

FDB2710 250V N-Channel PowerTrench MOSFET

General Description

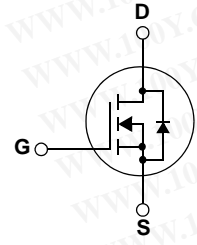
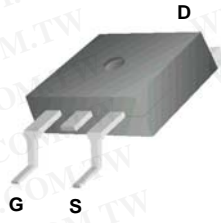
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Description

- 50A, 250V, $R_{DS(on)} = 36.3m\Omega @ V_{GS} = 10V$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability

Application

- PDP application



Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain-Source Voltage	250	V
V_{GS}	Gate-Source voltage	± 30	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ C$)	50
		- Continuous ($T_C = 100^\circ C$)	31.3
I_{DM}	Drain Current - Pulsed (Note 1)	See Figure 9	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	145	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ C$)	- Derate above $25^\circ C$	260
			2.1
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Min	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	0.48	$^\circ C/W$
$R_{\theta JA}^*$	Thermal Resistance, Junction-to-Ambient*	--	40	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ C/W$

*When mounted on the minimum pad size recommended (PCB Mount)

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB2710	FDB2710	D2-Pak	330mm	24mm	800

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A, T_J = 25^\circ\text{C}$	250	--	--	V	
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25°C	--	0.25	--	$V/^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 250V, V_{GS} = 0V$ $V_{DS} = 250V, V_{GS} = 0V, T_C = 125^\circ\text{C}$	--	--	1 500	μA μA	
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30V, V_{DS} = 0V$	--	--	100	nA	
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30V, V_{DS} = 0V$	--	--	-100	nA	
On Characteristics							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	4.0	5.0	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 25A$	--	36.3	42.5	$m\Omega$	
g_{FS}	Forward Transconductance	$V_{DS} = 10V, I_D = 25A$ (Note 4)	--	63	--	S	
Dynamic Characteristics							
C_{iss}	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	--	5470	7280	pF	
C_{oss}	Output Capacitance		--	426	570	pF	
C_{rss}	Reverse Transfer Capacitance		--	97	146	pF	
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125V, I_D = 50A$ $V_{GS} = 10V, R_{GEN} = 25\Omega$	--	80	170	ns	
t_r	Turn-On Rise Time		--	252	515	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4, 5)	--	112	235	ns
t_f	Turn-Off Fall Time		--	154	320	ns	
Q_g	Total Gate Charge	$V_{DS} = 125V, I_D = 50A$ $V_{GS} = 10V$	--	78	101	nC	
Q_{gs}	Gate-Source Charge		--	34	--	nC	
Q_{gd}	Gate-Drain Charge		(Note 4, 5)	--	18	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	50	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	150	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 50A$	--	--	1.2	V	
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V, I_S = 50A$ $di/dt = 100A/\mu s$	--	163	--	ns	
Q_{rr}	Reverse Recovery Charge		(Note 4)	--	1.3	--	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 1\text{mH}, I_{AS} = 17A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 50A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

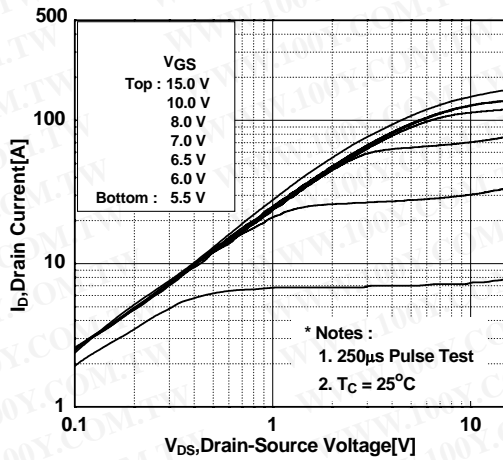


Figure 2. Transfer Characteristics

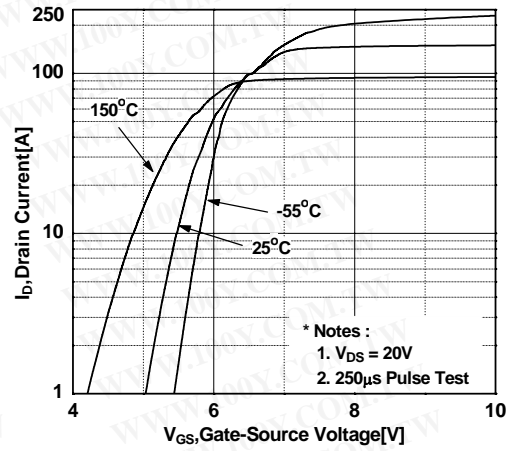


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

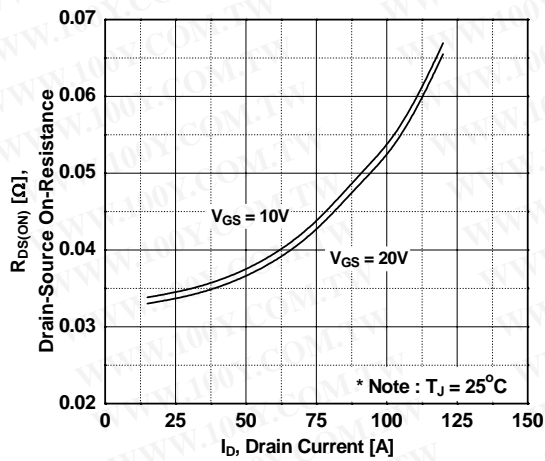


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

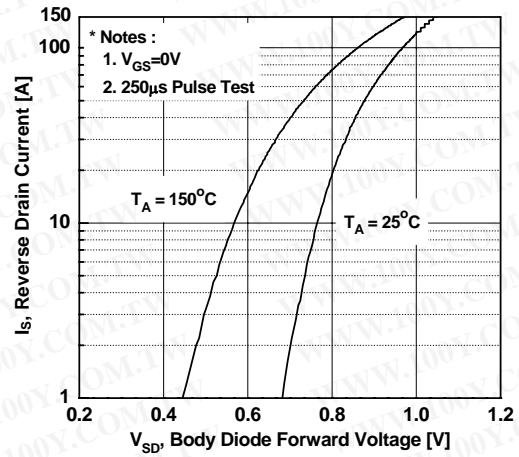


Figure 5. Capacitance Characteristics

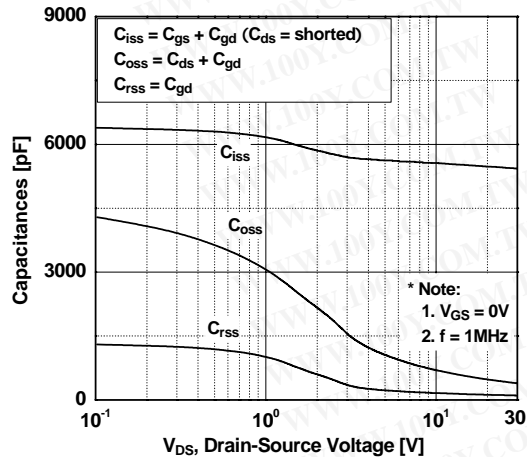
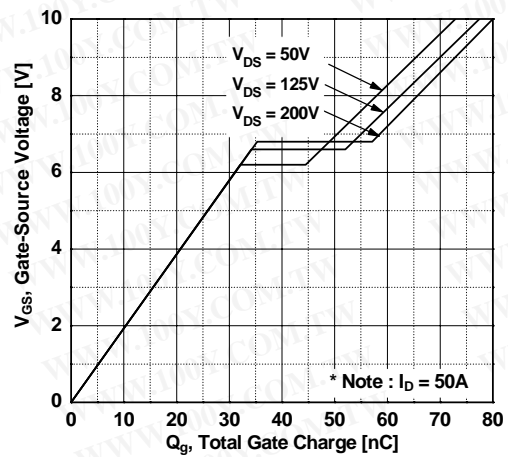


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

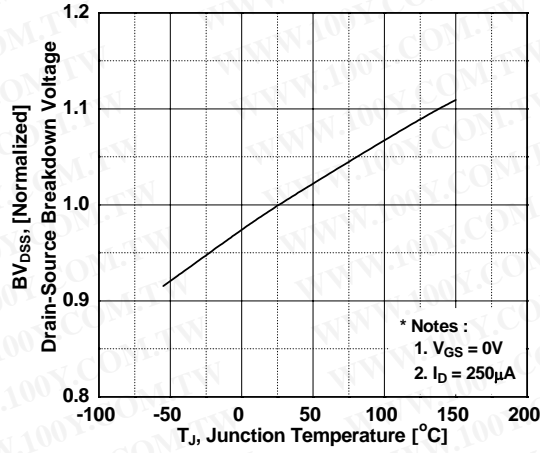


Figure 8. On-Resistance Variation vs. Temperature

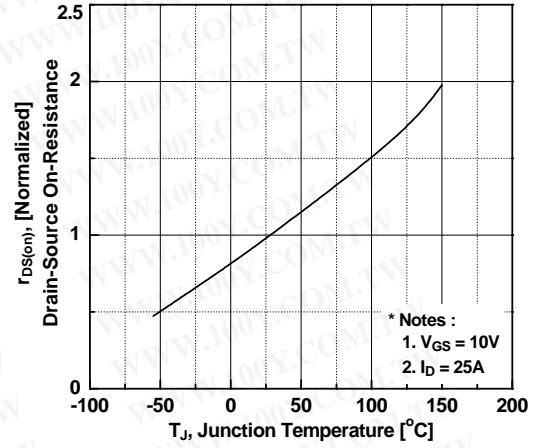


Figure 9. Maximum Safe Operating Area

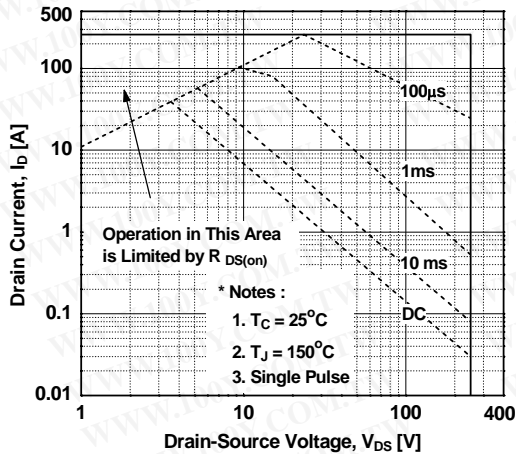


Figure 10. Maximum Drain Current vs. Case Temperature

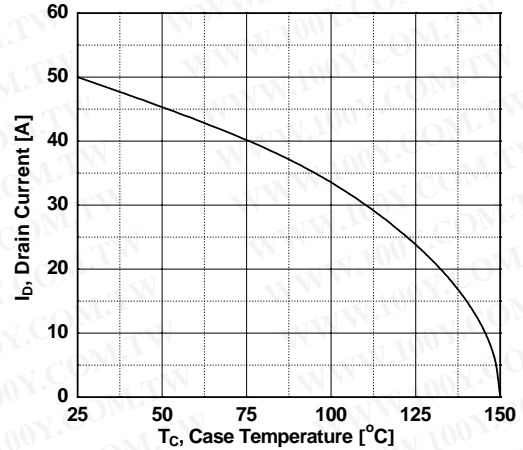
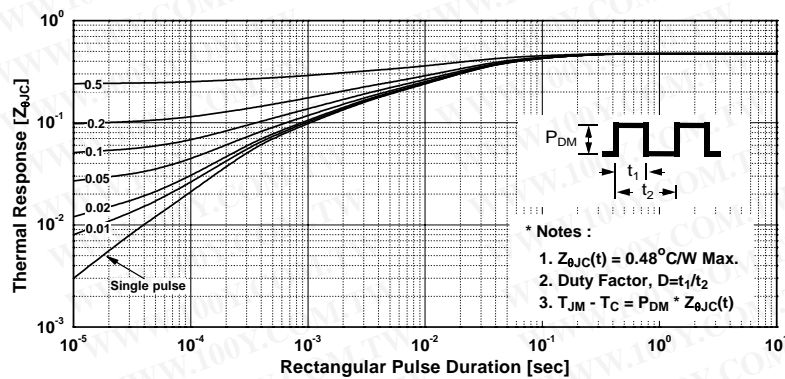
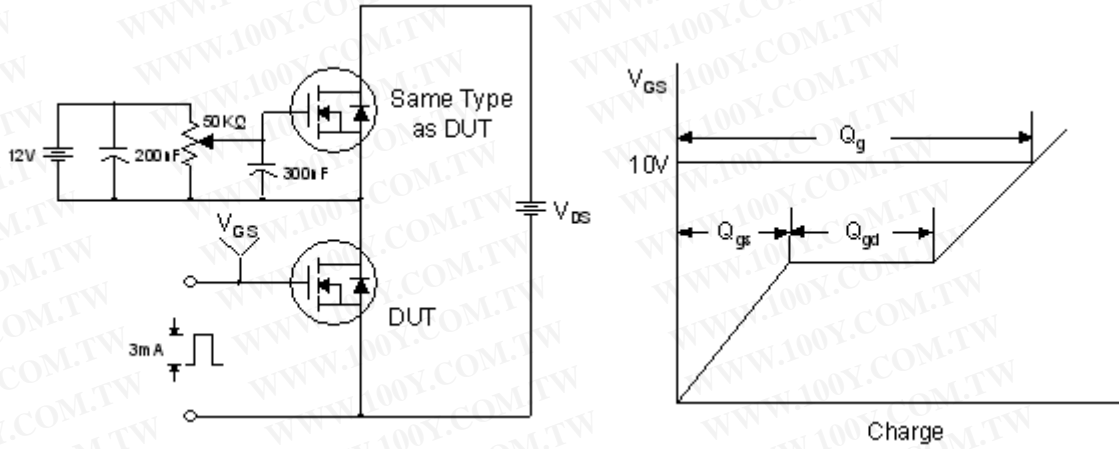


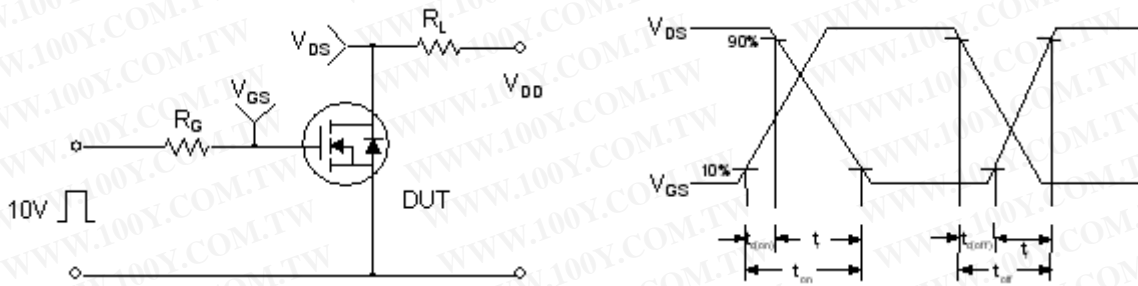
Figure 11. Transient Thermal Response Curve



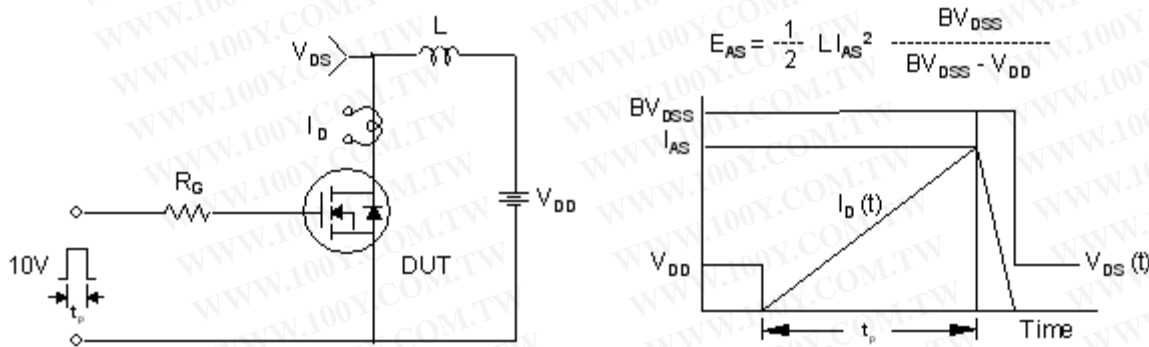
Gate Charge Test Circuit & Waveform



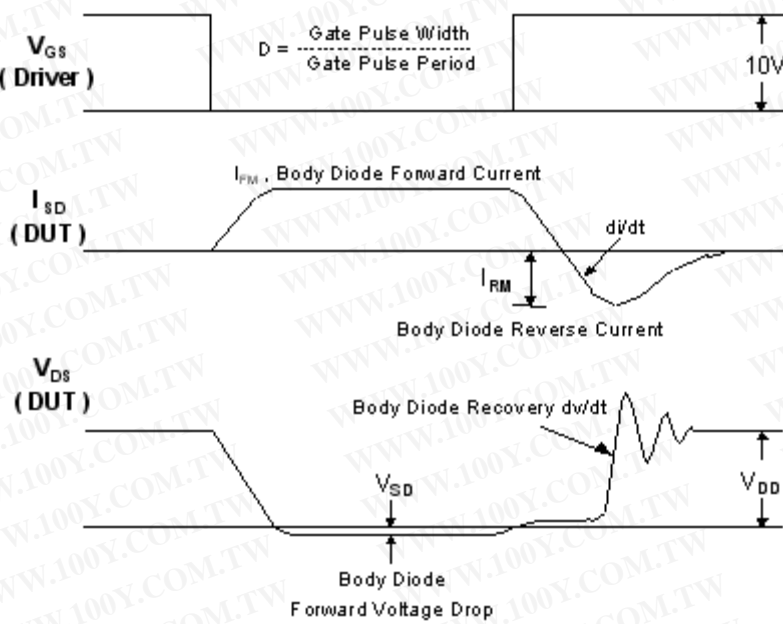
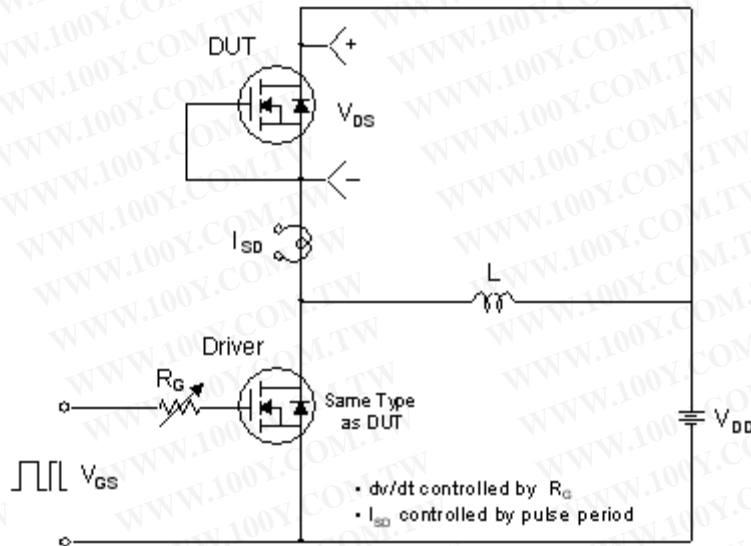
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

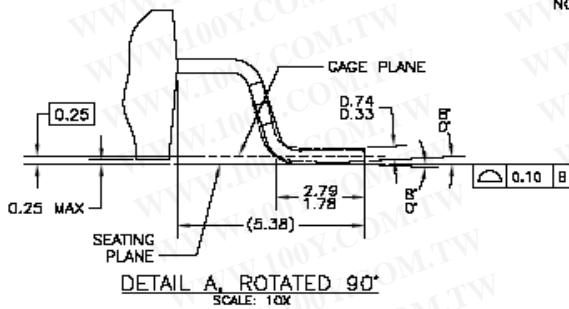
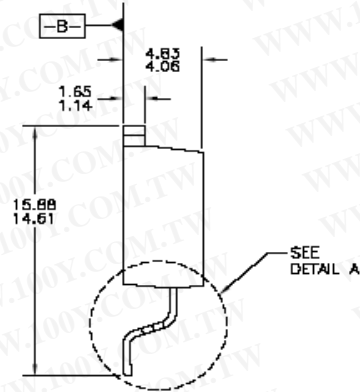
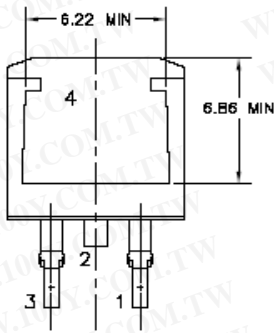
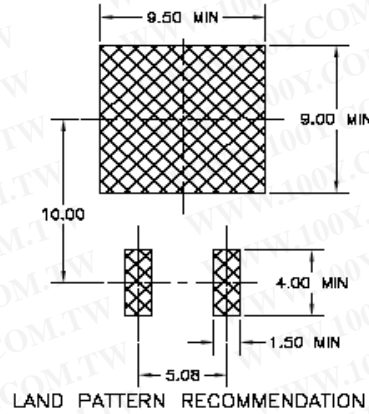
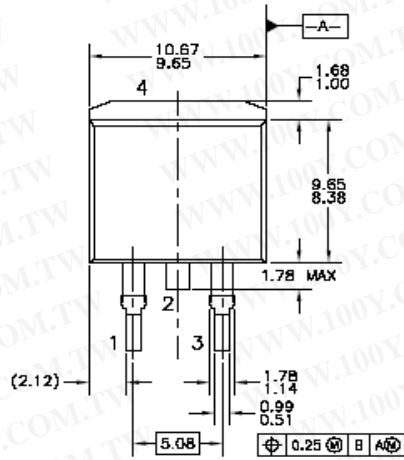


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package 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.

T02B3AD2REV D

Dimensions in Millimeters

Ultrafast Recovery Power Rectifier

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