

**Product Summary**

|                          |          |
|--------------------------|----------|
| $V_{RRM}$                | 1200 V   |
| $I_F (T_C=150^{\circ}C)$ | 40 A**   |
| $Q_C$                    | 212 nC** |

**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

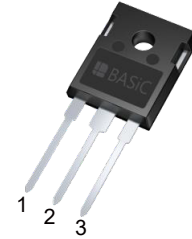
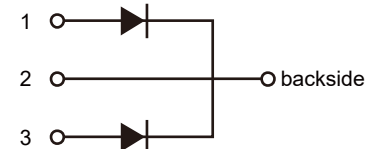
**Package Pin Definitions**

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

**Package Parameters**

| Part Number | Marking    | Package  |
|-------------|------------|----------|
| B3D40120HC  | B3D40120HC | TO-247-3 |

\* Per Leg, \*\* Per Device

**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      |                                                                                    | 1200         | V                |
| $V_{RSM}$     | Non-repetitive peak reverse voltage  |                                                                                    | 1200         | V                |
| $E_{AS}$      | Single pulse avalanche energy        | $T_c=25^\circ\text{C}$ , $L=1\text{mH}$ , $I_{AS}=22\text{A}$ ,<br>$V=140\text{V}$ | 242          | mJ               |
| $I_F$         | Continuous forward current           | $T_c=25^\circ\text{C}$                                                             | 60*/120**    | A                |
|               |                                      | $T_c=135^\circ\text{C}$                                                            | 28*/56**     |                  |
|               |                                      | $T_c=150^\circ\text{C}$                                                            | 20*/40**     |                  |
| $I_{FSM}$     | Non-repetitive forward surge current | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$<br>Half sine wave                       | 160*         | A                |
| $I_{FRM}$     | Repetitive forward surge current     | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$<br>Half sine wave                       | 90*          | A                |
| $\int i^2 dt$ | $i^2t$ value                         | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$                                         | 128*         | A <sup>2</sup> S |
| $P_{tot}$     | Power dissipation                    | $T_c=25^\circ\text{C}$<br>$T_c=110^\circ\text{C}$                                  | 258*<br>112* | 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 |       | 0.58*/<br>0.28** |      | K/W  |

\* Per Leg, \*\* Per Device

**Electrical Characteristics**  
**Static Characteristics**

| Symbol   | Parameter             | Test conditions                                                 | Value |              |              | Unit    |
|----------|-----------------------|-----------------------------------------------------------------|-------|--------------|--------------|---------|
|          |                       |                                                                 | Min.  | Typ.         | Max.         |         |
| $V_{DC}$ | DC blocking voltage   | $T_J=25^{\circ}C$                                               | 1200  |              |              | V       |
| $V_F$    | Diode forward voltage | $I_F=20A$ $T_J=25^{\circ}C$<br>$I_F=20A$ $T_J=175^{\circ}C$     |       | 1.40<br>2.03 | 1.62<br>2.52 | V       |
| $I_R$    | Reverse current       | $V_R=1200V$ $T_J=25^{\circ}C$<br>$V_R=1200V$ $T_J=175^{\circ}C$ |       | 5<br>20      | 80<br>150    | $\mu A$ |

**AC Characteristics**

| Symbol | Parameter                 | Test conditions                                                 | Value |                   |      | Unit    |
|--------|---------------------------|-----------------------------------------------------------------|-------|-------------------|------|---------|
|        |                           |                                                                 | Min.  | Typ.              | Max. |         |
| $Q_C$  | Total capacitive charge   | $V_R=800V$ $T_J=25^{\circ}C$<br>$Q_C=\int_0^{t_{VR}} C(V)dV$    |       | 106               |      | nC      |
| $C$    | Total capacitance         | $V_R=1V$ $f=1MHz$<br>$V_R=400V$ $f=1MHz$<br>$V_R=800V$ $f=1MHz$ |       | 1180<br>100<br>73 |      | pF      |
| $E_C$  | Capacitance stored energy | $V_R=800V$                                                      |       | 55                |      | $\mu J$ |

## Typical Performance

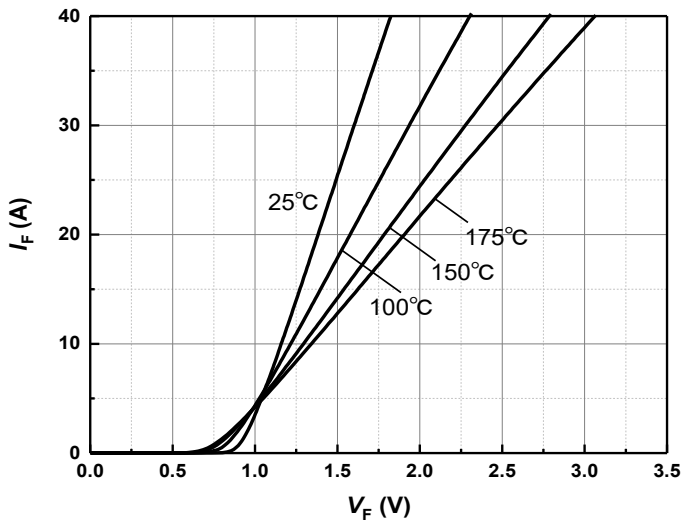


Figure 1 Typical forward characteristics

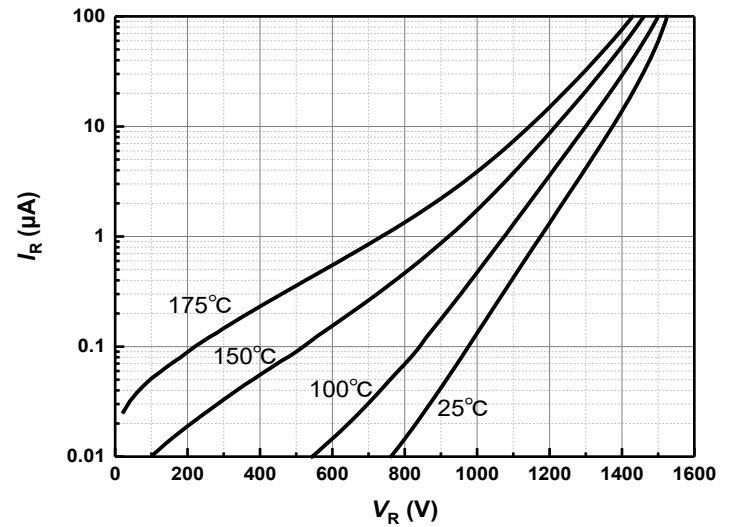


Figure 2 Typical reverse current as function of reverse voltage

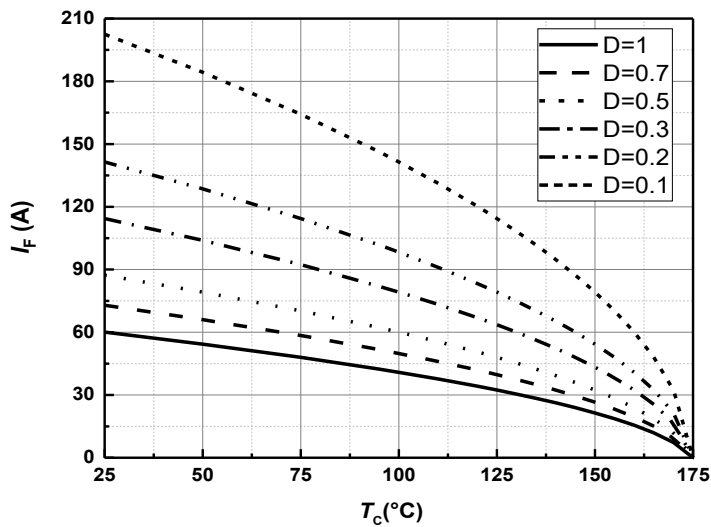


Figure 3 Diode forward current as function of temperature, D=duty cycle

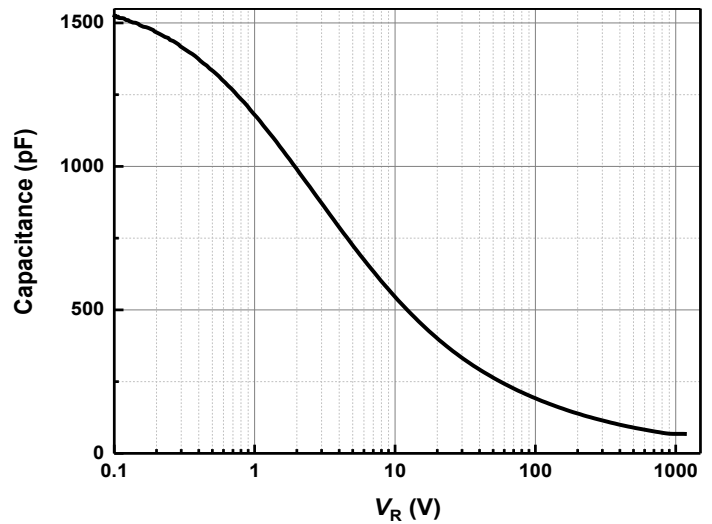
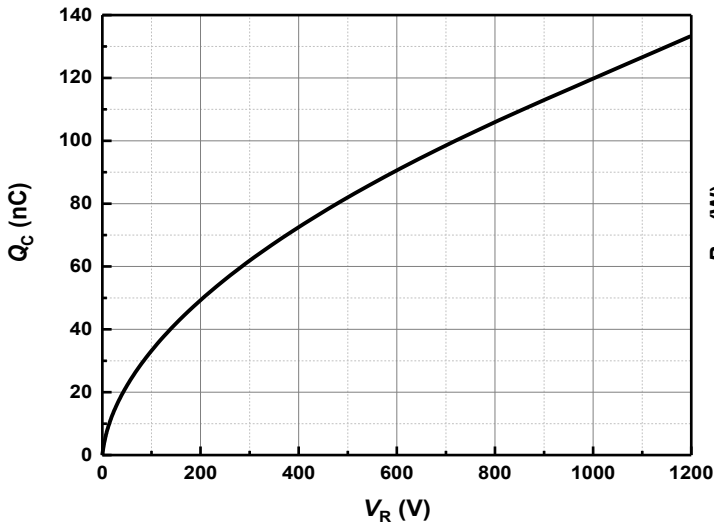
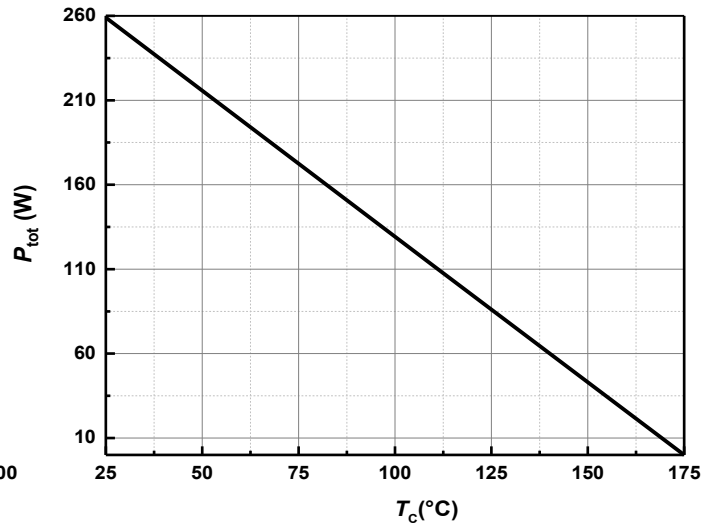


Figure 4 Typical capacitance as function of reverse voltage,  $C=f(V_R)$ ;  $T_j=25^\circ\text{C}$ ;  $f=1\text{ MHz}$

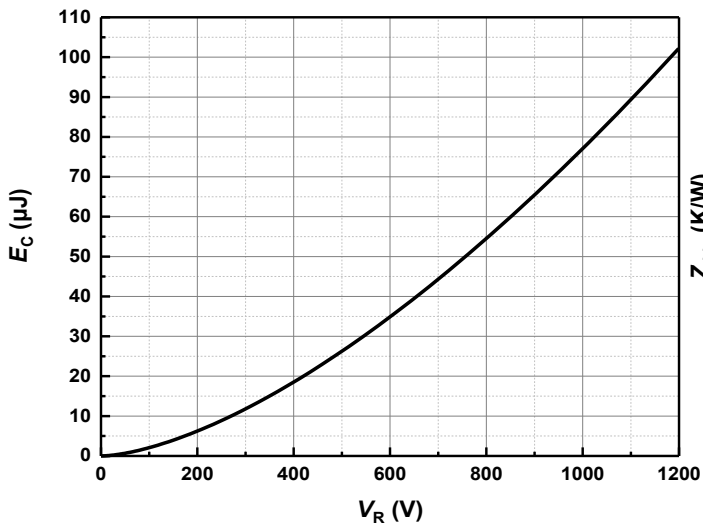
## Typical Performance



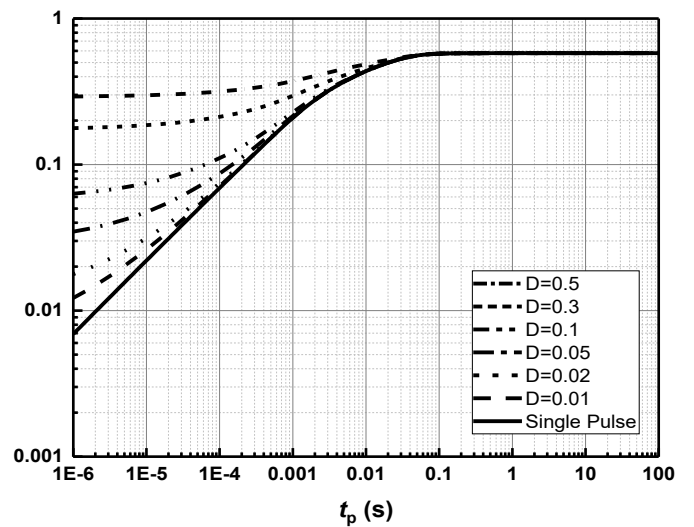
**Figure 5** Typical reverse charge as function of reverse voltage



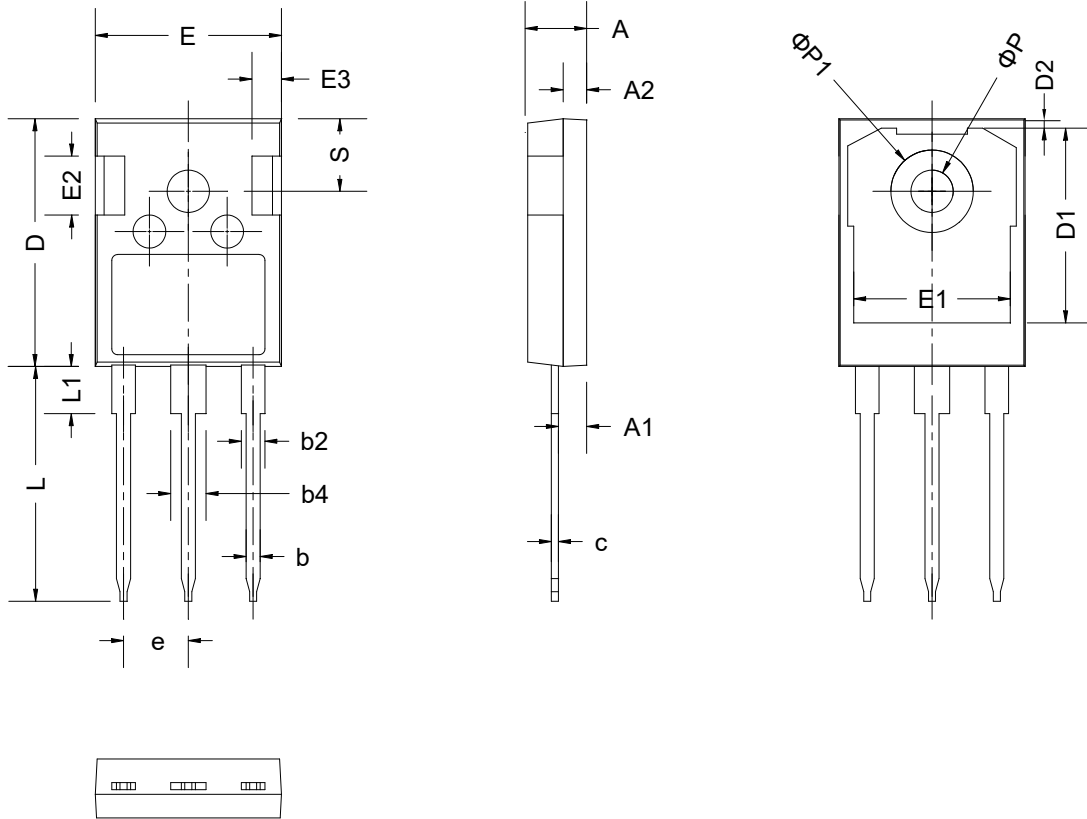
**Figure 6** Power dissipation as function of case temperature



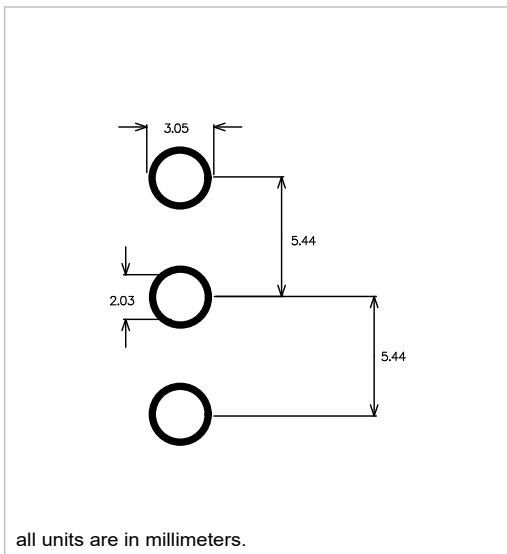
**Figure 7** Capacitance stored energy



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



### 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         | 2023-07-04      | Release of the datasheet. |
|                  |                 |                           |
|                  |                 |                           |
|                  |                 |                           |

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