Description

500V N-Channel MOSFET

Features

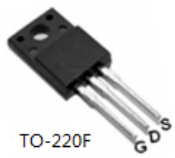
V_{DSS}	$R_{DS\,ON}$ @ 10V (Typ)	I_D
500V	2 Ω	4 A

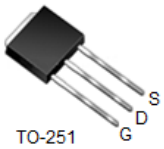
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant

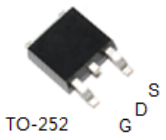
Application

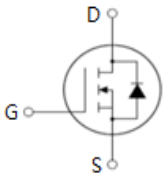
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

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℃ 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 note1		16				A
E_{AS}	Single Pulsed Avalanche Energy note2		42				mJ
I_{AR}	Avalanche Current note1		2.9				A
E_{AR}	Repetitive Avalanche Energy note1		8				mJ
P_D	Power Dissipation	T_C = 25℃	25	30			W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150				℃
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℃ 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 = 250μA	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} = ±30V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage note4	V_{DS} = V_{GS}, I_D = 250μA	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 = 25Ω	-	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, di/dt =100A/μs	-	402	-	ns
Q_{rr}	Reverse Recovery Charge		-	0.9	-	uC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L=0.5mH, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25 ºC
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics (T_J = 25ºC)

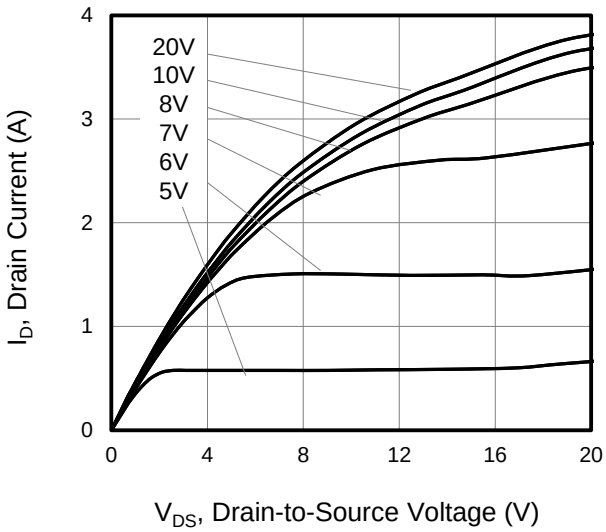


Figure 2. Body Diode Forward Voltage

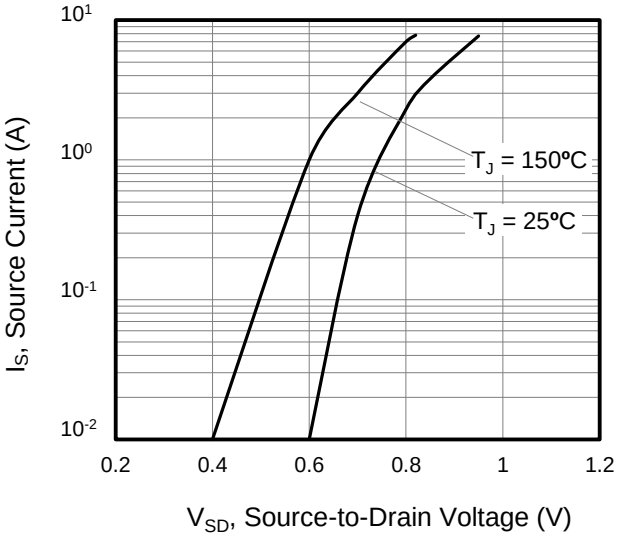


Figure 3. Drain Current vs. Temperature

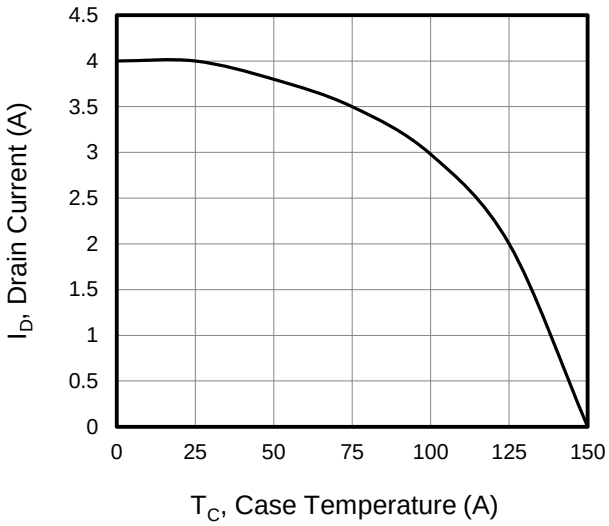


Figure 4. Power Dissipation vs. Temperature

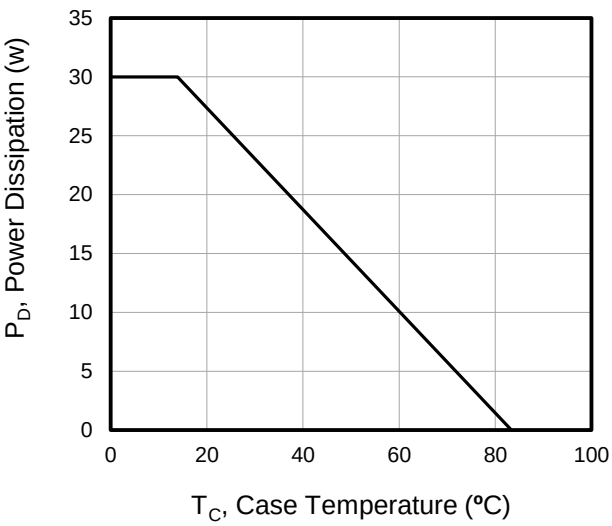


Figure 5. Transfer Characteristics

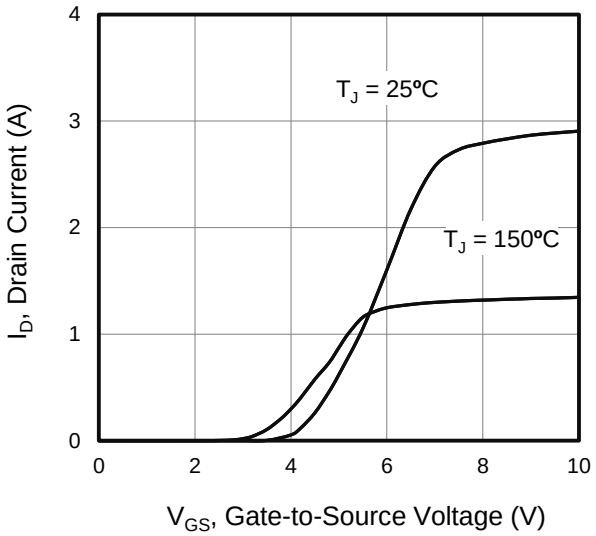
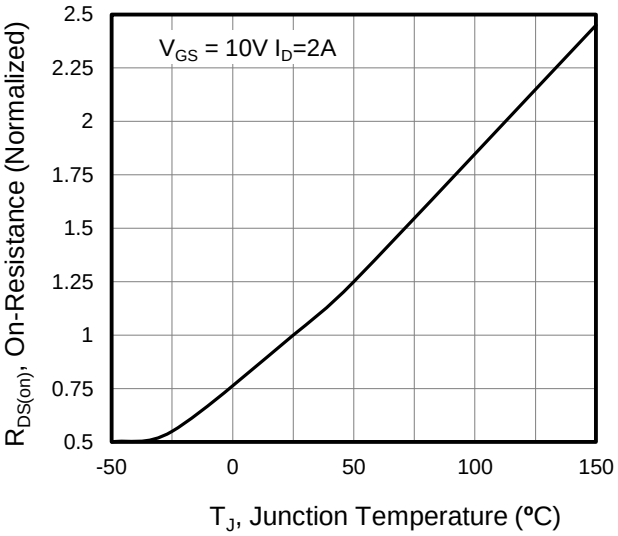


Figure 6. On-Resistance vs. Temperature



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. Capacitance

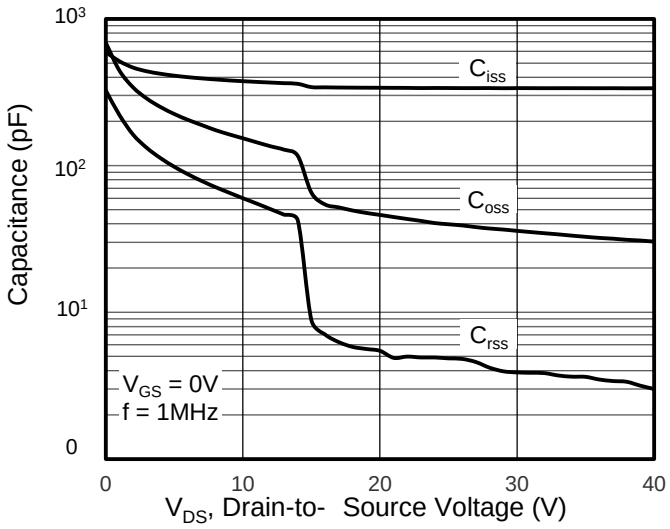


Figure 8. Gate Charge

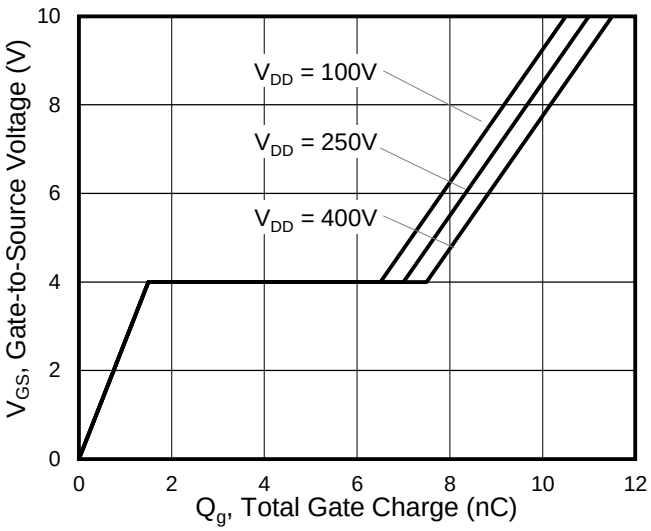


Figure 9. Transient Thermal Impedance TO-251,TO-252,TO-220

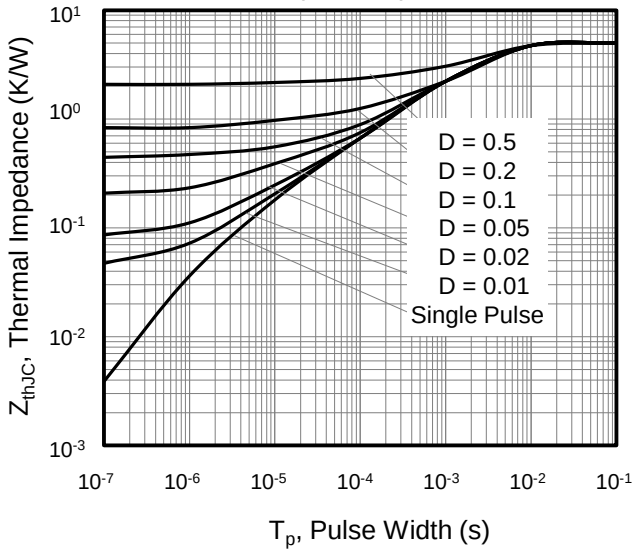


Figure 10. Transient Thermal Impedance TO-220F

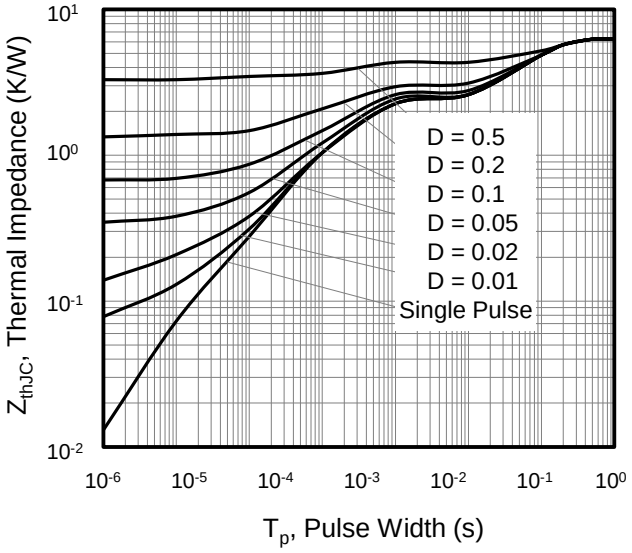


Figure 11：Gate Charge Test Circuit and Waveform

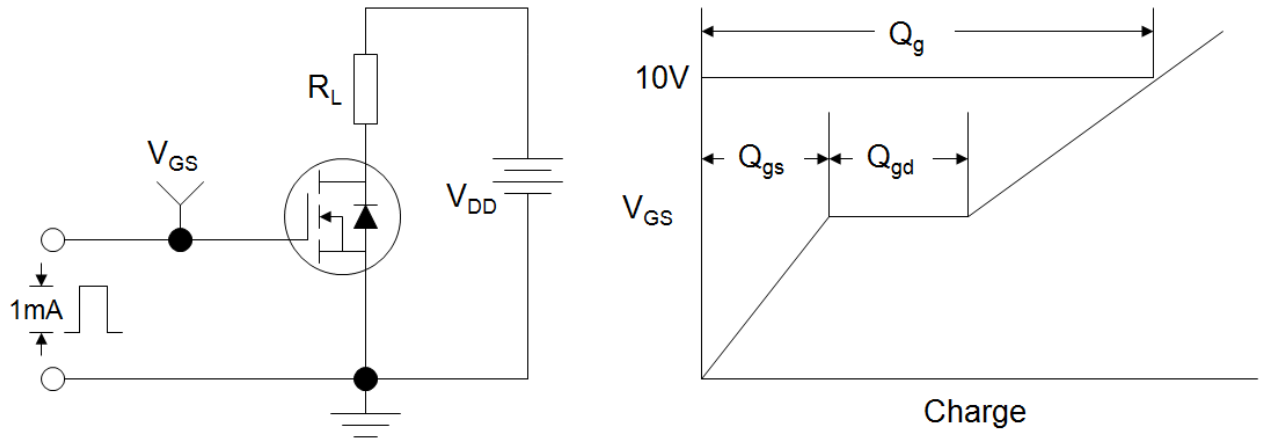


Figure 12：Resistive Switching Test Circuit and Waveform

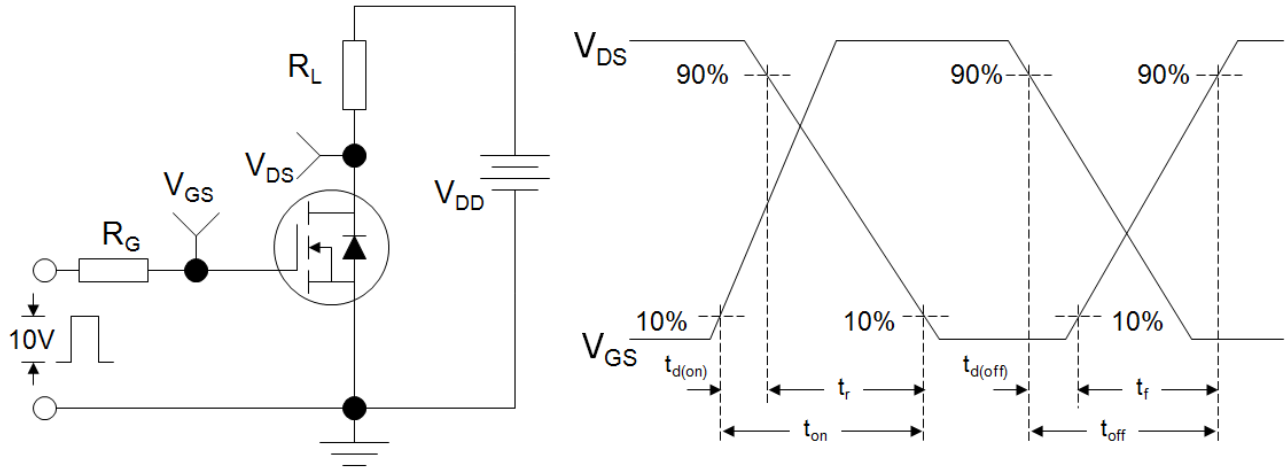
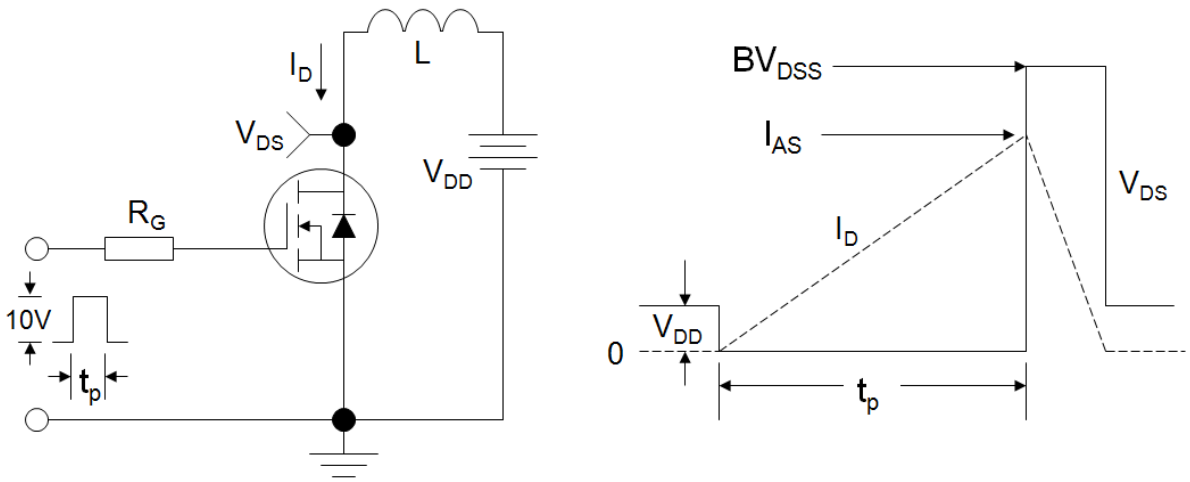
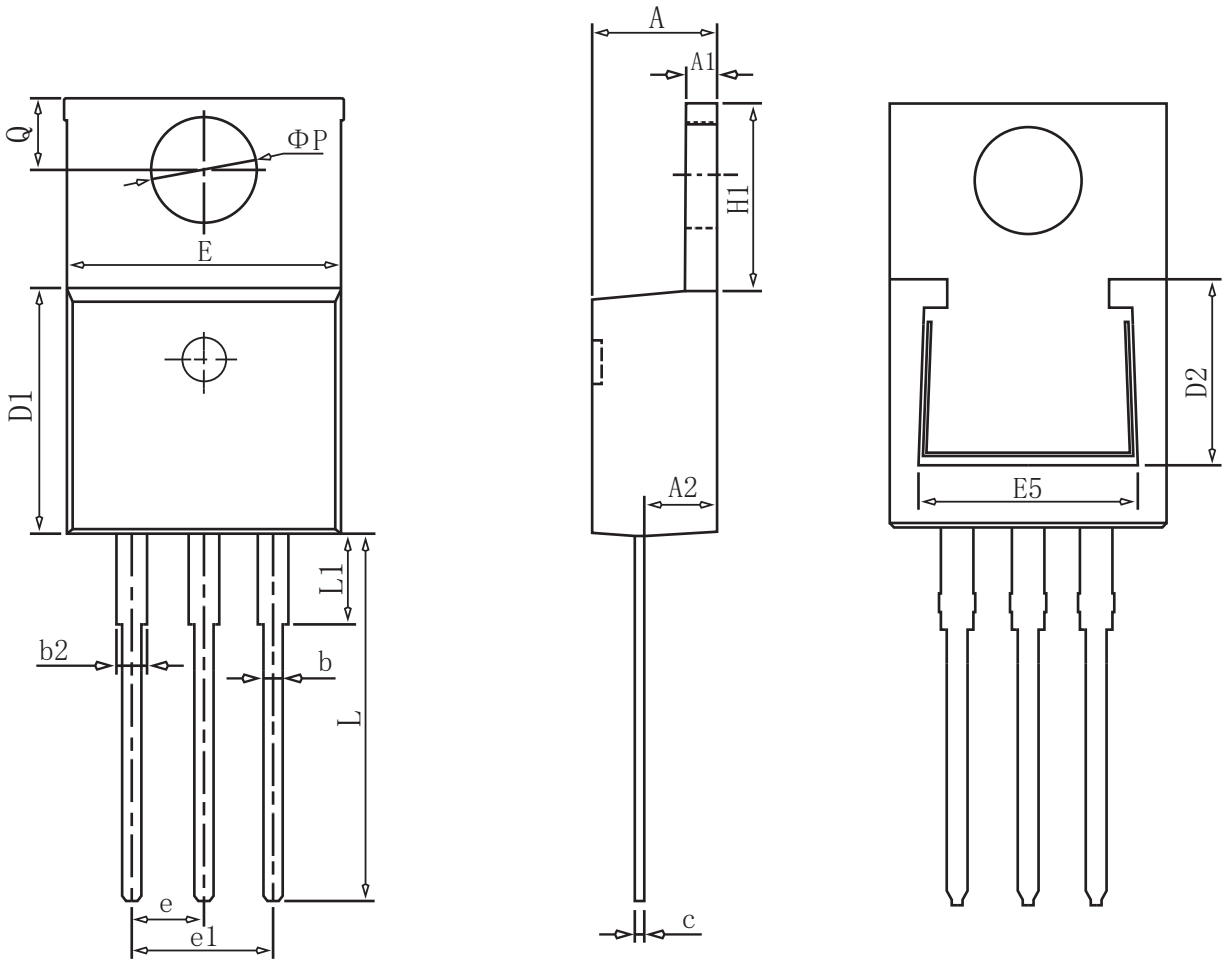


Figure 13：Unclamped Inductive Switching Test Circuit and Waveform



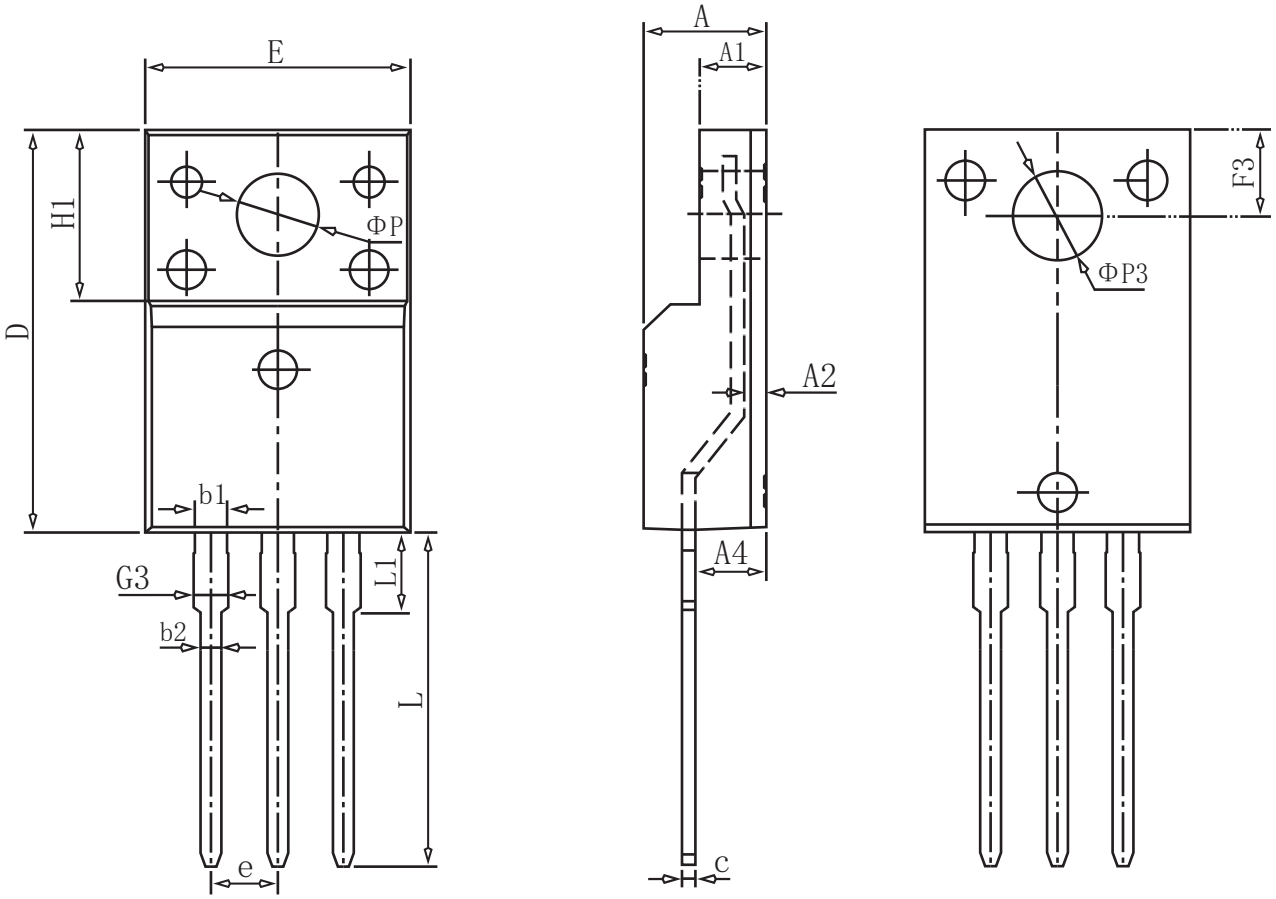
TO-220 package information



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

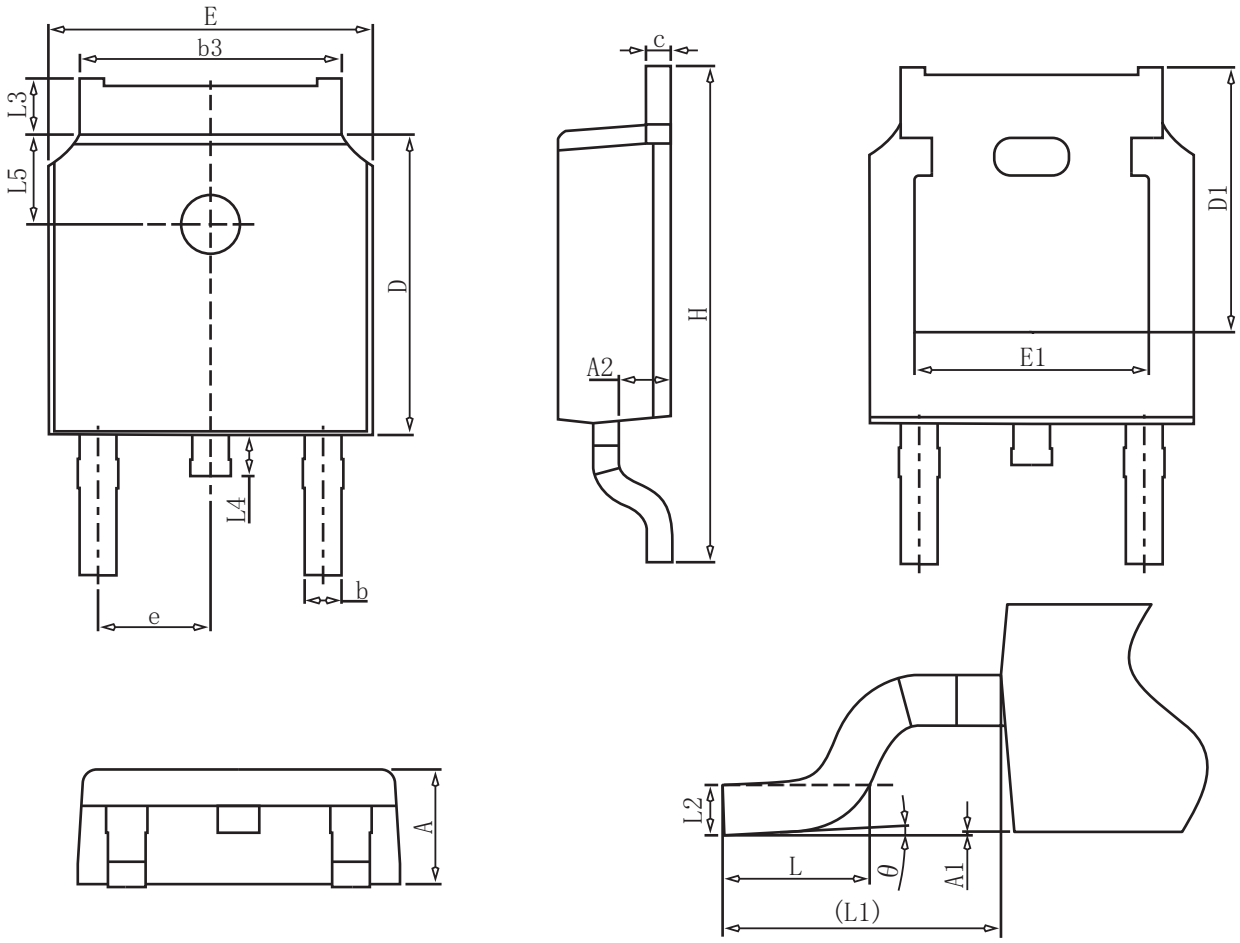
TO-220F package information



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
ΦP3	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

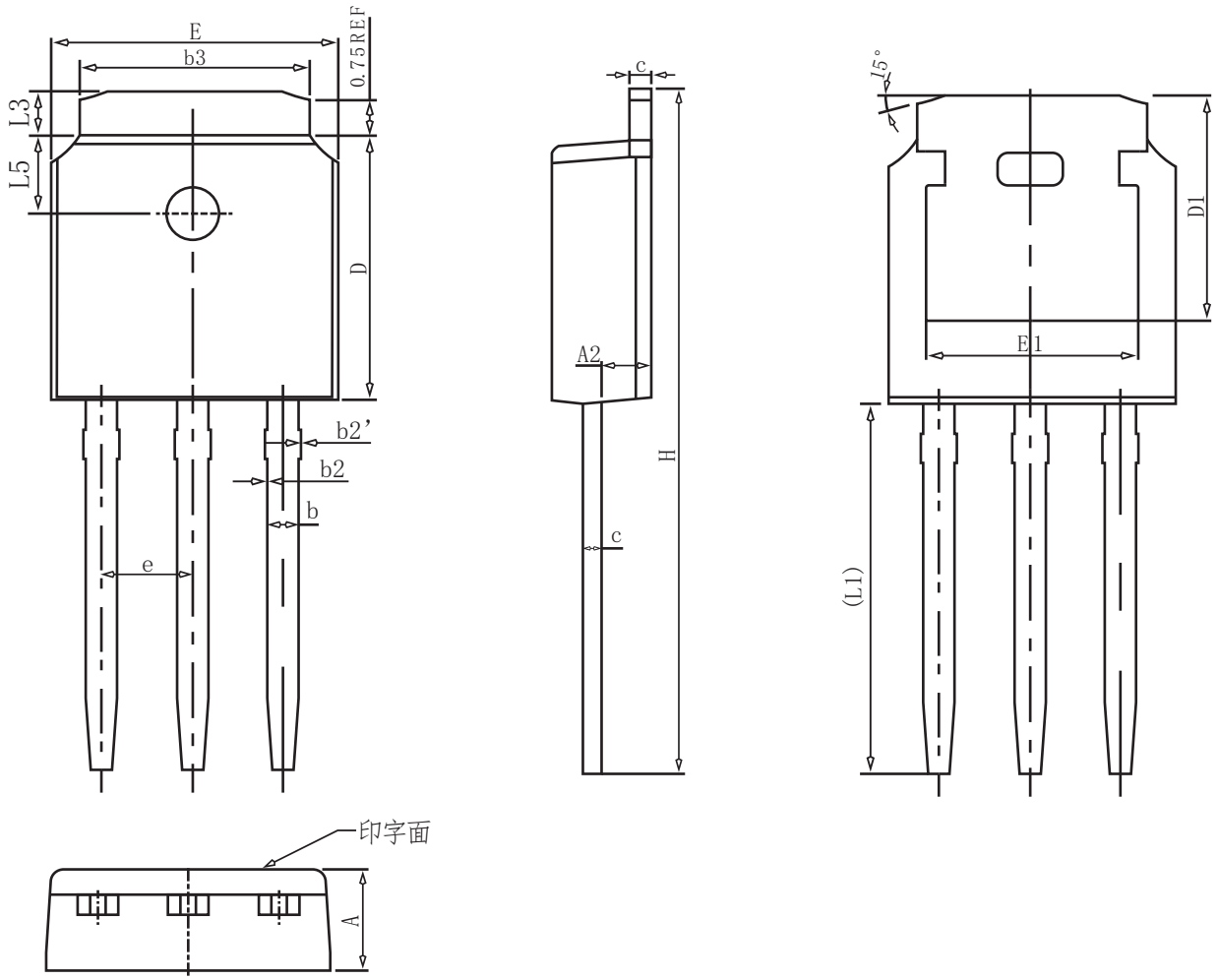
TO-252 package information



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