

# FDMS015N04B

## N-Channel PowerTrench® MOSFET

40V, 100A, 1.5mΩ

### Features

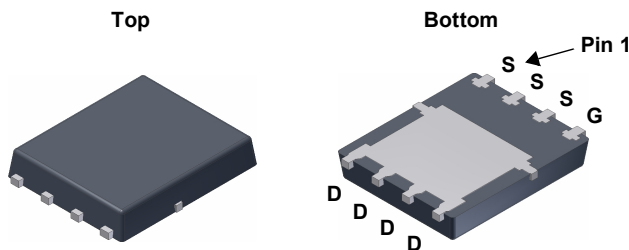
- $R_{DS(on)} = 1.13m\Omega$  (Typ.) @  $V_{GS} = 10V, I_D = 50A$
- Advanced Package and Silicon Combination for Low  $R_{DS(on)}$  and High Efficiency
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

### Description

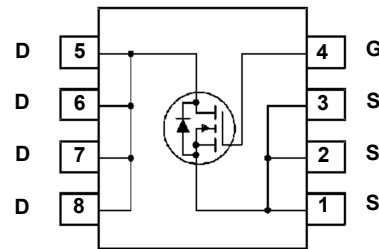
This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Application

- Synchronous Rectification for Server / Telecom PSU
- Battery Charger and Battery Protection circuit
- DC motor drives and Uninterruptible Power Supplies
- Micro Solar Inverter



Power 56



### MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted\*

Symbol	Parameter	Conditions	Rated Value	Units
$V_{DSS}$	Drain to Source Voltage		40	V
$V_{GSS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ )	100	A
		- Continuous ( $T_A = 25^\circ C$ ) (Note 1)	31.3	
$I_{DM}$	Drain Current	- Pulsed (Note 2)	400	A
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 3)	526	mJ
$P_D$	Power Dissipation	( $T_C = 25^\circ C$ )	104	W
		( $T_A = 25^\circ C$ ) (Note 1)	2.5	W
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Conditions	Rated Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case		1.2	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1)	50	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS015N04B	FDMS015N04B	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.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	37	-	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$	-	-	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	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 50\text{A}$	-	1.13	1.5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 50\text{A}$	-	171	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	6560	8725	pF
$C_{oss}$	Output Capacitance		-	2795	3720	pF
$C_{rss}$	Reverse Transfer Capacitance		-	162	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$	-	3896	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 20\text{V}, I_D = 50\text{A}$ $V_{GS} = 0\text{V to } 10\text{V}$	-	91	118	nC
$Q_{gs}$	Gate to Source Gate Charge		-	26	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	9	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	-	16	-

### Switching Characteristics

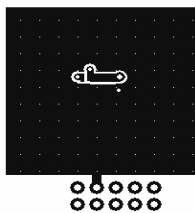
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{V}, I_D = 50\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$	-	34	78	ns	
$t_r$	Turn-On Rise Time		-	24	58	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4)	-	71	152	ns
$t_f$	Turn-Off Fall Time		-	26	62	ns	
ESR	Equivalent Series Resistance	Drain Open, $f = 1\text{MHz}$	-	1.4	-	$\Omega$	

### Drain-Source Diode Characteristics

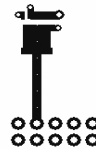
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	100	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	400	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 50\text{A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 50\text{A}$	-	78	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	90	-	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.

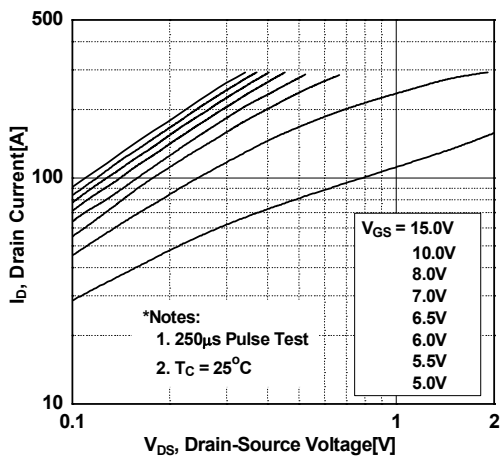


b.  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

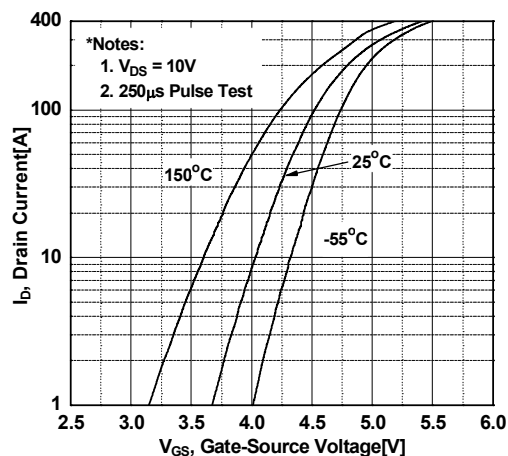
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3.  $L = 3\text{mH}$ ,  $I_{AS} = 18.72\text{A}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

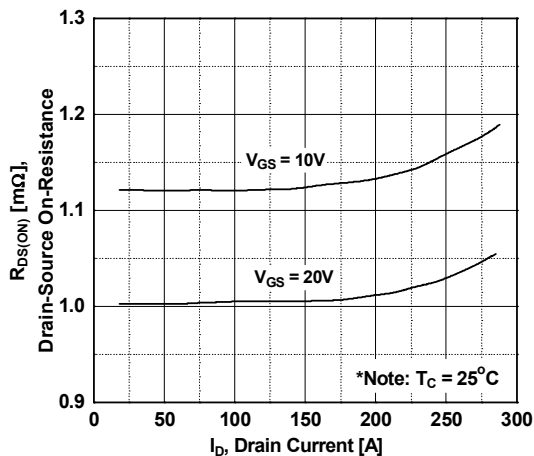
**Figure 1. On-Region Characteristics**



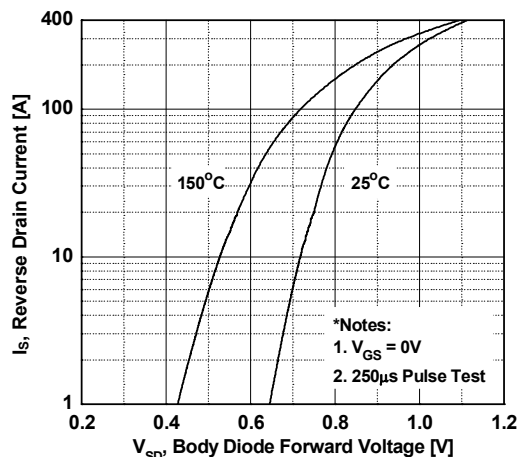
**Figure 2. Transfer Characteristics**



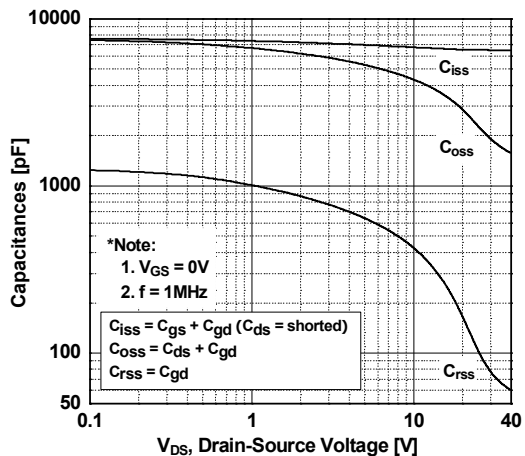
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



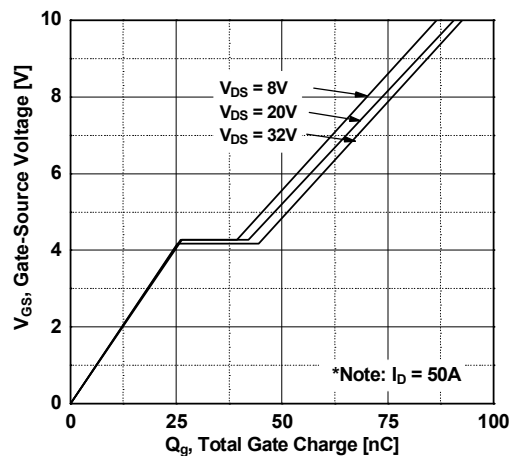
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

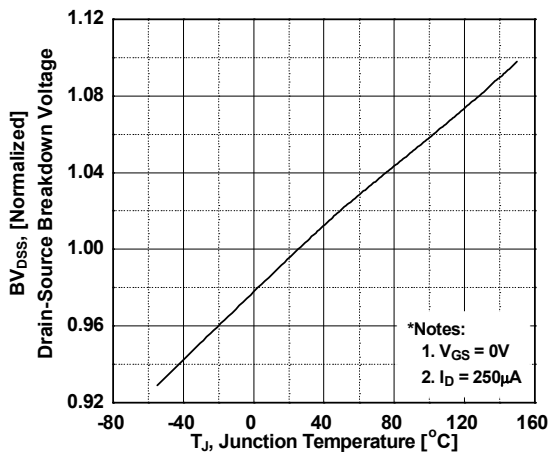


Figure 8. On-Resistance Variation vs. Temperature

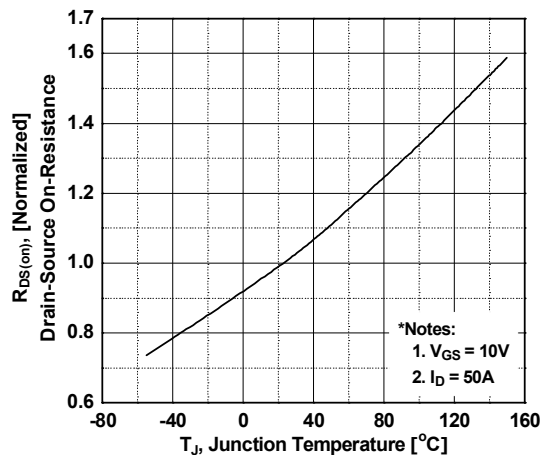


Figure 9. Maximum Safe Operating Area vs. Ambient Temperature

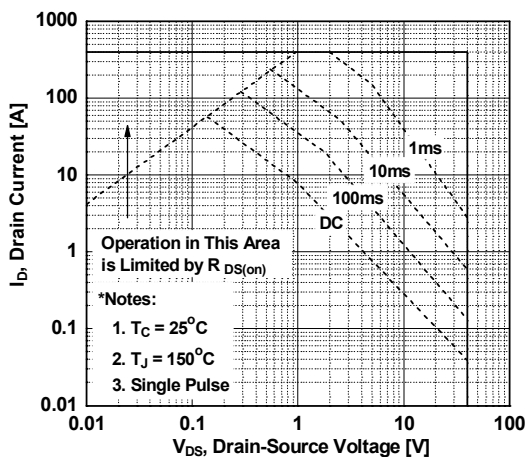


Figure 10. Maximum Drain Current

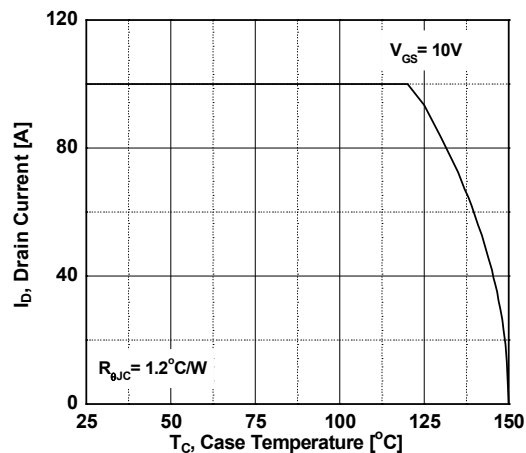


Figure 11. E\_oss vs. Drain to Source Voltage

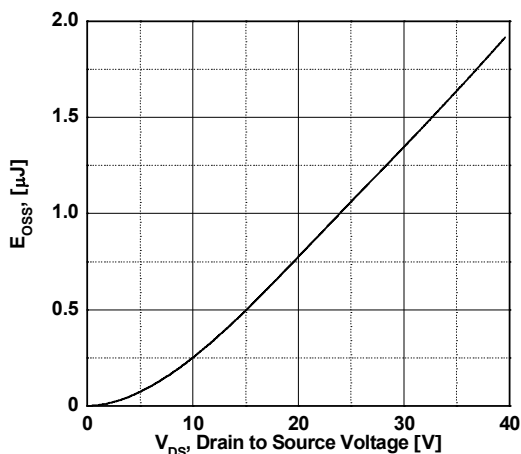
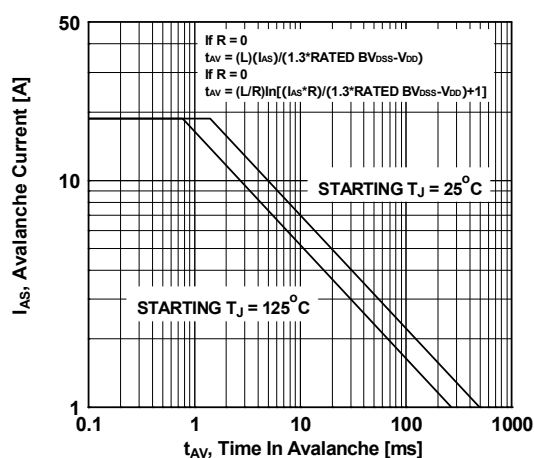
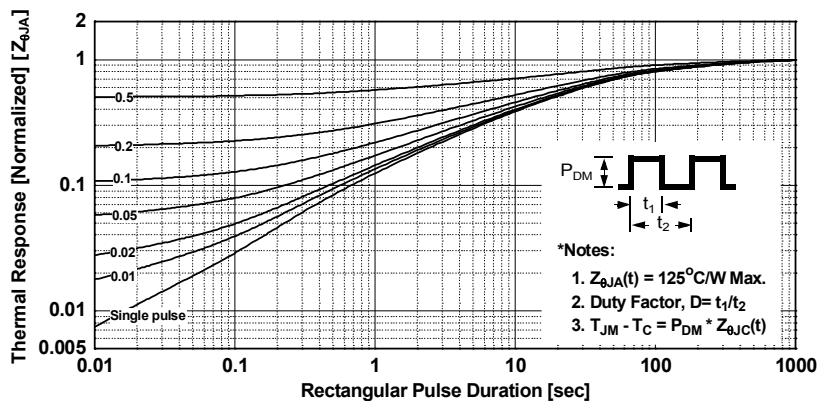


Figure 12. Unclamped Inductive Switching Capability

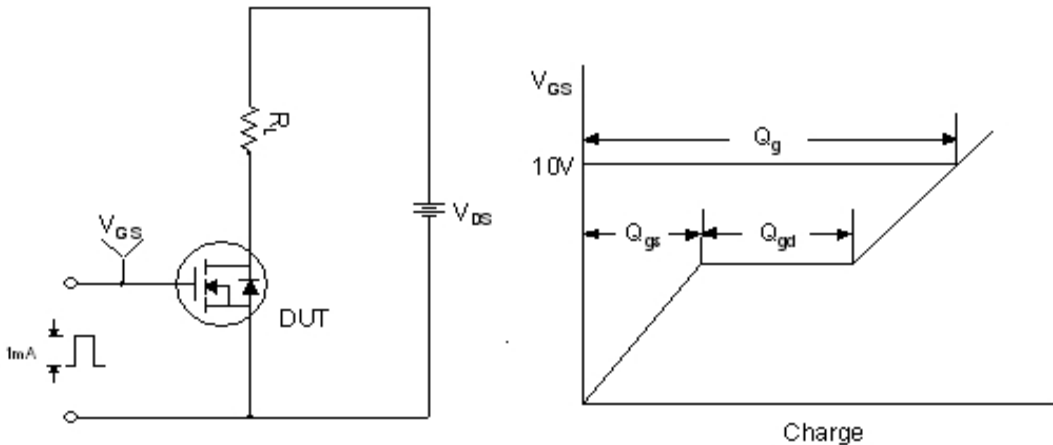


Typical Performance Characteristics (Continued)

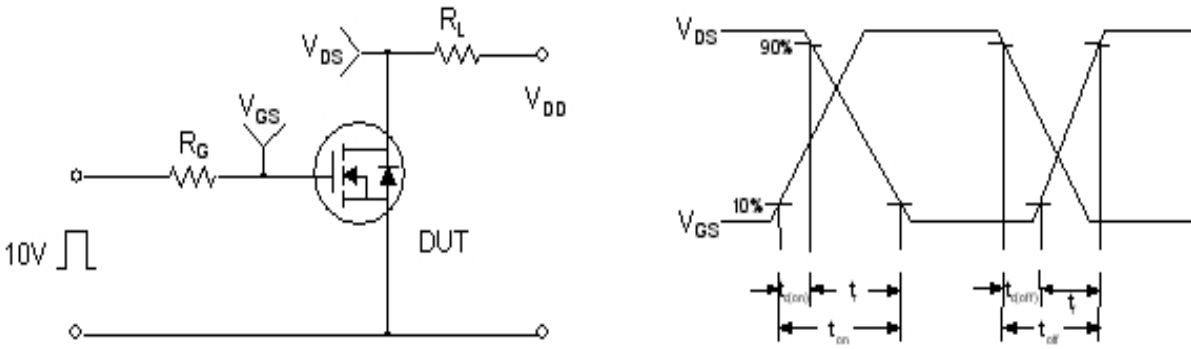
Figure 13. Transient Thermal Response Curve



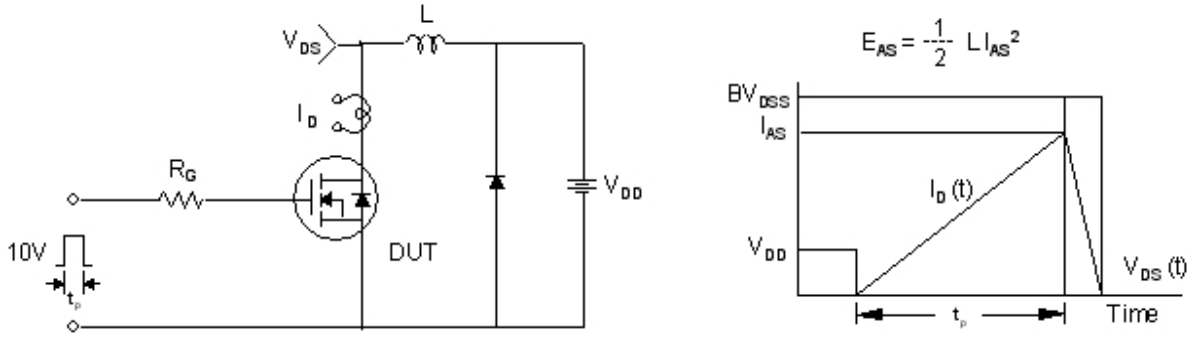
**Gate Charge Test Circuit & Waveform**



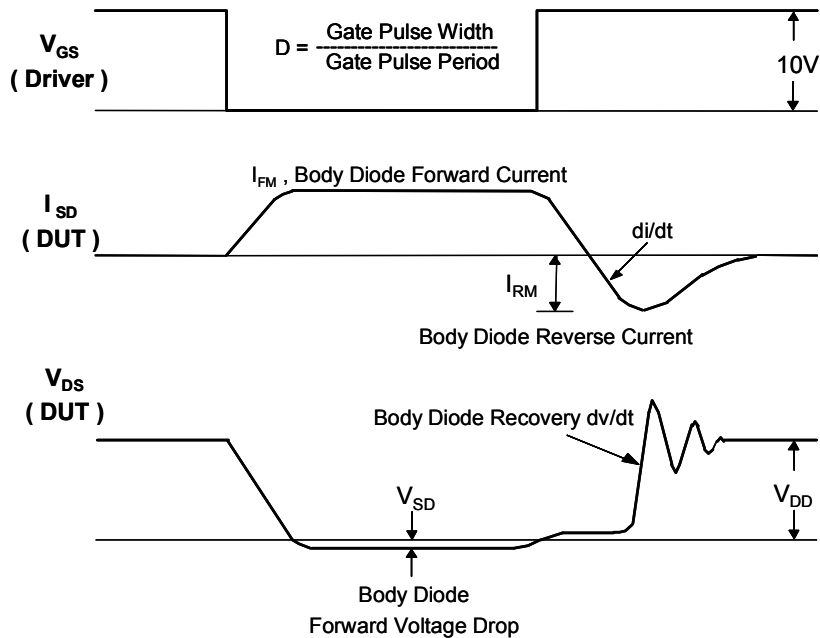
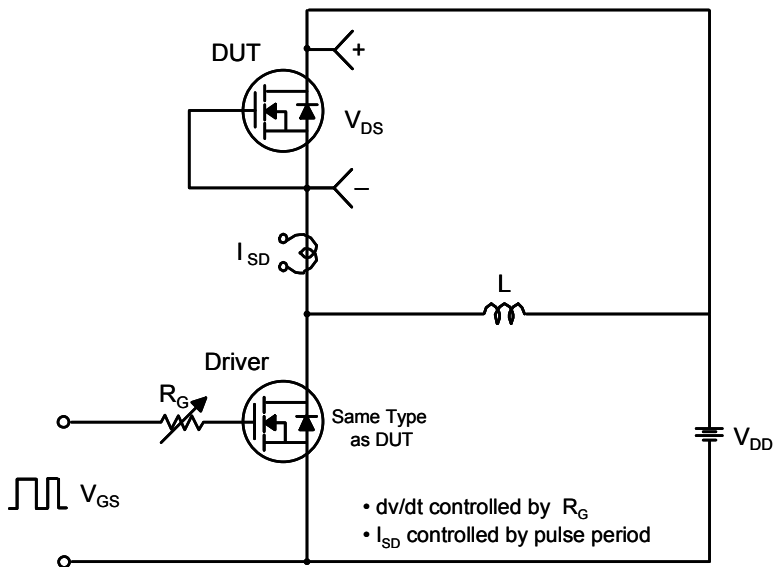
**Resistive Switching Test Circuit & Waveforms**



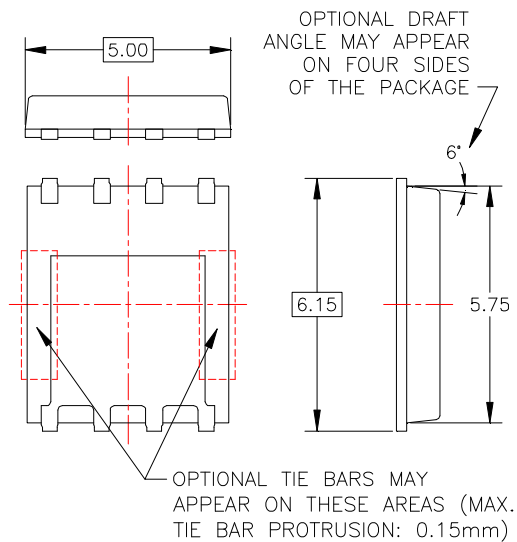
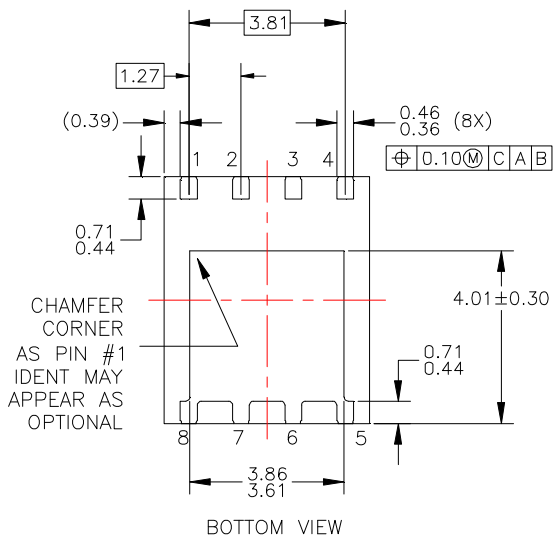
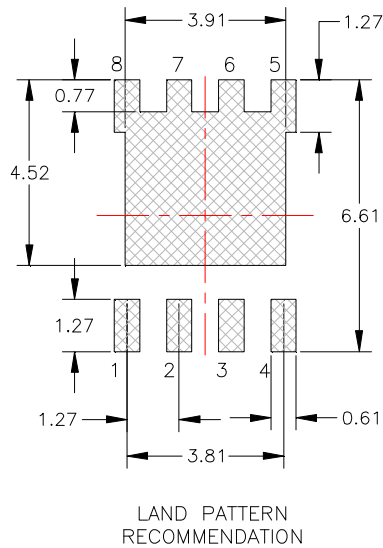
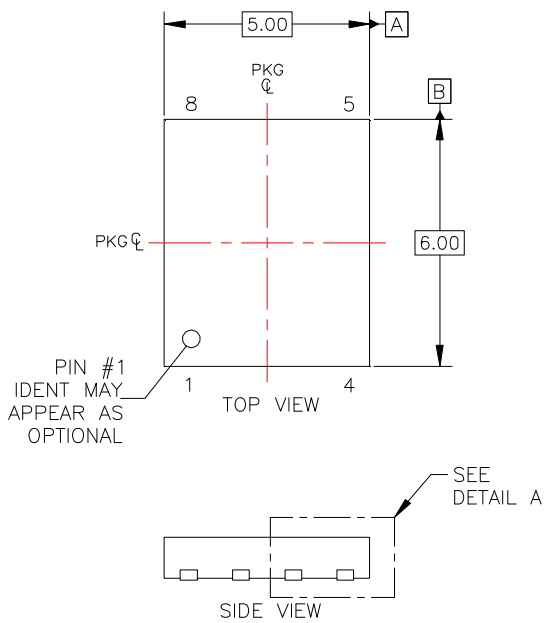
**Unclamped Inductive Switching Test Circuit & Waveforms**



Peak Diode Recovery dv/dt Test Circuit & Waveforms

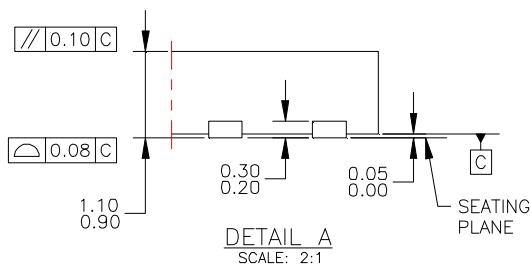


### Dimensional Outline and Pad Layout



NOTES: UNLESS OTHERWISE SPECIFIED

- A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- E) DRAWING FILE NAME: PQFN08REV4









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- |                                                                                   |                                                                                   |                                                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 2Cool™                                                                            | FPS™                                                                              | PDP SPM™                                                                          | The Power Franchise®                                                                |
| AccuPower™                                                                        | F-PFS™                                                                            | Power-SPM™                                                                        | the power®                                                                          |
| Auto-SPM™                                                                         | FRFET®                                                                            | PowerTrench®                                                                      | franchise                                                                           |
| AX-CAP™*                                                                          | Global Power ResourceSM                                                           | PowerXS™                                                                          | TinyBoost™                                                                          |
| BitSiC®                                                                           | Green FPS™                                                                        | Programmable Active Droop™                                                        | TinyBuck™                                                                           |
| Build it Now™                                                                     | Green FPS™ e-Series™                                                              | QFET®                                                                             | TinyCalc™                                                                           |
| CorePLUS™                                                                         | Gmax™                                                                             | QS™                                                                               | TinyLogic®                                                                          |
| CorePOWER™                                                                        | GTO™                                                                              | Quiet Series™                                                                     | TINYOPTO™                                                                           |
| CROSSVOLT™                                                                        | IntelliMAX™                                                                       | RapidConfigure™                                                                   | TinyPower™                                                                          |
| CTL™                                                                              | ISOPANAR™                                                                         | TM                                                                                | TinyPWM™                                                                            |
| Current Transfer Logic™                                                           | Marking Small Speakers Sound Louder and Better™                                   |  | TinyWire™                                                                           |
| DEUXPEED®                                                                         | MegaBuck™                                                                         | Saving our world, 1mW/W/kW at a time™                                             | TranSiC®                                                                            |
| Dual Cool™                                                                        | MICROCOUPLER™                                                                     | SignalWise™                                                                       | TriFault Detect™                                                                    |
| EcoSPARK®                                                                         | MicroFET™                                                                         | SmartMax™                                                                         | TRUECURRENT®*                                                                       |
| EfficientMax™                                                                     | MicroPak™                                                                         | SMART START™                                                                      | µSerDes™                                                                            |
| ESBC™                                                                             | MicroPak2™                                                                        | Solutions for Your Success™                                                       |  |
|  | MillerDrive™                                                                      | SPM®                                                                              | UHC®                                                                                |
| Fairchild®                                                                        | MotionMax™                                                                        | STEALTH™                                                                          | Ultra FRFET™                                                                        |
| Fairchild Semiconductor®                                                          | Motion-SPM™                                                                       | SuperFET®                                                                         | UniFET™                                                                             |
| FACT Quiet Series™                                                                | mWSaver™                                                                          | SuperSOT™_3                                                                       | VCX™                                                                                |
| FACT®                                                                             | OptoHiT™                                                                          | SuperSOT™_6                                                                       | VisualMax™                                                                          |
| FAST®                                                                             | OPTOLOGIC®                                                                        | SuperSOT™_8                                                                       | VoltagePlus™                                                                        |
| FastvCore™                                                                        | OPTOPLANAR®                                                                       | SupreMOS®                                                                         | XS™                                                                                 |
| FETBench™                                                                         |  | SyncFET™                                                                          |                                                                                     |
| FlashWriter®*                                                                     |                                                                                   | Sync-Lock™                                                                        |                                                                                     |
|                                                                                   |                                                                                   |  |                                                                                     |

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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.