MOSFET Silicon N-Channel MOS

1. Applications

Synchronous rectification in SMPS,
Hard switching and High speed circuit
DC/DC in telecoms and industrial

2. Features

Low drain-source on-resistance:
TO220 RDS(ON) = 4.3mΩ (typ.)
TO263 RDS(ON) = 4.2mΩ (typ.)
High speed power switching
Enhanced body diode dv/dt capability
Enhanced avalanche ruggedness

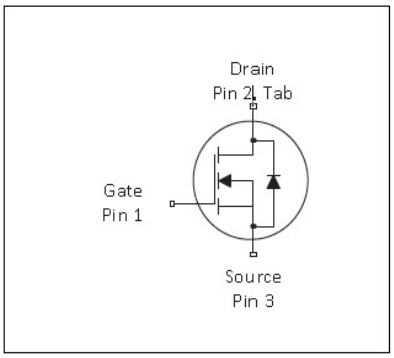
Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	100	V
$R_{DS(on),max}$	4.9	mΩ
$Q_{g,typ}$	60.7	nC
$I_{D,pulse}$	408	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
AUP049N10	TO220	AUP049N10
AUB049N10	TO263	AUB049N10

TO263	TO220
	



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		-	136	A	T_C=25°C
Continuous drain current[1)]	I_D			101	A	T_C=100°C
Pulsed drain current[2)]	$I_{D,pulse}$	-		408	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	282	mJ	Tc=25°C,VDD=50V,Id=33.6A, L=0.5Mh, RG=25Ω
Avalanche current, single pulse	I_{AR}	-	-	33.6	A	Tc=25°C, VDD=50V, L=0.5Mh, RG=25Ω
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Power dissipation (TO263,TO220)	P_{tot}	-	-	161	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	

[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 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.78	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

3 Electrical characteristics

atT_j=25°C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	V_{GS}=0V, I_D=250Ua
Gate threshold voltage	$V_{(GS)th}$	2.5		4.5	V	V_{DS}=V_{GS}, I_D=250Ua
Zero gate voltage drain current	I_{DSS}	-	-	1	Ua	V_{DS}=100V, V_{GS}=0V, T_j=25°C
Gate-source leakage current	I_{GSS}	-	-	100	Na	V_{GS}=20V, V_{DS}=0V
Drain-source on-state resistance(TO220)	$R_{DS(on)}$	-	4.3	4.9	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
Drain-source on-state resistance(TO263)	$R_{DS(on)}$	-	4.2	4.9	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
Gate resistance (Intrinsic)	R_G	-	1.5	-	Ω	f=1MHz, open drain
Transconductance	GFS	-	53	-	S	VDS=5V IDS=20A

Table 5 Dynamic characteristics(by calculating)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	3864	-	Pf	V_{GS}=0V, V_{DS}=50V, f=1MHz
Output capacitance	C_{oss}	-	379	-	Pf	V_{GS}=0V, V_{DS}=50V, f=1MHz
Reverse transfer capacitance	C_{rss}	-	15.3	-	Pf	V_{GS}=0V, V_{DS}=50V, f=1MHz
Turn-on delay time	$t_{d(on)}$	-	30.5	-	ns	V_{DD}=50V,V_{GS}=10V,I_D=20A, R_G=10Ω
Rise time	t_r	-	57	-	ns	V_{DD}=50V,V_{GS}=10V,I_D=20A, R_G=10Ω
Turn-off delay time	$t_{d(off)}$	-	72	-	ns	V_{DD}=50V,V_{GS}=10V,I_D=20A, R_G=10Ω
Fall time	t_f	-	45	-	ns	V_{DD}=50V,V_{GS}=10V,I_D=20A, R_G=10Ω

Table 6 Gate charge characteristics(by calculating)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	16.2	-	Nc	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	18.5	-	Nc	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V
Gate charge total	Q_g	-	63.7	-	Nc	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V

Table 7 Reverse diode characteristics (by calculating)

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}	-	47	-	ns	V_R=30V, I_F=20A, di_F/dt=300A/μs
Reverse recovery charge	Q_{rr}	-	221	-	Nc	V_R=30V, I_F=20A, di_F/dt=300A/μs
Peak reverse recovery current	I_{rrm}	-	8.8	-	A	V_R=30V, I_F=20A, di_F/dt=300A/μs

4 Electrical characteristics diagram

Diagram 1: Typ. Output characteristics

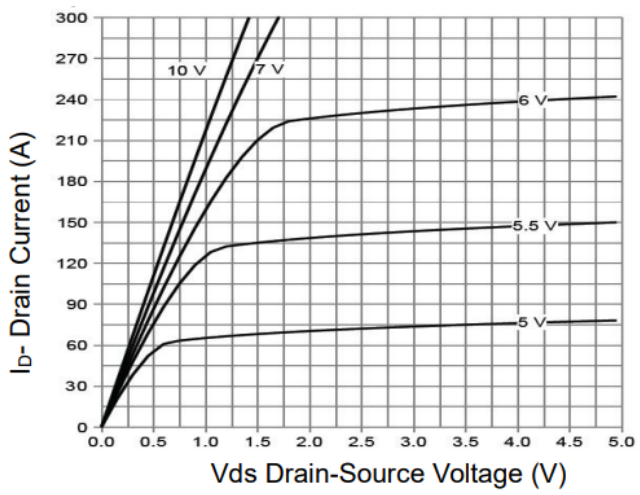


Diagram 2: Typ. Transfer characteristics

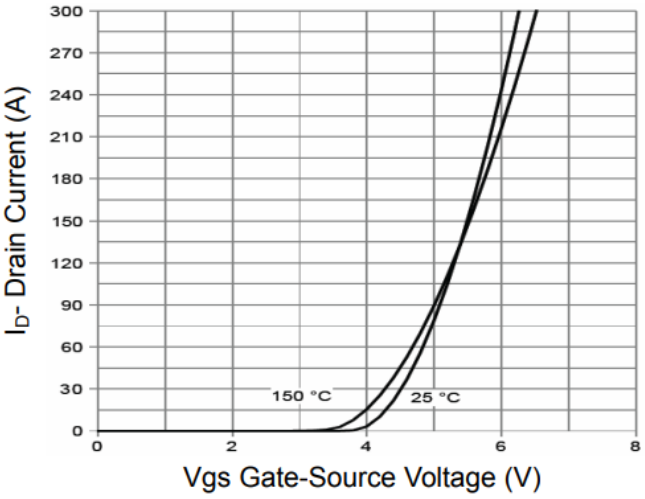


Diagram 3: Typ. Rdson vs. Drain Current

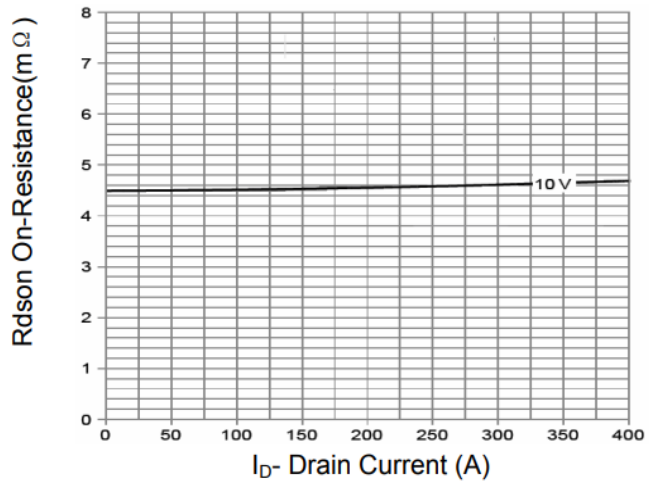


Diagram 4: Typ. Rdson – Junction Temperature

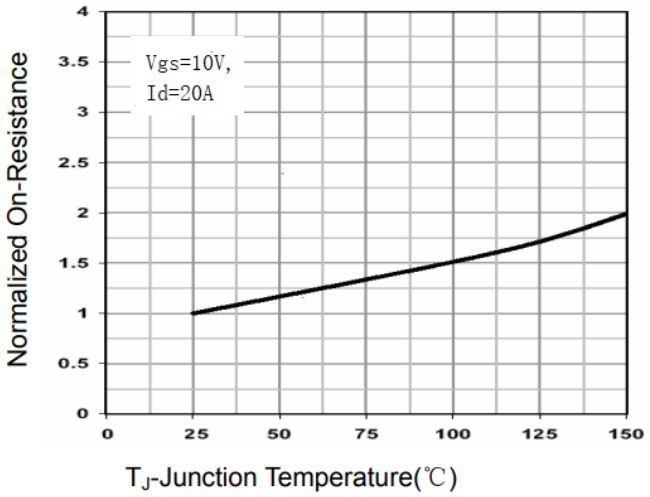


Diagram 5: Typ. Body-Diode Characteristics

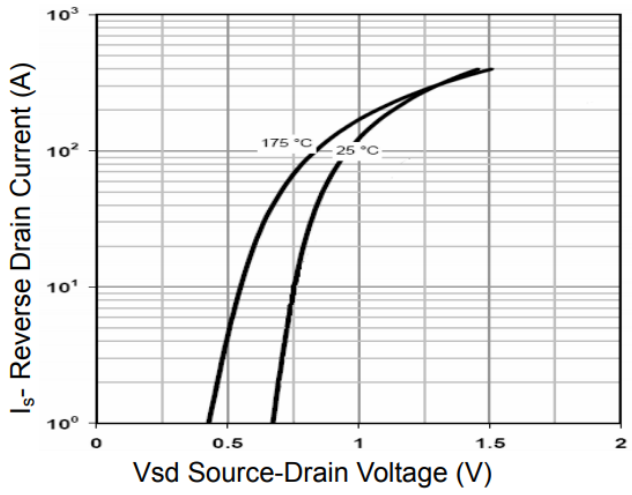


Diagram 6: Typ. Capacitance vs. Vds

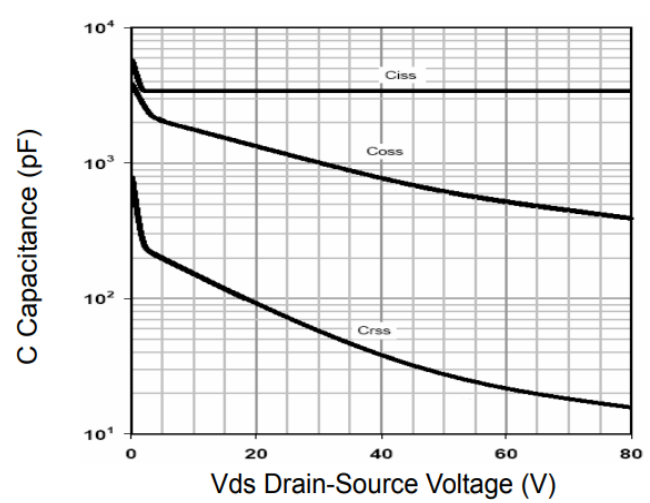


Diagram 7: Typ. Power Dissipation

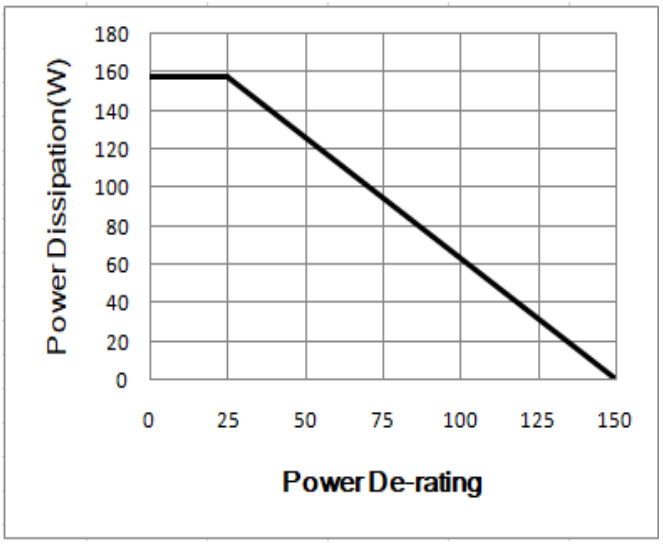


Diagram 8: Typ. Drain Current De-rating

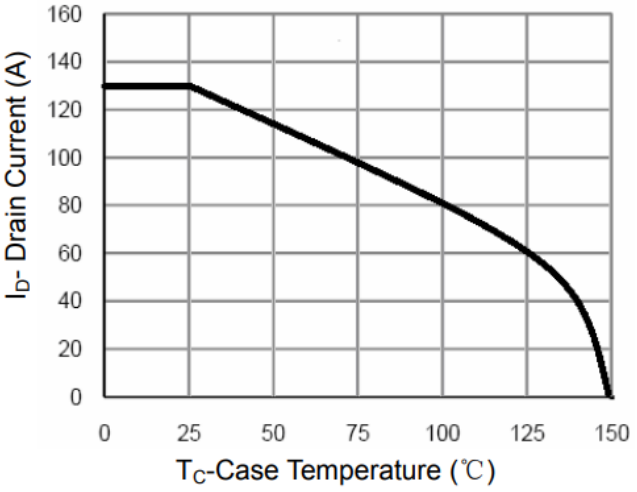


Diagram 9: Typ. Gate charge

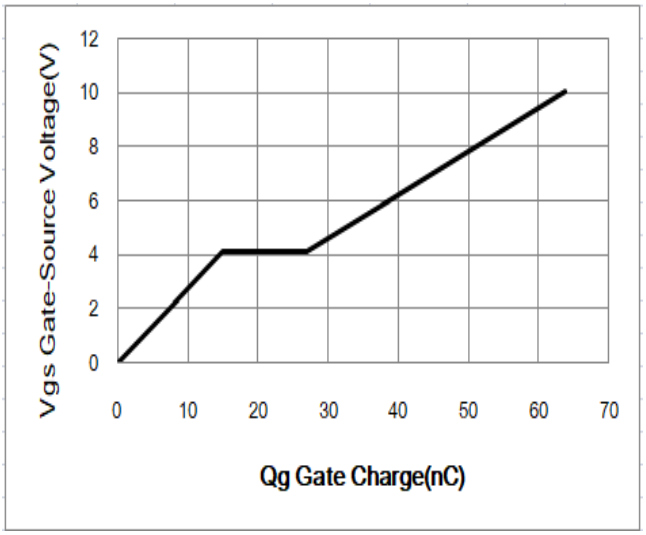
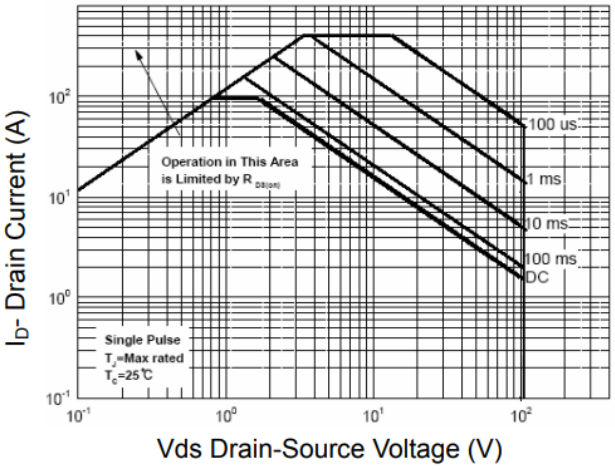


Diagram 10: Typ. Maximum Safe Operating Area



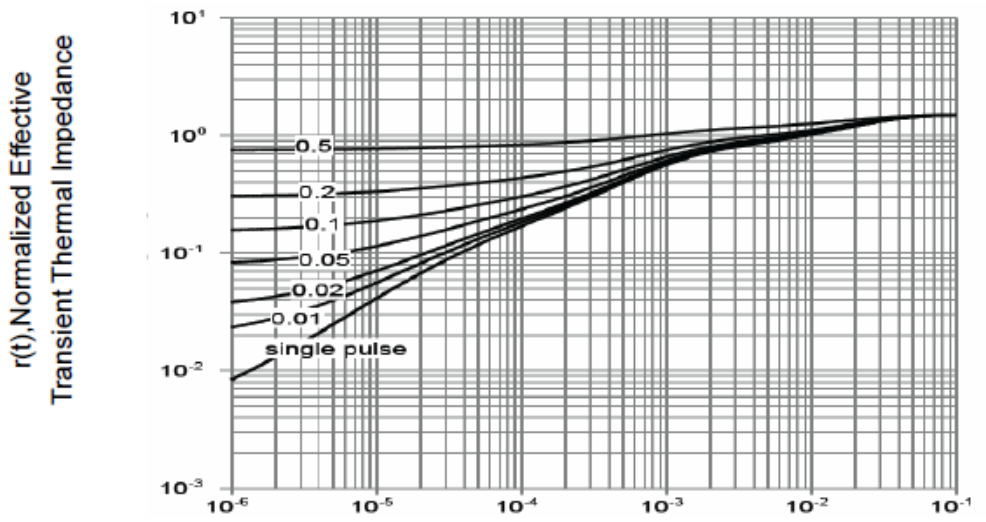


Figure 11 Normalized Maximum Transient Thermal Impedance

5 Test Circuits

Table 8 Diode characteristics

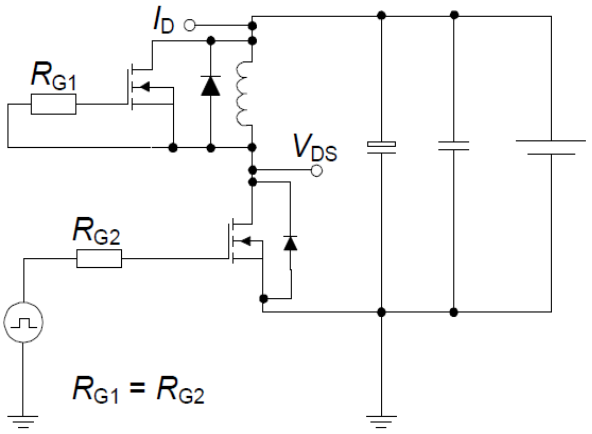
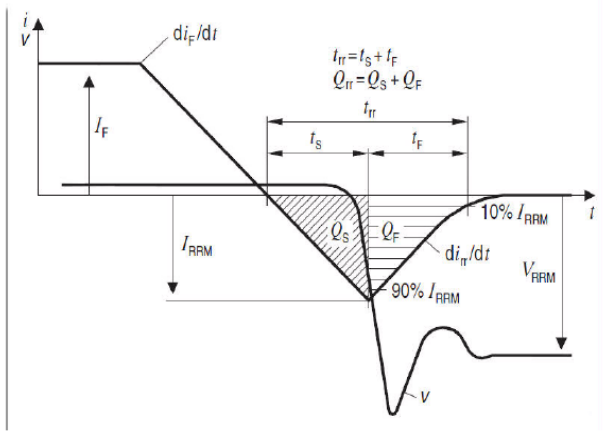
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times

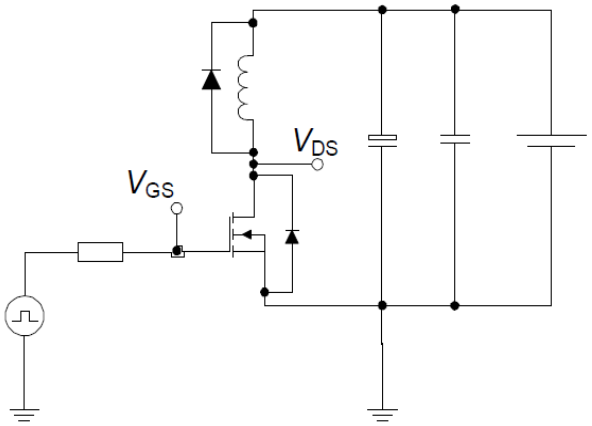
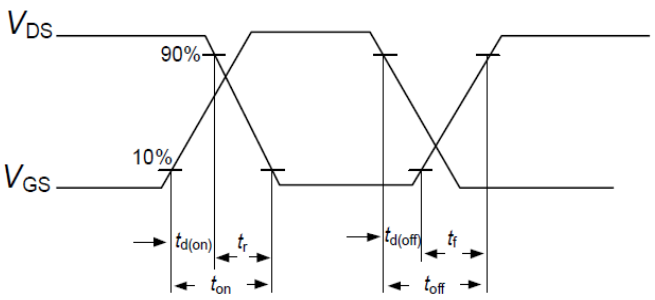
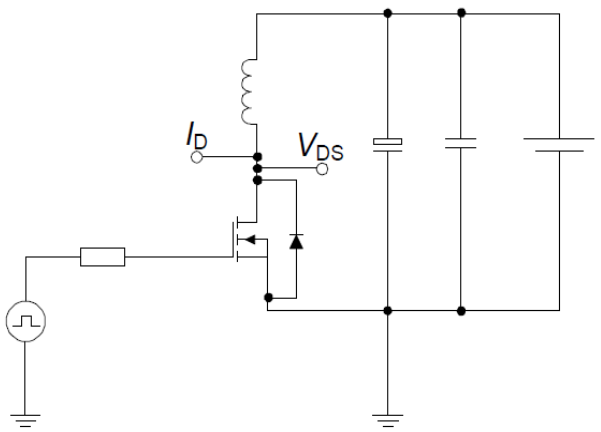
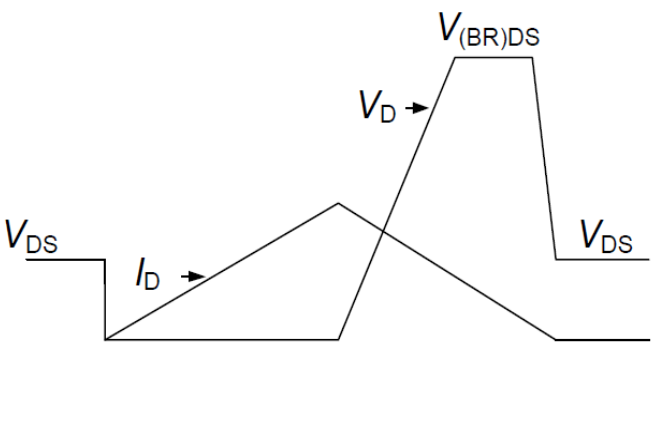
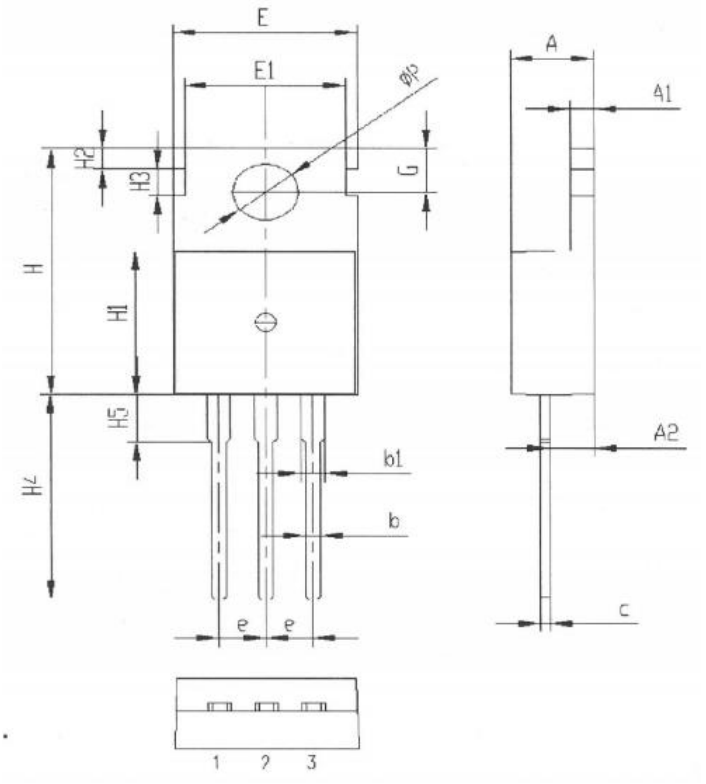
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load

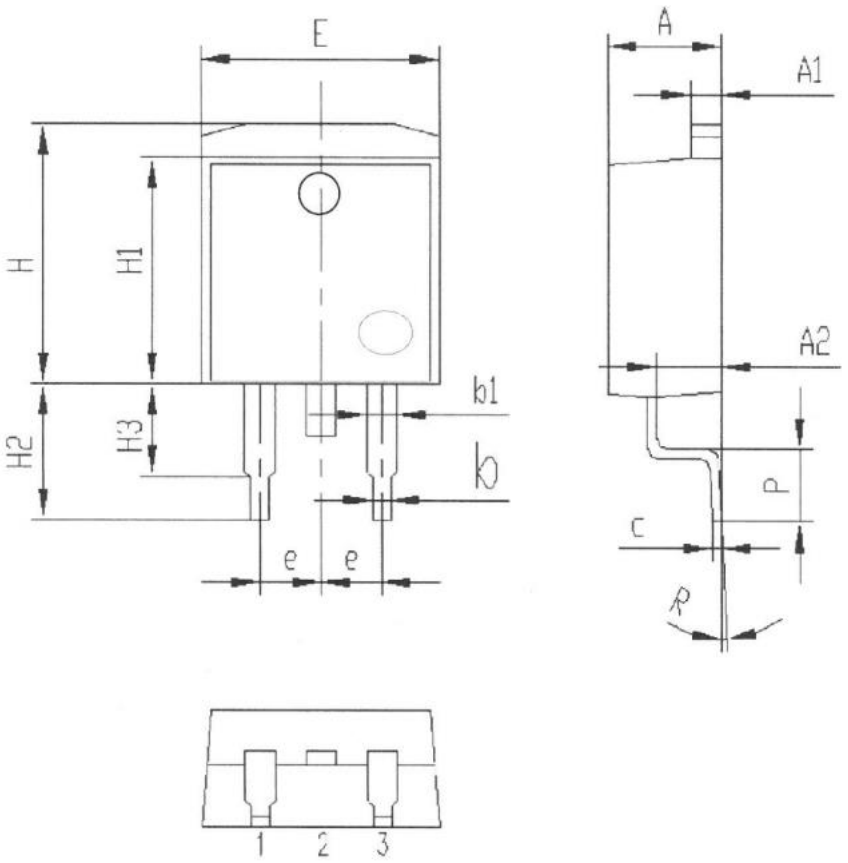
Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines



Symbol	单位 mm		
	min	Nom	max
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.50	2.82
b	0.60	0.80	1.00
b1	1.20	1.30	1.40
c	0.40	0.50	0.60
e	2.44	2.54	2.64
E	9.80	10.00	10.20
E1	8.50	8.70	8.90
H	15.40	15.70	15.90
H1	9.00	9.20	9.40
H2	1.10	1.34	1.50
H3	1.50	1.70	1.90
H4	12.90	13.30	13.70
H5	2.80	3.00	3.20
G	2.60	2.80	3.00
ΦP	3.40	3.60	3.88

Figure-1： Outline PG-TO220(CD&HT)



Symbol	单位 mm		
	Min	Nom	Max
A	4.40	4.6	4.80
A1	1.17	1.27	1.37
A2	2.40	2.6	2.80
b	0.60	0.8	1.00
b1	1.05	1.25	1.45
c	0.28	0.38	0.48
e	2.34	2.54	2.74
E	9.9	10.1	10.3
H	9.90	10.1	10.3
H1	8.50	8.7	8.90
H2	4.80	5.00	5.20
H3	2.60	2.8	3.00
R	0°	3°	6°
P	2.40	2.70	3.00

Figure-2： Outline PG-TO263(CD)

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2022-10-20	Preliminary version
1.1	2022-11-21	Added TO263 package