

**Product Summary**

|                          |       |
|--------------------------|-------|
| $V_{RRM}$                | 650 V |
| $I_F (T_C=165^{\circ}C)$ | 4 A   |
| $Q_c$                    | 14 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**

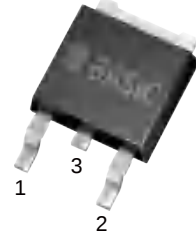
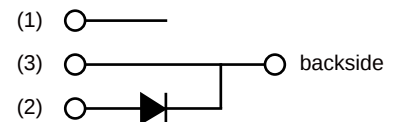
- Pin1 - NC
- Pin2 - Anode
- Pin3 and backside - Cathode

**Package Parameters**

| Part Number | Marking    | Package  |
|-------------|------------|----------|
| B2D04065E1  | B2D04065E1 | TO-252-3 |

**Packing Quantities**

| Tape & Reel Packing | PCS/Reel | Reels/Box | PCS/Box |
|---------------------|----------|-----------|---------|
| TO-252-3            | 2500     | 2         | 5000    |

**Package: TO-252-3**

**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           | $T_c=25^\circ\text{C}$                                       | 20       | A                    |
|               |                                      | $T_c=135^\circ\text{C}$                                      | 9        |                      |
|               |                                      | $T_c=165^\circ\text{C}$                                      | 4        |                      |
| $I_{FSM}$     | Non-repetitive forward surge current | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$<br>Half sine wave | 31       | A                    |
| $\int i^2 dt$ | $i^2t$ value                         | $T_c=25^\circ\text{C}$ , $t_p=10\text{ms}$                   | 4.8      | $\text{A}^2\text{S}$ |
| $P_{tot}$     | Power dissipation                    | $T_c=25^\circ\text{C}$<br>$T_c=110^\circ\text{C}$            | 90<br>39 | W                    |
| $T_j$         | Operating junction temperature       |                                                              | -55~175  | $^\circ\text{C}$     |
| $T_{stg}$     | Storage temperature                  |                                                              | -55~175  | $^\circ\text{C}$     |

**Thermal Characteristics**

| Symbol       | Parameter                                | Value |      |      | Unit |
|--------------|------------------------------------------|-------|------|------|------|
|              |                                          | Min.  | Typ. | Max. |      |
| $R_{th(jc)}$ | Thermal resistance from junction to case |       | 1.66 |      | K/W  |

**Electrical Characteristics**  
**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 | $I_F=4A$ $T_J=25^{\circ}C$<br>$I_F=4A$ $T_J=175^{\circ}C$     |       | 1.3<br>1.6 | 1.6<br>2.2 | V       |
| $I_R$    | Reverse current       | $V_R=650V$ $T_J=25^{\circ}C$<br>$V_R=650V$ $T_J=175^{\circ}C$ |       | 1<br>20    | 70<br>200  | $\mu A$ |

**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>$Q_C=\int_0^{t_{VR}} C(V)dV$    |       | 14              |      | nC      |
| $C$    | Total capacitance         | $V_R=1V$ $f=1MHz$<br>$V_R=300V$ $f=1MHz$<br>$V_R=600V$ $f=1MHz$ |       | 200<br>23<br>22 |      | pF      |
| $E_C$  | Capacitance stored energy | $V_R=400V$                                                      |       | 3.3             |      | $\mu J$ |

## Typical Performance

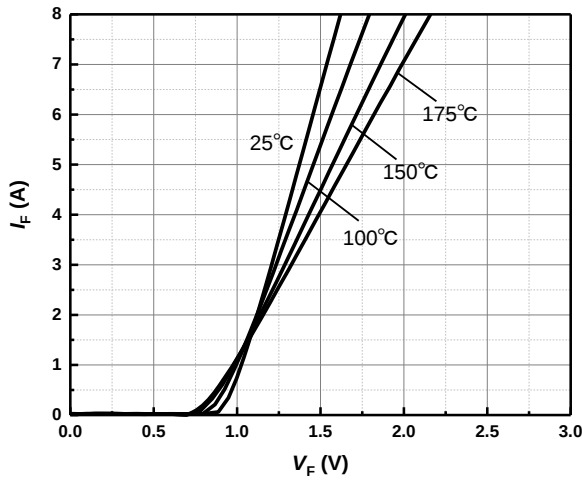


Figure 1 Typical forward characteristics

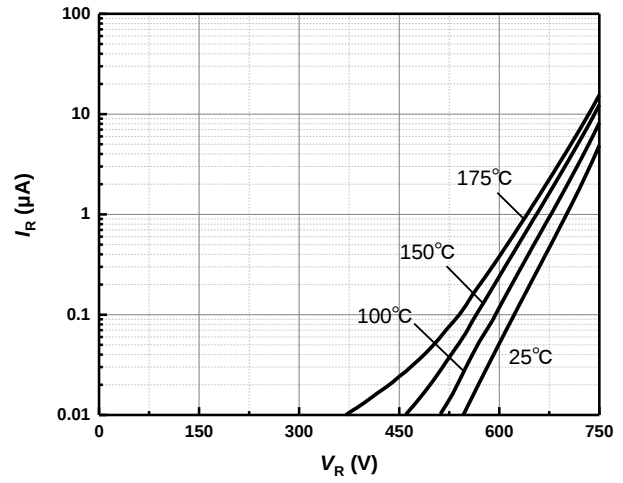


Figure 2 Typical reverse current as function of reverse voltage

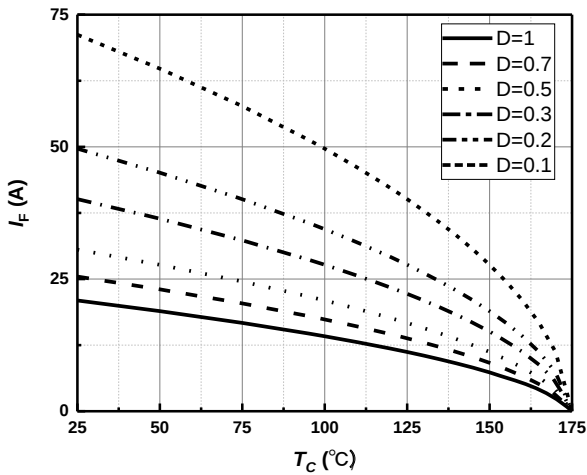


Figure 3 Diode forward current as function of temperature, D=duty cycle

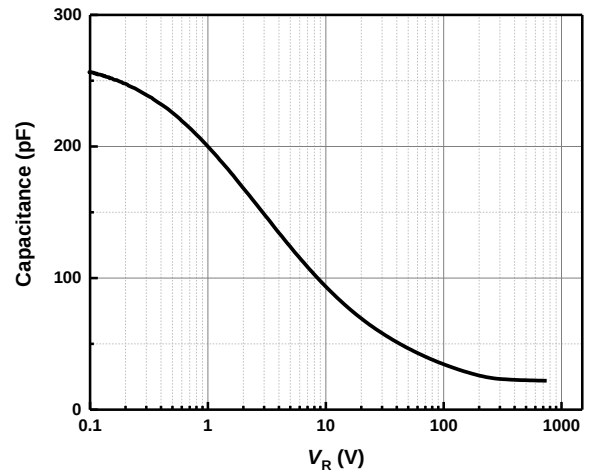
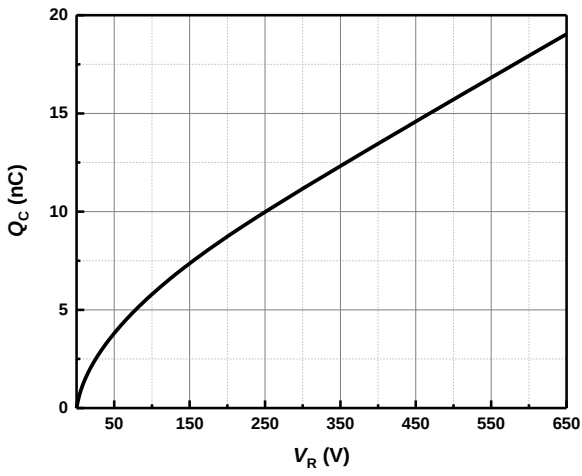
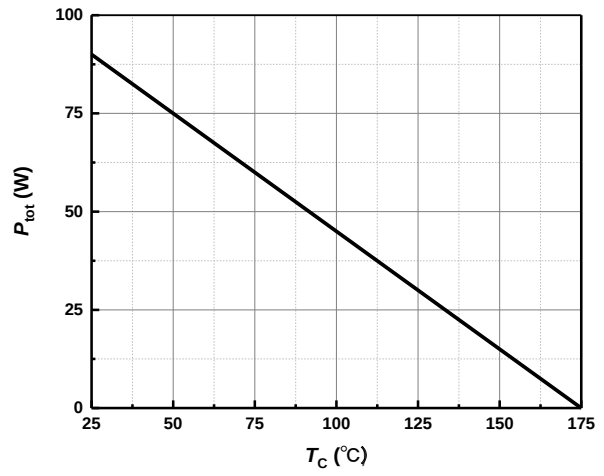


Figure 4 Typical capacitance as function of reverse voltage,  $C=f(V_R)$ ;  $T_J=25^\circ\text{C}$ ;  $f=1\text{ MHz}$

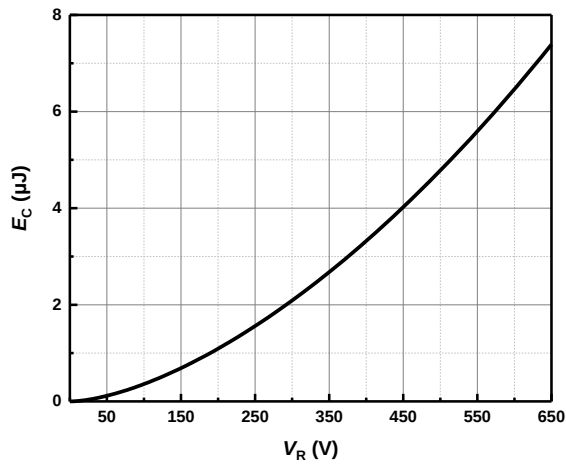
## Typical Performance



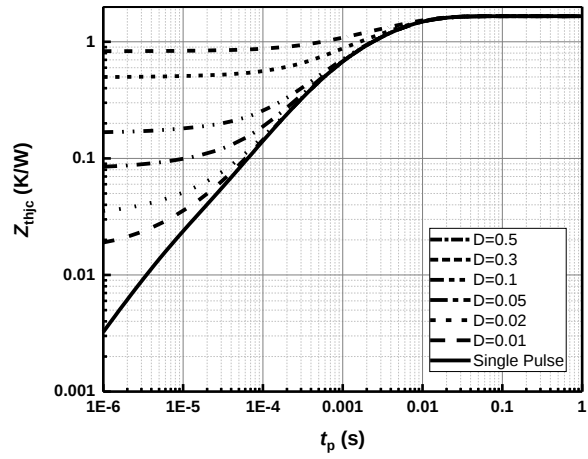
**Figure 5** Typical reverse charge as function of reverse voltage



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

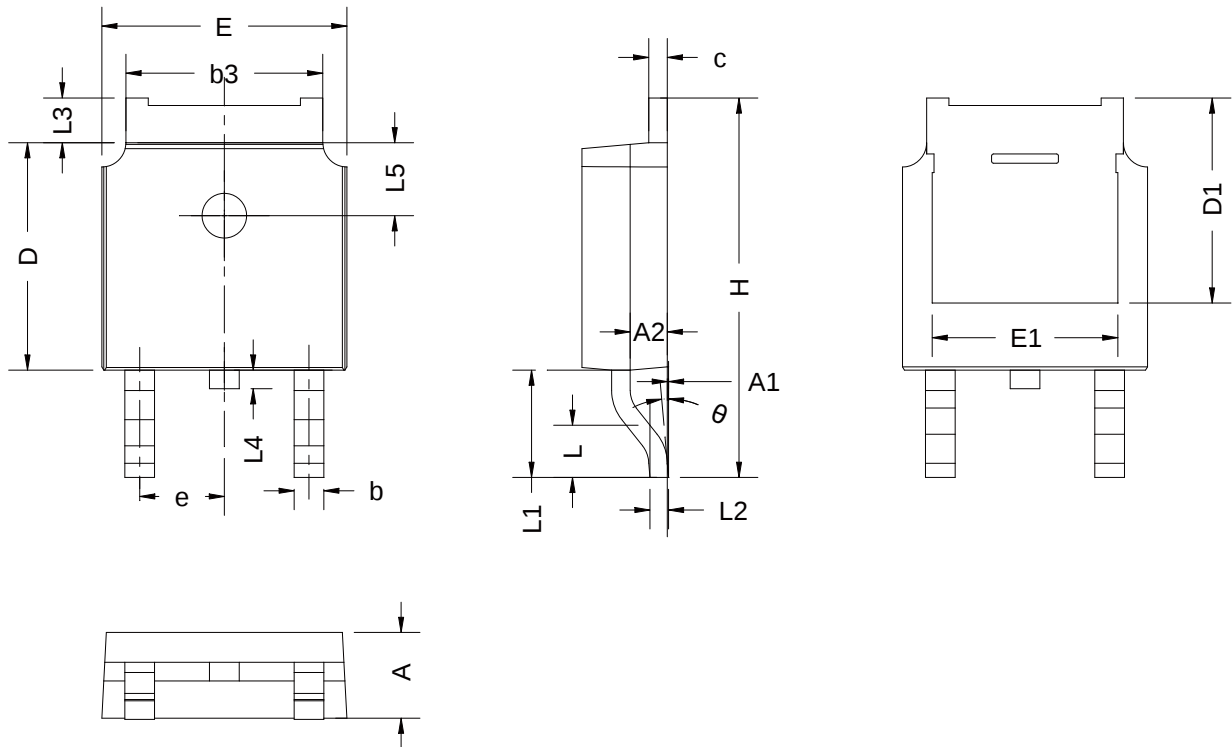


**Figure 7** Capacitance stored energy

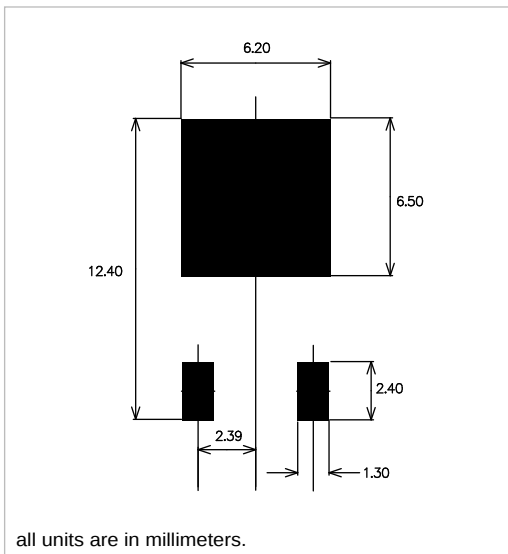


**Figure 8** Max. transient thermal impedance,  $Z_{thjc} = f(t)$ , parameter:  $D = t / T$

## Package Dimensions



## Recommended Solder Pad Layout



| SYMBOL   | mm        |       |       |
|----------|-----------|-------|-------|
|          | MIN       | NOM   | MAX   |
| A        | 2.20      | 2.30  | 2.38  |
| A1       | 0.00      | -     | 0.20  |
| A2       | 0.90      | 1.07  | 1.17  |
| b        | 0.68      | 0.78  | 0.90  |
| b3       | 5.23      | 5.33  | 5.46  |
| c        | 0.43      | 0.53  | 0.61  |
| D        | 5.98      | 6.10  | 6.22  |
| D1       | 5.30 REF  |       |       |
| E        | 6.40      | 6.60  | 6.73  |
| E1       | 4.63      | -     | -     |
| e        | 2.286 BSC |       |       |
| H        | 9.40      | 10.10 | 10.50 |
| L        | 1.38      | 1.50  | 1.75  |
| L1       | 2.90 REF  |       |       |
| L2       | 0.51 BSC  |       |       |
| L3       | 0.88      | -     | 1.28  |
| L4       | 0.50      | -     | 1.00  |
| L5       | 1.65      | 1.80  | 1.95  |
| $\theta$ | 0°        | -     | 8°    |

**Revision History**

| Document Version | Date of Release | Description of Changes    |
|------------------|-----------------|---------------------------|
| Rev. 0.0         | 2022-12-17      | Release of the datasheet. |
|                  |                 |                           |
|                  |                 |                           |
|                  |                 |                           |

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