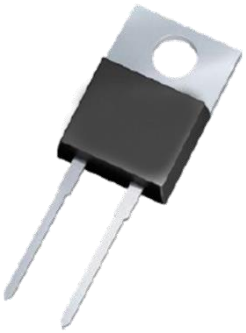


# B1D20065K

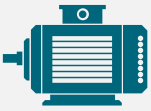
## 650V ▲ 20A ▲ SiC SCHOTTKY DIODE

**SILICON CARBIDE SiC SCHOTTKY DIODE** ▲ THT type
Excellent surge capability
Easy paralleling due to positive $V_F$ temperature coefficient
TO-220-2L package ▲ Epoxy meets UL94-V0
Low forward voltage
**Temperature independent switching**

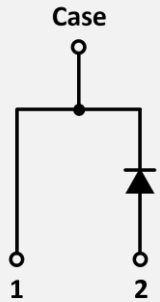
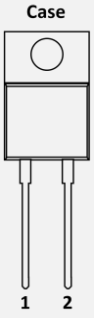
## SPECIFICATION

| Item ($T_C$ = 25°C, unless otherwise noted) | | Characteristics |
|---|---|---|
| Operating Temperature Range | $T_J$ | -55°C to +175°C |
| Storage Temperature Range | $T_S$ | -55°C to +175°C |
| Repetitive Peak Reverse Voltage | $V_{RRM}$ | 650V |
| Continuous Forward Current at $T_C$ = 150°C | $I_F$ | 20A |
| Total Capacitive Charge ($T_J$ = 25°C) | $Q_C$ | 64nC |
| Capacitance Stored Energy ($V_R$ = 400V) | $E_C$ | 16µJ |
| Diode Forward Voltage ($T_J$ = 175°C, $I_F$ = 20A) | $V_F$ | 1.75V |
| Power Dissipation | $P_{TOT}$ | 235W |

## APPLICATIONS

| EV Charging | Industrial Inverters | Motors & Drives | Power Factor Correction | Renewable Energy | SMPS | UPS |
|---|---|---|---|---|---|---|
|  |  |  |   |  |  |  |

## PIN DESCRIPTION

| Circuit Diagram | Outline ▪ Front View | Pin No. | Description |
|---|---|---|---|
|   |   | 1<br>2 | Cathode (Case Backside)<br>Anode |

## ABSOLUT MAXIMUM RATINGS ▲ $T_C$ = 25°C, unless otherwise noted

| Item | Condition | Symbol | | Unit |
|---|---|---|---|---|
| Repetitive Peak Reverse Voltage | | $V_{RRM}$ | 650 | V |
| Non-Repetitive Peak Reverse Voltage | | $V_{RSM}$ | 650 | V |
| Continuous Forward Current | $T_C$ = 25°C | $I_F$ | 63 | A |
| Continuous Forward Current | $T_C$ = 150°C | $I_F$ | 20 | A |
| Non-Repetitive Forward Surge Current | $T_C$ = 25°C, $t_p$ = 10ms, Half Sine Wave | $I_{FSM}$ | 150 | A |
| $I^2t$ Value | $T_C$ = 25°C, $t_p$ = 10ms | $\int i^2dt$ | 112.5 | $A^2s$ |
| Power Dissipation | $T_C$ = 25°C | $P_{TOT}$ | 235 | W |
| Power Dissipation | $T_C$ = 110°C | $P_{TOT}$ | 101 | W |
| Operating Junction Temperature | | $T_J$ | -55 to +175 | °C |
| Storage Temperature Range | | $T_{STG}$ | -55 to +175 | °C |
| TO-220 Mounting Torque | M3 Screw | | 0.7 | Nm |

## ELECTRICAL CHARACTERISTICS

| Item | Condition | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| DC Blocking Voltage | $T_J$ = 25°C | $V_{DC}$ | 650 | | | V |
| Diode Forward Voltage | $I_F$ = 20A, $T_J$ = 25°C | $V_F$ | | 1.42 | | V |
| Diode Forward Voltage | $I_F$ = 20A, $T_J$ = 175°C | $V_F$ | | 1.75 | | V |
| Reverse Current | $V_R$ = 650V, $T_J$ = 25°C | $I_R$ | | 1 | | µA |
| Reverse Current | $V_R$ = 650V, $T_J$ = 175°C | $I_R$ | | 20 | | µA |

| Item | Condition | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Dynamic Characteristics** | | | | | | |
| Total Capacitive Charge | $V_R$ = 400V, $T_J$ = 25°C $Q_C = \int_0^{V_R} C\,(V)dV$ | $Q_C$ | | 64 | | nC |
| Total Capacitance | $V_R$ = 1V, f = 1MHz, $T_J$ = 25°C | C | | 998 | | pF |
| Total Capacitance | $V_R$ = 300V, f = 1MHz, $T_J$ = 25°C | C | | 110 | | pF |
| Total Capacitance | $V_R$ = 600V, f = 1MHz, $T_J$ = 25°C | C | | 109 | | pF |
| Capacitance Stored Energy | $V_R$ = 400V, $T_J$ = 25°C | $E_C$ | | 16 | | µJ |

## THERMAL RESISTANCE PERFORMANCE

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta,JC}$ | | 0.638 | | K/W |

## REFERENCE DATA ▲ TYPICAL PERFORMANCE

**Fig. 1 ▪ Typical Forward Characteristics $I_F$ vs. $V_F$**

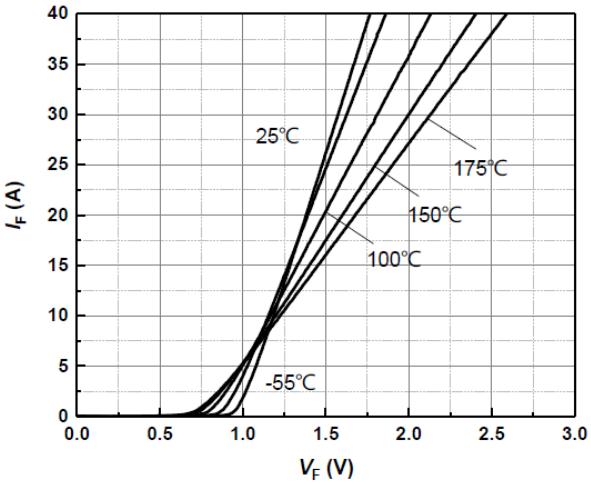



**Fig. 2 ▪ Typical Reverse Current $I_R$ as function of Reverse Voltage $V_R$**

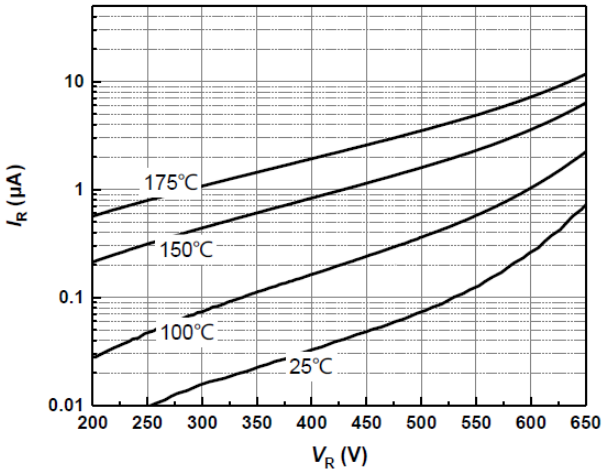



**Fig. 3 ▪ Diode Forward Current $I_F$ as function of Case Temperature $T_C$ (D = Duty Cycle)**

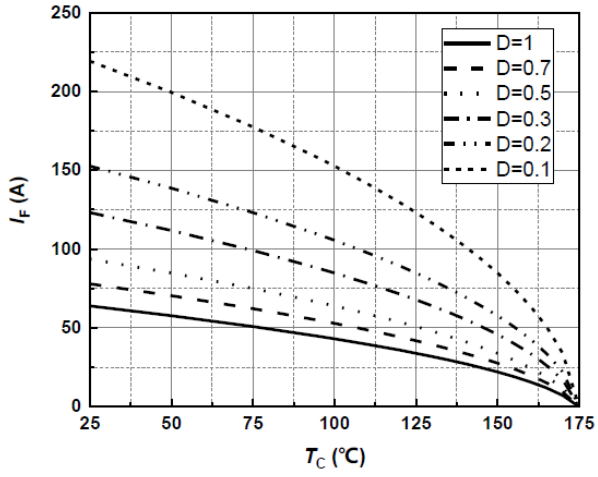



**Fig. 4 ▪ Typical Capacitance C as function of Reverse Voltage $V_R$, C =f($V_R$), $T_J$ = 25°C, f = 1MHz**

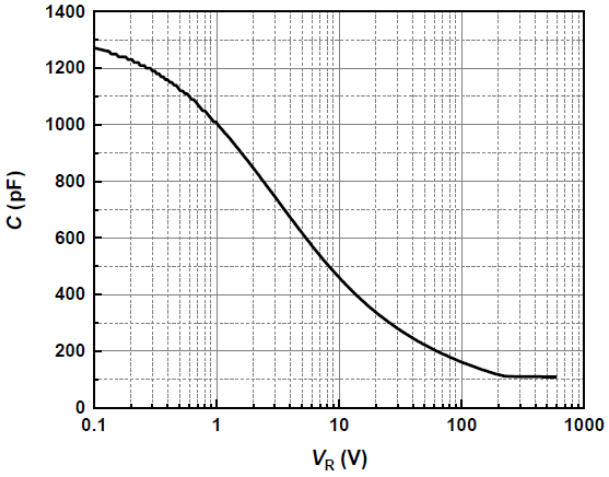



**Fig. 5 ▪ Typical Reverse Charge $Q_C$ as function of Reverse Voltage $V_R$**

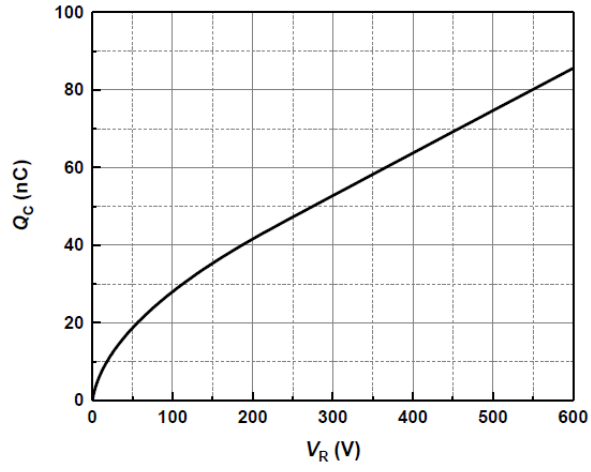
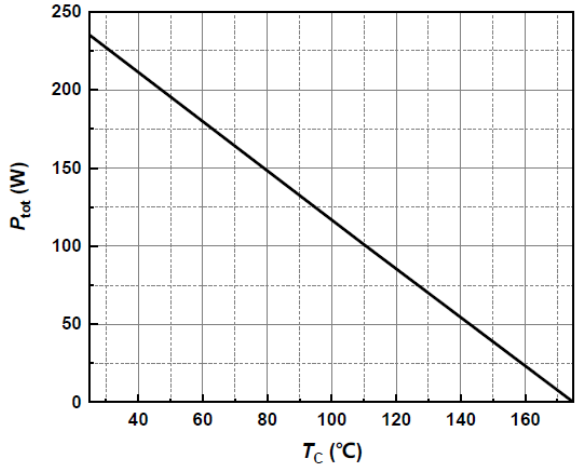



**Fig. 6 ▪ Power Dissipation $P_{TOT}$ as function of Case Temperature $T_C$**



## REFERENCE DATA ▲ TYPICAL PERFORMANCE

**Fig. 7 ▪ Capacitance Stored Energy**

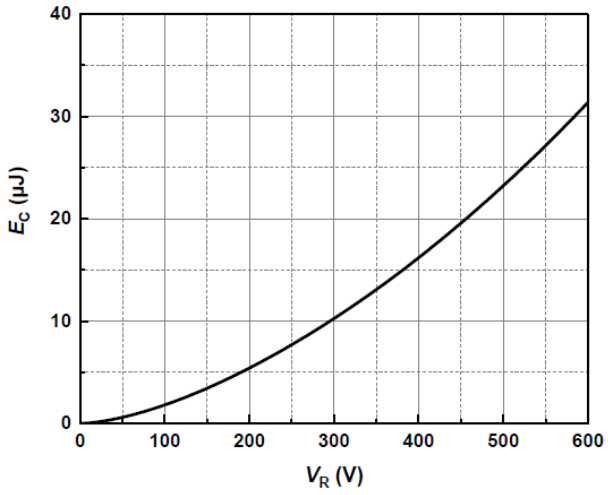
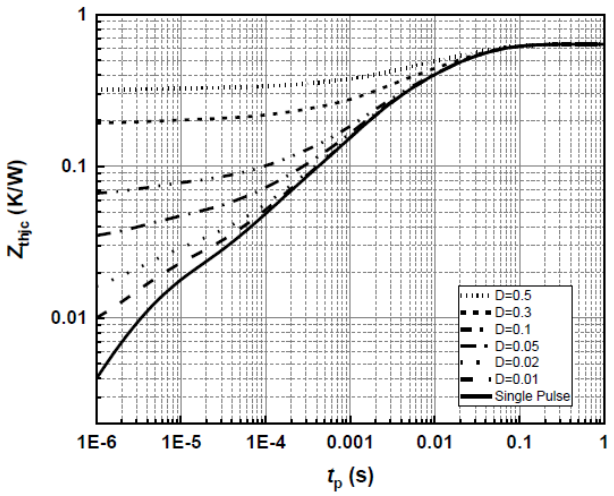
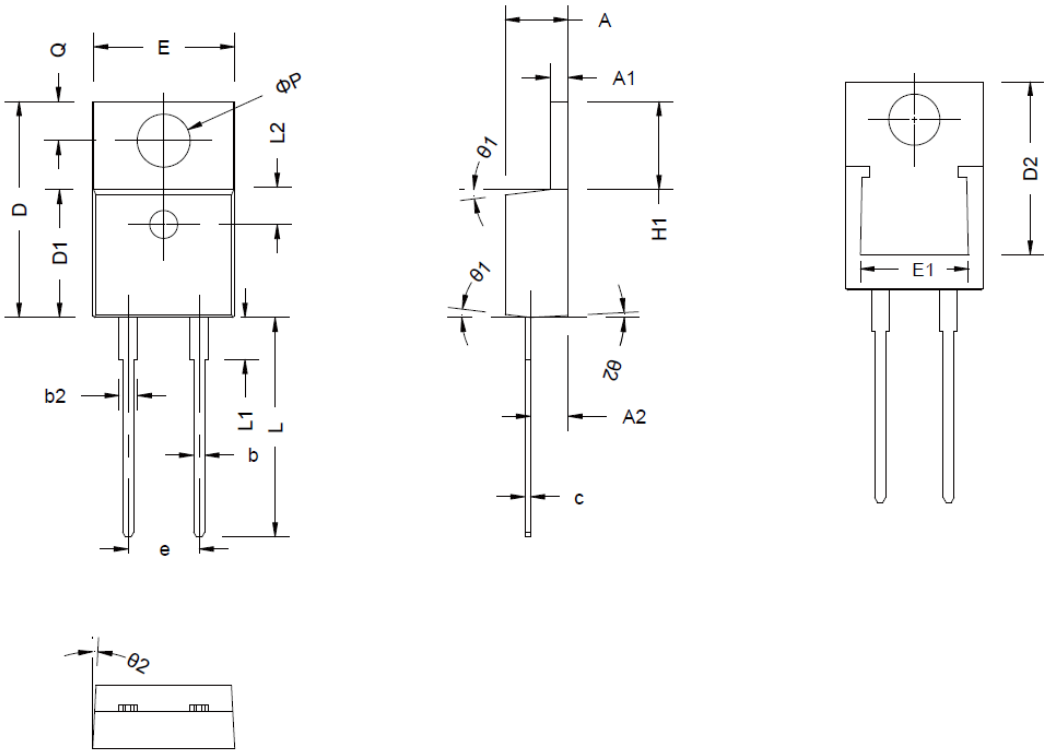



**Fig. 8 ▪ Maximum Transient Thermal Impedance, $Z_{thjc}$ = f(t), Parameter: D = t/T**



## PACKAGE OUTLINE



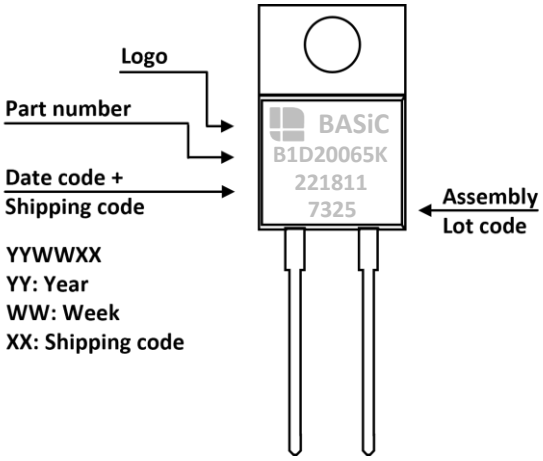

| Sym | Millimeters (Min.) | Millimeters (Typ.) | Millimeters (Max.) |
|---|---|---|---|
| A | 4.37 | 4.57 | 4.77 |
| A1 | 1.22 | - | 1.40 |
| A2 | 2.49 | 2.69 | 2.89 |
| b | 0.75 | - | 0.96 |
| b2 | 1.22 | - | 1.47 |
| c | 0.30 | - | 0.48 |
| D | 15.15 | 15.45 | 15.75 |
| D1 | 9.05 | 9.15 | 9.25 |
| D2 | 11.40 | - | 12.88 |
| E | 9.86 | 10.16 | 10.36 |

| Sym | Millimeters (Min.) | Millimeters (Typ.) | Millimeters (Max.) |
|---|---|---|---|
| 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 | |
| ØP | 3.70 | 3.84 | 3.99 |
| Q | 2.54 | - | 2.94 |
| $\theta$ 1 | 5° | 7° | 9° |
| $\theta$ 2 | 1° | 3° | 5° |

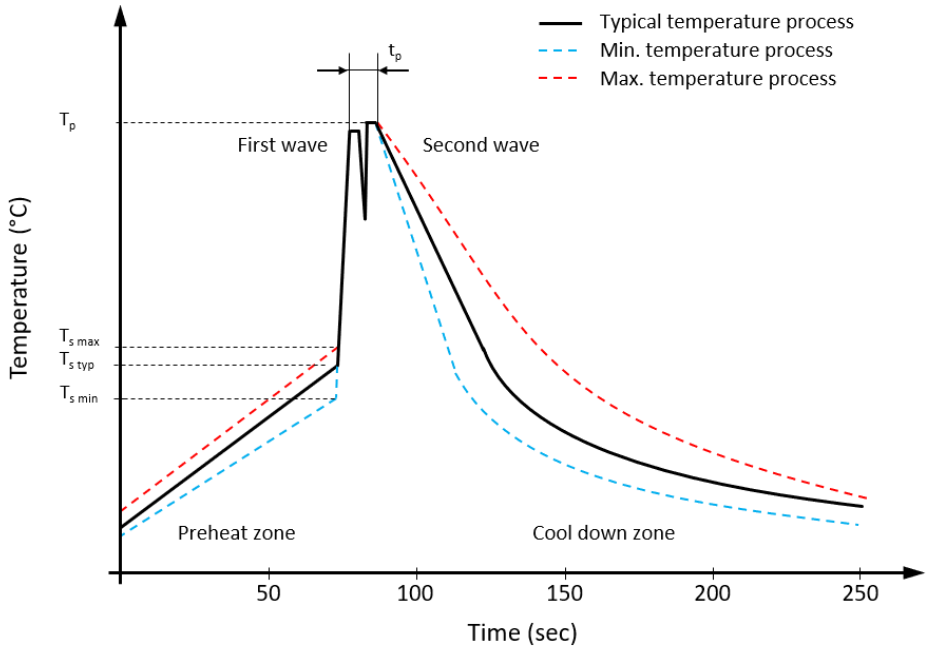
## ORDERING INFORMATION

| Part Number | Package | Packing | Tube Qty. | Inner Box Qty. | Outer Box Qty. |
|---|---|---|---|---|---|
| B1D20065K | TO-220-2L | Tube | 50pcs | 500pcs | 5,000pcs |

## PART MARKING




## RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE




**Classification wave soldering profile ▲ Refer to EN 61760-1: 2006**

| Profile Features | | Value ▲ Sn-Pb Assembly | Value ▲ Pb-free Assembly |
|---|---|---|---|
| Preheat temperature min. | $T_{s\,min}$ | 100 °C | 100 °C |
| Preheat temperature typical | $T_{s\,typ}$ | 120 °C | 120 °C |
| Preheat temperature max. | $T_{s\,max}$ | 130 °C | 130 °C |
| Preheat time $t_s$ from $T_{s\,min}$ to $T_{s\,max}$ | $t_s$ | 70 seconds | 70 seconds |
| Peak temperature | $T_p$ | 235 °C to 260 °C | 245 °C to 260 °C |
| Time of actual peak temperature | $t_p$ | Max. 10 seconds<br>Max. 5 second each wave | Max. 10 seconds<br>Max. 5 second each wave |
| Ramp-down date min. | | ~ 2 °C/second | ~ 2 °C/second |
| Ramp-down rate typical | | ~ 3.5 °C/second | ~ 3.5 °C/second |
| Ramp-down rate max. | | ~ 5 °C/second | ~ 5 °C/second |
| Time 25°C to 25°C | | 4 minutes | 4 minutes |

## REVISION TABLE

| Revision | Date | Status | Notes |
|---|---|---|---|
| 001 | 30/09/2022 | Initial release | Initial publication |
| | | | |
| | | | |
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| | | | |
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