ASA60R150E, ASW60R150E, ASB60R150E

MOSFET Silicon N-Channel MOS

1. Applications

Boost PFC switch, single-ended flyback or two-transistor forward,
Half bridge or Asymmetric half bridge or Series resonance half bridge topologies.
PC power, Adaptor, LCD & PDP TV,LED Lighting, Server power,
Telecom power, and UPS Application.

2. Features

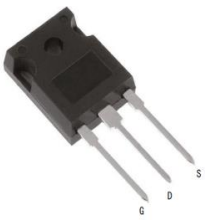
Low drain-source on-resistance: RDS(ON) = 0.120Ω (typ.)
Easy to control Gate switching
Enhancement mode: Vth = 2.8 to 4.2 V

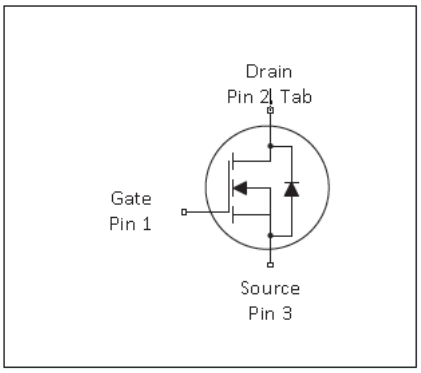
Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	650	V
$R_{DS(on),max}$	150	mΩ
$Q_{g,typ}$	47.6	nC
$I_{D,pulse}$	84	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
ASA60R150E	TO220F	ASA60R150E
ASW60R150E	TO247	ASW60R150E
ASB60R150E	TO263	ASB60R150E

TO220F	TO263	TO247
		



1 Maximum ratings

at T_j = 25°C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1)]	I_D		-	28	A	T_C=25°C
Pulsed drain current[2)]	$I_{D,pulse}$	-	-	84	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	605	mJ	Tc=25℃,VDD=50V,L=10mH, RG=25Ω
Avalanche current, single pulse	I_{AR}	-	-	11	A	Tc=25℃,VDD=50V,L=10mH, RG=25Ω
MOSFET dv/dt ruggedness	dv/dt	-	-	130	V/ns	V_{DS}=0...400V
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC (f>1 Hz)
Power dissipation (TO220F)	P_{tot}	-	-	34	W	T_C=25°C
Power dissipation (TO247&263)	P_{tot}	-	-	195	W	T_C=25°C
Storage temperature	T_{stg}	-55	-	150	°C	
Operating junction temperature	T_j	-55	-	150	°C	
Soldering Temperature Distance of 1.6mm from case for 10s	T_L			260	°C	
Reverse diode dv/dt[3)]	dv/dt	-	-	15	V/ns	V_{DS}=0...400V, I_{SD}<=48A, T_j=25°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 (TO220F)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	3.65	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	80	°C/W	device on PCB, minimal footprint

Thermal characteristics (TO247&263)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.64	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

3 Electrical characteristics

at T_j=25°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}=0V, I_D=250uA
Gate threshold voltage	$V_{(GS)th}$	2.8		4.2	V	V_{DS}=V_{GS}, I_D=250uA
Zero gate voltage drain current	I_{DSS}	-	-	1	uA	V_{DS}=600V, V_{GS}=0V, T_j=25°C
Gate-source leakage current	I_{GSS}	-	-	100	nA	V_{GS}=30V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	-	0.12	0.15	Ω	V_{GS}=10V, I_D=10A, T_j=25°C
Gate resistance (Intrinsic)	R_G	-	5.8	-	Ω	f=1MHz, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	2389	-	pF	V_{GS}=0V, V_{DS}=50V, f=10kHz
Output capacitance	C_{oss}	-	218	-	pF	V_{GS}=0V, V_{DS}=50V, f=10kHz
Reverse transfer capacitance	C_{rss}	-	5.07	-	pF	V_{GS}=0V, V_{DS}=50V, f=10kHz
Turn-on delay time	$t_{d(on)}$	-	12.4	-	ns	V_{DD}=400V,V_{GS}=13V,I_D=11.3A, R_G=1.7Ω;see table 9
Rise time	t_r	-	21.6	-	ns	V_{DD}=400V,V_{GS}=13V,I_D=11.3A, R_G=1.7Ω;see table 9
Turn-off delay time	$t_{d(off)}$	-	50	-	ns	V_{DD}=400V,V_{GS}=13V,I_D=11.3A, R_G=1.7Ω;see table 9
Fall time	t_f	-	18.4	-	ns	V_{DD}=400V,V_{GS}=13V,I_D=11.3A, R_G=1.7Ω;see table 9

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	8.522	-	nC	V_{DD}=400V, I_D=11.3A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	8.297	-	nC	V_{DD}=400V, I_D=11.3A, V_{GS}=0 to 10V
Gate charge total	Q_g	-	47.59	-	nC	V_{DD}=400V, I_D=11.3A, V_{GS}=0 to 10V
Gate plateau voltage	$V_{plateau}$	-	5.4	-	V	V_{DD}=400V, I_D=11.3A, 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}	-	0.7	-	V	V_{GS}=0V, I_F=1A, T_j=25°C
Reverse recovery time	t_{rr}	-	288	-	ns	V_R=400V, I_F=11.3 A,di_F/dt=100A/µs; see table 8
Reverse recovery charge	Q_{rr}	-	4.3	-	uC	V_R=400V, I_F=11.3 A,di_F/dt=100A/µs; see table 8
Peak reverse recovery current	I_{rrm}	-	26.2	-	A	V_R=400V, I_F=11.3 A,di_F/dt=100A/µs; see table 8

4 Electrical characteristics diagram

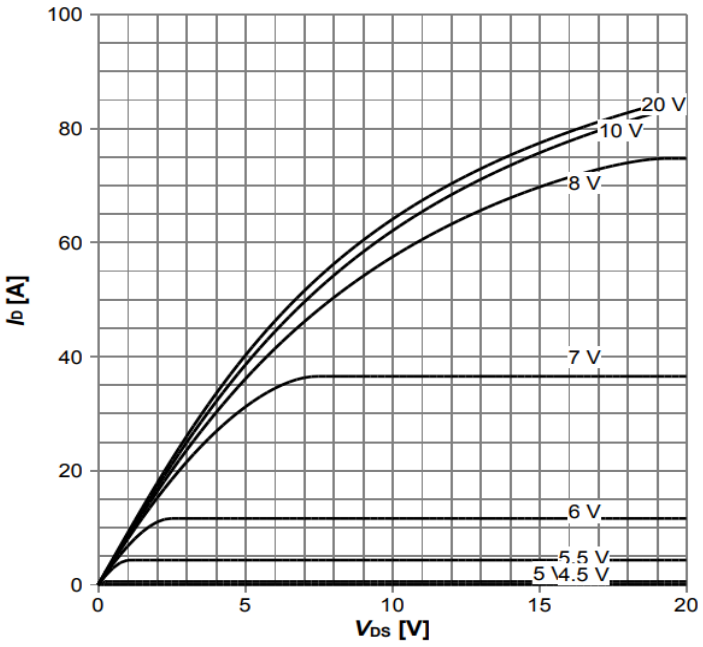
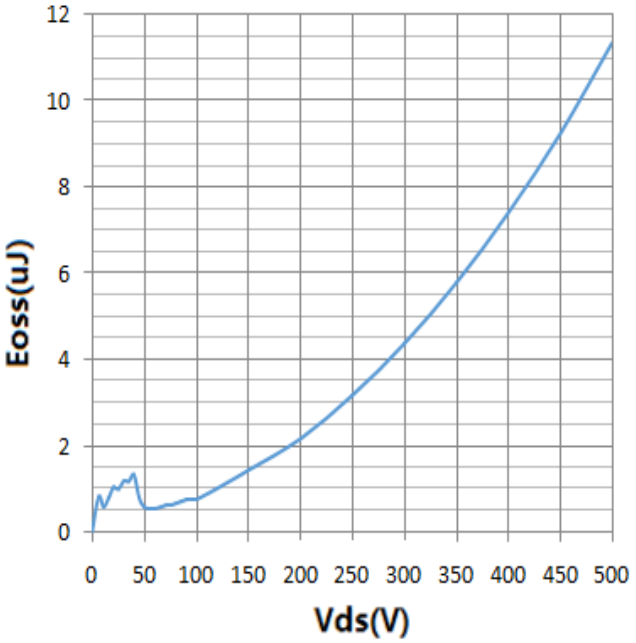
Diagram 1: Typ. output characteristics	Diagram 2: Typ. Coss stored energy
	
I_D=f(V_{DS});T_j=25 °C; parameter: V_{GS}	*Eoss=f(VDS)*

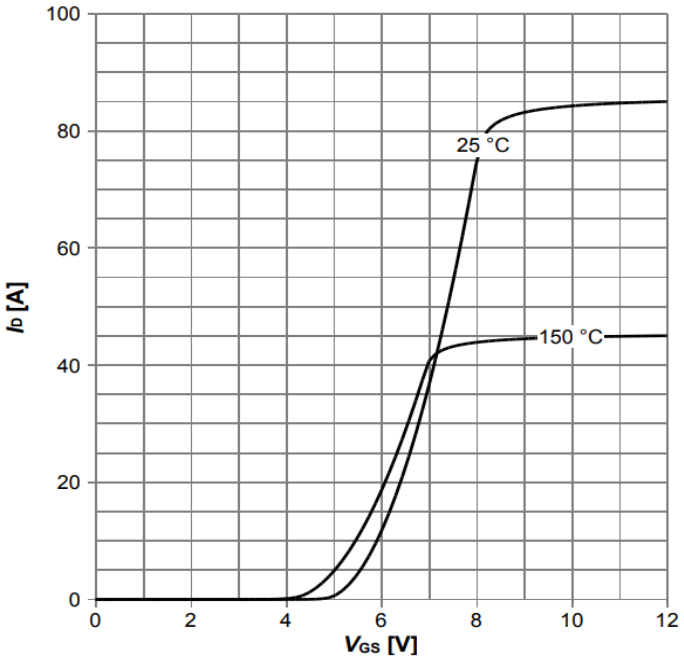
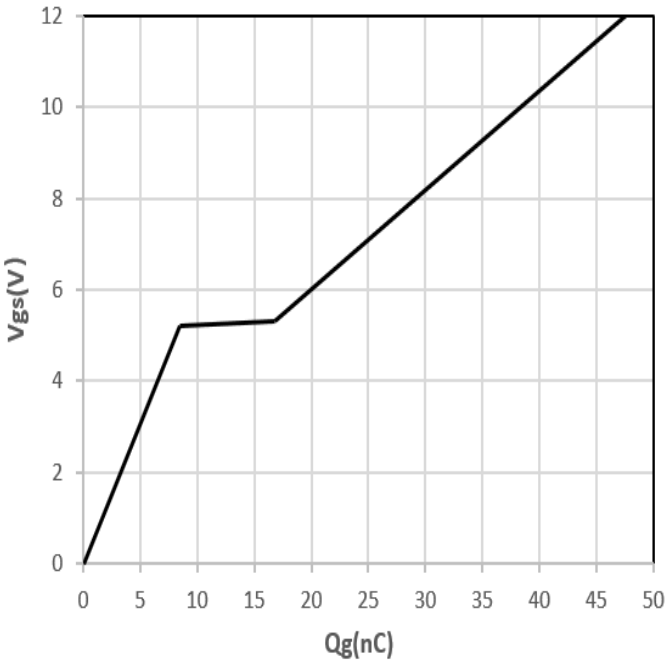
Diagram 3: Typ. transfer characteristics	Diagram 4: Typ. gate charge
	
I_D=f(V_{GS});parameter: T_j	V_{GS}=f(Q_{gate});I_D=11.3A pulsed; parameter: V_{DD}

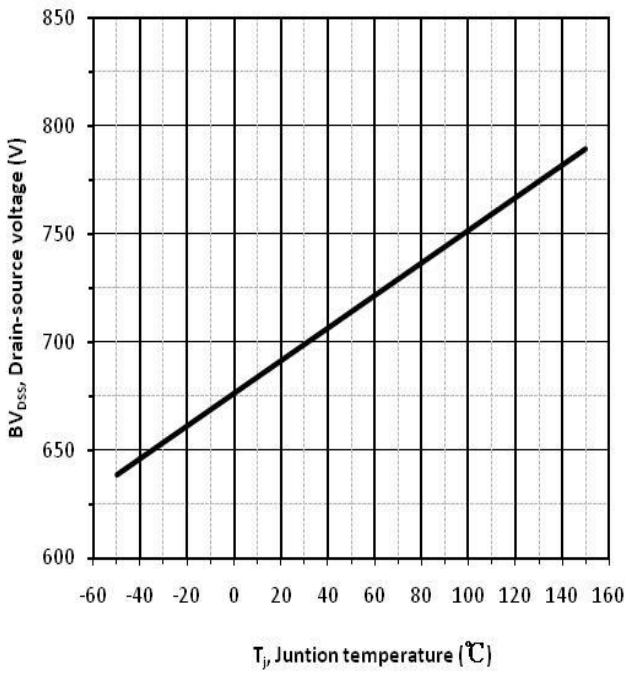
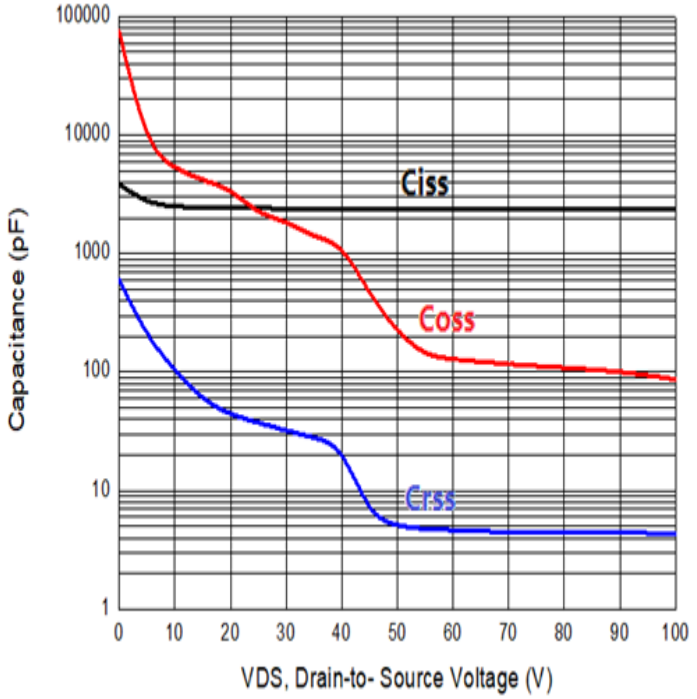
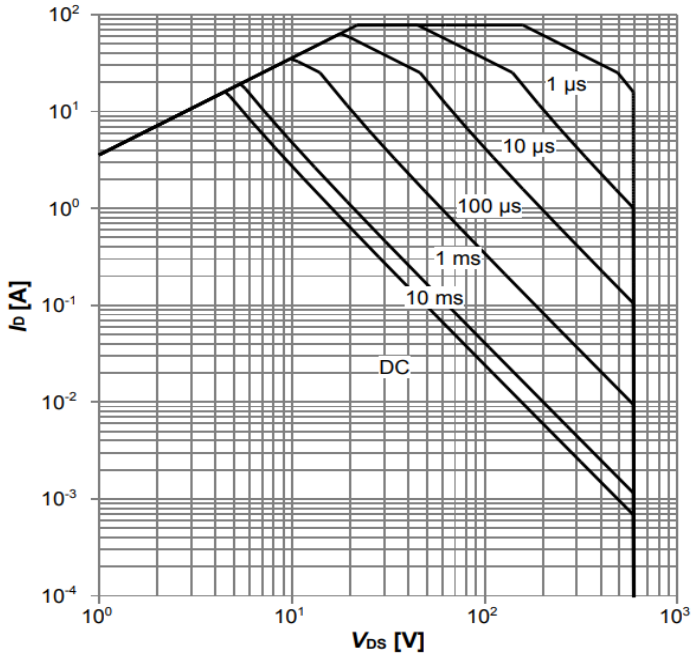
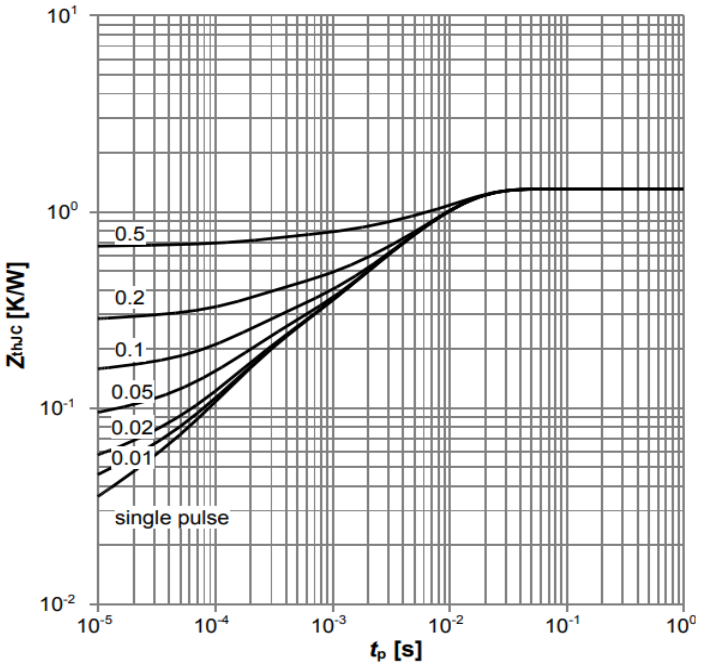
Diagram 5: Drain-source breakdown voltage	Diagram 6: Typ. capacitances
	
$V_{BR(DSS)}$=f(T_j);I_D=10mA	C=f(V_{DS});V_{GS}=0V; f=10 kHz

Diagram 7: Maximum Safe Operating Area	Diagram 8: Typ. Max. transient thermal impedance
	
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter tp	Z_{thJC} =f(t_P); parameter: D=t_p/T

5 Test Circuits

Table 8 Diode characteristics

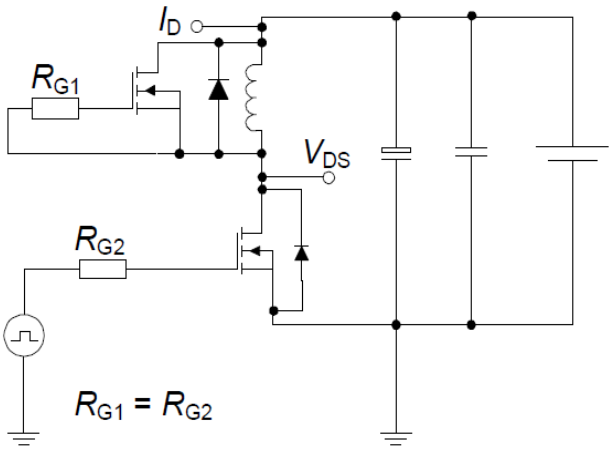
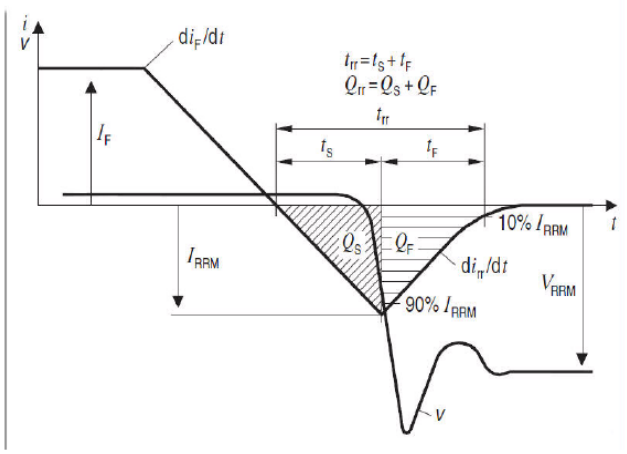
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switchingtimes

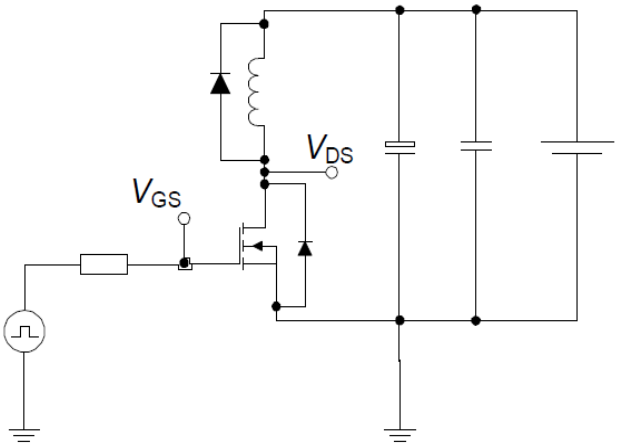
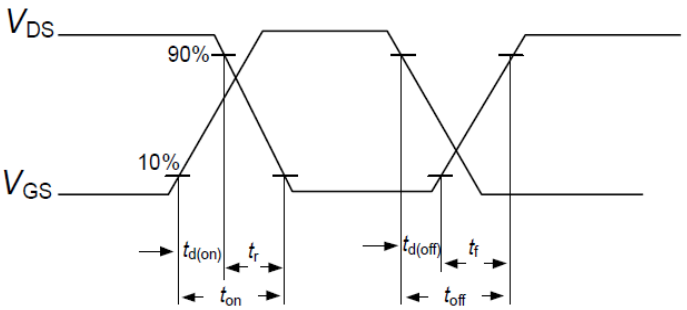
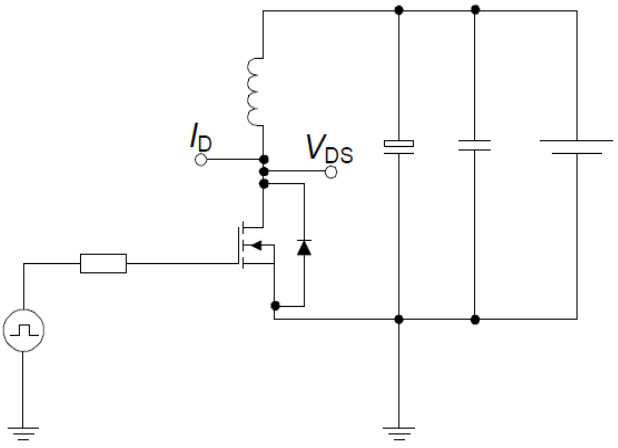
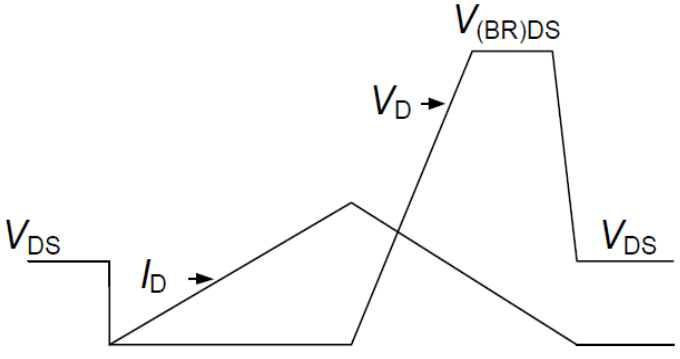
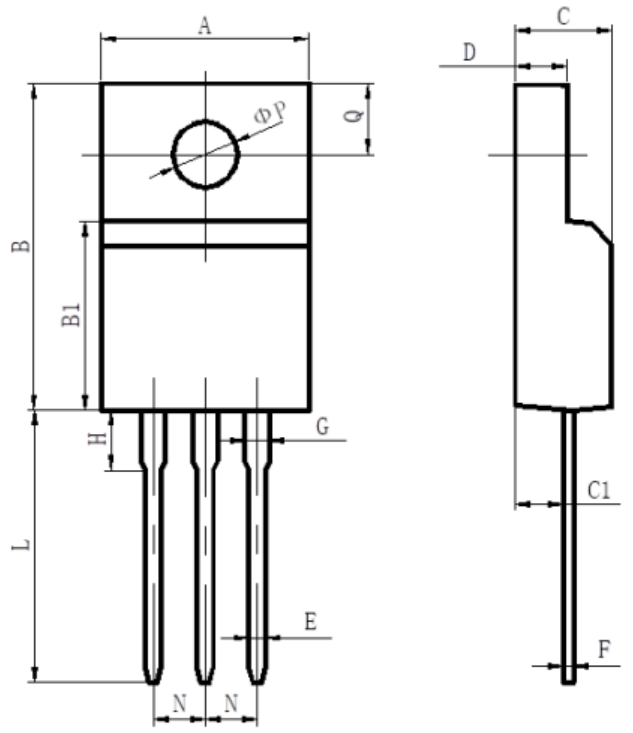
Switching times test circuit for inductive load	Switching times waveform
	

Table10 Unclamped inductive load

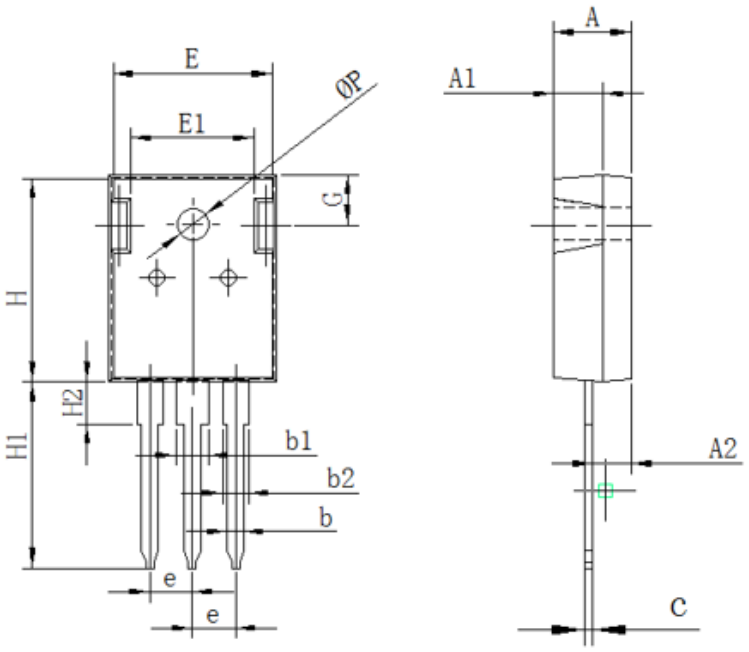
Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines



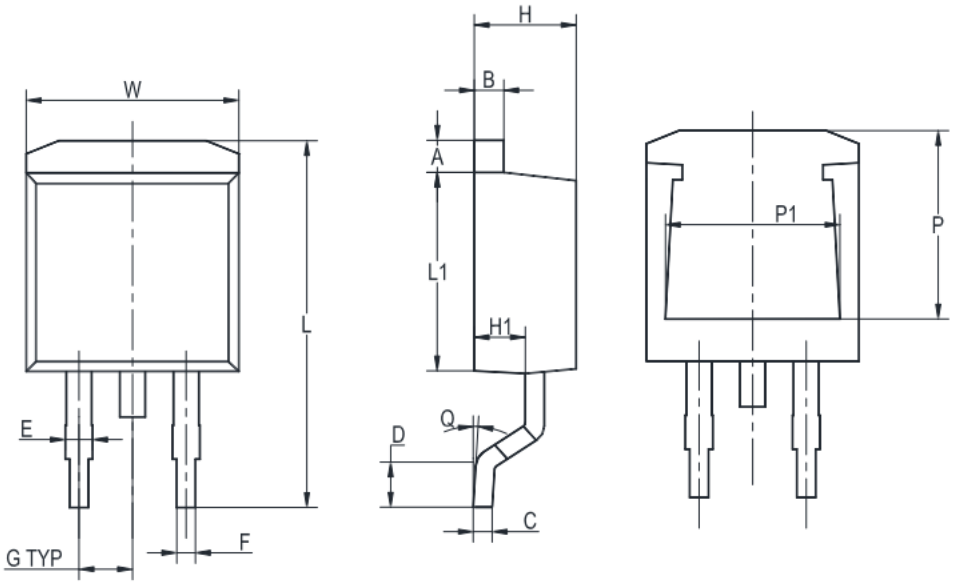
项目	规范(mm)	
	MIN	MAX
A	9.70	10.30
B	15.50	16.10
B1	8.99	9.39
C	4.40	4.80
C1	2.15	2.55
D	2.50	2.90
E	0.70	0.90
F	0.40	0.60
G	1.12	1.42
H	3.40	3.80
L	12.6	13.6
N	2.34	2.74
Q	3.15	3.55
ΦP	3.00	3.30

Figure1：Outline PG-TO220F(HT)



Symbol	单位 mm		
	Min	Nom	Max
A	4.8	5.00	5.20
A1	3.3	3.5	3.7
A2	2.20	2.40	2.60
b	1.00	1.2	1.40
b1	2.90	3.10	3.30
b2	1.90	2.10	2.30
c	0.50	0.60	0.70
e	5.25	5.45	5.65
E	15.2	15.7	16.2
E1	10.2	10.7	11.2
H	20.8	21	21.2
H1	19.5	20.0	20.5
H2	4.00	4.20	4.40
G	5.60	5.80	600
ΦP	3.50	3.70	3.90

Figure2：Outline PG-TO247(CD)



UNIT	A	B	C	D	E	F	G	W	H	H1	L	L1	Q	P	P1
mm	1.5	1.5	0.5	2.60	1.6	0.94	2.54 TYP	10.5	4.8	2.9	16.5	8.7	8° MAX	7.6	8.2
	1.1	1.1	0.3	2.15	1.1	0.68		9.6	4.4	2.5	14.5	8.2		7.1	7.4

Figure3：Outline PG-TO263(HC)

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2019-04-16	Preliminary version
2.0	2020-03-19	Add part name ”ASW60R150E” and Add Electrical characteristics Curve
2.1	2020-04-18	Add avalanche energy test condition, avalanche current data and test condition
2.2	2022-06-18	Updated TO220F POD to HT and TO247 POD to CD
2.3	2023-12-13	Added TO263 package