

# FDB024N06

## N-Channel PowerTrench® MOSFET

60V, 265A, 2.4mΩ

### Features

- $R_{DS(on)} = 1.8m\Omega$  (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

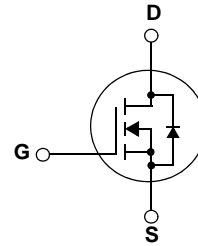
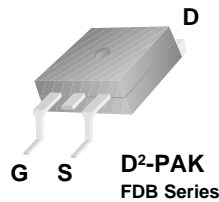


### General Description

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

### Application

- DC to DC convertors / Synchronous Rectification



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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	60	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ , Silicon Limited)	265*
		- Continuous ( $T_C = 100^\circ C$ , Silicon Limited)	190*
		- Continuous ( $T_C = 25^\circ C$ , Package Limited)	120
$I_{DM}$	Drain Current - Pulsed (Note 1)	1060	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	2531	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)	3.5	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ C$ )	- Derate above $25^\circ C$	395
			2.6
$T_J, T_{STG}$	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	0.38	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

**Package Marking and Ordering Information**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB024N06	FDB024N06	D2-PAK	330mm	24mm	800

**Electrical Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$ , $T_C = 25^\circ\text{C}$	60	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.04	-	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$ $V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$ , $T_C = 150^\circ\text{C}$	-	-	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	$V_{GS} = 10\text{V}$ , $I_D = 75\text{A}$	-	1.8	2.4	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}$ , $I_D = 75\text{A}$ (Note 4)	-	200	-	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	11190	14885	pF
$C_{oss}$	Output Capacitance		-	1610	2140	pF
$C_{rss}$	Reverse Transfer Capacitance		-	750	1125	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 48\text{V}$ , $I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ (Note 4, 5)	-	174	226	nC
$Q_{gs}$	Gate to Source Gate Charge		-	54	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	50	-	nC

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{V}$ , $I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ , $R_{GEN} = 25\Omega$ (Note 4, 5)	-	134	278	ns
$t_r$	Turn-On Rise Time		-	324	658	ns
$t_{d(off)}$	Turn-Off Delay Time		-	348	706	ns
$t_f$	Turn-Off Fall Time		-	250	510	ns

**Drain-Source Diode Characteristics**

$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	265	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	1060	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_{SD} = 75\text{A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}$ , $I_{SD} = 75\text{A}$	-	69	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	152	-	nC

**Notes:**

- 1: Repetitive Rating: Pulse width limited by maximum junction temperature
- 2:  $L = 0.9\text{mH}$ ,  $I_{AS} = 75\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , 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

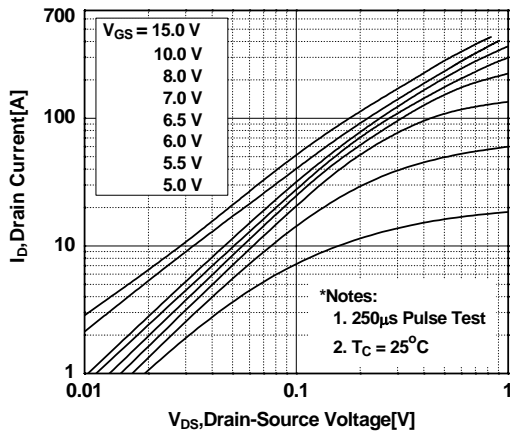


Figure 2. Transfer Characteristics

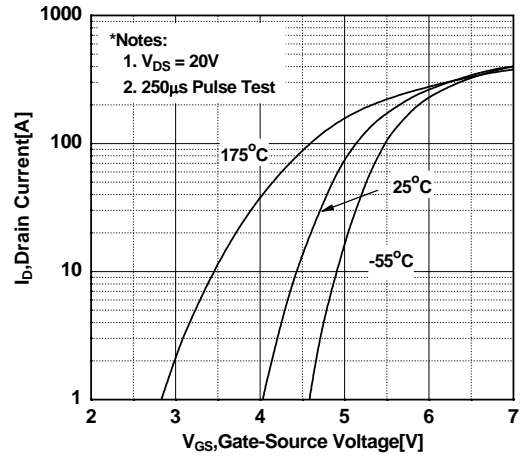


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

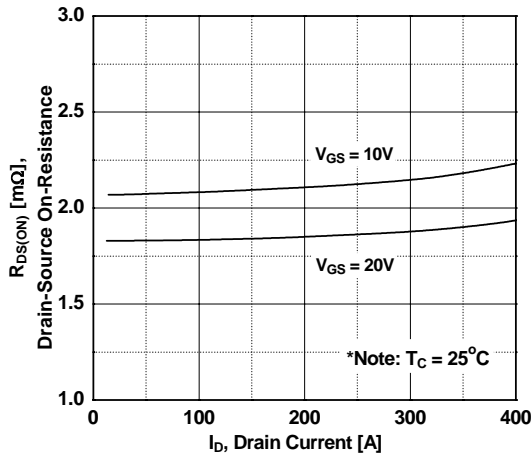


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

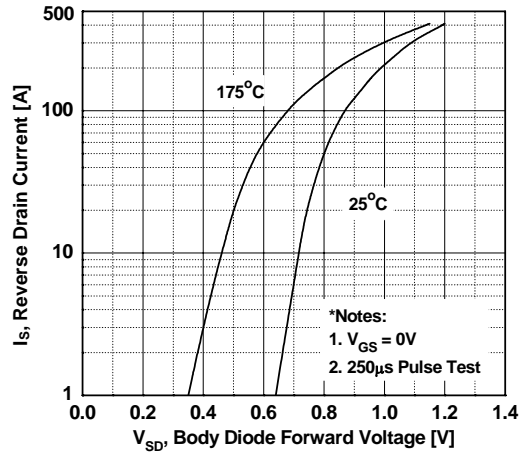


Figure 5. Capacitance Characteristics

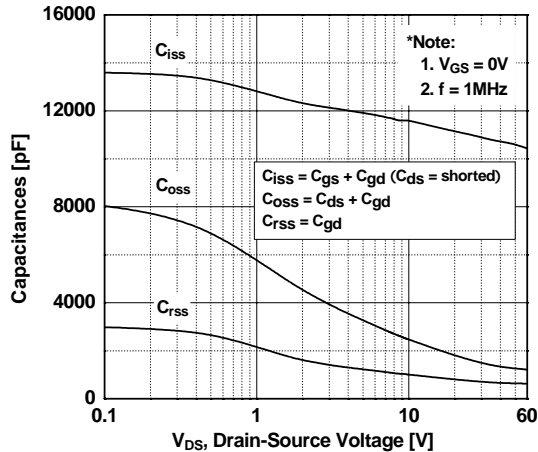
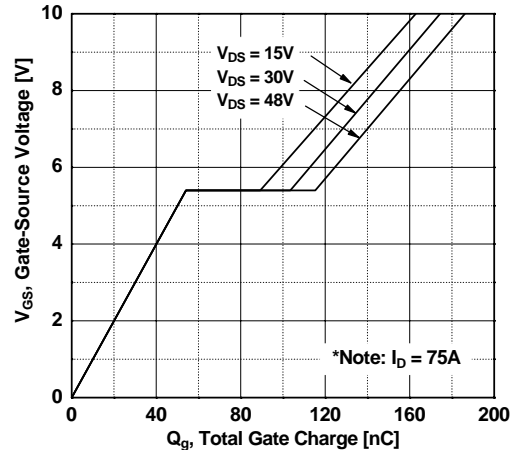


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

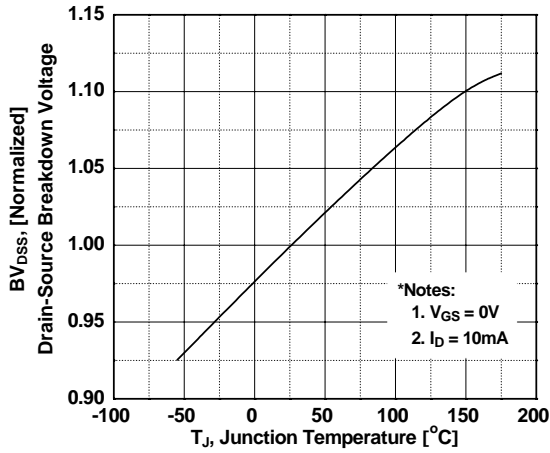


Figure 8. On-Resistance Variation vs. Temperature

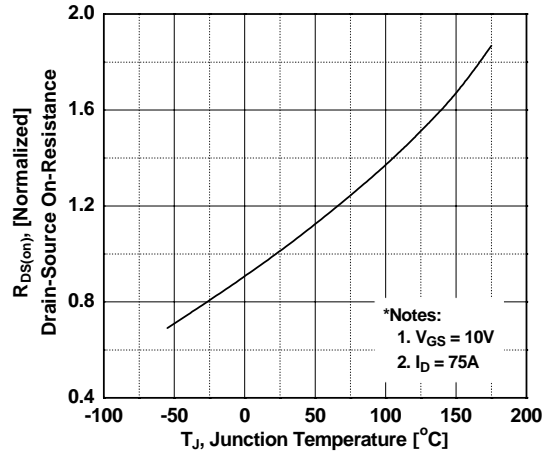


Figure 9. Maximum Safe Operating Area

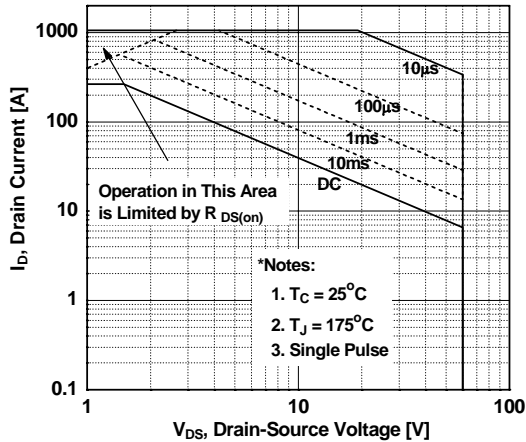


Figure 10. Maximum Drain Current vs. Case Temperature

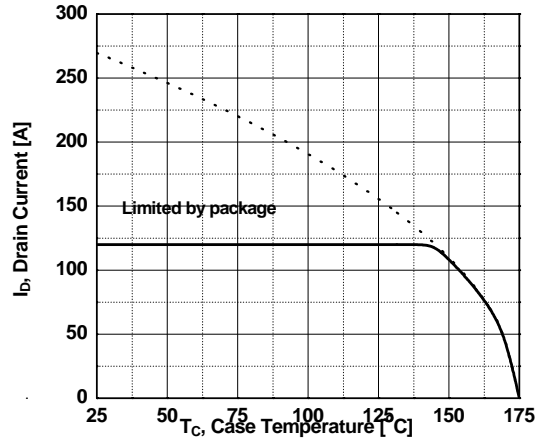
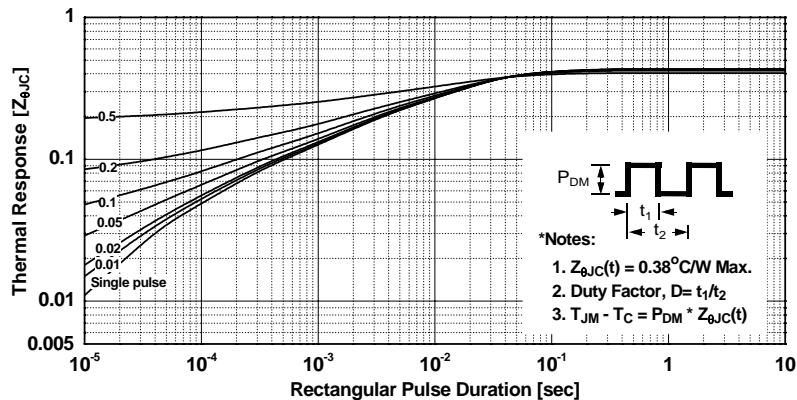
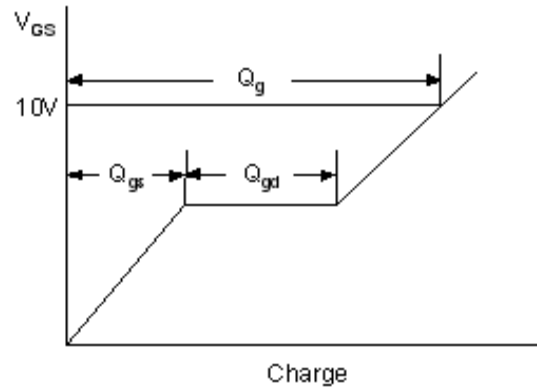
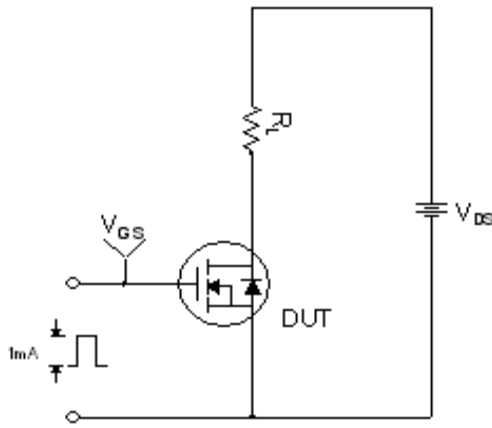


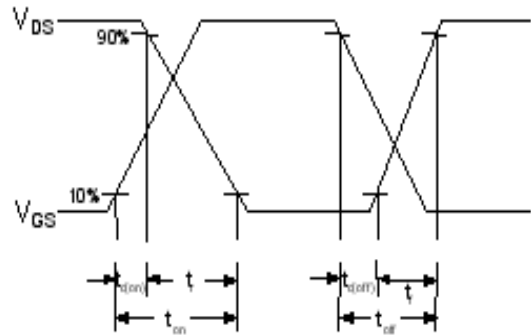
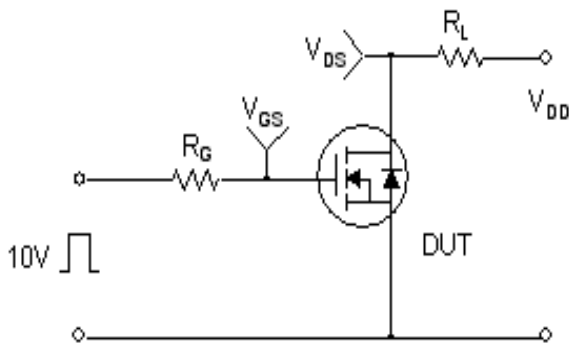
Figure 11. Transient Thermal Response Curve



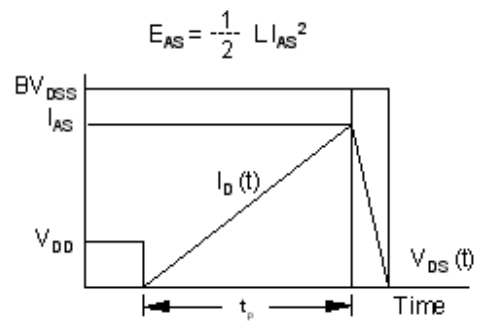
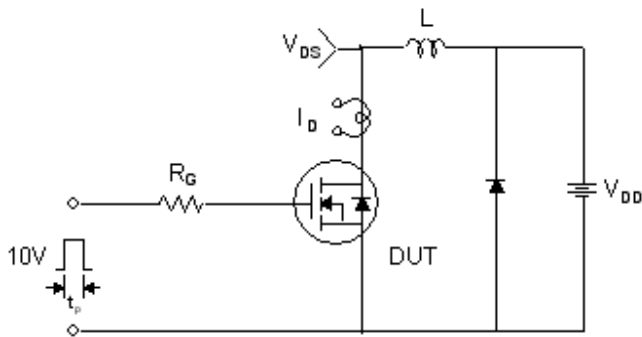
**Gate Charge Test Circuit & Waveform**



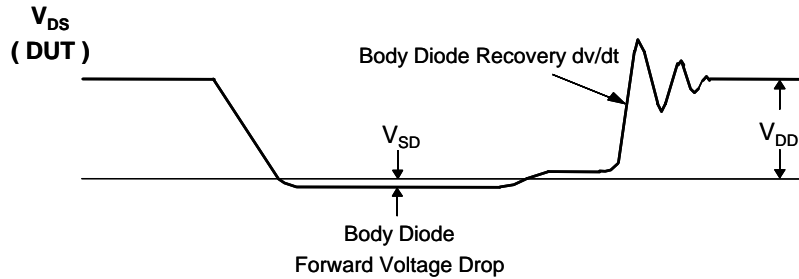
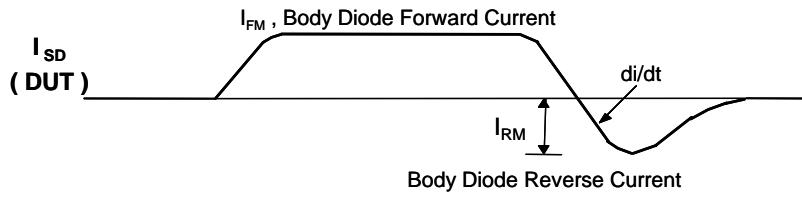
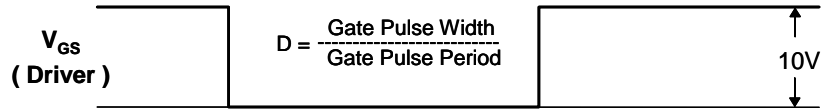
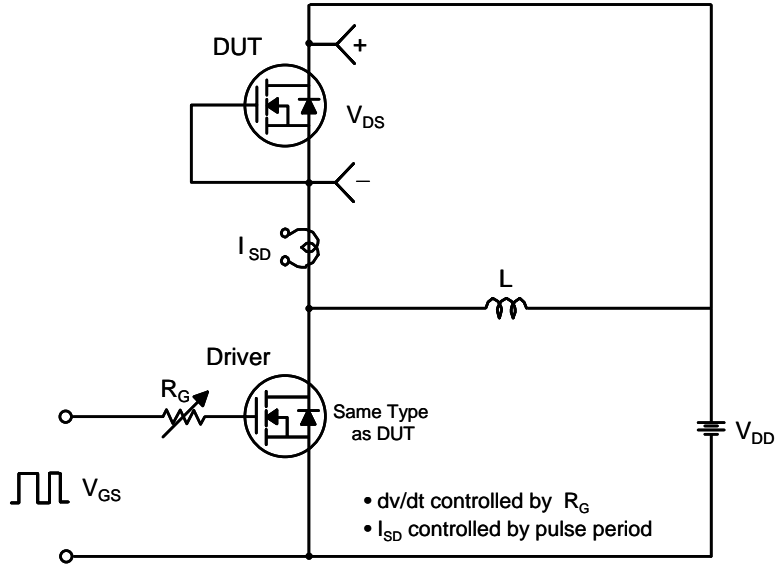
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

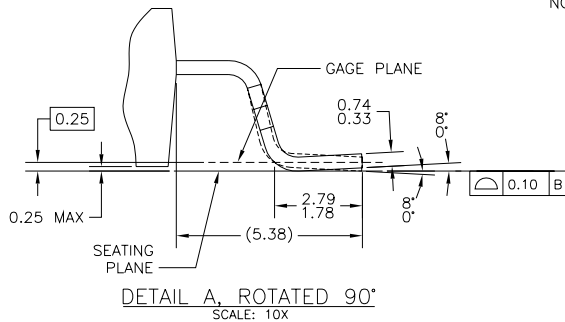
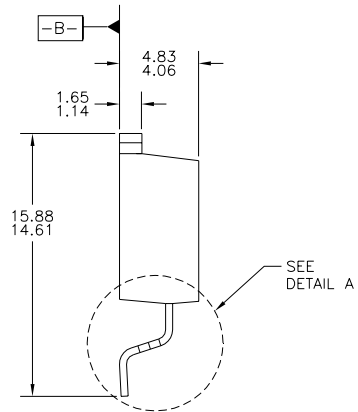
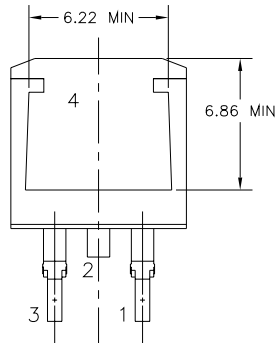
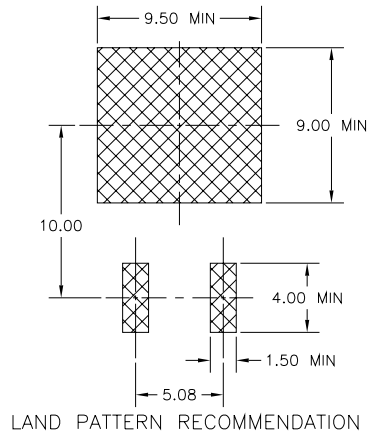
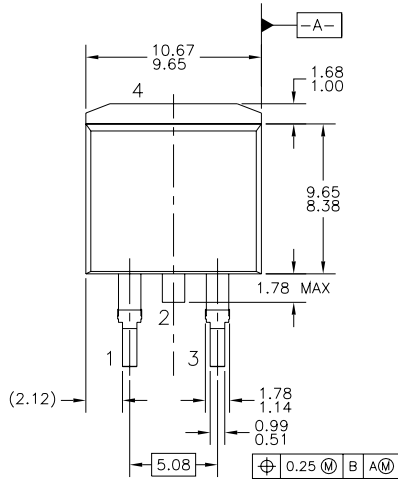


Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Mechanical Dimensions**

**D2-PAK**



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

TO263A02REVD

Dimensions in Millimeters



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