

## Product Summary

|                                 |         |
|---------------------------------|---------|
| $V_{RRM}$                       | 650 V   |
| $I_F (T_C=160^{\circ}\text{C})$ | 16 A**  |
| $Q_C$                           | 46 nC** |

\* Per Leg, \*\* Per Device

## Features

- Low leakage current ( $I_R$ )
- Zero reverse recovery current
- Temperature independent switching behavior
- Positive temperature coefficient on  $V_F$
- High surge current capacity
- Low capacitive charge

## Benefits

- System cost savings due to smaller magnetics
- System efficiency improvement over Si diodes
- Reduction of heat sink requirements
- Enabling higher frequency
- Reduced EMI

## Applications

- Switch mode power supplies (SMPS)
- Uninterruptible power supplies
- Server/telecom power supplies
- Power factor correction
- Solar

## Package Pin Definitions

- Pin1 - Anode
- Pin2 and backside - Cathode
- Pin3 - Anode

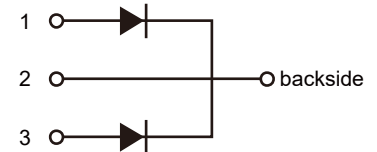
## Package Parameters

| Part Number | Marking     | Package  |
|-------------|-------------|----------|
| B2D16065HC1 | B2D16065HC1 | TO-247-3 |

## Package: TO-247-3



### Electrical Connection



**Maximum Ratings ( $T_c=25^\circ\text{C}$  unless otherwise specified)**

| Symbol        | Parameter                            | Test conditions                                              | Value       | Unit             |
|---------------|--------------------------------------|--------------------------------------------------------------|-------------|------------------|
| $V_{RRM}$     | Repetitive peak reverse voltage      |                                                              | 650         | V                |
| $V_{RSM}$     | Non-repetitive peak reverse voltage  |                                                              | 650         | V                |
| $I_F$         | Continuous forward current           | $T_c=25^\circ\text{C}$                                       | 34*/68**    | A                |
|               |                                      | $T_c=135^\circ\text{C}$                                      | 16*/32**    |                  |
|               |                                      | $T_c=160^\circ\text{C}$                                      | 8*/16**     |                  |
| $I_{FSM}$     | Non-repetitive forward surge current | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$<br>Half sine wave | 64*         | A                |
| $\int i^2 dt$ | $i^2t$ value                         | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$                   | 20*         | A <sup>2</sup> S |
| $P_{tot}$     | Power dissipation                    | $T_c=25^\circ\text{C}$<br>$T_c=110^\circ\text{C}$            | 164*<br>71* | W                |
| $T_j$         | Operating junction temperature       |                                                              | -55~175     | $^\circ\text{C}$ |
| $T_{stg}$     | Storage temperature                  |                                                              | -55~175     | $^\circ\text{C}$ |
|               | TO-247 mounting torque               | M3 Screw                                                     | 0.7         | Nm               |

\* Per Leg, \*\* Per Device

**Thermal Characteristics**

| Symbol       | Parameter                                | Value |                  |      | Unit |
|--------------|------------------------------------------|-------|------------------|------|------|
|              |                                          | Min.  | Typ.             | Max. |      |
| $R_{th(jc)}$ | Thermal resistance from junction to case |       | 0.92*<br>/0.46** |      | K/W  |

\* Per Leg, \*\* Per Device

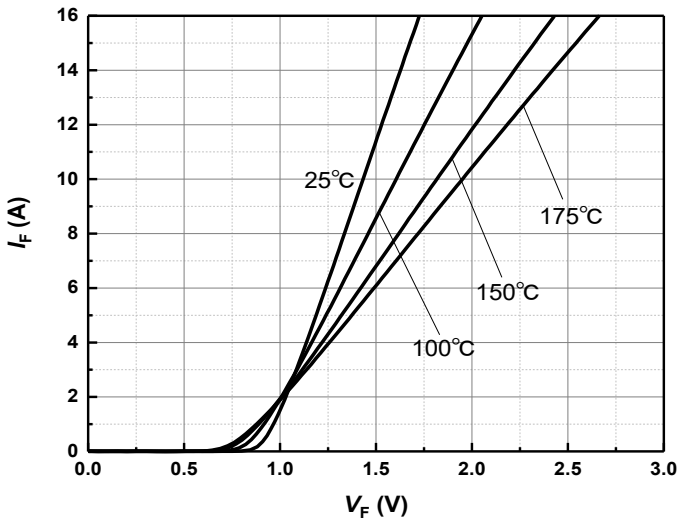
**Electrical Characteristics (Per Leg)**  
**Static Characteristics**

| Symbol   | Parameter             | Test conditions                                               | Value |              |             | Unit    |
|----------|-----------------------|---------------------------------------------------------------|-------|--------------|-------------|---------|
|          |                       |                                                               | Min.  | Typ.         | Max.        |         |
| $V_{DC}$ | DC blocking voltage   | $T_J=25^{\circ}C$                                             | 650   |              |             | V       |
| $V_F$    | Diode forward voltage | $I_F=8A$ $T_J=25^{\circ}C$<br>$I_F=8A$ $T_J=175^{\circ}C$     |       | 1.32<br>1.73 | 1.5<br>2.11 | V       |
| $I_R$    | Reverse current       | $V_R=650V$ $T_J=25^{\circ}C$<br>$V_R=650V$ $T_J=175^{\circ}C$ |       | 5<br>11      | 100<br>110  | $\mu A$ |

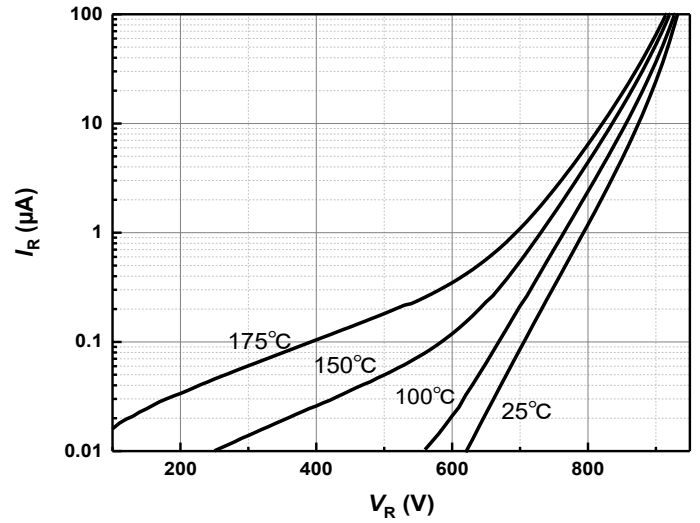
**AC Characteristics**

| Symbol | Parameter                 | Test conditions                                                 | Value |                 |      | Unit    |
|--------|---------------------------|-----------------------------------------------------------------|-------|-----------------|------|---------|
|        |                           |                                                                 | Min.  | Typ.            | Max. |         |
| $Q_C$  | Total capacitive charge   | $V_R=400V$ $T_J=25^{\circ}C$<br>$Q_C=\int_0^{t_{VR}} C(V)dV$    |       | 23              |      | nC      |
| $C$    | Total capacitance         | $V_R=1V$ $f=1MHz$<br>$V_R=300V$ $f=1MHz$<br>$V_R=600V$ $f=1MHz$ |       | 353<br>41<br>40 |      | pF      |
| $E_C$  | Capacitance stored energy | $V_R=400V$                                                      |       | 5.8             |      | $\mu J$ |

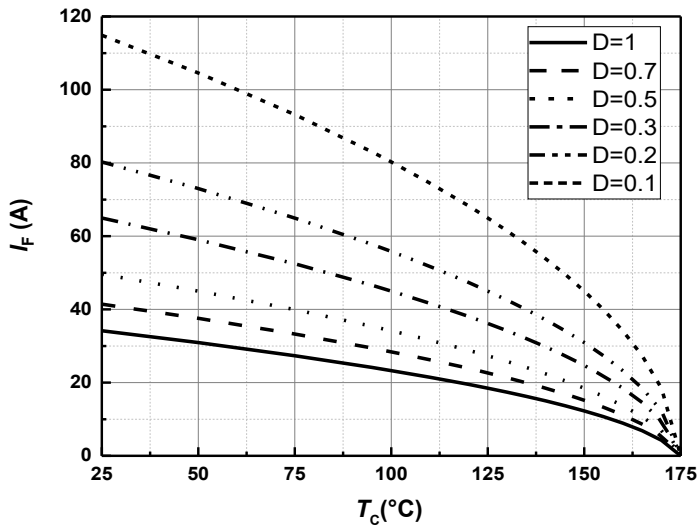
**Typical Performance (Per Leg)**



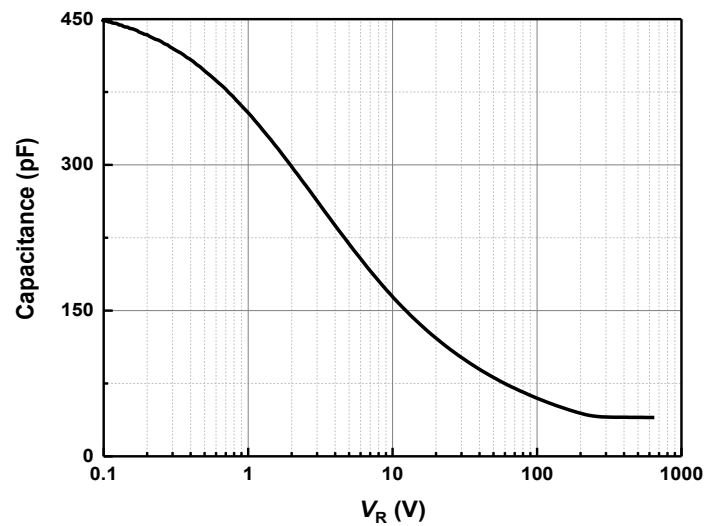
**Figure 1** Typical forward characteristics



**Figure 2** Typical reverse current as function of reverse voltage

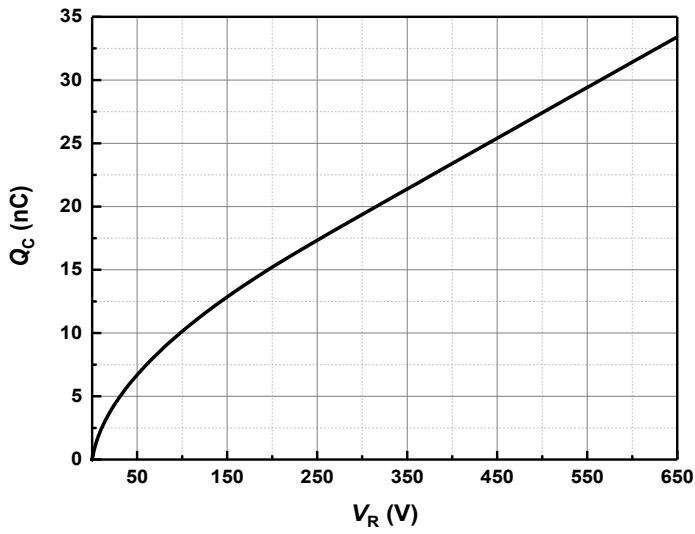


**Figure 3** Diode forward current as function of temperature,  $D$ =duty cycle

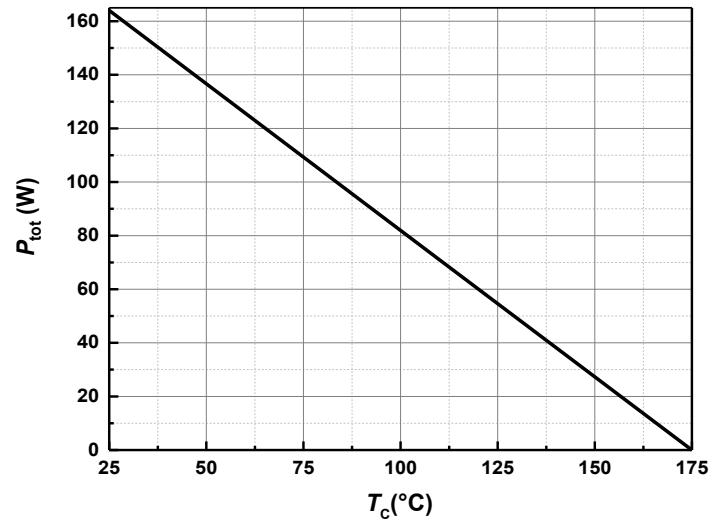


**Figure 4** Typical capacitance as function of reverse voltage,  $C=f(V_R)$ ;  $T_j=25^\circ\text{C}$ ;  $f=1\text{ MHz}$

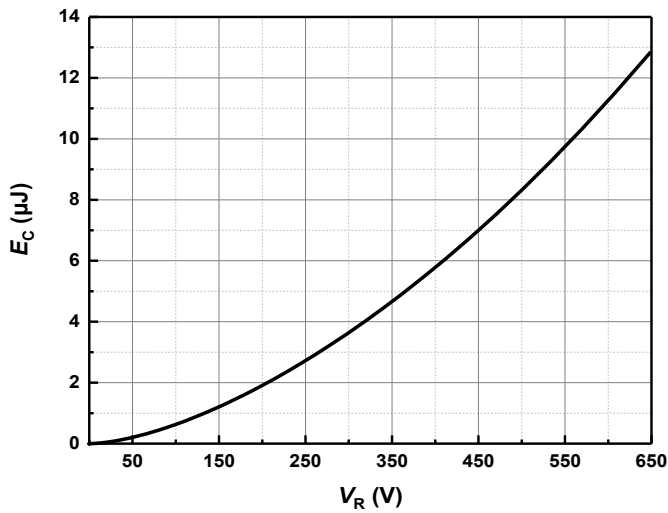
## Typical Performance



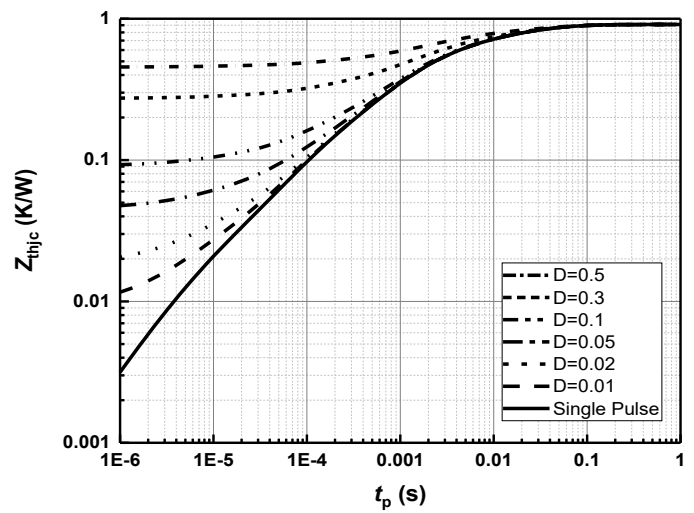
**Figure 5** Typical reverse charge as function of reverse voltage



**Figure 6** Power dissipation as function of case temperature

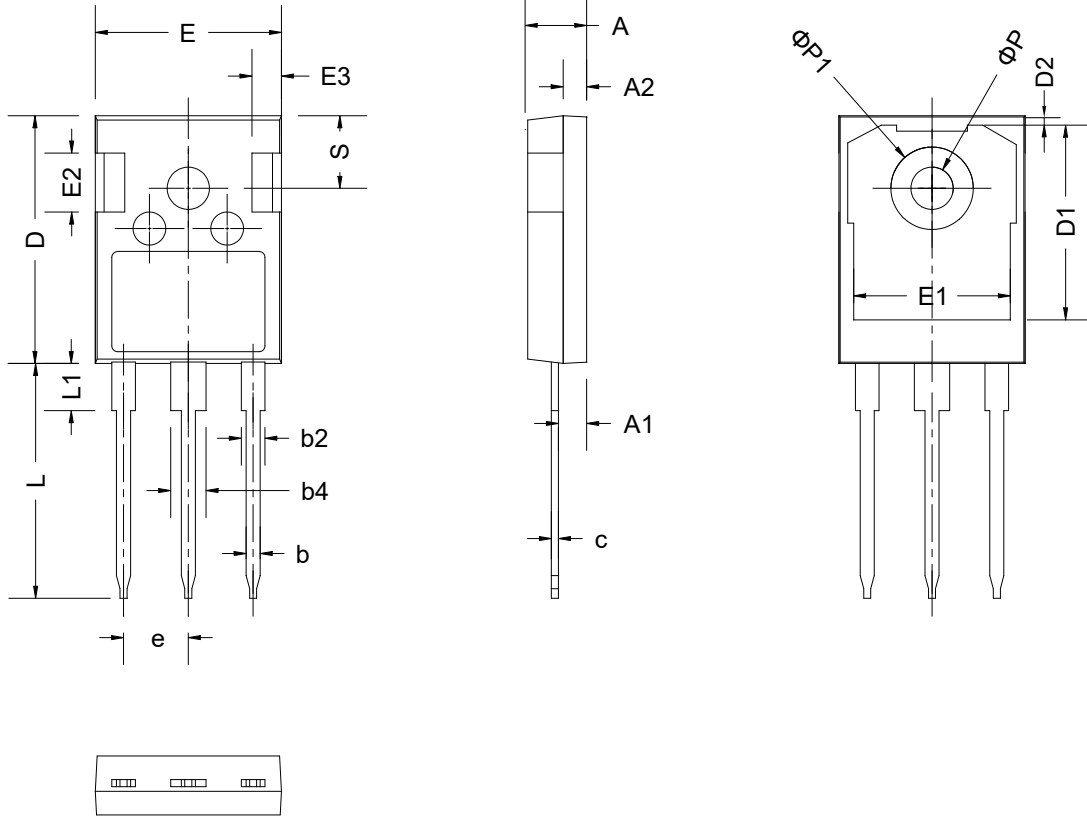


**Figure 7** Capacitance stored energy

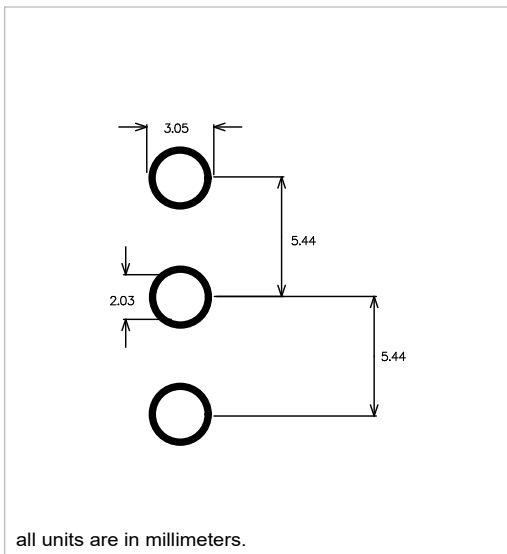


**Figure 8** Max. transient thermal impedance,  $Z_{thjc} = f(t_p)$ , parameter:  $D = t_p / T$

## Package Dimensions



## Recommended Solder Pad Layout



| SYMBOL | mm       |       |       |
|--------|----------|-------|-------|
|        | MIN      | NOM   | MAX   |
| A      | 4.80     | 5.00  | 5.20  |
| A1     | 2.21     | 2.41  | 2.59  |
| A2     | 1.85     | 2.00  | 2.15  |
| b      | 1.11     | -     | 1.36  |
| b2     | 1.91     | 2.01  | 2.21  |
| b4     | 2.91     | -     | 3.41  |
| c      | 0.51     | -     | 0.75  |
| D      | 20.80    | 21.00 | 21.30 |
| D1     | 16.25    | 16.55 | 16.85 |
| D2     | 1.05     | 1.17  | 1.35  |
| E      | 15.50    | 15.80 | 16.10 |
| E1     | 13.00    | 13.30 | 13.60 |
| E2     | 4.40     | -     | 5.20  |
| E3     | 1.50     | -     | 2.70  |
| e      | 5.436BSC |       |       |
| L      | 19.62    | 19.92 | 20.22 |
| L1     | -        | -     | 4.30  |
| φ P    | 3.40     | 3.60  | 3.80  |
| φ P1   | -        | -     | 7.40  |
| S      | 6.00     | 6.15  | 6.30  |

**Revision History**

| Document Version | Date of Release | Description of Changes    |
|------------------|-----------------|---------------------------|
| Rev. 0.0         | 2023-02-17      | Release of the datasheet. |
|                  |                 |                           |
|                  |                 |                           |
|                  |                 |                           |

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