

## 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:  $R_{DS(on)} = 4.1\text{m}\Omega$  (typ.)  
High speed power switching  
Enhanced body diode  $dv/dt$  capability  
Enhanced avalanche ruggedness

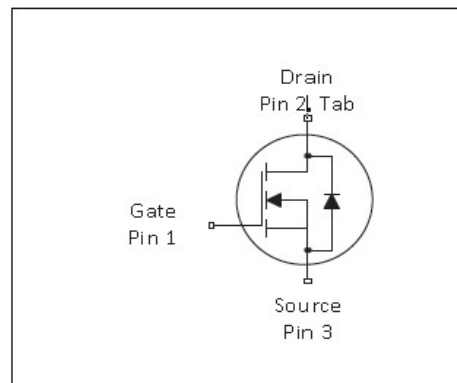
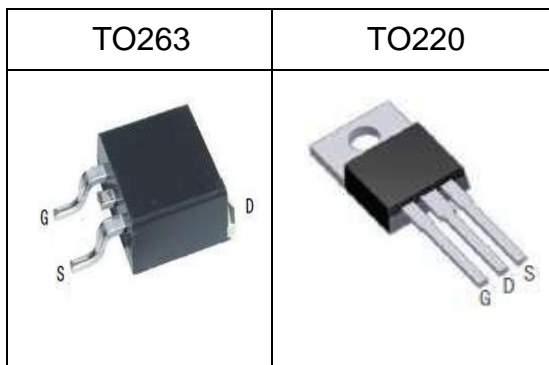


**Table 1 Key Performance Parameters**

| Parameter            | Value | Unit       |
|----------------------|-------|------------|
| $V_{DS} @ T_{j,max}$ | 120   | V          |
| $R_{DS(on),max}$     | 4.5   | m $\Omega$ |
| $Q_{g,typ}$          | 178.1 | nC         |
| $I_{D,pulse}$        | 490   | A          |

### 3. Packaging and Internal Circuit

| Part Name | Package | Marking   |
|-----------|---------|-----------|
| AUP045N12 | TO220   | AUP045N12 |
| AUB045N12 | TO263   | AUB045N12 |



## 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 at silicon <sup>1)</sup>            | $I_D$         |        | -    | 169  | A                | $T_C = 25^\circ\text{C}$                                                                                            |
| Continuous drain current at package <sup>1)</sup>            | $I_D$         |        | -    | 152  | A                | $T_C = 25^\circ\text{C}$                                                                                            |
| Continuous drain current at silicon <sup>1)</sup>            | $I_D$         |        |      | 119  | A                | $T_C = 100^\circ\text{C}$                                                                                           |
| Pulsed drain current <sup>2)</sup>                           | $I_{D,pulse}$ | -      |      | 490  | A                | $T_C = 25^\circ\text{C}$                                                                                            |
| Avalanche energy, single pulse                               | $E_{AS}$      | -      | -    | 635  | mJ               | $T_C = 25^\circ\text{C}$ , $V_{DD} = 50\text{V}$ , $V_{GS} = 10\text{V}$ ,<br>$L = 0.5\text{mH}$ , $R_G = 25\Omega$ |
| Avalanche current, single pulse                              | $I_{AR}$      | -      | -    | 50.4 | A                | $T_C = 25^\circ\text{C}$ , $V_{DD} = 50\text{V}$ , $L = 0.5\text{mH}$ ,<br>$R_G = 25\Omega$                         |
| Gate source voltage (static)                                 | $V_{GS}$      | -20    | -    | 20   | V                | static;                                                                                                             |
| Power dissipation                                            | $P_{tot}$     | -      | -    | 310  | W                | $T_C = 25^\circ\text{C}$                                                                                            |
| Storage temperature                                          | $T_{stg}$     | -55    | -    | 175  | $^\circ\text{C}$ |                                                                                                                     |
| Operating junction temperature                               | $T_j$         | -55    | -    | 175  | $^\circ\text{C}$ |                                                                                                                     |
| Soldering Temperature<br>Distance of 1.6mm from case for 10s | $T_L$         |        |      | 300  | $^\circ\text{C}$ |                                                                                                                     |

<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**

| Parameter                              | Symbol     | Values |      |      | Unit | Note / Test Condition            |
|----------------------------------------|------------|--------|------|------|------|----------------------------------|
|                                        |            | Min.   | Typ. | Max. |      |                                  |
| Thermal resistance, junction - case    | $R_{thJC}$ | -      | -    | 0.48 | °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   | $V_{(BR)DSS}$ | 120    | -     | -    | 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    | $\mu A$    | $V_{DS}=120V, V_{GS}=0V, T_j=25^\circ C$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | -     | 100  | nA         | $V_{GS}=20V, V_{DS}=0V$                  |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 4.1   | 4.5  | m $\Omega$ | $V_{GS}=10V, I_D=20A, T_j=25^\circ C$    |
| Gate resistance (Intrinsic)      | $R_G$         | -      | 2.0   | -    | $\Omega$   | $f=1\text{MHz}$ , open drain             |
| Transconductance                 | $G_{fs}$      |        | 115.8 |      | S          | $V_{DS}=5V, I_D=50A$                     |

**Table 5 Dynamic characteristics**

| Parameter                    | Symbol       | Values |       |      | Unit | Note / Test Condition                            |
|------------------------------|--------------|--------|-------|------|------|--------------------------------------------------|
|                              |              | Min.   | Typ.  | Max. |      |                                                  |
| Input capacitance            | $C_{iss}$    | -      | 11701 | -    | pF   | $V_{GS}=0V, V_{DS}=60V, f=1\text{MHz}$           |
| Output capacitance           | $C_{oss}$    | -      | 654   | -    | pF   | $V_{GS}=0V, V_{DS}=60V, f=1\text{MHz}$           |
| Reverse transfer capacitance | $C_{riss}$   | -      | 47    | -    | pF   | $V_{GS}=0V, V_{DS}=60V, f=1\text{MHz}$           |
| Turn-on delay time           | $t_{d(on)}$  | -      | 22    | -    | ns   | $V_{DD}=60V, V_{GS}=10V, I_D=50A, R_G=2.5\Omega$ |
| Rise time                    | $t_r$        | -      | 101   | -    | ns   | $V_{DD}=60V, V_{GS}=10V, I_D=50A, R_G=2.5\Omega$ |
| Turn-off delay time          | $t_{d(off)}$ | -      | 96    | -    | ns   | $V_{DD}=60V, V_{GS}=10V, I_D=50A, R_G=2.5\Omega$ |
| Fall time                    | $t_f$        | -      | 67    | -    | ns   | $V_{DD}=60V, V_{GS}=10V, I_D=50A, R_G=2.5\Omega$ |

**Table 6 Gate charge characteristics**

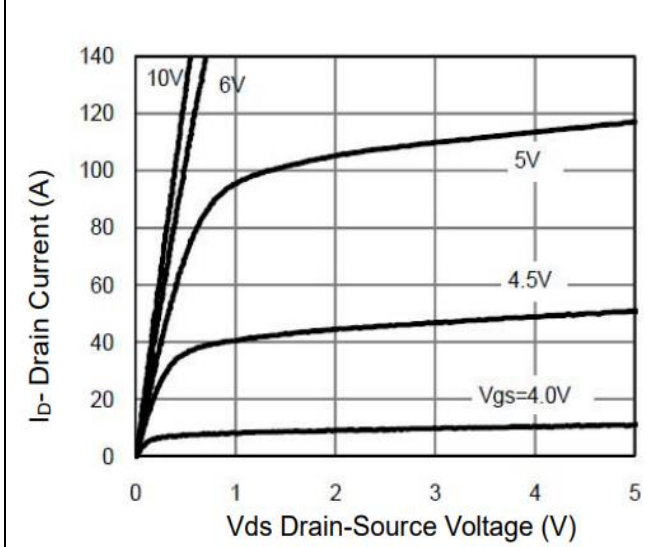
| Parameter             | Symbol   | Values |       |      | Unit | Note / Test Condition             |
|-----------------------|----------|--------|-------|------|------|-----------------------------------|
|                       |          | Min.   | Typ.  | Max. |      |                                   |
| Gate to source charge | $Q_{gs}$ | -      | 45.5  | -    | nC   | $V_{DD}=60V, I_D=20A, V_{GS}=10V$ |
| Gate to drain charge  | $Q_{gd}$ | -      | 50.0  | -    | nC   | $V_{DD}=60V, I_D=20A, V_{GS}=10V$ |
| Gate charge total     | $Q_g$    | -      | 178.1 | -    | nC   | $V_{DD}=60V, I_D=20A, V_{GS}=10V$ |

Table 7 Reverse diode characteristics

| Parameter                            | Symbol    | Values |       |      | Unit | Note / Test Condition                    |
|--------------------------------------|-----------|--------|-------|------|------|------------------------------------------|
|                                      |           | Min.   | Typ.  | Max. |      |                                          |
| Continuous Source Current at silicon | $I_{SD}$  | -      | -     | 169  | A    | Maximum Ratings                          |
| Diode forward voltage                | $V_{SD}$  | -      | -     | 1.2  | V    | $V_{GS}=0V, I_s=1A, T_j=25^\circ C$      |
| Reverse recovery time                | $t_{rr}$  | -      | 117.7 | -    | ns   | $V_{GS}=0V, I_F=50A, di_F/dt=100A/\mu s$ |
| Reverse recovery charge              | $Q_{rr}$  | -      | 433.8 | -    | nC   | $V_{GS}=0V, I_F=50A, di_F/dt=100A/\mu s$ |
| Peak Reverse Recovery Current        | $I_{rrm}$ | -      | 5.48  | -    | A    | $V_{GS}=0V, I_F=50A, di_F/dt=100A/\mu s$ |

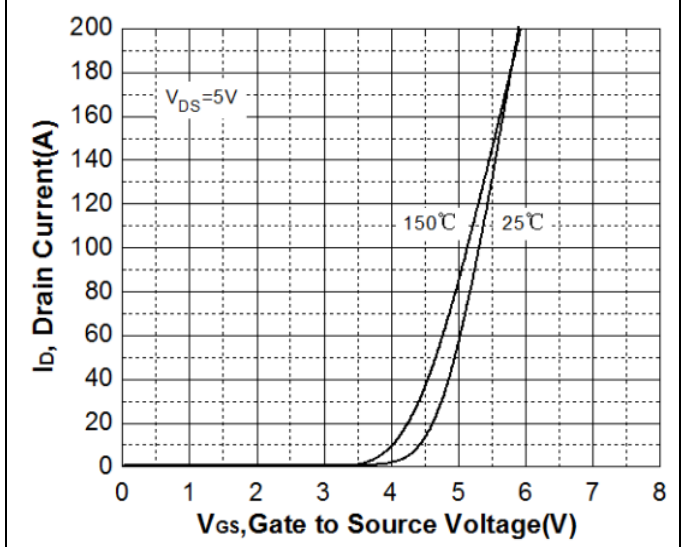
### 4 Electrical characteristics diagram

Diagram 1: Typ. Output characteristics



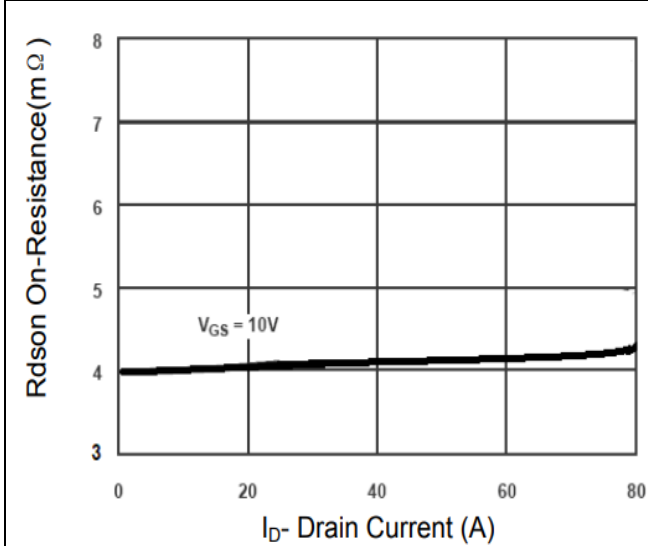
$I_D=f(V_{DS}); T_j=25^\circ C$ ; parameter:  $V_{GS}$

Diagram 2: Typ. Transfer characteristics



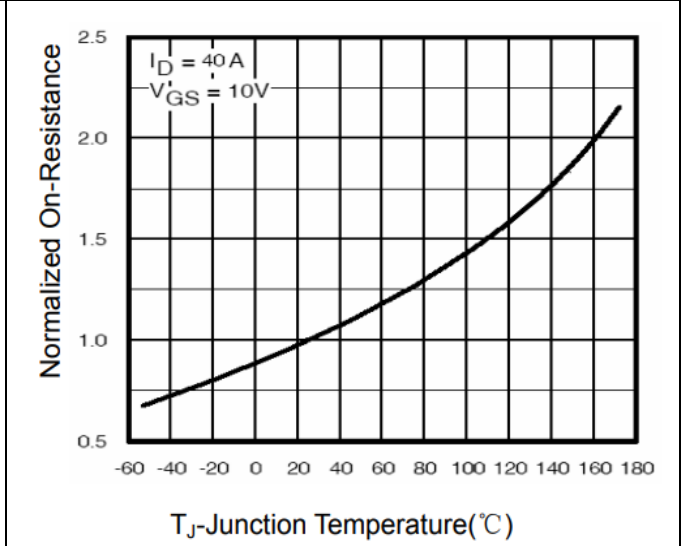
$I_D=f(V_{GS})$ ; parameter:  $T_j$

Diagram 3: Typ. Rdson vs. Drain Current



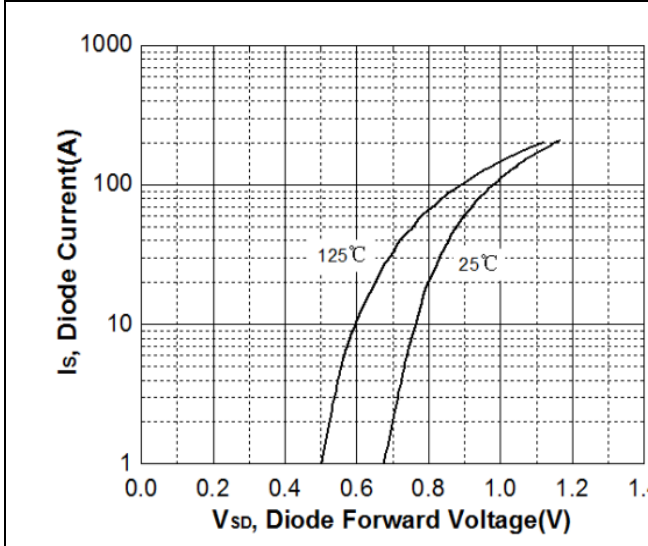
$R_{DS(on)}=f(I_D); V_{GS}=10V$

Diagram 4: Typ. Rdson – Junction Temperature



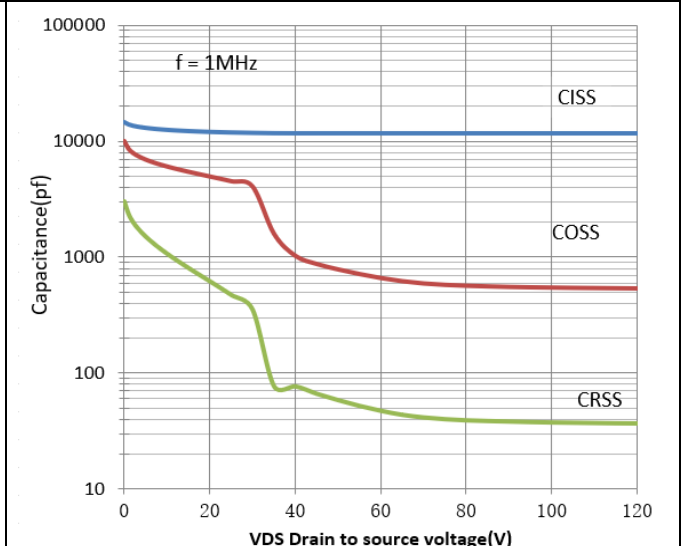
$R_{DS(on)}=f(T_j); V_{GS}=10V/I_D=40A$

Diagram 5: Typ. Body-Diode Characteristics



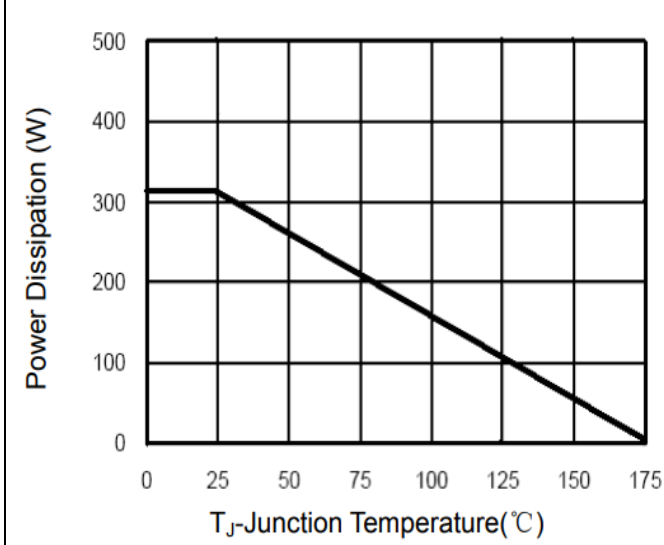
$I_F=f(V_{DS})$ ; parameter:  $T_j$

Diagram 6: Typ. Capacitance vs. Vds



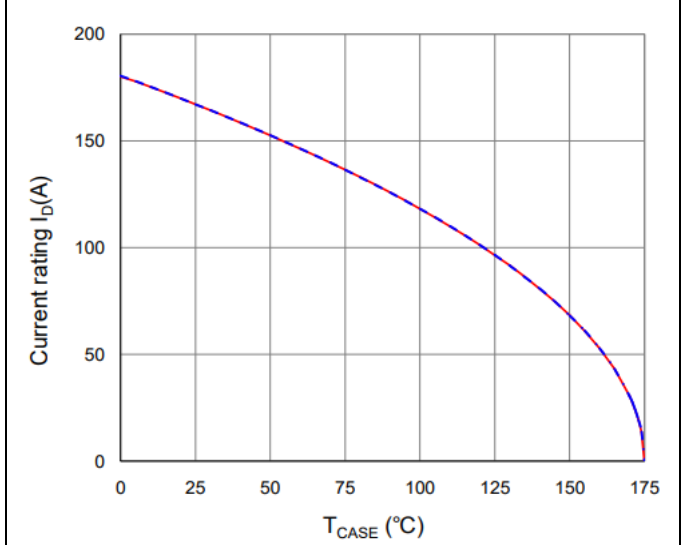
$C=f(V_{DS}); V_{GS}=0V; f=1MHz$

Diagram 7: Typ. Power Dissipation



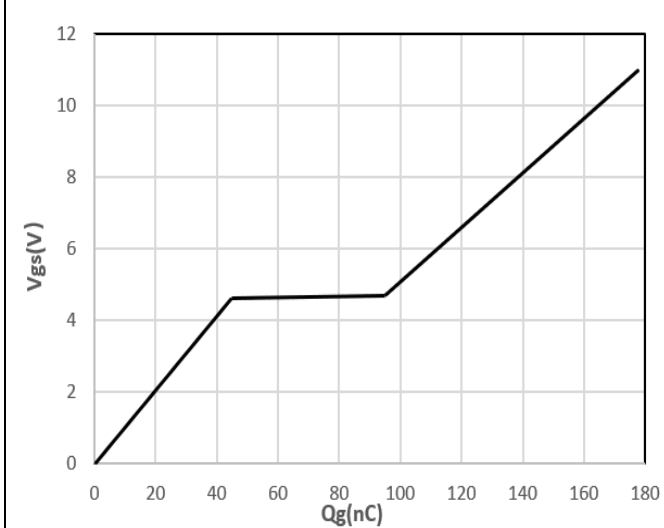
$P_{tot}=f(T_C)$ ;

Diagram 8: Typ. Drain Current De-rating



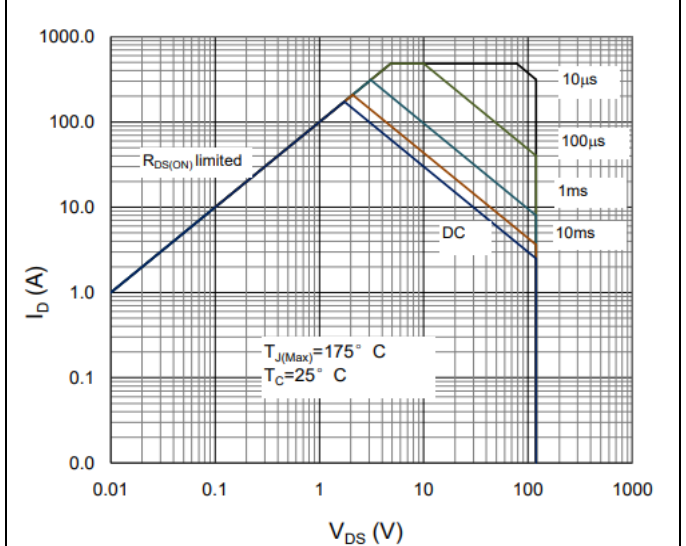
$I_d=f(T_C)$ ;

Diagram 9: Typ. Gate charge



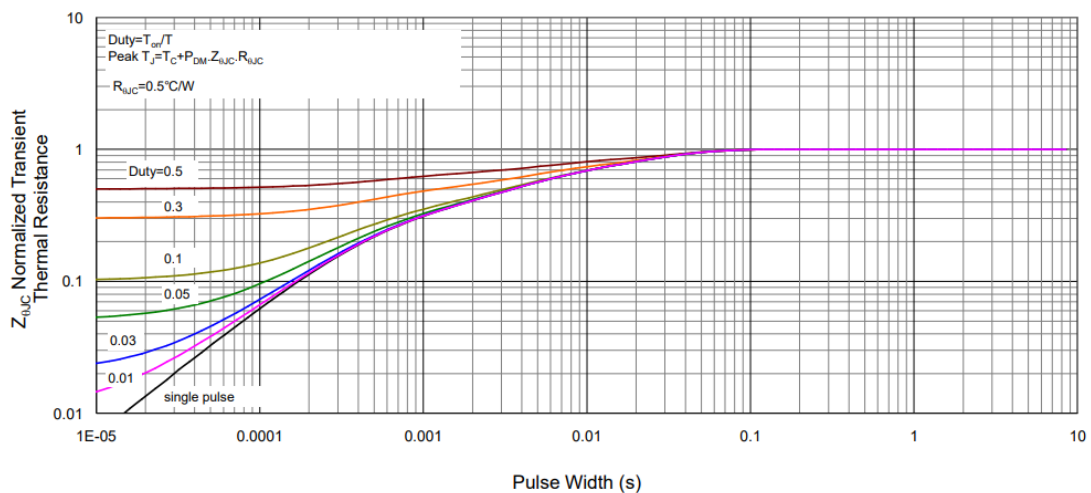
$V_{GS}=f(Q_{gate})$ ; I<sub>D</sub>=20A pulsed; parameter: V<sub>DP</sub>

Diagram 10: Typ. Maximum Safe Operating Area



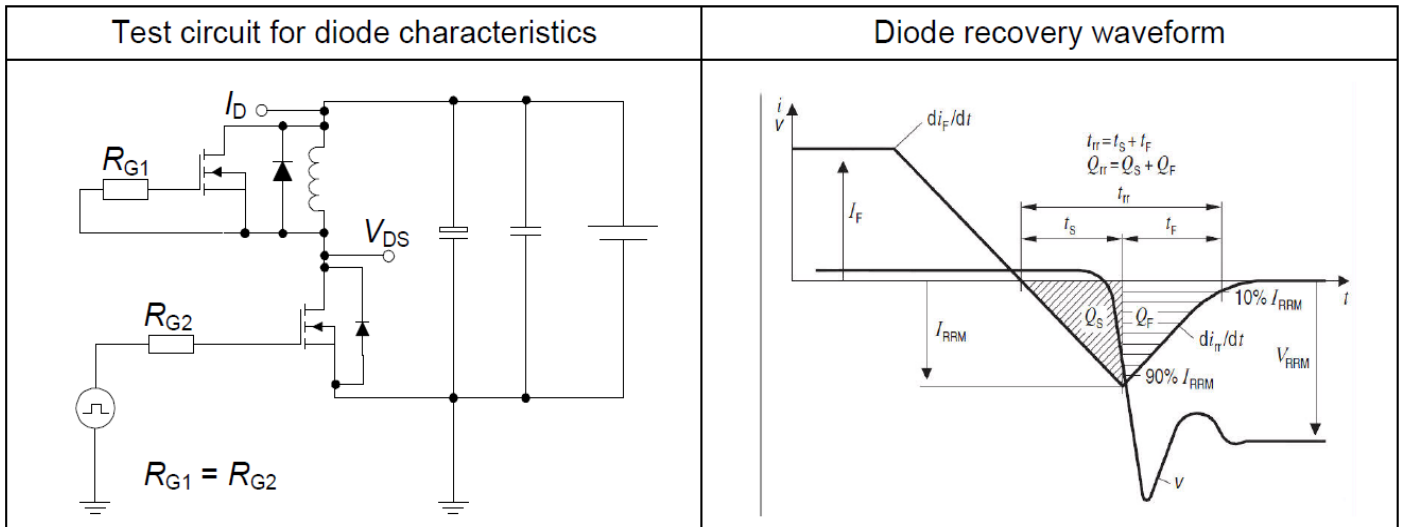
$I_D=f(V_{DS})$ ; T<sub>C</sub>=25 °C; V<sub>GS</sub>> 7V; D=0; parameter tp

Figure 11 Normalized Maximum Transient Thermal Impedance

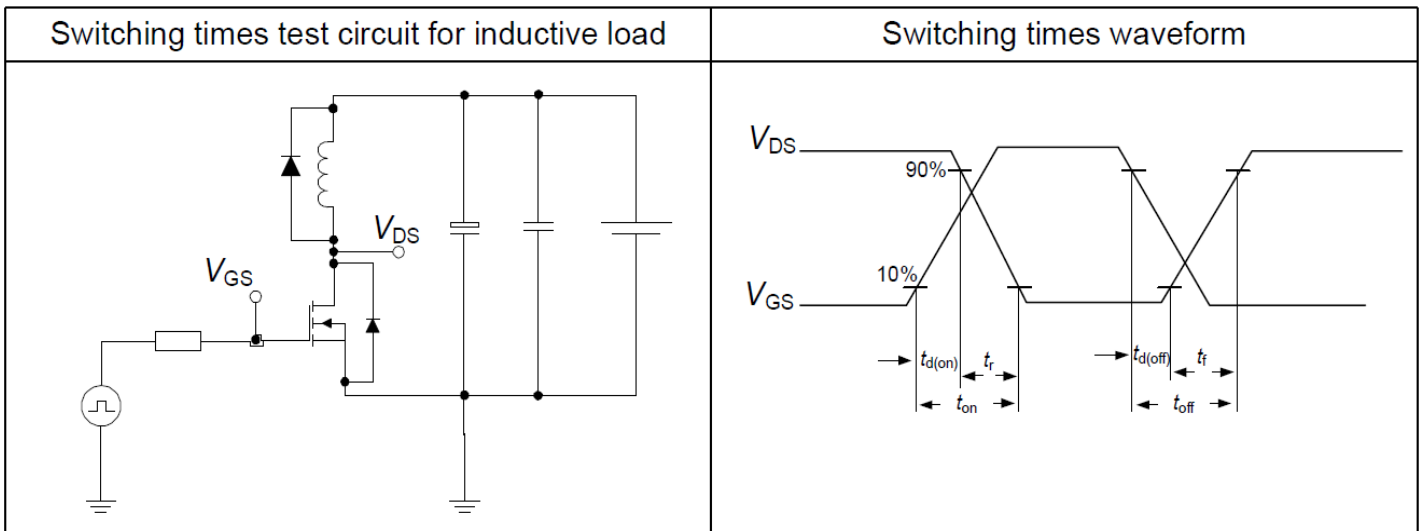


### 5. Test Circuits

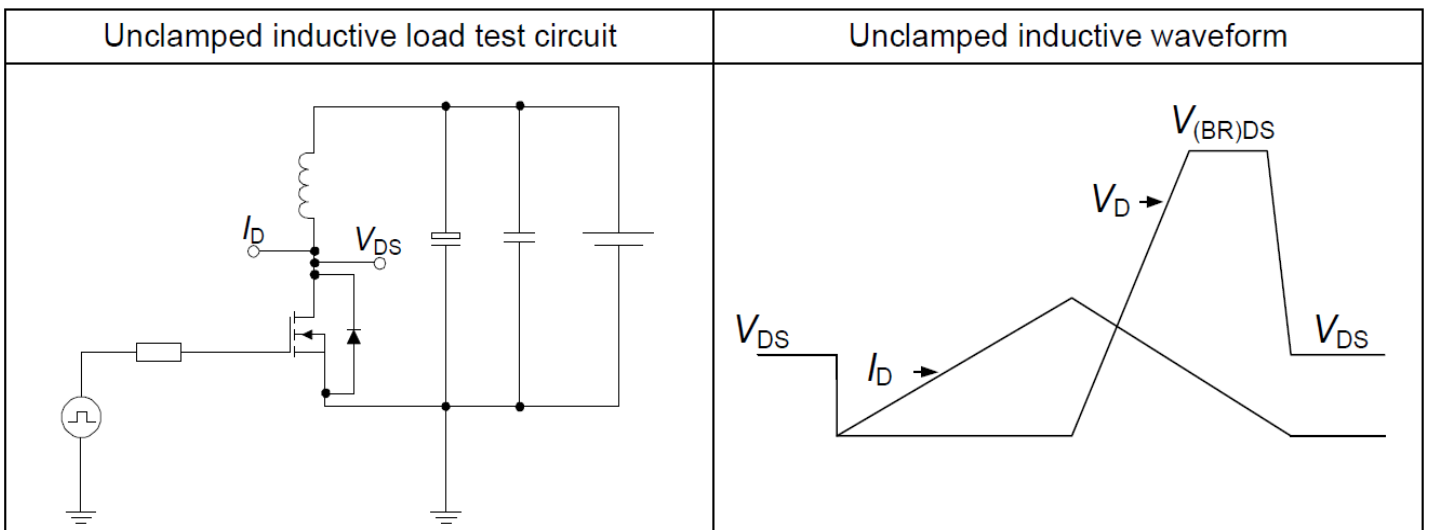
**Table 8 Diode characteristics**



**Table 9 Switching times**

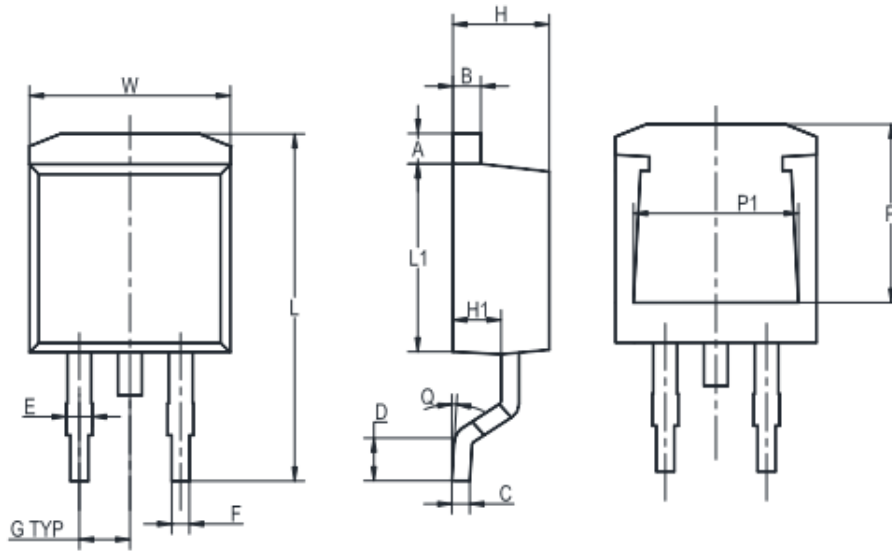


**Table 10 Unclamped inductive load**



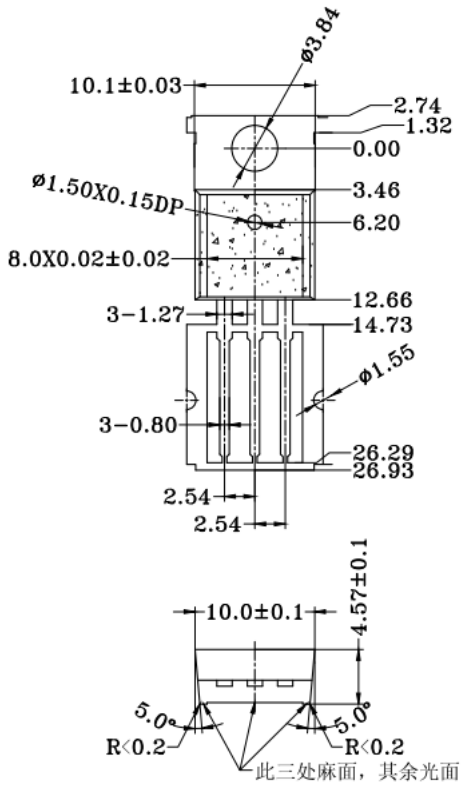


## 6. Package Outlines



| 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 | 10.5 | 4.8 | 2.9 | 16.5 | 8.7 | 8°  | 7.6 | 8.2 |
|      | 1.1 | 1.1 | 0.3 | 2.15 | 1.1 | 0.68 | TYP  | 9.6  | 4.4 | 2.5 | 14.5 | 8.2 | MAX | 7.1 | 7.4 |

Figure1: Outline PG-T0263(HC)



注：如图麻面Ra0.8~1.0

Figure2: Outline PG-T0220(HT)

**Revision History**

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 1.0      | 2023-06-15 | Preliminary version                          |
| 1.1      | 2023-07-06 | Added test circuits                          |

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [MOSFET](#) category:*

*Click to view products by [ANHI](#) manufacturer:*

Other Similar products are found below :

[IRFD120](#) [IRFY240C](#) [JANTX2N5237](#) [2SK2267\(Q\)](#) [BUK455-60A/B](#) [MIC4420CM-TR](#) [VN1206L](#) [NDP4060](#) [SI4482DY](#)  
[IPS70R2K0CEAKMA1](#) [SQD23N06-31L-GE3](#) [TK16J60W,S1VQ\(O](#) [2SK2614\(TE16L1,Q\)](#) [DMN1017UCP3-7](#) [EFC2J004NUZTDG](#)  
[DMN1053UCP4-7](#) [SQJ469EP-T1-GE3](#) [NTE2384](#) [DMC2700UDMQ-7](#) [DMN2080UCB4-7](#) [DMN61D9UWQ-13](#) [US6M2GTR](#)  
[DMN31D5UDJ-7](#) [DMP22D4UFO-7B](#) [DMN1006UCA6-7](#) [DMN16M9UCA6-7](#) [STF5N65M6](#) [IRF40H233XTMA1](#) [STU5N65M6](#)  
[DMN6022SSD-13](#) [DMN13M9UCA6-7](#) [DMTH10H4M6SPS-13](#) [DMN2990UFB-7B](#) [IPB80P04P405ATMA2](#) [2N7002W-G](#) [MCAC30N06Y-](#)  
[TP](#) [MCQ7328-TP](#) [NTMC083NP10M5L](#) [NVMFS2D3P04M8LT1G](#) [BXP7N65D](#) [BXP4N65F](#) [AOL1454G](#) [WMJ80N60C4](#) [BXP2N20L](#)  
[BXP2N65D](#) [BXT1150N10J](#) [BXT1700P06M](#) [TSM60NB380CP](#) [ROG](#) [RQ7L055BGTCR](#) [DMNH15H110SK3-13](#)