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FAIRCHILD SEMICONDUCTOR®

December 2013

FDP5800

N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

Features

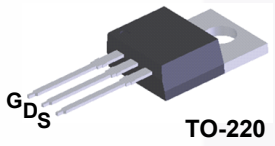
- $R_{DS(on)}$ = 4.6 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 80 A
- High Performance Trench Technology for Extermly Low $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handing Capability
- RoHS Compliant

Description

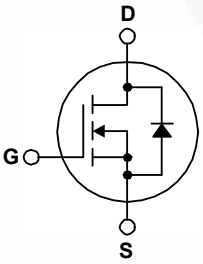
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Power Tools
- Motor Drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit



TO-220



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter		FDP5800	Unit
V_{DSS}	Drain-Source Voltage		60	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)	80	A
		- Continuous (T_C = 100°C)	80*	A
		- Continuous (T_A = 25°C)	14	A
I_{DM}	Drain Current - Pulsed		320	A
E_{AS}	Single Pulsed Avalanche Energy (Note 1)		652	mJ
P_D	Power Dissipation (T_C = 25°C) - Derate Above 25°C		242 1.61	W W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C

*Drain current limited by package.

Thermal Characteristics

Symbol	Parameter	FDP5800	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.62	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP5800	FDP5800	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics T_C= 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
B_{VDSS}	Drain-Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V, T_J =25°C	60	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 48 V, V_{GS} = 0 V, T_J = 150°C	--	--	500	μA
I_{GSS}	Gate-Body Leakage Current, Forward	V_{GS} = ±20 V, V_{DS} = 0 V	--	--	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.0	--	2.5	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS} = 10 V , I_D = 80 A	--	4.6	6.0	mΩ
		V_{GS} =4.5 V , I_D = 80 A	--	5.9	7.2	mΩ
		V_{GS} = 5 V , I_D = 80 A	--	5.6	7.0	mΩ
		V_{GS} =10 V, I_D = 80 A, T_J = 175°C	--	10.4	12.6	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V,V_{GS} = 0 V, f = 1 MHz	--	6890	9160	pF
C_{oss}	Output Capacitance		--	750	1000	pF
C_{rss}	Reverse Transfer Capacitance		--	295	445	pF
R_G	Gate Resistance	V_{GS} = 0.5 V, f = 1 MHz	--	1.2	--	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0 V to 10 V; V_{DS} = 30 V, I_D = 80 A, I_g = 1 mA	--	112	145	nC
$Q_{g(TH)}$	Total Gate Charge at 5V	V_{GS} = 0 V to 5 V; V_{DS} = 30 V, I_D = 80 A, I_g = 1 mA	--	58	--	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 V to 1 V; V_{DS} = 30 V, I_D = 80 A, I_g = 1 mA	--	7.0	--	nC
Q_{gs}	Gate to Source Gate Charge	V_{DS} = 30 V, I_D = 80 A, I_g = 1 mA	--	23	--	nC
Q_{gs2}	Gate Charge Threshold to Plateau	V_{DS} = 30 V, I_D = 80 A, I_g = 1 mA	--	13	--	nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DS} = 30 V, I_D = 80 A, I_g = 1 mA	--	18	--	nC
Switching Characteristics (V_{GS} = 10V)						
t_{ON}	Turn-On Time	V_{DD} = 30 V, I_D = 80 A, V_{GS} = 10 V, R_G = 1.5 Ω	--	37	85	ns
$t_{d(on)}$	Turn-On Delay Time		--	18	46	ns
t_r	Turn-On Rise Time		--	19	47	ns
$t_{d(off)}$	Turn-Off Delay Time		--	55	120	ns
t_f	Turn-Off Fall Time		--	9	28	ns
t_{OFF}	Turn-Off Time		--	64	138	ns
Drain-Source Diode Characteristics						
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 80 A	--	--	1.25	V
		V_{GS} = 0 V, I_{SD} = 40 A	--	--	1.0	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 60 A, dI_F/dt = 100 A/μs	--	58	--	ns
Q_{rr}	Reverse Recovery Charge		--	106	--	nC

Notes:
1: L = 1 mH, I_{AS} = 36 A, V_{DD} = 54 V, V_{GS} = 10 V, R_G = 25 Ω, Starting T_J = 25°C

Typical Performance Characteristics

Figure 1. On-Region Characteristics

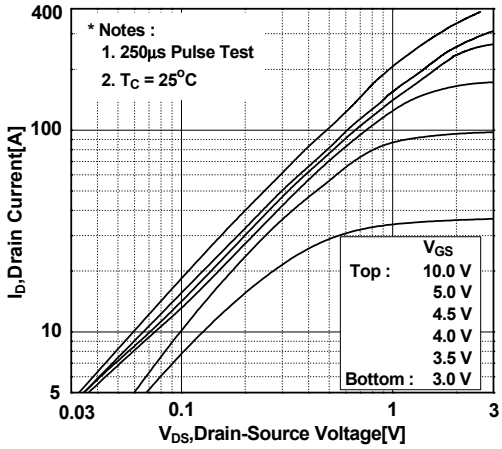


Figure 2. Transfer Characteristics

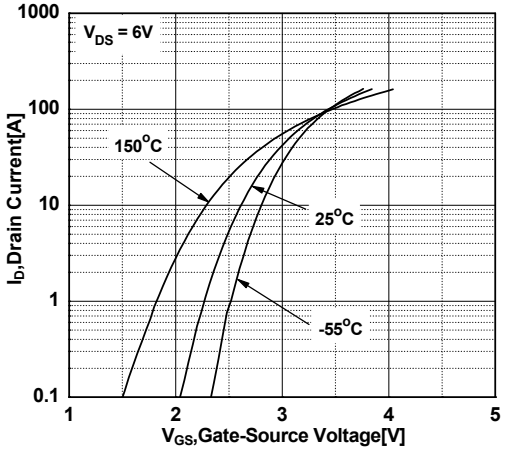


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

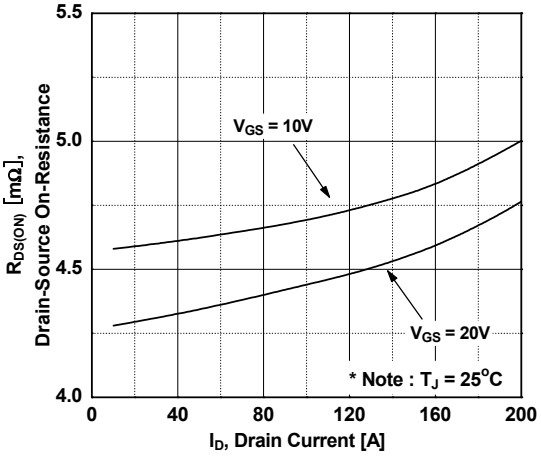


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

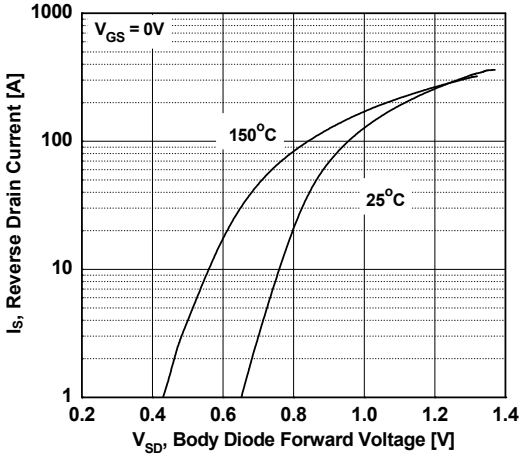


Figure 5. Capacitance Characteristics

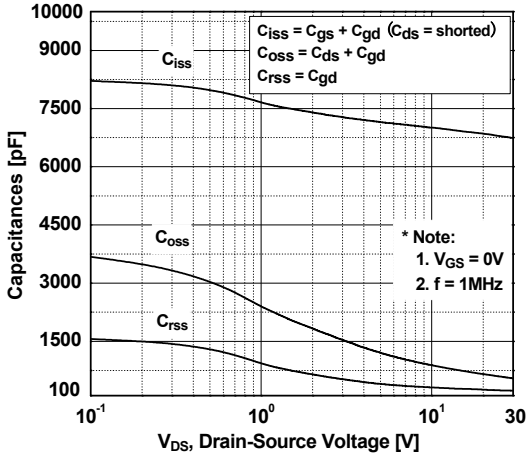
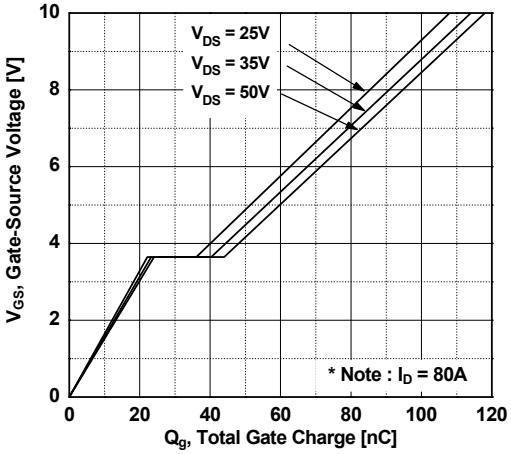


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

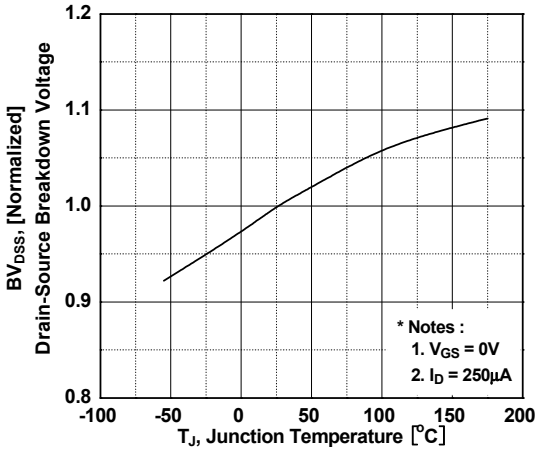


Figure 8. On-Resistance Variation vs. Temperature

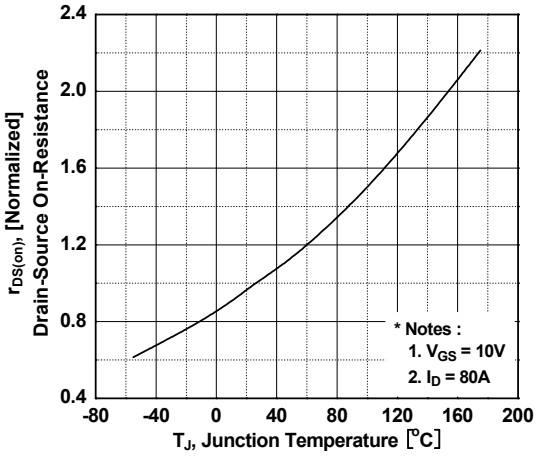


Figure 9. Maximum Safe Operating Area

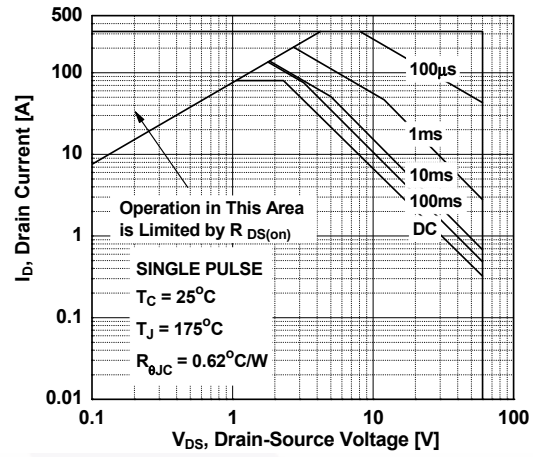


Figure 10. Maximum Drain Current vs. Case Temperature

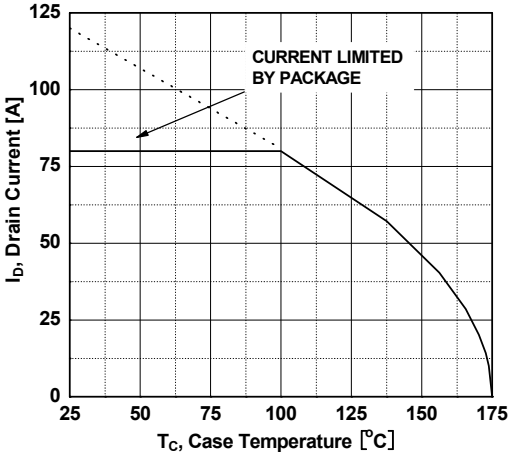
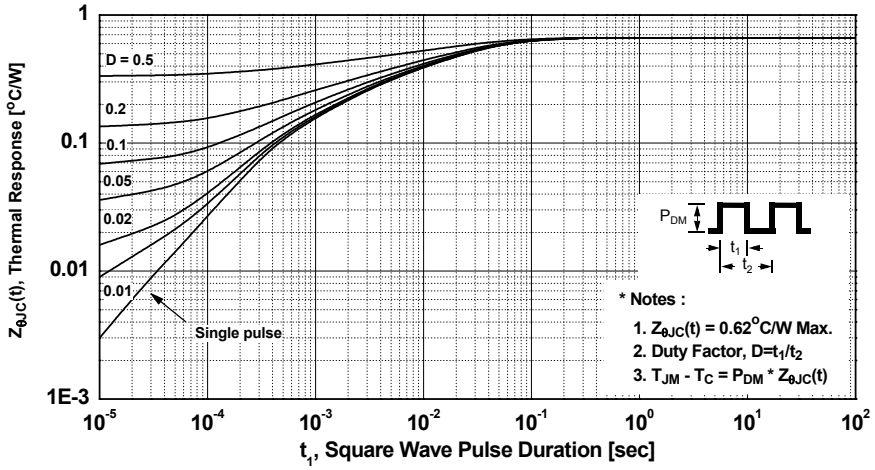


Figure 11. Transient Thermal Response Curve



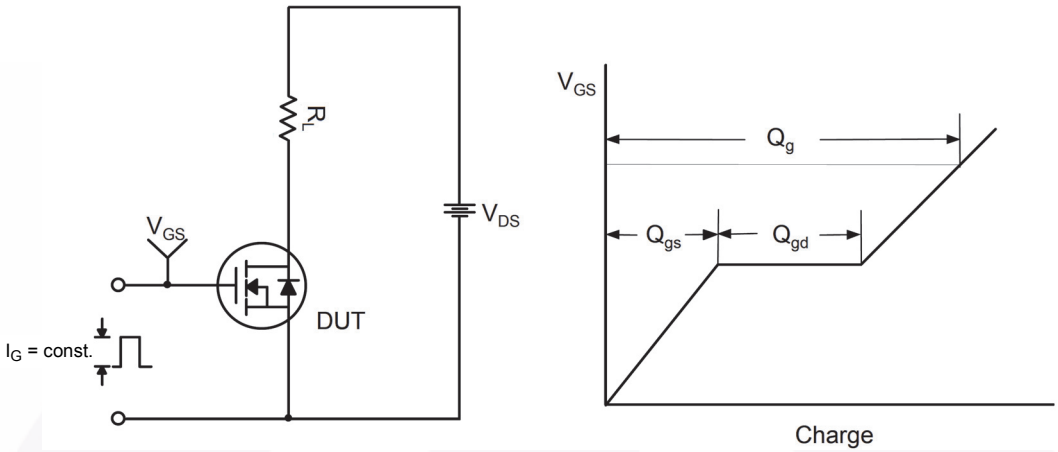


Figure 12. Gate Charge Test Circuit & Waveform

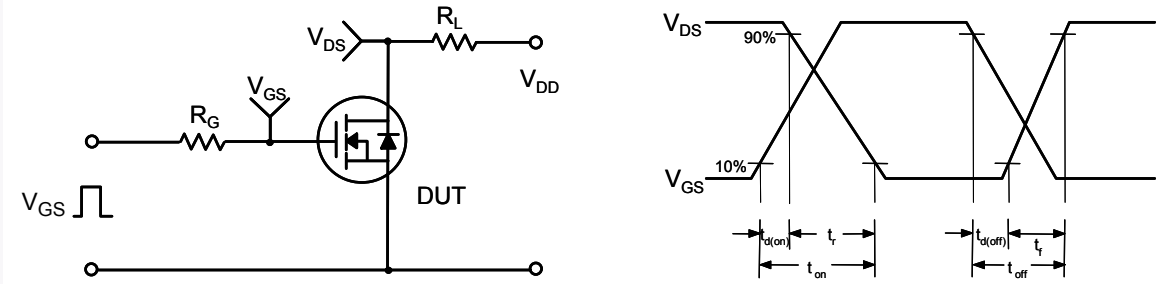


Figure 13. Resistive Switching Test Circuit & Waveforms

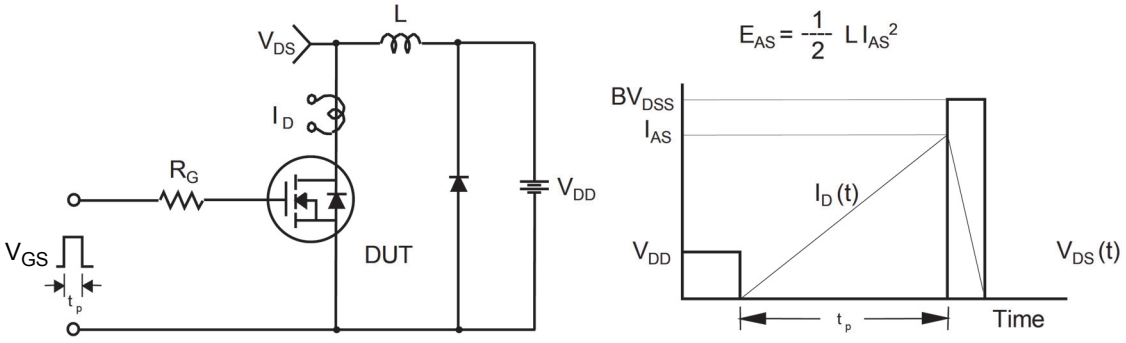


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

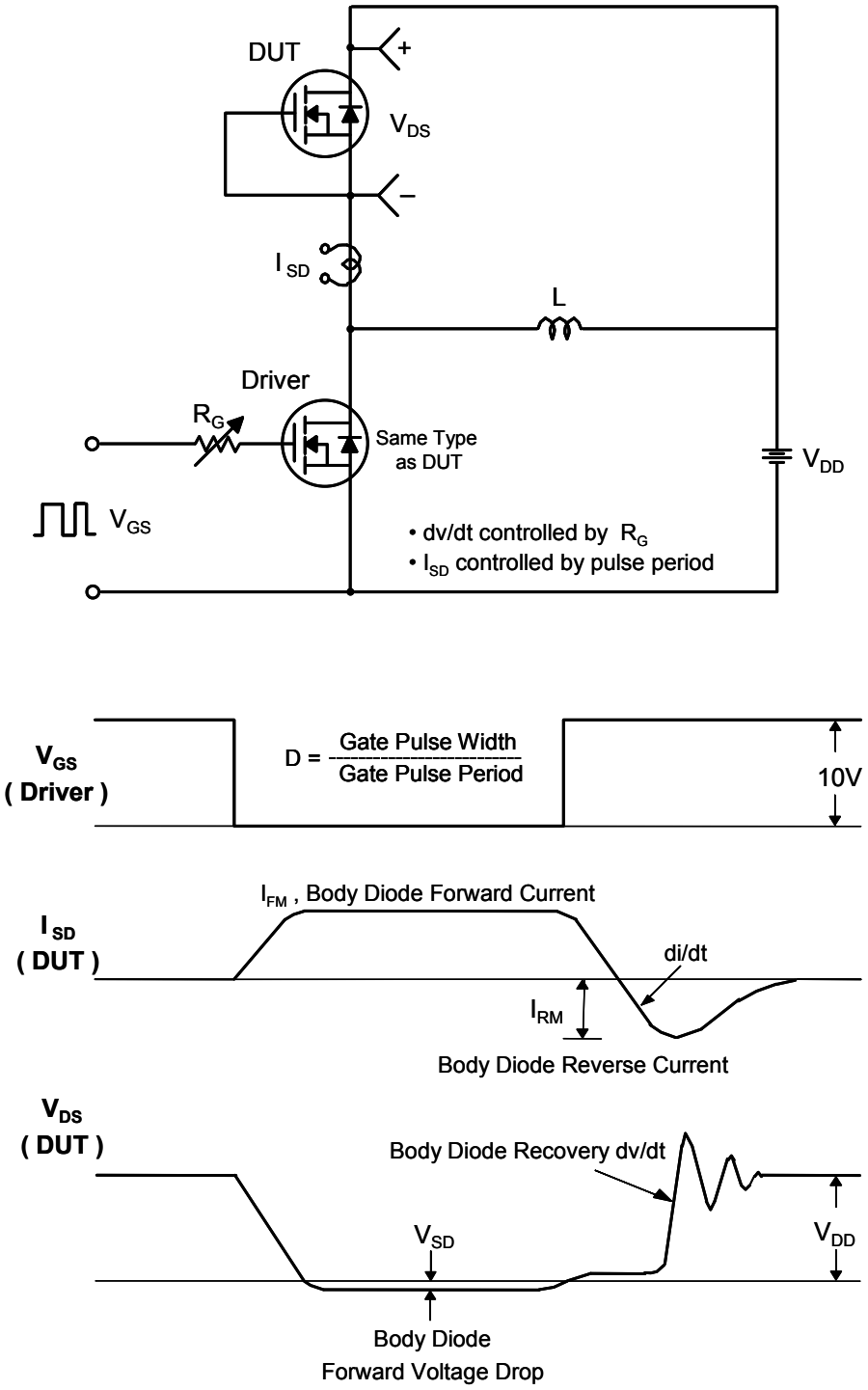


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

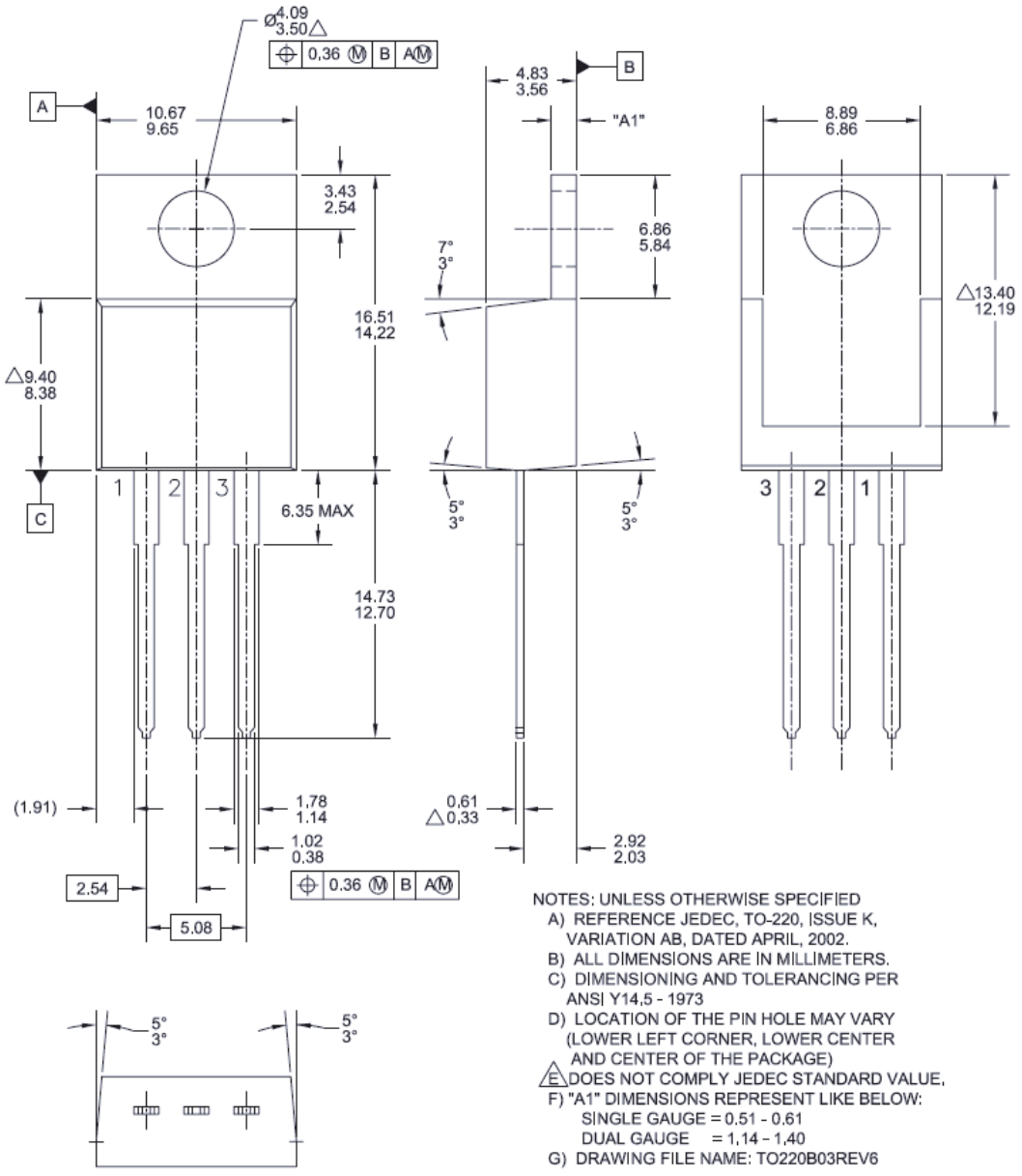


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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