

# FDP2710

## N-Channel PowerTrench® MOSFET

### 250 V, 50 A, 42.5 mΩ

#### Features

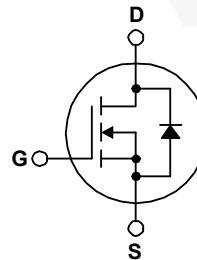
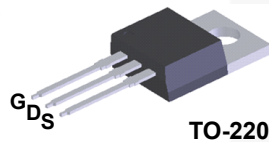
- $R_{DS(on)} = 36.3 \text{ m}\Omega$  (Typ.)@  $V_{GS} = 10 \text{ V}$ ,  $I_D = 25 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

#### 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

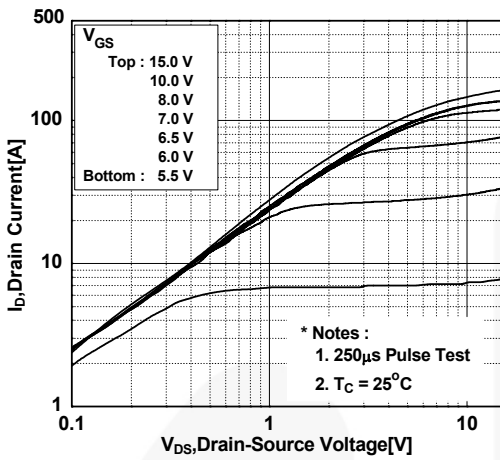


Figure 2. Transfer Characteristics

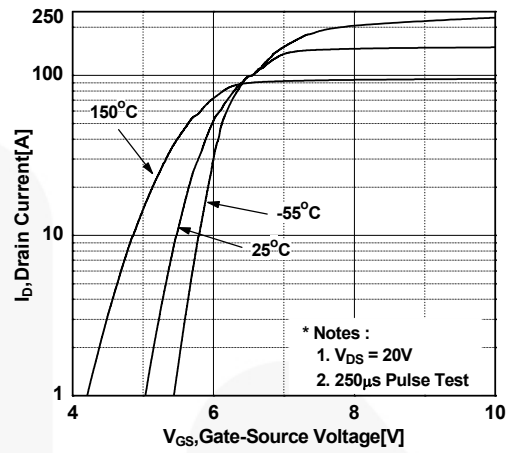


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

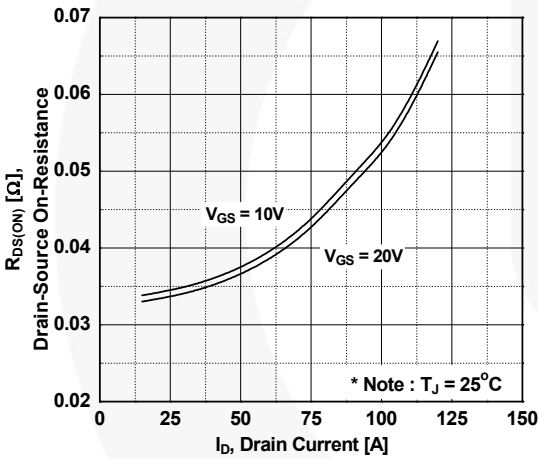


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

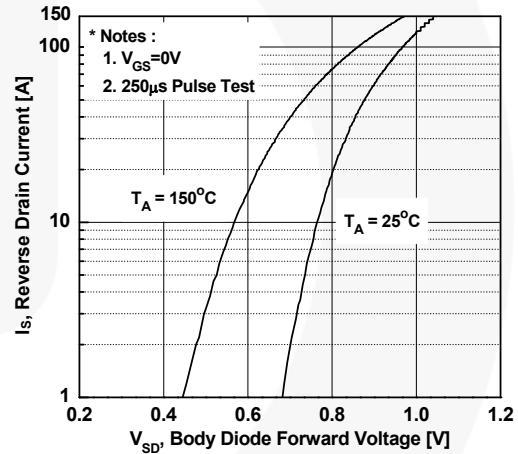


Figure 5. Capacitance Characteristics

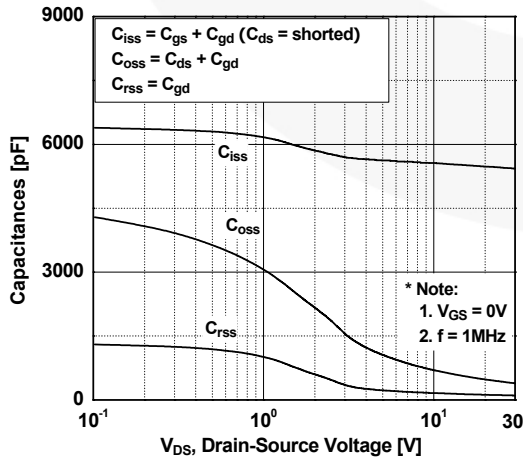
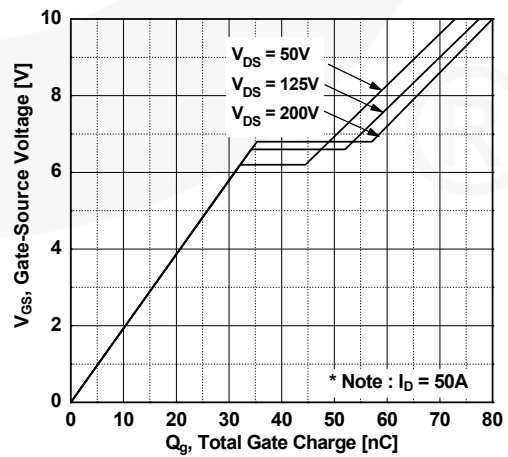


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

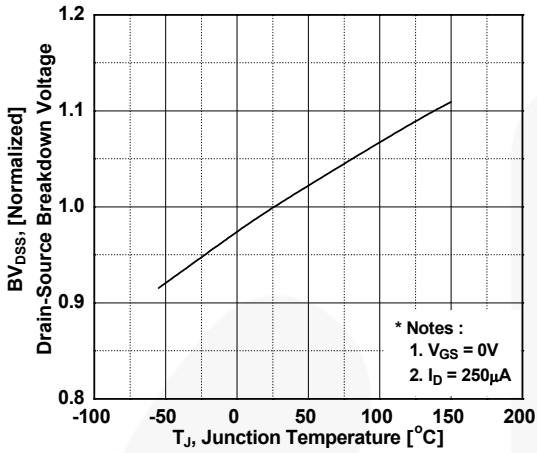


Figure 8. On-Resistance Variation vs. Temperature

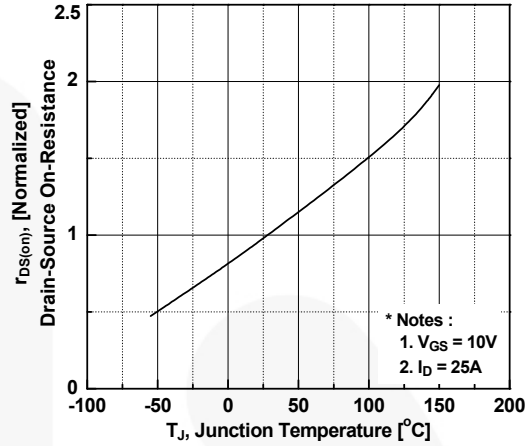


Figure 9. Maximum Safe Operating Area

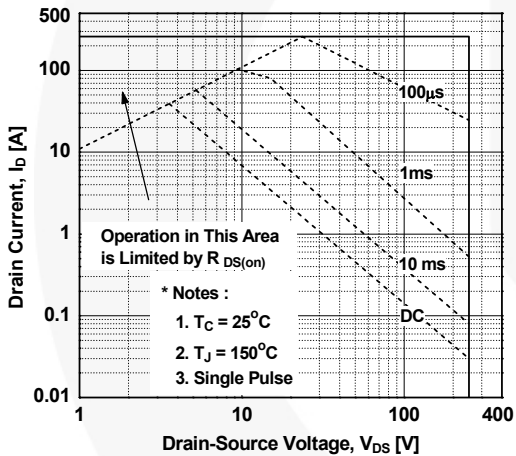


Figure 10. Maximum Drain Current vs. Case Temperature

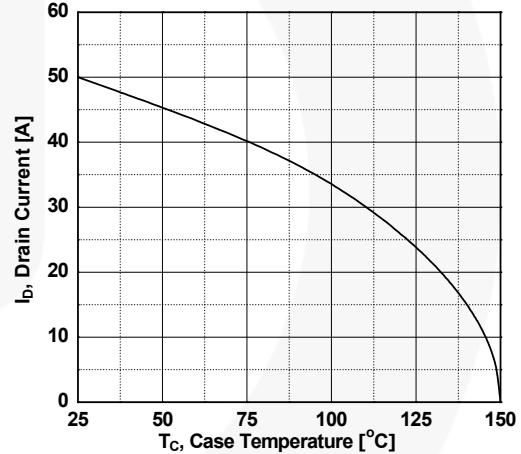
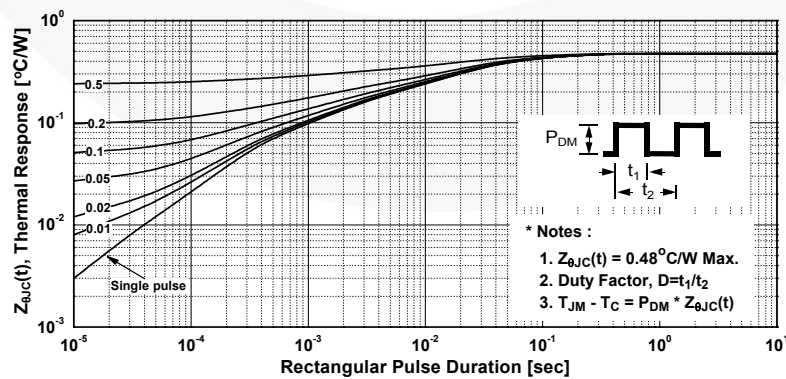
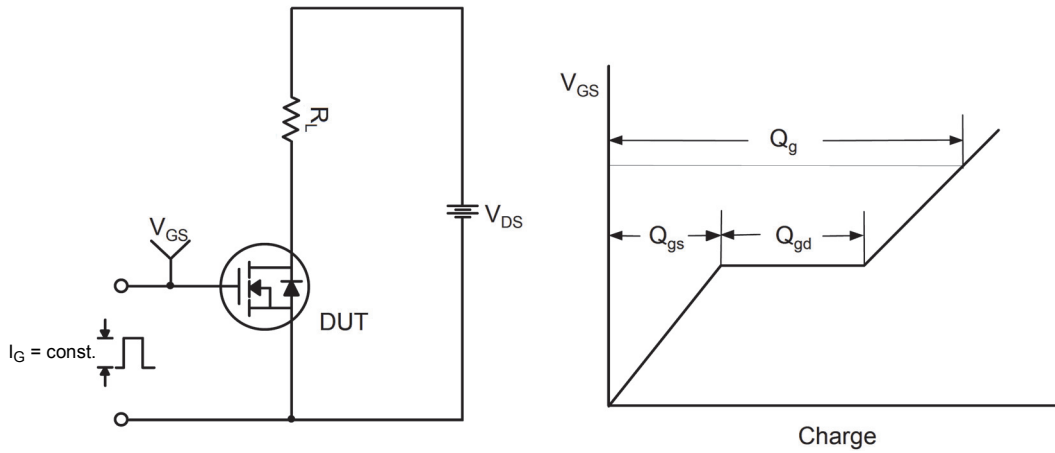


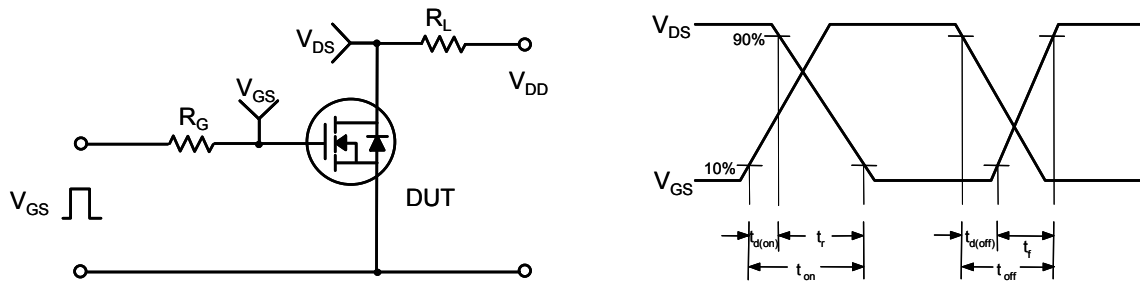
Figure 11. Transient Thermal Response Curve



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



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



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

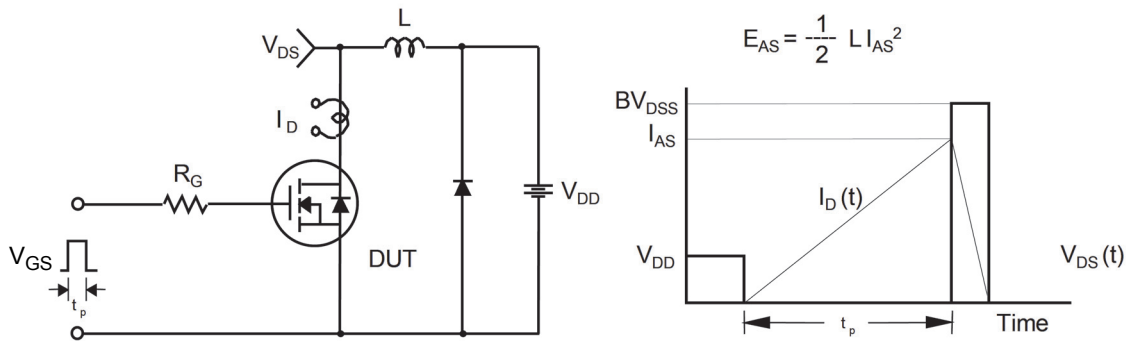
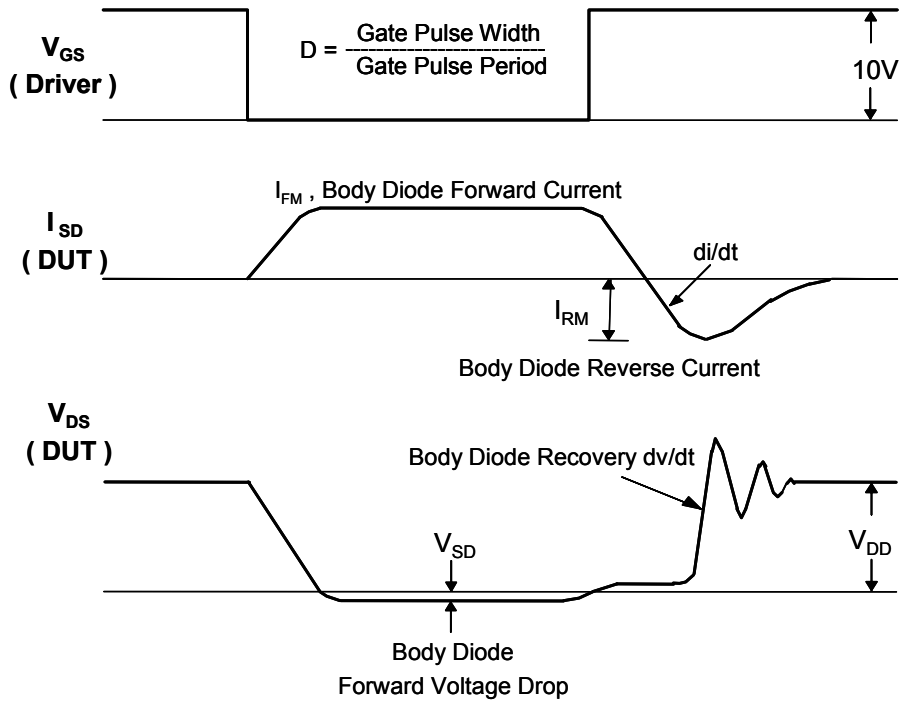
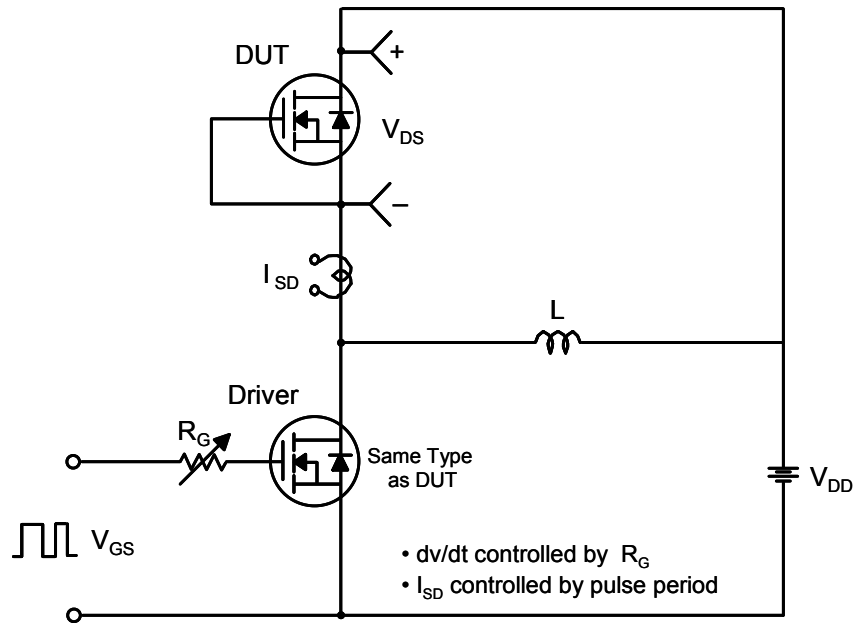
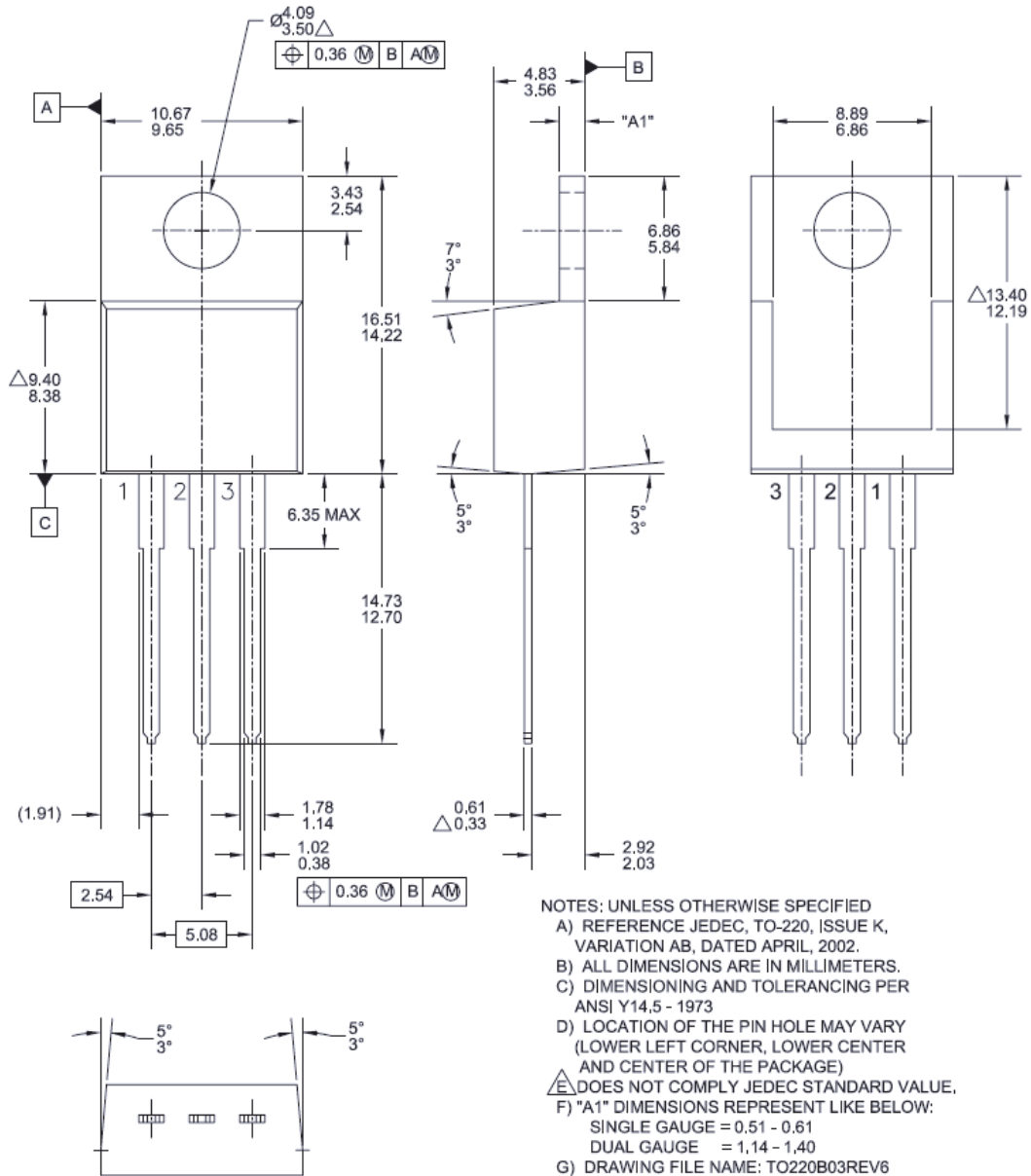


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

### TO-220 3L



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

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Dimension in Millimeters



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|                          | Programmable Active Droop™                      |                           |
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|                          | STEALTH™  |                           |
|                          | SuperFET®                                       |                           |
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|                          | SuperSOT™-6                                     |                           |
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