

# FDP2710 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.

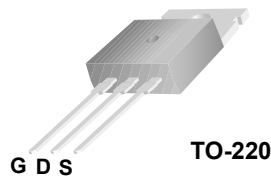
## Application

- PDP application

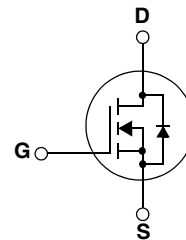


## Description

- 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
- RoHS compliant



TO-220



## Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
$V_{DS}$	Drain-Source Voltage	250	V
$V_{GS}$	Gate-Source voltage	$\pm 30$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ )	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°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	--	62.5	$^\circ C/W$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP2710	FDP2710	TO-220	-	-	50

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<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
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	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	$V_{DS} = 10V, I_D = 25A$ (Note 4)	--	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, 5)	--	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, 5)	--	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	$V_{GS} = 0V, I_S = 50A$	--	163	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 100A/\mu s$ (Note 4)	--	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. 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

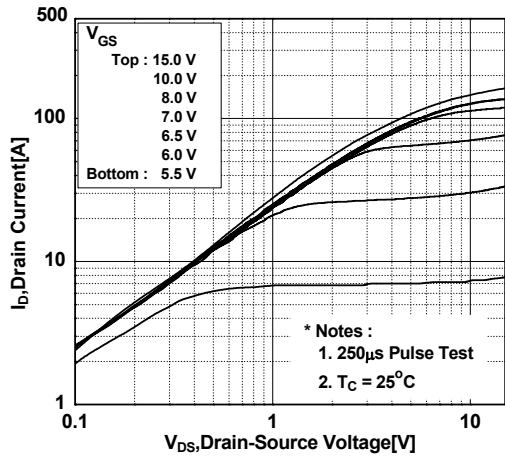


Figure 2. Transfer Characteristics

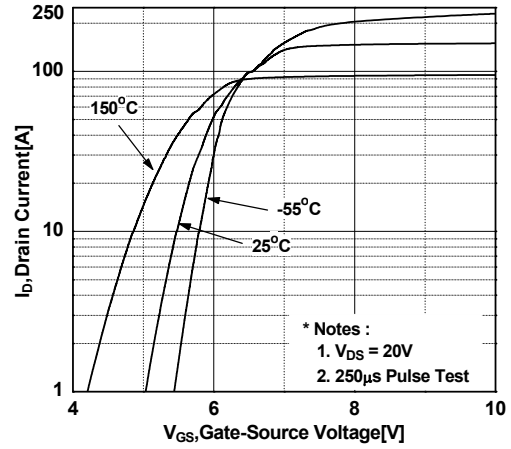


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

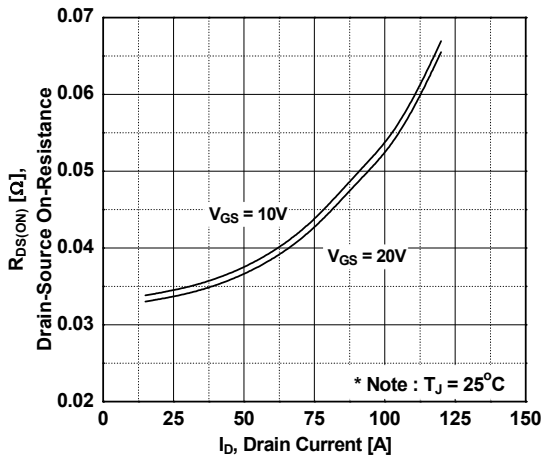


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

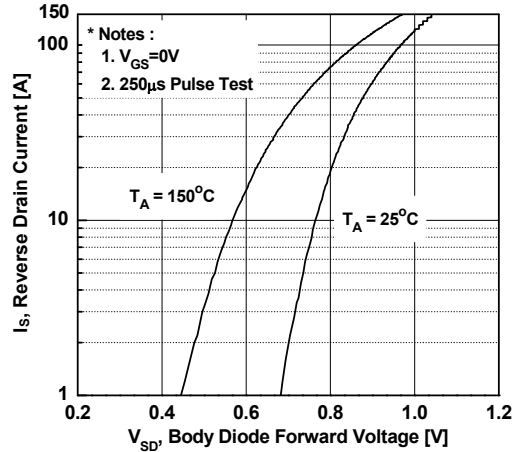


Figure 5. Capacitance Characteristics

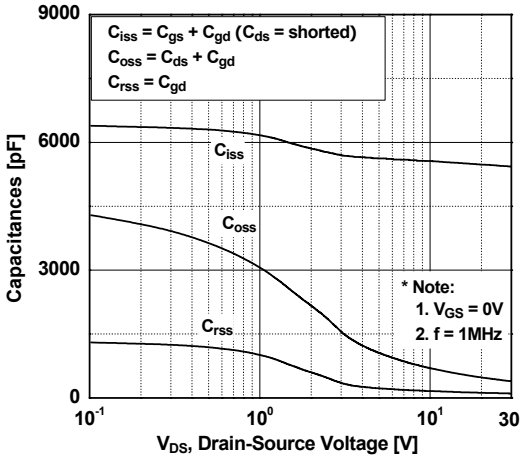
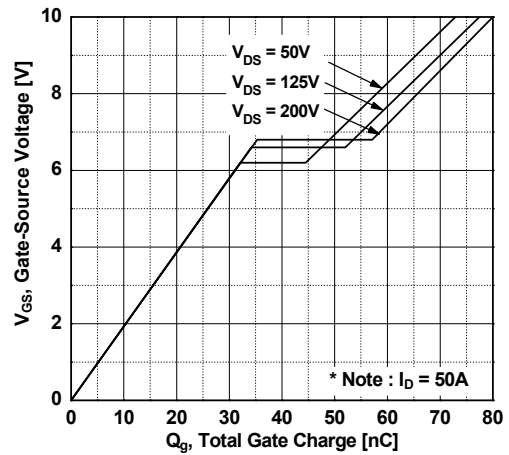
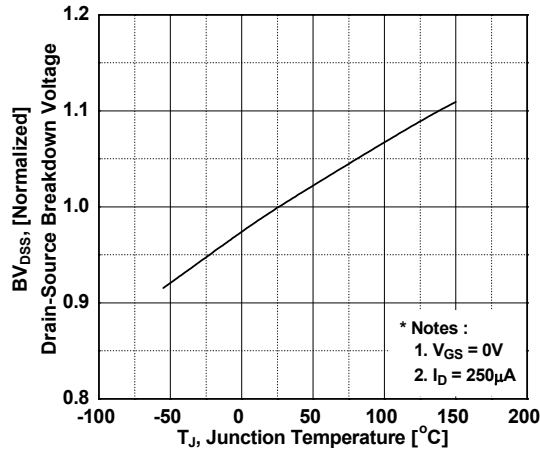


Figure 6. Gate Charge Characteristics

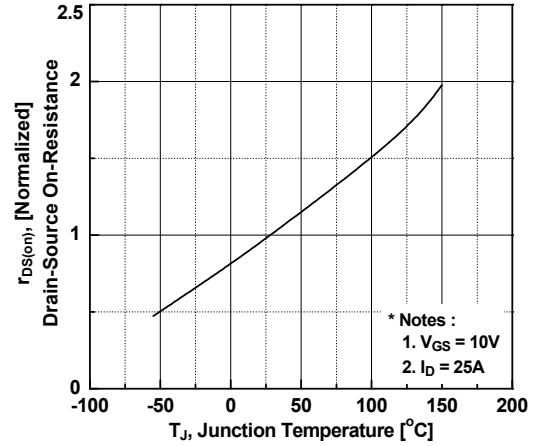


## Typical Performance Characteristics (Continued)

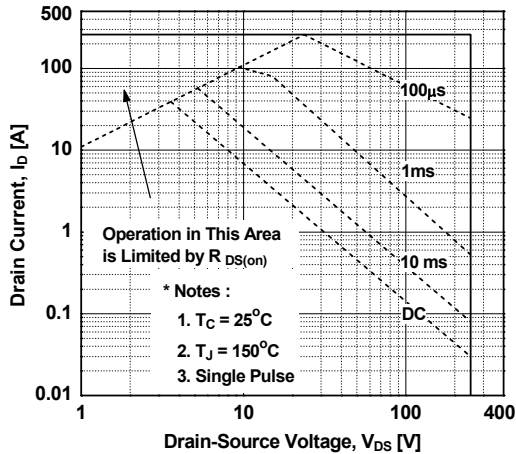
**Figure 7. Breakdown Voltage Variation vs. Temperature**



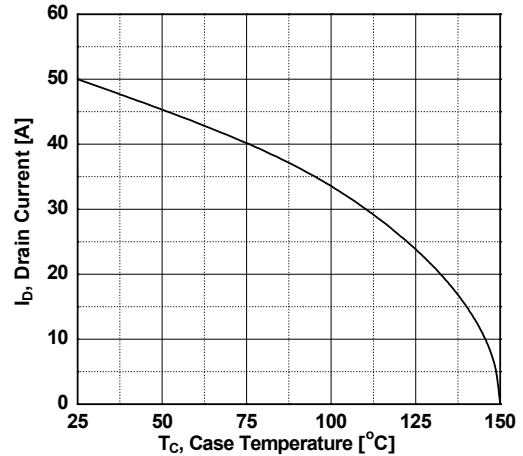
**Figure 8. On-Resistance Variation vs. Temperature**



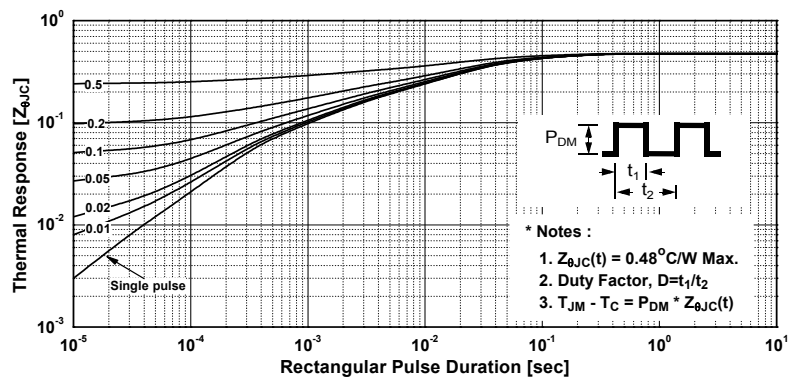
**Figure 9. Maximum Safe Operating Area**



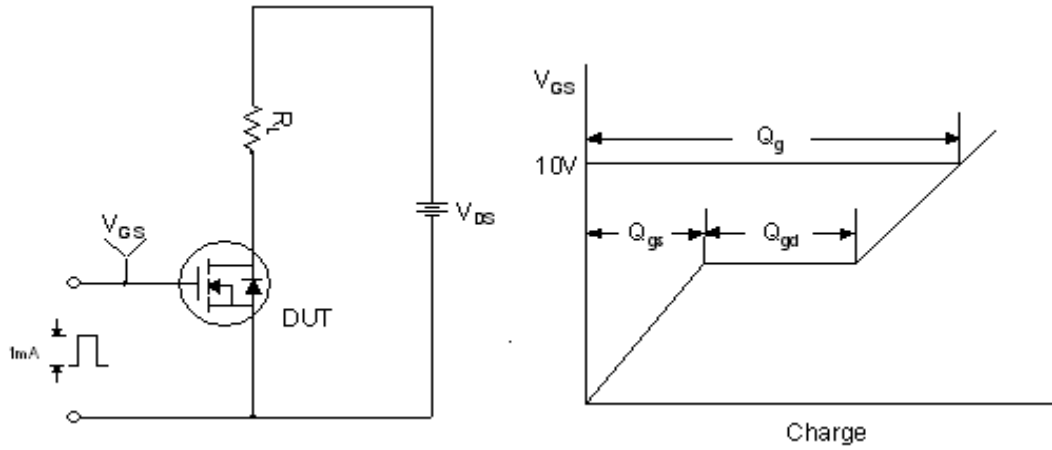
**Figure 10. Maximum Drain Current vs. Case Temperature**



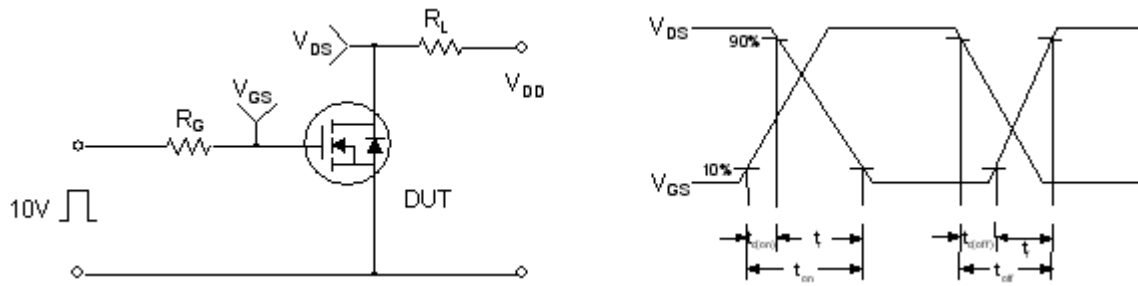
**Figure 11. Transient Thermal Response Curve**



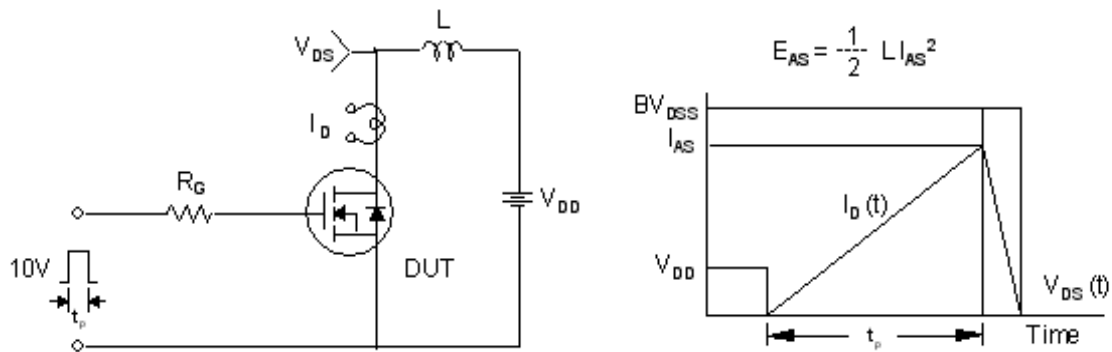
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

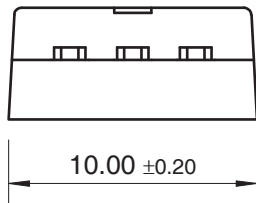
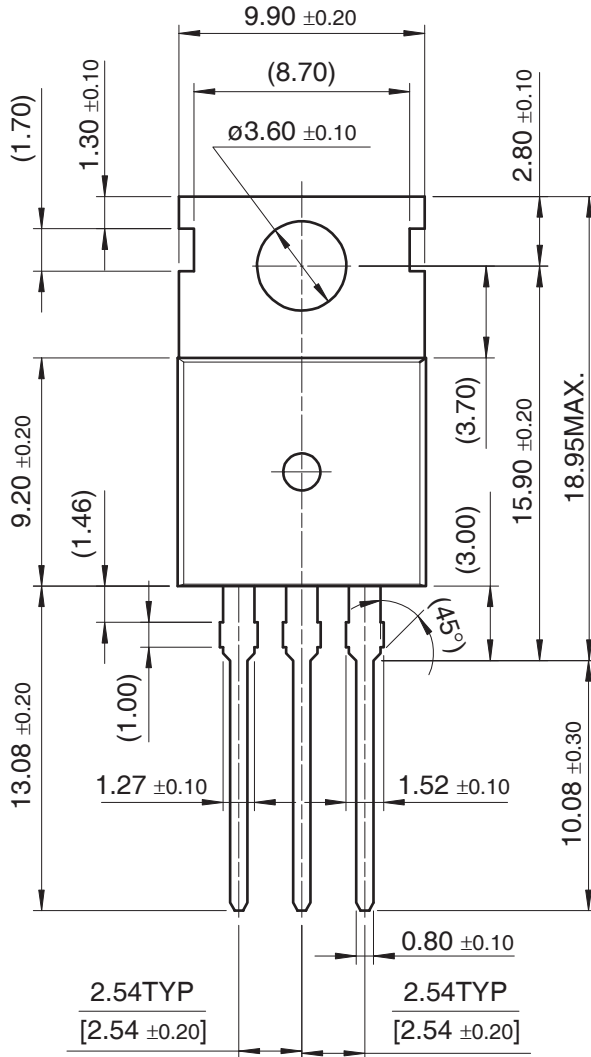


**Peak Diode Recovery dv/dt Test Circuit & Waveforms**



Mechanical Dimensions


TO-220





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Rev. I31