

# FDB047N10

## N-Channel PowerTrench® MOSFET

### 100V, 164A, 4.7mΩ

### Description

- $R_{DS(on)} = 3.9m\Omega$  (Typ.) @  $V_{GS} = 10V, I_D = 75A$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low  $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

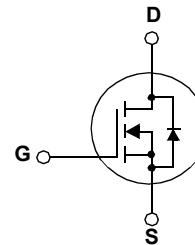
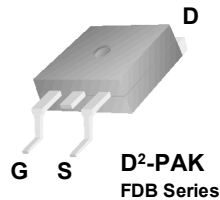


### General Description

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

- DC to DC converters / Synchronous Rectification



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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	100	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ , Silicon Limited)	164*
		- Continuous ( $T_C = 100^\circ C$ , Silicon Limited)	116*
		- Continuous ( $T_C = 25^\circ C$ , Package Limited)	120
$I_{DM}$	Drain Current	- Pulsed (Note 1)	656*
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	1153
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ C$ )	375
		- Derate above $25^\circ C$	2.5
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

\*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

### Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.4	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (minimum pad of 2 oz copper)	62.5	
	Thermal Resistance, Junction to Ambient (1 in <sup>2</sup> pad of 2 oz copper)	40	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB047N10	FDB047N10	D2-PAK	330mm	24mm	800

## 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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.1	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 100\text{V}, V_{GS} = 0\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	$\mu\text{A}$
$I_{GSS}$	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	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 75\text{A}$	-	3.9	4.7	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 75\text{A}$ (Note 4)	-	170	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	11500	15265	pF
$C_{oss}$	Output Capacitance		-	1120	1500	pF
$C_{rss}$	Reverse Transfer Capacitance		-	455	680	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{V}, I_D = 75\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 25\Omega$ (Note 4, 5)	-	174	358	ns
$t_r$	Turn-On Rise Time		-	386	782	ns
$t_{d(off)}$	Turn-Off Delay Time		-	344	698	ns
$t_f$	Turn-Off Fall Time		-	244	499	ns
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 80\text{V}, I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ (Note 4, 5)	-	160	210	nC
$Q_{gs}$	Gate to Source Gate Charge		-	56	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	36	-	nC

### Drain-Source Diode Characteristics

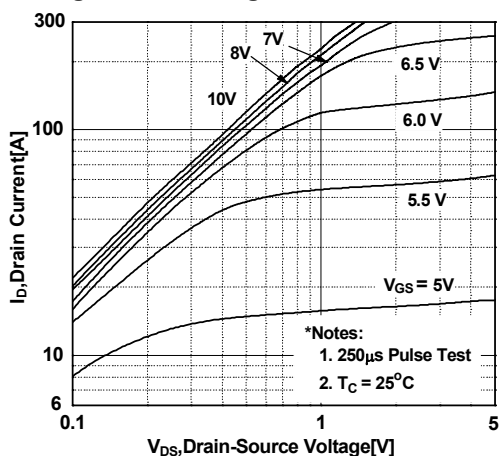
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	164*	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	656	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 75\text{A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 75\text{A}$	-	88	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	245	-	nC

#### Notes:

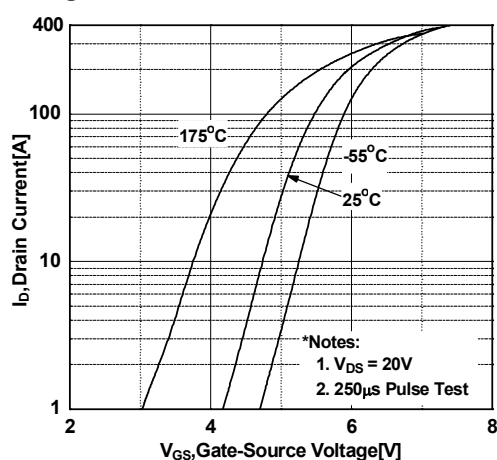
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 0.41\text{mH}, I_{AS} = 75\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 75\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

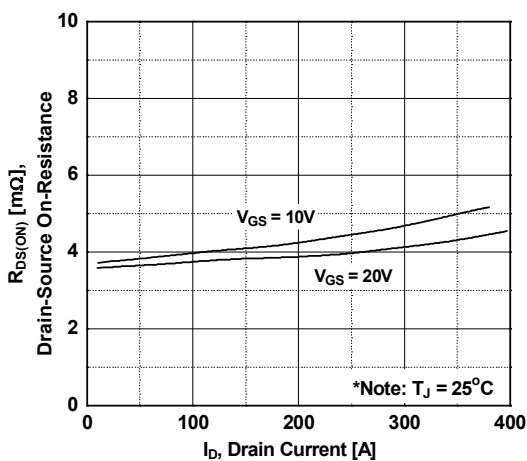
**Figure 1. On-Region Characteristics**



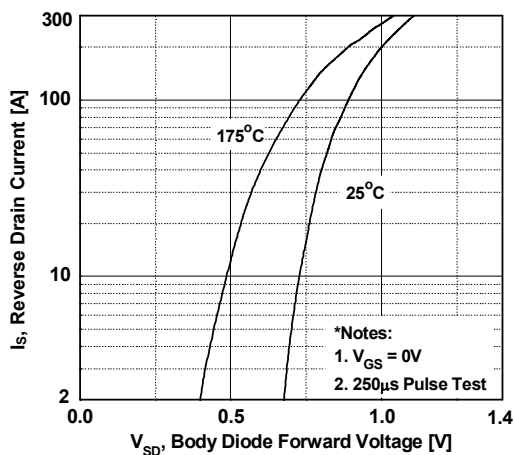
**Figure 2. Transfer Characteristics**



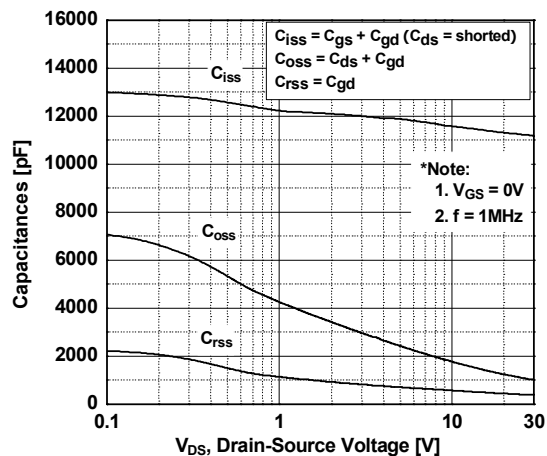
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



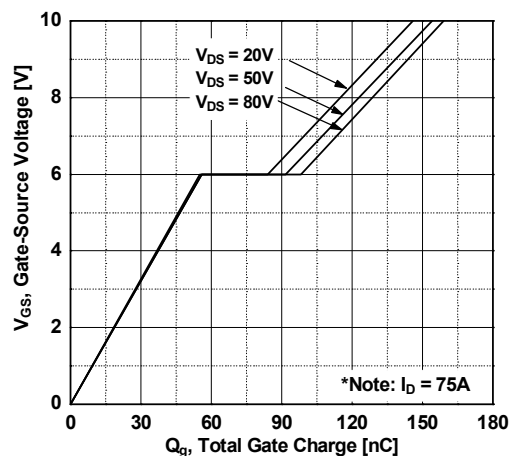
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

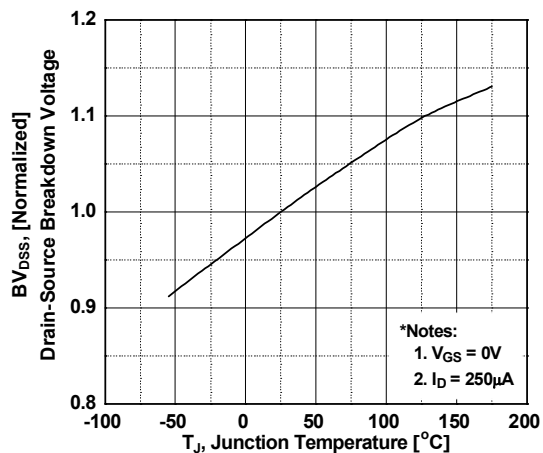


**Figure 6. Gate Charge Characteristics**

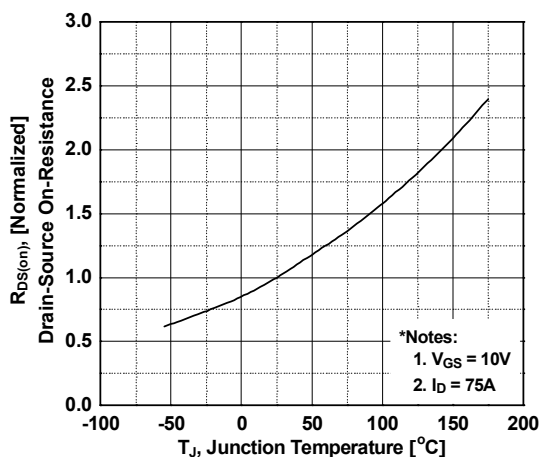


### Typical Performance Characteristics (Continued)

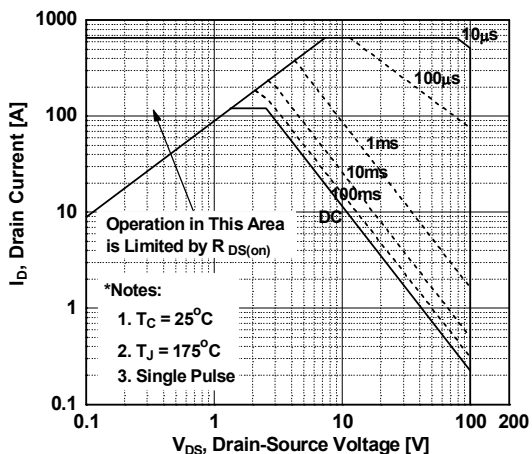
**Figure 7. Breakdown Voltage Variation vs. Temperature**



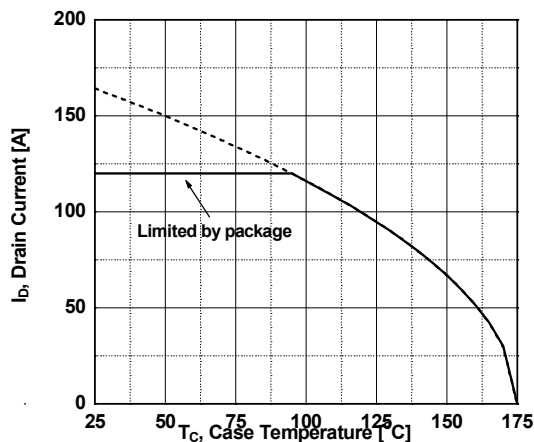
**Figure 8. On-Resistance Variation vs. Temperature**



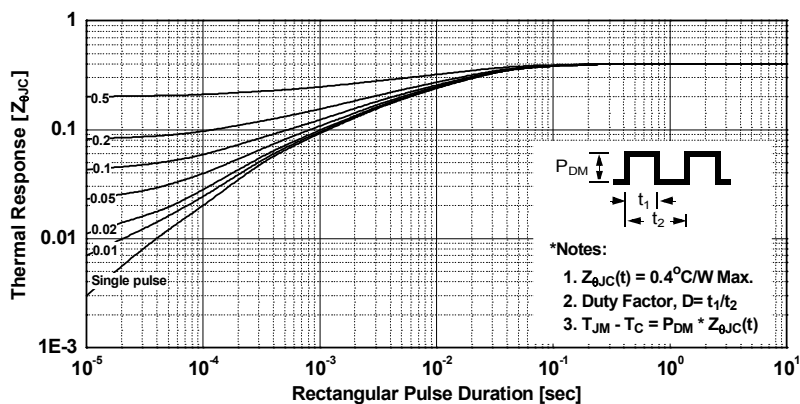
**Figure 9. Maximum Safe Operating Area**



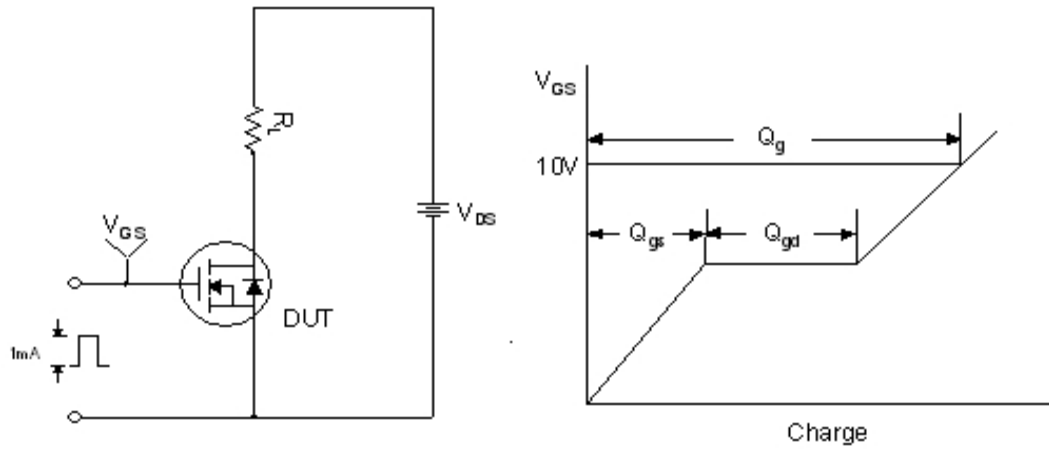
**Figure 10. Maximum Drain Current vs. Case Temperature**



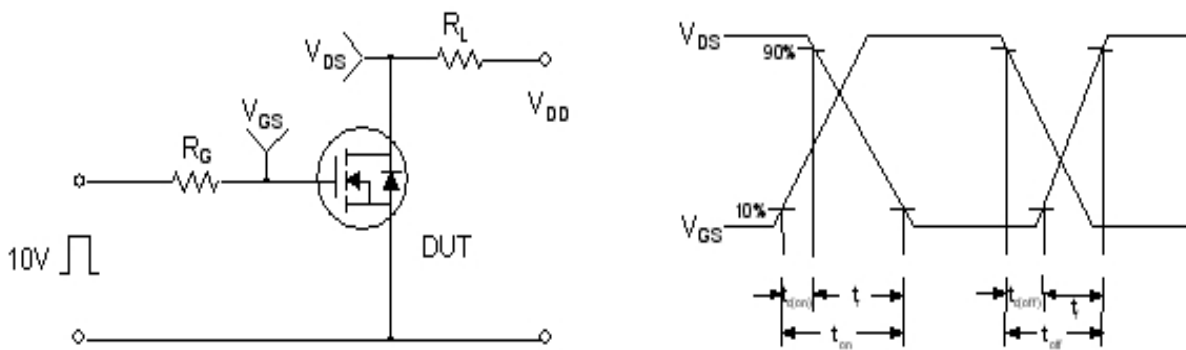
**Figure 11. Transient Thermal Response Curve**



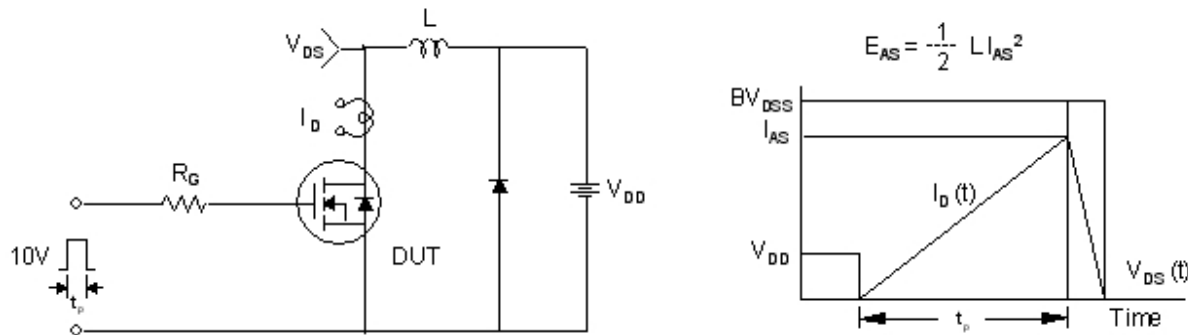
**Gate Charge Test Circuit & Waveform**



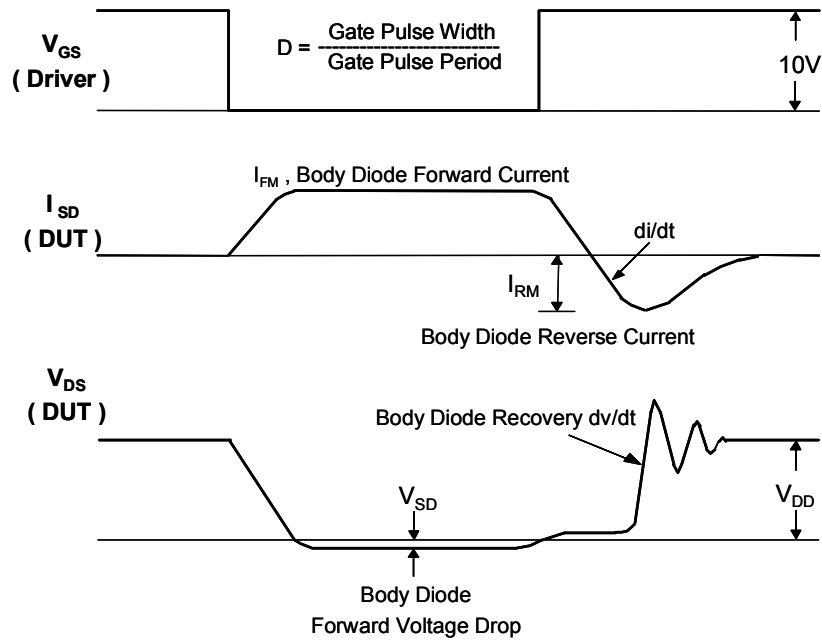
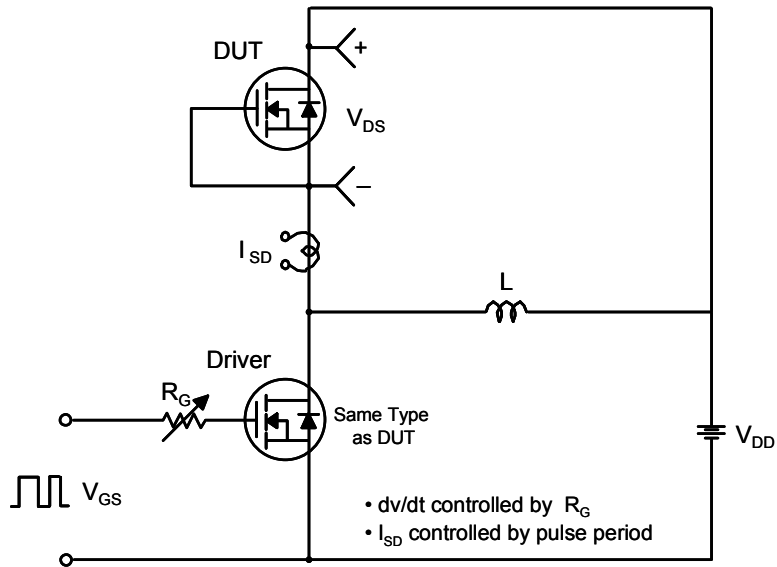
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

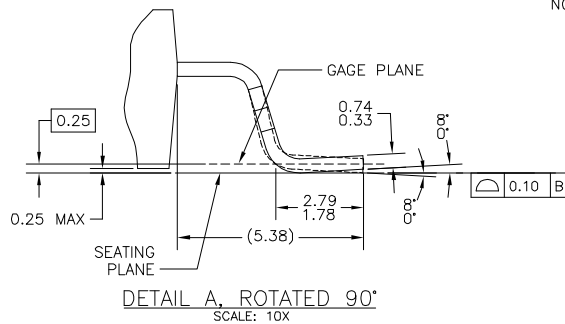
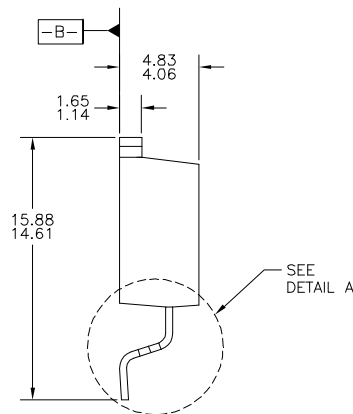
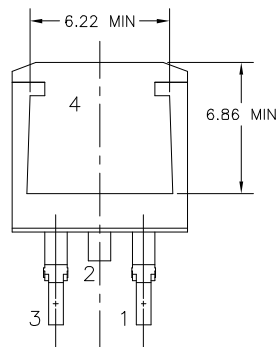
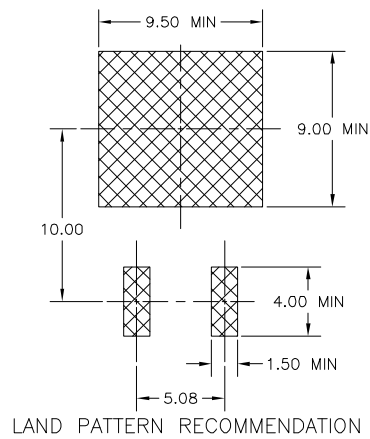
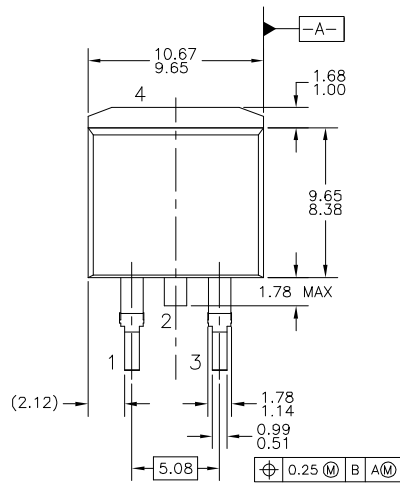


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

# D2-PAK



- NOTES: UNLESS OTHERWISE SPECIFIED
- ALL DIMENSIONS ARE IN MILLIMETERS.
  - REFERENCE JEDEC, TO-263, ISSUE D, VARIATION AB, DATED JULY 2003.
  - DIMENSIONING AND TOLERANCING PER ANSI Y14.5M - 1982.
  - LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
  - PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.


T0263A02REVD

Dimensions in Millimeters



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| FACT®   | OptiHIT™               | SupreMOS®  | VCX™  |
| FAST®   | OPTOLOGIC®             | SyncFET™   | VisualMax™  |
| FastvCore™  | OPTOPLANAR®            | Sync-Lock™   | XS™   |
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