



FDP047N08

N-Channel PowerTrench® MOSFET

75V, 164A, 4.7mΩ

Features

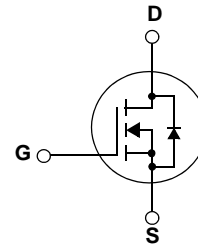
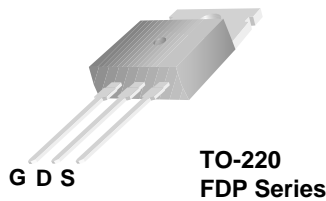
- $R_{DS(on)} = 3.8m\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 80A$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

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

- DC to DC converters / Synchronous Rectification



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

Symbol	Parameter	Conditions	Ratings	Units
V_{DSS}	Drain to Source Voltage		75	V
V_{GSS}	Gate to Source Voltage		± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	164*	A
		- Continuous ($T_C = 100^\circ\text{C}$)	116*	A
I_{DM}	Drain Current	- Pulsed (Note 1)	656	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	670	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	3.0	V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	268	W
		- Derate above 25°C	1.79	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 80A.

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.56	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink Typ.	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information $T_C = 25^\circ\text{C}$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP047N08	FDP047N08	TO-220	-	-	50

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_C = 25^\circ\text{C}$	75	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	-	0.02	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 75\text{V}, V_{GS} = 0\text{V}$	-	-	1	μA
		$V_{DS} = 75\text{V}, T_C = 150^\circ\text{C}$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 80\text{A}$	-	3.7	4.7	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 80\text{A}$ (Note 4)	-	150	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	7080	9415	μF
C_{oss}	Output Capacitance		-	870	1155	μF
C_{rss}	Reverse Transfer Capacitance		-	410	615	μF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 37.5\text{V}, I_D = 80\text{A}$ $R_{GEN} = 25\Omega, V_{GS} = 10\text{V}$	-	100	210	ns	
t_r	Turn-On Rise Time		-	147	304	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4, 5)	-	220	450	ns
t_f	Turn-Off Fall Time		(Note 4, 5)	-	114	238	ns
$Q_{g(tot)}$	Total Gate Charge at 10V		(Note 4, 5)	-	117	152	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DS} = 60\text{V}, I_D = 80\text{A}$ $V_{GS} = 10\text{V}$	-	37	-	nC	
Q_{gd}	Gate to Drain "Miller" Charge	(Note 4, 5)	-	32	-	nC	

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	164	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	656	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 80\text{A}$	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 80\text{A}$	-	45	-	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	66	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 0.21\text{mH}, I_{AS} = 80\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 75\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

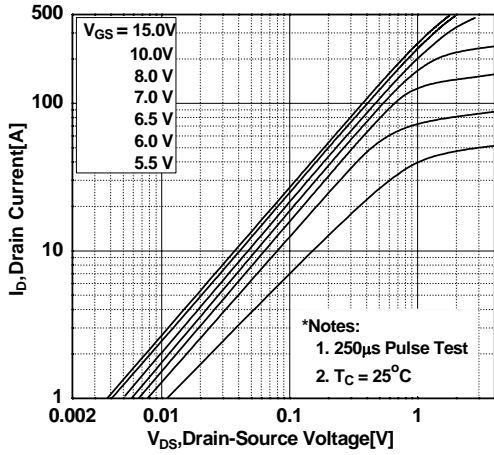


Figure 2. Transfer Characteristics

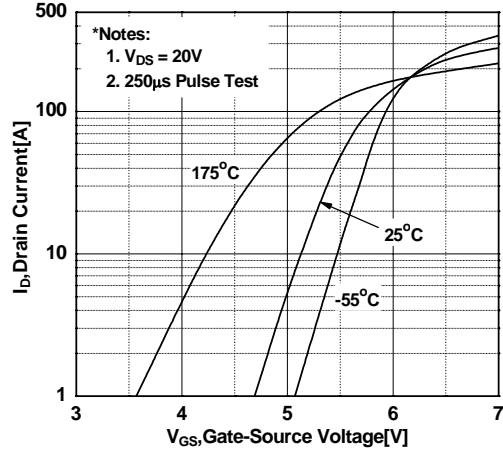


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

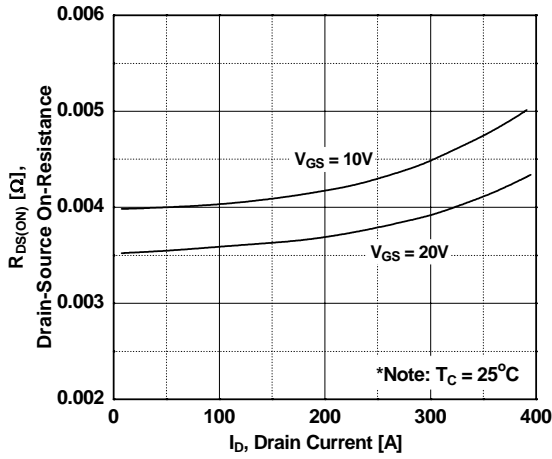


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

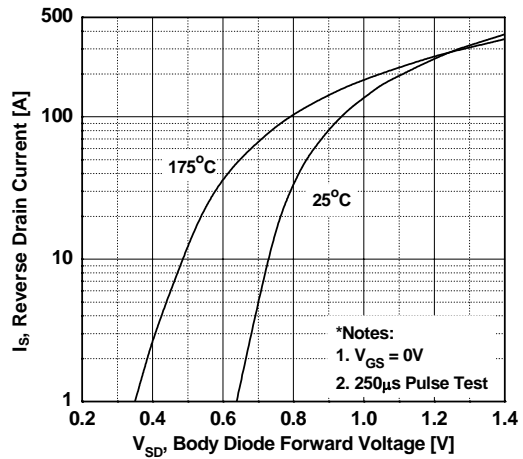


Figure 5. Capacitance Characteristics

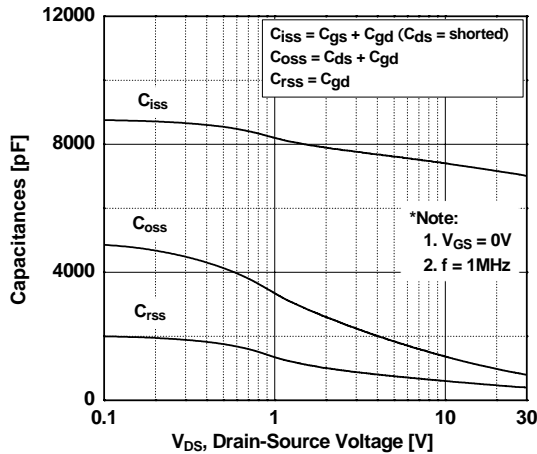
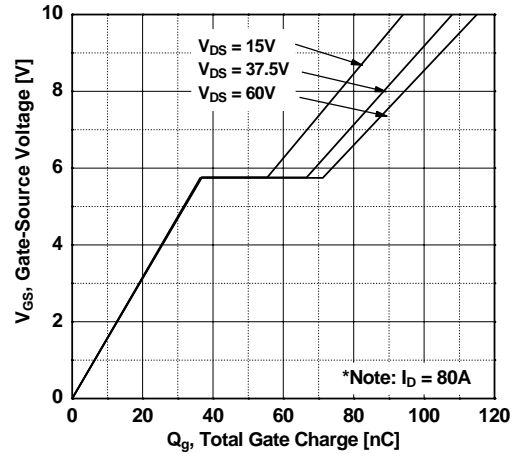


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

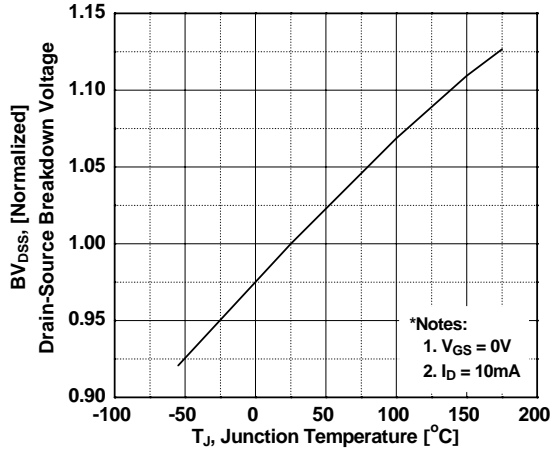


Figure 8. On-Resistance Variation vs. Temperature

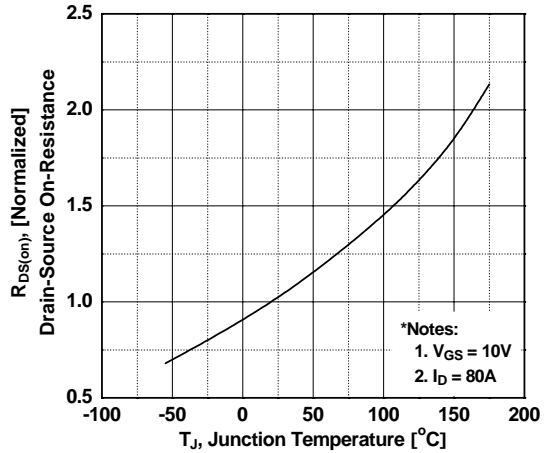


Figure 9. Maximum Safe Operating Area

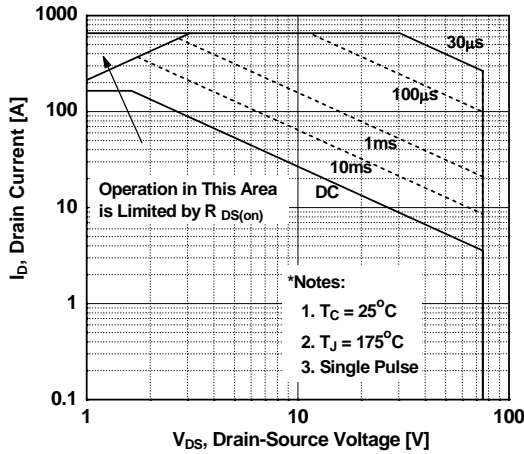


Figure 10. Maximum Drain Current vs. Case Temperature

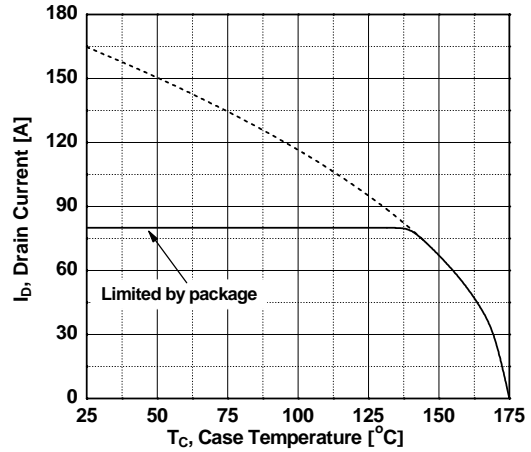
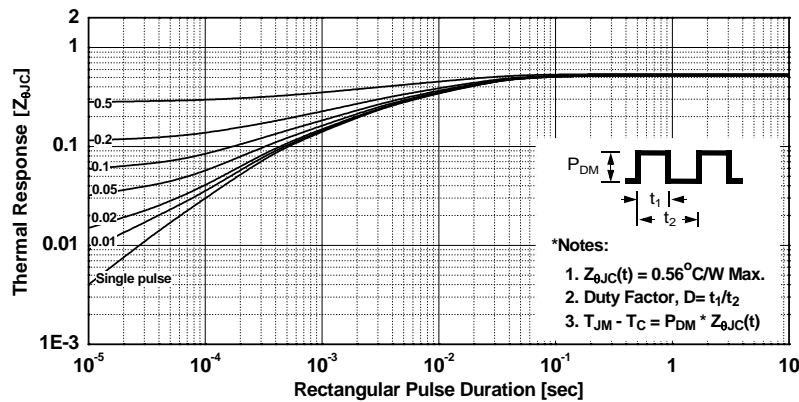
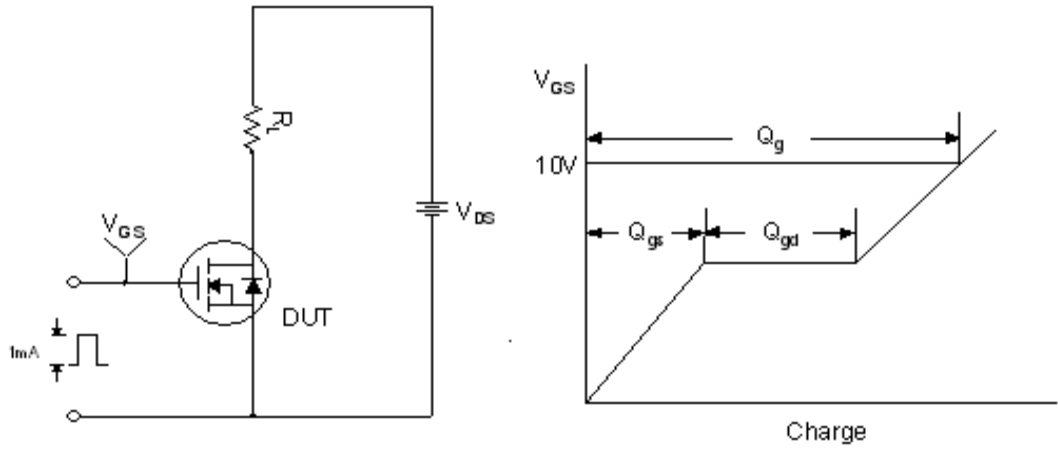


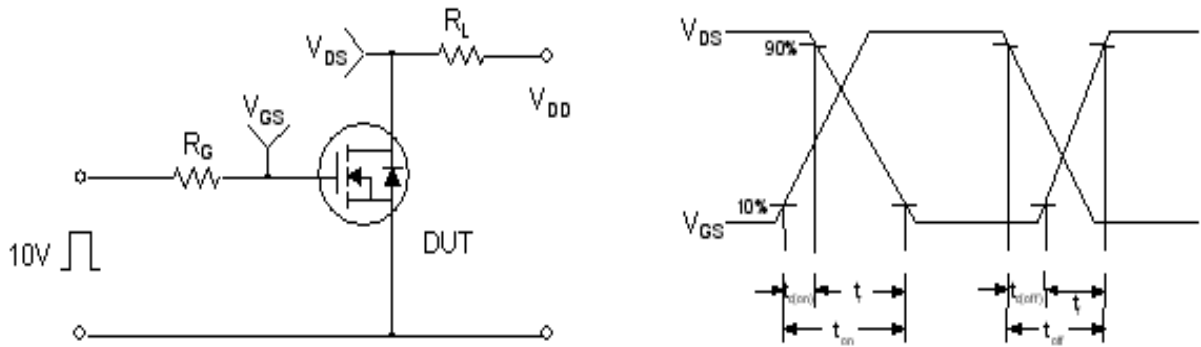
Figure 11. Transient Thermal Response Curve



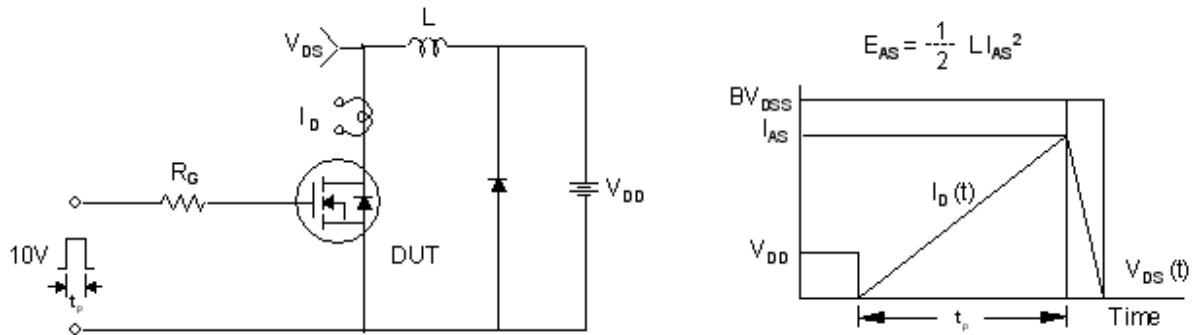
Gate Charge Test Circuit & Waveform



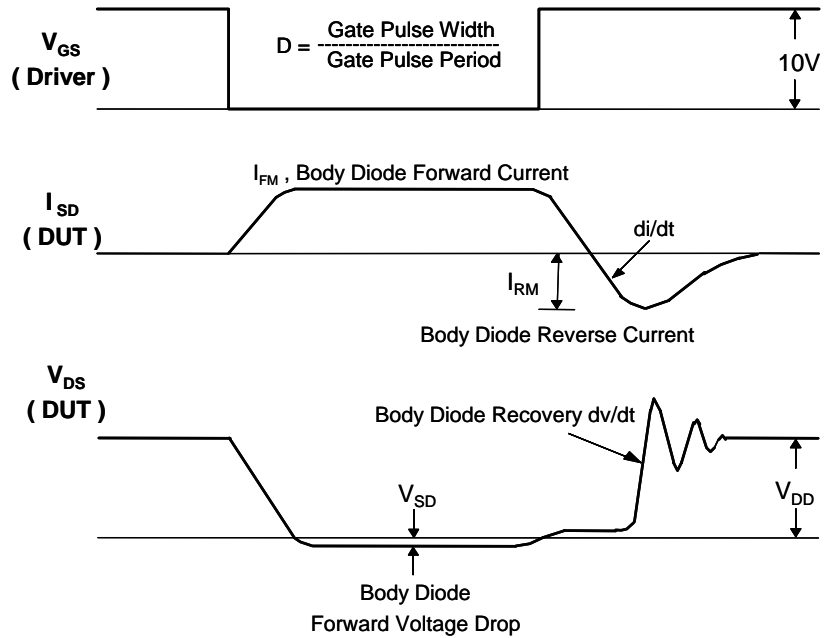
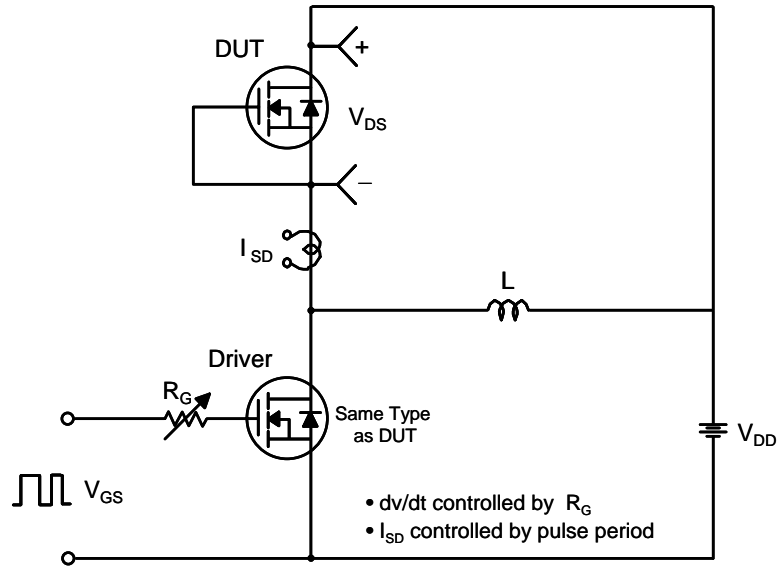
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

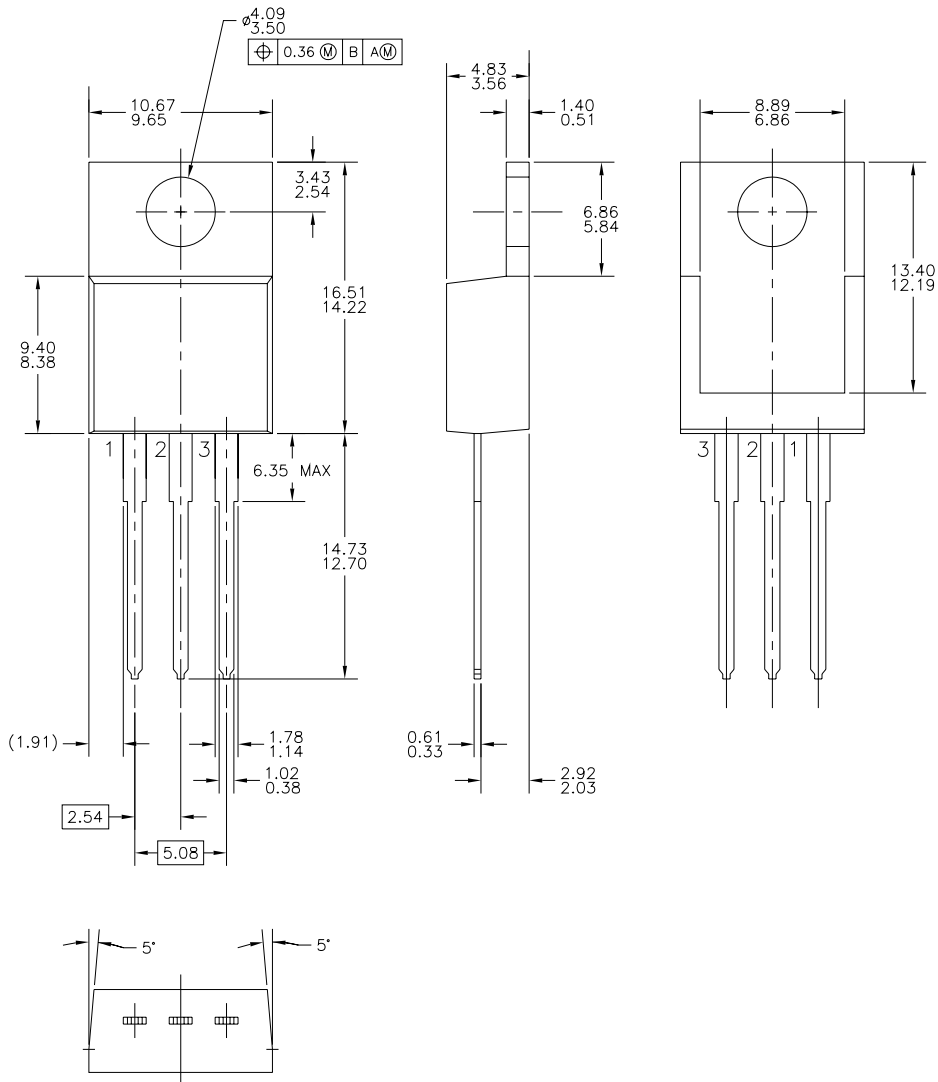


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

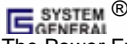
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