

# NTTFS5826NL

## Power MOSFET

60 V, 24 mΩ, Single N-Channel, μ8FL

### Features

- Small Footprint (3.3 x 3.3 mm) for Compact Designs
- Low  $Q_{G(TOT)}$  to Minimize Switching Losses
- Low Capacitance to Minimize Driver Losses
- These are Pb-Free Devices

### Applications

- Motor Drivers
- DC-DC Converters
- Synchronous Rectification
- Power Management

### 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 $R_{\Psi J-mb}$ (Notes 1, 2, and 3)	Steady State	$T_{mb} = 25^{\circ}\text{C}$	$I_D$	20	A
		$T_{mb} = 100^{\circ}\text{C}$		14	
$T_{mb} = 25^{\circ}\text{C}$		$P_D$	19	W	
$T_{mb} = 100^{\circ}\text{C}$			10		
Continuous Drain Current $R_{\theta JA}$ (Notes 1 & 3)		$T_A = 25^{\circ}\text{C}$	$I_D$	8	A
		$T_A = 100^{\circ}\text{C}$		6	
Power Dissipation $R_{\theta JA}$ (Notes 1 & 3)		$T_A = 25^{\circ}\text{C}$	$P_D$	3.1	W
		$T_A = 100^{\circ}\text{C}$		1.6	
Pulsed Drain Current	$T_A = 25^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$		$I_{DM}$	133	A
Operating Junction and Storage Temperature			$T_J$ , $T_{stg}$	-55 to 175	$^{\circ}\text{C}$
Source Current (Body Diode)			$I_S$	20	A
Single Pulse Drain-to-Source Avalanche Energy ( $T_J = 25^{\circ}\text{C}$ , $V_{DD} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_{L(pk)} = 14.4\text{ A}$ , $L = 1.0\text{ mH}$ , $R_G = 25\text{ }\Omega$ )			$E_{AS}$	20	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.

### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Mounting Board (top) – Steady State (Notes 2, 3)	$R_{\Psi J-mb}$	7.9	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	48	

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.

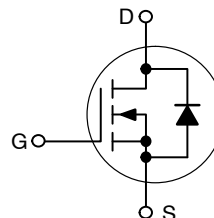


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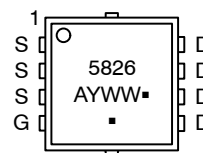
$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
60 V	24 mΩ @ 10 V	20 A
	32 mΩ @ 4.5 V	

### N-Channel



WDFN8  
(μ8FL)  
CASE 511AB

### MARKING DIAGRAM



5826 = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTTFS5826NLTAG	WDFN8 (Pb-Free)	1500/Tape & Reel
NTTFS5826NLTWG	WDFN8 (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.

# NTTFS5826NL

## 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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			58.6		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

## ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.5		3.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.6		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 7.5\text{ A}$		19	24	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 7.5\text{ A}$		25	32	
Forward Transconductance	$g_{FS}$	$V_{DS} = 15\text{ V}, I_D = 5.0\text{ A}$		8		S

## CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		850		pF
Output Capacitance	$C_{oss}$			85		
Reverse Transfer Capacitance	$C_{rss}$			50		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 48\text{ V}, I_D = 5.0\text{ A}$		8.4		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.0		
Gate-to-Source Charge	$Q_{GS}$			2.5		
Gate-to-Drain Charge	$Q_{GD}$			3.9		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 5.0\text{ A}$		16	25	nC
Gate Resistance	$R_G$	$T_A = 25^\circ\text{C}$		1.5		$\Omega$

## SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 48\text{ V}, I_D = 5.0\text{ A}, R_G = 2.5\text{ }\Omega$		9.0	18	ns
Rise Time	$t_r$			15	28	
Turn-Off Delay Time	$t_{d(off)}$			14	25	
Fall Time	$t_f$			5.4	12	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 5.0\text{ A}, R_G = 2.5\text{ }\Omega$		7.0	12	ns
Rise Time	$t_r$			10	20	
Turn-Off Delay Time	$t_{d(off)}$			17	30	
Fall Time	$t_f$			3.5	6.0	

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A}$	$T_J = 25^\circ\text{C}$		0.8	2.3	V
			$T_J = 125^\circ\text{C}$		0.7		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 5.0\text{ A}$			15		ns
Charge Time	$t_a$				12		
Discharge Time	$t_b$				4		
Reverse Recovery Charge	$Q_{RR}$				13		nC

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

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

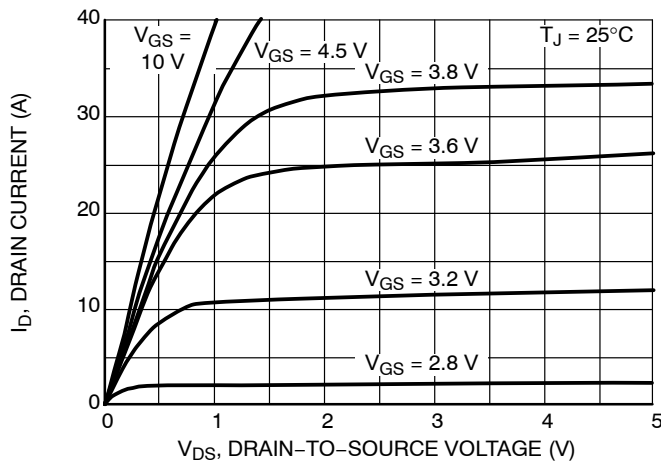


Figure 1. On-Region Characteristics

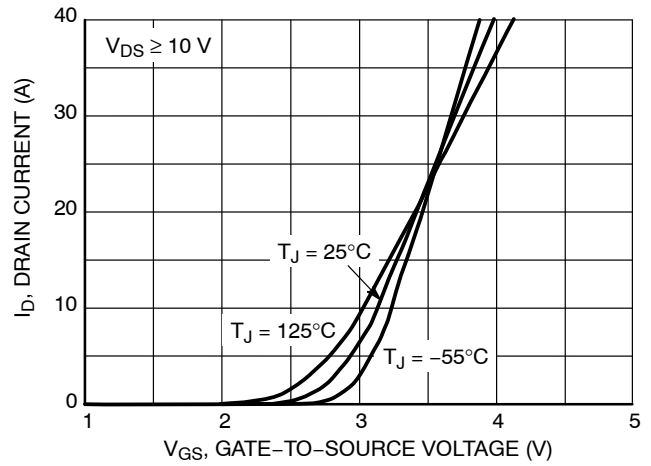


Figure 2. Transfer Characteristics

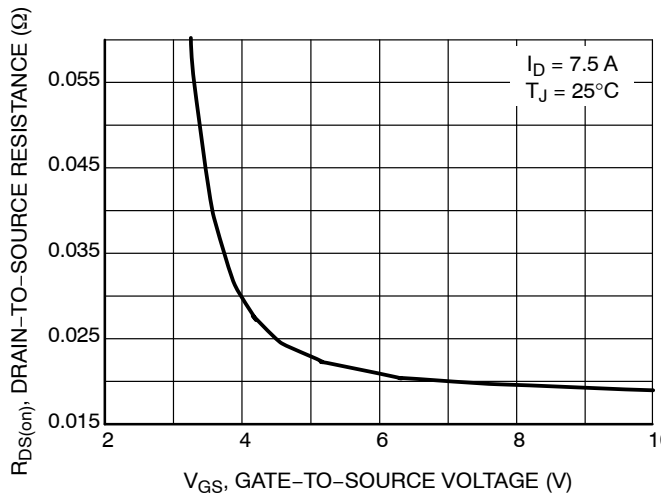


Figure 3. On-Resistance vs. Gate-to-Source Voltage

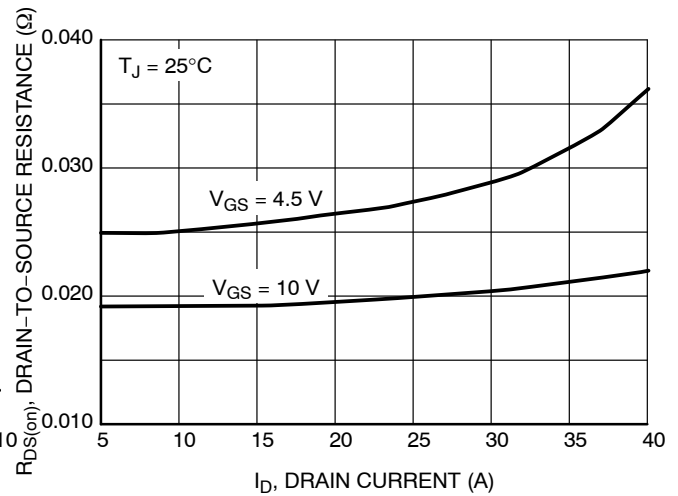


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

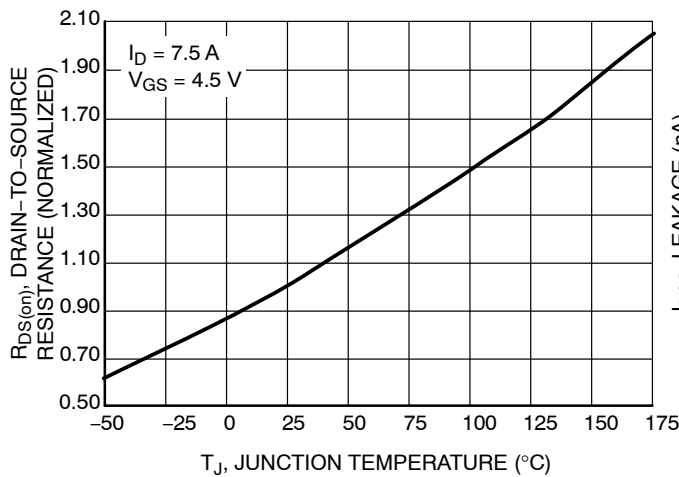


Figure 5. On-Resistance Variation with Temperature

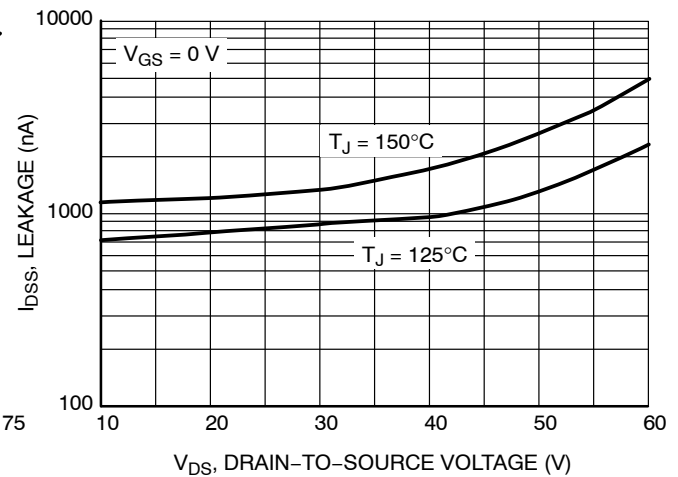


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

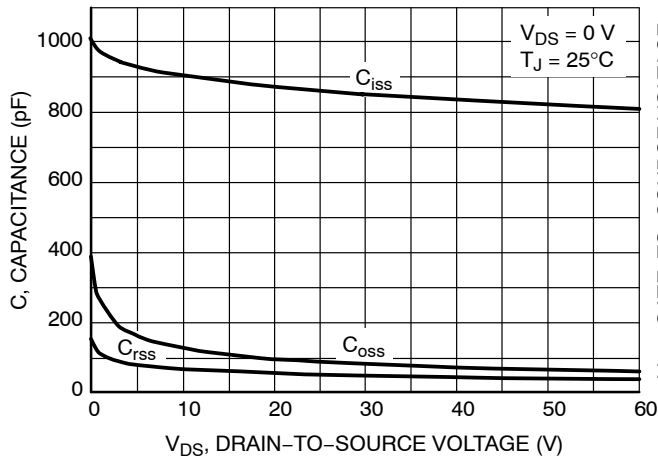


Figure 7. Capacitance Variation

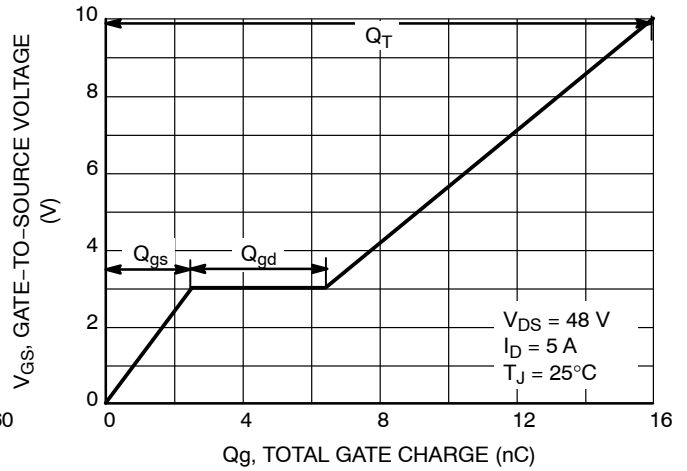


Figure 8. Gate-to-Source vs. Total Charge

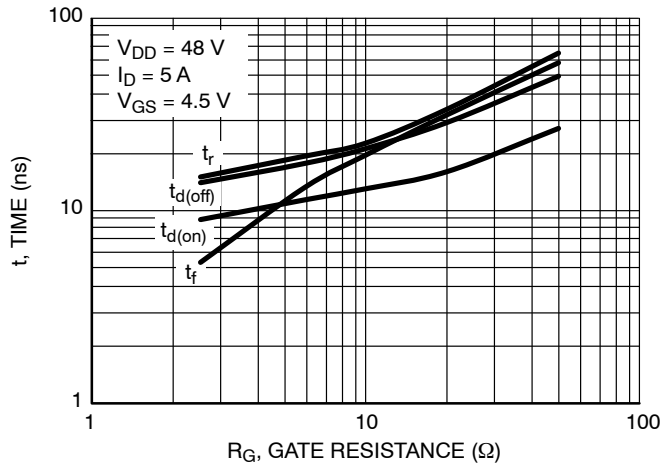


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

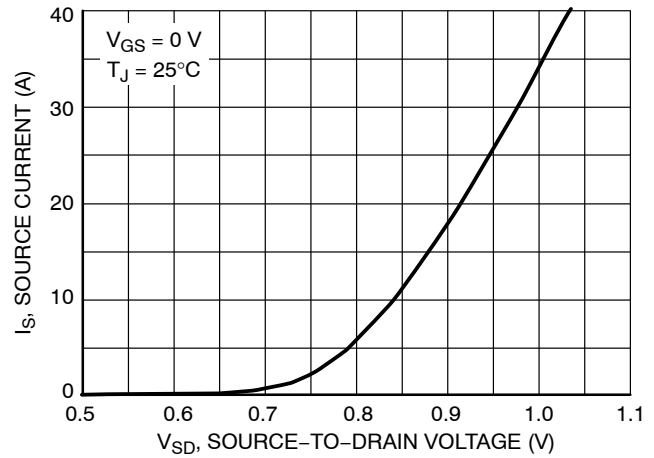


Figure 10. Diode Forward Voltage vs. Current

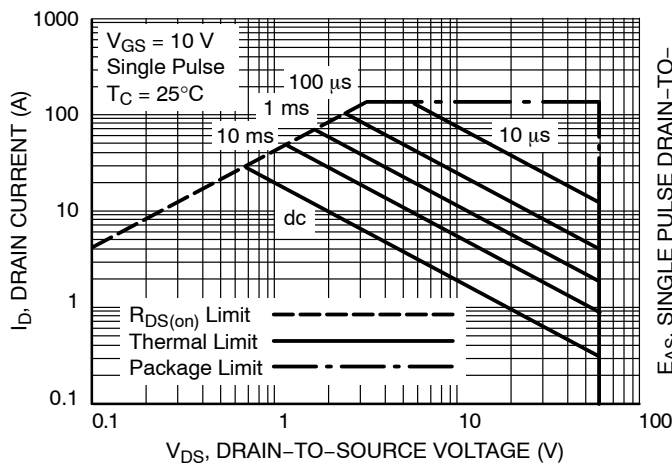


Figure 11. Maximum Rated Forward Biased Safe Operating Area

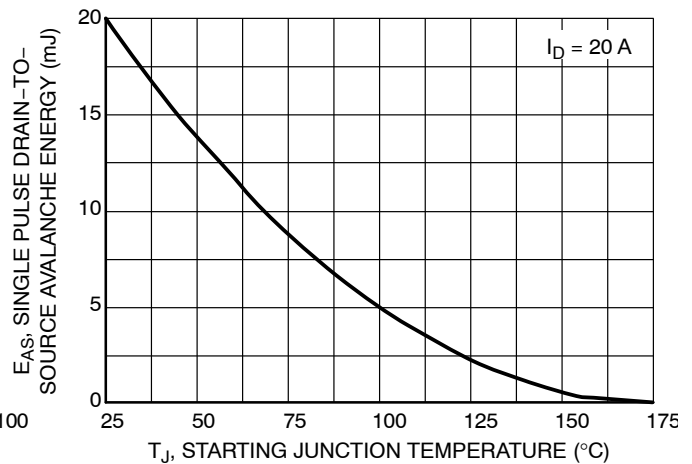


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

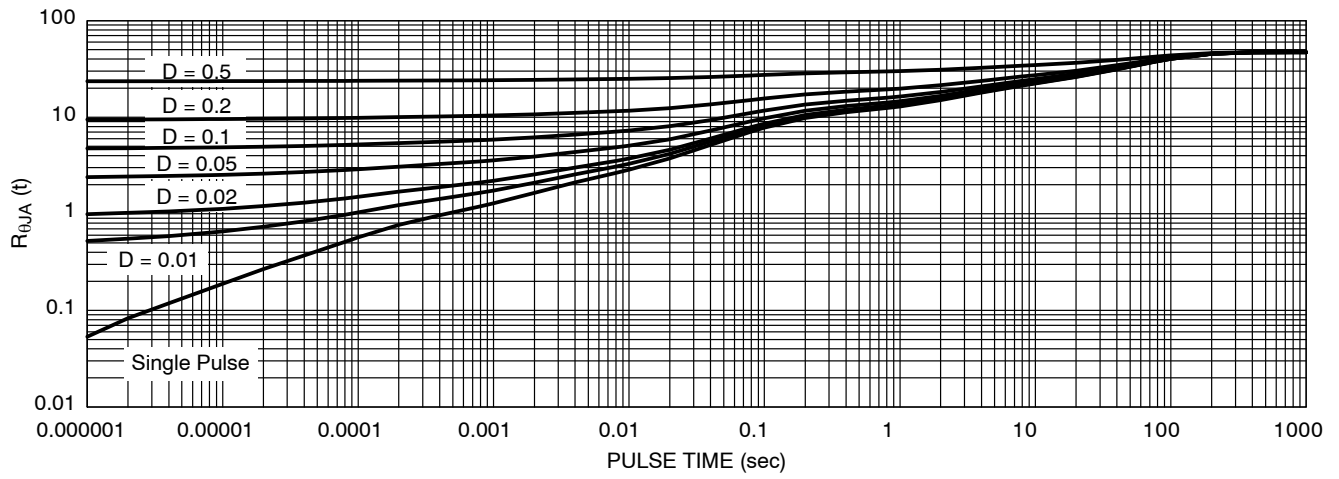
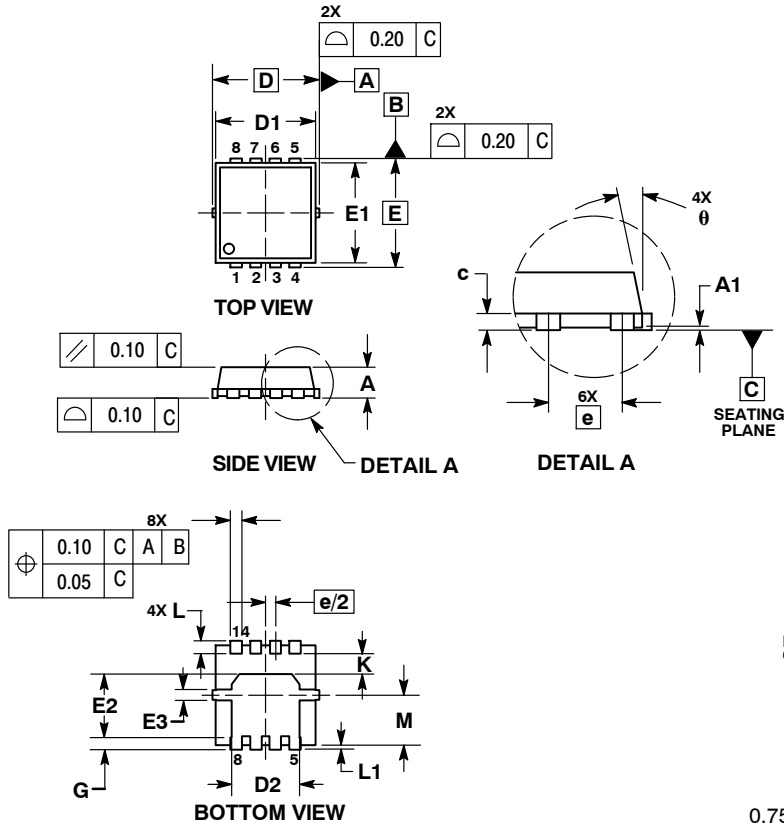


Figure 13. Thermal Response

## PACKAGE DIMENSIONS

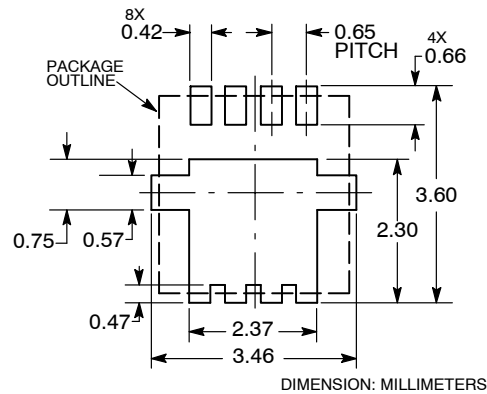
WDFN8 3.3x3.3, 0.65P  
CASE 511AB  
ISSUE C

## NOTES:

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

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	---	0.05	0.000	---	0.002
b	0.23	0.30	0.40	0.009	0.012	0.016
c	0.15	0.20	0.25	0.006	0.008	0.010
D	3.30 BSC			0.130 BSC		
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
E	3.30 BSC			0.130 BSC		
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	0.23	0.30	0.40	0.009	0.012	0.016
e	0.65 BSC			0.026 BSC		
G	0.30	0.41	0.51	0.012	0.016	0.020
K	0.64	---	---	0.025	---	---
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
M	1.40	1.50	1.60	0.055	0.059	0.063
θ	0°	---	12°	0°	---	12°

## SOLDERING FOOTPRINT\*



\*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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