

Description

The GC20N70 uses advanced super junction technology and design to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for industry AC-DC SMPS requirement of PFC, AC/DC power conversion, and other industrial power applications.

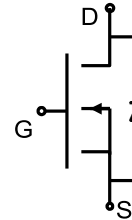
General Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small Package
- Ultra Low Gate Charge cause lower driving requirement
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power Factor Correction (PFC)
- Switched Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)

V_{DS}	$R_{DS(ON)}$ @ 10V (Typ)	I_D
700V	170mΩ	20 A



Schematic Diagram



Marking and Pin Assignment

Ordering Information

Part Number	Marking	Case	Packaging
GC20N70Q	GC20N70	TO-247	50pcs/Tube
GC20N70T	GC20N70	TO-220	50pcs/Tube
GC20N70F	GC20N70	TO-220F	50pcs/Tube

Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value		Unit
		TO-247 TO-220	TO-220F	
Drain-Source Voltage	V_{DS}	700		V
Gate-Source Voltage	V_{GS}	± 30		V
Drain Current-Continuous ($T_C=25^{\circ}\text{C}$)	I_D	20		A
Drain Current-Continuous ($T_C=100^{\circ}\text{C}$)	I_D	12		A
Drain Current-Pulsed (Note 1)	I_{DM}	60		A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	484		mJ
Repetitive Avalanche Energy (Note 1)	E_{AR}	0.7		mJ
Avalanche Current (Note 1)	I_{AR}	3.5		A
Maximum Power Dissipation ($T_C=25^{\circ}\text{C}$)	P_D	151	34	W
MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 480\text{V}$	dv/dt	50		V/ns
Reverse diode dv/dt, $V_{DS} = 0 \dots 480\text{V}$, $I_{SD} \leq I_D$	di_F/dt	15		V/ μs
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150		$^{\circ}\text{C}$

Thermal Characteristic

Parameter	Symbol	Value		Unit
		TO-247 TO-220	TO-220F	
Thermal Resistance,Junction-to-Case	R_{thJC}	0.83	3.7	°C/W
Thermal Resistance,Junction-to-Ambient (Note 2)	R_{thJA}	62	80	°C/W

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/ Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	700	-	-	V
Zero Gate Voltage Drain Current (T _C =25℃)	I _{DSS}	V _{DS} =700V,V _{GS} =0V	-	-	1	μA
Zero Gate Voltage Drain Current (T _C =125℃)	I _{DSS}	V _{DS} =700V,V _{GS} =0V	-	-	100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±30V,V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate 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 =10A	-	170	190	mΩ
Gate resistance	R _G	f = 1.0MHz open drain	-	12	-	Ω
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =100V,V _{GS} =0 V, F=1.0MHz	-	1724	-	PF
Output Capacitance	C _{oss}		-	61	-	PF
Reverse Transfer Capacitance	C _{rss}		-	6	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =400V, I _D =20A, R _{GEN} =25Ω	-	15	-	ns
Turn-on Rise Time	t _r		-	59	-	ns
Turn-Off Delay Time	t _{d(off)}		-	121	-	ns
Turn-Off Fall Time	t _f		-	44	-	ns
Total Gate Charge	Q _g	V _{DD} =520V, I _D =20A, V _{GS} =10V	-	39	-	nC
Gate-Source Charge	Q _{gs}		-	8	-	nC
Gate-Drain Charge	Q _{gd}		-	15	-	nC
Drain-Source Diode Characteristics						
Continuous Body Diode Current	I _S	T _C =25℃	-	-	20	A
Pulsed Diode Forward Current	I _{SM}	T _C =25℃	-	-	60	A
Diode Forward Voltage	V _{SD}	T _J =25℃, I _{SD} =20A,V _{GS} =0V	-	-	1.2	V
Reverse Recovery Time	t _{rr}	V _R =400V, I _F =I _S , di _F /dt = 100A/ μ s	-	423	-	ns
Reverse Recovery Charge	Q _{rr}		-	5.3	-	μC
Peak Reverse Recovery Current	I _{rrm}		-	25	-	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $I_{AS} = 3.5A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 1\%$.
4. Guaranteed by design, not subject to production

Typical Electrical And Thermal Characteristics

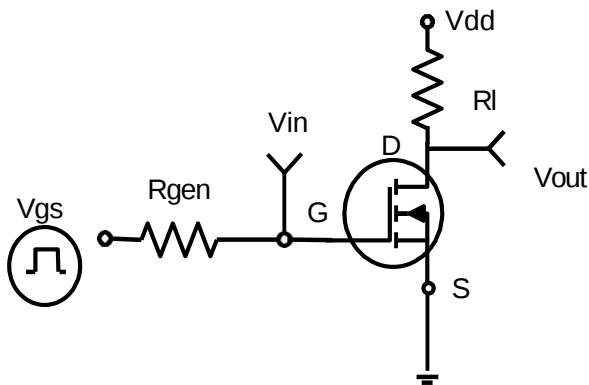


Figure 1. Switching Test Circuit

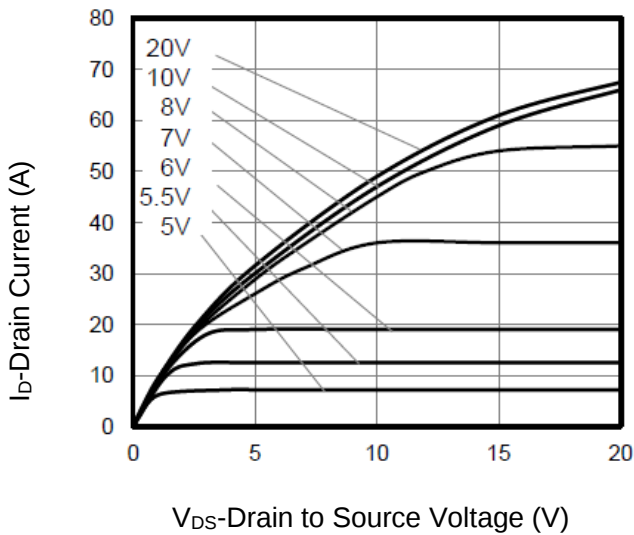


Figure 3. Output Characteristics

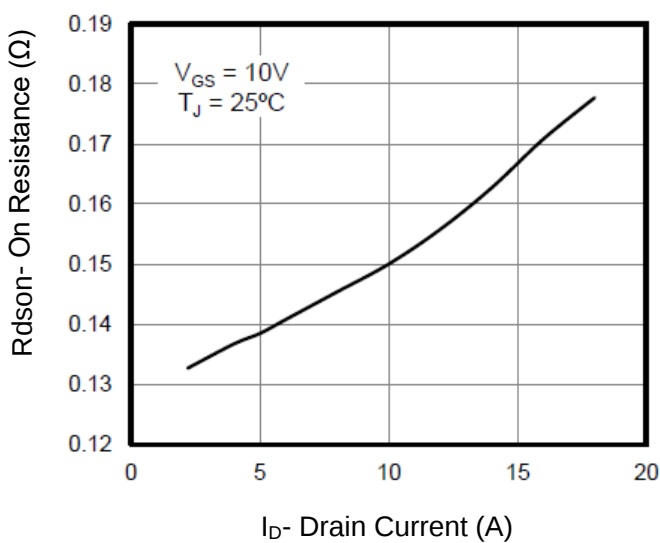


Figure 5. On Resistance vs. Drain Current

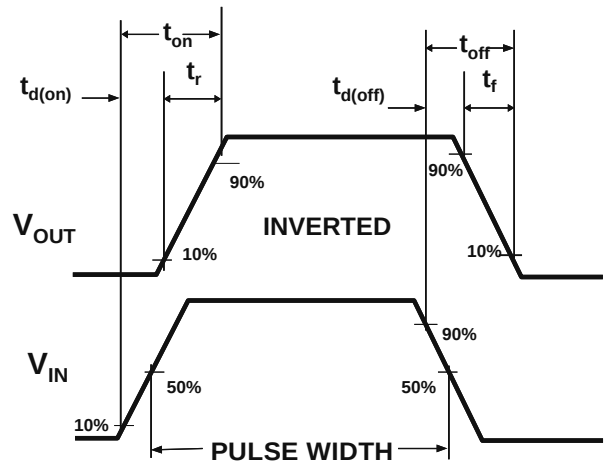


Figure 2. Switching Waveforms

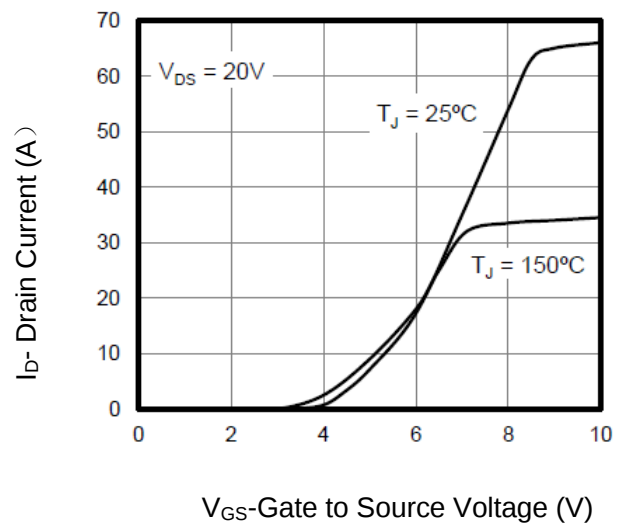


Figure 4. Transfer Characteristics

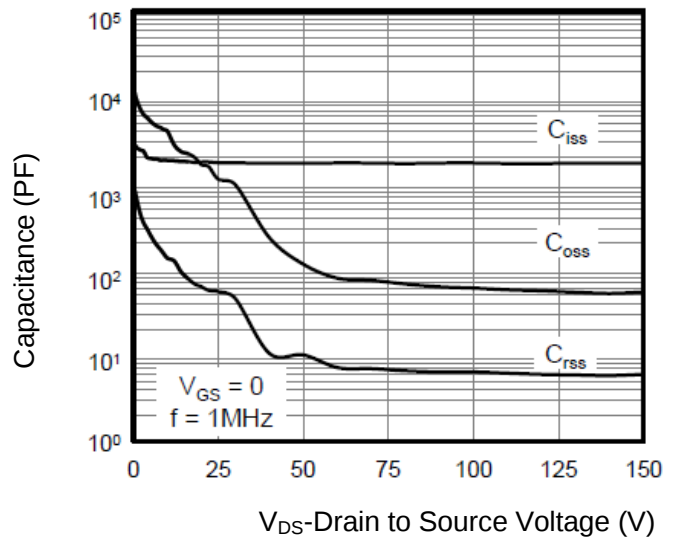


Figure 6. Capacitance

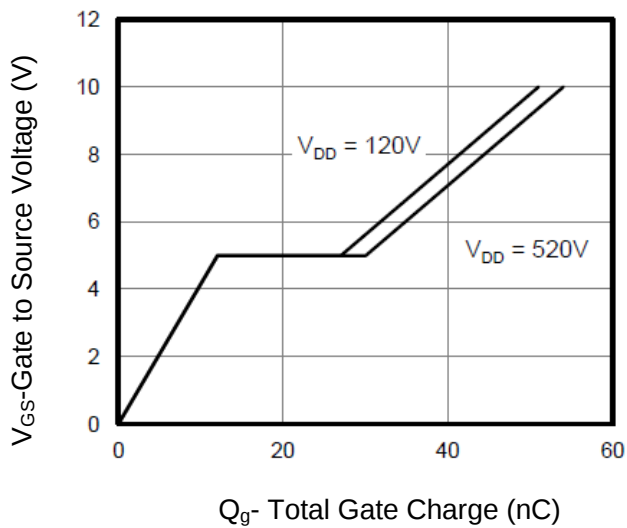


Figure 7. Gate Charge

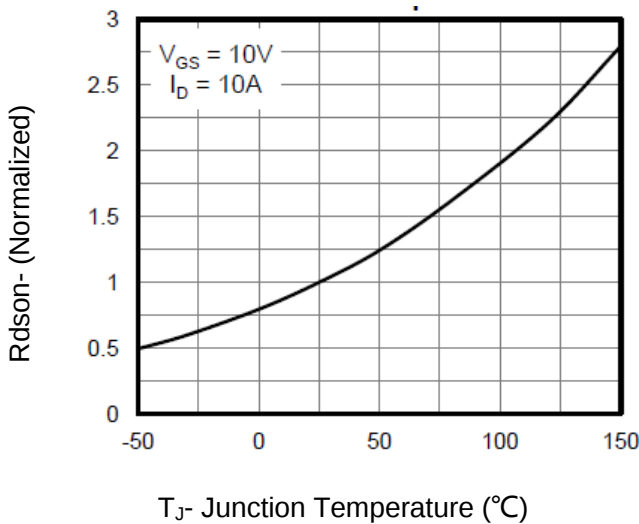


Figure 9. On- Resistance vs. Junction Temperature

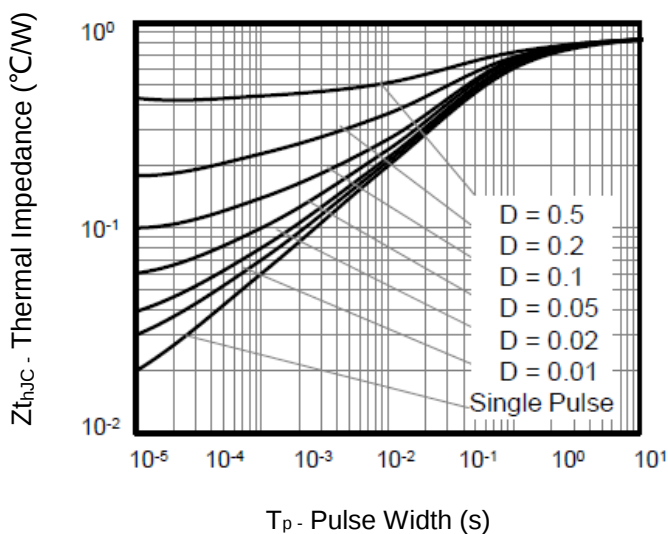


Figure 11. Transient Thermal Impedance (TO-247/TO-220)

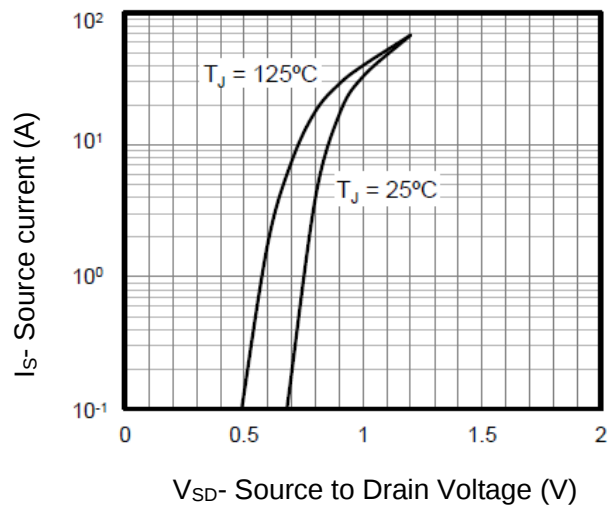


Figure 8. Body Diode Forward Voltage

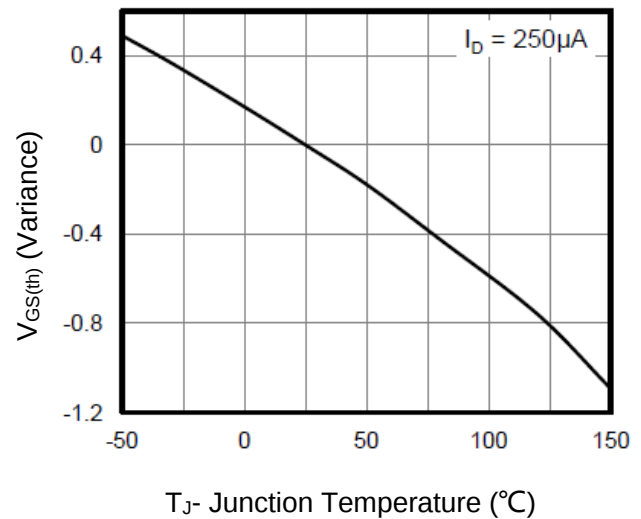


Figure 10. Threshold Voltage vs. Junction Temperature

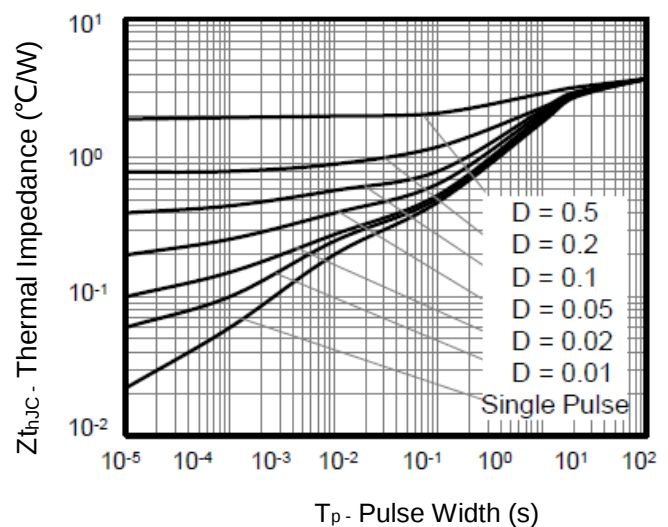
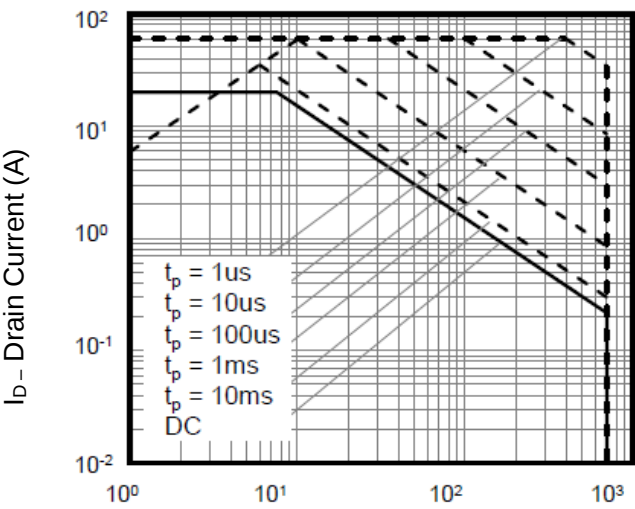
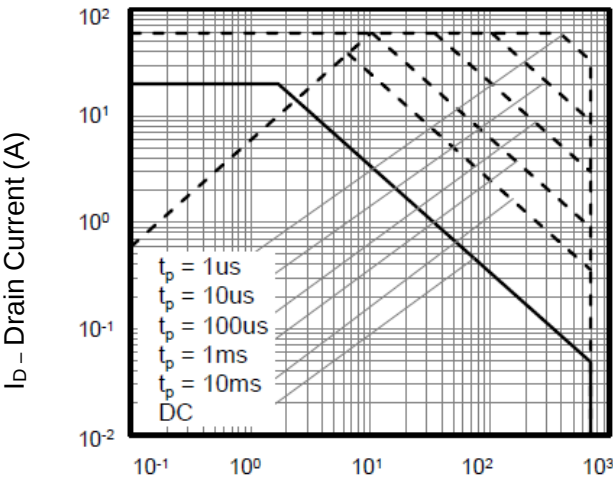


Figure 12. Transient Thermal Impedance (TO-220F)



V_{DS} - Drain to Source voltage (V)

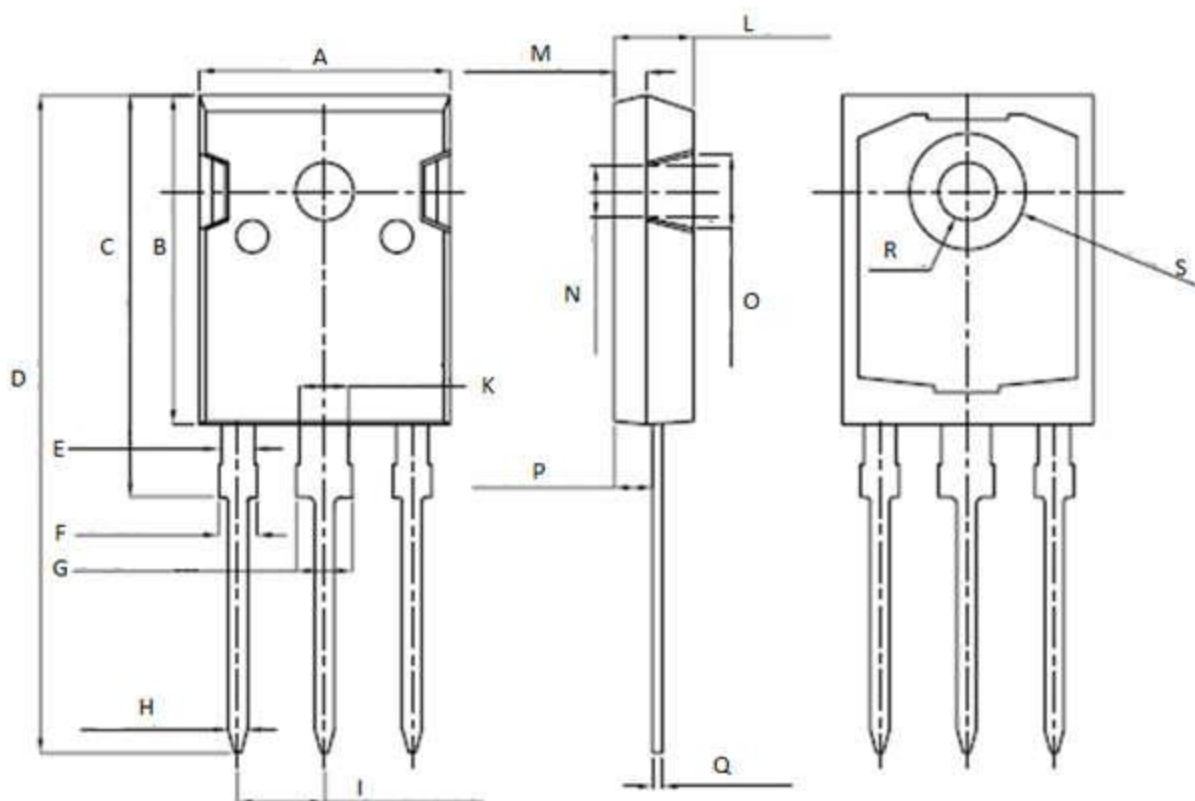
Figure 13. Safe Operation Area for TO-247/TO-220



V_{DS} - Drain to Source Voltage (V)

Figure 14. Safe Operation Area for TO-220F

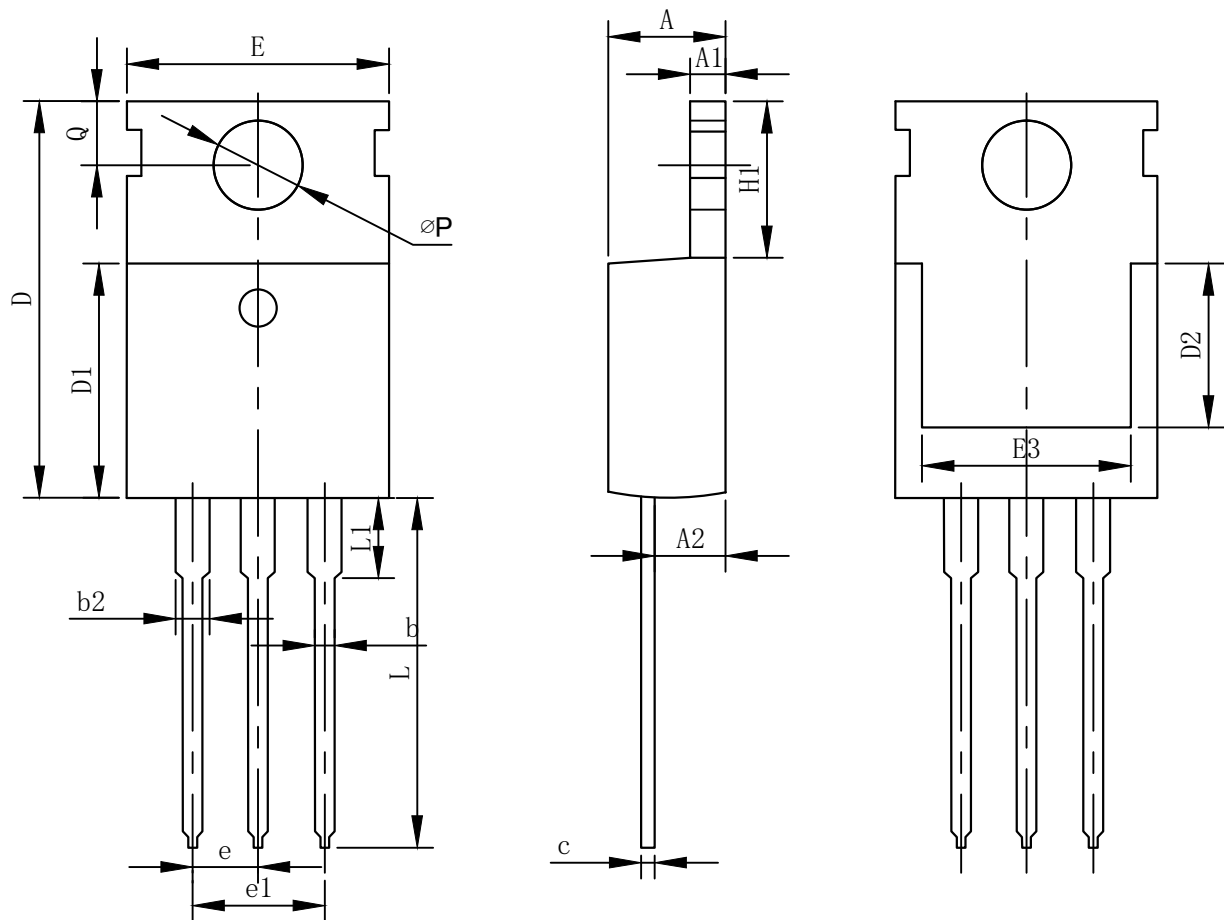
TO-247 Package information



Unit: mm		
Symbol	Min.	Max.
A	15.95	16.25
B	20.85	21.25
C	20.95	21.35
D	40.5	40.9
E	1.9	2.1
F	2.1	2.25
G	3.1	3.25
H	1.1	1.3
I	5.40	5.50

Unit: mm		
Symbol	Min.	Max.
K	2.90	3.10
L	4.90	5.30
M	1.90	2.10
N	4.50	4.70
O	5.40	5.60
P	2.29	2.49
Q	0.51	0.71
R	Φ3.5	Φ3.7
S	Φ7.1	Φ7.3

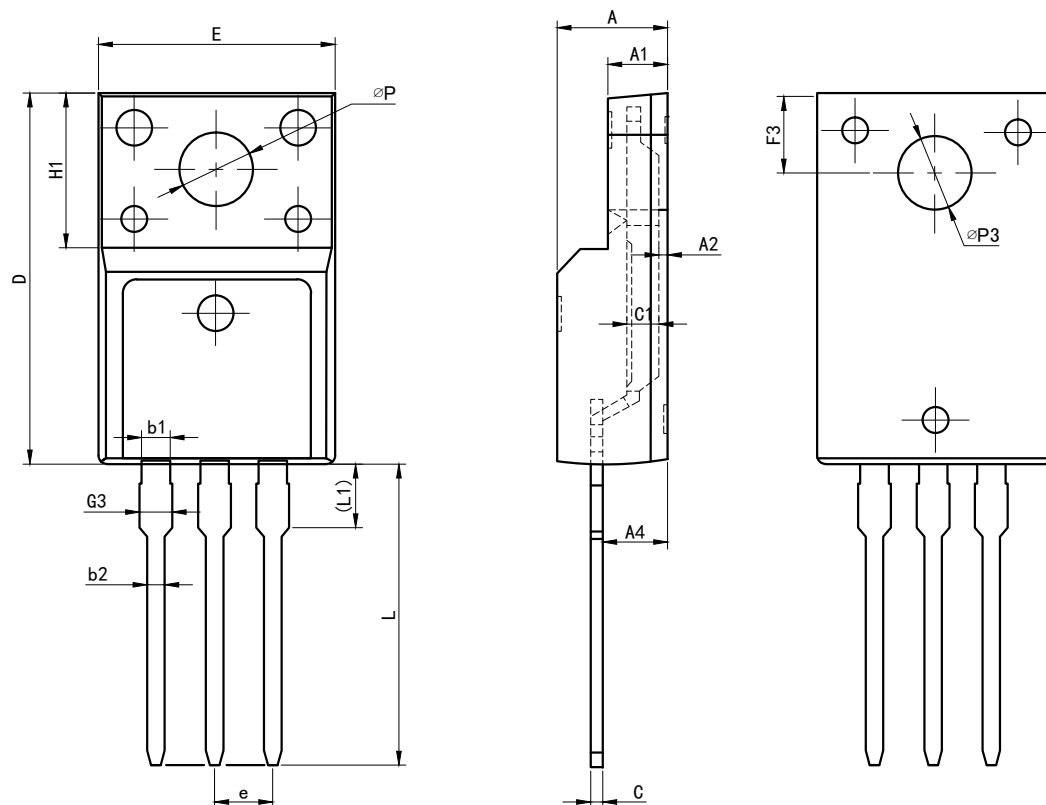
TO-220 Package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.70	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	—	—
E	9.70	10.00	10.30
E3	7.00	—	—
e	2.54BSC		
e1	5.08BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	—	3.10	3.40
øP	3.40	3.60	3.80
Q	2.60	2.80	3.00

TO-220F Package information



COMMON DIMENSIONS

SYMBOL	mm		
	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		
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.93	3.03	3.13
ϕP	3.03	3.18	3.38
$\phi P3$	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