

MOSFET Silicon N-Channel MOS



1. Applications

Boost PFC switch, single-ended flyback or two-transistor forward, HB or AHB or LLC topologies.
For PC power, PD Adaptor, LCD & PDP TV, LED Lighting, Server power, UPS application.

2. Features

Low drain-source on-resistance: $R_{DS(ON)} = 0.257\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 2.8$ to 4.2 V

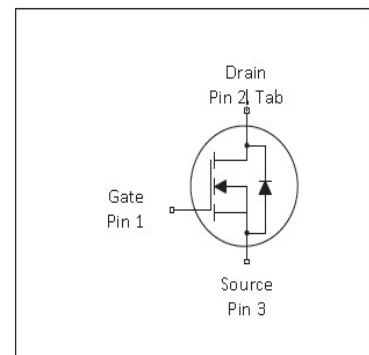
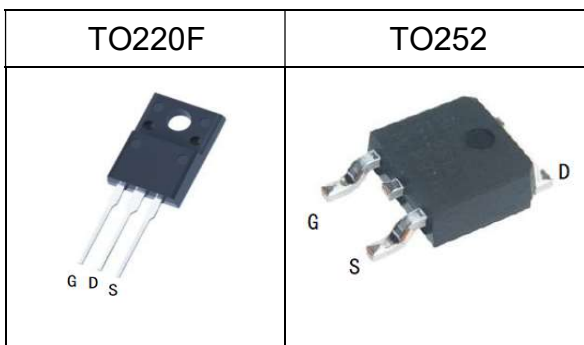


Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(on),max}$	280	m Ω
$Q_{g,typ}$	22.94	nC
$I_{D,pulse}$	45	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
ASA60R280E	TO220F	ASA60R280E
ASD60R280E	TO252	ASD60R280E



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		-	15	A	$T_C = 25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	45	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	405	mJ	
MOSFET dv/dt ruggedness	dv/dt	-	-	137	V/ns	$V_{DS} = 0 \dots 150\text{V}$
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}	-	-	32	W	$T_C = 25^\circ\text{C}$
Power dissipation (TO252)	P_{tot}	-	-	118	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/S	$V_{DS} = 0 \dots 400\text{V}$, $I_{SD} \leq 48\text{A}$, $T_j = 25^\circ\text{C}$ 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

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}	-	-	3.9	°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}	-	-	1.06	°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	$V_{(BR)DSS}$	605	-	-	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	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$, $T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30\text{V}$, $V_{DS}=0\text{V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.257	0.28	Ω	$V_{GS}=10\text{V}$, $I_D=7.5\text{A}$, $T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	R_G	-	5.3	-		$f=1\text{MHz}$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	1020	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Output capacitance	C_{oss}	-	108	-	pF	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=10\text{kHz}$
Reverse transfer capacitance	C_{rss}	-	5.11	-	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	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $R_G=10\ \Omega$; see table 9
Rise time	t_r	-	21.2	-	ns	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $R_G=10\ \Omega$; see table 9
Turn-off delay time	$t_{d(off)}$	-	32.4	-	ns	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $R_G=10\ \Omega$; see table 9
Fall time	t_f	-	20.8	-	ns	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $R_G=10\ \Omega$; see table 9

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	5.7	-	nC	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $V_{GS}=10\text{V}$
Gate to drain charge	Q_{gd}	-	17.2	-	nC	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $V_{GS}=10\text{V}$
Gate charge total	Q_g	-	22.94	-	nC	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $V_{GS}=10\text{V}$
Gate plateau voltage	V_{plateau}	-	5.4	-	V	$V_{DD}=400\text{V}$, $I_D=3.8\text{A}$, $V_{GS}=10\text{V}$

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.736	-	V	$V_{GS}=0V, I_F=1 A, T_j=25^{\circ}C$
Reverse recovery time	t_{rr}	-	216	-	ns	$V_R=400V, I_F=2A, di_F/dt=100A/\mu s$; see table 8
Reverse recovery charge	Q_{rr}	-	1.3	-	uC	$V_R=400V, I_F=2A, di_F/dt=100A/\mu s$; see table 8
Peak reverse recovery current	I_{rrm}	-	16.7	-	A	$V_R=400V, I_F=2A, di_F/dt=100A/\mu s$; see table 8

5 Test Circuits

Table 8 Diode characteristics

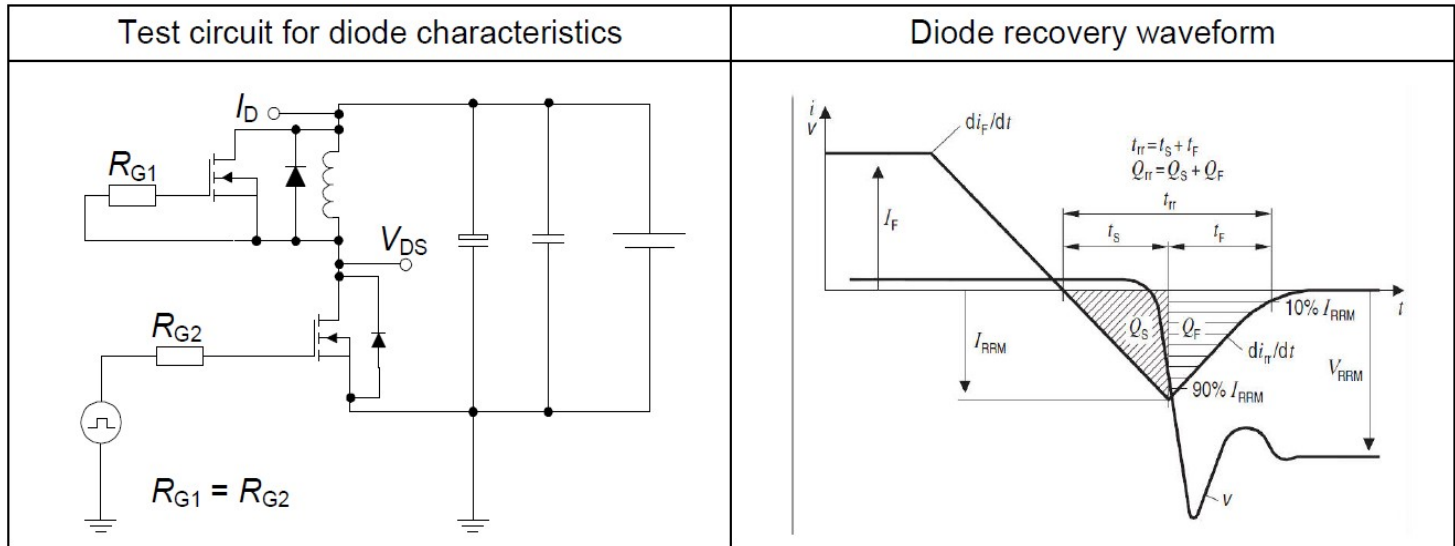


Table 9 Switching times

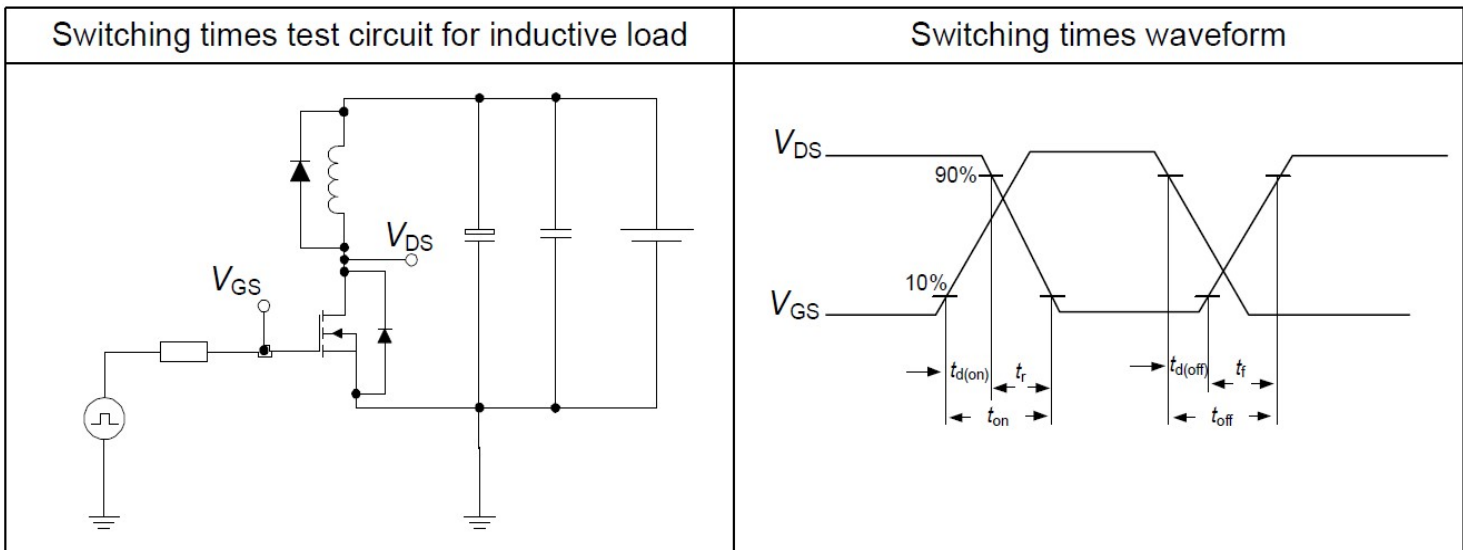
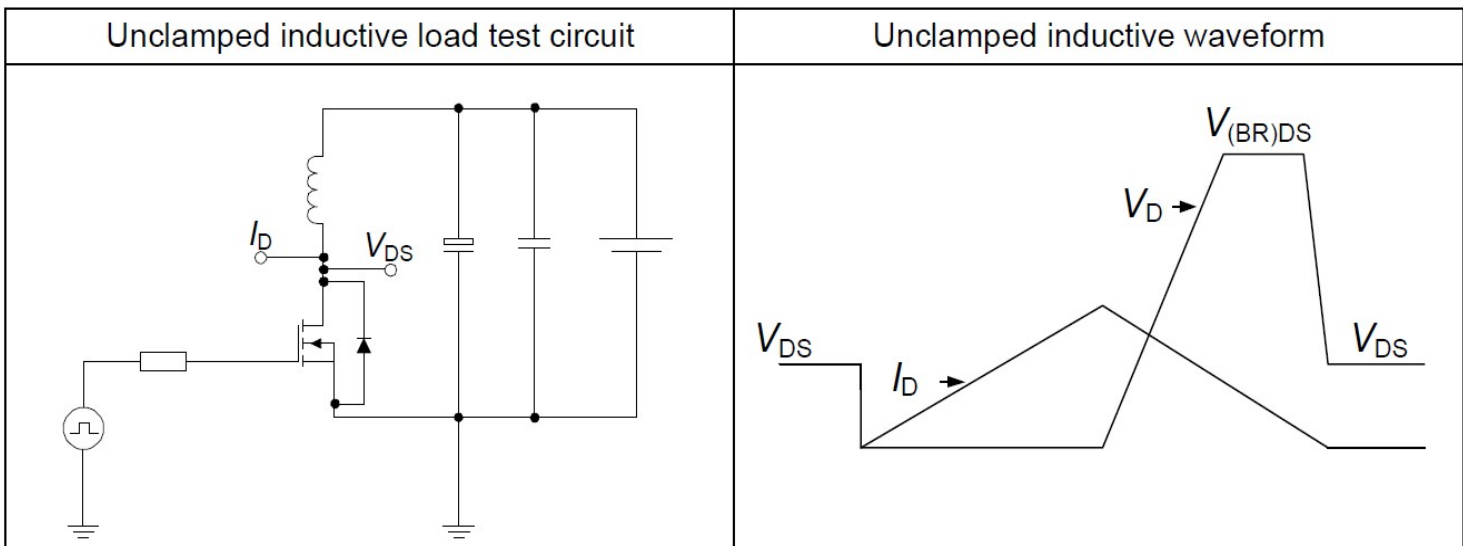


Table 10 Unclamped inductive load



6 Package Outlines

TO-220F

单位: mm

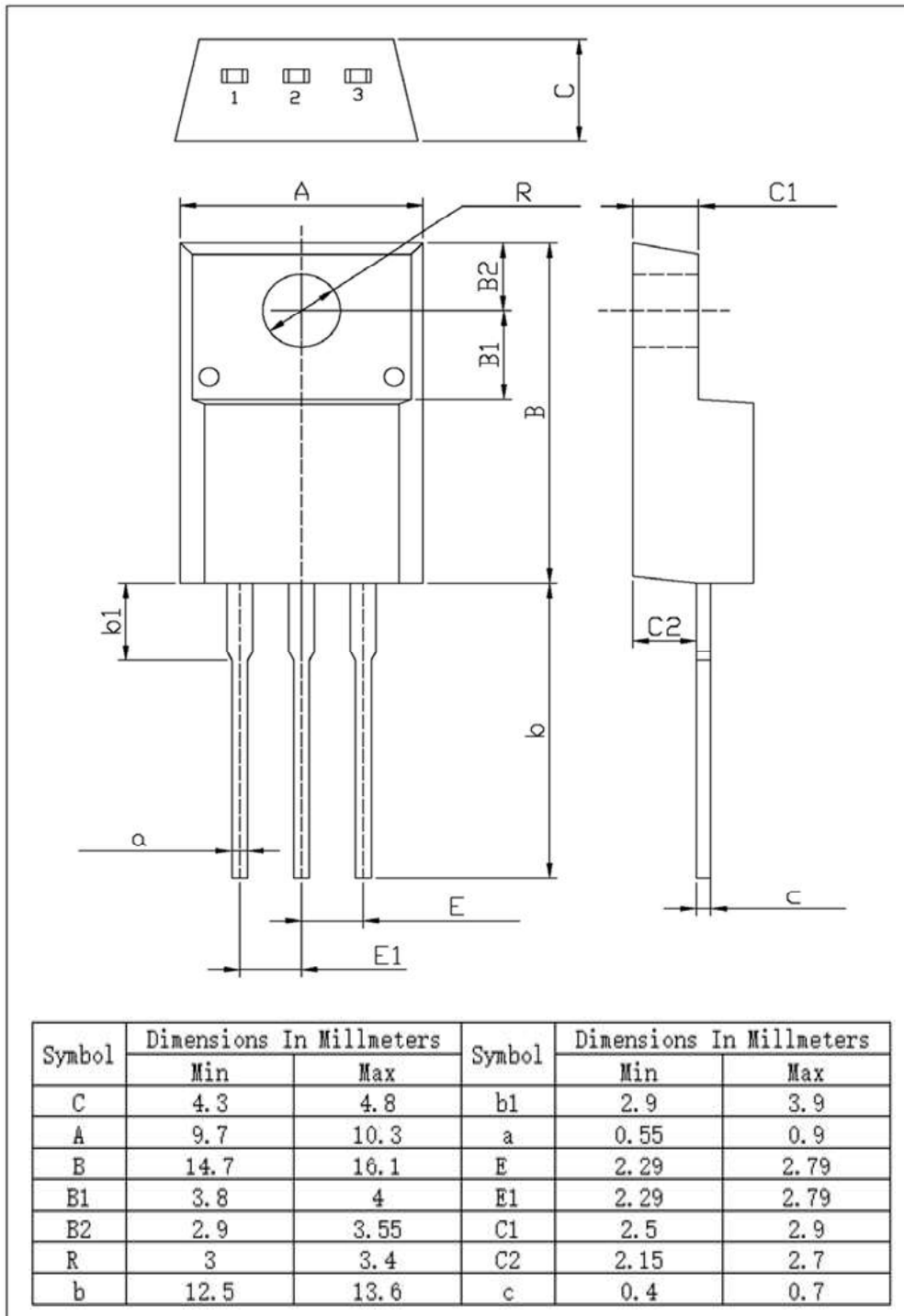
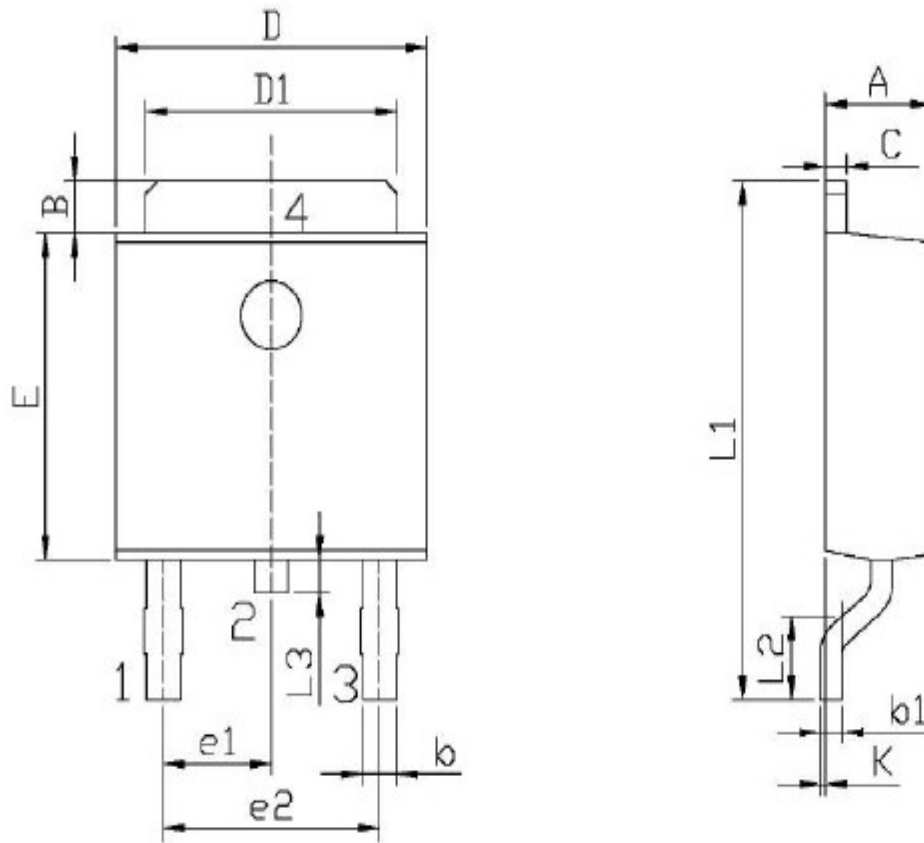


Figure1: Outline PG-TO220F



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

Figure2: Outline PG-T0252

Revision History

ASA60R280E

Revision	Date	Subjects (major changes since last revision)
1.0	2020-3-12	Release version