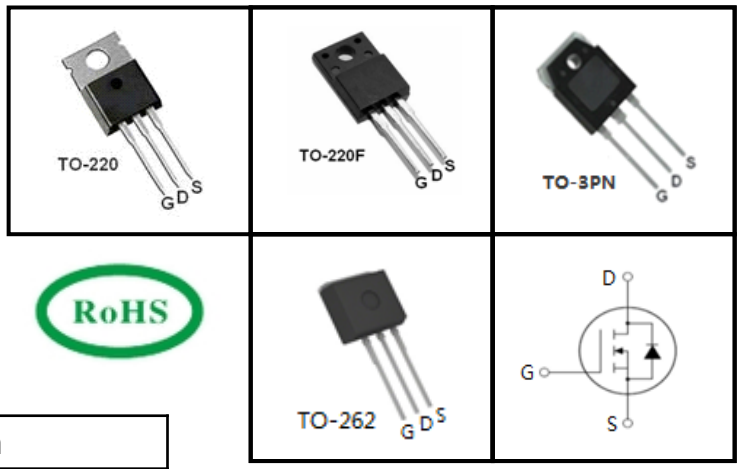
700V Super-Junction Power MOSFET

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-3PN	70R190C
TPC70R190C	TO-262	70R190C

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value		Unit
		TO-220, TO-3PN, TO-262	TO-220F	
Drain-Source Voltage (V_{GS} = 0V)	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}	480		mJ
Avalanche Current (note1)	I_{AR}	4		A
Repetitive Avalanche Energy (note1)	E_{AR}	0.75		mJ
Power Dissipation (T_C = 25ºC)	P_D	151	34	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150		ºC

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220, TO-3PN, TO-262	TO-220F	
Thermal Resistance, Junction-to-Case	R_{thJC}	0.83	3.7	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	80	

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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	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 10A	--	0.19	0.21	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 = 1.0MHz	--	2328	--	pF
Output Capacitance	C_{oss}		--	116	--	
Reverse Transfer Capacitance	C_{rss}		--	7	--	
Total Gate Charge	Q_g	V_{DD} = 480V, I_D = 20A, V_{GS} = 10V	--	46	--	nC
Gate-Source Charge	Q_{gs}		--	11	--	
Gate-Drain Charge	Q_{gd}		--	13	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 300V, I_D = 20A, R_G = 25Ω	--	43	--	ns
Turn-on Rise Time	t_r		--	14	--	
Turn-off Delay Time	$t_{d(off)}$		--	150	--	
Turn-off Fall Time	t_f		--	7	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	20.6	A
Pulsed Diode Forward Current	I_{SM}		--	--	70	
Body Diode Voltage	V_{SD}	T_J = 25ºC, 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/μs	--	410	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.8	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	35	--	A

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. I_{AS} = 4A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

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Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

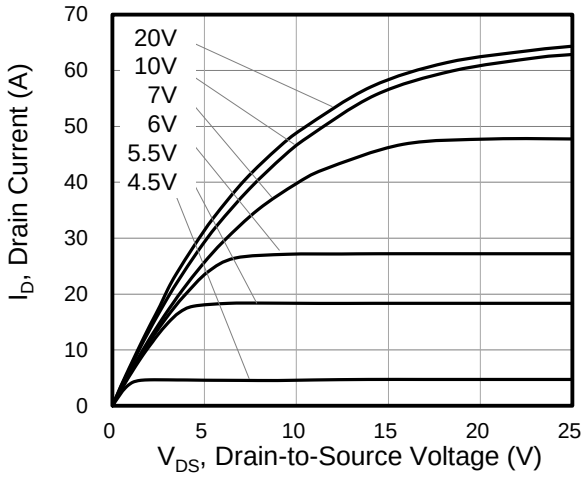


Figure 2. Transfer Characteristics

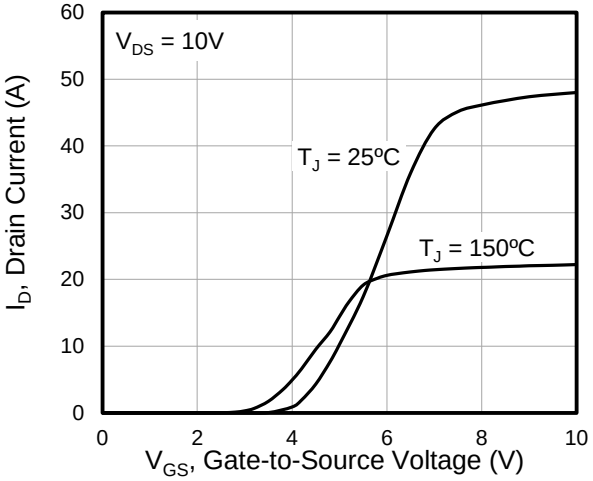


Figure 3. On-Resistance vs. Drain Current

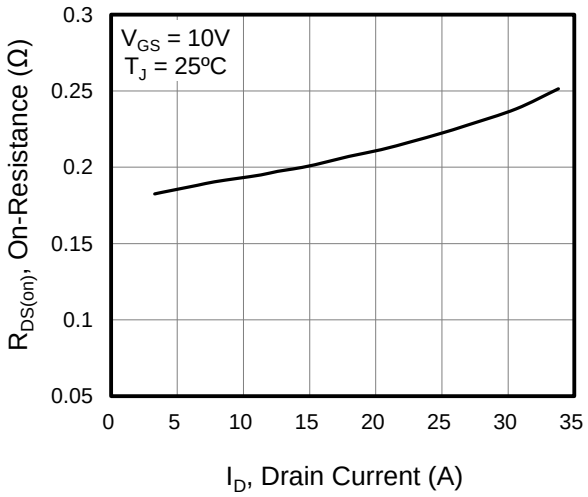


Figure 4. Capacitance

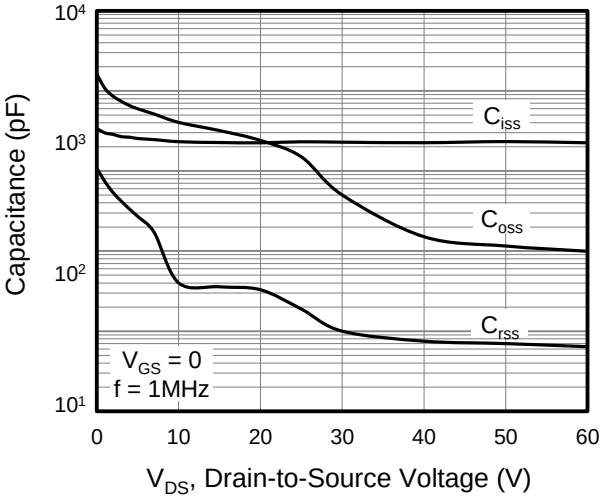


Figure 5. Gate Charge

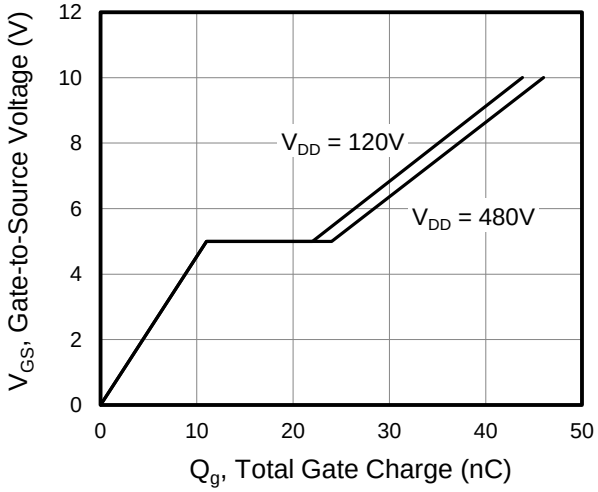
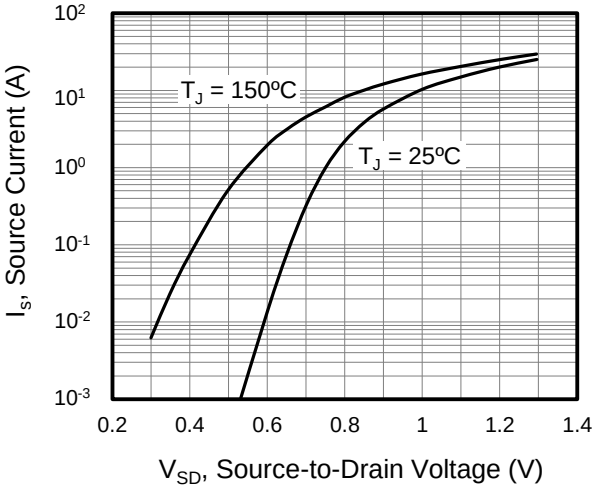


Figure 6. Body Diode Forward Voltage



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Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

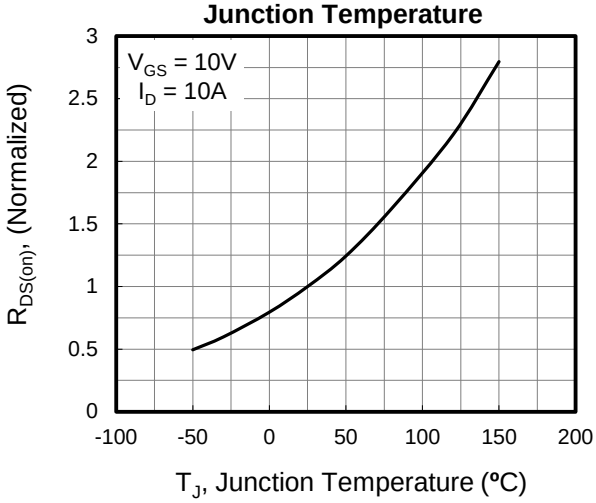


Figure 8. Threshold Voltage vs. Junction Temperature

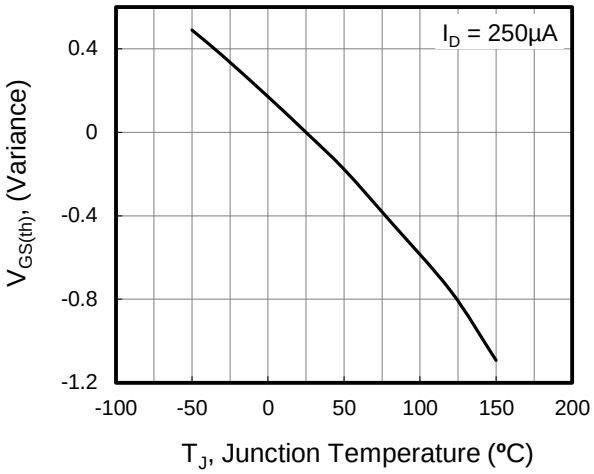


Figure 9. Transient Thermal Impedance TO-220/TO-3P

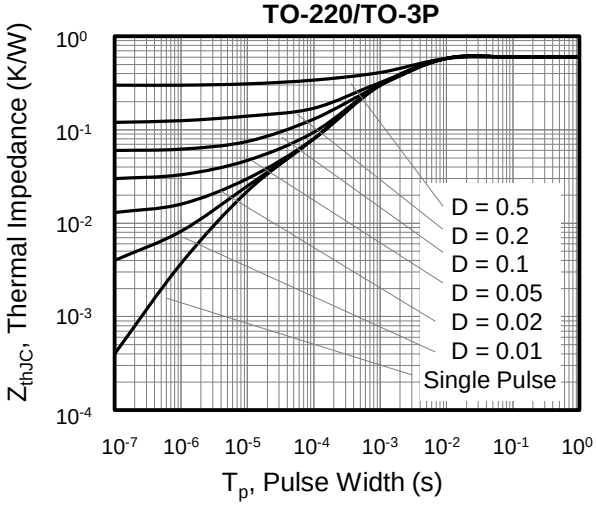
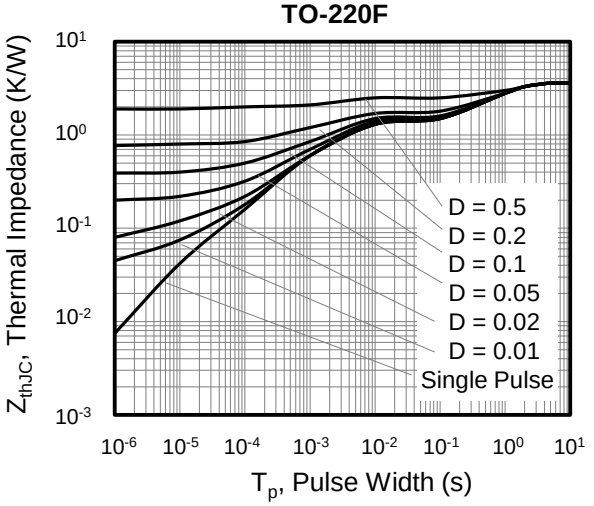


Figure 10. Transient Thermal Impedance TO-220F



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Figure A：Gate Charge Test Circuit and Waveform

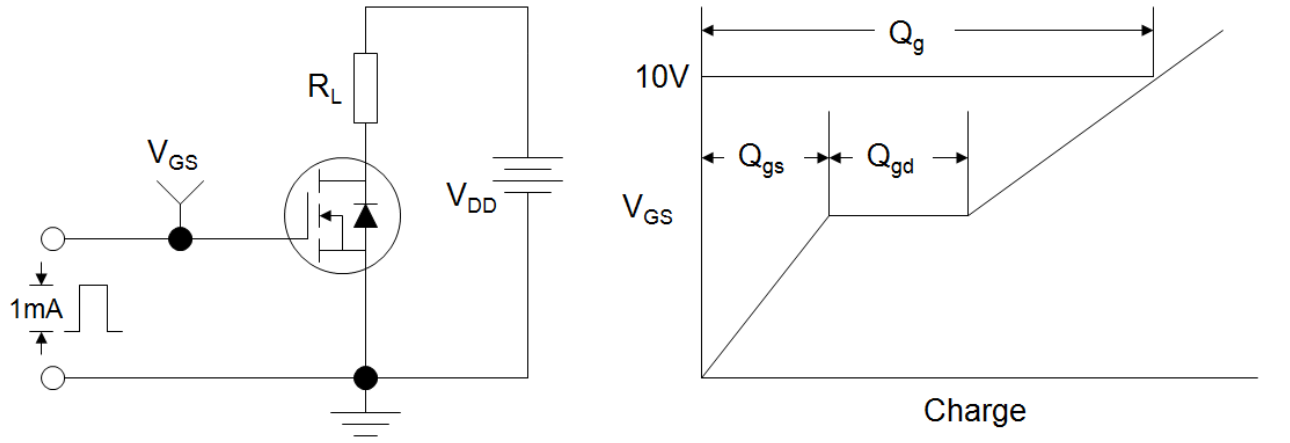


Figure B：Resistive Switching Test Circuit and Waveform

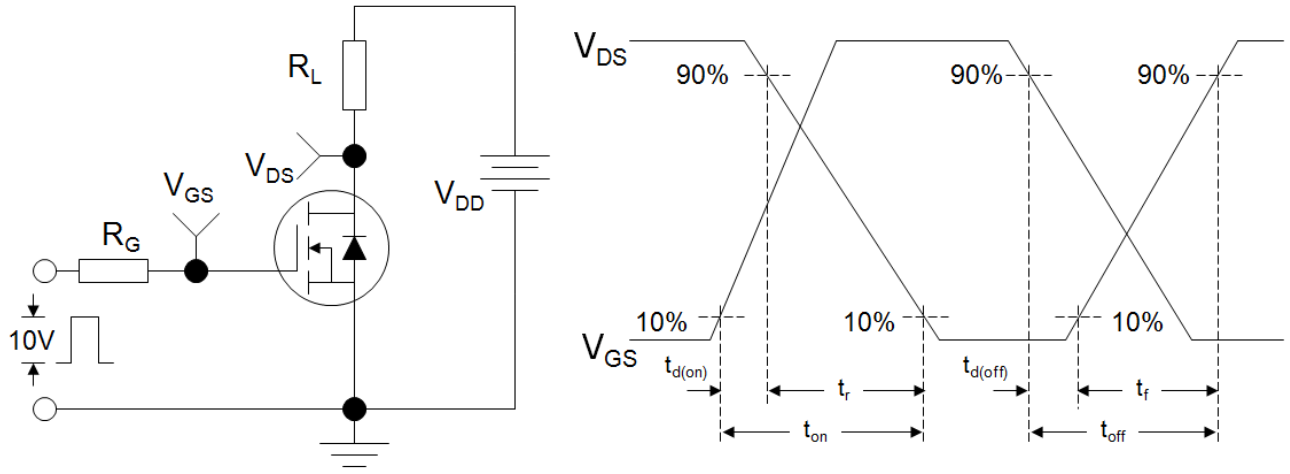
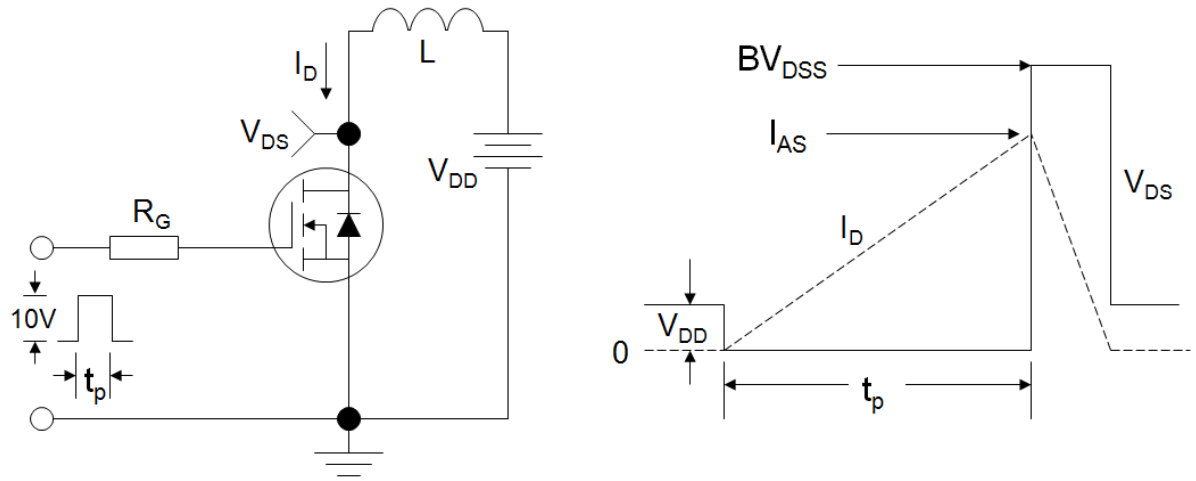
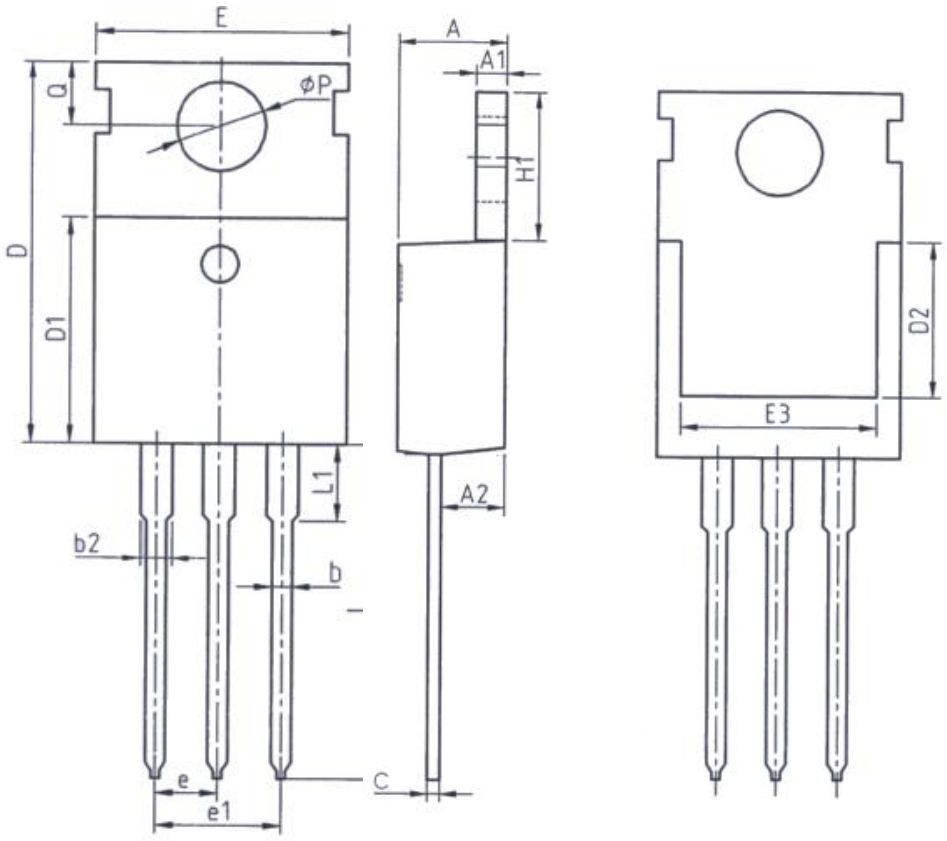


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



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TO-220

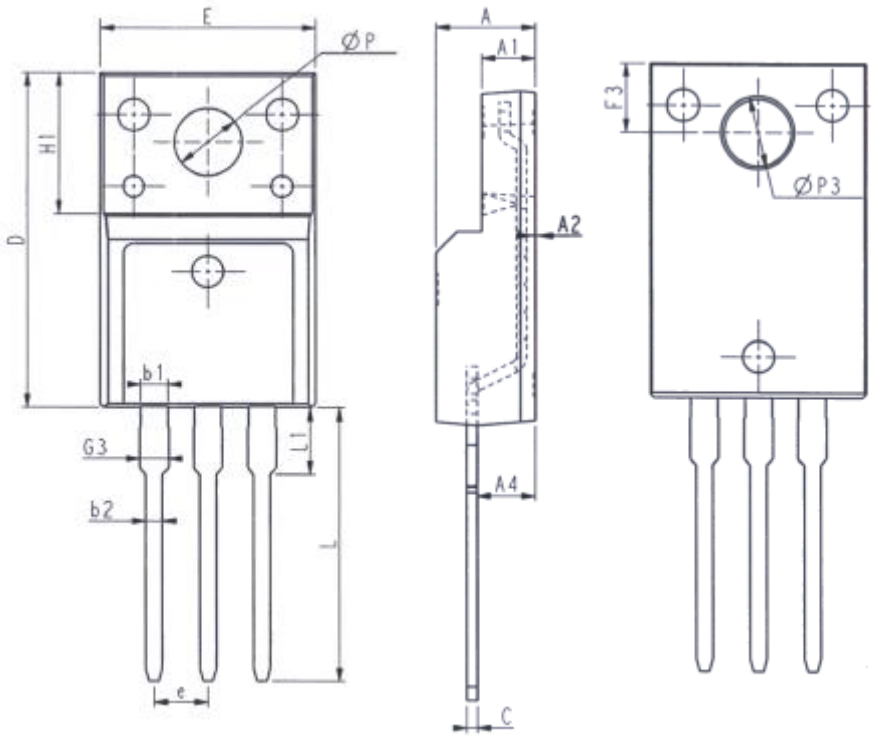


Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	–
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	–	3.40
P	3.40	3.80
Q	2.60	3.00

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TO-220F

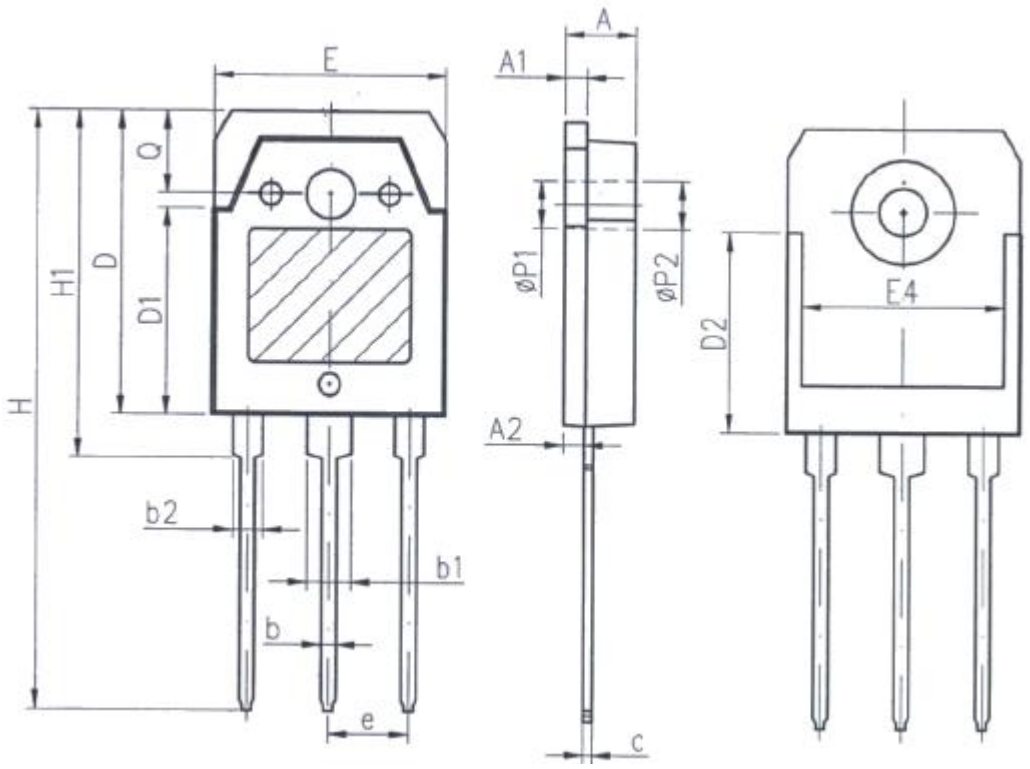


Unit: mm		
Symbol	Min.	Max.
E	9.96	10.36
A	4.50	4.90
A1	2.34	2.74
A2	0.30	0.60
A4	2.56	2.96
c	0.40	0.65
D	15.57	16.17
H1	6.70REF	
e	2.54BSC	

Unit: mm		
Symbol	Min.	Max.
L	12.68	13.28
L1	2.93	3.13
P	3.03	3.38
P3	3.15	3.65
F3	3.15	3.45
G3	1.25	1.55
b1	1.18	1.43
b2	0.70	0.95

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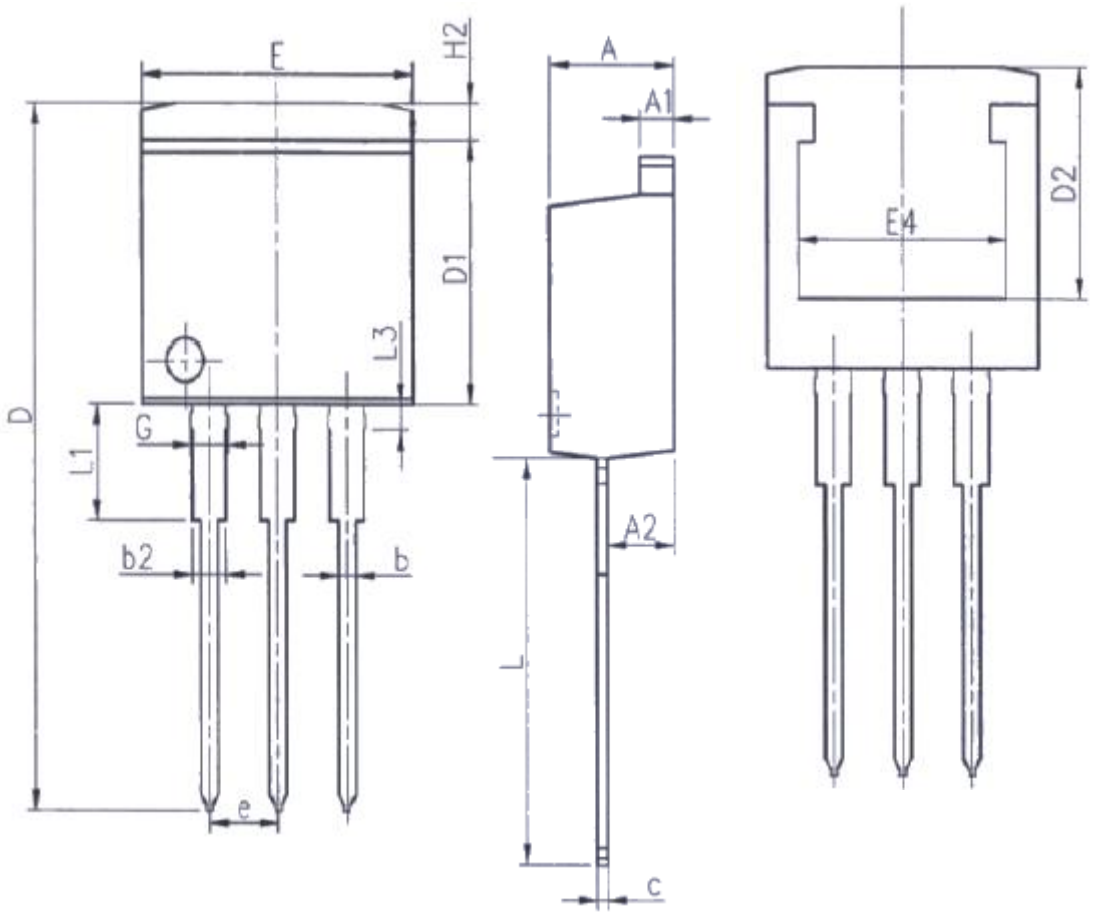
TO-3PN



Unit:mm		
Symbol	Min.	Max.
A	4.6	5
A1	1.4	1.65
A2	1.18	1.58
b	0.8	1.2
b1	2.8	3.2
b2	1.8	2.2
c	0.5	0.75
D	19.6	20.2
D1	13.55	14.25
D2	12.9REF	
E	15.35	15.85
E4	12.6	-
e	5.45TYP	
H	40.1	40.9
H1	23.15	23.65
P1	3.2REF	
P2	3.5REF	

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TO-262



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.22	1.42
A2	2.47	2.87
b	0.70	0.97
b2	1.17	1.42
c	0.28	0.53
D	23.20	24.02
D1	8.38	8.90
D2	6.00	-

Unit: mm		
Symbol	Min.	Max.
E	9.90	10.39
E4	7.30	-
e	2.54BSC	
G	1.25	1.50
H2	-	1.31
L	13.34	14.10
L1	3.30	4.06
L3	0.95	1.15

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