

# FDMS039N08B

## N-Channel PowerTrench® MOSFET

80 V, 100 A, 3.9 mΩ



### Features

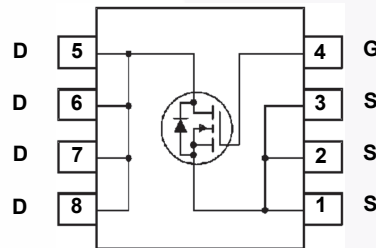
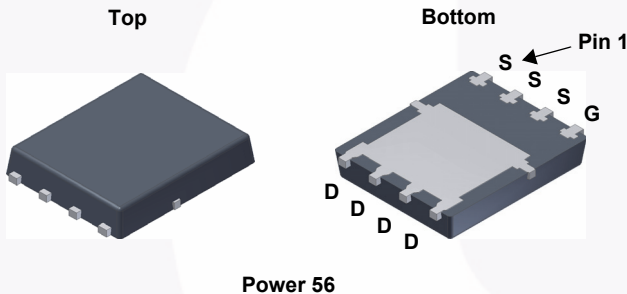
- $R_{DS(on)} = 3.2 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 50 \text{ A}$
- Low FOM  $R_{DS(on)} \cdot Q_G$
- Low Reverse Recovery Charge,  $Q_{rr} = 80 \text{ nC}$
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor drives and Uninterruptible Power Supplies



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter		FDMS039N08B	Unit
$V_{DSS}$	Drain to Source Voltage		80	V
$V_{GSS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	100	A
		- Continuous ( $T_A = 25^\circ\text{C}$ ) (Note 1a)	19.4	
$I_{DM}$	Drain Current	- Pulsed (Note 2)	400	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 3)		240	mJ
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	104	W
		( $T_A = 25^\circ\text{C}$ ) (Note 1a)	2.5	W
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter		FDMS039N08B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.		1.2	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. (Note 1a)		50	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS039N08B	FDMS039N08B	Power 56	13 "	12 mm	3000 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	80	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.04	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 64 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$	-	3.2	3.9	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 50 \text{ A}$	-	100	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	-	5715	7600	pF
$C_{oss}$	Output Capacitance		-	881	1170	pF
$C_{rss}$	Reverse Transfer Capacitance		-	15	-	pF
$C_{oss(er)}$	Energy Releated Output Capacitance	$V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}$	-	1646	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 40 \text{ V}, I_D = 50 \text{ A}$ $V_{GS} = 0 \text{ V to } 10 \text{ V}$	-	77	100	nC
$Q_{gs}$	Gate to Source Gate Charge		-	34	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	13	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	-	16	-
ESR	Equivalent Series Resistance	$f = 1 \text{ MHz}$	-	1.2	-	$\Omega$

### Switching Characteristics

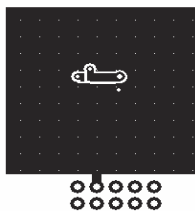
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40 \text{ V}, I_D = 50 \text{ A}$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	42	94	ns
$t_r$	Turn-On Rise Time		-	25	60	ns
$t_{d(off)}$	Turn-Off Delay Time		-	48	106	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	17	44

### Drain-Source Diode Characteristics

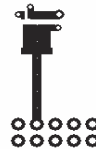
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	100	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	400	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}, V_{DD} = 40 \text{ V}$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	68	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	80	-	nC

#### Notes:

1.  $R_{\theta JA}$  is determined with the device mounted on a  $1 \text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5 \text{ in.}$  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.  $50^\circ\text{C}/\text{W}$  when mounted on a  $1 \text{ in}^2$  pad of 2 oz copper.

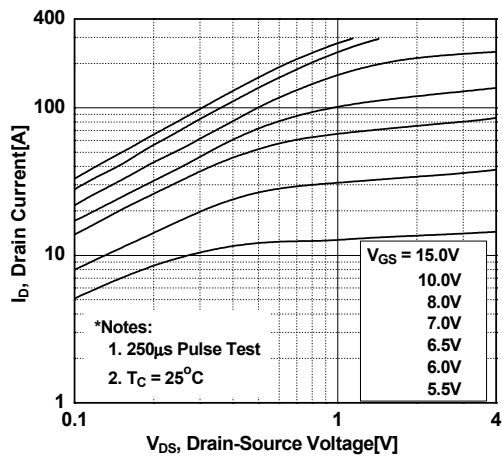


b.  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

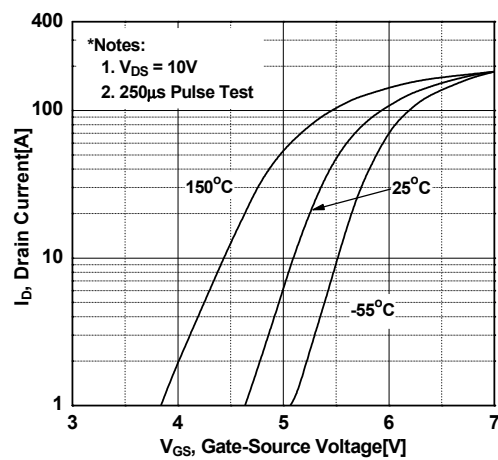
2. Repetitive rating: pulse-width limited by maximum junction temperature.
3.  $L = 0.3 \text{ mH}, I_{AS} = 40 \text{ A}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

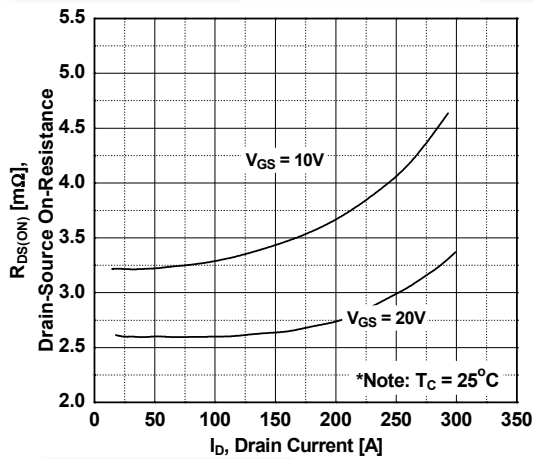
**Figure 1. On-Region Characteristics**



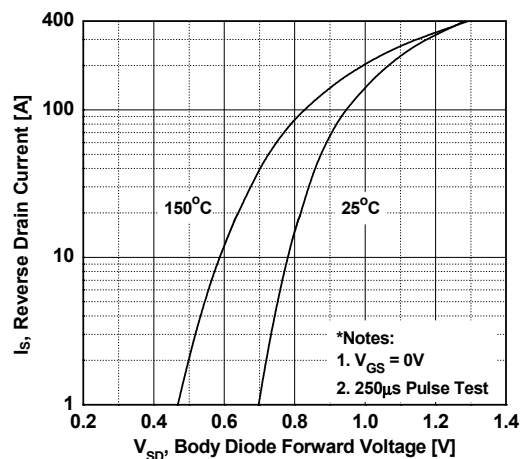
**Figure 2. Transfer Characteristics**



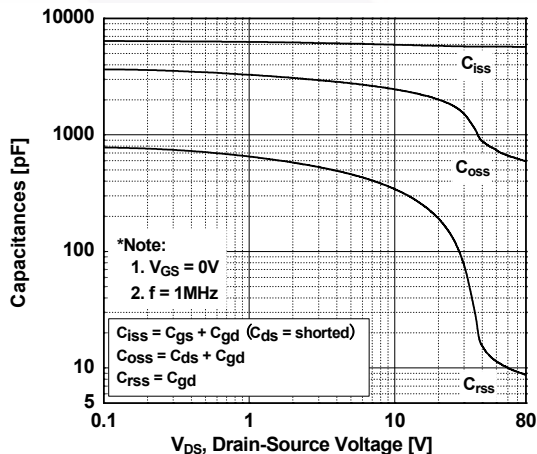
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



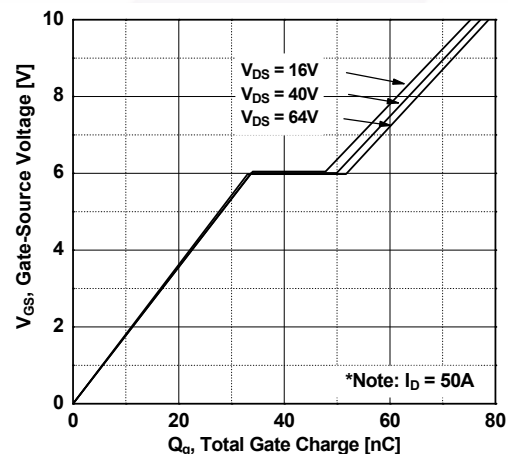
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

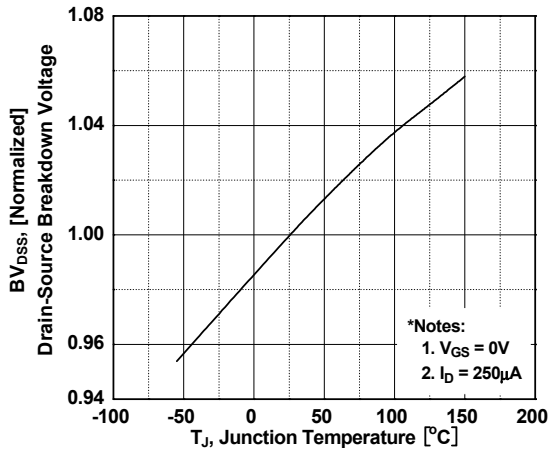


**Figure 6. Gate Charge Characteristics**

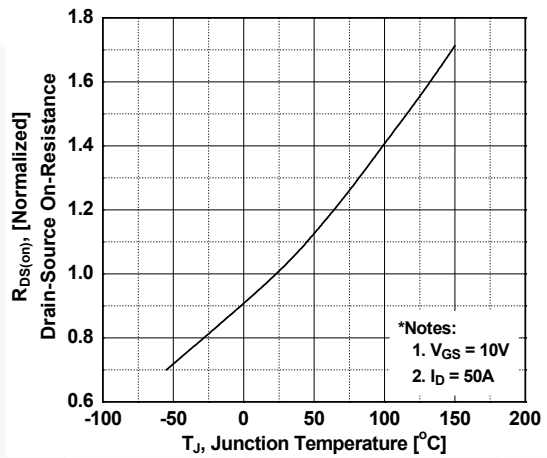


## Typical Performance Characteristics (Continued)

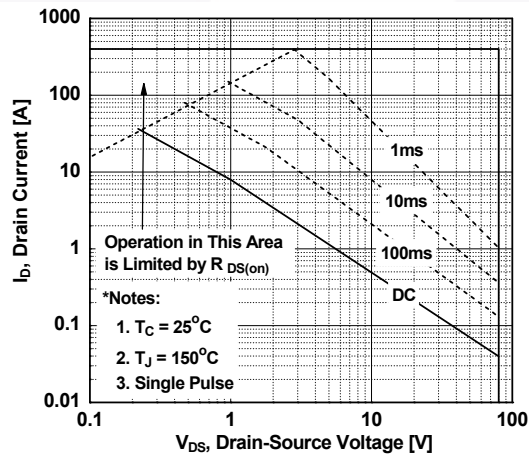
**Figure 7. Breakdown Voltage Variation vs. Temperature**



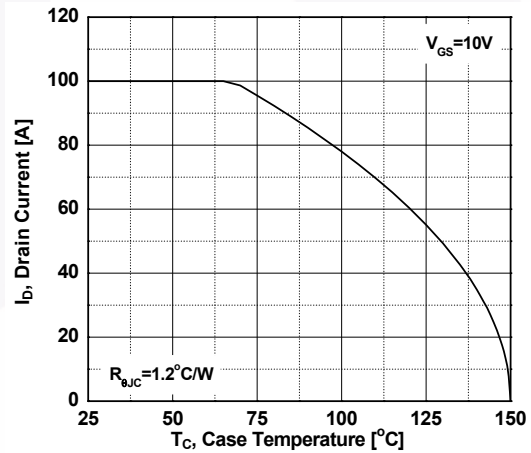
**Figure 8. On-Resistance Variation vs. Temperature**



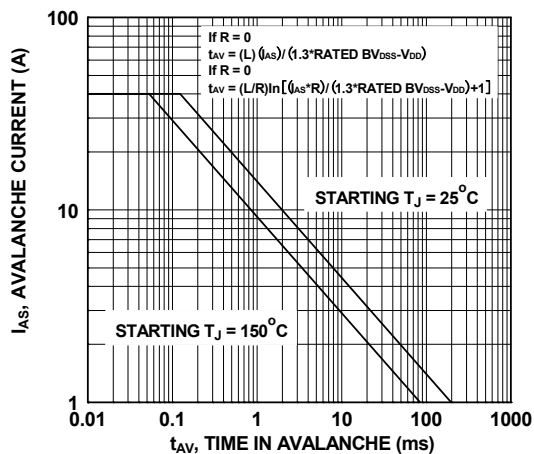
**Figure 9. Maximum Safe Operating Area**



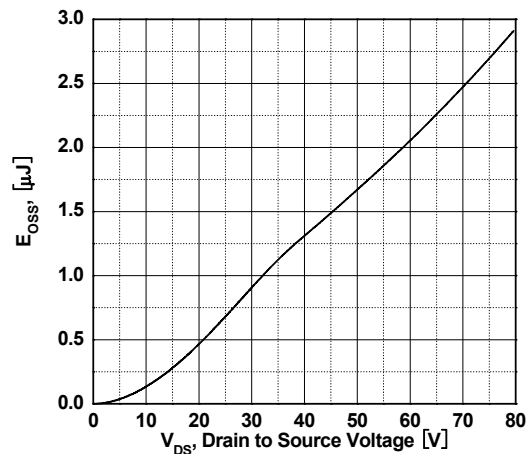
**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Unclamped Inductive Switching Capability**

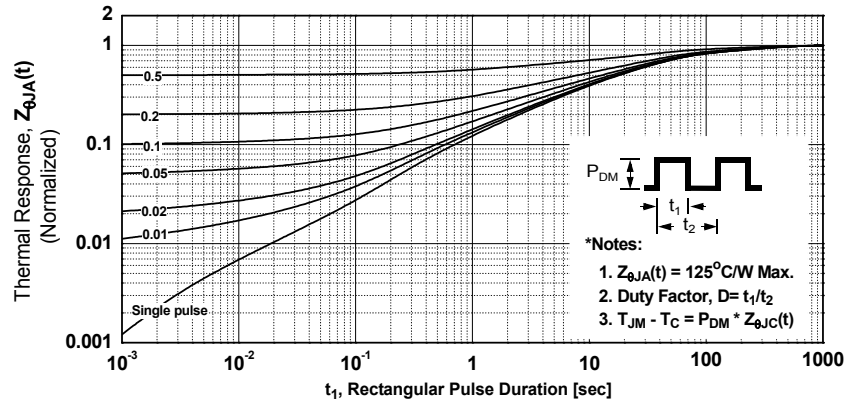


**Figure 12. Eoss vs. Drain to Source Voltage**

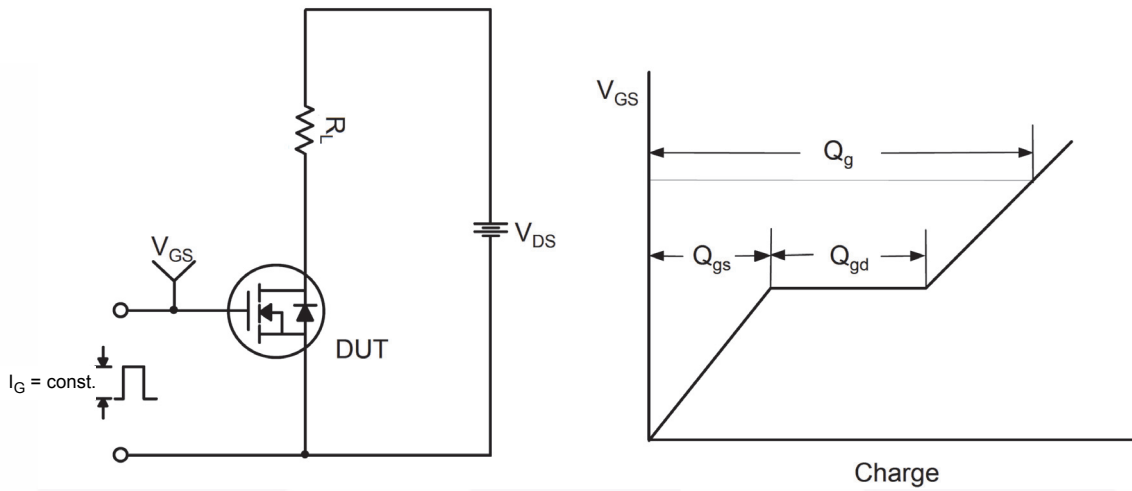


Typical Performance Characteristics (Continued)

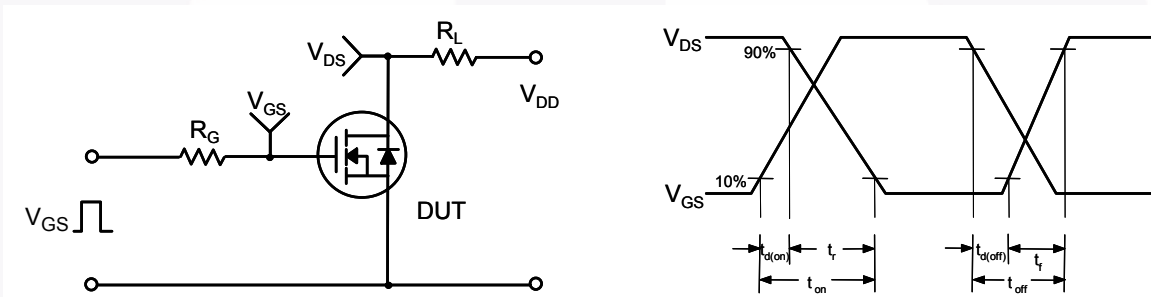
Figure 13. Transient Thermal Response Curve



**Figure 14. Gate Charge Test Circuit & Waveform**



**Figure 15. Resistive Switching Test Circuit & Waveforms**



**Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms**

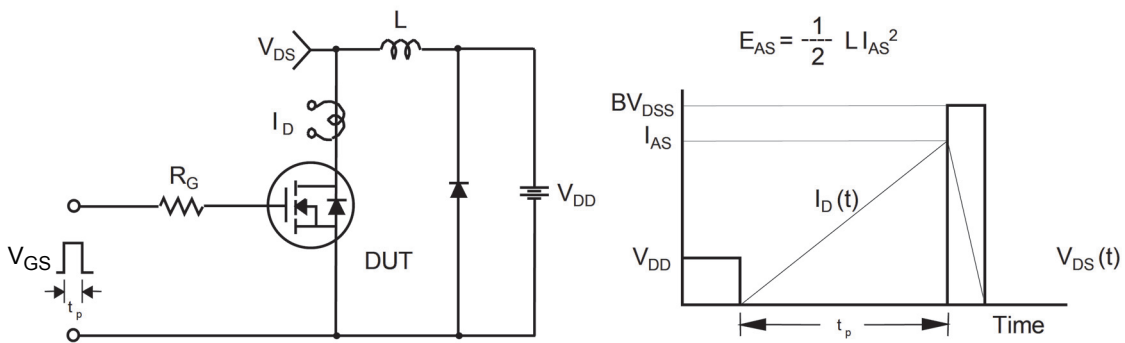
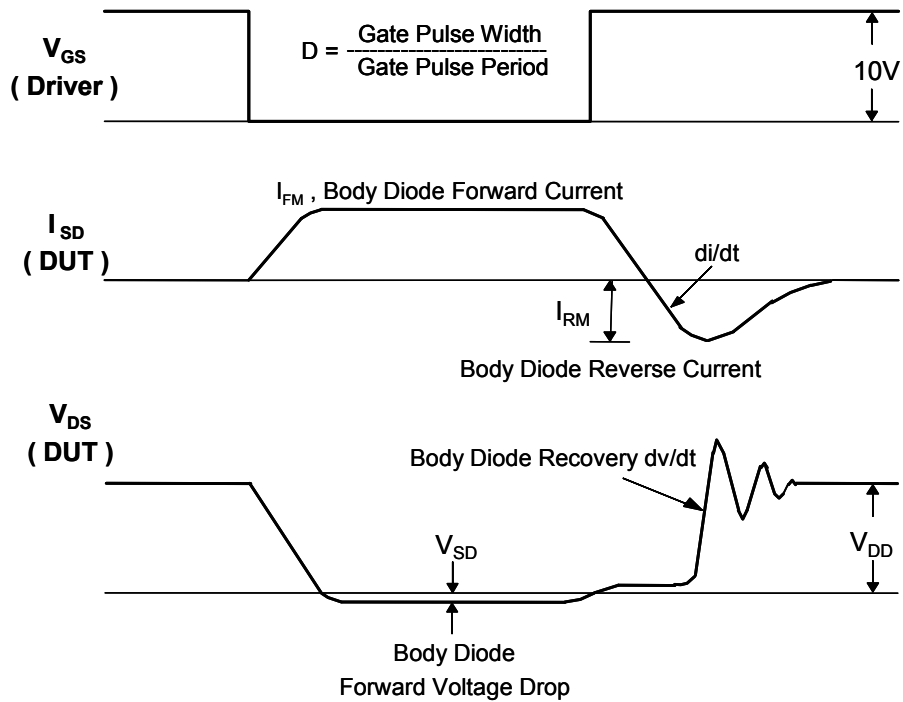
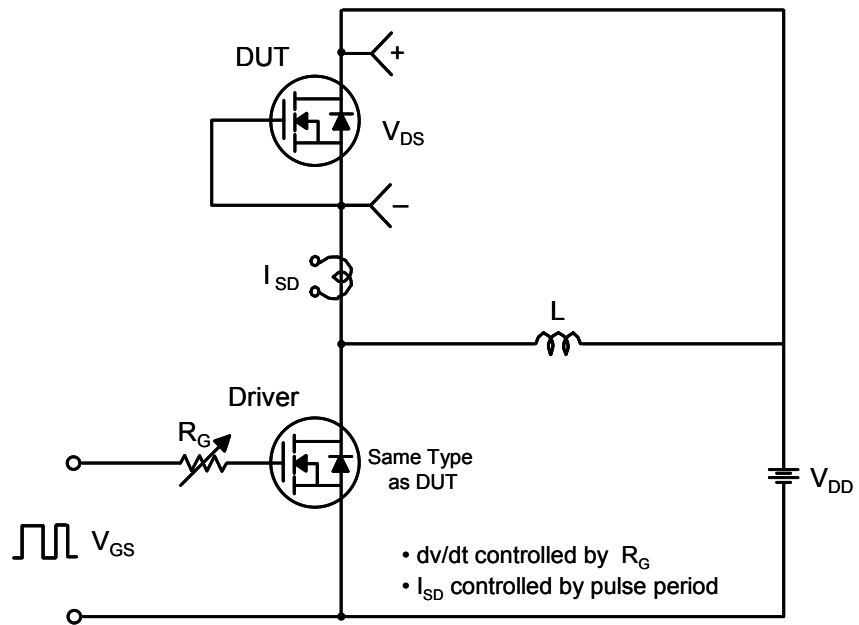
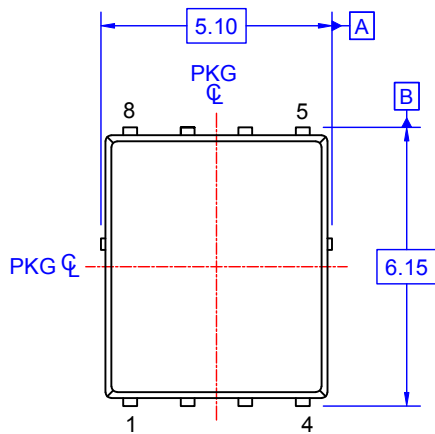
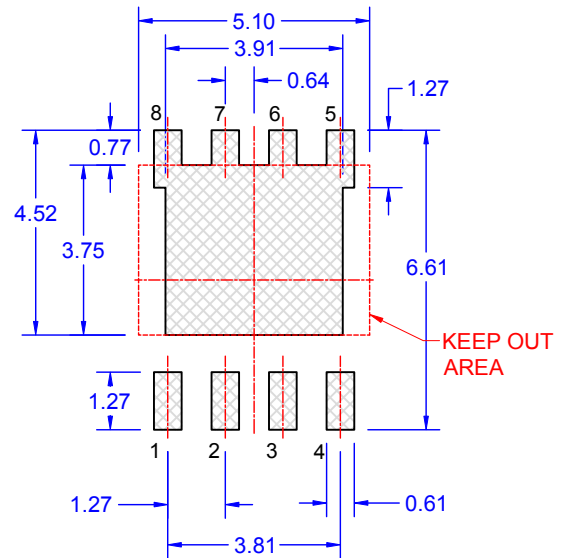
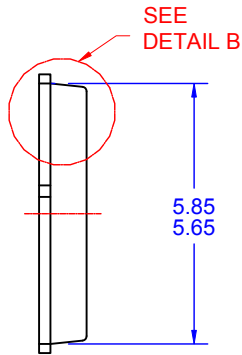


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

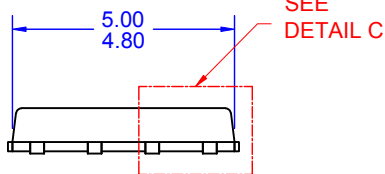




TOP VIEW

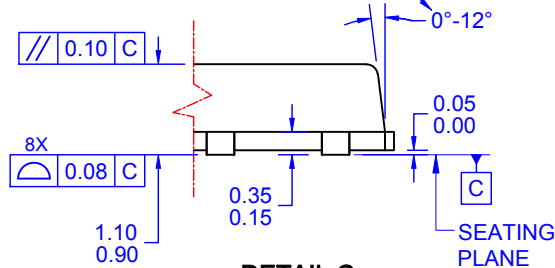


LAND PATTERN RECOMMENDATION



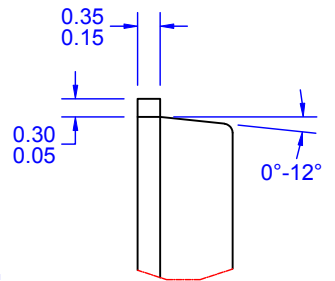
SIDE VIEW

OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



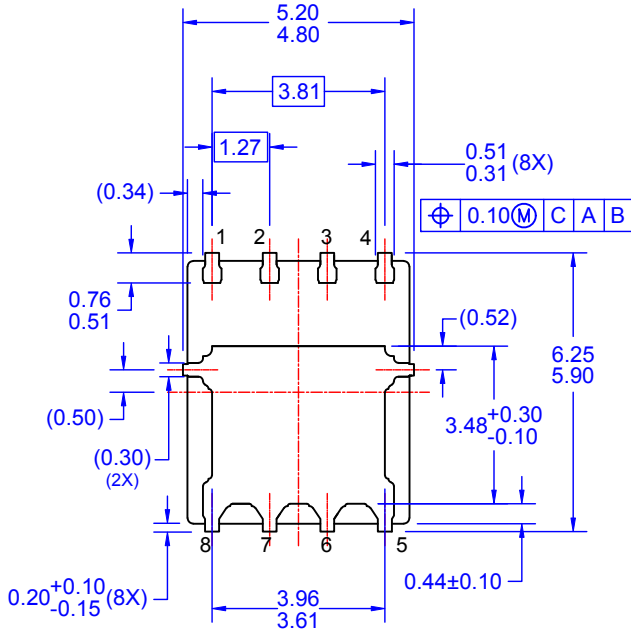
**DETAIL C**

SCALE: 2:1



**DETAIL B**

SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- A. PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
- F. DRAWING FILE NAME: PQFN08AREV9





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| Awinda®                  | Global Power Resource <sup>SM</sup>            | PowerTrench®                          | TinyBuck®        |
| AX-CAP®*                 | GreenBridge™                                   | PowerXS™                              | TinyCalc™        |
| BitSiC™                  | Green FPS™                                     | Programmable Active Droop™            | TinyLogic®       |
| Build it Now™            | Green FPS™ e-Series™                           | QFET®                                 | TINYOPTO™        |
| CorePLUS™                | Gmax™  | QS™                                   | TinyPower™       |
| CorePOWER™               | GTO™   | Quiet Series™                         | TinyPWM™         |
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| EfficientMax™            | MicroPak™                                      | SPM®                                  | Ultra FRFET™     |
| ESBC™                    | MicroPak2™                                     | STEALTH™                              | UniFET™          |
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| FastvCore™               | MVN®   | SyncFET™                              | 仙童®              |
| FETBench™                | mWSaver®                                       | Sync-Lock™                            |                  |
| FPS™                     | OptoHiT™                                       |                                       |                  |
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**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	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	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	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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