NTTFS4939N

Power MOSFET
30 V, 52 A, Single N−Channel, μ8FL

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
- Low−Side DC−DC Converters
- Power Load Switch
- Notebook Battery Management
- Motor Control

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	14.3	A
		T_A = 85°C		10.3	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.21	W
Continuous Drain Current $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	I_D	20.3	A
		T_A = 85°C		14.7	
Power Dissipation $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	P_D	4.48	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	I_D	8.9	A
		T_A = 85°C		6.4	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.85	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	52	A
		T_C = 85°C		38	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	29.8	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	170	A
Current Limited by Pkg.	T_A = 25°C		$I_{DmaxPkg}$	70	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to +150	°C
Source Current (Body Diode)			I_S	35	A
Drain to Source DV/DT			dV/dt	6.0	V/ns
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{DD} = 50 V, V_{GS} = 10 V, I_L = 31 A_{pk}, L = 0.1 mH, R_G = 25 Ω)			E_{AS}	48	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

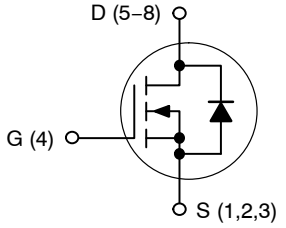
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.
1. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size.

ON Semiconductor®

http://onsemi.com

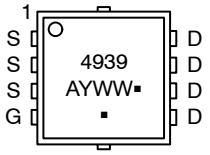
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	5.5 mΩ @ 10 V	52 A
	8.0 mΩ @ 4.5 V	

N−Channel MOSFET



WDFN8
(μ8FL)
CASE 511AB

MARKING DIAGRAM



4939	= 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†
NTTFS4939NTAG	WDFN8 (Pb−Free)	1500/Tape & Reel
NTTFS4939NTWG	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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	4.2	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	56.5	
Junction−to−Ambient − Steady State (Note 4)	$R_{\theta JA}$	146.5	
Junction−to−Ambient − (t ≤ 10 s) (Note 3)	$R_{\theta JA}$	28	

3. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
4. Surface−mounted on FR4 board using the minimum recommended pad size (40 mm^2, 1 oz. Cu).

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 Temperature Coefficient	$V_{(BR)DSS}/T_J$				15		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 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.2		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				4.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 20 A		4.1	5.5	mΩ
			I_D = 10 A		4.1		
		V_{GS} = 4.5 V	I_D = 20 A		6.0	8.0	
			I_D = 10 A		5.9		
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			35		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 15 V			1979		pF
Output Capacitance	C_{oss}				711		
Reverse Transfer Capacitance	C_{rss}				20.2		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 20 A			12.4		nC
Threshold Gate Charge	$Q_{G(TH)}$				3.2		
Gate−to−Source Charge	Q_{GS}				6.0		
Gate−to−Drain Charge	Q_{GD}				1.8		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V, I_D = 20 A			28		nC
SWITCHING CHARACTERISTICS (Note 6)							
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			12.2		ns
Rise Time	t_r				20.6		
Turn−Off Delay Time	$t_{d(off)}$				20.8		
Fall Time	t_f				3.9		

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

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			8.7		ns
Rise Time	t_r				19.5		
Turn−Off Delay Time	$t_{d(off)}$				25.3		
Fall Time	t_f				3.2		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 20 A	T_J = 25°C		0.84	1.2	V
			T_J = 125°C		0.71		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs, I_S = 20 A			35.5		ns
Charge Time	t_a				19		
Discharge Time	t_b				16.5		
Reverse Recovery Charge	Q_{RR}				28		nC
PACKAGE PARASITIC VALUES							
Source Inductance	L_S	T_A = 25°C			0.38		nH
Drain Inductance	L_D				0.054		
Gate Inductance	L_G				1.3		
Gate Resistance	R_G				1.1	2.0	Ω

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

TYPICAL CHARACTERISTICS

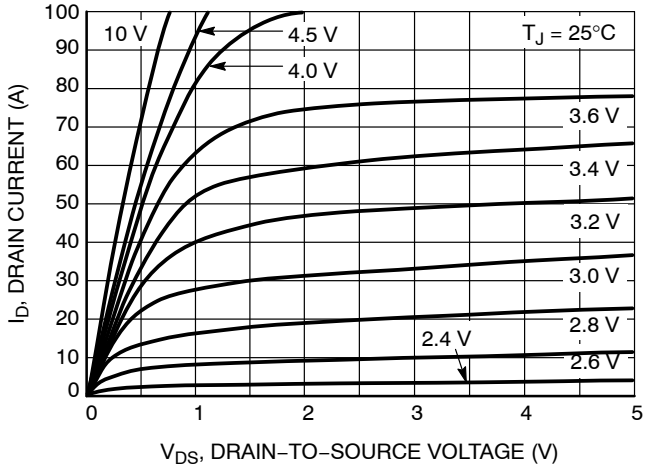


Figure 1. On−Region Characteristics

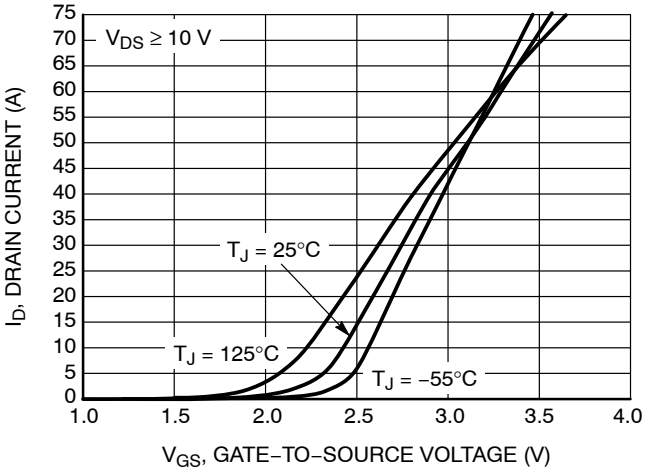


Figure 2. Transfer Characteristics

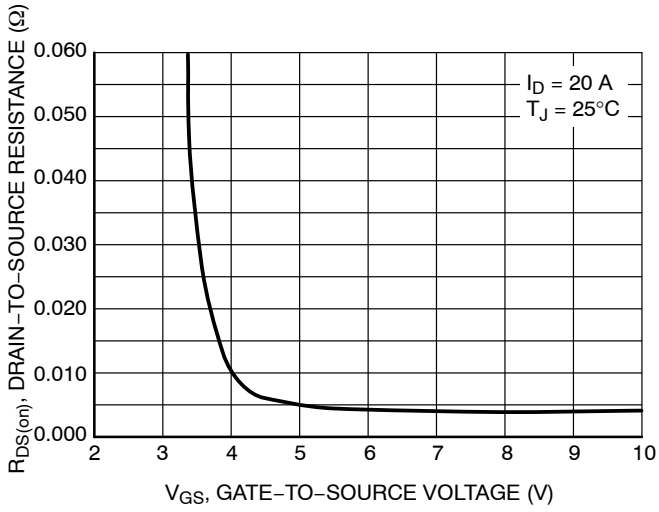


Figure 3. On−Resistance vs. V_{GS}

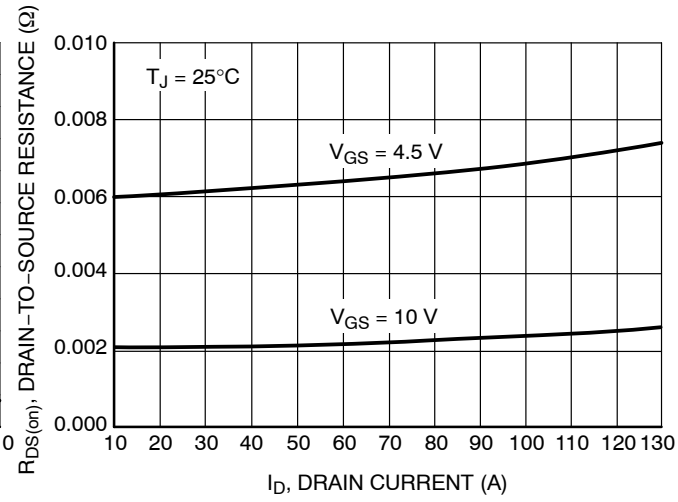


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

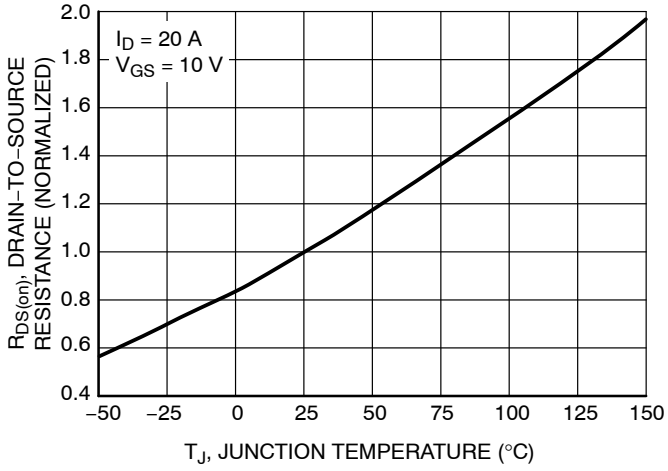


Figure 5. On−Resistance Variation with Temperature

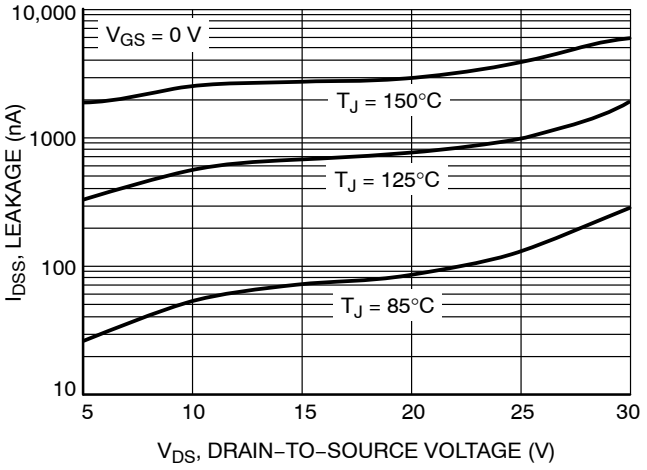


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

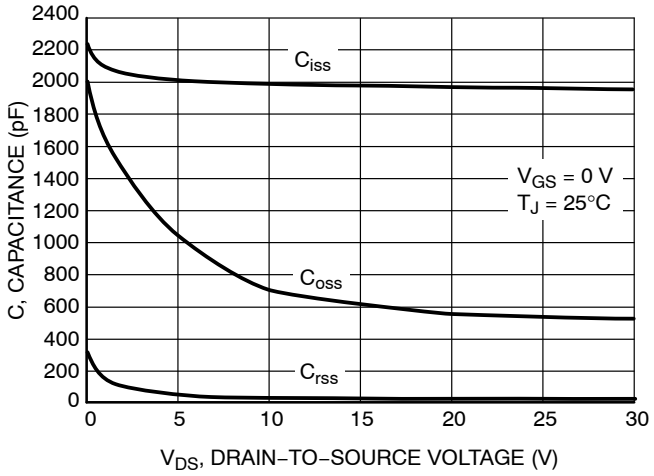


Figure 7. Capacitance Variation

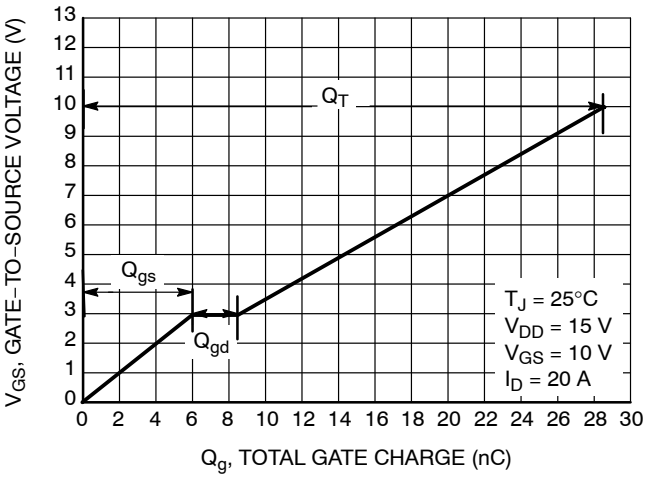


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

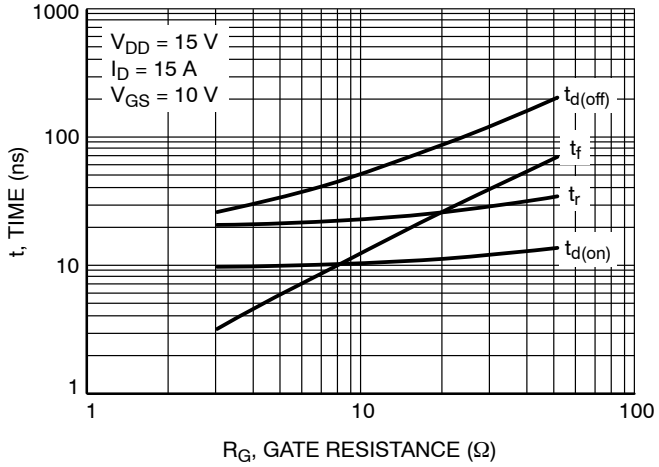


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

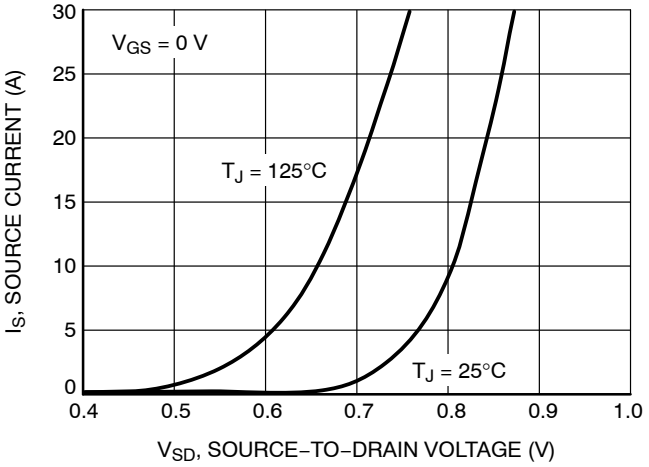


Figure 10. Diode Forward Voltage vs. Current

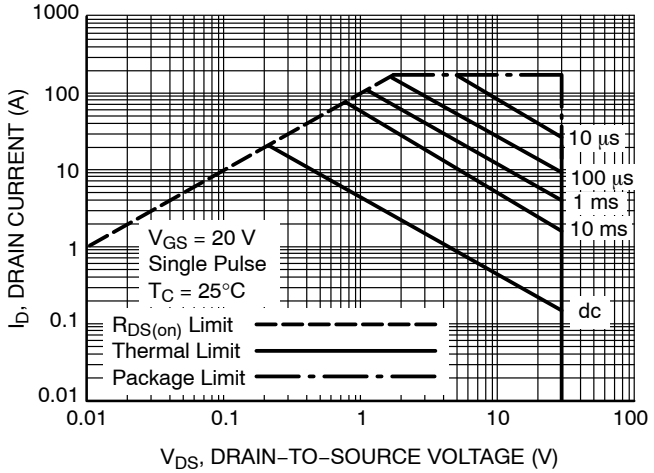


Figure 11. Maximum Rated Forward Biased Safe Operating Area

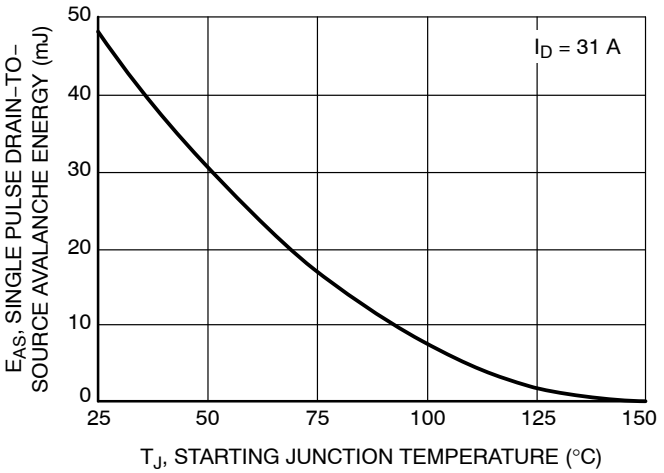


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

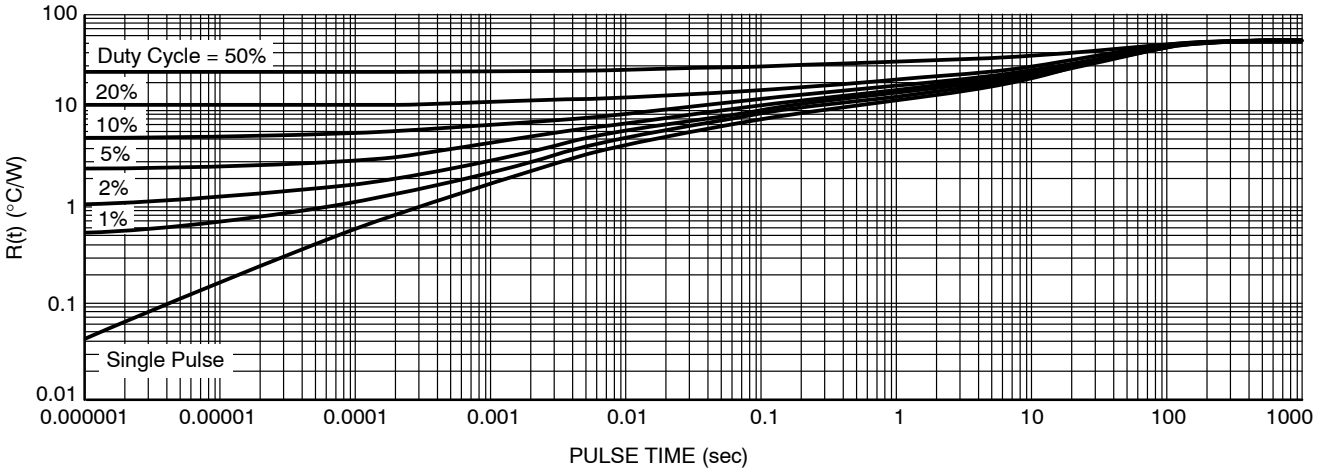
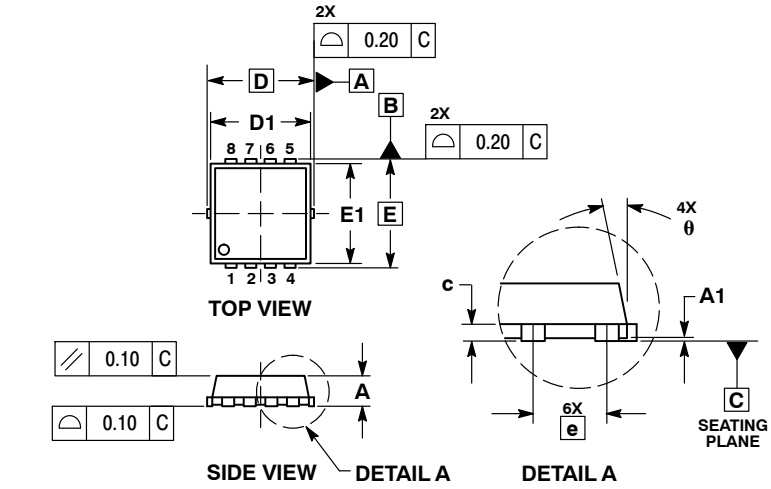


Figure 13. Thermal Response

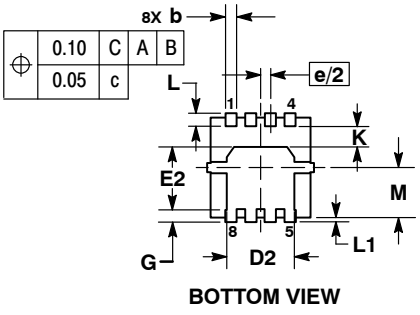
PACKAGE DIMENSIONS

WDFN8 3.3x3.3, 0.65P
CASE 511AB−01
ISSUE B

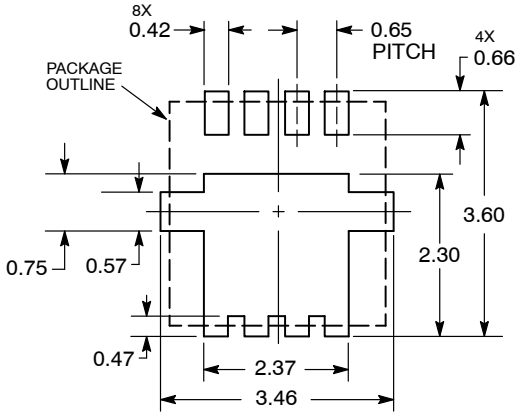


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	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
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*



DIMENSION: 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative