N-channel 650V, 4A, 1.0Ω Super-Junction Power MOSFET

Description

Super-junction power MOSFET is a revolutionary technology for high voltage power MOSFET， designed according to the SJ principle. The resulting device has extremely low on resistance,making it especially suitable for applications which require superior power density and outstanding efficiency.

Features

- Very low FOM RDS(on)×Qg
- 100% UIS tested
- RoHS compliant

Applications

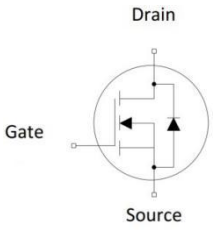
- Power factor correction (PFC).
- Switched mode power supplies (SMPS).
- Uninterrupted power supply (UPS).

Product Summary

V_{DS} @ $T_{j,25℃}$	650V
$R_{DS(on),max}$	1.0Ω
I_D	4.0A
$Q_{g,typ}$	9.1 nC



TO-252 **TO-251** **TO-220F**



RoHS

N-Channel MOSFET

Marking information

Product	Package	Marking	Packing methed
RMA65R1K0SN	TO-252	RMA65R1K0SN	Reel
RMG65R1K0SN	TO-251	RMG65R1K0SN	Tube
RMC65R1K0SN	TO-220F	RMC65R1K0SN	Tube

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current (T_C = 25°C)	I_D	4	A
(T_C = 100°C)		2.5	A
Pulsed drain current [1]	I_{DM}	12	A
Gate-Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse [2]	E_{AS}	50	mJ
Avalanche current, repetitive [3]	I_{AR}	0.9	A
Power Dissipation TO-252 /TO-251 (T_C = 25°C)	P_D	37	W
- Derate above 25°C		0.3	W/°C
Power Dissipation TO-220F (T_C = 25°C)	P_D	30	W
- Derate above 25°C		0.24	W/°C
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	4	A

Diode pulse current	$I_{S,pulse}$	12	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO252/TO-251	TO-220F	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.8	4.4	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62	73	°C/W
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	260	°C

Electrical Characteristics

T_c = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=250uA	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250uA	2.5		4.0	V
Drain cut-off current	I_{DSS}	V_{DS}=650 V, V_{GS}=0 V, T_j = 25°C T_j = 125°C	 - -	 - 10	 1	μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=30 V, V_{DS}=0 V	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-30 V, V_{DS}=0 V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=2 A T_j = 25°C	- - -	0.88	1.0	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 100 V, V_{GS} = 0 V, f = 1MHz	-	315	-	pF
Output capacitance	C_{oss}		-	27	-	
Reverse transfer capacitance	C_{rss}		-	1.2	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 400V, I_D = 2A R_G = 25Ω, V_{GS}=10V	-	9.4	-	ns
Rise time	t_r		-	22.6	-	
Turn-off delay time	$t_{d(off)}$		-	36.4	-	
Fall time	t_f		-	25.4	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=520 V, I_D=2A, V_{GS}=0 to 10 V	-	2.1	-	nC
Gate to drain charge	Q_{gd}		-	4.0	-	
Gate charge total	Q_g		-	9.1	-	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=2A	-	0.85	-	V
Reverse recovery time	t_{rr}	V_R=50 V, I_F=2A, dI_F/dt=100 A/μs	-	159	-	ns
Reverse recovery charge	Q_{rr}		-	0.93	-	μC
Peak reverse recovery current	I_{rrm}		-	11.2	-	A

Notes:

1. Limited by maximum junction temperature, maximum duty cycle is 0.75.

2. I_{AS} = 1A, V_{DD} = 50V, Starting T_j= 25°C.

Electrical Characteristics Diagrams

Figure 1. Output Characteristics

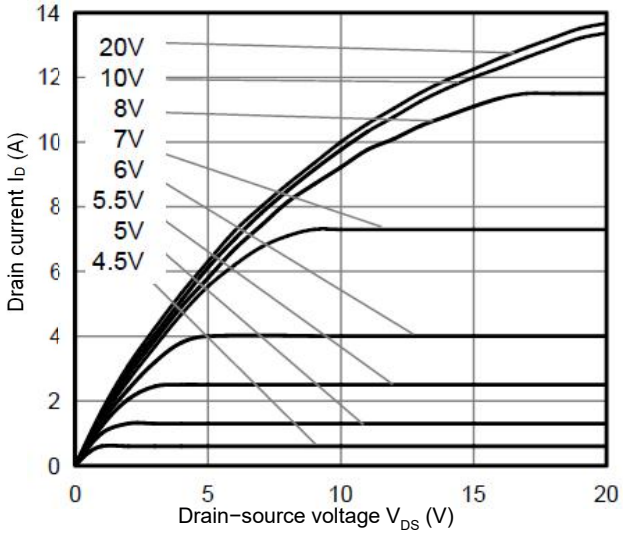


Figure 2. Transfer Characteristics

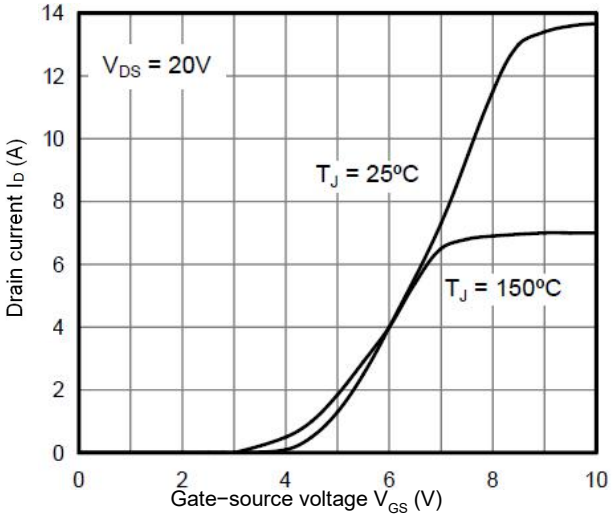


Figure 3. On-Resistance vs. Drain Current

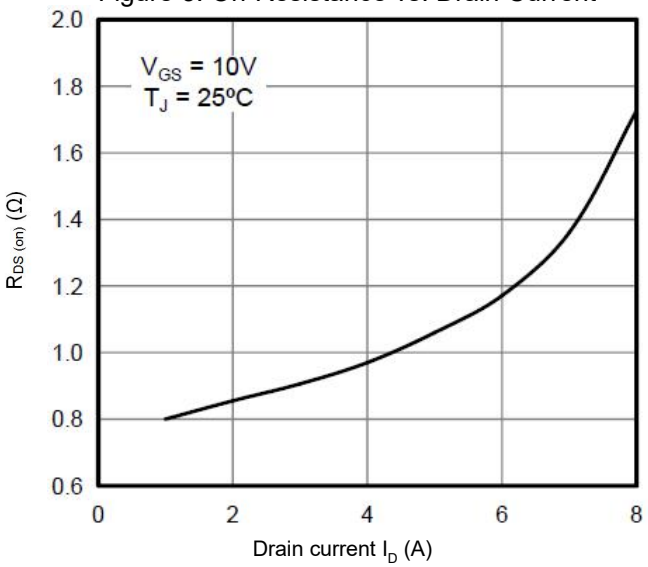


Figure 4. Capacitance Characteristics

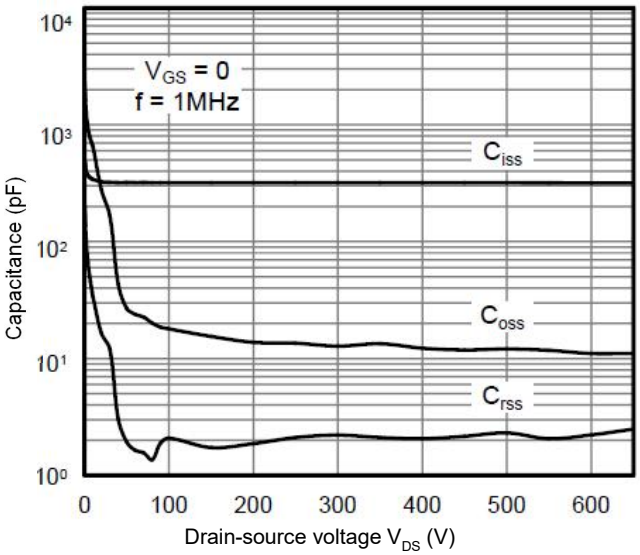


Figure 5. Gate Charge Characteristics

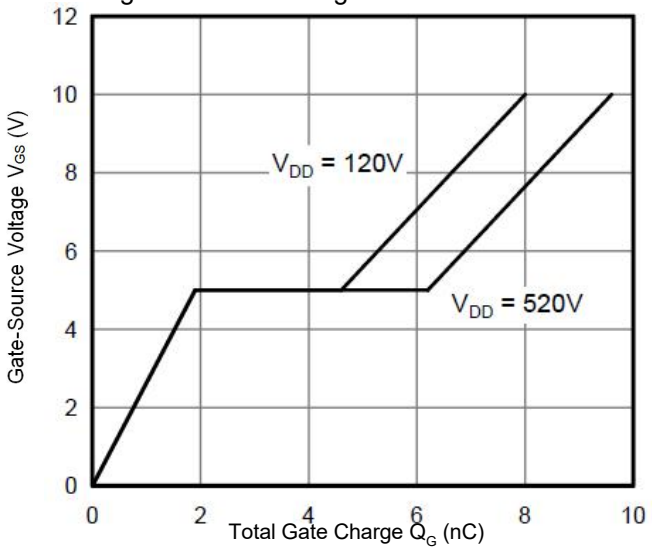


Figure 6. Body Diode Forward Voltage

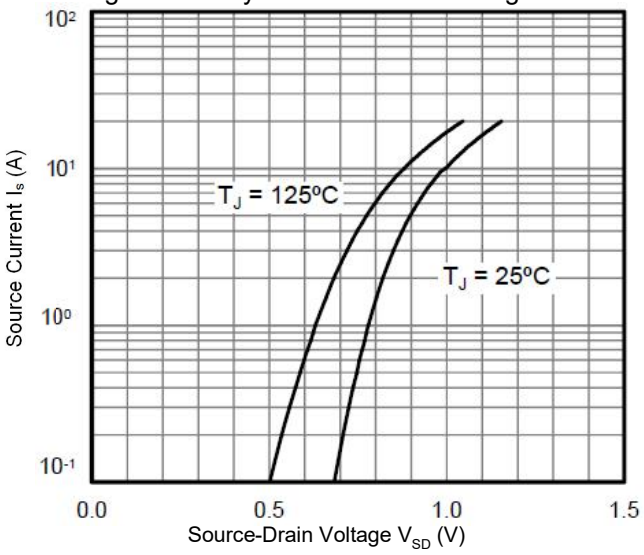


Figure 7. Breakdown Voltage vs. Temperature

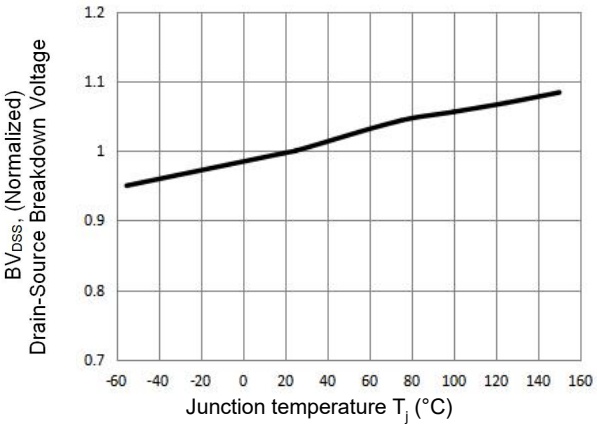


Figure 8. On-Resistance vs. Temperature

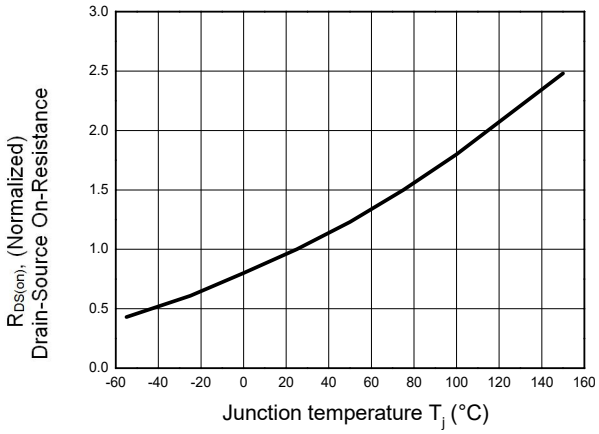


Figure 9. Maximum Safe Operating Area
TO-252/TO-251

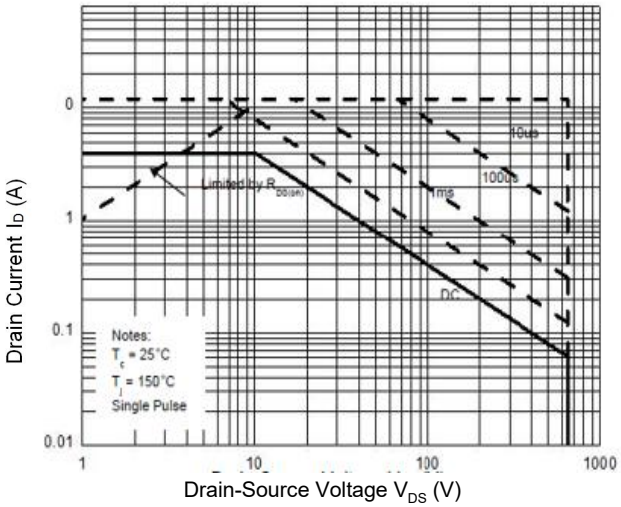
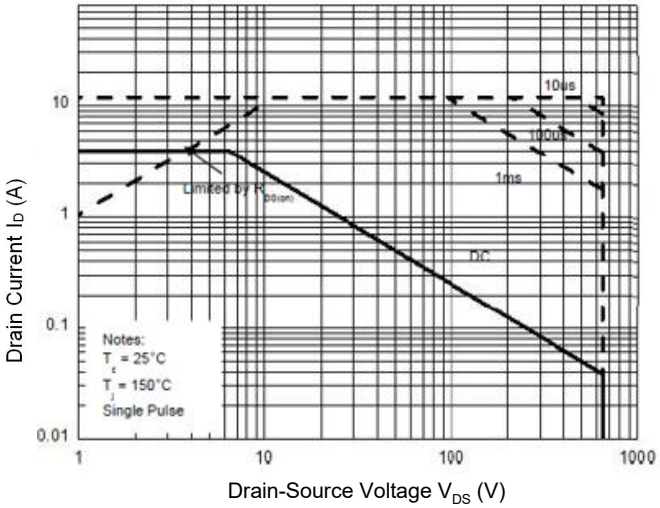
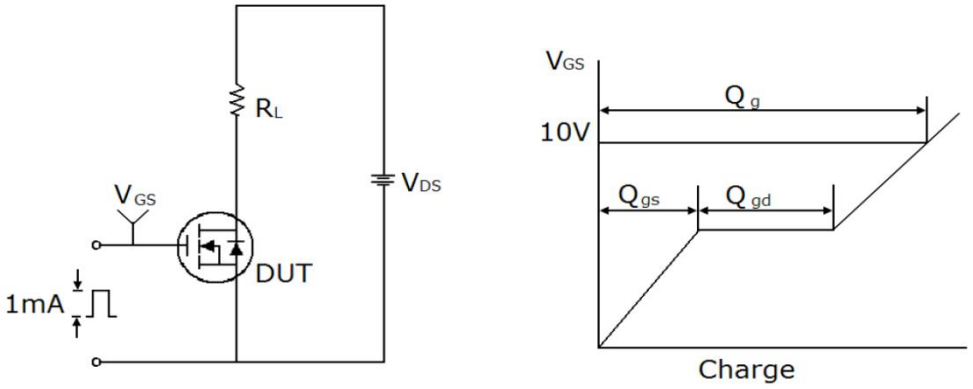


Figure 10. Maximum Safe Operating Area
TO-220F

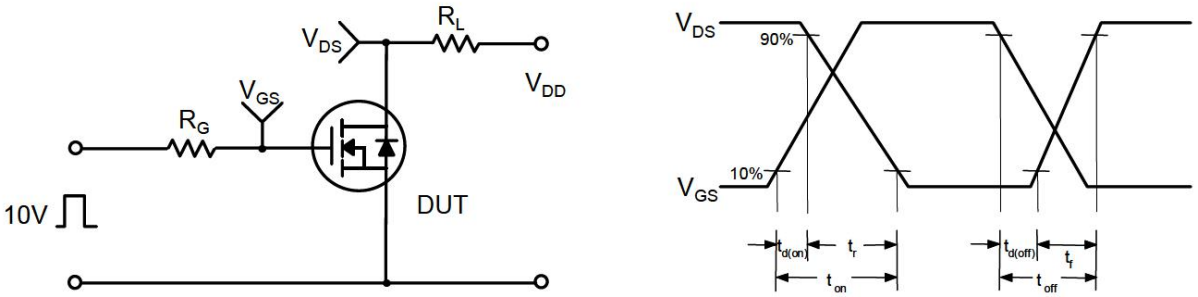


Test Circuits

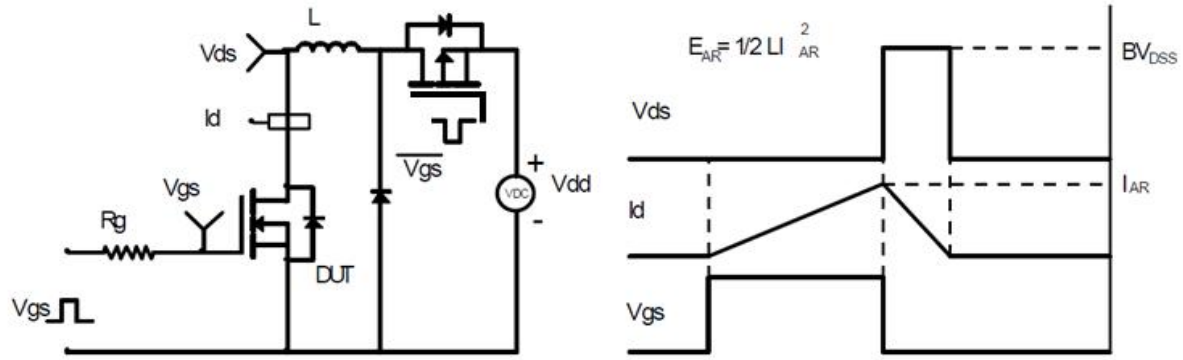
Gate Charge Test Circuit & Waveform



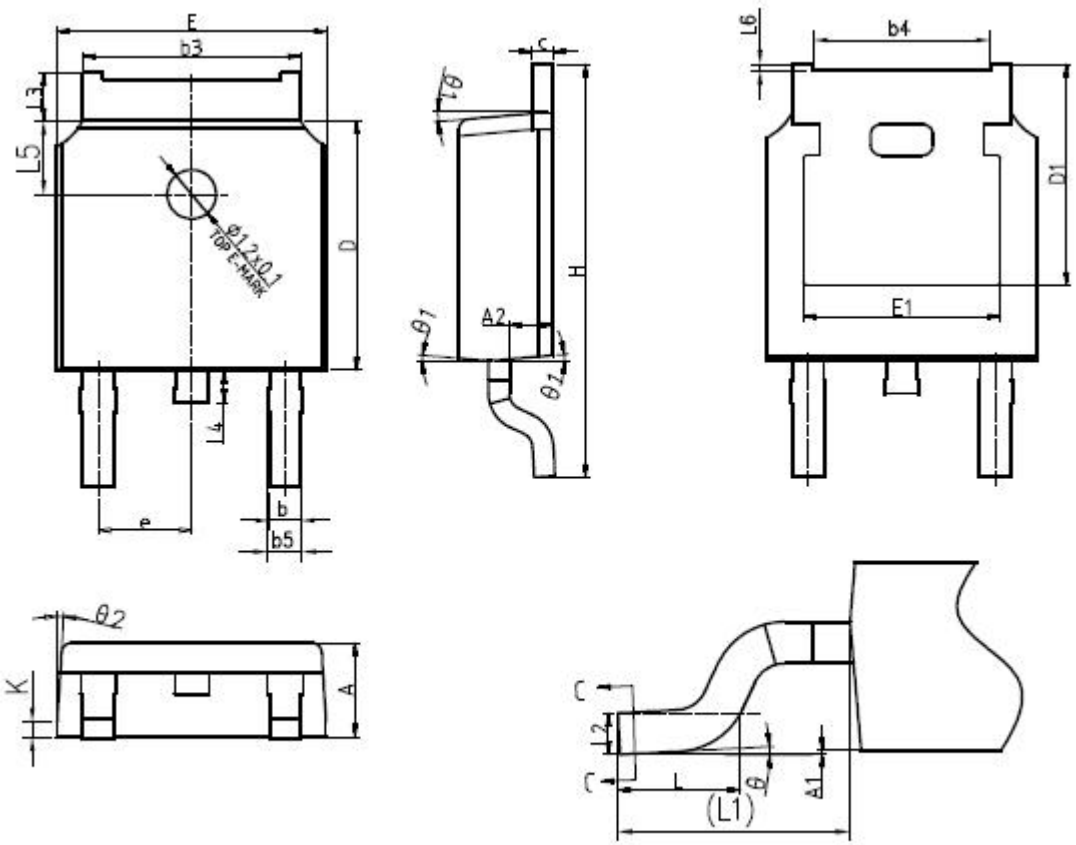
Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Mechanical Dimensions for TO-252

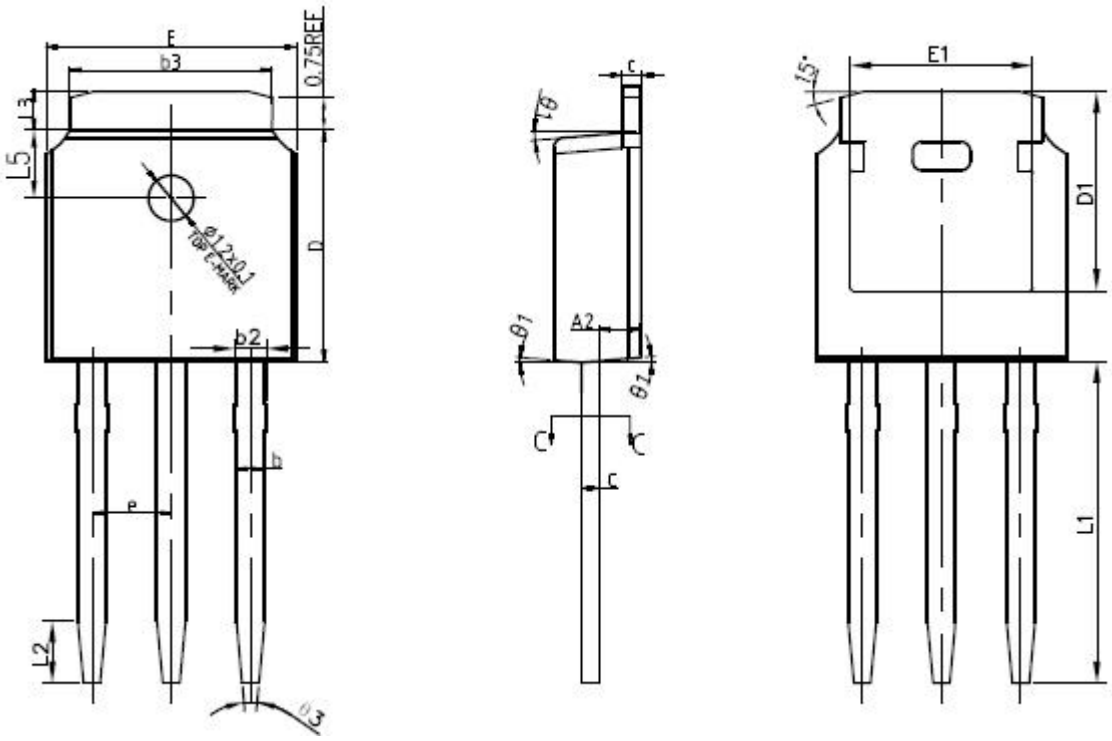


单位：mm

SYMBOL	mm		
	MIN	NOM	MAX
*A	2.20	2.30	2.38
*A1	0.00	-	0.10
A2	0.97	1.07	1.17
*b	0.72	0.78	0.85
b1	0.71	0.76	0.81
*b3	5.23	5.33	5.46
b4	4.27	4.32	4.37
b5	0.72	0.88	0.93
*c	0.47	0.53	0.58
c1	0.46	0.51	0.56
*D	6.00	6.10	6.20
D1	5.30REF		

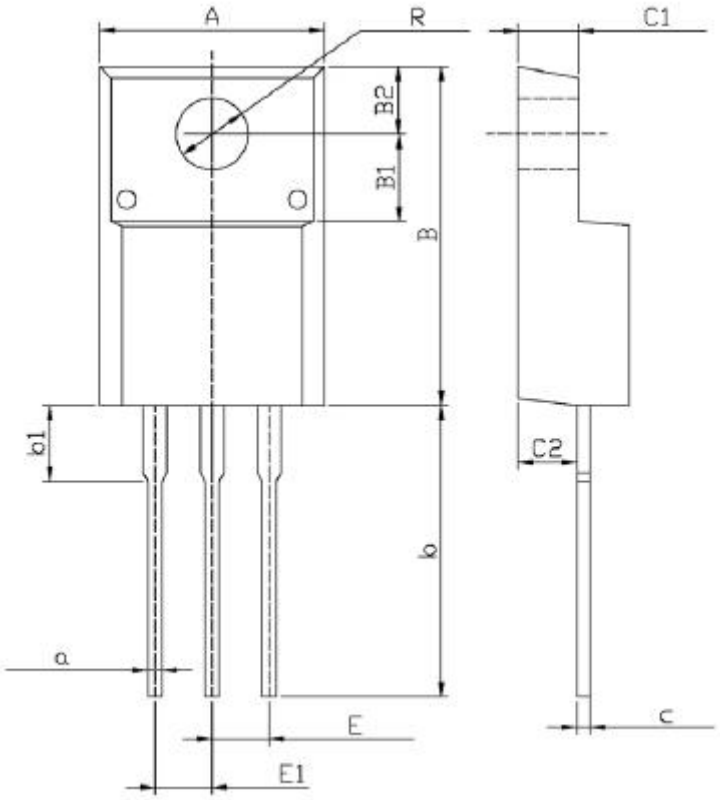
*E	6.50	6.60	6.70
E1	4.70	4.83	4.92
*e	2.286BSC		
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
*L3	0.90	-	1.25
*L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
L6	0	0.047	0.123
θ	0°	-	8°
*θ1	5°	7°	9°
θ2	5°	7°	9°
K	0.40REF		

Mechanical Dimensions for TO-251



SYMBOL	MM		
	MIN	NOM	MAX
*A	2.20	2.30	2.38
*A2	0.97	1.07	1.17
*b	0.72	0.78	0.85
b1	0.71	0.76	0.81
*b2	0.72	0.88	0.95
*b3	5.23	5.33	5.46
*c	0.47	0.53	0.58
c1	0.46	0.51	0.56
*D	6.00	6.10	6.20
D1	5.30REF		
*E	6.50	6.60	6.70
E1	4.70	4.83	4.92
*e	2.286BSC		
*L1	9.20	9.40	9.60
L2	1.25	1.35	1.45
*L3	0.90	1.02	1.25
L5	1.70	1.80	1.90
*θ1	5°	7°	9°
θ2	5°	7°	9°
θ3	11°	13°	15°
K	0.40REF		

Mechanical Dimensions for TO-220F



Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
C	4.3	4.7	b1	2.9	3.9
A	9.7	10.3	a	0.55	0.75
B	14.7	15.3	E	2.29	2.79
B1	3.8	4.0	E1	2.29	2.79
B2	2.9	3.1	C1	2.5	2.9
R	3.0	3.4	C2	2.5	2.7
b	12.5	13.5	c	0.5	0.7

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