

Product Summary

| | |
|-------------------------------|--------|
| V_{RRM} | 650 V |
| $I_F (T_C=160^\circ\text{C})$ | 2 A |
| Q_C | 6.8 nC |

Features

- Extremely low reverse current
- No reverse recovery current
- Temperature independent switching
- Positive temperature coefficient on V_F
- Excellent surge current capability
- Low capacitive charge

Benefits

- Essentially no switching losses
- System efficiency improvement over Si diodes
- Increased power density
- Enabling higher switching frequency
- Reduction of heat sink requirements
- System cost savings due to smaller magnetics
- Reduced EMI

Applications

- Switch mode power supplies (SMPS)
- Uninterruptible power supplies
- Motor drivers
- Power factor correction

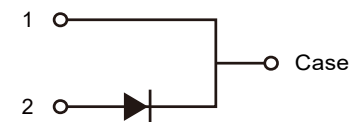
Package Pin Definitions

- Pin1 and backside - Cathode
- Pin2 - Anode

Package Parameters

| Part Number | Marking | Package |
|-------------|-----------|----------|
| B1D02065K | B1D02065K | TO-220-2 |

Package: TO-220-2

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 | $T_c=25^\circ\text{C}$ $T_c=160^\circ\text{C}$ | 9 2 | A |
| I_{FSM} | Non-repetitive forward surge current | $T_c=25^\circ\text{C}$, $t_p=10\text{ms}$ Half sine wave | 16 | A |
| $\int i^2 dt$ | i^2t value | $T_c=25^\circ\text{C}$, $t_p=10\text{ms}$ | 1.28 | A ² S |
| P_{tot} | Power dissipation | $T_c=25^\circ\text{C}$ $T_c=110^\circ\text{C}$ | 43 18 | W |
| T_j | Operating junction temperature | | -55~175 | $^\circ\text{C}$ |
| T_{stg} | Storage temperature | | -55~175 | $^\circ\text{C}$ |
| | TO-220 mounting torque | M3 Screw | 0.7 | Nm |

Thermal Characteristics

| Symbol | Parameter | Value | | | Unit |
|---------------------|--|-------|-------|------|------|
| | | Min. | Typ. | Max. | |
| $R_{\text{th(jc)}}$ | Thermal resistance from junction to case | | 3.482 | | K/W |

Electrical Characteristics
Static Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|----------|-----------------------|---|-------|--------------|------|---------------|
| | | | Min. | Typ. | Max. | |
| V_{DC} | DC blocking voltage | $T_j=25^\circ\text{C}$ | 650 | | | V |
| V_F | Diode forward voltage | $I_F=2\text{A } T_j=25^\circ\text{C}$ $I_F=2\text{A } T_j=175^\circ\text{C}$ | | 1.40 1.70 | | V |
| I_R | Reverse current | $V_R=650\text{V } T_j=25^\circ\text{C}$ $V_R=650\text{V } T_j=175^\circ\text{C}$ | | 0.1 1 | | μA |

AC Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|--------|---------------------------|--|-------|--------------------|------|---------------|
| | | | Min. | Typ. | Max. | |
| Q_C | Total capacitive charge | $V_R=400\text{V } T_j=25^\circ\text{C}$ $Q_C=\int_0^{VR} C(V)dV$ | | 6.8 | | nC |
| C | Total capacitance | $V_R=1\text{V } f=1\text{MHz}$ $V_R=300\text{V } f=1\text{MHz}$ $V_R=600\text{V } f=1\text{MHz}$ | | 99 11.9 11.8 | | pF |
| E_C | Capacitance stored energy | $V_R=400\text{V}$ | | 1.6 | | μJ |

Typical Performance

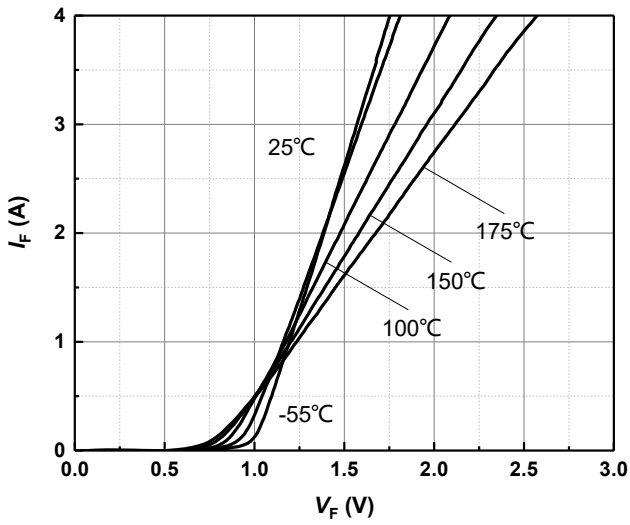


Figure 1 Typical forward characteristics

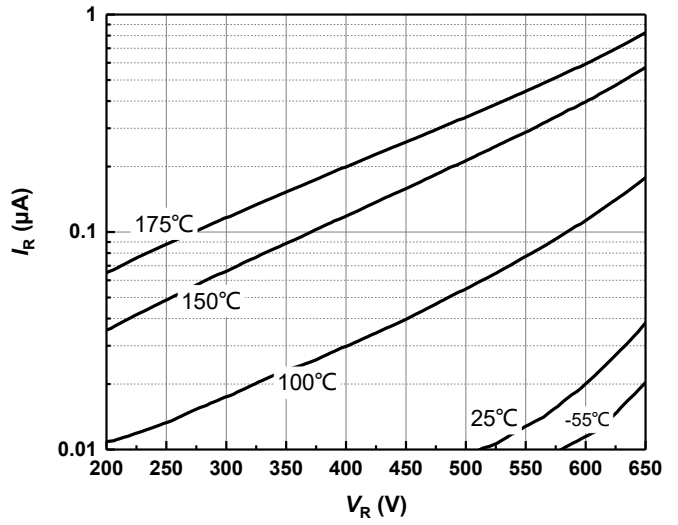


Figure 2 Typical reverse current as function of reverse voltage

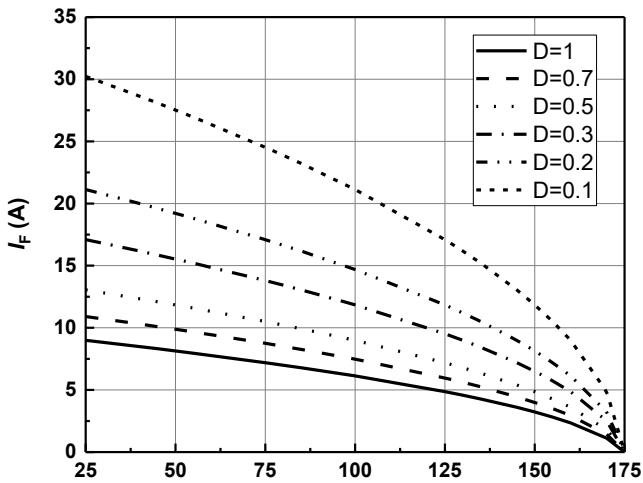


Figure 3 Diode forward current as function of temperature, D=duty cycle

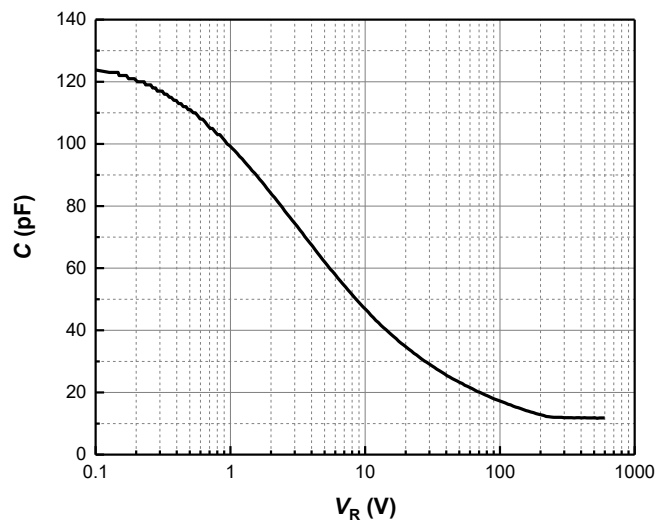


Figure 4 Typical capacitance as function of reverse voltage, $C=f(V_R)$; $T_j=25^\circ\text{C}$; $f=1\text{ MHz}$

Typical Performance

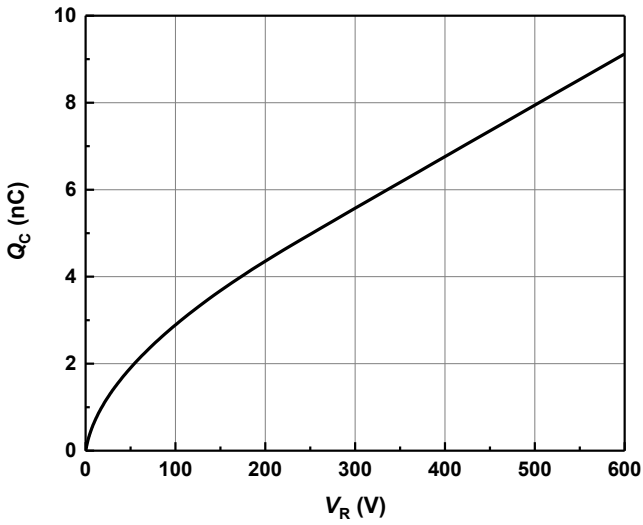


Figure 5 Typical reverse charge as function of reverse voltage

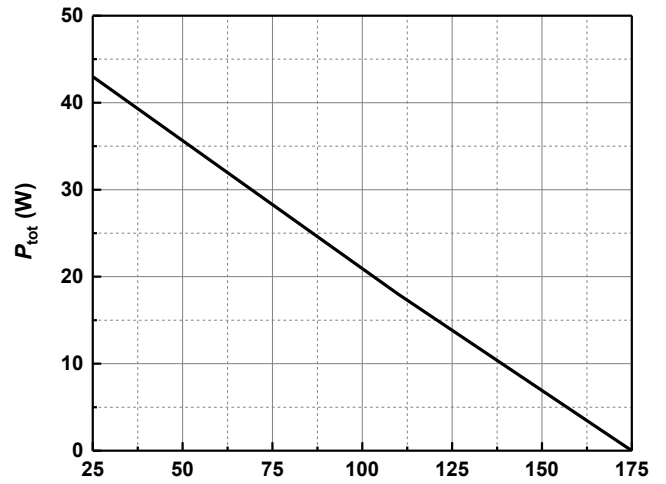


Figure 6 Power dissipation as function of case temperature

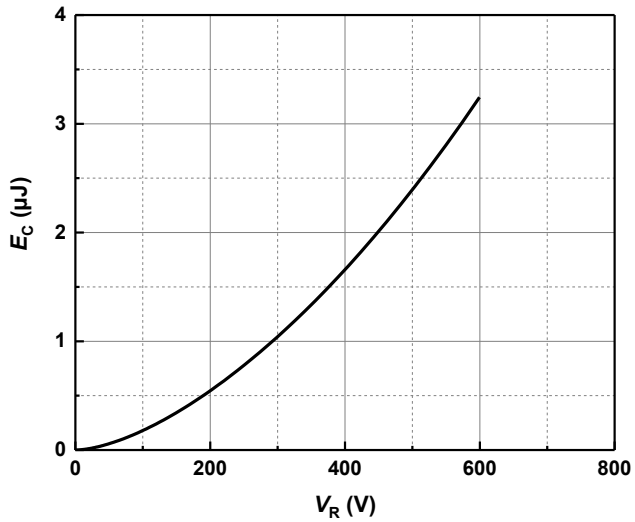


Figure 7 Capacitance stored energy

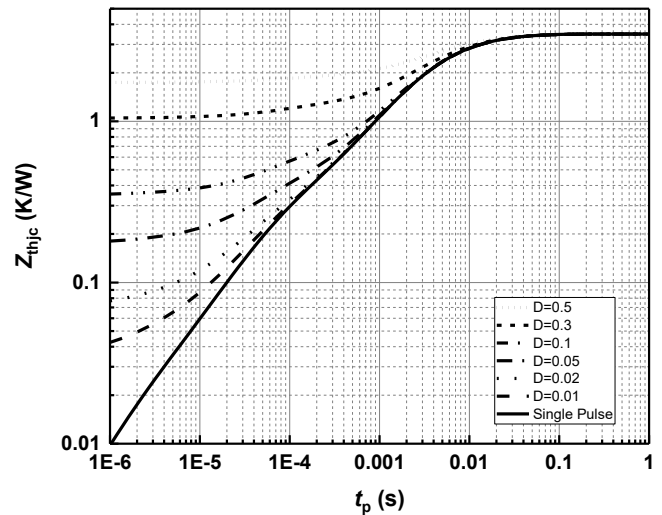
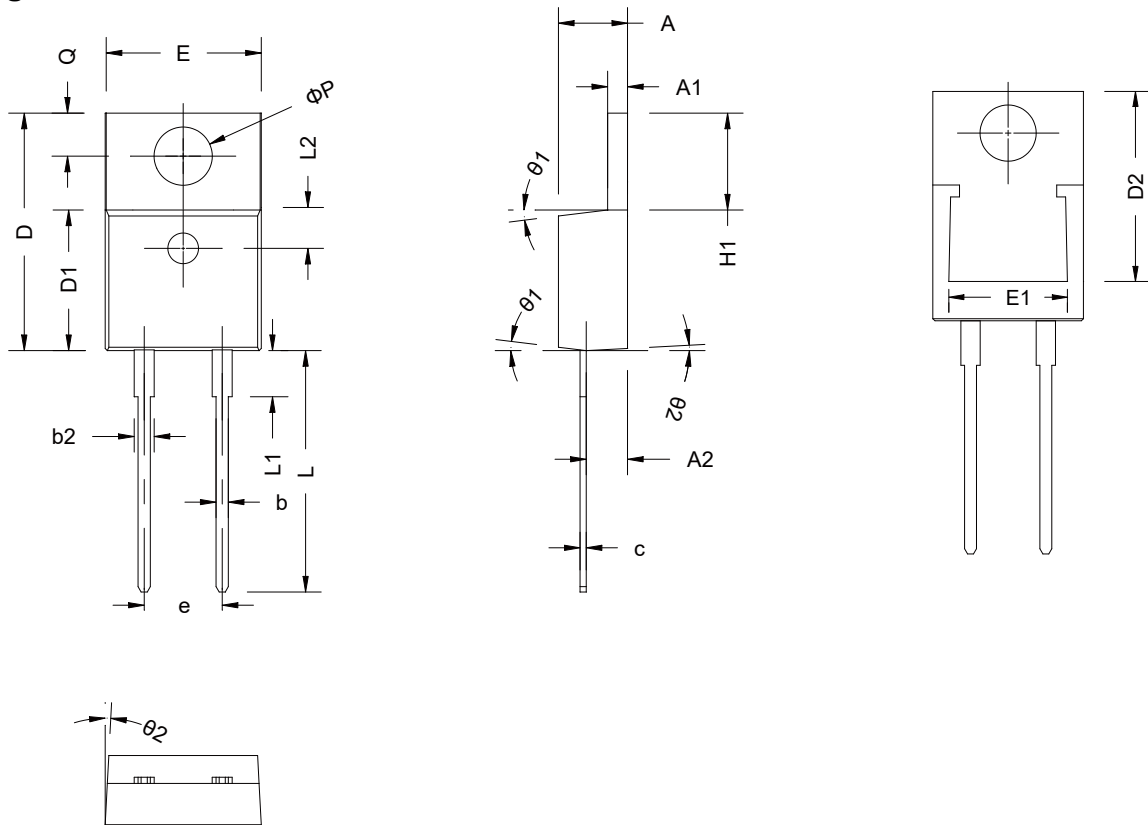


Figure 8 Max. transient thermal impedance, $Z_{thjc} = f(t)$, parameter: $D = t / T$

Package Dimensions


| SYMBOL | mm | | |
|------------|----------|-------|-------|
| | MIN | NOM | MAX |
| A | 4.37 | 4.57 | 4.77 |
| A1 | 1.22 | - | 1.40 |
| A2 | 2.49 | 2.69 | 2.89 |
| b | 0.75 | - | 0.96 |
| b2 | 1.22 | - | 1.47 |
| c | 0.30 | - | 0.48 |
| D | 15.15 | 15.45 | 15.75 |
| D1 | 9.05 | 9.15 | 9.25 |
| D2 | 11.40 | - | 12.88 |
| E | 9.86 | 10.16 | 10.36 |
| E1 | 6.86 | - | 8.89 |
| e | 4.98 | 5.08 | 5.18 |
| H1 | 6.10 | 6.30 | 6.50 |
| L | 12.70 | - | 13.70 |
| L1 | - | - | 4.10 |
| L2 | 2.50 REF | | |
| ϕP | 3.70 | 3.84 | 3.99 |
| Q | 2.54 | - | 2.94 |
| $\theta 1$ | 5° | 7° | 9° |
| $\theta 2$ | 1° | 3° | 5° |

Revision History

| Document Version | Date of Release | Description of Changes |
|-------------------------|------------------------|-------------------------------|
| Rev 1.0 | 2020-07-06 | Release of the datasheet. |
| Rev 1.1 | 2021-11-03 | Characteristics updated. |
| Rev 1.2 | 2021-12-06 | Updated. |
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