

MOSFET Silicon N-Channel MOS



1. Applications

Single-ended flyback.
PD Adaptor, LCD & PDP TV and LED lighting.

2. Features

Low drain-source on-resistance: $R_{DS(ON)} = 0.870\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 2.8$ to 4.2 V



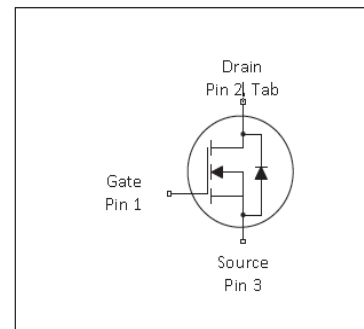
Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	750	V
$R_{DS(on),max}$	950	m Ω
$Q_{g,typ}$	10.3	nC
$I_{D,pulse}$	18	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
ASA70R950E	TO220F	ASA70R950E
ASD70R950E	TO252	ASD70R950E
ASE70R950E	SOT223-2L	ASE70R950E

TO220F	SOT223	TO252



1 Maximum ratings
at $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D		-	6	A	$T_C=25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	18	A	$T_C=25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	180	mJ	$T_C=25^\circ\text{C}, V_{DD}=50\text{V}, L=10\text{mH}, R_G=25\Omega$
Avalanche current, single pulse	I_{AS}	-	-	6	A	$T_C=25^\circ\text{C}, V_{DD}=50\text{V}, L=10\text{mH}, R_G=25\Omega$
MOSFET dv/dt ruggedness	dv/dt	-	-	36	V/ns	$V_{DS}=0\dots400\text{V}$
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC ($f>1\text{ Hz}$)
Power dissipation (TO220F)	P_{tot}	-	-	26	W	$T_C=25^\circ\text{C}$
Power dissipation (TO252/SOT223)	P_{tot}	-	-	37	W	$T_C=25^\circ\text{C}$
Storage temperature	T_{stg}	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	T_j	-55	-	150	$^\circ\text{C}$	
Soldering Temperature Distance of 1.6mm from case for 10s	T_L			260	$^\circ\text{C}$	
Continuous diode forward current	I_S	-	-	6	A	$T_C=25^\circ\text{C}$
Reverse diode dv/dt ³⁾	dv/dt	-	-	15	V/ns	$V_{DS}=0\dots400\text{V}, I_{SD}\leq 48\text{A}, T_j=25^\circ\text{C}$ see table 8

¹⁾Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.50$

²⁾Pulse width t_p limited by $T_{j,max}$

³⁾Identical low side and high side switch with identical R_G

2 Thermal characteristics

Table 3 Thermal characteristics (T0220 FullPAK)

Parameter		Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
Thermal resistance, junction	- case	R_{thJC}	-	-	4.9	°C/W	-
Thermal resistance, junction	- ambient	R_{thJA}	-	-	80	°C/W	device on PCB, minimal footprint

Thermal characteristics (T0252/SOT223)

Parameter		Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
Thermal resistance, junction	- case	R_{thJC}	-	-	3.41	°C/W	-
Thermal resistance, junction	- ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

3 Electrical characteristics

at $T_j=25^{\circ}\text{C}$, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	705	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{(GS)th}$	2.8		4.2	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=700V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.87	0.95	Ω	$V_{GS}=10V, I_D=2A, T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	R_G	-	32	-		$f=1\text{MHz}$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	377	-	pF	$V_{GS}=0V, V_{DS}=50V, f=10\text{kHz}$
Output capacitance	C_{oss}	-	33	-	pF	$V_{GS}=0V, V_{DS}=50V, f=10\text{kHz}$
Reverse transfer capacitance	C_{rss}	-	4.55	-	pF	$V_{GS}=0V, V_{DS}=50V, f=10\text{kHz}$
Turn-on delay time	$t_{d(on)}$	-	8.4	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=2.5A, R_G=6.8\Omega$; see table 9
Rise time	t_r	-	21.6	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=2.5A, R_G=6.8\Omega$; see table 9
Turn-off delay time	$t_{d(off)}$	-	45.2	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=2.5A, R_G=6.8\Omega$; see table 9
Fall time	t_f	-	24.4	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=2.5A, R_G=6.8\Omega$; see table 9

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	1.845	-	nC	$V_{DD}=400V, I_D=2.5A, V_{GS}=0$ to 10V
Gate to drain charge	Q_{gd}	-	2.723	-	nC	$V_{DD}=400V, I_D=2.5A, V_{GS}=0$ to 10V
Gate charge total	Q_g	-	10.3	-	nC	$V_{DD}=400V, I_D=2.5A, V_{GS}=0$ to 10V
Gate plateau voltage	$V_{plateau}$	-	6.4	-	V	$V_{DD}=400V, I_D=2.5A, V_{GS}=0$ to 10V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.77	-	V	$V_{GS}=0V, I_F=1A, T_J=25^{\circ}C$
Reverse recovery time	t_{rr}	-	124	-	ns	$V_R=400V, I_F=2.5 A, di_F/dt=100A/\mu s$; see table 8
Reverse recovery charge	Q_{rr}	-	0.88	-	μC	$V_R=400V, I_F=2.5 A, di_F/dt=100A/\mu s$; see table 8
Peak reverse recovery current	I_{rrm}	-	10	-	A	$V_R=400V, I_F=2.5 A, di_F/dt=100A/\mu s$; see table 8

4 Electrical characteristics diagram

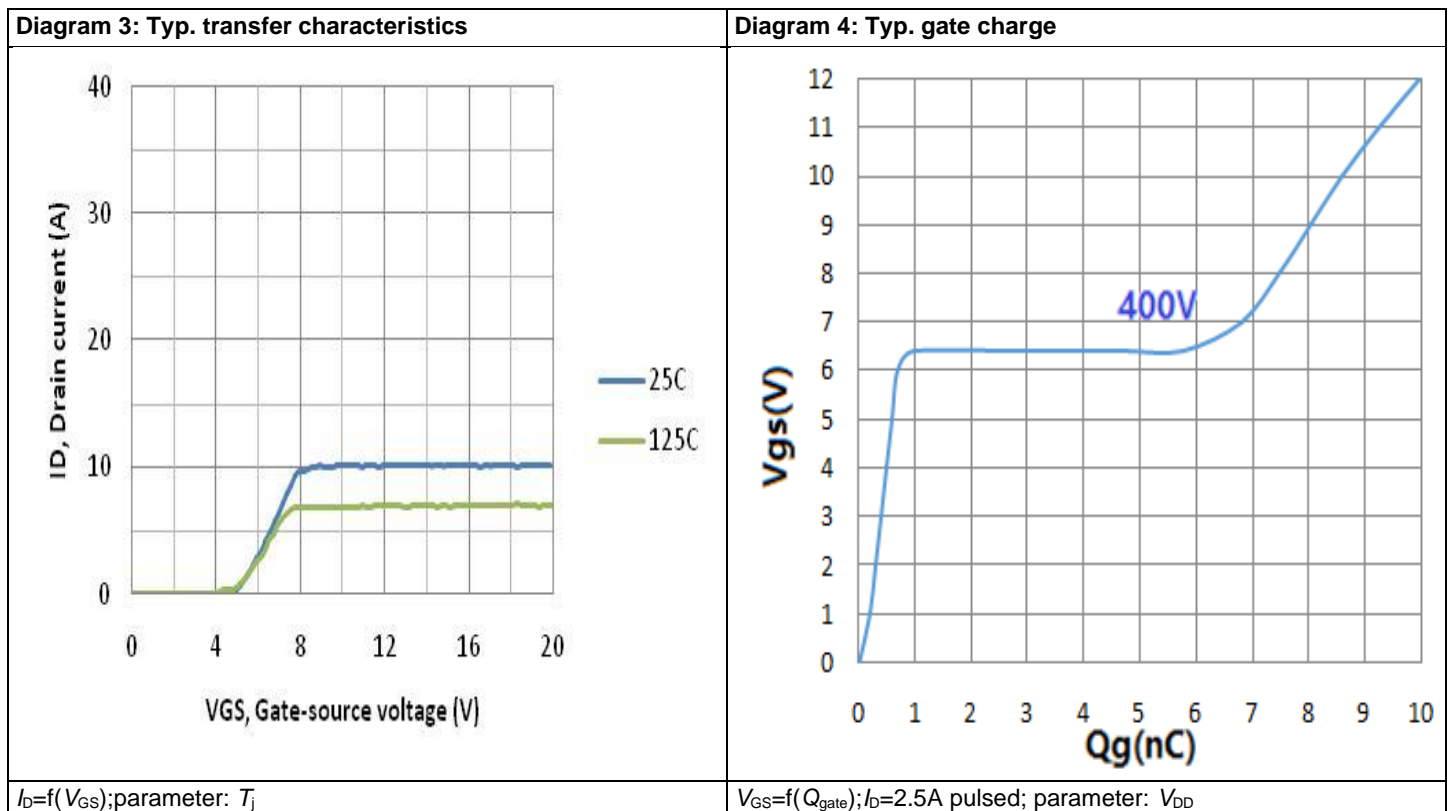
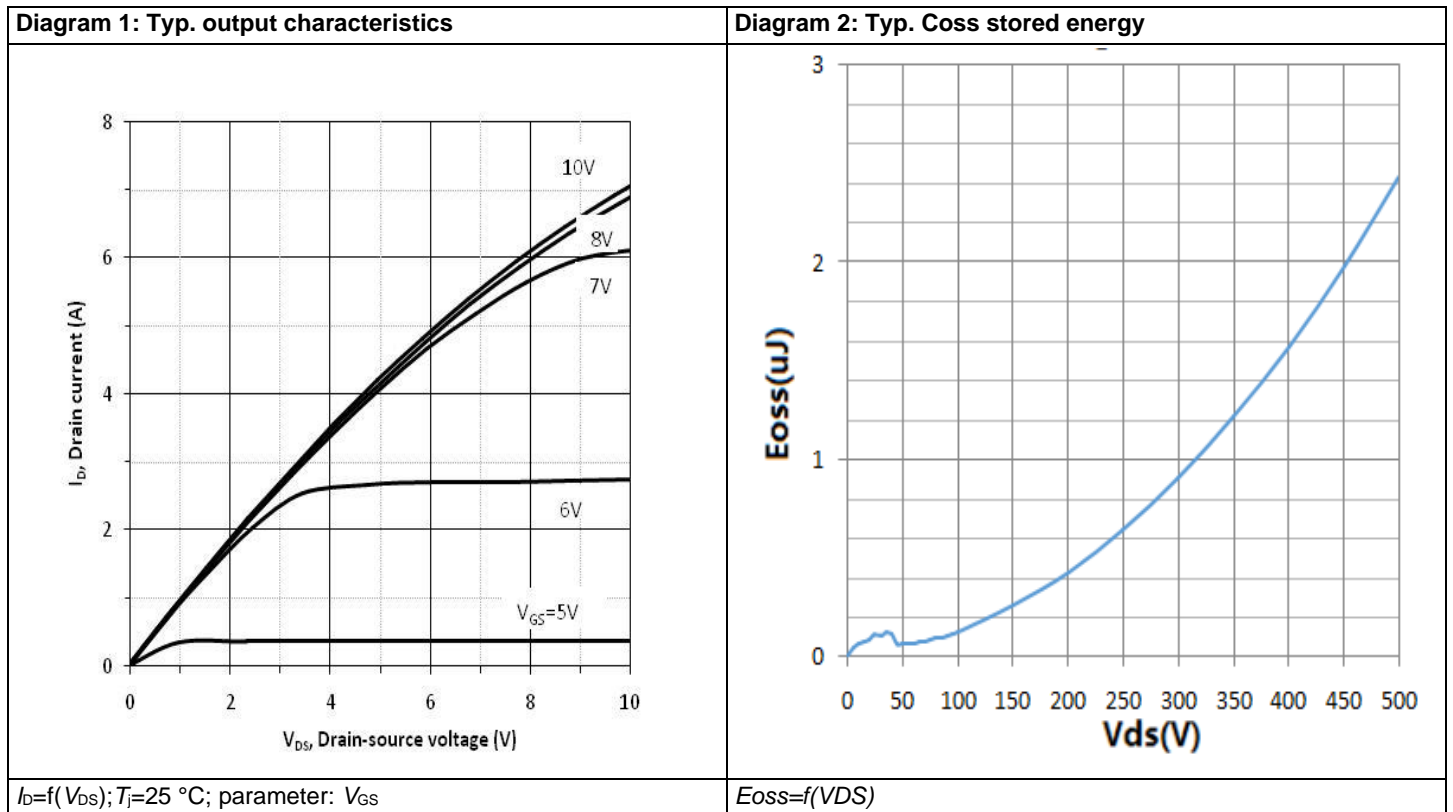
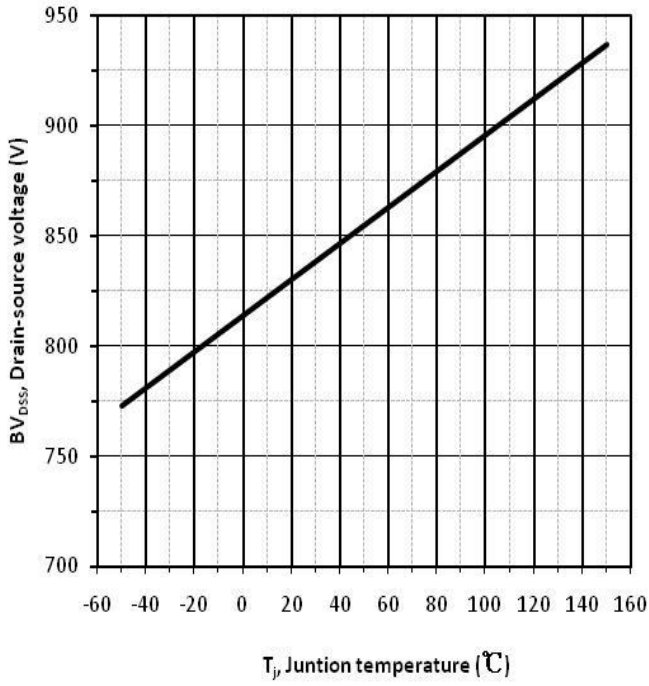
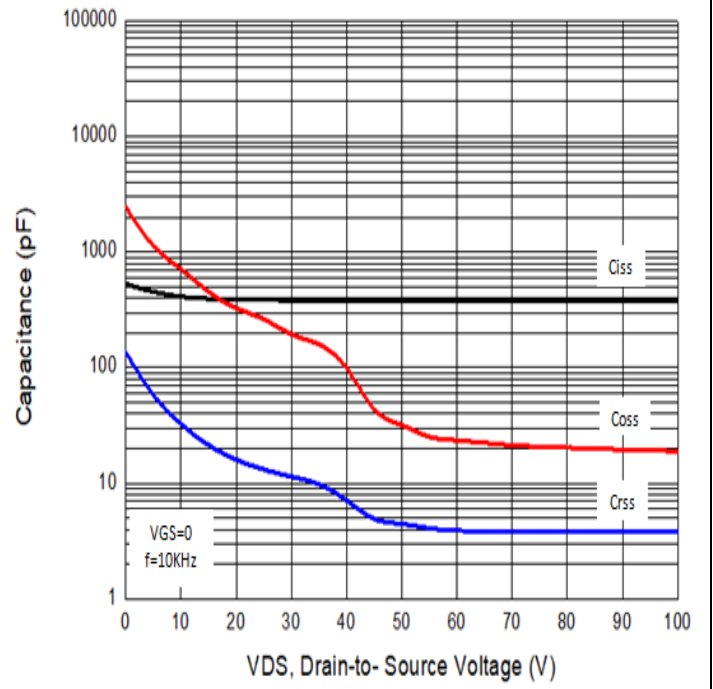


Diagram 5: Drain-source breakdown voltage



$V_{BR(DSS)} = f(T_j); I_D = 10\text{mA}$

Diagram 6: Typ. capacitances



$C = f(V_{DS}); V_{GS} = 0V; f = 10\text{ kHz}$

5 Test Circuits

Table 8 Diode characteristics

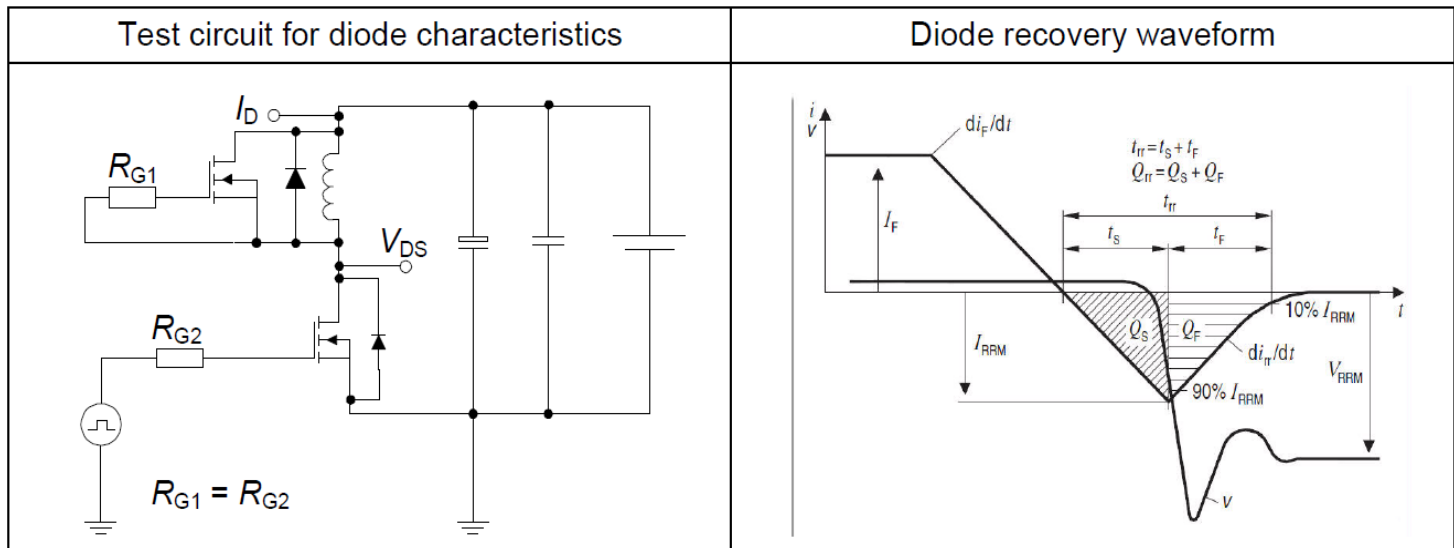


Table 9 Switching times

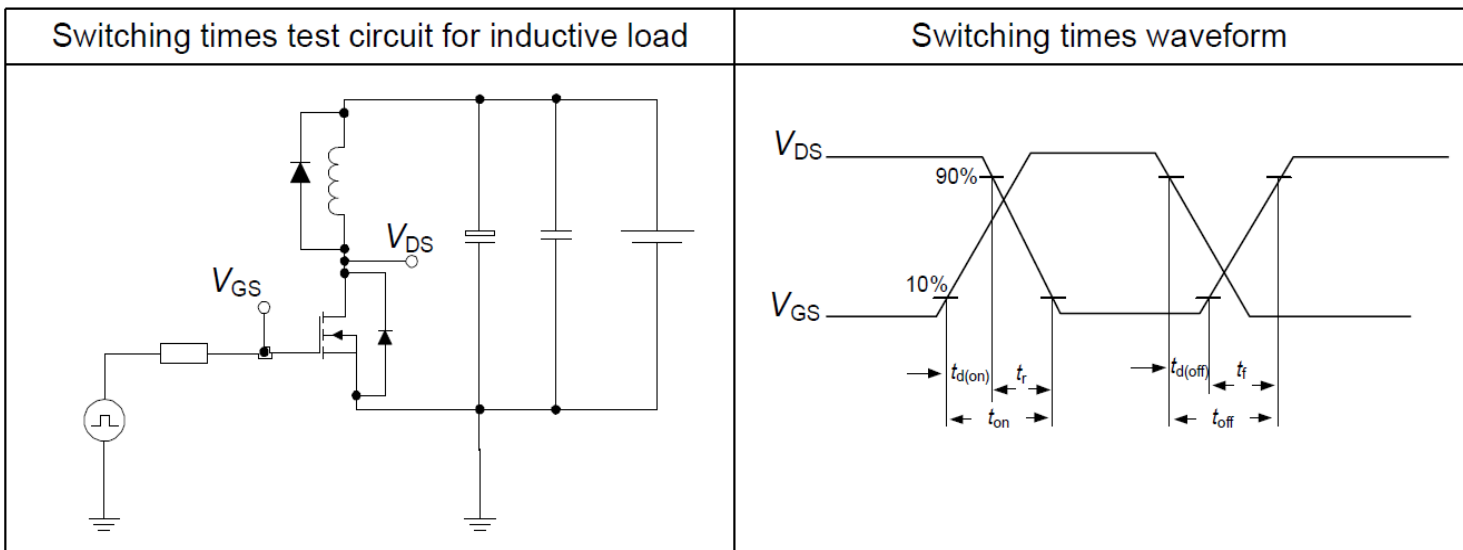
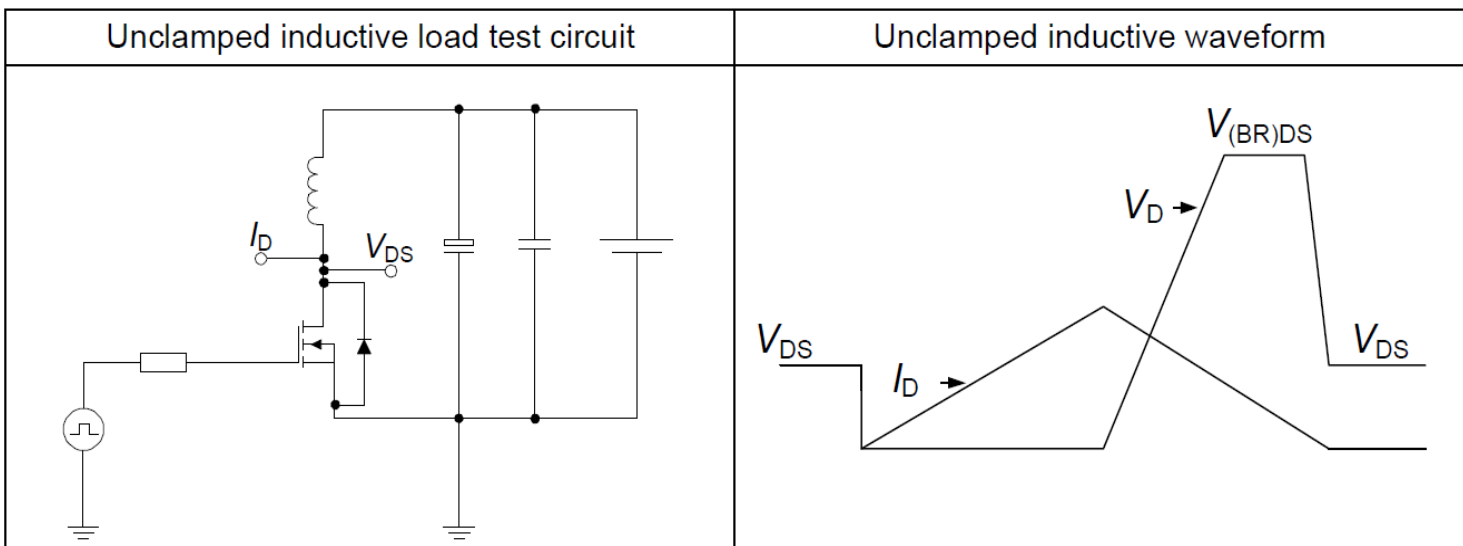
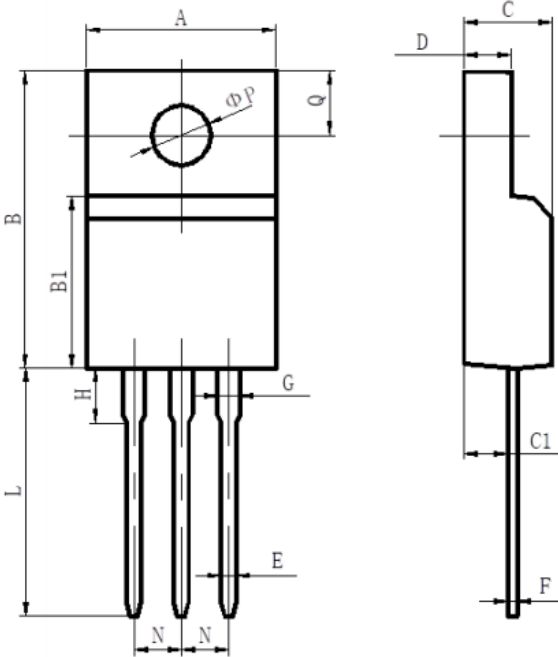


Table10 Unclamped inductive load

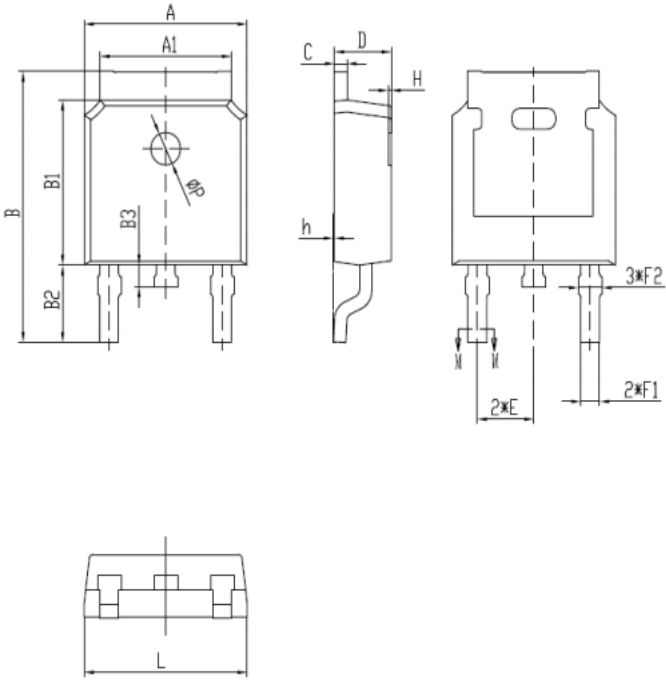


6 Package Outlines



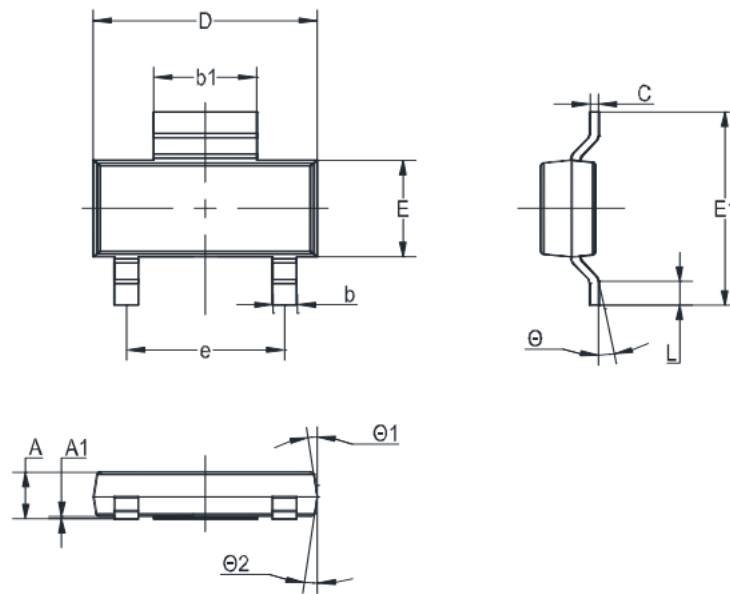
项目	规范(mm)	
	MIN	MAX
A	9.70	10.30
B	15.50	16.10
B1	8.99	9.39
C	4.40	4.80
C1	2.15	2.55
D	2.50	2.90
E	0.70	0.90
F	0.40	0.60
G	1.12	1.42
H	3.40	3.80
L	12.6	13.6
N	2.34	2.74
Q	3.15	3.55
ϕP	3.00	3.30

Figure1: Outline PG-T0220F(HT)



项目	规范(mm)	
	MIN	MAX
A	6.50	6.70
A1	5.16	5.46
B	9.77	10.17
B1	6.00	6.20
B2	2.60	3.00
B3	0.70	0.90
C	0.45	0.61
D	2.20	2.40
E	2.186	2.386
F1	0.67	0.87
F2	0.76	0.96
H	0.00	0.30
h	0.00	0.127
L	6.50	6.70
φ P	1.10	1.30

Figure2: Outline PG-T0252(HT)



Unit	A	A1	b	b1	C	D	E	E1	e	L	Θ	Θ1	Θ2
mm	1.8	0.1	0.8	3.1	0.32	6.7	3.7	7.3	4.6	1.1	10°	7°	7°
	1.5	MAX	0.6	2.9	0.22	6.3	3.3	6.7	TYP	0.7	0°	0°	0°

Figure3: Outline PG-SOT223-2L(HC)

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2019-07-15	Preliminary version
1.1	2020-03-27	Fine tune outline and add Crss test data etc.Add Electrical characteristics Curve
1.2	2020-04-18	Add avalanche energy test condition, avalanche current data and test condition
1.3	2022-06-14	Updated TO220F &TO252 POD for HT
1.4	2022-11-15	Added SOT223-2L package