MOSFET – P-Channel, POWERTRENCH® Integrated with Schottky Diode

-20 V, -3.1 A, 95 mΩ

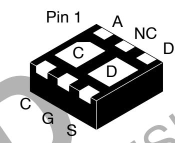
FDFMA2P029Z, FDFMA2P029Z-F106

MOSFET

V_{DS} MAX	$r_{DS(on)}$ MAX	I_D MAX
−20 V	95 mΩ @ −4.5 V	−3.1 A
	141 mΩ @ −2.5 V	

SCHOTTKY DIODE

V_{RRM} MAX	V_F MAX	I_O MAX
20 V	0.37 V @ 500 mA	2 A



WDFN6 2x2, 0.65P MicroFET CASE 511DA

General Description

This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra−portable applications. It features a MOSFET with very low on−state resistance and an independently connected low forward voltage schottky diode allows for minimum conduction losses.

The MicroFET™ 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

Features

MOSFET

- Max $r_{DS(on)}$ = 95 mΩ at V_{GS} = –4.5 V, I_D = –3.1 A
- Max $r_{DS(on)}$ = 141 mΩ at V_{GS} = –2.5 V, I_D = –2.5 A
- HBM ESD Protection Level > 2.5 kV (Note 1)

Schottky

- V_F < 0.37 V @ 500 mA
- Low Profile – 0.8 mm Maximum – In the New Package MicroFET 2x2 mm
- These Devices are Pb−Free and are RoHS Compliant

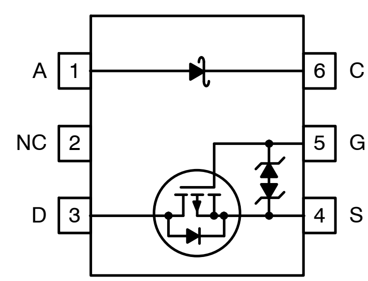
NOTE:
1. The diode connected between the gate and source serves only protection against ESD. No gate overvoltage rating is implied.

MARKING DIAGRAM

&Z&2&K
P29

&Z = Assembly Plant Code
&2 = 2−Digit Date Code
&K = 2−Digits Lot Run Traceability Code
P29 = Device Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Ratings	Unit
V_{DS}	Drain to Source Voltage		–20	V
V_{GS}	Gate to Source Voltage		±12	V
I_D	Drain Current	Continuous (Note 2a)	–3.1	A
		Pulsed	–6	
P_D	Power Dissipation	(Note 2a)	1.4	W
		(Note 2b)	0.7	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +150	°C
V_{RRM}	Schottky Repetitive Peak Reverse Voltage		20	V
I_O	Schottky Average Forward Current		2	A

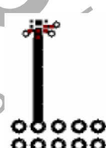
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

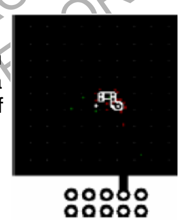
Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2a)	86	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2b)	173	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2c)	86	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2d)	140	

2. $R_{\theta JA}$ is determined with the device mounted on a 1 in^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 $R_{\theta JA}$ is determined by the user's board design.
   a. MOSFET $R_{\theta JA}$ = 86°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.
   b. MOSFET $R_{\theta JA}$ = 173°C/W when mounted on a minimum pad of 2 oz copper.
   c. Schottky $R_{\theta JA}$ = 86°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.
   d. Schottky $R_{\theta JA}$ = 140°C/W when mounted on a minimum pad of 2 oz copper.

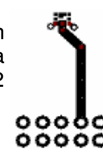
a. 86°C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 173°C/W when mounted on a minimum pad of 2 oz copper.



c. 86°C/W when mounted on a 1 in^2 pad of 2 oz copper.



d. 140°C/W when mounted on a minimum pad of 2 oz copper.

ELECTRICAL CHARACTERISTICS (T_J = 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	–20	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 μA, referenced to 25°C	–	–12	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –16 V, V_{GS} = 0 V	–	–	–1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12 V, V_{DS} = 0 V	–	–	±10	μA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = –250 μA	–0.6	–1.0	–1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = –250 μA, referenced to 25°C	–	4	–	mV/°C
$r_{DS(on)}$	Static Drain to Source On−Resistance	V_{GS} = –4.5 V, I_D = –3.1 A	–	60	95	mΩ
		V_{GS} = –2.5 V, I_D = –2.5 A	–	88	141	
		V_{GS} = –4.5 V, I_D = –3.1 A, T_J = 125°C	–	87	140	
g_{FS}	Forward Transconductance	V_{DS} = –10 V, I_D = –3.1 A	–	–11	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = –10 V, V_{GS} = 0 V, f = 1 MHz	–	540	720	pF
C_{oss}	Output Capacitance		–	120	160	pF
C_{rss}	Reverse Transfer Capacitance		–	100	150	pF
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = –10 V, I_D = –1 A V_{GS} = –4.5 V, R_{GEN} = 6 Ω	–	13	24	ns
t_r	Rise Time		–	11	20	ns
$t_{d(off)}$	Turn−Off Delay Time		–	37	59	ns
t_f	Fall Time		–	36	58	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{DD} = –10 V, I_D = –3.1 A V_{GS} = –4.5 V	–	7	10	nC
Q_{gs}	Gate to Source Gate Charge		–	1.1	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	2.4	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS						
I_S	Maximum Continuous Drain−Source Diode Forward Current		–	–	–1.1	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = –1.1 A (Note 3)	–	–0.8	–1.2	V
t_{rr}	Reverse Recovery Time	I_F = –3.1 A, di/dt = 100 A/μs	–	25	–	ns
Q_{rr}	Reverse Recovery Charge		–	9	–	nC
SCHOTTKY DIODE CHARACTERISTICS						
V_R	Reverse Voltage	I_R = 1 mA, T_J = 25°C	20	–	–	V
I_R	Reverse Leakage	V_R = 20 V, T_J = 25°C	–	30	300	μA
		T_J = 125°C	–	10	45	mA
V_F	Forward Voltage	I_F = 500 mA, T_J = 25°C	–	0.32	0.37	V
		T_J = 125°C	–	0.21	0.26	
		I_F = 1 A, T_J = 25°C	–	0.37	0.435	
		T_J = 125°C	–	0.28	0.33	

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.

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted)

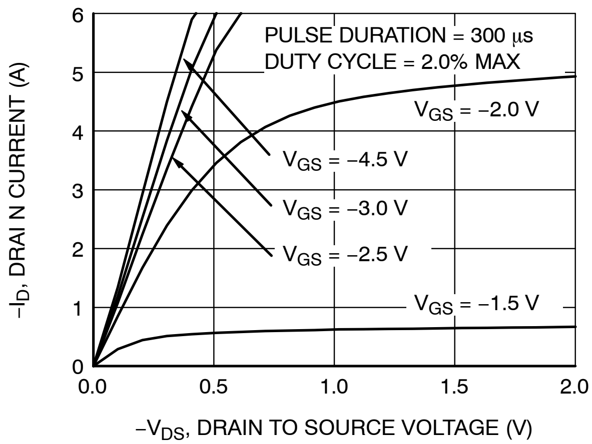


Figure 1. On Region Characteristics

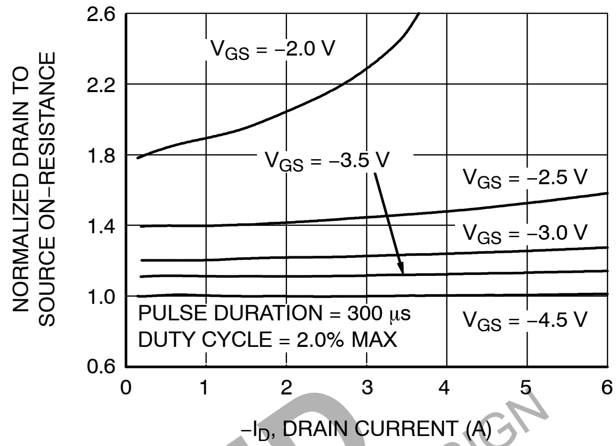


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

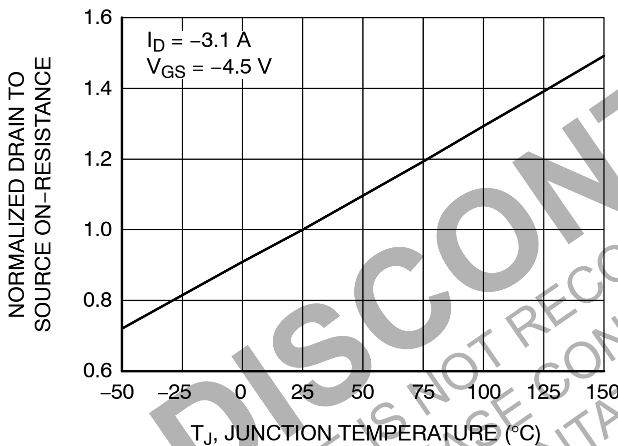


Figure 3. Normalized On−Resistance vs. Junction Temperature

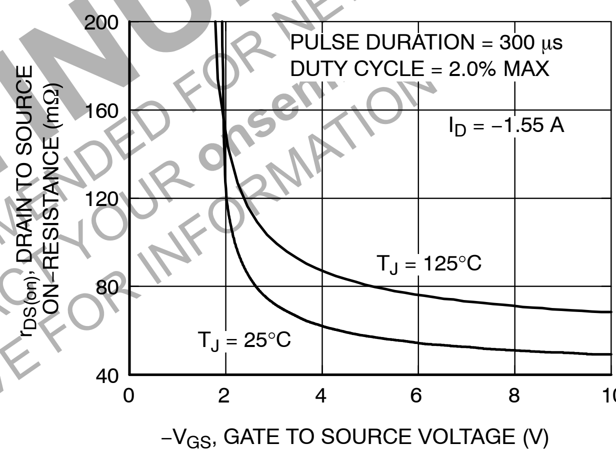


Figure 4. On−Resistance vs. Gate to Source Voltage

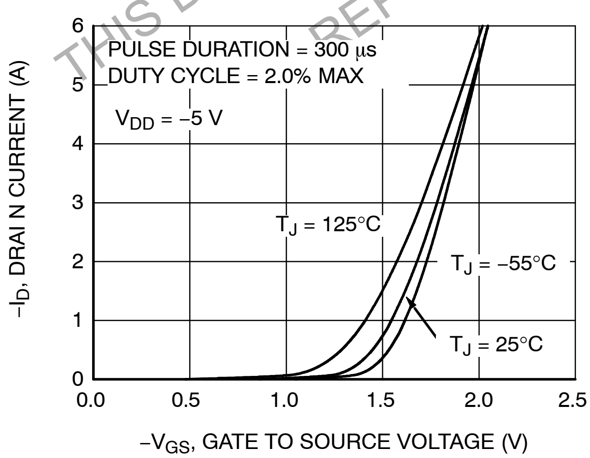


Figure 5. Transfer Characteristics

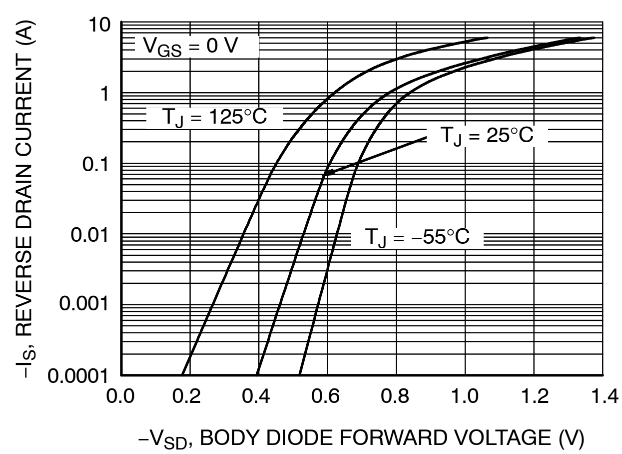


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted) (continued)

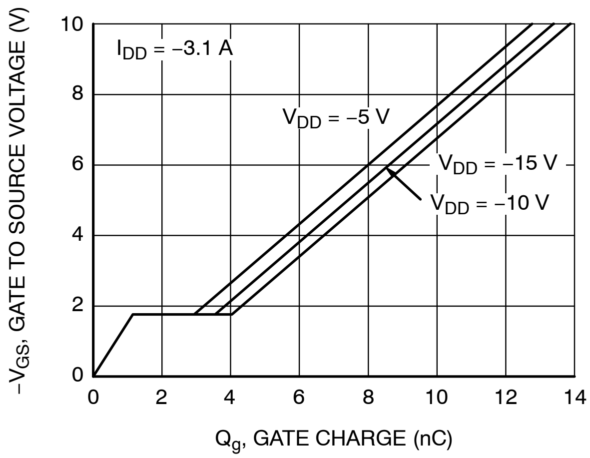


Figure 7. Gate Charge Characteristics

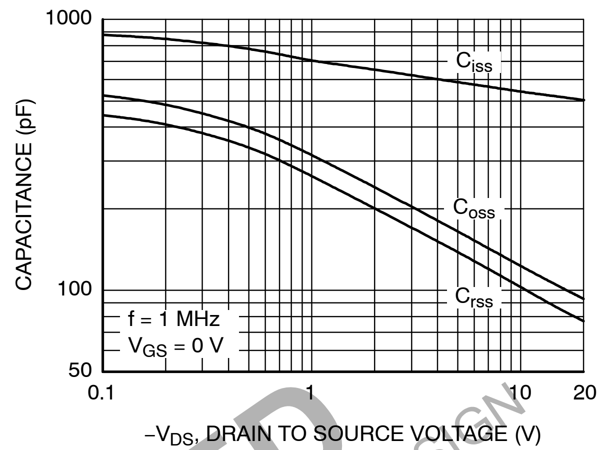


Figure 8. Capacitance Characteristics

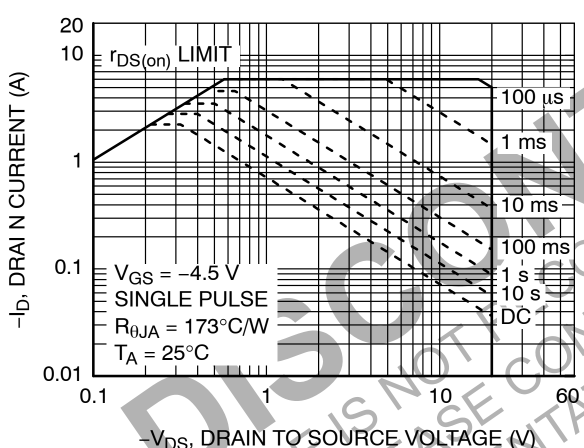


Figure 9. Forward Bias Safe Operating Area

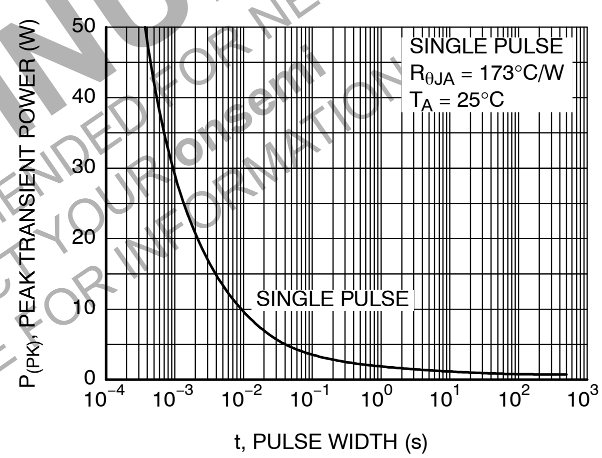


Figure 10. Single Pulse Maximum Power Dissipation

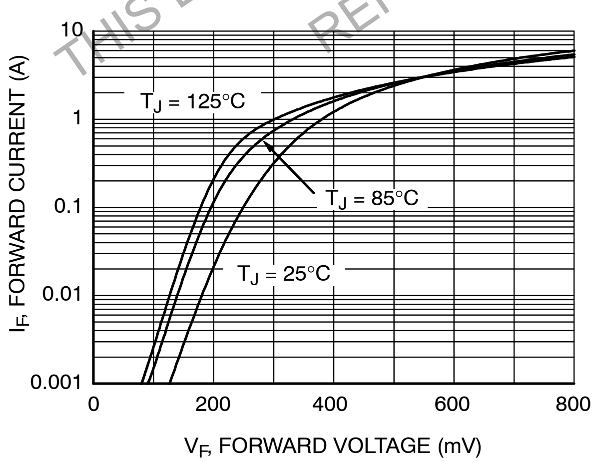


Figure 11. Schottky Diode Forward Voltage

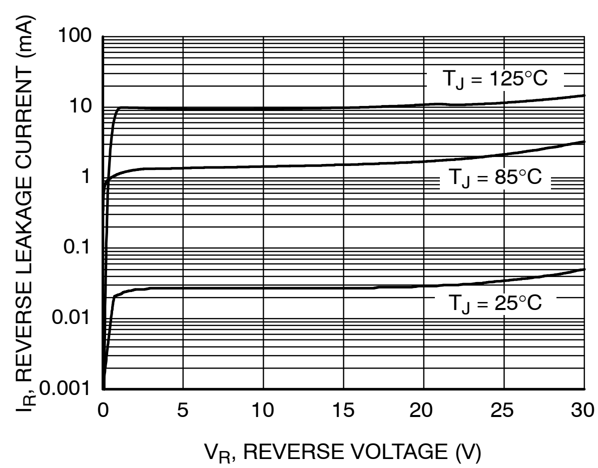


Figure 12. Schottky Diode Reverse Current

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted) (continued)

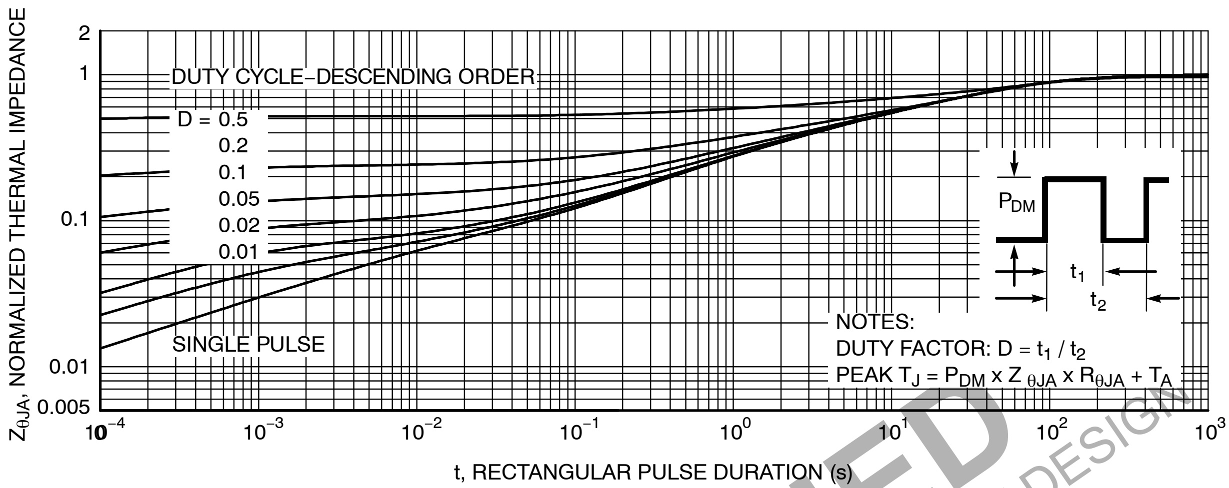


Figure 13. Transient Thermal Response Curve

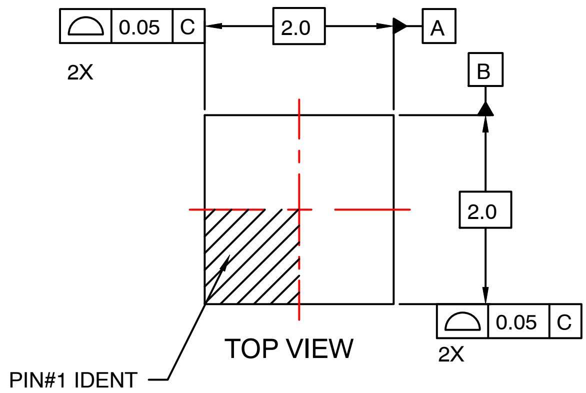
PACKAGE MARKING AND ORDERING INFORMATION

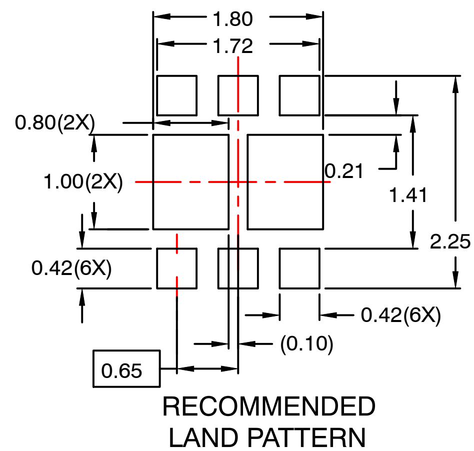
Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping†
FDFMA2P029Z	P29	WDFN6 2x2, 0.65P MicroFET (Pb−Free)	7”	8 mm	3000 / Tape & Reel
FDFMA2P029Z−F106	P29	WDFN6 2x2, 0.65P MicroFET (Pb−Free)	7”	8 mm	3000 / Tape & Reel

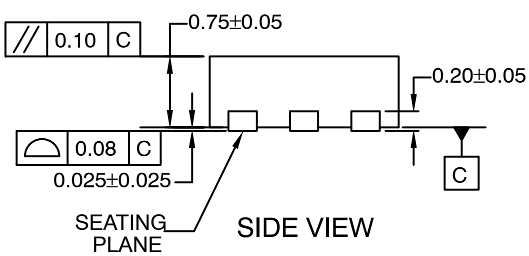
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

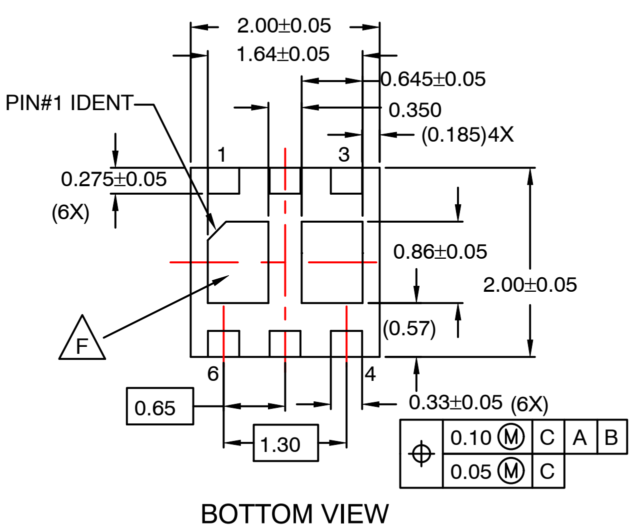
WDFN6 2x2, 0.65P
CASE 511DA
ISSUE O

DATE 31 JUL 2016









NOTES:

A. CONFORM TO JADEC REGISTRATIONS MO−229, VARIATION VCCC, EXCEPT WHERE NOTED.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
F. NON−JEDEC DUAL DAP

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