



January 2009



FDP8440

N-Channel PowerTrench[®] MOSFET

40V, 277A, 2.2mΩ

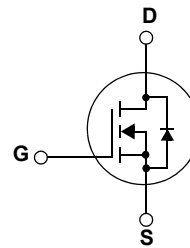
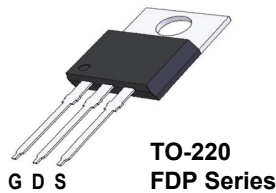
Features

- $R_{DS(on)} = 1.64m\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 80A$
- $Q_{g(tot)} = 345nC$ (Typ.) @ $V_{GS} = 10V$
- Low Miller Charge
- Low Q_{RR} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant



Application

- Automotive Engine Control
- Powertrain Management
- Motors, Solenoids
- Electronic Steering
- Integrated Starter/ Alternator
- Distributed Power Architectures and VRMs
- Primary Switch for 12V Systems



MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	40	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ C$, Silicon Limited)	277*
		- Continuous ($T_C = 100^\circ C$, Silicon Limited)	196*
		- Continuous ($T_C = 25^\circ C$, Package Limited)	100
I_{DM}	Drain Current	- Pulsed (Note 1)	500
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1682
P_D	Power Dissipation	($T_C = 25^\circ C$)	306
		- Derate above $25^\circ C$	2.04
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 100A.

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.49	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink (Typ.)	0.5	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ C/W$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8440	FDP8440	TO-220	N/A	N/A	50units

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
Off Characteristics							
BV _{DSS}	Drain to Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	40	--	--	V	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 32V	--	--	1	μA	
		V _{GS} = 0V, T _C = 150°C	--	--	250	μA	
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±20V	--	--	±100	nA	
On Characteristics							
V _{GS(th)}	Gate to Source Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1	--	3	V	
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 4.5V, I _D = 80A	--	1.88	2.4	mΩ	
		V _{GS} = 10V, I _D = 80A	--	1.64	2.2		
		V _{GS} = 10V, I _D = 80A, T _C = 175°C	--	3.00	4.4		
Dynamic Characteristics							
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	18600	24740	pF	
C _{oss}	Output Capacitance		--	1840	2450	pF	
C _{rss}	Reverse Transfer Capacitance		--	1400	2100	pF	
R _G	Gate Resistance	V _{GS} = 0.5V, f = 1MHz	--	1.1	--	Ω	
Q _{g(tot)}	Total Gate Charge at 10V	V _{GS} = 0V to 10V	V _{DD} = 20V I _D = 80A I _g = 1.0mA	--	345	450	nC
Q _{g(2)}	Threshold Gate Charge	V _{GS} = 0V to 2V		--	32.5	--	nC
Q _{gs}	Gate to Source Gate Charge			--	49	--	nC
Q _{gs2}	Gate Charge Threshold to Plateau			--	16.5	--	nC
Q _{gd}	Gate to Drain "Miller" Charge			--	74	--	nC
Switching Characteristics (V_{GS} = 10V)							
t _{ON}	Turn-On Time	V _{DD} = 20V, I _D = 80A V _{GS} = 10V, R _{GEN} = 7Ω	--	175	360	ns	
t _{d(on)}	Turn-On Delay Time		--	43	95	ns	
t _r	Rise Time		--	130	275	ns	
t _{d(off)}	Turn-Off Delay Time		--	435	875	ns	
t _f	Fall Time		--	290	590	ns	
t _{OFF}	Turn-Off Time		--	730	1470	ns	
Drain-Source Diode Characteristics and Maximum Ratings							
V _{SD}	Source to Drain Diode Voltage	I _{SD} = 80A	--	--	1.25	V	
		I _{SD} = 40A	--	--	1.0	V	
t _{rr}	Reverse Recovery Time	I _{SD} = 75A, dI _{SD} /dt = 100A/μs	--	59	--	ns	
Q _{RR}	Reverse Recovery Charge	I _{SD} = 75A, dI _{SD} /dt = 100A/μs	--	77	--	nC	

NOTES:

- 1: Pulse width limited by maximum junction temperature.
- 2: Starting T_J = 25°C, L = 1mH, I_{AS} = 58A, V_{DD} = 36V, V_{GS} = 10V.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

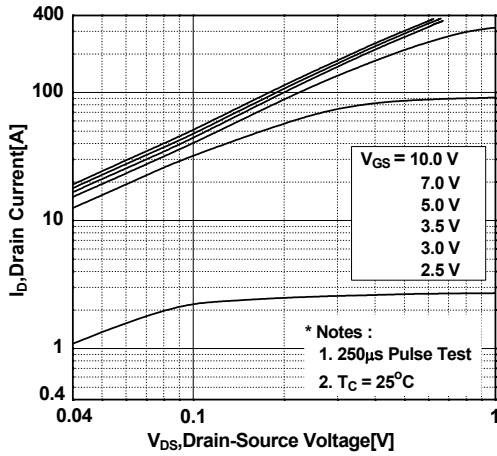


Figure 2. Transfer Characteristics

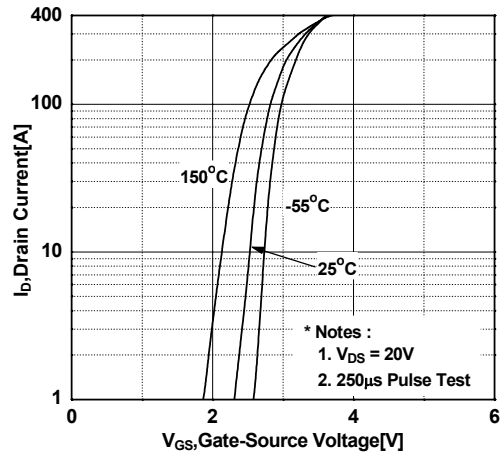


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

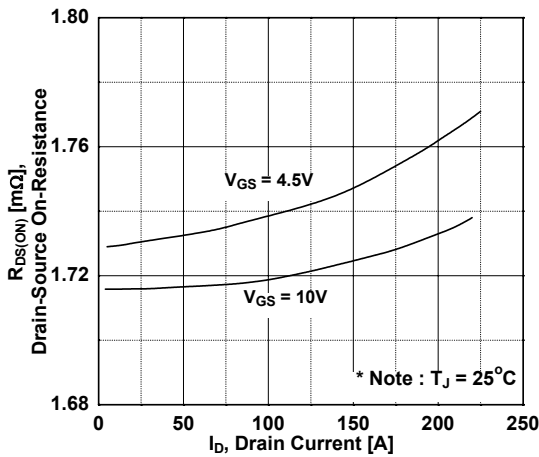


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

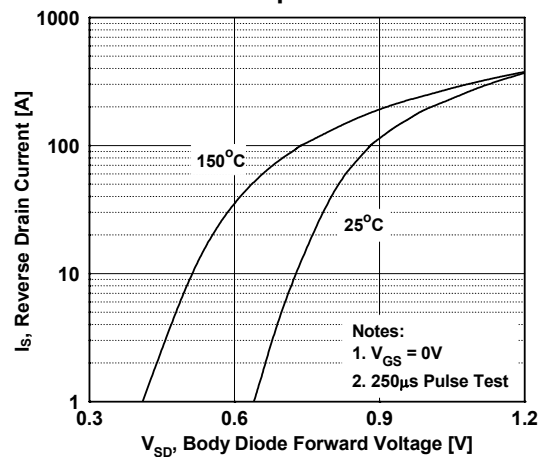


Figure 5. Capacitance Characteristics

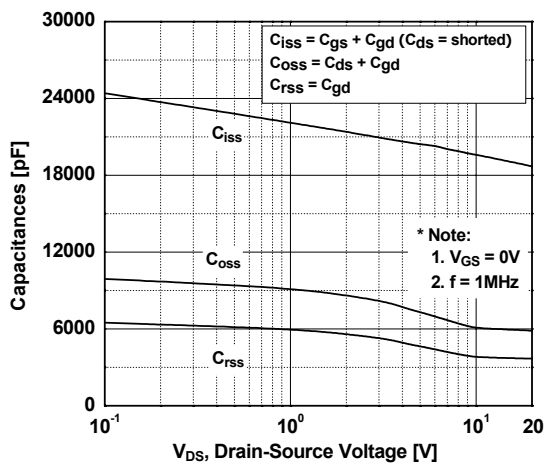
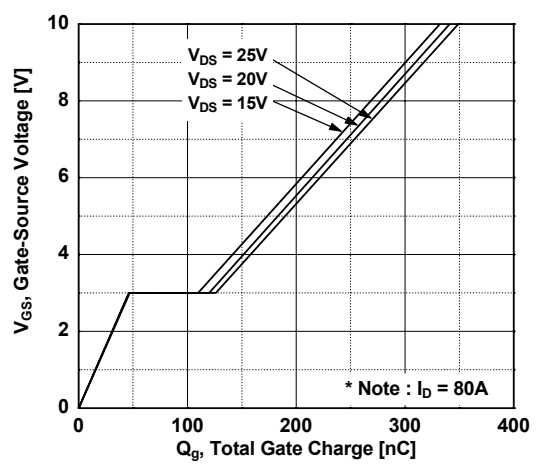


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

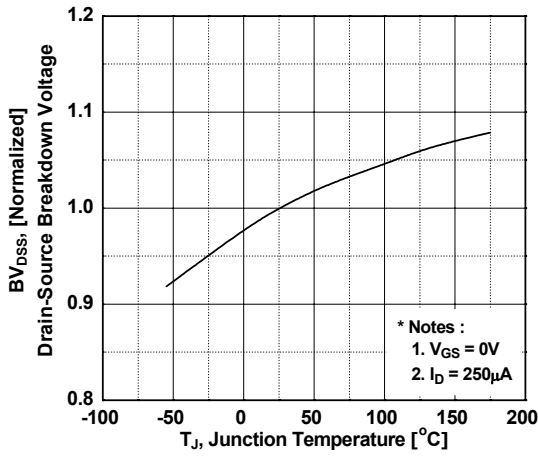


Figure 8. On-Resistance Variation vs. Temperature

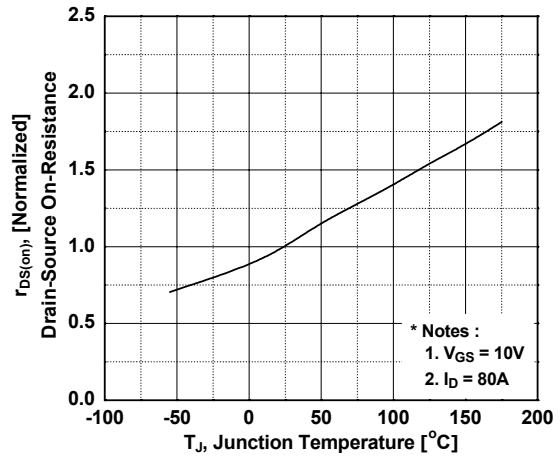


Figure 9. Unclamped Inductive Switching Capability

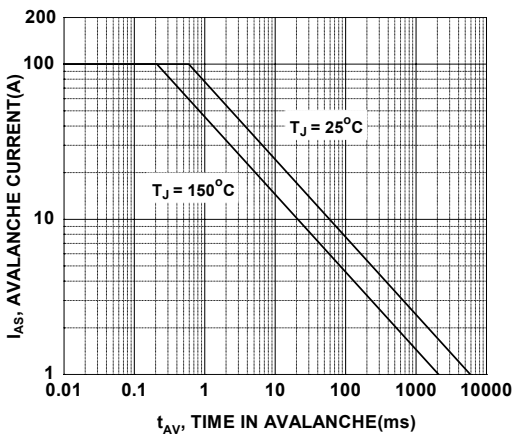


Figure 10. Safe Operating Area

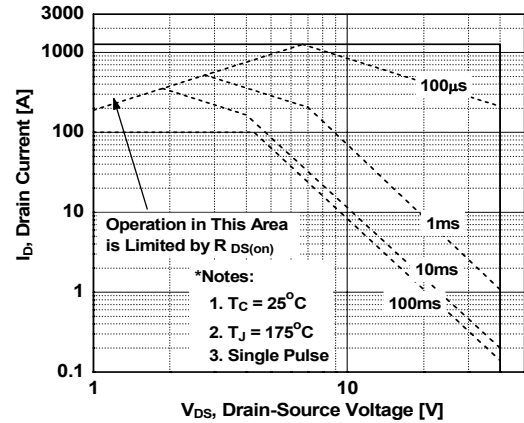
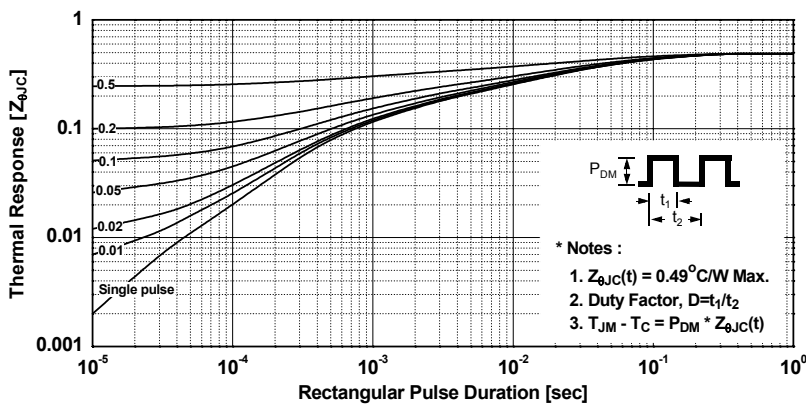
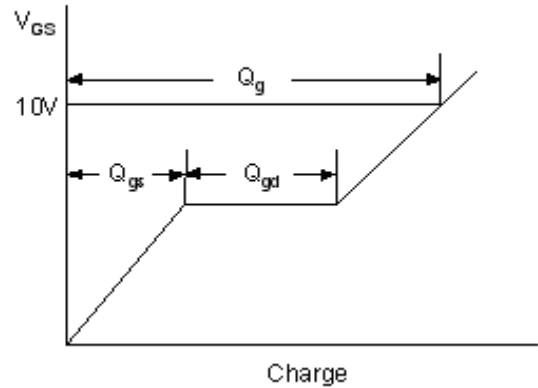
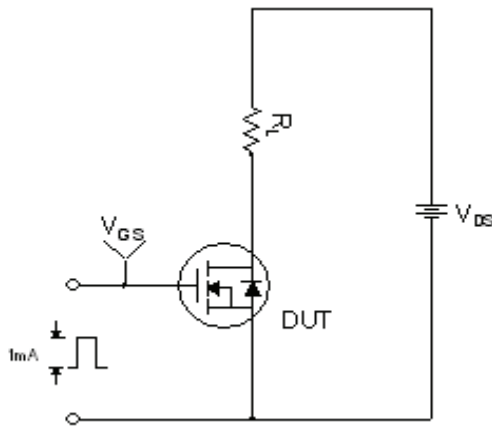


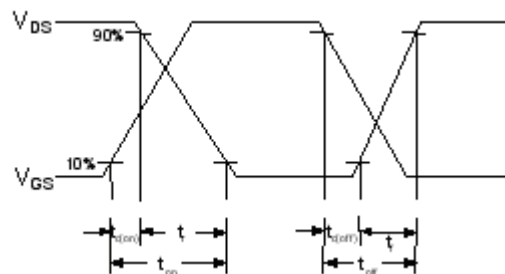
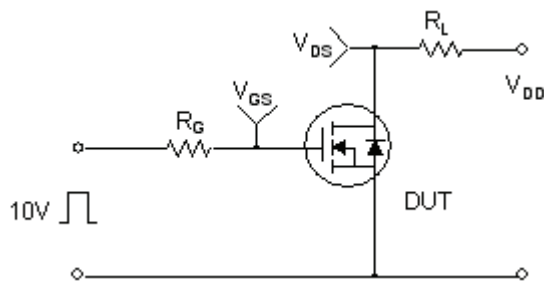
Figure 11. Transient Thermal Response Curve



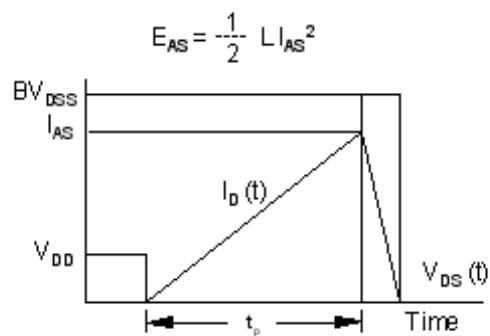
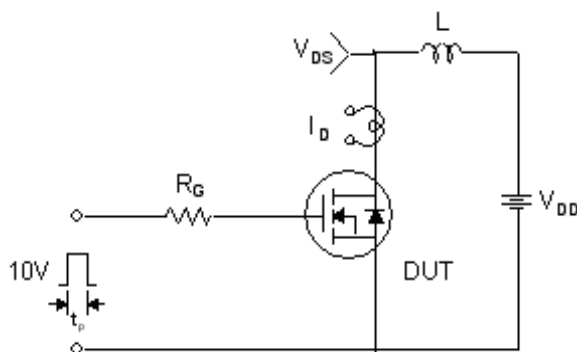
Gate Charge Test Circuit & Waveform



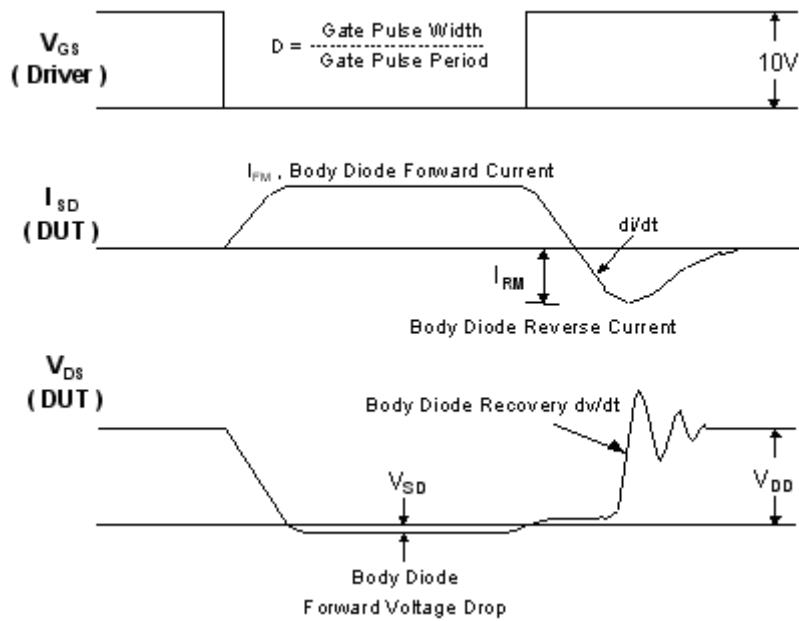
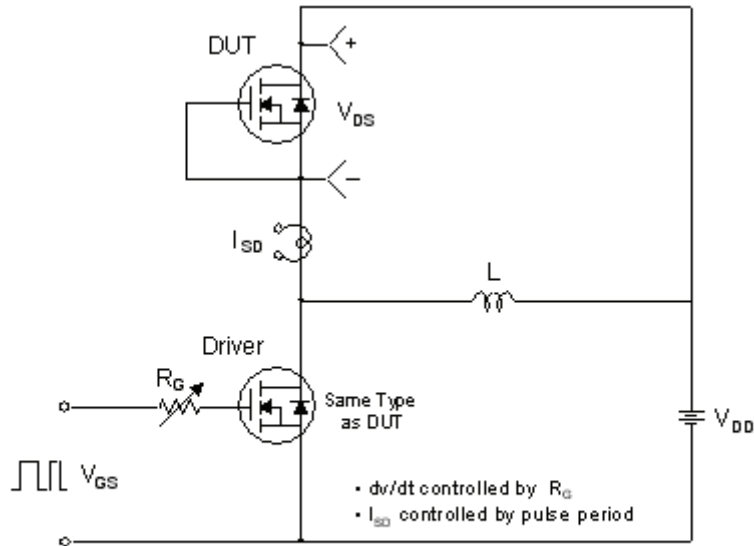
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

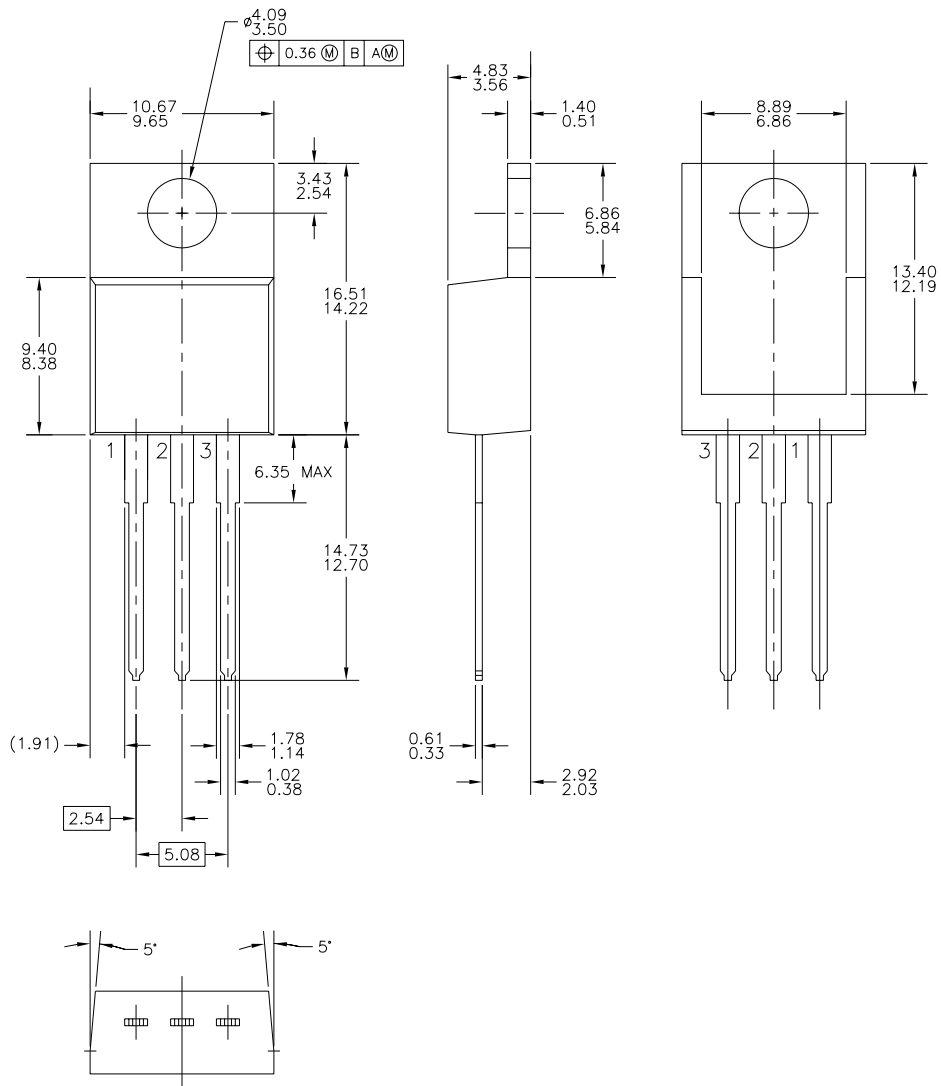


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220





TRADEMARKS


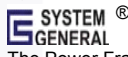
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