

MOSFET Silicon N-Channel MOS

1. Applications

Single-ended flyback or two-transistor forward topologies.
PD Adaptor, LCD & PDP TV and LED lighting.



2. Features

Low drain-source on-resistance: $R_{DS(ON)} = 0.540\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 2.8$ to 4.2 V

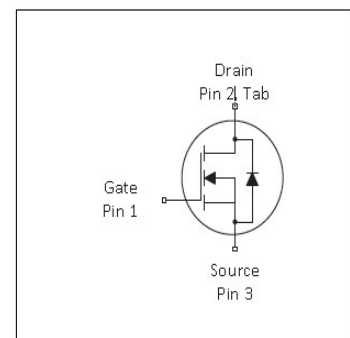
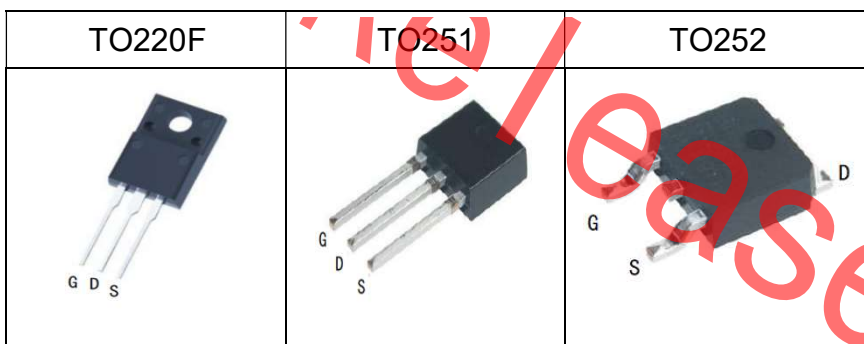


Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	750	V
$R_{DS(on),max}$	600	m Ω
$Q_{g,typ}$	8.0	nC
$I_{D,pulse}$	24	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
ASA70R600E	TO220F	ASA70R600E
ASU70R600E	TO251	ASU70R600E
ASD70R600E	TO252	ASD70R600E



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		-	8	A	$T_C = 25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	24	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	624	mJ	$T_C = 25^\circ\text{C}, V_{DD} = 50\text{V}, L = 49.9\text{mH}, R_G = 25\Omega$
Avalanche current, single pulse	I_{AS}	-	-	5	A	$T_C = 25^\circ\text{C}, V_{DD} = 50\text{V}, L = 49.9\text{mH}, R_G = 25\Omega$
MOSFET dv/dt ruggedness	dv/dt	-	-	15	V/ns	$V_{DS} = 0 \dots 400\text{V}$
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}	-	-	28	W	$T_C = 25^\circ\text{C}$
Power dissipation(TO252& TO251)	P_{tot}	-	-	86	W	$T_C = 25^\circ\text{C}$
Storage temperature	T_{stg}	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	T_j	-55	-	150	$^\circ\text{C}$	
Reverse diode dv/dt ³⁾	dv/dt	-	-	15	V/ns	$V_{DS} = 0 \dots 400\text{V}, I_{SD} \leq 48\text{A}, T_j = 25^\circ\text{C}$ 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

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2 Thermal characteristics

Table 3 Thermal characteristics (TO220F)

Parameter		Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
Thermal resistance, junction	- case	R_{thJC}	-	-	4.5	°C/W	-
Thermal resistance, junction	- ambient	R_{thJA}	-	-	80	°C/W	device on PCB, minimal footprint

Thermal characteristics (TO251 and TO252)

Parameter		Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
Thermal resistance, junction	- case	R_{thJC}	-	-	1.45	°C/W	-
Thermal resistance, junction	- ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

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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}	-	-	100	nA	$V_{DS}=700\text{V}$, $V_{GS}=0\text{V}$, $T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30\text{V}$, $V_{DS}=0\text{V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.54	0.60	Ω	$V_{GS}=10\text{V}$, $I_D=3\text{A}$, $T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	R_G	-	24	-	Ω	$f=1\text{MHz}$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	599	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Output capacitance	C_{oss}	-	76	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Reverse transfer capacitance	C_{rss}	-	3.55	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Turn-on delay time	$t_{d(on)}$	-	26.8	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=3\text{A}$, $R_G=6.8\Omega$; see table 9
Rise time	t_r	-	24.8	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=3\text{A}$, $R_G=6.8\Omega$; see table 9
Turn-off delay time	$t_{d(off)}$	-	127.6	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=3\text{A}$, $R_G=6.8\Omega$; see table 9
Fall time	t_f	-	21.2	-	ns	$V_{DD}=400\text{V}$, $V_{GS}=13\text{V}$, $I_D=3\text{A}$, $R_G=6.8\Omega$; see table 9

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	2.6	-	nC	$V_{DD}=400\text{V}$, $I_D=3\text{A}$, $V_{GS}=0$ to 10V
Gate to drain charge	Q_{gd}	-	1.7	-	nC	$V_{DD}=400\text{V}$, $I_D=3\text{A}$, $V_{GS}=0$ to 10V
Gate charge total	Q_g	-	8.0	-	nC	$V_{DD}=400\text{V}$, $I_D=3\text{A}$, $V_{GS}=0$ to 10V
Gate plateau voltage	$V_{plateau}$	-	6.6	-	V	$V_{DD}=400\text{V}$, $I_D=3\text{A}$, $V_{GS}=0$ to 10V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.76	-	V	$V_{GS}=0V, I_F=1A, T_j=25^{\circ}C$
Reverse recovery time	t_{rr}	-	174	-	ns	$V_R=400V, I_F=3A, di_F/dt=100A/\mu s$; see table 8
Reverse recovery charge	Q_{rr}	-	1.2	-	uC	$V_R=400V, I_F=3A, di_F/dt=100A/\mu s$; see table 8
Peak reverse recovery current	I_{rrm}	-	13.5	-	A	$V_R=400V, I_F=3A, di_F/dt=100A/\mu s$; see table 8

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4 Electrical characteristics diagram

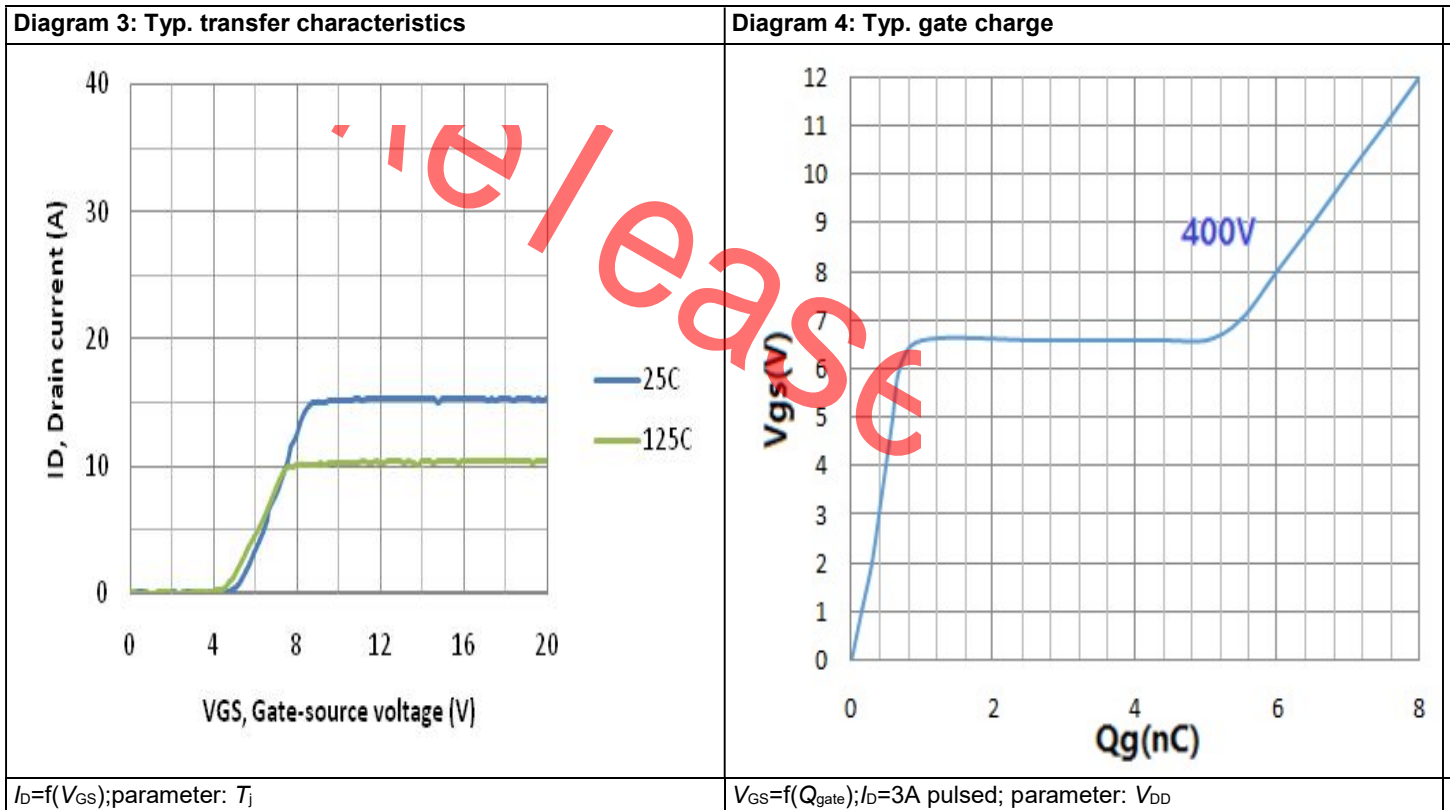
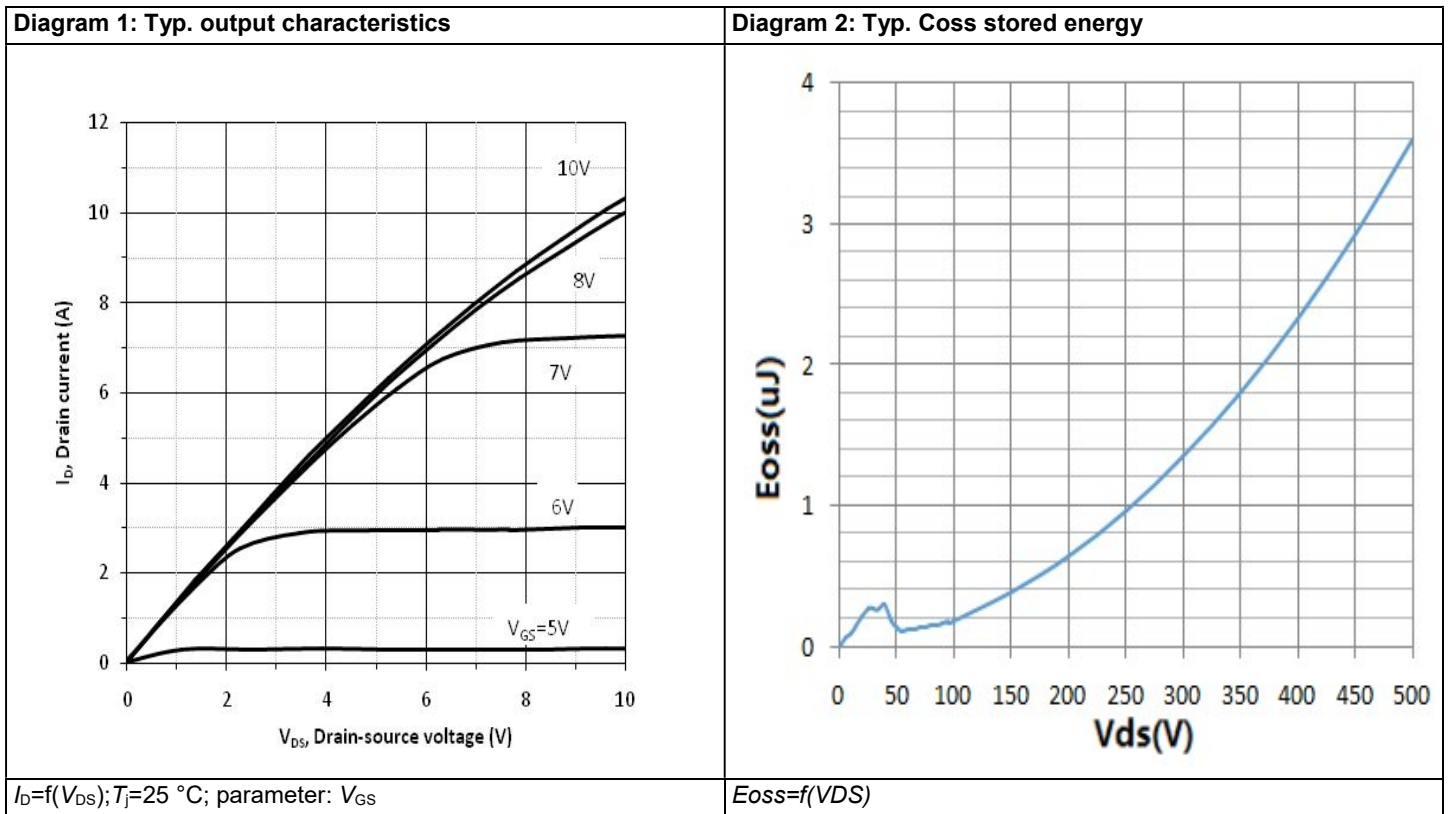
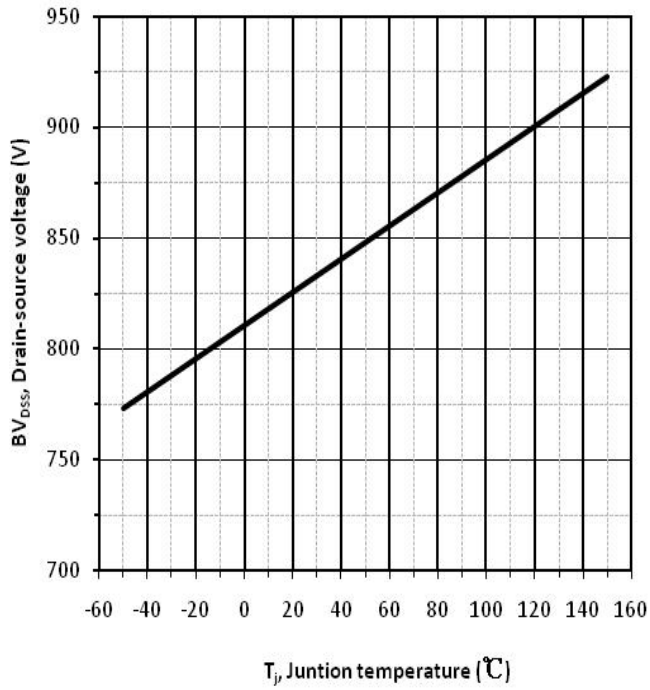
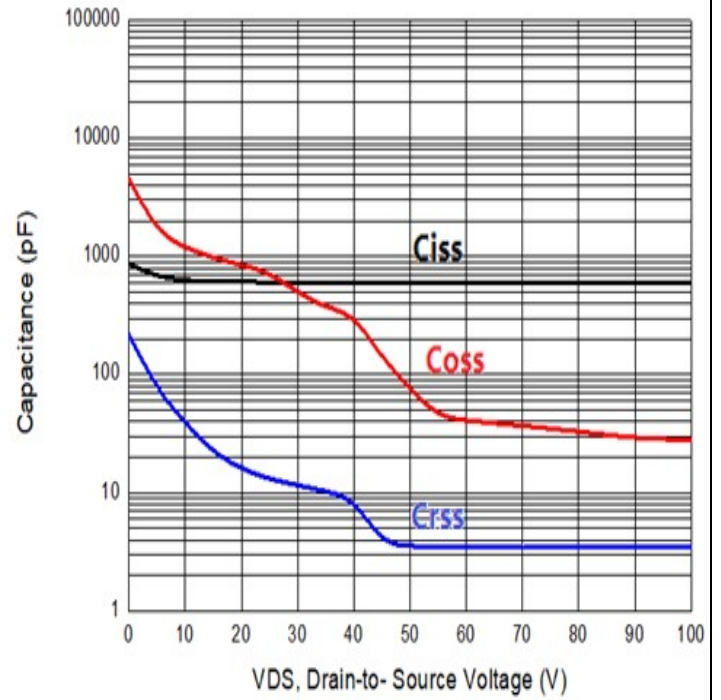


Diagram 5: Drain-source breakdown voltage



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

Diagram 6: Typ. capacitances



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

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5 TestCircuits

Table 8 Diodecharacteristics

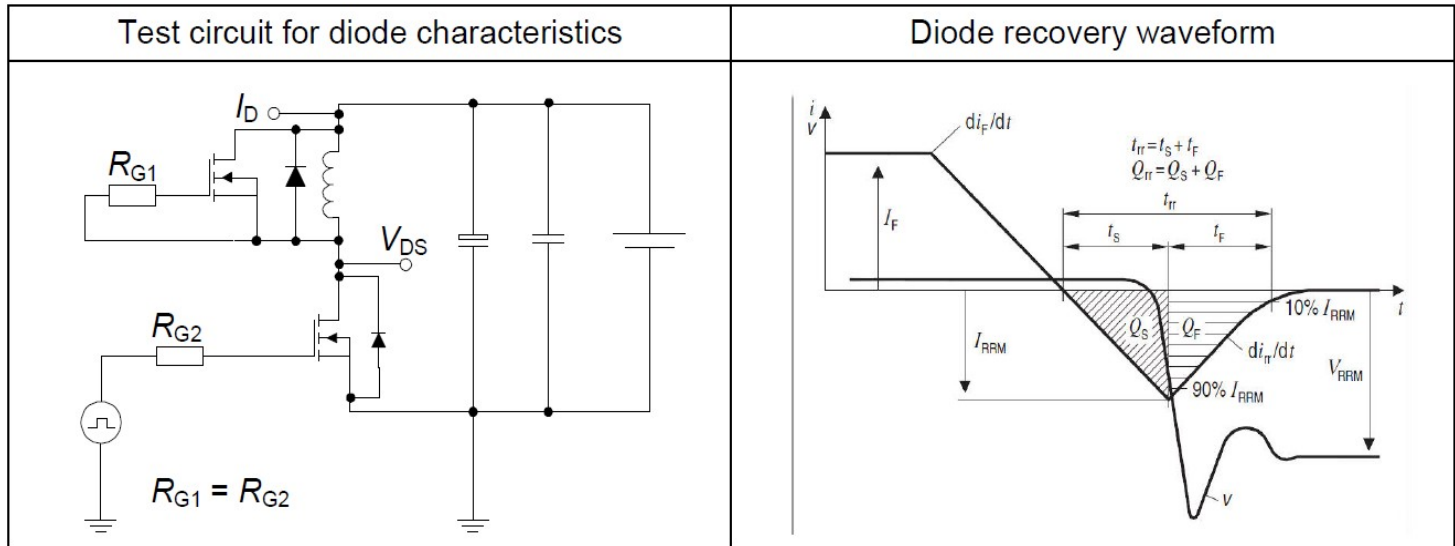


Table 9 Switchingtimes

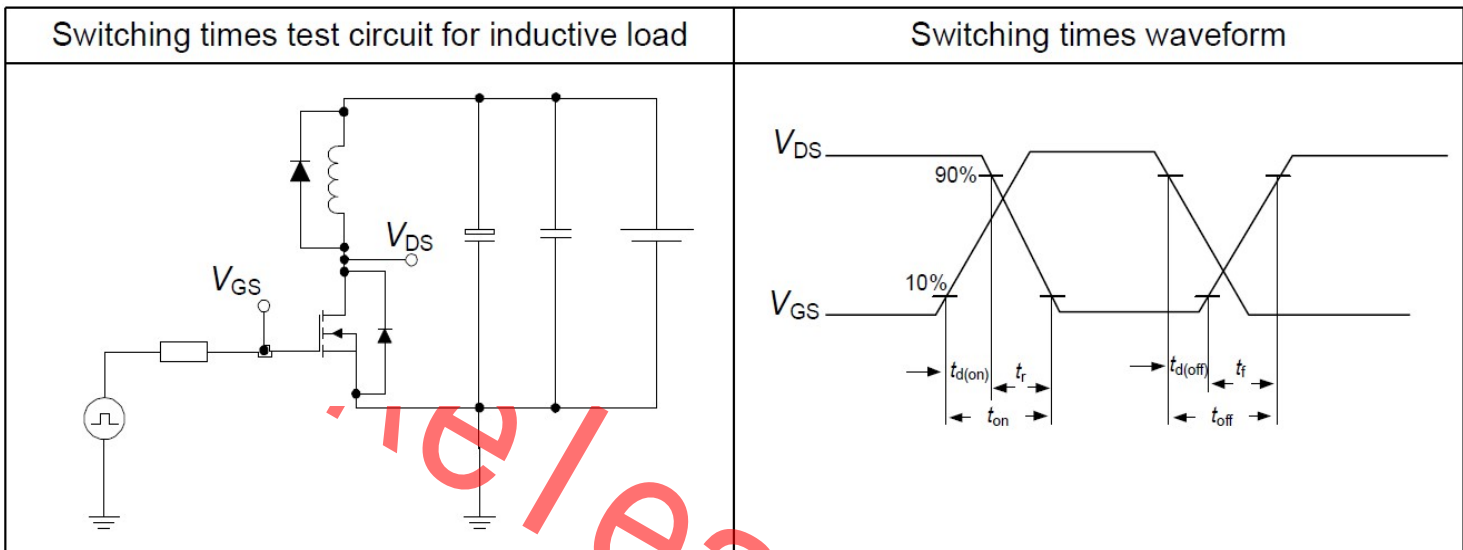
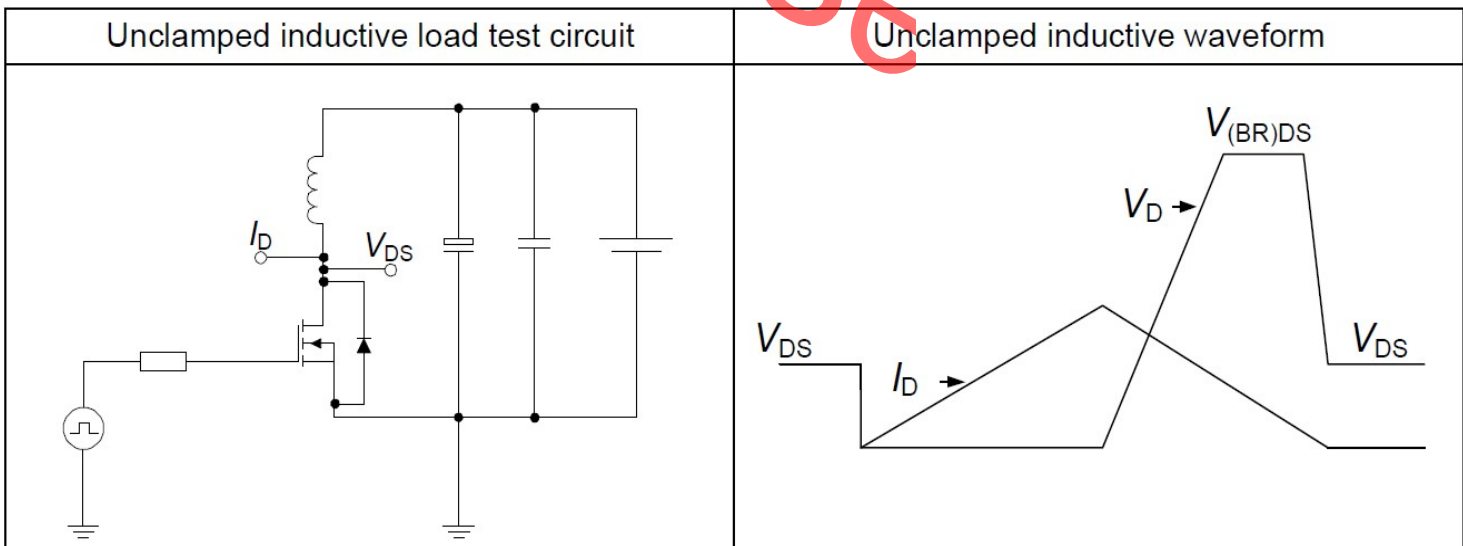


Table10 Unclamped inductiveload



6 PackageOutlines

TO-220F

单位: mm

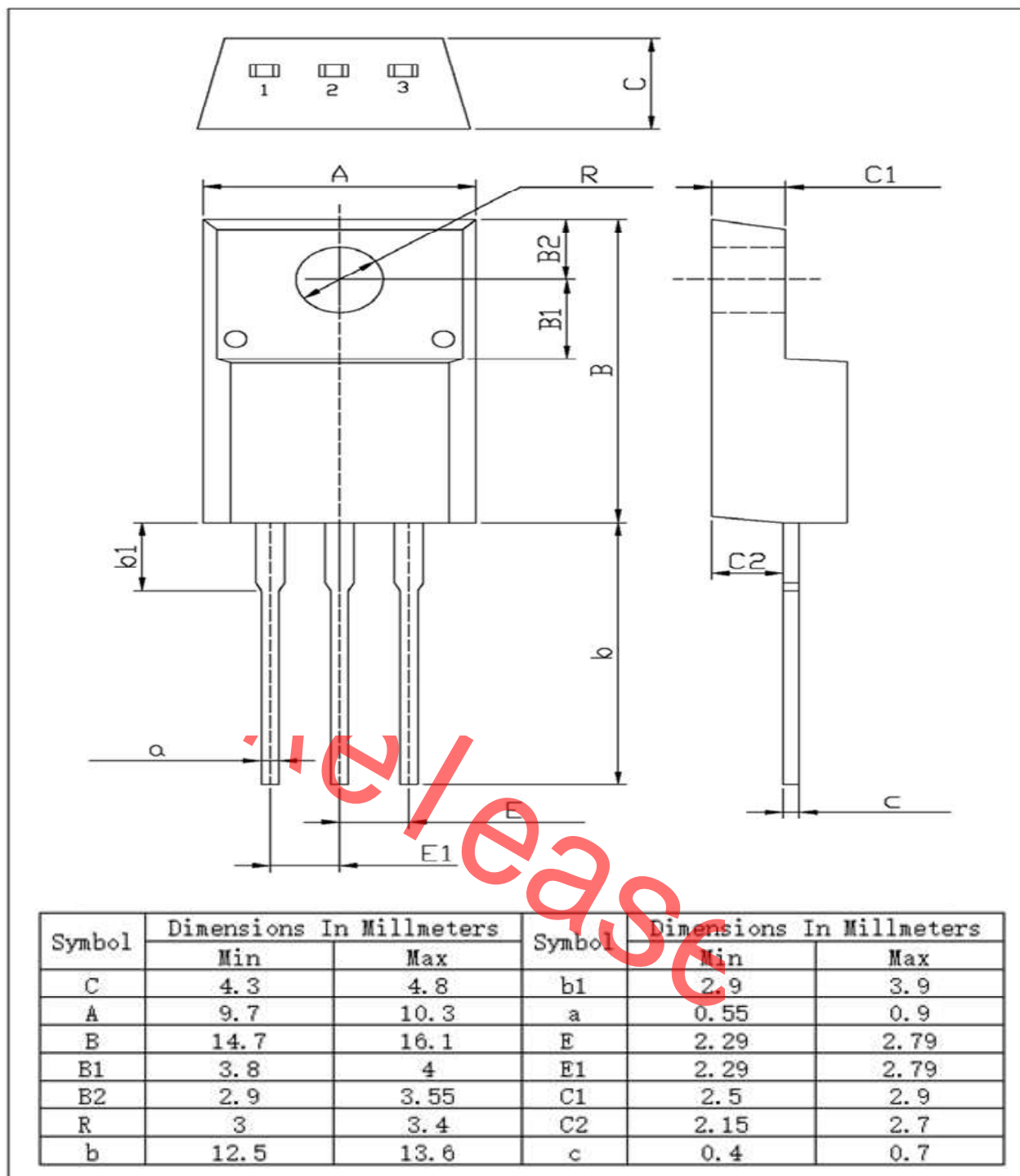
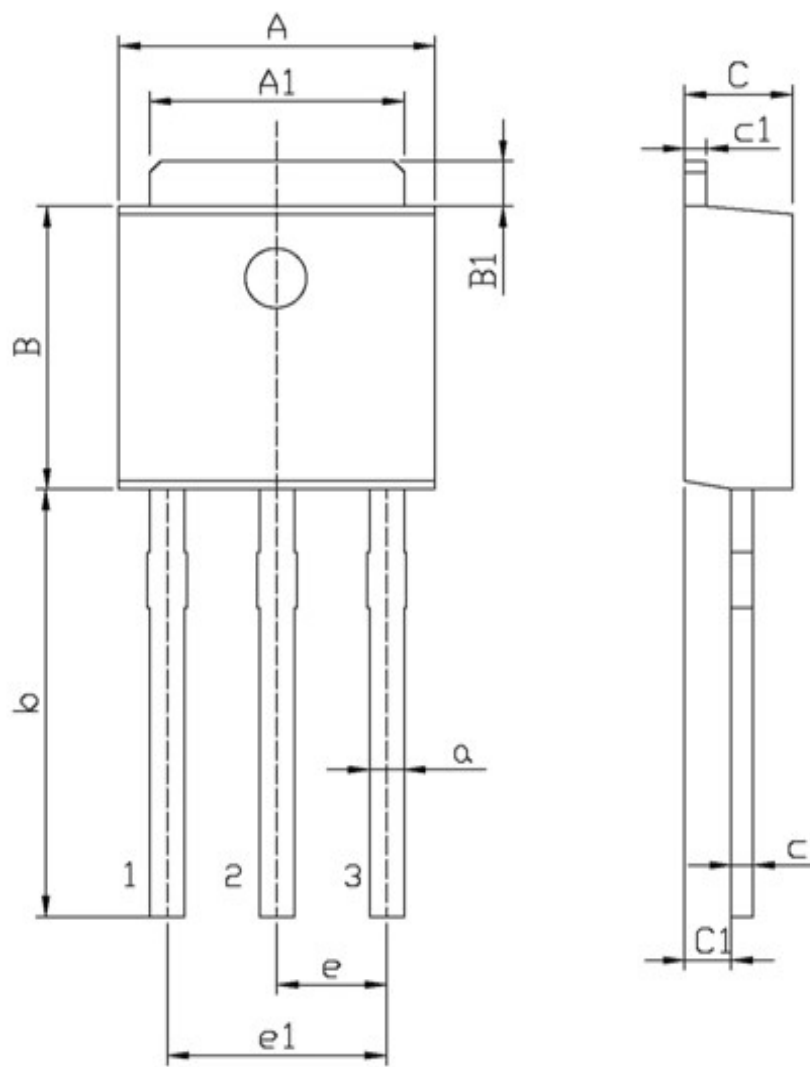


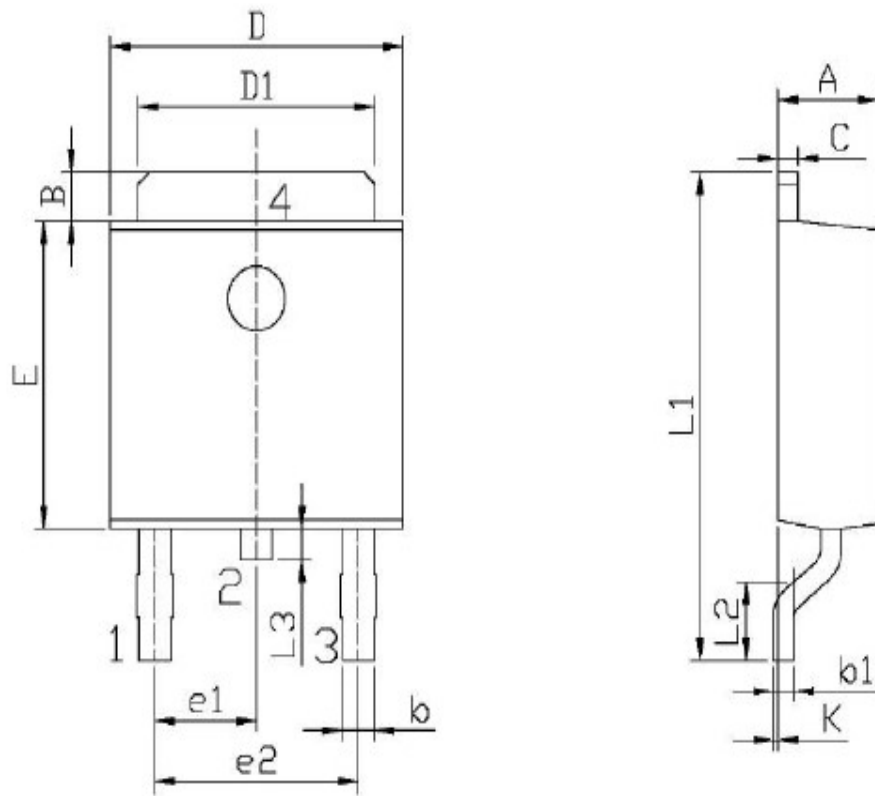
Figure1: Outline PG-T0220F



单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	6.45	6.75	a	0.50	0.70
A1	5.10	5.50	b	9.00	9.40
B	5.95	6.25	c	0.45	0.55
B1	0.95	1.25	c1	0.45	0.55
C	2.20	2.40	e	2.24	2.34
C1	0.95	1.15	e1	4.43	4.73

Figure2: OutlinePG-T0251



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

Figure3: OutlinePG-T0252

Revision History

Revision	Date	Subjects (major changes since last revision)
0.1	2019-04-16	Preliminary version
1.0	2019-11-07	Fine tune outline and add Crss test data.etc
1.1	2020-04-05	Add Electrical characteristics Curve
1.2	2020-04-29	1. Add avalanche energy test condition, avalanche current data and test condition. Update Rg data 2. Add TO251 and TO252 Package, Maximum ratings, Thermal characteristics data.

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