

Description

500V N-Channel MOSFET

Features

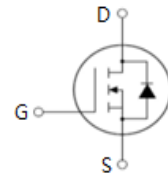
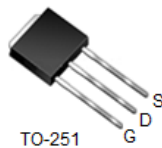
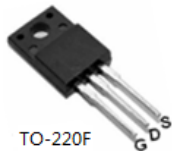
V _{DSS}	R _{DS(ON)} @ 10V (Typ)	I _D
500V	2 Ω	4 A

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant

Application

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

Package



Ordering Information

Part Number	Marking	Case	Packaging
G4N50F	G4N50	TO-220F	50pcs/Tube
G4N50J	G4N50	TO-251	72pcs/Tube
G4N50K	G4N50	TO-252	2500pcs/Reel
G4N50T	G4N50	TO-220	50pcs/Tube

Absolute Maximum Ratings T_C=25°C unless otherwise specified

Symbol	Parameter	Max.				Units	
		TO-220F	TO-251	TO-252	TO-220		
V _{DSS}	Drain-Source Voltage	500				V	
V _{GSS}	Gate-Source Voltage	± 30				V	
I _D	Continuous Drain Current	4				A	
I _{DM}	Pulsed Drain Current <small>note1</small>	16				A	
E _{AS}	Single Pulsed Avalanche Energy <small>note2</small>	42				mJ	
I _{AR}	Avalanche Current <small>note1</small>	2.9				A	
E _{AR}	Repetitive Avalanche Energy <small>note1</small>	8				mJ	
P _D	Power Dissipation	T _C = 25°C		25		30	W
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150				°C	
R _{thJC}	Thermal Resistance, Junction-to-Case	5	4.2			K/W	
R _{thJA}	Thermal Resistance, Junction-to-Ambient	62.5	60			K/W	

*Drain current limited by maximum junction temperature

Electrical Characteristics $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	500	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 500V, V_{GS} = 0V$	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage ^{note4}	$V_{DS} = V_{GS}, I_D = 250\mu A$	3	3.2	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 2A$	-	2	2.3	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	-	340	-	pF
C_{oss}	Output Capacitance		-	40	-	pF
C_{rss}	Reverse Transfer Capacitance		-	6	-	pF
Q_g	Total Gate Charge	$V_{DD} = 400V, I_D = 4A,$ $V_{GS} = 10V$	-	12	-	nC
Q_{gs}	Gate-Source Charge		-	1.6	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	6	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 250V, I_D = 4A,$ $R_G = 25\Omega$	-	34.5	-	ns
t_r	Turn-On Rise Time		-	8	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	70	-	ns
t_f	Turn-Off Fall Time		-	55	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	4	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	16	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 2A$	-	-	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V, I_F = 4A,$	-	402	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt = 100A/\mu s$	-	0.9	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=0.5mH, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ C$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

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

Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)

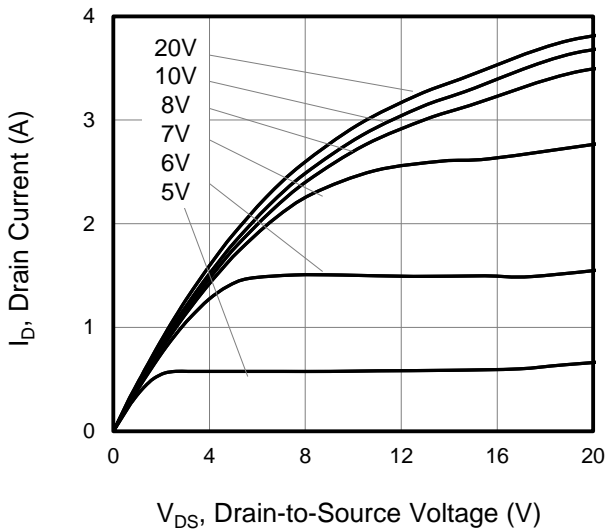


Figure 2. Body Diode Forward Voltage

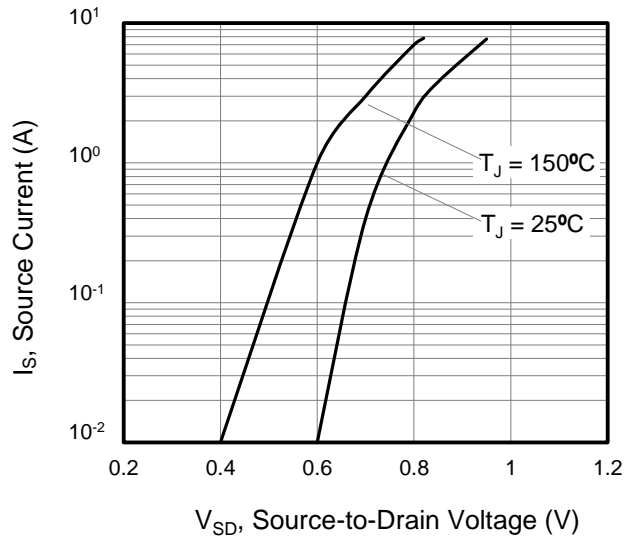


Figure 3. Drain Current vs. Temperature

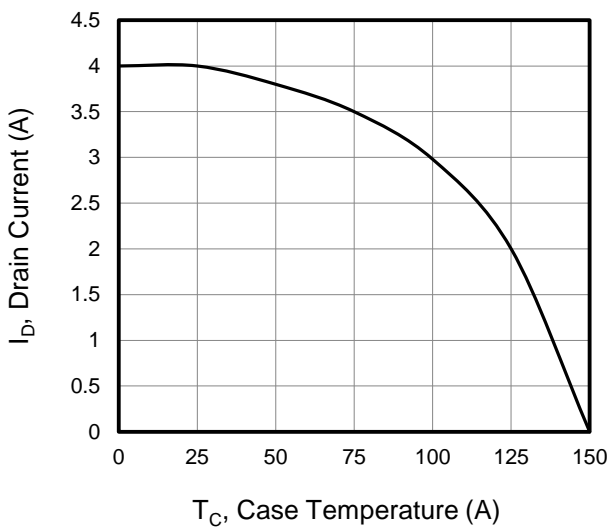


Figure 4. Power Dissipation vs. Temperature

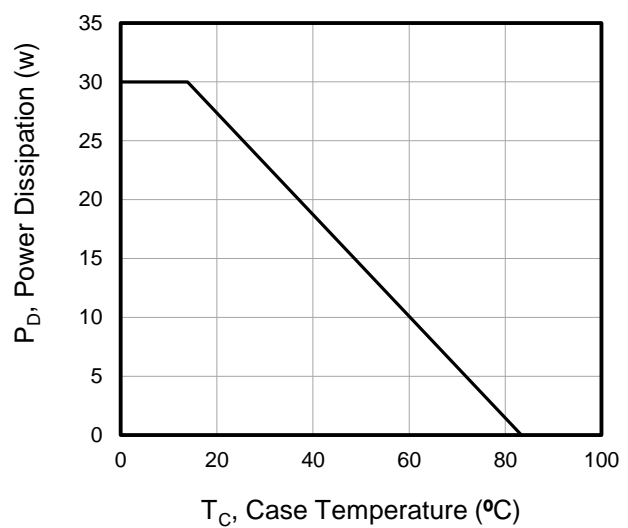


Figure 5. Transfer Characteristics

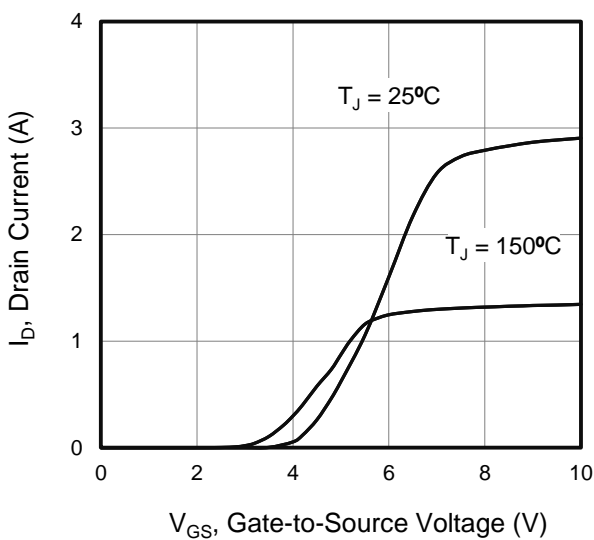
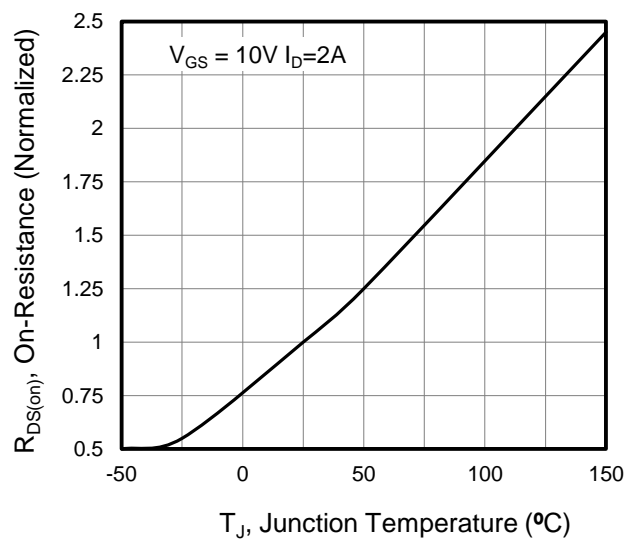


Figure 6. On-Resistance vs. Temperature



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

Figure 7. Capacitance

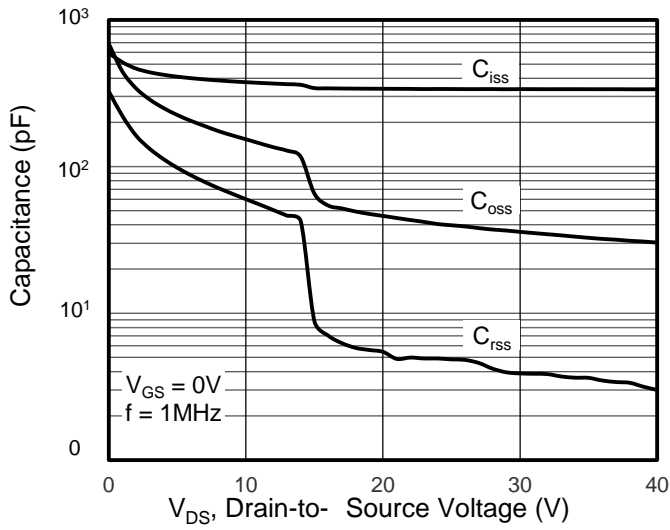


Figure 8. Gate Charge

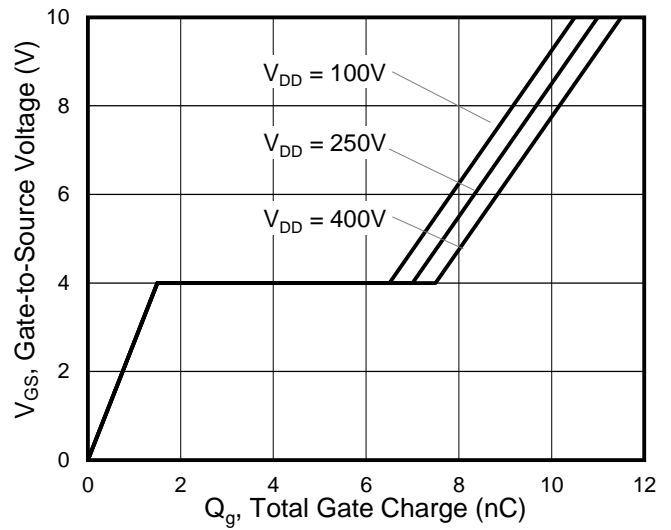


Figure 9. Transient Thermal Impedance
TO-251, TO-252, TO-220

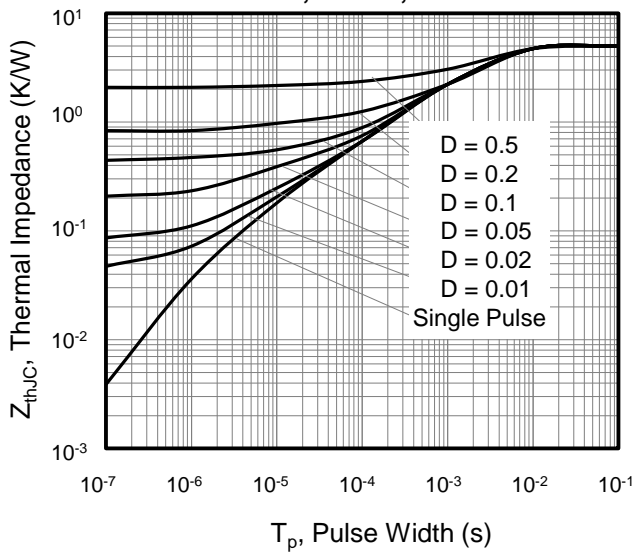


Figure 10. Transient Thermal Impedance
TO-220F

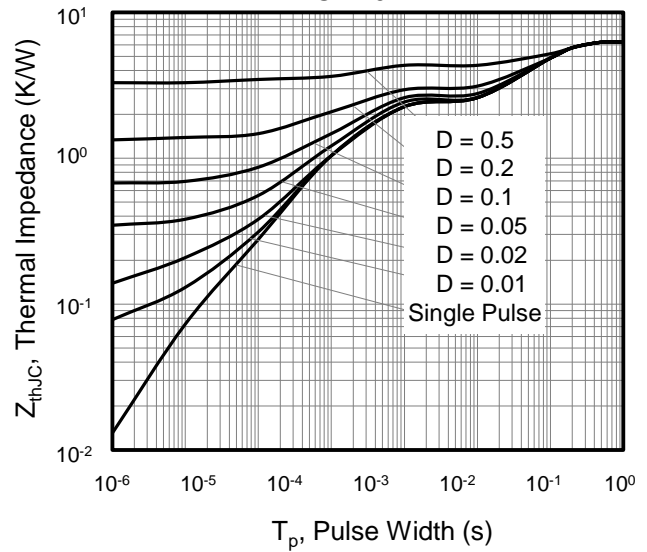


Figure 11: Gate Charge Test Circuit and Waveform

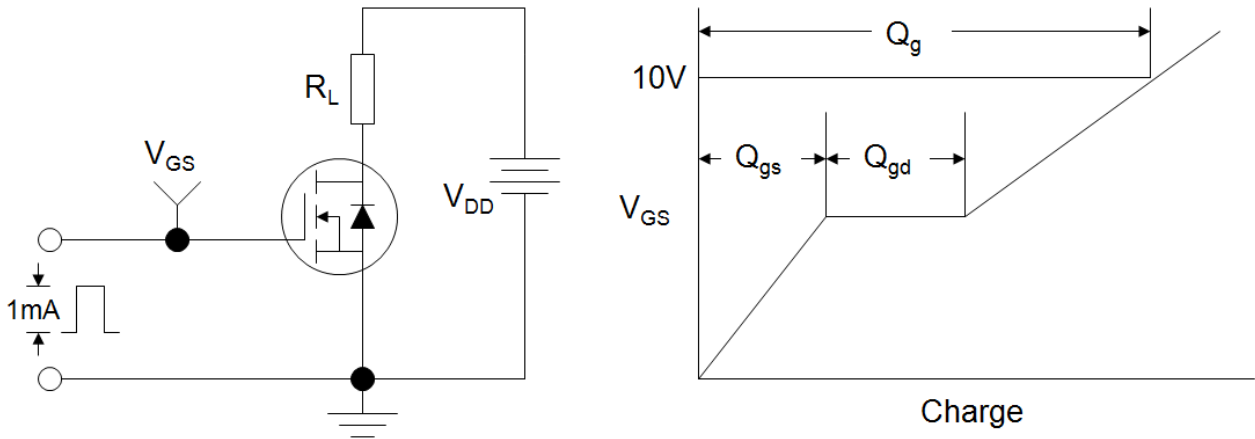
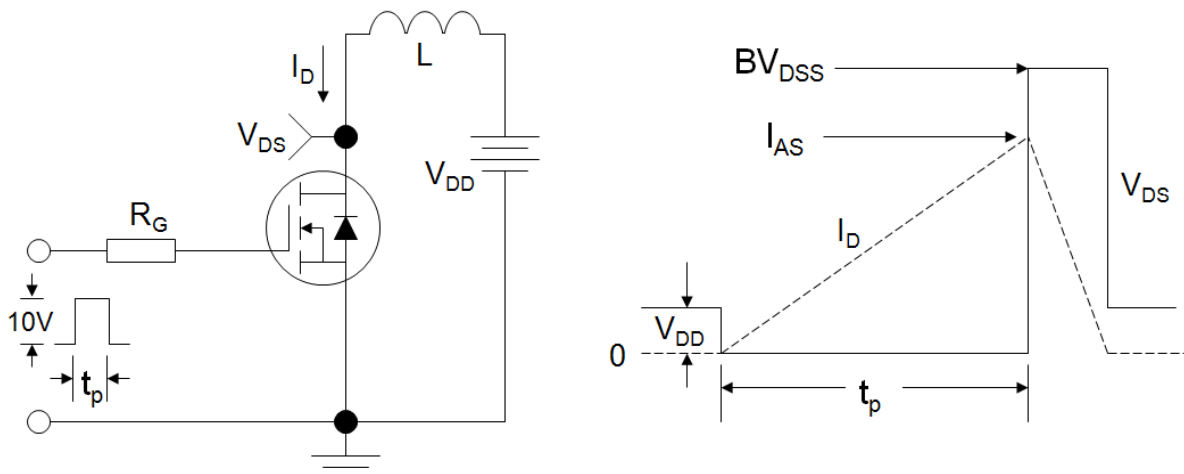


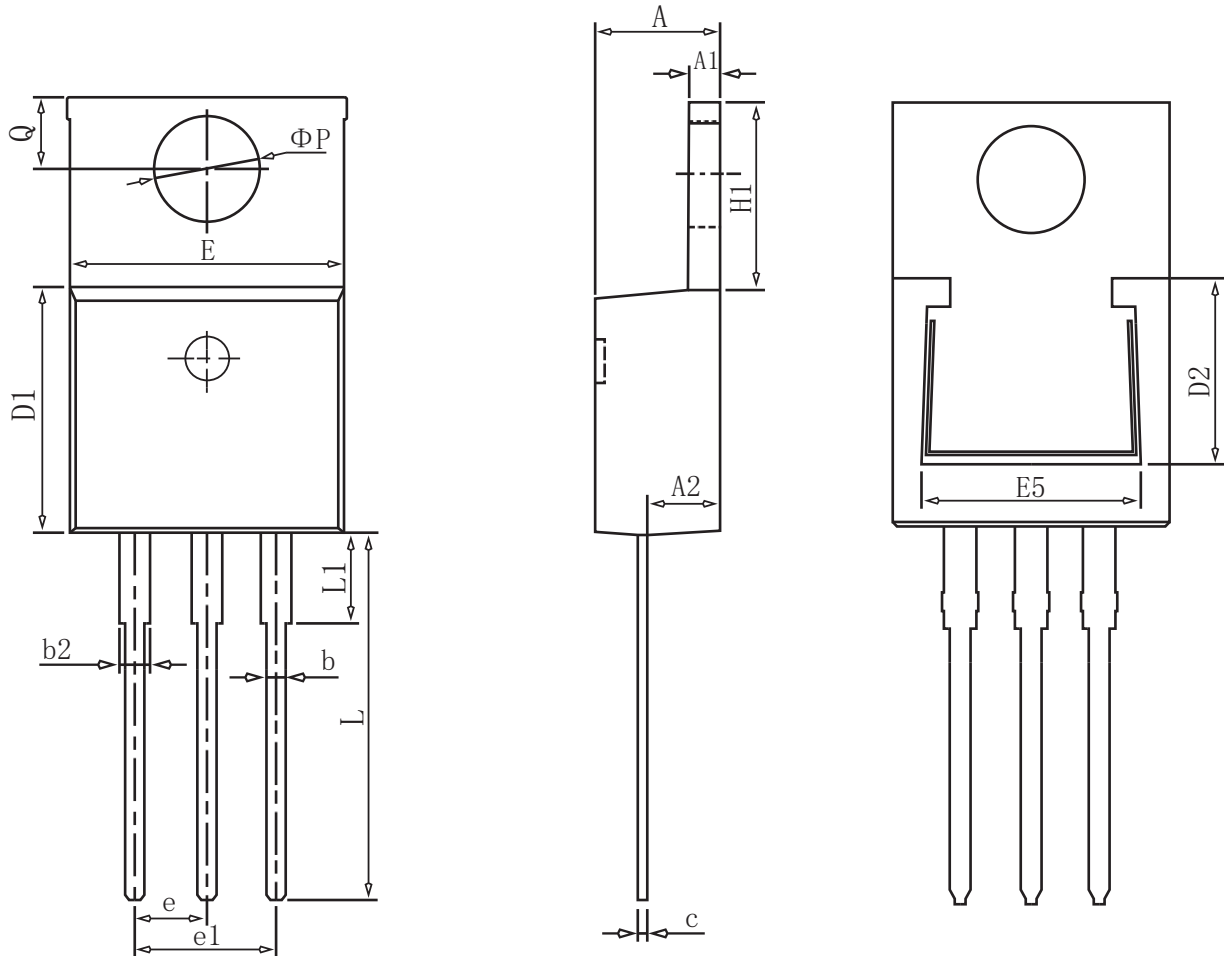
Figure 12: Resistive Switching Test Circuit and Waveform



Figure 13: Unclamped Inductive Switching Test Circuit and Waveform



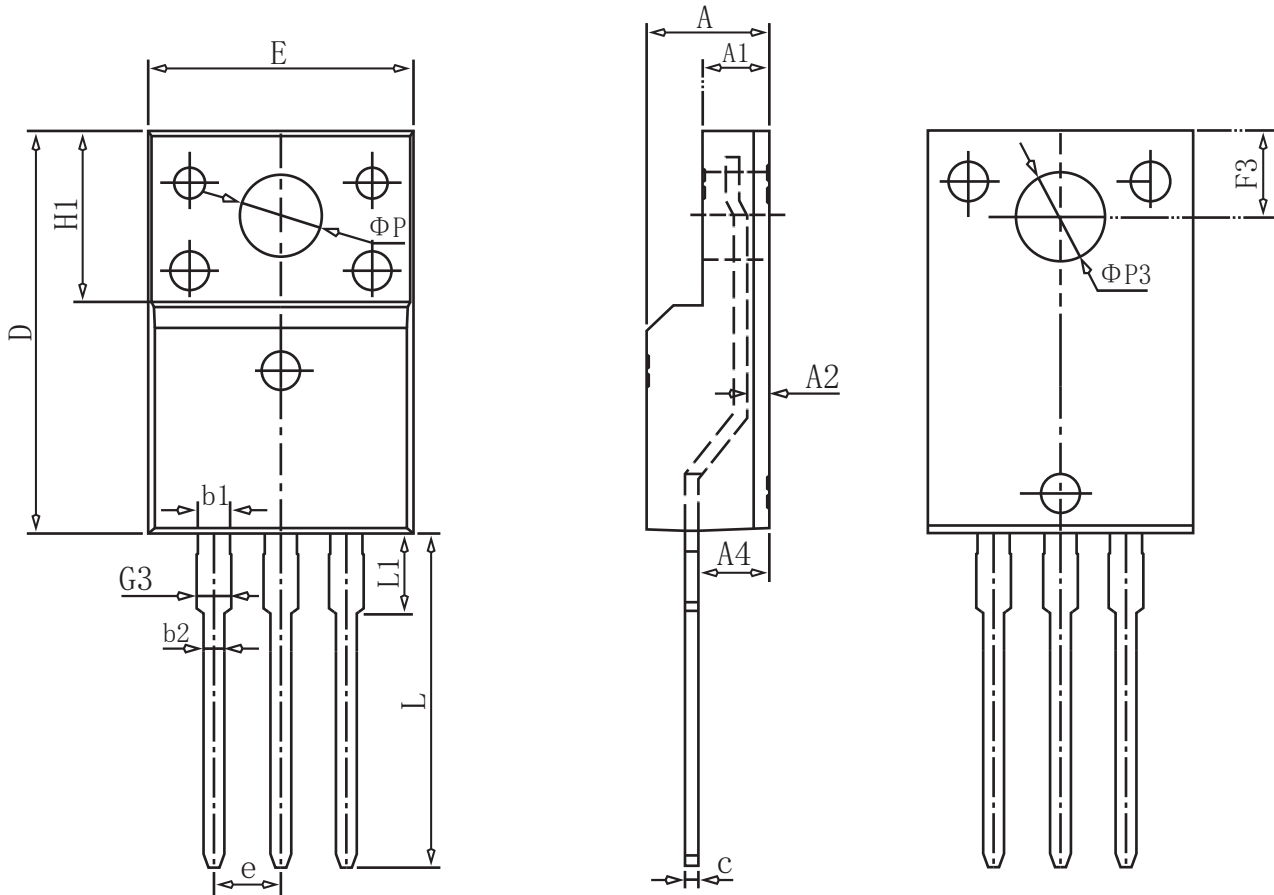
TO-220 package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
b	0.75	0.81	0.96
b2	1.22	1.27	1.47
c	0.30	0.38	0.48
D1	8.50	8.70	8.90
D2	5.20	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54BSC		
e1	5.08BSC		
H1	6.10	6.30	6.50
L	13.10	13.40	13.70
L1	-	3.75	4.10
ΦP	3.70	3.84	3.99
Q	2.54	2.74	2.94

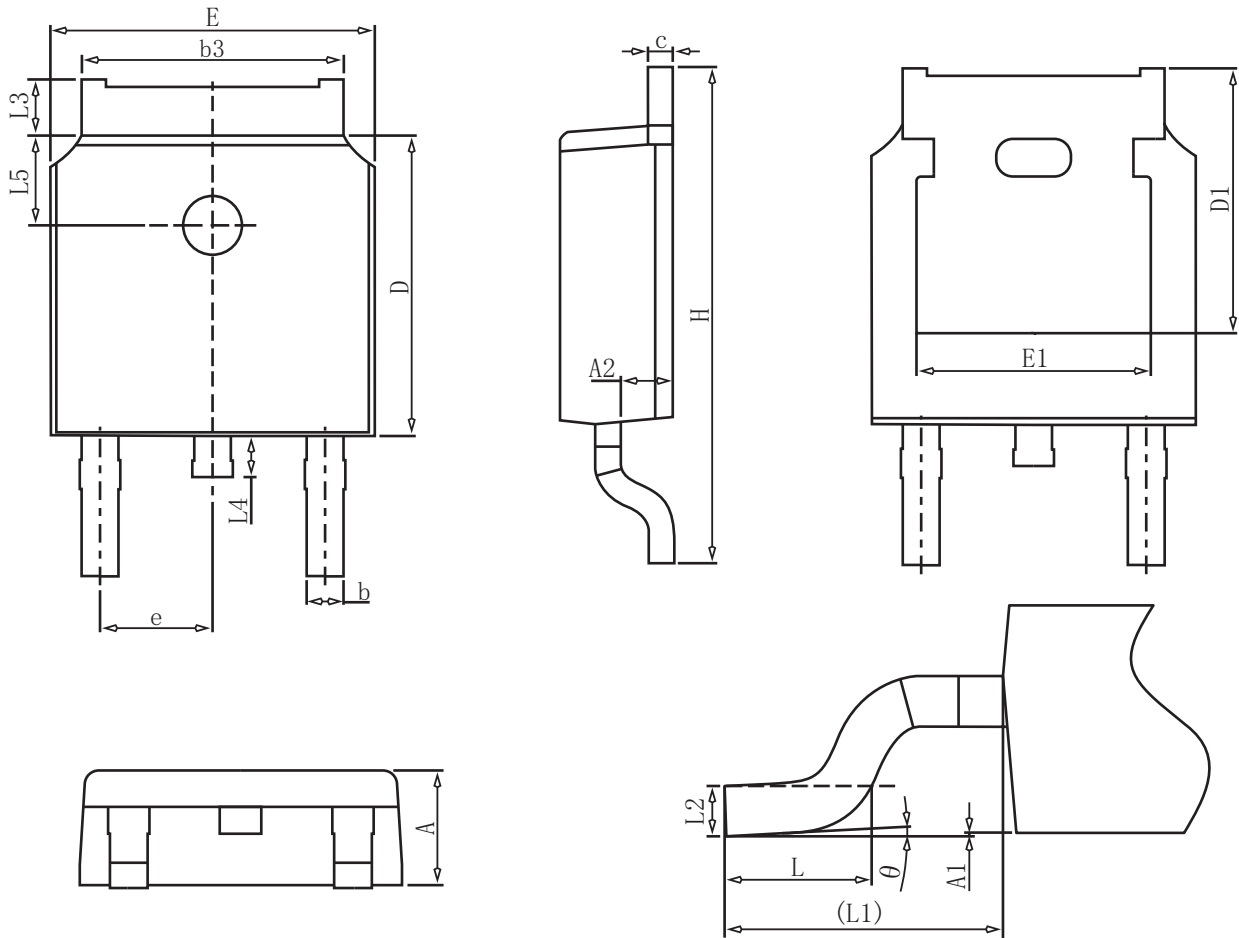
TO-220F package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
E	10.00	10.20	10.40
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.65	0.85	1.30
A4	2.55	2.75	2.95
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
ΦP	3.183REF		
L	12.68	12.98	13.28
L1	3.25	3.45	3.65
$\Phi P3$	3.45REF		
F3	3.10	3.30	3.50
G3	1.10	1.30	1.50
b1	1.05	1.20	1.35
b2	0.70	0.80	0.92

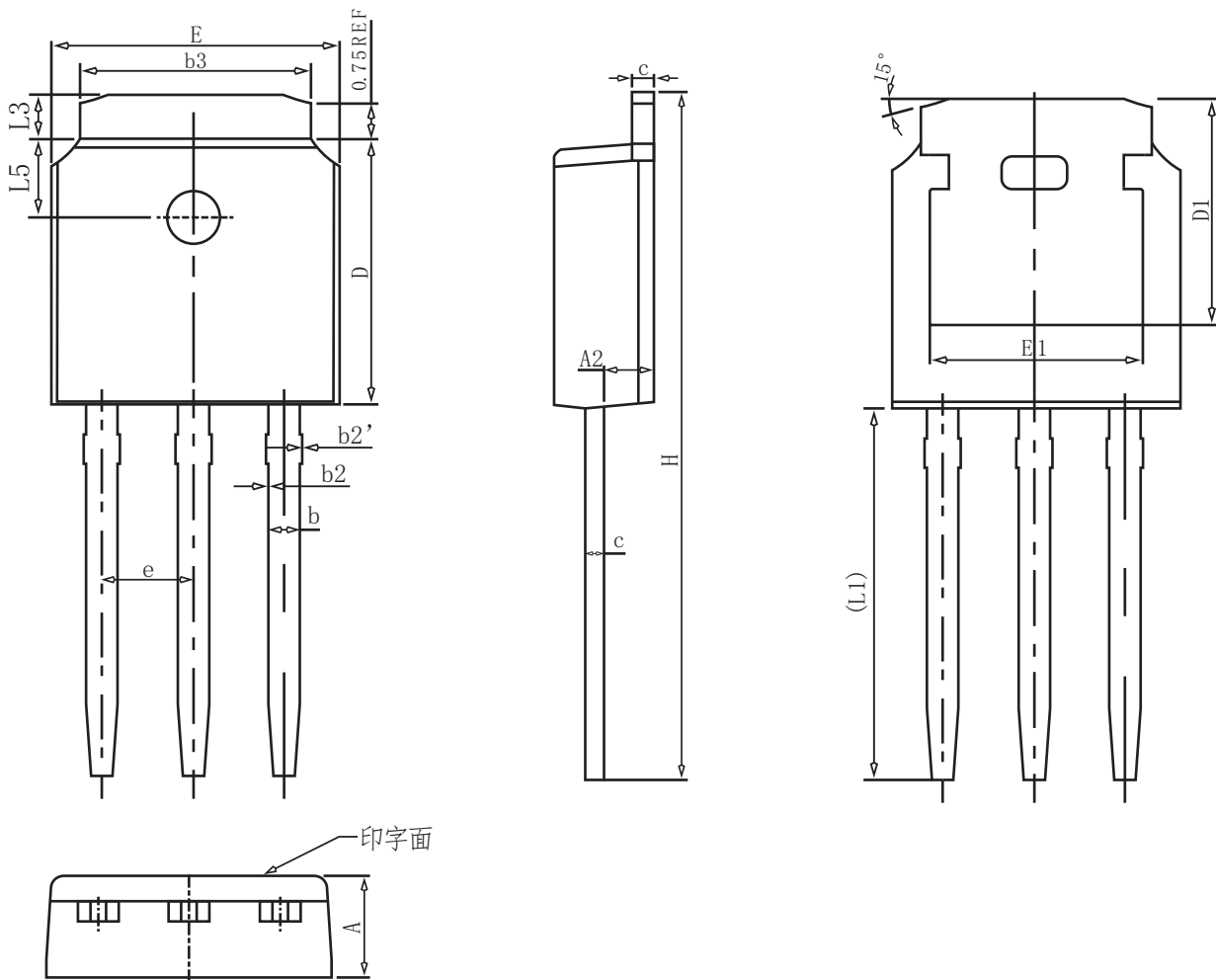
TO-252 package information



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-251 package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
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	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95