

# B1D05120K

1200V ▲ 5A ▲ 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



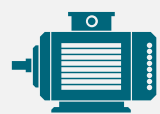




Low forward voltage

Temperature independent switching

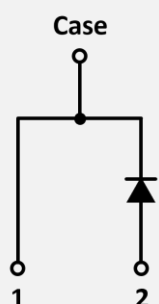
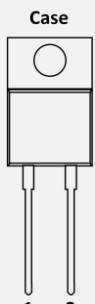
## SPECIFICATION

| Item ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)               |           | Characteristics                             |
|---|-----------|---|
| Operating Temperature Range   | $T_J$     | $-55^\circ\text{C}$ to $+175^\circ\text{C}$ |
| Storage Temperature Range   | $T_S$     | $-55^\circ\text{C}$ to $+175^\circ\text{C}$ |
| Repetitive Peak Reverse Voltage   | $V_{RRM}$ | 1200V                                       |
| Continuous Forward Current at $T_C = 160^\circ\text{C}$                 | $I_F$     | 5A  |
| Total Capacitive Charge ( $T_J = 25^\circ\text{C}$ )                    | $Q_C$     | 32nC  |
| Capacitance Stored Energy ( $V_R = 800\text{V}$ )                       | $E_C$     | 16μJ  |
| Diode Forward Voltage ( $T_J = 175^\circ\text{C}$ , $I_F = 5\text{A}$ ) | $V_F$     | 1.78V                                       |
| Power Dissipation   | $P_{TOT}$ | 129W  |

## 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 ▲ $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Item                                 | Condition   | Symbol        |             | Unit                 |
|--------------------------------------|---|---------------|-------------|----------------------|
| Repetitive Peak Reverse Voltage      |   | $V_{RRM}$     | 1200        | V                    |
| Non-Repetitive Peak Reverse Voltage  |   | $V_{RSM}$     | 1200        | V                    |
| Continuous Forward Current           | $T_C = 25^\circ\text{C}$  | $I_F$         | 30          | A                    |
| Continuous Forward Current           | $T_C = 160^\circ\text{C}$                                       | $I_F$         | 5           | A                    |
| Non-Repetitive Forward Surge Current | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ms}$ , Half Sine Wave | $I_{FSM}$     | 60          | A                    |
| $I^2t$ Value                         | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ms}$                  | $\int i^2 dt$ | 18          | $\text{A}^2\text{s}$ |
| Power Dissipation                    | $T_C = 25^\circ\text{C}$  | $P_{TOT}$     | 129         | W                    |
| Power Dissipation                    | $T_C = 110^\circ\text{C}$                                       | $P_{TOT}$     | 56          | W                    |
| Operating Junction Temperature       |   | $T_J$         | -55 to +175 | $^\circ\text{C}$     |
| Storage Temperature Range            |   | $T_{STG}$     | -55 to +175 | $^\circ\text{C}$     |
| TO-220 Mounting Torque               | M3 Screw  |               | 0.7         | Nm                   |

## ELECTRICAL CHARACTERISTICS

| Item                          | Condition  | Symbol   | Min. | Typ. | Max. | Unit          |
|-------------------------------|--|----------|------|------|------|---------------|
| <b>Static Characteristics</b> |  |          |      |      |      |               |
| DC Blocking Voltage           | $T_J = 25^\circ\text{C}$                         | $V_{DC}$ | 1200 |      |      | V             |
| Diode Forward Voltage         | $I_F = 5\text{A}$ , $T_J = 25^\circ\text{C}$     | $V_F$    |      | 1.40 | 1.60 | V             |
| Diode Forward Voltage         | $I_F = 5\text{A}$ , $T_J = 175^\circ\text{C}$    | $V_F$    |      | 1.78 | 2.30 | V             |
| Reverse Current               | $V_R = 1200\text{V}$ , $T_J = 25^\circ\text{C}$  | $I_R$    |      | 2    | 60   | $\mu\text{A}$ |
| Reverse Current               | $V_R = 1200\text{V}$ , $T_J = 175^\circ\text{C}$ | $I_R$    |      | 10   | 100  | $\mu\text{A}$ |

| Item                           | Condition  | Symbol | Min. | Typ. | Max. | Unit          |
|--------------------------------|--|--------|------|------|------|---------------|
| <b>Dynamic Characteristics</b> |  |        |      |      |      |               |
| Total Capacitive Charge        | $V_R = 800\text{V}$ , $T_J = 25^\circ\text{C}$<br>$Q_C = \int_0^{V_R} C(V) dV$ | $Q_C$  |      | 32   |      | nC            |
| Total Capacitance              | $V_R = 1\text{V}$ , $f = 1\text{MHz}$ , $T_J = 25^\circ\text{C}$               | $C$    |      | 352  |      | pF            |
| Total Capacitance              | $V_R = 400\text{V}$ , $f = 1\text{MHz}$ , $T_J = 25^\circ\text{C}$             | $C$    |      | 31   |      | pF            |
| Total Capacitance              | $V_R = 800\text{V}$ , $f = 1\text{MHz}$ , $T_J = 25^\circ\text{C}$             | $C$    |      | 23   |      | pF            |
| Capacitance Stored Energy      | $V_R = 800\text{V}$ , $T_J = 25^\circ\text{C}$                                 | $E_C$  |      | 16   |      | $\mu\text{J}$ |

## THERMAL RESISTANCE PERFORMANCE

| Item                                 | Symbol          | Min. | Typ. | Max. | Unit |
|--------------------------------------|-----------------|------|------|------|------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ |      | 1.16 |      | K/W  |

## REFERENCE DATA ▲ TYPICAL PERFORMANCE

Fig. 1 • Typical Forward Characteristics  $I_F$  vs.  $V_F$

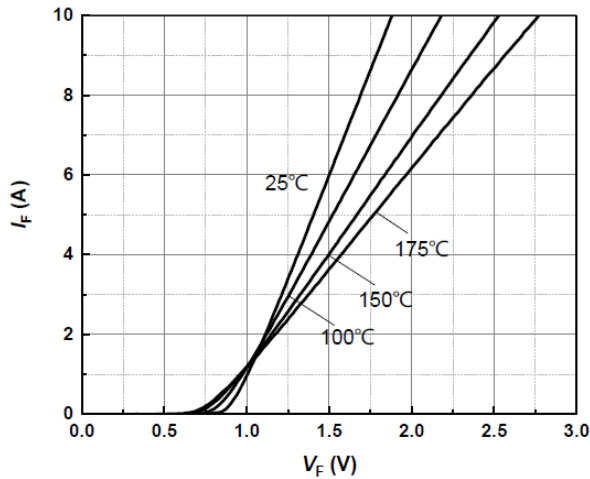


Fig. 2 • Typical Reverse Current  $I_R$  as function of Reverse Voltage  $V_R$

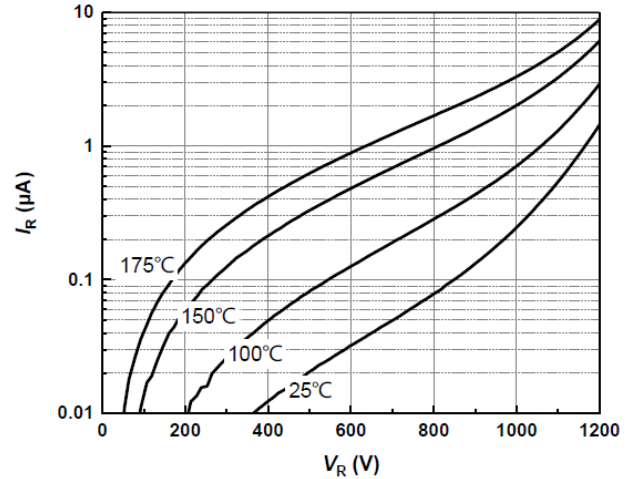


Fig. 3 • Diode Forward Current  $I_F$  as function of Case Temperature  $T_C$  (D = Duty Cycle)

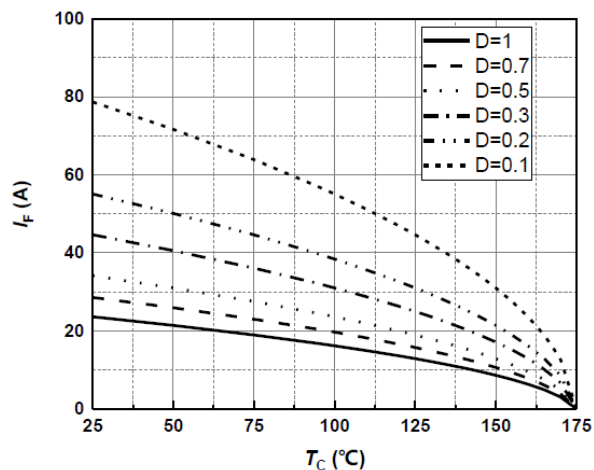


Fig. 4 • Typical Capacitance C as function of Reverse Voltage  $V_R$ ,  $C = f(V_R)$ ,  $T_J = 25^\circ\text{C}$ ,  $f = 1\text{MHz}$

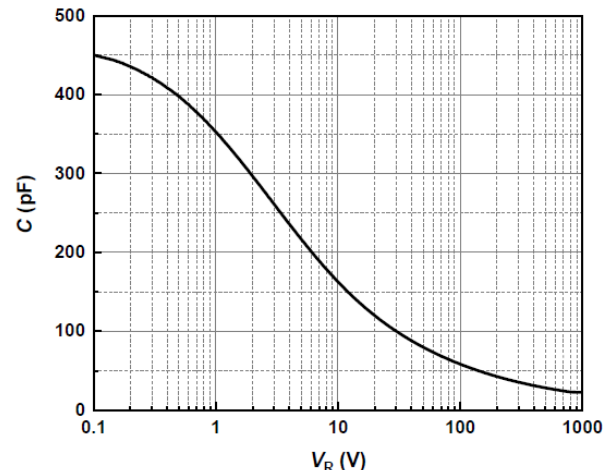


Fig. 5 • Typical Reverse Charge  $Q_C$  as function of Reverse Voltage  $V_R$

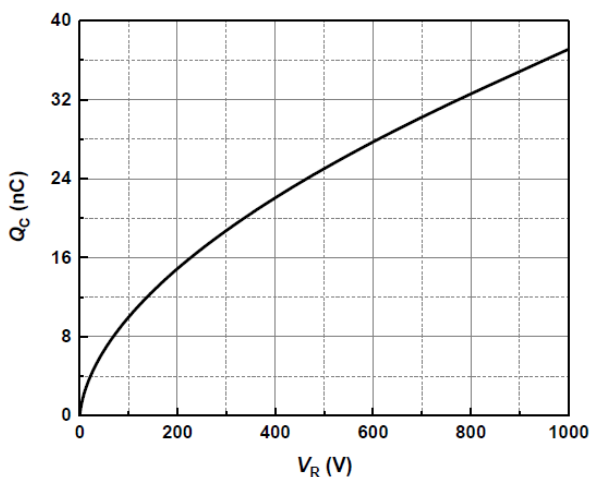
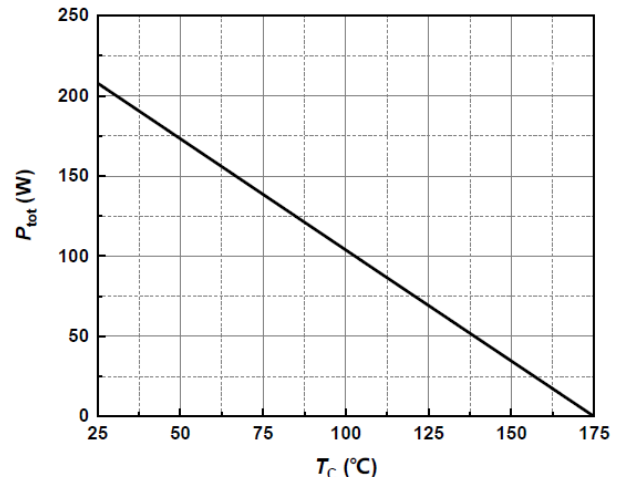


Fig. 6 • Power Dissipation  $P_{TOT}$  as function of Case Temperature  $T_C$



## REFERENCE DATA ▲ TYPICAL PERFORMANCE

Fig. 7 • Capacitance Stored Energy

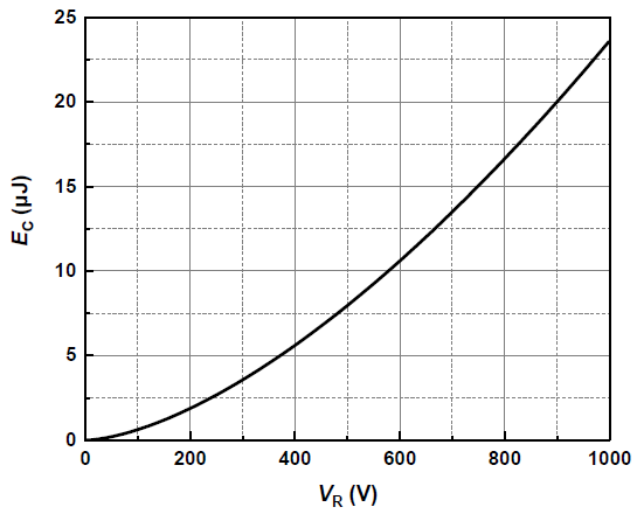
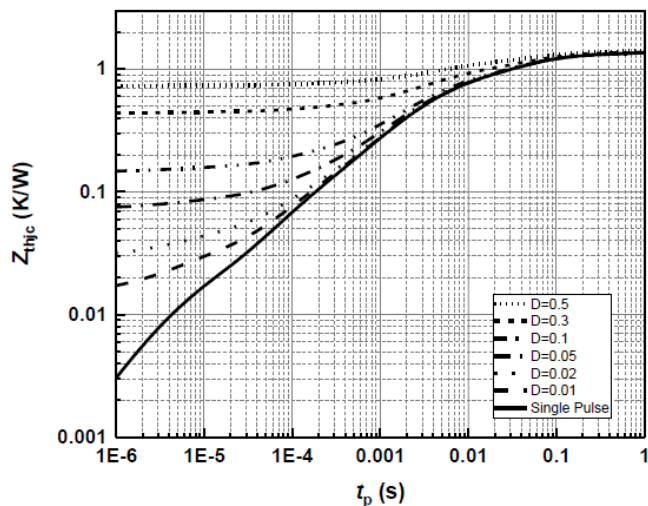
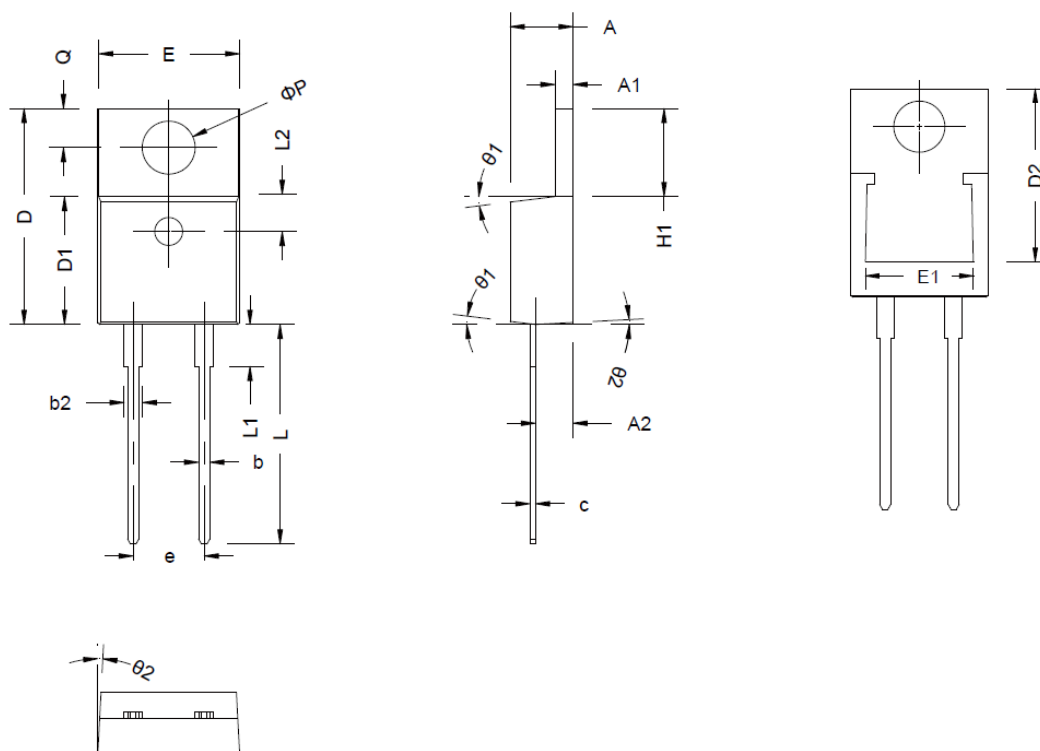


Fig. 8 • Maximum Transient Thermal Impedance,  $Z_{thjc} = f(t)$ , Parameter:  $D = t/T$



## PACKAGE OUTLINE



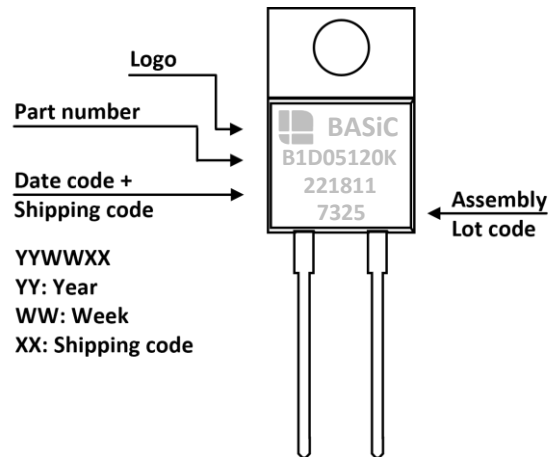
| Sym | Millimeters<br>(Min.) | Millimeters<br>(Typ.) | Millimeters<br>(Max.) |
|-----|-----------------------|-----------------------|-----------------------|
| A   | 4.37                  | 4.57                  | 4.77                  |
| A1  | 1.22                  | -                     | 1.40                  |
| 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<br>(Min.) | Millimeters<br>(Typ.) | Millimeters<br>(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                  |
| θ 1 | 5°                    | 7°                    | 9°                    |
| θ 2 | 1°                    | 3°                    | 5°                    |

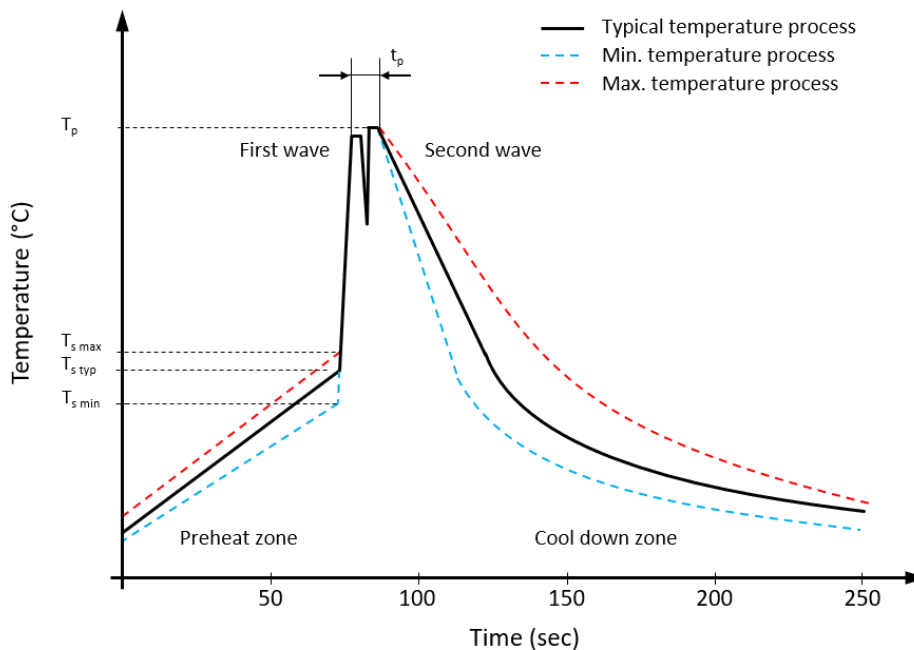
## ORDERING INFORMATION

| Part Number | Package   | Packing | Tube Qty. | Inner Box Qty. | Outer Box Qty. |
|-------------|-----------|---------|-----------|----------------|----------------|
| B1D05120K   | 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                          | $T_{s \text{ typ}}$ | 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 rate 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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