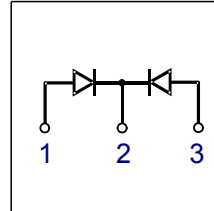


## Silicon Carbide Schottky Diode

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery
- No temperature influence on the switching behavior
- No forward recovery
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>0)</sup> for target applications

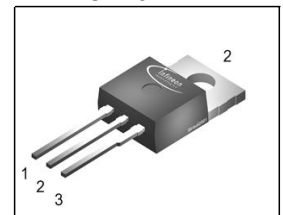
## thinQ!<sup>TM</sup> SiC Schottky Diode



### Product Summary

|           |      |    |
|-----------|------|----|
| $V_{RRM}$ | 300  | V  |
| $Q_C$     | 23   | nC |
| $I_F$     | 2x10 | A  |

P-TO220



| Type     | Package   | Ordering Code | Marking |
|----------|-----------|---------------|---------|
| SDP20S30 | P-TO220-3 | Q67040-S4419  | D20S30  |

### Maximum Ratings, at $T_j = 25^\circ\text{C}$ , unless otherwise specified (per leg)

| Parameter                                                                                         | Symbol            | Value       | Unit                 |
|---------------------------------------------------------------------------------------------------|-------------------|-------------|----------------------|
| Continuous forward current, $T_C=100^\circ\text{C}$                                               | $I_F$             | 10          | A                    |
| RMS forward current, $f=50\text{Hz}$                                                              | $I_{FRMS}$        | 14          |                      |
| Surge non repetitive forward current, sine halfwave<br>$T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$ | $I_{FSM}$         | 36          |                      |
| Repetitive peak forward current<br>$T_j=150^\circ\text{C}$ , $T_C=100^\circ\text{C}$ , $D=0.1$    | $I_{FRM}$         | 45          |                      |
| Non repetitive peak forward current<br>$t_p=10\mu\text{s}$ , $T_C=25^\circ\text{C}$               | $I_{FMAX}$        | 100         |                      |
| $i^2t$ value, $T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$                                          | $\int i^2 dt$     | 6.5         | $\text{A}^2\text{s}$ |
| Repetitive peak reverse voltage                                                                   | $V_{RRM}$         | 300         | V                    |
| Surge peak reverse voltage                                                                        | $V_{RSM}$         | 300         |                      |
| Power dissipation, single diode mode, $T_C=25^\circ\text{C}$                                      | $P_{tot}$         | 65          | 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 (per leg) | $R_{thJC}$ | - | - | 2.3 | K/W |
|-----------------------------------------------|------------|---|---|-----|-----|

### Electrical Characteristics, at $T_j = 25^\circ\text{C}$ , unless otherwise specified (per leg)

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

### Static Characteristics

|                                             |       |   |     |      |               |
|---------------------------------------------|-------|---|-----|------|---------------|
| Diode forward voltage                       | $V_F$ |   |     |      | V             |
| $I_F=10\text{A}$ , $T_j=25^\circ\text{C}$   |       | - | 1.5 | 1.7  |               |
| $I_F=10\text{A}$ , $T_j=150^\circ\text{C}$  |       | - | 1.5 | 1.9  |               |
| Reverse current                             | $I_R$ |   |     |      | $\mu\text{A}$ |
| $V_R=300\text{V}$ , $T_j=25^\circ\text{C}$  |       | - | 15  | 200  |               |
| $V_R=300\text{V}$ , $T_j=150^\circ\text{C}$ |       | - | 20  | 1000 |               |

<sup>0</sup>J-STD20 and JESD22

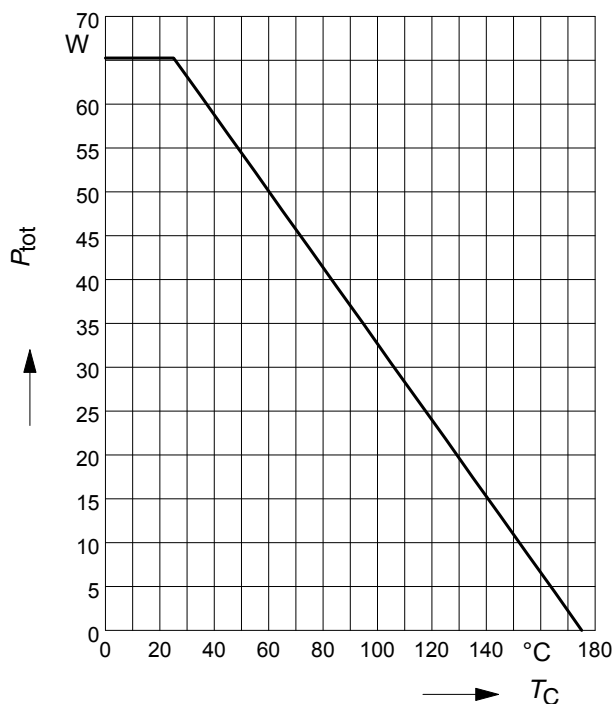
<sup>1</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

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

| Parameter                                                                                                                                                                                                                                           | Symbol                 | Values      |                 |             | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------|-----------------|-------------|------|
|                                                                                                                                                                                                                                                     |                        | min.        | typ.            | max.        |      |
| AC Characteristics                                                                                                                                                                                                                                  |                        |             |                 |             |      |
| Total capacitive charge <sup>1)</sup><br><i>V</i> <sub>R</sub> =200V, <i>I</i> <sub>F</sub> =10A, di <sub>F</sub> /dt=-200A/μs, <i>T</i> <sub>j</sub> =150°C                                                                                        | Q <sub>C</sub>         | -           | 23              | -           | nC   |
| Switching time <sup>2)</sup><br><i>V</i> <sub>R</sub> =200V, <i>I</i> <sub>F</sub> =10A, di <sub>F</sub> /dt=-200A/μs, <i>T</i> <sub>j</sub> =150°C                                                                                                 | <i>t</i> <sub>rr</sub> | -           | n.a.            | -           | ns   |
| Total capacitance<br><i>V</i> <sub>R</sub> =0V, <i>T</i> <sub>C</sub> =25°C, <i>f</i> =1MHz<br><i>V</i> <sub>R</sub> =150V, <i>T</i> <sub>C</sub> =25°C, <i>f</i> =1MHz<br><i>V</i> <sub>R</sub> =300V, <i>T</i> <sub>C</sub> =25°C, <i>f</i> =1MHz | C                      | -<br>-<br>- | 600<br>55<br>40 | -<br>-<br>- | pF   |

### 1 Power dissipation (per leg)

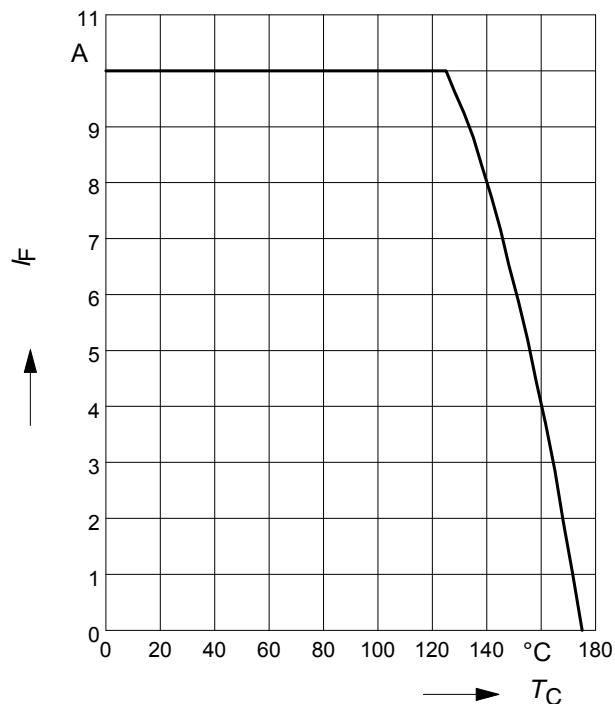
$$P_{\text{tot}} = f(T_C)$$



### 2 Diode forward current (per leg)

$$I_F = f(T_C)$$

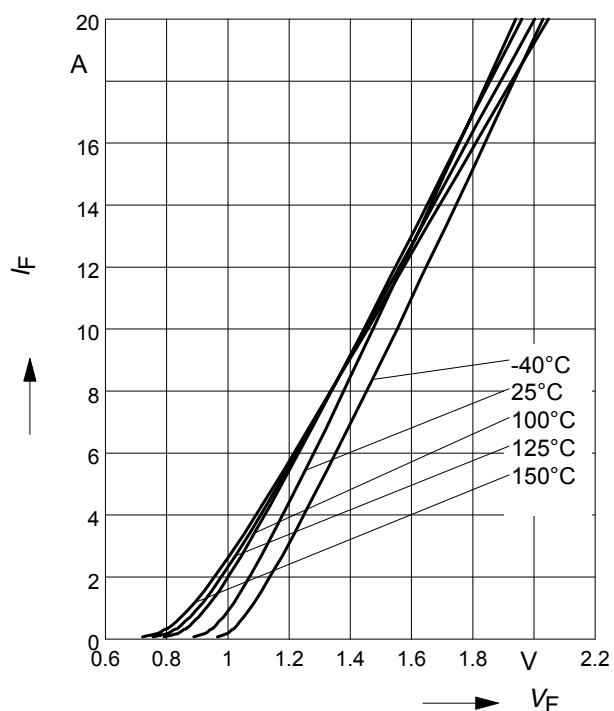
parameter:  $T_j \leq 175^\circ\text{C}$



### 3 Typ. forward characteristic (per leg)

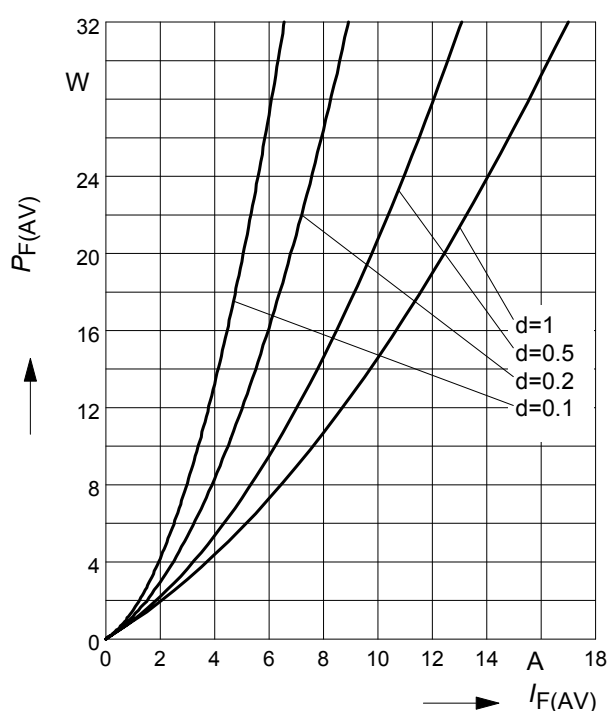
$$I_F = f(V_F)$$

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

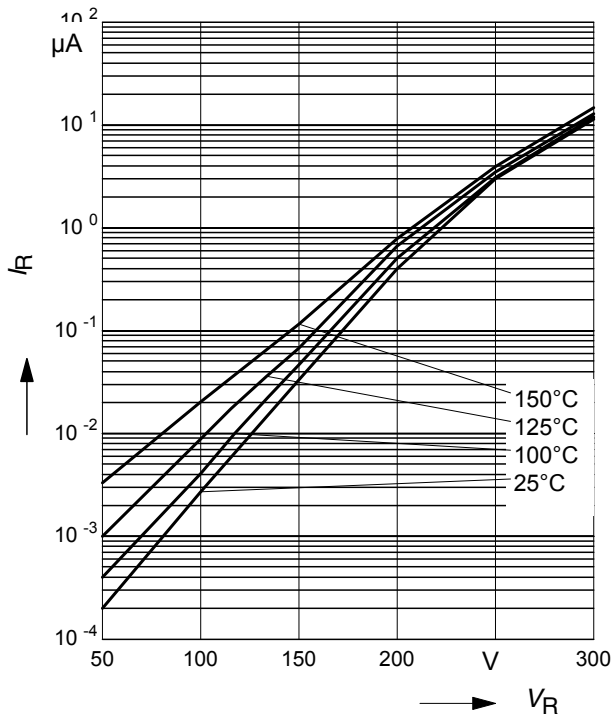


### 4 Typ. forward power dissipation vs. average forward current (per leg)

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



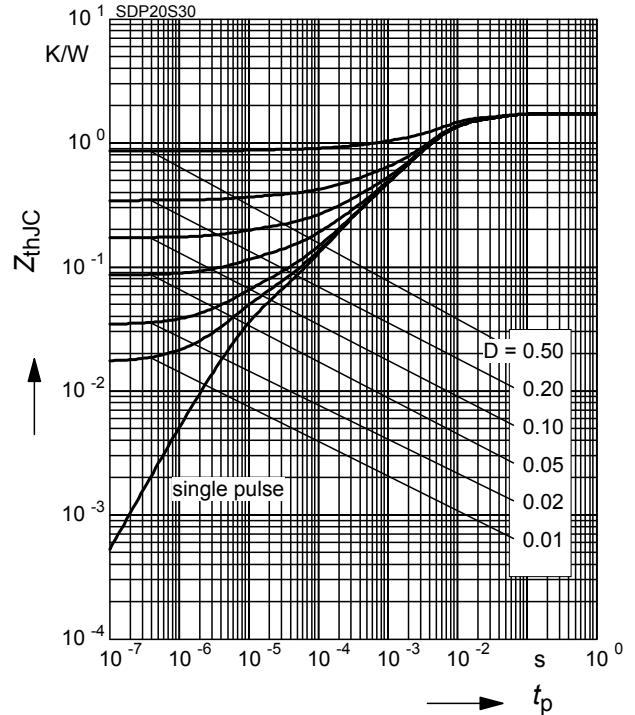
**5 Typ. reverse current vs. reverse voltage**  
(per leg)  $I_R = f(V_R)$



**6 Transient thermal impedance (per leg)**

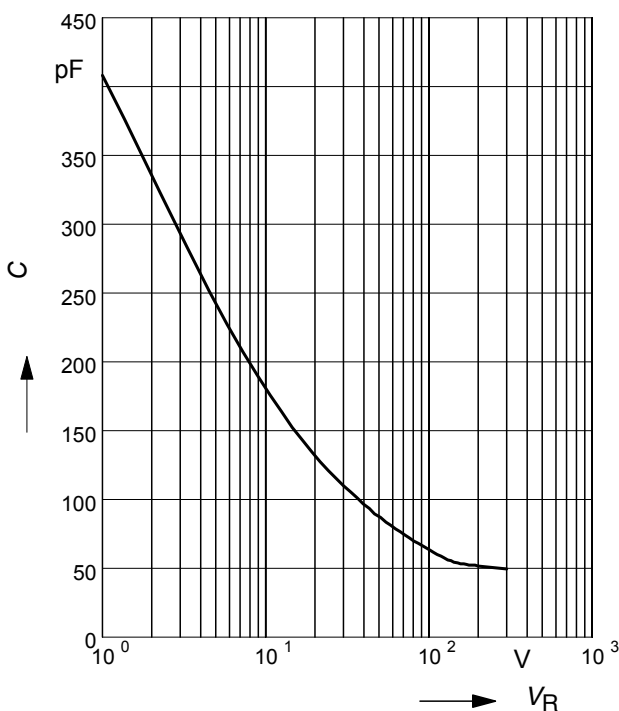
$$Z_{thJC} = f(t_p)$$

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



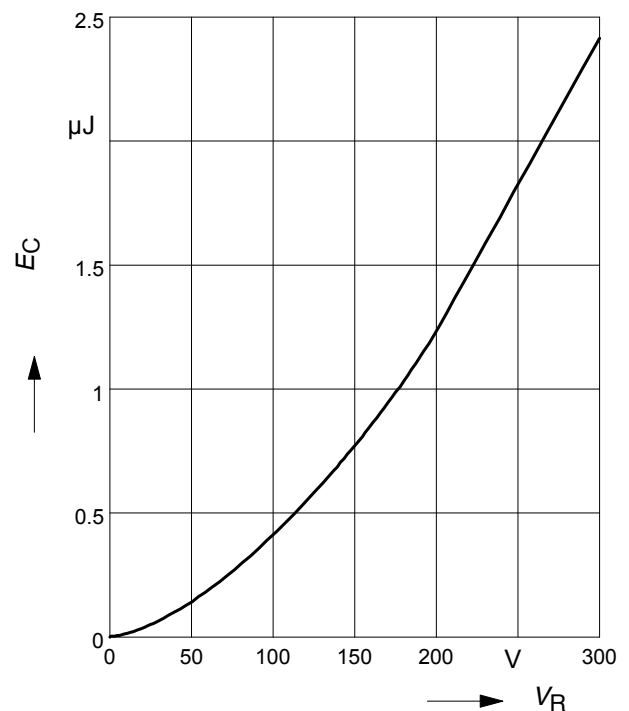
**7 Typ. capacitance vs. reverse voltage**  
(per leg)  $C = f(V_R)$

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



**8 Typ. C stored energy (per leg)**

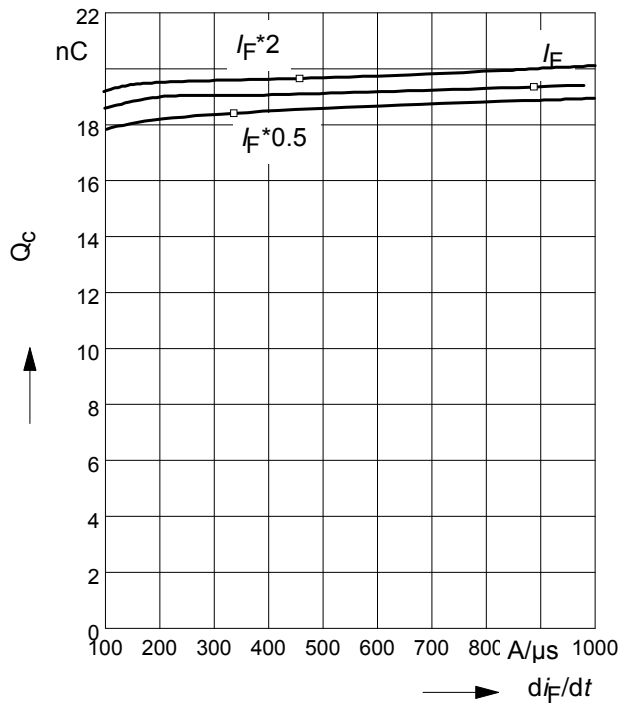
$$E_C = f(V_R)$$



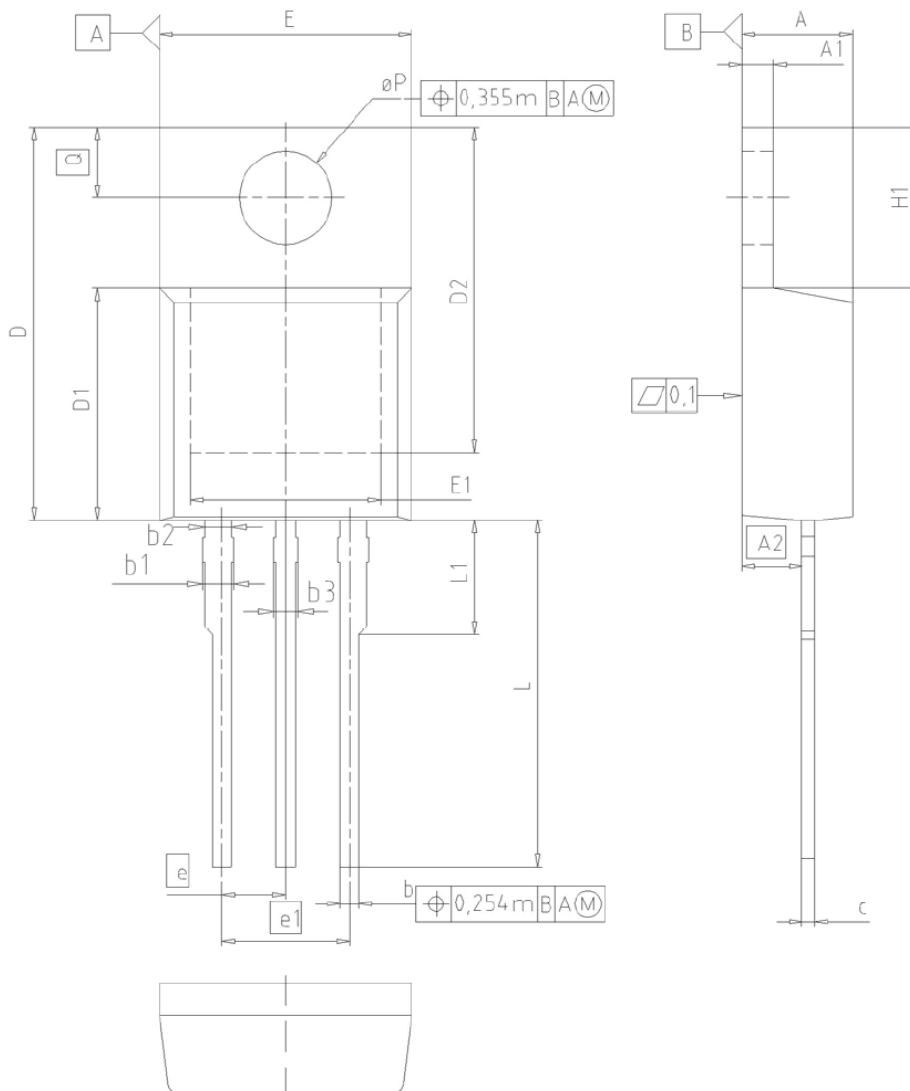
## 9 Typ. capacitive charge vs. current slope

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

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



P-TO220-3-1, P-TO220-3-21



| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 4.30        | 4.57  | 0.169  | 0.180 |
| A1  | 1.17        | 1.40  | 0.046  | 0.055 |
| A2  | 2.15        | 2.72  | 0.085  | 0.107 |
| b   | 0.65        | 0.86  | 0.026  | 0.034 |
| b1  | 0.95        | 1.40  | 0.037  | 0.055 |
| b2  | 0.95        | 1.15  | 0.037  | 0.045 |
| b3  | 0.65        | 1.15  | 0.026  | 0.045 |
| c   | 0.33        | 0.60  | 0.013  | 0.024 |
| D   | 14.81       | 15.95 | 0.583  | 0.628 |
| D1  | 8.51        | 9.45  | 0.335  | 0.372 |
| D2  | 12.19       | 13.10 | 0.480  | 0.516 |
| E   | 9.70        | 10.36 | 0.382  | 0.408 |
| E1  | 6.50        | 8.60  | 0.256  | 0.339 |
| e   | 2.54        |       | 0.100  |       |
| e1  | 5.08        |       | 0.200  |       |
| N   | 3           |       | 3      |       |
| H1  | 5.90        | 6.90  | 0.232  | 0.272 |
| L   | 13.00       | 14.00 | 0.512  | 0.551 |
| L1  | -           | 4.80  | -      | 0.189 |
| øP  | 3.60        | 3.89  | 0.142  | 0.153 |
| Q   | 2.60        | 3.00  | 0.102  | 0.118 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
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