MT3205A

N-Channel Power MOSFET
60V, 140A, 3.6mΩ

MT Semiconductor®

http://www.mtsemi.com

General Description

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

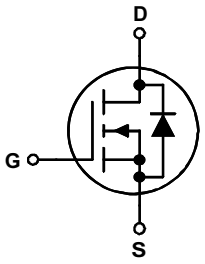
Features

- $R_{DS(on)}$ = 3.6mΩ(Typ.)@ V_{GS}= 10V, I_D= 100A
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability
- RoHS compliant

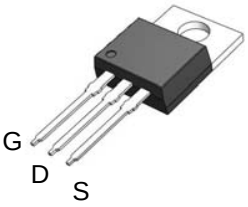
Applications

- DC/DC converters

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



TO-220FB-3L

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

Symbol	Parameter			Ratings	Units
V_{DSS}	Drain to Source Voltage			60	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	-Continuous (T_C = 25°C)	(Note 1)	140	A
I_{DM}	Drain Current	- Pulsed		470	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	700	mJ
P_D	Power Dissipation	(T_C = 25°C)		250	W
		- Derate above 25°C		1.0	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +175	°C

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	35	

Package Marking and Ordering Information T_C = 25°C unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3205A	MT3205A	TO-220	-	-	50units

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_J = 25	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 44V, V_{GS} = 0V	-	-	25	μA
		V_{DS} = 44V, T_C = 150°C	-	-	250	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	VGS = VDS, ID = 250μA	2		4	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 100A	-	3.6	4. 5	mΩ
		V_{GS} = 10V, I_D = 56A T_J = 175°C	-	10	-	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V f = 1MHz	-	3520	4360	pF
C_{oss}	Output Capacitance		-	550	760	pF
C_{rss}	Reverse Transfer Capacitance		-	340	470	pF
R_G	Gate Resistance	V_{GS} = 0V, f = 1MHz	3	4	5	Ω
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V; V_{DS} = 44V, I_D = 59A, I_g = 1mA	-	121	145	nC
$Q_{g(th)}$	Threshold Gate Charge	V_{GS} = 0V to 2V; V_{DS} = 44V, I_D = 59A, I_g = 1mA	-	35	46	nC
Q_{gs}	Gate to Source Gate Charge	V_{DS} = 44V, I_D = 59A, I_g = 1mA	-	45	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau	V_{DS} = 44V, I_D = 59A, I_g = 1mA		18	-	nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DS} = 44V, I_D = 59A, I_g = 1mA	-	39	-	nC
Switching Characteristics						
t_{ON}	Turn-On Time	V_{DD} = 28V, I_D = 59A V_{GS} = 10V, R_{GEN} = 2.5Ω	-	99	137	ns
$t_{d(on)}$	Turn-On Delay Time		-	19	38	ns
t_r	Turn-On Rise Time		-	127	251	ns
$t_{d(off)}$	Turn-Off Delay Time		-	47	73	ns
t_f	Turn-Off Fall Time		-	19	49	ns
t_{OFF}	Turn-Off Time		-	67	89	ns
Drain-Source Diode Characteristics						
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 59A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 59A dI_F/dt = 100A/μs	-	49	-	ns
Q_{rr}	Reverse Recovery Charge		-	78	-	nC

Notes:
1: Calculated continuous current based on maximum allowable junction temperature. Package limited to 75A continuous, see Figure 9.
2: L = 0.21mH, I_{AS} = 59A, V_{DD} = 50V, V_{GS} = 10V, R_G = 25Ω, Starting T_J = 25°C

Typical Performance Characteristics

Figure 1. On-Region Characteristics

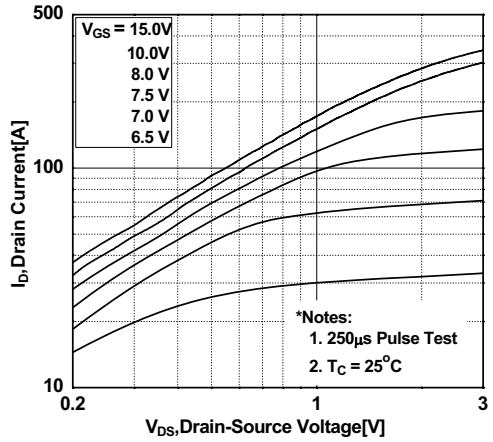


Figure 2. Transfer Characteristics

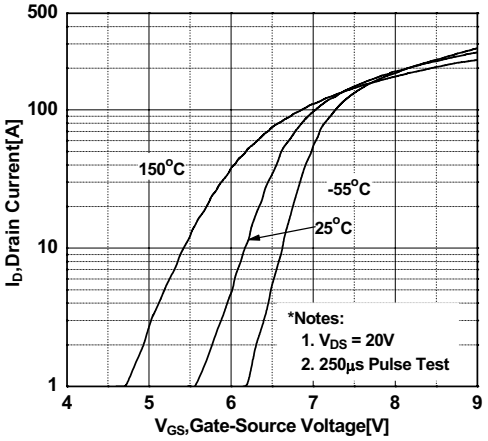


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

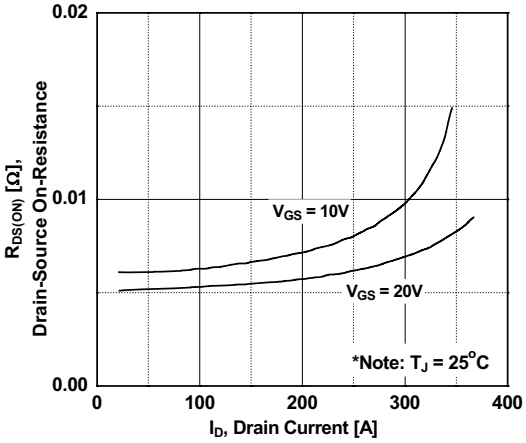


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

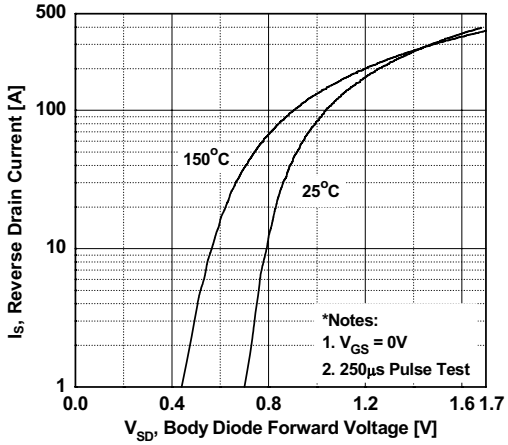


Figure 5. Capacitance Characteristics

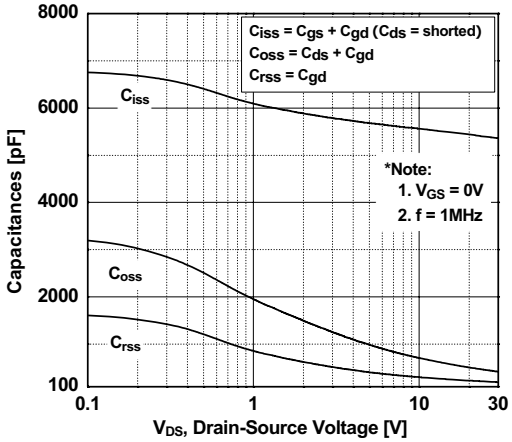
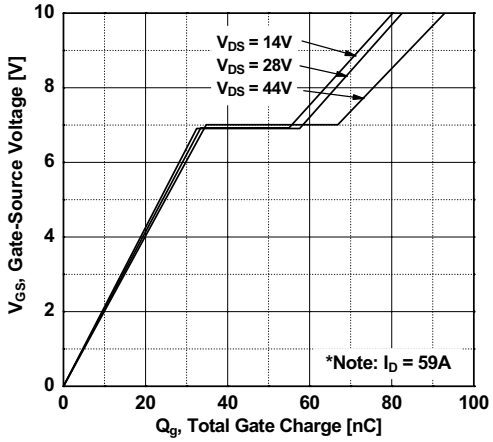


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

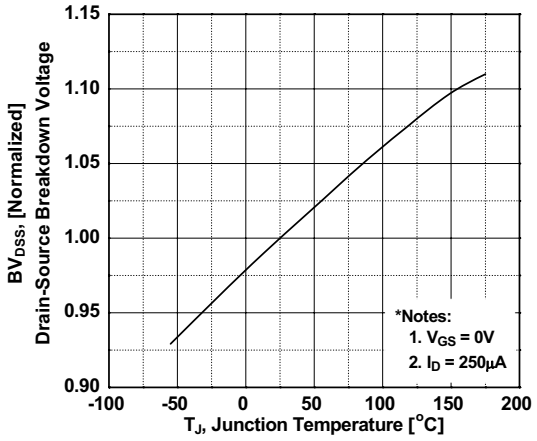


Figure 8. On-Resistance Variation vs. Temperature

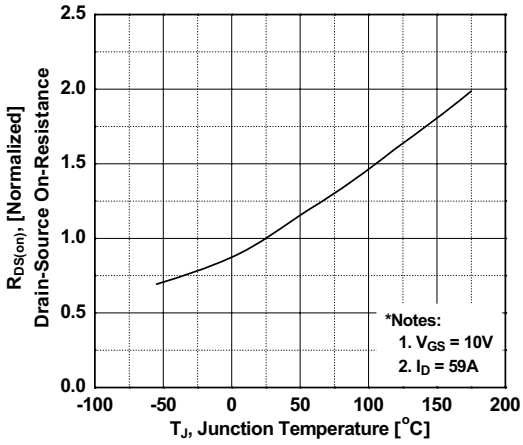


Figure 9. Maximum Safe Operating Area

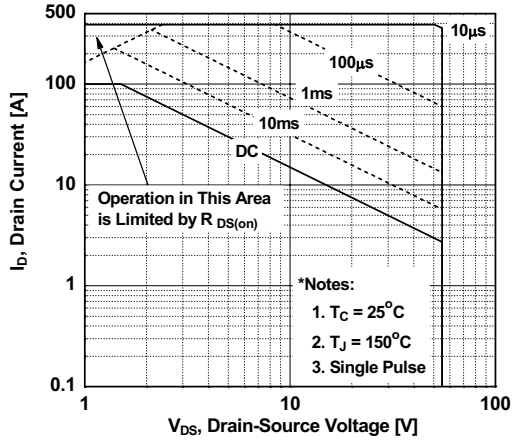


Figure 10. Maximum Drain Current vs. Case Temperature

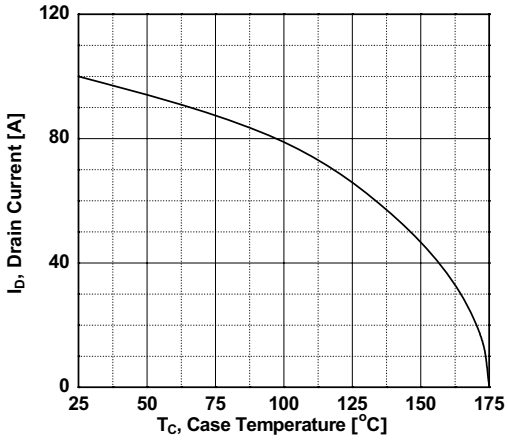
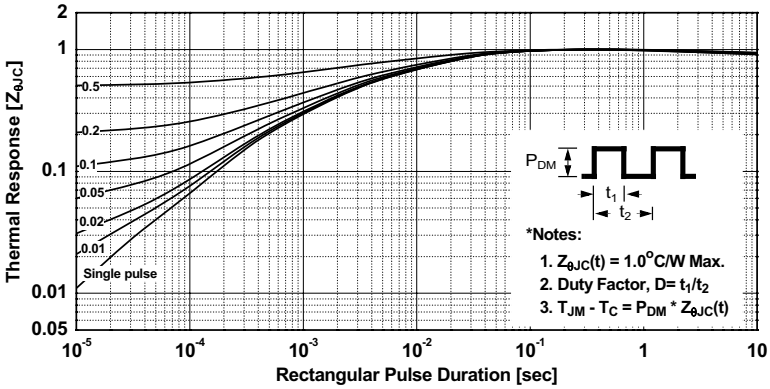
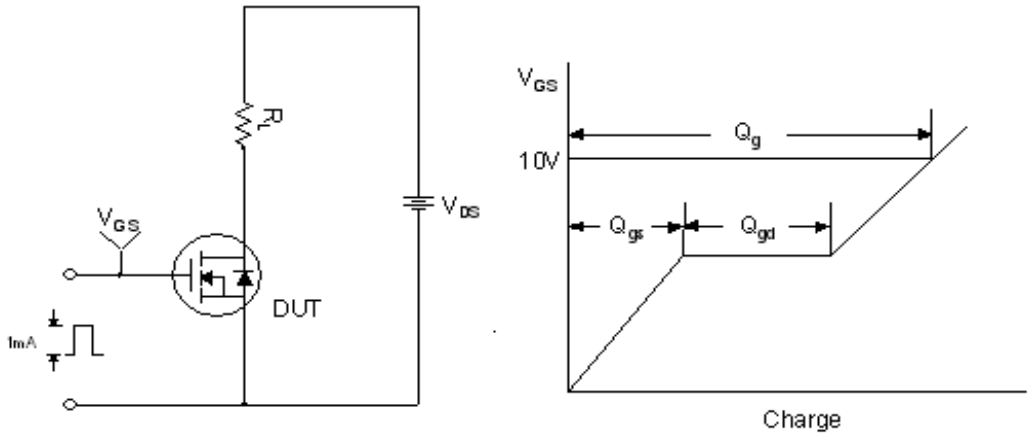


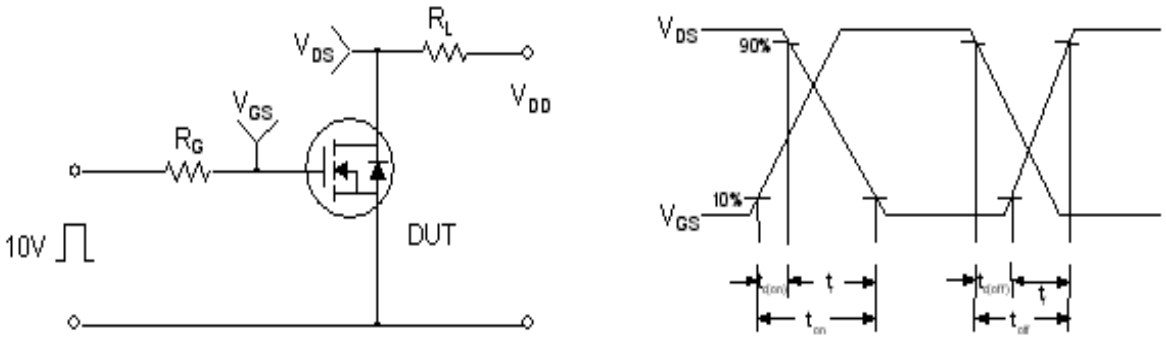
Figure 11. Transient Thermal Response Curve



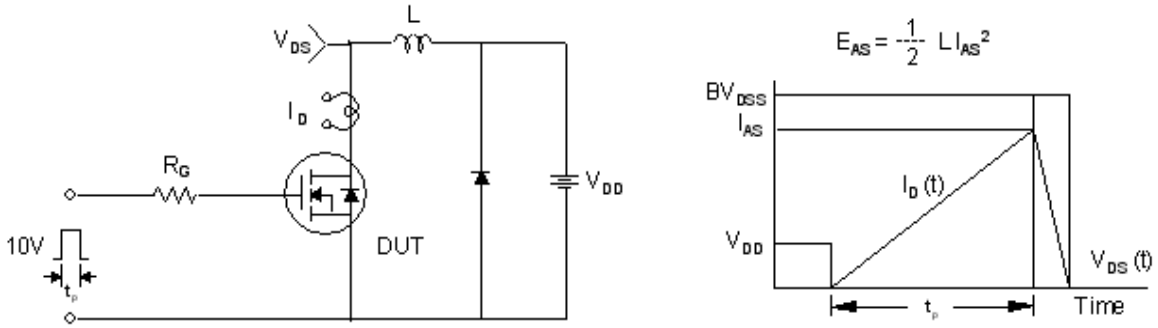
Gate Charge Test Circuit & Waveform



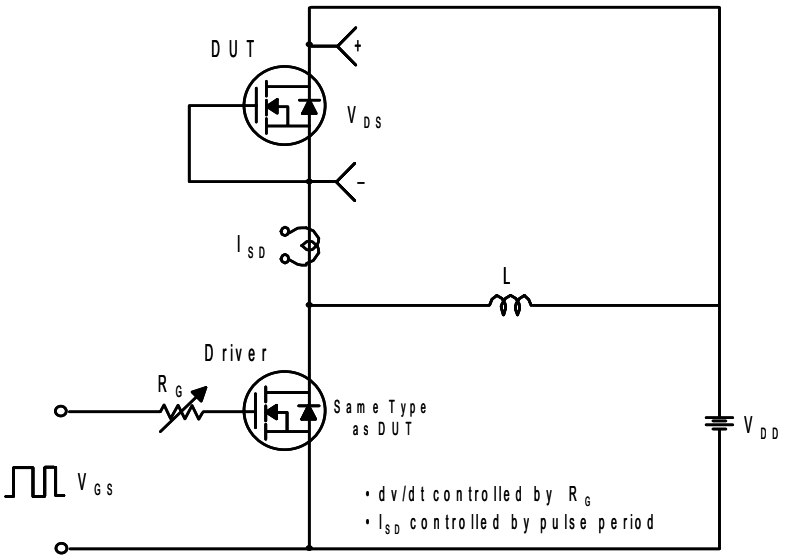
Resistive Switching Test Circuit & Waveforms

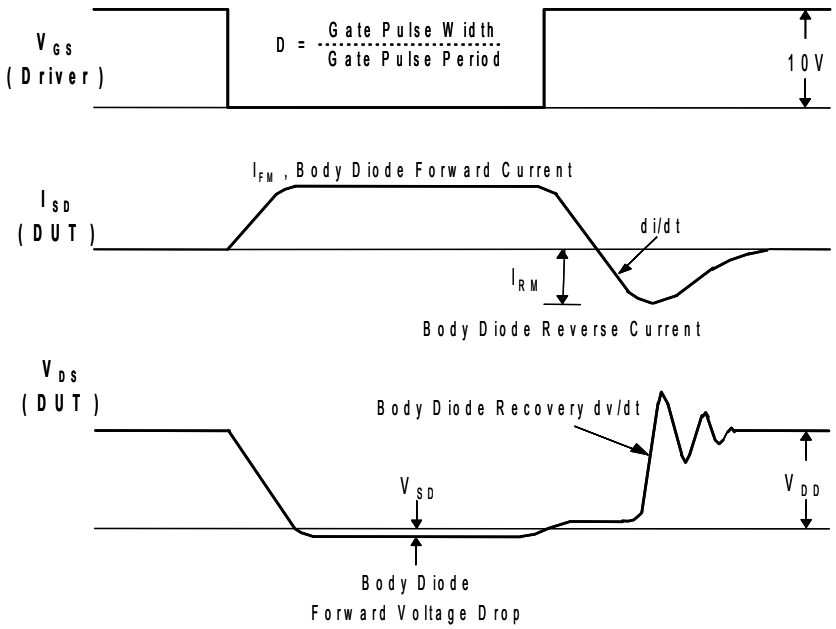


Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms





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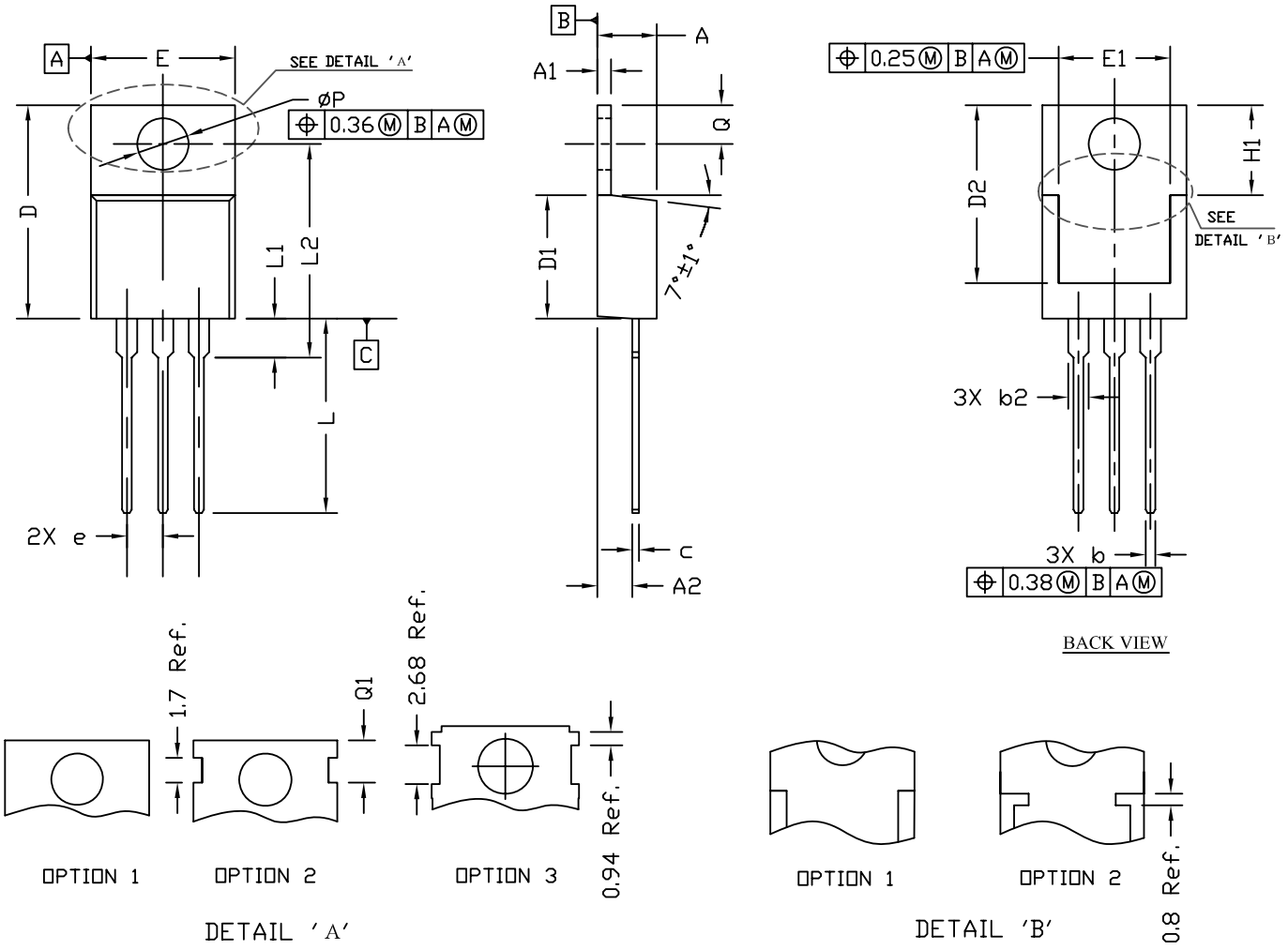
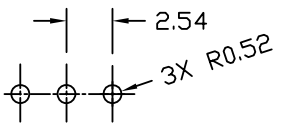
TO220 PACKAGE OUTLINE



RECOMMENDATION OF HOLE PATTERN



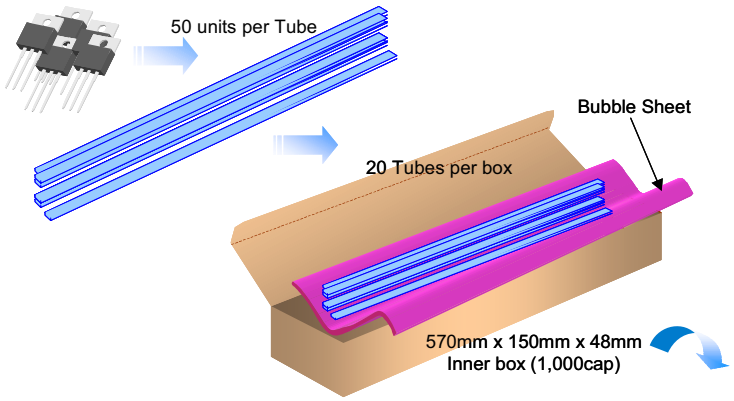
UNIT: mm

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

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.

TO-220 Short Lead Tube Packing Data

TO-220 Short Lead Tube Packing Configuration: Figure 1.0



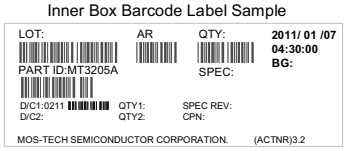
Packaging Description:

TO-220 parts are shipped normally in tube. The tube is made of PVC plastic treated with anti-static agent.These tubes in standard option are placed inside a dissipative plastic bubble sheet, barcode labeled, and placed inside a box made of recyclable corrugated paper. One box contains twenty tubes maximum (see fig. 1.0). And one or several of these boxes are replaced inside a labeled shipping box which comes in different sizes depending on the number of parts shipped. The units in this option are placed inside a small box laid with anti-static bubble sheet. These larger boxes then will be placed finally inside a labeled shipping box which still comes in different sizes depending on the number of units shipped.

TO-220 Short Lead Packaging Information: Figure 2.0

TO-220 Packaging Information	
Packaging Option	Standard (no flow code)
Packaging type	Rail/Tube
Qty per Tube/ Inner Box	50
Inner Box Dimension (mm)	570x150x48
Max qty per Box	1,000
Outer Box Dimension (mm)	590x330x245
Max qty per Box	8,000
Weight per unit (gm)	1.9588
Note/Comments	

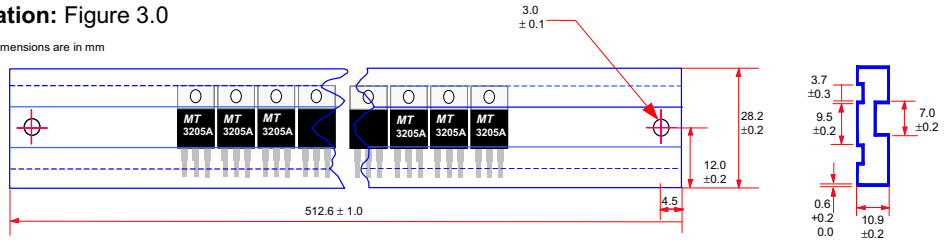
Inner Box Barcode Label Sample



Outer Box Barcode Label Sample

TO-220 Short Lead Tube Configuration: Figure 3.0

Note: All dimensions are in mm



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   3）用于治疗（切除患部、给药等）的装置。
   4）其他直接影响到人的生命的装置。
9. 在使用本资料所记载的产品时，对于最大额定值、工作电源电压的范围、放热特性、安装条件及其他条件请在本公司规定的保证范围内使用。如果超出了本公司规定的保证范围使用时，对于由此而造成的故障和出现的事故，本公司将不承担任何责任。
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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.