

## 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

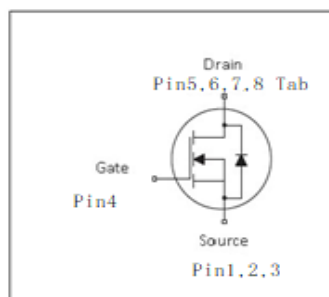
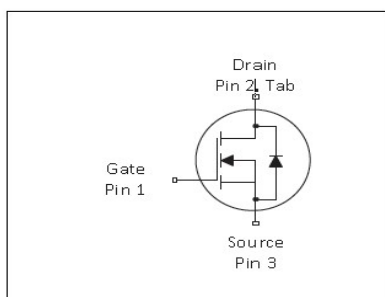
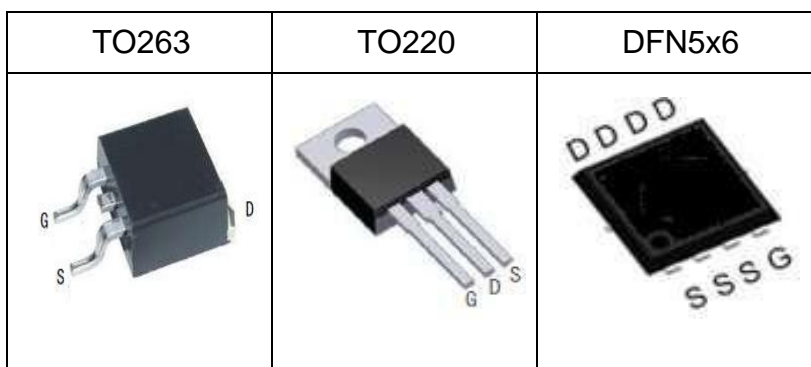
Low drain-source on-resistance:  
DFN5X6  $R_{DS(ON)} = 4.6m\Omega$  (typ.)  
TO263  $R_{DS(ON)} = 4.8m\Omega$  (typ.)  
TO220  $R_{DS(ON)} = 4.8m\Omega$  (typ.)  
High speed power switching  
Enhanced body diode  $dv/dt$  capability  
Enhanced avalanche ruggedness

**Table 1 Key Performance Parameters**

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	100	V
DFN5X6 $R_{DS(on),max}$	5.3	m $\Omega$
TO263 $R_{DS(on),max}$	5.6	m $\Omega$
TO220 $R_{DS(on),max}$	5.6	m $\Omega$
$Q_{g,typ}$	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



## 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 <sup>1)</sup>	$I_D$		-	136	A	$T_C = 25^\circ\text{C}$
Continuous drain current <sup>1)</sup>	$I_D$			101	A	$T_C = 100^\circ\text{C}$
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	-		399	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	$E_{AS}$	-	-	282	mJ	$T_C = 25^\circ\text{C}$ , $V_{DD} = 50\text{V}$ , $I_D = 33.6\text{A}$ , $L = 0.5\text{mH}$ , $R_G = 25\Omega$
Avalanche current, single pulse	$I_{AR}$	-	-	33.6	A	$T_C = 25^\circ\text{C}$ , $V_{DD} = 50\text{V}$ , $L = 0.5\text{mH}$ , $R_G = 25\Omega$
Gate source voltage (static)	$V_{GS}$	-20	-	20	V	static;
Power dissipation (DFN5x6)	$P_{tot}$	-	-	151	W	$T_C = 25^\circ\text{C}$
Power dissipation (TO263,TO220)	$P_{tot}$	-	-	161	W	$T_C = 25^\circ\text{C}$
Storage temperature	$T_{stg}$	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	$T_j$	-55	-	150	$^\circ\text{C}$	
Soldering Temperature Distance of 1.6mm from case for 10s	$T_L$			260	$^\circ\text{C}$	

<sup>1)</sup> Limited by  $T_{j,max}$ . Maximum Duty Cycle  $D = 0.50$

<sup>2)</sup> Pulse width  $t_p$  limited by  $T_{j,max}$

<sup>3)</sup> 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

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	$V_{(BR)DSS}$	100	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{(GS)th}$	2.5		4.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	-	1	$\mu A$	$V_{DS}=95V, V_{GS}=0V, T_j=25^\circ C$
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	m $\Omega$	$V_{GS}=10V, I_D=20A, T_j=25^\circ C$
Drain-source on-state resistance(TO263,TO220)	$R_{DS(on)}$	-	4.8	5.6	m $\Omega$	$V_{GS}=10V, I_D=20A, T_j=25^\circ C$
Gate resistance (Intrinsic)	$R_G$	-	1.5	-	$\Omega$	$f=1\text{MHz}$ , open drain
Transconductance	GFS	-	53	-	S	$V_{DS}=5V, I_{DS}=20A$

**Table 5 Dynamic characteristics(by calculating)**

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

**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	$V_{GS}=0V, I_F=1A, T_j=25^\circ C$
Reverse recovery time	$t_{rr}$	-	47	-	ns	$V_R=30V, I_F=20A, di_F/dt=300A/\mu s$
Reverse recovery charge	$Q_{rr}$	-	221	-	nC	$V_R=30V, I_F=20A, di_F/dt=300A/\mu s$
Peak reverse recovery current	$I_{rrm}$	-	8.8	-	A	$V_R=30V, I_F=20A, di_F/dt=300A/\mu s$

### 4 Electrical characteristics diagram

Diagram 1: Typ. output characteristics

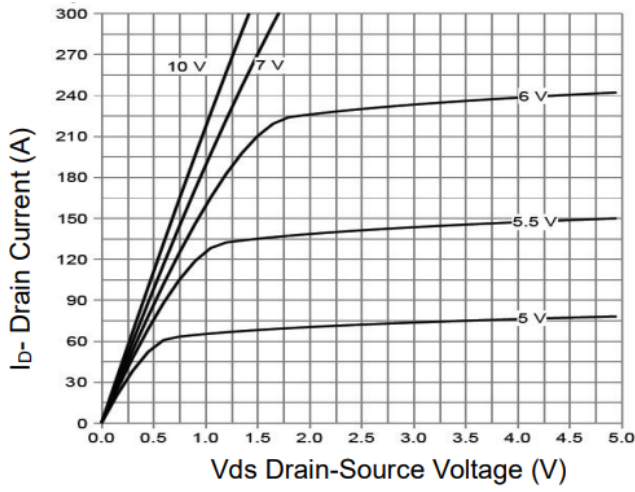


Diagram 2: Typ. transfer characteristics

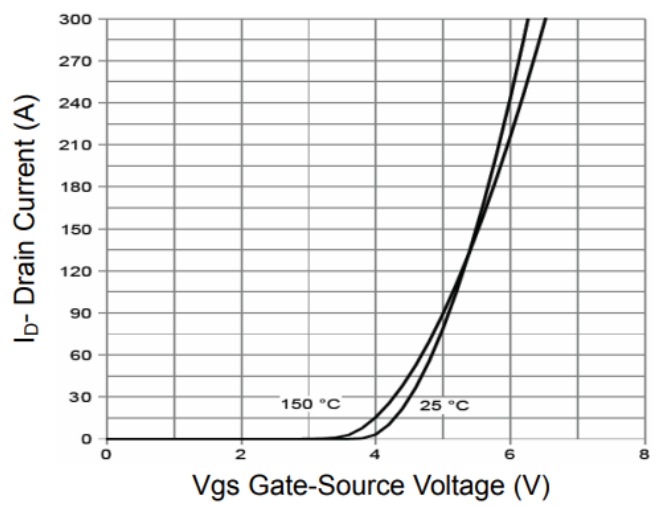


Diagram 3: Typ. Rdson vs. Drain Current

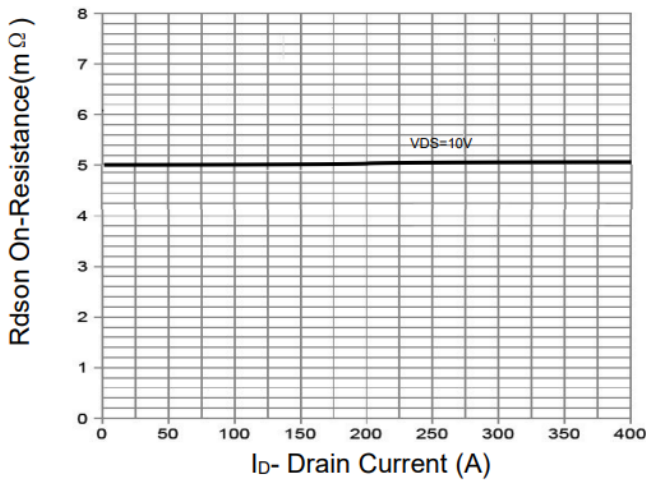


Diagram 4: Typ. Rdson – Junction Temperature

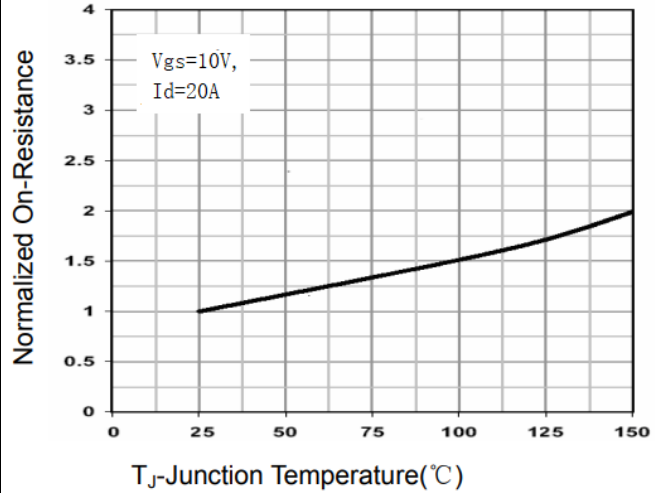


Diagram 5: Typ. Body-Diode Characteristics

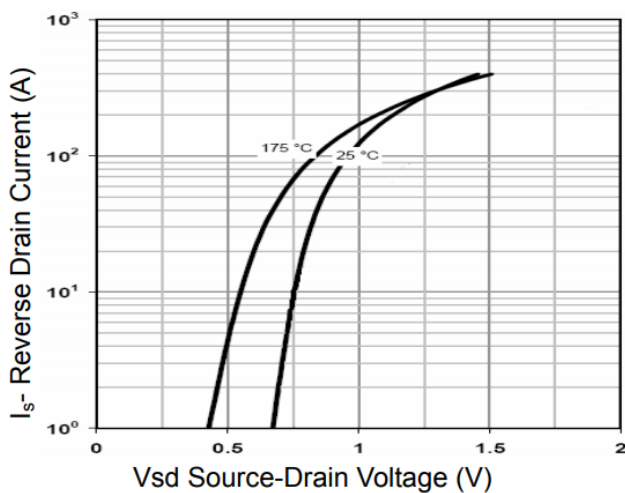


Diagram 6: Typ. Capacitance vs. Vds

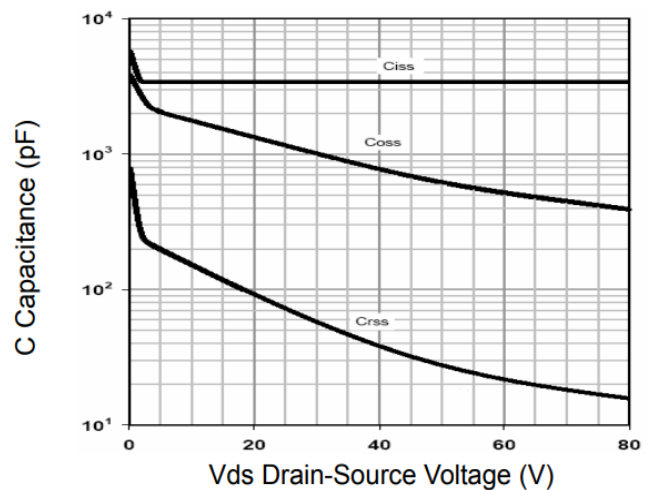


Diagram 7: Typ. Power Dissipation

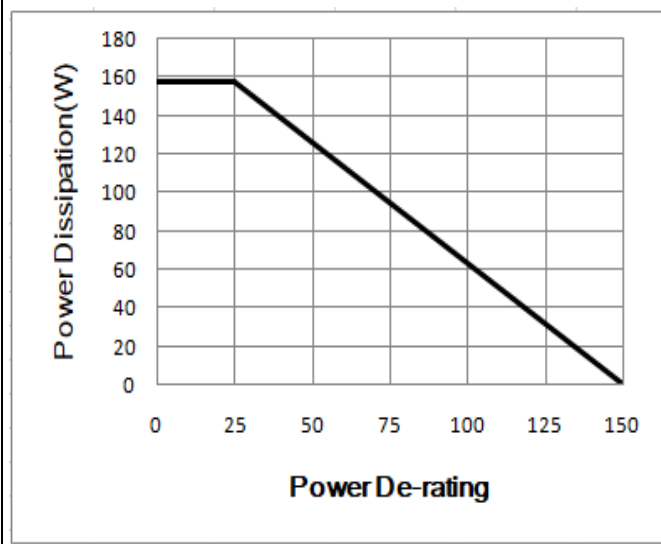


Diagram 8: Typ. Drain Current De-rating

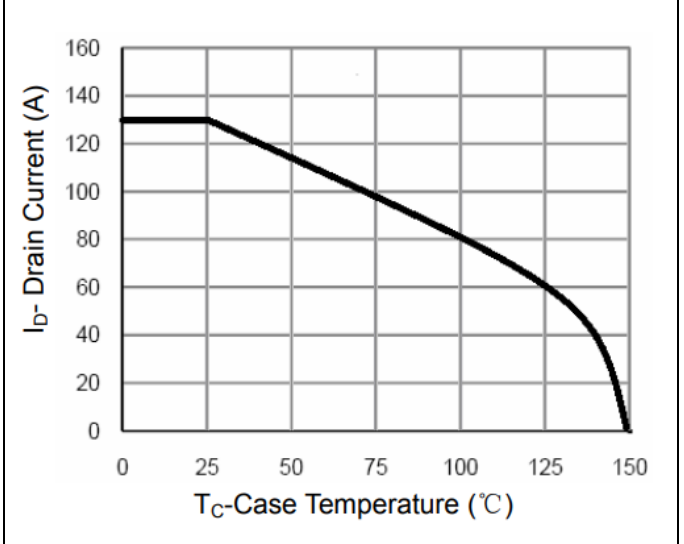


Diagram 9: Typ. Gate charge

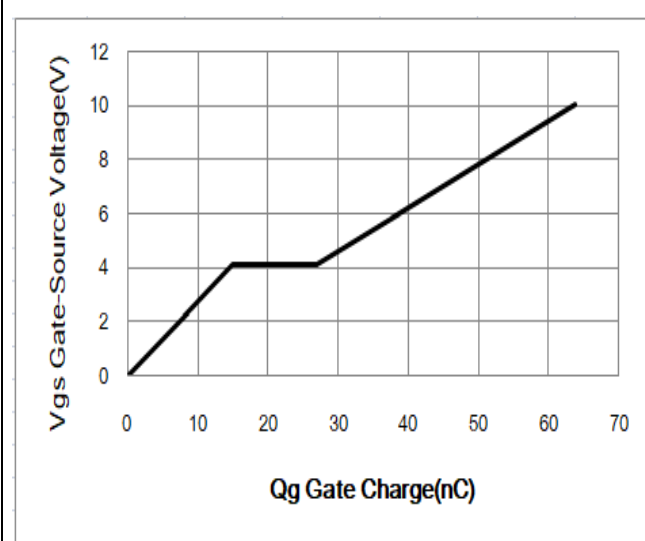


Diagram 10: Typ. Maximum Safe Operating Area

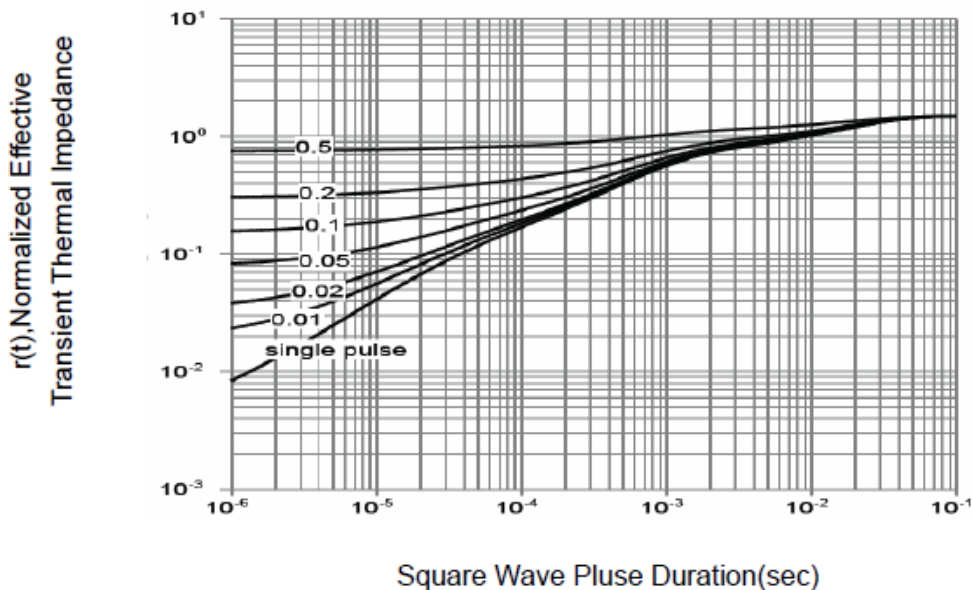
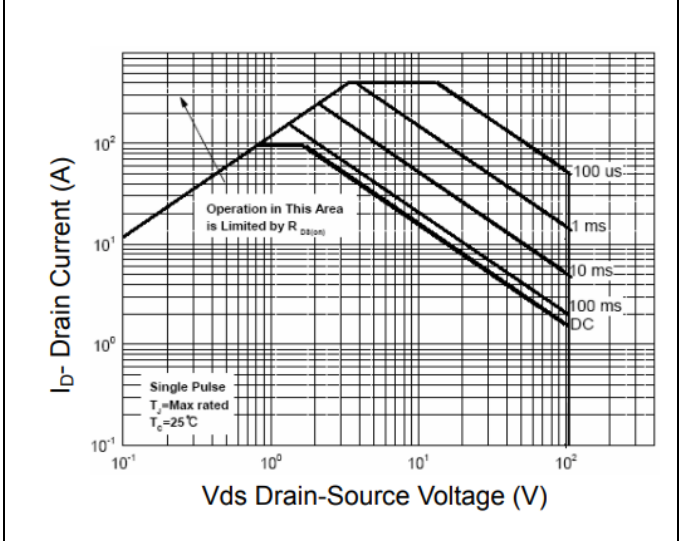
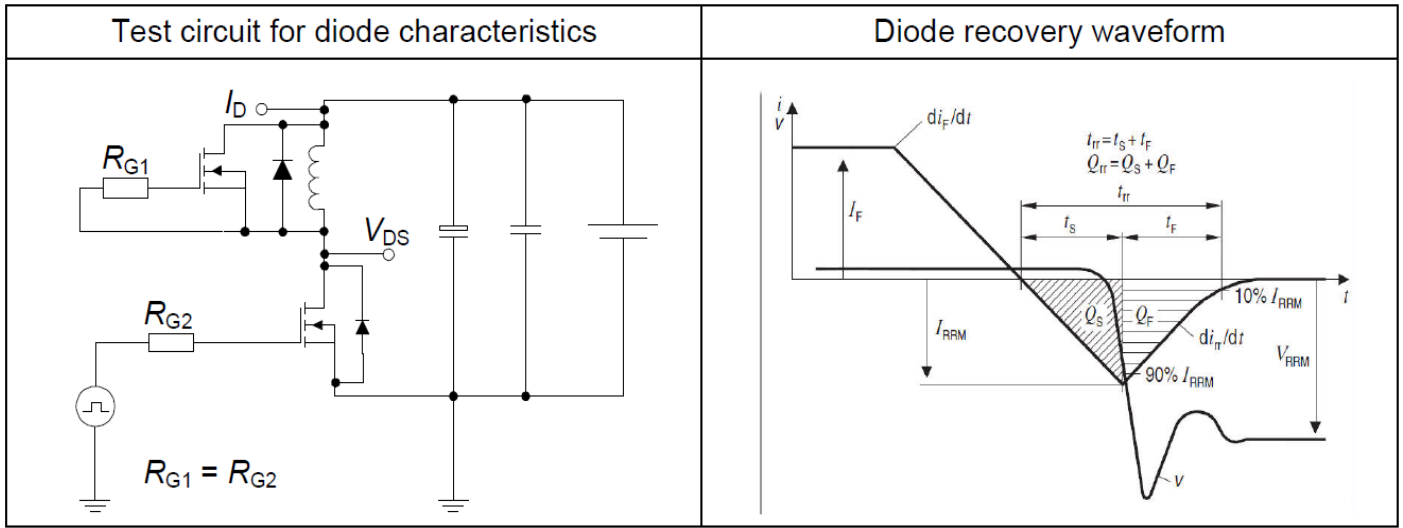


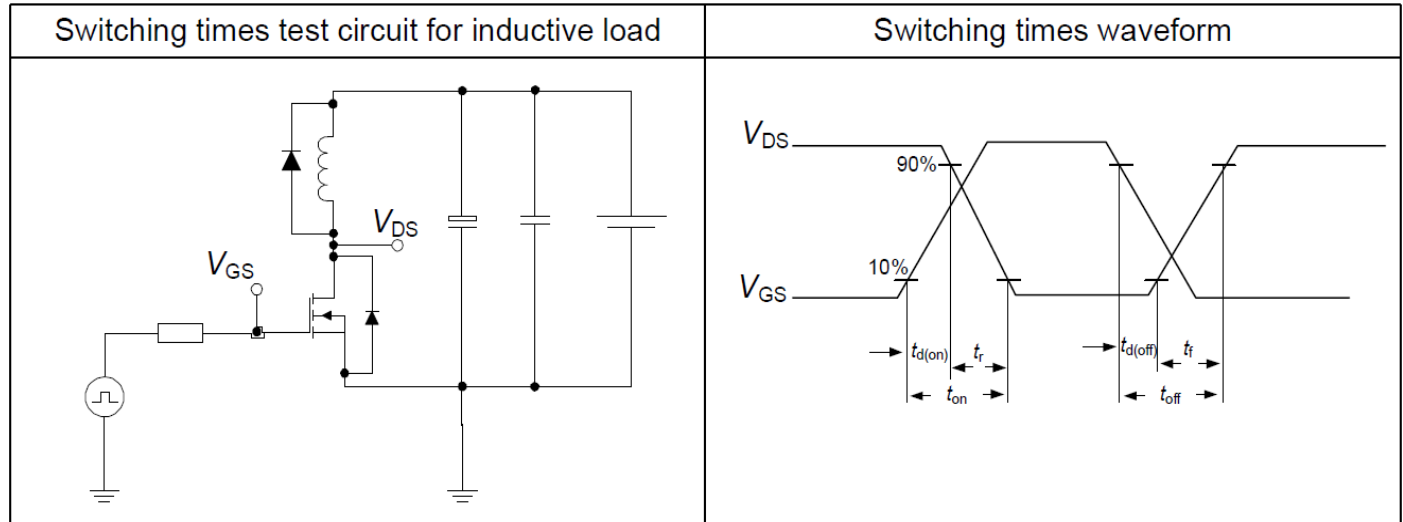
Figure 11 Normalized Maximum Transient Thermal Impedance

**5 Test Circuits**

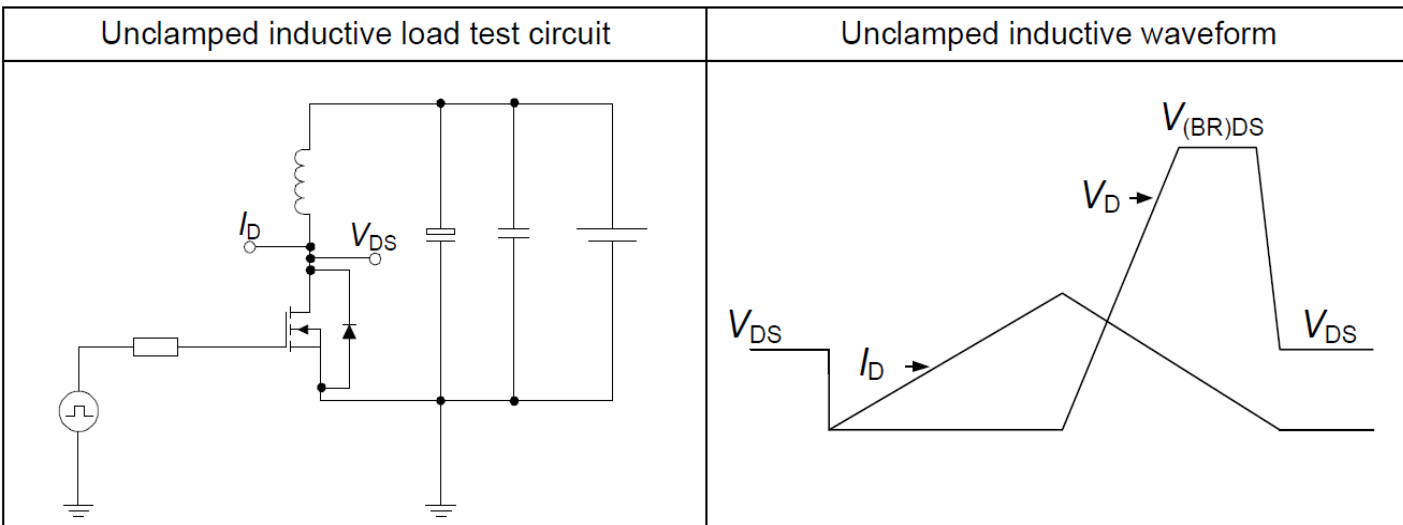
**Table 8 Diode characteristics**



**Table 9 Switching times**

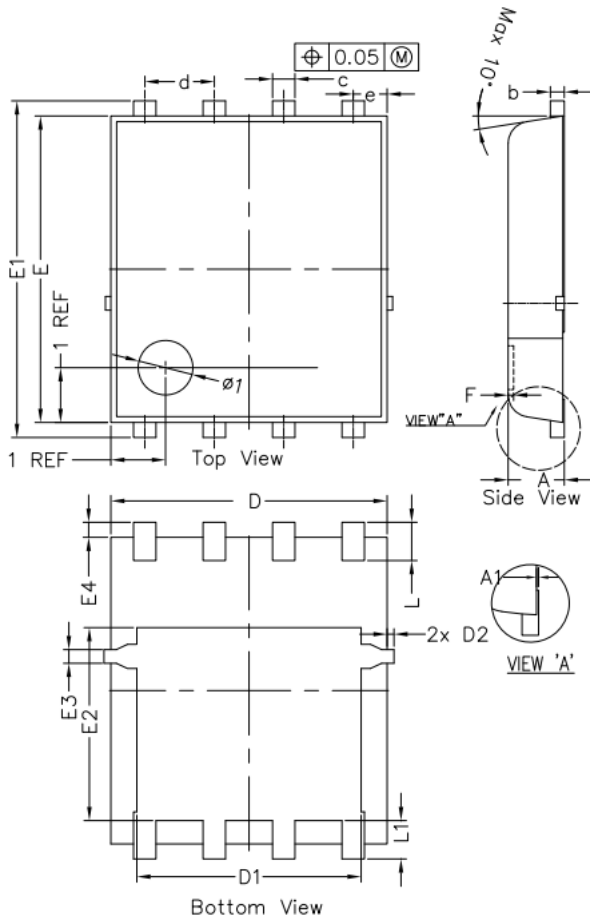


**Table 10 Unclamped inductive load**





## 6 Package Outlines

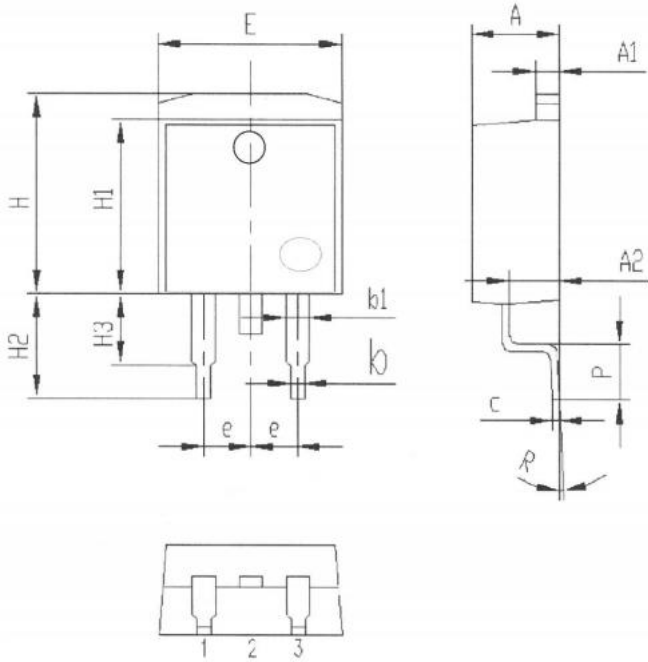


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SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
* A	0.900	1.000	1.100	0.035	0.039	0.043
A1	0.000	---	0.050	0.000	----	0.002
b	0.246	0.254	0.312	0.010	0.010	0.012
* c	0.310	0.410	0.510	0.012	0.016	0.020
d	1.27 BSC			0.050 BSC		
* 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

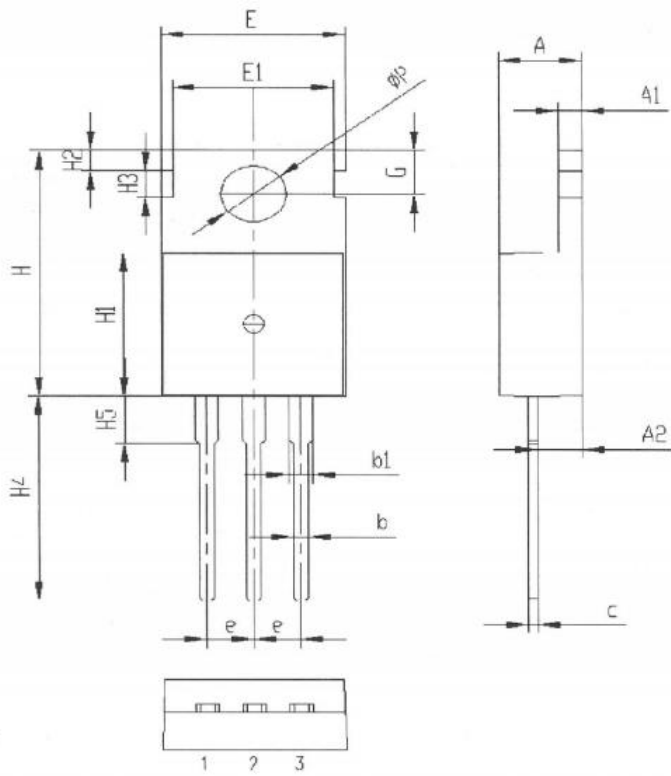
NOTE:  
 1. PACKAGE BODY SIZE EXCLUDE MOLD FLASH AND GATE BURR.  
 MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MIL EACH SIDE.  
 2. CONTROLLING DIMENSION IS MILLIMETER, INCH FOR REFERENCE ONLY.

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-T0263(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
$\Phi P$	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

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