MOSFET – POWERTRENCH®, 20 V Complementary

N-Channel: 20 V, 3.7 A, 68 mΩ
P-Channel: -20 V, -3.1 A, 95 mΩ

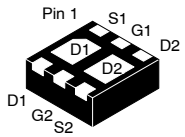
FDMA1032CZ

N−Channel

V_{DS} MAX	$R_{DS(on)}$	I_D MAX
20 V	68 mΩ @ 4.5 V	3.7 A
	86 mΩ @ 2.5 V	

P−Channel

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



WDFN6 2x2, 0.65P
(MicroFET)
CASE 511DA

General Description

This device is designed specifically as a single package solution for a DC/DC "Switching" MOSFET in cellular handset and other ultra−portable applications. It features an independent N−Channel & P−Channel MOSFET with low on−state resistance for minimum conduction losses. The gate charge of each MOSFET is also minimized to allow high frequency switching directly from the controlling device. The MicroFET™ 2x2 package offers exceptional thermal performance for its physical size and is well suited to switching applications.

Features

Q1: N−Channel

- $R_{DS(on)}$ = 68 mΩ at V_{GS} = 4.5 V
- $R_{DS(on)}$ = 86 mΩ at V_{GS} = 2.5 V

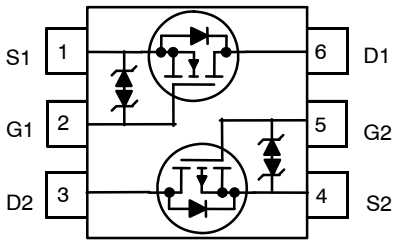
Q2: P−Channel

- $R_{DS(on)}$ = 95 mΩ at V_{GS} = −4.5 V
- $R_{DS(on)}$ = 141 mΩ at V_{GS} = −2.5 V
- Low Profile − 0.8 mm Maximum − In the New Package MicroFET 2x2 mm
- HBM ESD Protection Level > 2 kV (Note 3)
- Free from Halogenated Compounds and Antimony Oxides
- This Device is Pb−Free, Halide Free and is RoHS Compliant

MARKING DIAGRAM

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

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
FDMA1032CZ	WDFN6 (Pb−Free, Halide Free)	3000 / 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.

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

Symbol	Parameter		Q1	Q2	Unit
V_{DS}	Drain−Source Voltage		20	−20	V
V_{GS}	Gate−Source Voltage		±12	±12	V
I_D	Drain Current	Continuous (Note 1a)	3.7	−3.1	A
		Pulsed	6	−6	
P_D	Power Dissipation for Single Operation	(Note 1a)	1.4		W
		(Note 1b)	0.7		
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)	86 (Single Operation)	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	173 (Single Operation)	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1c)	69 (Dual Operation)	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1d)	151 (Dual Operation)	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

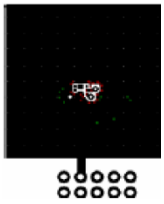
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
BV_{DSS}	Drain−Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V I_D = −250 μA, V_{GS} = 0 V	Q1 Q2	20 −20	– –	– –	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = −250 μA, referenced to 25°C	Q1 Q2	– –	15 −12	– –	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V V_{DS} = −16 V, V_{GS} = 0 V	Q1 Q2	– –	– –	1 −1	μA
I_{GSS}	Gate−Body Leakage	V_{GS} = ±12 V, V_{DS} = 0 V	All	–	–	±10	μA
ON CHARACTERISTICS (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	I_D = 250 μA, V_{DS} = V_{GS} I_D = −250 μA, V_{DS} = V_{GS}	Q1 Q2	0.6 −0.6	1.0 −1.0	1.5 −1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = −250 μA, referenced to 25°C	Q1 Q2	– –	−4 4	– –	mV/°C
$R_{DS(on)}$	Static Drain−Source On−Resistance	V_{GS} = 4.5 V, I_D = 3.7 A V_{GS} = 2.5 V, I_D = 3.3 A V_{GS} = 4.5 V, I_D = 3.7 A, T_J = 125°C	Q1	– – –	37 50 53	68 86 90	mΩ
		V_{GS} = −4.5 V, I_D = −3.1 A V_{GS} = −2.5 V, I_D = −2.5 A V_{GS} = −4.5 V, I_D = −3.1 A, T_J = 125°C	Q2	– – –	60 88 87	95 141 140	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 3.7 A V_{DS} = −10 V, I_D = −3.1 A	Q1 Q2	– –	16 −11	– –	S
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	Q1 V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz	Q1 Q2	– –	340 540	– –	pF
C_{oss}	Output Capacitance	Q2 V_{DS} = −10 V, V_{GS} = 0 V, f = 1.0 MHz	Q1 Q2	– –	80 120	– –	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2	– –	60 100	– –	pF

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

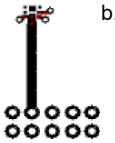
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 2)							
$t_{d(on)}$	Turn−On Delay Time	Q1 V_{DD} = 10 V, I_D = 1 A V_{GS} = 4.5 V, R_{GEN} = 6 Ω Q2 V_{DD} = −10 V, I_D = −1 A V_{GS} = −4.5 V, R_{GEN} = 6 Ω	Q1 Q2	– –	8 13	16 24	ns
t_r	Turn−On Rise Time		Q1 Q2	– –	8 11	16 20	ns
$t_{d(off)}$	Turn−Off Delay Time		Q1 Q2	– –	14 37	26 59	ns
t_f	Turn−Off Fall Time		Q1 Q2	– –	3 36	6 58	ns
Q_g	Total Gate Charge	Q1 V_{DS} = 10 V, I_D = 3.7 A, V_{GS} = 4.5 V Q2 V_{DS} = −10 V, I_D = −3.1 A, V_{GS} = −4.5 V	Q1 Q2	– –	4 7	6 10	nC
Q_{gs}	Gate−Source Charge		Q1 Q2	– –	0.7 1.1	– –	nC
Q_{gd}	Gate−Drain Charge		Q1 Q2	– –	1.1 2.4	– –	nC
DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
I_S	Maximum Continuous Source−Drain Diode Forward Current		Q1 Q2	– –	– –	1.1 −1.1	A
V_{SD}	Source−Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.1 A (Note 2) V_{GS} = 0 V, I_S = −1.1 A (Note 2)	Q1 Q2	– –	0.7 −0.8	1.2 −1.2	V
t_{rr}	Diode Reverse Recovery Time	Q1 I_F = 3.7 A, dI_F/dt = 100 A/μs Q2 I_F = −3.1 A, dI_F/dt = 100 A/μs	Q1 Q2	– –	11 25	– –	ns
Q_{rr}	Diode Reverse Recovery Charge		Q1 Q2	– –	2 9	– –	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.

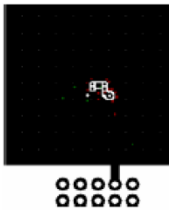
1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 oz. copper pad on a 1.5 x 1.5 in. board of FR−4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.
   a. $R_{\theta JA}$ = 86°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB. For single operation.
   b. $R_{\theta JA}$ = 173°C/W when mounted on a minimum pad of 2 oz copper.. For single operation.
   c. $R_{\theta JA}$ = 69°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB. For dual operation.
   d. $R_{\theta JA}$ = 151°C/W when mounted on a minimum pad of 2 oz copper. For dual operation.



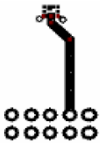
a. 86°C/W when mounted on a 1 in^2 pad of 2 oz copper.



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



c. 69°C/W when mounted on a 1 in^2 pad of 2 oz copper.



d. 151°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%
3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

TYPICAL CHARACTERISTICS Q1 (N−Channel)

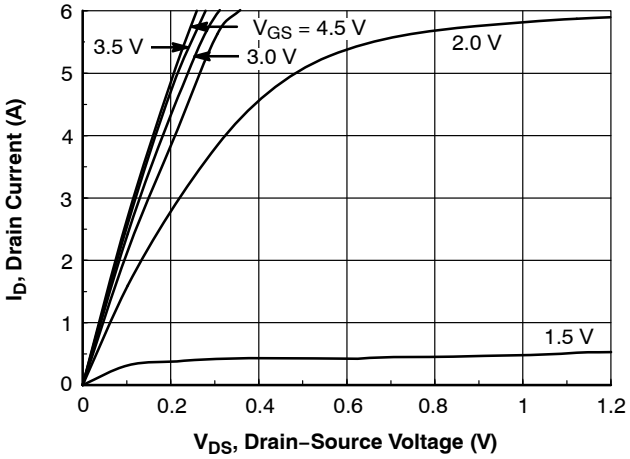


Figure 1. On−Region Characteristics

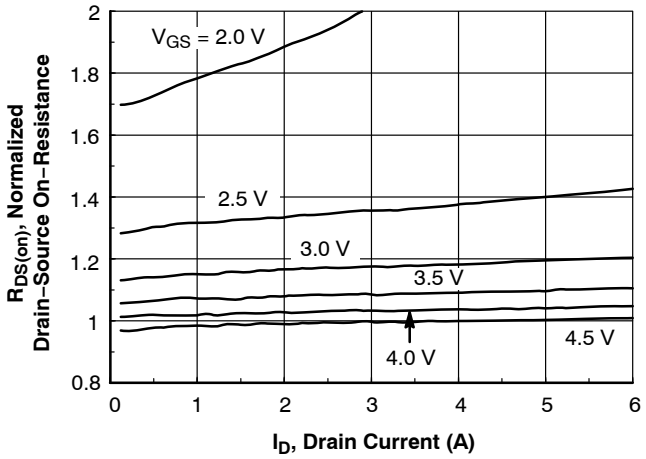


Figure 2. On−Resistance Variation with Drain Current and Gate Voltage

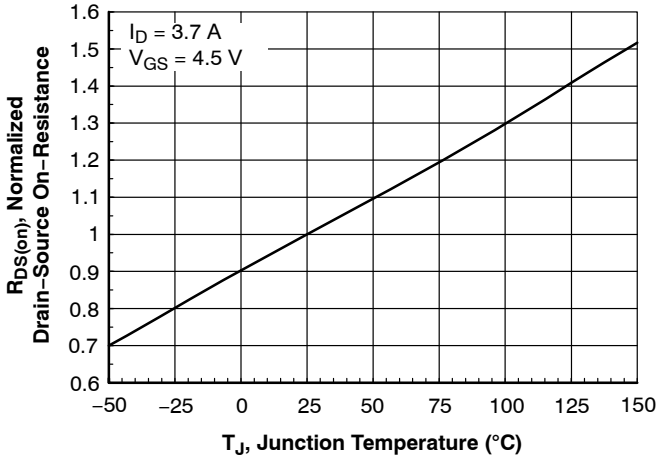


Figure 3. On−Resistance Variation with Temperature

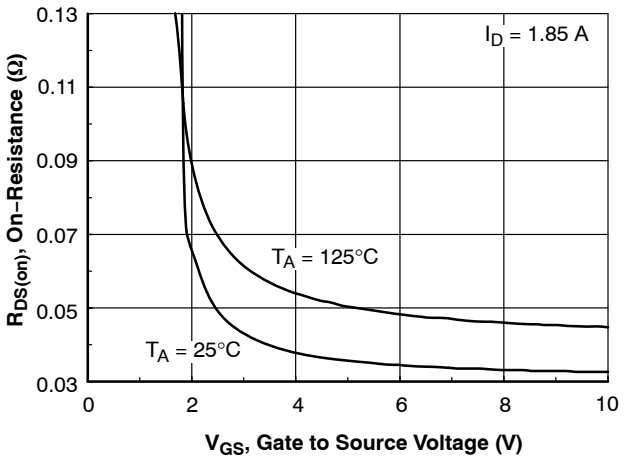


Figure 4. On−Resistance Variation with Gate−to−Source Voltage

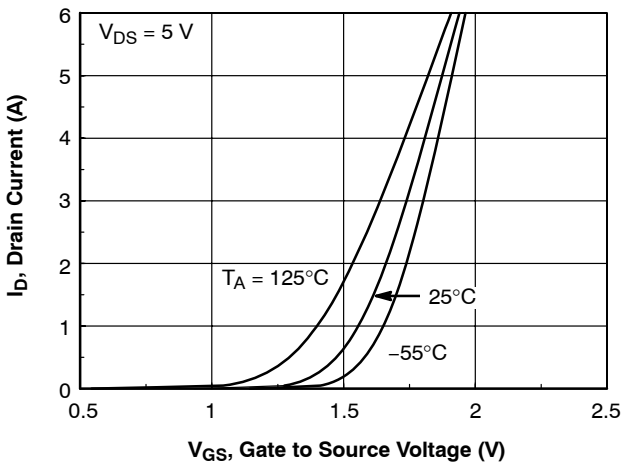


Figure 5. Transfer Characteristics

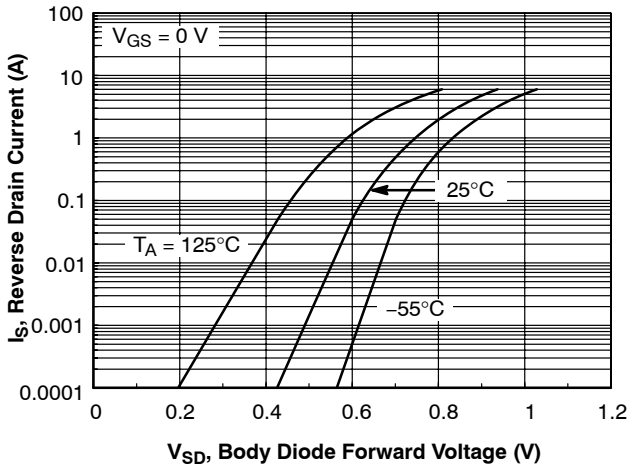


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS Q1 (N−Channel) (continued)

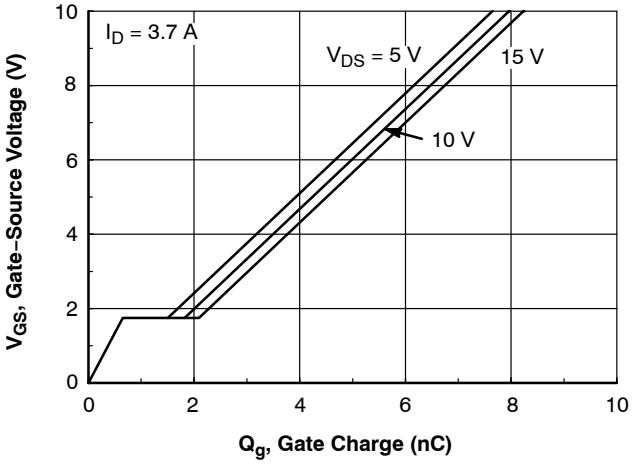


Figure 7. Gate Charge Characteristics

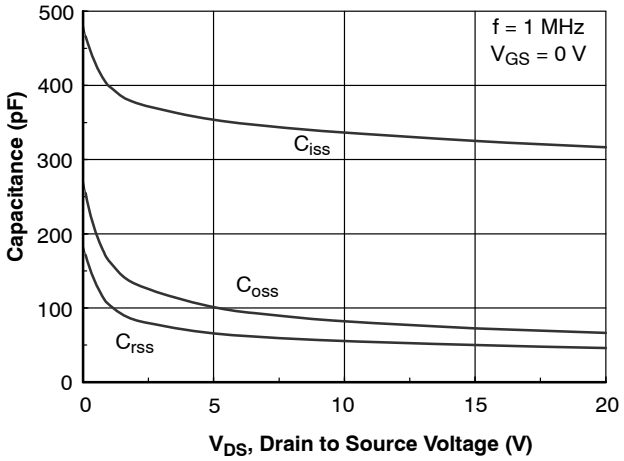


Figure 8. Capacitance Characteristics

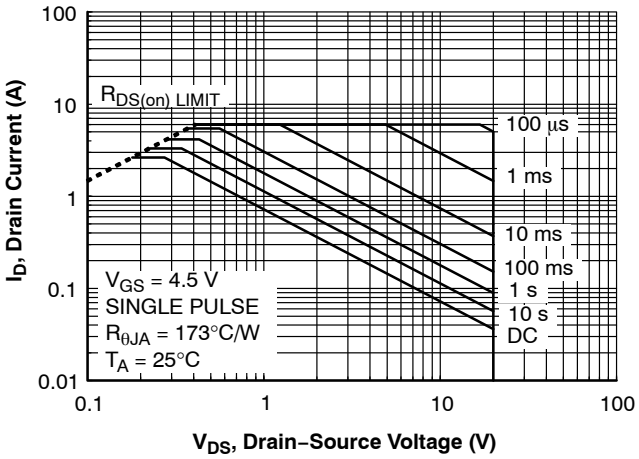


Figure 9. Forward Safe Operating Area

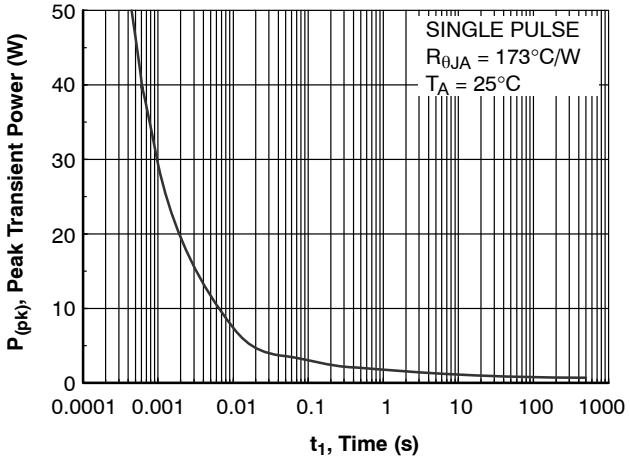


Figure 10. Single Pulse Maximum Power Dissipation

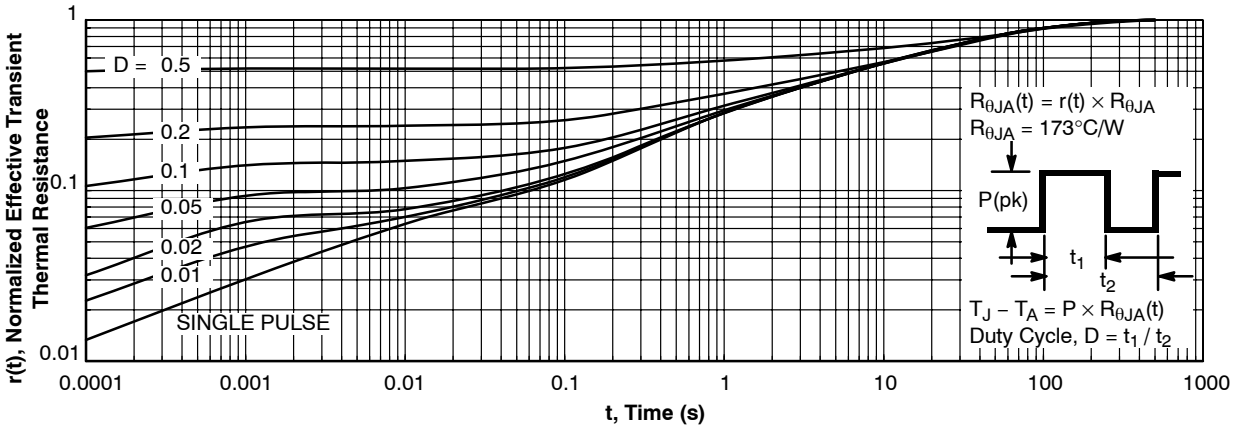


Figure 11. Transient Thermal Response Curve

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

TYPICAL CHARACTERISTICS Q2 (P−Channel)

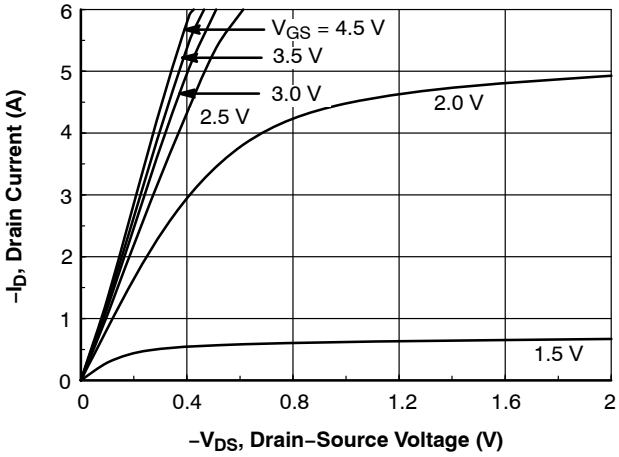


Figure 12. On−Region Characteristics

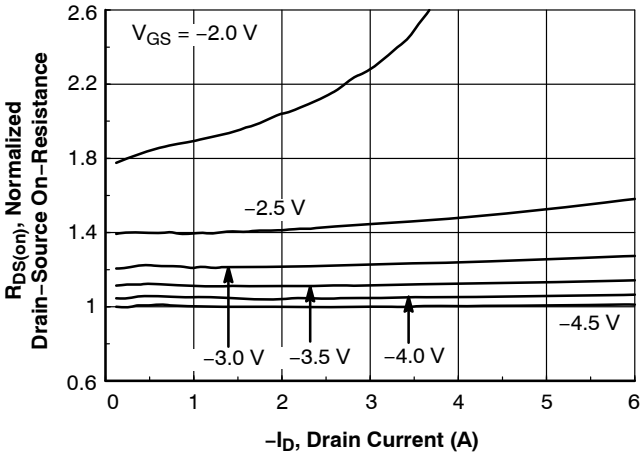


Figure 13. On−Resistance Variation with Drain Current and Gate Voltage

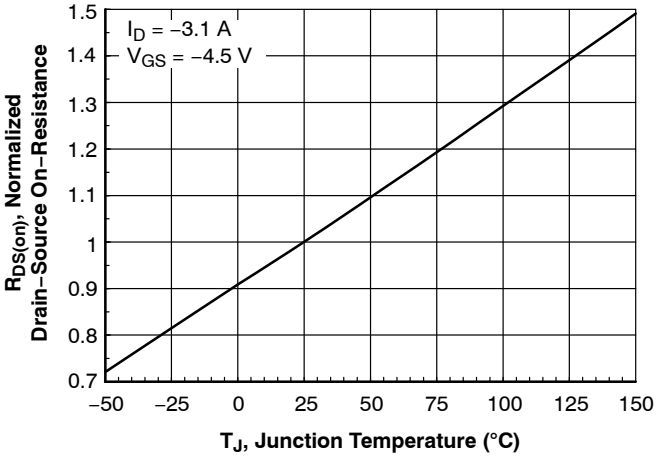


Figure 14. On−Resistance Variation with Temperature

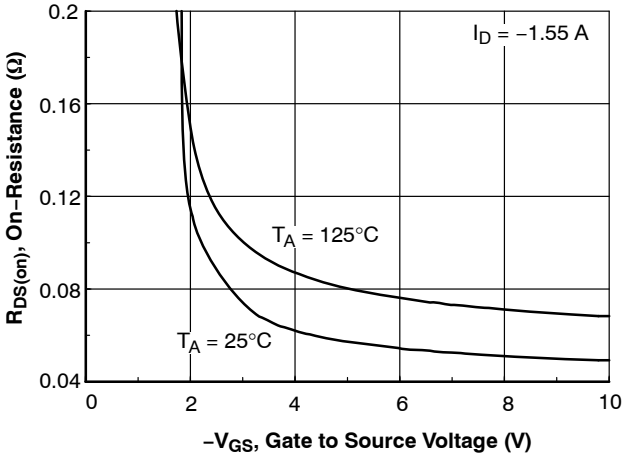


Figure 15. On−Resistance Variation with Gate−to−Source Voltage

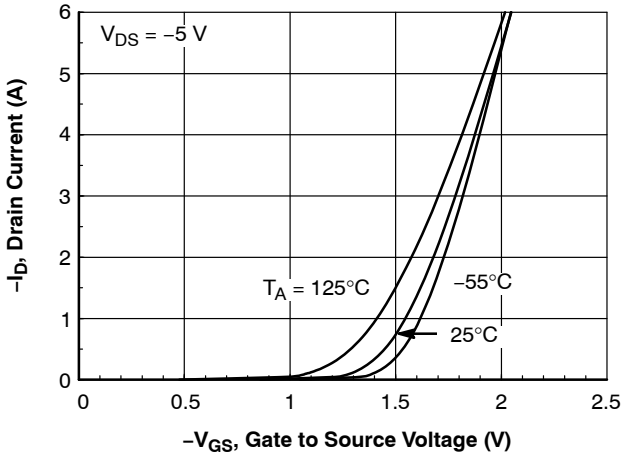


Figure 16. Transfer Characteristics

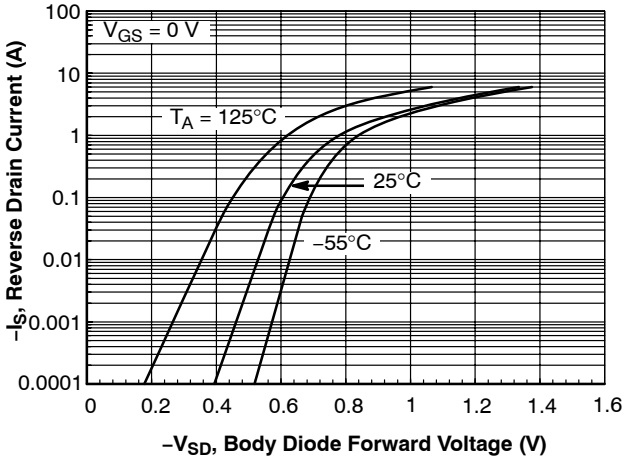


Figure 17. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS Q2 (P−Channel) (continued)

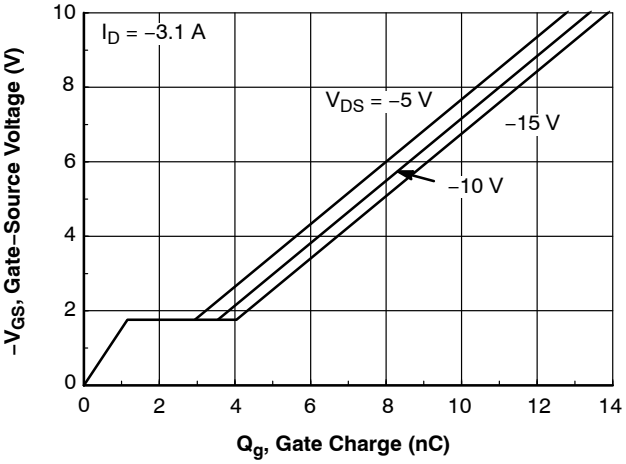


Figure 18. Gate Charge Characteristics

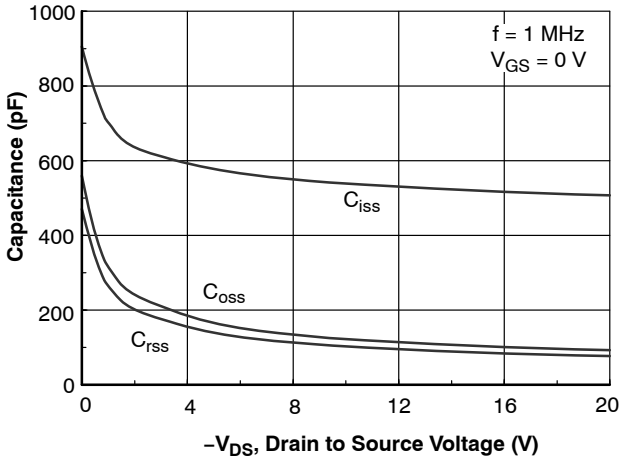


Figure 19. Capacitance Characteristics

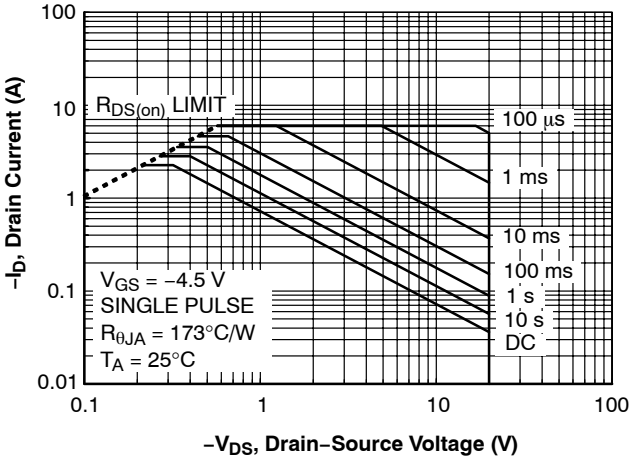


Figure 20. Maximum Safe Operating Area

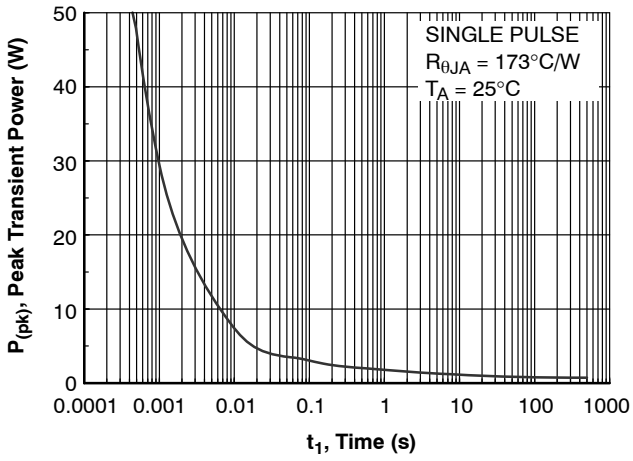


Figure 21. Single Pulse Maximum Power Dissipation

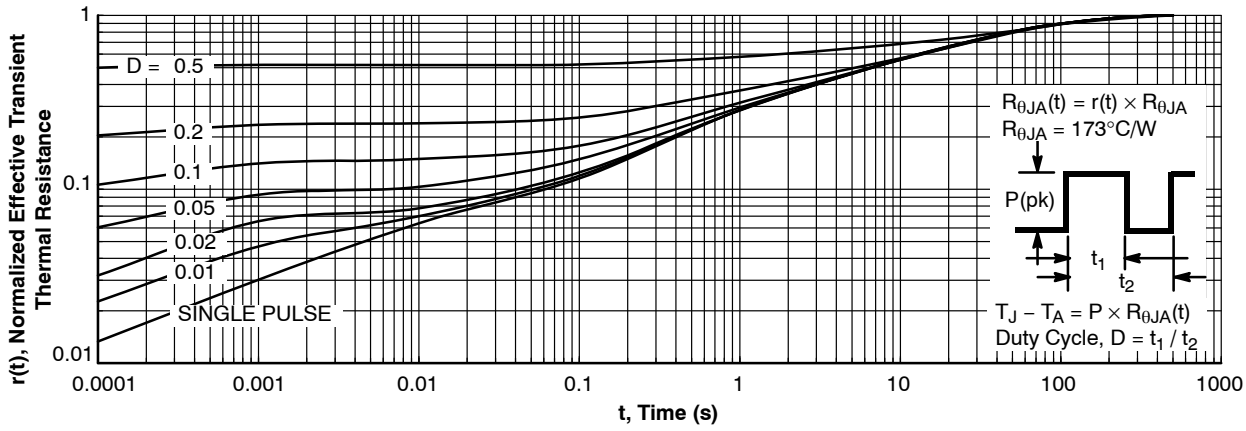


Figure 22. Transient Thermal Response Curve

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

WDFN6 2x2, 0.65P
CASE 511DA
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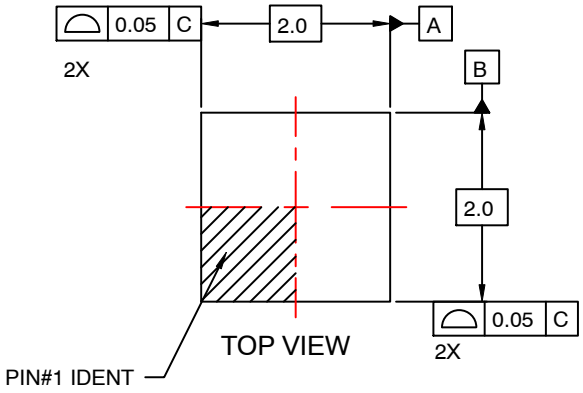
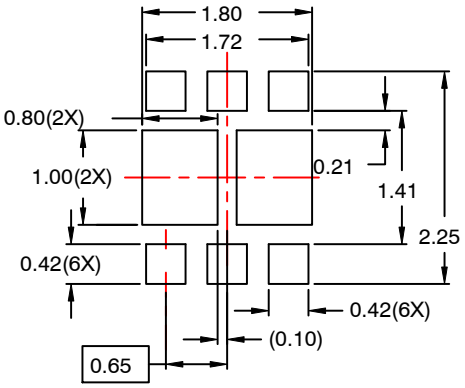
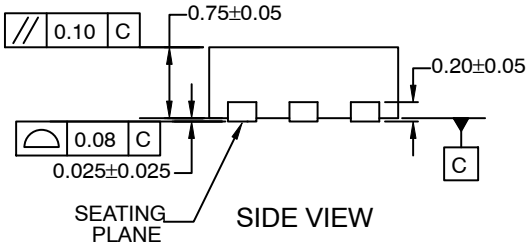
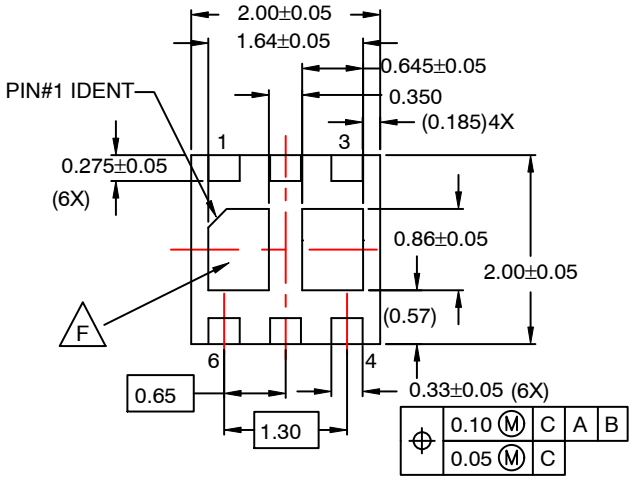
DATE 31 JUL 2016





RECOMMENDED
LAND PATTERN





BOTTOM VIEW

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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DESCRIPTION:	**WDFN6 2X2, 0.65P**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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