



800V Super-junction Power MOSFET

Description

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Super-junction power MOSFET is a revolutionary technology for high voltage power MOSFETs, designed according to the SJ principle. The deep trench SJ MOSFET provide an extremely low switching, communication and conduction losses device with highest robustness make especially resonant switching applications more reliable, more efficient, lighter and cooler, designed by Wuxi Unigroup Microelectronics Company.

Features

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- Easy to use/drive
- RoHS compliant

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Low Power Chargers and Adapters

TO-220F



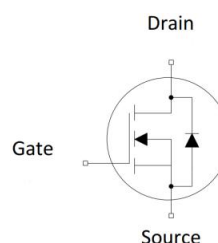
TO-220



TO-247



TO-220FP-NL



Device Marking and Package Information

Device	Package	Marking
TPA80R250A	TO-220F	80R250A
TPP80R250A	TO-220	80R250A
TPR80R250A	TO-220F-NL	80R250A
TPW80R250A	TO-247	80R250A

Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	850	V
$R_{DS(on),max}$	0.28	Ω
$Q_{g,typ}$	62.3	nC
I_D	18	A
$I_{D,pulse}$	54	A
$E_{OSS} @ 400V$	7.21	μJ



Absolute Maximum Ratings				
T _C = 25°C, unless otherwise noted				
Parameter		Symbol	Values	Unit
Continuous Drain Current	T _C = 25°C	I _D	18	A
	T _C = 100°C		10.8	
Pulsed Drain Current (note1)		I _{D,pulse}	54	A
Gate-Source Voltage		V _{GSS}	±30V	V
Single Pulse Avalanche Energy (note2)		E _{AS}	280	mJ
Repetitive Avalanche Energy (note2)		E _{AR}	0.5	mJ
Avalanche Current		I _{AR}	7.5	A
MOSFET dv/dt Ruggedness, V _{DS} = 0...480V		dv/dt	50	V/ns
Power Dissipation For TO-220F,TO-220F-NL		P _D	34	W
Power Dissipation For TO-220,TO-247			240	
Continuous Diode Forward CurrentF		I _S	18	A
Diode Pulsed Current (note1)		I _{S,pulse}	54	
Reverse Diode dv/dt (note3)		dv/dt	15	V/ns
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55~+150	°C

Thermal Resistance For TO-220F, TO-220F-NL			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	3.67	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	80	

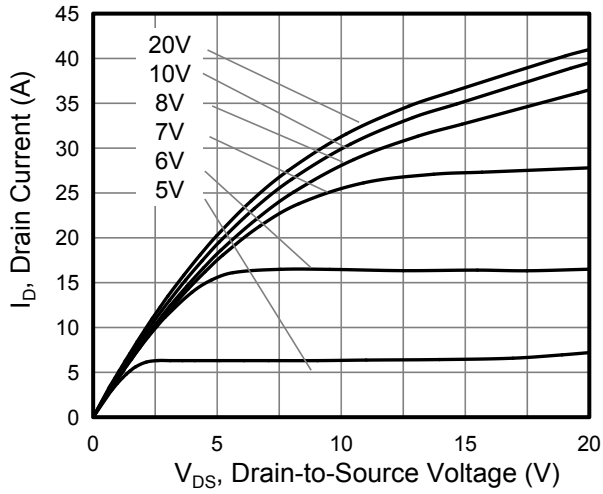
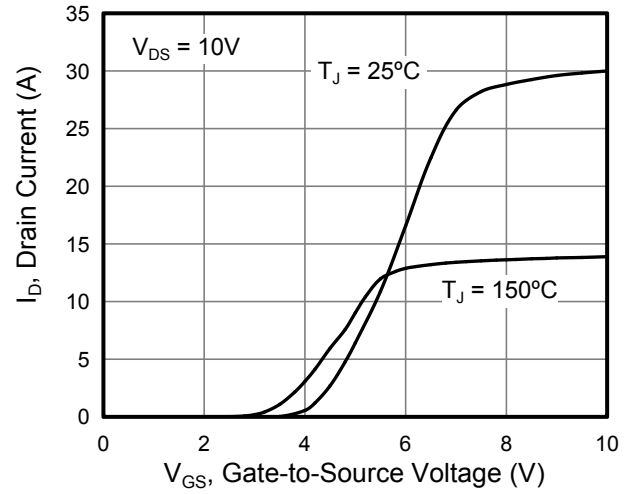
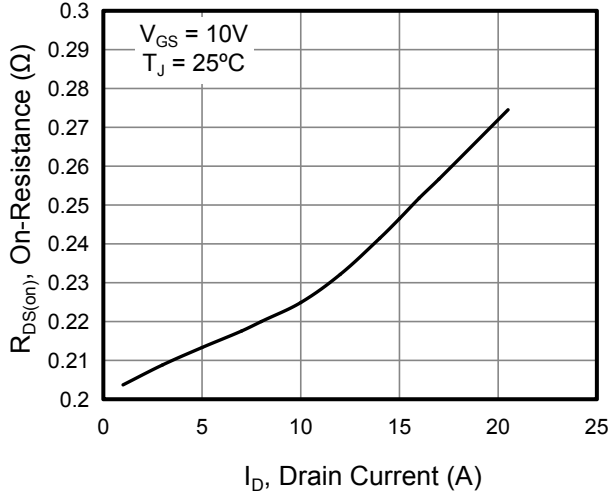
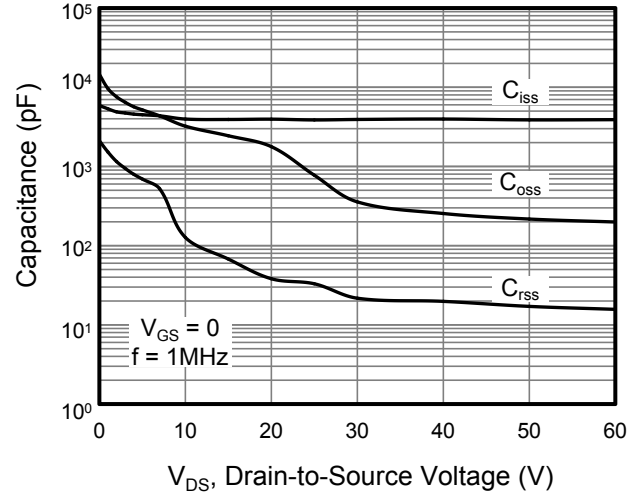
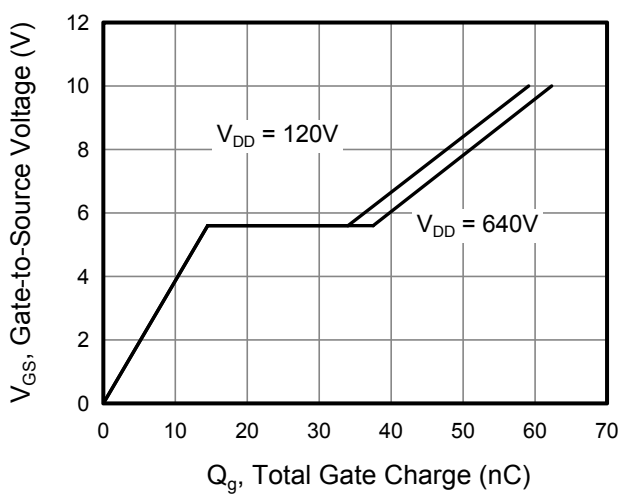
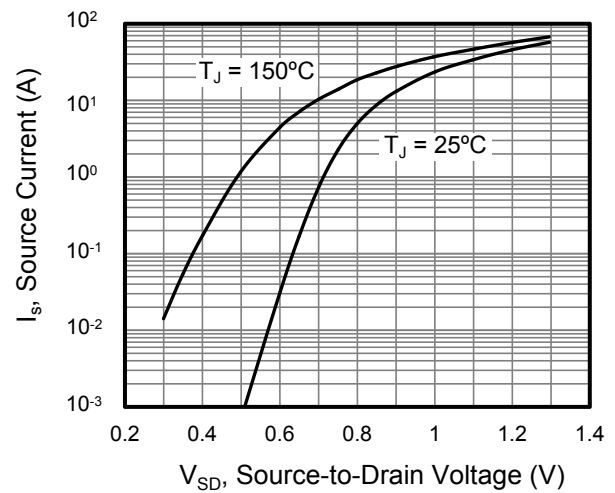
Thermal Resistance For TO-220, TO-247			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	0.52	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	

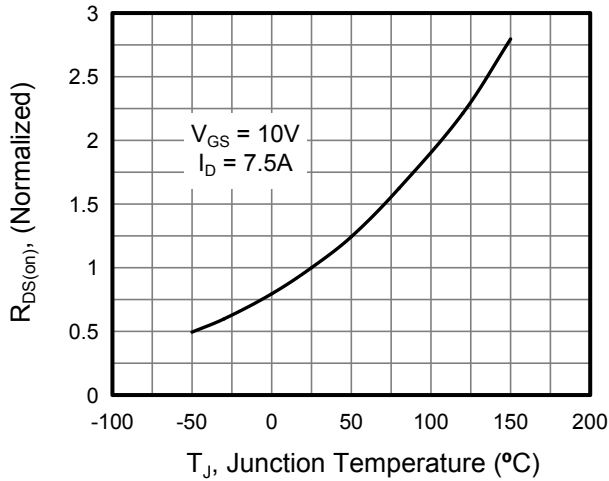
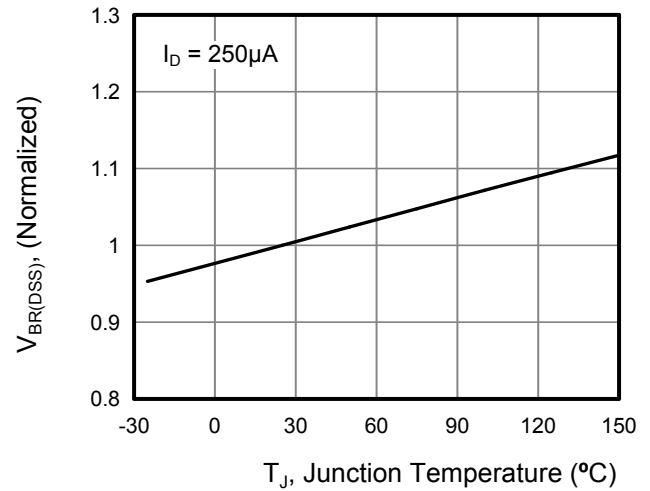
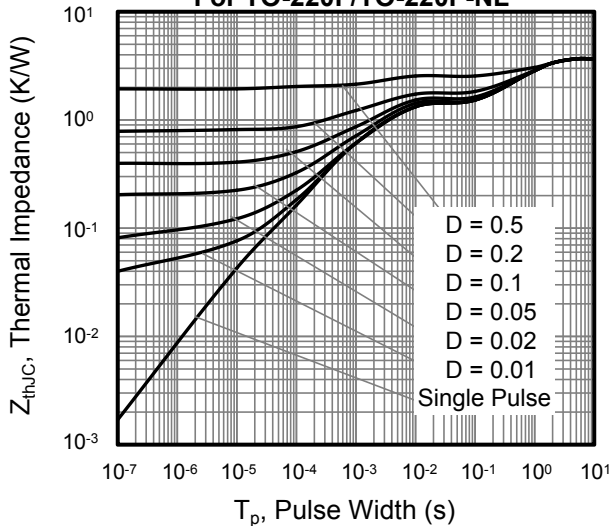
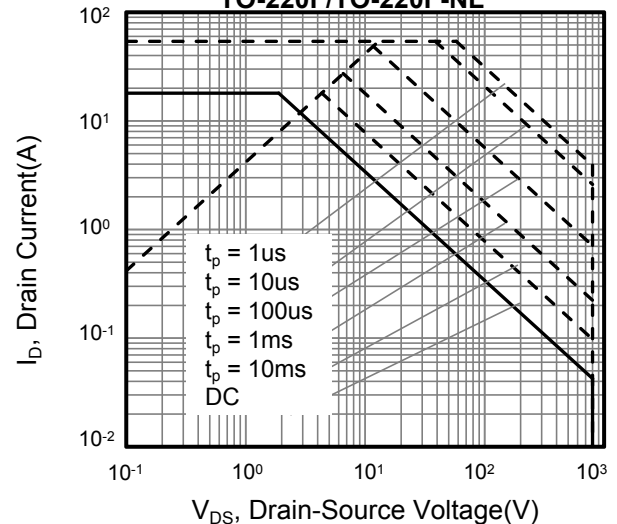
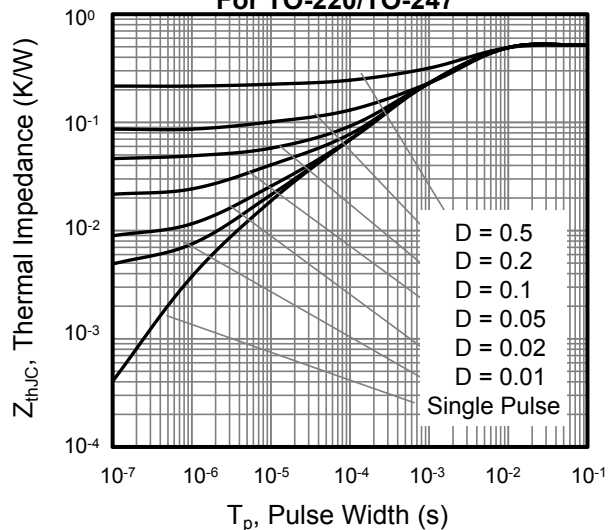
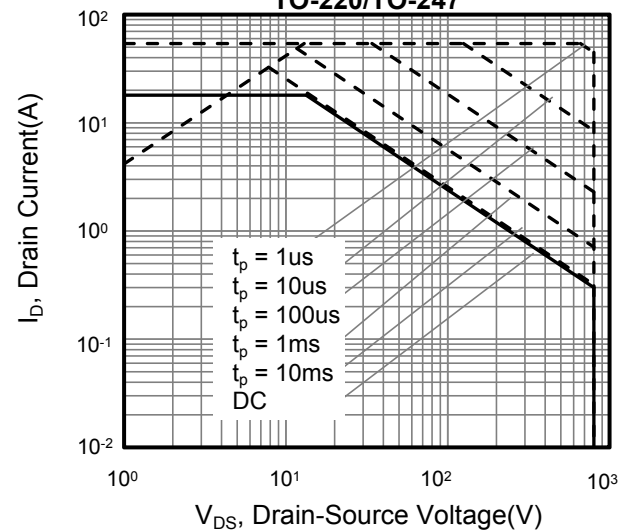


Electrical Characteristics T _J = 25°C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Characteristics						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 250μA	800	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 800V, V _{GS} = 0V, T _J = 25°C	--	--	1	μA
		V _{DS} = 800V, V _{GS} = 0V, T _J = 150°C	--	--	100	
Gate-Source Leakage Current	I _{GSS}	V _{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	2.5	--	4.5	V
Drain-Source On-State-Resistance	R _{DS(on)}	V _{GS} = 10V, I _D = 9A	--	0.24	0.28	Ω
Gate Resistance	R _G	f = 1.0MHz open drain	--	1	--	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{GS} = 0V, V _{DS} = 50V, f = 1.0MHz	--	3871	--	pF
Output Capacitance	C _{oss}		--	217	--	
Reverse Transfer Capacitance	C _{rss}		--	17.1	--	
Total Gate Charge	Q _g	V _{DD} = 640V, I _D = 18A, V _{GS} = 10V	--	62.3	--	nC
Gate-Source Charge	Q _{gs}		--	14.5	--	
Gate-Drain Charge	Q _{gd}		--	23	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} = 400V, I _D = 9A, R _G = 25Ω	--	49	--	ns
Turn-on Rise Time	t _r		--	42.6	--	
Turn-off Delay Time	t _{d(off)}		--	166	--	
Turn-off Fall Time	t _f		--	13	--	
Drain-Source Body Diode Characteristics						
Body Diode Forward Voltage	V _{SD}	T _J = 25°C, I _{SD} = 18A, V _{GS} = 0V	--	0.9	1.2	V
Reverse Recovery Time	t _{rr}	V _R = 400V, I _F = I _S , di _F /dt = 100A/μs	--	400	--	ns
Reverse Recovery Charge	Q _{rr}		--	4	--	μC
Peak Reverse Recovery Current	I _{rrm}		--	20	--	A

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_D = 10A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. Identical low side and high side switch with identical R_G

**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. Breakdown voltage vs. Junction Temperature****Figure 9. Transient Thermal Impedance For TO-220F/TO-220F-NL****Figure 10. Safe Operation Area For TO-220F/TO-220F-NL****Figure 11. Transient Thermal Impedance For TO-220/TO-247****Figure 12. Safe Operation Area For TO-220/TO-247**



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

Figure 13. Typ. Coss Stored Energy

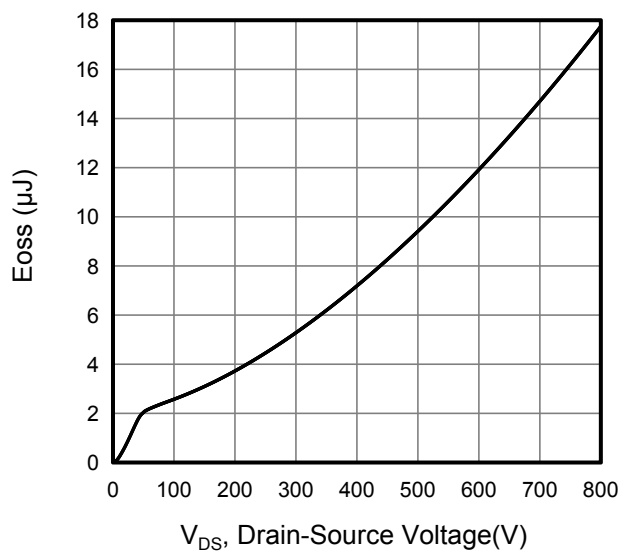




Figure A: Gate Charge Test Circuit and Waveform

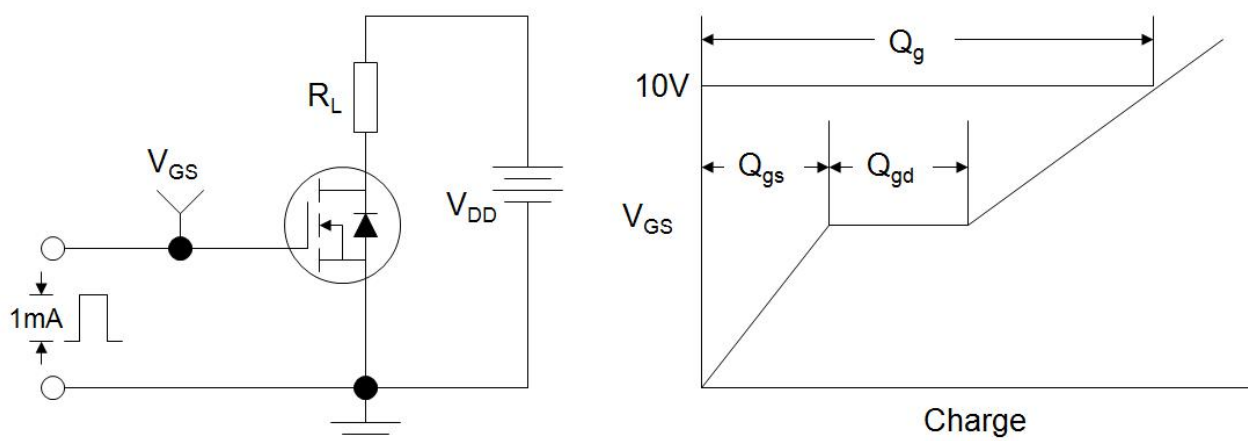


Figure B: Resistive Switching Test Circuit and Waveform

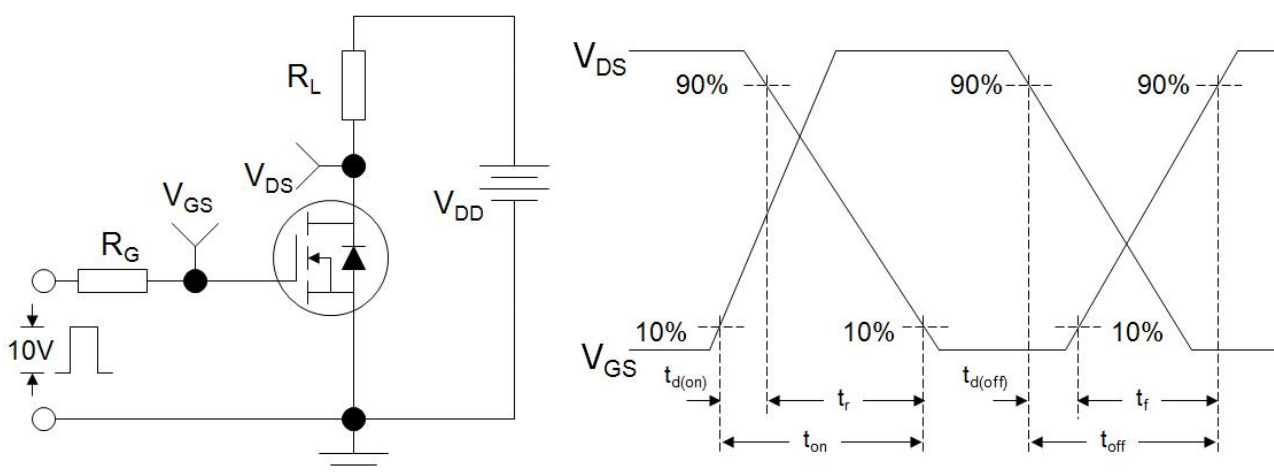
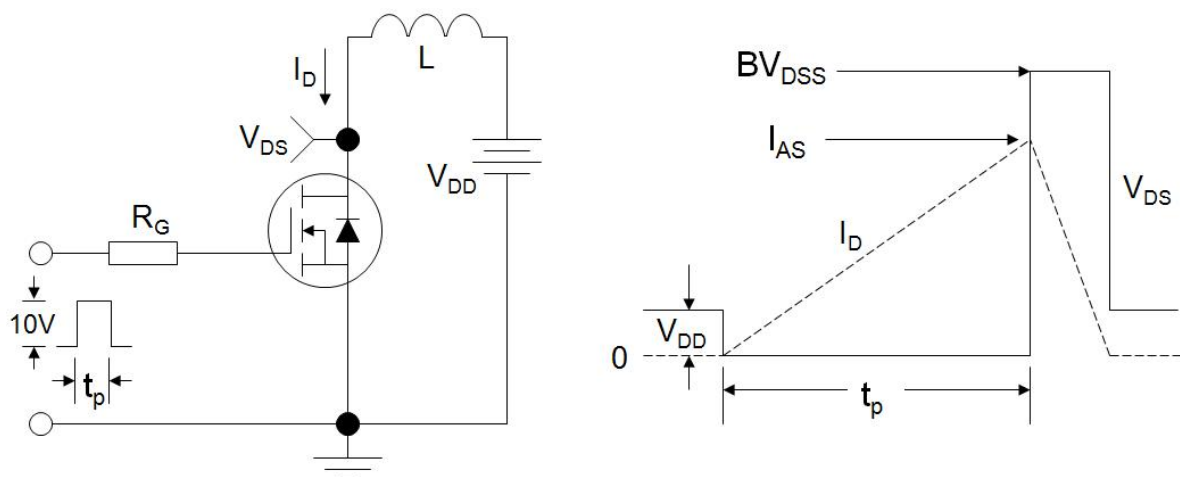
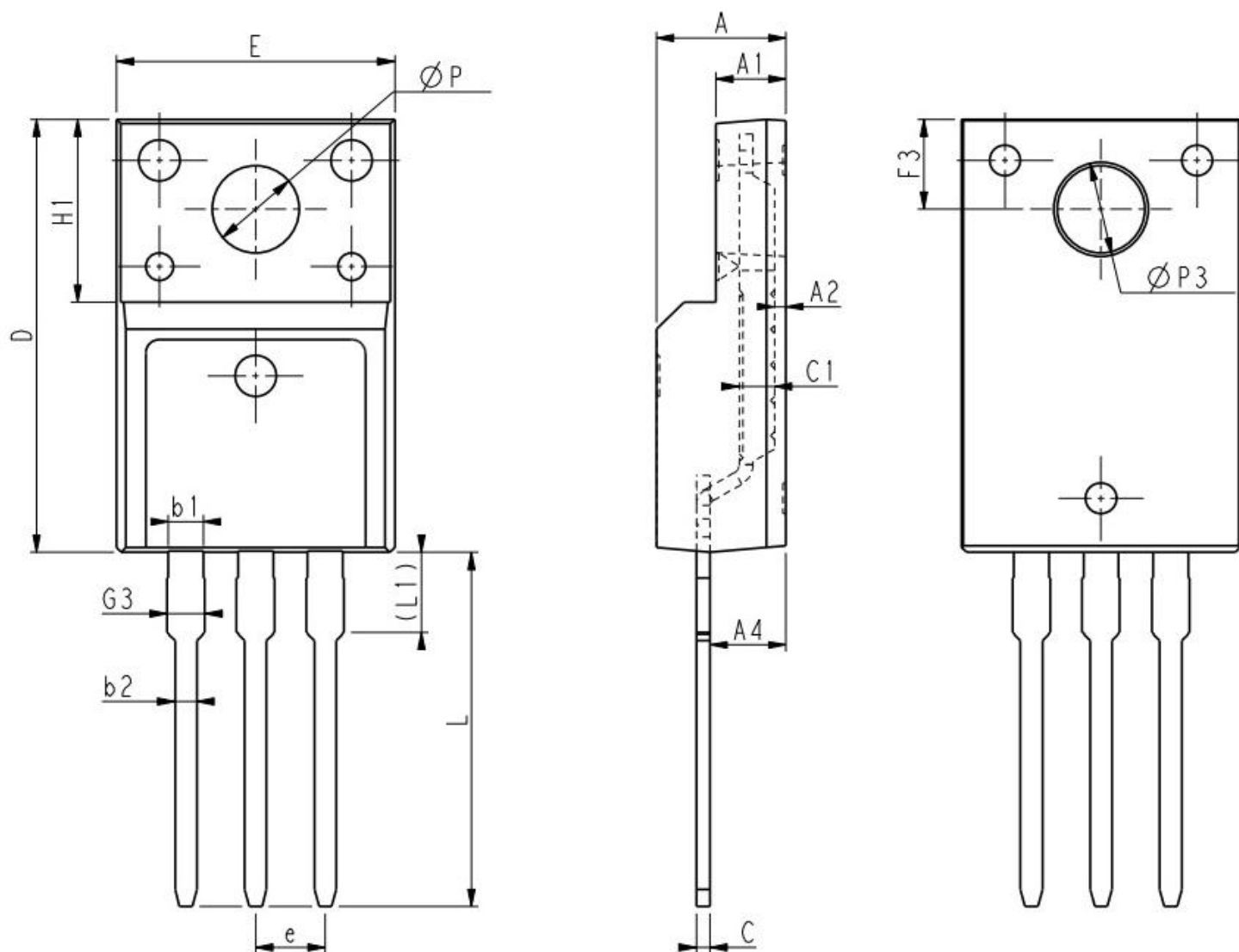


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-220F (封装厂 H)

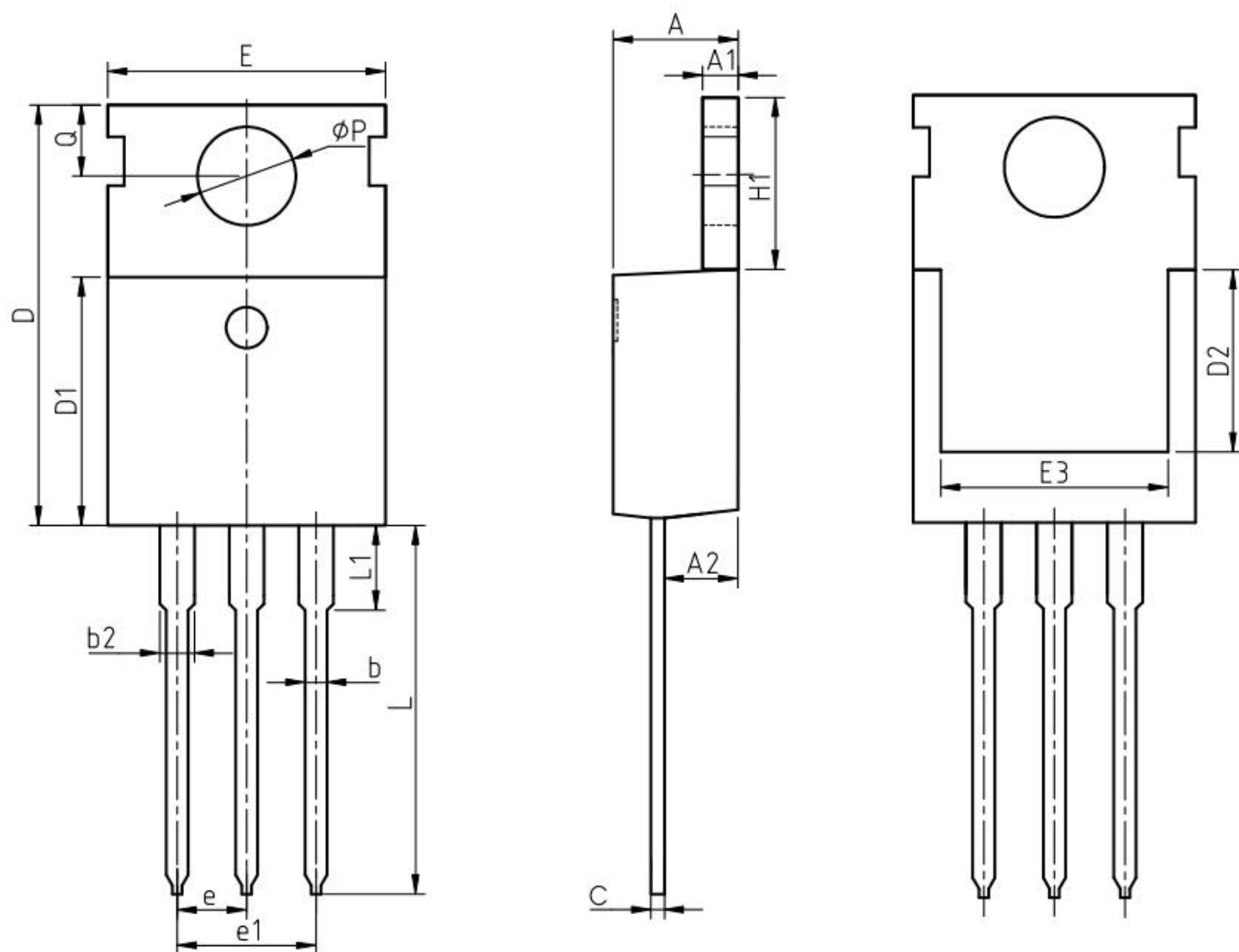


Unit:mm			
Symbol	Min.	Nom	Max.
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
c1	1.20	1.30	1.35
D	15.57	15.87	16.17
H1	6.70REF		

Unit:mm			
Symbol	Min.	Nom	Max.
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.93	3.03	3.13
ØP	3.03	3.18	3.38
ØP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95



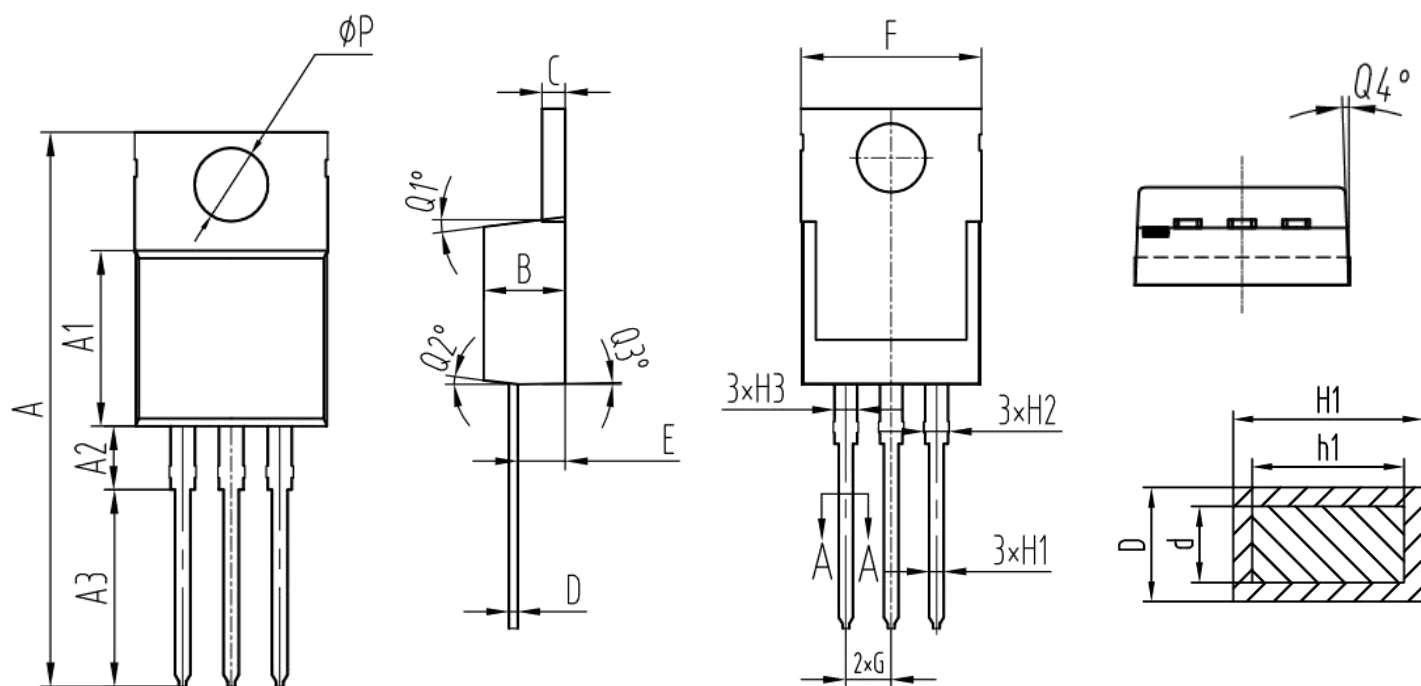
TO-220 (封装厂 H)



Unit:mm				Unit:mm			
Symbol	Min.	Nom	Max.	Symbol	Min.	Nom	Max.
A	4.37	4.57	4.77	E	9.70	10.00	10.30
A1	1.25	1.30	1.40	E3	7.00	-	-
A2	2.20	2.40	2.60	e	2.54 BSC		
b	0.70	0.80	0.95	e1	5.08 BSC		
b2	1.17	1.27	1.47	H1	6.25	6.50	6.85
c	0.45	0.50	0.60	L	12.75	13.50	13.80
D	15.10	15.60	16.10	L1	-	3.10	3.40
D1	8.80	9.10	9.40	ϕP	3.40	3.60	3.80
D2	5.50	-	-	Q	2.60	2.80	3.00



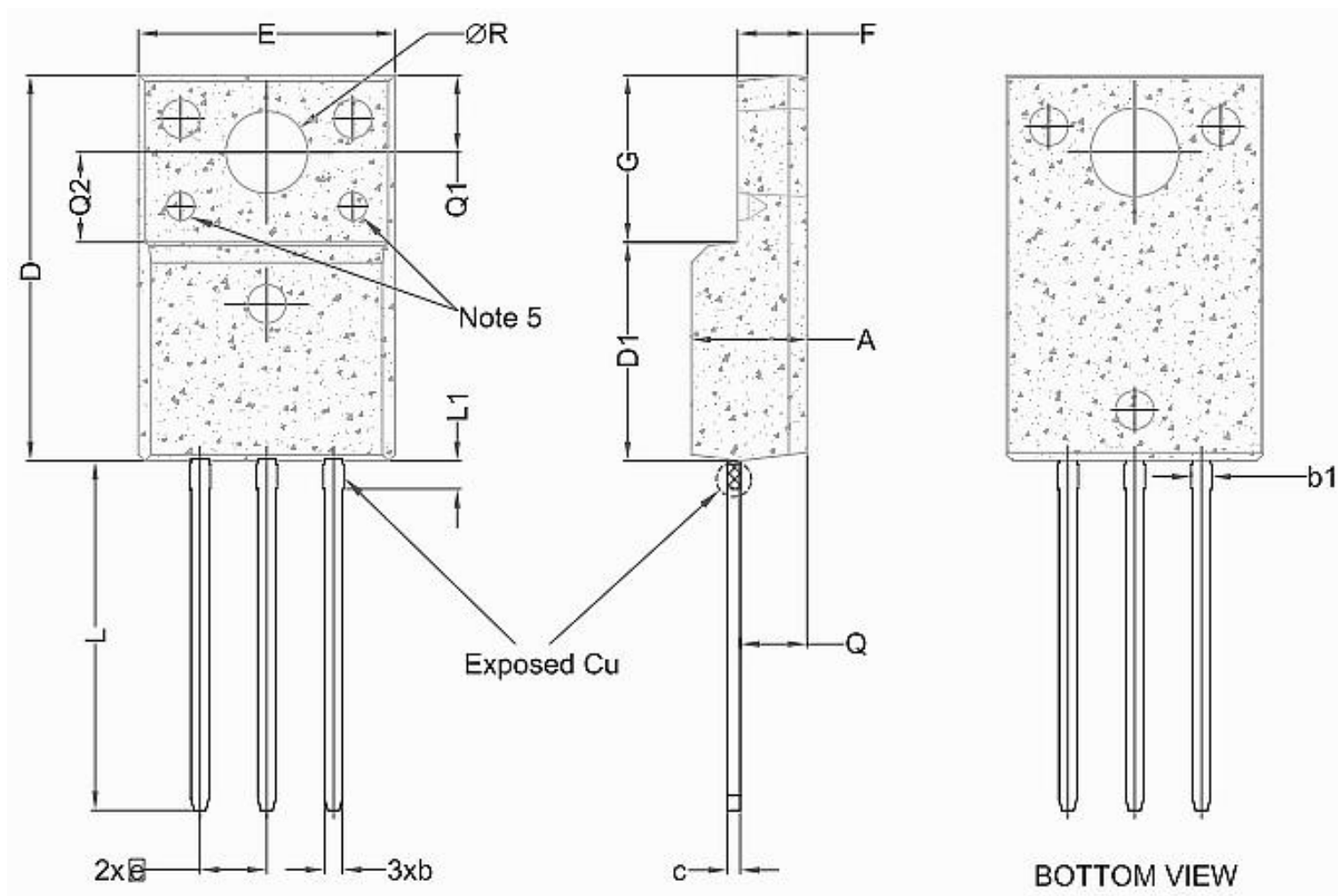
TO-220 (封装厂 T)



SYMBOL	MIN	NOM	MAX
A	18.60	18.80	19.00
A1	9.10	9.20	9.30
A2	3.40	3.60	3.80
A3	9.60	9.80	10.00
B	4.45	4.55	4.65
C	1.25	1.30	1.35
D	0.41	—	0.61
d	0.40	0.50	0.60
E	2.52	2.67	2.82
F	9.90	10.10	10.30
G	2.44	2.54	2.64
H1	0.71	—	0.91
h1	0.70	0.80	0.90
H2	1.25	1.35	1.45
H3	1.20	1.27	1.35
øP	3.74	3.84	3.94



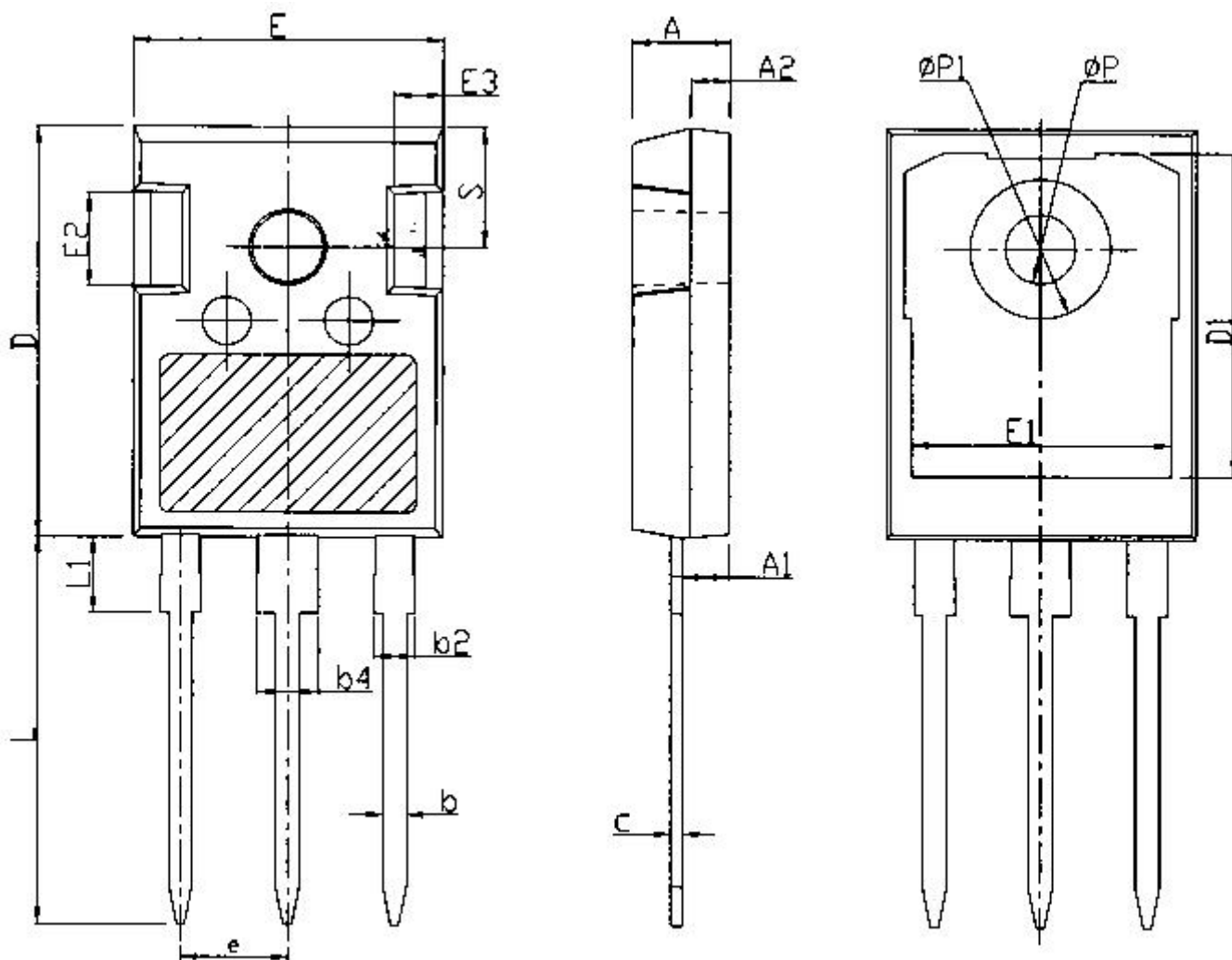
TO-220FP-NL (封装厂 M)



Unit:mm				Unit:mm			
Symbol	Min.	Nom	Max.	Symbol	Min.	Nom	Max.
A	4.30	4.50	4.70	F	2.50	2.70	2.90
b	0.60	0.70	0.80	G	6.30	6.50	6.70
b1	0.60	0.80	0.90	L	13.40	13.60	13.80
c	0.45	0.50	0.60	L1	1.00	1.10	1.20
D	14.70	15.00	15.30	Q	2.50	2.60	2.70
D1	8.50 REF			Q1	2.90	3.00	3.10
e	2.60BSC			Q2	3.50 REF		
E	9.70	10.00	10.30	ΦR	3.00	3.20	3.40



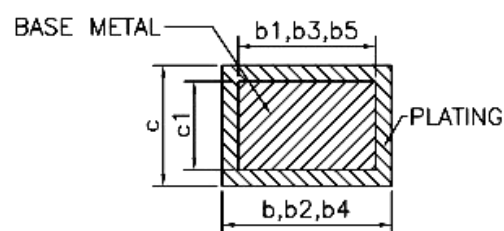
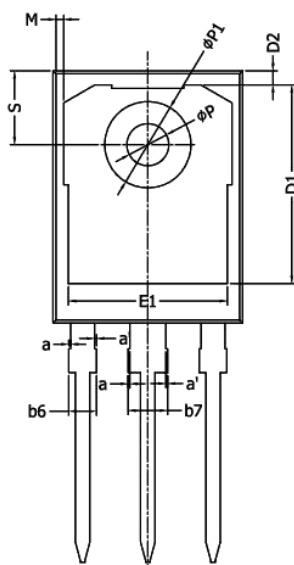
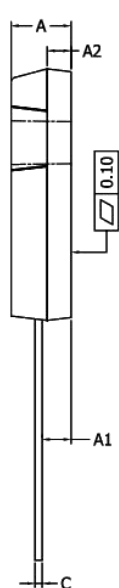
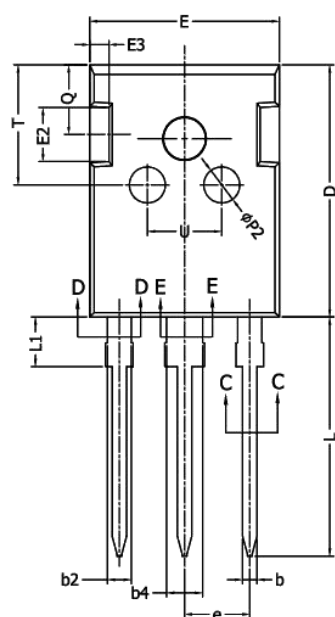
TO-247 (封装厂 H)



Unit:mm			
Symbol	Min.	Nom	Max.
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85

Unit:mm			
Symbol	Min.	Nom.	Max.
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

TO-247 (封装厂 I)



SYMBOL	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
a	0	---	0.15
a'	0	---	0.15
b	1.16	---	1.26
b1	1.15	1.2	1.22
b2	1.96	---	2.06
b3	1.95	2.00	2.02
b4	2.96	---	3.06
b5	2.96	3.00	3.02
b6	---	---	2.25
b7	---	---	3.25
c	0.59	---	0.66
c1	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.17	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.40	4.50	4.60
E3	2.40	2.50	2.60
e	5.436 BSC		
L	19.80	19.92	20.10
L1	---	---	4.30
M	0.35	---	0.95
P	3.40	3.50	3.60
P1	7.00	---	7.40
P2	2.40	2.50	2.60
Q	5.60	---	6.00
S	6.05	6.15	6.25
T	9.80	---	10.20
U	6.00	---	6.40



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