

# FDP2710

## N-Channel PowerTrench® MOSFET

### 250 V, 50 A, 42.5 mΩ

#### Features

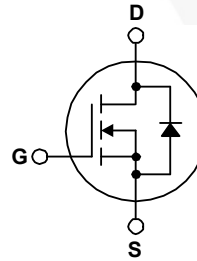
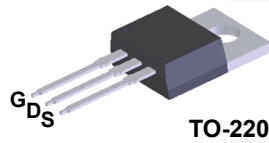
- $R_{DS(on)} = 36.3 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 25 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

#### General Description

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

#### Applications

- Consumer Appliances
- Synchronous Rectification



#### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FDP2710	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	FDP2710	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.	62.5	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP2710	FDP2710	TO-220	Tube	N/A	50 units

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

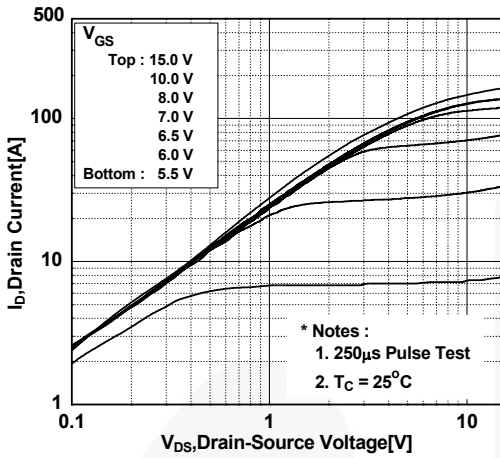
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A, T_J = 25^\circ\text{C}$	250	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$ , Referenced to $25^\circ\text{C}$	--	0.25	--	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 250V, V_{GS} = 0V$ $V_{DS} = 250V, V_{GS} = 0V, T_C = 125^\circ\text{C}$	--	--	10 500	$\mu A$ $\mu A$
$I_{GSSF}$	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
<b>On Characteristics</b>						
$V_{GS(th)}$	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	$V_{DS} = 10V, I_D = 25A$	--	63	--	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	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
<b>Switching Characteristics</b>						
$t_{d(on)}$	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		--	112	235	ns
$t_f$	Turn-Off Fall Time		(Note 4)	--	154	320
$Q_g$	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)	--	18	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	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	$V_{GS} = 0V, I_S = 50A$ $di_F/dt = 100A/\mu s$	--	163	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	1.3	--	$\mu C$

### Notes:

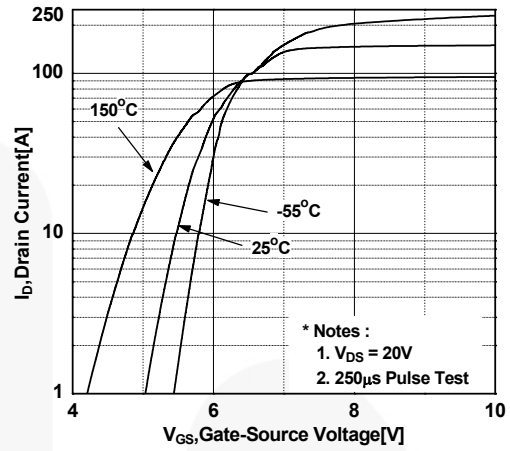
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 1\text{mH}, I_{AS} = 17A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 50A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent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

## Typical Performance Characteristics

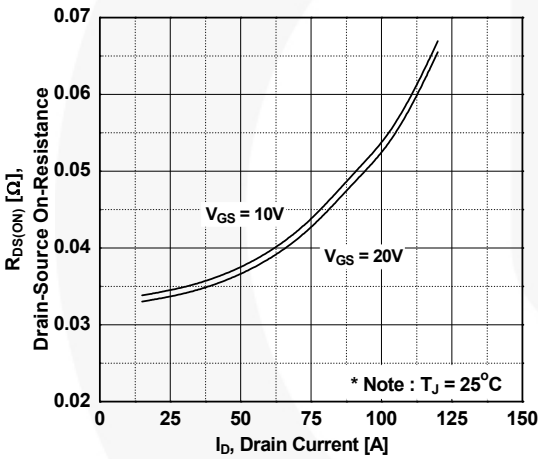
**Figure 1. On-Region Characteristics**



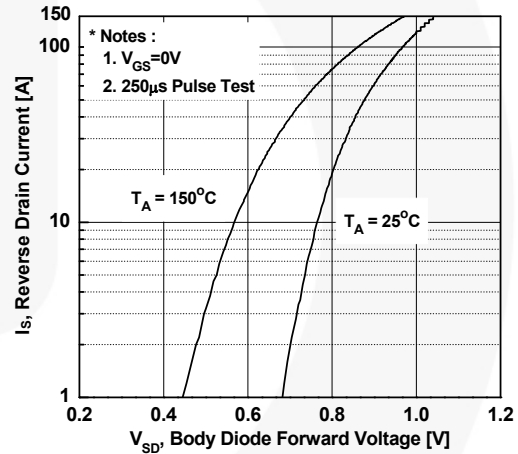
**Figure 2. Transfer Characteristics**



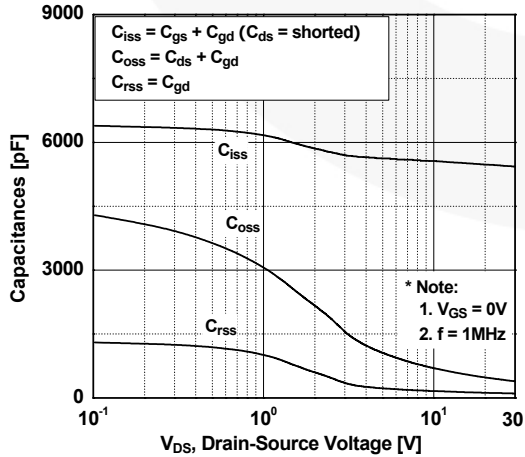
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



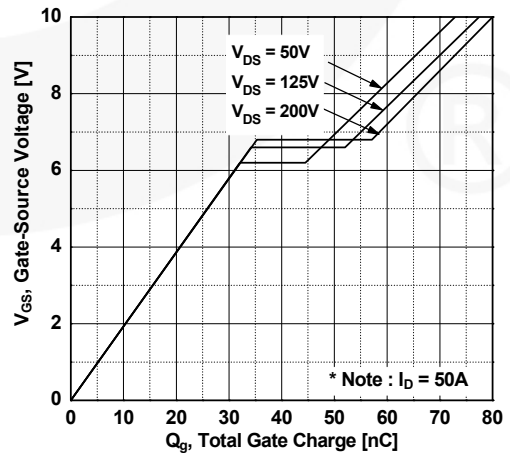
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

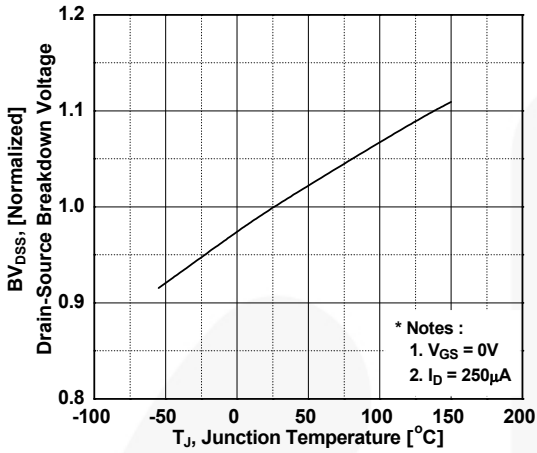


Figure 8. On-Resistance Variation vs. Temperature

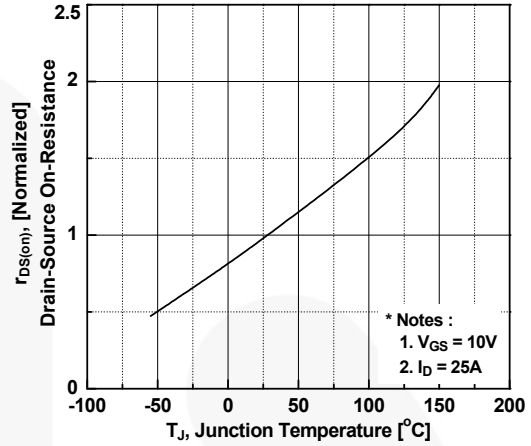


Figure 9. Maximum Safe Operating Area

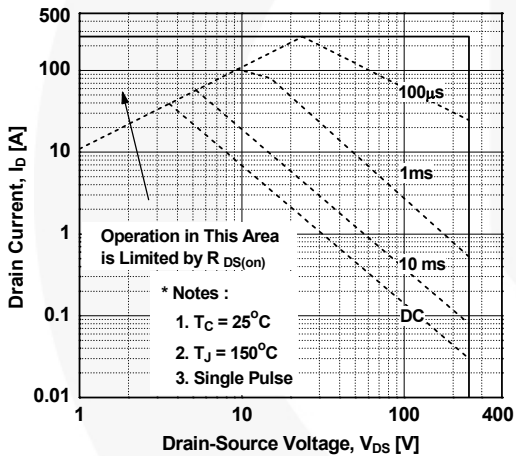


Figure 10. Maximum Drain Current vs. Case Temperature

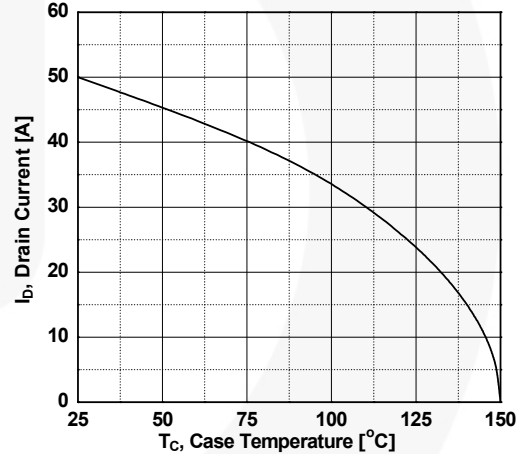
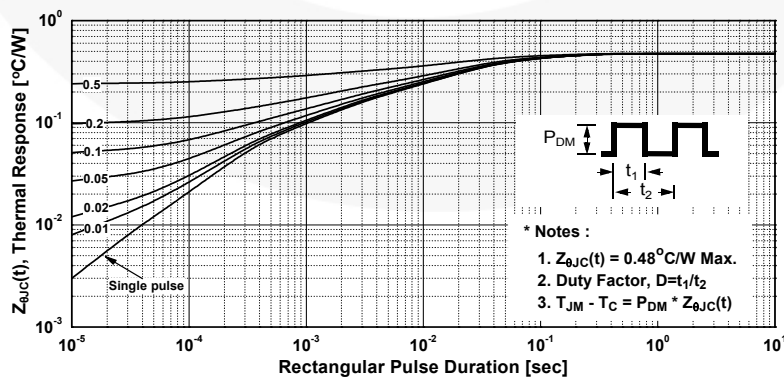
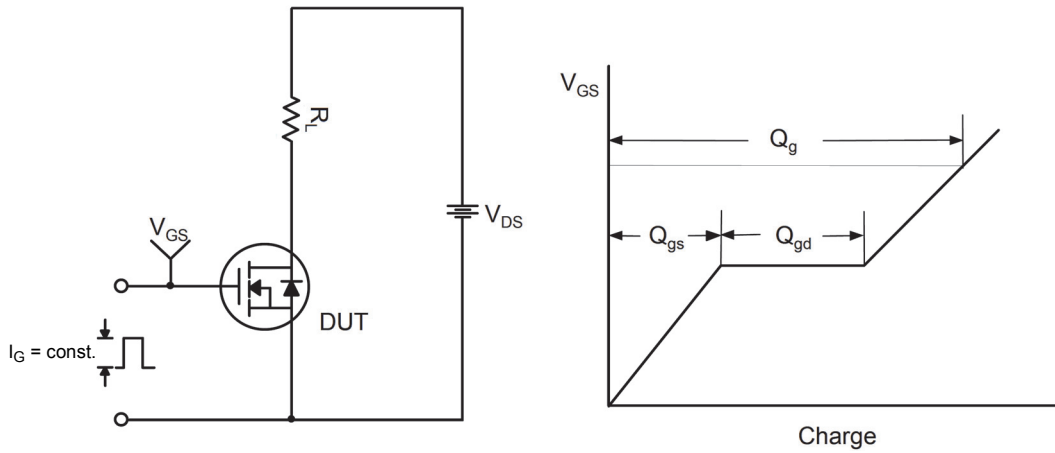


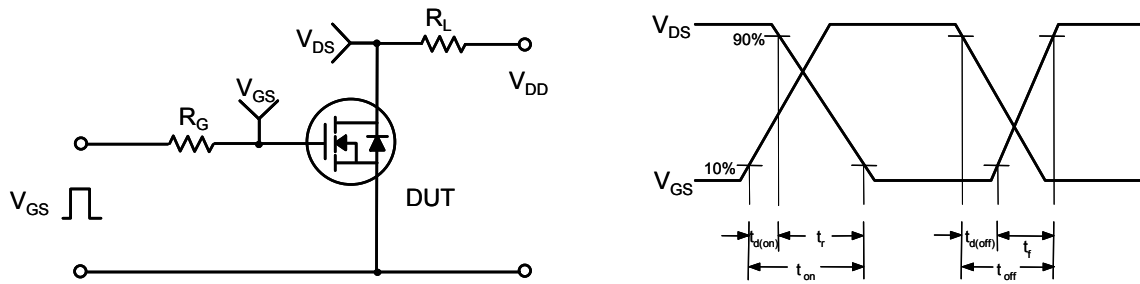
Figure 11. Transient Thermal Response Curve



**Figure 12. Gate Charge Test Circuit & Waveform**



**Figure 13. Resistive Switching Test Circuit & Waveforms**



**Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms**

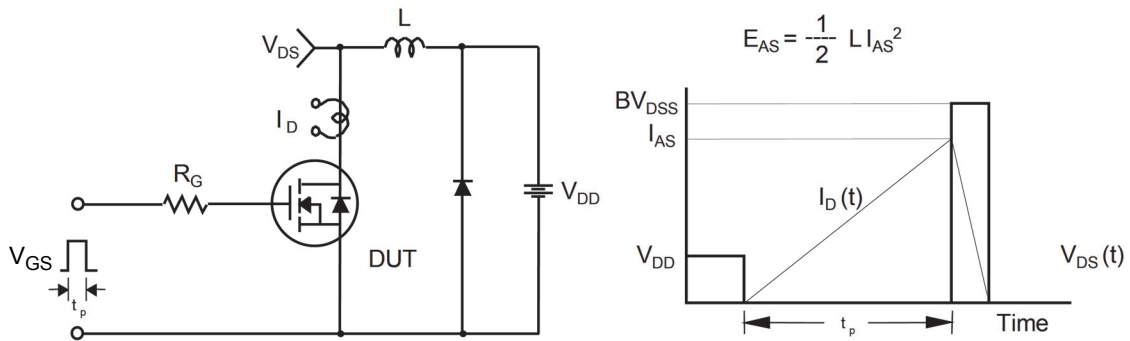
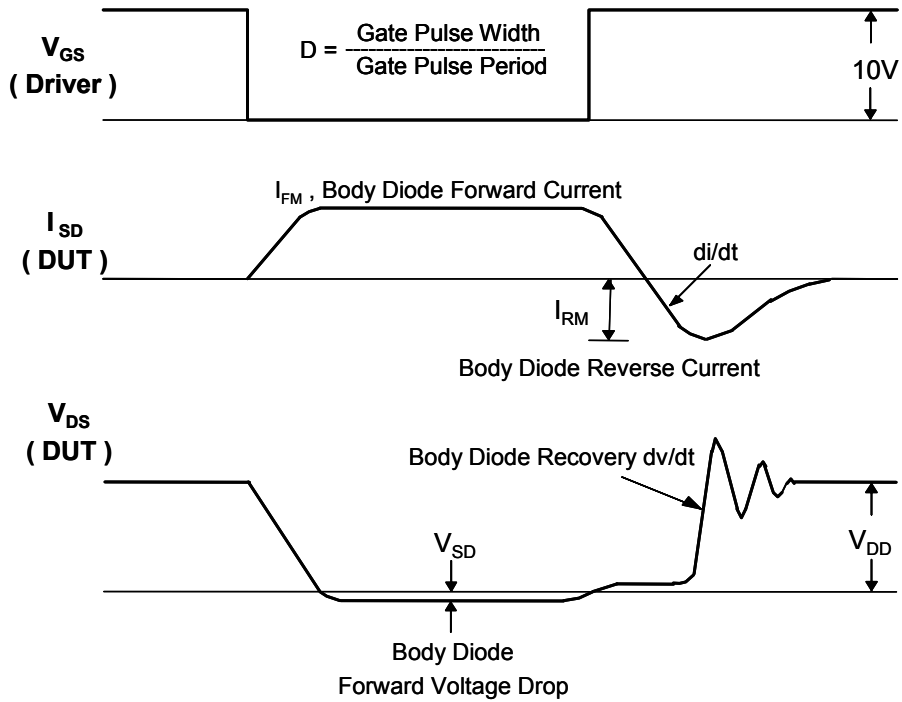
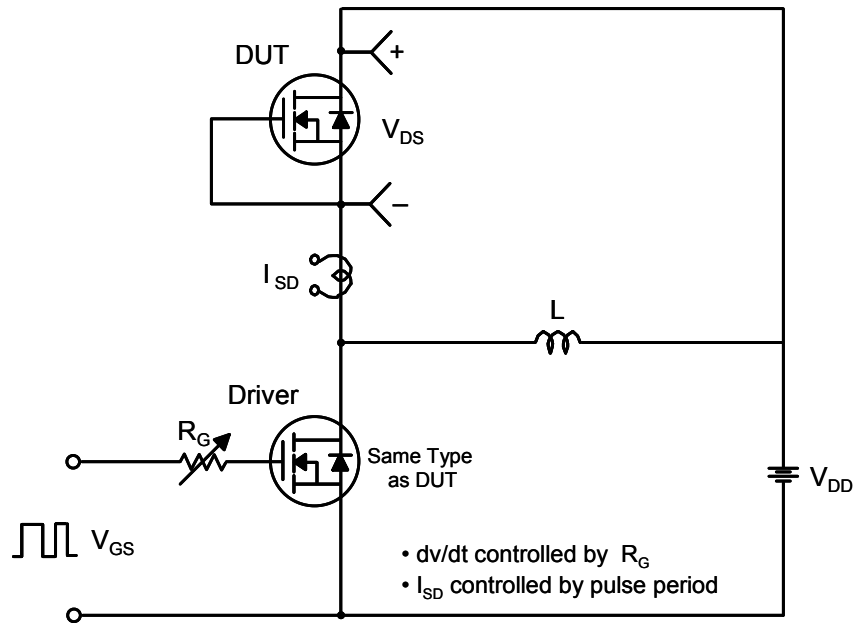
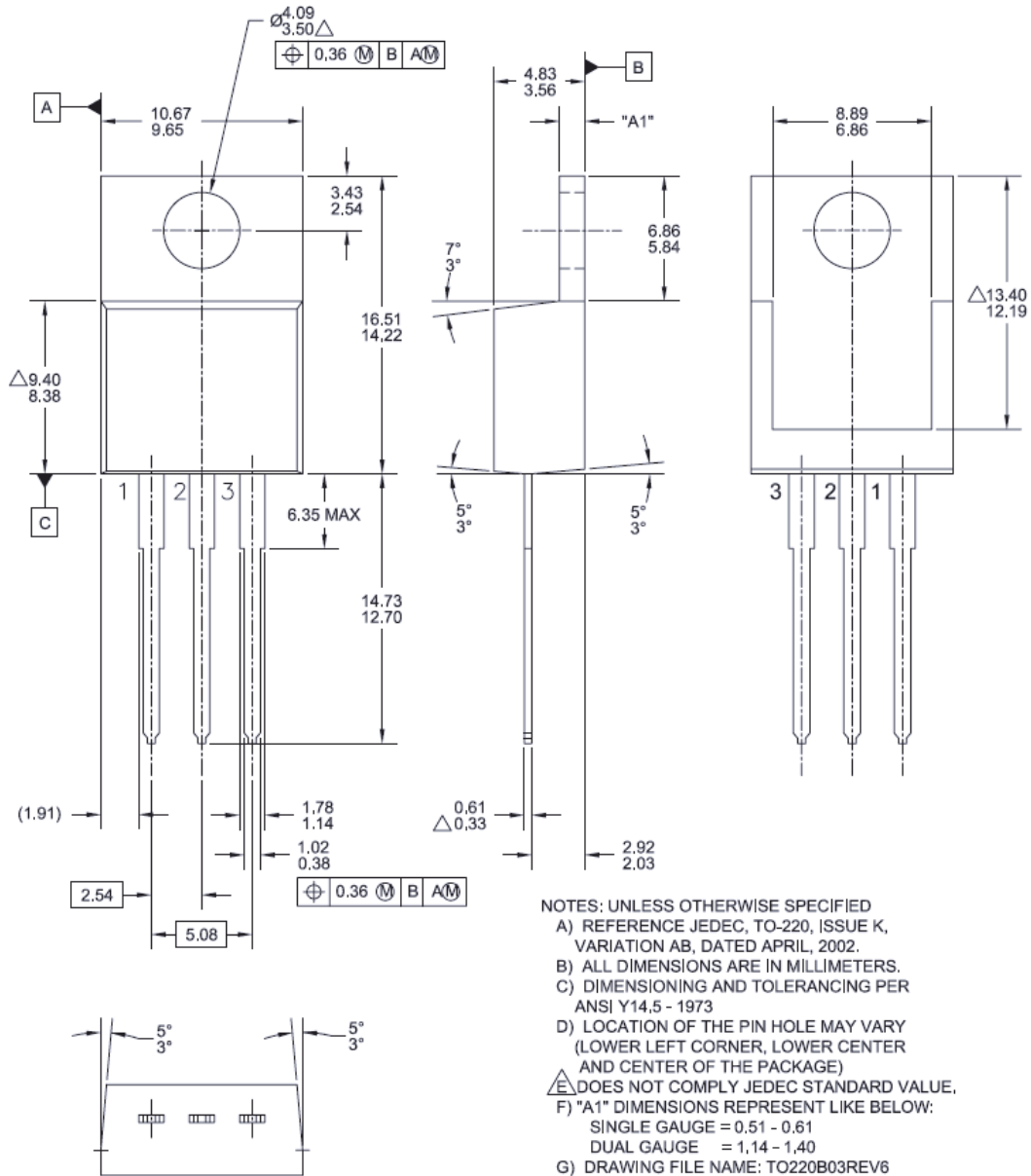


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Mechanical Dimensions**

**TO-220 3L**



**Figure 16. TO-220, Molded, 3Lead, Jedec Variation AB**

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Dimension in Millimeters



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| AX-CAP®*                 | FRFET®  | PowerXS™                   | SYSTEM GENERAL®* |
| BitSiC™                  | Global Power ResourceSM                         | Programmable Active Droop™ | TinyBoost®       |
| Build it Now™            | GreenBridge™                                    | QFET®                      | TinyBuck®        |
| CorePLUS™                | Green FPS™                                      | QS™                        | TinyCalc™        |
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| <b>F</b> ®               | MicroPak™                                       |                            | <b>µ</b> SerDes™ |
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