

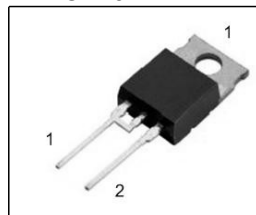
**Silicon Carbide Schottky Diode**

- Worlds first 600V Schottky diode
- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery
- No temperature influence on the switching behavior
- Ideal diode for Power Factor Correction up to 1200W<sup>1)</sup>
- No forward recovery

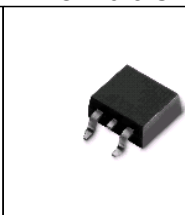
**thinQ!™ SiC Schottky Diode**
**Product Summary**

|           |     |    |
|-----------|-----|----|
| $V_{RRM}$ | 600 | V  |
| $Q_C$     | 21  | nC |
| $I_F$     | 6   | A  |

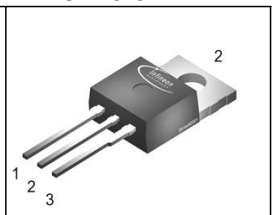
P-TO220-2-2.



P-TO220-3.SMD



P-TO220-3-1.



| Type     | Package       | Ordering Code | Marking | Pin 1 | Pin 2 | Pin 3 |
|----------|---------------|---------------|---------|-------|-------|-------|
| SDP06S60 | P-TO220-3-1.  | Q67040-S4371  | D06S60  | n.c.  | C     | A     |
| SDB06S60 | P-TO220-3.SMD | Q67040-S4370  | D06S60  | n.c.  | C     | A     |
| SDT06S60 | P-TO220-2-2.  | Q67040-S4446  | D06S60  | C     | A     |       |

**Maximum Ratings, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter                                                                                         | Symbol            | Value       | Unit             |
|---------------------------------------------------------------------------------------------------|-------------------|-------------|------------------|
| Continuous forward current, $T_C=100^\circ\text{C}$                                               | $I_F$             | 6           | A                |
| RMS forward current, $f=50\text{Hz}$                                                              | $I_{FRMS}$        | 8.4         |                  |
| Surge non repetitive forward current, sine halfwave<br>$T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$ | $I_{FSM}$         | 21.5        |                  |
| Repetitive peak forward current<br>$T_j=150^\circ\text{C}$ , $T_C=100^\circ\text{C}$ , $D=0.1$    | $I_{FRM}$         | 28          |                  |
| Non repetitive peak forward current<br>$t_p=10\mu\text{s}$ , $T_C=25^\circ\text{C}$               | $I_{FMAX}$        | 60          |                  |
| $i^2t$ value, $T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$                                          | $\int i^2 dt$     | 2.3         | A <sup>2</sup> s |
| Repetitive peak reverse voltage                                                                   | $V_{RRM}$         | 600         | V                |
| Surge peak reverse voltage                                                                        | $V_{RSM}$         | 600         |                  |
| Power dissipation, $T_C=25^\circ\text{C}$                                                         | $P_{tot}$         | 57.6        | W                |
| Operating and storage temperature                                                                 | $T_j$ , $T_{stg}$ | -55... +175 | $^\circ\text{C}$ |

**Thermal Characteristics**

| Parameter                                                   | Symbol     | Values |      |      | Unit |
|-------------------------------------------------------------|------------|--------|------|------|------|
|                                                             |            | min.   | typ. | max. |      |
| Characteristics                                             |            |        |      |      |      |
| Thermal resistance, junction - case                         | $R_{thJC}$ | -      | -    | 2.6  | K/W  |
| Thermal resistance, junction - ambient, leaded              | $R_{thJA}$ | -      | -    | 62   |      |
| SMD version, device on PCB:                                 | $R_{thJA}$ |        |      |      |      |
| P-TO263-3-2: @ min. footprint                               |            | -      | -    | 62   |      |
| P-TO263-3-2: @ 6 cm <sup>2</sup> cooling area <sup>2)</sup> |            | -      | 35   | -    |      |
| P-TO252-3-1: @ min. footprint                               |            | -      | -    | 75   |      |
| P-TO252-3-1: @ 6 cm <sup>2</sup> cooling area <sup>2)</sup> |            | -      | -    | 50   |      |

**Electrical Characteristics, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter                    | Symbol | Values |      |      | Unit    |
|------------------------------|--------|--------|------|------|---------|
|                              |        | min.   | typ. | max. |         |
| Static Characteristics       |        |        |      |      |         |
| Diode forward voltage        | $V_F$  |        |      |      | V       |
| $I_F=6A, T_j=25^{\circ}C$    |        | -      | 1.5  | 1.7  |         |
| $I_F=6A, T_j=150^{\circ}C$   |        | -      | 1.7  | 2.1  |         |
| Reverse current              | $I_R$  |        |      |      | $\mu A$ |
| $V_R=600V, T_j=25^{\circ}C$  |        | -      | 20   | 200  |         |
| $V_R=600V, T_j=150^{\circ}C$ |        | -      | 50   | 1000 |         |

<sup>1</sup>CCM,  $V_{IN} = 85\text{VAC}$ ,  $T_j = 150^\circ\text{C}$ ,  $T_C = 100^\circ\text{C}$ ,  $\eta = 93\%$ ,  $\Delta I_{IN} = 30\%$

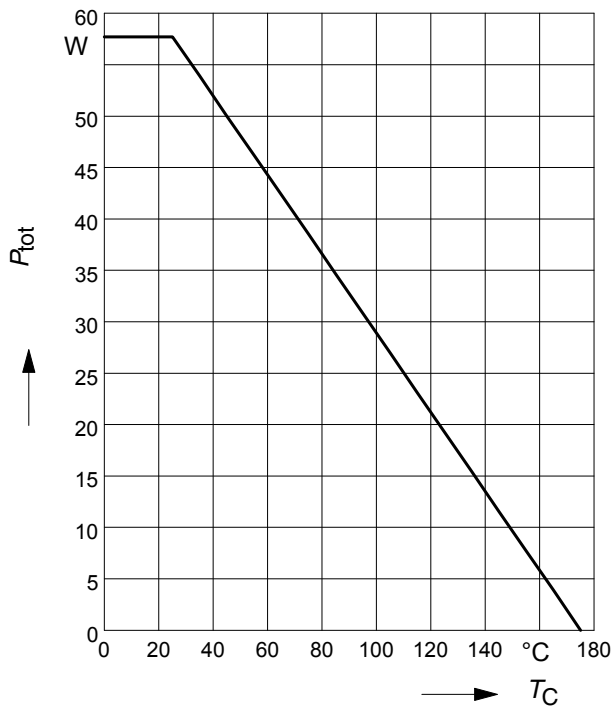
<sup>2</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

**Electrical Characteristics**, at  $T_j = 25\text{ °C}$ , unless otherwise specified

| Parameter                                                                                                                                              | Symbol   | Values      |                 |             | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-----------------|-------------|------|
|                                                                                                                                                        |          | min.        | typ.            | max.        |      |
| AC Characteristics                                                                                                                                     |          |             |                 |             |      |
| Total capacitive charge<br>$V_R=400V$ , $I_F=6A$ , $di_F/dt=200A/\mu s$ , $T_J=150^{\circ}C$                                                           | $Q_C$    | -           | 21              | -           | nC   |
| Switching time<br>$V_R=400V$ , $I_F=6A$ , $di_F/dt=200A/\mu s$ , $T_J=150^{\circ}C$                                                                    | $t_{rr}$ | -           | n.a.            | -           | ns   |
| Total capacitance<br>$V_R=0V$ , $T_C=25^{\circ}C$ , $f=1MHz$<br>$V_R=300V$ , $T_C=25^{\circ}C$ , $f=1MHz$<br>$V_R=600V$ , $T_C=25^{\circ}C$ , $f=1MHz$ | $C$      | -<br>-<br>- | 300<br>20<br>15 | -<br>-<br>- | pF   |

### 1 Power dissipation

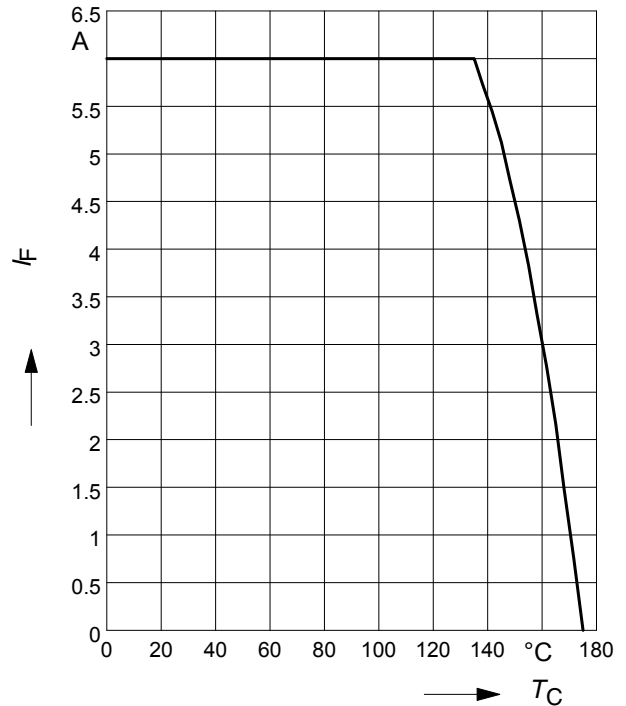
$$P_{\text{tot}} = f(T_C)$$



### 2 Diode forward current

$$I_F = f(T_C)$$

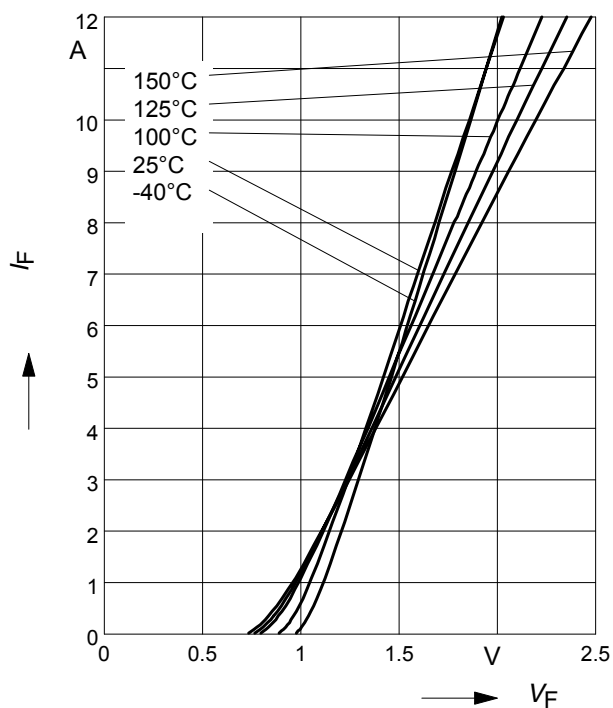
parameter:  $T_j \leq 175^\circ\text{C}$



### 3 Typ. forward characteristic

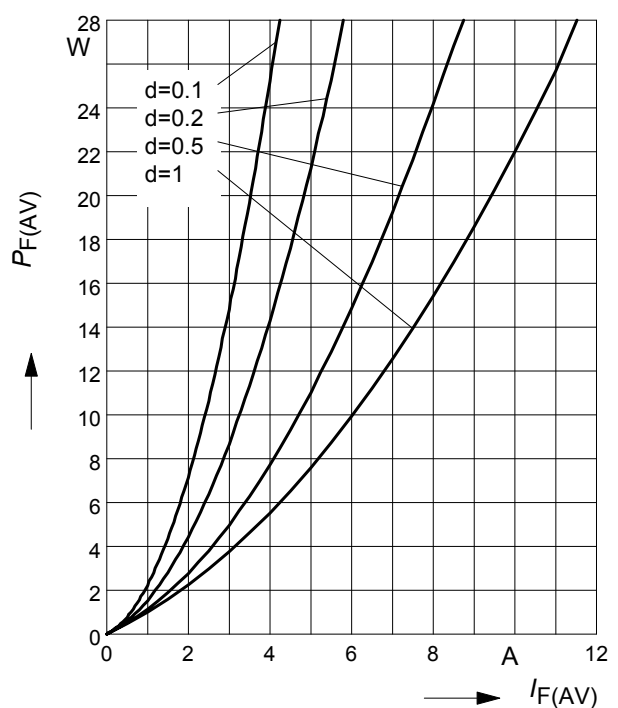
$$I_F = f(V_F)$$

parameter:  $T_j$ ,  $t_p = 350 \mu\text{s}$



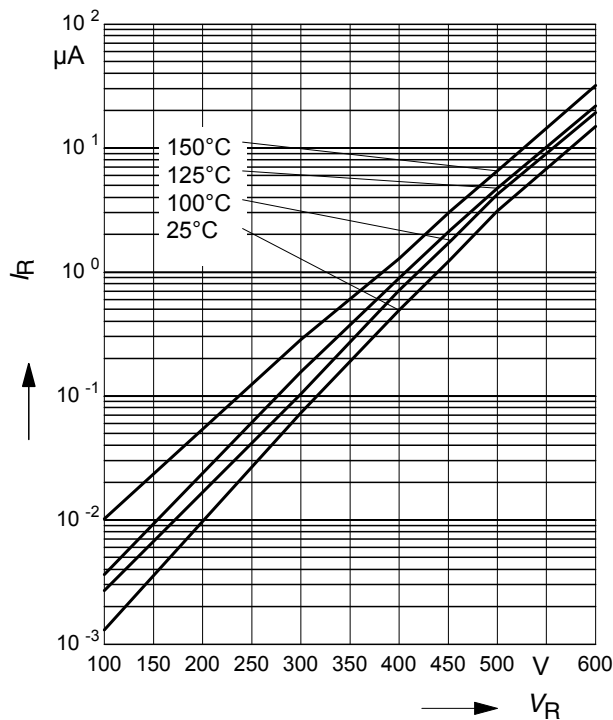
### 4 Typ. forward power dissipation vs. average forward current

$$P_{F(AV)} = f(I_F) \quad T_C = 100^\circ\text{C}, d = t_p/T$$



## 5 Typ. reverse current vs. reverse voltage

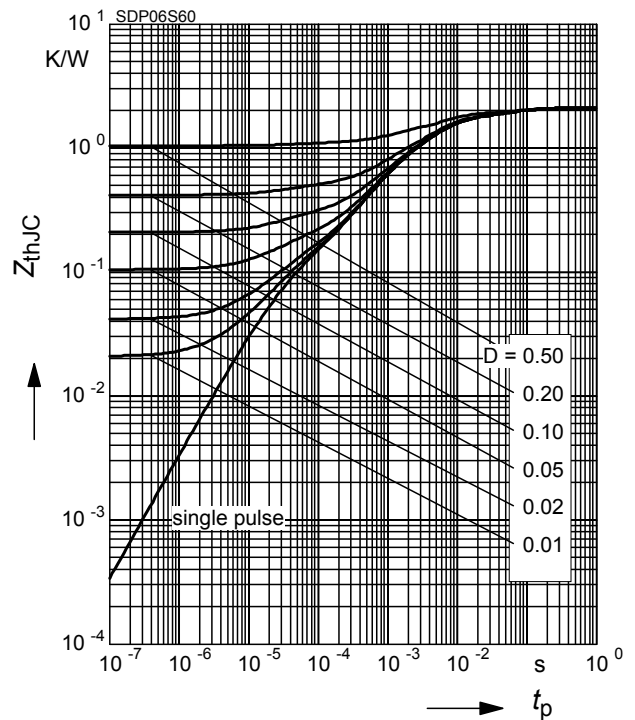
$$I_R = f(V_R)$$



## 6 Transient thermal impedance

$$Z_{thJC} = f(t_p)$$

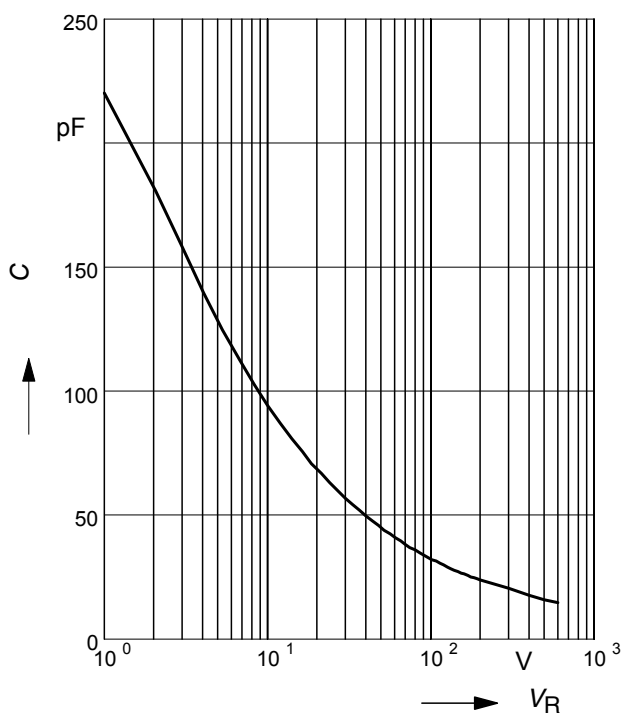
$$\text{parameter : } D = t_p/T$$



## 7 Typ. capacitance vs. reverse voltage

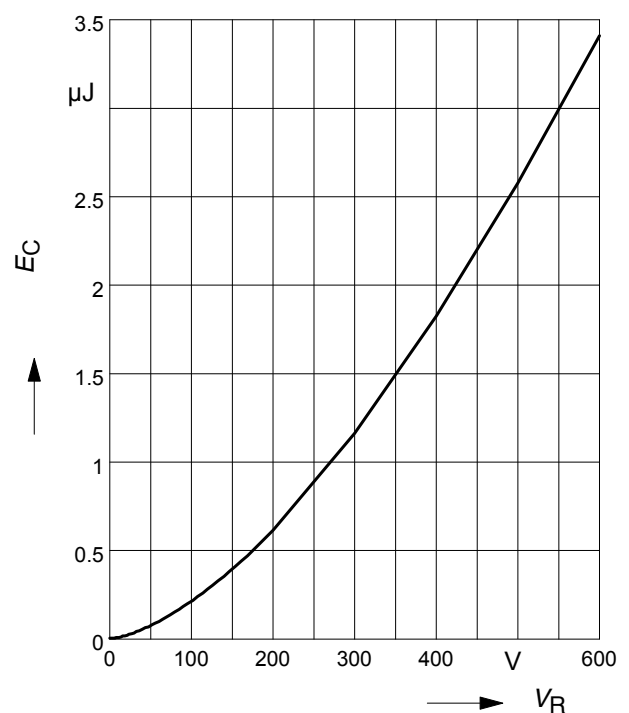
$$C = f(V_R)$$

parameter:  $T_C = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$



## 8 Typ. C stored energy

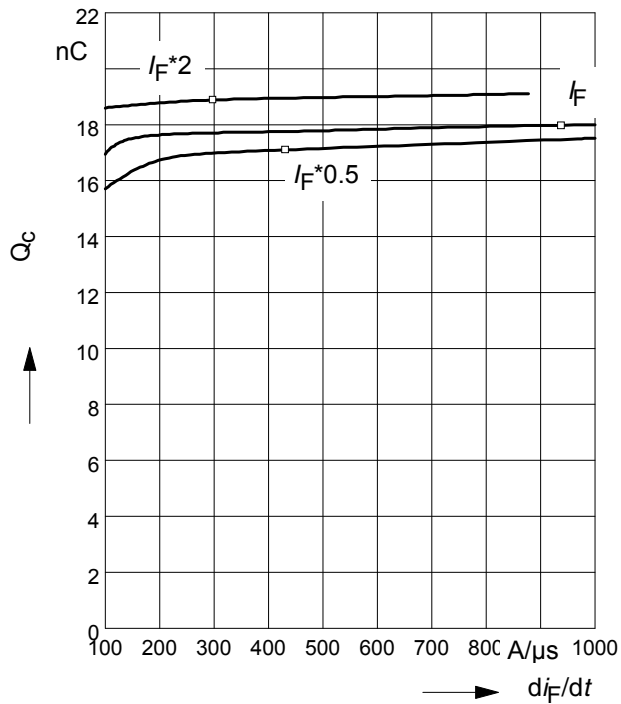
$$E_C = f(V_R)$$



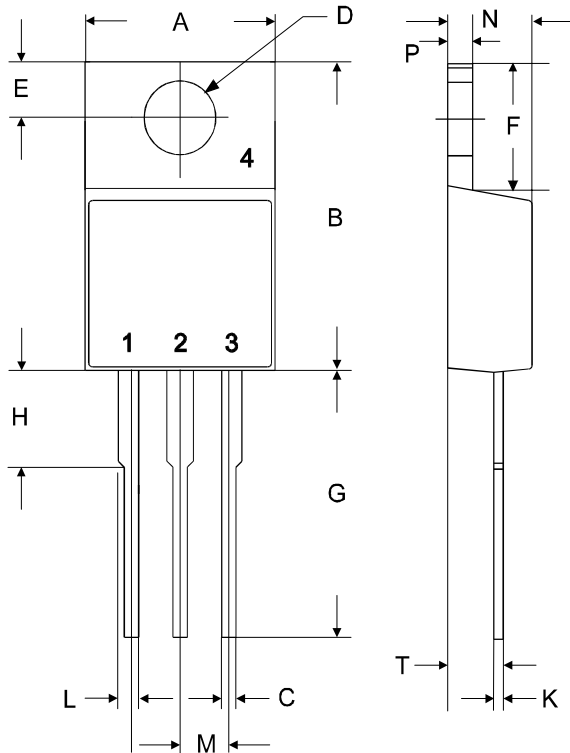
## 9 Typ. capacitive charge vs. current slope

$$Q_C = f(di_F/dt)$$

parameter:  $T_j = 150\text{ }^{\circ}\text{C}$

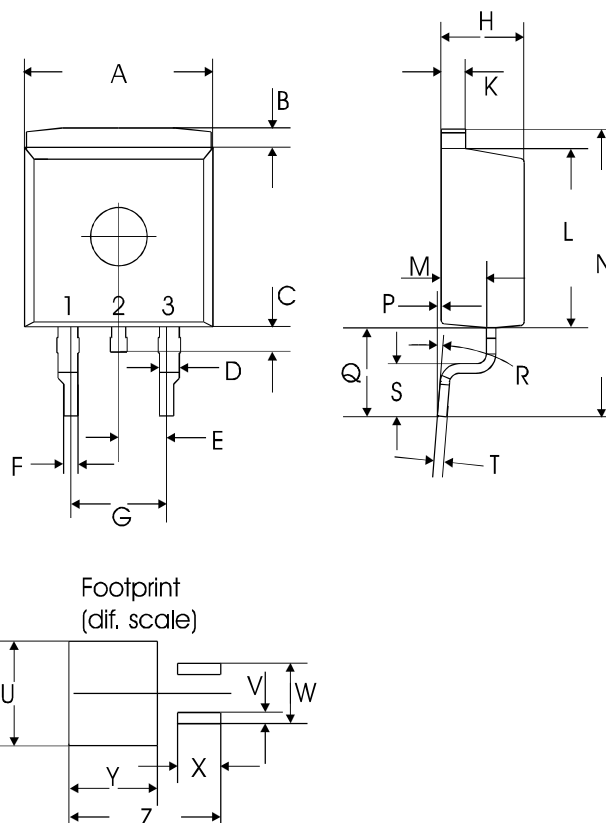


P-TO220-3-1

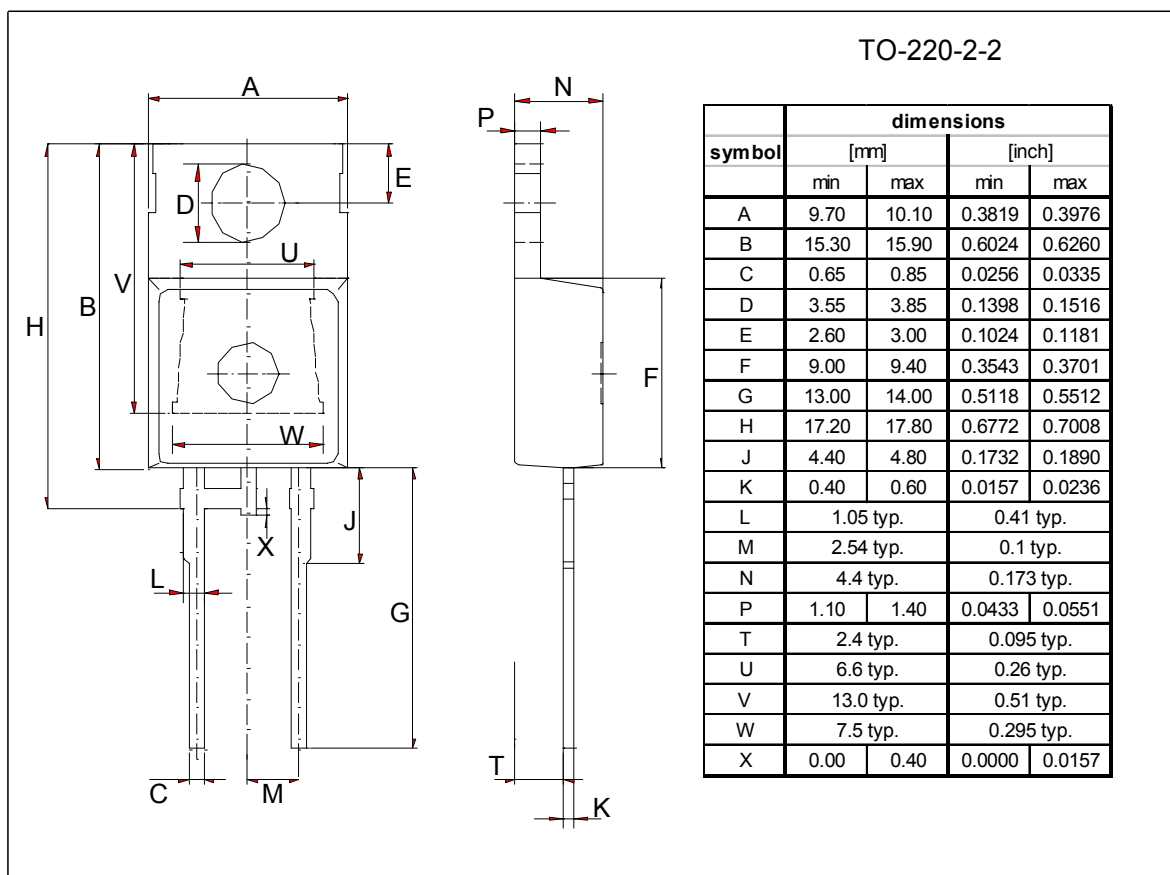


| symbol | dimensions |       |          |        |
|--------|------------|-------|----------|--------|
|        | [mm]       |       | [inch]   |        |
|        | min        | max   | min      | max    |
| A      | 9.70       | 10.30 | 0.3819   | 0.4055 |
| B      | 14.88      | 15.95 | 0.5858   | 0.6280 |
| C      | 0.65       | 0.86  | 0.0256   | 0.0339 |
| D      | 3.55       | 3.89  | 0.1398   | 0.1531 |
| E      | 2.60       | 3.00  | 0.1024   | 0.1181 |
| F      | 6.00       | 6.80  | 0.2362   | 0.2677 |
| G      | 13.00      | 14.00 | 0.5118   | 0.5512 |
| H      | 4.35       | 4.75  | 0.1713   | 0.1870 |
| K      | 0.38       | 0.65  | 0.0150   | 0.0256 |
| L      | 0.95       | 1.32  | 0.0374   | 0.0520 |
| M      | 2.54 typ.  |       | 0.1 typ. |        |
| N      | 4.30       | 4.50  | 0.1693   | 0.1772 |
| P      | 1.17       | 1.40  | 0.0461   | 0.0551 |
| T      | 2.30       | 2.72  | 0.0906   | 0.1071 |

TO-220-3-45 (P-TO220SMD)



| symbol | dimensions |       |             |        |
|--------|------------|-------|-------------|--------|
|        | [mm]       |       | [inch]      |        |
|        | min        | max   | min         | max    |
| A      | 9.80       | 10.00 | 0.3858      | 0.3937 |
| B      | 1.3 typ.   |       | 0.0512 typ. |        |
| C      | 1.25       | 1.75  | 0.0492      | 0.0689 |
| D      | 0.95       | 1.15  | 0.0374      | 0.0453 |
| E      | 2.54 typ.  |       | 0.1 typ.    |        |
| F      | 0.72       | 0.85  | 0.0283      | 0.0335 |
| G      | 5.08 typ.  |       | 0.2 typ.    |        |
| H      | 4.30       | 4.50  | 0.1693      | 0.1772 |
| K      | 1.28       | 1.40  | 0.0504      | 0.0551 |
| L      | 9.00       | 9.40  | 0.3543      | 0.3701 |
| M      | 2.30       | 2.50  | 0.0906      | 0.0984 |
| N      | 14.1 typ.  |       | 0.5551 typ. |        |
| P      | 0.00       | 0.20  | 0.0000      | 0.0079 |
| Q      | 3.30       | 3.90  | 0.1299      | 0.1535 |
| R      | 8° max     |       | 8° max      |        |
| S      | 1.70       | 2.50  | 0.0669      | 0.0984 |
| T      | 0.50       | 0.65  | 0.0197      | 0.0256 |
| U      | 10.8 typ.  |       | 0.4252 typ. |        |
| V      | 1.35 typ.  |       | 0.0532 typ. |        |
| W      | 6.43 typ.  |       | 0.2532 typ. |        |
| X      | 4.60 typ.  |       | 0.1811 typ. |        |
| Y      | 9.40 typ.  |       | 0.3701 typ. |        |
| Z      | 16.15 typ. |       | 0.6358 typ. |        |



**Published by**  
**Infineon Technologies AG,**  
**Bereichs Kommunikation**  
**St.-Martin-Strasse 53,**  
**D-81541 München**  
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