

# MT3117/B

## N-Channel 125V/170A Power MOSFET

### Features

- Typ  $R_{DS(on)}=6.3m\Omega$  /  $V_{GS}=10V, I_D=85A$
- Fast Switching Speed
- Low Gate Charge
- 100% avalanche tested

### General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

### Applications

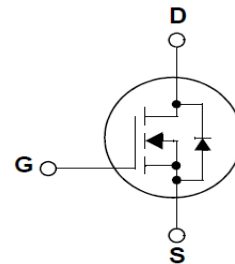
- DC-DC primary bridge
- DC-DC Synchronous rectification
- Power Management for Inverter Systems



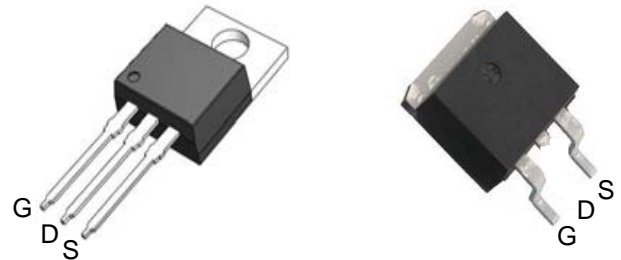
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### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



		<b>Package Code</b> MT3117: T0-220FB-3L MT3117B: T0-263-2L
		<b>Date Code</b> <b>Lot No</b> PYWWM                              XX

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
<b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted)				
$V_{DSS}$	Drain-Source Voltage	125	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 25$		
$T_J$	Maximum Junction Temperature	175	$^\circ C$	
$T_{STG}$	Storage Temperature Range	-55 to 175	$^\circ C$	
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ C$	170	A

**Mounted on Large Heat Sink**

$I_{DM}$	Pulsed Drain Current *	$T_C=25^\circ\text{C}$	585**	A
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$	170	A
		$T_C=100^\circ\text{C}$	124	
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	339	W
		$T_C=100^\circ\text{C}$	170	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		0.44	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		62.5	

**Avalanche Ratings**

$E_{AS}$	Avalanche Energy, Single Pulsed	$L=0.5\text{mH}$	1155***	mJ
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Note : \* Repetitive rating ; pulse width limited by junction temperature

\*\* Drain current is limited by junction temperature

\*\*\*  $V_D=100\text{V}$

**Electrical Characteristics** ( $T_C = 25^\circ\text{C}$  Unless Otherwise Noted)

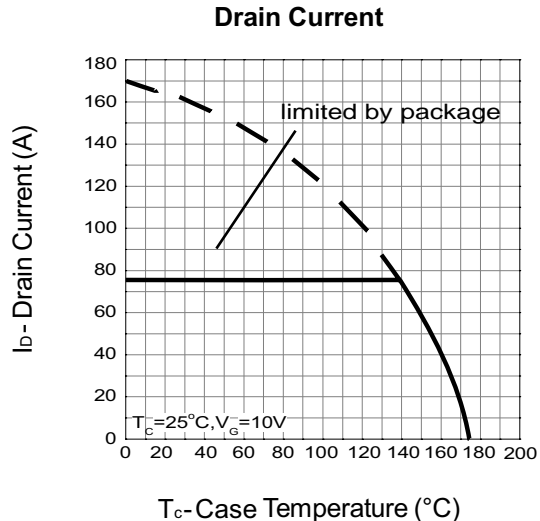
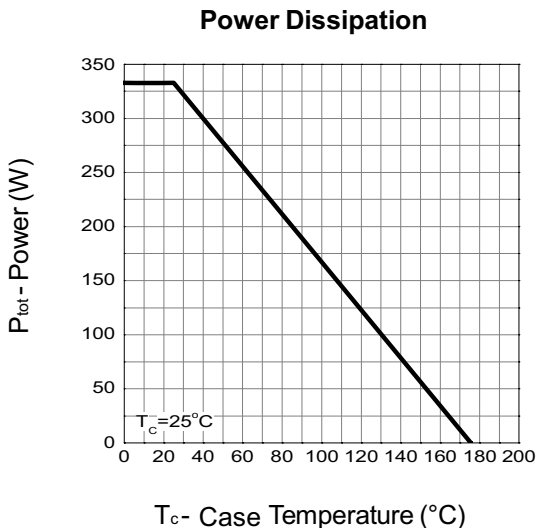
Symbol	Parameter	Test Conditions				Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_{DS}=250\mu\text{A}$	125	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=125\text{V}, V_{GS}=0\text{V}$ $T_J=85^\circ\text{C}$	-	-	1	$\mu\text{A}$
			-	-	10	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	2.0	3.0	4.0	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 25\text{V}, V_{DS}=0\text{V}$	-	-	$\pm 100$	nA
$R_{DS(ON)}^*$	Drain-Source On-state Resistance	$V_{GS}=10\text{V}, I_{DS}=85\text{A}$	-	6.3	7.5	$\text{m}\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^*$	Diode Forward Voltage	$I_{SD}=85\text{A}, V_{GS}=0\text{V}$	-	0.8	1	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=85\text{A}, dI_{SD}/dt=100\text{A}/\mu\text{s}$	-	70	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	110	-	nC

## Electrical Characteristics (Cont.) ( $T_C = 25^\circ\text{C}$ Unless Otherwise Noted)

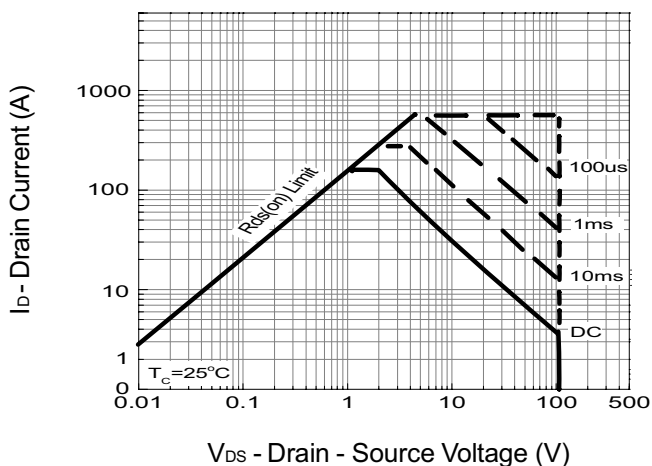
Symbol	Parameter	Test Conditions				Unit
			Min.	Typ.	Max.	
<b>Dynamic Characteristics</b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	3.0	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=25V,$ Frequency=1.0MHz	-	8162	-	pF
$C_{oss}$	Output Capacitance		-	980	-	
$C_{rss}$	Reverse Transfer Capacitance		-	509	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=62.5\text{ V}, R_G=6\ \Omega,$ $I_{DS}=85A, V_{GS}=10V,$	-	35	-	ns
$T_r$	Turn-on Rise Time		-	46	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	95	-	
$T_f$	Turn-off Fall Time		-	52	-	
<b>Gate Charge Characteristics</b>						
$Q_g$	Total Gate Charge	$V_{DS}=100V, V_{GS}=10V,$ $I_{DS}=85A$	-	189	-	nC
$Q_{gs}$	Gate-Source Charge		-	29	-	
$Q_{gd}$	Gate-Drain Charge		-	70	-	

Note \* : Pulse test ; pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

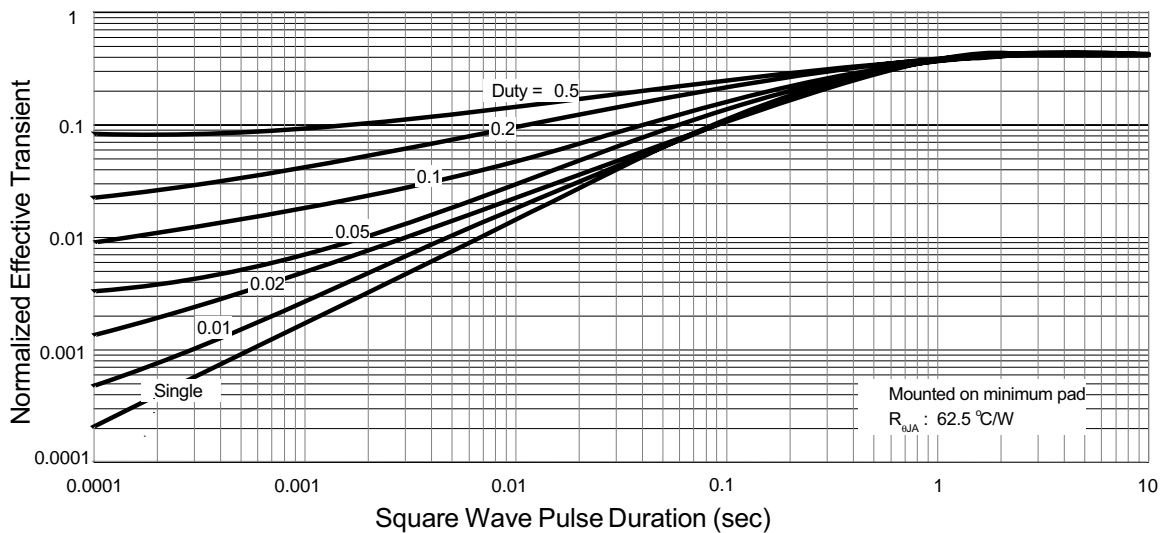
## Typical Operating Characteristics



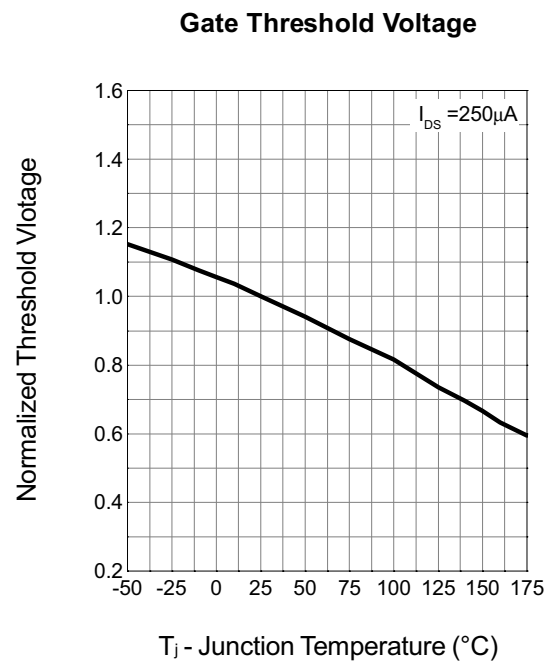
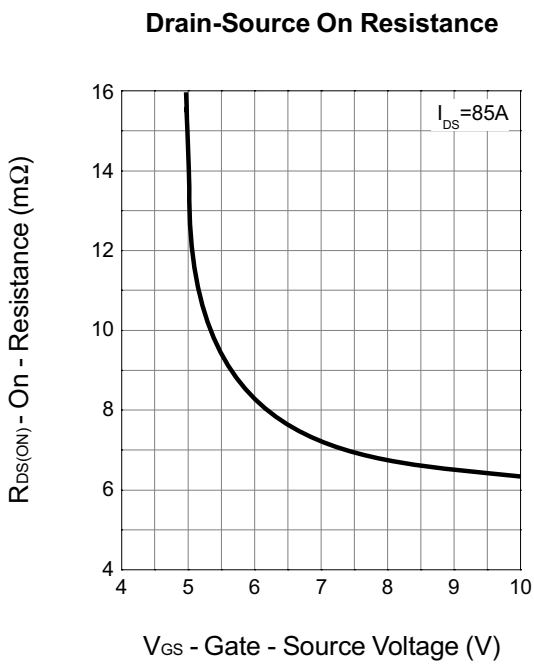
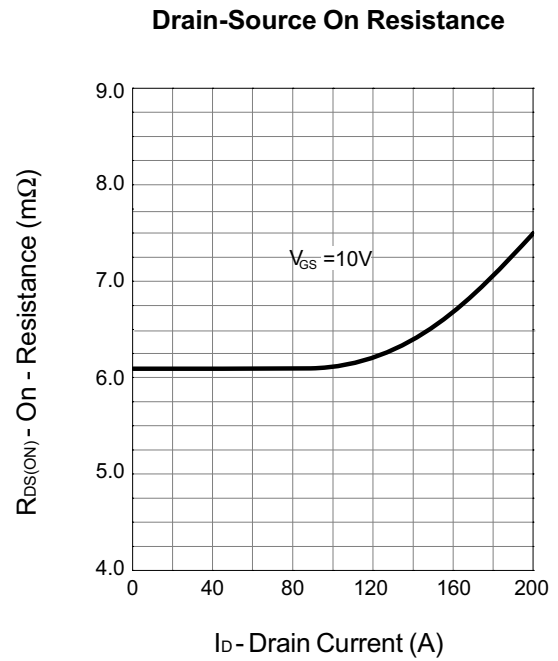
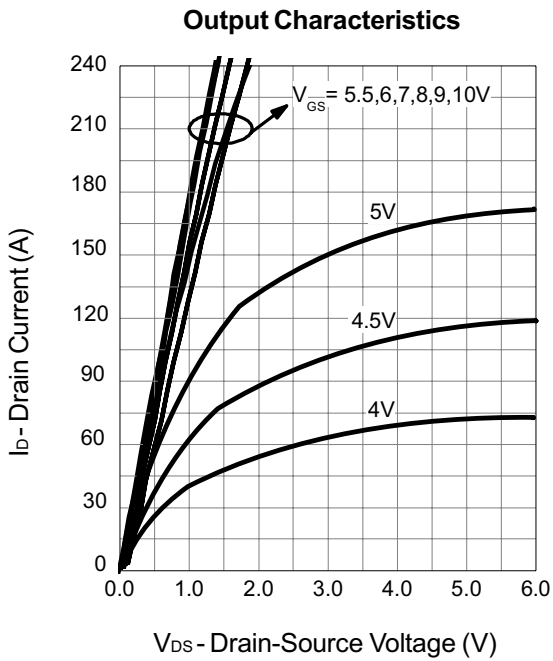
### Safe Operation Area



### Thermal Transient Impedance

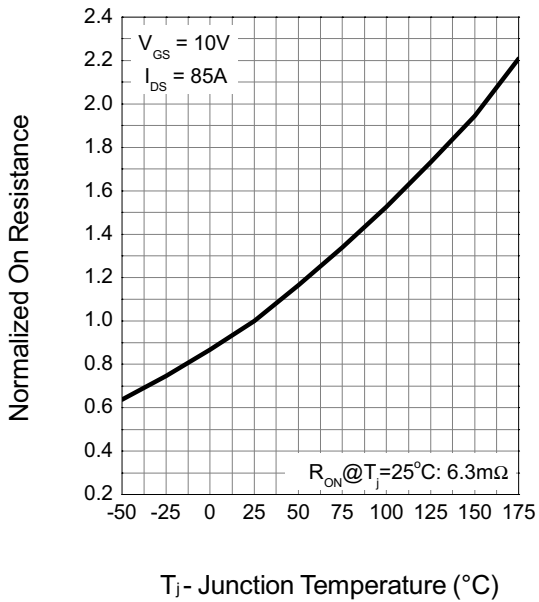


## Typical Operating Characteristics (Cont.)

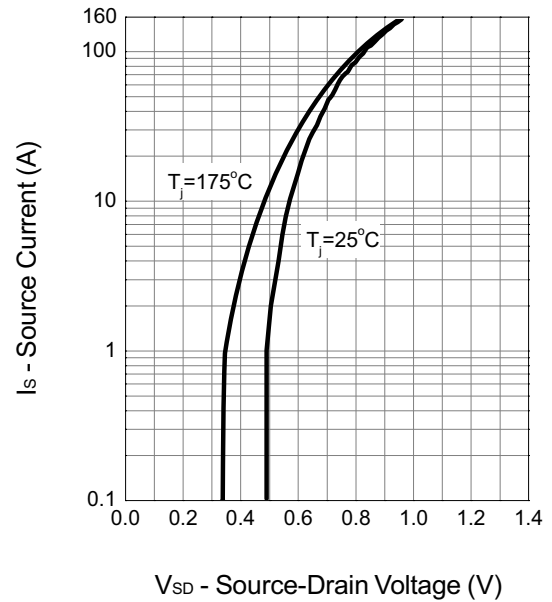


## Typical Operating Characteristics (Cont.)

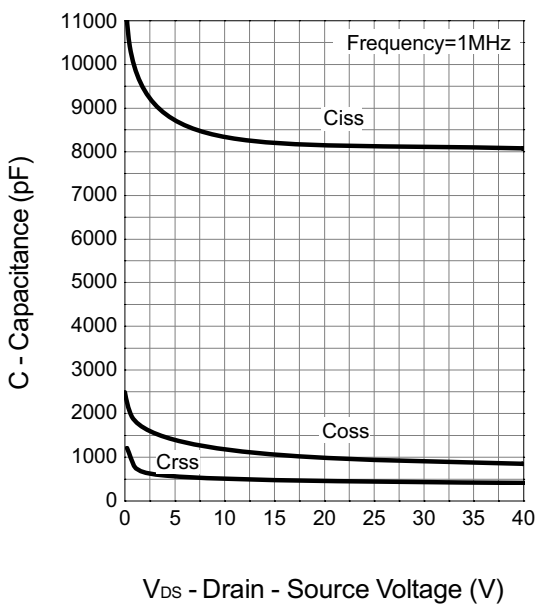
**Drain-Source On Resistance**



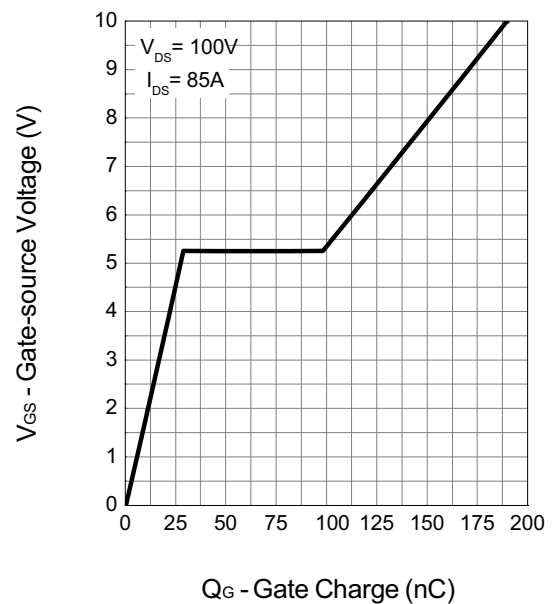
**Source-Drain Diode Forward**



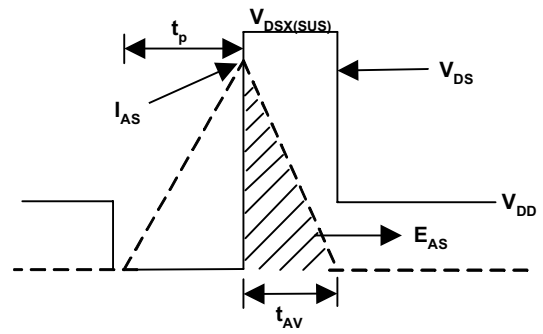
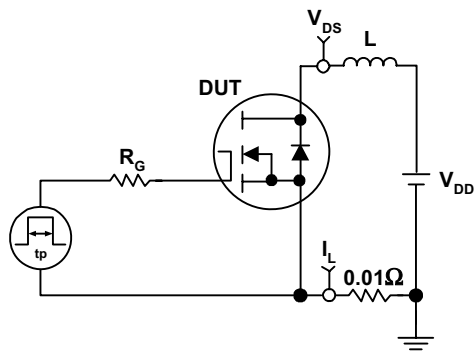
**Capacitance**



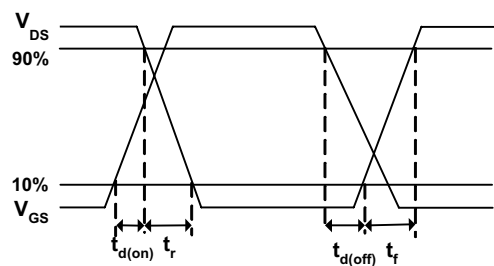
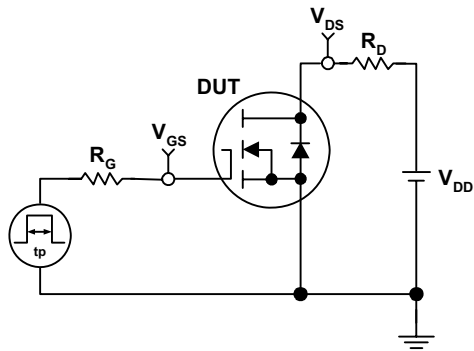
**Gate Charge**



## Avalanche Test Circuit and Waveforms

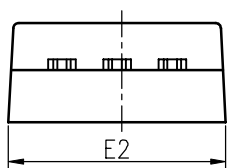
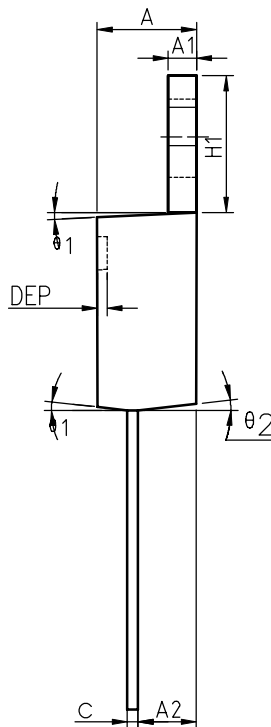
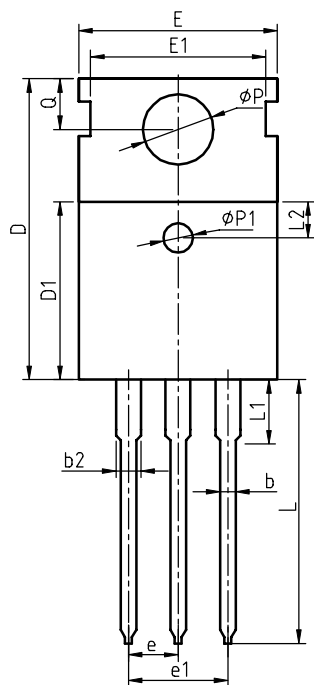


## Avalanche Test Circuit and Waveforms



# Package Information

## TO-220FB-3L

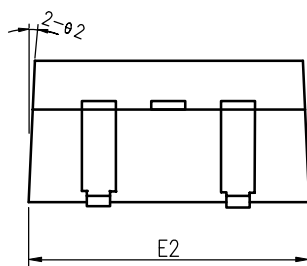
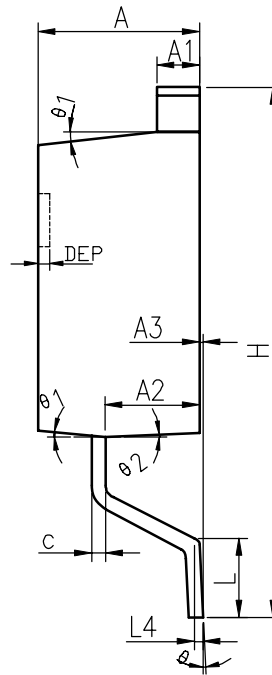
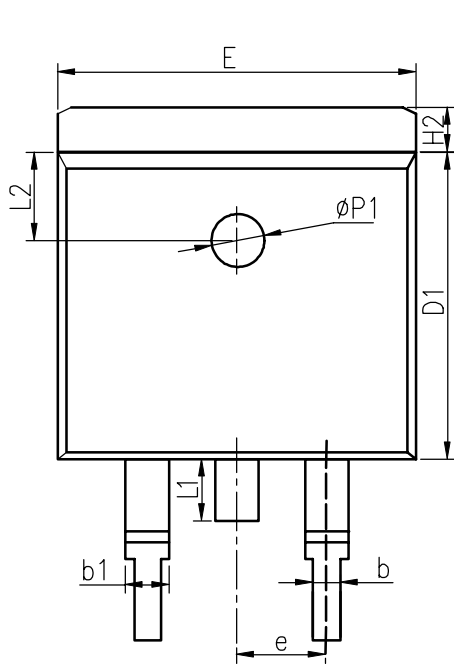


COMMON DIMENSIONS

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
theta 1	5°	7°	9°	5°	7°	9°
theta 2	1°	3°	5°	1°	3°	5°
theta 3	1°	3°	5°	1°	3°	5°



TO-263-2L



COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
A3	0.00	0.10	0.20	0.000	0.004	0.008
b	0.77	0.813	0.90	0.030	0.032	0.035
b1	1.20	1.270	1.36	0.047	0.050	0.054
c	0.34	0.381	0.47	0.013	0.015	0.019
D1	8.60	8.70	8.80	0.339	0.343	0.346
E	10.00	10.16	10.26	0.394	0.400	0.404
E2	10.00	10.10	10.20	0.394	0.398	0.402
e	2.54 BSC			0.100 BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
H2	1.17	1.27	1.40	0.046	0.050	0.055
L	2.00	2.30	2.60	0.079	0.091	0.102
L1	1.45	1.55	1.70	0.057	0.061	0.067
L2	2.50 REF			0.098 REF		
L4	0.25 BSC			0.010 BSC		
	0°	5°	8°	0°	5°	8°
1	5°	7°	9°	5°	7°	9°
2	1°	3°	5°	1°	3°	5°
$\phi P1$	1.40	1.50	1.60	0.055	0.059	0.063
DEP	0.05	0.10	0.20	0.002	0.004	0.008

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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.