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

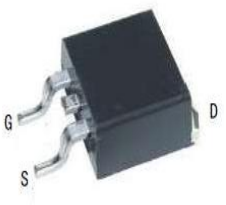
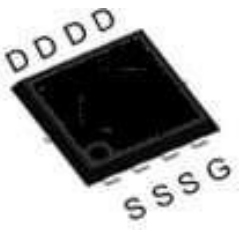
Low drain-source on-resistance:
DFN5X6 RDS(ON) = 4.6mΩ (typ.)
TO263 RDS(ON) = 4.8mΩ (typ.)
TO220 RDS(ON) = 4.8mΩ (typ.)
High speed power switching
Enhanced body diode dv/dt capability
Enhanced avalanche ruggedness

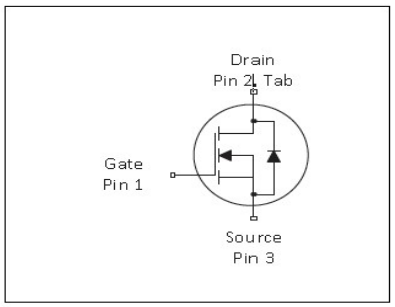
Table 1 Key Performance Parameters

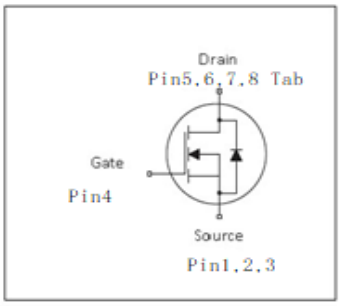
Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	100	V
DFN5X6 $R_{DS(on),max}$	5.3	mΩ
TO263 $R_{DS(on),max}$	5.6	mΩ
TO220 $R_{DS(on),max}$	5.6	mΩ
$Q_{g,typ}$	60.7	nC
$I_{D,pulse}$	399	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
AUN053N10	DFN5x6	AUN053N10
AUB056N10	TO263	AUB056N10
AUP056N10	TO220	AUP056N10

TO263	TO220	DFN5x6
		





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)]	$I_{D,pulse}$	-		399	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 (DFN5x6)	P_{tot}	-	-	151	W	T_C=25°C
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 (TO263&TO220)

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

Table Thermal characteristics (DFN5X6)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.85	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	50	°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}=95V, 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(DFN5X6)	$R_{DS(on)}$	-	4.6	5.3	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
Drain-source on-state resistance(TO263,TO220)	$R_{DS(on)}$	-	4.8	5.6	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

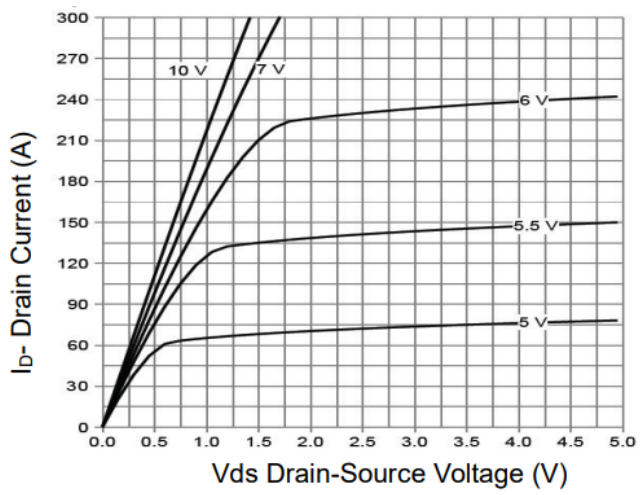


Diagram 2: Typ. transfer characteristics

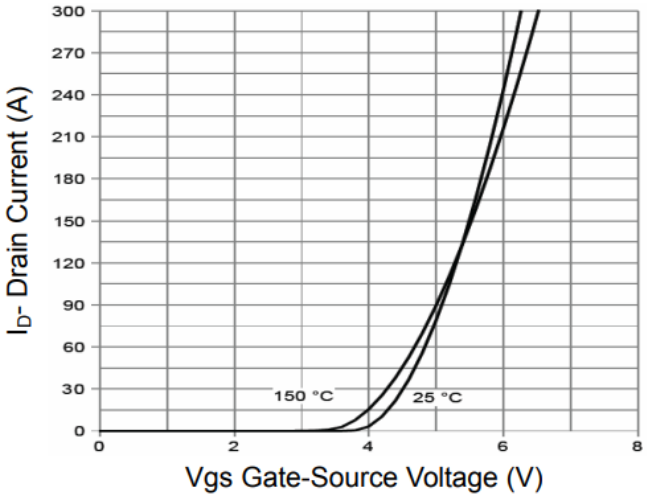


Diagram 3: Typ. Rdson vs. Drain Current

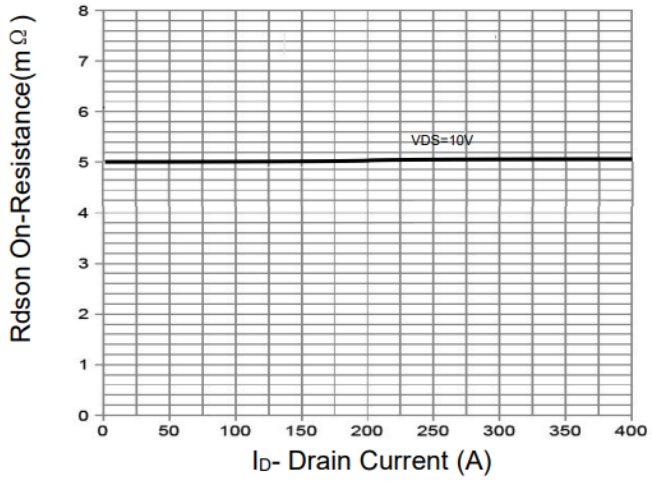


Diagram 4: Typ. Rdson – Junction Temperature

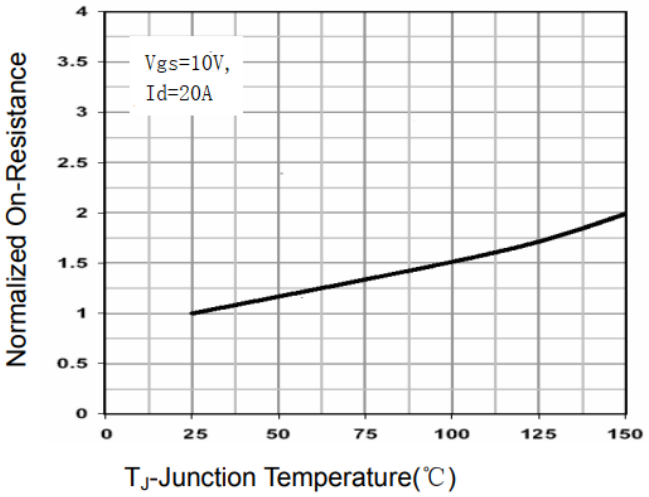


Diagram 5: Typ. Body-Diode Characteristics

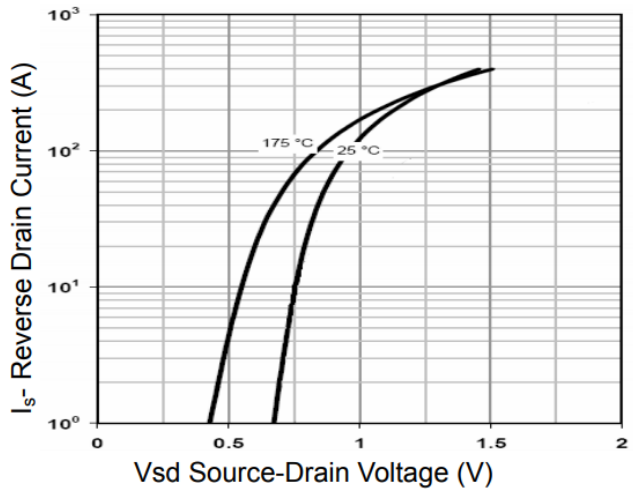


Diagram 6: Typ. Capacitance vs. Vds

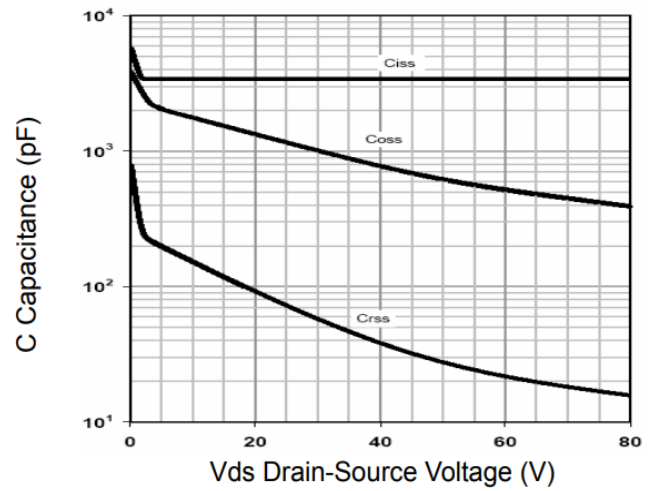


Diagram 7: Typ. Power Dissipation

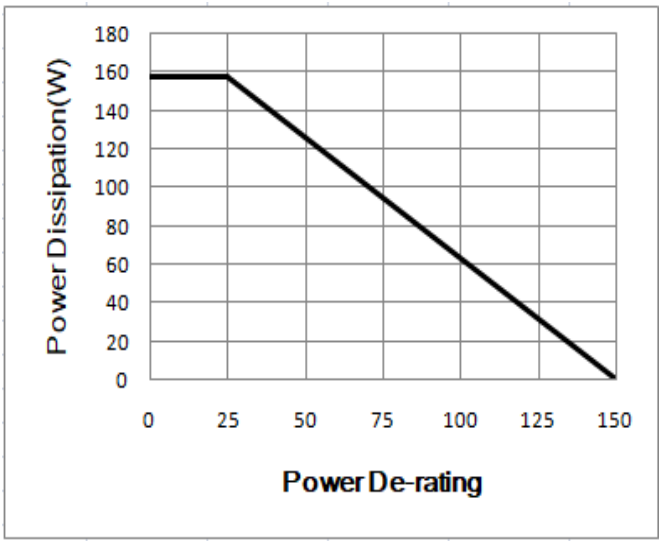


Diagram 8: Typ. Drain Current De-rating

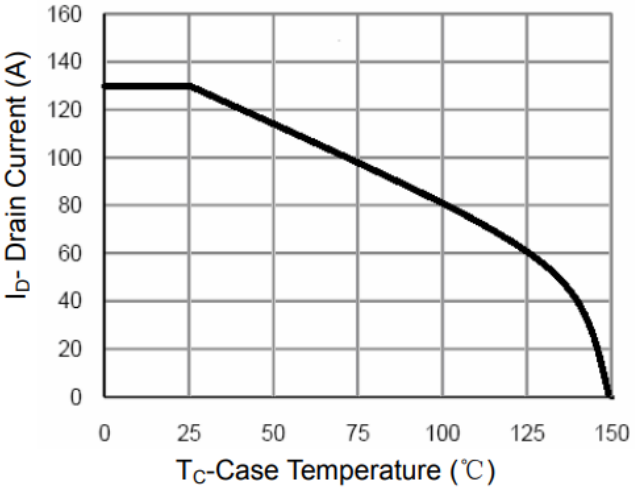


Diagram 9: Typ. Gate charge

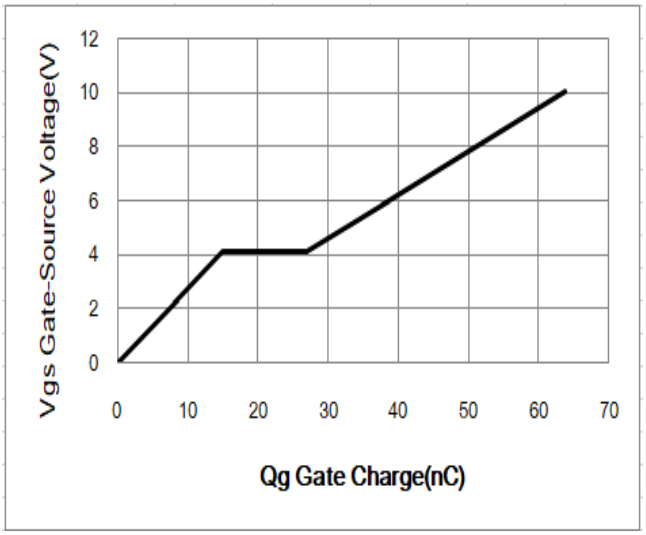
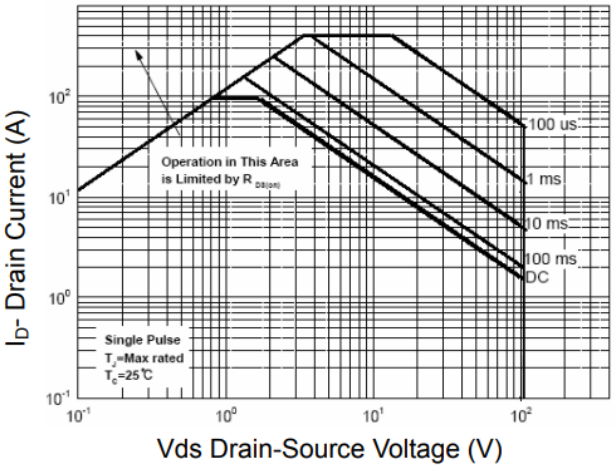


Diagram 10: Typ. Maximum Safe Operating Area



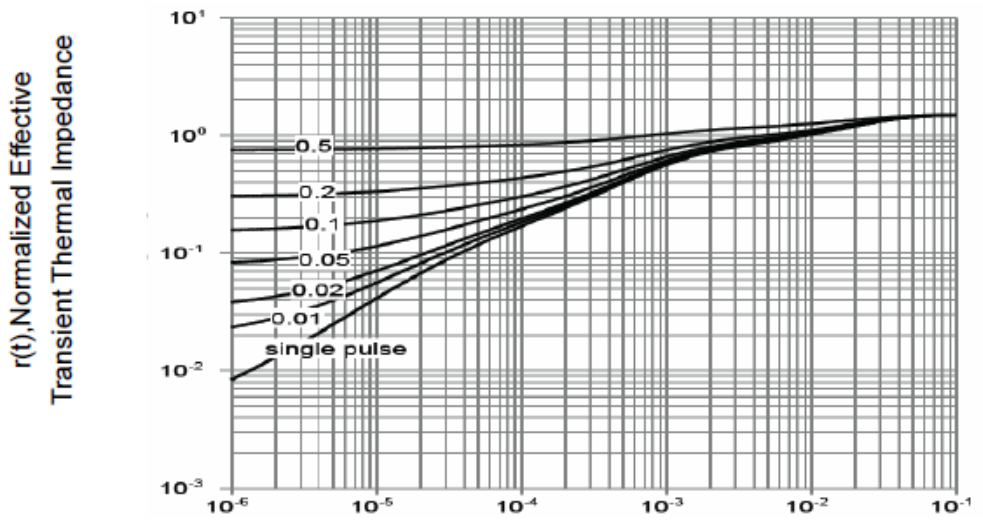


Figure 11 Normalized Maximum Transient Thermal Impedance

5 Test Circuits

Table 8 Diode characteristics

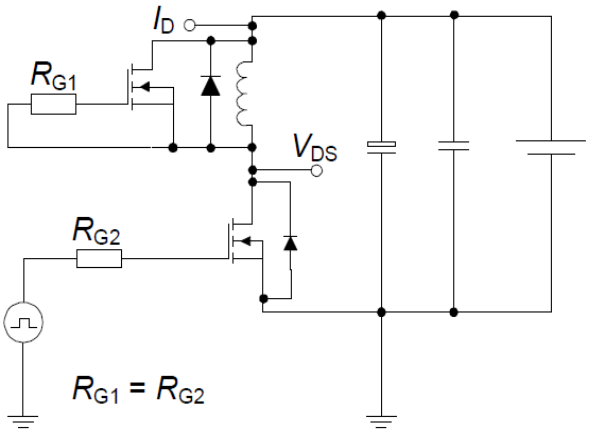
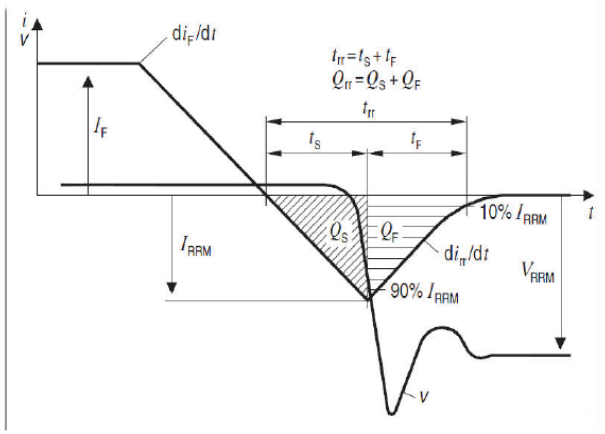
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times

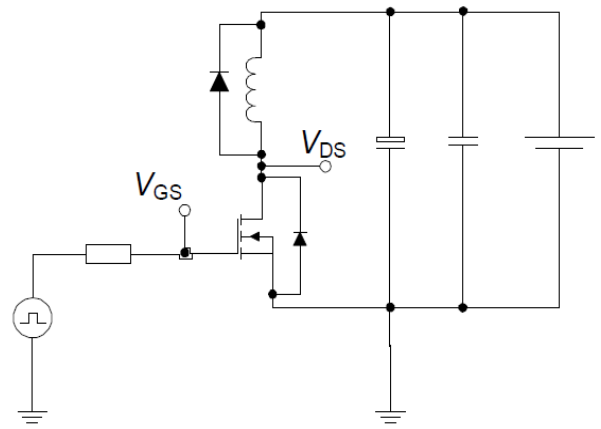
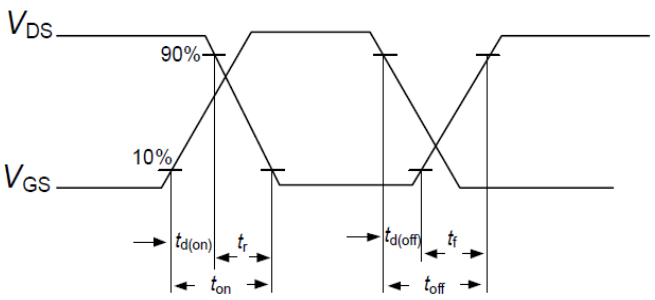
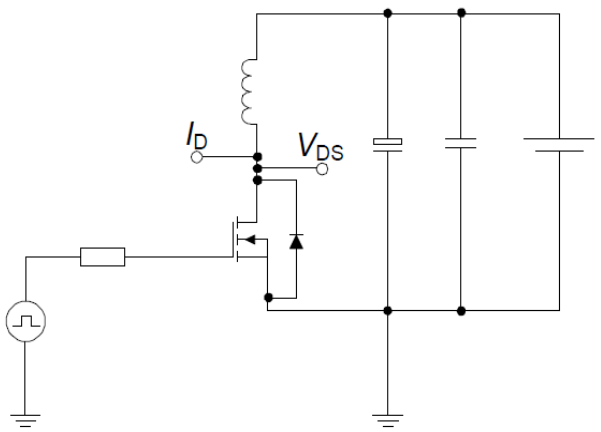
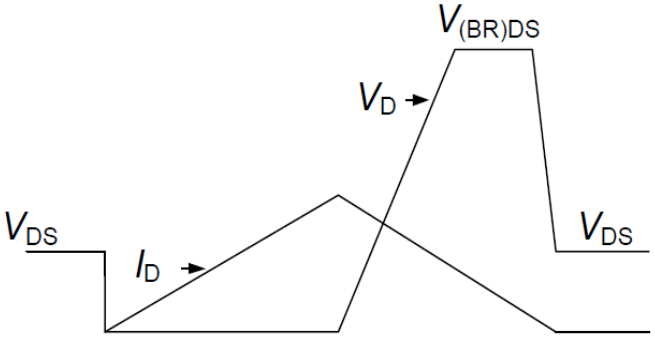
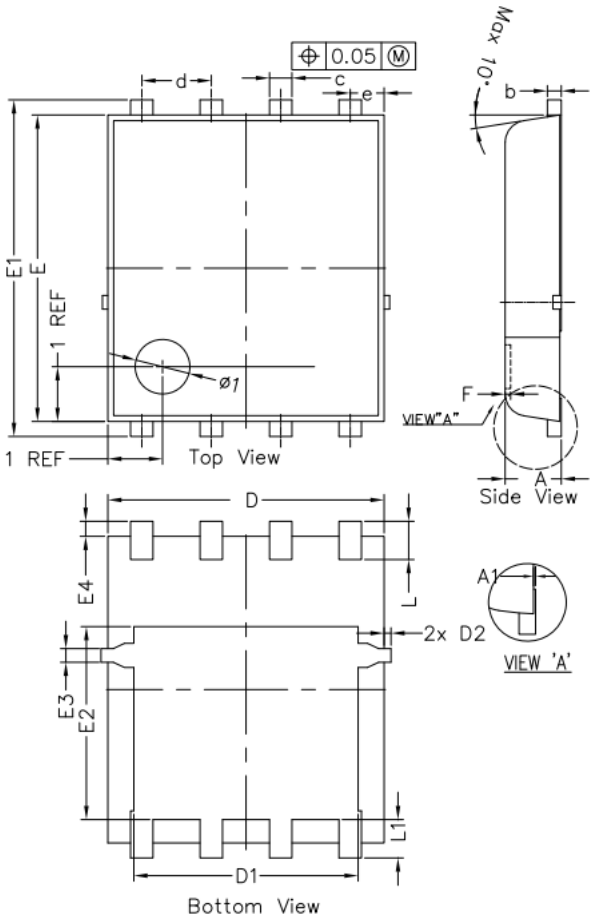
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines



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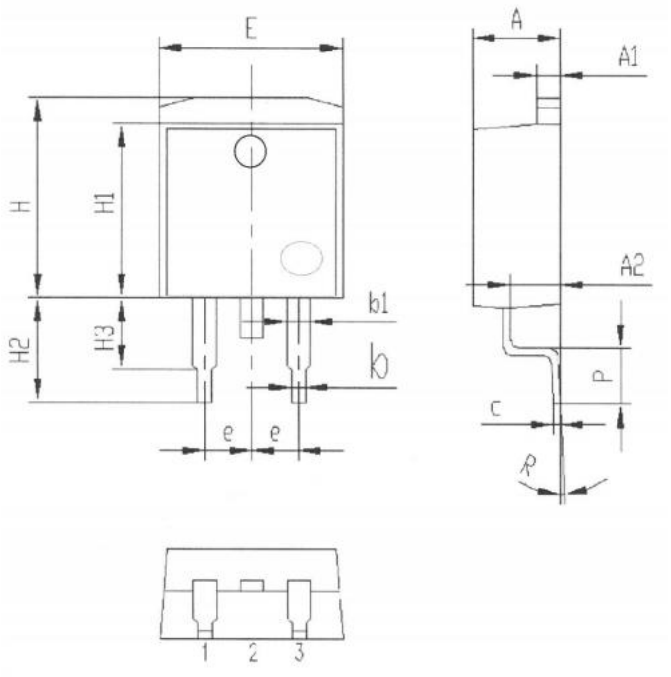
SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
* A	0.900	1.000	1.100	0.035	0.039	0.043
A1	0.000	---	0.050	0.000	----	0.002
b	0.246	0.254	0.312	0.010	0.010	0.012
* c	0.310	0.410	0.510	0.012	0.016	0.020
d		1.27 BSC			0.050 BSC	
* D	4.950	5.050	5.150	0.195	0.199	0.203
D1	4.000	4.100	4.200	0.157	0.161	0.165
⚠ * D2	---	---	0.125	---	---	0.005
e		0.62 BSC			0.024 BSC	
* E	5.500	5.600	5.700	0.217	0.220	0.224
* E1	6.050	6.150	6.250	0.238	0.242	0.246
E2	3.425	3.525	3.625	0.135	0.139	0.143
E3	0.150	0.250	0.350	0.006	0.010	0.014
* E4	0.175	0.275	0.375	0.007	0.011	0.015
F	-	-	0.100	-	-	0.004
⚠ * L	0.500	0.600	0.700	0.02	0.02	0.03
L1	0.600	0.700	0.800	0.02	0.03	0.03

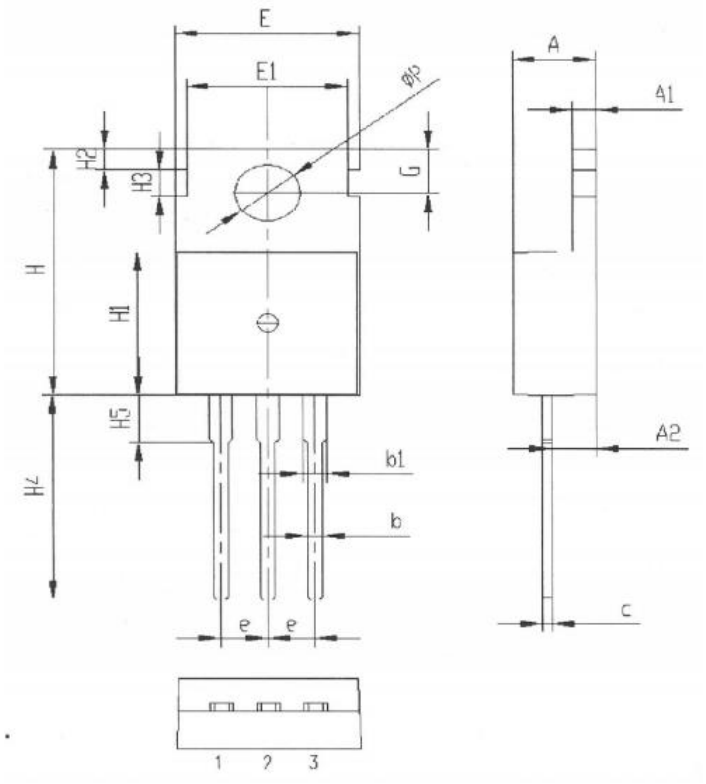
NOTE:
1. PACKAGE BODY SIZE EXCLUDE MOLD FLASH AND GATE BURR.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MIL EACH SIDE.
2. CONTROLLING DIMENSION IS MILLIMETER, INCH FOR REFERENCE ONLY.

Figure1：Outline PG-DFN5x6(JJW)



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

Figure2：Outline PG-TO263(CD)



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

Figure3：Outline PG-TO220(CD&HT)

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2022-04-03	Preliminary version
1.1	2022-04-15	Added TO220,TO263 packages
1.2	2022-05-19	Added electrical characteristics diagram
1.3	2022-06-18	Updated TO220 POD for CD&HT
1.4	2022-09-16	Updated Vth