MT3256/S

N-Channel 60V/50A Power MOSFET

MT Semiconductor®

http://www.mtsemi.com

Features

- Max R_{DS}(on)=10mΩ at V_{GS} =10V,I_D=25A
- Low gate charge(typical 43 nC)
- Low crss(typical 85pF)
- 100% avalanche tested
- Improved dv/dt capability

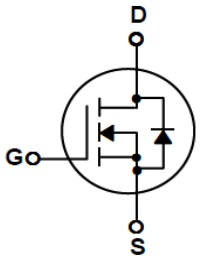
General Description

These N-Channel enhancem ent m ode power field effect transistors ar e produced using Mos-tech's proprietary, planar stripe, DMOS technology.

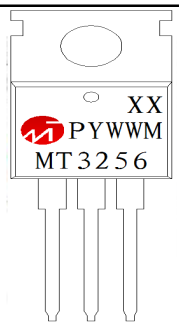
Applications

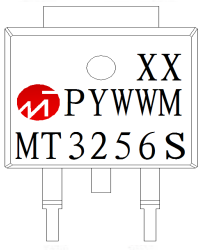
- DC-DC Buck Converters
- Notebook battery power management
- Load Switch im Notebook

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT





Package Code

MT3256: TO-220FB-3L

MT3256S:TO-252-2L

Date Code PYWWM

Lot NO XX

MOSFET Maximum Ratings T_C = 25°C 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 Curren	- Continuous (Silicon Limited)	T_C = 25°C	50	A
		- Continuous(Package Limited)	T_C = 25°C	28	
		- Continuous	T_C = 25°C(Note 1a)	45	
		- Pulsed		180	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 3)	10	mJ
P_D	Power Dissipation	- T_C = 25°C	(Note 1a)	TO-220=100/TO-252=50	W
		- T_A = 25°C	(Note 1b)	0.9	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C

Thermal Characteristics

Symbol	Parameter		Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	1.64	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	65.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3206/S	MT3206/S	TO-220/TO-252	-	-	50/2500

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	2.0	2.7	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 25 A	--	10	--	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 25 V, I_D = 25 A (Note 4)	--	20	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1380	1600	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)	--	18	45	ns
t_r	Turn-On Rise Time		--	135	270	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns
t_f	Turn-Off Fall Time		--	65	140	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	--	-	1.25	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

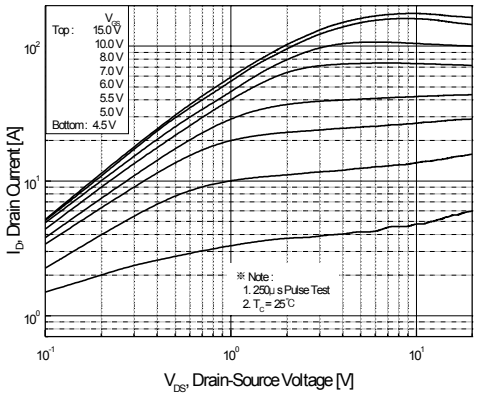


Figure 1. On-Region Characteristics

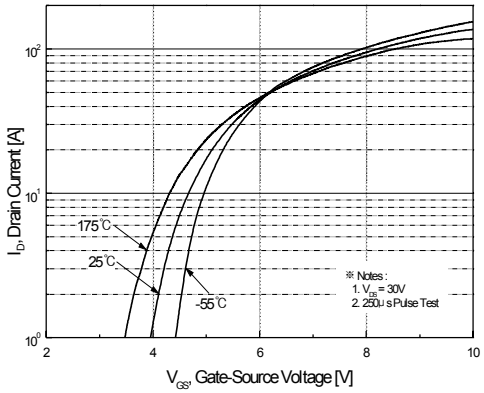


Figure 2. Transfer Characteristics

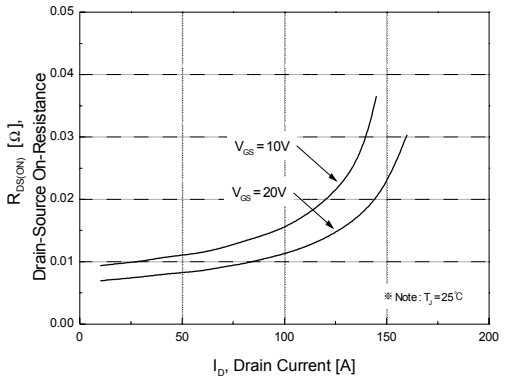


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

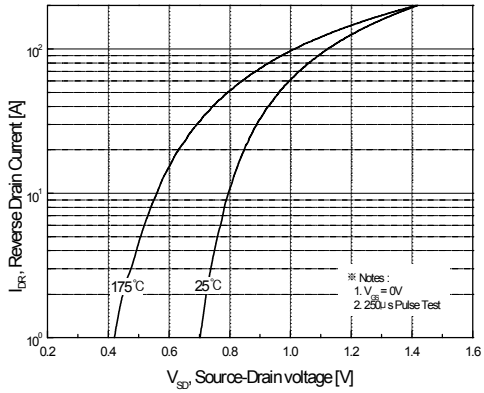


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

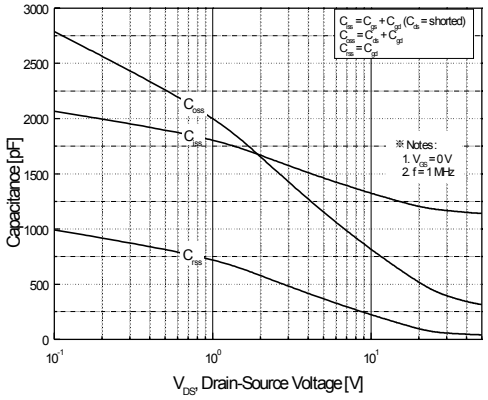


Figure 5. Capacitance Characteristics

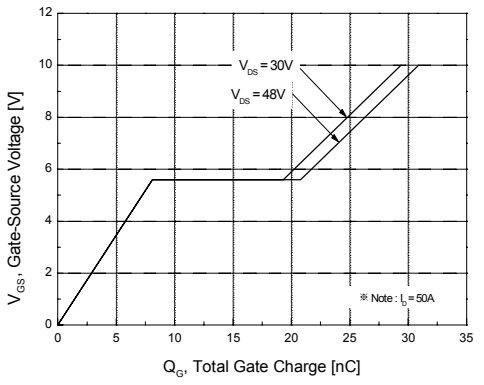


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

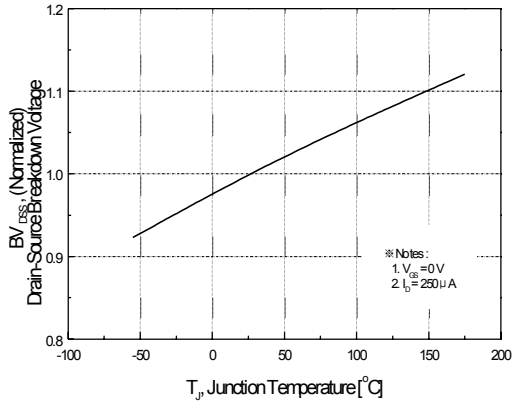


Figure 7. Breakdown Voltage Variation vs. Temperature

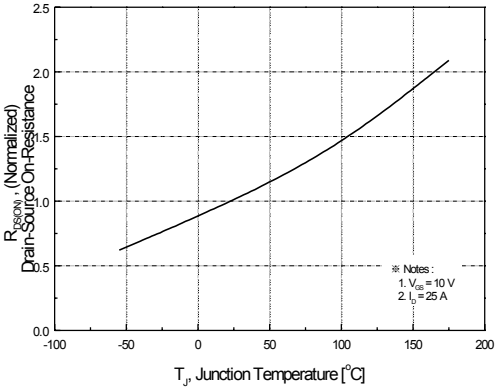


Figure 8. On-Resistance Variation vs. Temperature

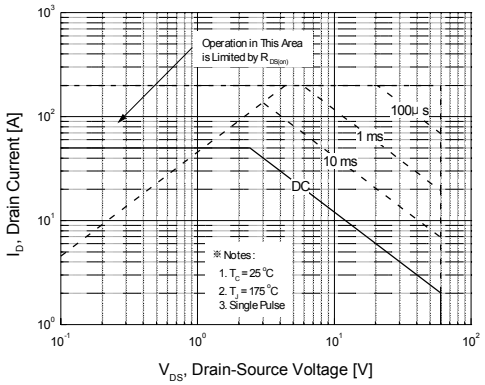


Figure 9. Maximum Safe Operating Area

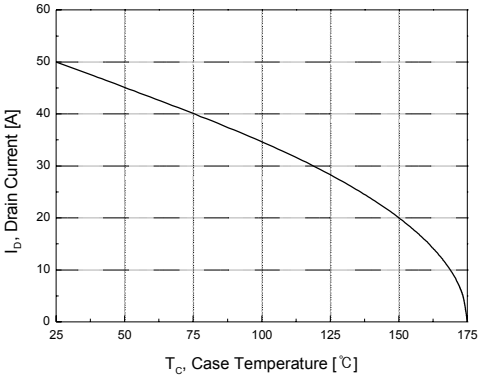


Figure 10. Maximum Drain Current vs. Case Temperature

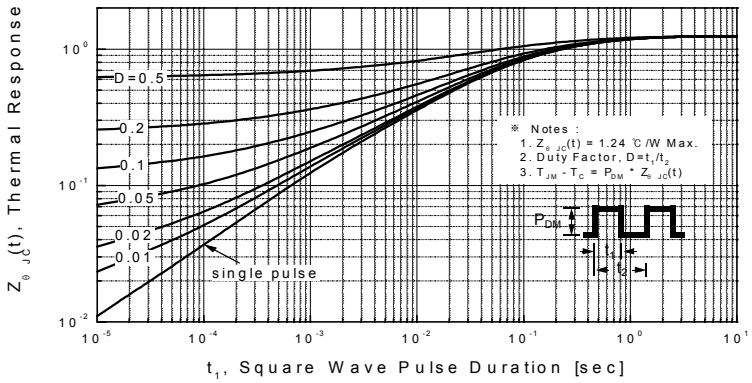
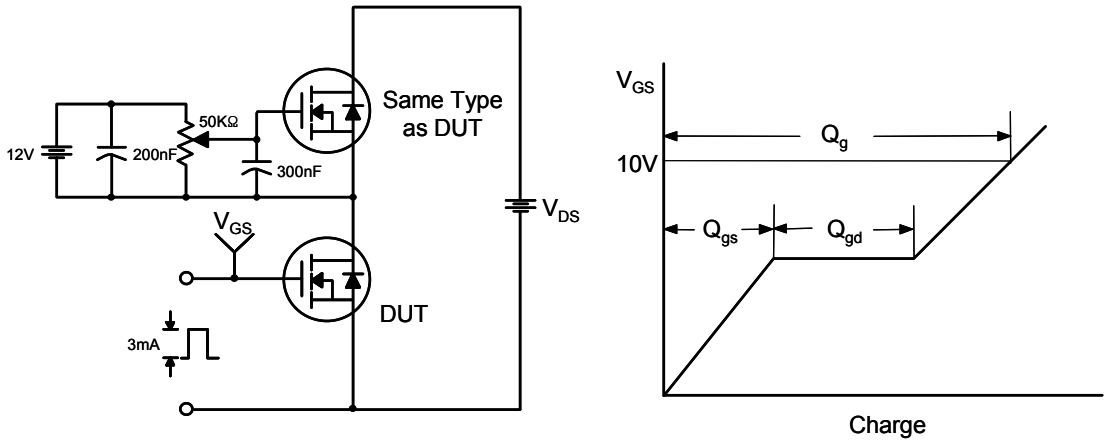
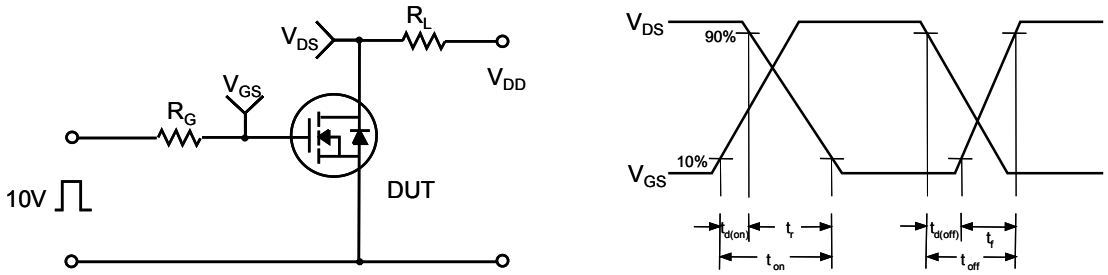


Figure 11. Transient Thermal Response Curve

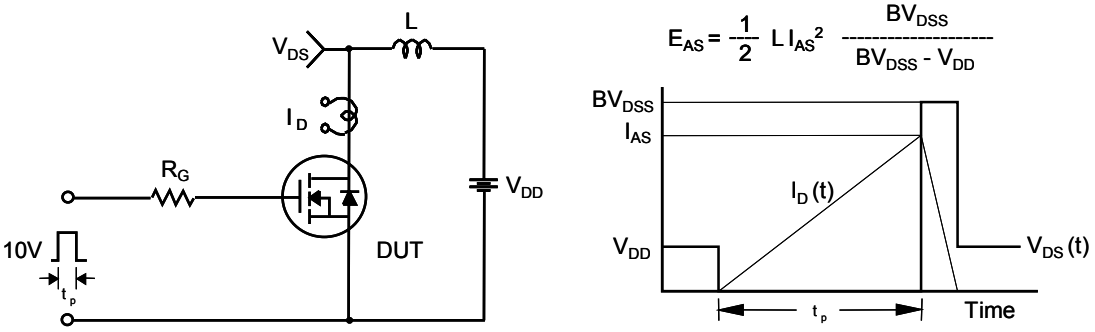
Gate Charge Test Circuit & Waveform



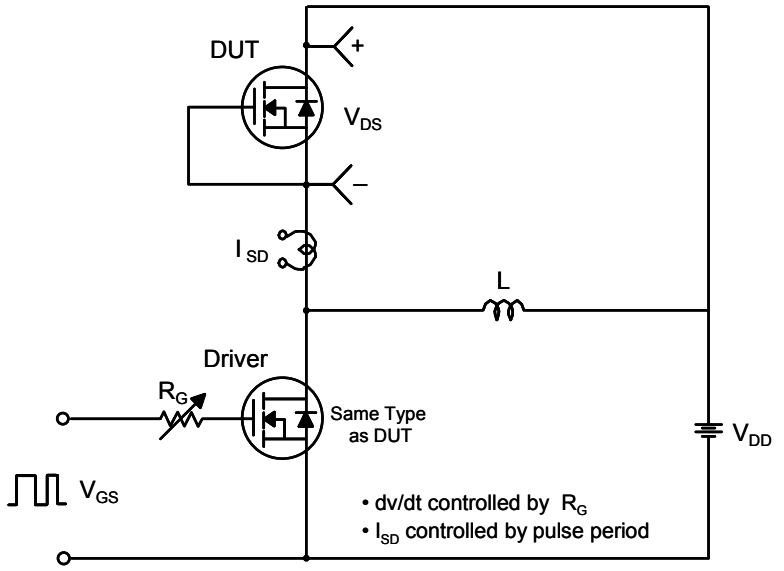
Resistive Switching Test Circuit & Waveforms

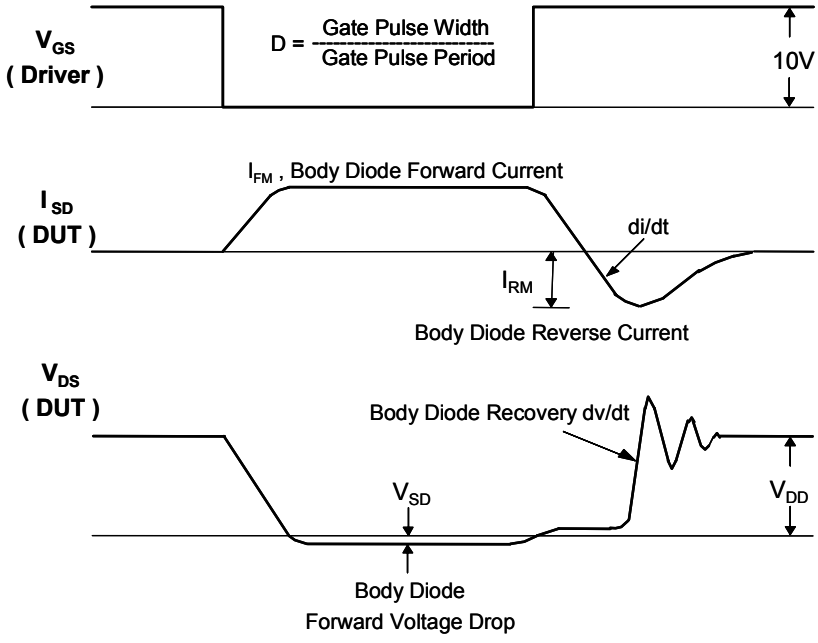


Unclamped Inductive Switching Test Circuit & Waveforms



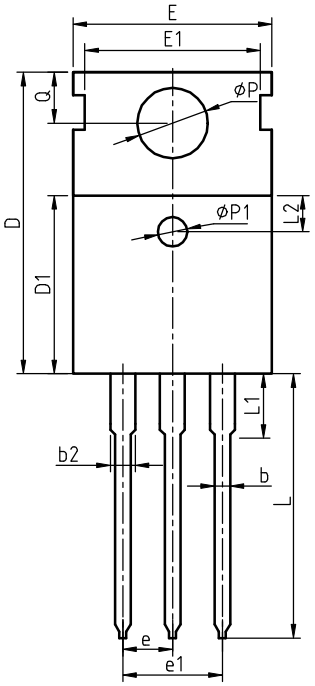
Peak Diode Recovery dv/dt Test Circuit & Waveforms

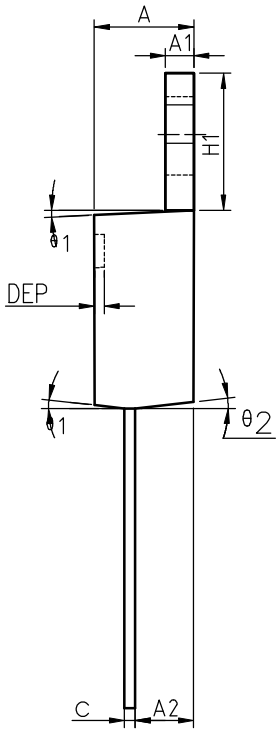


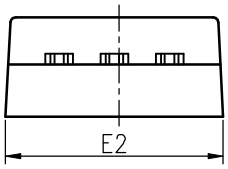


Package Information

TO-220FB-3L





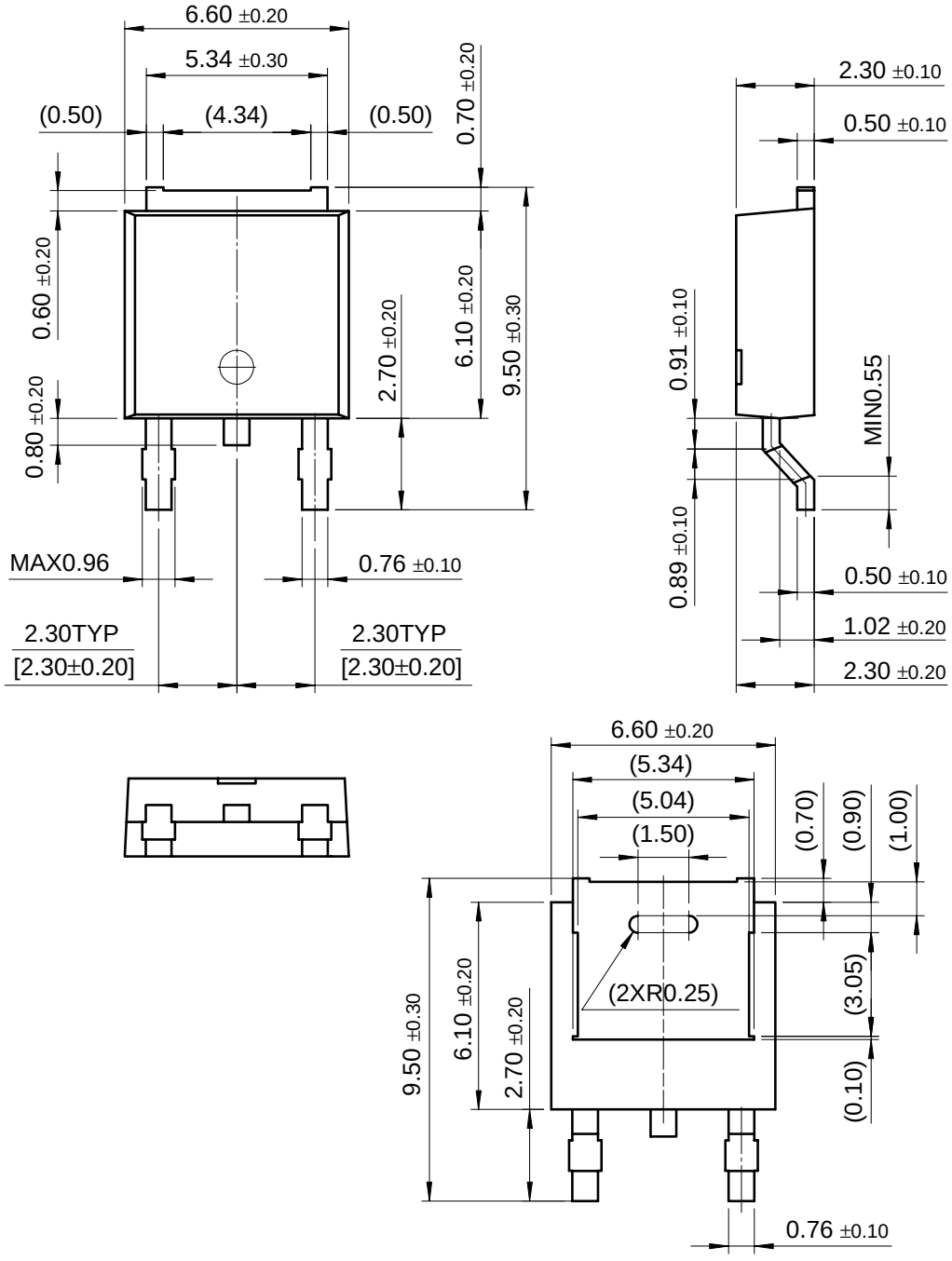


COMMON DIMENSIONS

SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.27	1.30	1.33	0.050	0.051	0.052
A2	2.35	2.40	2.50	0.093	0.094	0.098
b	0.77	0.80	0.90	0.030	0.031	0.035
b2	1.17	1.27	1.36	0.046	0.050	0.054
c	0.48	0.50	0.56	0.019	0.020	0.022
D	15.40	15.60	15.80	0.606	0.614	0.622
D1	9.00	9.10	9.20	0.354	0.358	0.362
DEP	0.05	0.10	0.20	0.002	0.004	0.008
E	9.80	10.00	10.20	0.386	0.394	0.402
E1	-	8.70	-	-	0.343	-
E2	9.80	10.00	10.20	0.386	0.394	0.402
e		2.54	BSC		0.100	BSC
e1		5.08	BSC		0.200	BSC
H1	6.40	6.50	6.60	0.252	0.256	0.260
L	12.75	13.50	13.65	0.502	0.531	0.537
L1	-	3.10	3.30	-	0.122	0.130
L2		2.50	REF		0.098	REF
P	3.50	3.60	3.63	0.138	0.142	0.143
P1	3.50	3.60	3.63	0.138	0.142	0.143
Q	2.73	2.80	2.87	0.107	0.110	0.113
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°
θ3	1°	3°	5°	1°	3°	5°

Package Dimensions

TO-252-2L



Dimensions in Millimeters

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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.