



### DESCRIPTION

The AM20N50 is available in TO-220, TO220F TO-3PN, TO-3PF Packages.

BVDSS	RDS(ON)	ID
500V	230mΩ	20A

### APPLICATION

- High speed switching and general purpose applications.

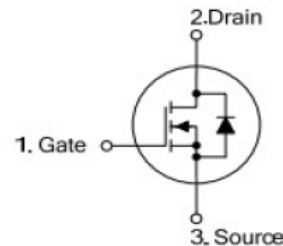
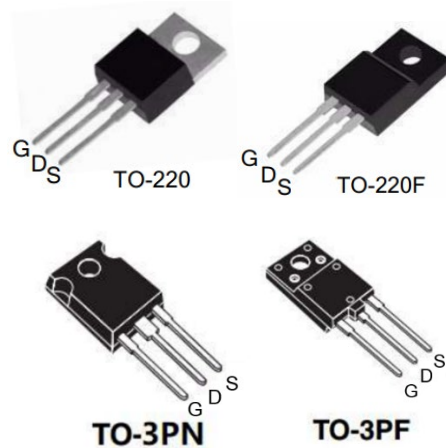
### ORDERING INFORMATION

Package Type	Part Number	
TO-220 SPQ: 50pcs/Tube	T3	AM20N50T3U
		AM20N50T3VU
TO-220F SPQ: 50pcs/Tube	T3F	AM20N50T3FU
		AM20N50T3FVU
TO-3PN SPQ: 30pcs/Tube	TX	AM20N50TXU
		AM20N50TXVU
TO-3PF SPQ: 30pcs/Tube	TXF	AM20N50TXFU
		AM20N50TXFVU
Note	V: Halogen free Package U: Tube	
AiT provides all RoHS products		

### FEATURE

- Fast Switching
- Low Crss (typical 18pF )
- $R_{DS(ON),typ.} = 230m\Omega @ V_{GS}=10V$
- Improved dv/dt capability

### PIN DESCRIPTION



Pin#	Symbol	Function
1	G	Gate
2	D	Drain
3	S	Source

**ABSOLUTE MAXIMUM RATINGS**T<sub>A</sub> = 25°C, unless otherwise specified.

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	500	V
Continuous Drain Current	I <sub>D</sub>	20	A
Continuous Drain Current TC = 100 °C		12.5	A
Pulsed Drain Current <sup>(1)</sup>	I <sub>DM</sub>	80	A
Gate-to-Source Voltage	V <sub>GS</sub>	±30	V
Single Pulse Avalanche Energy <sup>(2)</sup>	EAS	1200	mJ
Peak Diode Recovery dv/dt <sup>(3)</sup>	dv/dt	5.0	V/ns
Power Dissipation TO-220, TO-3PN	P <sub>D</sub>	230	W
Derating Factor above 25°C		1.83	W/°C
Power Dissipation TO-220F, TO-3PF	P <sub>D</sub>	48	W
Derating Factor above 25°C		0.36	W/°C
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	150 , -55 to 150	°C
Maximum Temperature for Soldering	T <sub>L</sub>	300	°C
<b>Thermal Data</b> TO-220, TO-3PN			
Junction-to-Case	R <sub>θJC</sub>	0.54	°C/W
Junction-to-Ambient	R <sub>θJA</sub>	62.5	°C/W
TO-220F, TO-3PF			
Junction-to-Case	R <sub>θJC</sub>	2.6	°C/W
Junction-to-Ambient	R <sub>θJA</sub>	62.5	°C/W

(1) Pulse width limited by maximum junction temperature

(2) L=10mH, V<sub>Ds</sub>=50V, Start T<sub>A</sub>=25°C(3) ISD =20A, di/dt ≤100A/us, V<sub>DD</sub>≤B<sub>VDS</sub>, Start T<sub>A</sub>=25°C

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



**ELECTRICAL CHARACTERISTICS**

T<sub>A</sub> = 25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
<b>OFF Characteristics</b>						
Drain-Source Breakdown Voltage	V <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	500	-	-	V
B <sub>V</sub> DSS Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250uA, Reference25°C	-	0.6	-	V/°C
Drain to Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> = 0V, T <sub>A</sub> = 25°C	-	-	10	μA
		V <sub>DS</sub> =400V, V <sub>GS</sub> = 0V, T <sub>J</sub> =125°C	-	-	100	μA
Gate to Source Forward Leakage	I <sub>GSS(F)</sub>	V <sub>GS</sub> =+30V	-	-	100	nA
Gate to Source Reverse Leakage	I <sub>GSS(R)</sub>	V <sub>GS</sub> =-30V	-	-	-100	nA
<b>ON Characteristics</b>						
Drain-to-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A <sup>(4)</sup>	-	0.23	0.28	Ω
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA <sup>(4)</sup>	2.0	-	4.0	V
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =20V, I <sub>D</sub> =10A <sup>(4)</sup>	-	18	-	S
<b>Dynamic Characteristics</b>						
Gate Resistance	R <sub>g</sub>	f = 1.0MHz	-	2.5	-	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0V V <sub>DS</sub> = 25V f = 1.0MHz	-	1920	-	pF
Output Capacitance	C <sub>oss</sub>		-	290	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	18	-	
<b>Switching Characteristics</b>						
Turn-on Delay Time	t <sub>d (ON)</sub>	I <sub>D</sub> =20A V <sub>DD</sub> = 250V V <sub>GS</sub> = 10V R <sub>G</sub> =20Ω	-	33	-	ns
Rise Time	t <sub>r</sub>		-	75	-	
Turn-Off Delay Time	t <sub>d (OFF)</sub>		-	91	-	
Fall Time	t <sub>f</sub>		-	83	-	
Total Gate Charge	Q <sub>g</sub>	I <sub>D</sub> =20A V <sub>DD</sub> =400V V <sub>GS</sub> = 10V	-	56	-	nC
Gate to Source Charge	Q <sub>gs</sub>		-	13	-	
Gate to Drain ("Miller") Charge	Q <sub>gd</sub>		-	20	-	
<b>Source-Drain Diode Characteristics</b>						
Continuous Source Current (Body Diode)	I <sub>S</sub>	T <sub>A</sub> =25 °C	-	-	20	A
Maximum Pulsed Current (Body Diode)	I <sub>SM</sub>		-	-	80	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V <sup>(4)</sup>	-	-	1.2	V
Reverse Recovery Time	T <sub>rr</sub>	I <sub>S</sub> =20A, T <sub>A</sub> = 25°C dIF/dt=100A/us, V <sub>GS</sub> =0V	-	536	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>		-	5668	-	nC
Reverse Recovery Current	I <sub>rrm</sub>		-	21.1	-	A

(4) Pulse width t<sub>p</sub>≤300μs, δ≤2%



**TYPICAL PERFORMANCE CHARACTERISTICS**

Fig1. Safe Operating Area (TO-220, TO-3PN)

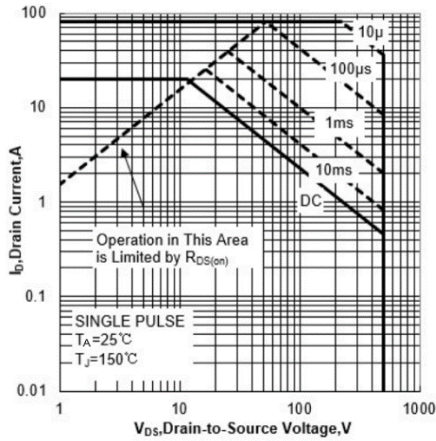


Fig 2. Safe Operating Area (TO-220F, TO-3PF)

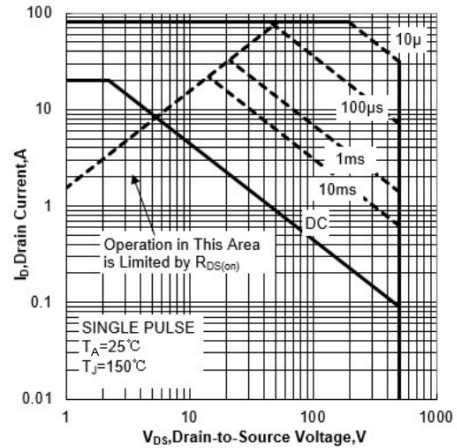


Fig 3. Power Dissipation (TO-220, TO-3PN)

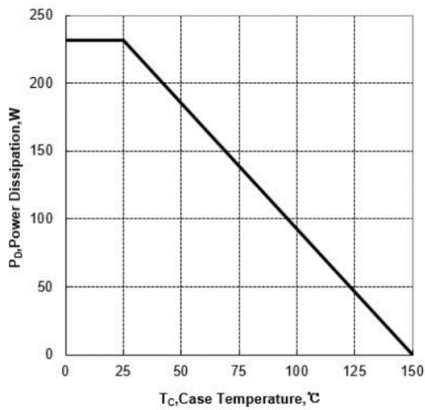


Fig 4. Power Dissipation (TO-220F, TO-3PF)

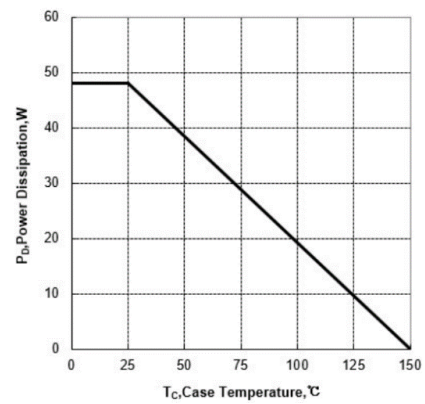


Fig 5. Max Thermal Impedance (TO-220, TO-3PN)

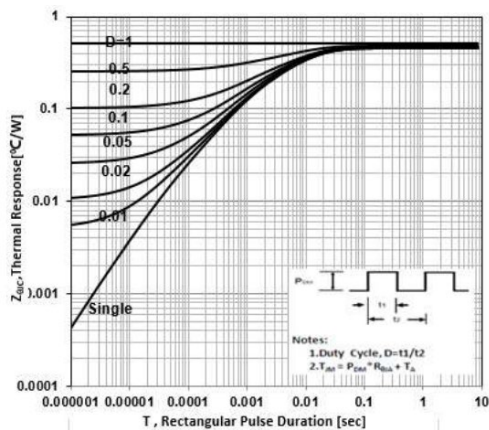


Fig 6. Max Thermal Impedance (TO-220F, TO-3PF)

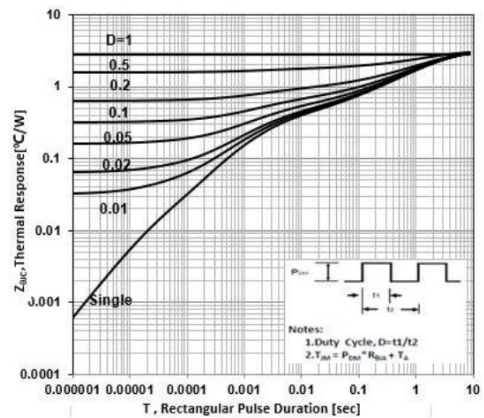




Fig7. Typical Output Characteristics

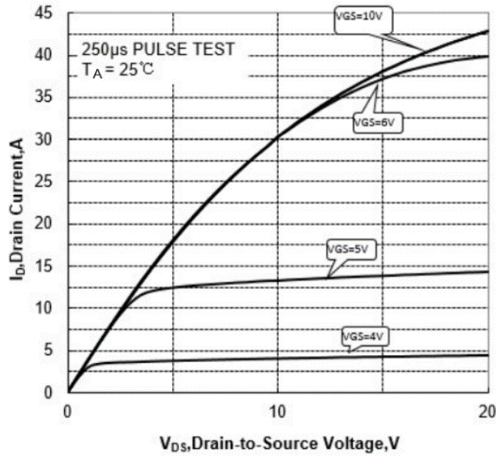


Fig 8. Typical Transfer Characteristics

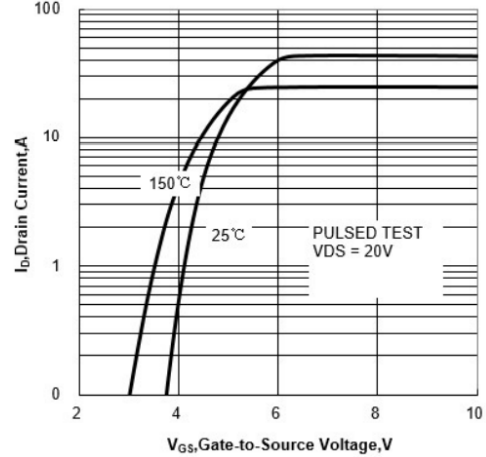


Fig 9. Typical Drain to Source ON Resistance vs Drain Current

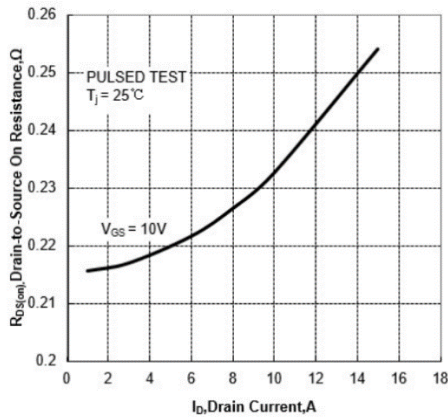


Fig 10. Typical Drian to Source on Resistance vs Junction Temperature

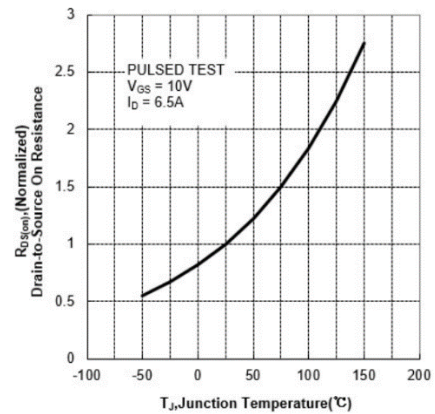


Fig 11. Typical Theshold Voltage vs Junction Temperature

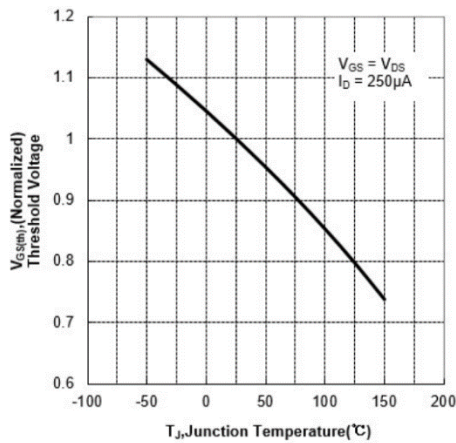


Fig 12. Typical Breakdown Voltage vs Junction Temperature

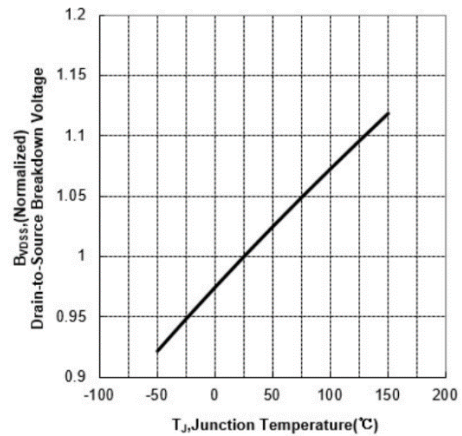






Fig 13. Typical Theshold Voltage vs Junction Temperature

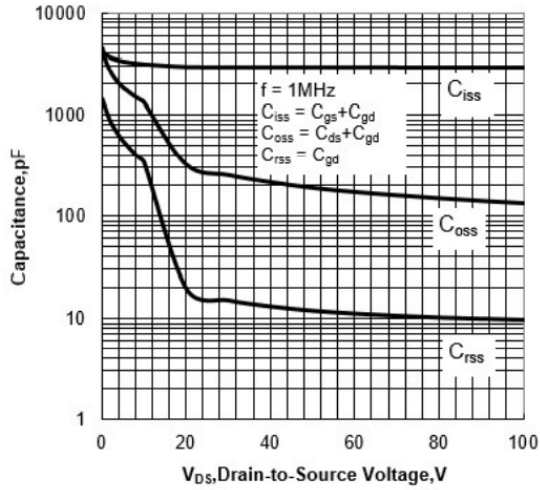
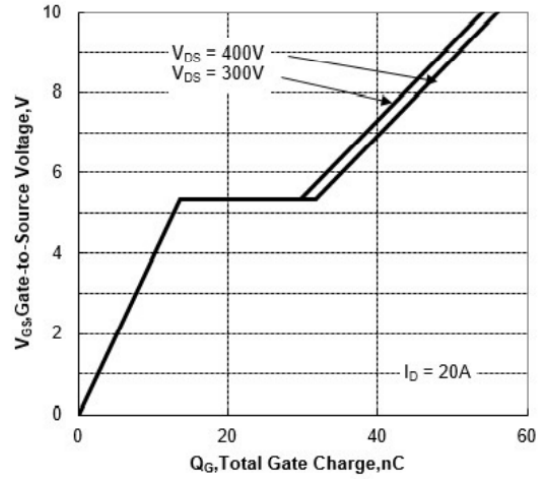


Fig 14. Typical Breakdown Voltage vs Junction Temperature



**TEST CIRCUIT AND WAVEFORM**

Fig 15. Gate Charge Test Circuit

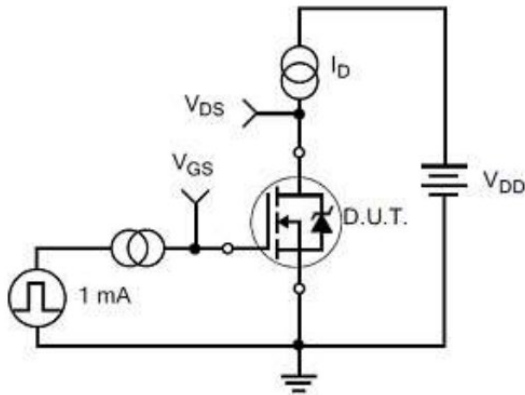


Fig 16. Gate Charge Waveforms

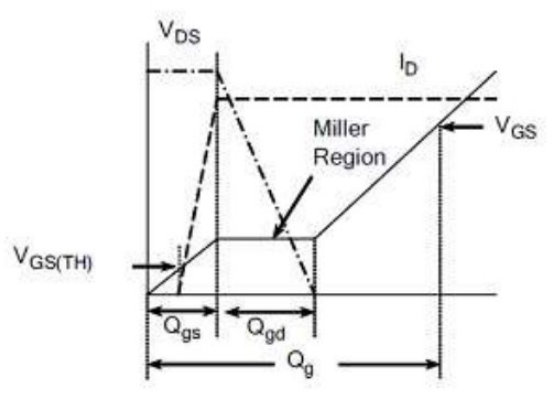


Fig 17. Resistive Switching Test Circuit

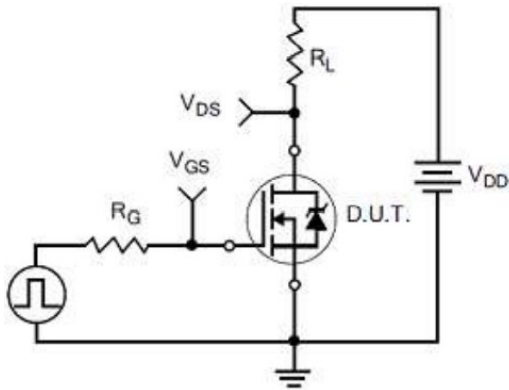


Fig 18. Resistive Switching Waveforms

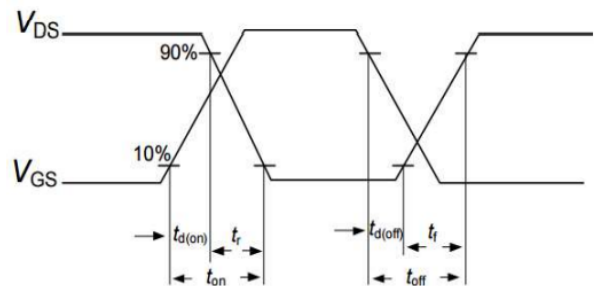




Fig 19. Diode Reverse Recovery Test Circuit

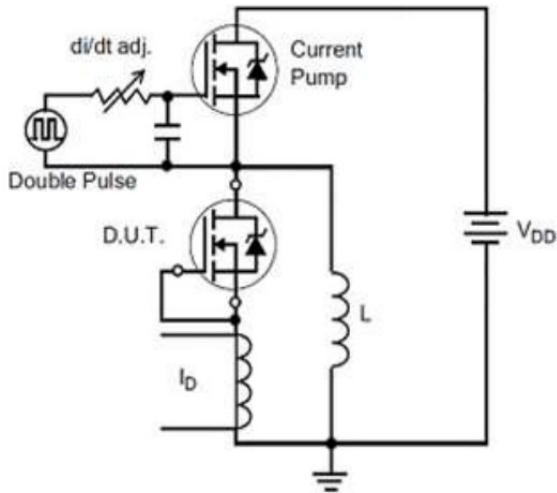


Fig 20. Diode Reverse Recovery Waveform

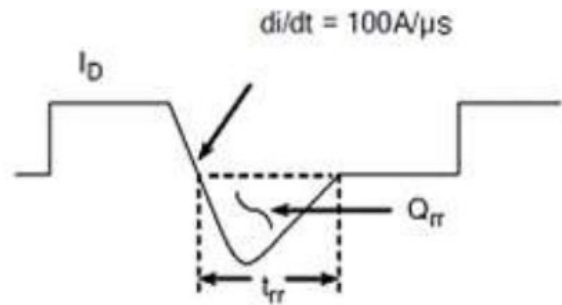


Fig 21. Unclamped Inductive Switching Test Circuit

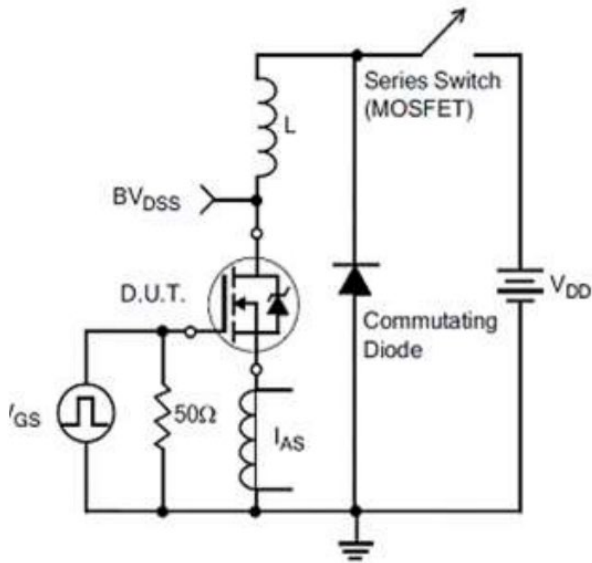
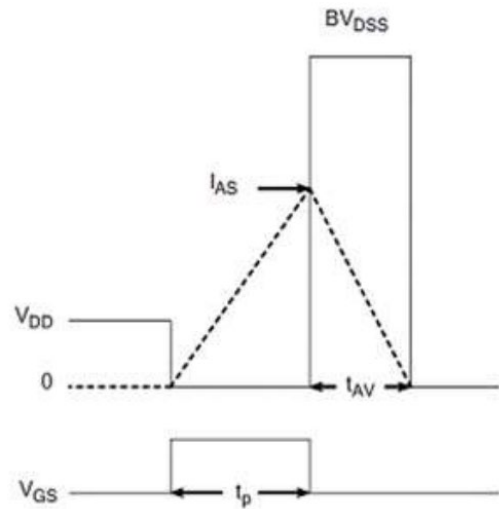


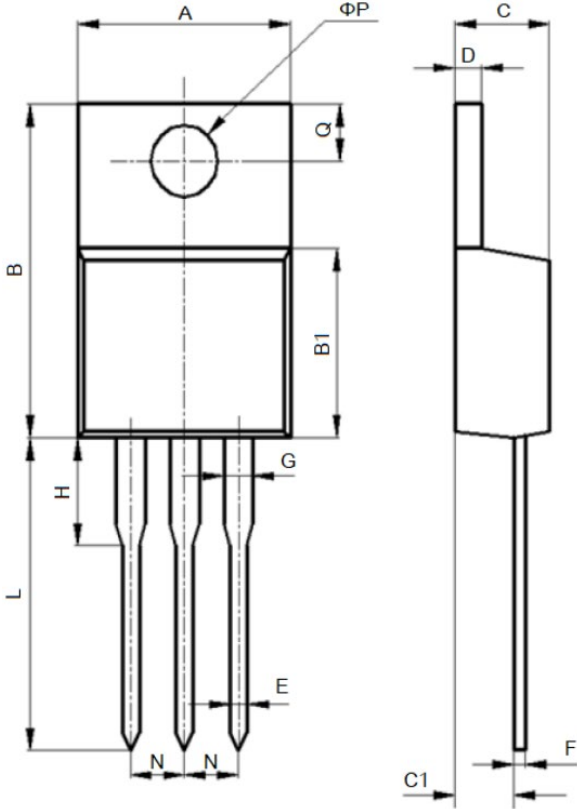
Fig 22. Unclamped Inductive Switching Waveform





**PACKAGE INFORMATION**

Dimension in TO-220F (Unit: mm)

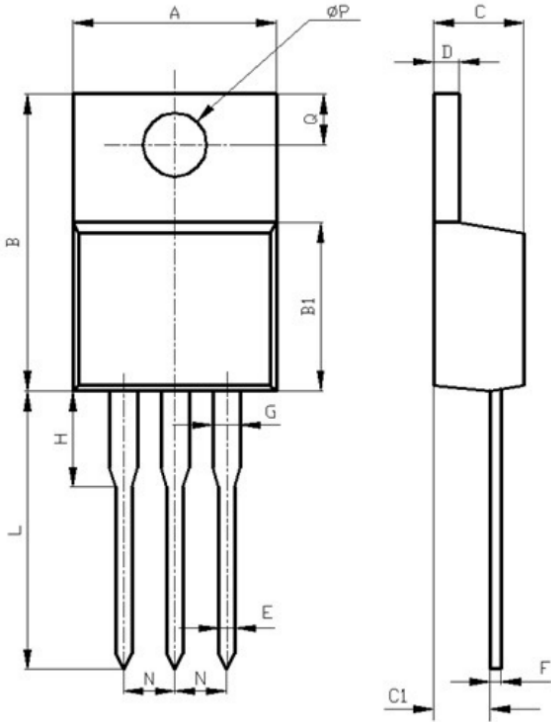


Symbol	Min.	Max.
A	9.600	10.40
B	15.40	16.20
B1	8.900	9.500
C	4.300	4.900
C1	2.100	3.000
D	2.400	3.000
E	0.600	1.000
F	0.300	0.600
G	1.120	1.420
H	3.400	3.800
	2.000	2.400
L	12.00	14.00
	6.300	7.700
N	2.340	2.740
Q	3.150	3.550
$\Phi P$	3.000	3.300





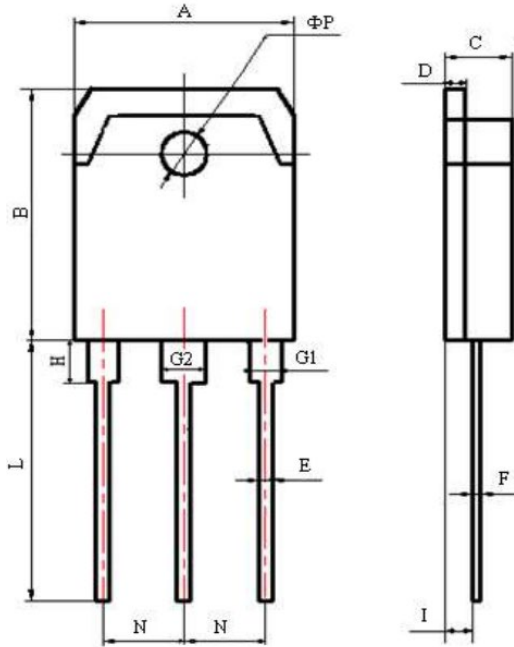
Dimension in TO-220 (Unit: mm)



Symbol	Min.	Max.
A	10.00	10.60
B	15.00	16.00
B1	8.900	9.500
C	4.300	4.800
C1	2.300	3.100
D	1.200	1.400
E	0.700	0.900
F	0.300	0.600
G	1.170	1.370
H	3.300	3.800
L	6.400	7.500
	6.700	7.900
	7.200	8.000
	7.500	8.600
	12.70	14.70
N	2.340	2.740
Q	2.400	3.000
ΦP	3.500	3.900



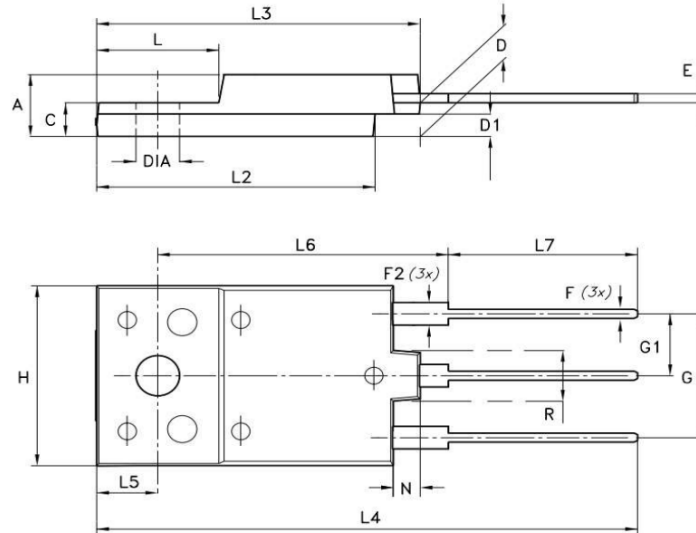
Dimension in TO-3PN (Unit: mm)



Symbol	Min.	Max.
A	15.00	16.00
B	19.20	20.60
C	4.600	5.000
D	1.400	1.600
E	0.900	1.100
F	0.500	0.700
G1	2.000	2.200
G2	3.000	3.200
H	3.000	3.700
I	1.200	1.700
	2.700	2.900
L	19.00	21.00
N	5.250	5.650
ΦP	3.100	3.300



Dimension in TO-3PF (Unit: mm)



Symbol	Min.	Max.
A	5.300	5.700
C	2.800	3.200
D	3.100	3.500
D1	1.800	2.200
E	0.800	1.100
F	0.650	0.950
F2	1.800	2.200
G	10.30	11.50
G1	5.450	
H	15.30	15.70
L	9.800	10.20
L2	22.80	23.20
L3	26.30	26.70
L4	43.20	44.40
L5	4.300	4.700
L6	24.30	24.70
L7	14.60	15.00
N	1.800	2.200
R	3.800	4.200
Dia	3.400	3.800



## IMPORTANT NOTICE

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