

# MOSFET – Dual N-Channel, POWERTRENCH®

40 V, 12 A, 10 mΩ

## FDMC8030

### General Description

This device includes two 40 V N-Channel MOSFETs in a dual Power 33 (3 mm x 3 mm MLP) package. The package is enhanced for exceptional thermal performance.

### Features

- Max  $r_{DS(on)}$  = 10 mΩ at  $V_{GS} = 10$  V,  $I_D = 12$  A
- Max  $r_{DS(on)}$  = 14 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 10$  A
- Max  $r_{DS(on)}$  = 28 mΩ at  $V_{GS} = 3.2$  V,  $I_D = 4$  A
- This Device is Pb-Free and is RoHS Compliant

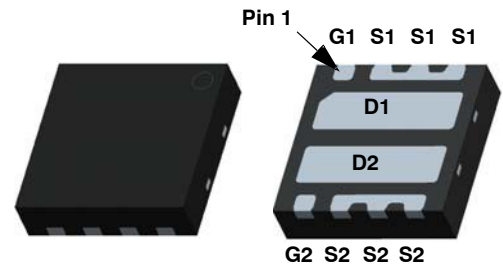
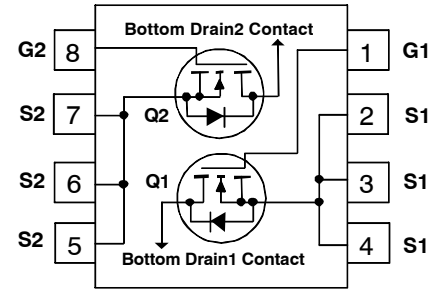
### Applications

- Battery Protection
- Load Switching
- Point of Load

### MOSFET MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Units
V <sub>DS</sub>	Drain to Source Voltage	40	V
V <sub>GS</sub>	Gate to Source Voltage (Note 4)	±12	V
I <sub>D</sub>	Drain Current		A
	– Continuous T <sub>A</sub> = 25°C (Note 1a)	12	
	– Pulsed	50	
E <sub>AS</sub>	Single Pulse Avalanche Energy (Note 3)	21	mJ
P <sub>D</sub>	Power Dissipation T <sub>C</sub> = 25°C	14	W
	Power Dissipation T <sub>A</sub> = 25°C (Note 1a)	1.9	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range	-55 to +150	°C

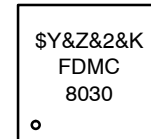
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



Power 33

WDFN8 3x3, 0.65P  
CASE 511DG

### MARKING DIAGRAM



\$Y = onsemi Logo  
&Z = Assembly Plant Code  
&2 = Numeric Date Code  
&K = Lot Code  
FDMC8030 = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# FDMC8030

## THERMAL CHARACTERISTICS

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	9.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	65	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	155	

## PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Shipping†
FDMC8030	FDMC8030	WDFN8 3x3, 0.65P, Power 33 (Pb-Free)	3000 units / Tape & Reel

†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.

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

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		19		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = 12 \text{ V}, V_{DS} = 0 \text{ V}$			100	nA

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0	1.5	2.8	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}$		8	10	m $\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$		10	14	
		$V_{GS} = 3.2 \text{ V}, I_D = 4 \text{ A}$		19	28	
		$V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}, T_J = 125^\circ\text{C}$		13	16	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5 \text{ V}, I_D = 12 \text{ A}$		57		S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$		1462	1975	pF
$C_{oss}$	Output Capacitance			321	430	pF
$C_{rss}$	Reverse Transfer Capacitance			20	30	pF
$R_g$	Gate Resistance			0.9	2.5	$\Omega$

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20 \text{ V}, I_D = 12 \text{ A}$ $V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$		7	13	ns
$t_r$	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	33	ns
$t_f$	Fall Time			3	10	ns
$Q_g(TOT)$	Total Gate Charge	$V_{GS} = 0 \text{ V to } 10 \text{ V}, V_{DD} = 20 \text{ V}, I_D = 12 \text{ A}$		21	30	nC
	Total Gate Charge	$V_{GS} = 0 \text{ V to } 5 \text{ V}, V_{DD} = 20 \text{ V}, I_D = 12 \text{ A}$		12	17	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 20 \text{ V}$ $I_D = 12 \text{ A}$		2.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.5		nC

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

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 12\text{ A}$ (Note 2)		0.83	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 12\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		25	40	ns
$Q_{rr}$	Reverse Recovery Charge			9	18	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### NOTES:

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a.  $65^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b.  $155^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- $E_{AS}$  of 21 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.3\text{ mH}$ ,  $I_{AS} = 12\text{ A}$ ,  $V_{DD} = 36\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% tested at  $L = 3\text{ mH}$ ,  $I_{AS} = 5\text{ A}$ .
- As an N-ch device, the negative  $V_{GS}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

TYPICAL CHARACTERISTICS

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

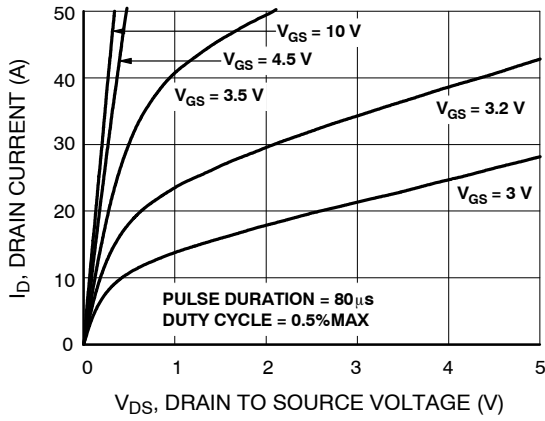


Figure 1. On-Region Characteristics

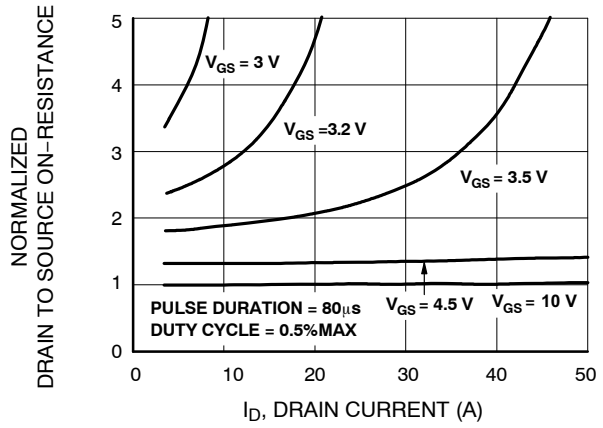


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

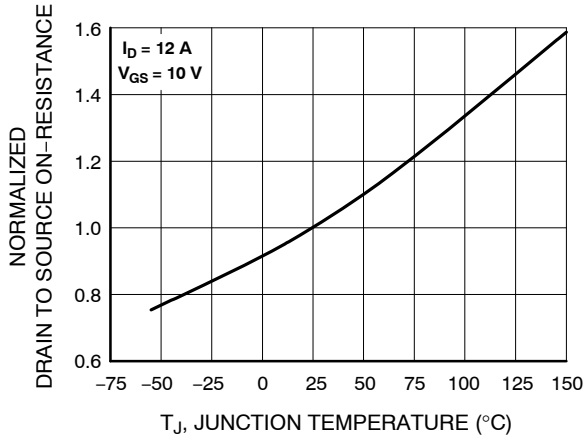


Figure 3. Normalized On-Resistance vs Junction Temperature

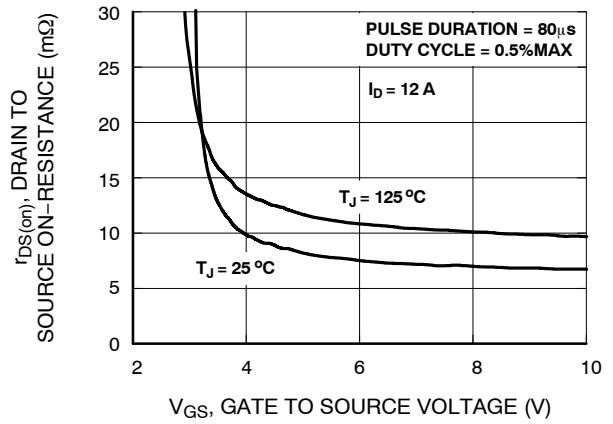


Figure 4. On-Resistance vs Gate to Source Voltage

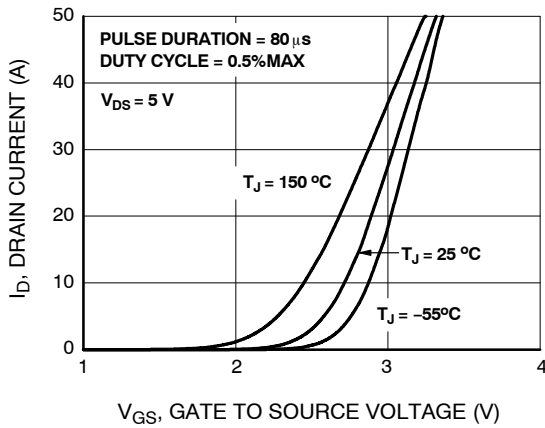


Figure 5. Transfer Characteristics

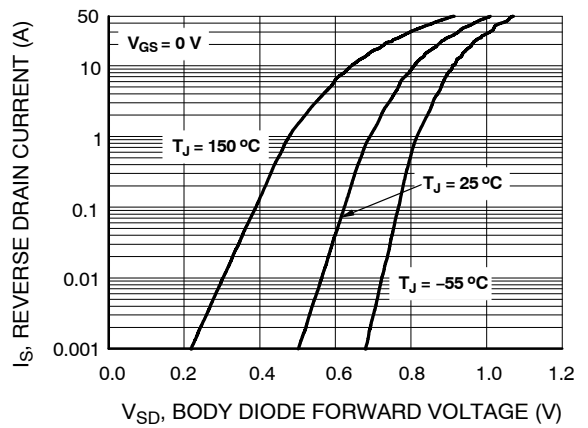


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (continued)

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

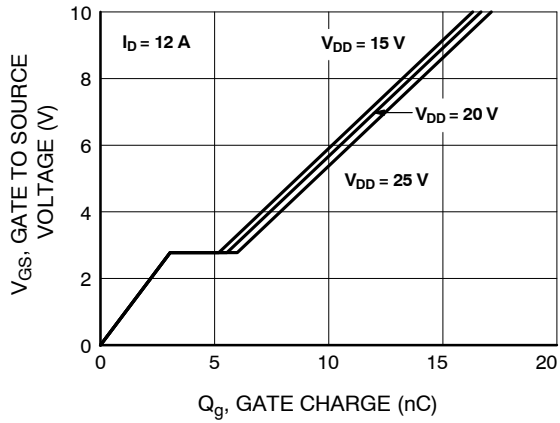


Figure 7. Gate Charge Characteristics

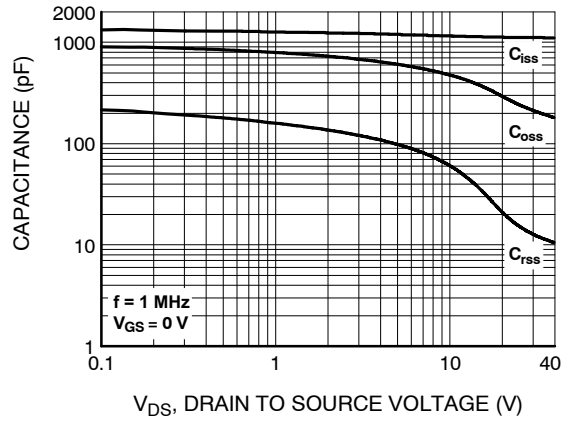


Figure 8. Capacitance vs Drain to Source Voltage

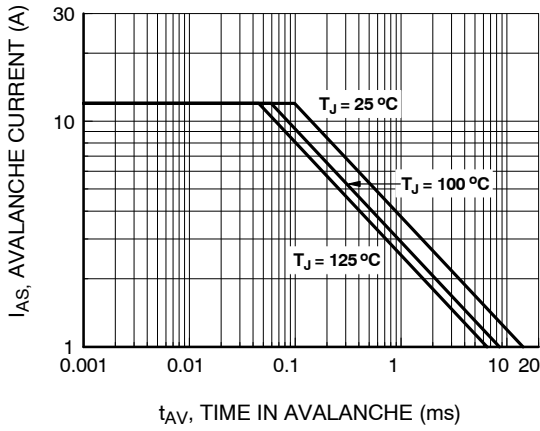


Figure 9. Unclamped Inductive Switching Capability

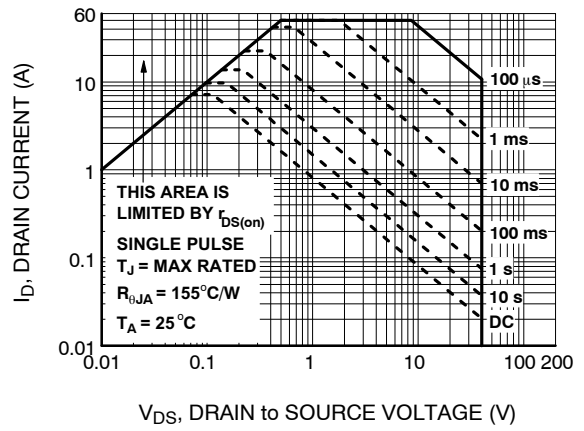


Figure 10. Forward Bias Safe Operating Area

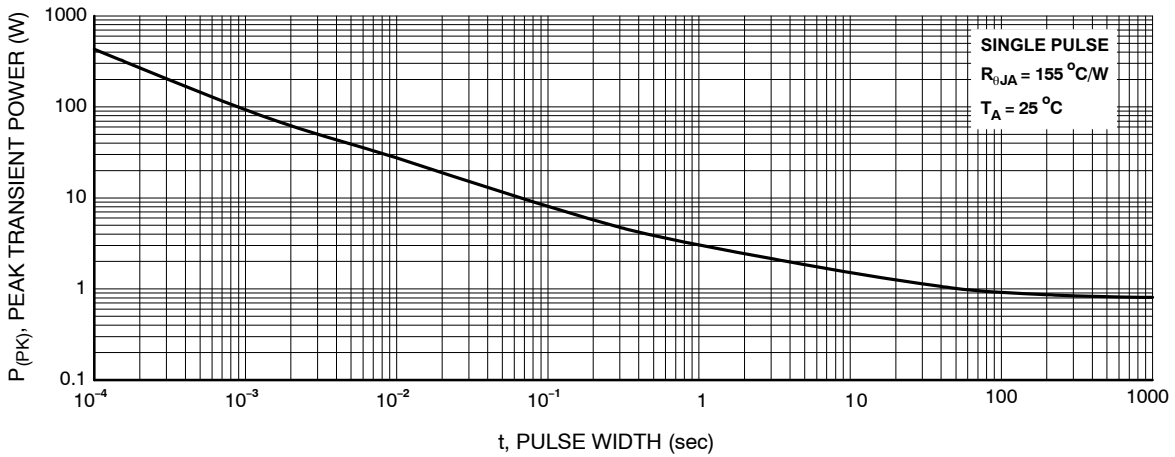
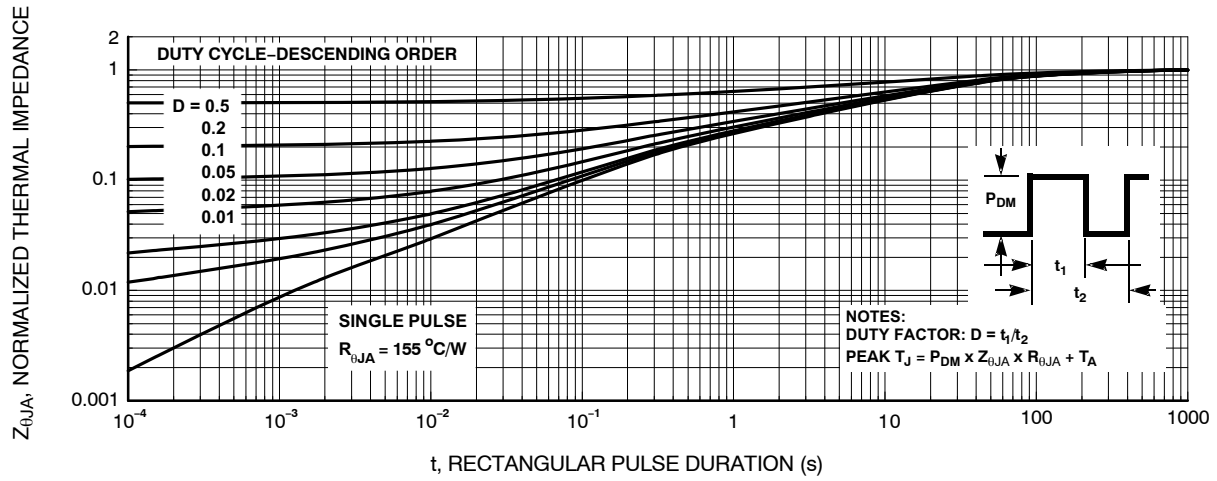


Figure 11. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS (continued)

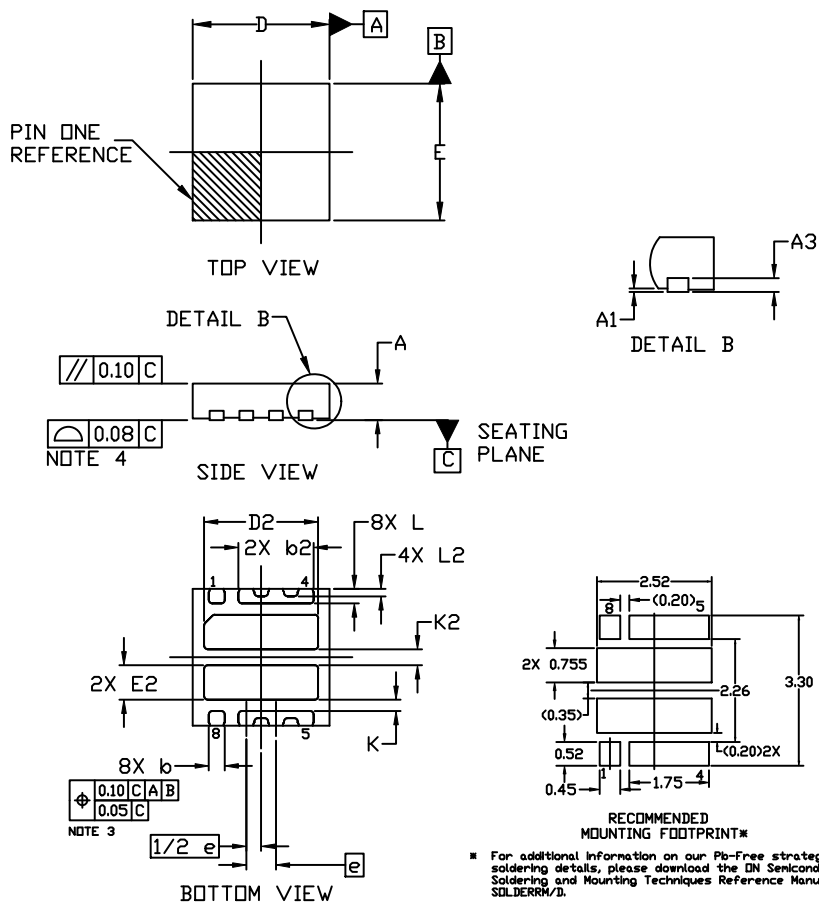
( $T_J = 25^\circ\text{C}$  unless otherwise noted)



**Figure 12. Transient Thermal Response Curve**

**WDFN8 3x3, 0.65P**  
**CASE 511DG**  
**ISSUE A**

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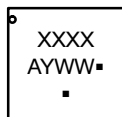


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION **b** APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15 AND 0.30MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	---	0.05
A3	0.20 REF		
b	0.30	0.35	0.40
b2	1.65 REF		
D	2.90	3.00	3.10
D2	2.45	2.50	2.55
E	2.90	3.00	3.10
E2	1.40	1.50	1.60
e	0.65 BSC		
K	0.25	---	---
K2	0.35 REF		
L	0.27	0.32	0.37
L2	0.163 REF		

**GENERIC MARKING DIAGRAM\***



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

(Note: Microdot may be in either location)

\*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.

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