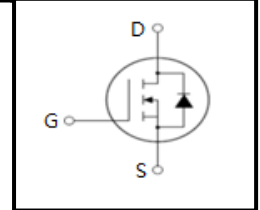
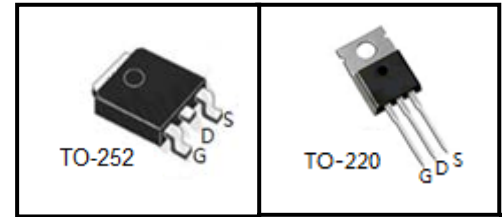




## 40V N-Channel Trench MOSFET

### FEATURES

- Trench Power MOSFET Technology
- Low  $R_{DS(ON)}$
- Low Gate Charge
- Optimized For Fast-switching Applications



### APPLICATIONS

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

Device Marking and Package Information		
Device	Package	Marking
TTD120N04AT	TO-252	120N04AT
TTP120N04AT	TO-220	120N04AT

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted			
Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS} = 0\text{V}$ )	$V_{DSS}$	40	V
Continuous Drain Current	$I_D$	120	A
Pulsed Drain Current (note1)	$I_{DM}$	480	A
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Single Pulse Avalanche Energy (note2)	$E_{AS}$	138.4	mJ
Avalanche Current	$I_{AS}$	35	A
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	143	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55~+175	$^\circ\text{C}$

Thermal Resistance			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{thJC}$	1.05	K/W
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	60	



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	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	$\mu A$
		$V_{DS} = 40V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	100	
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20V$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.7	2.4	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 30A$	--	2.7	3.5	$m\Omega$
		$V_{GS} = 4.5V, I_D = 30A$	--	3.6	4.7	$m\Omega$
Forward Transconductance (Note3)	$g_{fs}$	$V_{DS} = 10V, I_D = 20A$	--	45.5	--	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 20V, f = 1.0\text{MHz}$	--	10179	--	$\mu F$
Output Capacitance	$C_{oss}$		--	587	--	
Reverse Transfer Capacitance	$C_{rss}$		--	439	--	
Total Gate Charge	$Q_g$	$V_{DD} = 20V, I_D = 20A, V_{GS} = 10V$	--	132	--	nC
Gate-Source Charge	$Q_{gs}$		--	23	--	
Gate-Drain Charge	$Q_{gd}$		--	23	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 20V, I_D = 20A, R_G = 3\Omega$	--	27	--	ns
Turn-on Rise Time	$t_r$		--	11	--	
Turn-off Delay Time	$t_{d(off)}$		--	83	--	
Turn-off Fall Time	$t_f$		--	14	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	120	A
Pulsed Diode Forward Current	$I_{SM}$		--	--	480	
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = 20A, V_{GS} = 0V$	--	--	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F = 20A, di_F/dt = 100A/\mu s$	--	66	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	73	--	nC

**Notes**

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2.  $V_{DD} = 40V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
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

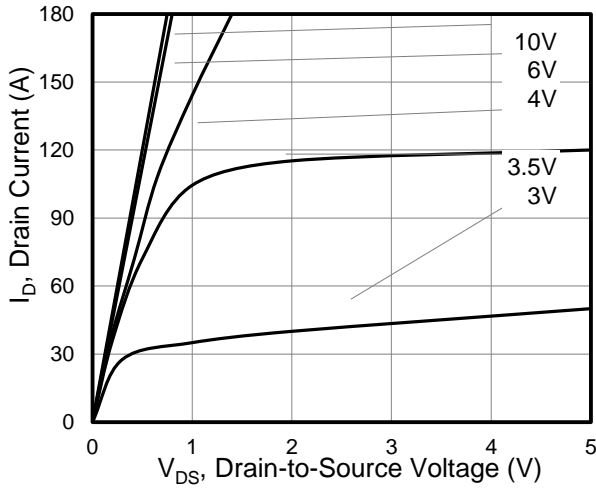


Figure 2. Transfer Characteristics

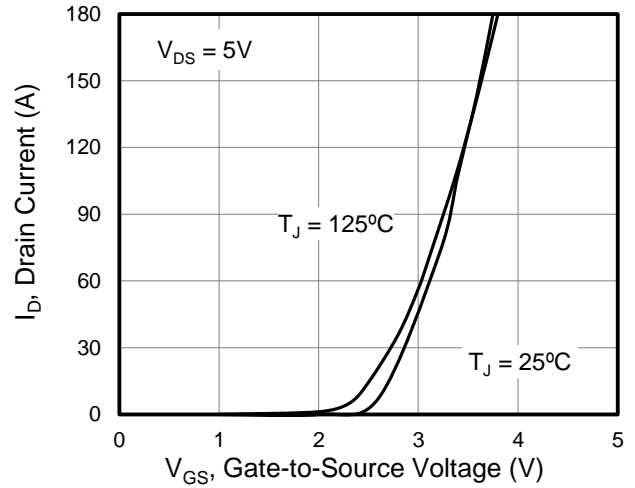


Figure 3. On-Resistance vs. Drain Current

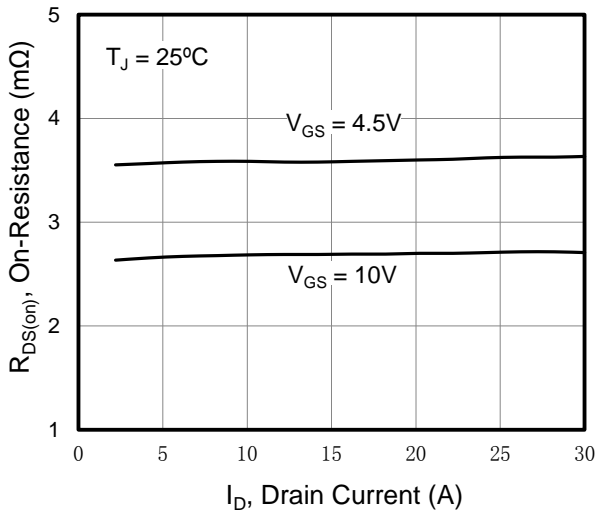


Figure 4. Capacitance

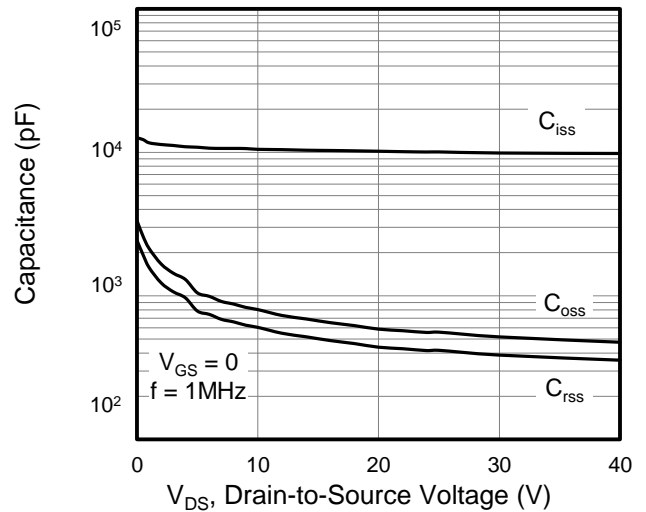


Figure 5. Gate Charge

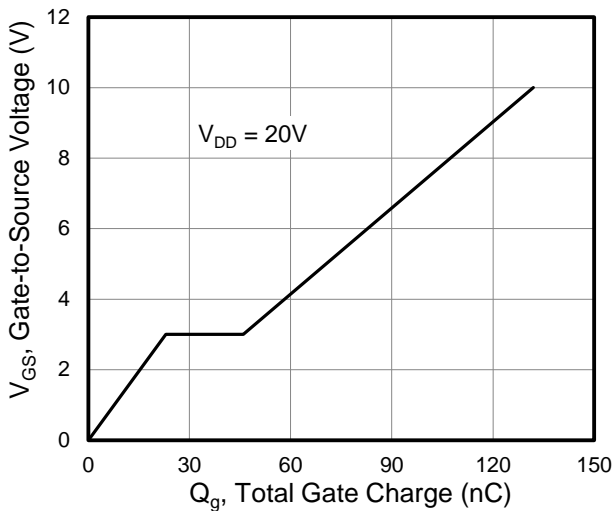
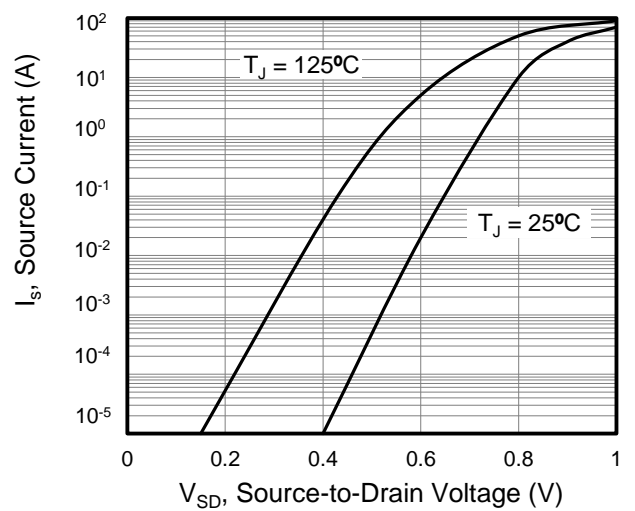


Figure 6. Body Diode Forward Voltage





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

Figure 7. On-Resistance vs. Junction Temperature

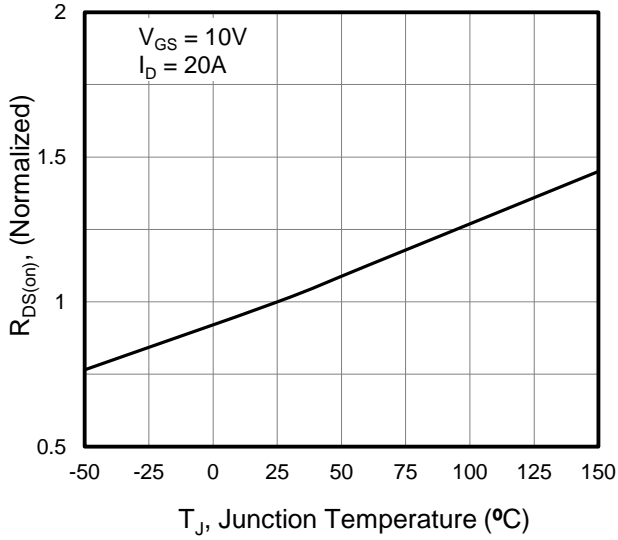


Figure 8. Threshold Voltage vs. Junction Temperature

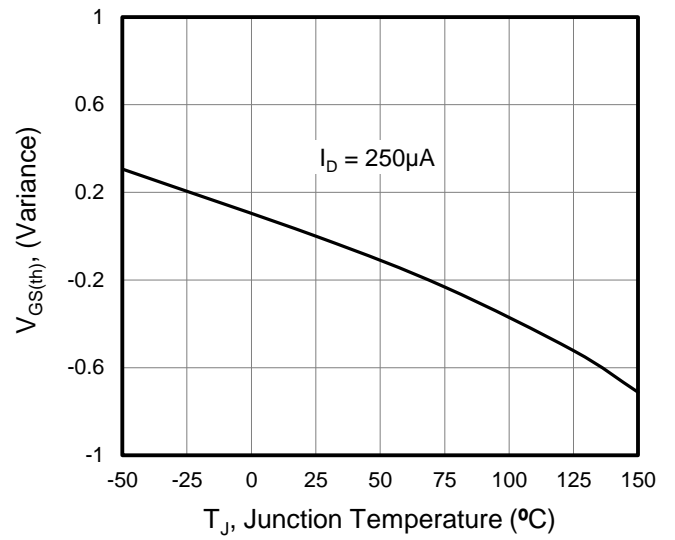


Figure 9. Transient Thermal Impedance

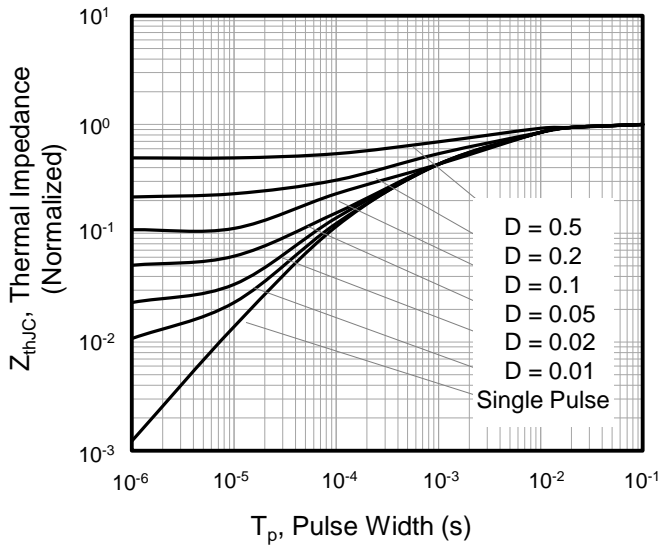




Figure A: Gate Charge Test Circuit and Waveform

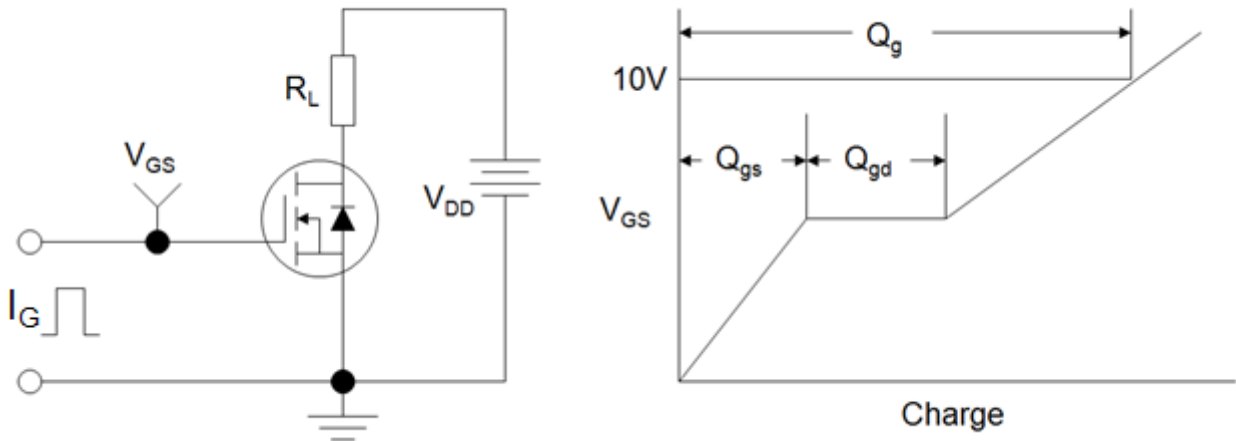


Figure B: Resistive Switching Test Circuit and Waveform

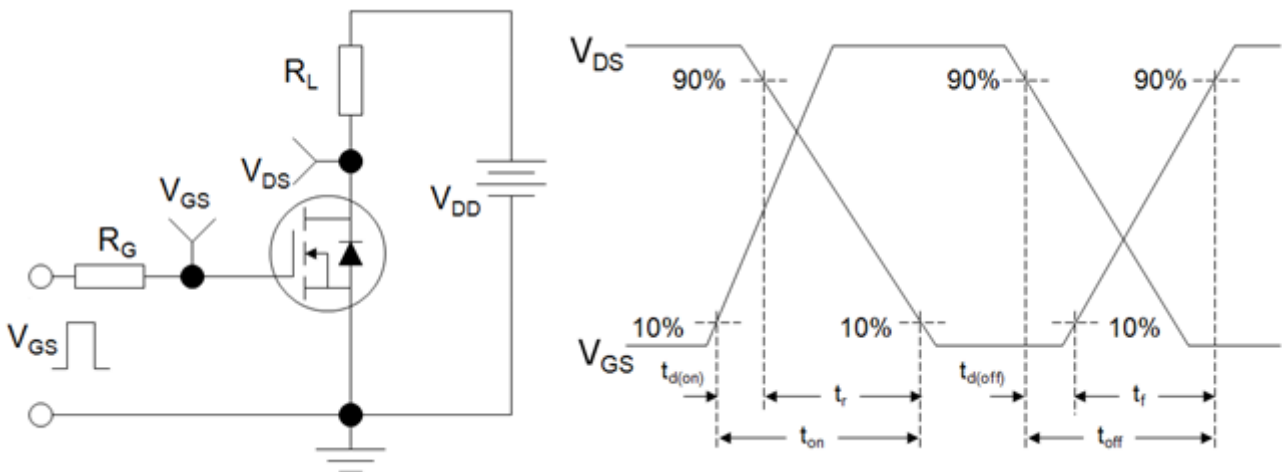
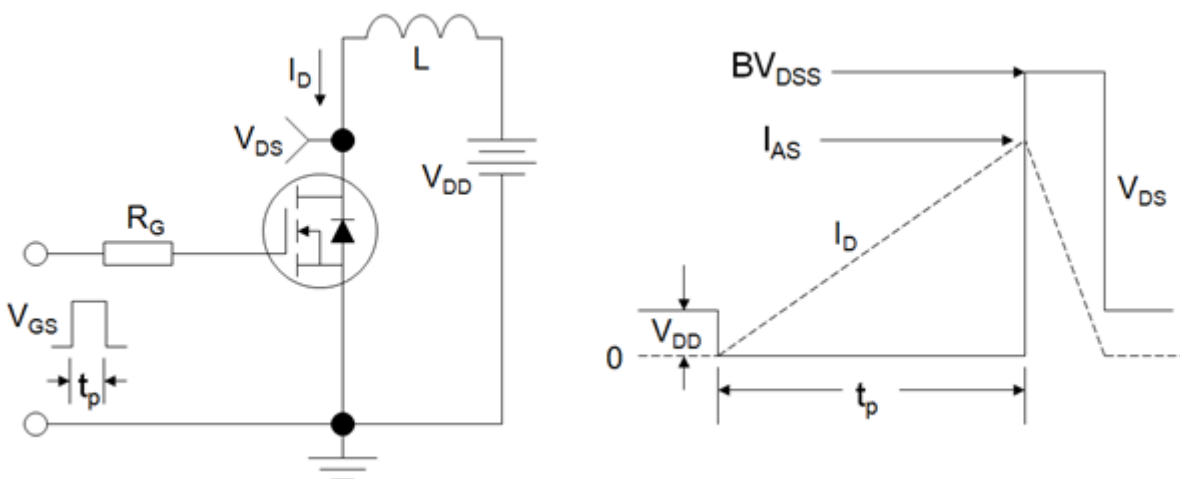
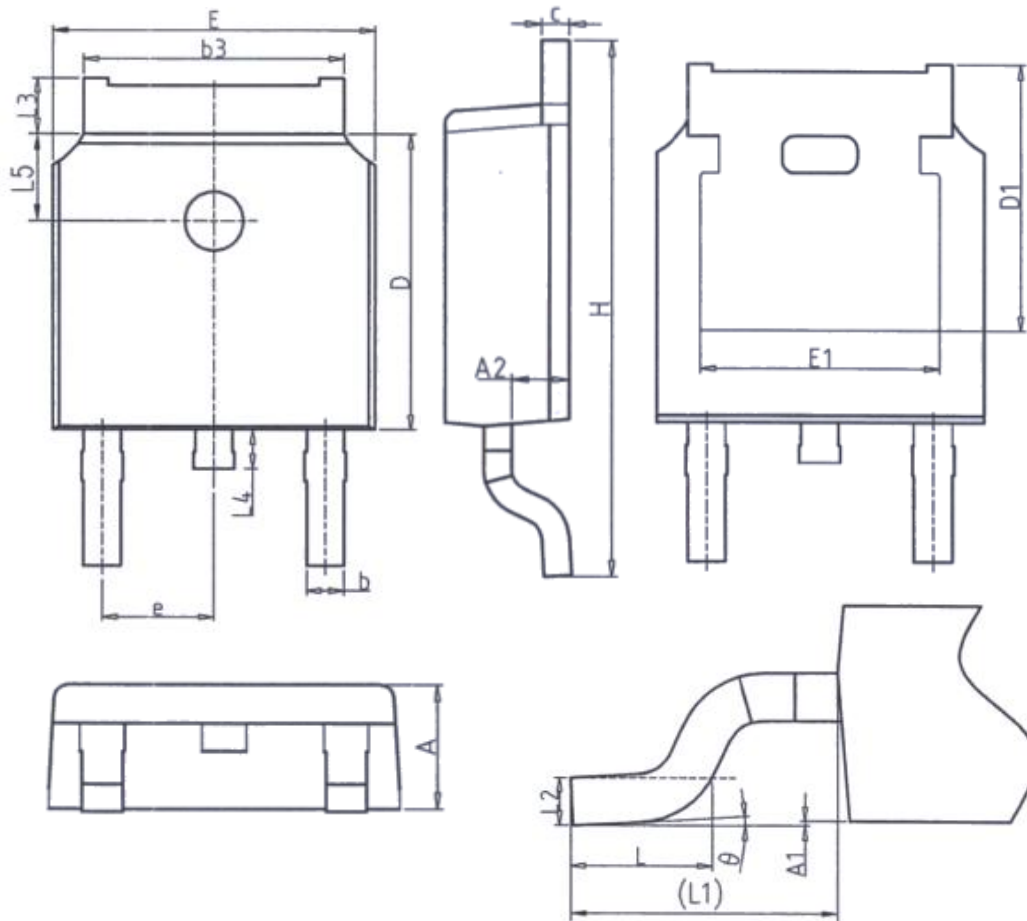


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





### TO-252

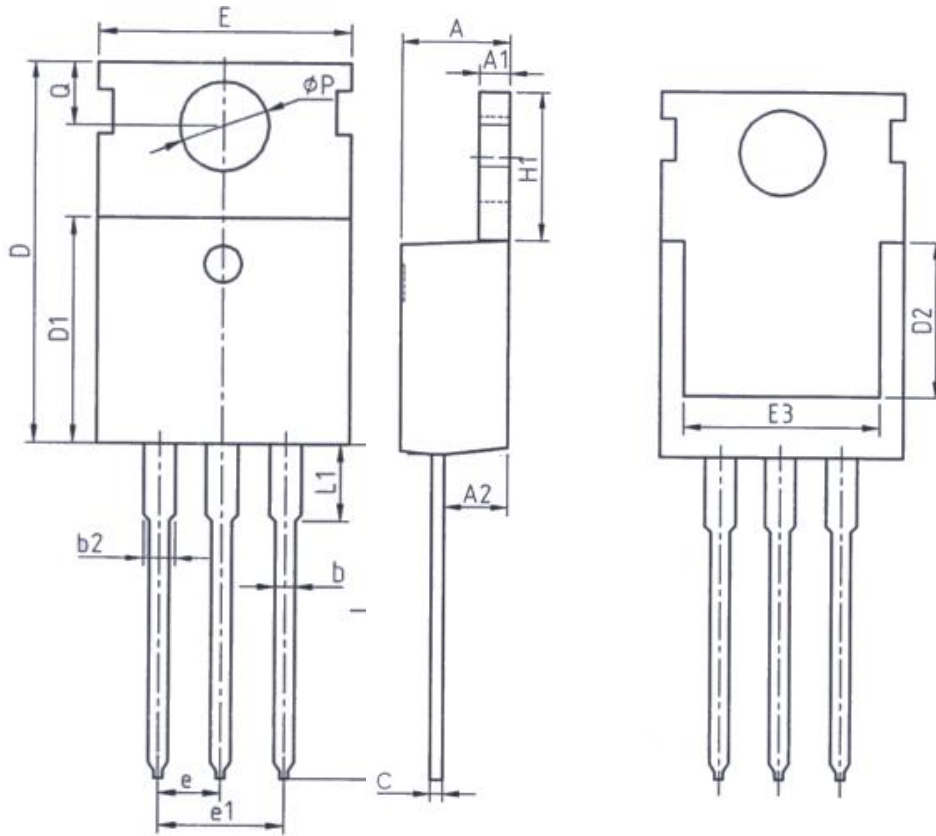


Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	-

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	-	1.00
L5	1.65	1.95
theta	0°	8°



### 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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