

MOSFET – Dual N-Channel, POWERTRENCH®

40 V, 7 A, 20 mΩ

FDMC8032L

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 $r_{DS(on)}$ = 20 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 7\text{ A}$
- Max $r_{DS(on)}$ = 27 mΩ at $V_{GS} = 4.5\text{ V}$, $I_D = 6\text{ A}$
- Low Inductance Packaging Shortens Rise/Fall Times
- Lower Switching Losses
- 100% Rg Tested
- This Device is Pb-Free and is RoHS Compliant

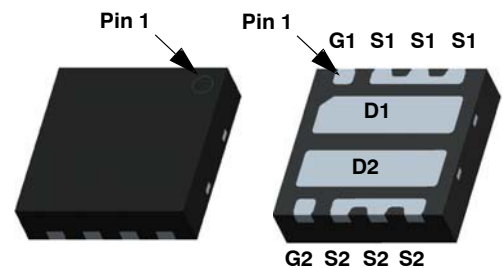
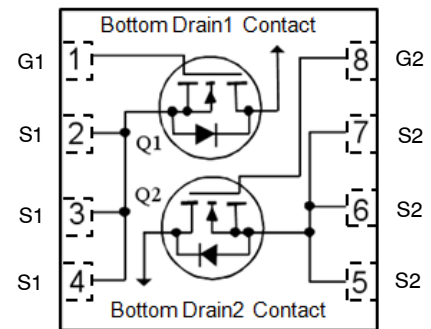
Applications

- Battery Protection
- Load Switching
- Point of Load

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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current – Continuous $T_C = 25^\circ\text{C}$ – Continuous $T_A = 25^\circ\text{C}$ (Note 1a) – Pulsed (Note 4)	20	A
		7	
		50	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	13	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	12	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	1.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

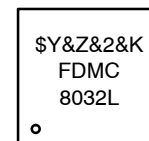
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



Power 33

WDFN8 3x3, 0.65P
CASE 511DG

MARKING DIAGRAM



\$Y = onsemi Logo
&Z = Assembly Plant Code
&2 = Numeric Date Code
&K = Lot Code
FDMC8032L = Specific Device Code

ORDERING INFORMATION

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

FDMC8032L

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	9.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	65	

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC8032L	FDMC8032L	Power 33	13"	12 mm	3000 Units

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

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

BVDSS	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	40			V
$\frac{\Delta V_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		23		mV/°C
IDSS	Zero Gate Voltage Drain Current	$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$			1	μA
IGSS	Gate to Source Leakage Current, Forward	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$			100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0	1.8	3.0	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°C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 7 \text{ A}$		16	20	m Ω
		$V_{GS} = 4.5 \text{ V}, I_D = 6 \text{ A}$		21	27	
		$V_{GS} = 10 \text{ V}, I_D = 7 \text{ A}, T_J = 125^\circ\text{C}$		23	29	
g_{FS}	Forward Transconductance	$V_{DD} = 5 \text{ V}, I_D = 7 \text{ A}$		27		S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$		513	720	pF
C_{oss}	Output Capacitance			137	195	
C_{rss}	Reverse Transfer Capacitance			9.3	15	
R_g	Gate Resistance	$f = 1 \text{ MHz}$	0.1	2.6	3.6	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20 \text{ V}, I_D = 7 \text{ A}$ $V_{GS} = 10 \text{ V},$ $R_{GEN} = 6 \Omega$		5.5	11	ns
t_r	Rise Time			1.2	10	
$t_{d(off)}$	Turn-Off Delay Time			13	24	
t_f	Fall Time			1.3	10	
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0 \text{ V to } 10 \text{ V}$		7.6	11	nC
	Total Gate Charge	$V_{GS} = 0 \text{ V to } 4.5 \text{ V}$		3.6	5.1	
Q_{gs}	Gate to Source Charge	$V_{DD} = 20 \text{ V}$ $I_D = 7 \text{ A}$		1.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.0		nC

FDMC8032L

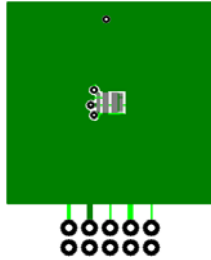
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 7\text{ A}$ (Note 2)		0.85	1.3	V
		$V_{GS} = 0\text{ V}, I_S = 1.4\text{ A}$ (Note 2)		0.75	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 7\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		16	29	ns
Q_{rr}	Reverse Recovery Charge			3.9	10	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 in² 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 in² 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 μs , Duty cycle < 2.0%.
- E_{AS} of 13 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 3\text{ A}$, $V_{DD} = 40\text{ V}$, $V_{GS} = 10\text{ V}$. 100% tested at $L = 0.1\text{ mH}$, $I_{AS} = 11\text{ A}$.
- Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.

TYPICAL CHARACTERISTICS

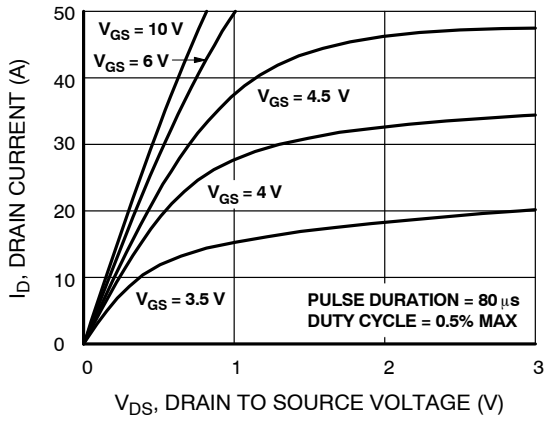


Figure 1. On-Region Characteristics

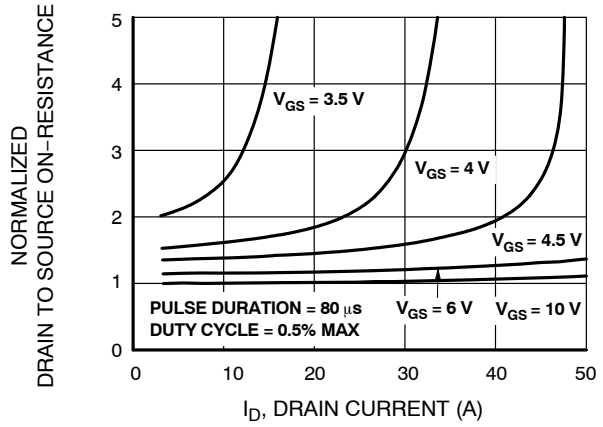


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

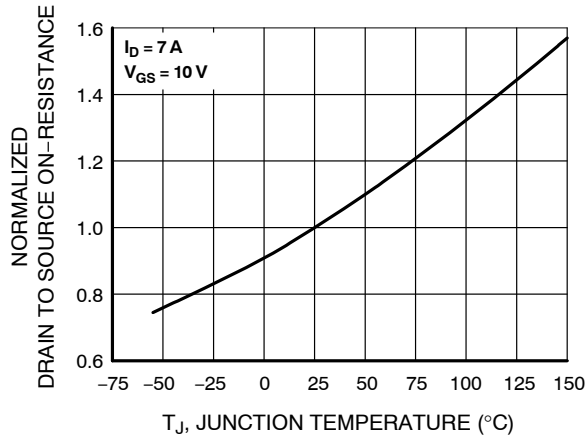


Figure 3. Normalized On-Resistance vs Junction Temperature

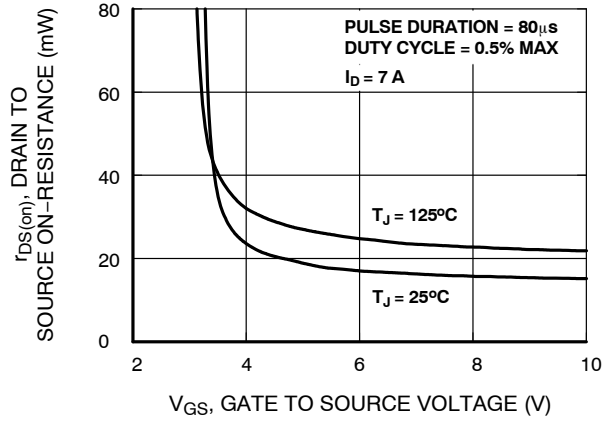


Figure 4. On-Resistance vs Gate to Source Voltage

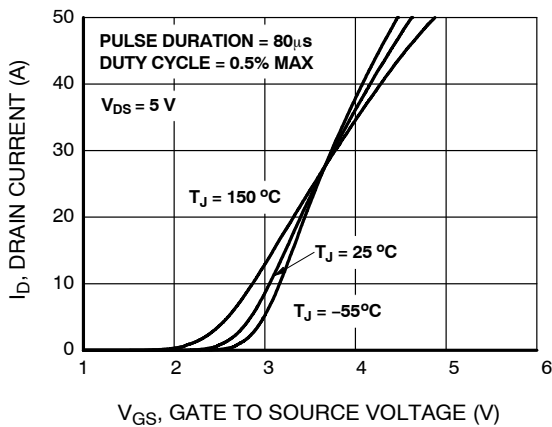


Figure 5. Transfer Characteristics

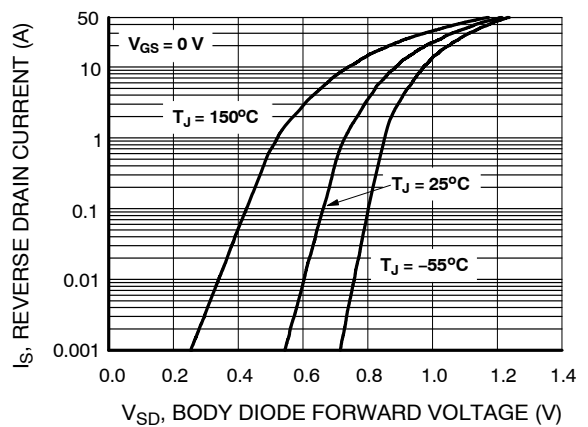


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (continued)

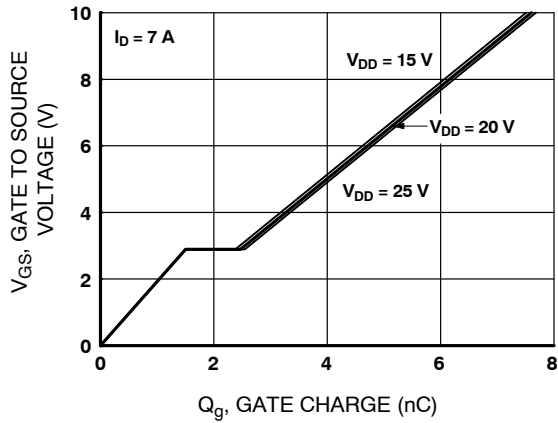


Figure 7. Gate Charge Characteristics

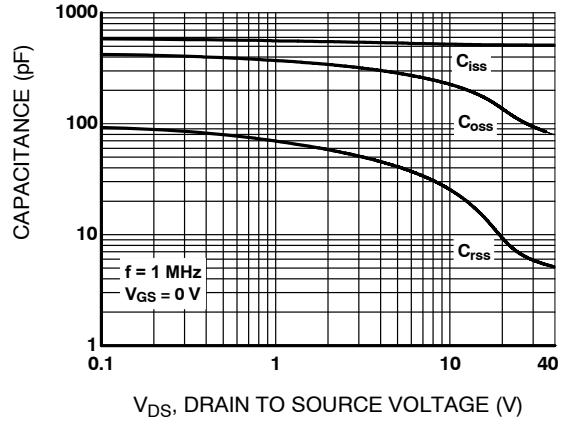


Figure 8. Capacitance vs Drain to Source Voltage

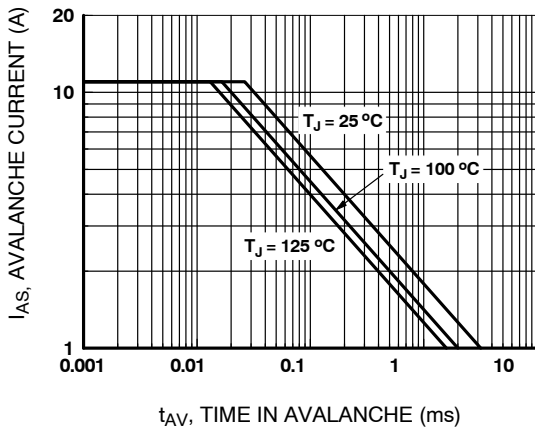


Figure 9. Unclamped Inductive Switching Capability

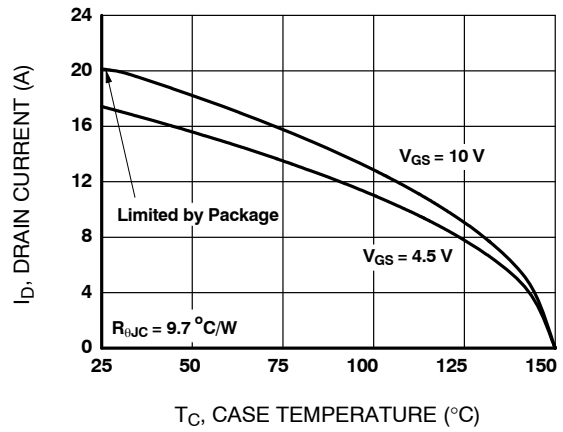


Figure 10. Maximum Continuous Drain Current vs Case Temperature

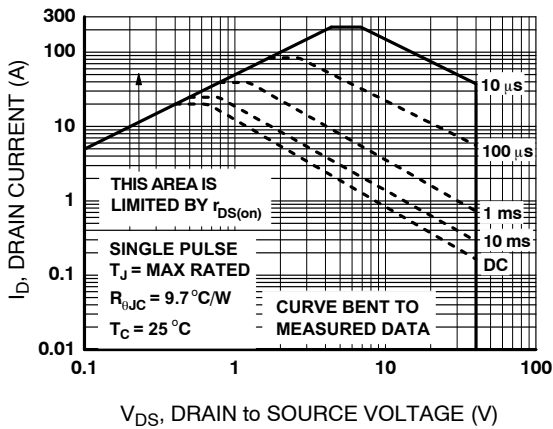


Figure 11. Forward Bias Safe Operating Area

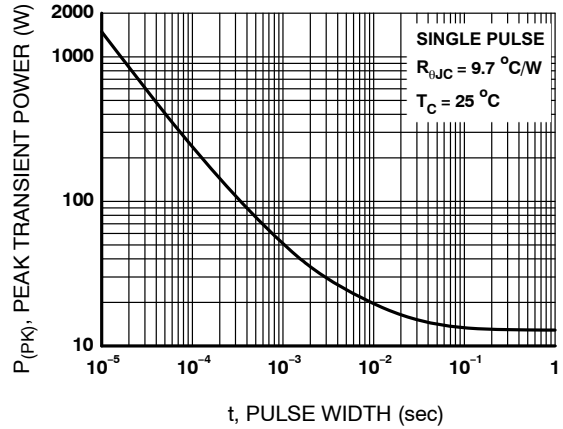


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

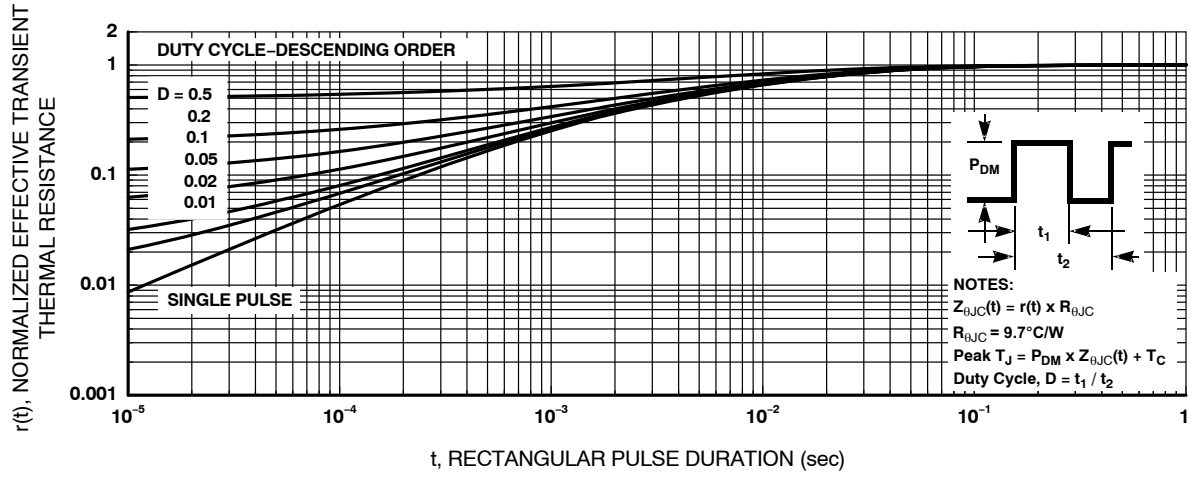
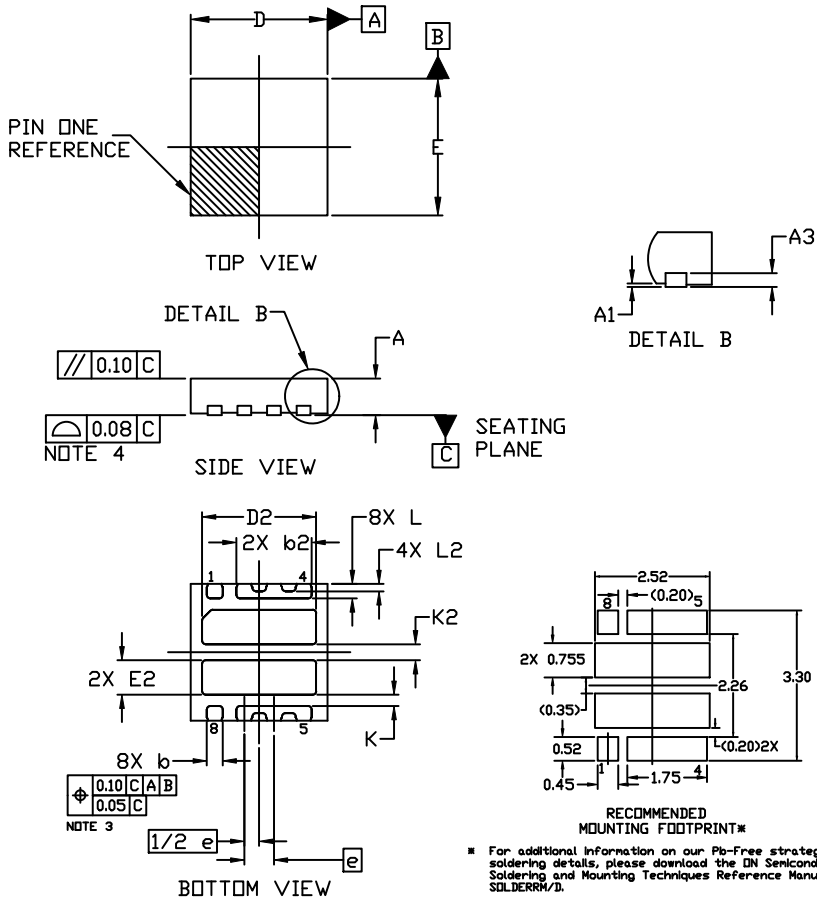


Figure 13. Transient Thermal Response Curve

WDFN8 3x3, 0.65P
CASE 511DG
ISSUE A

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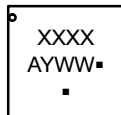


NOTES:

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		
<i>b</i>	0.30	0.35	0.40
<i>b</i> 2	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
<i>e</i>	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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