

NTTFS4941N

MOSFET – Power, Single, N-Channel, μ 8FL 30 V, 46 A

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	30	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	I_D	13.5	A
		9.7	
Power Dissipation $R_{\theta JA}$ (Note 1)	P_D	2.19	W
Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1)	I_D	19	A
		13.7	
Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)	P_D	4.42	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)	I_D	8.3	A
		6.0	
Power Dissipation $R_{\theta JA}$ (Note 2)	P_D	0.84	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)	I_D	46	A
		33	
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	25.5	W
Pulsed Drain Current	I_{DM}	140	A
Operating Junction and Storage Temperature	T_J , T_{stg}	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)	I_S	29	A
Drain to Source dV/dt	dV/dt	6.0	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}$, $V_{DD} = 50$ V, $V_{GS} = 10$ V, $I_L = 29$ A _{pk} , $L = 0.1$ mH, $R_G = 25$ Ω)	E_{AS}	42	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.

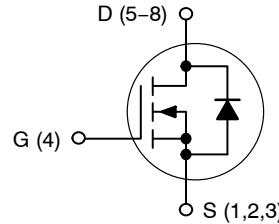


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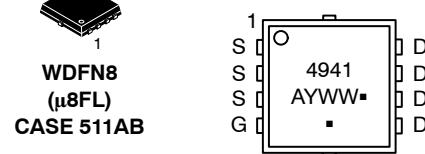
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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	6.2 m Ω @ 10 V	
	9.0 m Ω @ 4.5 V	46 A

N-Channel MOSFET



MARKING DIAGRAM



4941 = 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 [†]
NTTFS4941NTAG	WDFN8 (Pb-Free)	1500/Tape & Reel
NTTFS4941NTWG	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.

NTTFS4941N

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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	4.9	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	57	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	148	
Junction-to-Ambient – ($t \leq 10$ s) (Note 3)	$R_{\theta JA}$	28.3	

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 mm², 1 oz. Cu).

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$			15		$\text{mV}/^{\circ}\text{C}$
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 5)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_D = 250 \mu\text{A}$	1.2		2.2	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})}/T_J$			4.3		$\text{mV}/^{\circ}\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$	$I_D = 20 \text{ A}$		4.8	6.2
			$I_D = 10 \text{ A}$		4.8	
		$V_{\text{GS}} = 4.5 \text{ V}$	$I_D = 20 \text{ A}$		7.0	9.0
			$I_D = 10 \text{ A}$		7.0	
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 1.5 \text{ V}, I_D = 15 \text{ A}$		33		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}, f = 1.0 \text{ MHz}, V_{\text{DS}} = 15 \text{ V}$		1619		pF
Output Capacitance	C_{oss}			573		
Reverse Transfer Capacitance	C_{rss}			18		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 4.5 \text{ V}, V_{\text{DS}} = 15 \text{ V}, I_D = 20 \text{ A}$		10.1		nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			2.6		
Gate-to-Source Charge	Q_{GS}			4.9		
Gate-to-Drain Charge	Q_{GD}			1.3		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 15 \text{ V}, I_D = 20 \text{ A}$		22.8		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{\text{d}(\text{on})}$	$V_{\text{GS}} = 4.5 \text{ V}, V_{\text{DS}} = 15 \text{ V}, I_D = 15 \text{ A}, R_G = 3.0 \Omega$		11		ns
Rise Time	t_r			21		
Turn-Off Delay Time	$t_{\text{d}(\text{off})}$			19		
Fall Time	t_f			3.0		

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

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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 6)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}$, $V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$, $R_G = 3.0\ \Omega$	8.0			ns
Rise Time	t_r		20			
Turn-Off Delay Time	$t_{d(off)}$		23			
Fall Time	t_f		2.0			

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}$, $I_S = 20\text{ A}$	$T_J = 25^\circ\text{C}$		0.87	1.2	V
			$T_J = 125^\circ\text{C}$		0.75		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$, $I_S = 20\text{ A}$			30		ns
Charge Time	t_a				16		
Discharge Time	t_b				14		
Reverse Recovery Charge	Q_{RR}				22		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		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 $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

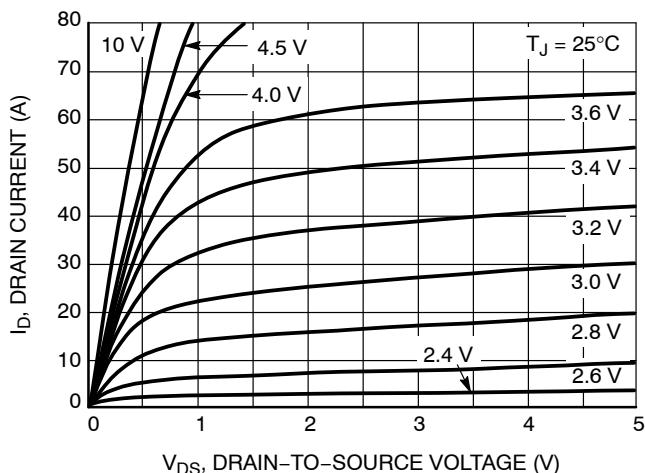


Figure 1. On-Region Characteristics

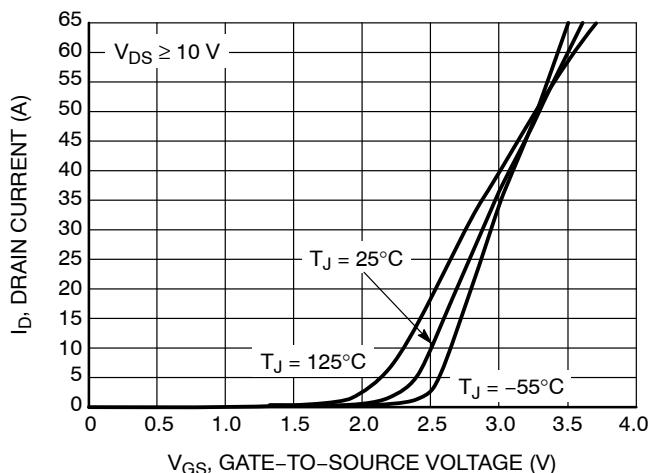


Figure 2. Transfer Characteristics

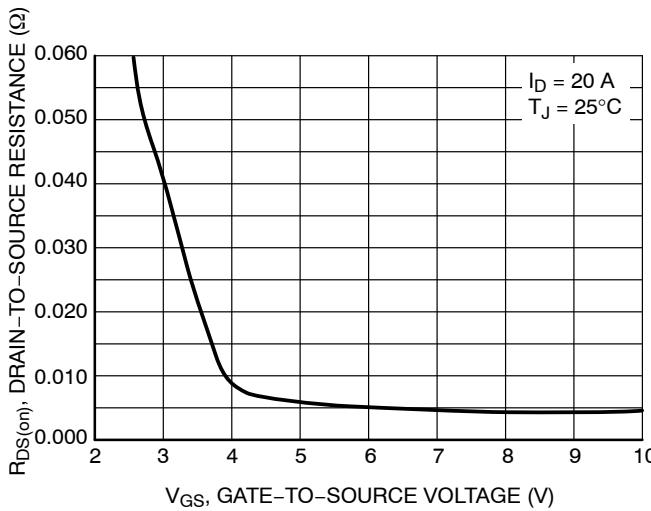
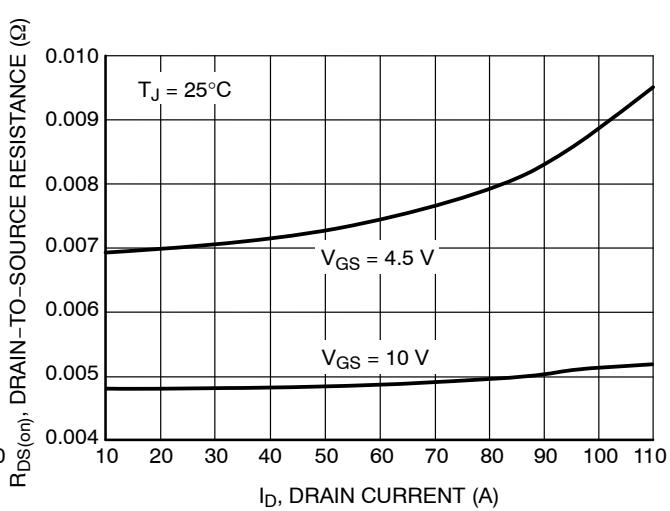
Figure 3. On-Resistance vs. V_{GS} 

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

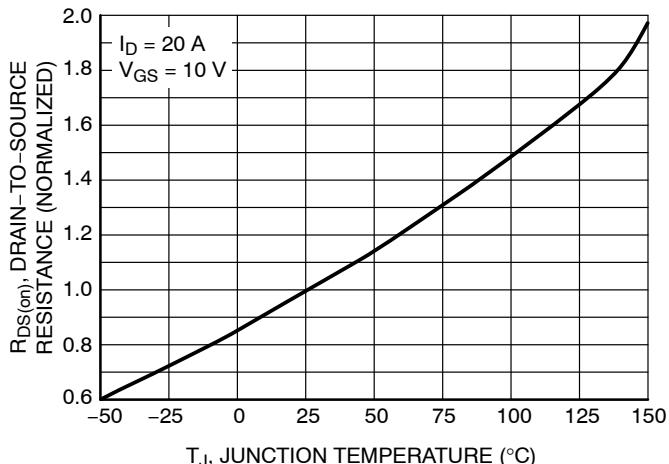


Figure 5. On-Resistance Variation with Temperature

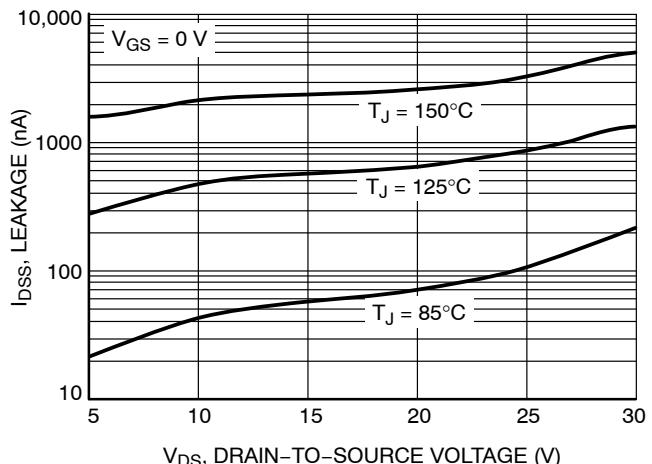
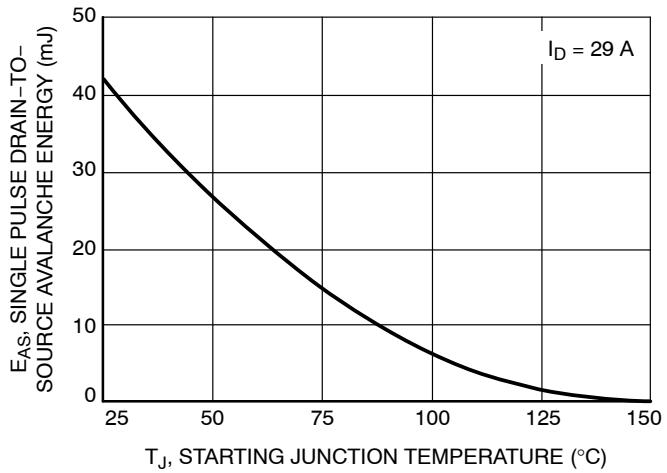
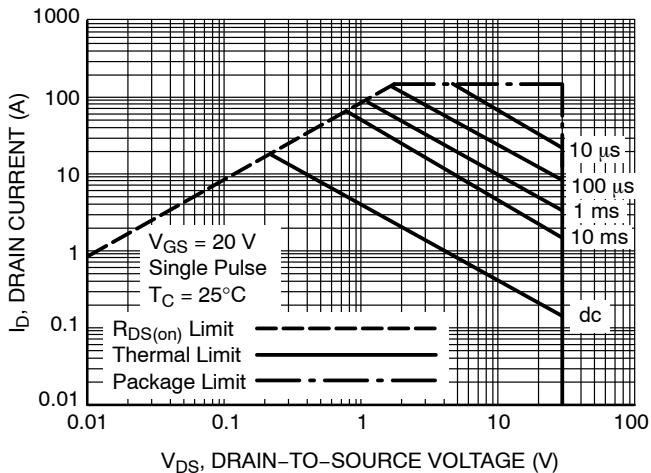
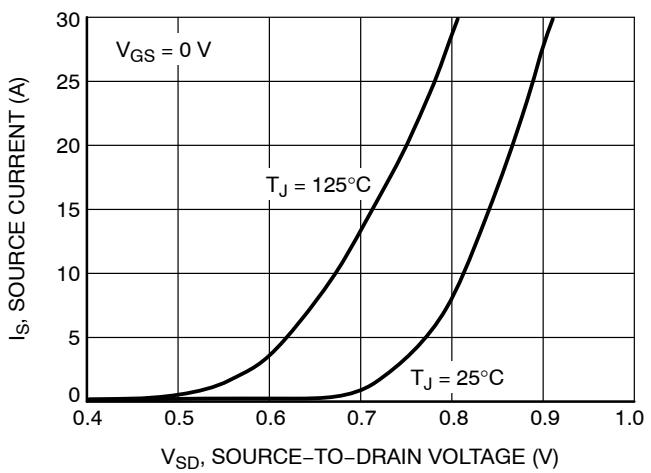
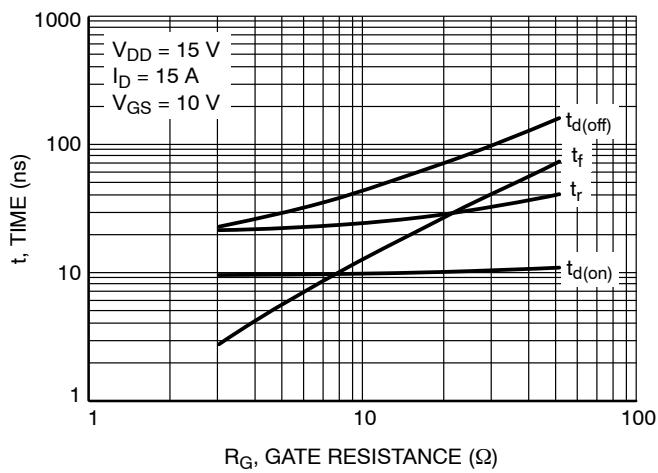
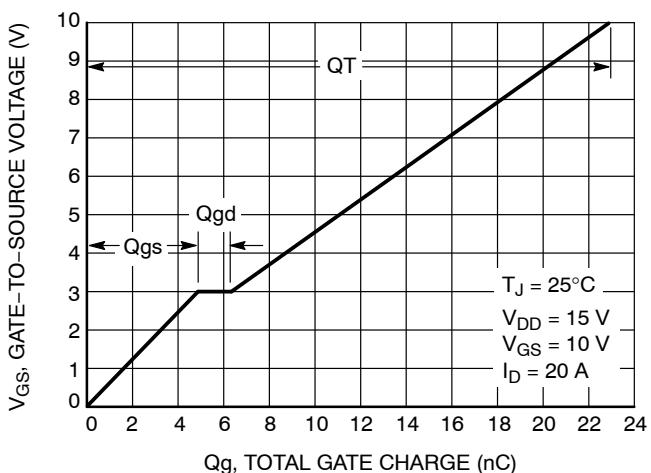
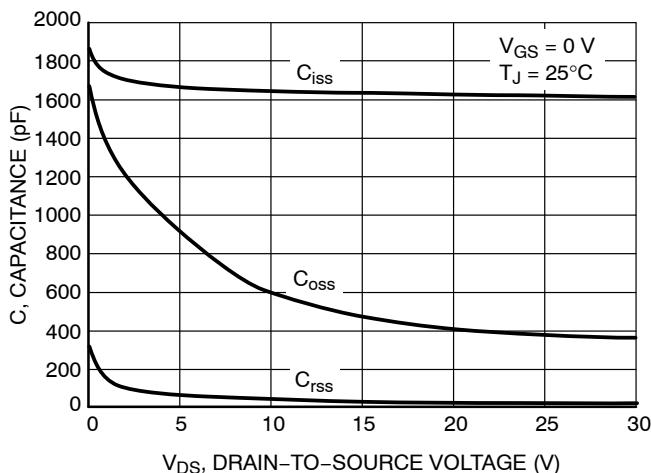


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS



NTTFS4941N

TYPICAL CHARACTERISTICS

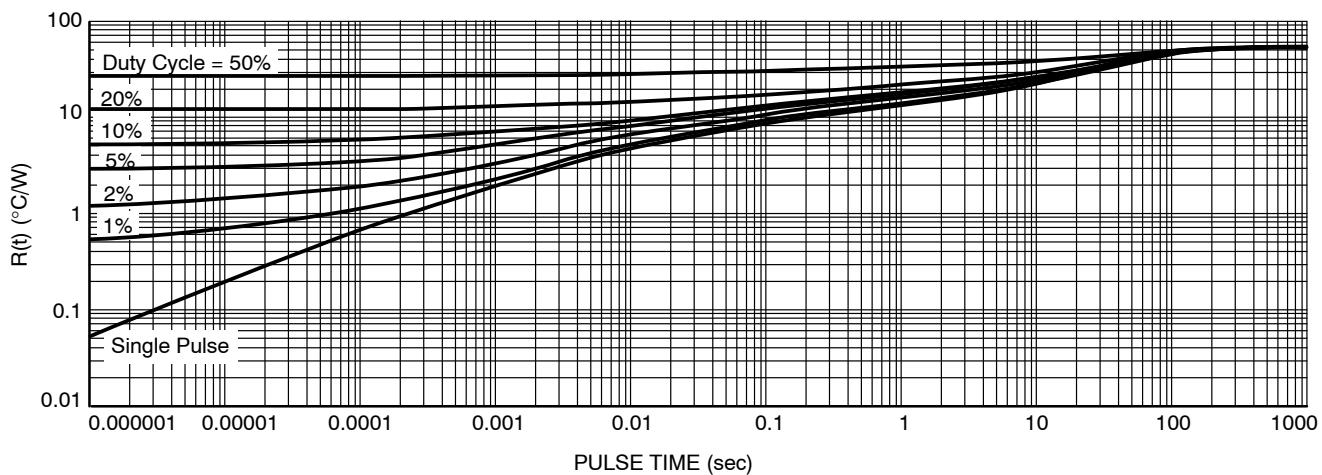


Figure 13. Thermal Response

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

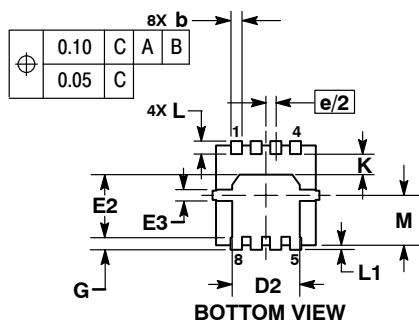
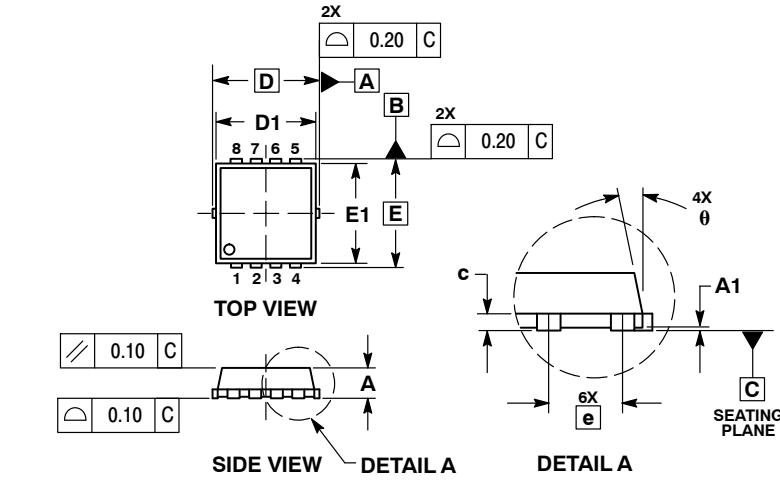
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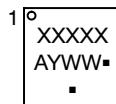
SCALE 2:1

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

DATE 23 APR 2012



**GENERIC
MARKING DIAGRAM***



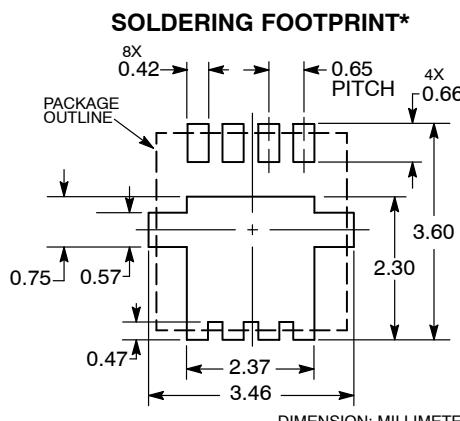
XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
□ = Pb-Free Package

*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.

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	0.65	0.80	0.95	0.026	0.032	0.037
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



*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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