

FDMA1032CZ

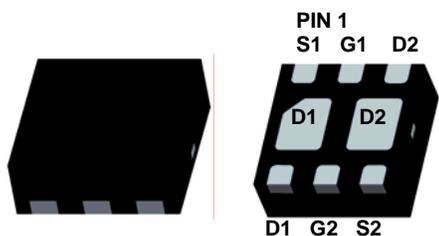
20V Complementary PowerTrench® MOSFET

General Description

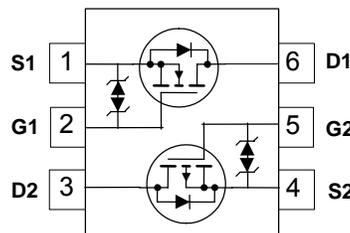
This device is designed specifically as a single package solution for a DC/DC 'Switching' MOSFET in cellular handset and other ultra-portable applications. It features an independent N-Channel & P-Channel MOSFET with low on-state resistance for minimum conduction losses. The gate charge of each MOSFET 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
3.7 A, 20V. $R_{DS(ON)} = 68 \text{ m}\Omega @ V_{GS} = 4.5\text{V}$
 $R_{DS(ON)} = 86 \text{ m}\Omega @ V_{GS} = 2.5\text{V}$
- Q2: P-Channel
-3.1 A, -20V. $R_{DS(ON)} = 95 \text{ m}\Omega @ V_{GS} = -4.5\text{V}$
 $R_{DS(ON)} = 141 \text{ m}\Omega @ V_{GS} = -2.5\text{V}$
- Low profile – 0.8 mm maximum – in the new package MicroFET 2x2 mm
- HBM ESD protection level > 2kV (Note 3)
- RoHS Compliant



MicroFET 2x2



Absolute Maximum Ratings

$T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Q1	Q2	Units
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		$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	86 (Single Operation)	$^\circ\text{C/W}$
$R_{\theta JA}$	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)	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
032	FDMA1032CZ	7"	8mm	3000 units

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	Q1 Q2	20 -20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C $I_D = -250\ \mu\text{A}$, Referenced to 25°C	Q1 Q2		15 -12		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$	Q1 Q2			1 -1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$	All			± 10	μA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	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	$I_D = 250\ \mu\text{A}$, Referenced to 25°C $I_D = -250\ \mu\text{A}$, Referenced to 25°C	Q1 Q2		-4 4		mV/ $^\circ\text{C}$	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 4.5\text{ V}, I_D = 3.7\text{ A}$	Q1		37	68	m Ω	
		$V_{GS} = 2.5\text{ V}, I_D = 3.3\text{ A}$			50	86		
		$V_{GS} = 4.5\text{ V}, I_D = 3.7\text{ A}, T_J = 125^\circ\text{C}$				53	90	m Ω
		$V_{GS} = -4.5\text{ V}, I_D = -3.1\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -3.1\text{ A}, T_J = 125^\circ\text{C}$	Q2		60 88 87	95 141 140		
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 3.7\text{ A}$	Q1		16		S	
		$V_{DS} = -10\text{ V}, I_D = -3.1\text{ A}$	Q2		-11			

Dynamic Characteristics

C_{iss}	Input Capacitance	Q1 $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	Q1		340		pF
			Q2		540		
C_{oss}	Output Capacitance	Q2	Q1		80		pF
			Q2		120		
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	Q1		60		pF
			Q2		100		

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
--------	-----------	-----------------	------	-----	-----	-----	-------

Switching Characteristics (Note 2)

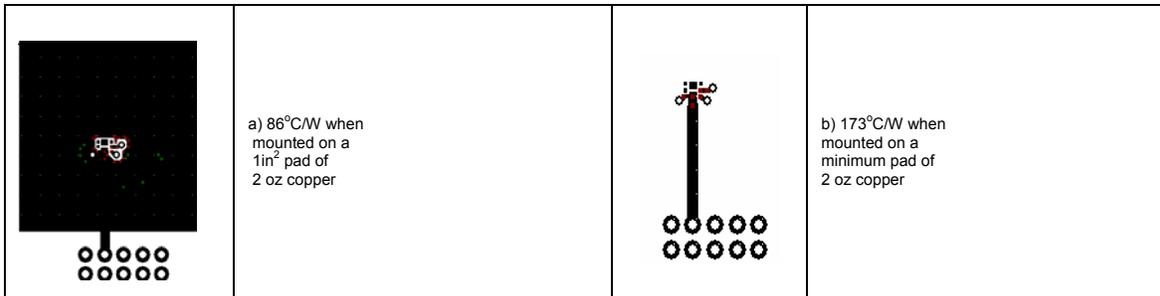
$t_{d(on)}$	Turn-On Delay Time	Q1 $V_{DD} = 10\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		8 13	16 24	ns
t_r	Turn-On Rise Time		Q1 Q2		8 11	16 20	ns
$t_{d(off)}$	Turn-Off Delay Time	Q2 $V_{DD} = -10\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$	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 $V_{DS} = 10\text{ V}, I_D = 3.7\text{ A}, V_{GS} = 4.5\text{ V}$	Q1 Q2		4 7	6 10	nC
Q_{gs}	Gate-Source Charge	Q2	Q1 Q2		0.7 1.1		nC
Q_{gd}	Gate-Drain Charge	$V_{DS} = -10\text{ V}, I_D = -3.1\text{ A},$ $V_{GS} = -4.5\text{ V}$	Q1 Q2		1.1 2.4		nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current		Q1 Q2			1.1 -1.1	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1.1\text{ A}$ (Note 2) $V_{GS} = 0\text{ V}, I_S = -1.1\text{ A}$ (Note 2)	Q1 Q2		0.7 -0.8	1.2 -1.2	V
t_{rr}	Diode Reverse Recovery Time	Q1 $I_F = 3.7\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	Q1 Q2		11 25		ns
Q_{rr}	Diode Reverse Recovery Charge	Q2 $I_F = -3.1\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	Q1 Q2		2 9		nC

Notes:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad of 2 oz. copper on a $1.5 \times 1.5\text{ in.}$ board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.
 - $R_{\theta JA} = 86^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper, $1.5" \times 1.5" \times 0.062"$ thick PCB
 - $R_{\theta JA} = 173^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper
 - $R_{\theta JA} = 69^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper, $1.5" \times 1.5" \times 0.062"$ thick PCB
 - $R_{\theta JA} = 151^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper



Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width $< 300\ \mu\text{s}$, Duty Cycle $< 2.0\%$

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

Typical Characteristics Q1 (N-Channel)

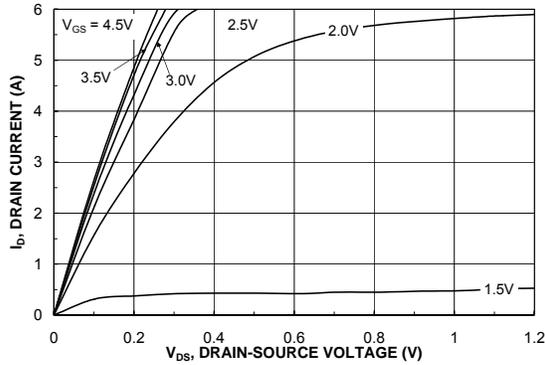


Figure 1. On-Region Characteristics.

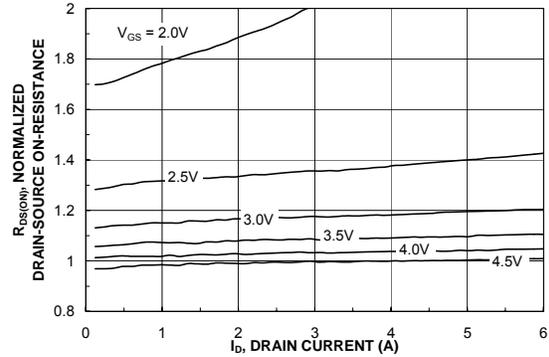


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

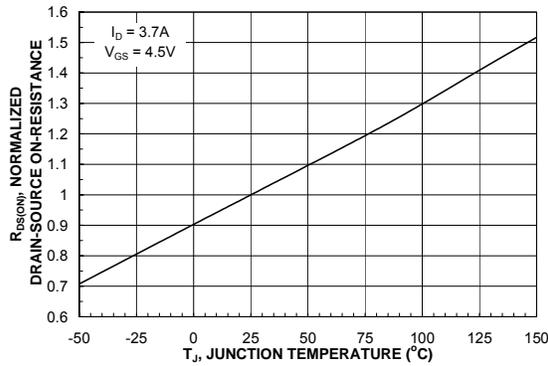


Figure 3. On-Resistance Variation with Temperature.

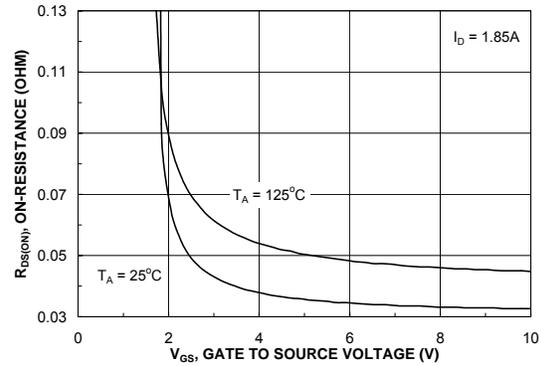


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

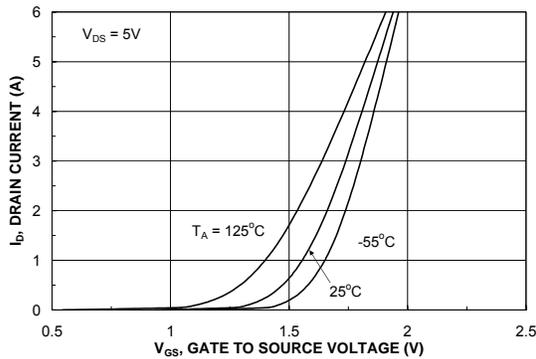


Figure 5. Transfer Characteristics.

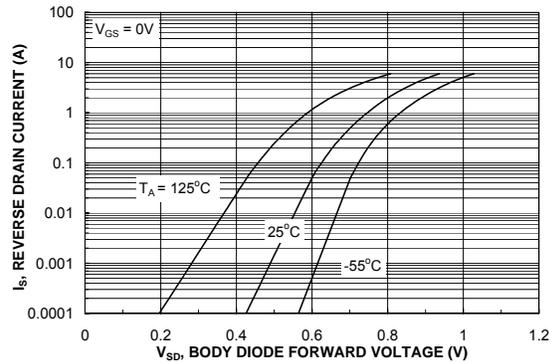


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics Q1 (N-Channel)

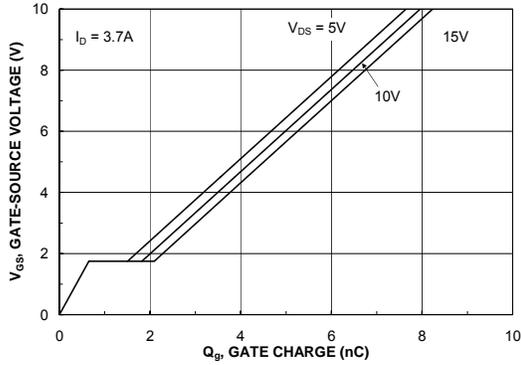


Figure 7. Gate Charge Characteristics.

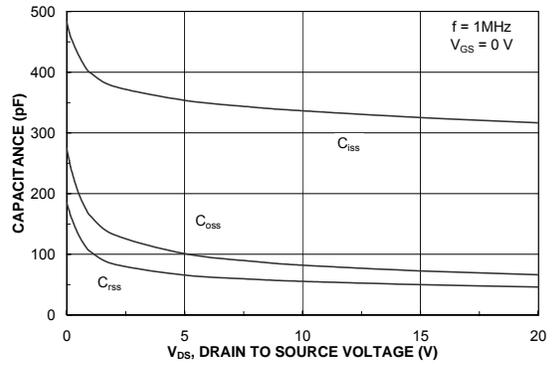


Figure 8. Capacitance Characteristics.

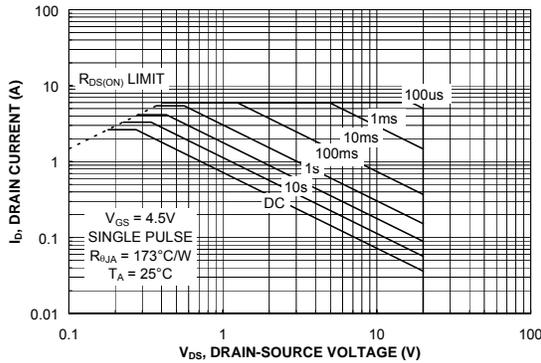


Figure 9. Maximum Safe Operating Area.

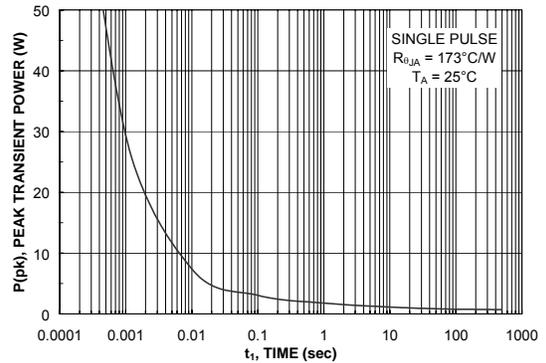


Figure 10. Single Pulse Maximum Power Dissipation.

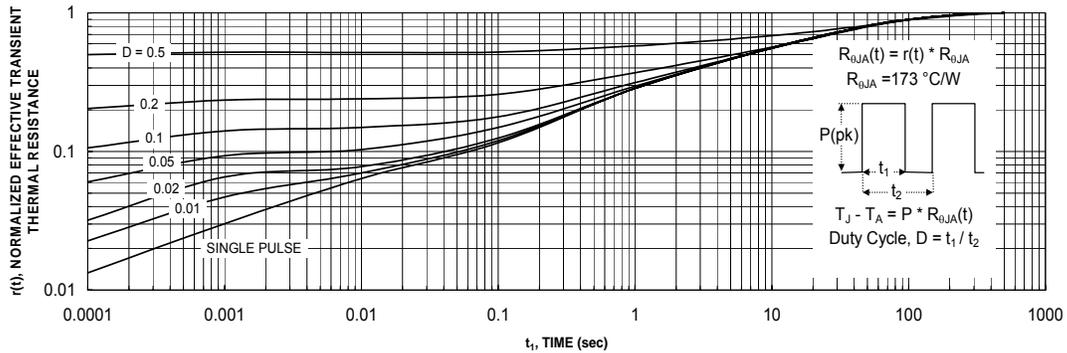


Figure 11. Transient Thermal Response Curve.

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

Typical Characteristics: Q2 (P-Channel)

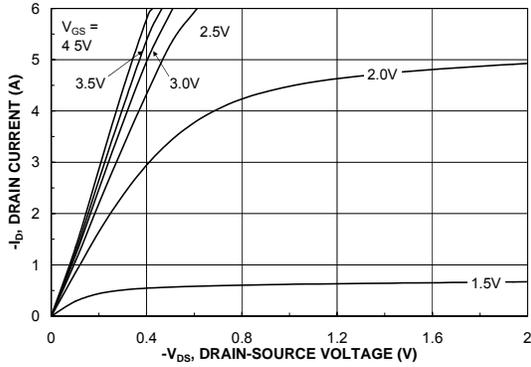


Figure 12. On-Region Characteristics.

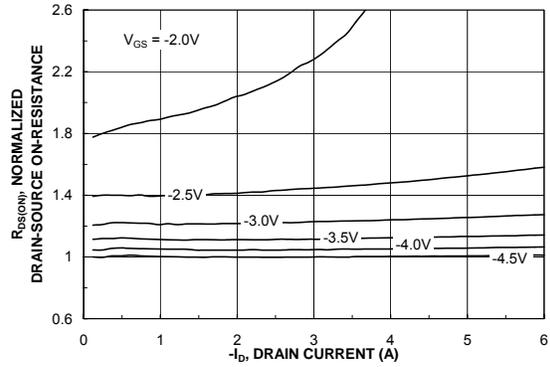


Figure 13. On-Resistance Variation with Drain Current and Gate Voltage.

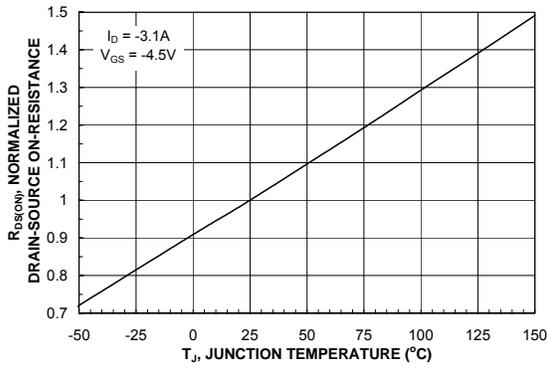


Figure 14. On-Resistance Variation with Temperature.

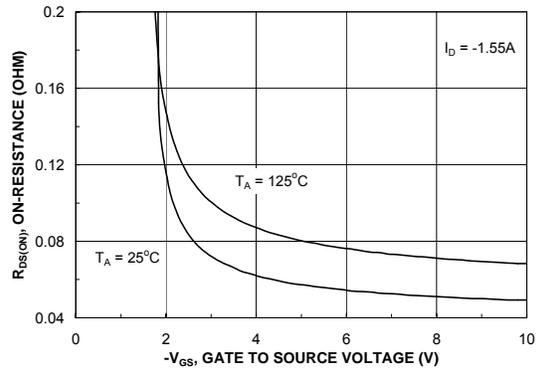


Figure 15. On-Resistance Variation with Gate-to-Source Voltage.

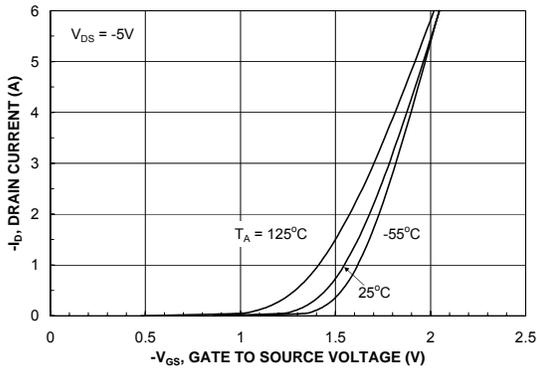


Figure 16. Transfer Characteristics.

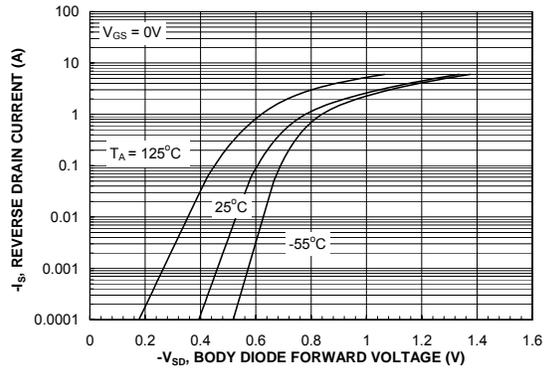


Figure 17. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q2 (P-Channel)

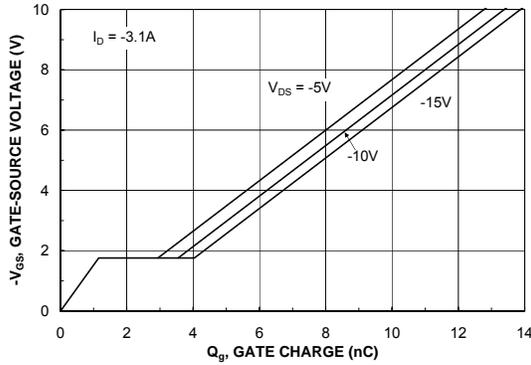


Figure 18. Gate Charge Characteristics.

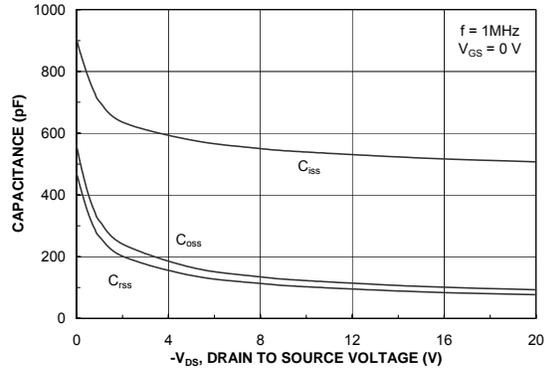


Figure 19. Capacitance Characteristics.

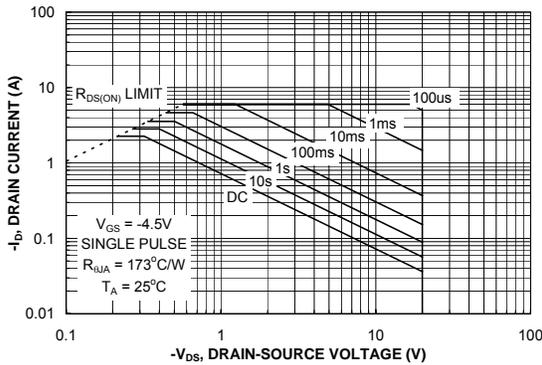


Figure 20. Maximum Safe Operating Area.

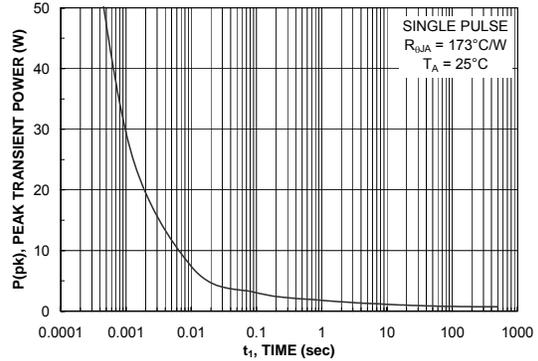


Figure 21. Single Pulse Maximum Power Dissipation.

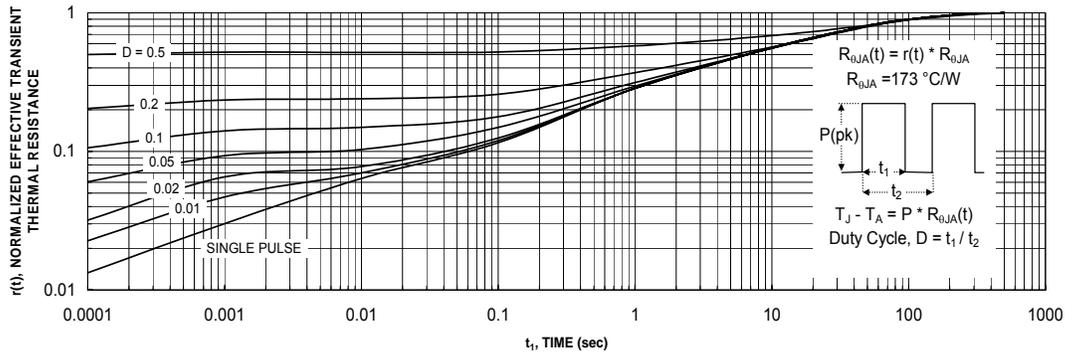
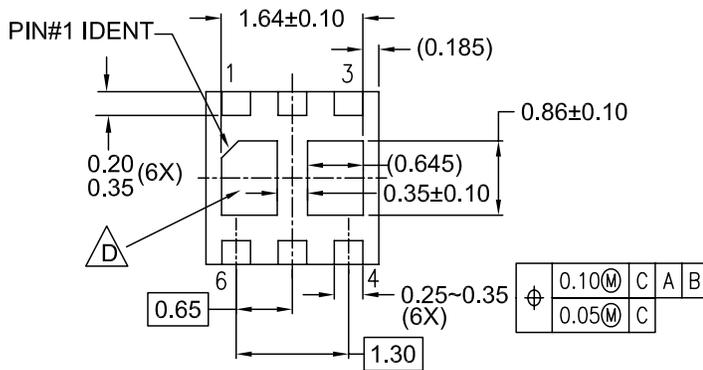
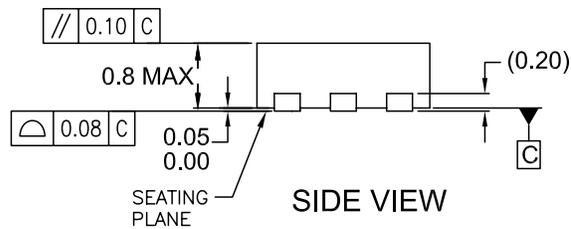
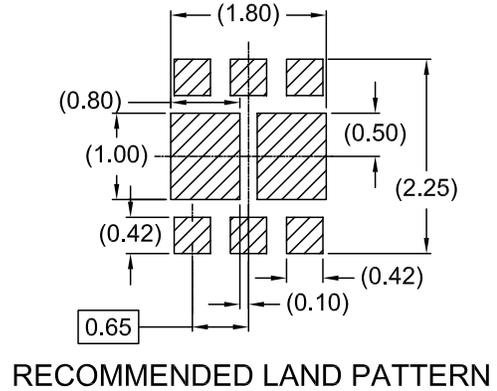
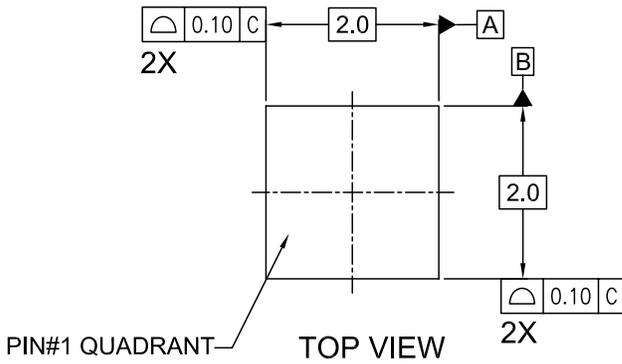


Figure 22. Transient Thermal Response Curve.

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

Dimensional Outline and Pad Layout



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION VCCC EXCEPT AS NOTED.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
-  D. NON-JEDEC DUAL DAP
- E. DRAWING FILE NAME : MLP06J rev3



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- | | | | |
|---|---|---|---|
| ACEx® | FPS™ | PDP-SPM™ | The Power Franchise® |
| Build it Now™ | F-PFS™ | Power-SPM™ | power
the franchise |
| CorePLUS™ | FRFET® | PowerTrench® | TinyBoost™ |
| CorePOWER™ | Global Power ResourceSM | Programmable Active Droop™ | TinyBuck™ |
| CROSSVOLT™ | Green FPS™ | QFET® | TinyLogic® |
| CTL™ | Green FPS™ e-Series™ | QS™ | TINYOPTO™ |
| Current Transfer Logic™ | GTO™ | Quiet Series™ | TinyPower™ |
| EcoSPARK® | IntelliMAX™ | RapidConfigure™ | TinyPWM™ |
| EfficientMax™ | ISOPLANAR™ | Saving our world 1mW at a time™ | TinyWire™ |
| EZSWITCH™ * | MegaBuck™ | SmartMax™ | µSerDes™ |
|  ™ | MICROCOUPLER™ | SMART START™ |  |
|  ™ | MicroFET™ | SPM® | UHC® |
| Fairchild® | MicroPak™ | STEALTH™ | Ultra FRFET™ |
| Fairchild Semiconductor® | MillerDrive™ | SuperFET™ | UniFET™ |
| FACT Quiet Series™ | MotionMax™ | SuperSOT™-3 | VCX™ |
| FACT® | Motion-SPM™ | SuperSOT™-6 | VisualMax™ |
| FAST® | OPTOLOGIC® | SuperSOT™-8 | |
| FastvCore™ | OPTOPLANAR® | SuperMOS™ | |
| FlashWriter® * |  ® |  ® | |

* EZSWITCH™ and FlashWriter® are trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	This datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.