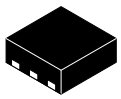
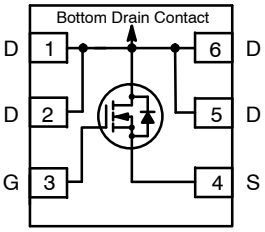
MOSFET – N-Channel, POWERTRENCH®

30 V, 9.0 A, 16 mΩ

FDMA8878, FDMA8878-F130



WDFN6
CASE 511CZ



General Description

This N−Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH process that has been optimized for $R_{DS(on)}$, switching performance.

Features

- Max $R_{DS(on)}$ = 16 mΩ @ V_{GS} = 10 V, I_D = 9.0 A
- Max $R_{DS(on)}$ = 19 mΩ @ V_{GS} = 4.5 V, I_D = 8.5 A
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- Fast Switching Speed
- Pb−Free, Halide Free and RoHS Compliant

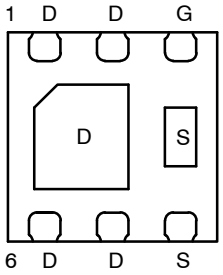
Applications

- DC−DC Buck Converters
- Load Switch in NB
- Notebook Battery Power Management

MARKING DIAGRAM

Z	= Assembly Plant Code
XY	= 2−Digit Date Code
KK	= Lot Run Code
878	= Specific Device Code

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C unless otherwise noted.

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage (Note 3)	±20	V
I_D	Drain Current Continuous (Package Limited), T_C = 25°C Continuous, T_A = 25°C (Note 1a) Pulsed	 10 9.0 40	A
P_D	Power Dissipation, T_A = 25°C (Note 1a) (Note 1b)	 2.4 0.9	W
T_J, T_{STG}	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.

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a) (Note 1b)	 52 145	°C/W

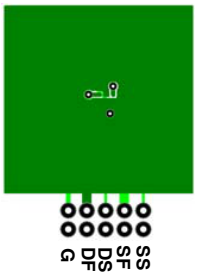
ELECTRICAL CHARACTERISTICS T_A = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	26	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V	–	–	1	μA
I_{GSS}	Gate−Body Leakage	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	1.2	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	−5	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On−Resistance	I_D = 9.0 A, V_{GS} = 10 V,	–	13	16	mΩ
		I_D = 8.5 A, V_{GS} = 4.5 V	–	16	19	
		I_D = 9.0 A, V_{GS} = 10 V, T_J = 125°C	–	17	21	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 9.0 A	–	41	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = −15 V, V_{GS} = 0 V, f = 1.0 MHz	–	539	720	pF
C_{oss}	Output Capacitance		–	172	230	
C_{rss}	Reverse Transfer Capacitance		–	24	35	
R_G	Gate Resistance		–	1.3	–	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 15 V, I_D = 9.0 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	6	12	ns
t_r	Rise Time		–	2	10	
$t_{d(off)}$	Turn−Off Delay Time		–	14	25	
t_f	Fall Time		–	2	10	
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 15 V, I_D = 9.0 A	–	8.5	12	nC
		V_{GS} = 0 V to 4.5 V, V_{DD} = 15 V, I_D = 9.0 A	–	4.1	5.8	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15 V, I_D = 9.0 A	–	1.6	–	
Q_{gd}	Gate to Drain “Miller” Charge		–	1.2	–	
DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.0 A (Note 2)	–	0.75	1.2	V
		V_{GS} = 0 V, I_S = 9.0 A (Note 2)	–	0.86	1.2	
t_{rr}	Reverse Recovery Time	I_F = 9.0 A, di/dt = 100 A/μs	–	16	28	ns
Q_{rr}	Reverse Recovery Charge		–	4	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:

1. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user’s board design.



a) 52°C/W when mounted on a 1 in^2 pad of 2 oz. copper.

b) 145°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%
3. 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°C unless otherwise noted)

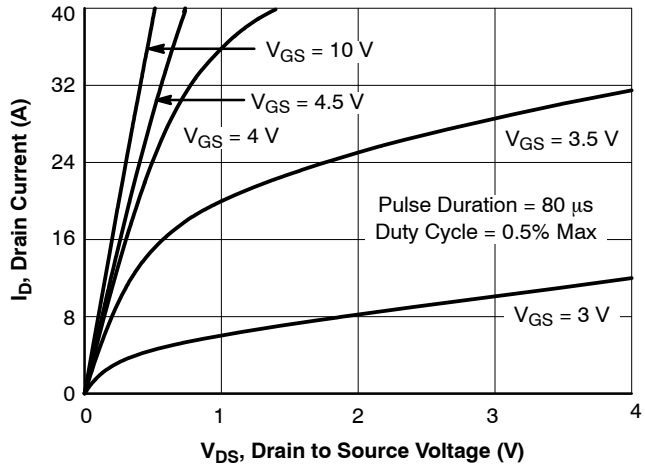


Figure 1. On−Region Characteristics

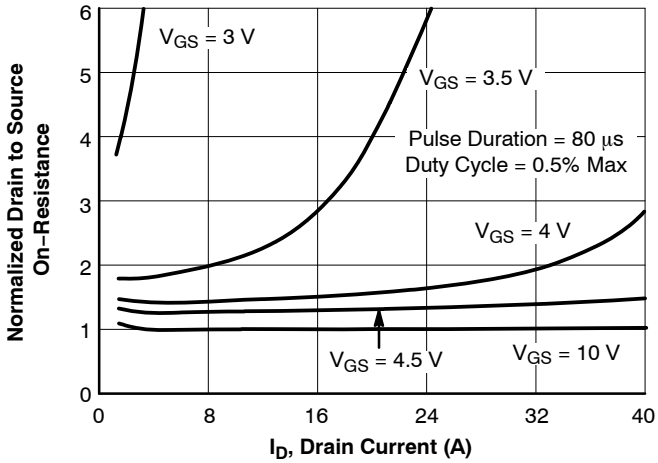


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

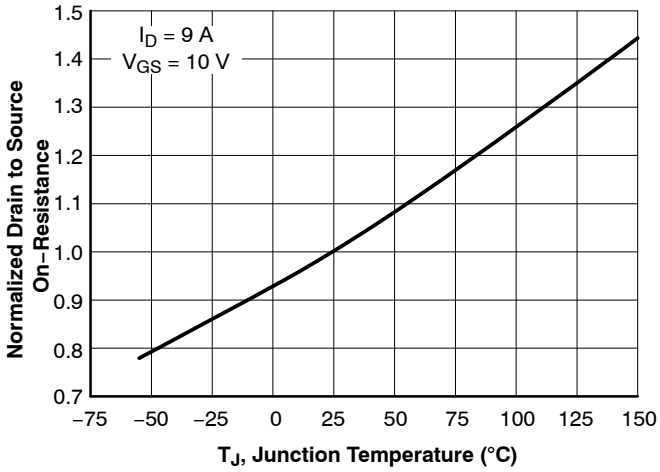


Figure 3. Normalized On−Resistance vs. Junction Temperature

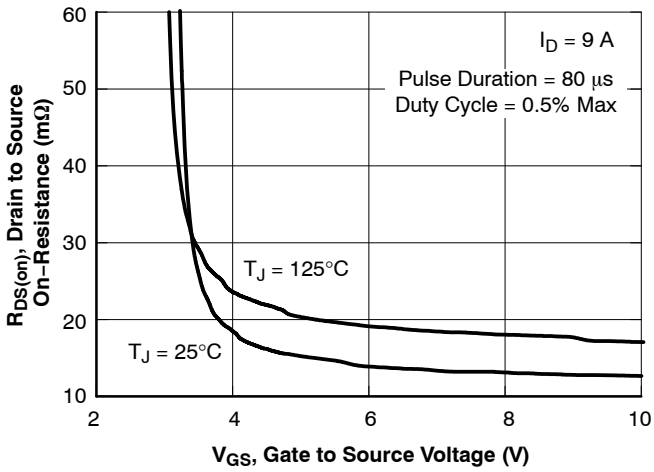


Figure 4. On−Resistance vs. Gate−to−Source Voltage

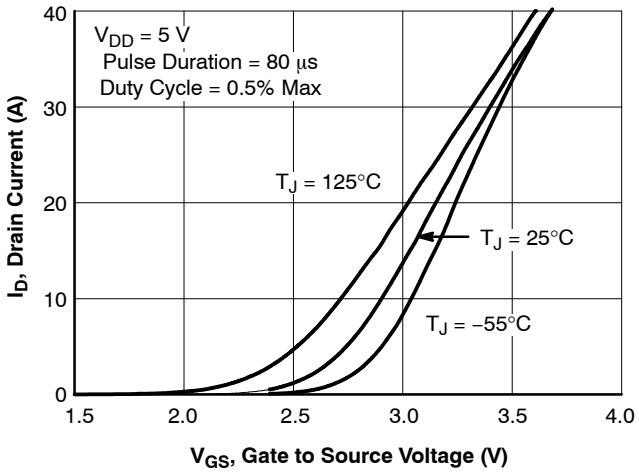


Figure 5. Transfer Characteristics

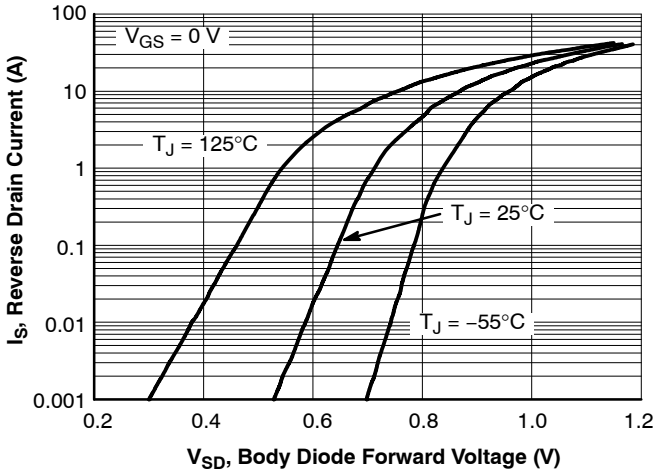


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS (continued)

(T_J = 25°C unless otherwise noted)

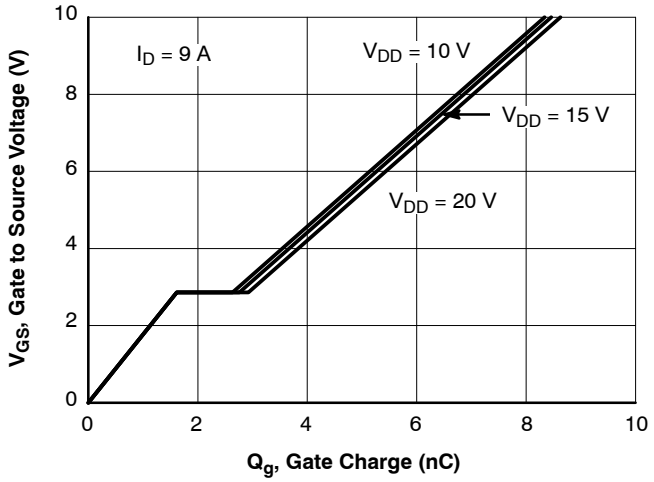


Figure 7. Gate Charge Characteristics

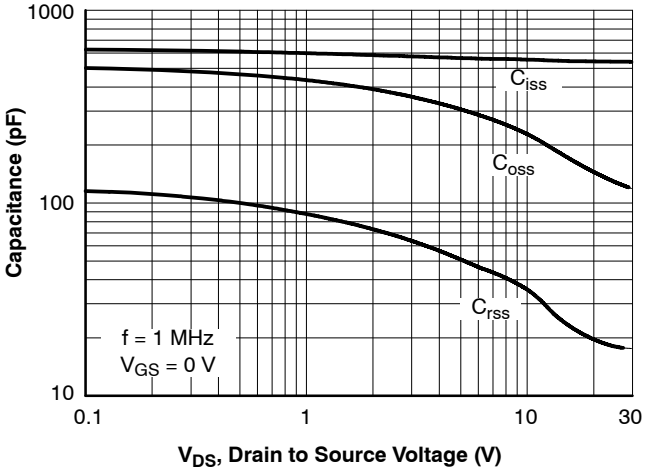


Figure 8. Capacitance Characteristics

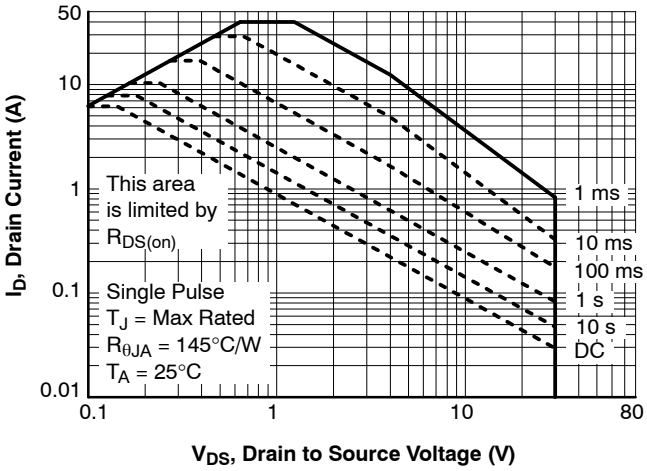


Figure 9. Maximum Safe Operating Area

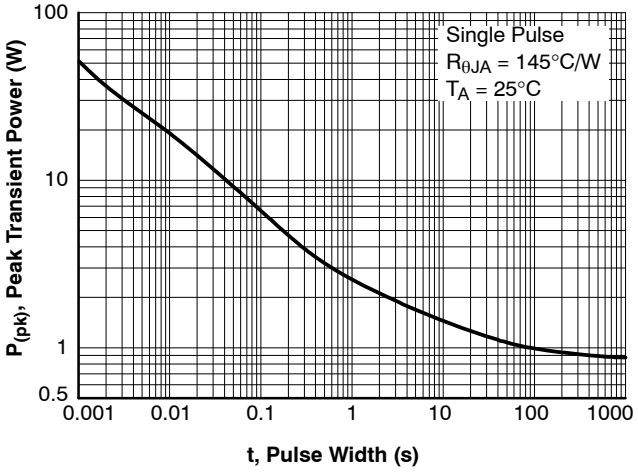


Figure 10. Single Pulse Maximum Power Dissipation

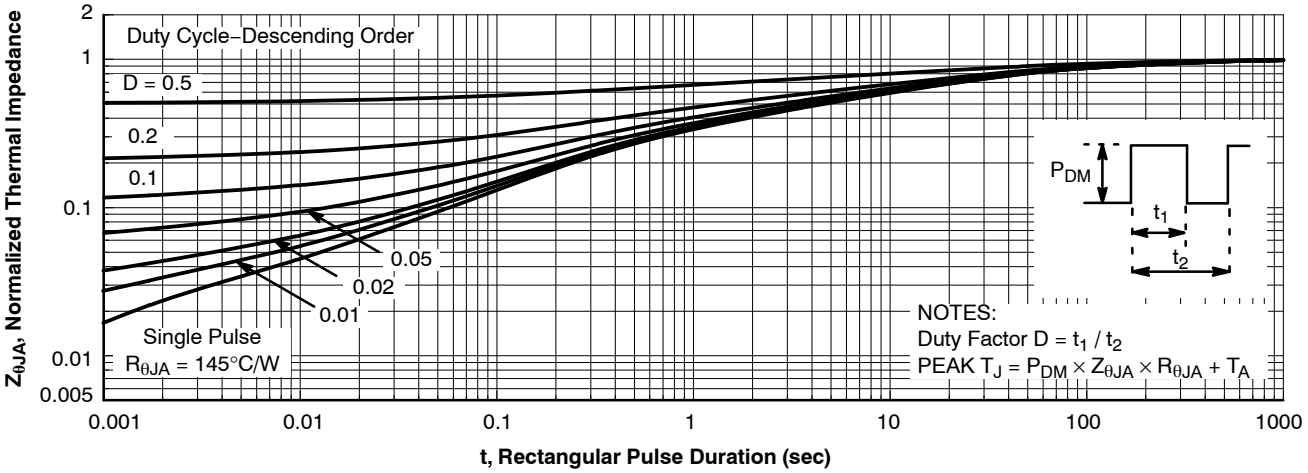


Figure 11. Transient Thermal Response Curve

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

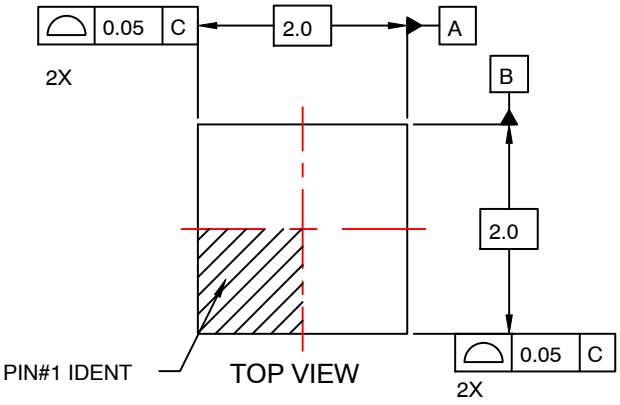
ORDERING INFORMATION

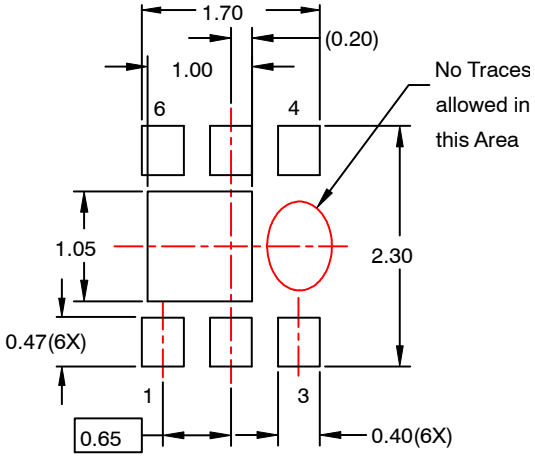
Device Order Number	Package Type	Pin 1 Orientation in Tape Cavity	Shipping†
FDMA8878	WDFN6 (Pb−Free/Halide Free)	Top Left	3000 / Tape & Reel
FDMA8878−F130	WDFN6 (Pb−Free/Halide Free)	Top Right	3000 / Tape & Reel

†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.

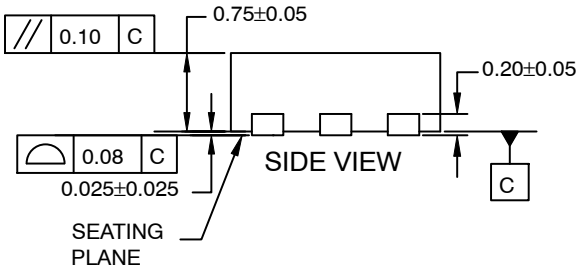
WDFN6 2x2, 0.65P
CASE 511CZ
ISSUE O

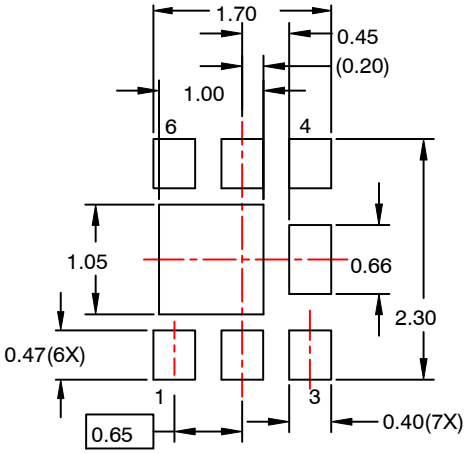
DATE 31 JUL 2016





RECOMMENDED
LAND PATTERN OPT 1





RECOMMENDED
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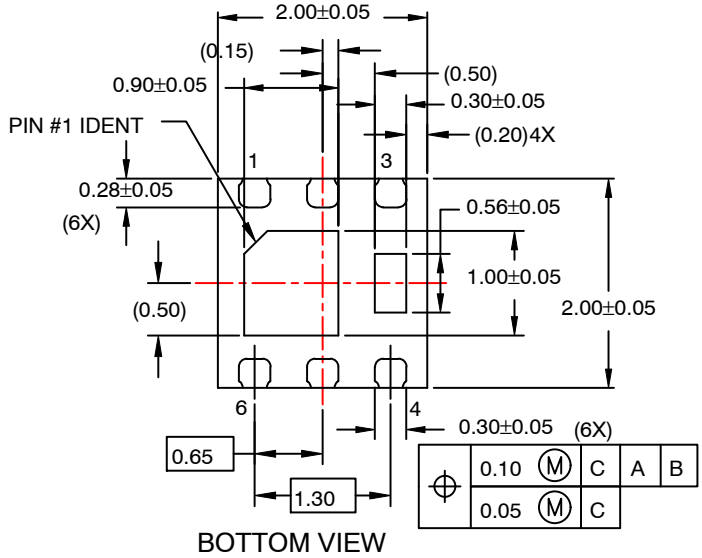

BOTTOM VIEW

NOTES:

A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC MO−229 REGISTRATION

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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