MT3108

N-Channel Power MOSFET

100V, 85A, 9mΩ

Features

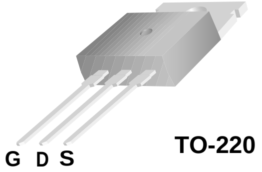
- $R_{DS(on)}$ = 9mΩ (Typ.) @ V_{GS} = 10V, I_D = 85A
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

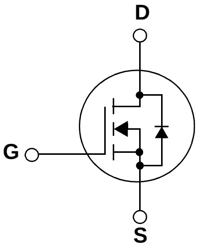
Application

- DC to DC convertors / Synchronous Rectification

General Description

This N-Channel MOSFET is producedusing mos-tech semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.





MOSFET Maximum Ratings $T_C = 25^oC$ unless otherwise noted*

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		100	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current	-Continuous ($T_C = 85^oC$)	85	A
I_{DM}	Drain Current	- Pulsed (Note 1)	320	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	630	mJ
I_{AR}	Avalance Current	(Note 1)	85	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	20.8	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.6	V/ns
P_D	Power Dissipation	($T_C = 25^oC$)	228	W
		- Derate above 25^oC	1.39	$W/^oC$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	^oC
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	^oC

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.72	$^oC/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink Typ.	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information $T_C = 25^oC$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3108	MT3108	TO-220	-	-	50

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$, $T_C = 25^oC$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25^oC	-	0.1	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100V$, $V_{GS} = 0V$	-	-	1	μA
		$V_{DS} = 100V$, $V_{GS} = 0V$, $T_C = 150^oC$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20V$, $V_{DS} = 0V$	-	-	±100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 75A$	-	9		$m\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10V$, $I_D = 37.5A$ (Note 4)	-	100	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$ f = 1MHz	-	3900	-	pF
C_{oss}	Output Capacitance		-	300	-	pF
C_{rss}	Reverse Transfer Capacitance		-	170	-	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50V$, $I_D = 75A$ $V_{GS} = 10V$, $R_{GEN} = 25\Omega$ (Note 4, 5)	-	38	-	ns
t_r	Turn-On Rise Time		-	65	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	218	-	ns
t_f	Turn-Off Fall Time		-	72	-	ns
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 50V$, $I_D = 75A$ $V_{GS} = 10V$ (Note 4, 5)	-	89	116	nC
Q_{gs}	Gate to Source Gate Charge		-	37	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	22	-	nC

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	85	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	320	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V$, $I_{SD} = 75A$	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_{SD} = 75A$ $dI_F/dt = 100A/\mu s$ (Note 4)	-	73	-	ns
Q_{rr}	Reverse Recovery Charge		-	166	-	nC

Notes:

1: Repetitive Rating: Pulse width limited by maximum junction temperature

2: L = 0.11mH, $I_{AS} = 75A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25°C$

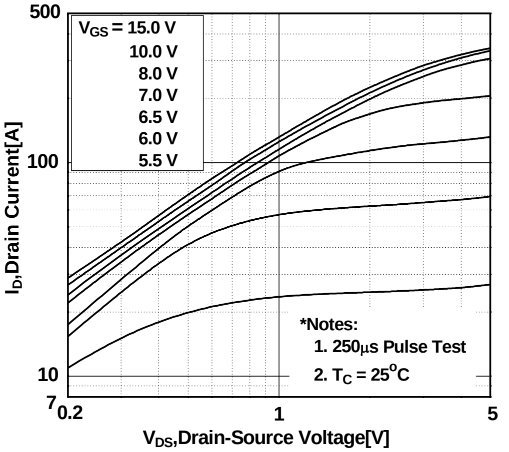
3: $I_{SD} \leq 85A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25°C$

4: Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

5: Essentially Independent of Operating Temperature Typical Characteristics

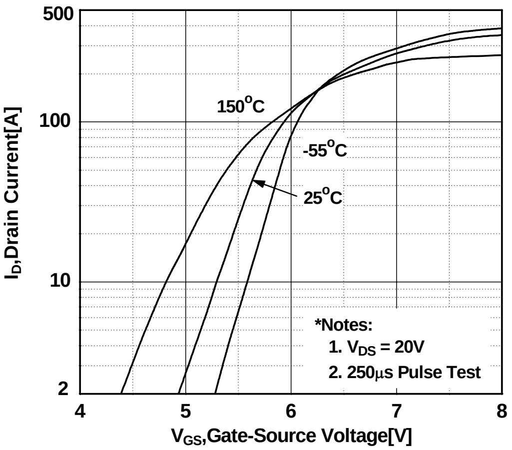
Typical Performance Characteristics

Figure 1. On-Region Characteristics



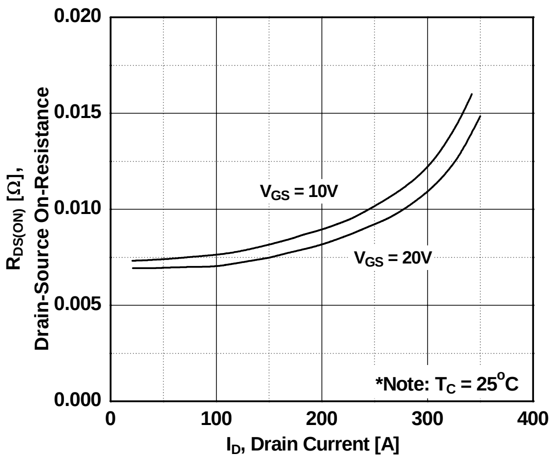
*Notes:
1. 250µs Pulse Test
2. $T_C = 25^oC$

Figure 2. Transfer Characteristics



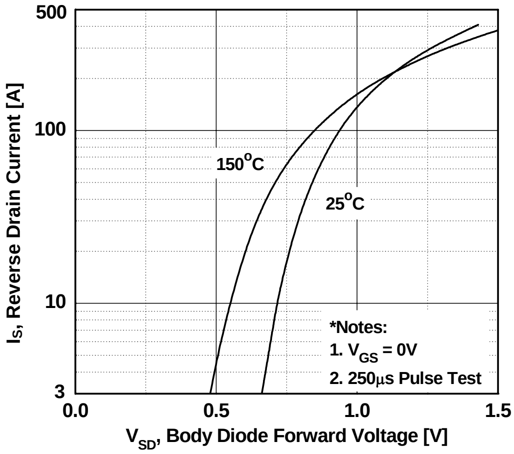
*Notes:
1. V_{DS} = 20V
2. 250µs Pulse Test

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



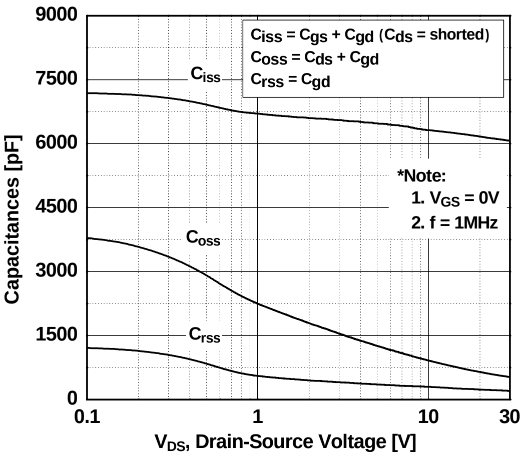
*Note: $T_C = 25^oC$

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



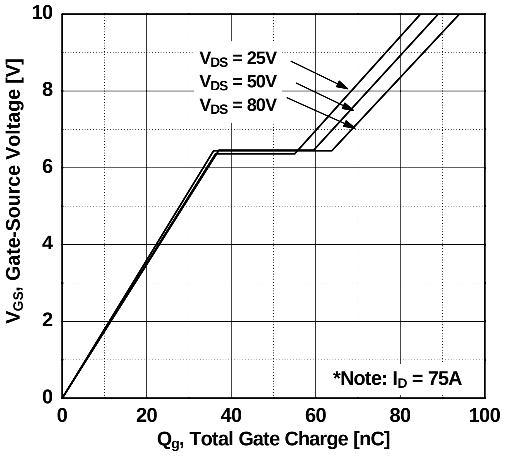
*Notes:
1. V_{GS} = 0V
2. 250µs Pulse Test

Figure 5. Capacitance Characteristics



*Note:
1. V_{GS} = 0V
2. f = 1MHz

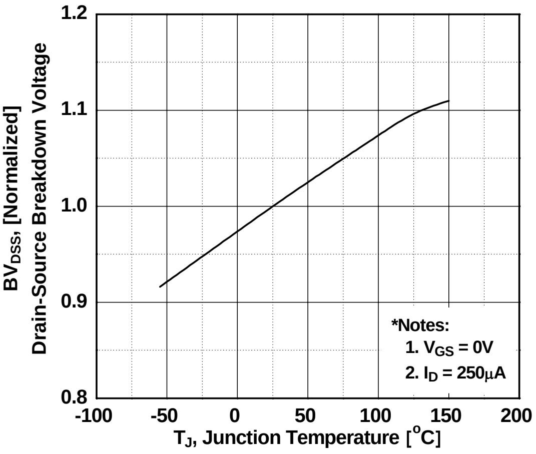
Figure 6. Gate Charge Characteristics



*Note: I_D = 75A

Typical Performance Characteristics (Continued)

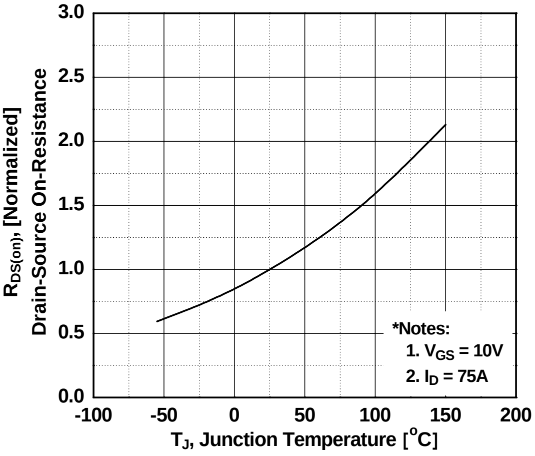
Figure 7. Breakdown Voltage Variation vs. Temperature



*Notes:

1. $V_{GS} = 0V$
2. $I_D = 250\mu A$

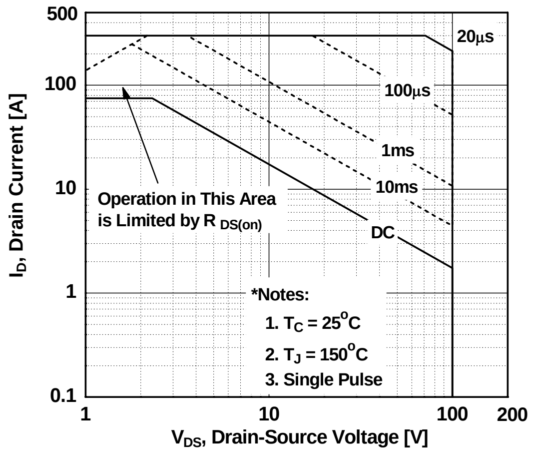
Figure 8. On-Resistance Variation vs. Temperature



*Notes:

1. $V_{GS} = 10V$
2. $I_D = 75A$

Figure 9. Maximum Safe Operating Area



*Notes:

1. $T_C = 25^oC$
2. $T_J = 150^oC$
3. Single Pulse

Figure 10. Maximum Drain Current vs. Case Temperature

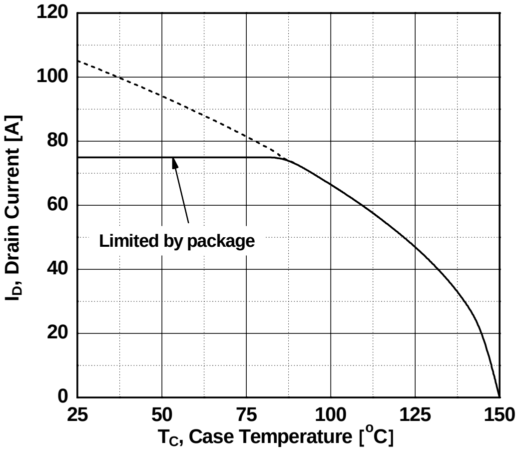
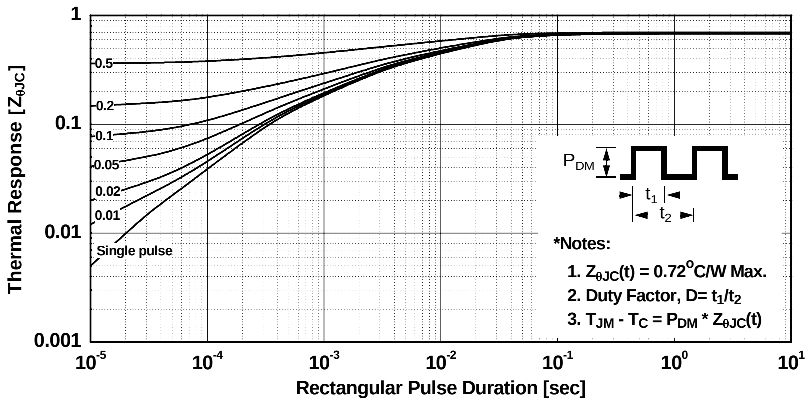


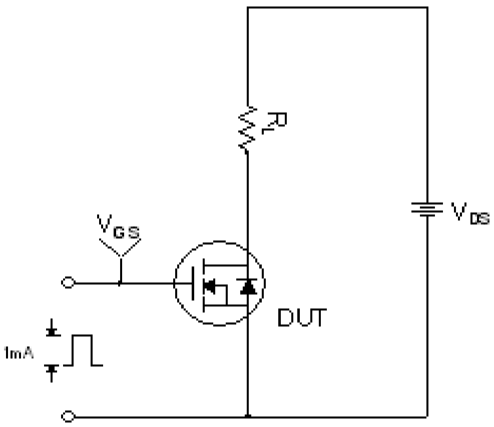
Figure 11. Transient Thermal Response Curve

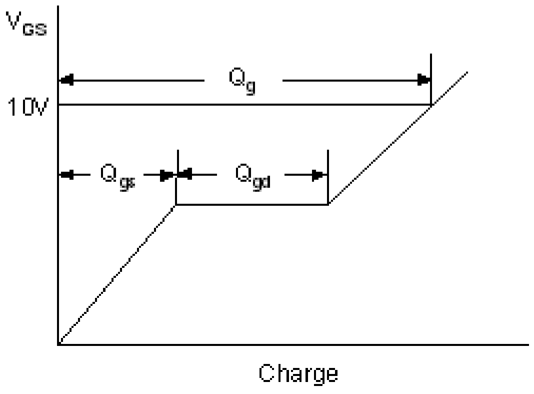


*Notes:

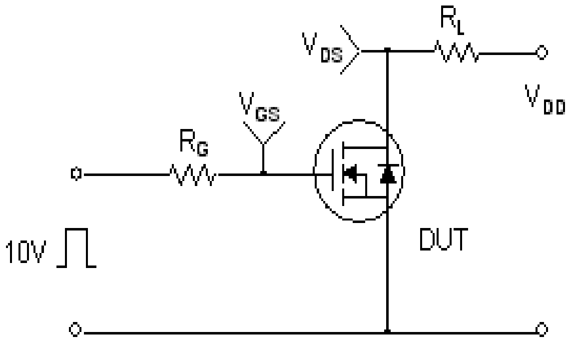
1. $Z_{\theta JC}(t) = 0.72^oC/W$ Max.
2. Duty Factor, $D= t_1/t_2$
3. $T_{JM} - T_C = P_{DM} * Z_{\theta JC}(t)$

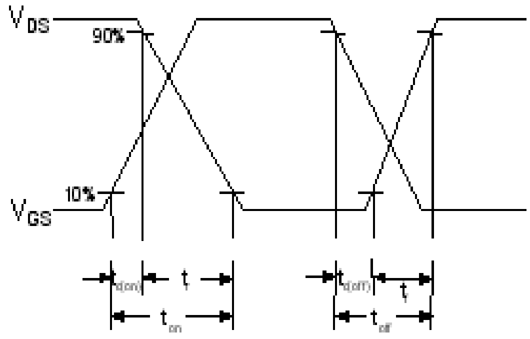
Gate Charge Test Circuit & Waveform



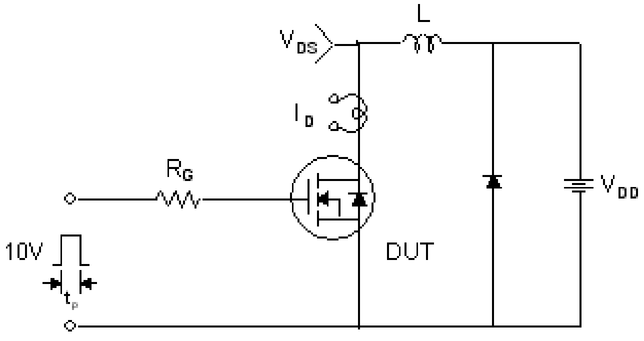


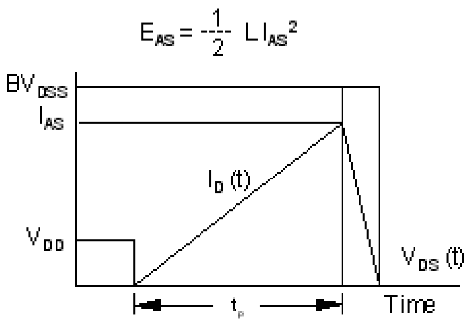
Resistive Switching Test Circuit & Waveforms



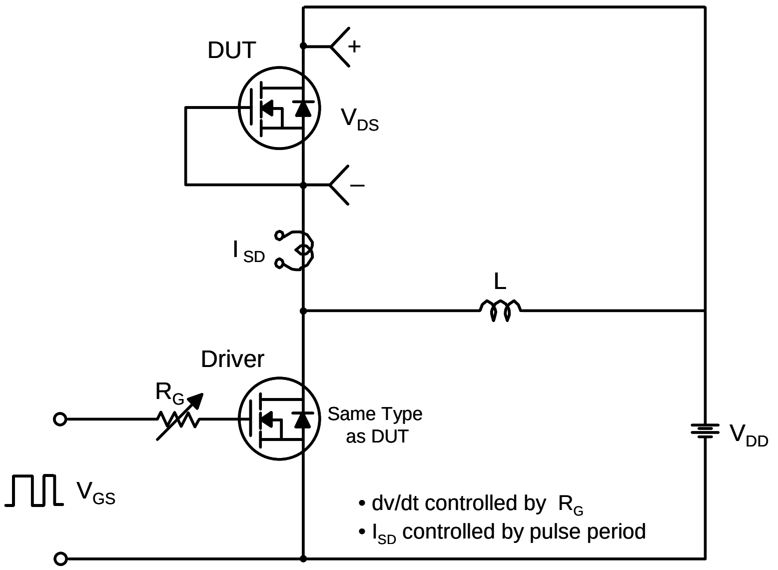


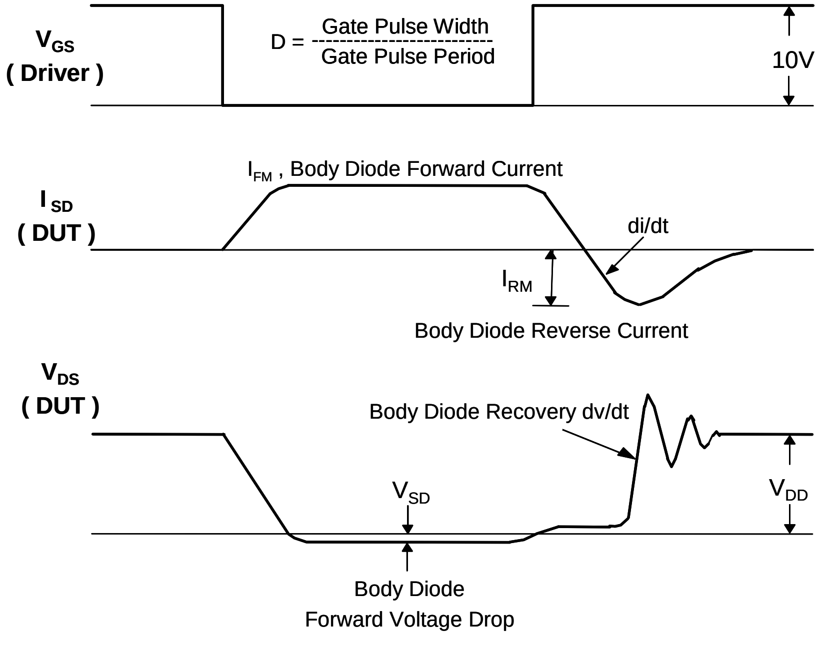
Unclamped Inductive Switching Test Circuit & Waveforms

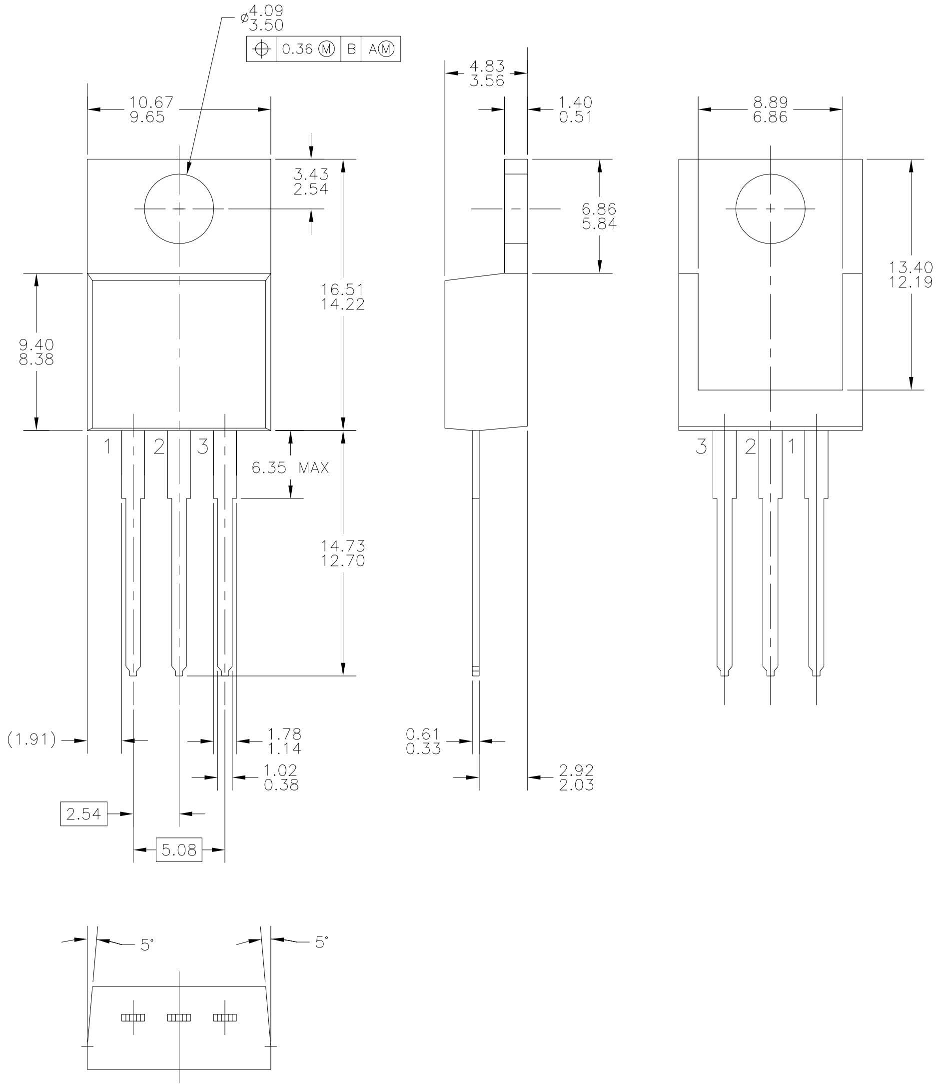




Peak Diode Recovery dv/dt Test Circuit & Waveforms







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