RECTRON SEMICONDUCTOR
TECHNICAL SPECIFICATION

RMP4N65IP THRU RMP4N65T2

N-CHANNEL ENHANCEMENT MODE MOSFET

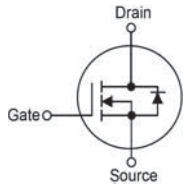
General Description

RMP4N65 is an N-channel enhancement mode MOSFET,which uses the self-aligned planar process and improved terminal technology,reducing the conduction loss, enhancing the avalanche energy.

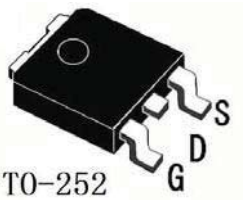
MAIN CHARACTERISTICS

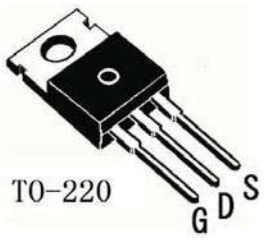
V_{DSS}	650	V
I_D	4.0	A
$R_{DS(ON)}$	2.1	Ω
Crss	8	pF

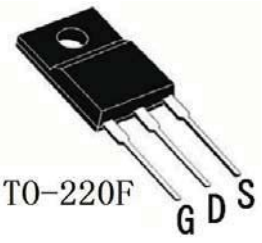
Symbol



Package







FEATURES

- Low Crss
- Low gate charge
- Fast switching
- Improved ESD capability
- Improved dv/dt capability
- 100% avalanche energy test

APPLICATIONS

- High efficiency swith mode power supplies
- Electronic lamp ballasts
- UPS
- P/N suffix V means AEC-Q101 qualified, e.g:RMP4N65IPV
- P/N suffix V means Halogen-free

Package Marking And Ordering Information

Device	Device Package	Marking
RMP4N65IP	TO-251	4N65
RMP4N65LD	TO-252	4N65
RMP4N65TI	TO-220F	4N65
RMP4N65T2	TO-220	4N65

2019-04/27
REV:B

ABSOLUTE MAXIMUM RATINGS (Tc=25℃)

Parameter	Symbol		Value	Unit
Drain-Source Voltage	V_{DSS}		650	V
Continues Drain Current	I_D	Tc=25℃	4*	A
		Tc=100℃	2.5*	
Plused Drain Current (note 1)	I_{DM}		16	A
Gate-to-Source Voltage	V_{GS}		±30	V
Single Pulsed Avalanche Energy (note 2)	E_{AS}		218	mJ
Avalanche Current (note 1)	I_{AR}		4.0	A
Repetitive Avalanche Energy (note 1)	E_{AR}		10	mJ
Peak Diode Recovery (note 3)	dv/dt		4.5	V/ns
Power Dissipation	P_D Tc=25℃	TO-251/TO-252	51	W
		TO-220	100	
		TO-220F	33	
Power Dissipation Derating Factor	$P_{D(DF)}$ Above 25℃	TO-251/TO-252	0.39	W/℃
		TO-220	0.8	
		TO-220F	0.26	
Operating and Storage Temperature Range	T_J, T_{STG}		150, -55～+150	℃
Maximum Temperature for Soldering	T_L		300	℃

THERMAL CHARACTERIASTIC

Parameter	Symbol		Max	Unit
Thermal Resistance, Junction to Case	Rth(j-c)	TO-251/TO-252	2.5	℃/W
		TO-220	1.25	
		TO-220F	3.79	
Thermal Resistance, Junction to Ambient	Rth(j-A)	TO-251/TO-252	83	℃/W
		TO-220	62.5	
		TO-220F	62.5	

＊ Drain current limited by maximum junction temperature

ELECTRICAL CHARACTERISTICS

Off-Characteristics

Parameter	Symbol	Tests Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V	650	-	-	V
Breakdown Voltage Temperature Coefficient	$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA, referenced to 25℃	-	0.7	-	V/℃
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=600V,V_{GS}=0V, T_C=25℃	-	-	1	μA
		V_{DS}=480V, T_C=125℃	-	-	10	
Gate-body leakage current, forward	I_{GSSF}	V_{DS}=0V, V_{GS}=30V	-	-	100	nA
Gate-body leakage current, reverse	I_{GSSR}	V_{DS}=0V, V_{GS}=-30V	-	-	-100	nA

On-Characteristics

Parameter	Symbol	Tests Conditions	Min	Typ	Max	Unit
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2.0	-	4.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=2.0A	-	2.1	2.5	Ω
Forward Transconductance	g_{fs}	V_{DS}=40V, I_D=2.0A (note4)	-	4.0	-	S

Dynamic Characteristics

Parameter	Symbol	Tests Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	V_{DS}=25V, V_{GS}=0V, f=1.0MHZ	-	580	720	pF
Output capacitance	C_{oss}		-	54	70	pF
Reverse transfer capacitance	C_{rss}		-	8	10	pF

Switching Characteristics

Parameter	Symbol	Tests Conditions	Min	Typ	Max	Unit
Turn-On delay time	$t_{d(on)}$	V_{DD}=300V, I_D=4A, R_G=25Ω (note 4，5)	-	16	42	ns
Turn-On rise time	t_r		-	48	112	ns
Turn-Off delay time	$t_{d(off)}$		-	48	105	ns
Turn-Off Fall time	t_f		-	38	86	ns
Total Gate Charge	Qg	V_{DS}=480V , I_D=4A, V_{GS}=10V (note 4，5)	-	15	20	nC
Gate-Source charge	Qgs		-	2.8	-	nC
Gate-Drain charge	Qgd		-	6.8	-	nC

Drain-Source Diode Characteristics and Maximum Ratings

Parameter	Symbol	Tests Conditions	Min	Typ	Max	Unit
Maximum Continuous Drain-Source Diode Forward Current	I_S		-	-	4	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}		-	-	16	A
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=4A	-	-	1.4	V
Reverse recovery time	t_{rr}	V_{GS}=0V, I_S=4A dI_F/dt=100A/μs (note 4)	-	320	-	ns
Reverse recovery charge	Q_{rr}		-	2.4	-	μC

Notes:

1：Pulse width limited by maximum junction temperature

2：L= 25mH,I_{AS}= 4A,V_{DD}= 50V,R_G= 25Ω, Starting T_J = 25℃

3：I_{SD} ≤4A, di/dt ≤300A/μs, V_{DD}≤BV_{DSS}, Starting T_J =25℃

4：Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%

5：Essentially independent of operating temperature

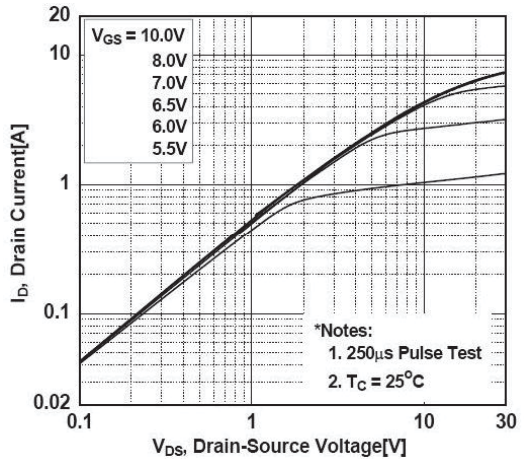


Fig. 1 On-State Characteristics

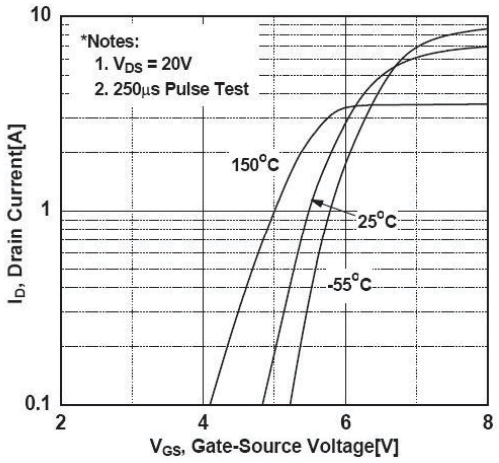


Fig. 2 Transfer Characteristics

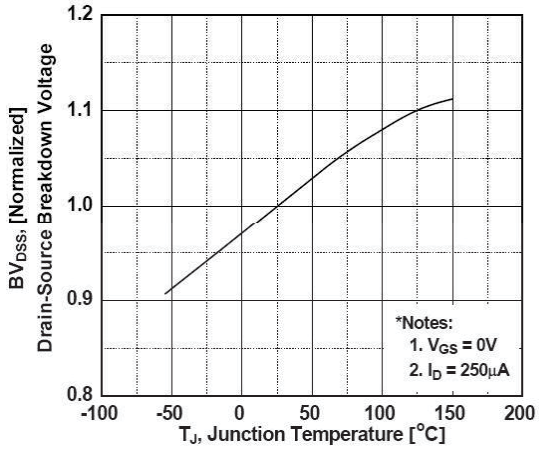


Fig. 3 Breakdown Voltage Variation vs Temperature

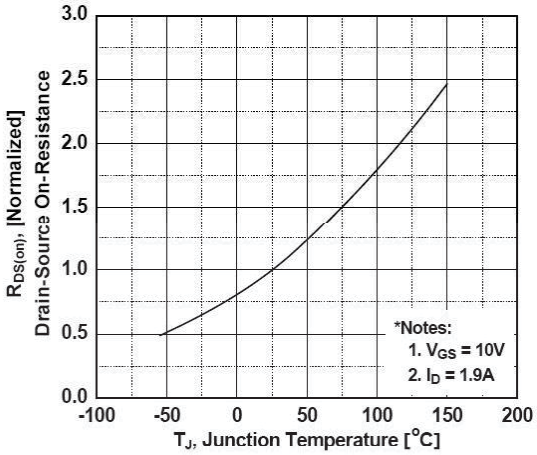


Fig. 4 On-Resistance Variation vs Temperature

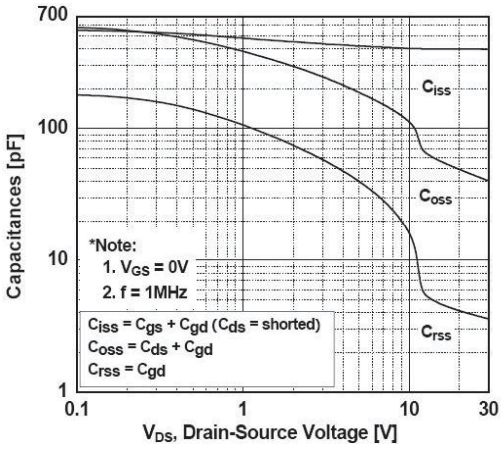


Fig. 5 Capacitance Characteristics

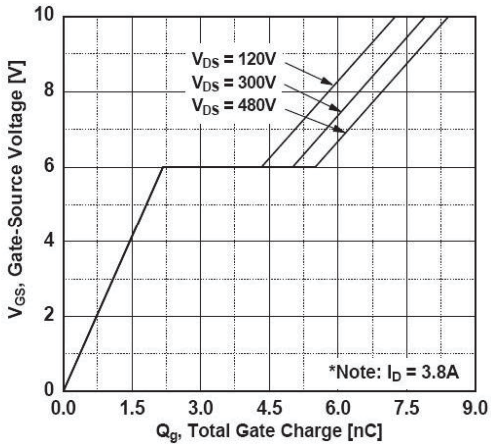


Fig. 6 Gate Charge Characteristics

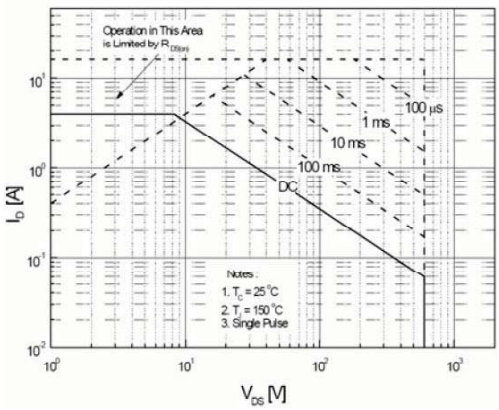


Fig. 7 Maximum Safe Operating Area

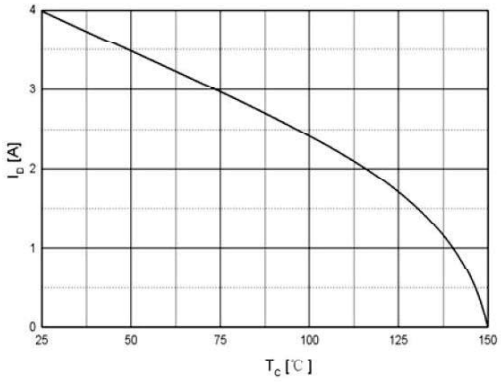


Fig. 8 Maximum Drain Current vs Case Temperature

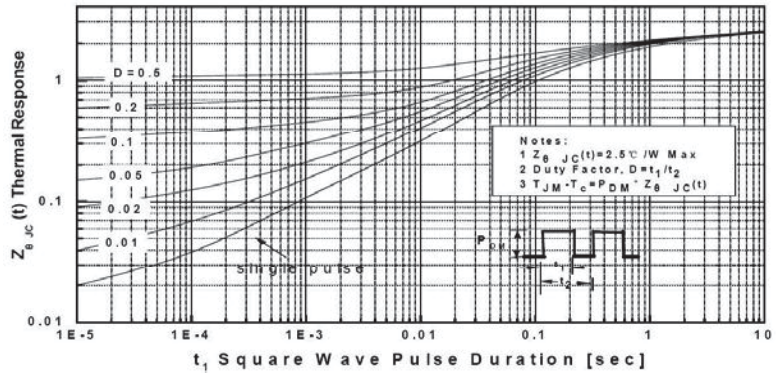


Fig. 9 Transient Thermal Response Curve (TO-251/TO-252)

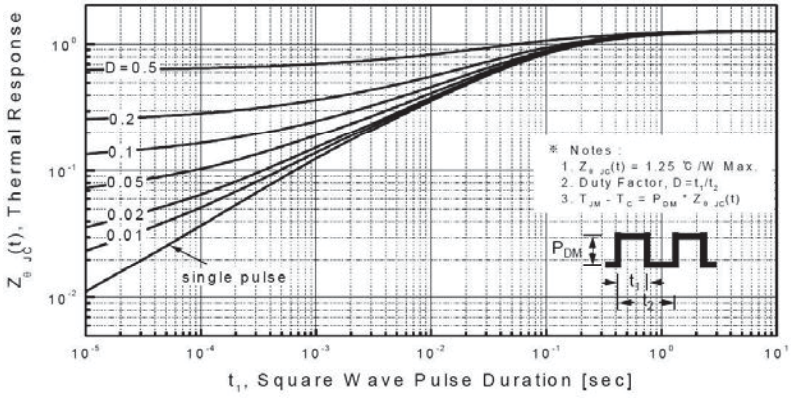
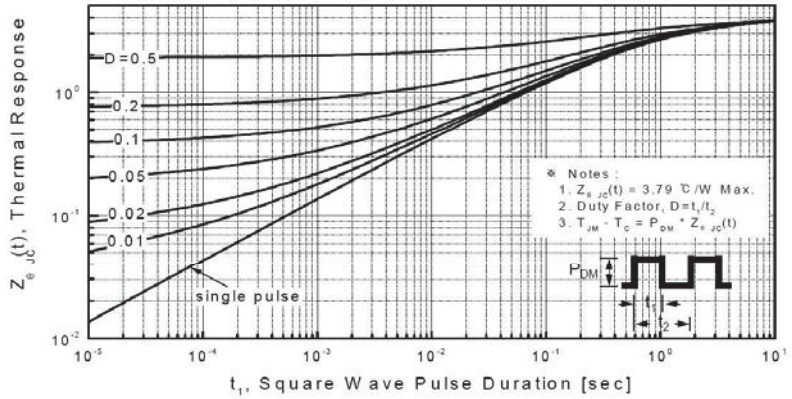


Fig. 10 Transient Thermal Response Curve(TO-220/TO-262)



TEST CIRCUITS AND WAVEFORMS

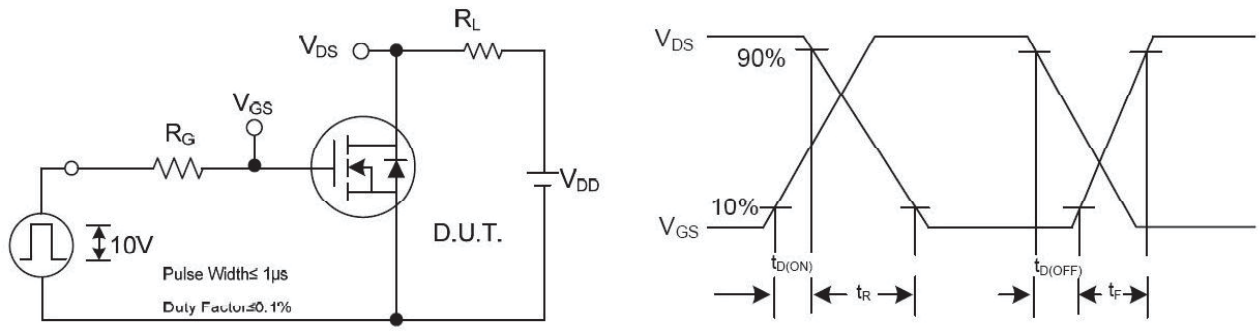


Fig.12 Resistive Switching Test Circuit & Waveforms

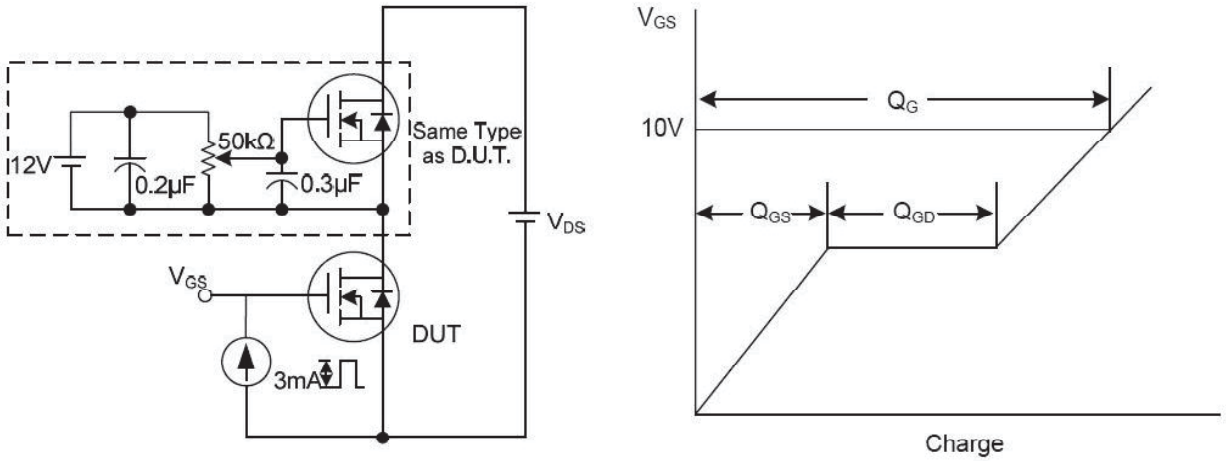


Fig.13 Gate Charge Test Circuit & Waveform

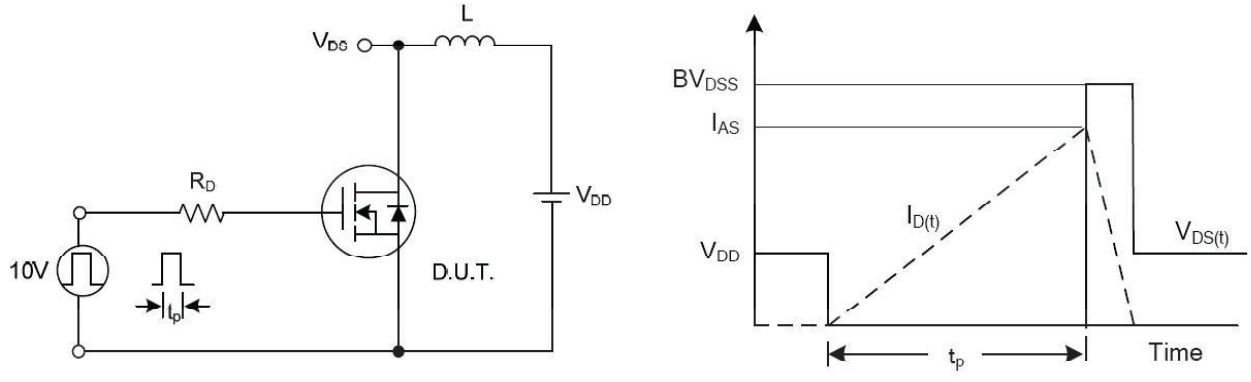
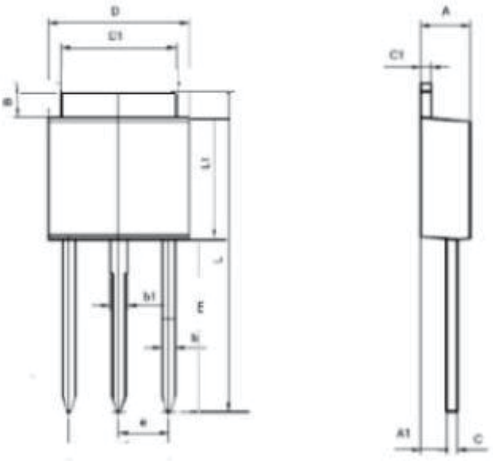


Fig.14 Unclamped Inductive Switching Test Circuit & Waveforms

PACKAGE MECHANICAL DATA

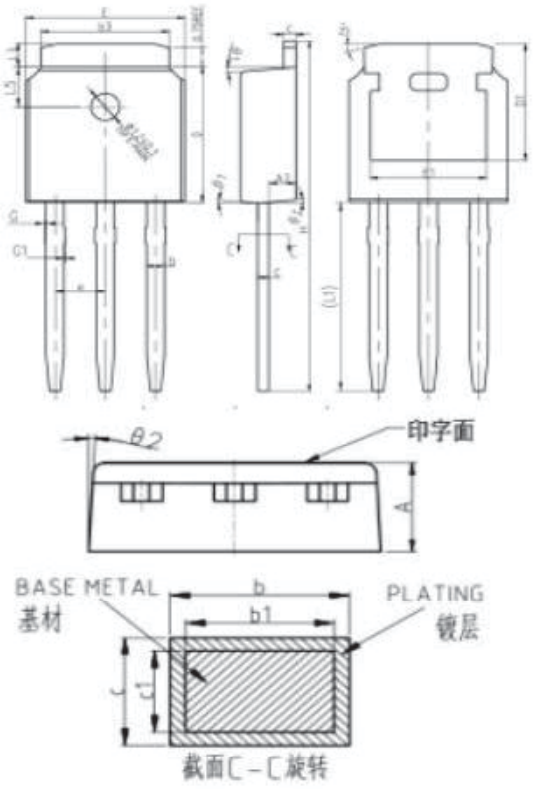
TO-251（2）外形尺寸



单位：MM

SYMBOL	MILLIMETERS		SYMBOL	MILLIMETERS	
	Min	Max		Min	Max
A	2.0	2.6	E	8.0	9.6
B	0.9	1.3	L	14.25	17.25
C	0.4	0.6	b1	0.69	0.92
D	5.8	6.8	c1	0.4	0.6
L1	5.7	6.2	D1	4.8	5.8
A1	1.0	1.3	b	0.64	0.89
e	2.28 TYP				

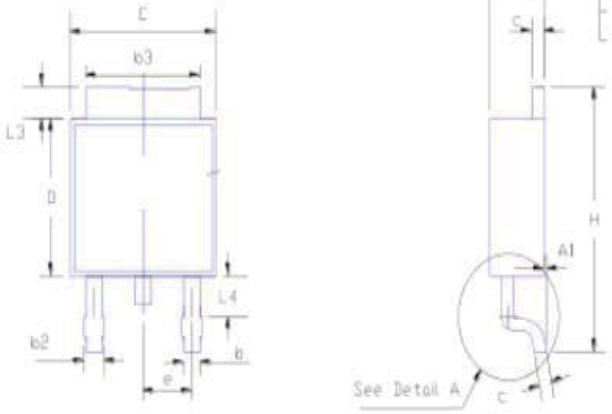
TO-251（3）外形尺寸



COMMON DIMENSIONS

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
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		
H	16.10	16.40	16.60
L1	9.20	9.40	9.60
L3	0.90	1.02	1.25
L5	1.70	1.80	1.90
θ1	5°	7°	9°
θ2	5°	7°	9°

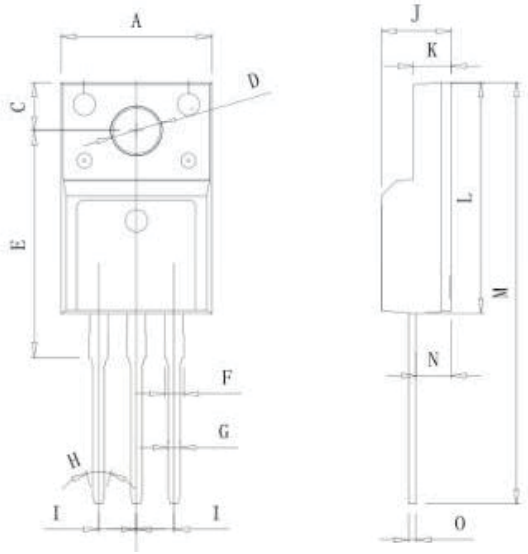
TO-252（2）外形尺寸



单位：MM

SYMBOL	MILLIMETERS		SYMBOL	MILLIMETERS	
	Min	Max		Min	Max
A	2.1	2.4	e	2.29 BSC	
A1	-	0.13	H	9.6	11.1
b	0.6	0.9	L3	0.8	1.4
b2	0.8	1.2	L4	0.6	1.1
b3	5.2	5.5	D	5.8	6.3
c	0.4	0.6	E	6.3	6.7

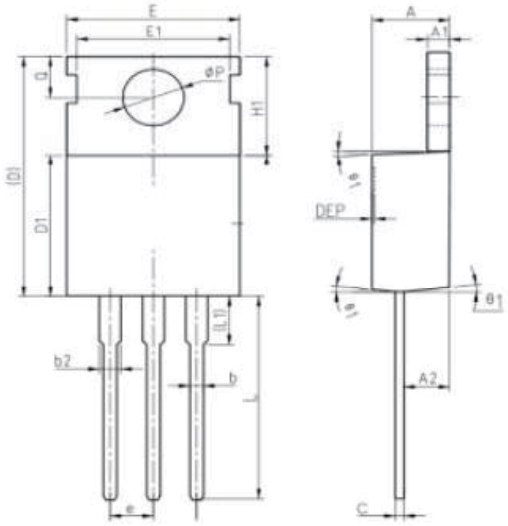
TO-220F 外形尺寸



单位：MM

SYMBOL	MILLIMETERS		SYMBOL	MILLIMETERS	
	Min	Max		Min	Max
A	9.96	10.36	K	2.34	2.74
J	4.5	4.9	O	0.4	0.6
M	28	29.6	G	0.7	0.9
E	15.4	15.6	D	2.9	3.3
L	15.5	16.1	C	3.25	3.5
N	2.2	2.9	I	2.54 TYP	
F		1.4			

TO-220A 外形尺寸



单位：MM

SYMBOL	MILLIMETERS		SYMBOL	MILLIMETERS	
	Min	Max		Min	Max
A	4.2	4.8	C	0.4	0.6
D1	8.9	9.4	b	0.7	0.9
E	9.7	10.3	A1	1.2	1.4
H1	6.3	6.9	Q	2.7	2.9
b2	1.27	1.43	A2	2.3	2.5
ØP	3.6	3.9	e	2.54 TYP	
D	15.5	15.7			

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