MT3206A

60V N-Channel MOSFET

MT Semiconductor®

http://www.mtsemi.com

General Description

These N-Channel enhancement mode power field effect transistors are produced using Mos-tech's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior swiching performance, and withstand high energy pulse in the avalanche and commutation mode.

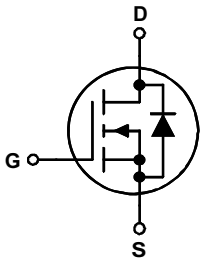
Features

- 50A, 60V, $R_{DS(on)}$ = 11.2mΩ @V_{GS} = 10 V
- Low gate charge(typical 43 nC)
- Low Crss(typical 85 nF)
- Fast switching
- 100% avalanche tested
- Impproved dv/dt capability
- 175 ℃ maximum junction temperature rating

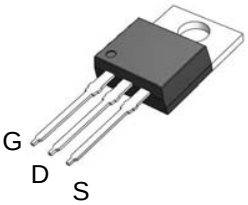
Applications

- DC/DC converters
- Automotive
- Portable equipment

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



TO-220FB-3L

Absolute Maximum Ratings (T_A = 25℃ unless otherwise noted)

Symbol	Parameter		MT3206A	Units
V_{DSS}	Drain-Source Voltage		60	V
I_D	Drain Current - Continuous (T_C = 25°C)		50	A
	- Continuous (T_C = 100°C)		28	A
I_{DM}	Drain Current - Pulsed	(Note 1)	180	A
V_{GSS}	Gate-Source Voltage		± 25	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	427	mJ
I_{AR}	Avalanche Current	(Note 1)	45	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	16	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0	V/ns
P_D	Power Dissipation (T_C = 25°C)		100	W
	- Derate above 25°C		0.8	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.64	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink	0.7	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	65.5	°C/W

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	60	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.06	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 48 V, T_C = 150°C	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 25 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -25 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	1.0	-	2.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 25 A	--	11.2	12.4	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 25 V, I_D = 25 A (Note 4)	--	23	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1386	1650	pF
C_{oss}	Output Capacitance		--	490	590	pF
C_{rss}	Reverse Transfer Capacitance		--	85	90	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 25 A, R_G = 25 Ω (Note 4, 5)	--	15	43	ns
t_r	Turn-On Rise Time		--	115	250	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	120	ns
t_f	Turn-Off Fall Time		--	62	110	ns
Q_g	Total Gate Charge	V_{DS} = 48 V, I_D = 50 A, V_{GS} = 10 V (Note 4, 5)	--	31	41	nC
Q_{gs}	Gate-Source Charge		--	8	--	nC
Q_{gd}	Gate-Drain Charge		--	13	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	50	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	170	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 50 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 50 A, dI_F / dt = 100 A/μs (Note 4)	--	57	--	ns
Q_{rr}	Reverse Recovery Charge		--	79	--	nC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 230μH, I_{AS} = 50A, V_{DD} = 25V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 50A, di/dt ≤ 300A/μs, V_{DD} ≤ $BV_{DSS,}$ Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

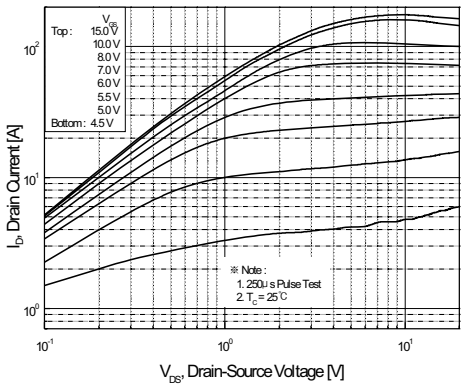


Figure 1. On-Region Characteristics

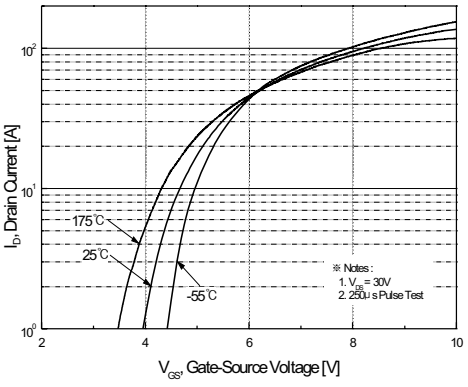


Figure 2. Transfer Characteristics

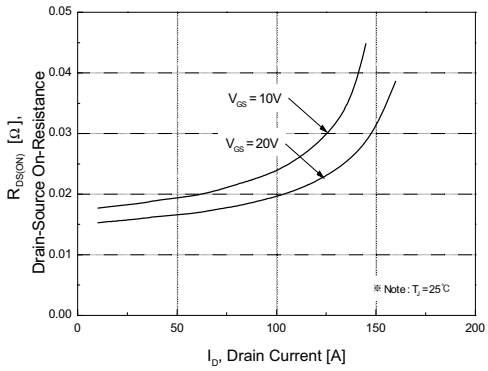


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

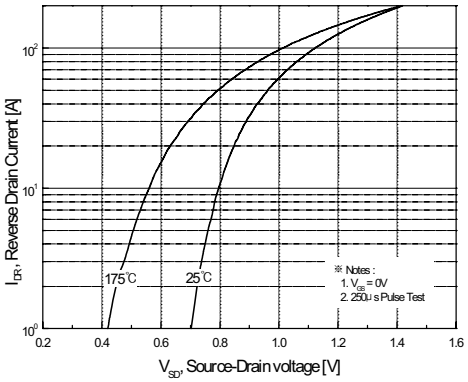


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

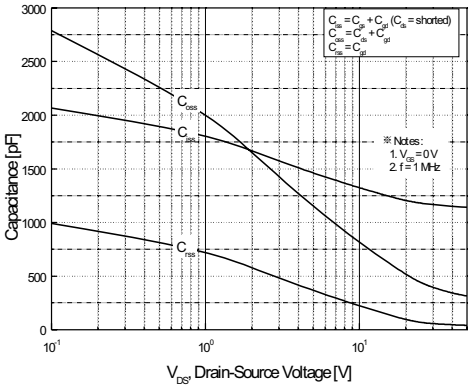


Figure 5. Capacitance Characteristics

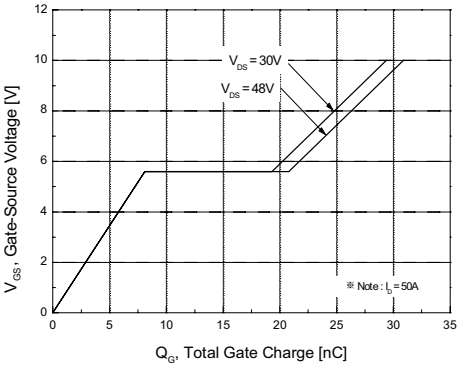


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

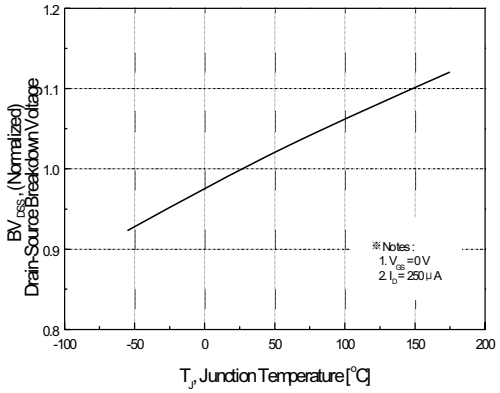


Figure 7. Breakdown Voltage Variation vs. Temperature

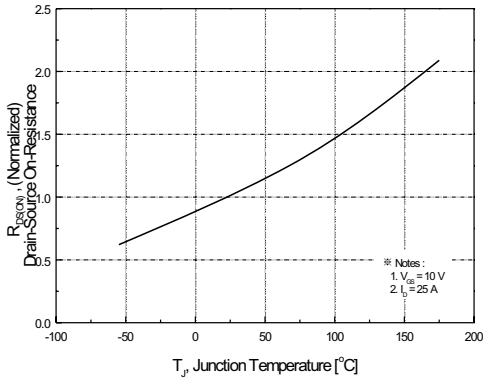


Figure 8. On-Resistance Variation vs. Temperature

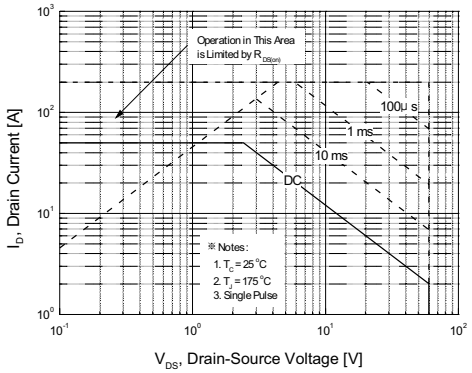


Figure 9. Maximum Safe Operating Area

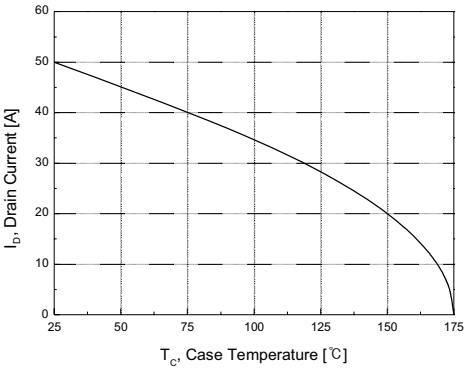


Figure 10. Maximum Drain Current vs. Case Temperature

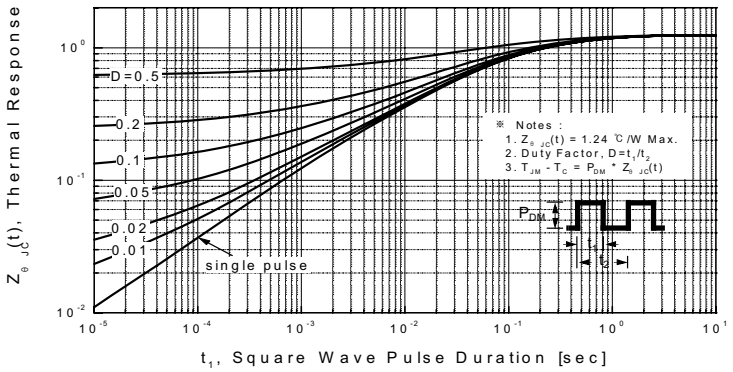
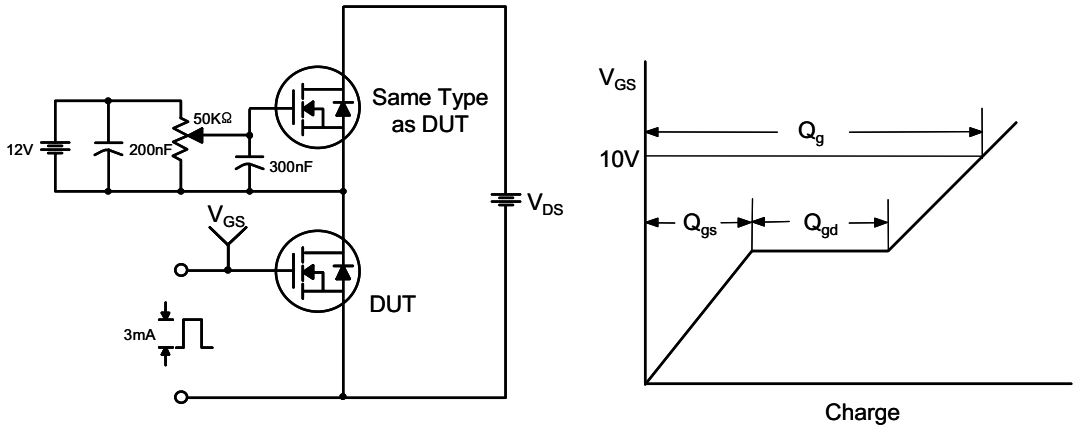
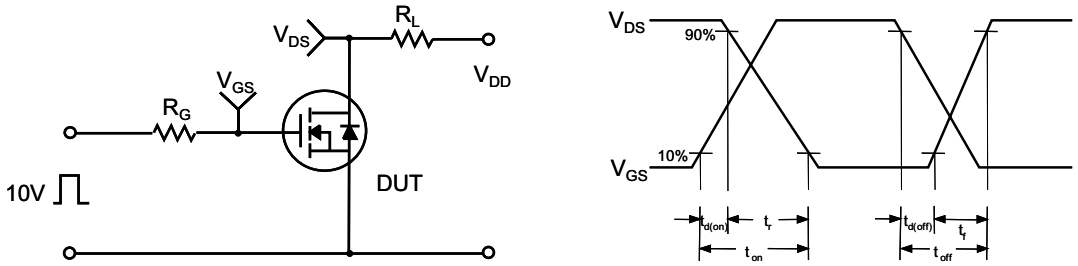


Figure 11. Transient Thermal Response Curve

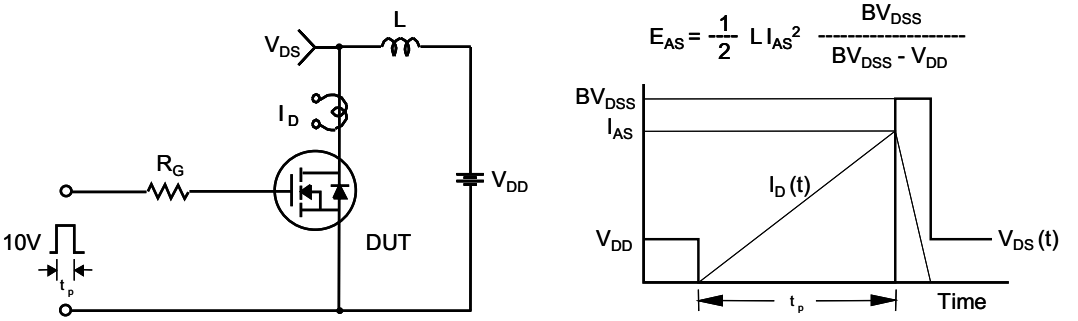
Gate Charge Test Circuit & Waveform



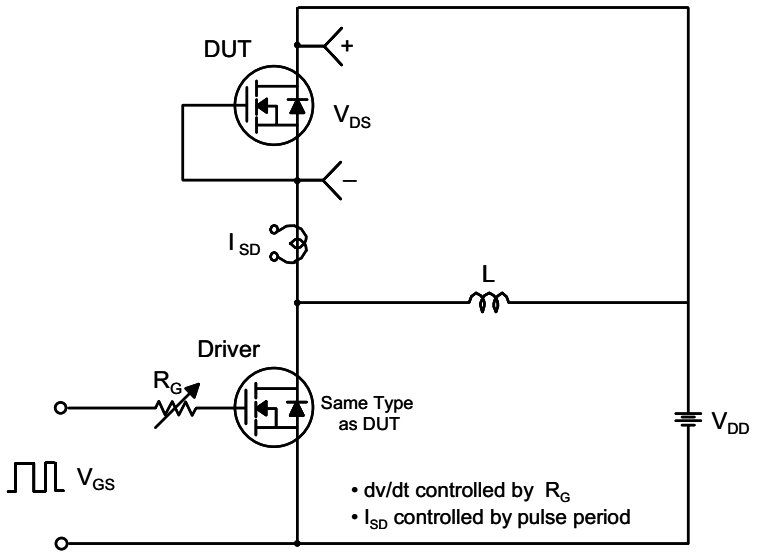
Resistive Switching Test Circuit & Waveforms

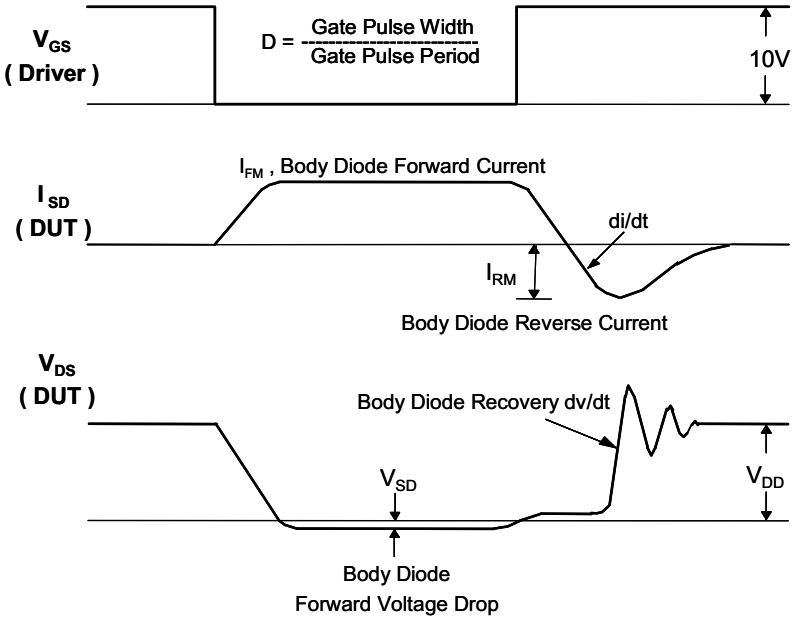


Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms





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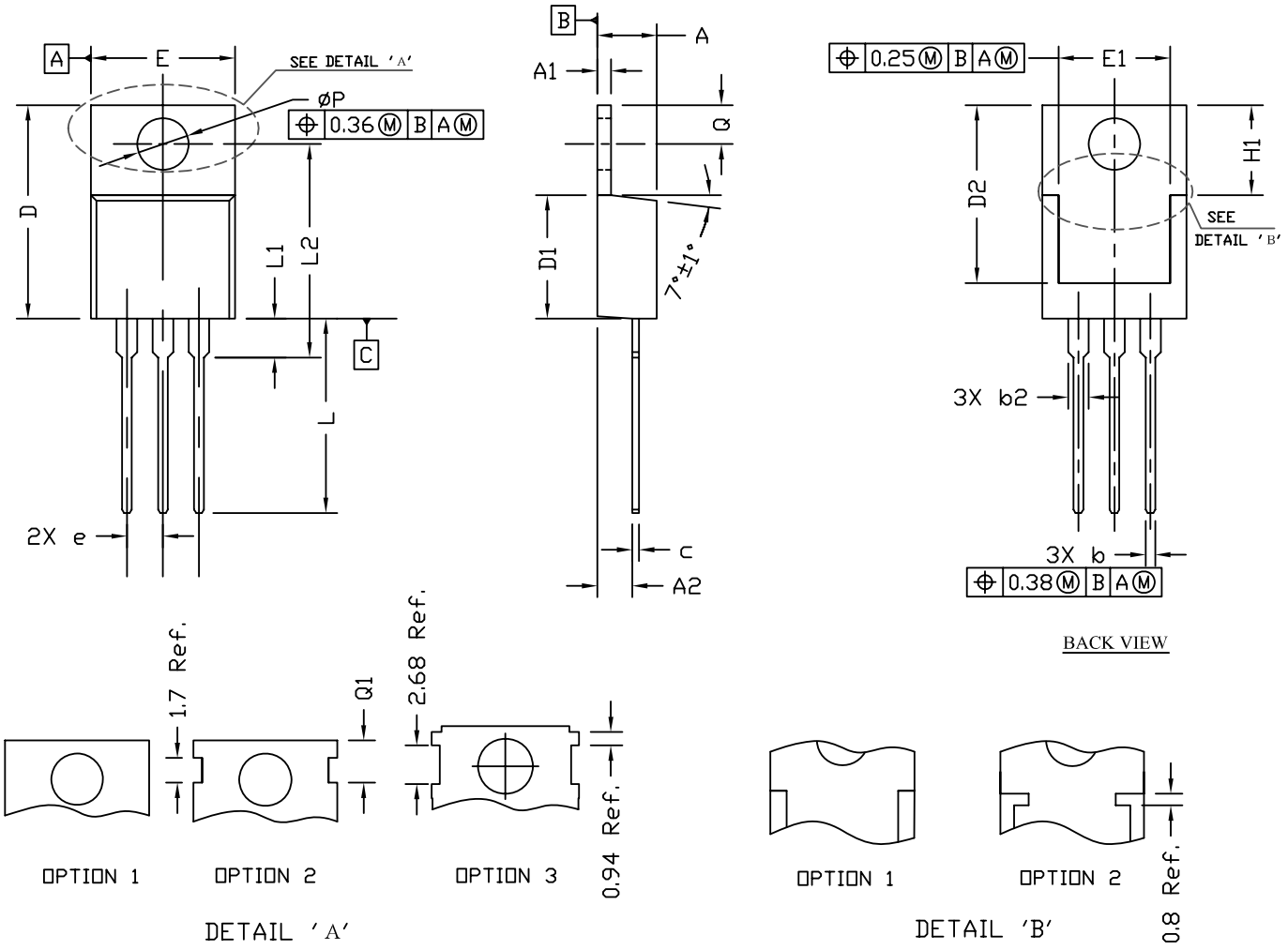
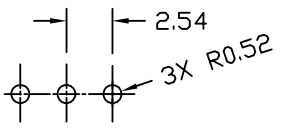
TO220 PACKAGE OUTLINE



RECOMMENDATION OF HOLE PATTERN



UNIT: mm

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
øP	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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Keep safety first in your circuit designs!

1. MOS-TECH Semiconductor Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
   Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.