

## N-Channel Super Junction Power MOSFET III

### General Description

The series of devices use advanced trench gate super junction technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

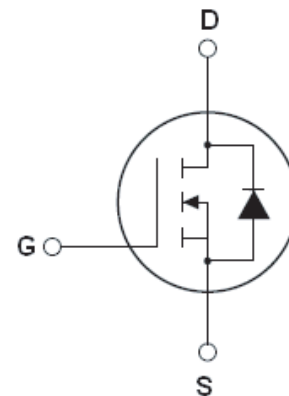
### Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

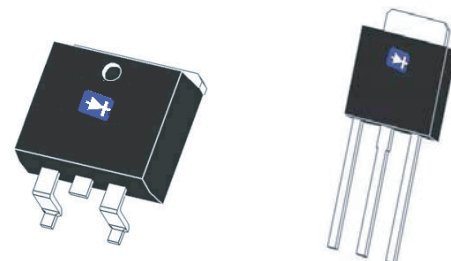
### Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

$V_{DS}$	800	V
$R_{DS(ON)MAX}$	900	m $\Omega$
$I_D$	6	A



### Schematic diagram



TO-252

TO-251

### Package Marking And Ordering Information

Device	Device Package	Marking
RM6N800LD	TO-252	6N800
RM6N800IP	TO-251	6N800

**Table 1. Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )**

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	800	V
Gate-Source Voltage ( $V_{DS}=0V$ ), AC ( $f>1$ Hz)	$V_{GS}$	$\pm 30$	V
Continuous Drain Current at $T_C = 25^\circ\text{C}$	$I_{D(DC)}$	6	A
Continuous Drain Current at $T_C=100^\circ\text{C}$	$I_{D(DC)}$	3.8	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	24	A
Maximum Power Dissipation( $T_C = 25^\circ\text{C}$ )	$P_D$	98	W
Derate above $25^\circ\text{C}$		0.78	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note2)	$E_{AS}$	100	mJ
Avalanche current (Note 1)	$I_{AR}$	5	A
Repetitive Avalanche energy, $t_{AR}$ limited by $T_{jmax}$ (Note 1)	$E_{AR}$	0.3	mJ

Parameter	Symbol	Value	Unit
Drain Source voltage slope, $V_{DS} \leq 480 V$ ,	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS} \leq 480 V, I_{SD} < I_D$	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55...+150	°C

**Table 2. Thermal Characteristic**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	1.27	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	62	°C/W

**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/off states</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	800			V
Zero Gate Voltage Drain Current( $T_C=25^\circ C$ )	$I_{DSS}$	$V_{DS}=800V, V_{GS}=0V$			1	$\mu A$
Zero Gate Voltage Drain Current( $T_C=125^\circ C$ )	$I_{DSS}$	$V_{DS}=800V, V_{GS}=0V$			100	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	3.5	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=4A$		780	900	m $\Omega$
<b>Dynamic Characteristics</b>						
Forward Transconductance	$g_{FS}$	$V_{DS} = 20V, I_D = 4A$		6		S
Input Capacitance	$C_{ISS}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		1290		pF
Output Capacitance	$C_{OSS}$			55		pF
Reverse Transfer Capacitance	$C_{RSS}$			3		pF
Total Gate Charge	$Q_g$	$V_{DS}=640V, I_D=6A,$ $V_{GS}=10V$		24		nC
Gate-Source Charge	$Q_{gs}$			8.5		nC
Gate-Drain Charge	$Q_{gd}$			7.5		nC
<b>Switching times</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=400V, I_D=3A,$ $R_G=3\Omega, V_{GS}=10V$		10		nS
Turn-on Rise Time	$t_r$			5		nS
Turn-Off Delay Time	$t_{d(off)}$			53	70	nS
Turn-Off Fall Time	$t_f$			6	9	nS
<b>Source- Drain Diode Characteristics</b>						
Source-drain current(Body Diode)	$I_{SD}$	$T_C=25^\circ C$			6	A
Pulsed Source-drain current(Body Diode)	$I_{SDM}$				24	A
Forward on voltage	$V_{SD}$	$T_J=25^\circ C, I_{SD}=6A, V_{GS}=0V$		0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J=25^\circ C, I_F=3A,$ $di/dt=100A/\mu s$		260		nS
Reverse Recovery Charge	$Q_{rr}$			1.7		$\mu C$
Peak Reverse Recovery Current	$I_{rrm}$			13		A

Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.  $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

# RATING AND CHARACTERISTICS CURVES (RM6N800IP/LD)

Figure1. Safe operating area

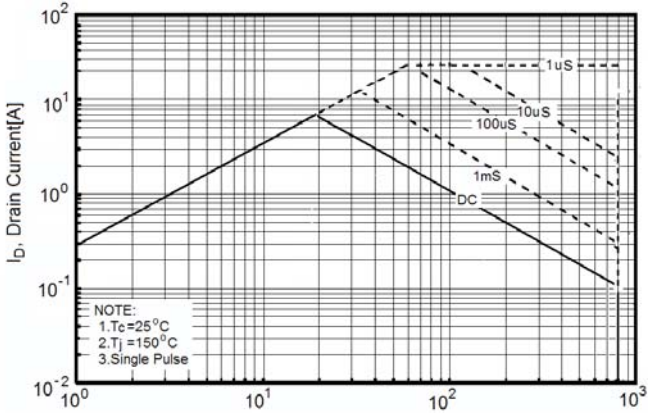


Figure2. Transient Thermal Impedance

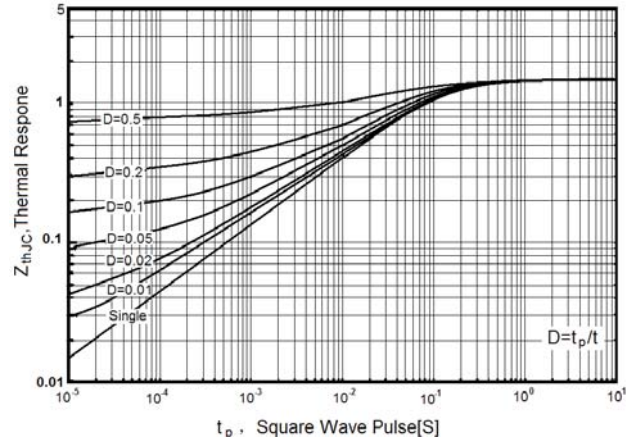


Figure3. Source-Drain Diode Forward Voltage

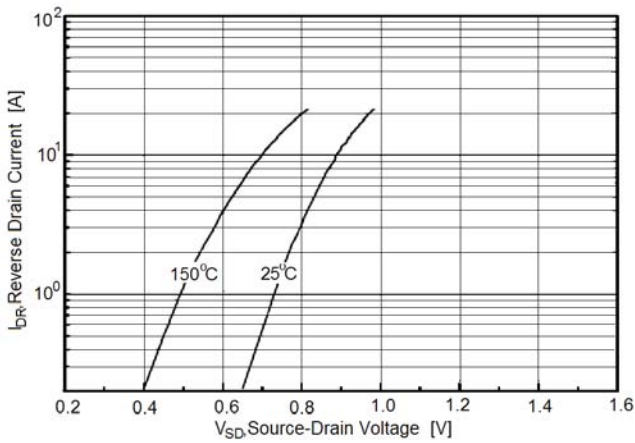


Figure4. Output characteristics

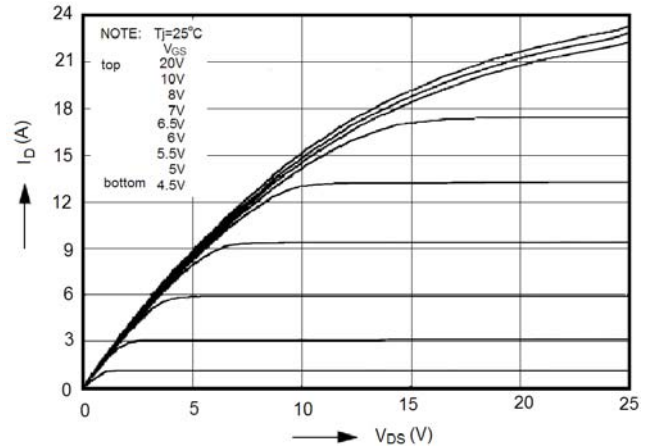


Figure5. Transfer characteristics

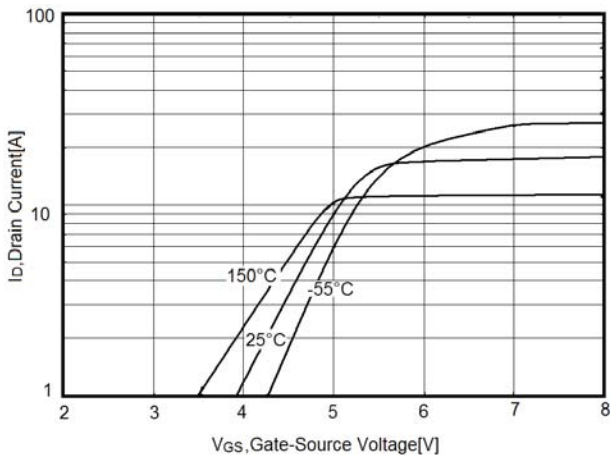
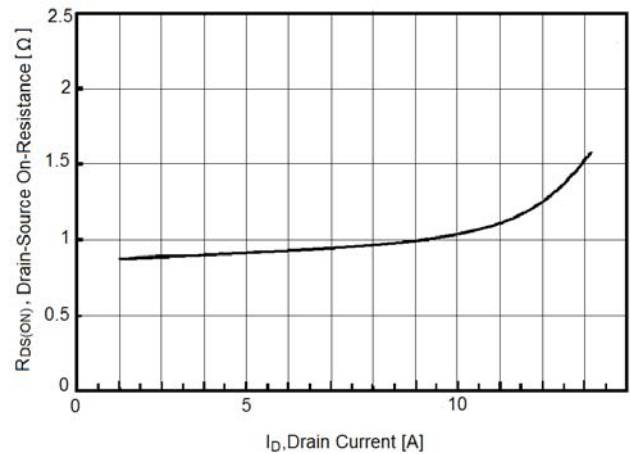


Figure6. Static drain-source on resistance



# RATING AND CHARACTERISTICS CURVES ( RM6N800IP/LD)

Figure7.  $R_{DS(ON)}$  vs Junction Temperature

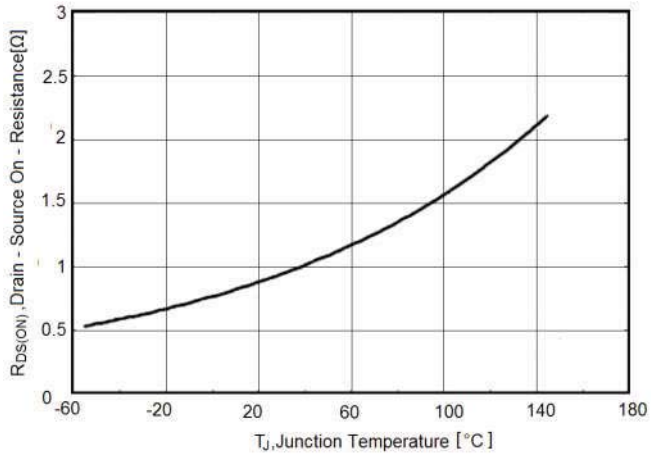


Figure8.  $BV_{DSS}$  vs Junction Temperature

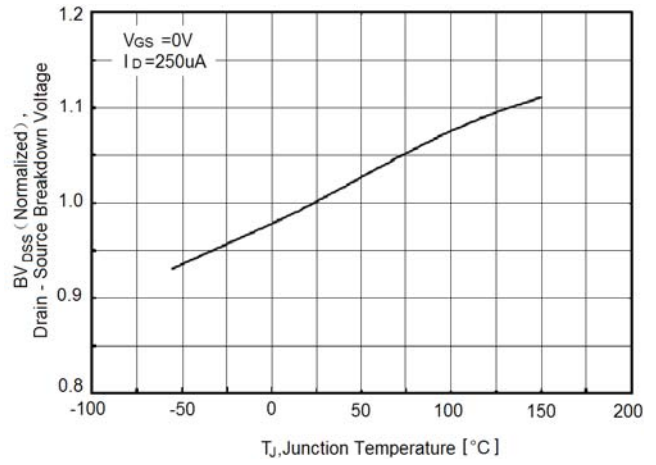


Figure9. Maximum  $I_D$  vs Junction Temperature

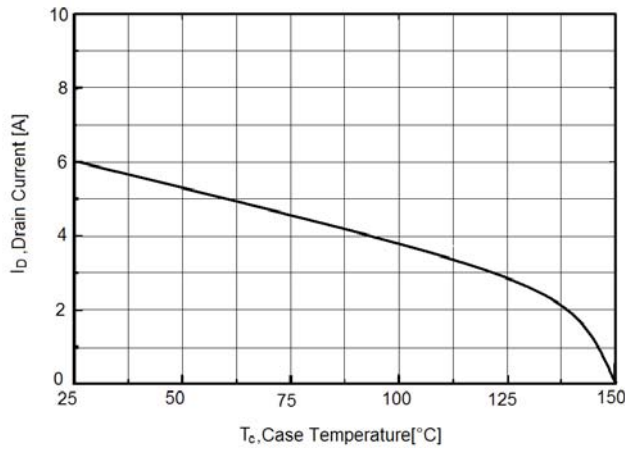
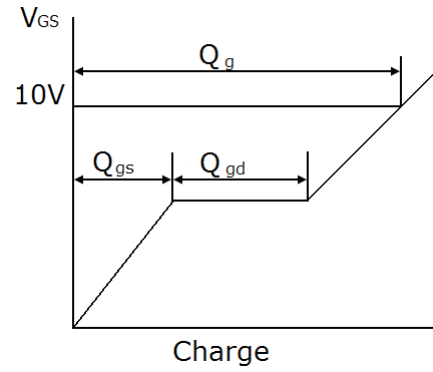
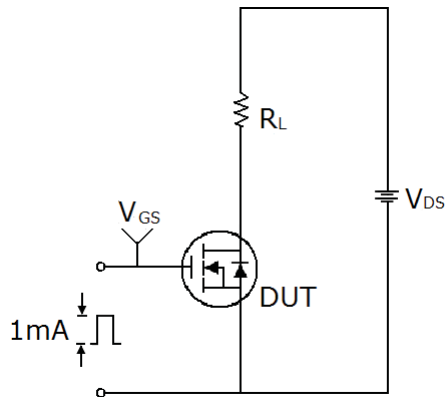


Figure10. Gate charge waveforms

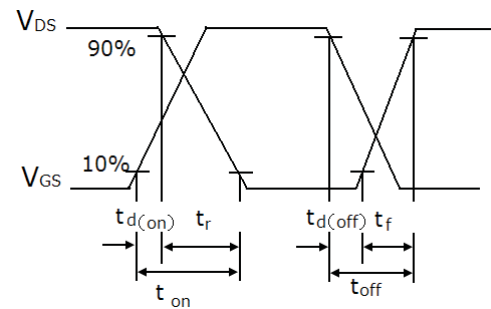
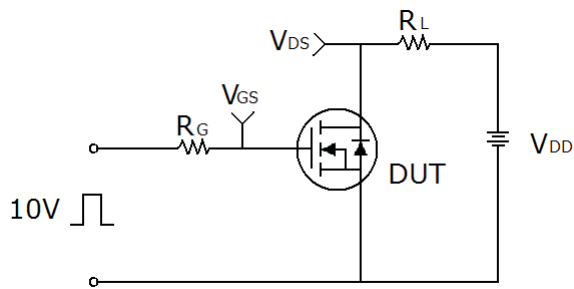
Figure11. Capacitance

# Test circuit

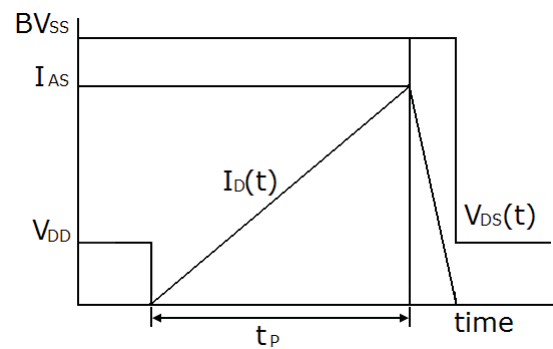
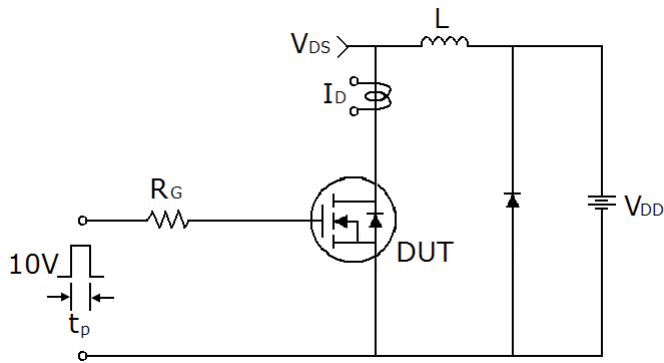
## 1) Gate charge test circuit & Waveform



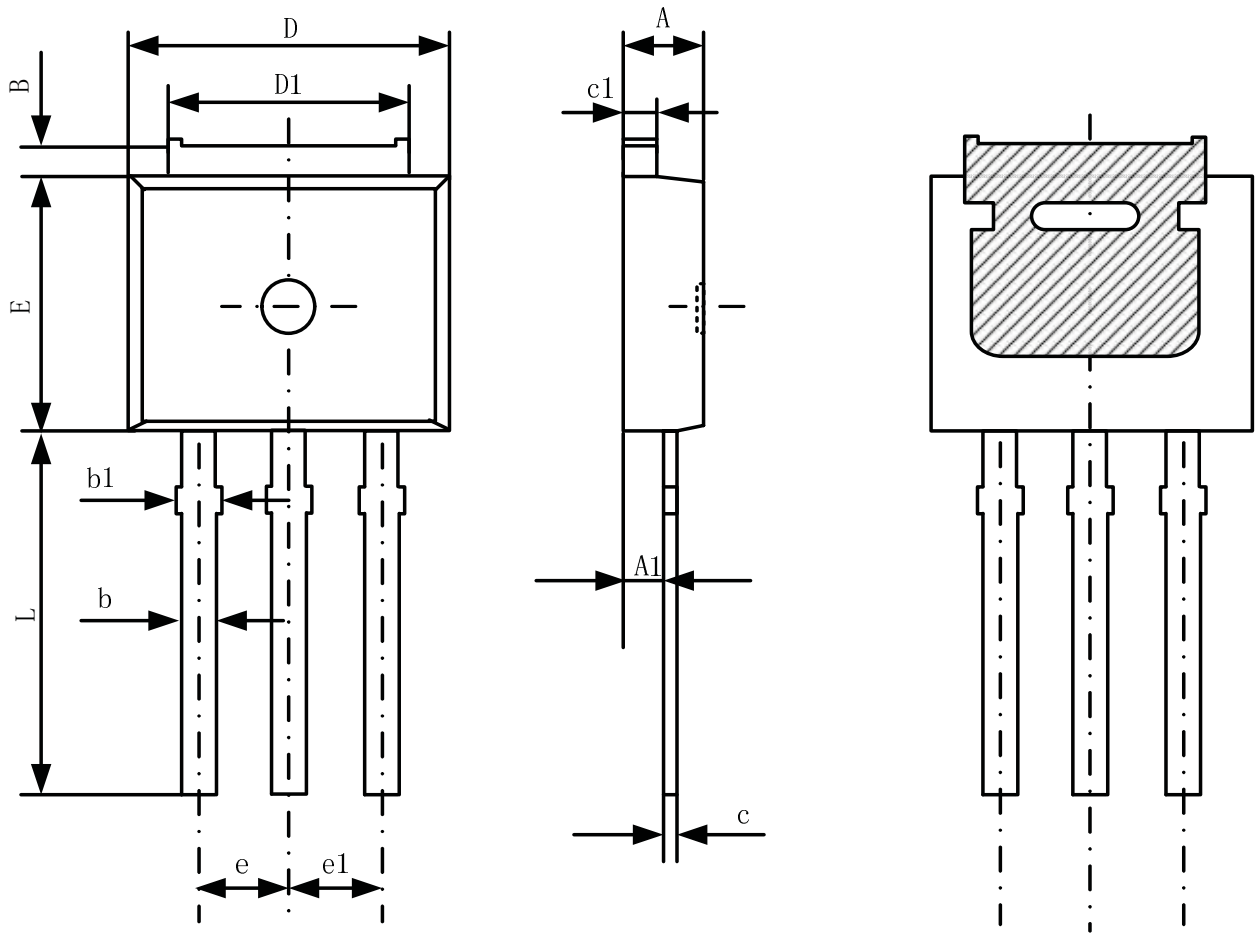
## 2) Switch Time Test Circuit:



## 3) Unclamped Inductive Switching Test Circuit & Waveforms

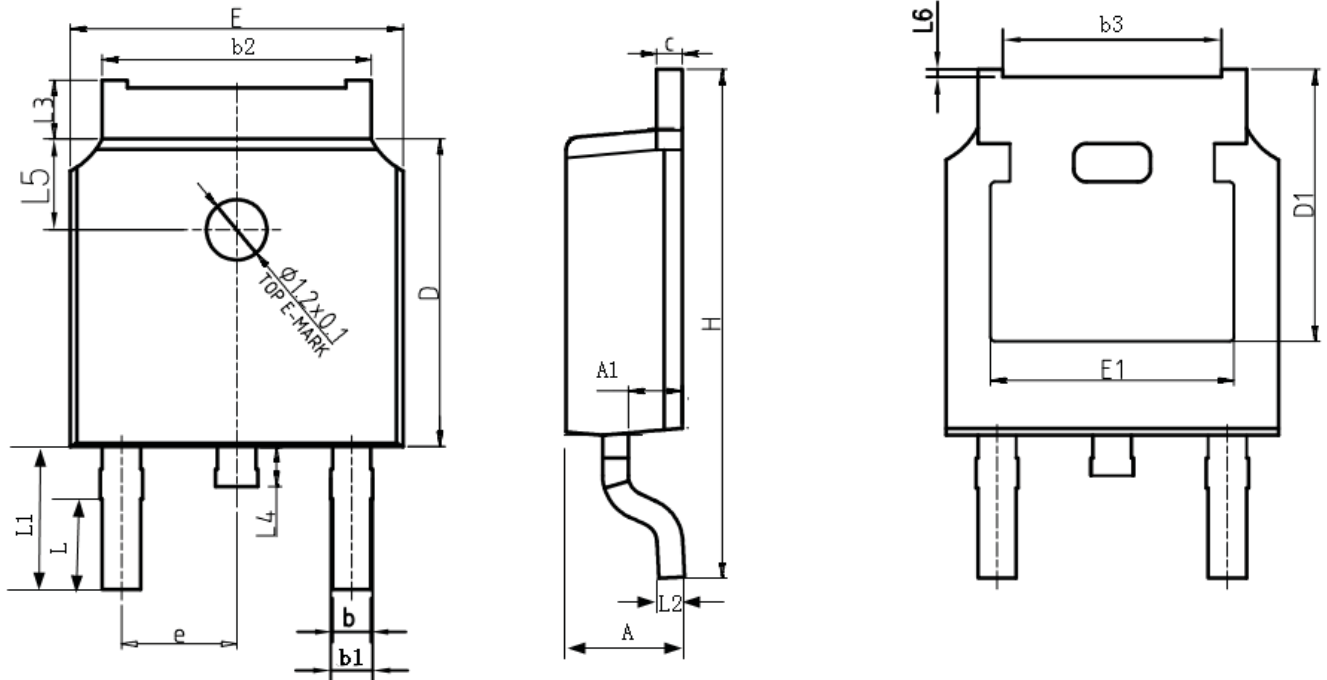


# TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.100	2.500	0.083	0.099
A1	0.850	1.150	0.034	0.045
B	0.718	1.018	0.028	0.040
b	0.700	0.900	0.028	0.036
b1	0.700	1.000	0.028	0.040
c	0.408	0.608	0.016	0.024
c1	0.408	0.508	0.016	0.020
D	6.400	6.800	0.253	0.269
D1	5.180	5.480	0.205	0.217
E	5.950	6.350	0.235	0.251
e	2.286		0.090	
e1	2.286		0.090	
L	6.700	7.300	0.265	0.289

# TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.056	0.061
A1	0.970	1.17	0.025	0.030
b	0.720	0.850	0.018	0.022
b1	0.720	0.930	0.018	0.024
b2	5.230	5.460	0.133	0.139
b3	4.270	4.370	0.108	0.111
c	0.470	0.580	0.012	0.015
D	6.000	6.200	0.152	0.157
D1	5.300 TYP.		0.135	
E	6.500	6.700	0.165	0.170
E1	4.700	4.920	0.119	0.125
e	2.286 TYP		0.058	
L	1.400	1.700	0.036	0.043
L1	2.900 TYP.		0.074	
L2	0.510 TYP.		0.013	
L3	0.900	1.250	0.023	0.032
L4	0.600	1.000	0.015	0.025
L5	1.700	1.900	0.043	0.048
L6	0	0.1223	0.000	0.003

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