

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

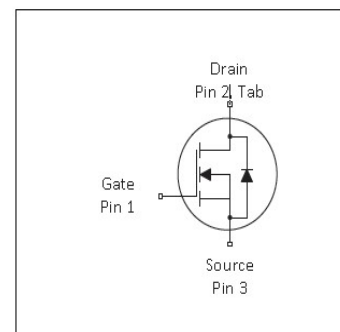
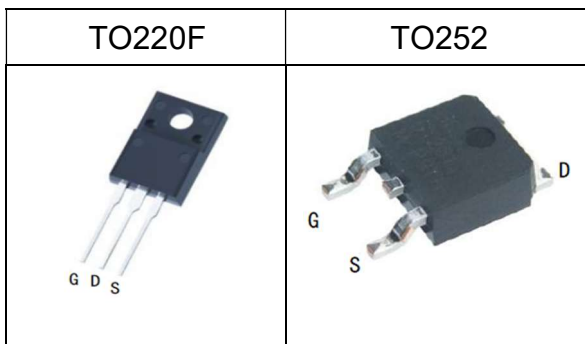


Table 1 Key Performance Parameters

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



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)	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	$^\circ\text{C}$	
Continuous diode forward current	I_S	-	-	48	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 Fu11PAK)

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)

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	$V_{GS}=0\text{V}$, $I_D=10\text{mA}$
Gate threshold voltage	$V_{(GS)th}$	2.8		4.2	V	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=700\text{V}$, $V_{GS}=0\text{V}$, $T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30\text{V}$, $V_{DS}=0\text{V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.87	0.95	Ω	$V_{GS}=10\text{V}$, $I_D=2\text{A}$, $T_j=25^{\circ}\text{C}$
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	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Output capacitance	C_{oss}	-	33	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Reverse transfer capacitance	C_{rss}	-	4.55	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Turn-on delay time	$t_{d(on)}$	-	8.4	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=2.5\text{A}$, $R_G=6.8\Omega$; see table 9
Rise time	t_r	-	21.6	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=2.5\text{A}$, $R_G=6.8\Omega$; see table 9
Turn-off delay time	$t_{d(off)}$	-	45.2	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=2.5\text{A}$, $R_G=6.8\Omega$; see table 9
Fall time	t_f	-	24.4	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=2.5\text{A}$, $R_G=6.8\Omega$; 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	$V_{DD}=400\text{V}$, $I_D=2.5\text{A}$, $V_{GS}=0$ to 10V
Gate to drain charge	Q_{gd}	-	2.723	-	nC	$V_{DD}=400\text{V}$, $I_D=2.5\text{A}$, $V_{GS}=0$ to 10V
Gate charge total	Q_g	-	10.3	-	nC	$V_{DD}=400\text{V}$, $I_D=2.5\text{A}$, $V_{GS}=0$ to 10V
Gate plateau voltage	$V_{plateau}$	-	6.4	-	V	$V_{DD}=400\text{V}$, $I_D=2.5\text{A}$, $V_{GS}=0$ 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

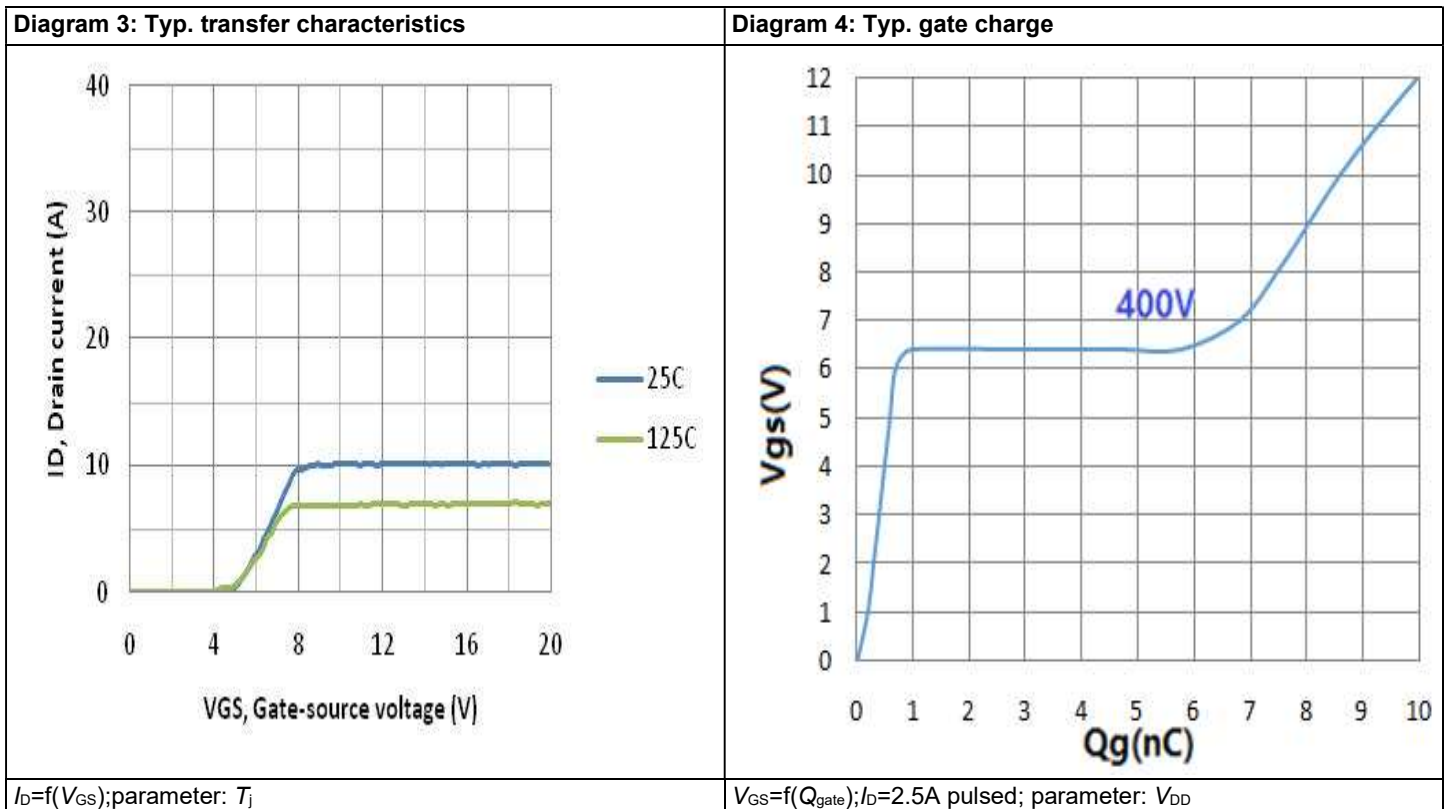
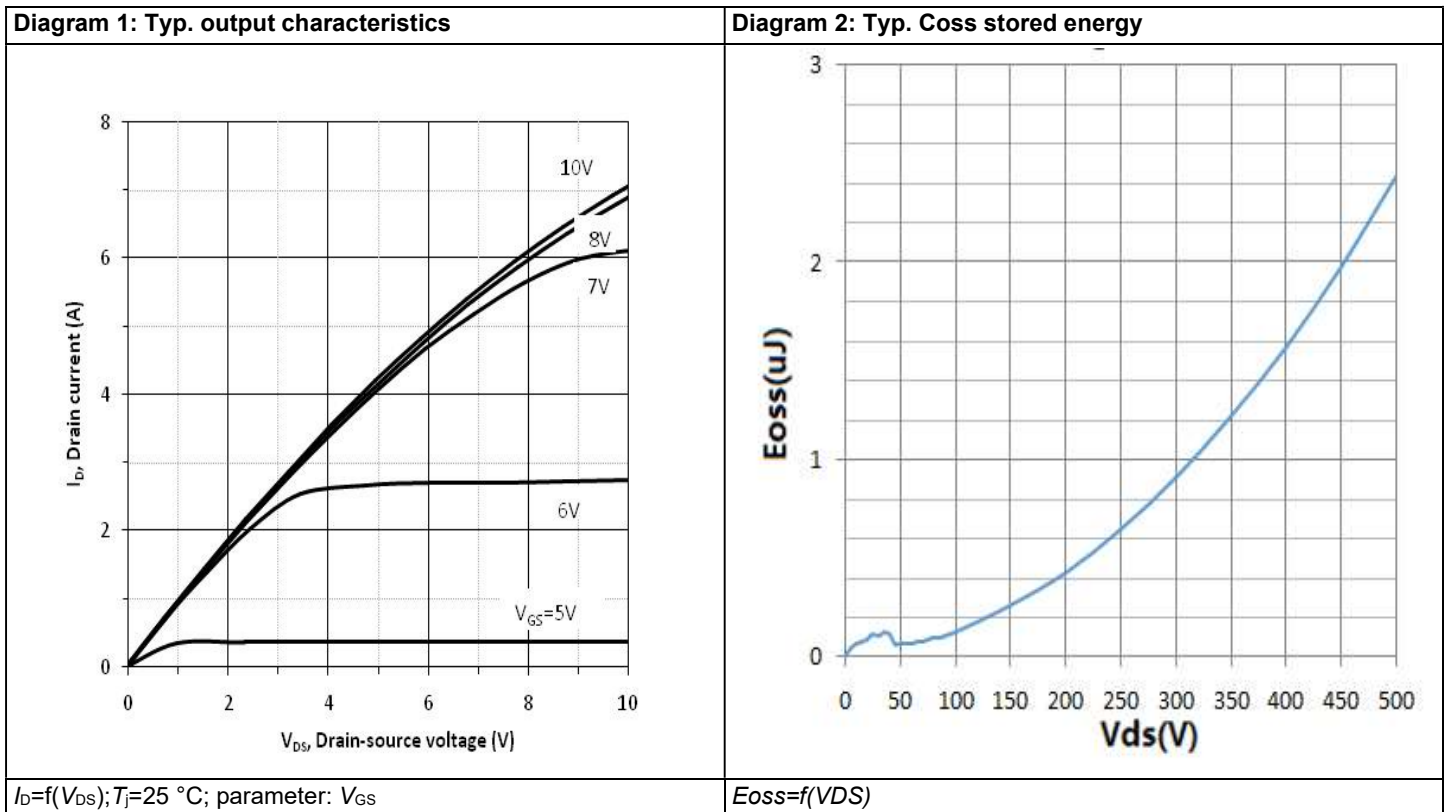
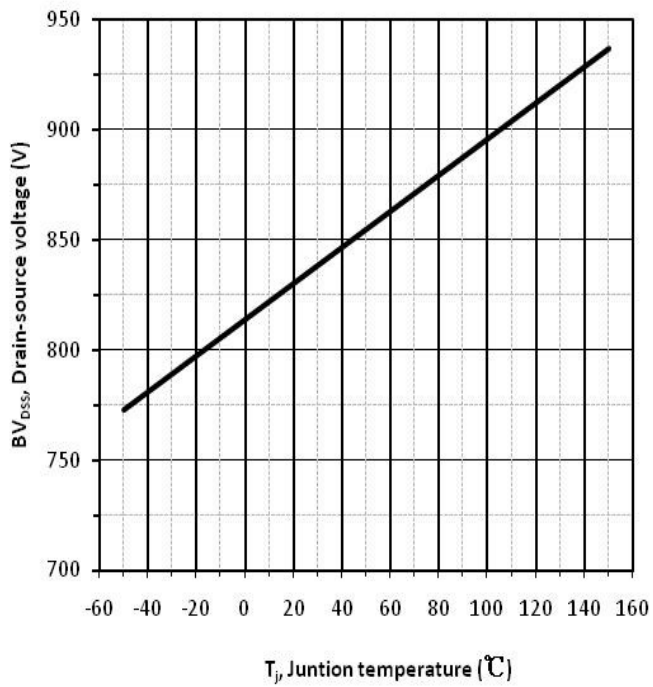
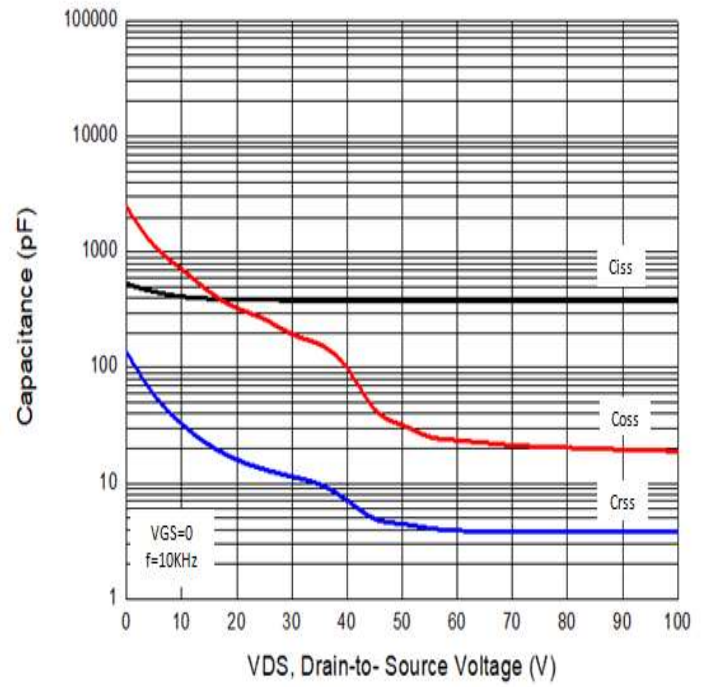


Diagram 5: Drain-source breakdown voltage



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

Diagram 6: Typ. capacitances



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

5 Test Circuits

Table 8 Diode characteristics

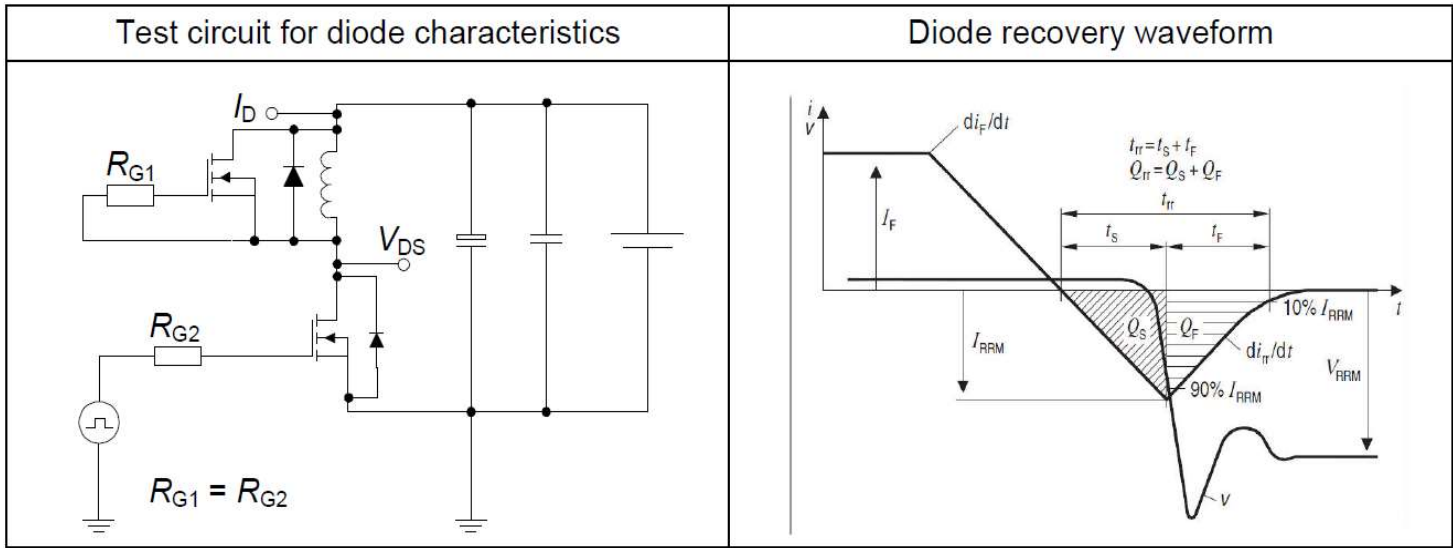


Table 9 Switching times

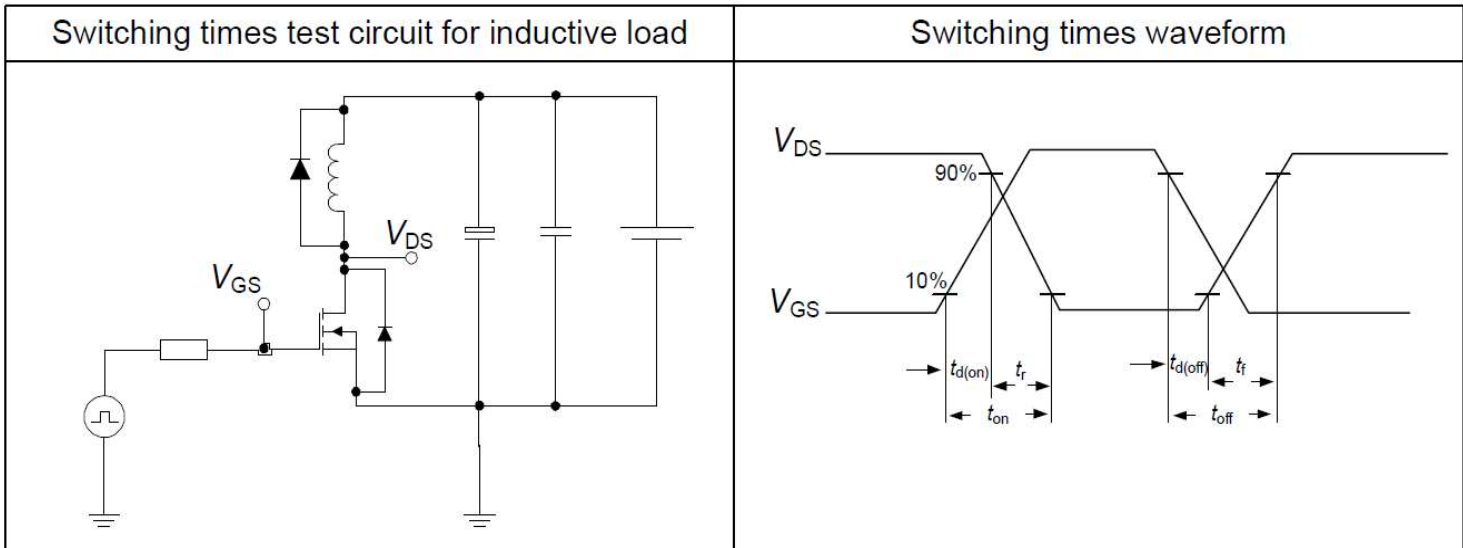
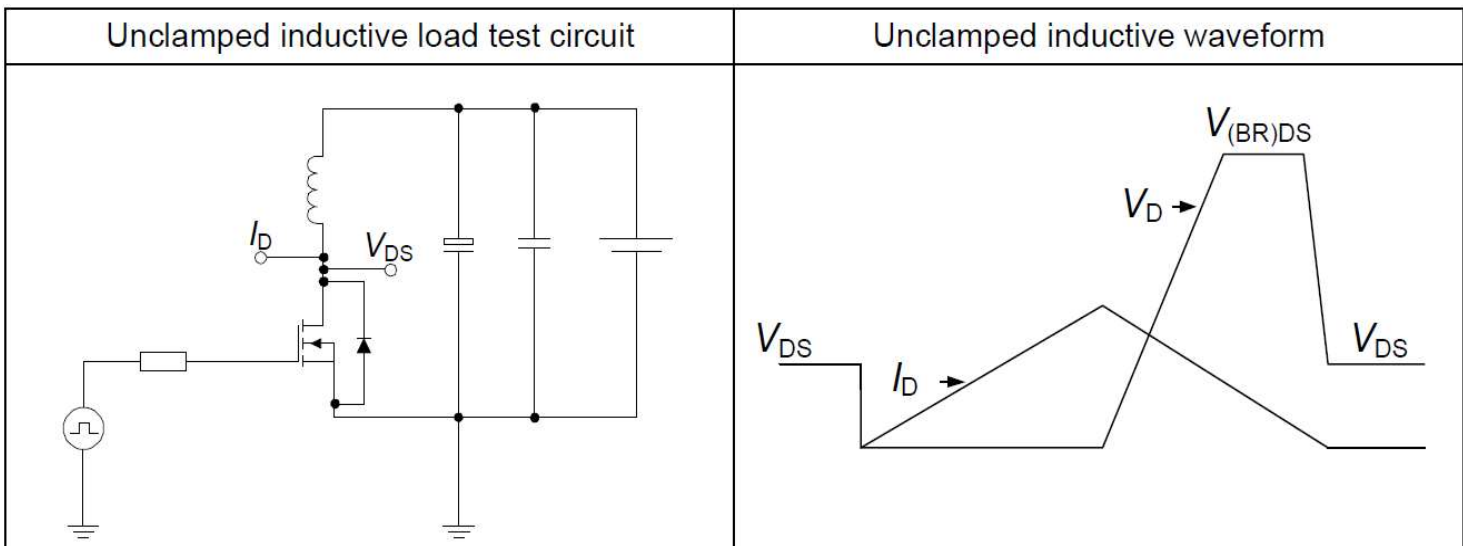


Table10 Unclamped inductive load



6 Package Outlines

TO-220F

单位: mm

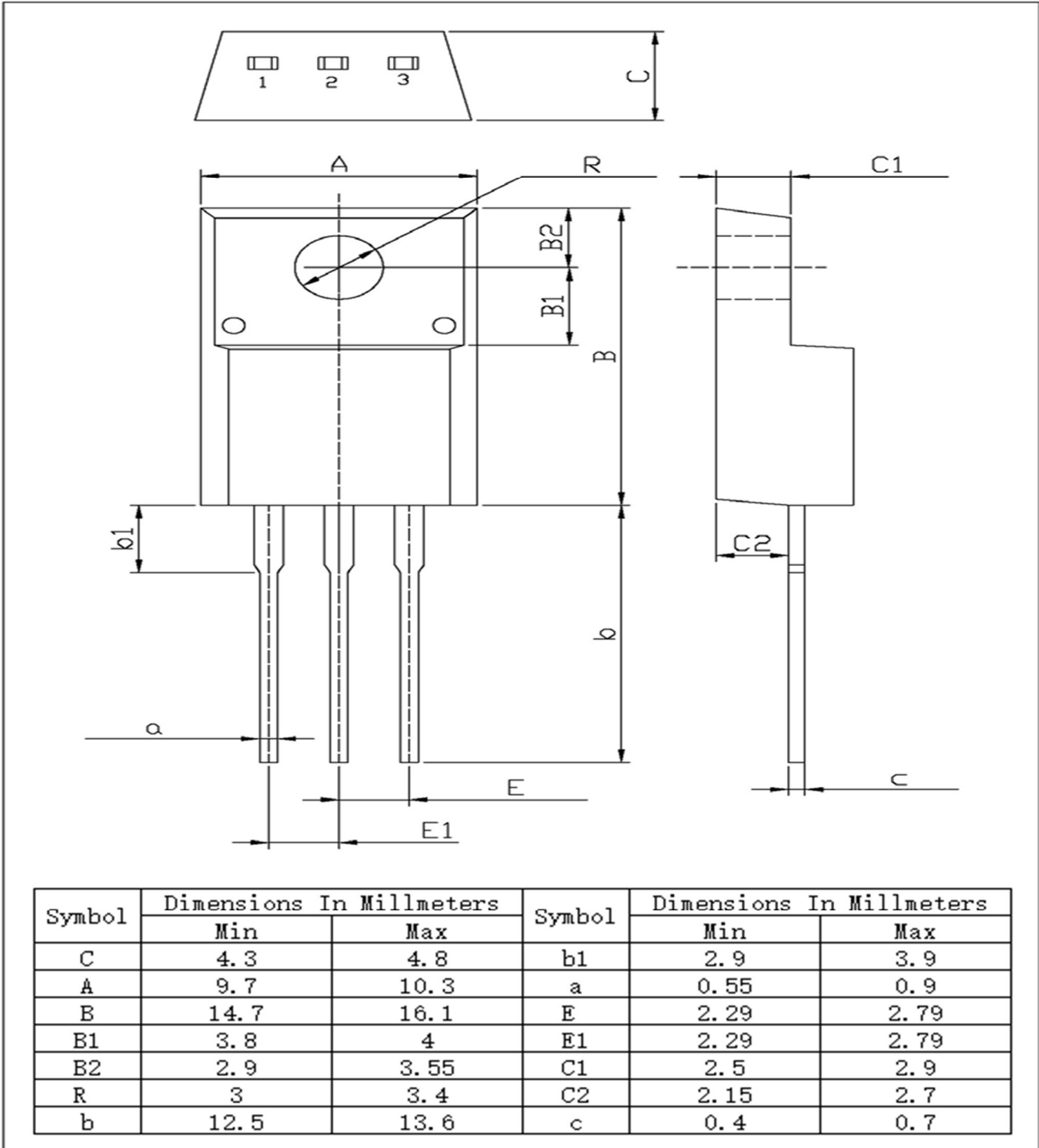
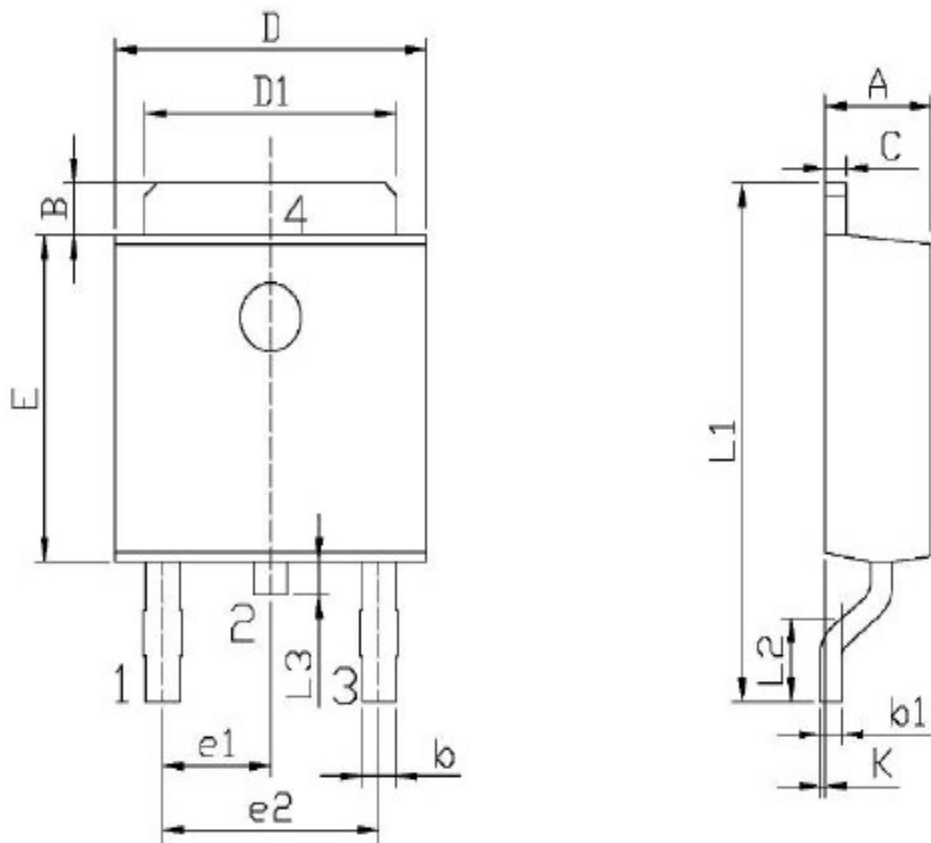


Figure3: Outline PG-T0220F



单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	2.20	2.40	E	5.95	6.25
B	0.95	1.25	e1	2.24	2.34
b	0.50	0.70	e2	4.43	4.73
b1	0.45	0.55	L1	9.45	9.95
C	0.45	0.55	L2	1.25	1.75
D	6.45	6.75	L3	0.60	0.90
D1	5.10	5.50	K	0.00	0.10

Figure4: Outline PG-T0252

Revision History

Revision	Date	Subjects (major changes since last revision)
0.1	2019-07-15	Preliminary version
1.0	2019-11-07	Fine tune outline and add Crss test data.etc
1.1	2020-03-27	Add Electrical characteristics Curve
1.2	2020-04-18	Add avalanche energy test condition, avalanche current data and test condition