



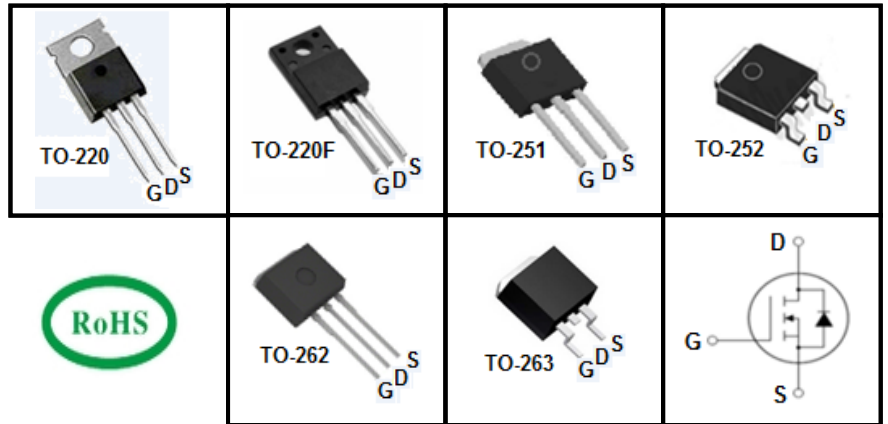
## 500V Super-Junction Power MOSFET

### 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	TPP50R700C	TPA50R700C	TPU50R700C	TPD50R700C	TPC50R700C	TPB50R700C
Package	TO-220	TO-220F	TO-251	TO-252	TO-262	TO-263
Marking	50R700C	50R700C	50R700C	50R700C	50R700C	50R700C

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted				
Parameter	Symbol	Value		Unit
		TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Drain-Source Voltage ( $V_{GS} = 0V$ )	$V_{DSS}$	500		V
Continuous Drain Current	$I_D$	4		A
Pulsed Drain Current (note1)	$I_{DM}$	12		A
Gate-Source Voltage	$V_{GSS}$	$\pm 30$		V
Single Pulse Avalanche Energy (note2)	$E_{AS}$	110		mJ
Avalanche Current (note1)	$I_{AR}$	2		A
Repetitive Avalanche Energy (note1)	$E_{AR}$	0.09		mJ
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	36.8	31.3	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55~+150		$^\circ\text{C}$

Thermal Resistance				
Parameter	Symbol	Value		Unit
		TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Thermal Resistance, Junction-to-Case	$R_{thJC}$	3.4	4	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	75	80	



Specifications $T_J = 25^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	$\mu A$
		$V_{DS} = 500V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	100	
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30V$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5	--	4	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 2A$	--	0.56	0.67	$\Omega$
Forward Transconductance (Note3)	$g_{fs}$	$V_{DS} = 10V, I_D = 2A$	--	3	--	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = 50V,$ $f = 1.0\text{MHz}$	--	350	--	$\mu F$
Output Capacitance	$C_{oss}$		--	40	--	
Reverse Transfer Capacitance	$C_{rss}$		--	3.5	--	
Total Gate Charge	$Q_g$	$V_{DD} = 400V, I_D = 4A,$ $V_{GS} = 10V$	--	7	--	nC
Gate-Source Charge	$Q_{gs}$		--	1.5	--	
Gate-Drain Charge	$Q_{gd}$		--	2.5	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 4A,$ $R_G = 25\Omega$	--	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	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	3.9	A
Pulsed Diode Forward Current	$I_{SM}$		--	--	12	
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = 4A, V_{GS} = 0V$	--	0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$V_R = 400V, I_F = I_S,$ $di_F/dt = 100A/\mu s$	--	226	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	1.3	--	$\mu C$
Peak Reverse Recovery Current	$I_{rrm}$		--	9.9	--	A

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 2A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s, \text{Duty Cycle } \leq 1\%$



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 1. Output Characteristics

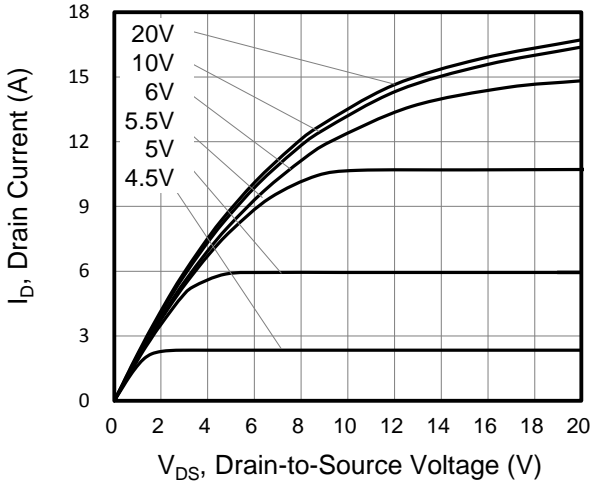


Figure 2. Transfer Characteristics

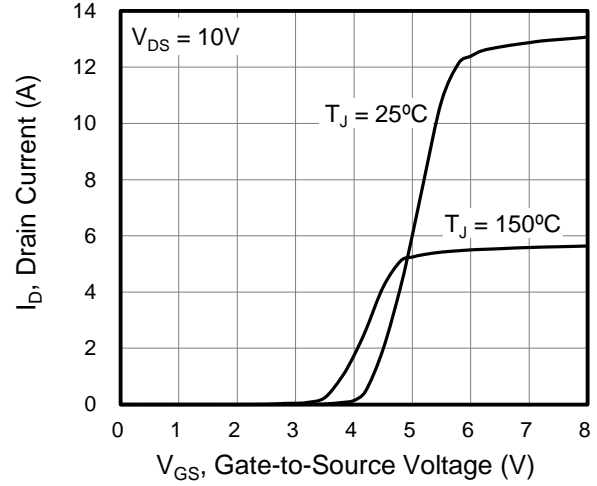


Figure 3. On-Resistance vs. Drain Current

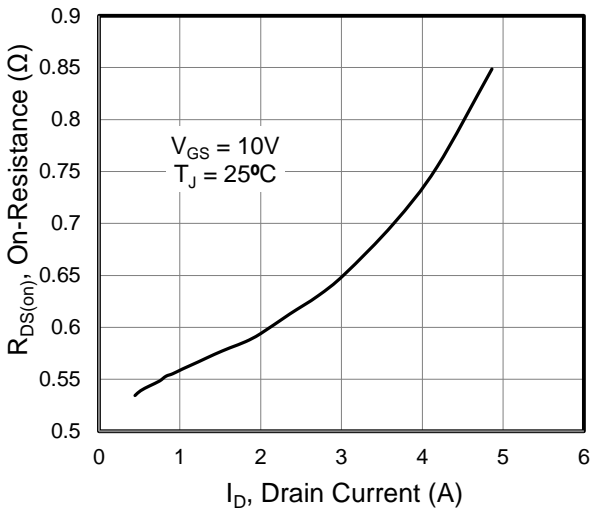


Figure 4. Capacitance

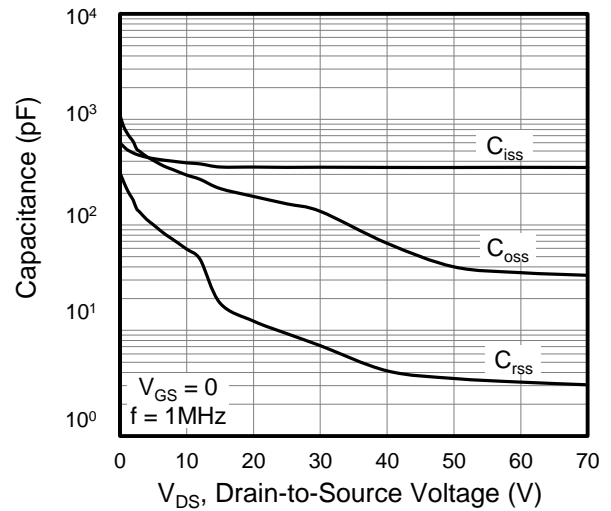


Figure 5. Gate Charge

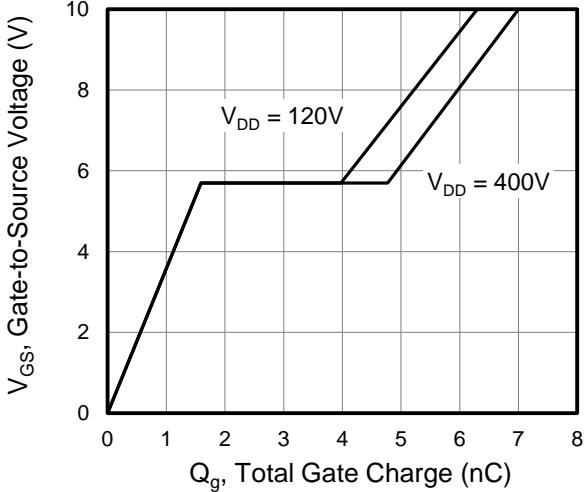
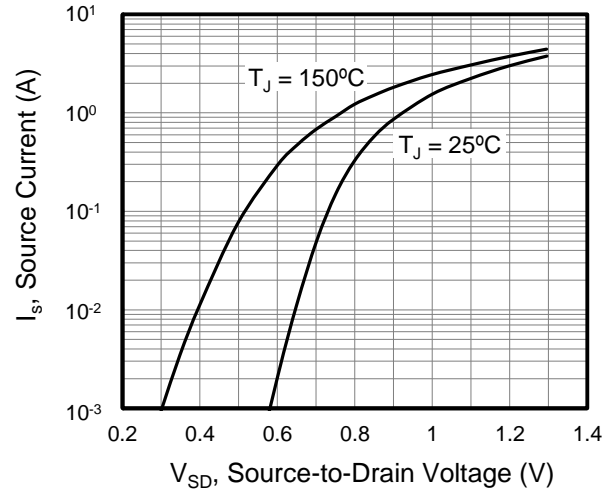


Figure 6. Body Diode Forward Voltage





Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

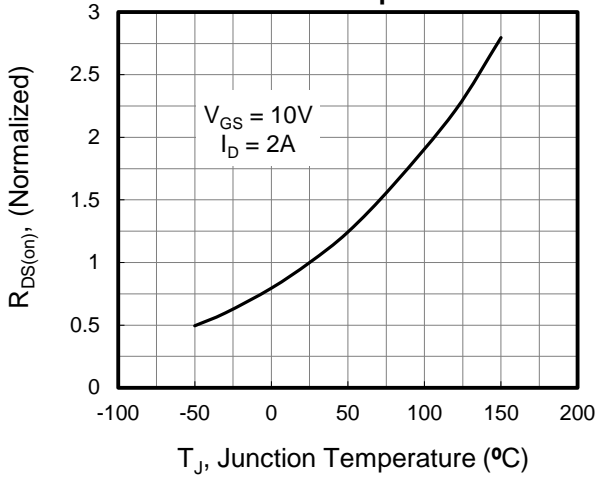


Figure 8. Threshold Voltage vs. Junction Temperature

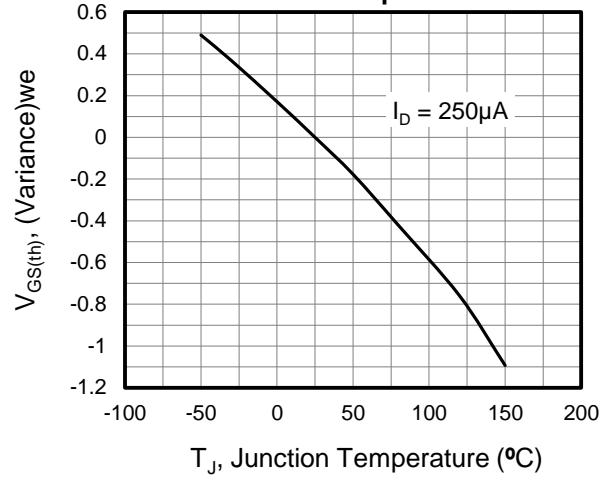


Figure 9. Transient Thermal Impedance TO-220, TO-251, TO-252, TO-262, TO-263

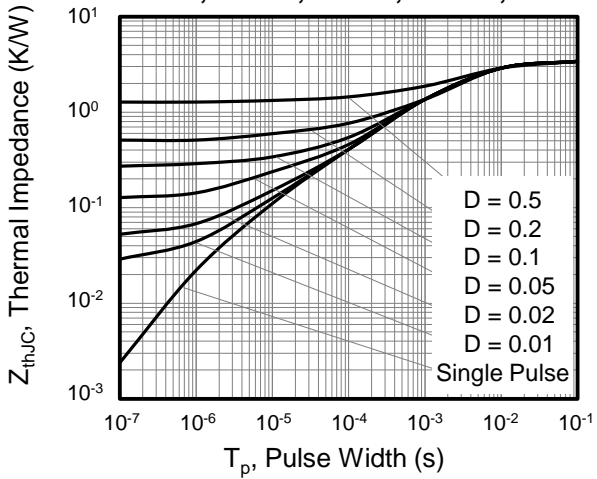


Figure 10. Transient Thermal Impedance TO-220F

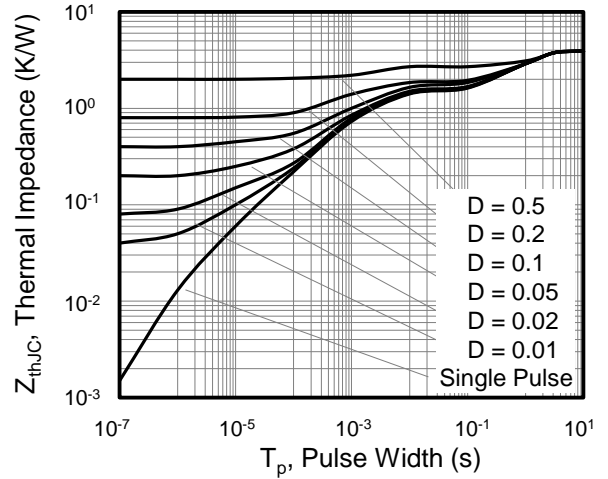




Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

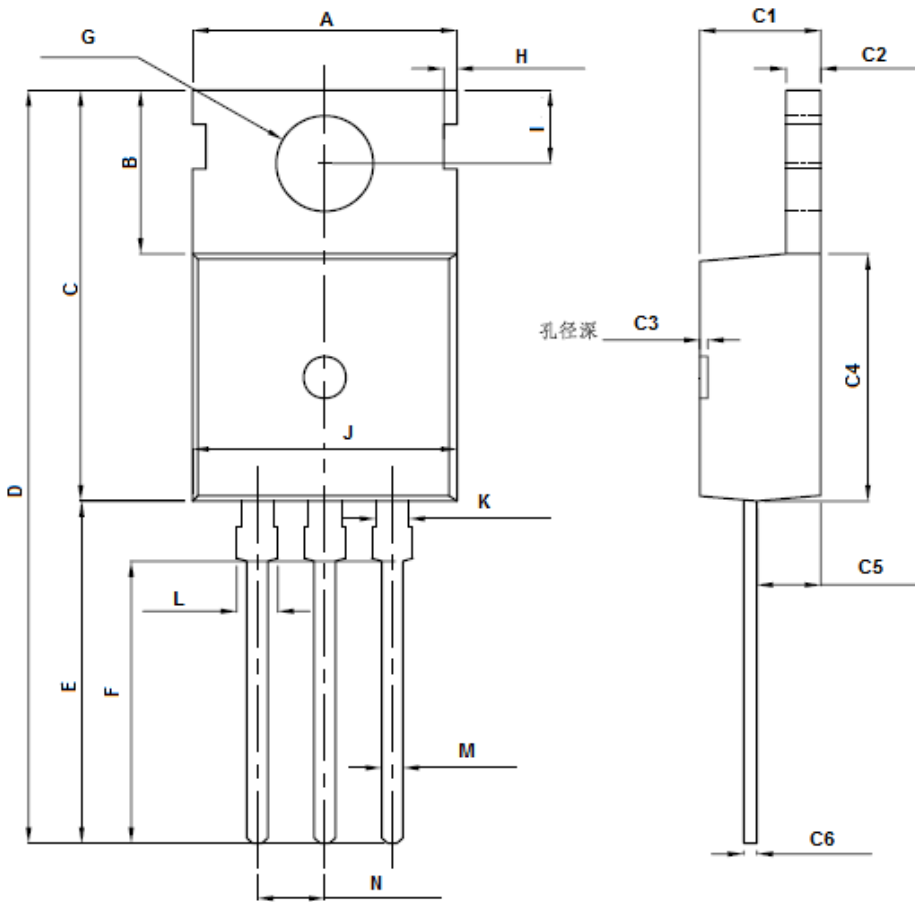


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





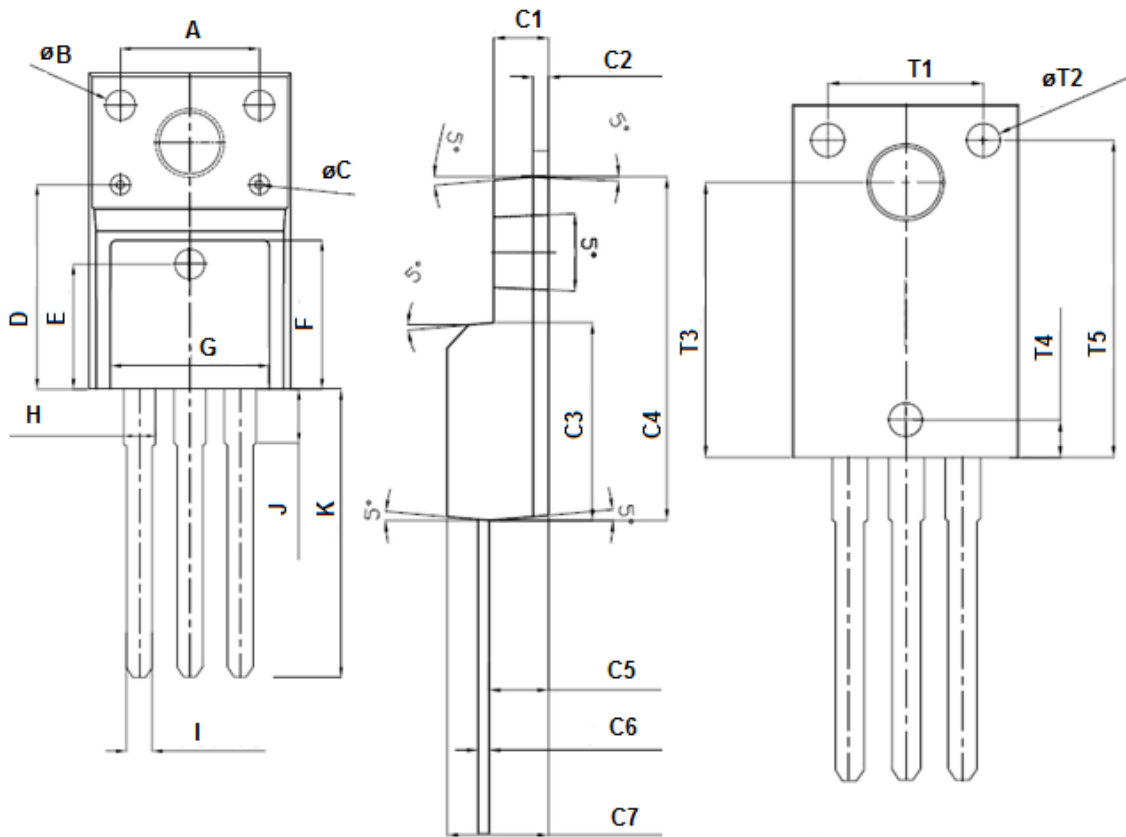
## TO-220



Unit: mm		
Symbol	Min.	Max.
A	9.78	9.98
B	6.05	6.45
C	15.50	15.90
D	28.58	28.98
E	12.88	13.28
F	9.88	10.28
G	3.55	3.75
H	0.50	0.70
I	2.70	2.90
J	9.60	10.00
K	1.14	1.34
L	1.24	1.39
M	0.70	0.90
C1	4.40	4.70
C2	1.20	1.40
C3	0.00	0.30
C4	9.25	9.65
C5	2.30	2.50
C6	0.40	0.60



## TO-220F

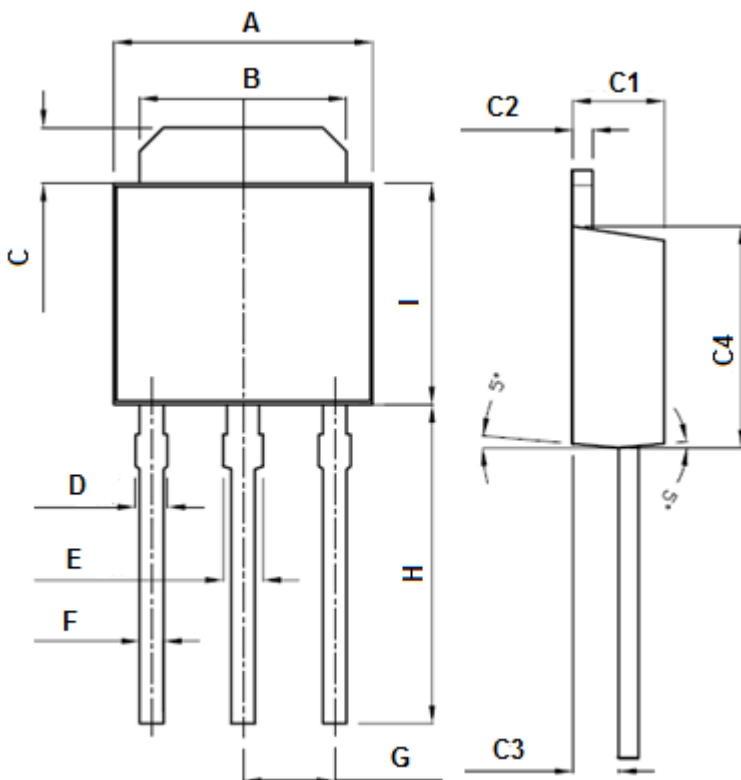


Unit: mm		
Symbol	Min.	Max.
A	6.80	7.20
B	1.40	1.60
C	0.50	0.70
D	10.10	10.50
E	6.10	6.50
F	7.30	7.70
G	7.80	8.20
H	1.30	1.50
I	0.70	0.90
J	3.00	3.40
K	12.95	13.35

Unit: mm		
Symbol	Min.	Max.
C1	2.37	2.77
C2	0.50	0.90
C3	8.95	9.35
C4	15.70	16.10
C5	2.80	3.20
C6	0.40	0.60
C7	4.50	4.90
T1	6.80	7.20
T2	1.40	1.60
T3	12.30	12.50
T4	1.40	1.80
T5	14.10	14.50



## TO-251

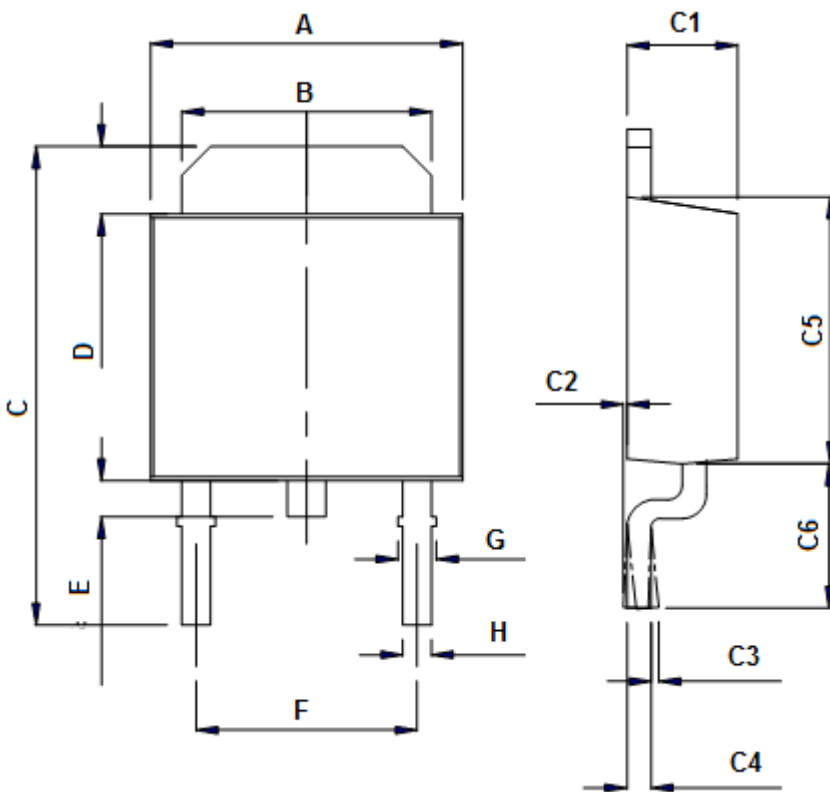


Unit: mm		
Symbol	Min.	Max.
A	6.30	6.70
B	5.10	5.30
C	1.20	1.60
D	0.60	0.75
E	0.80	0.95
F	0.50	0.70
G	2.25	2.35
H	7.80	8.20
I	5.35	5.75
C1	2.20	2.40
C2	0.40	0.60
C3	1.05	1.25
C4	5.35	5.75





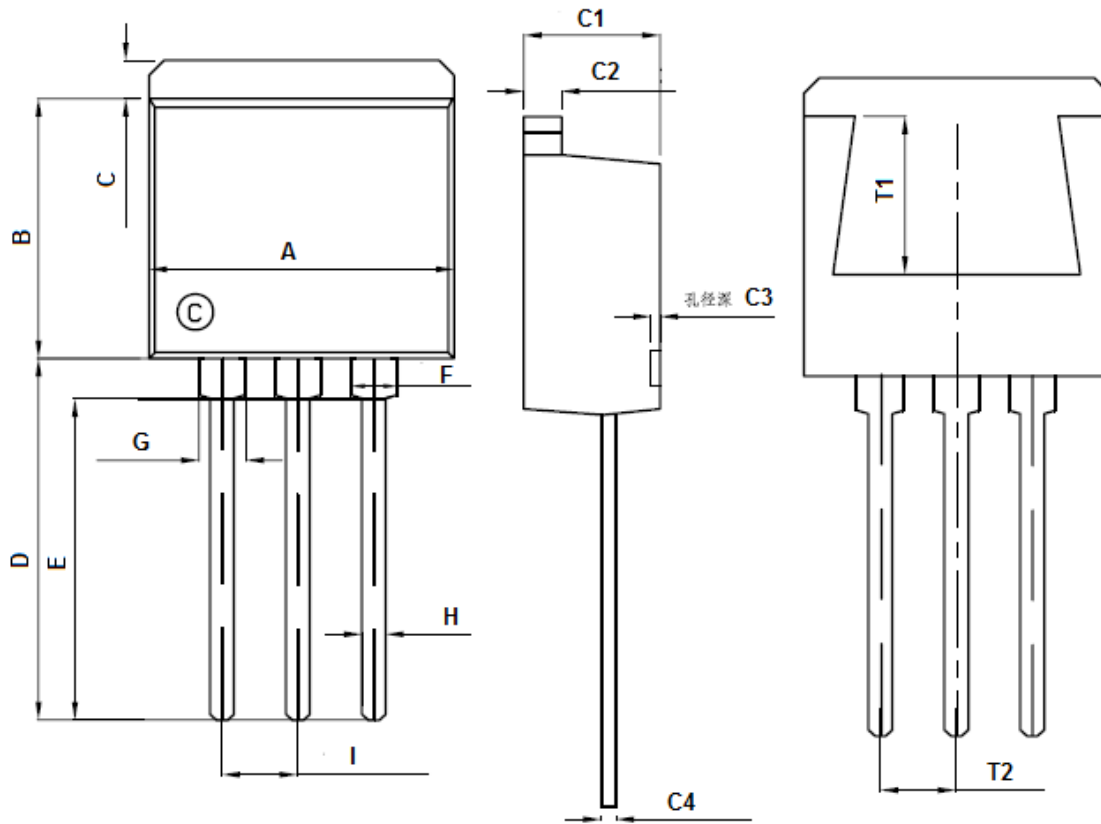
## TO-252



Unit: mm		
Symbol	Min.	Max.
A	6.30	6.70
B	5.10	5.30
C	9.50	9.90
D	1.20	1.60
E	0.60	0.90
F	4.50	4.70
G	0.60	0.75
H	0.40	0.80
C1	2.20	2.40
C2	0.00	0.10
C3	0.00	0.05
C4	0.40	0.60
C5	5.35	5.75
C6	2.55	2.95



## TO-262

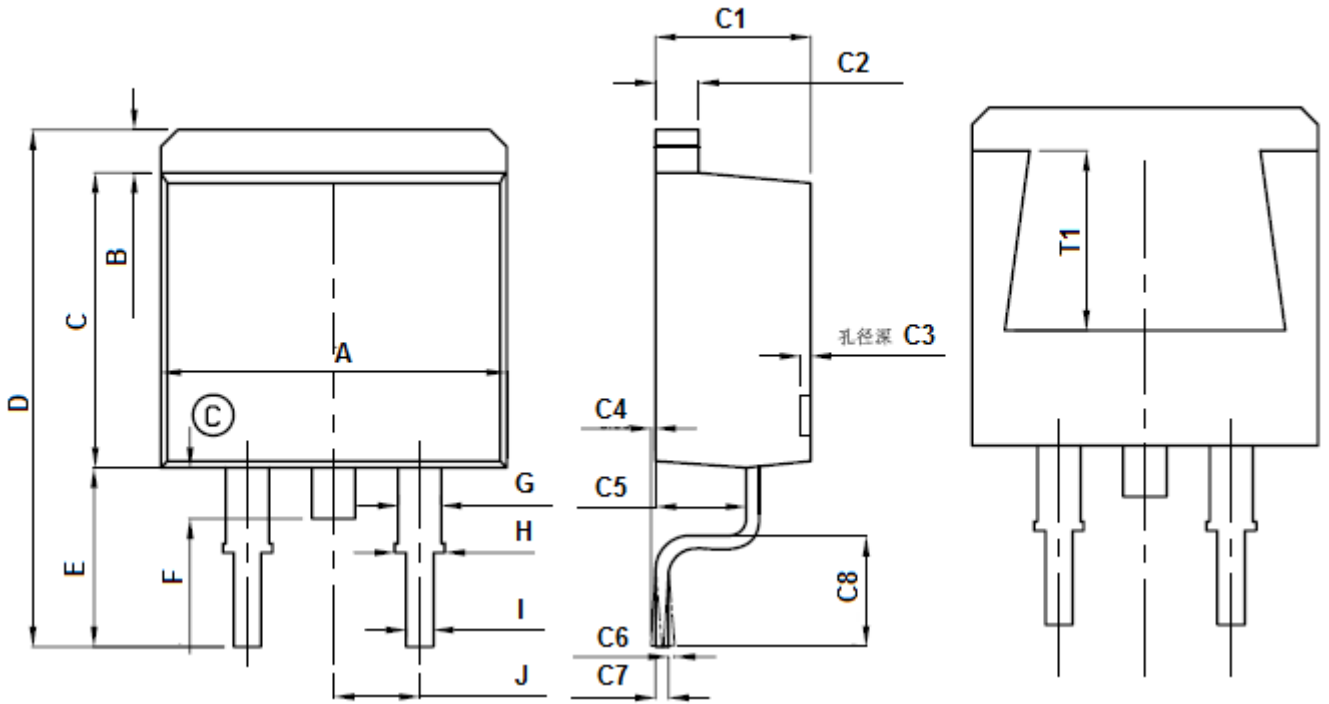


Unit: mm		
Symbol	Min.	Max.
A	9.90	10.30
B	8.50	8.90
C	1.17	1.37
D	13.30	13.70
E	9.88	10.28
F	1.14	1.34
G	1.24	1.39
H	0.70	0.90
I	2.49	2.59

Unit: mm		
Symbol	Min.	Max.
C1	4.47	4.67
C2	1.17	1.37
C3	0.00	0.30
C4	0.40	0.60
T1	5.60REF	
T2	2.49	2.59



## TO-263



Unit: mm		
Symbol	Min.	Max.
A	9.90	10.30
B	1.17	1.37
C	8.50	8.90
D	15.05	15.45
E	5.08	5.48
F	1.30	1.70
G	1.17	1.37
H	1.27	1.42
I	0.61	1.02
J	2.49	2.59

Unit: mm		
Symbol	Min.	Max.
C1	4.47	4.67
C2	1.17	1.37
C3	0.00	0.30
C4	0.00	0.15
C5	2.60	2.80
C6	0.00	0.10
C7	0.28	0.49
C8	2.45	2.75
T1	5.60REF	



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