

## 2<sup>nd</sup> Generation thinQ!™ SiC Schottky Diode

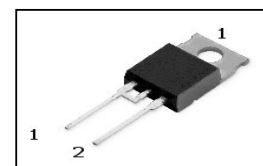
### Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery / No forward recovery
- No temperature influence on the switching behavior
- High surge current capability
- Pb-free lead plating; RoHs compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Breakdown voltage tested at 5mA<sup>2)</sup>

### Product Summary

|          |     |    |
|----------|-----|----|
| $V_{DC}$ | 600 | V  |
| $Q_c$    | 12  | nC |
| $I_F$    | 5   | A  |

PG-TO220-2-2



thinQ! 2G Diode specially designed for fast switching applications like:

- CCM PFC
- Motor Drives

| Type      | Package      |  | Marking | Pin 1 | Pin 2 |
|-----------|--------------|--|---------|-------|-------|
| IDT05S60C | PG-TO220-2-2 |  | D05S60C | C     | A     |

Maximum ratings, at  $T_j=25\text{ °C}$ , unless otherwise specified

| Parameter                                           | Symbol            | Conditions                                             | Value       | Unit             |
|-----------------------------------------------------|-------------------|--------------------------------------------------------|-------------|------------------|
| Continuous forward current                          | $I_F$             | $T_C < 140\text{ °C}$                                  | 5           | A                |
| RMS forward current                                 | $I_{F,RMS}$       | $f=50\text{ Hz}$                                       | 7.5         |                  |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$        | $T_C=25\text{ °C}$ , $t_p=10\text{ ms}$                | 42          |                  |
| Repetitive peak forward current                     | $I_{F,RM}$        | $T_j=150\text{ °C}$ ,<br>$T_C=100\text{ °C}$ , $D=0.1$ | 21          |                  |
| Non-repetitive peak forward current                 | $I_{F,max}$       | $T_C=25\text{ °C}$ , $t_p=10\text{ μs}$                | 180         |                  |
| $i^2t$ value                                        | $\int i^2 dt$     | $T_C=25\text{ °C}$ , $t_p=10\text{ ms}$                | 9           | A <sup>2</sup> s |
| Repetitive peak reverse voltage                     | $V_{RRM}$         |                                                        | 600         | V                |
| Diode ruggedness dv/dt                              | dv/dt             | $V_R = 0 \dots 480\text{V}$                            | 50          | V/ns             |
| Power dissipation                                   | $P_{tot}$         | $T_C=25\text{ °C}$                                     | 55          | W                |
| Operating and storage temperature                   | $T_j$ , $T_{stg}$ |                                                        | -55 ... 175 | °C               |
| Mounting torque                                     |                   | M3 and M3.5 screws                                     | 60          | Ncm              |

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

#### Thermal characteristics

|                                                            |              |                                     |   |   |     |     |
|------------------------------------------------------------|--------------|-------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case                        | $R_{thJC}$   |                                     | - | - | 2.7 | K/W |
| Thermal resistance, junction - ambient                     | $R_{thJA}$   | leaded                              | - | - | 62  |     |
| Soldering temperature, wavesoldering only allowed at leads | $T_{solder}$ | 1.6mm ( 0.063in.) from case for 10s | - | - | 260 | °C  |

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

#### Static characteristics

|                       |          |                                           |     |     |     |               |
|-----------------------|----------|-------------------------------------------|-----|-----|-----|---------------|
| DC blocking voltage   | $V_{DC}$ | $I_R=0.07\text{ mA}$                      | 600 | -   | -   | V             |
| Diode forward voltage | $V_F$    | $I_F=5\text{ A}, T_j=25^\circ\text{C}$    | -   | 1.5 | 1.7 |               |
|                       |          | $I_F=5\text{ A}, T_j=150^\circ\text{C}$   | -   | 1.7 | 2.1 |               |
| Reverse current       | $I_R$    | $V_R=600\text{ V}, T_j=25^\circ\text{C}$  | -   | 0.6 | 70  | $\mu\text{A}$ |
|                       |          | $V_R=600\text{ V}, T_j=150^\circ\text{C}$ | -   | 2.5 | 700 |               |

#### AC characteristics

|                              |       |                                                                                                 |   |     |     |    |
|------------------------------|-------|-------------------------------------------------------------------------------------------------|---|-----|-----|----|
| Total capacitive charge      | $Q_c$ | $V_R=400\text{ V}, I_F \leq I_{F,max}, di_F/dt=200\text{ A}/\mu\text{s}, T_j=150^\circ\text{C}$ | - | 12  | -   | nC |
| Switching time <sup>3)</sup> | $t_c$ |                                                                                                 | - | -   | <10 | ns |
| Total capacitance            | $C$   | $V_R=1\text{ V}, f=1\text{ MHz}$                                                                | - | 240 | -   | pF |
|                              |       | $V_R=300\text{ V}, f=1\text{ MHz}$                                                              | - | 30  | -   |    |
|                              |       | $V_R=600\text{ V}, f=1\text{ MHz}$                                                              | - | 30  | -   |    |

<sup>1)</sup> J-STD20 and JESD22

<sup>2)</sup> All devices tested under avalanche conditions, for a time periode of 5ms, at 5mA.

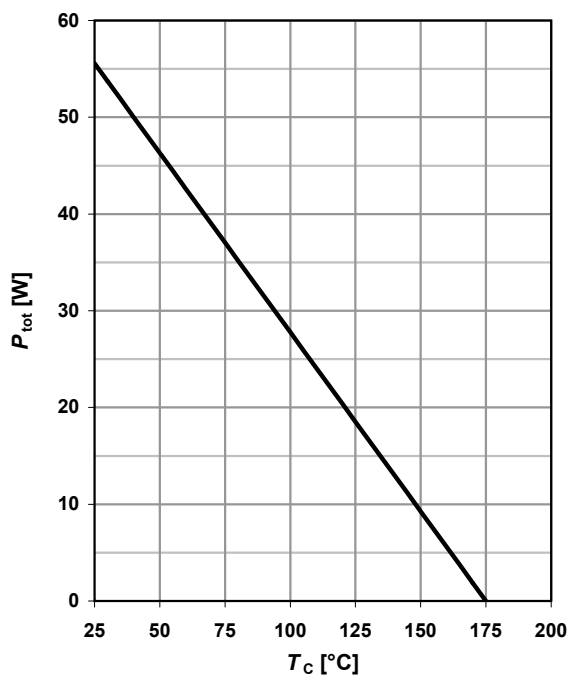
<sup>3)</sup>  $t_c$  is the time constant for the capacitive displacement current waveform (independent from  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ ), different from  $t_{rr}$ , which is dependent on  $T_j$ ,  $I_{LOAD}$ ,  $di/dt$ . No reverse recovery time constant  $t_{rr}$  due to absence of minority carrier injection.

<sup>4)</sup> Only capacitive charge occuring, guaranteed by design.

### 1 Power dissipation

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

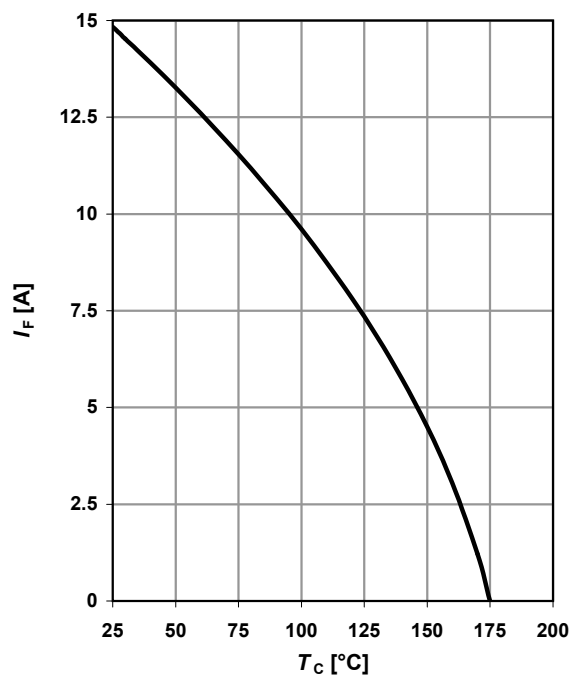
parameter:  $R_{\text{thJC(max)}}$



### 2 Diode forward current

$$I_F = f(T_C); T_j \leq 175 \text{ °C}$$

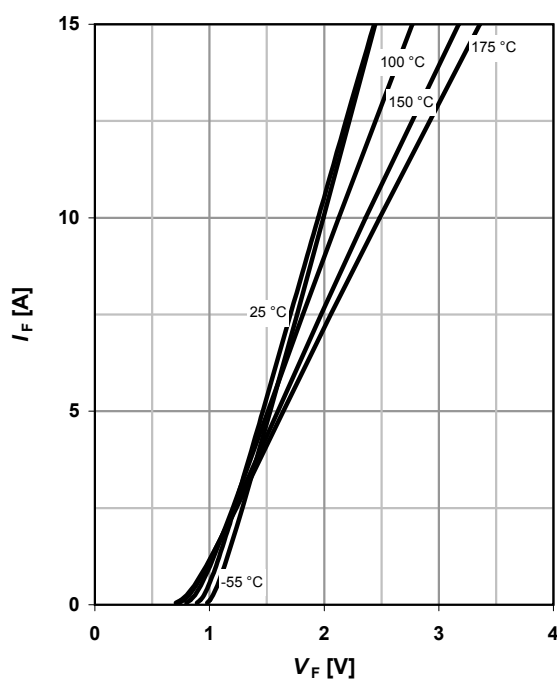
parameter:  $R_{\text{thJC(max)}}$ ;  $V_{F(\text{max})}$



### 3 Typ. forward characteristic

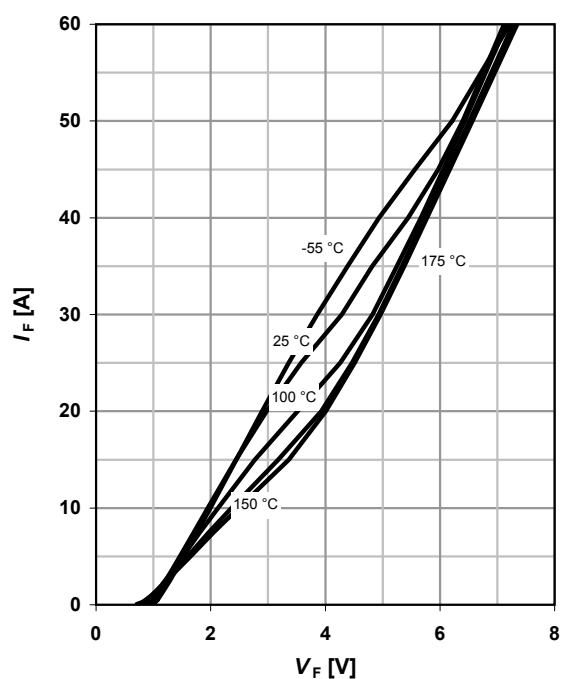
$$I_F = f(V_F); t_p = 400 \text{ } \mu\text{s}$$

parameter:  $T_j$



### 4 Typ. forward characteristic in surge current mode

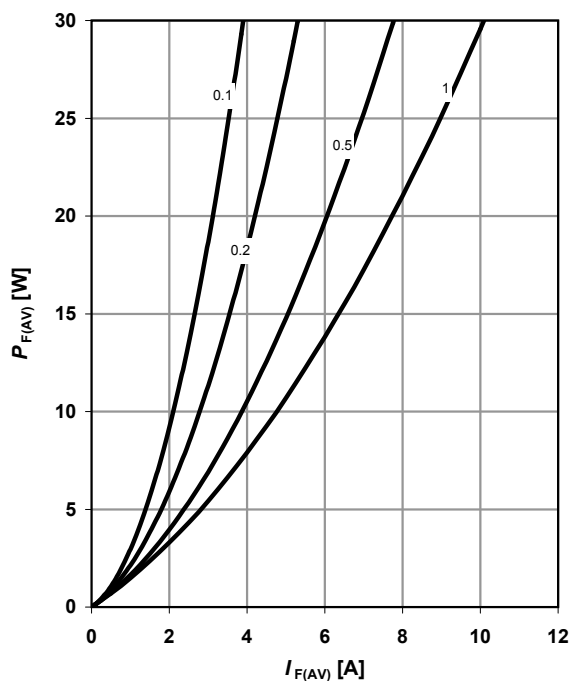
$$I_F = f(V_F); t_p = 400 \text{ } \mu\text{s}; \text{ parameter: } T_j$$



### 5 Typ. forward power dissipation vs.

average forward current

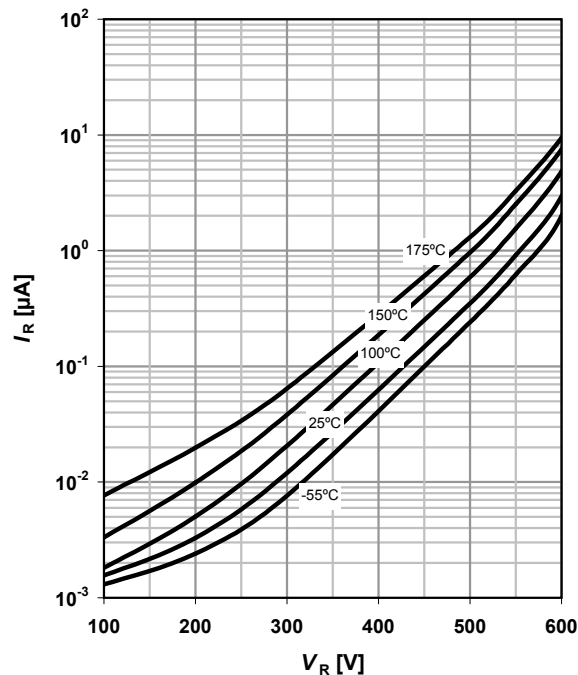
$$P_{F,AV}=f(I_F), T_C=100\text{ }^{\circ}\text{C}, \text{ parameter: } D=t_p/T$$



### 6 Typ. reverse current vs. reverse voltage

$$I_R=f(V_R)$$

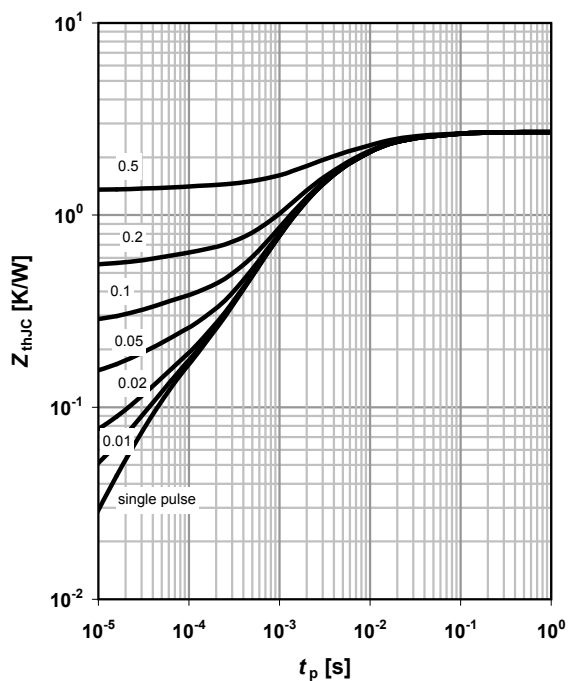
parameter:  $T_j$



### 7 Transient thermal impedance

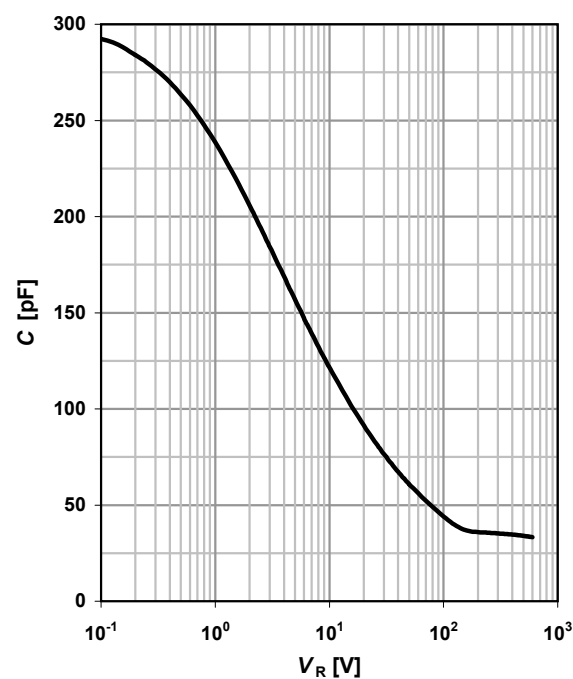
$$Z_{thJC}=f(t_p)$$

parameter:  $D=t_p/T$



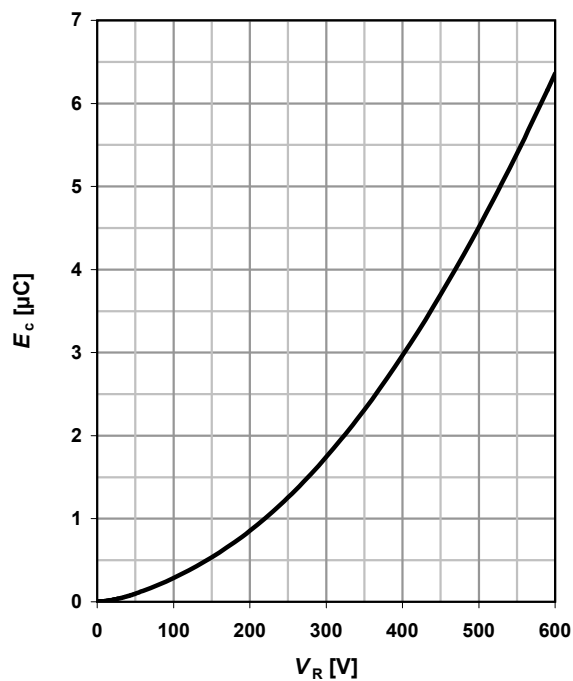
### 8 Typ. capacitance vs. reverse voltage

$$C=f(V_R); T_C=25\text{ }^{\circ}\text{C}, f=1\text{ MHz}$$



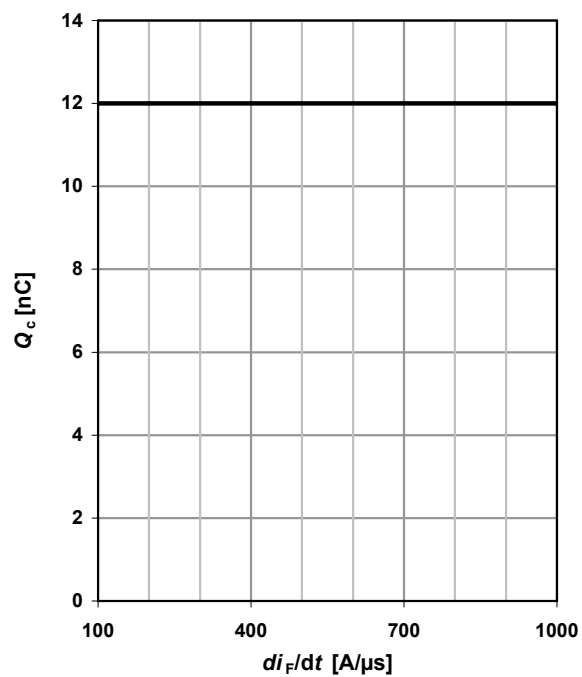
### 9 Typ. C stored energy

$$E_C = f(V_R)$$

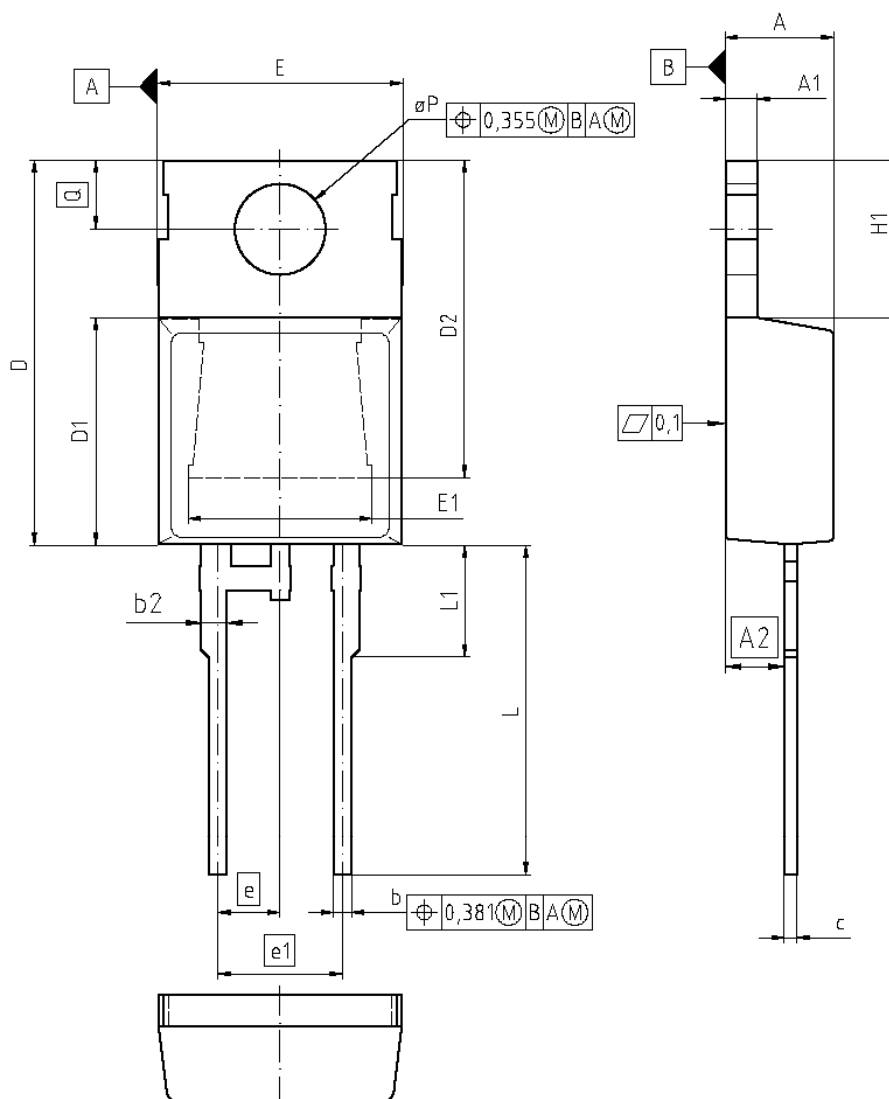


### 10 Typ. capacitance charge vs. current slope

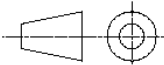
$$Q_C = f(di_F/dt)^4; T_J = 150^\circ\text{C}; I_F \leq I_{F,\text{max}}$$



## PG-TO220-2-2: Outline



| DIM | MILLIMETERS |        | INCHES |       |
|-----|-------------|--------|--------|-------|
|     | MIN         | MAX    | MIN    | MAX   |
| A   | 4.191       | 4.699  | 0.165  | 0.185 |
| A1  | 1.170       | 1.400  | 0.046  | 0.055 |
| A2  | 2.215       | 2.718  | 0.087  | 0.107 |
| b   | 0.635       | 0.889  | 0.025  | 0.035 |
| b2  | 0.950       | 1.851  | 0.037  | 0.065 |
| c   | 0.330       | 0.635  | 0.013  | 0.025 |
| D   | 14.808      | 15.950 | 0.583  | 0.628 |
| D1  | 8.509       | 9.450  | 0.335  | 0.372 |
| D2  | 12.850      | 14.245 | 0.506  | 0.561 |
| E   | 9.677       | 10.363 | 0.381  | 0.408 |
| E1  | 6.500       | 8.788  | 0.256  | 0.346 |
| e   | 2.540       |        | 0.100  |       |
| e1  | 5.080       |        | 0.200  |       |
| N   | 2           |        | 2      |       |
| H1  | 5.800       | 6.900  | 0.232  | 0.272 |
| L   | 12.700      | 14.000 | 0.500  | 0.551 |
| L1  | 3.048       | 4.800  | 0.120  | 0.189 |
| øP  | 3.550       | 3.886  | 0.140  | 0.153 |
| Q   | 2.540       | 3.048  | 0.100  | 0.120 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
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| EUROPEAN PROJECTION<br> |
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