

### 3<sup>rd</sup> Generation thinQ!™ SiC Schottky Diode

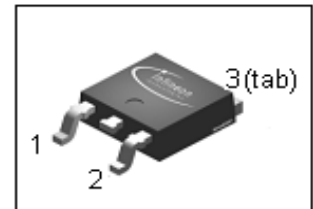
#### Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery / No forward recovery
- Temperature independent 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 20mA<sup>2)</sup>
- Optimized for high temperature operation
- Lowest Figure of Merit  $Q_C/I_F$

#### Product Summary

|                            |     |    |
|----------------------------|-----|----|
| $V_{DC}$                   | 600 | V  |
| $Q_C$                      | 4.5 | nC |
| $I_F; T_C < 130\text{ °C}$ | 4   | A  |

#### PG-TO252-3



#### thinQ! 3G Diode designed for fast switching applications like:

- SMPS e.g.; CCM PFC
- Motor Drives; Solar Applications; UPS



| Type       | Package    | Marking | Pin 1 | Pin 2 | Pin 3 |
|------------|------------|---------|-------|-------|-------|
| IDD04SG60C | PG-TO252-3 | D04G60C | n.c.  | A     | C     |

#### Maximum ratings

| Parameter                                           | Symbol         | Conditions                                | Value       | Unit             |
|-----------------------------------------------------|----------------|-------------------------------------------|-------------|------------------|
| Continuous forward current                          | $I_F$          | $T_C < 130\text{ °C}$                     | 4           | A                |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$     | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$  | 18          |                  |
|                                                     |                | $T_C = 150\text{ °C}, t_p = 10\text{ ms}$ | 13.5        |                  |
| Non-repetitive peak forward current                 | $I_{F,max}$    | $T_C = 25\text{ °C}, t_p = 10\text{ μs}$  | 120         |                  |
| $i^2t$ value                                        | $\int i^2 dt$  | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$  | 1.8         | A <sup>2</sup> s |
|                                                     |                | $T_C = 150\text{ °C}, t_p = 10\text{ ms}$ | 0.93        |                  |
| Repetitive peak reverse voltage                     | $V_{RRM}$      | $T_J = 25\text{ °C}$                      | 600         | V                |
| Diode dv/dt ruggedness                              | dv/dt          | $V_R = 0 \dots 480\text{ V}$              | 50          | V/ns             |
| Power dissipation                                   | $P_{tot}$      | $T_C = 25\text{ °C}$                      | 43          | W                |
| Operating and storage temperature                   | $T_J, T_{stg}$ |                                           | -55 ... 175 | °C               |
| Soldering temperature, reflow soldering (max)       | $T_{sld}$      | reflow MSL1                               | 260         |                  |

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

**Thermal characteristics**

|                                        |            |                                                                          |   |    |     |     |
|----------------------------------------|------------|--------------------------------------------------------------------------|---|----|-----|-----|
| Thermal resistance, junction - case    | $R_{thJC}$ |                                                                          | - | -  | 3.5 | K/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | SMD version, device on PCB, minimal footprint                            | - | -  | 75  |     |
|                                        |            | SMD version, device on PCB, 6 cm <sup>2</sup> cooling area <sup>5)</sup> | - | 50 | -   |     |

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

|                       |          |                                           |     |     |     |               |
|-----------------------|----------|-------------------------------------------|-----|-----|-----|---------------|
| DC blocking voltage   | $V_{DC}$ | $I_R=0.05\text{ mA}$ , $T_j=25\text{ °C}$ | 600 | -   | -   | V             |
| Diode forward voltage | $V_F$    | $I_F=4\text{ A}$ , $T_j=25\text{ °C}$     | -   | 2.1 | 2.3 |               |
|                       |          | $I_F=4\text{ A}$ , $T_j=150\text{ °C}$    | -   | 2.8 | -   |               |
| Reverse current       | $I_R$    | $V_R=600\text{ V}$ , $T_j=25\text{ °C}$   | -   | 0.3 | 25  | $\mu\text{A}$ |
|                       |          | $V_R=600\text{ V}$ , $T_j=150\text{ °C}$  | -   | 1.3 | 270 |               |

**AC characteristics**

|                              |       |                                                                                                            |   |     |     |    |
|------------------------------|-------|------------------------------------------------------------------------------------------------------------|---|-----|-----|----|
| Total capacitive charge      | $Q_c$ | $V_R=400\text{ V}$ , $I_F \leq I_{F,max}$ ,<br>$di_F/dt=200\text{ A}/\mu\text{s}$ ,<br>$T_j=150\text{ °C}$ | - | 4.5 | -   | nC |
| Switching time <sup>3)</sup> | $t_c$ |                                                                                                            | - | -   | <10 | ns |
| Total capacitance            | $C$   | $V_R=1\text{ V}$ , $f=1\text{ MHz}$                                                                        | - | 80  | -   | pF |
|                              |       | $V_R=300\text{ V}$ , $f=1\text{ MHz}$                                                                      | - | 10  | -   |    |
|                              |       | $V_R=600\text{ V}$ , $f=1\text{ MHz}$                                                                      | - | 10  | -   |    |

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

<sup>2)</sup> All devices tested under avalanche conditions, for a time periode of 10ms, at 20mA.

<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  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ . No reverse recovery time constant  $t_{rr}$  due to absence of minority carrier injection.

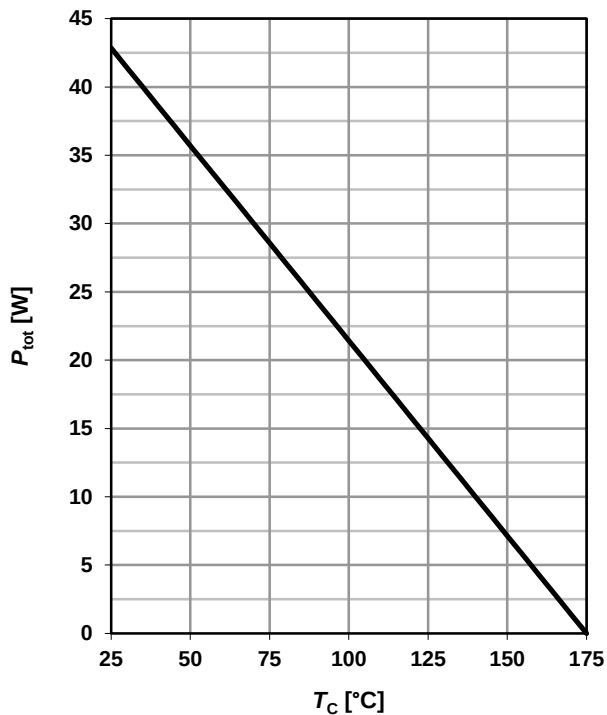
<sup>4)</sup> Under worst case  $Z_{th}$  conditions.

<sup>5)</sup> Device on 40mm\*40mm\*1.5 epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70μm thick) copper area for drain connection. PCB is vertical without blown air

<sup>6)</sup> Only capacitive charge occuring, guaranteed by design.

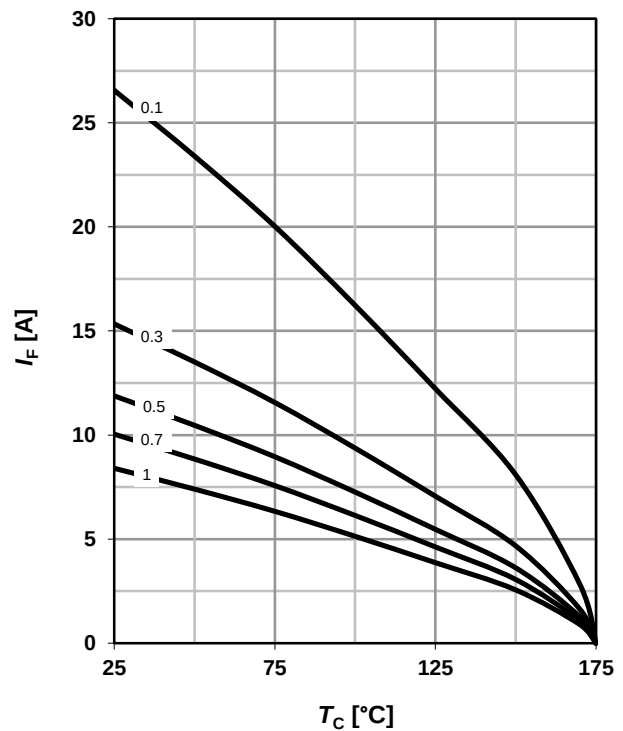
### 1 Power dissipation

$P_{\text{tot}} = f(T_C)$ ; parameter:  $R_{\text{thJC(max)}}$



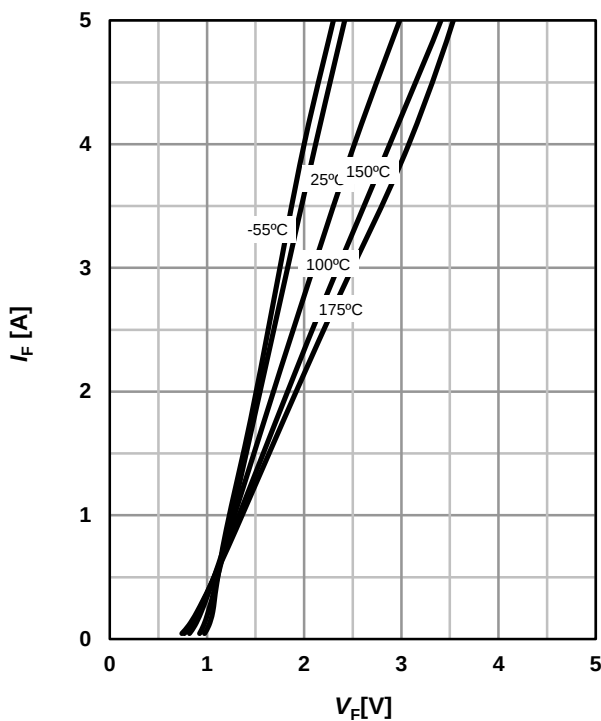
### 2 Diode forward current

$I_F = f(T_C)^{4}$ ;  $T_j \leq 175$  °C; parameter:  $D = t_p/T$



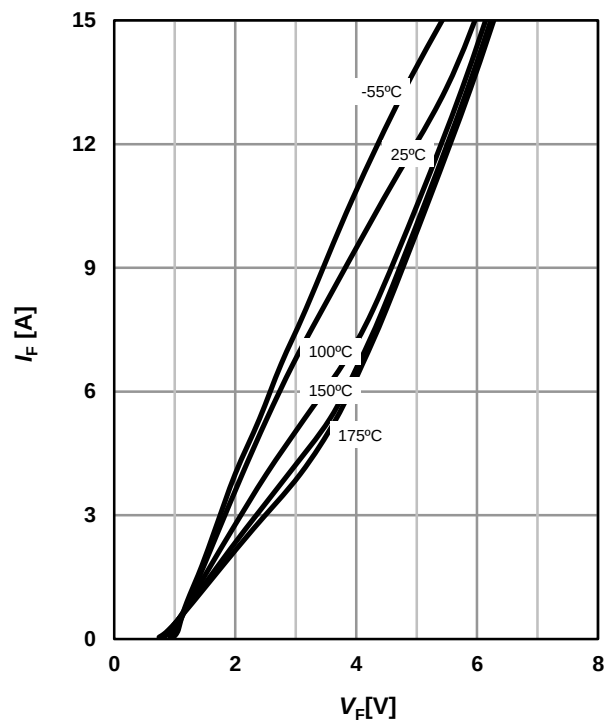
### 3 Typ. forward characteristic

$I_F = f(V_F)$ ;  $t_p = 400$  μs; parameter:  $T_j$



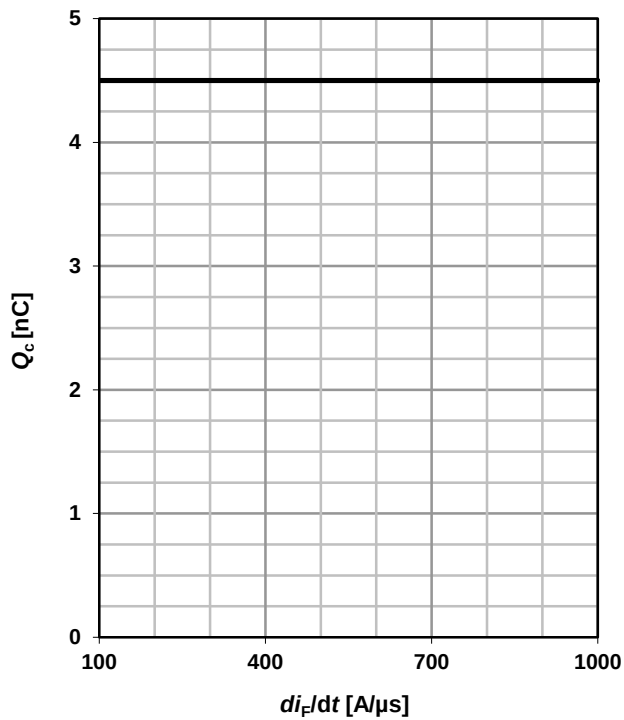
### 4 Typ. forward characteristic in surge current mode

$I_F = f(V_F)$ ;  $t_p = 400$  μs; parameter:  $T_j$



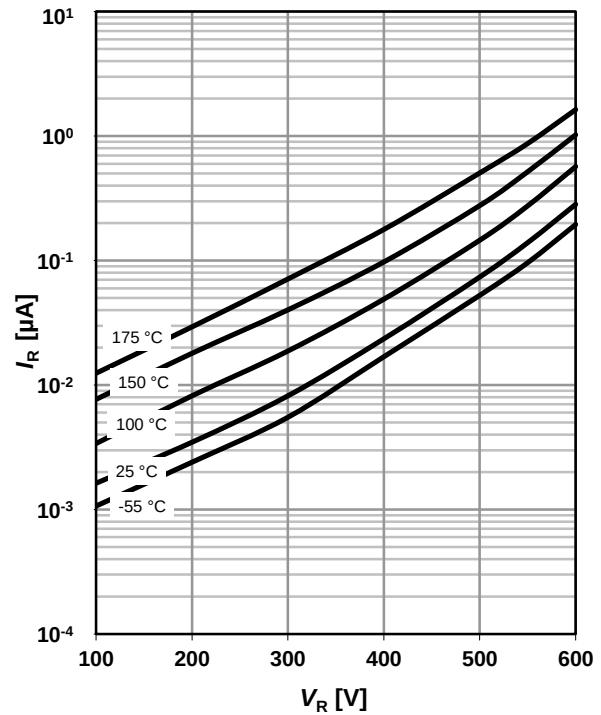
### 5 Typ. capacitance charge vs. current slope

$$Q_C = f(di_F/dt)^{0.6}; I_F \leq I_{F,max}$$



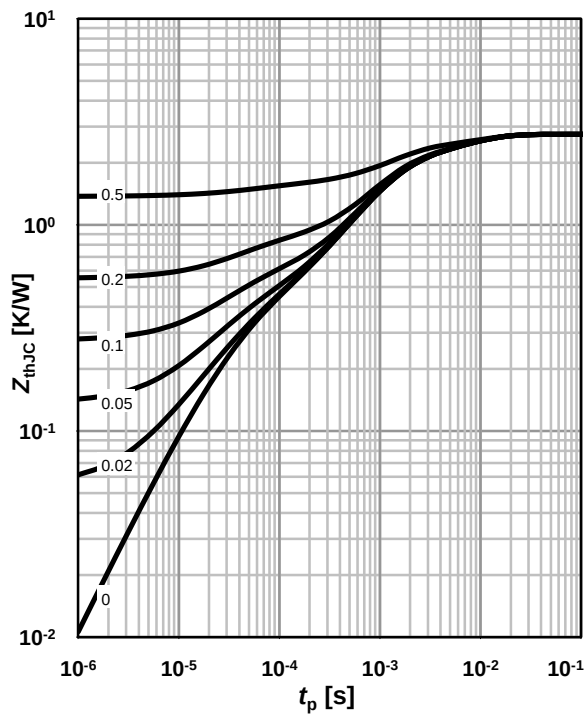
### 6 Typ. reverse current vs. reverse voltage

$$I_R = f(V_R); \text{ parameter: } T_j$$



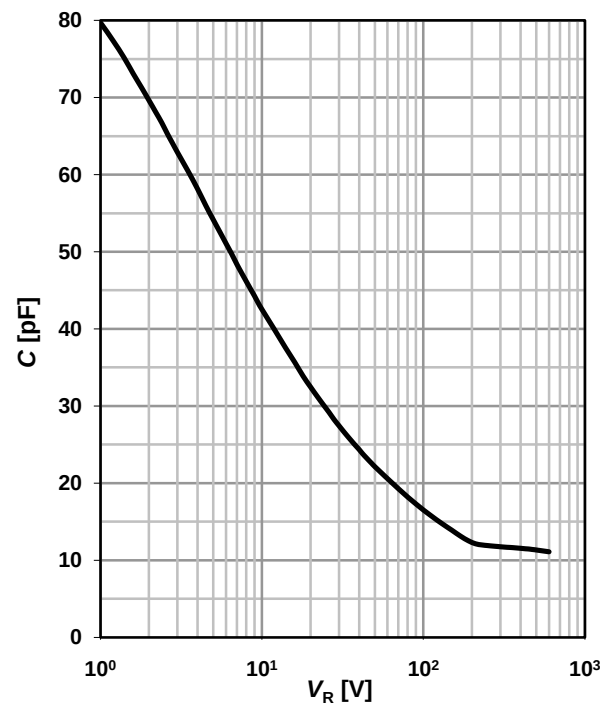
### 7 Transient thermal impedance

$$Z_{thJC} = f(t_p); \text{ parameter: } D = t_p/T$$



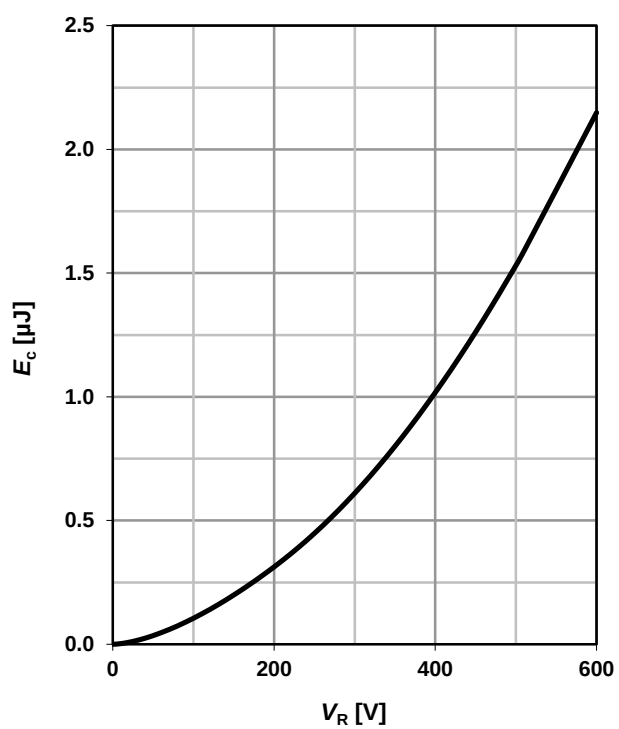
### 8 Typ. capacitance vs. reverse voltage

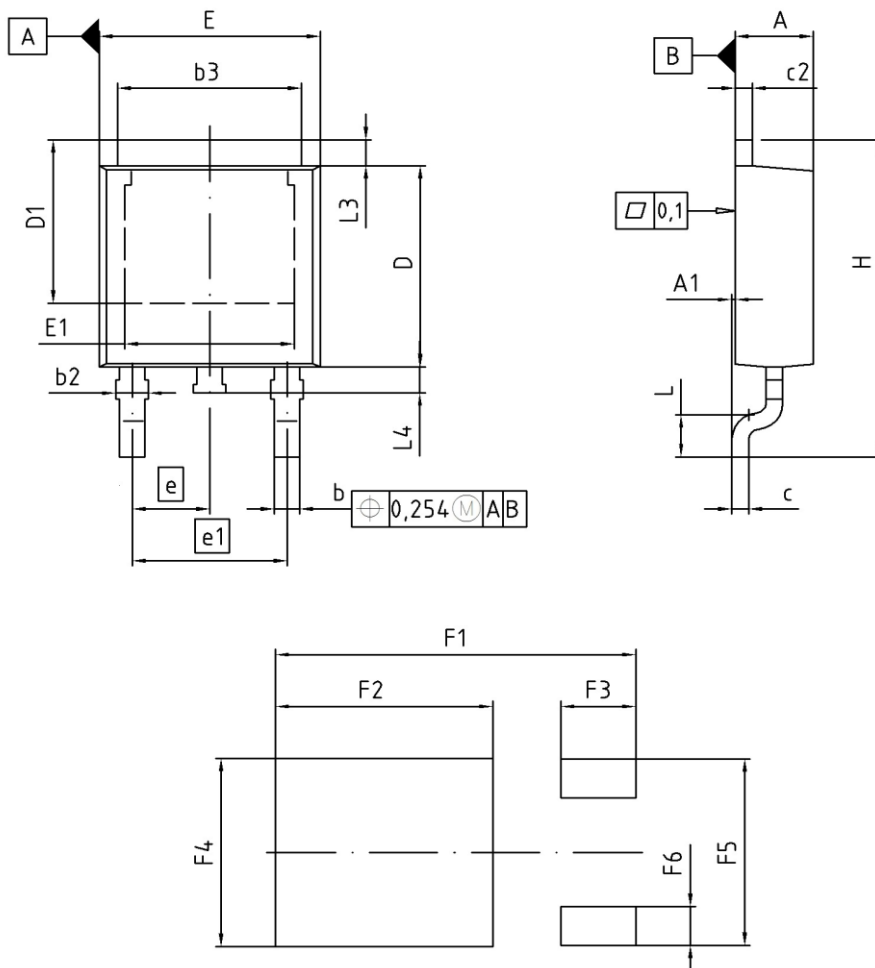
$$C = f(V_R); T_C = 25^\circ\text{C}, f = 1\text{ MHz}$$



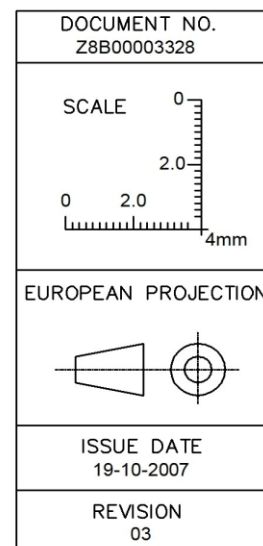
## 9 Typ. C stored energy

$$E_C = f(V_R)$$



**PG-TO252-3: Outline**


| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 2.16        | 2.41  | 0.085  | 0.095 |
| A1  | 0.00        | 0.15  | 0.000  | 0.006 |
| b   | 0.64        | 0.89  | 0.025  | 0.035 |
| b2  | 0.65        | 1.15  | 0.026  | 0.045 |
| b3  | 5.00        | 5.50  | 0.197  | 0.217 |
| c   | 0.46        | 0.60  | 0.018  | 0.024 |
| c2  | 0.46        | 0.98  | 0.018  | 0.039 |
| D   | 5.97        | 6.22  | 0.235  | 0.245 |
| D1  | 5.02        | 5.84  | 0.198  | 0.230 |
| E   | 6.40        | 6.73  | 0.252  | 0.265 |
| E1  | 4.70        | 5.21  | 0.185  | 0.205 |
| e   | 2.29        |       | 0.090  |       |
| e1  | 4.57        |       | 0.180  |       |
| N   | 3           |       | 3      |       |
| H   | 9.40        | 10.48 | 0.370  | 0.413 |
| L   | 1.18        | 1.70  | 0.046  | 0.067 |
| L3  | 0.90        | 1.25  | 0.035  | 0.049 |
| L4  | 0.51        | 1.00  | 0.020  | 0.039 |
| F1  | 10.50       | 10.70 | 0.413  | 0.421 |
| F2  | 6.30        | 6.50  | 0.248  | 0.256 |
| F3  | 2.10        | 2.30  | 0.083  | 0.091 |
| F4  | 5.70        | 5.90  | 0.224  | 0.232 |
| F5  | 5.66        | 5.86  | 0.223  | 0.231 |
| F6  | 1.10        | 1.30  | 0.043  | 0.051 |



Dimensions in mm/inches

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