

## MOSFET Silicon N-Channel MOS

### 1 Description

#### Features

- Ultra-fast body diode
- Low drain-source on-resistance:  $R_{DS(ON)} = 0.036\Omega$  (typ.)
- Easy to drive
- Pb-free plating, Halogen free mold compound and meet RoHS requirement

#### Applications

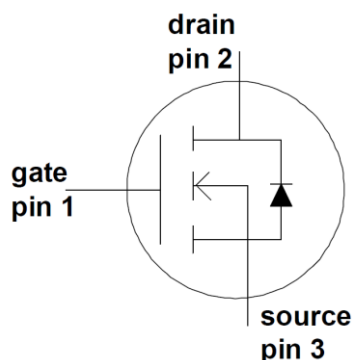
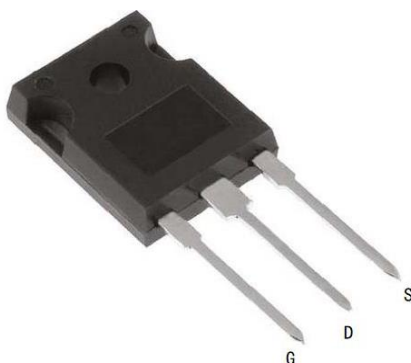
- For Soft Switching Boost PFC switch, HB or AHB or LLC half bridge and full bridge topologies.
- Such as phase-shift-bridge(ZVS),LLC Application-Server Power, Telecom Power, EV Charging, Solar inverter.

**Table 1 Key Performance Parameters**

| Parameter            | Value | Unit       |
|----------------------|-------|------------|
| $V_{DS} @ T_{j,max}$ | 700   | V          |
| $R_{DS(on),max}$     | 41    | m $\Omega$ |
| $Q_g,typ$            | 176   | nC         |
| $I_D,pulse$          | 240   | A          |
| Body diode dv/dt     | 50    | V/ns       |

#### Packaging and Internal Circuit

| Part Name    | Package | Marking      | Packing Method | QTY/BOX |
|--------------|---------|--------------|----------------|---------|
| CMW65R041DFD | TO-247  | CMW65R041DFD | Tube           | 1200PCS |



## 2 Maximum ratings

at  $T_j = 25^\circ\text{C}$ , unless otherwise specified

**Table 2 Maximum ratings**

| Parameter                              | Symbol        | Value |      |      | Unit             | Note / Test Condition                                                                          |
|----------------------------------------|---------------|-------|------|------|------------------|------------------------------------------------------------------------------------------------|
|                                        |               | Min.  | Typ. | Max. |                  |                                                                                                |
| Continuous drain current <sup>1)</sup> | $I_D$         |       | -    | 70   | A                | $T_C=25^\circ\text{C}$                                                                         |
| Pulsed drain current <sup>2)</sup>     | $I_{D,pulse}$ | -     | -    | 240  | A                | $T_C=25^\circ\text{C}$                                                                         |
| Avalanche energy, single pulse         | $E_{AS}$      | -     | -    | 2095 | mJ               | $T_C=25^\circ\text{C}$ , $V_{DD}=50\text{V}$ , $L = 23\text{mH}$ , $R_G=25\Omega$              |
| Avalanche current, single pulse        | $I_{AR}$      | -     | -    | 13.5 | A                | $T_C=25^\circ\text{C}$ , $V_{DD}=50\text{V}$ , $L = 23\text{mH}$ , $R_G=25\Omega$              |
| MOSFET dv/dt ruggedness                | dv/dt         | -     | -    | 50   | V/ns             | $V_{DS}=0\ldots 400\text{V}$                                                                   |
| Gate source voltage (static)           | $V_{GS}$      | -20   | -    | 20   | V                | static;                                                                                        |
| Gate source voltage (dynamic)          | $V_{GS}$      | -30   | -    | 30   | V                | AC ( $f>1\text{ Hz}$ )                                                                         |
| Power dissipation                      | $P_{tot}$     | -     | -    | 500  | W                | $T_C=25^\circ\text{C}$                                                                         |
| Storage temperature                    | $T_{stg}$     | -55   | -    | 150  | $^\circ\text{C}$ |                                                                                                |
| Operating junction temperature         | $T_j$         | -55   | -    | 150  | $^\circ\text{C}$ |                                                                                                |
| Reverse diode dv/dt <sup>3)</sup>      | dv/dt         | -     | -    | 50   | V/ns             | $V_{DS}=0\ldots 400\text{V}$ , $I_{SD}\leq 50\text{A}$ , $T_j=25^\circ\text{C}$<br>see table 8 |

<sup>1)</sup> Limited by  $T_{j,max}$ . Maximum Duty Cycle  $D = 0.5$

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

<sup>3)</sup> Identical low side and high side switch with identical  $R_G$

### 3 Thermal characteristics

**Table 3 Thermal characteristics**

| Parameter                            | Symbol     | Value |      |      | Unit | Note / Test Condition            |
|--------------------------------------|------------|-------|------|------|------|----------------------------------|
|                                      |            | Min.  | Typ. | Max. |      |                                  |
| Thermal resistance, junction-case    | $R_{thJC}$ | -     | -    | 0.25 | °C/W | -                                |
| Thermal resistance, junction-ambient | $R_{thJA}$ | -     | -    | 62   | °C/W | device on PCB, minimal footprint |

#### 4 Electrical characteristics

at  $T_J=25^{\circ}\text{C}$ , unless otherwise specified

**Table 4 Static characteristics**

| Parameter                        | Symbol        | Value |       |       | Unit     | Note / Test Condition                            |
|----------------------------------|---------------|-------|-------|-------|----------|--------------------------------------------------|
|                                  |               | Min.  | Typ.  | Max.  |          |                                                  |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | 650   | -     | -     | V        | $V_{GS}=0V, I_D=1mA$                             |
| Gate threshold voltage           | $V_{(GS)th}$  | 3     |       | 5     | V        | $V_{DS}=V_{GS}, I_D=2mA$                         |
| Zero gate voltage drain current  | $I_{DSS}$     | -     | -     | 5     | $\mu A$  | $V_{DS}=650V, V_{GS}=0V, T_J=25^{\circ}\text{C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -     | -     | 100   | nA       | $V_{GS}=30V, V_{DS}=0V$                          |
| Drain-source on-state resistance | $R_{DS(on)}$  | -     | 0.036 | 0.041 | $\Omega$ | $V_{GS}=10V, I_D=50A, T_J=25^{\circ}\text{C}$    |
| Gate resistance (Intrinsic)      | $R_G$         | -     | 1.1   | -     | $\Omega$ | $f=100kHz$ , open drain                          |

**Table 5 Dynamic characteristics**

| Parameter                    | Symbol       | Value |      |      | Unit | Note / Test Condition                                              |
|------------------------------|--------------|-------|------|------|------|--------------------------------------------------------------------|
|                              |              | Min.  | Typ. | Max. |      |                                                                    |
| Input capacitance            | $C_{iss}$    | -     | 7470 | -    | pF   | $V_{GS}=0V, V_{DS}=100V, f=100kHz$                                 |
| Output capacitance           | $C_{oss}$    | -     | 263  | -    | pF   | $V_{GS}=0V, V_{DS}=100V, f=100kHz$                                 |
| Reverse transfer capacitance | $C_{rss}$    | -     | 3    | -    | pF   | $V_{GS}=0V, V_{DS}=100V, f=100kHz$                                 |
| Turn-on delay time           | $t_{d(on)}$  | -     | 53.3 | -    | ns   | $V_{DD}=400V, V_{GS}=13V, I_D=50A$<br>$R_G=2\Omega$ ; see table 15 |
| Rise time                    | $t_r$        | -     | 28.3 | -    | ns   | $V_{DD}=400V, V_{GS}=13V, I_D=50A$<br>$R_G=2\Omega$ ; see table 15 |
| Turn-off delay time          | $t_{d(off)}$ | -     | 253  | -    | ns   | $V_{DD}=400V, V_{GS}=13V, I_D=50A$<br>$R_G=2\Omega$ ; see table 15 |
| Fall time                    | $t_f$        | -     | 12   | -    | ns   | $V_{DD}=400V, V_{GS}=13V, I_D=50A$<br>$R_G=2\Omega$ ; see table 15 |

**Table 6 Gate charge characteristics**

| Parameter             | Symbol        | Value |      |      | Unit | Note / Test Condition              |
|-----------------------|---------------|-------|------|------|------|------------------------------------|
|                       |               | Min.  | Typ. | Max. |      |                                    |
| Gate to source charge | $Q_{gs}$      | -     | 25.6 | -    | nC   | $V_{DD}=480V, I_D=50A, V_{GS}=10V$ |
| Gate to drain charge  | $Q_{gd}$      | -     | 127  | -    | nC   | $V_{DD}=480V, I_D=50A, V_{GS}=10V$ |
| Gate charge total     | $Q_g$         | -     | 176  | -    | nC   | $V_{DD}=480V, I_D=50A, V_{GS}=10V$ |
| Gate plateau voltage  | $V_{plateau}$ | -     | 7.6  | -    | V    | $V_{DD}=480V, I_D=50A, V_{GS}=10V$ |

**Table 7 Reverse diode characteristics**

| Parameter                     | Symbol    | Value |      |      | Unit    | Note / Test Condition                                 |
|-------------------------------|-----------|-------|------|------|---------|-------------------------------------------------------|
|                               |           | Min.  | Typ. | Max. |         |                                                       |
| Diode forward voltage         | $V_{SD}$  | -     | 1    | -    | V       | $V_{GS}=0V, I_F=50A, T_J=25^{\circ}C$                 |
| Reverse recovery time         | $t_{rr}$  | -     | 166  | -    | ns      | $V_r=400V, I_F=50A, di/dt=100A/\mu s$<br>see table 14 |
| Reverse recovery charge       | $Q_{rr}$  | -     | 1.2  | -    | $\mu C$ | $V_r=400V, I_F=50A, di/dt=100A/\mu s$<br>see table 14 |
| Peak reverse recovery current | $I_{rrm}$ | -     | 14.5 | -    | A       | $V_r=400V, I_F=50A, di/dt=100A/\mu s$<br>see table 14 |

## 5 Electrical characteristics diagram

Table 8

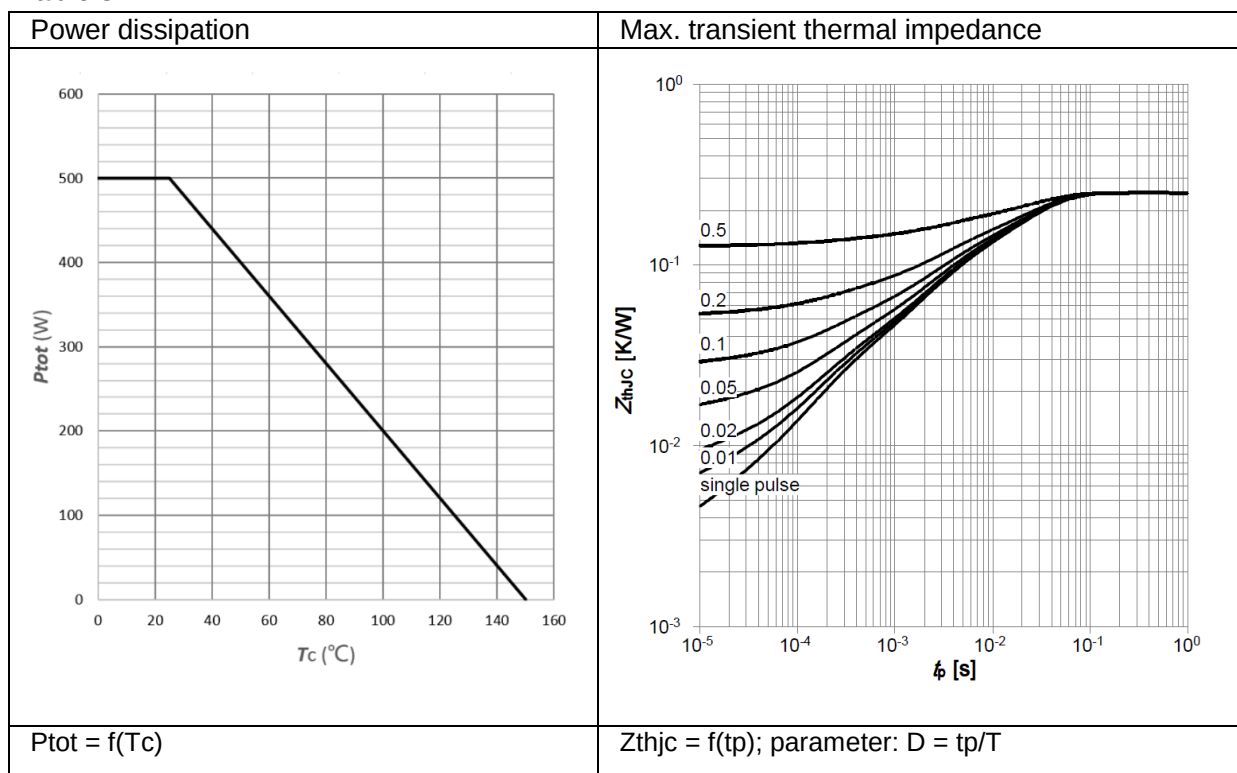
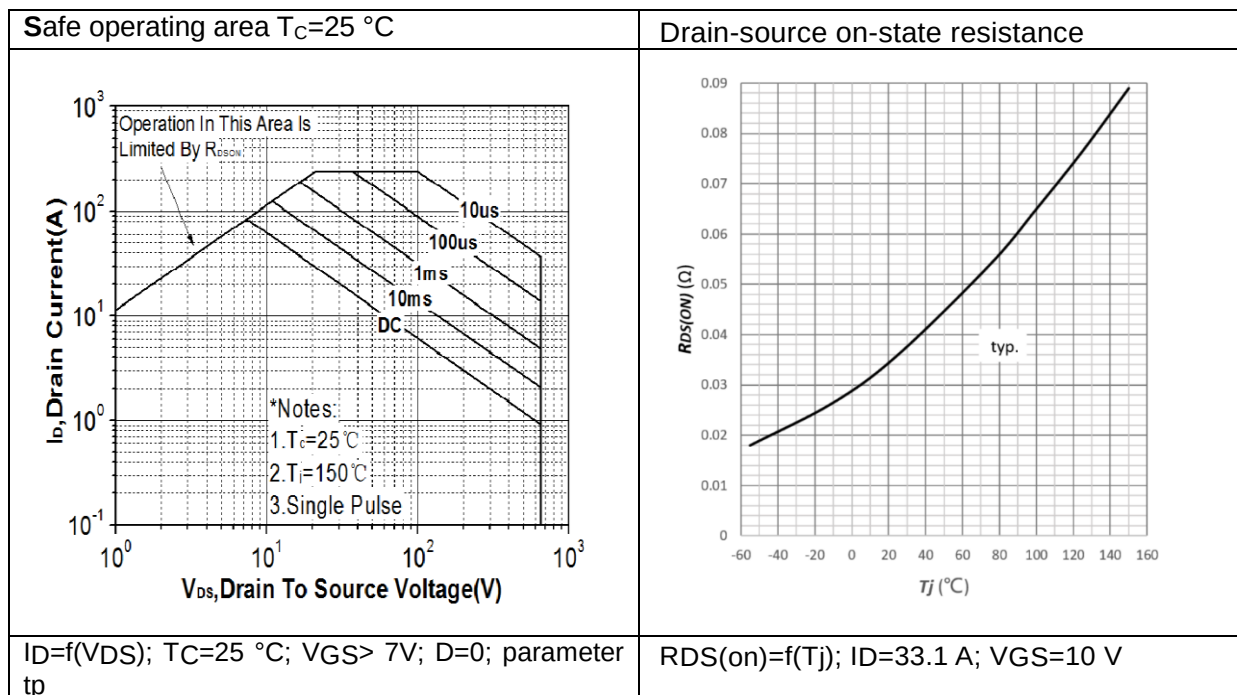
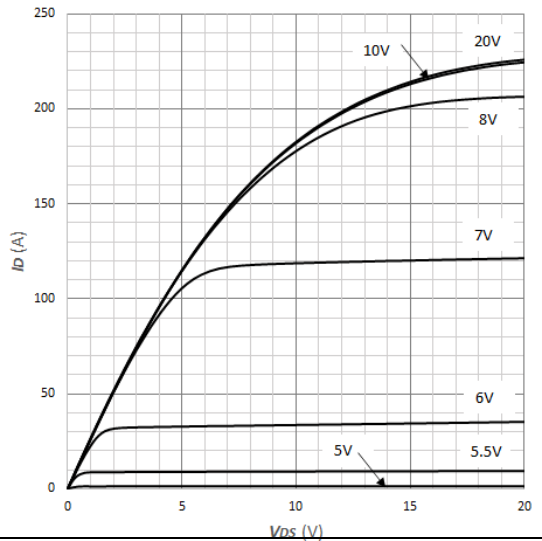
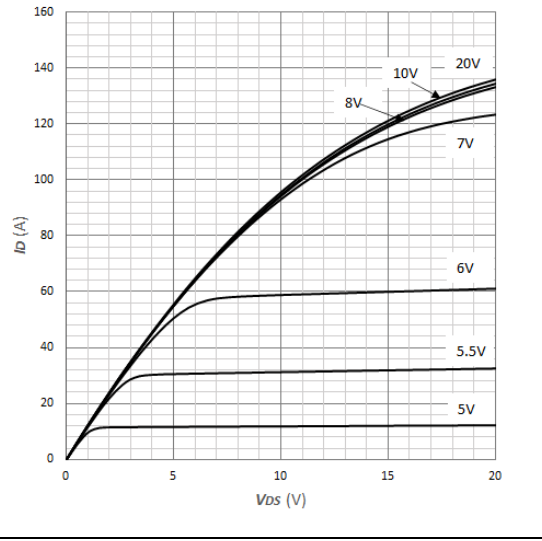


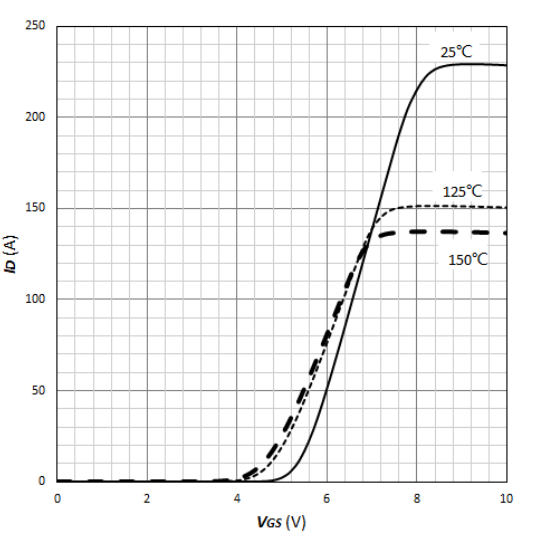
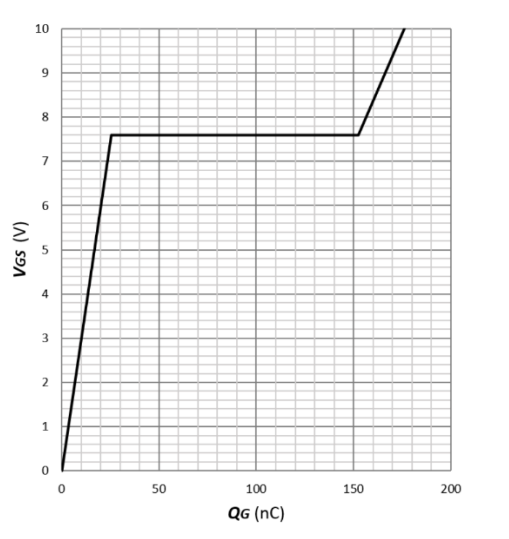
Table 9



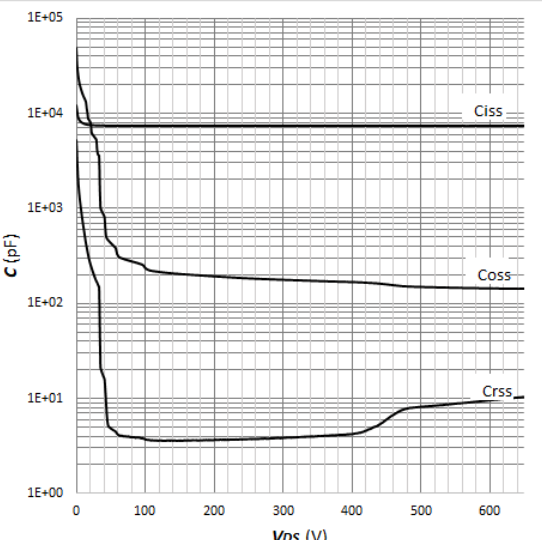
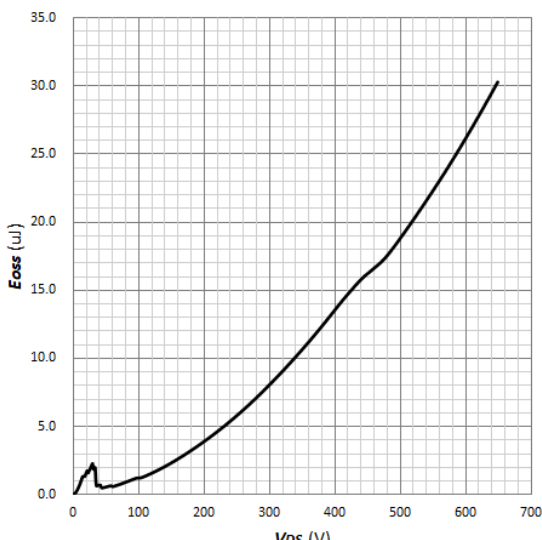
**Table 10**

| Typ. output characteristics $T_c=25^{\circ}\text{C}$                              | Typ. output characteristics $T_c=125^{\circ}\text{C}$                              |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  |  |
| $I_D=f(V_{DS}); T_j=25^{\circ}\text{C}; \text{parameter: } V_{GS}$                | $I_D=f(V_{DS}); T_j=125^{\circ}\text{C}; \text{parameter: } V_{GS}$                |

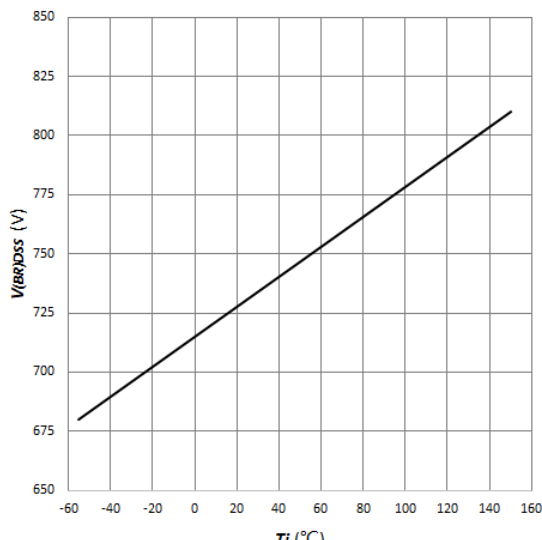
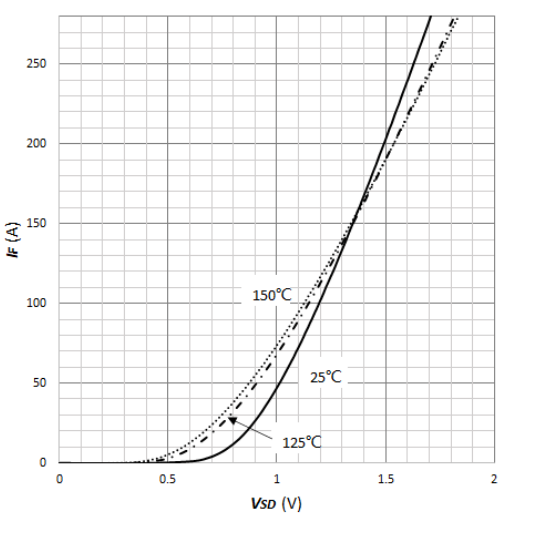
**Table 11**

| Typ. transfer characteristics                                                       | Typ. gate charge                                                                     |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| $I_D=f(V_{GS}); I_{VDSI}=20\text{V};$                                               | $V_{GS}=f(Q_{\text{gate}}); I_D=50\text{ A pulsed}; \text{parameter: } V_{DD}$       |

**Table 12**

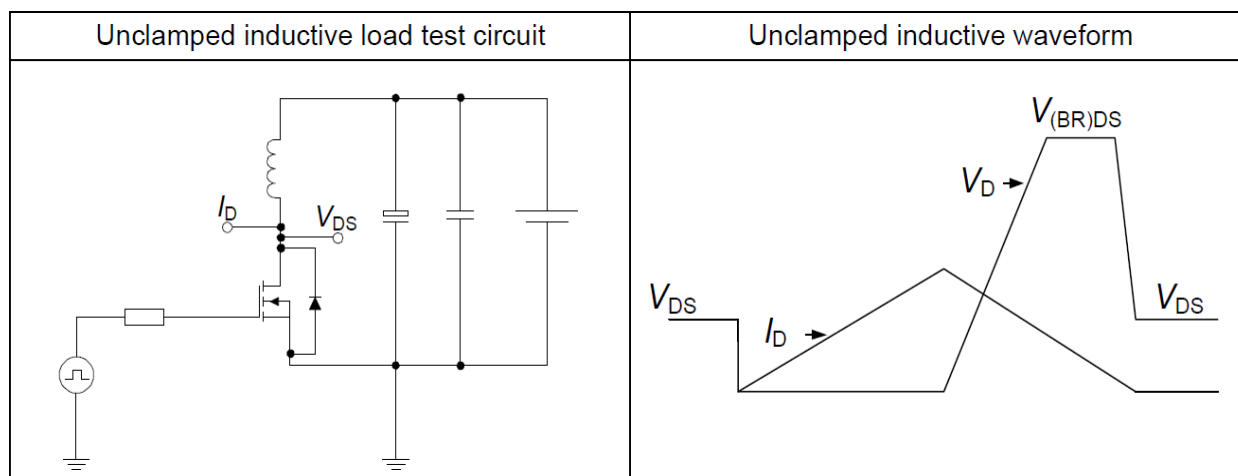
| Typ. capacitances                                                                 | Typ. Coss stored energy                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  |  |
| $C=f(V_{DS}); V_{GS}=0\text{ V}; f=100\text{ kHz}$                                | $E_{oss}=f(V_{DS})$                                                                |

**Table 13**

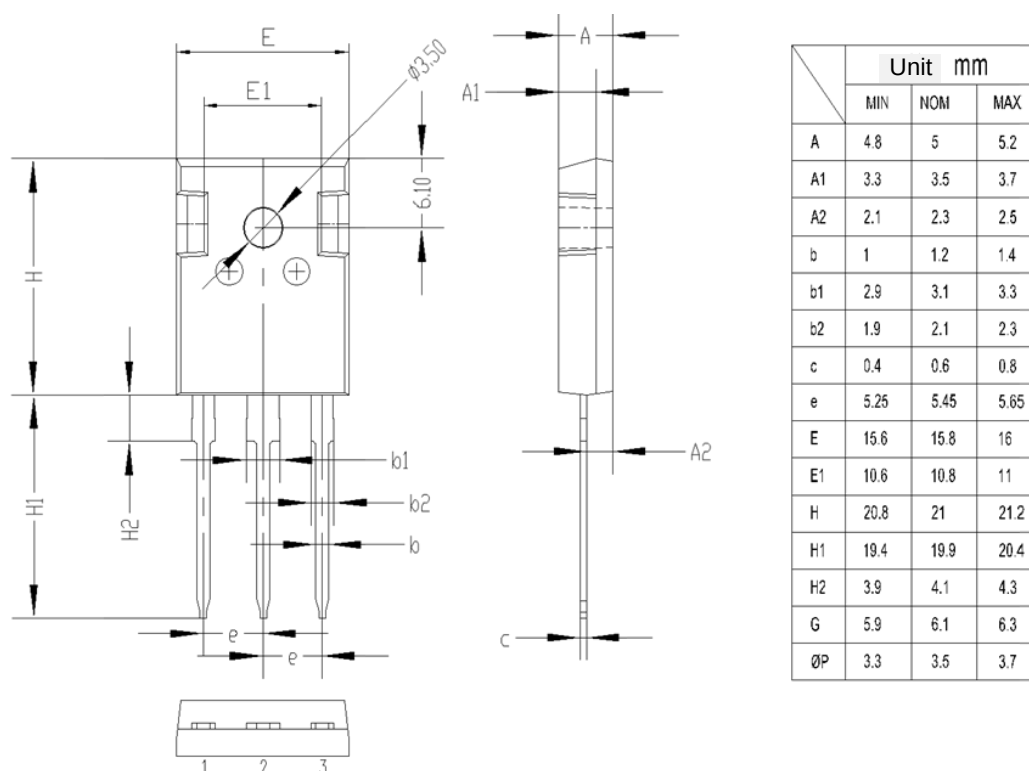
| Drain-source breakdown voltage                                                      | Forward characteristics of reverse diode                                             |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| $V_{BR(DSS)}=f(T_j); I_D=10\text{ mA}$                                              | $I_F=f(V_{SD}); \text{parameter: } T_j$                                              |





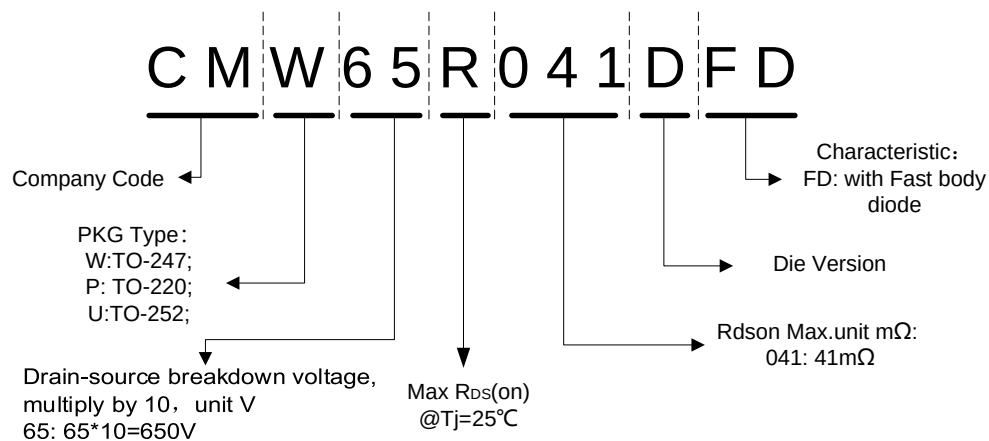
**Table16 Unclamped inductive load**


## 7 Package Outlines

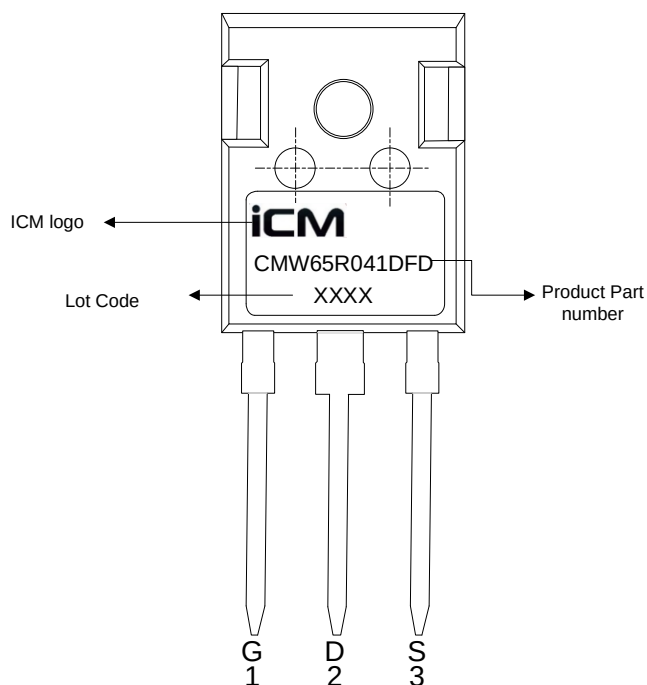
**Figure1: Outline of PG-T0247**


## 8 Product Code

**Figure2: Product number Decode**



**Figure3: Part Marking Information**



**Revision History**

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 1.0      | 2021-07-12 | Preliminary version                          |