

# MT3245

## N-Channel Power MOSFET

45V, 120A, 3mΩ

### 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

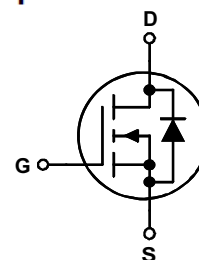
- Automotive Engine Control
- Powertrain Management
- Motors, Solenoids
- Electronic Steering
- Integrated Starter/ Alternator
- Distributed Power Architectures and VRMs
- Primary Switch for 12V Systems



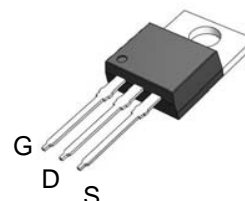
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### Simplified Schematic



### 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) - Continuous ( $T_C = 100^\circ C$ , Silicon Limited) - Continuous ( $T_C = 25^\circ C$ , Package Limited)	120* 90* 35	A
$I_{DM}$	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
Off Characteristics						
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μ				V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32V V <sub>GS</sub> = 0V	--	--	1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	T <sub>C</sub> = 150°C V <sub>GS</sub> = ±20V	--	--	250	μA
			--	--	±100	nA
On Characteristics						
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	
Dynamic Characteristics						
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	--	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	V <sub>DD</sub> = 20V I <sub>D</sub> = 80A I <sub>g</sub> = 1.0mA	--	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
Switching Characteristics (V <sub>GS</sub> = 10V)						
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
Drain-Source Diode Characteristics and Maximum Ratings						
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

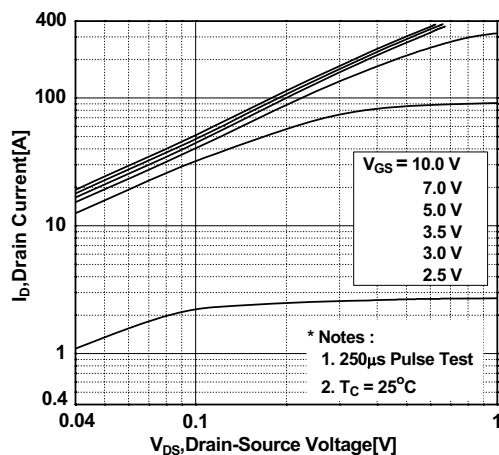


Figure 2. Transfer Characteristics

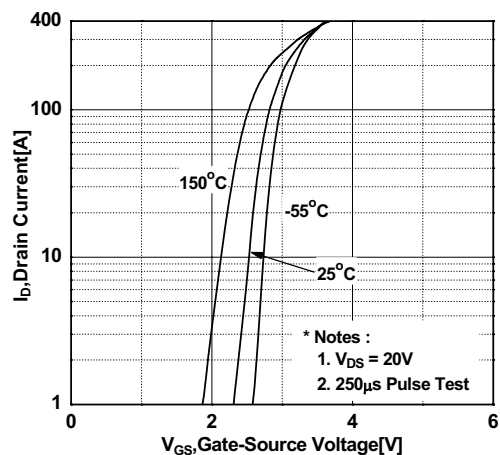


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

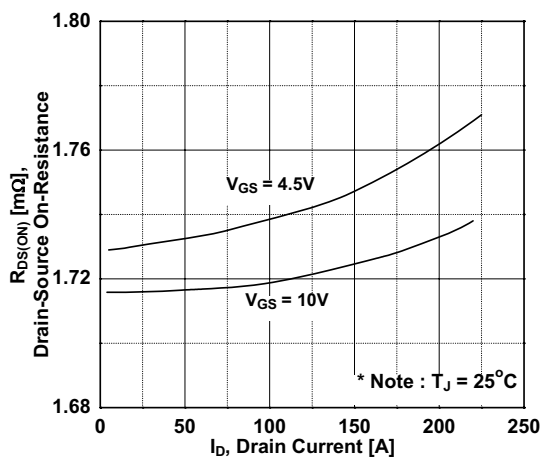


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

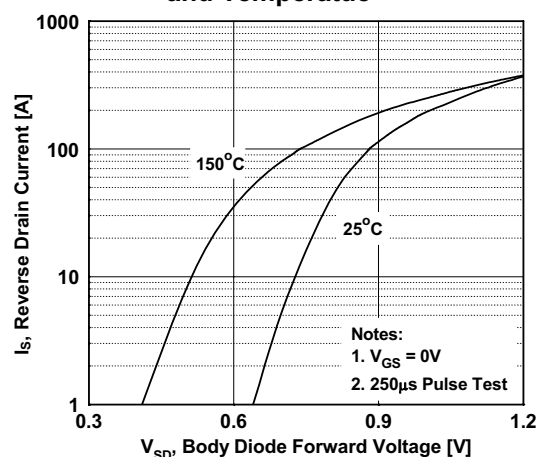


Figure 5. Capacitance Characteristics

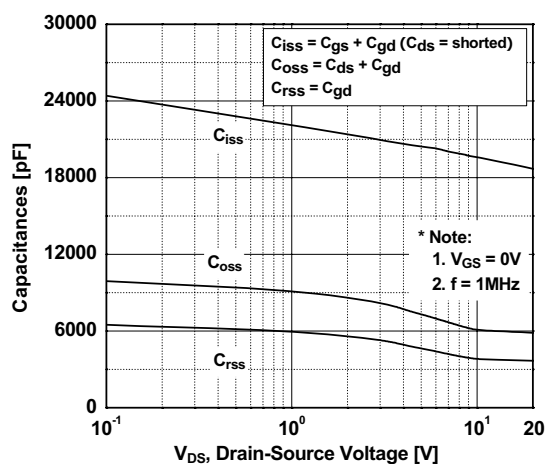
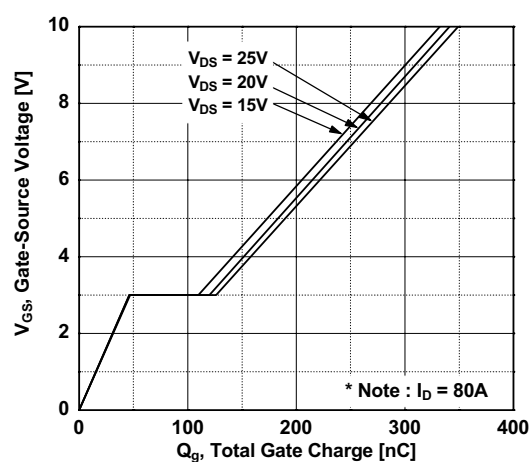


Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

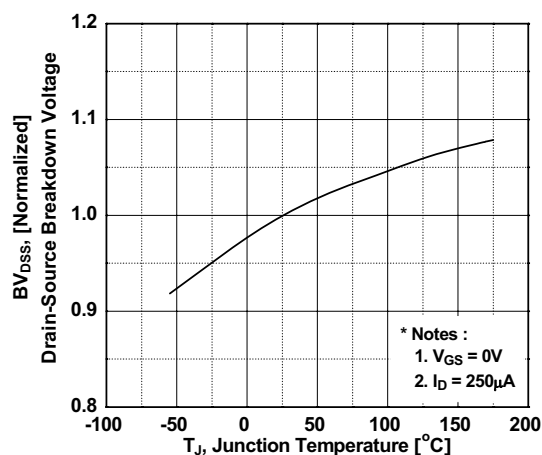


Figure 8. On-Resistance Variation vs. Temperature

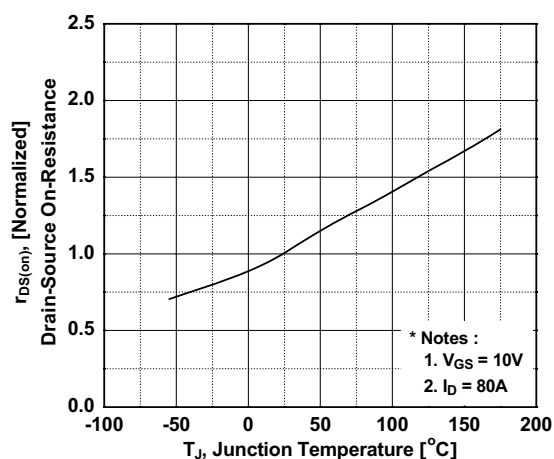


Figure 9. Unclamped Inductive Switching Capability

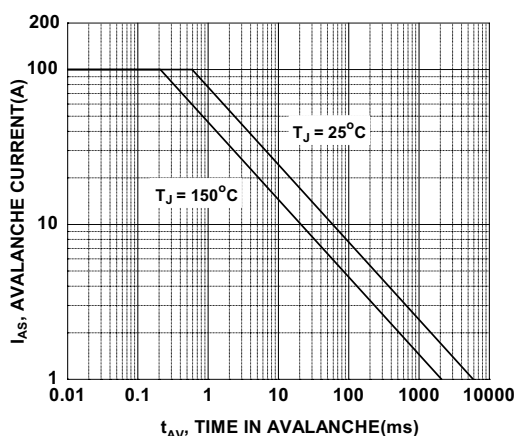


Figure 10. Safe Operating Area

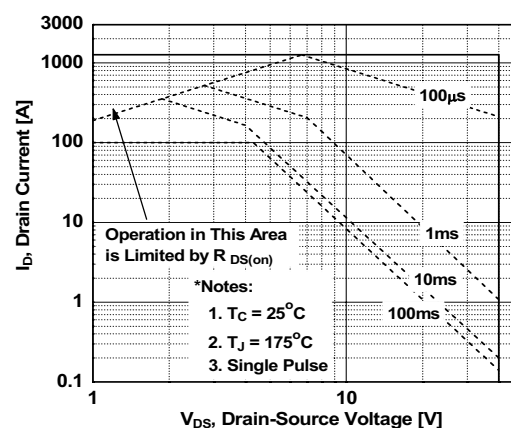
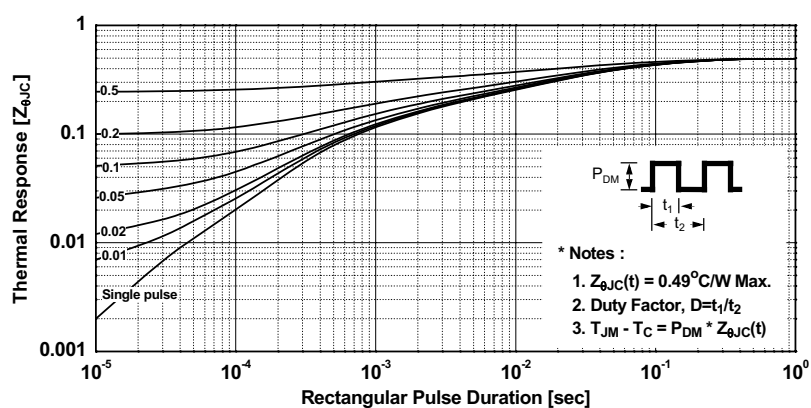
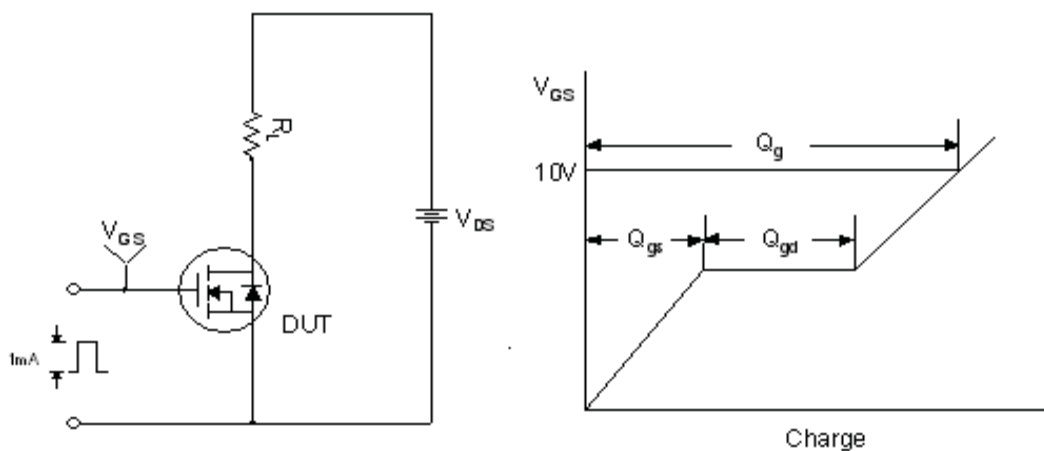


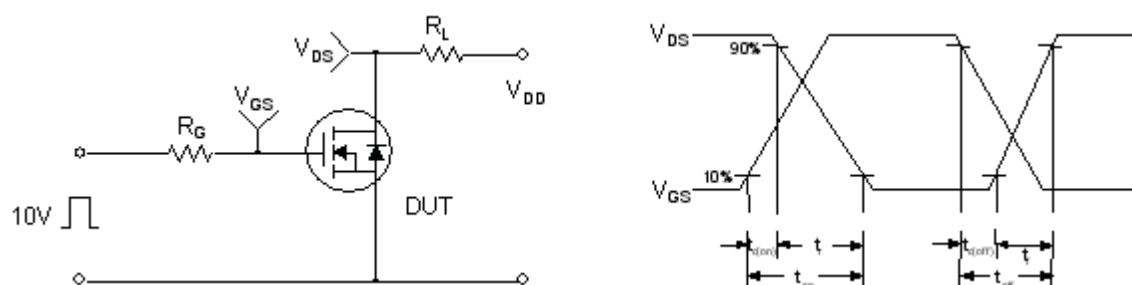
Figure 11. Transient Thermal Response Curve



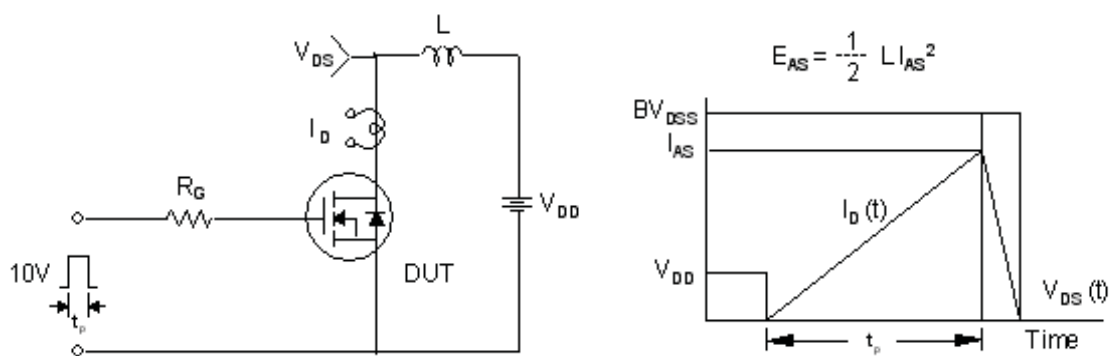
### Gate Charge Test Circuit & Waveform



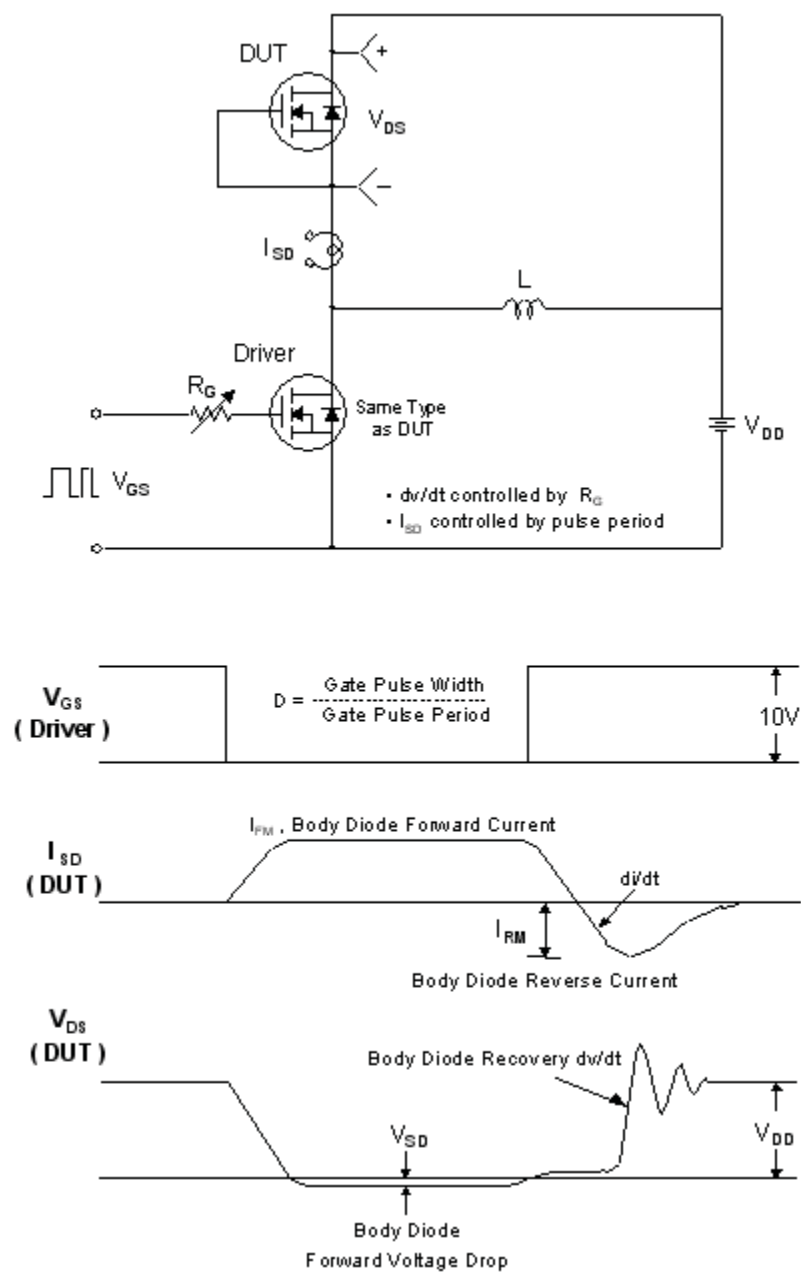
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching Test Circuit & Waveforms



## Peak Diode Recovery dv/dt Test Circuit &amp; Waveforms



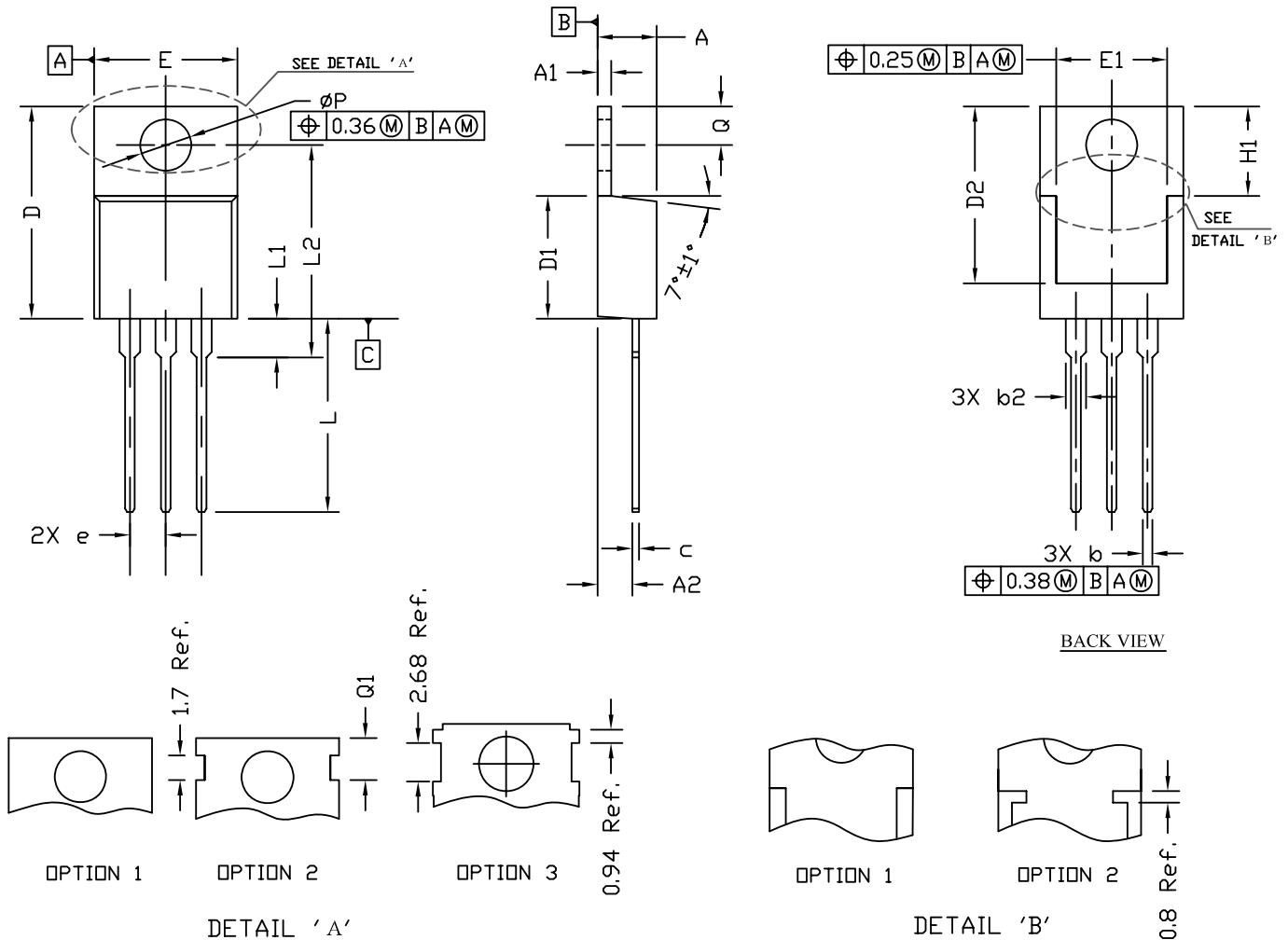
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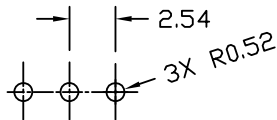
Version

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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