

# MT3245

## N-Channel Power MOSFET

45V, 120A, 3mΩ



**MT Semiconductor®**

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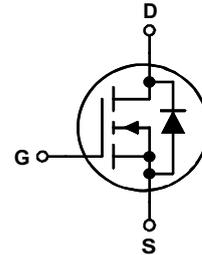
### Features

- $R_{DS(on)} = 3m\Omega$  (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

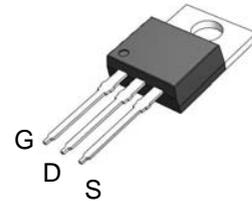
### Applications

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

### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



TO-220FB-3L

### Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

Symbol	Parameter		Ratings	Units
$V_{DSS}$	Drain to Source Voltage		45	V
$V_{GSS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ , Silicon Limited)	120*	A
		- Continuous ( $T_C = 100^\circ C$ , Silicon Limited)	90*	
		- Continuous ( $T_C = 25^\circ C$ , Package Limited)	35	
$I_{DM}$	Drain Current	- Pulsed (Note 1)	400	A
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	1232	mJ
$P_D$	Power Dissipation	( $T_C = 25^\circ C$ )	206	W
		- Derate above $25^\circ C$	2.04	W/ $^\circ C$
$T_J, T_{STG}$	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		200	$^\circ C$

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

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.79	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink (Typ.)	0.8	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	69.5	$^\circ C/W$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3245	MT3245	TO-220	N/A	N/A	50units

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
<b>Off Characteristics</b>							
B <sub>V</sub> DSS	Drain to Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA				V	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32V	--	--	1	μA	
		V <sub>GS</sub> = 0V, T <sub>C</sub> = 150°C	--	--	250	μA	
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>GS</sub> = ±20V	--	--	±100	nA	
<b>On Characteristics</b>							
V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1	--	3	V	
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 80A	--	5	6	mΩ	
		V <sub>GS</sub> = 10V, I <sub>D</sub> = 80A	--	3	4		
		V <sub>GS</sub> = 10V, I <sub>D</sub> = 80A, T <sub>C</sub> = 175°C	--	6	7		
<b>Dynamic Characteristics</b>							
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	--	15500	20110	pF	
C <sub>oss</sub>	Output Capacitance		--	1740	2050	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	1500	2000	pF	
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0.5V, f = 1MHz	--	1.1	--	Ω	
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 0V to 10V	V <sub>DD</sub> = 20V I <sub>D</sub> = 80A I <sub>g</sub> = 1.0mA	--	345	450	nC
Q <sub>g(2)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 0V to 2V		--	32.5	--	nC
Q <sub>gs</sub>	Gate to Source Gate Charge			--	49	--	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau			--	16.5	--	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge			--	74	--	nC
<b>Switching Characteristics (V<sub>GS</sub> = 10V)</b>							
t <sub>ON</sub>	Turn-On Time	V <sub>DD</sub> = 20V, I <sub>D</sub> = 80A V <sub>GS</sub> = 10V, R <sub>GEN</sub> = 7Ω	--	175	360	ns	
t <sub>d(on)</sub>	Turn-On Delay Time		--	43	95	ns	
t <sub>r</sub>	Rise Time		--	130	275	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time		--	435	875	ns	
t <sub>f</sub>	Fall Time		--	290	590	ns	
t <sub>OFF</sub>	Turn-Off Time		--	730	1470	ns	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>							
V <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 80A	--	--	1.25	V	
		I <sub>SD</sub> = 40A	--	--	1.0	V	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 75A, dI <sub>SD</sub> /dt = 100A/μs	--	59	--	ns	
Q <sub>RR</sub>	Reverse Recovery Charge	I <sub>SD</sub> = 75A, dI <sub>SD</sub> /dt = 100A/μs	--	77	--	nC	

### NOTES:

1: Pulse width limited by maximum junction temperature.

2: Starting T<sub>J</sub> = 25°C, L = 1mH, I<sub>AS</sub> = 58A, V<sub>DD</sub> = 36V, V<sub>GS</sub> = 10V.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

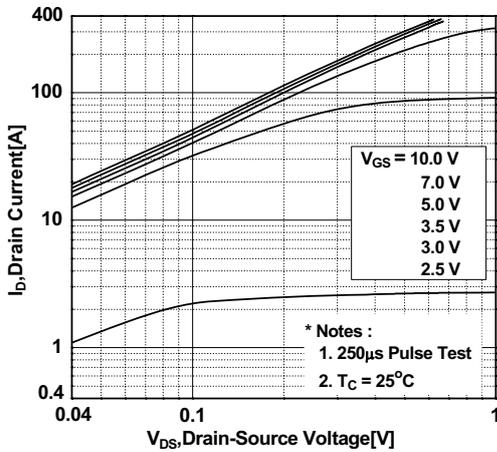


Figure 2. Transfer Characteristics

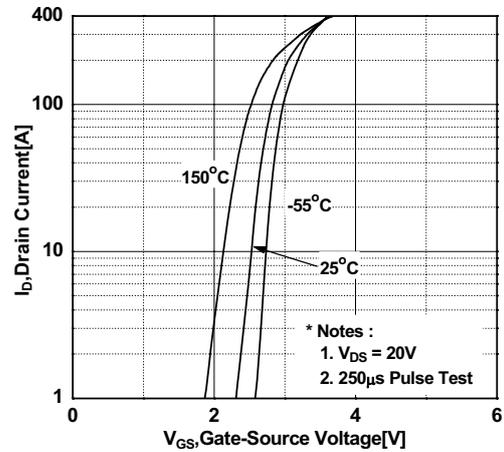


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

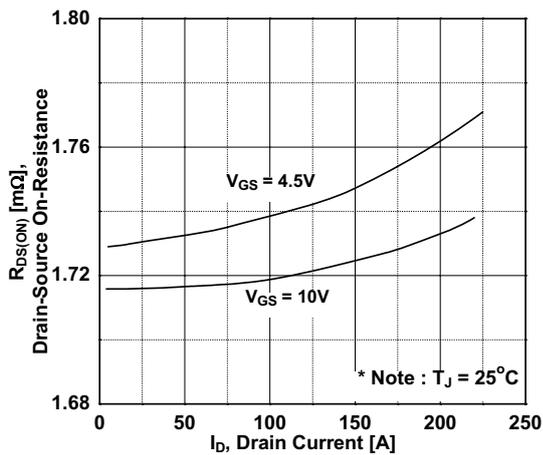


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

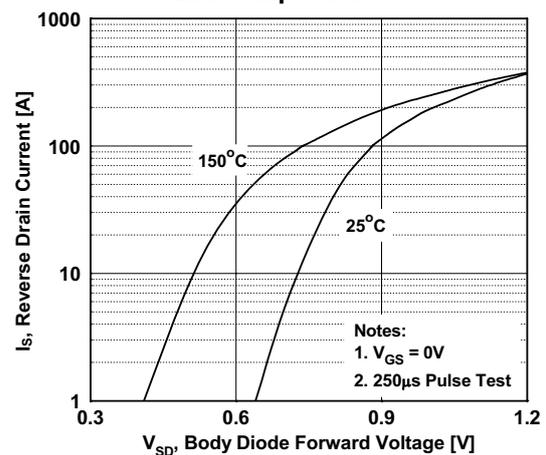


Figure 5. Capacitance Characteristics

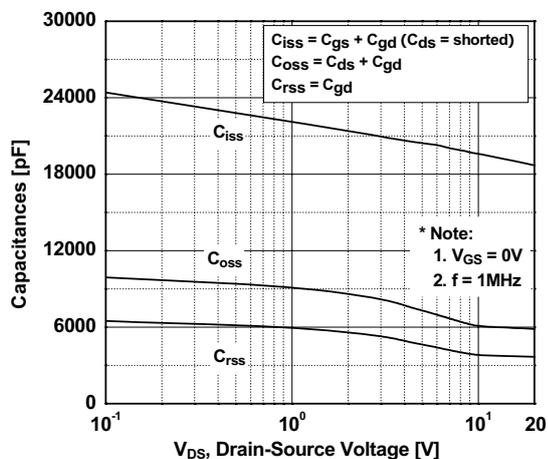
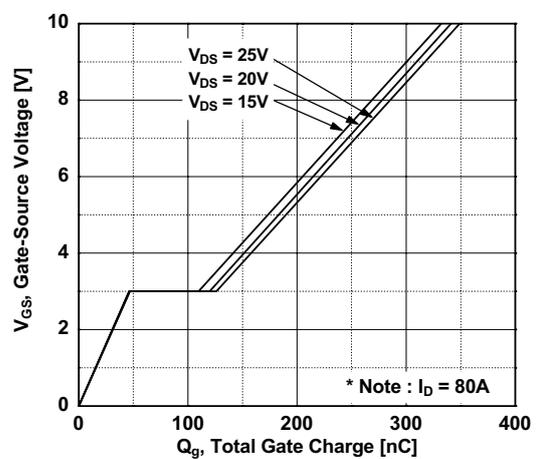


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

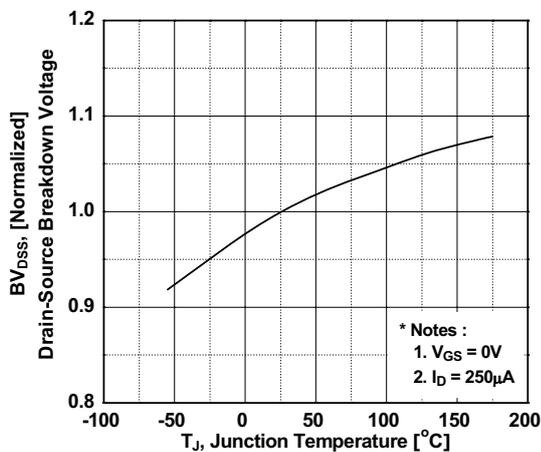


Figure 8. On-Resistance Variation vs. Temperature

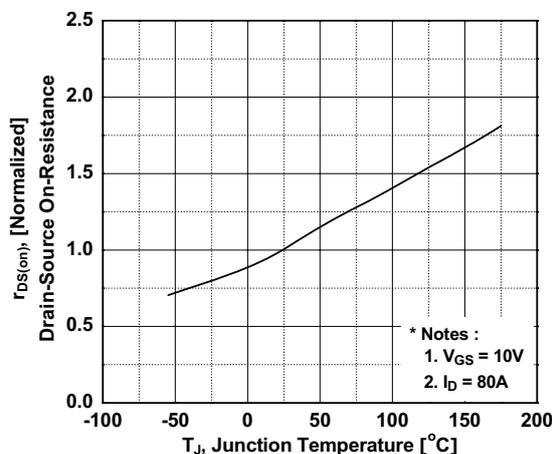


Figure 9. Unclamped Inductive Switching Capability

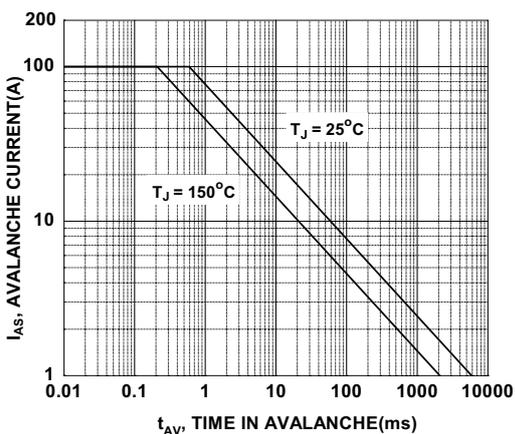


Figure 10. Safe Operating Area

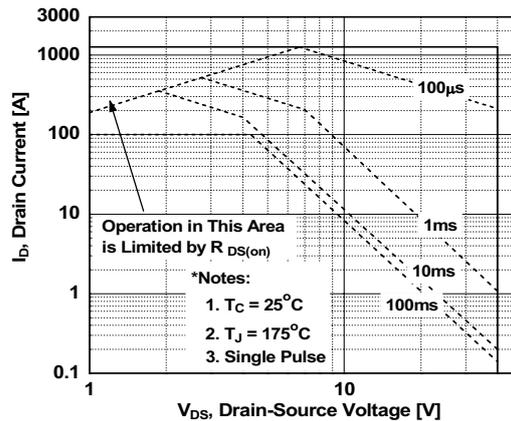
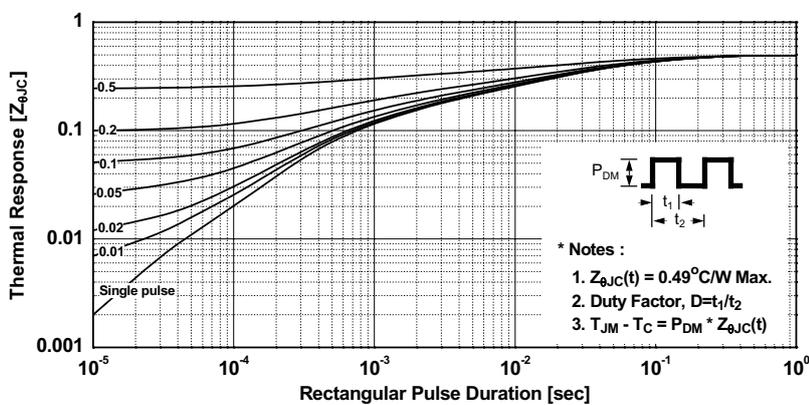
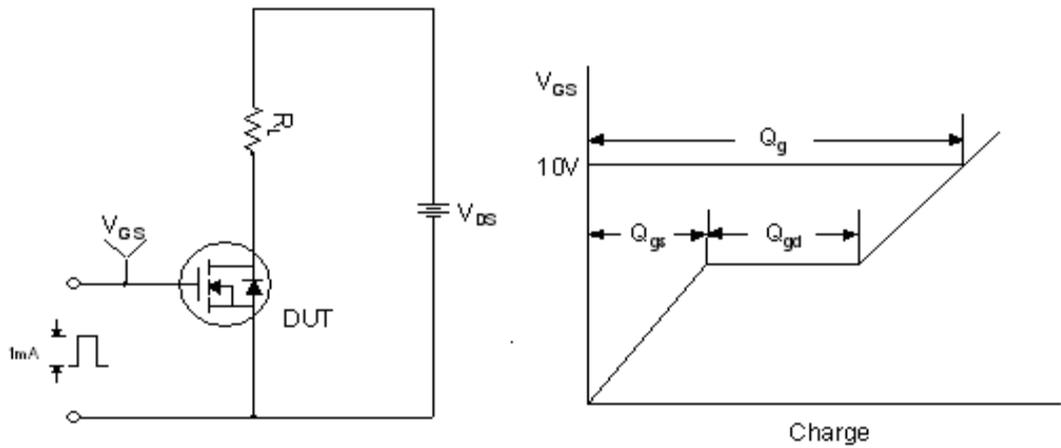


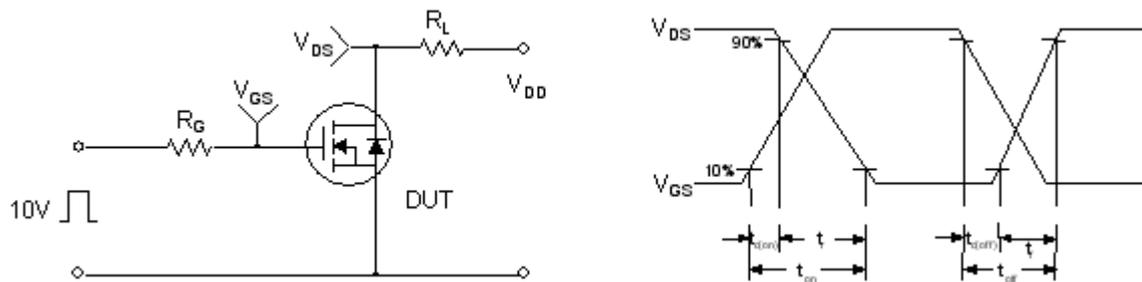
Figure 11. Transient Thermal Response Curve



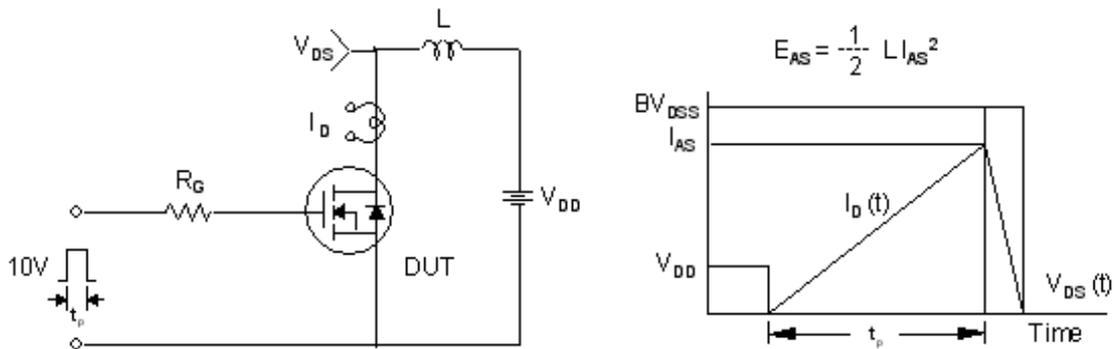
**Gate Charge Test Circuit & Waveform**



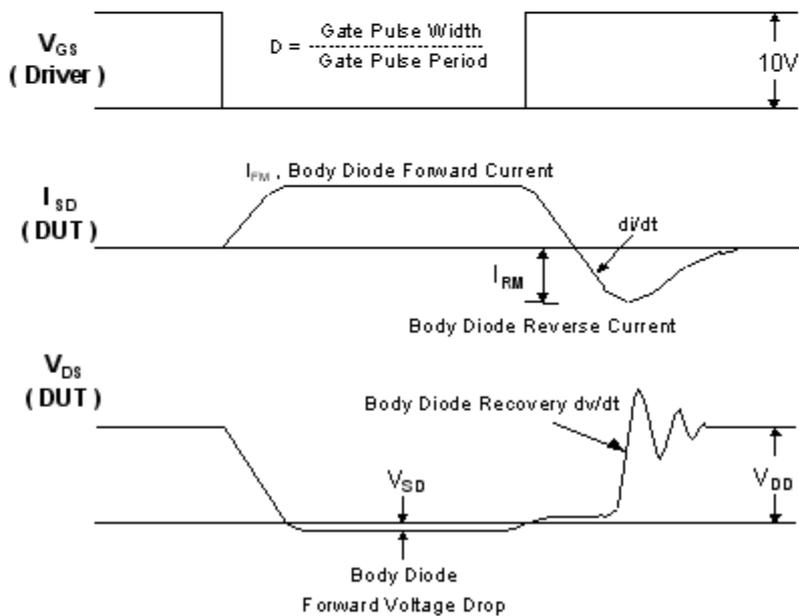
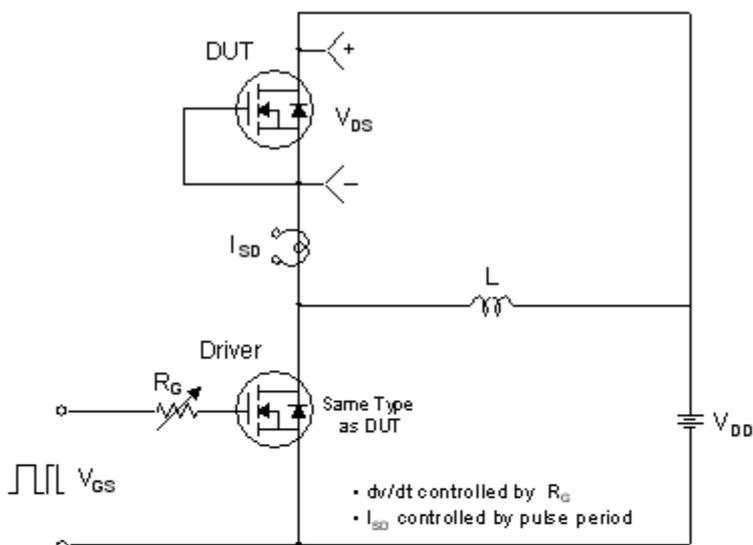
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

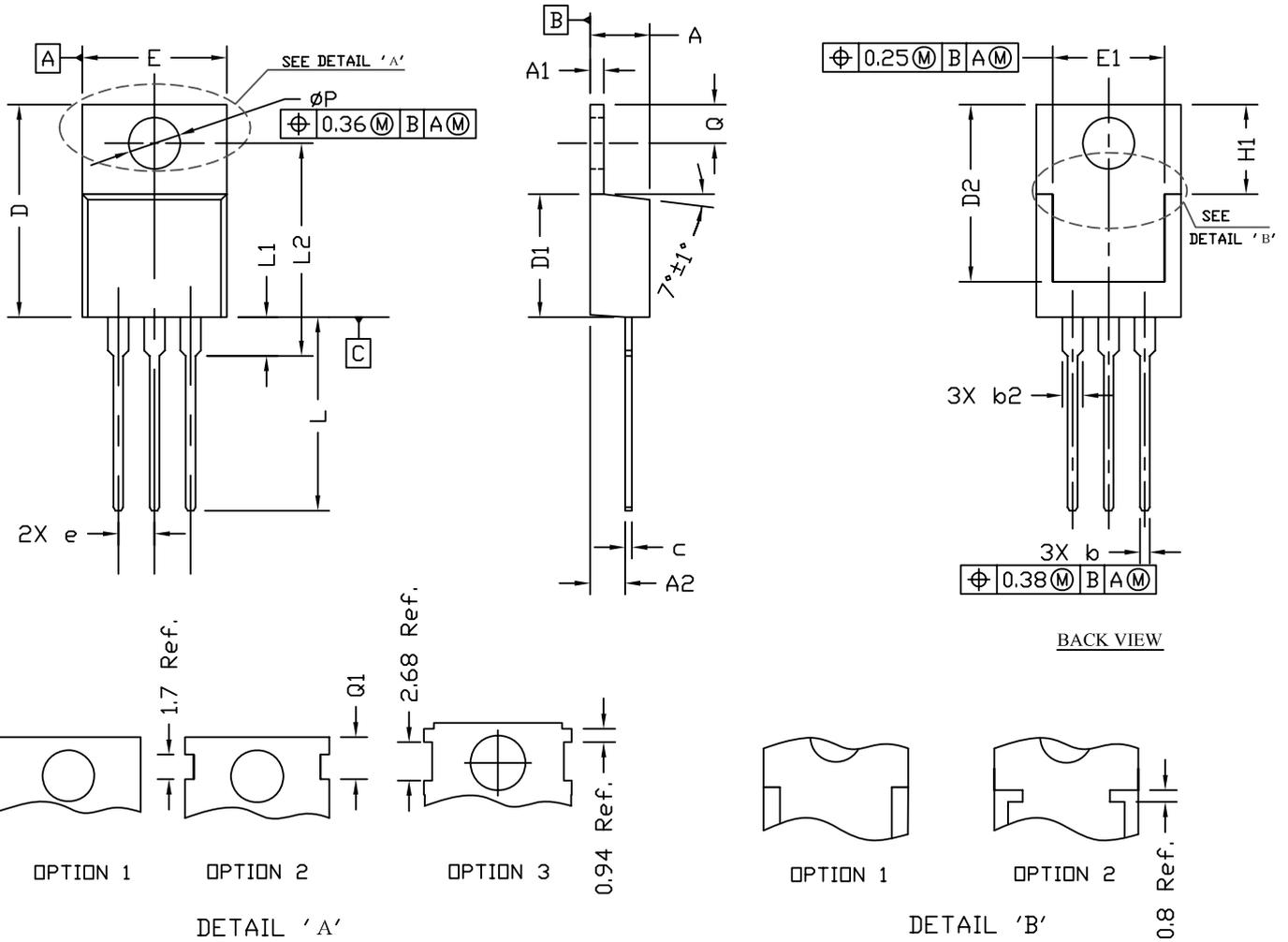


Peak Diode Recovery dv/dt Test Circuit & Waveforms

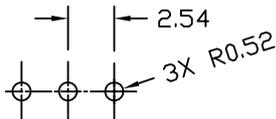


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Version	L

TO220 PACKAGE OUTLINE



RECOMMENDATION OF HOLE PATTERN



UNIT: mm

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MIL.
2. TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.30	4.45	4.72	0.169	0.175	0.186
A1	1.15	1.27	1.40	0.045	0.050	0.055
A2	2.20	2.67	2.90	0.087	0.105	0.114
b	0.69	0.81	0.95	0.027	0.032	0.037
b2	1.17	1.37	1.45	0.046	0.050	0.068
c	0.36	0.38	0.60	0.014	0.015	0.024
D	14.50	15.44	15.80	0.571	0.608	0.622
D1	8.59	9.14	9.65	0.338	0.360	0.380
D2	11.43	11.73	12.48	0.450	0.462	0.491
e	2.54 BSC			0.100 BSC.		
E	9.66	10.03	10.54	0.380	0.395	0.415
E1	6.22	---	---	0.245	---	---
H1	6.10	6.30	6.50	0.240	0.248	0.256
L	12.27	12.82	14.27	0.483	0.505	0.562
L1	2.47	---	3.90	0.097	---	0.154
L2	---	---	16.70	---	---	0.657
Q	2.59	2.74	2.89	0.102	0.108	0.114
$\phi P$	3.50	3.84	3.89	0.138	0.151	0.153
Q1	2.70	---	2.90	0.106	---	0.114

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