

# FDB2710

## N-Channel PowerTrench® MOSFET

250 V, 50 A, 42.5 mΩ

### Features

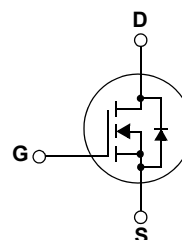
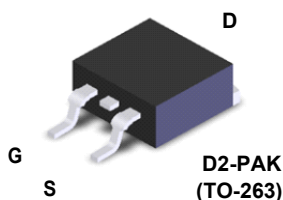
- $R_{DS(on)} = 36.3 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 25 \text{ A}$
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability

### Description

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

### Applications

- Synchronous Rectification
- Battery Protection Circuit
- Motor drives and Uninterruptible Power Supplies



### Absolute Maximum Ratings

Symbol	Parameter	FDB2710	Unit
$V_{DS}$	Drain-Source Voltage	250	V
$V_{GS}$	Gate-Source voltage	$\pm 30$	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	50 31.3	A A
$I_{DM}$	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 ( $T_C = 25^\circ\text{C}$ ) - Derate above $25^\circ\text{C}$	260 2.1	W W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDB2710	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.48	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$
$R_{\theta JA}^*$	Thermal Resistance, Junction-to-Ambient, Max. *	62.5	$^\circ\text{C}/\text{W}$

\*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<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA, T <sub>J</sub> = 25°C	250	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C	--	0.25	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V, T <sub>C</sub> = 125°C	--	--	1 500	μA μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V	--	--	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	3.0	4.0	5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 25A	--	36.3	42.5	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10V, I <sub>D</sub> = 25A	--	63	--	S
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	--	5470	7280	pF
C <sub>oss</sub>	Output Capacitance		--	426	570	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	97	146	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125V, I <sub>D</sub> = 50A V <sub>GS</sub> = 10V, R <sub>GEN</sub> = 25Ω  (Note 4)	--	80	170	ns
t <sub>r</sub>	Turn-On Rise Time		--	252	515	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	112	235	ns
t <sub>f</sub>	Turn-Off Fall Time		--	154	320	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 125V, I <sub>D</sub> = 50A V <sub>GS</sub> = 10V  (Note 4)	--	78	101	nC
Q <sub>gs</sub>	Gate-Source Charge		--	34	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	18	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	50	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	150	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 50A	--	--	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 50A di/dt = 100A/μs	--	163	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	1.3	--	μC

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 1mH, I<sub>AS</sub> = 17A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 50A, di/dt ≤ 100A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

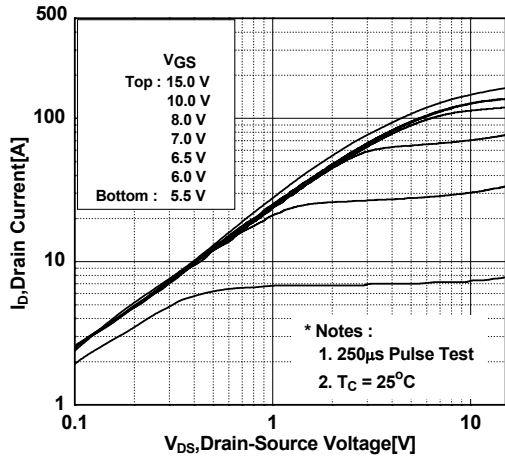


Figure 2. Transfer Characteristics

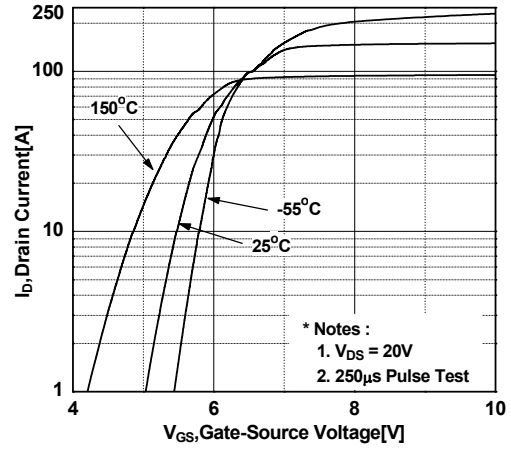


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

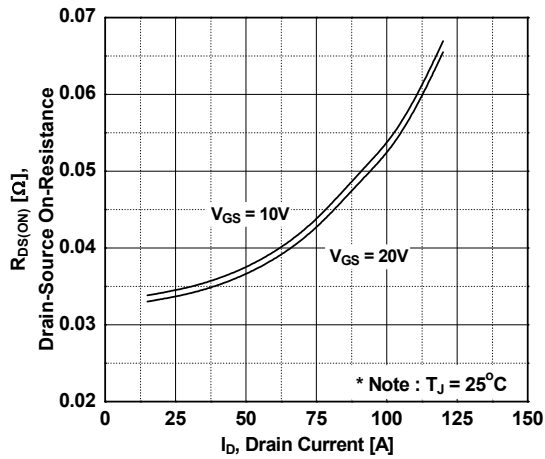


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

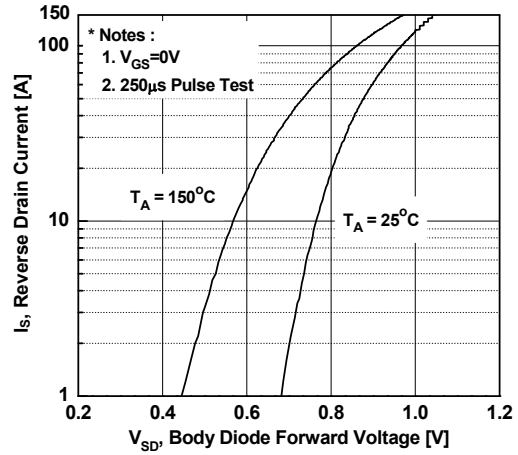


Figure 5. Capacitance Characteristics

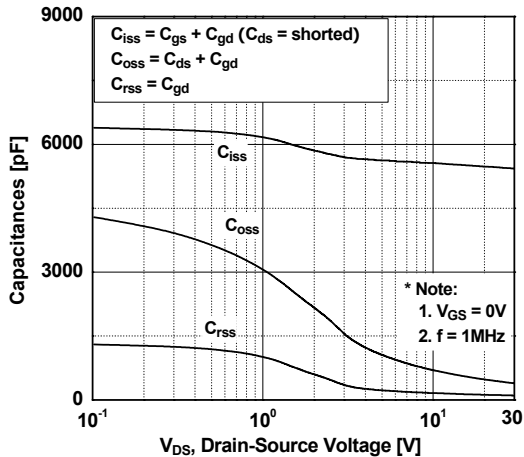
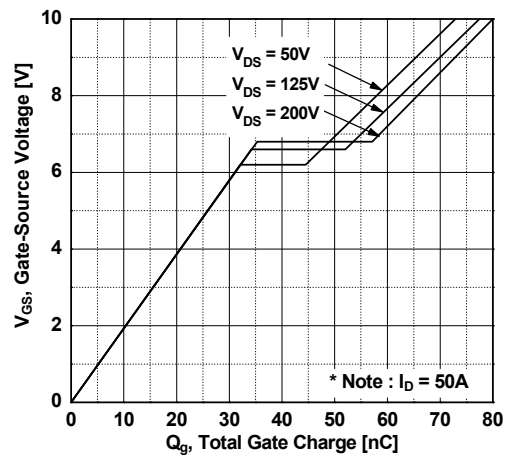
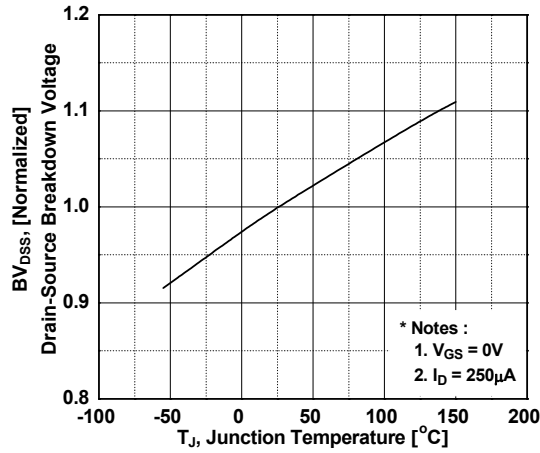


Figure 6. Gate Charge Characteristics

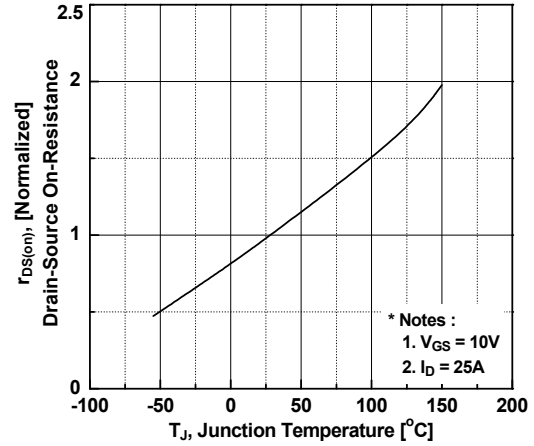


## Typical Performance Characteristics (Continued)

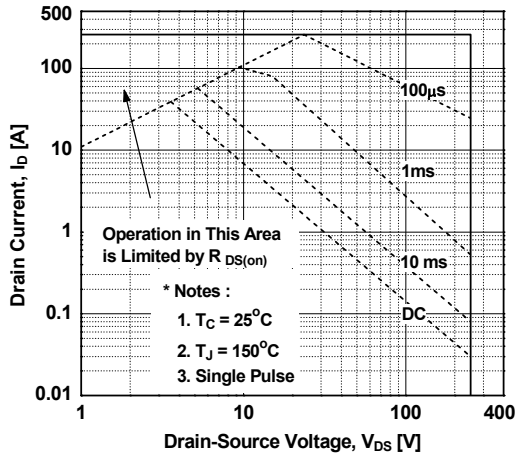
**Figure 7. Breakdown Voltage Variation vs. Temperature**



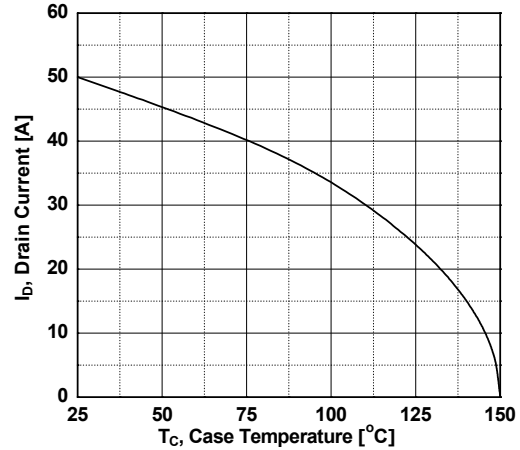
**Figure 8. On-Resistance Variation vs. Temperature**



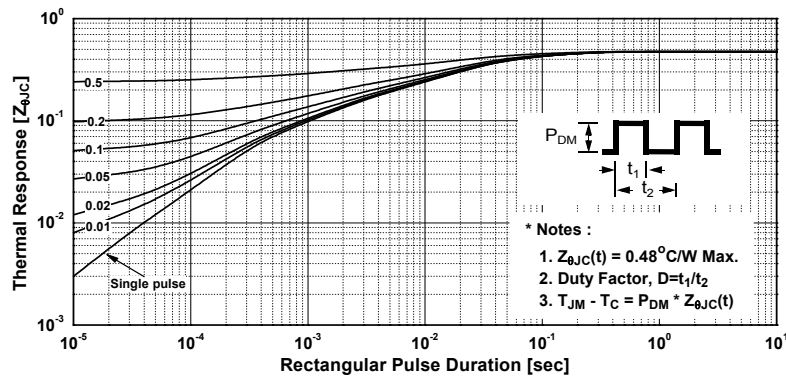
**Figure 9. Maximum Safe Operating Area**



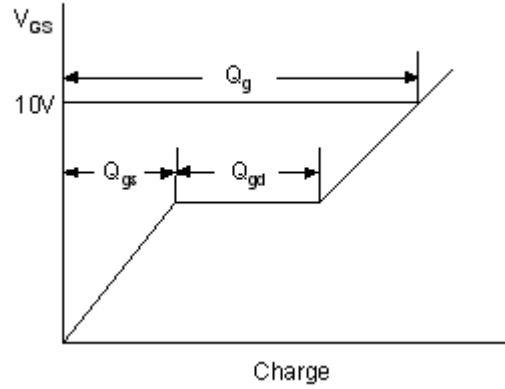
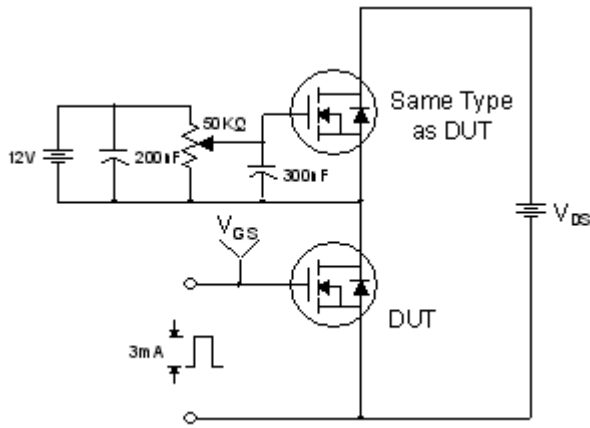
**Figure 10. Maximum Drain Current vs. Case Temperature**



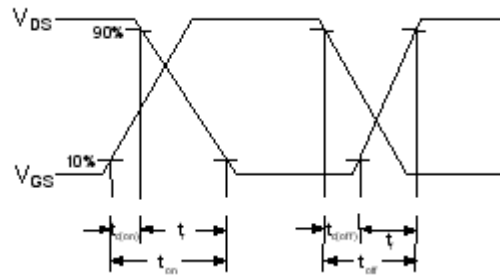
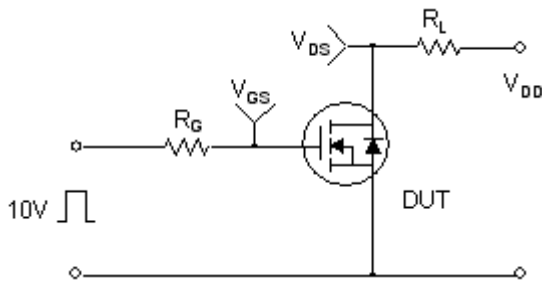
**Figure 11. Transient Thermal Response Curve**



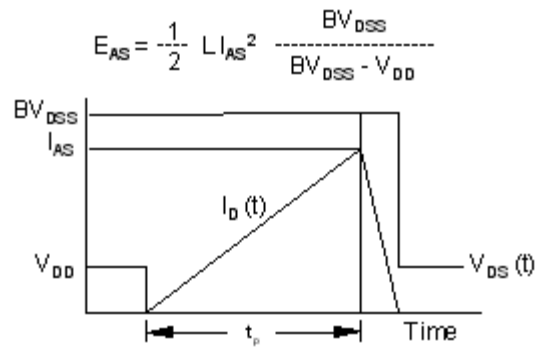
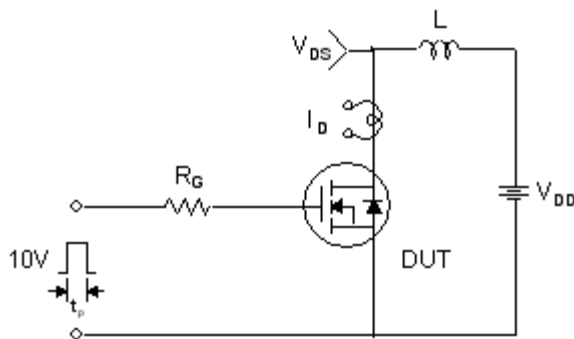
**Gate Charge Test Circuit & Waveform**



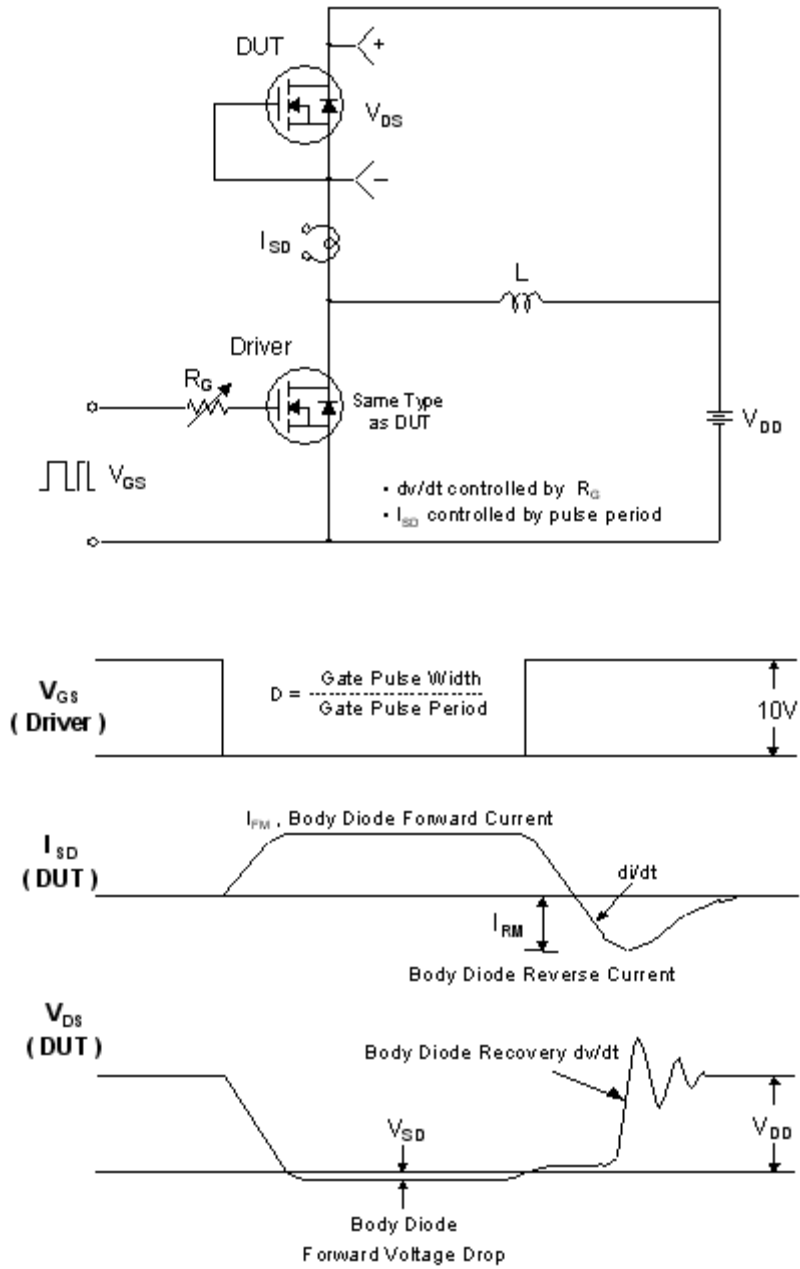
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

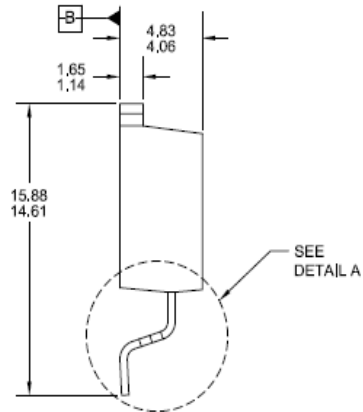
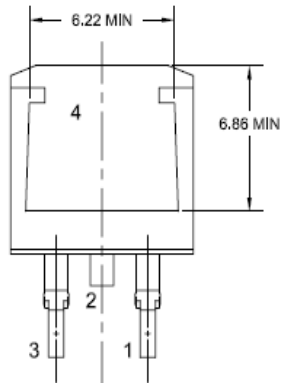
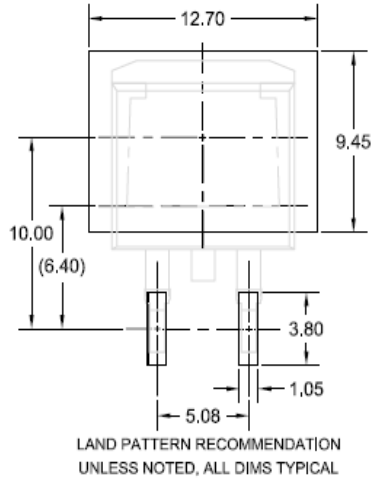
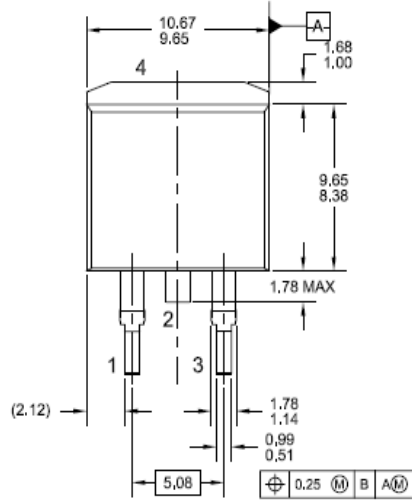


**Peak Diode Recovery dv/dt Test Circuit & Waveforms**

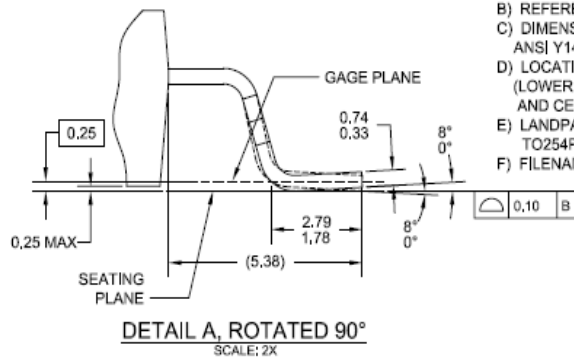


# Mechanical Dimensions

## D<sup>2</sup>-PAK



- NOTES: UNLESS OTHERWISE SPECIFIED  
 A) ALL DIMENSIONS ARE IN MILLIMETERS.  
 B) REFERENCE JEDEC, TO-263, VARIATION AB.  
 C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5M - 1994.  
 D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).  
 E) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N  
 F) FILENAME: TO263A02REV6







Dimensions in Millimeters



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| BitSiC™  | Global Power ResourceSM                         | QFET®   | TinyBuck™  |
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| ESBC™  | MicroFET™                                       | SuperFET®   |  SerDes™          |
|  Fairchild® | MicroPak™                                       | SuperSOT™-3   | UHC®   |
| Fairchild Semiconductor®   | MicroPak2™                                      | SuperSOT™-6   | Ultra FRFET™   |
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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.
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Rev. I64



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