



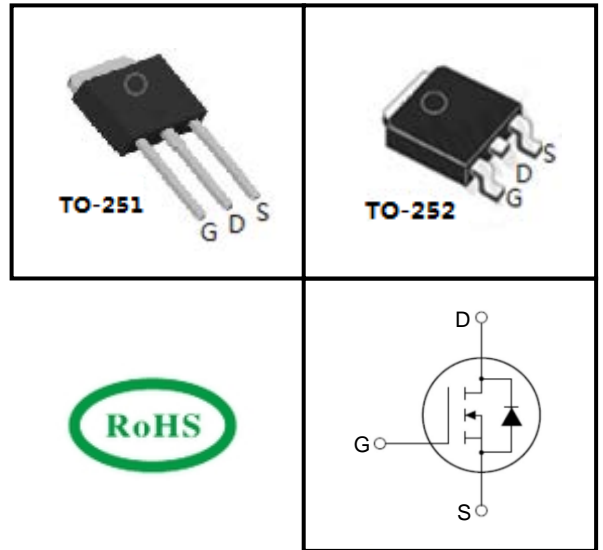
500V Super-Junction Power MOSFET

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	Package	Marking
TPU50R1K6C	TO-251	50R1K6C
TPD50R1K6C	TO-252	50R1K6C

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted				
Parameter	Symbol	Value		Unit
		TO-251	TO-252	
Drain-Source Voltage ($V_{GS} = 0\text{V}$)	V_{DSS}	500		V
Continuous Drain Current	I_D	2.0		A
Pulsed Drain Current (note1)	I_{DM}	6.0		A
Gate-Source Voltage	V_{GSS}	± 30		V
Single Pulse Avalanche Energy (note2)	E_{AS}	80		mJ
Avalanche Current (note1)	I_{AR}	1		A
Repetitive Avalanche Energy (note1)	E_{AR}	0.05		mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	24		W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150		$^\circ\text{C}$

Thermal Resistance				
Parameter	Symbol	Value		Unit
		TO-251	TO-252	
Thermal Resistance, Junction-to-Case	R_{thJC}	5.2		K/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	75		



Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	μA
		$V_{DS} = 500V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	100	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 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)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 1A$	--	1.34	1.6	Ω
Forward Transconductance (Note3)	g_{fs}	$V_{DS} = 10V, I_D = 1A$	--	2	--	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 50V,$ $f = 1.0\text{MHz}$	--	170	--	μF
Output Capacitance	C_{oss}		--	21	--	
Reverse Transfer Capacitance	C_{rss}		--	1.7	--	
Total Gate Charge	Q_g	$V_{DD} = 400V, I_D = 2A,$ $V_{GS} = 10V$	--	3.5	--	nC
Gate-Source Charge	Q_{gs}		--	0.9	--	
Gate-Drain Charge	Q_{gd}		--	1.3	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 2A,$ $R_G = 25\Omega$	--	8	--	ns
Turn-on Rise Time	t_r		--	7	--	
Turn-off Delay Time	$t_{d(off)}$		--	40	--	
Turn-off Fall Time	t_f		--	20	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ\text{C}$	--	--	2	A
Pulsed Diode Forward Current	I_{SM}		--	--	8	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 2A, V_{GS} = 0V$	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	$V_R = 400V, I_F = I_S,$ $di_F/dt = 100A/\mu s$	--	230	--	ns
Reverse Recovery Charge	Q_{rr}		--	1.1	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	9.8	--	A

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 1A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
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

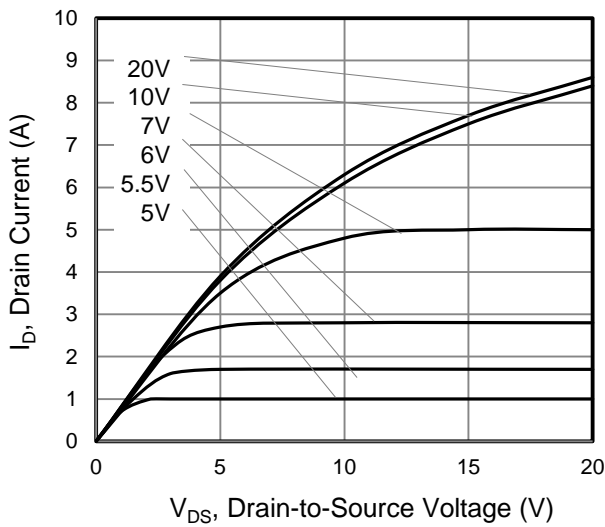


Figure 2. Transfer Characteristics

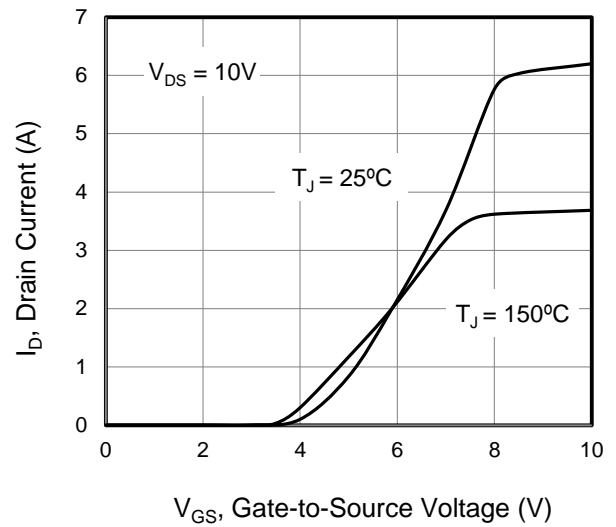


Figure 3. On-Resistance vs. Drain Current

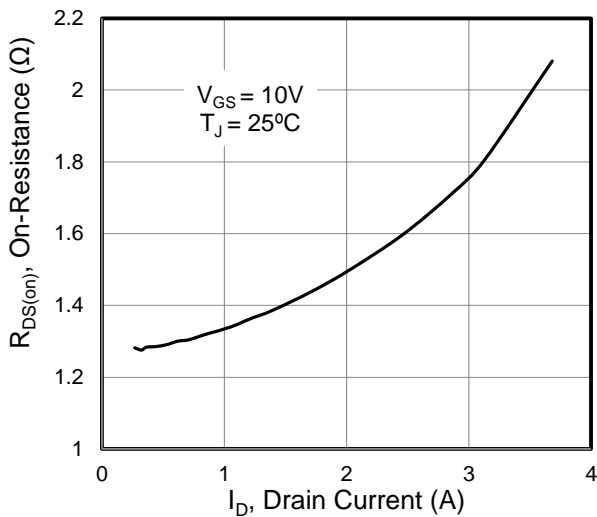


Figure 4. Capacitance

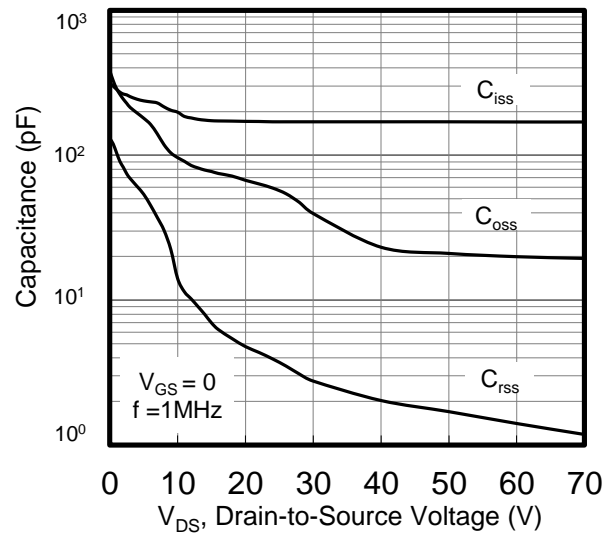


Figure 5. Gate Charge

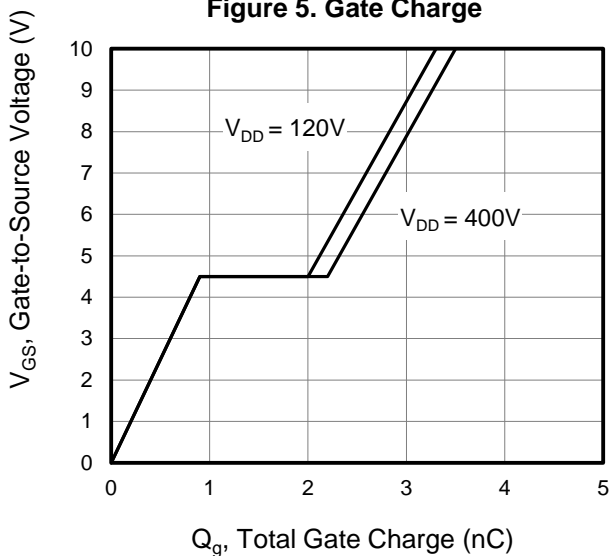
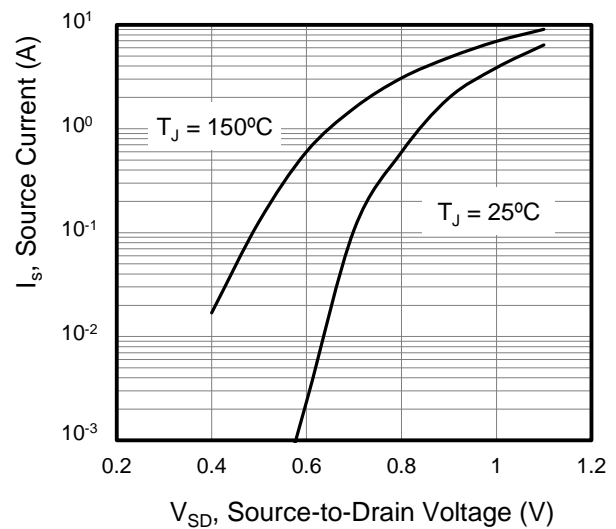


Figure 6. Body Diode Forward Voltage





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

Figure 7. On-Resistance vs. Junction Temperature

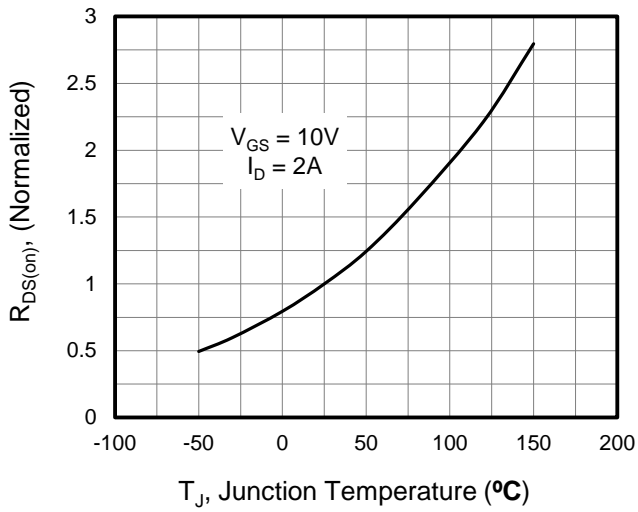


Figure 8. Threshold Voltage vs. Junction Temperature

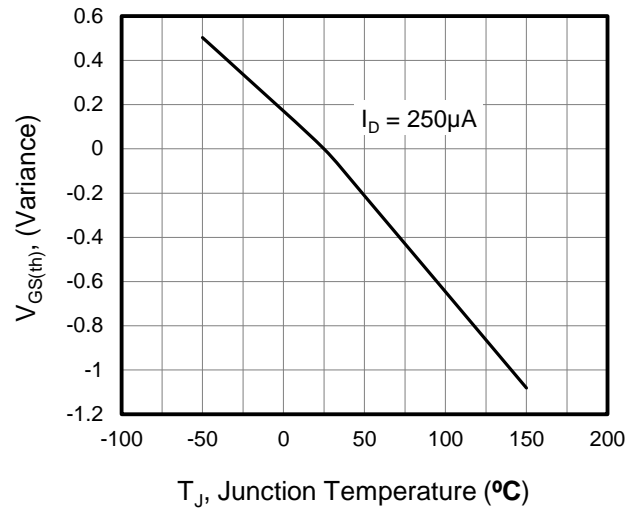


Figure 9. Transient Thermal Impedance TO-2251/TO-252

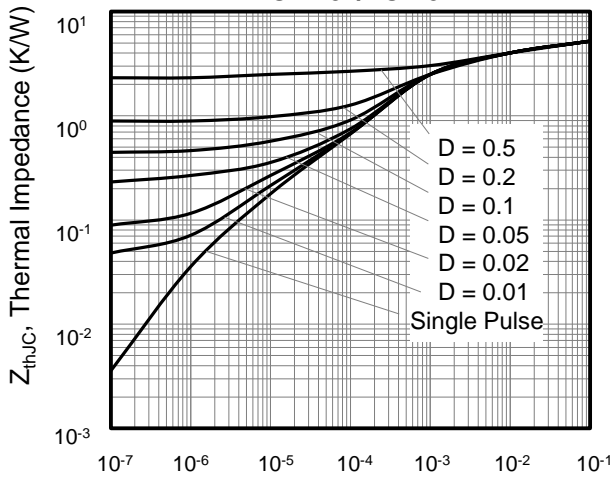




Figure A: Gate Charge Test Circuit and Waveform

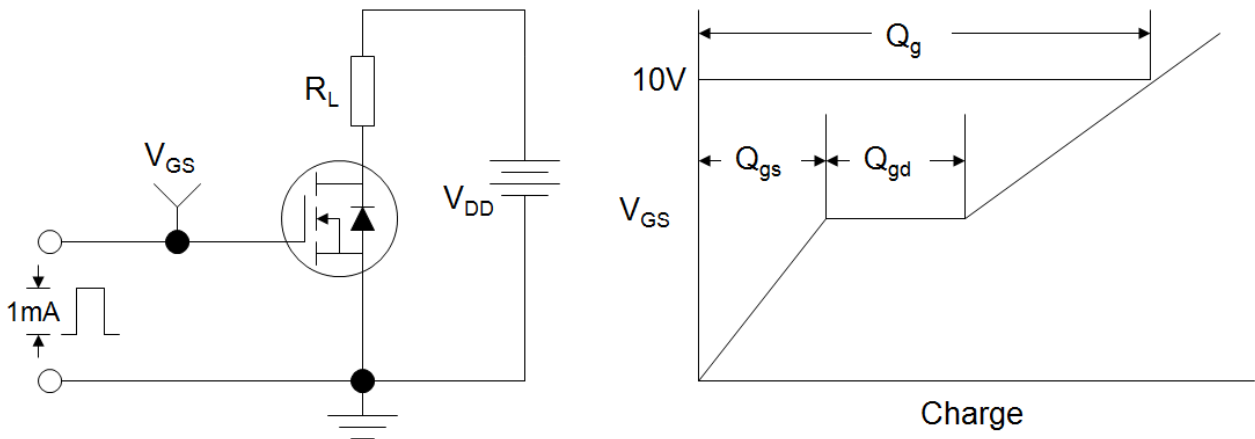


Figure B: Resistive Switching Test Circuit and Waveform

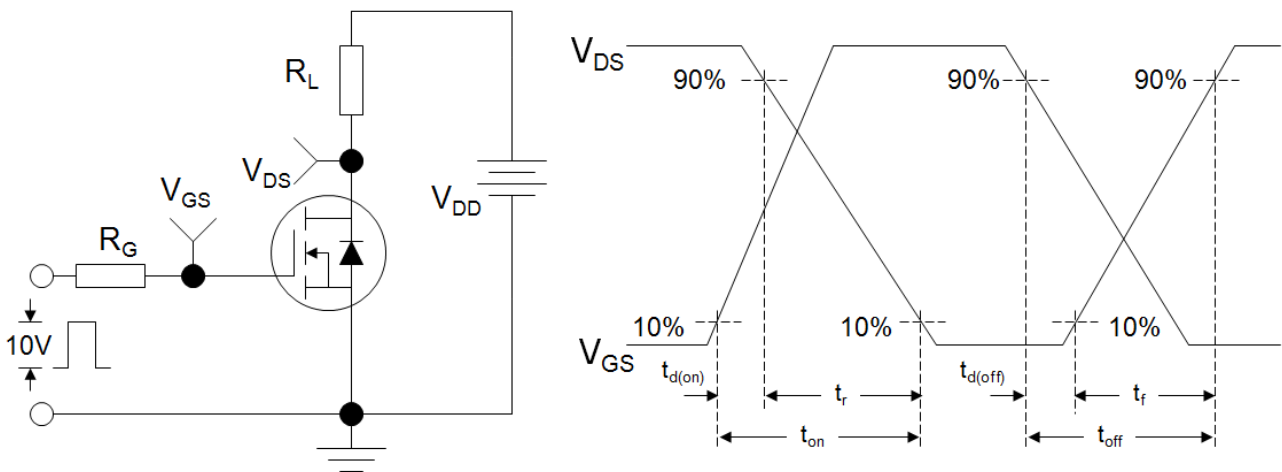
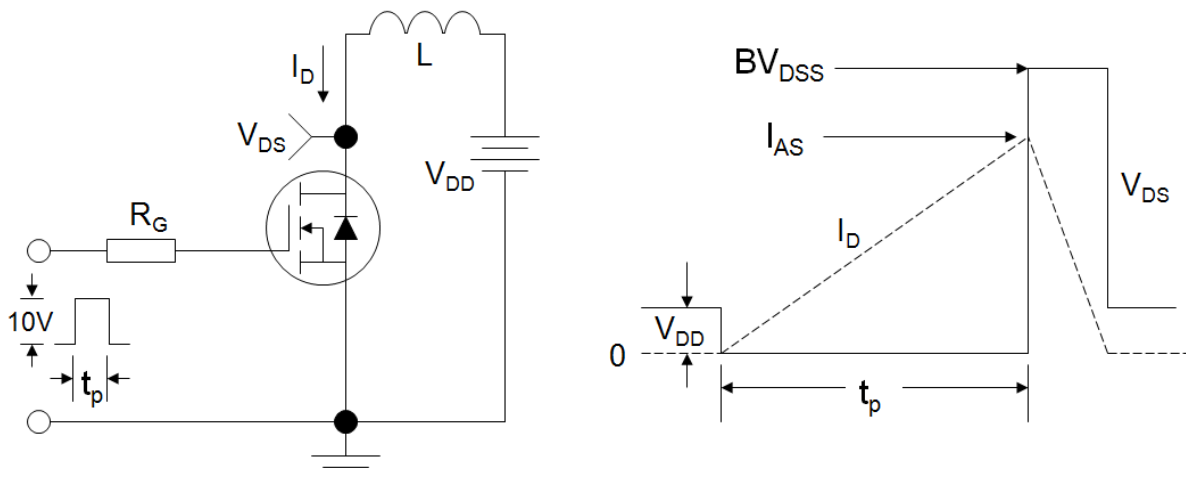
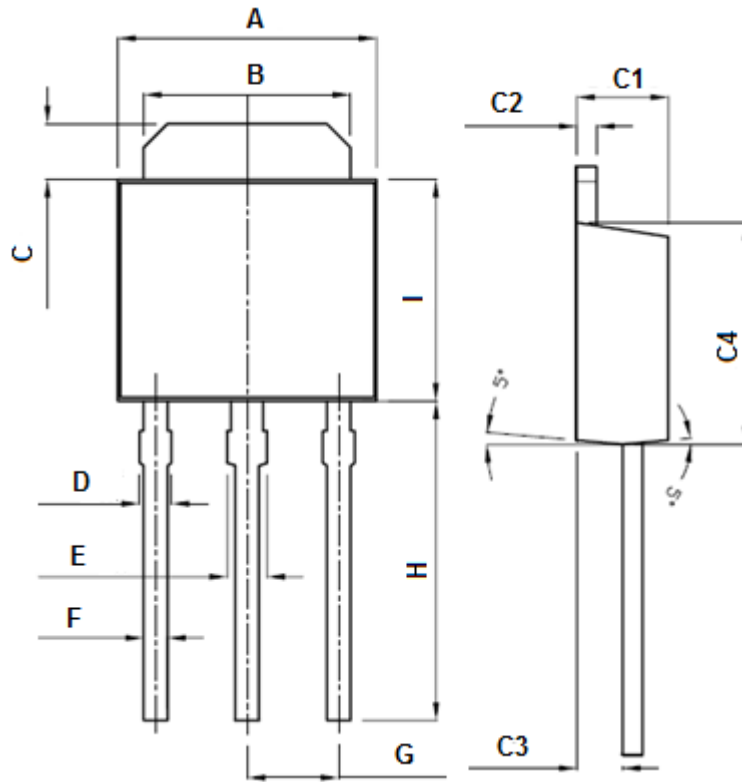


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





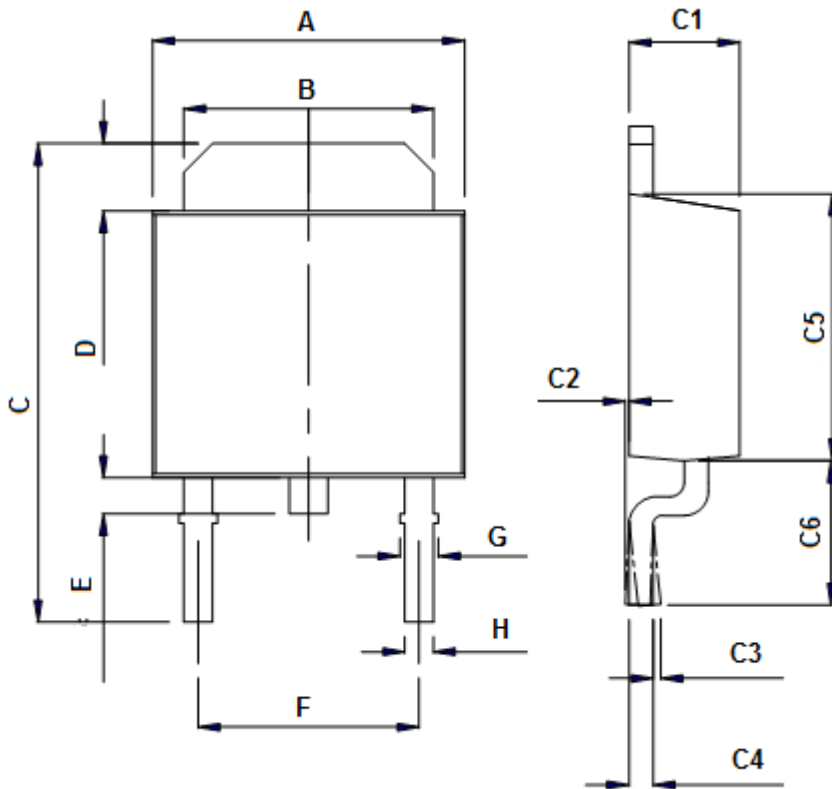
TO-251



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



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