

Description

The GC11N60 uses advanced super junction technology and design to provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for industry's AC-DC SMPS requirement for PFC, AC/DC power conversion, and industrial power application.

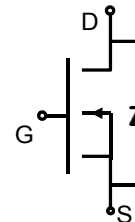
General Features

- 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 (Typ)	I_D
600V	290mΩ	11 A



Schematic Diagram



Marking and Pin Assignment

Ordering Information

Part Number	Marking	Case	Packaging
GC11N60K	GC11N60	TO-252	2500pcs/Reel
GC11N60T	GC11N60	TO-220	50pcs/Tube
GC11N60F	GC11N60	TO-220F	50pcs/Tube

Absolute Maximum Ratings ($T_c=25^{\circ}C$ 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	11		A
Drain Current-Pulsed (Note 1)	I_{DM}	33		A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	210		mJ
Avalanche Current (Note 1)	I_{AR}	1.8		A
Repetitive Avalanche Energy (Note 1)	E_{AR}	0.32		mJ
Maximum Power Dissipation	P_D	78	31.3	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150		°C

Thermal Characteristic

Parameter	Symbol	Value		Unit
		TO-252 TO-220	TO-220F	
Thermal Resistance,Junction-to-Case	R_{thJC}	1.6	4	°C/W
Thermal Resistance,Junction-to-Ambient (Note 2)	R_{thJA}	62	80	°C/W

Electrical Characteristics (T_J=25°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	600	-	-	V
Zero Gate Voltage Drain Current (T _J =25°C)	I _{DSS}	V _{DS} =650V, V _{GS} =0V	-	-	1	μA
Zero Gate Voltage Drain Current (T _J =150°C)	I _{DSS}	V _{DS} =650V, 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	V
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} =10V, I _D =5.5A	-	290	330	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =5.5A	-	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz	-	857	-	PF
Output Capacitance	C _{oss}		-	31	-	PF
Reverse Transfer Capacitance	C _{rss}		-	1.5	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =400V, I _D =11A V _{GS} =10V, R _{GEN} =25Ω	-	28	-	nS
Turn-on Rise Time	t _r		-	61	-	nS
Turn-Off Delay Time	t _{d(off)}		-	89	-	nS
Turn-Off Fall Time	t _f		-	41	-	nS
Total Gate Charge	Q _g	V _{DD} =480V, I _D =11A, V _{GS} =10V	-	19	-	nC
Gate-Source Charge	Q _{gs}		-	4.8	-	nC
Gate-Drain Charge	Q _{gd}		-	7.2	-	nC
Drain-Source Diode Characteristics						
Continuous Body Diode Current (Note 2)	I _S	T _C =25°C	-	-	11	A
Pulsed Diode Forward Current	I _{SM}	T _C =25°C	-	-	33	A
Diode Forward Voltage (Note 3)	V _{SD}	T _J =25°C, I _{SD} =11A, V _{GS} =0V	-	-	1.2	V
Reverse Recovery Time	t _{rr}	V _R =400V, I _F =I _S , di _F /dt = 100A/ μ s	-	377	-	nS
Reverse Recovery Charge	Q _{rr}		-	3.4	-	μC
Peak Reverse Recovery Current	I _{rrm}		-	17.8	-	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. I_{AS} = 1.6A, 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

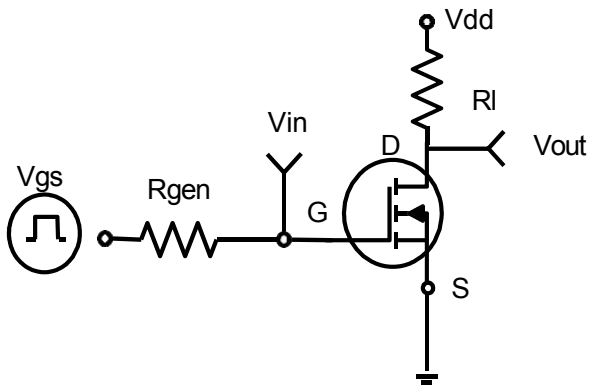


Figure 1. Switching Test Circuit

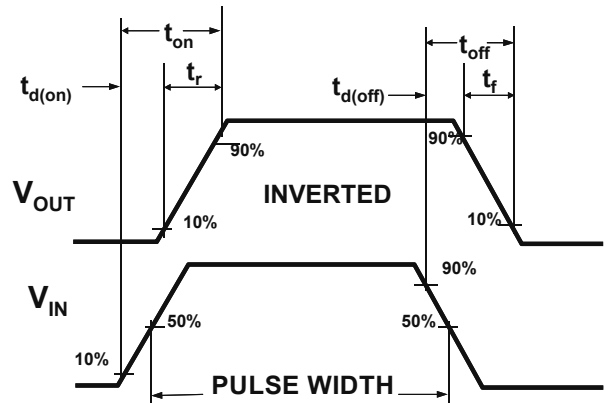


Figure 2. Switching Waveforms

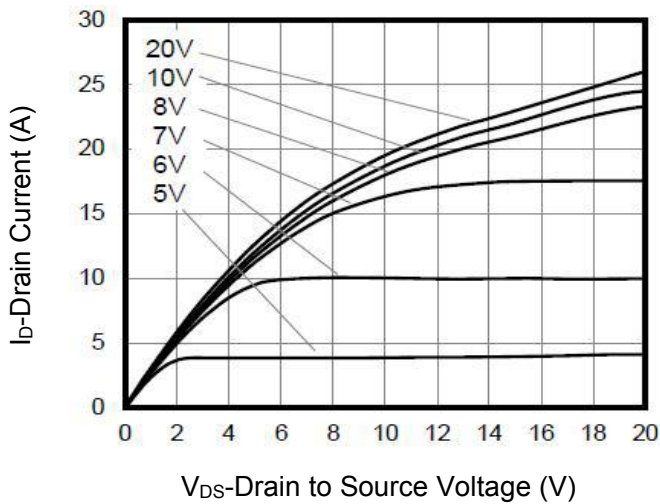


Figure 3. Output Characteristics

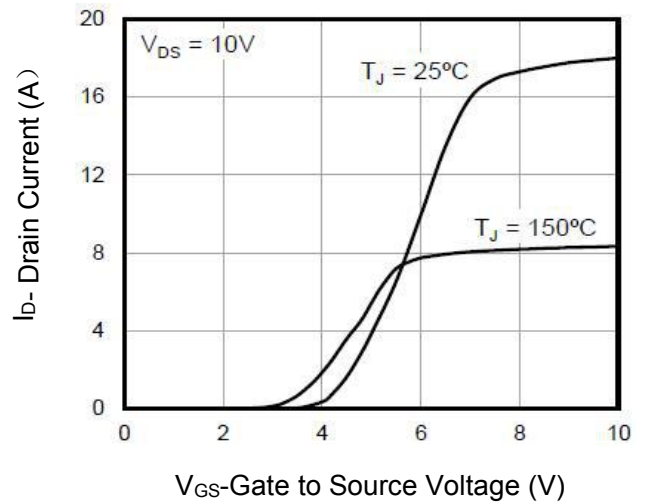


Figure 4 Transfer Characteristics

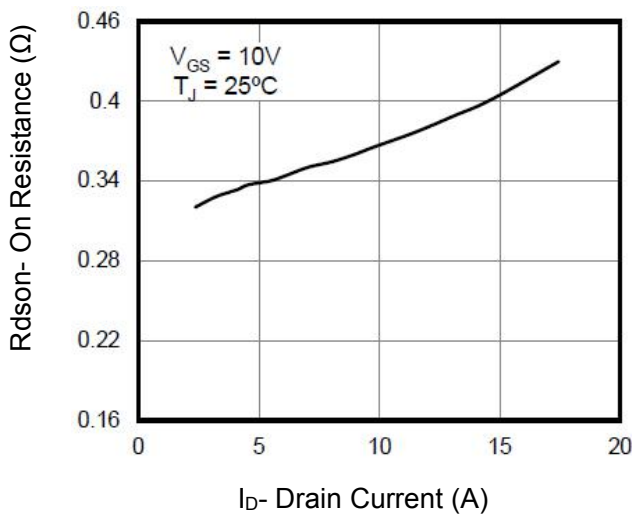


Figure 5. On Resistance vs. Drain Current

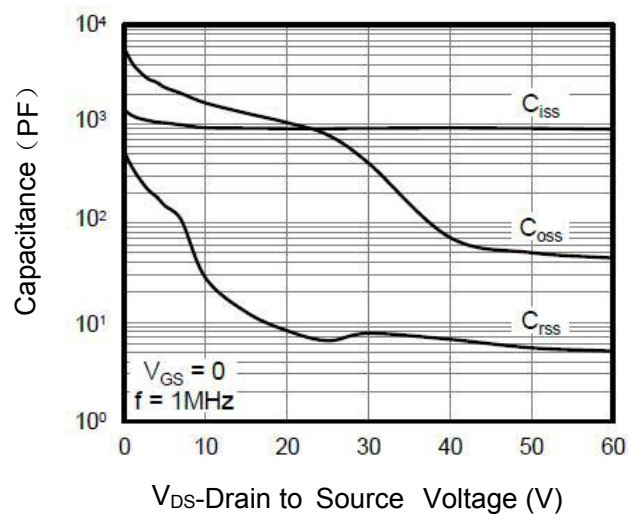


Figure 6. Capacitance

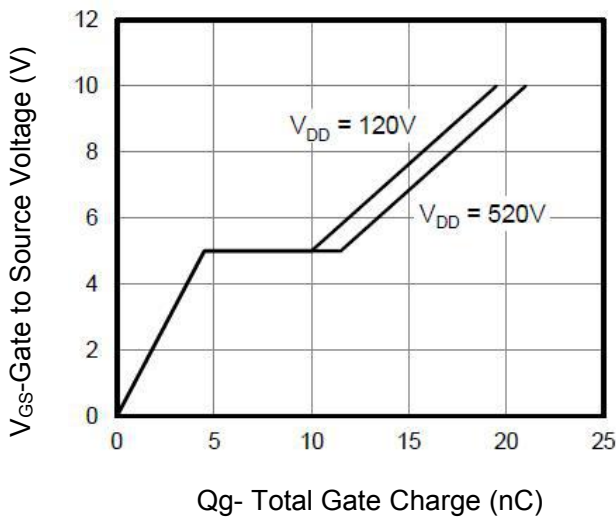


Figure 7. Gate Charge

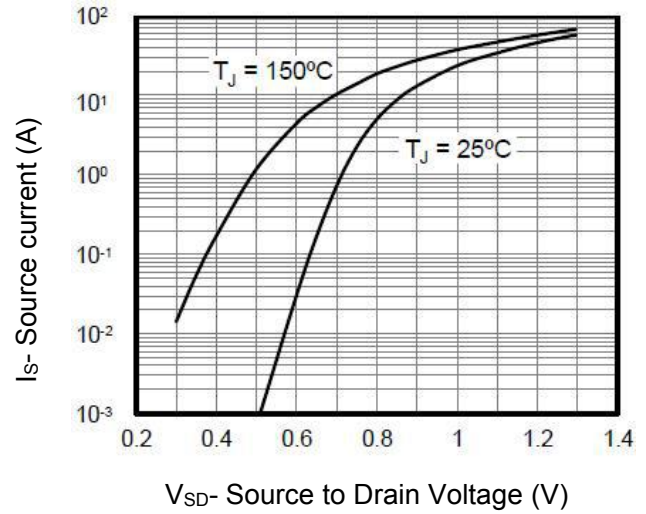


Figure 8. Body Diode Forward Voltage

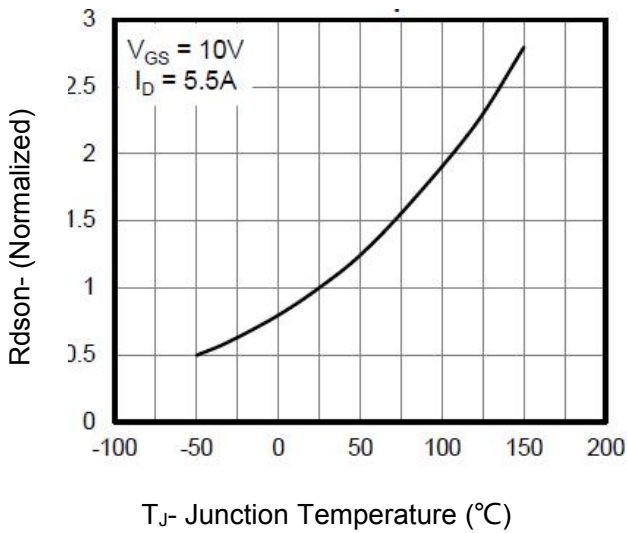


Figure 9. Rdson vs TJ

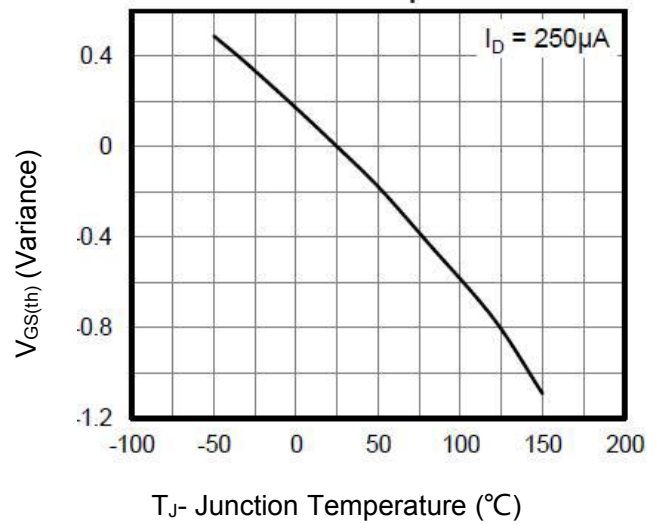


Figure 10. Vth vs TJ

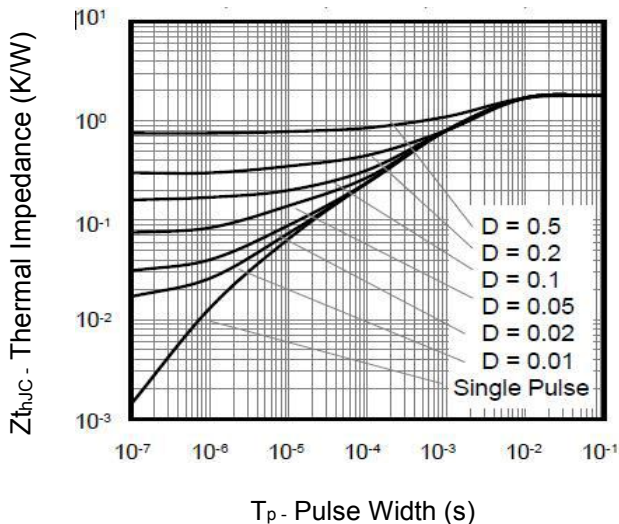


Figure 11. Transient Thermal Impedance (TO-252, TO-220)

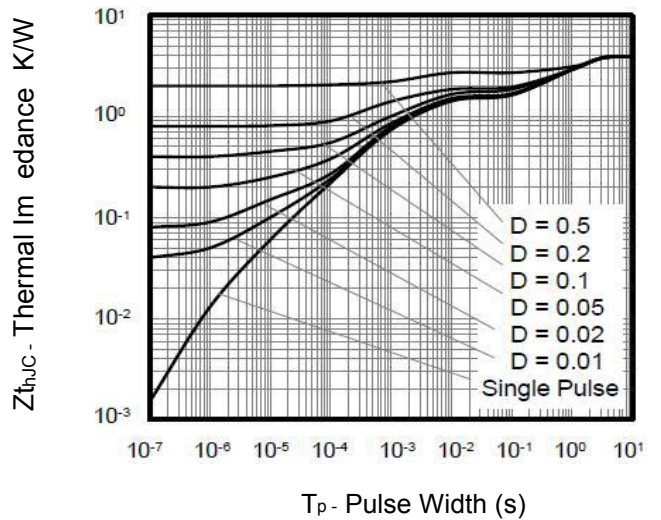
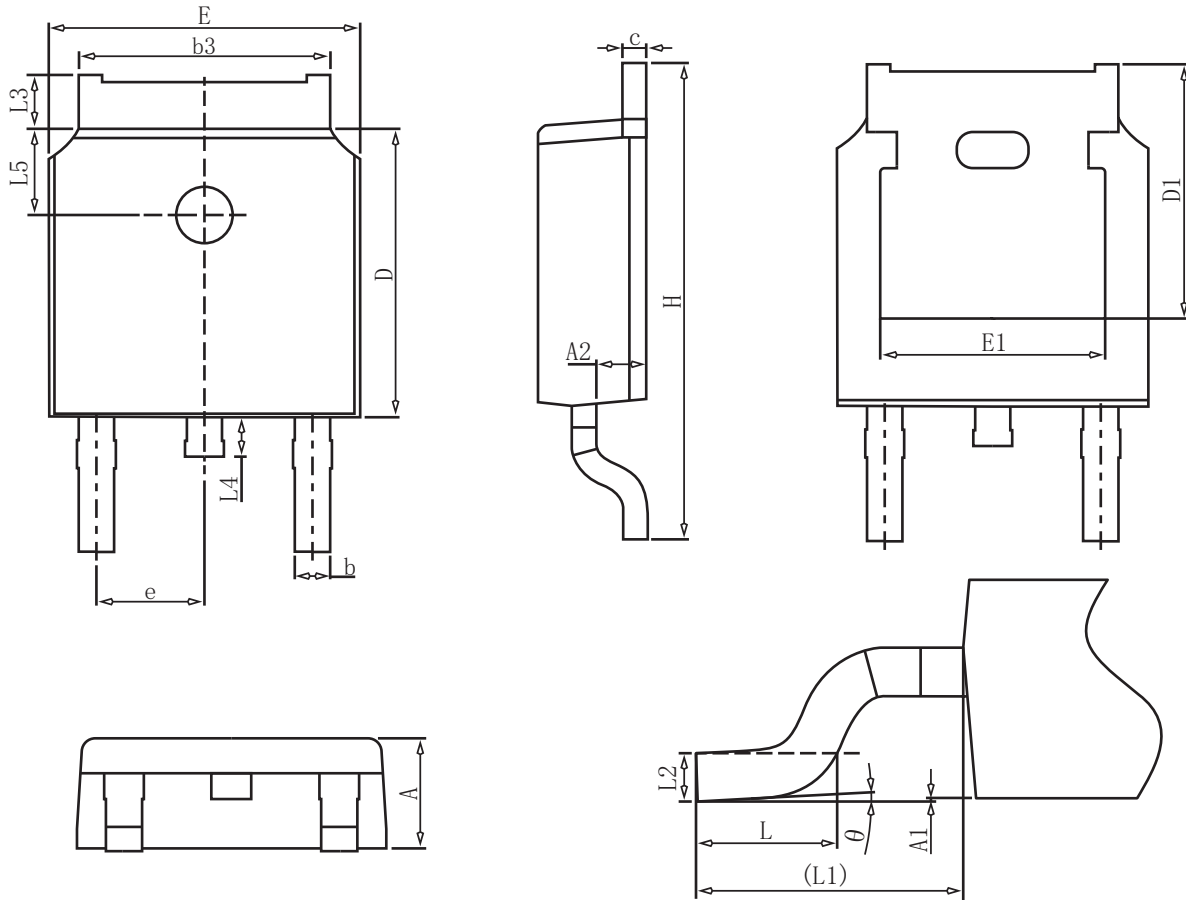


Figure 12. Transient Thermal Impedance (TO-220F)

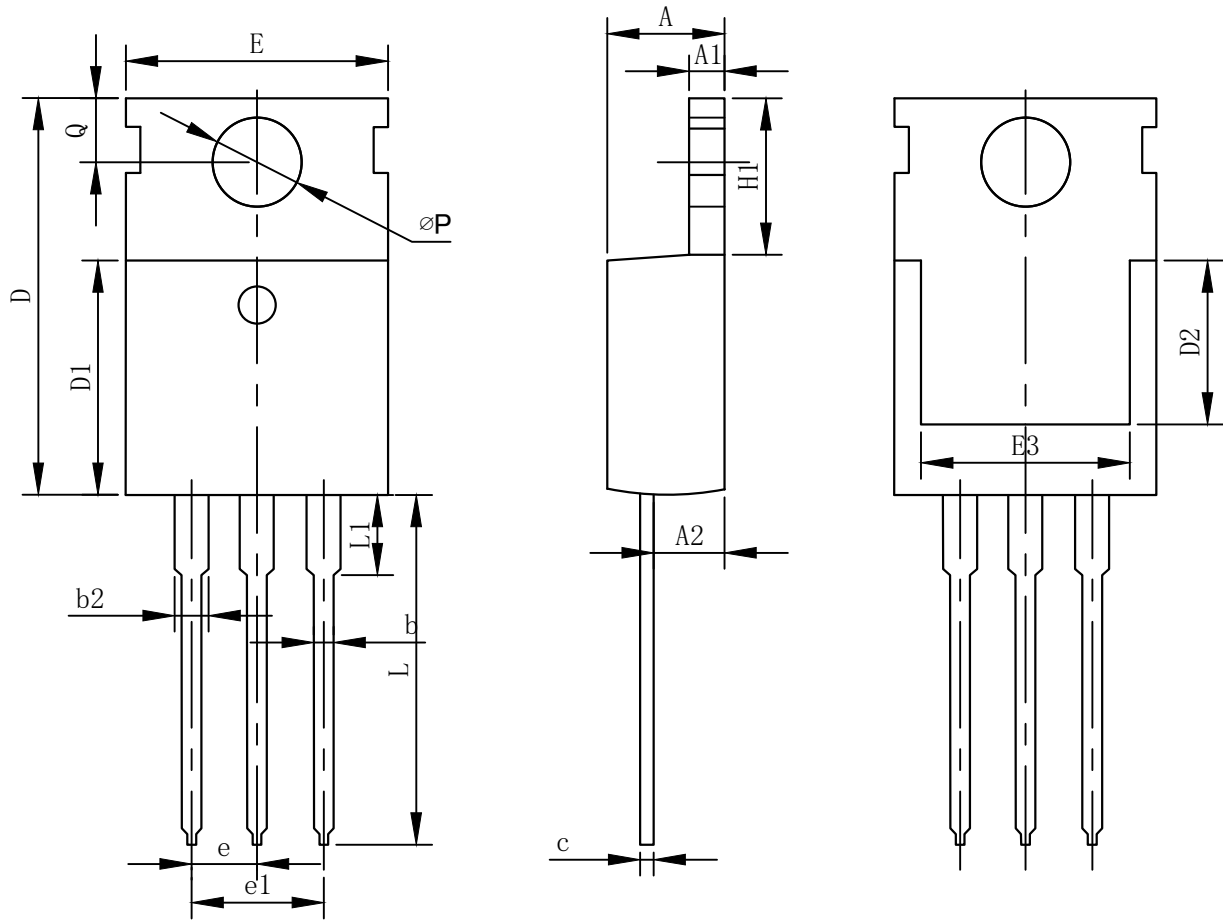
TO-252 Package information



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
θ	0°	-	8°

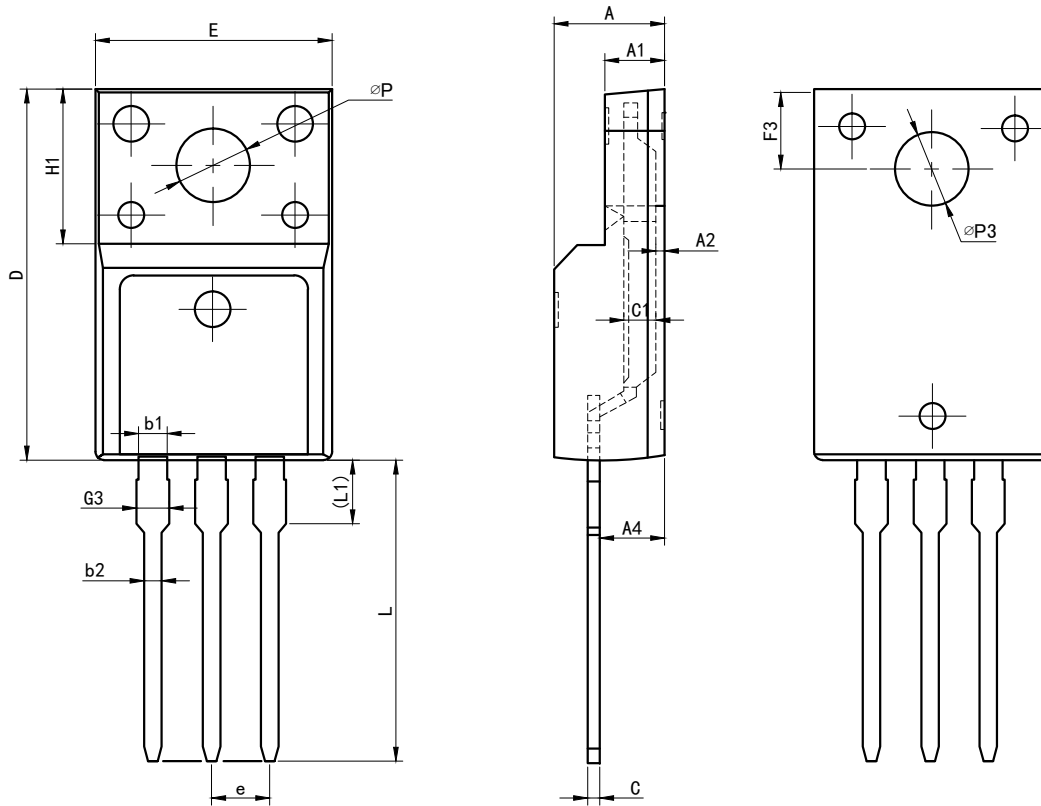
TO-220 Package information



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
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