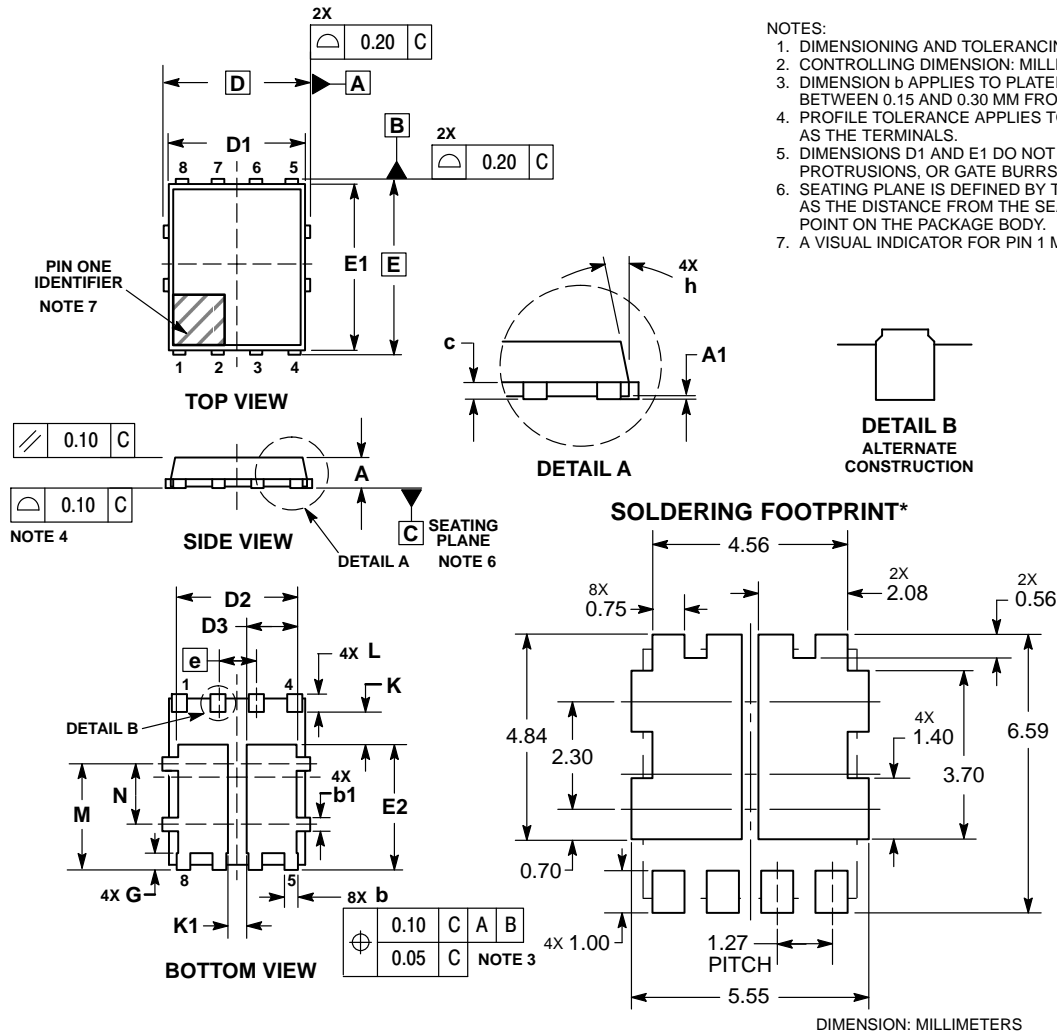


Figure 12. Thermal Response

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## PACKAGE DIMENSIONS

### DFN8 5x6, 1.27P Dual Flag (SO8FL-Dual) CASE 506BT ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
  4. PROFILE TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
  5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
  6. SEATING PLANE IS DEFINED BY THE TERMINALS. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
  7. A VISUAL INDICATOR FOR PIN 1 MUST BE LOCATED IN THIS AREA.

\*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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