

Description

The GC20N60 uses advanced super junction technology and design to provide excellent $R_{DS(ON)}$, low gate charge and operation. This device is suitable for industry's AC-DC SMPS requirement for PFC, AC/DC power conversion, and industrial power application.

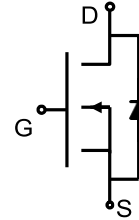
General Features

- 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 (Max)	I_D
600V	190m Ω	20A



Schematic Diagram



Marking and Pin Assignment

Ordering Information

Part Number	Marking	Case	Packaging
GC20N60K	GC20N60	TO-252	2500pcs/Reel
GC20N60T	GC20N60	TO-220	50pcs/Tube
GC20N60F	GC20N60	TO-220F	50pcs/Tube

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

Parameter	Symbol	Value		Unit
		TO-252 TO-220	TO-220F	
Drain-Source Voltage	V_{DS}	600		V
Gate-Source Voltage	V_{GS}	± 30		V
Drain Current-Continuous	I_D	20		A
Drain Current-Pulsed (Note 1)	I_{DM}	60		A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	500		mJ
Avalanche Current (Note 1)	I_{AR}	10		A
Repetitive Avalanche Energy (Note 1)	E_{AR}	1		mJ
Maximum Power Dissipation	P_D	208	34.5	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150		$^\circ\text{C}$

Thermal Characteristic

Parameter	Symbol	Value		Unit
		TO-252 TO-220	TO-220F	
Thermal Resistance, Junction-to-Case	R_{thJC}	0.6	3.6	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient (Note 2)	R_{thJA}	62	80	$^\circ\text{C/W}$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	600	-	-	V
Zero Gate Voltage Drain Current (T _J =25°C)	I _{DSS}	V _{DS} =600V, V _{GS} =0V	-	-	1	μA
Zero Gate Voltage Drain Current (T _J =150°C)	I _{DSS}	V _{DS} =600V, 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	-	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A	-	-	190	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =10A	-	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =50V, V _{GS} =0V, f=1.0MHz	-	2140	-	PF
Output Capacitance	C _{OSS}		-	300	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	18	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =480V, I _D =20A R _{GEN} =25Ω	-	48	104	nS
Turn-on Rise Time	t _r		-	108	220	nS
Turn-Off Delay Time	t _{d(off)}		-	176	360	nS
Turn-Off Fall Time	t _f		-	50	108	nS
Total Gate Charge	Q _g	V _{DD} =480V, I _D =20A, V _{GS} =10V	-	54	-	nC
Gate-Source Charge	Q _{gs}		-	10	-	nC
Gate-Drain Charge	Q _{gd}		-	20	-	nC
Drain-Source Diode Characteristics						
Continuous Body Diode Current (Note 2)	I _S	T _C =25°C	-	-	20	A
Pulsed Diode Forward Current	I _{SM}	T _C =25°C	-	-	60	A
Diode Forward Voltage (Note 3)	V _{SD}	T _J =25°C, I _{SD} =20A, V _{GS} =0V	-	-	1.4	V
Reverse Recovery Time	t _{rr}	V _R =480V, I _F =I _S , di _F /dt = 100A/μs	-	440	-	nS
Reverse Recovery Charge	Q _{rr}		-	5	-	μC
Peak Reverse Recovery Current	I _{rrm}		-	24	-	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. I_{AS} = 10A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%.
4. Guaranteed by design, not subject to production

Typical Electrical And Thermal Characteristics

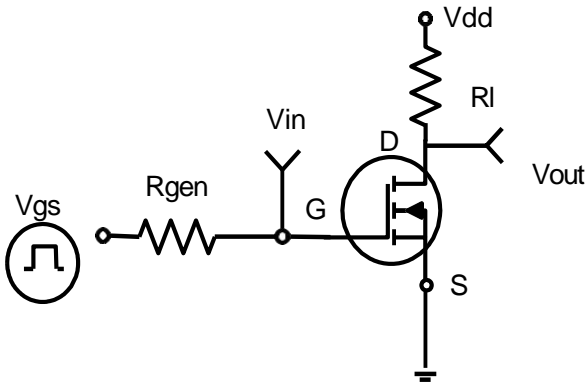


Figure 1. Switching Test Circuit

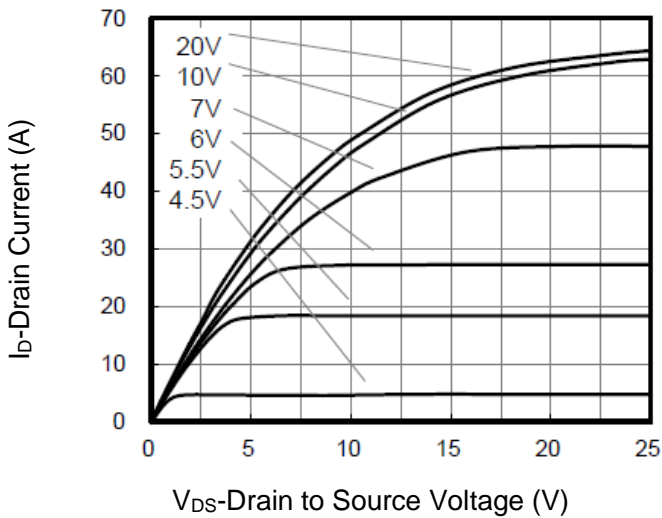


Figure 3. Output Characteristics

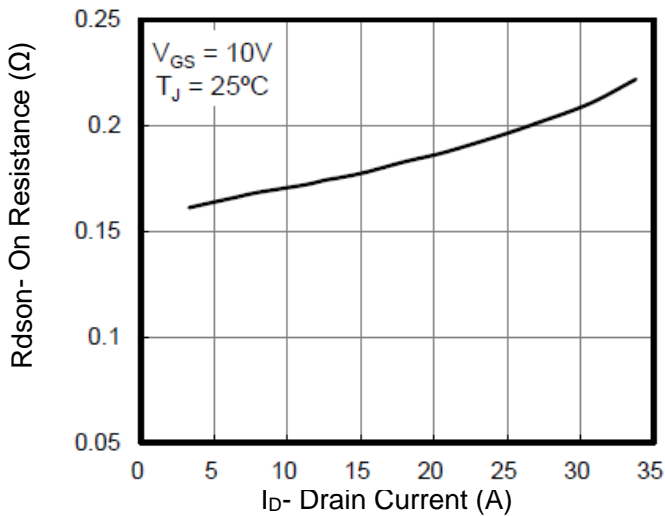


Figure 5. On Resistance vs. Drain Current

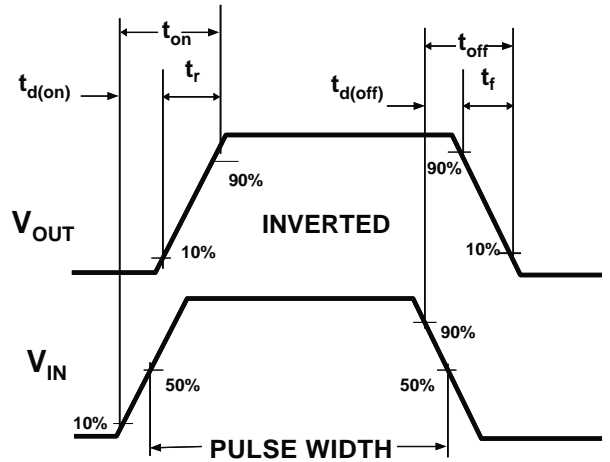


Figure 2. Switching Waveforms

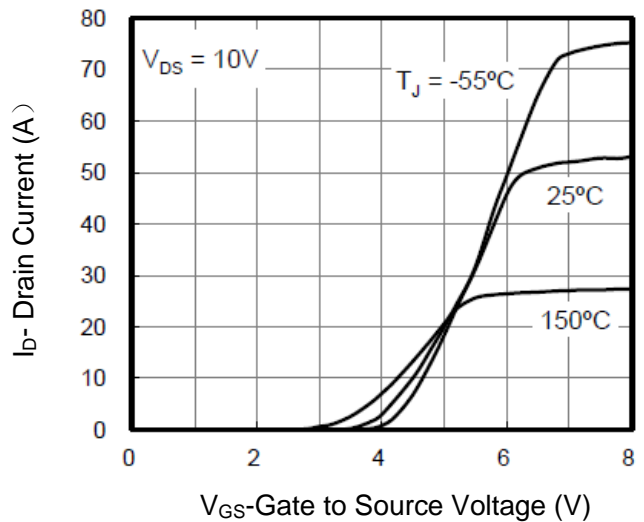


Figure 4. Transfer Characteristics

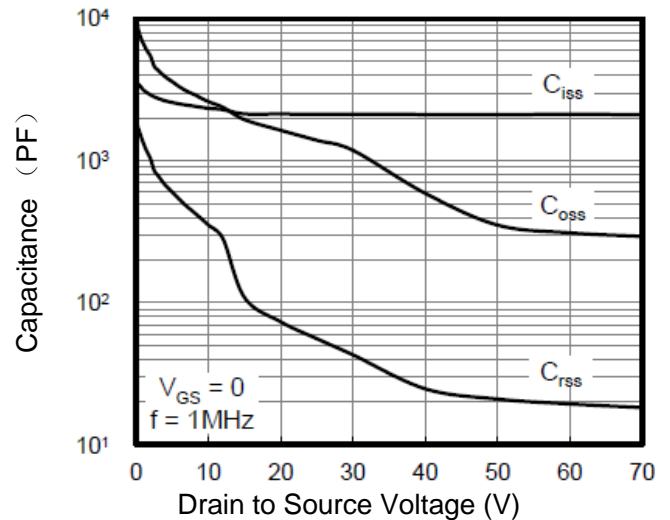


Figure 6. Capacitance

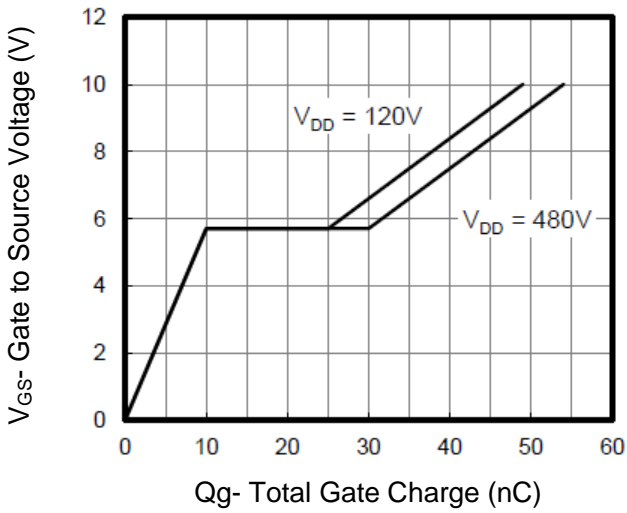


Figure 7. Gate Charge

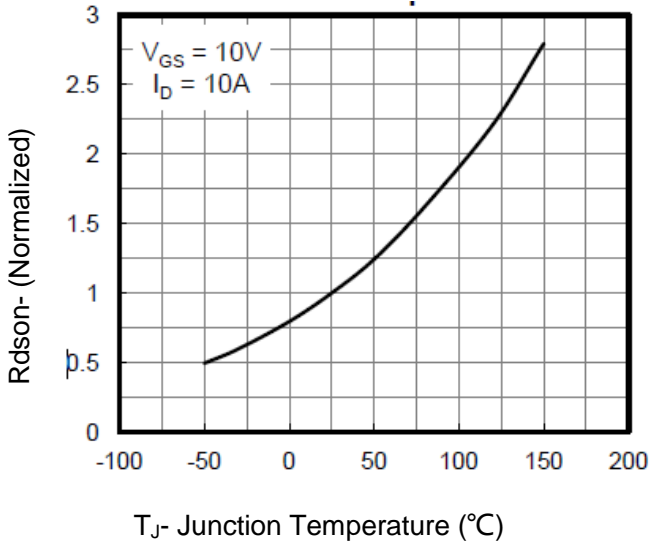


Figure 9. Rdson vs T_J

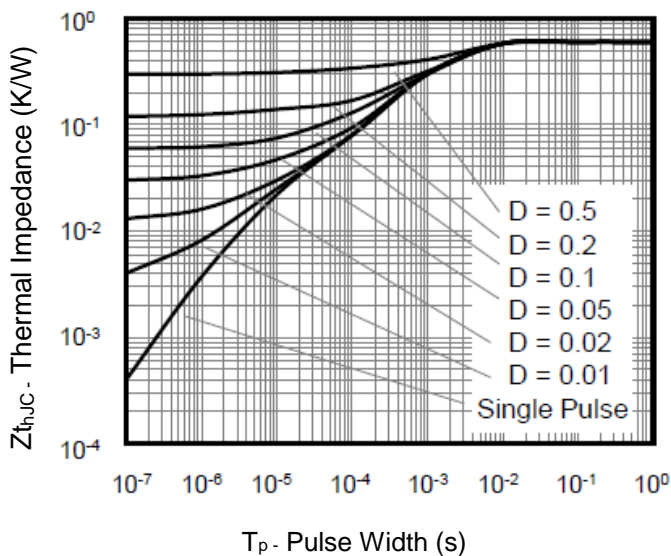


Figure 11. Transient Thermal Impedance (TO-252, TO-220)

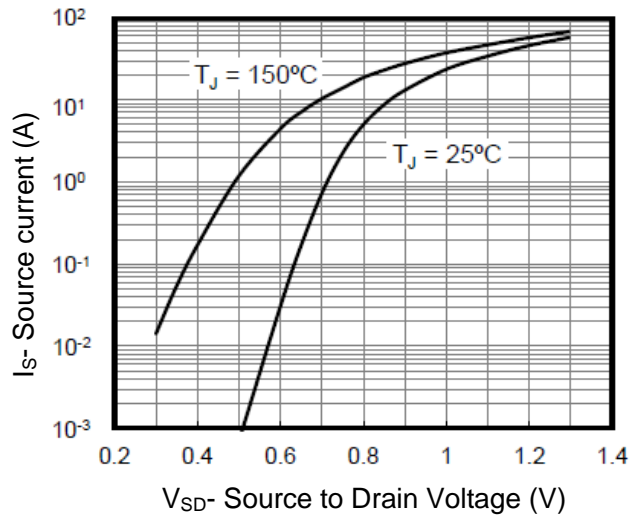


Figure 8. Body Diode Forward Voltage

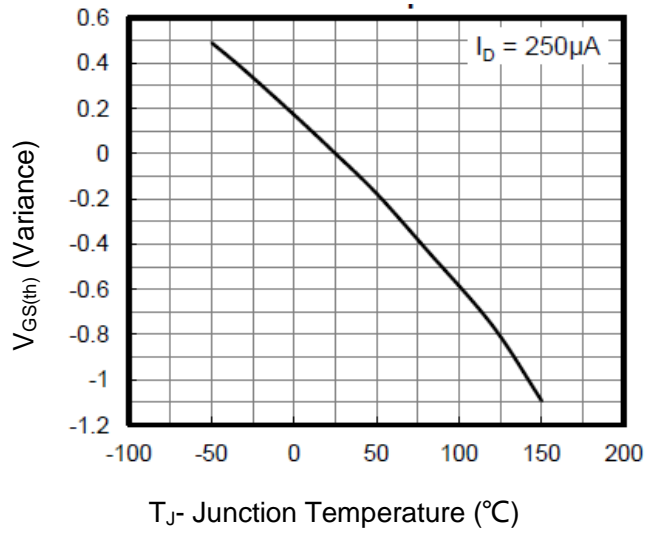


Figure 10. V_{th} vs T_J

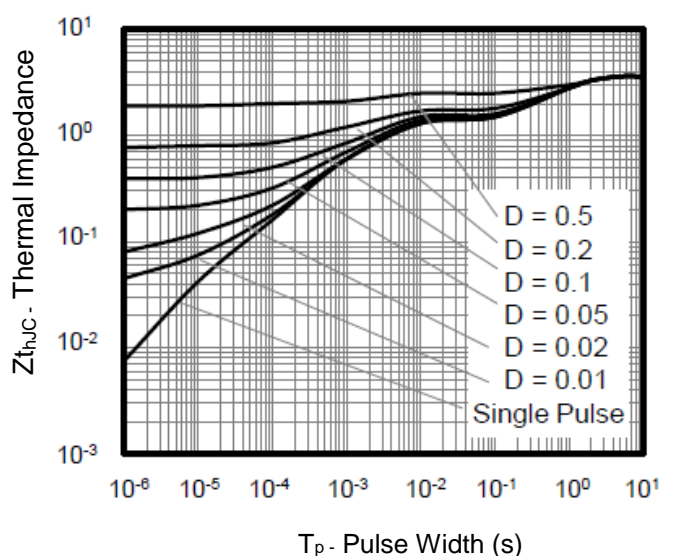


Figure 12. Transient Thermal Impedance (TO-220F)

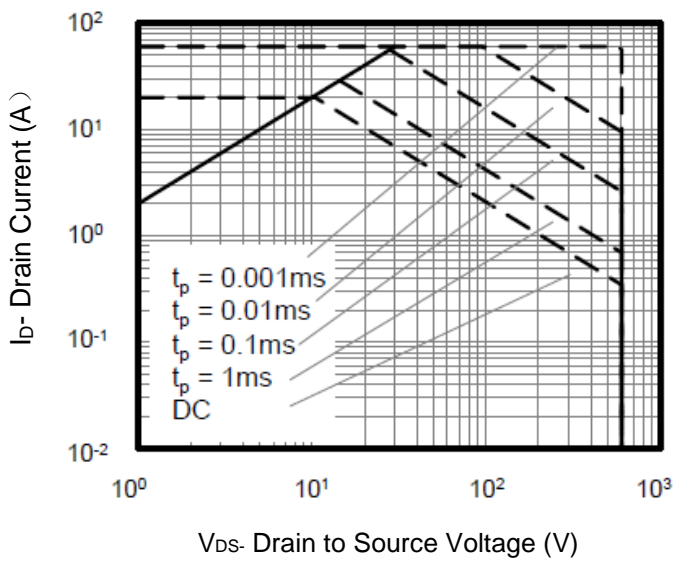


Figure 13. Safe Operating Area (TO-252, TO-220)

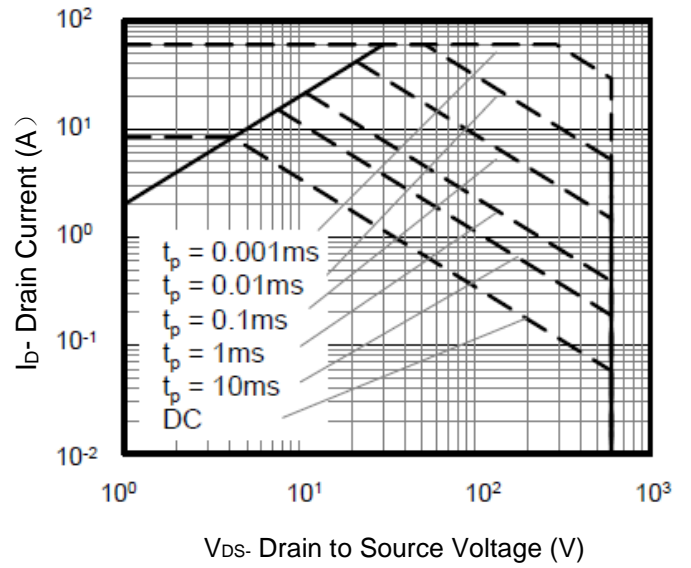
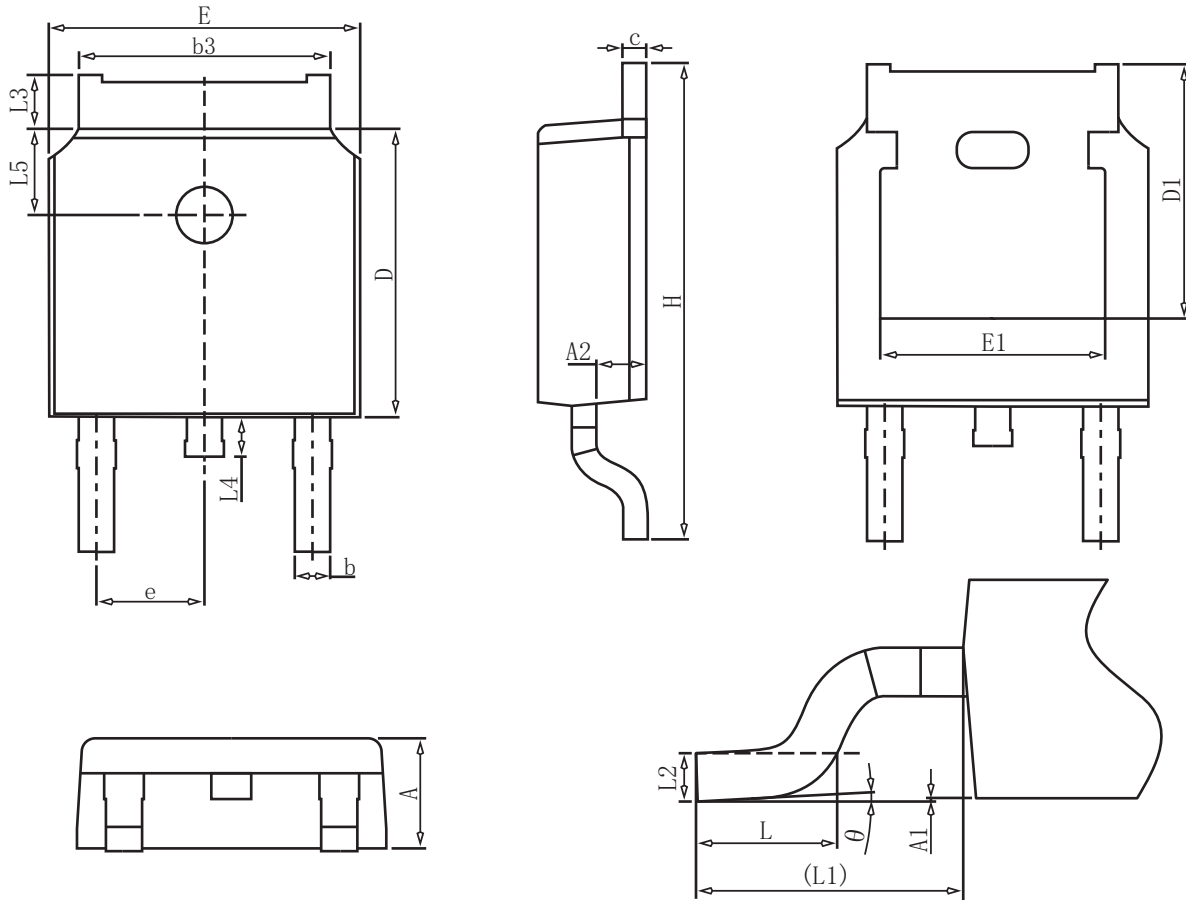


Figure 14. Safe Operating Area (TO-220F)

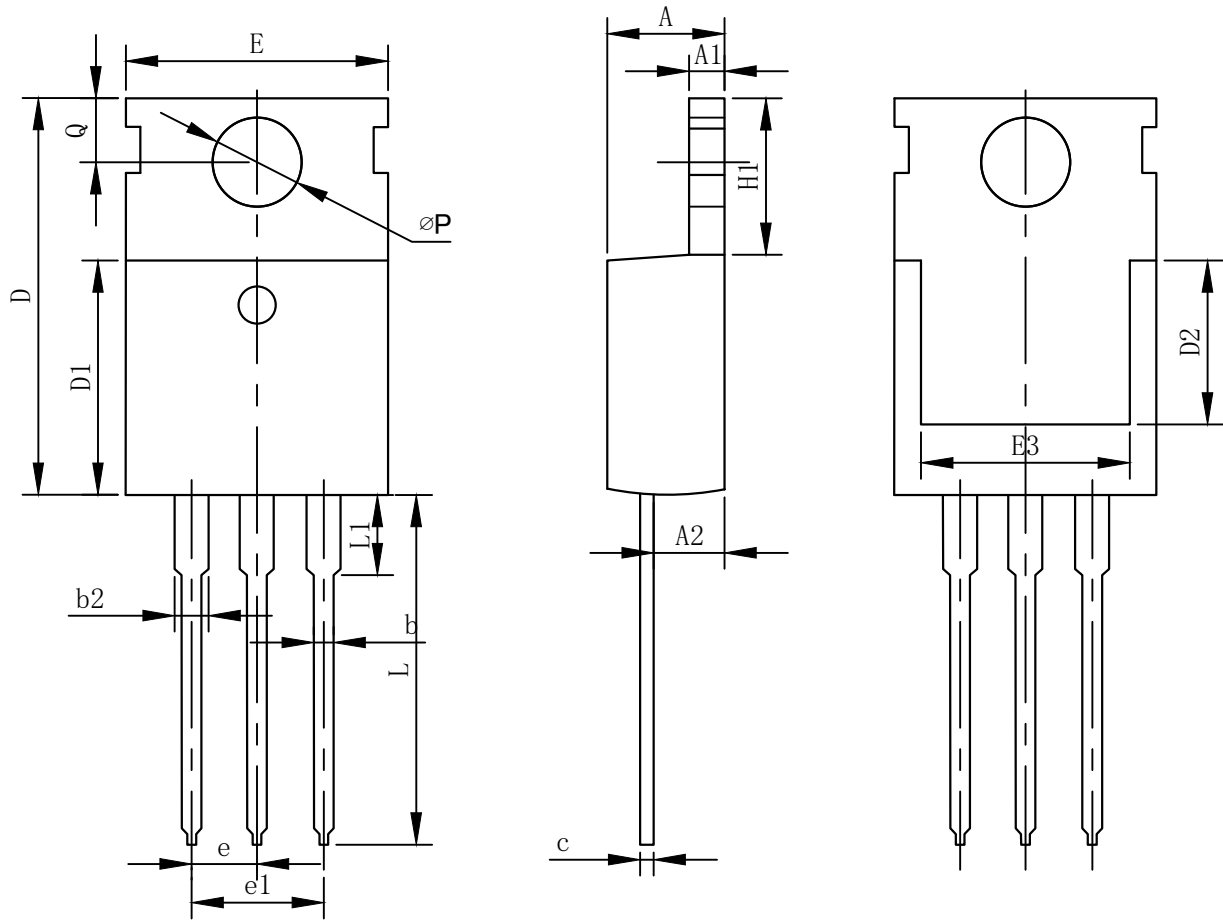
TO-252 Package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
L5	1.65	1.80	1.95
theta	0°	-	8°

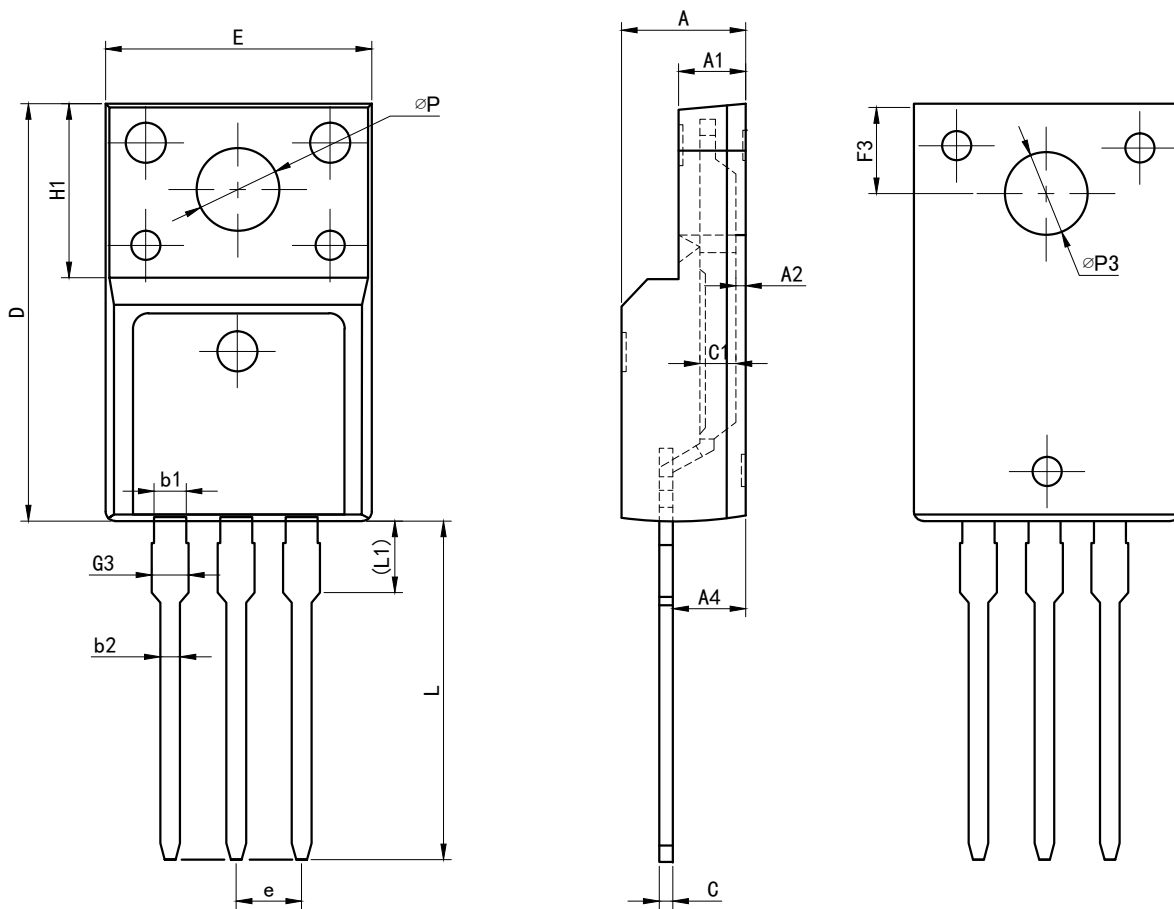
TO-220 Package information



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
ϕP	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
φP3	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