FAIRCHILD SEMICONDUCTOR®

March 2008

FDP047N08

N-Channel PowerTrench® MOSFET

75V, 164A, 4.7mΩ

Features

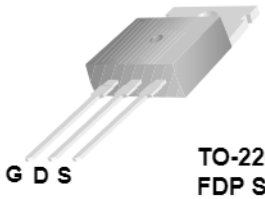
- $R_{DS(on)}$ = 3.8mΩ (Typ.)@ V_{GS} = 10V, I_D = 80A
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

Description

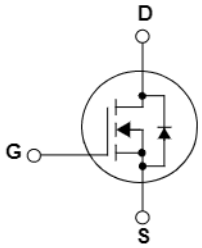
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- DC to DC convertors / Synchronous Rectification



TO-220
FDP Series



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

Symbol	Parameter			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°C)		164*	A
		-Continuous (T_C = 100°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°C)		268	W
		- Derate above 25°C		1.79	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°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	°C/W
$R_{\theta CS}$	Thermal Resistance, Case to Sink Typ.	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

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Package Marking and Ordering Information $T_C = 25^oC$ 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
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, $T_C = 25^oC$	75	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25^oC	-	0.02	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 75V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 75V, $T_C = 150^oC$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 80A	-	3.7	4.7	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 80A (Note 4)	-	150	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	7080	9415	pF
C_{oss}	Output Capacitance		-	870	1155	pF
C_{rss}	Reverse Transfer Capacitance		-	410	615	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 37.5V, I_D = 80A, R_{GEN} = 25Ω, V_{GS} = 10V (Note 4, 5)	-	100	210	ns
t_r	Turn-On Rise Time		-	147	304	ns
$t_{d(off)}$	Turn-Off Delay Time		-	220	450	ns
t_f	Turn-Off Fall Time		-	114	238	ns
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 60V, I_D = 80A, V_{GS} = 10V (Note 4, 5)	-	117	152	nC
Q_{gs}	Gate to Source Gate Charge		-	37	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	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} = 0V, I_{SD} = 80A	-	-	1.25	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 80A, dI_F/dt = 100A/μs (Note 4)	-	45	-	ns
Q_{rr}	Reverse Recovery Charge		-	66	-	nC

Notes:

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

Typical Performance Characteristics

Figure 1. On-Region Characteristics

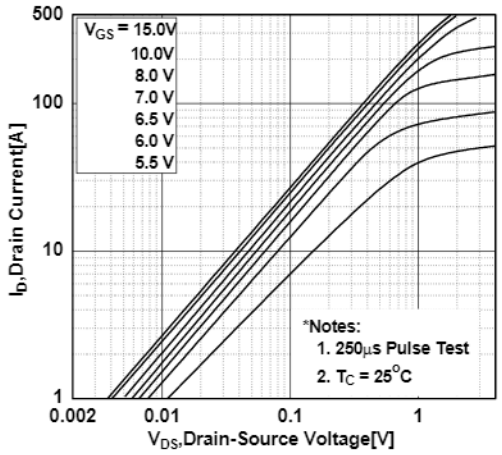


Figure 2. Transfer Characteristics

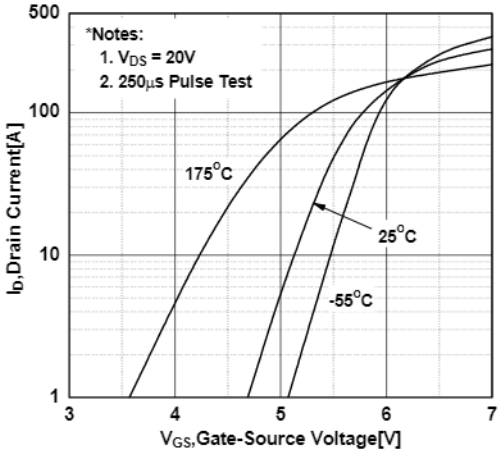


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

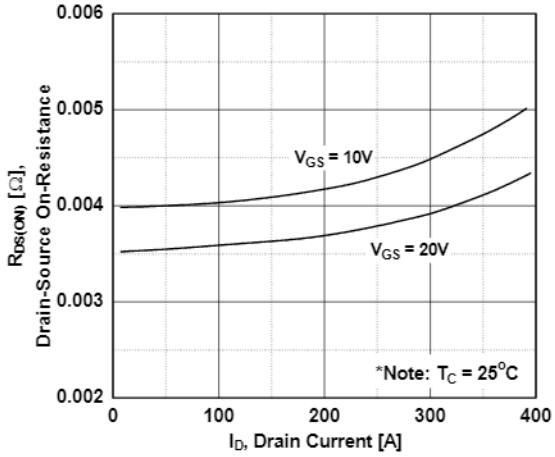


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

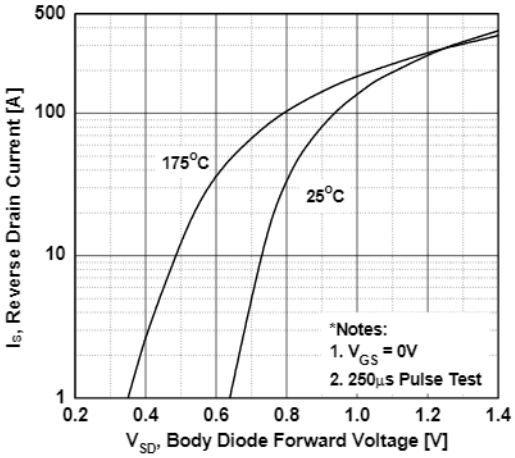


Figure 5. Capacitance Characteristics

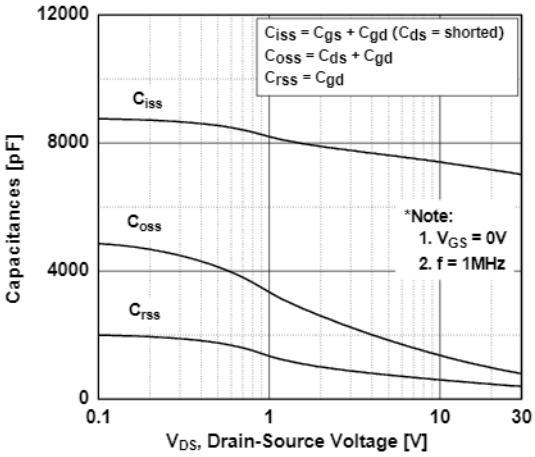
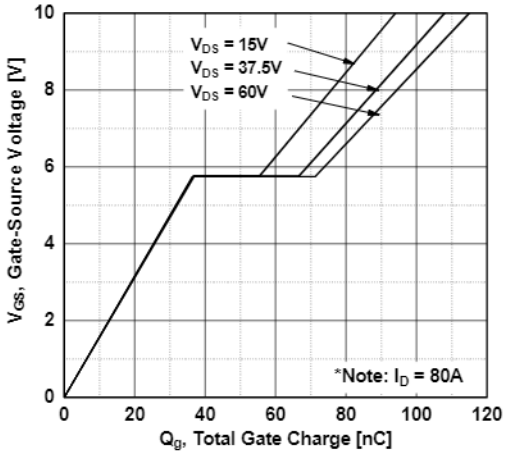


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

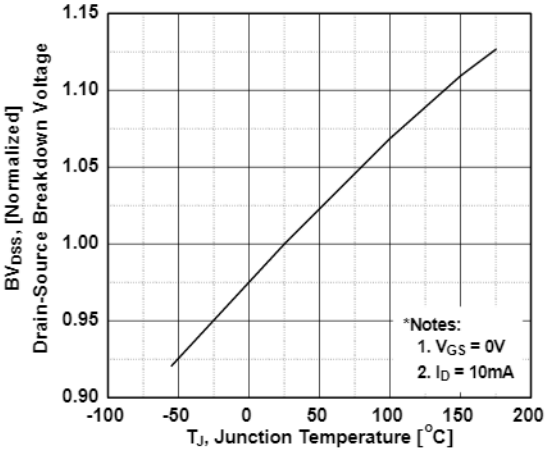


Figure 8. On-Resistance Variation vs. Temperature

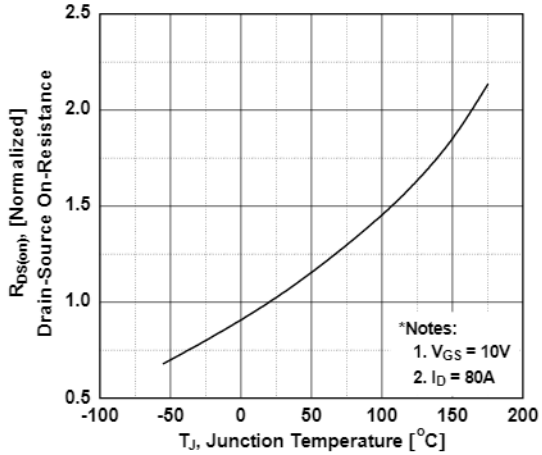


Figure 9. Maximum Safe Operating Area

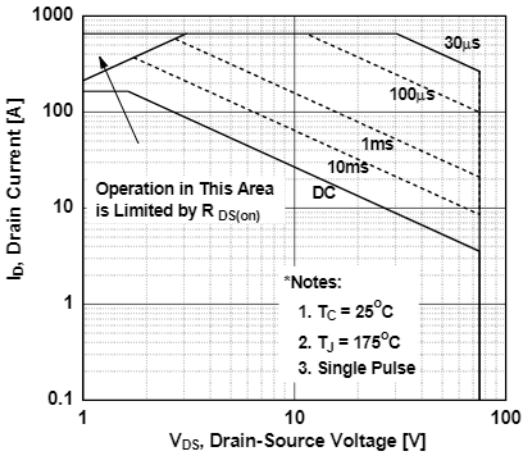


Figure 10. Maximum Drain Current vs. Case Temperature

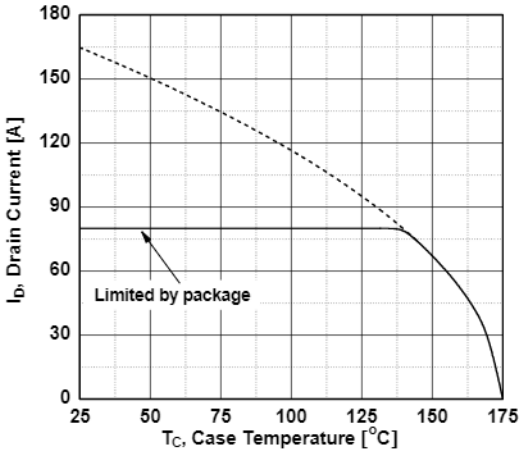
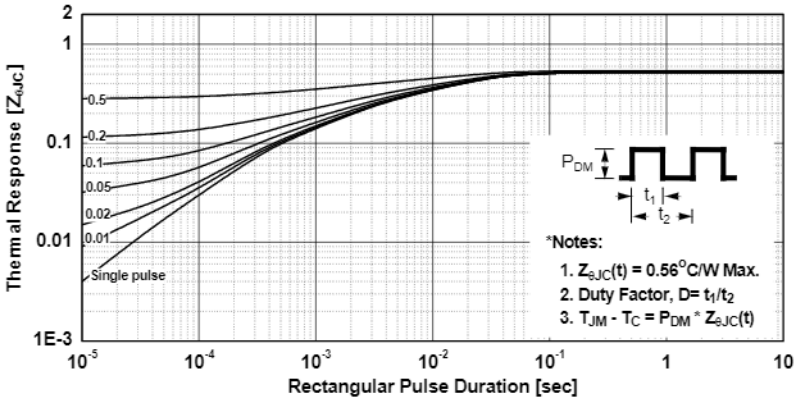
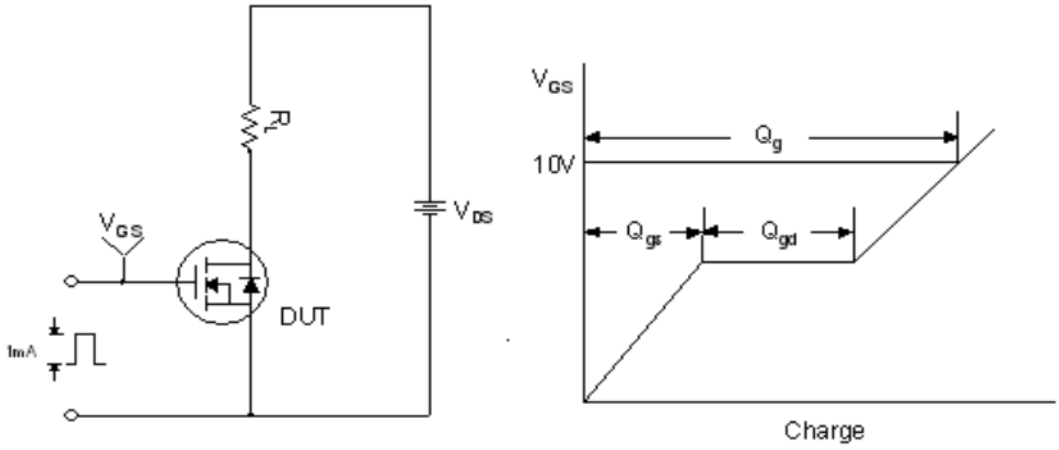


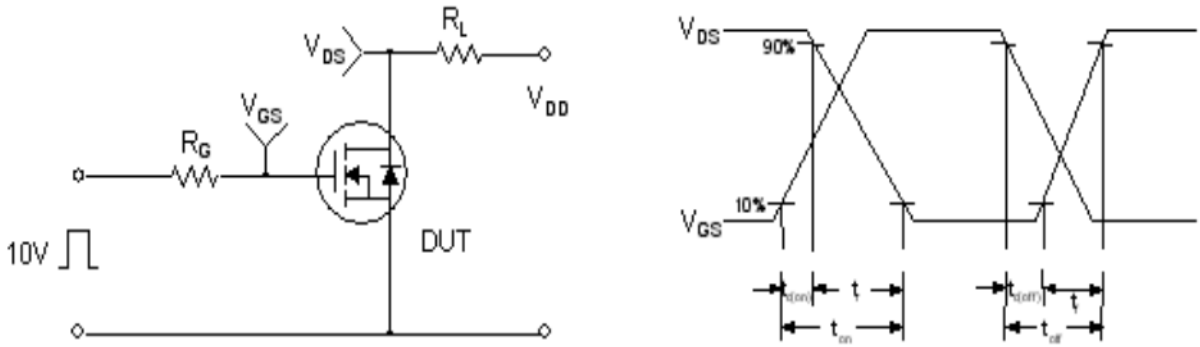
Figure 11. Transient Thermal Response Curve



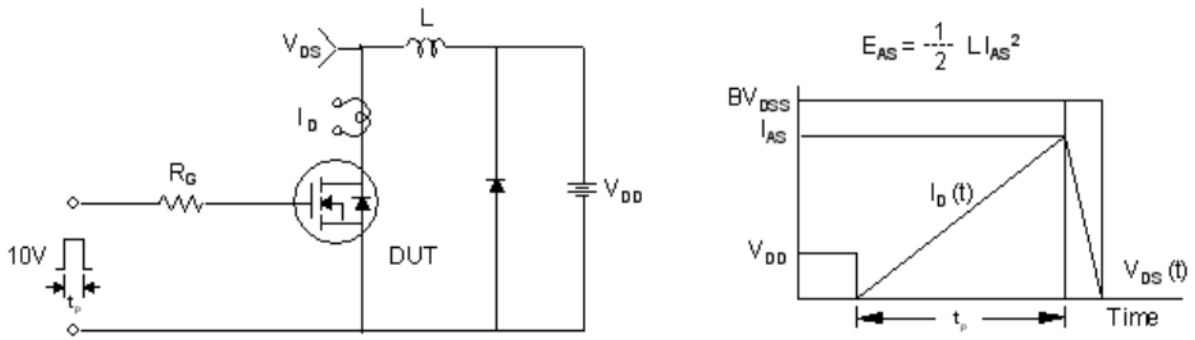
Gate Charge Test Circuit & Waveform



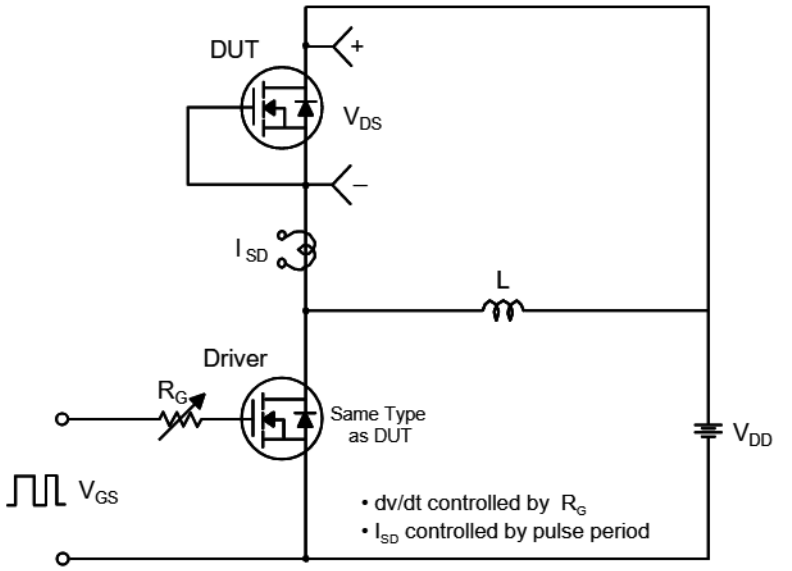
Resistive Switching Test Circuit & Waveforms

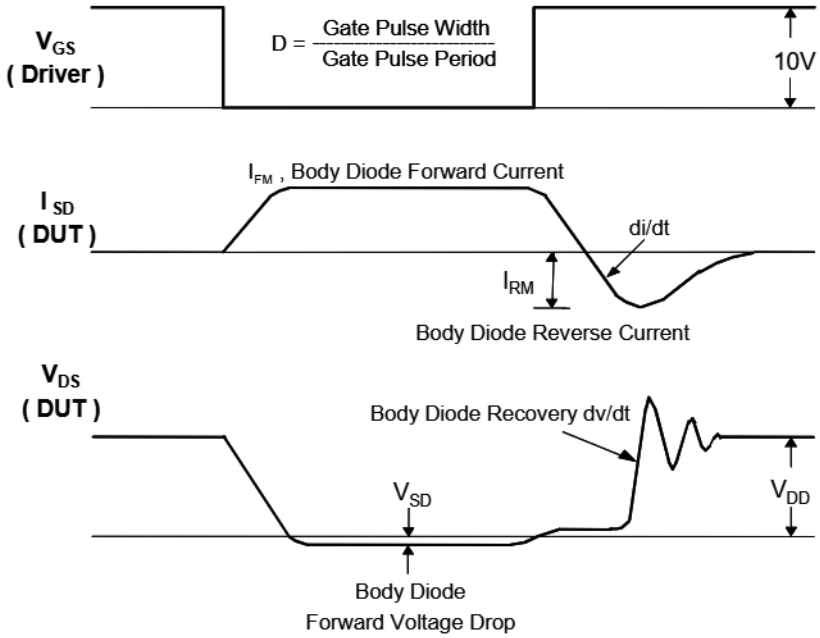


Unclamped Inductive Switching Test Circuit & Waveforms



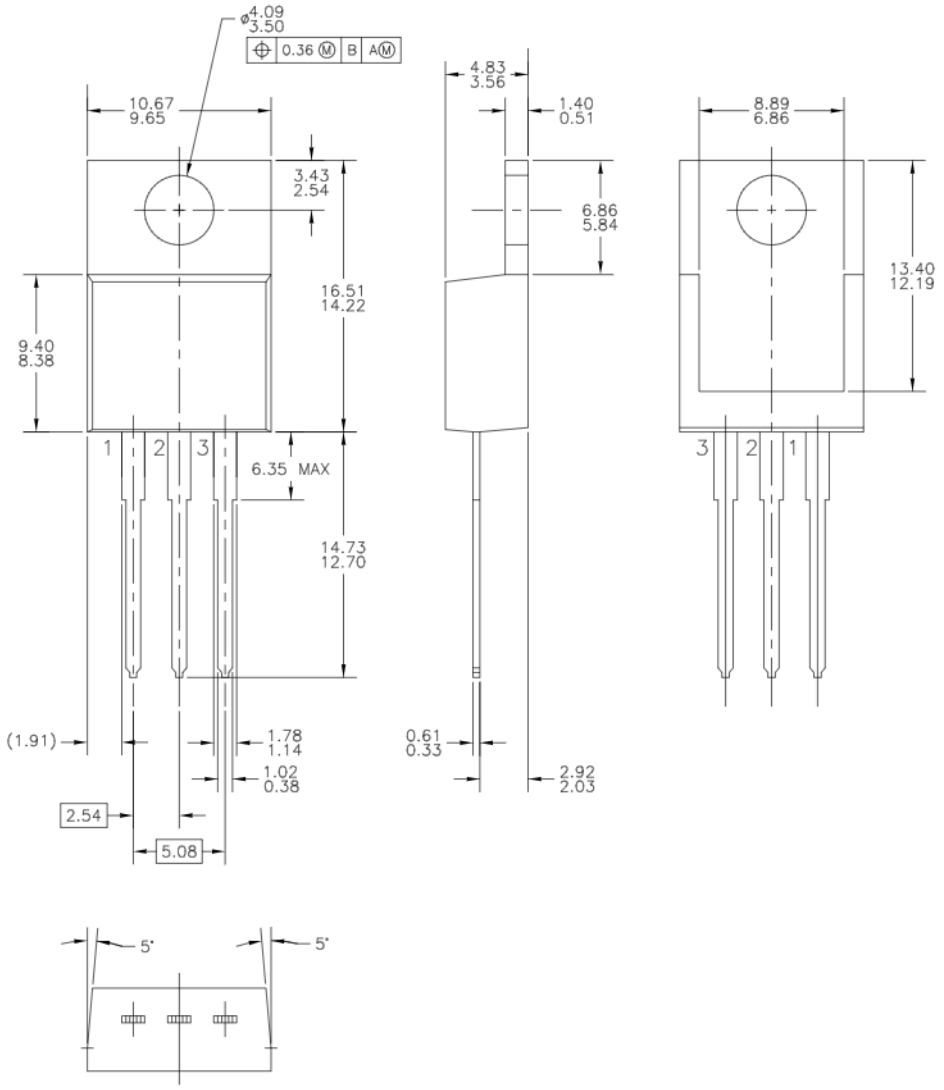
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

TO-220



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