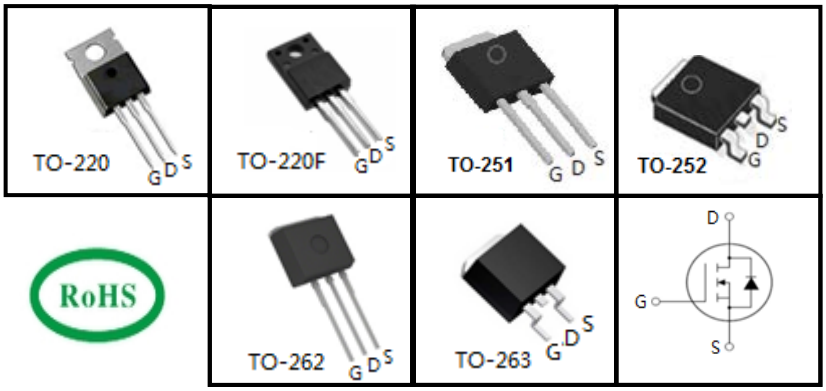
700V Super-Junction Power MOSFET

FEATURES

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- RoHS compliant



APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

Device Marking and Package Information

Device	TPP70R950C	TPA70R950C	TPU70R950C	TPD70R950C	TPC70R950C	TPB70R950C
Package	TO-220	TO-220F	TO-251	TO-252	TO-262	TO-263
Marking	70R950C	70R950C	70R950C	70R950C	70R950C	70R950C

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value		Unit
		TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	700		V
Continuous Drain Current	I_D	6		A
Pulsed Drain Current (note1)	I_{DM}	18		A
Gate-Source Voltage	V_{GSS}	±30		V
Single Pulse Avalanche Energy (note2)	E_{AS}	120		mJ
Avalanche Current (note1)	I_{AR}	3		A
Repetitive Avalanche Energy (note1)	E_{AR}	0.5		mJ
Power Dissipation (T_C = 25ºC)	P_D	83	32	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150		ºC

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Thermal Resistance, Junction-to-Case	R_{thJC}	1.5	3.9	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	80	

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	700	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 700V, V_{GS} = 0V, T_J = 25ºC	--	--	1	μA
		V_{DS} = 700V, V_{GS} = 0V, T_J = 150ºC	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	--	4	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D =3A	--	0.85	0.95	Ω
Forward Transconductance (Note3)	g_{fs}	V_{DS} = 8V, I_D =4A	--	5	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 50V, f = 1.0MHz	--	400	--	pF
Output Capacitance	C_{oss}		--	72	--	
Reverse Transfer Capacitance	C_{rss}		--	3	--	
Total Gate Charge	Q_g	V_{DD} = 560V, I_D = 6A, V_{GS} = 10V	--	8	--	nC
Gate-Source Charge	Q_{gs}		--	2	--	
Gate-Drain Charge	Q_{gd}		--	3	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 6A, R_G = 25Ω	--	6.6	--	ns
Turn-on Rise Time	t_r		--	5.2	--	
Turn-off Delay Time	$t_{d(off)}$		--	41	--	
Turn-off Fall Time	t_f		--	13.6	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	3.9	A
Pulsed Diode Forward Current	I_{SM}		--	--	12	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 6A, V_{GS} = 0V	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R = 560V, I_F = I_S, di_F/dt = 100A/μs	--	226	--	ns
Reverse Recovery Charge	Q_{rr}		--	1.3	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	9.9	--	A

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 3A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

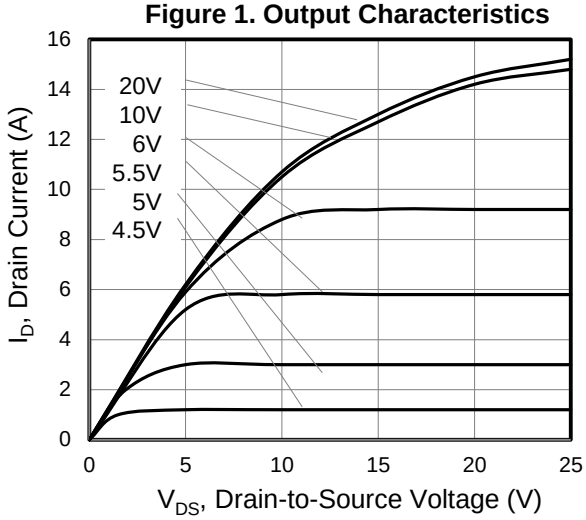


Figure 2. Transfer Characteristics

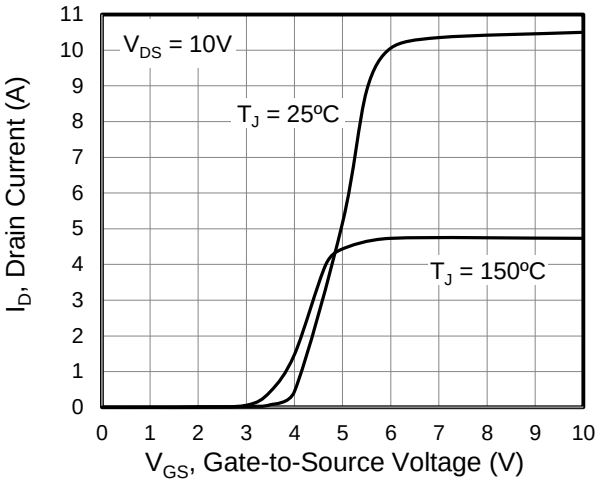


Figure 3. On-Resistance vs. Drain Current

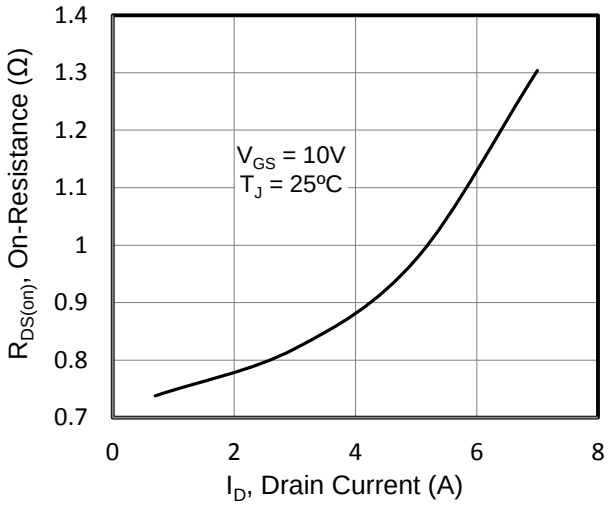


Figure 4. Capacitance

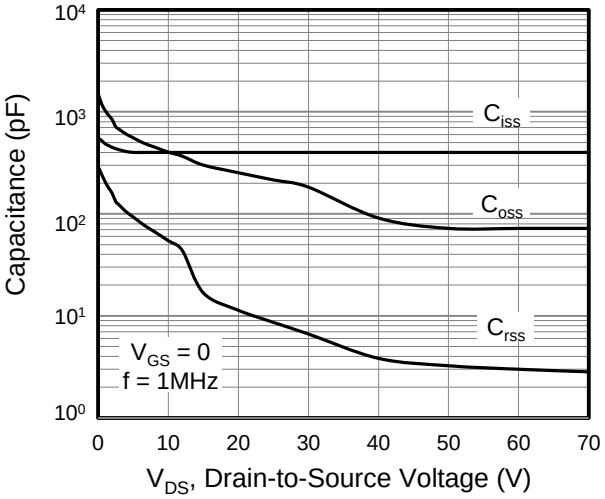


Figure 5. Gate Charge

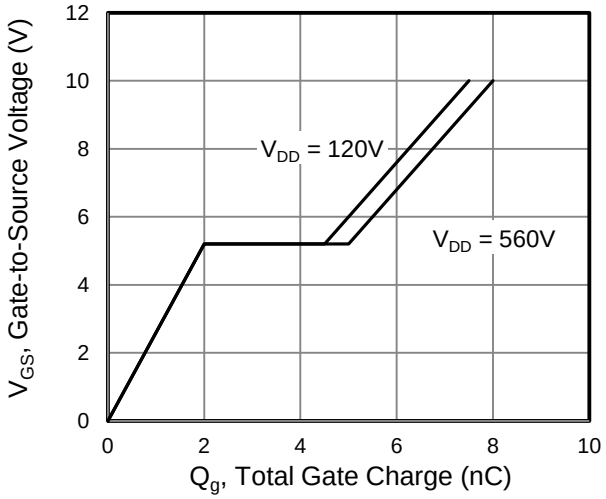
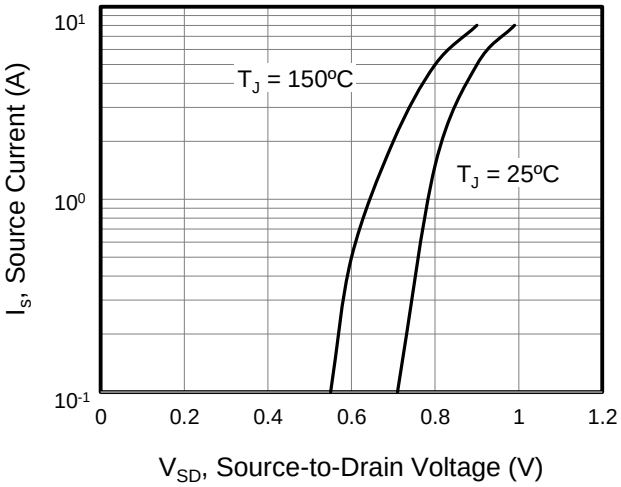


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

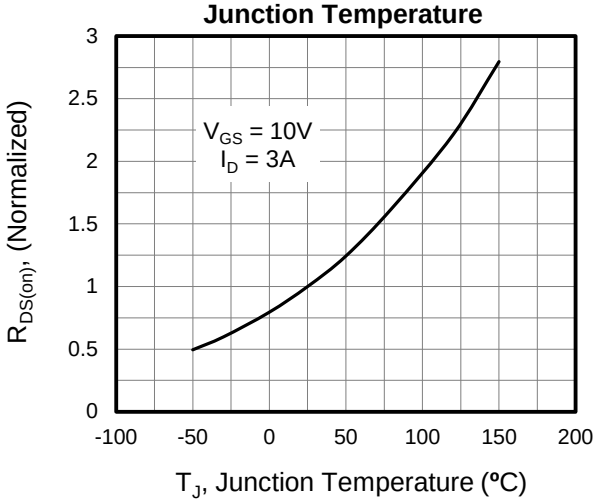


Figure 8. Threshold Voltage vs. Junction Temperature

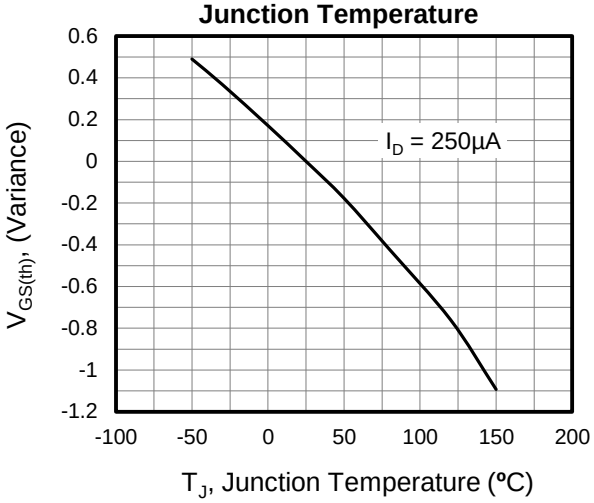


Figure 9. Transient Thermal Impedance TO-220,TO-251,TO-252,TO-262,TO-263

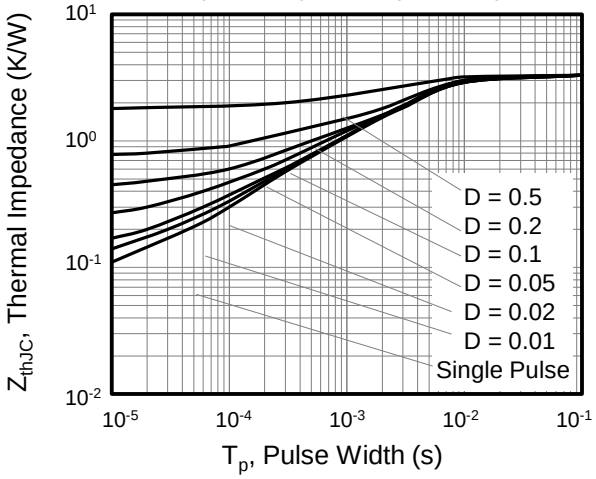


Figure 10. Transient Thermal Impedance TO-220F

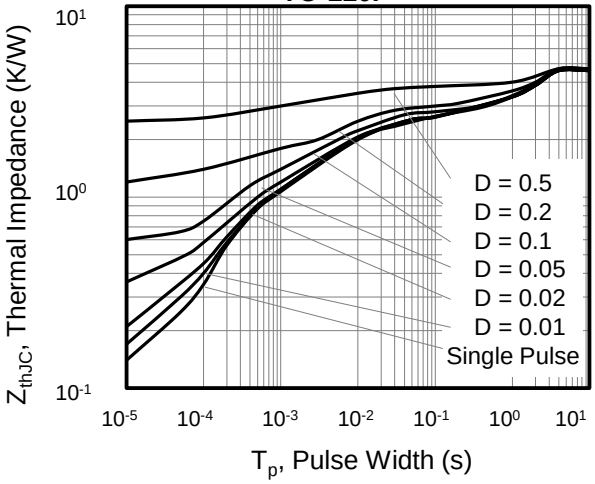


Figure A：Gate Charge Test Circuit and Waveform

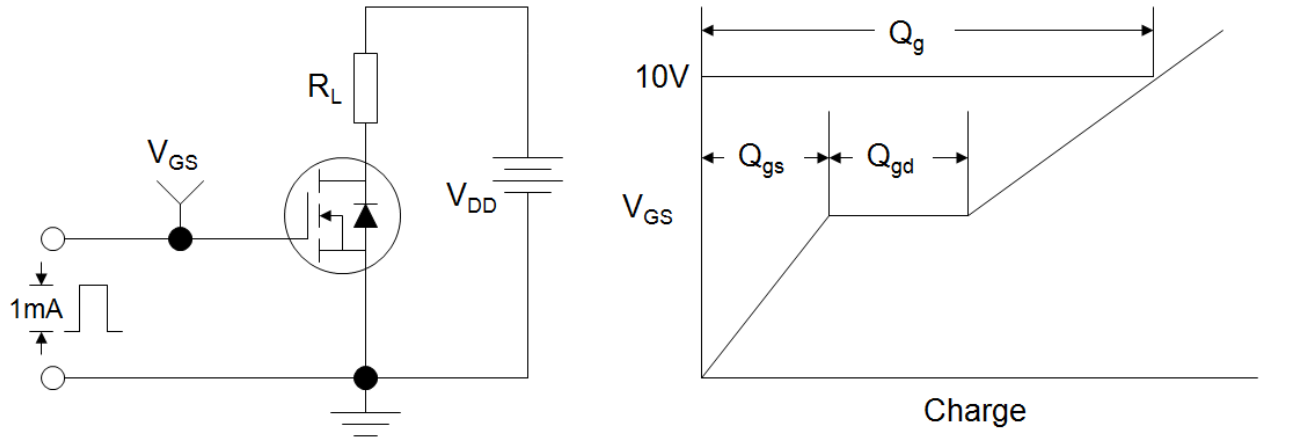


Figure B：Resistive Switching Test Circuit and Waveform

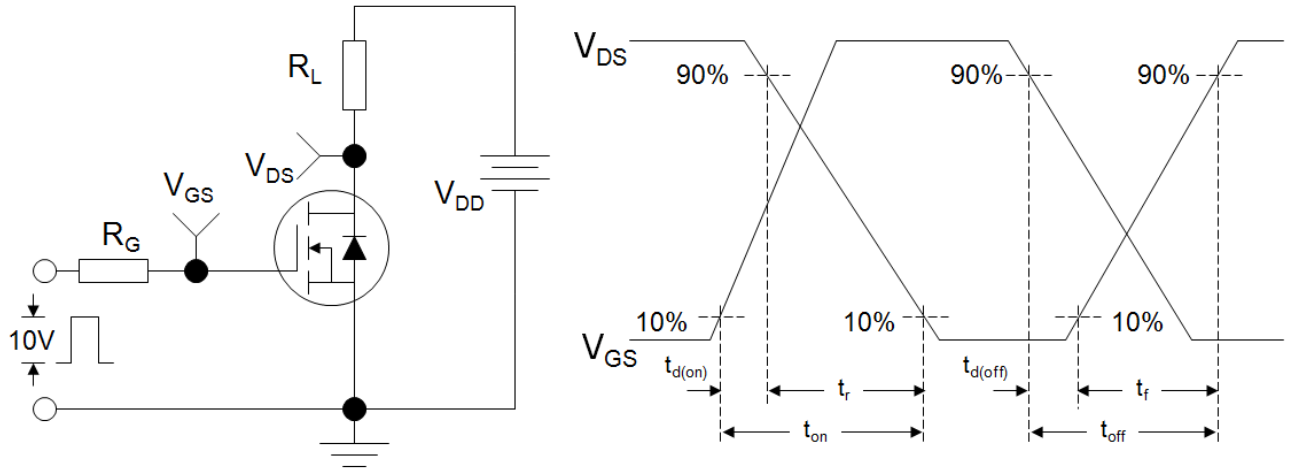
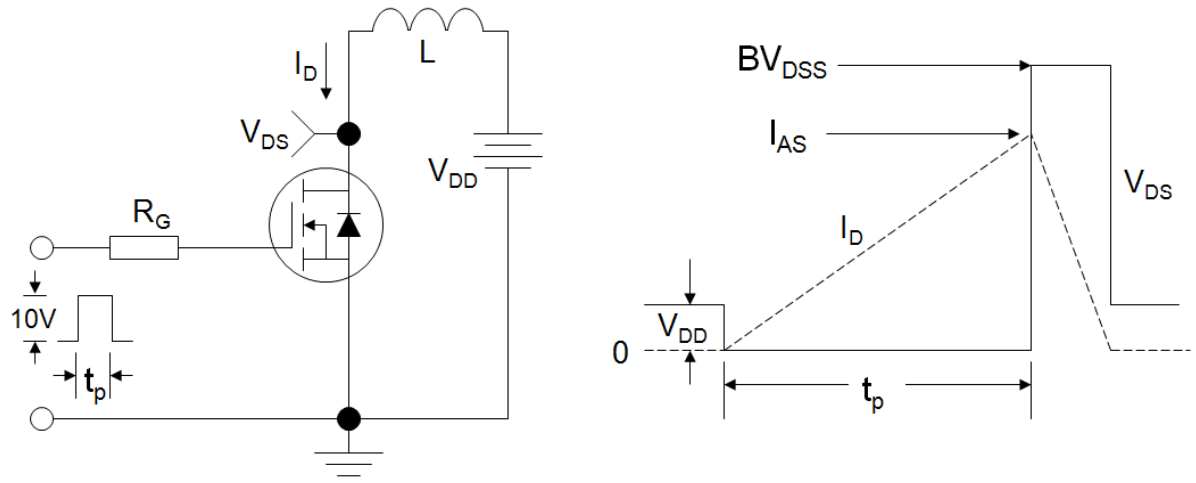
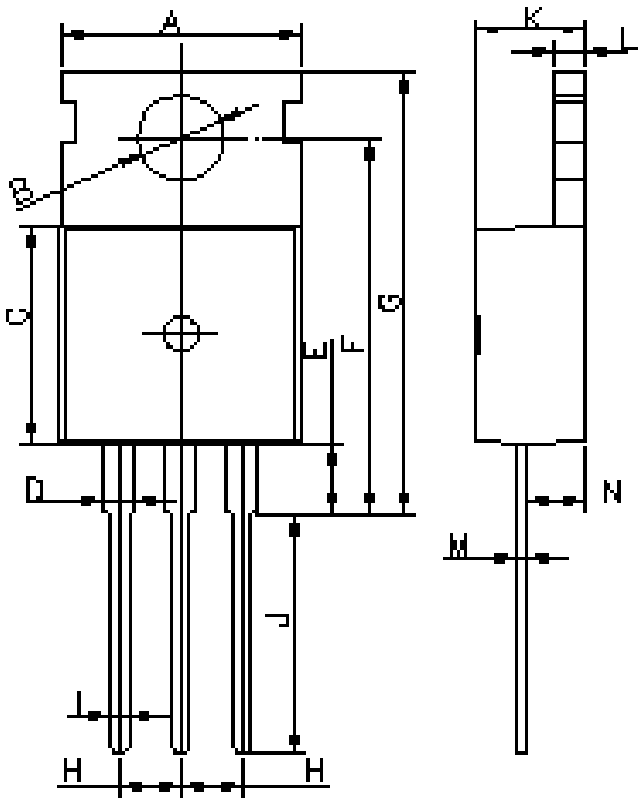


Figure C：Unclamped Inductive Switching Test Circuit and Waveform

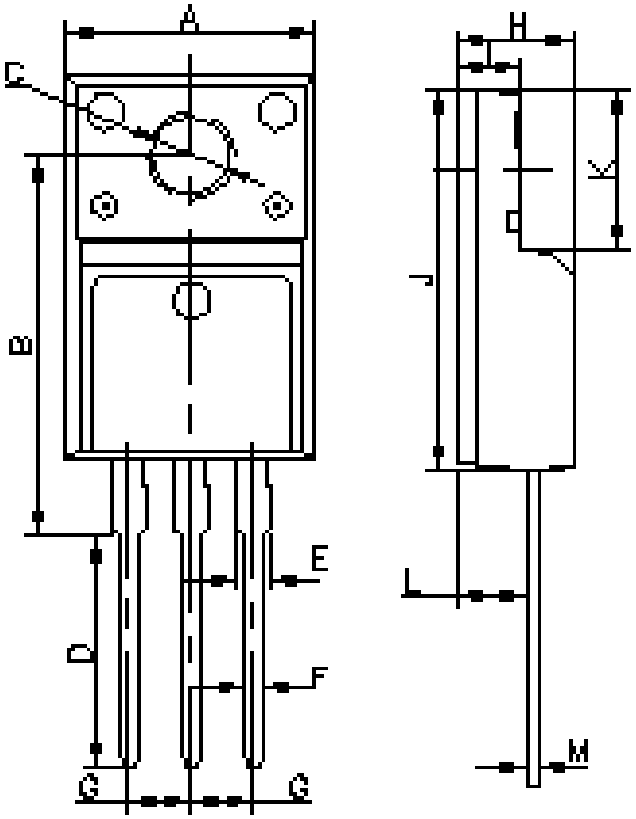


TO-220



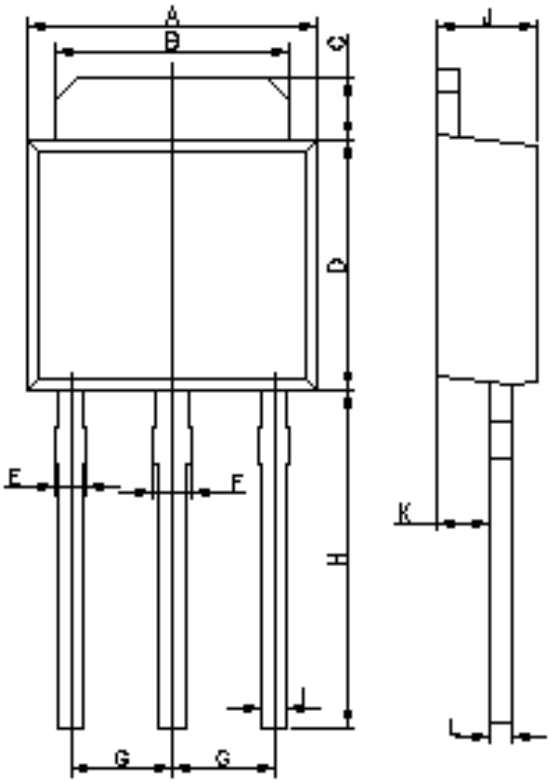
Unit: mm		
Symbol	Min.	Max.
A	9.70	10.10
B	3.50	3.70
C	9.00	9.40
D	1.17	1.47
E	2.80	3.20
F	25.80	16.20
G	18.95MAX	
H	2.44	2.84
I	0.70	0.90
J	9.78	10.38
K	4.30	4.70
L	1.20	1.40
M	0.40	0.80
N	2.25	2.55

TO-220F



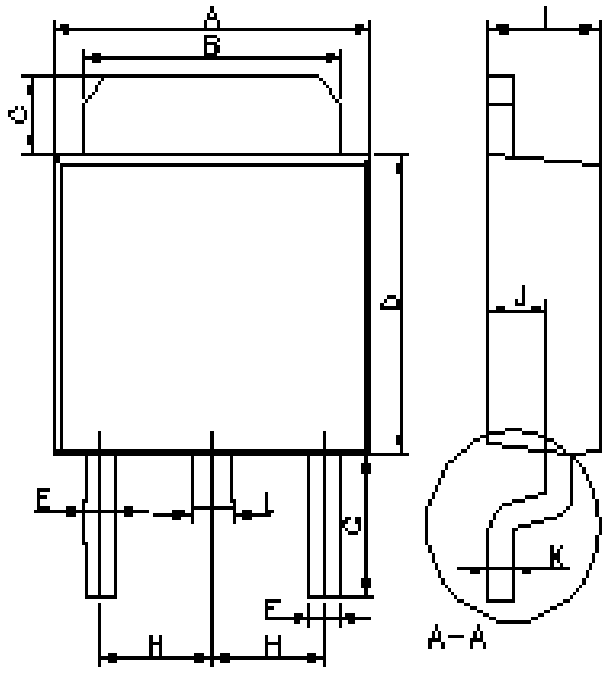
Unit: mm		
Symbol	Min.	Max.
A	9.96	10.36
B	15.5	16.1
C	3.08	3.28
D	12.64	13.24
E	1.18	1.58
F	0.7	0.9
G	2.39	2.69
H	4.5	4.9
I	2.34	2.74
J	15.67	16.07
K	6.5	6.9
L	2.56	2.96
M	0.4	0.6

TO-251



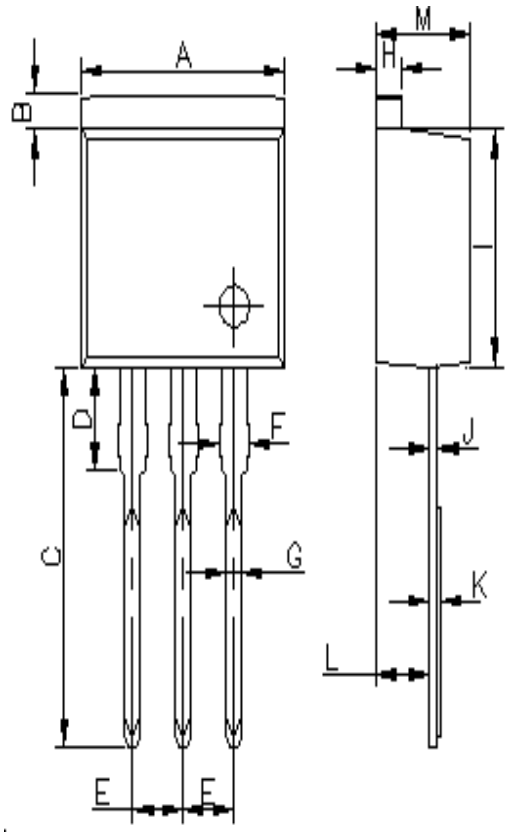
Unit: mm		
Symbol	Min.	Max.
A	6.40	6.80
B	5.15	5.45
C	1.45	1.75
D	5.40	5.80
E	0.45	0.85
F	0.65	1.05
G	2.10	2.50
H	7.20	7.80
I	0.50	0.70
J	2.10	2.50
K	1.05	1.35
L	0.40	0.60

TO-252



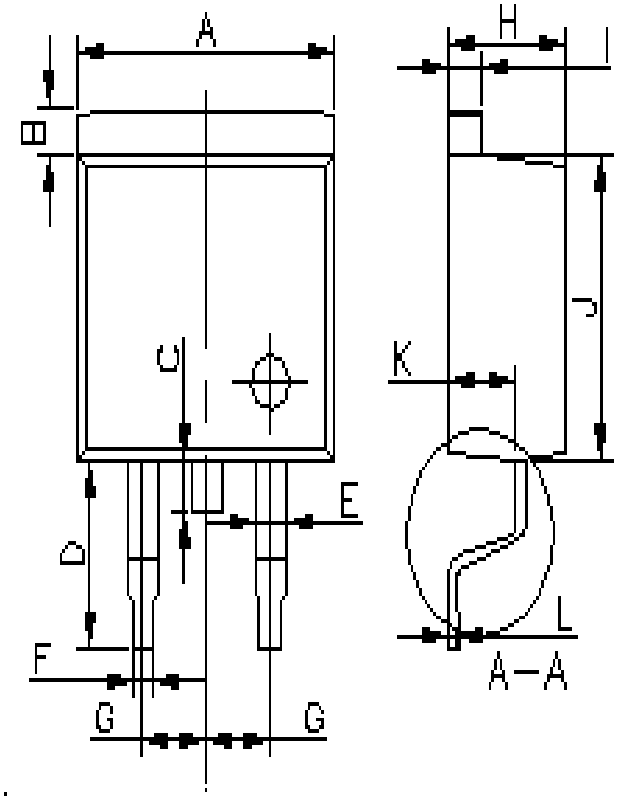
Unit: mm		
Symbol	Min.	Max.
A	6.40	6.80
B	5.15	5.45
C	1.45	1.75
D	5.40	5.80
E	0.50	0.90
F	0.50	0.70
G	2.40	3.00
H	2.15	2.45
I	2.10	2.50
J	1.05	1.35
K	0.40	0.60
L	0.75	1.05

TO-262



Unit: mm		
Symbol	Min.	Max.
A	10.00	10.40
B	1.11	1.41
C	13.56	14.16
D	3.58	3.98
E	2.39	2.69
F	1.07	1.47
G	0.71	0.91
H	1.17	1.37
I	8.45	8.85
J	0.28	0.48
K	0.32	0.52
L	2.54	2.84
M	4.50	4.90

TO-263



Unit: mm		
Symbol	Min.	Max.
A	10.00	10.40
B	1.11	1.41
C	1.25	1.55
D	5.10	5.50
E	1.12	1.42
F	0.71	0.91
G	2.39	2.69
H	4.49	4.89
I	1.17	1.37
J	8.45	8.85
K	2.54	2.84
L	0.28	0.48

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