



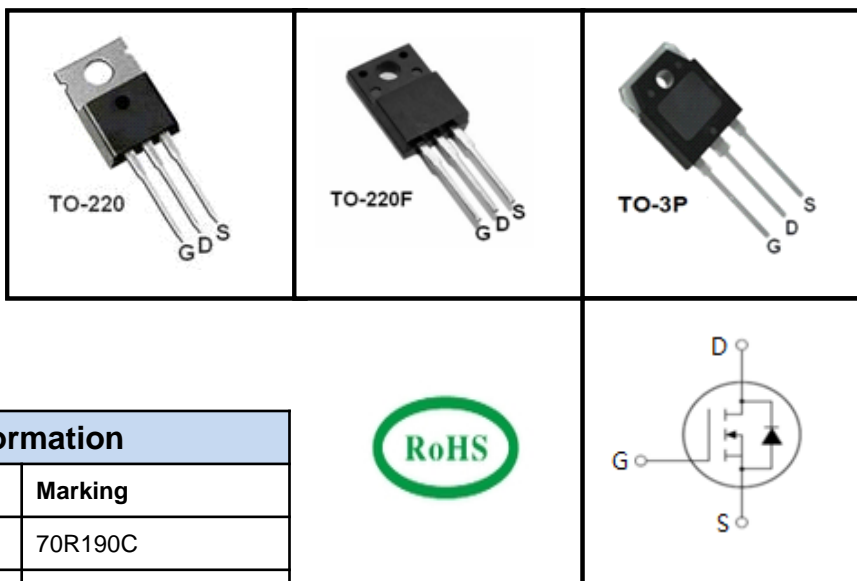
700V Super-Junction Power MOSFET

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	Package	Marking
TPP70R190C	TO-220	70R190C
TPA70R190C	TO-220F	70R190C
TPV70R190C	TO-3P	70R190C

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted					
Parameter	Symbol	Value			Unit
		TO-220	TO-3P	TO-220F	
Drain-Source Voltage ($V_{GS} = 0\text{V}$)	V_{DSS}	700			V
Continuous Drain Current	I_D	20			A
Pulsed Drain Current (note1)	I_{DM}	60			A
Gate-Source Voltage	V_{GSS}	± 30			V
Single Pulse Avalanche Energy (note2)	E_{AS}	180			mJ
Avalanche Current (note1)	I_{AR}	6			A
Repetitive Avalanche Energy (note1)	E_{AR}	1			mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	176		34	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-3P	TO-220F	
Thermal Resistance, Junction-to-Case	R_{thJC}	0.71			$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62		80	



Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	700	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 700V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	μA
		$V_{DS} = 700V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	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)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 10A$	--	0.18	0.2	Ω
Forward Transconductance (Note3)	g_{fs}	$V_{DS} = 10V, I_D = 10A$	--	18.8	--	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 50V,$ $f = 1.0\text{MHz}$	--	1605	--	μF
Output Capacitance	C_{oss}		--	225	--	
Reverse Transfer Capacitance	C_{rss}		--	14	--	
Total Gate Charge	Q_g	$V_{DD} = 560V, I_D = 20A,$ $V_{GS} = 10V$	--	41	--	nC
Gate-Source Charge	Q_{gs}		--	7.5	--	
Gate-Drain Charge	Q_{gd}		--	15	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 20A,$ $R_G = 25\Omega$	--	13	--	ns
Turn-on Rise Time	t_r		--	13	--	
Turn-off Delay Time	$t_{d(off)}$		--	96	--	
Turn-off Fall Time	t_f		--	8	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ\text{C}$	--	--	20.6	A
Pulsed Diode Forward Current	I_{SM}		--	--	70	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 20A, V_{GS} = 0V$	--	0.95	1.2	V
Reverse Recovery Time	t_{rr}	$V_R = 560V, I_F = I_S,$ $di_F/dt = 100A/\mu s$	--	460	--	ns
Reverse Recovery Charge	Q_{rr}		--	8.2	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	35	--	A

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 6A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
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

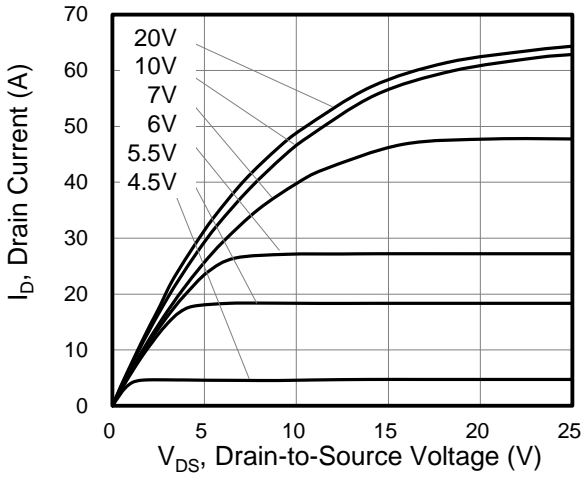


Figure 2. Transfer Characteristics

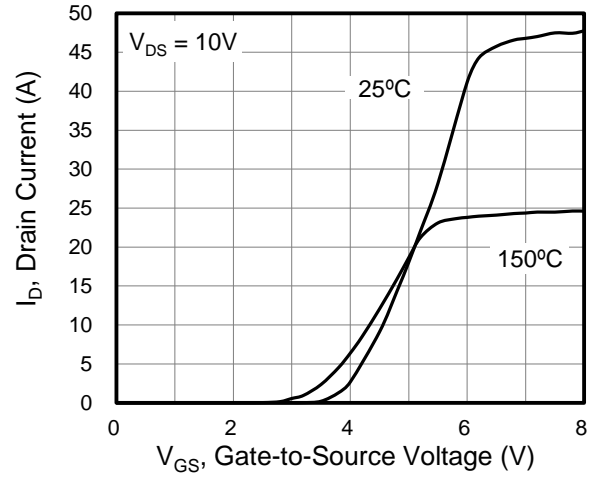


Figure 3. On-Resistance vs. Drain Current

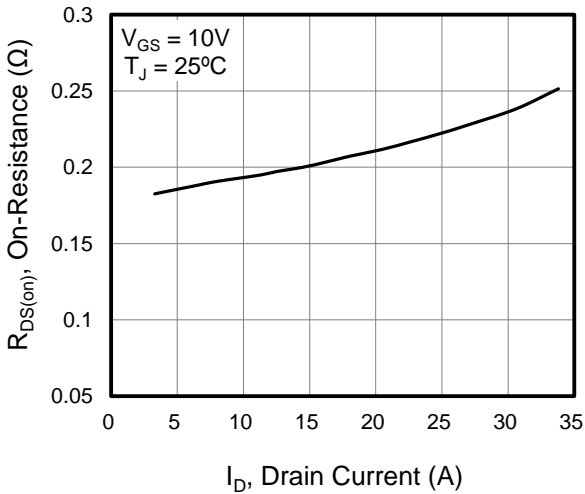


Figure 4. Capacitance

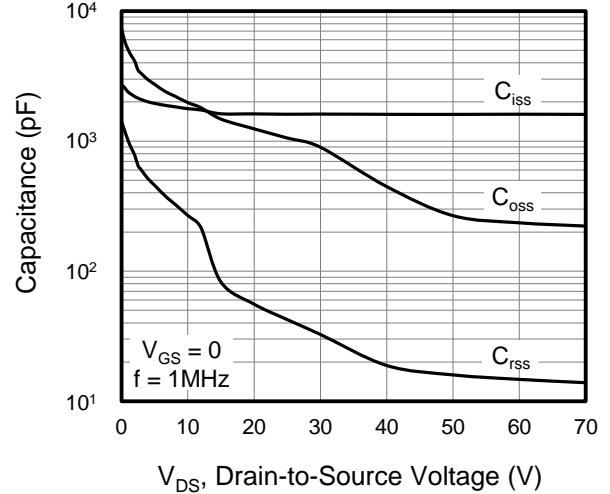


Figure 5. Gate Charge

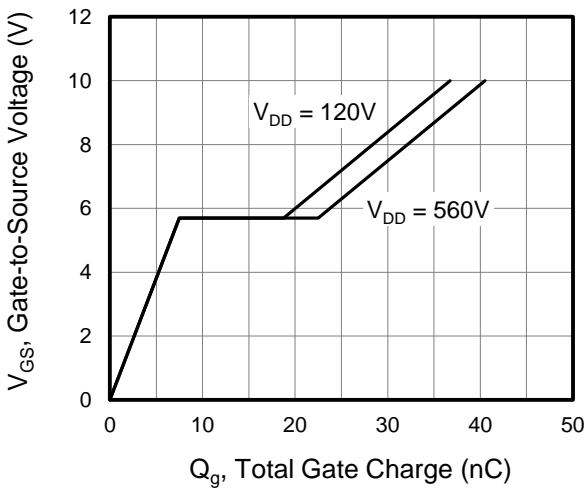
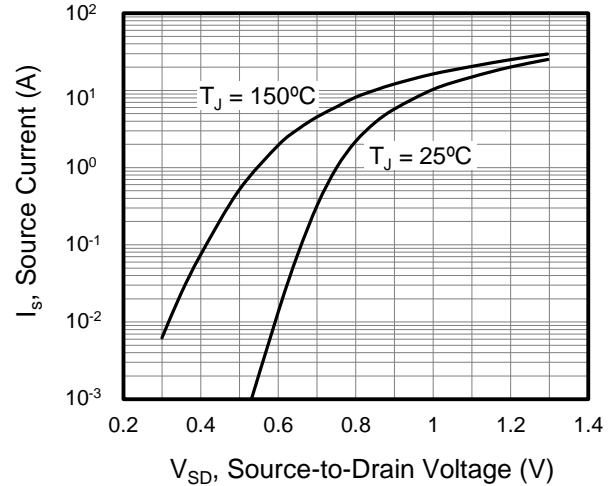


Figure 6. Body Diode Forward Voltage





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

Figure 7. On-Resistance vs. Junction Temperature

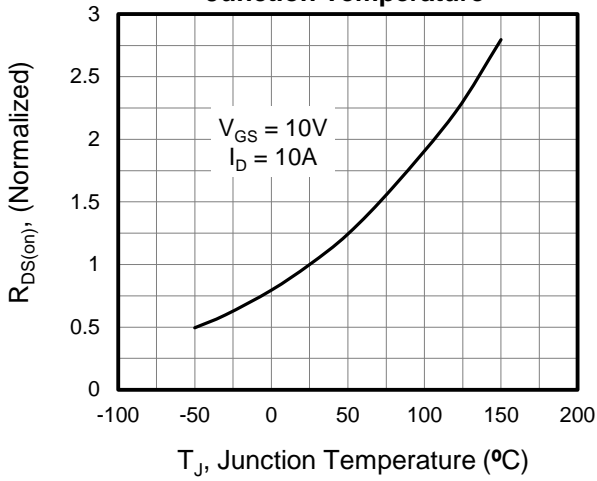


Figure 8. Threshold Voltage vs. Junction Temperature

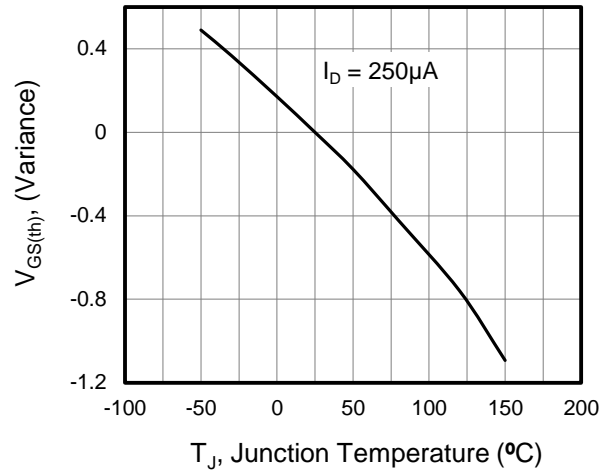


Figure 9. Transient Thermal Impedance TO-220/TO-3P

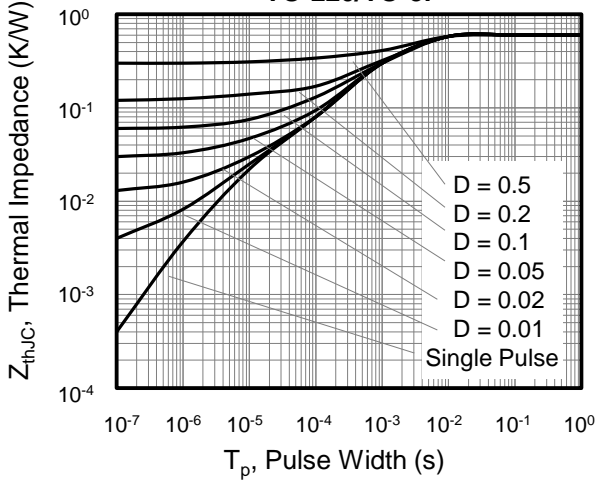


Figure 10. Transient Thermal Impedance TO-220F

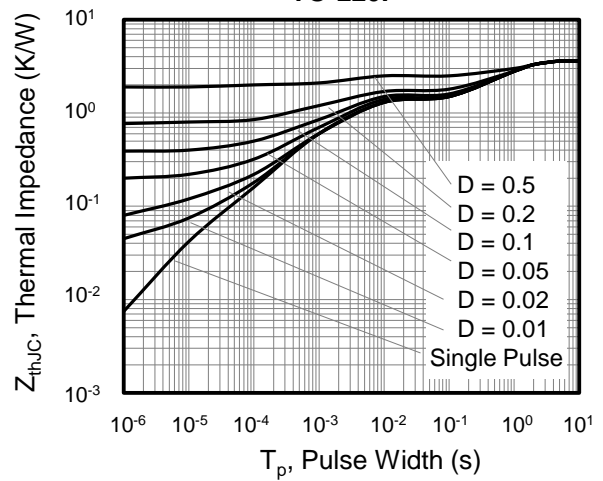




Figure A: Gate Charge Test Circuit and Waveform

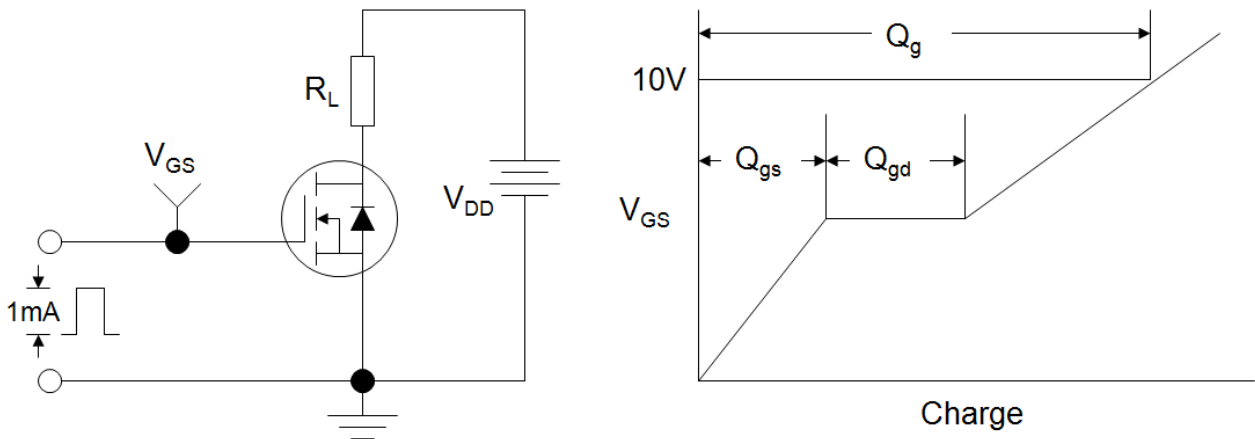


Figure B: Resistive Switching Test Circuit and Waveform

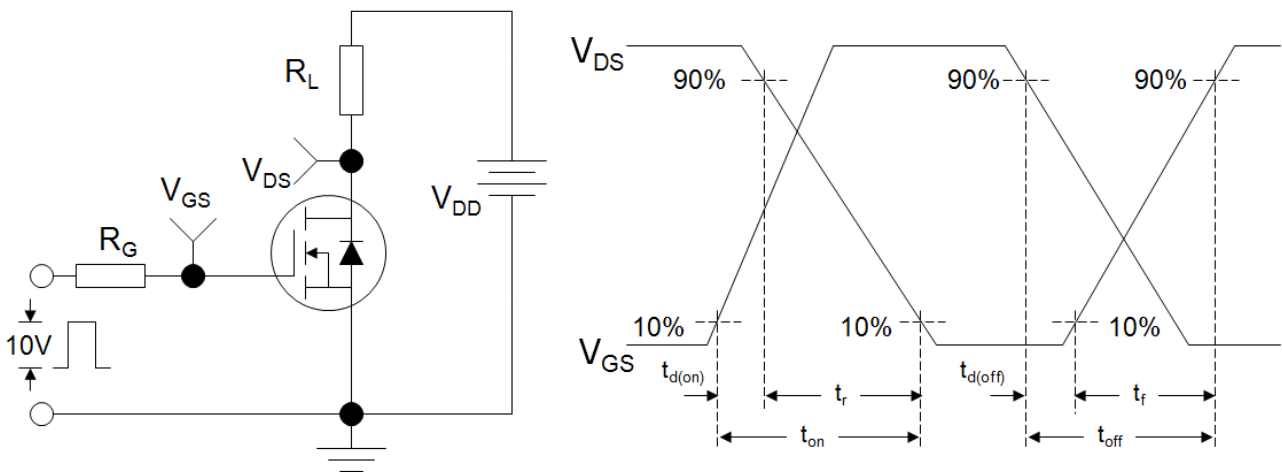
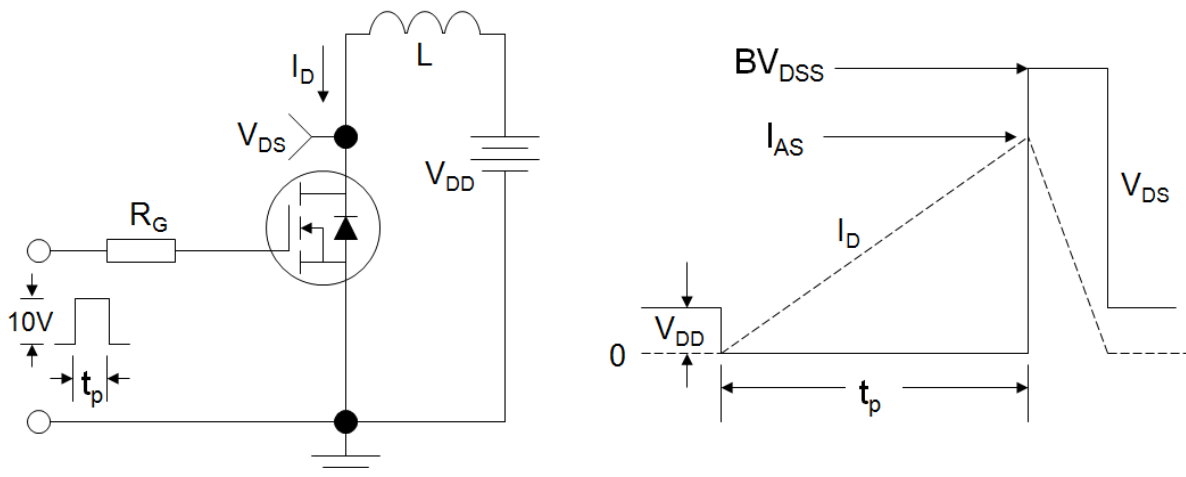
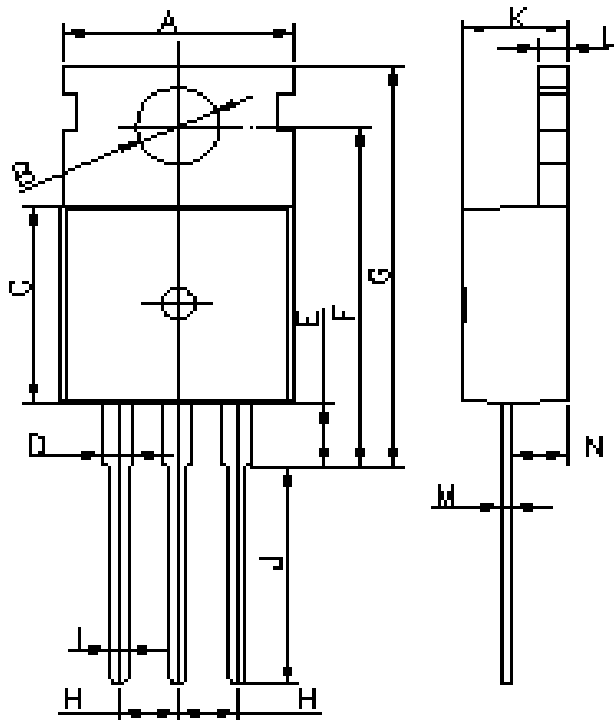


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





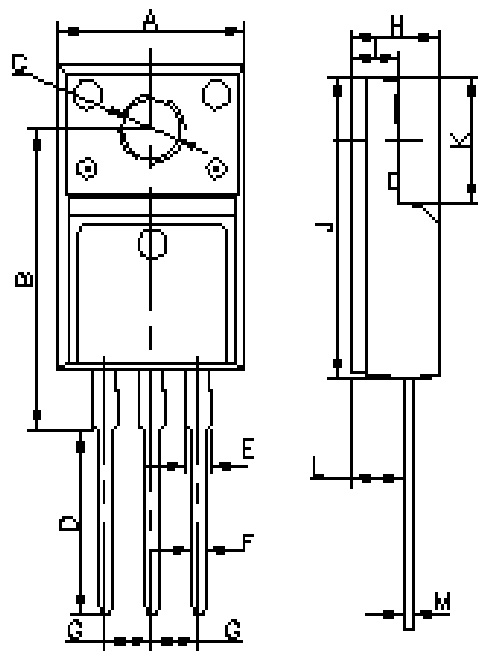
TO-220



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	18.20
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



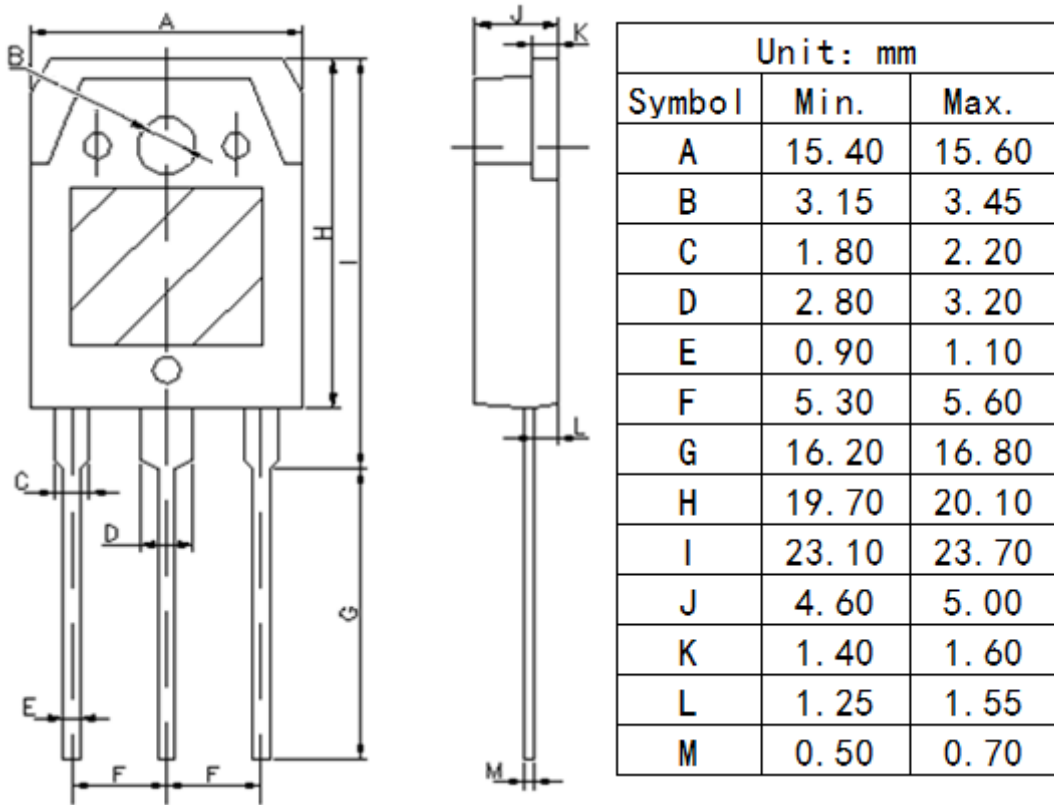
TO-220F



Unit: mm		
Symbol	Min.	Max.
A	9.96	10.38
B	15.50	16.10
C	3.08	3.28
D	12.64	13.24
E	1.18	1.58
F	0.70	0.90
G	2.39	2.69
H	4.50	4.90
I	2.34	2.74
J	15.67	16.07
K	6.50	6.90
L	2.56	2.96
M	0.40	0.60



TO-3PN





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