

# BAR90-02EL

## Single silicon RF PIN diode



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Simulation



Support

## Product description

This Infineon RF PIN diode provides high-voltage handling capabilities and comes with low loss and low distortion levels. Its low forward resistance, low capacitance and low inductance simplify design and support designers in creating smaller and lighter end-solutions.



## Feature list

- Very low capacitance  $C = 0.23 \text{ pF}$  (typical) at voltage  $V_R = 0 \text{ V}$  and frequency  $f = 1 \text{ GHz}$
- Low forward resistance  $R_F = 1.6 \Omega$  (typical) at  $I_F = 3 \text{ mA}$  and frequency  $f = 100 \text{ MHz}$
- Balanced ON / OFF harmonic distortion
- TSLP-2-19 package (1 mm x 0.6 mm x 0.31 mm) with a 0402 foot print
- Pb-free, RoHS compliant and halogen-free

## Product validation

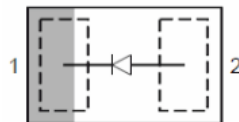
Qualified for industrial applications according to the relevant tests of JEDEC47/20/22.

## Potential applications

Optimized for low bias current RF and high-speed interface switches in:

- Set-top boxes, digital media players
- Laptops and desktop PCs

## Device information



**Table 1** Part information

| Product name / Ordering code     | Package   | Pin configuration | Marking | Pieces / Reel |
|----------------------------------|-----------|-------------------|---------|---------------|
| BAR90-02EL / BAR9002ELE6327XTMA1 | TSLP-2-19 | Single, leadless  | X       | 15 k          |

**Attention:** *ESD (Electrostatic discharge) sensitive device, observe handling precautions!*

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**1 Absolute maximum ratings**

**Table 2 Absolute maximum ratings at  $T_A = 25\text{ °C}$ , unless otherwise specified**

| Parameter               | Symbol    | Values |      | Unit | Note or test condition                 |
|-------------------------|-----------|--------|------|------|--|
|                         |           | Min.   | Max. |      |  |
| Diode reverse voltage   | $V_R$     | –      | 80   | V    |  |
| Forward current         | $I_F$     | –      | 100  | mA   |  |
| Total power dissipation | $P_{TOT}$ | –      | 250  | mW   | $T_S \leq 133\text{ °C}$ <sup>1)</sup> |
| Junction temperature    | $T_J$     | –      | 150  | °C   |  |
| Operating temperature   | $T_{OP}$  | -55    | 125  |      |  |
| Storage temperature     | $T_{STG}$ | -55    | 150  |      |  |

**Attention:** *Stresses above the maximum values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Exceeding only one of these values may cause irreversible damage to the component.*

<sup>1</sup>  $T_S$  is the soldering point temperature.

**Electrical performance in test fixture**

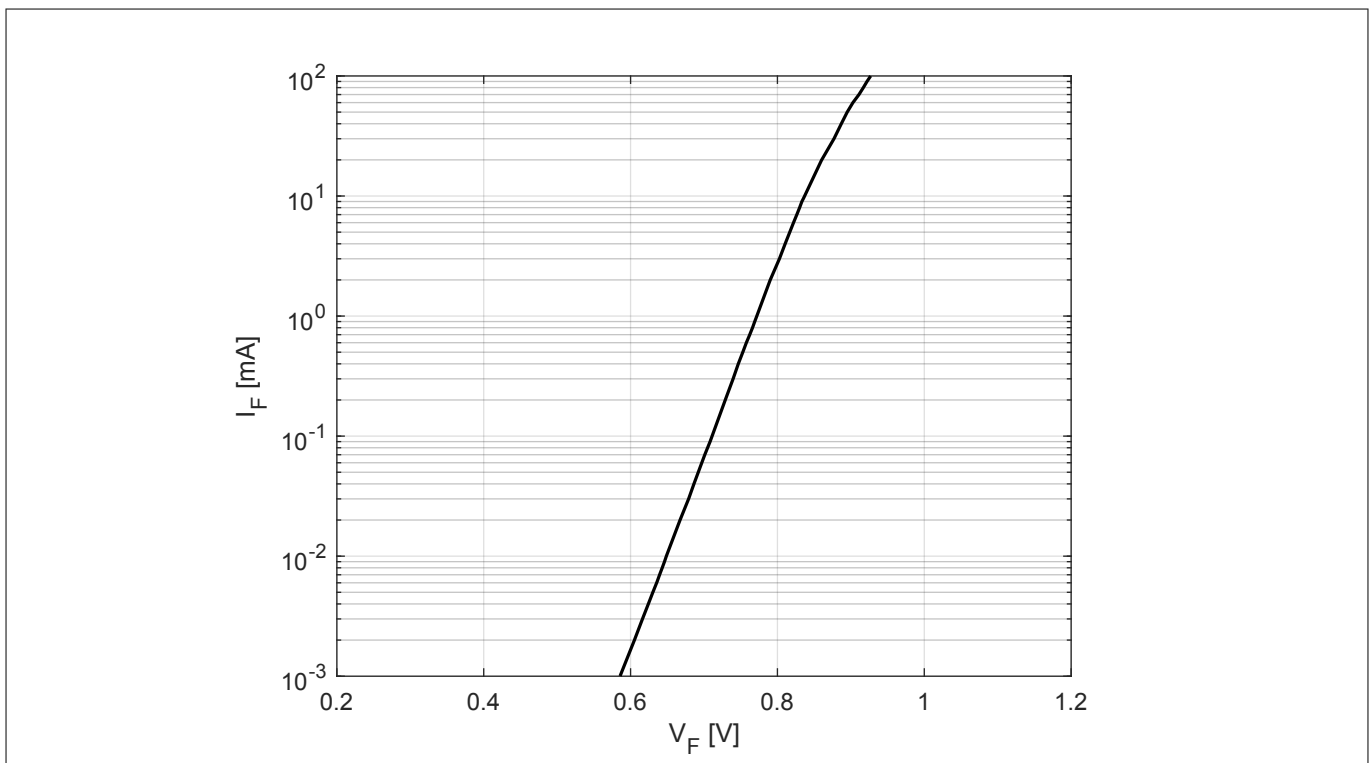
**2 Electrical performance in test fixture**

**2.1 DC characteristics**

At  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

**Table 3 DC characteristics**

| Parameter               | Symbol      | Values |      |      | Unit          | Note or test condition   |
|-------------------------|-------------|--------|------|------|---------------|--|
|                         |             | Min.   | Typ. | Max. |               |  |
| Breakdown voltage       | $V_{BR}$    | 80     | –    | –    | V             | $I_{BR} = 5\text{ }\mu\text{A}$  |
| Reverse current         | $I_R$       | –      | –    | 50   | nA            | $V_R = 60\text{ V}$  |
| Forward voltage         | $V_F$       | 0.75   | 0.79 | 0.87 | V             | $I_F = 3\text{ mA}$  |
|                         |             | 0.82   | 0.91 | 1    |               | $I_F = 100\text{ mA}$  |
| I-region width          | $W_I$       | –      | 20   | –    | $\mu\text{m}$ |  |
| Charge carrier lifetime | $\tau_{rr}$ | –      | 750  | –    | ns            | $I_F = 10\text{ mA}$ , $I_R = 6\text{ mA}$ ,<br>measured at $I_R = 3\text{ mA}$ ,<br>$R_L = 100\text{ }\Omega$ |



**Figure 1 Forward current  $I_F$  vs. forward voltage  $V_F$**

**Electrical performance in test fixture**

**2.2 AC characteristics**

At  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

**Table 4 Key parameter**

| Parameter          | Symbol | Values |      |      | Unit     | Note or test condition                   |
|--------------------|--------|--------|------|------|----------|--|
|                    |        | Min.   | Typ. | Max. |          |  |
| Capacitance        | C      | -      | 0.35 | -    | pF       | $V_R = 0\text{ V}, f = 1\text{ MHz}$     |
|                    |        | -      | 0.26 | 0.35 |          | $V_R = 1\text{ V}, f = 1\text{ MHz}$     |
| Forward resistance | $R_F$  | -      | 2.3  | -    | $\Omega$ | $I_F = 1\text{ mA}, f = 100\text{ MHz}$  |
|                    |        | -      | 1.6  | 2.3  |          | $I_F = 3\text{ mA}, f = 100\text{ MHz}$  |
|                    |        | -      | 1.1  | -    |          | $I_F = 10\text{ mA}, f = 100\text{ MHz}$ |
| Inductance         | $L_S$  | -      | 0.4  | -    | nH       |  |

**Table 5 AC parameter at frequency  $f = 1\text{ GHz}$**

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or Test Condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | C        | -      | 0.23 | -    | pF         | $V_R = 0\text{ V}$     |
| Reverse parallel resistance | $R_P$    | -      | 2.4  | -    | k $\Omega$ | $V_R = 0\text{ V}$     |
| Forward resistance          | $R_F$    | -      | 2.4  | -    | $\Omega$   | $I_F = 1\text{ mA}$    |
|                             |          | -      | 1.8  | -    |            | $I_F = 3\text{ mA}$    |
|                             |          | -      | 1.4  | -    |            | $I_F = 10\text{ mA}$   |
| Insertion loss              | $I_L$    | -      | 0.18 | -    | dB         | $I_F = 1\text{ mA}$    |
|                             |          | -      | 0.13 | -    |            | $I_F = 3\text{ mA}$    |
|                             |          | -      | 0.1  | -    |            | $I_F = 10\text{ mA}$   |
| Isolation                   | $I_{SO}$ | -      | 16.9 | -    |            | $V_R = 0\text{ V}$     |

**Table 6 AC parameter at frequency  $f = 1.8\text{ GHz}$**

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or Test Condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | C        | -      | 0.20 | -    | pF         | $V_R = 0\text{ V}$     |
| Reverse parallel resistance | $R_P$    | -      | 1.8  | -    | k $\Omega$ | $V_R = 0\text{ V}$     |
| Forward resistance          | $R_F$    | -      | 2.5  | -    | $\Omega$   | $I_F = 1\text{ mA}$    |
|                             |          | -      | 1.9  | -    |            | $I_F = 3\text{ mA}$    |
|                             |          | -      | 1.5  | -    |            | $I_F = 10\text{ mA}$   |
| Insertion loss              | $I_L$    | -      | 0.19 | -    | dB         | $I_F = 1\text{ mA}$    |
|                             |          | -      | 0.14 | -    |            | $I_F = 3\text{ mA}$    |
|                             |          | -      | 0.11 | -    |            | $I_F = 10\text{ mA}$   |
| Isolation                   | $I_{SO}$ | -      | 13   | -    |            | $V_R = 0\text{ V}$     |

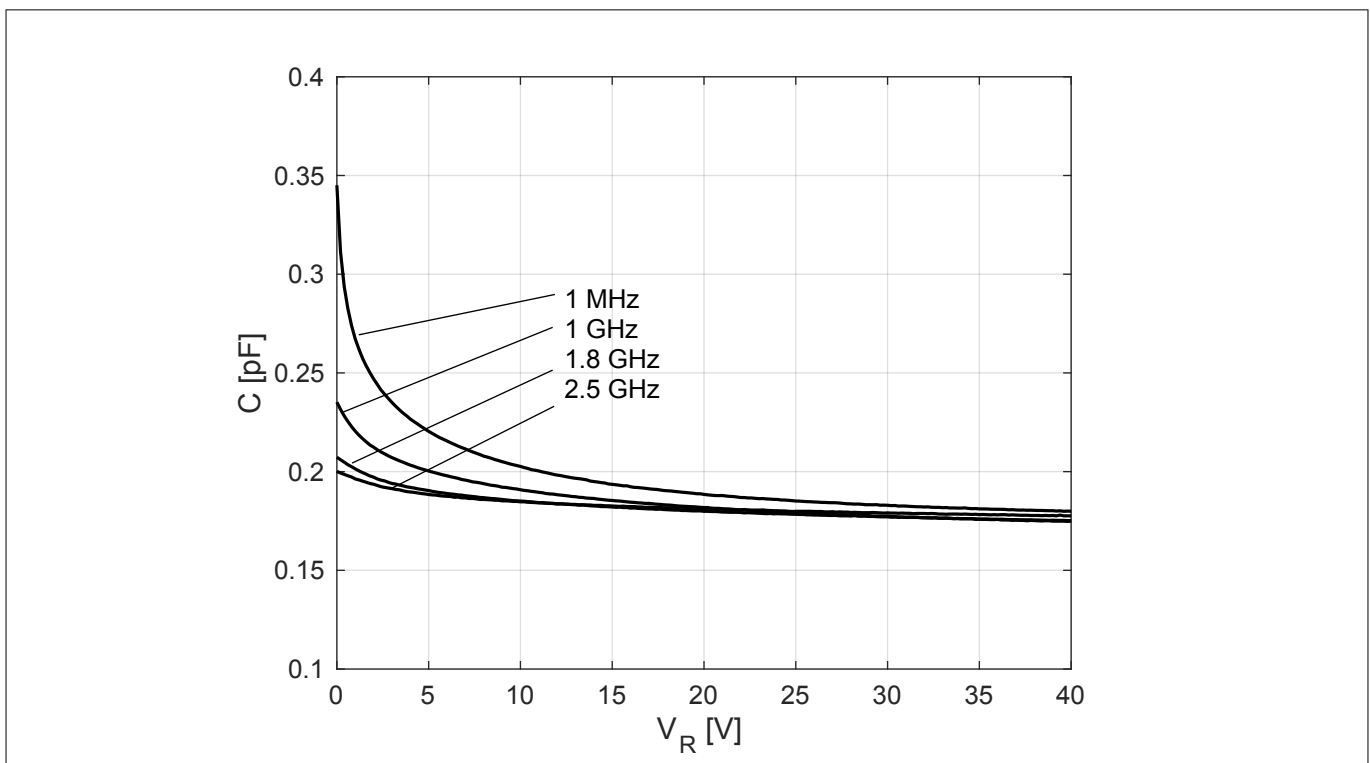
**Electrical performance in test fixture**

**Table 7 AC parameter at frequency  $f = 2.5$  GHz**

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or Test Condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | $C$      | -      | 0.20 | -    | pF         | $V_R = 0$ V            |
| Reverse parallel resistance | $R_P$    | -      | 1.6  | -    | k $\Omega$ | $V_R = 0$ V            |
| Forward resistance          | $R_F$    | -      | 2.7  | -    | $\Omega$   | $I_F = 1$ mA           |
|                             |          | -      | 2.1  | -    |            | $I_F = 3$ mA           |
|                             |          | -      | 1.7  | -    |            | $I_F = 10$ mA          |
| Insertion loss              | $I_L$    | -      | 0.2  | -    | dB         | $I_F = 1$ mA           |
|                             |          | -      | 0.16 | -    |            | $I_F = 3$ mA           |
|                             |          | -      | 0.12 | -    |            | $I_F = 10$ mA          |
| Isolation                   | $I_{SO}$ | -      | 10.8 | -    |            | $V_R = 0$ V            |

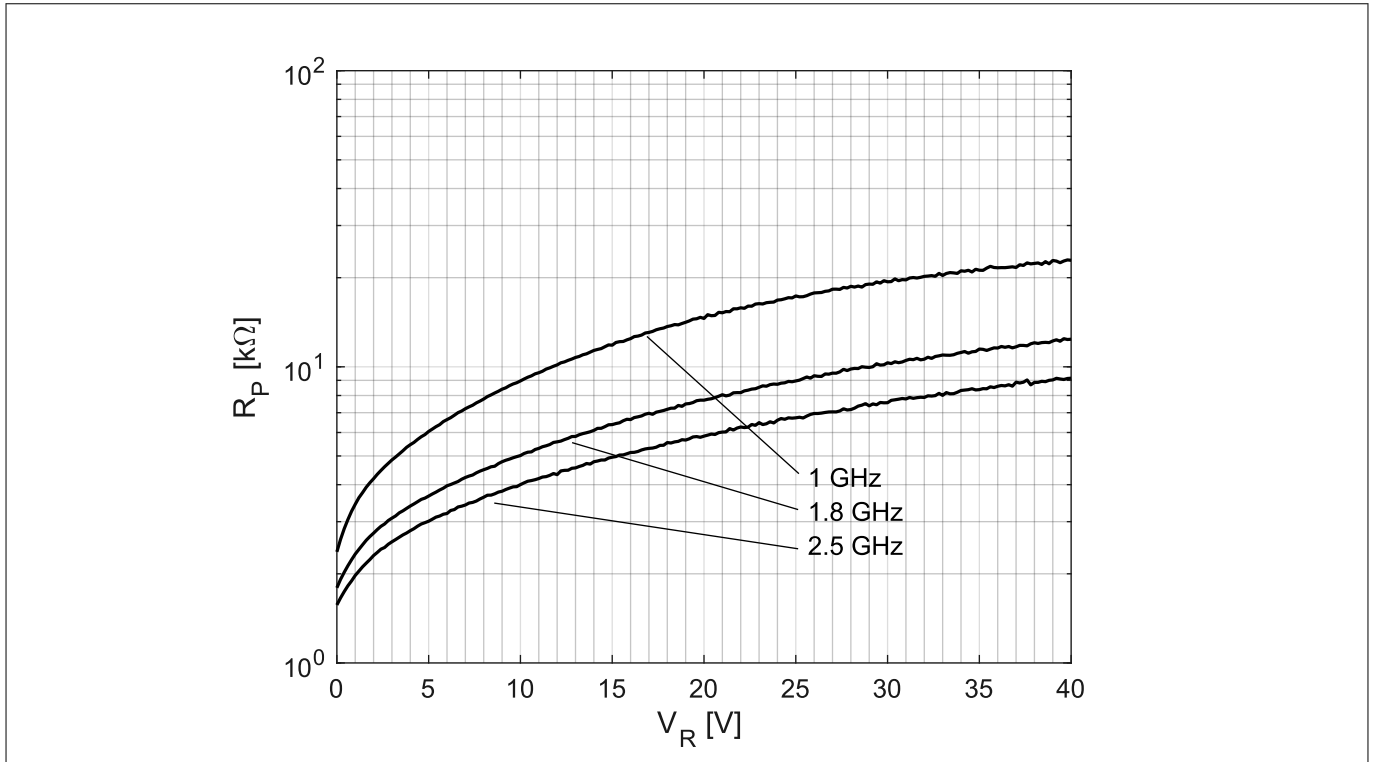
**Table 8 AC parameter at frequency  $f = 5.5$  GHz**

| Parameter      | Symbol   | Values |      |      | Unit | Note or Test Condition |
|----------------|----------|--------|------|------|------|------------------------|
|                |          | Min.   | Typ. | Max. |      |                        |
| Insertion loss | $I_L$    | -      | 0.27 | -    | dB   | $I_F = 1$ mA           |
|                |          | -      | 0.23 | -    |      | $I_F = 3$ mA           |
|                |          | -      | 0.2  | -    |      | $I_F = 10$ mA          |
| Isolation      | $I_{SO}$ | -      | 5.6  | -    |      | $V_R = 0$ V            |

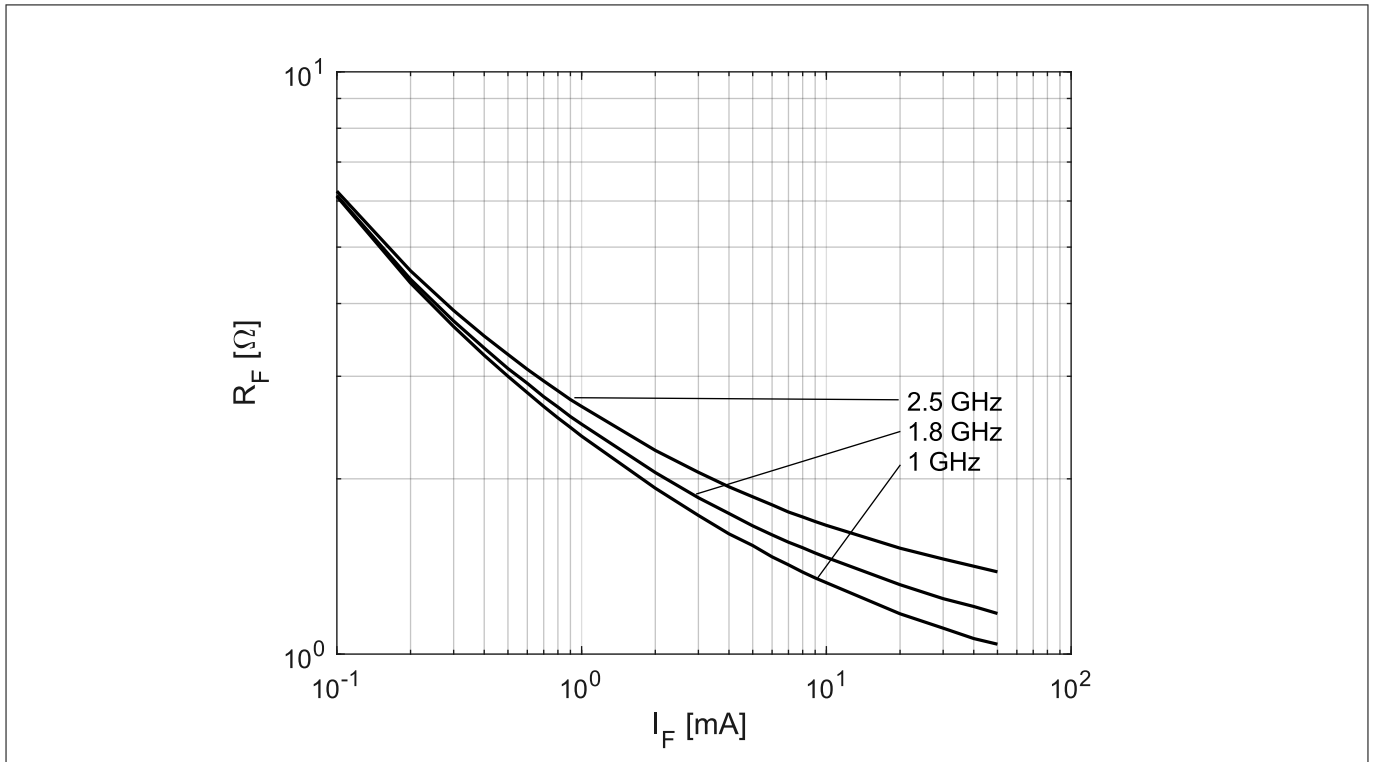


**Figure 2 Capacitance  $C$  vs. reverse voltage  $V_R$  at different frequencies**

**Electrical performance in test fixture**

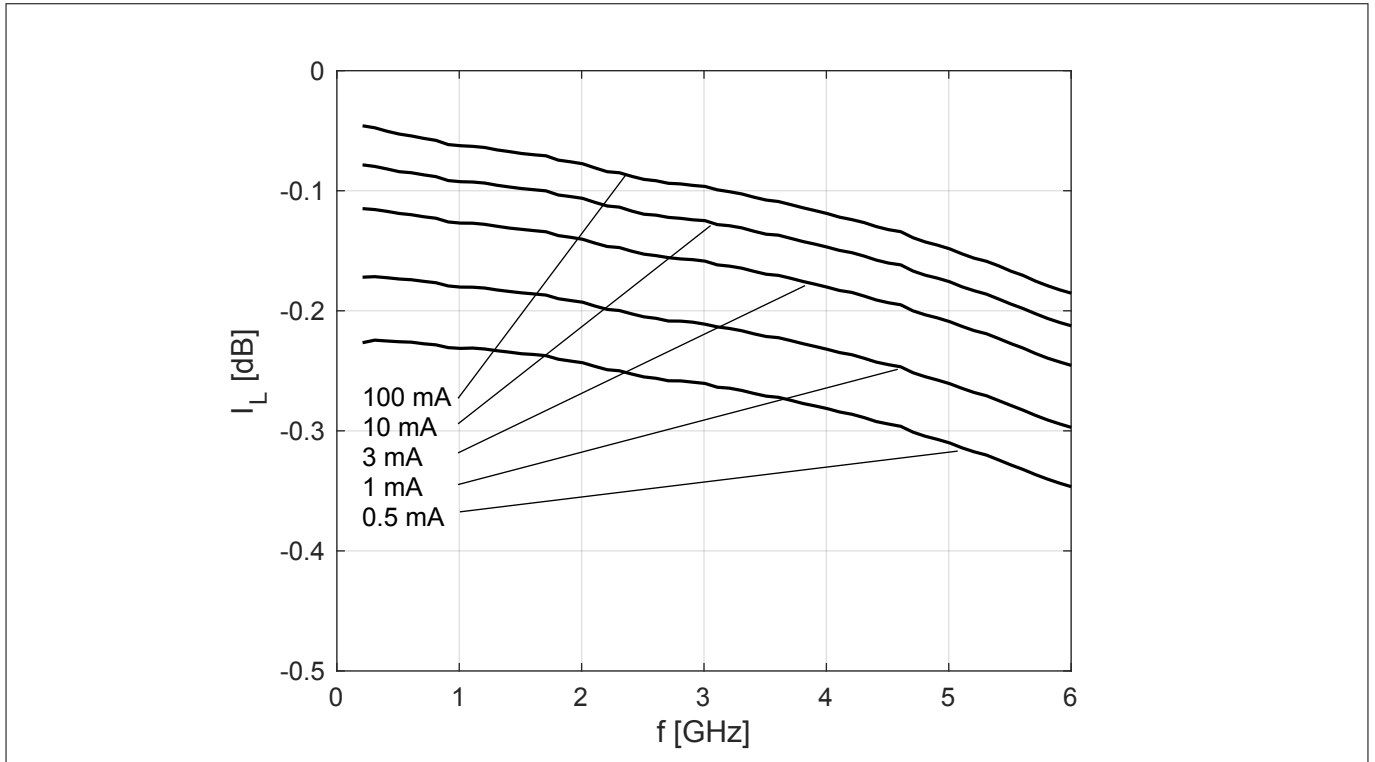


**Figure 3** Reverse parallel resistance  $R_P$  vs. reverse voltage  $V_R$  at different frequencies

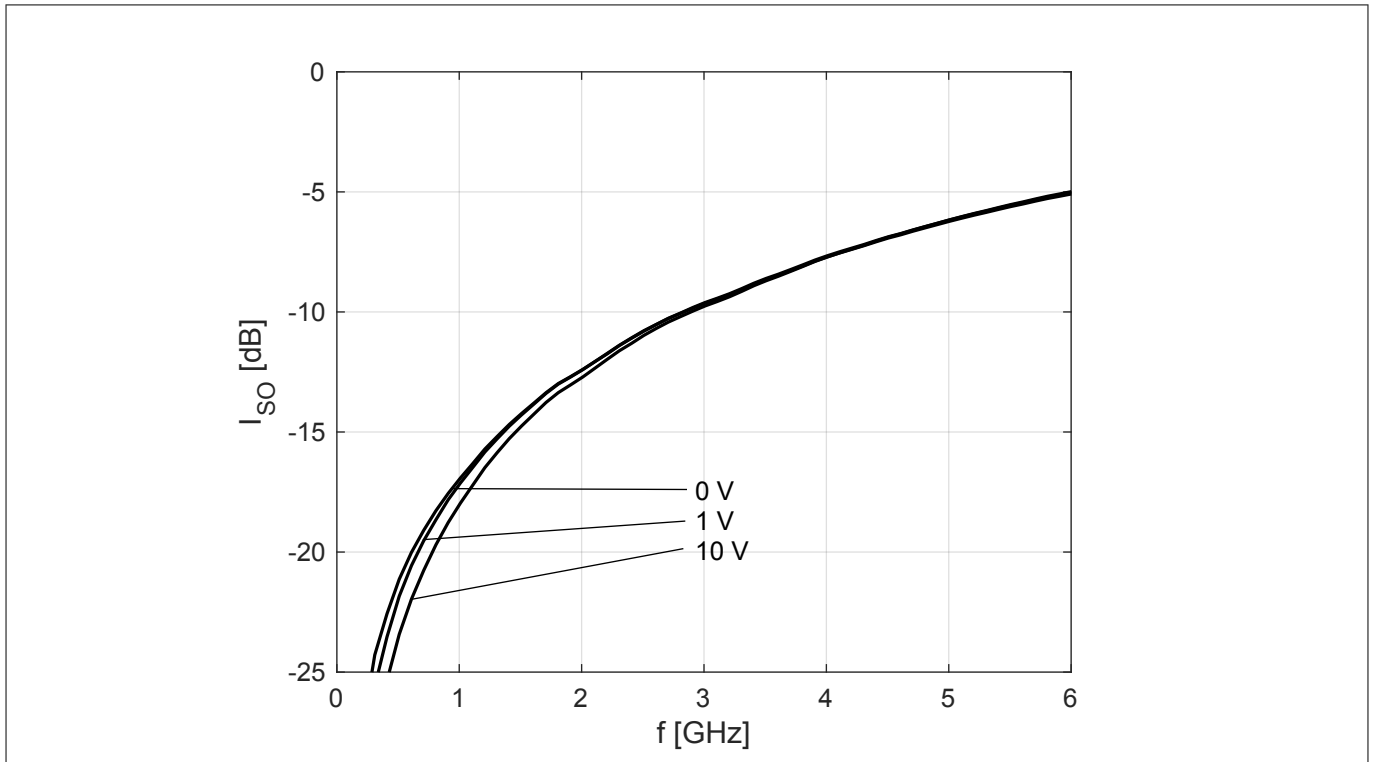


**Figure 4** Forward resistance  $R_F$  vs. forward current  $I_F$  at different frequencies

**Electrical performance in test fixture**



**Figure 5** Insertion loss  $I_L$  vs. frequency  $f$  at different currents



**Figure 6** Isolation  $I_{SO}$  vs. frequency  $f$  at different reverse voltages

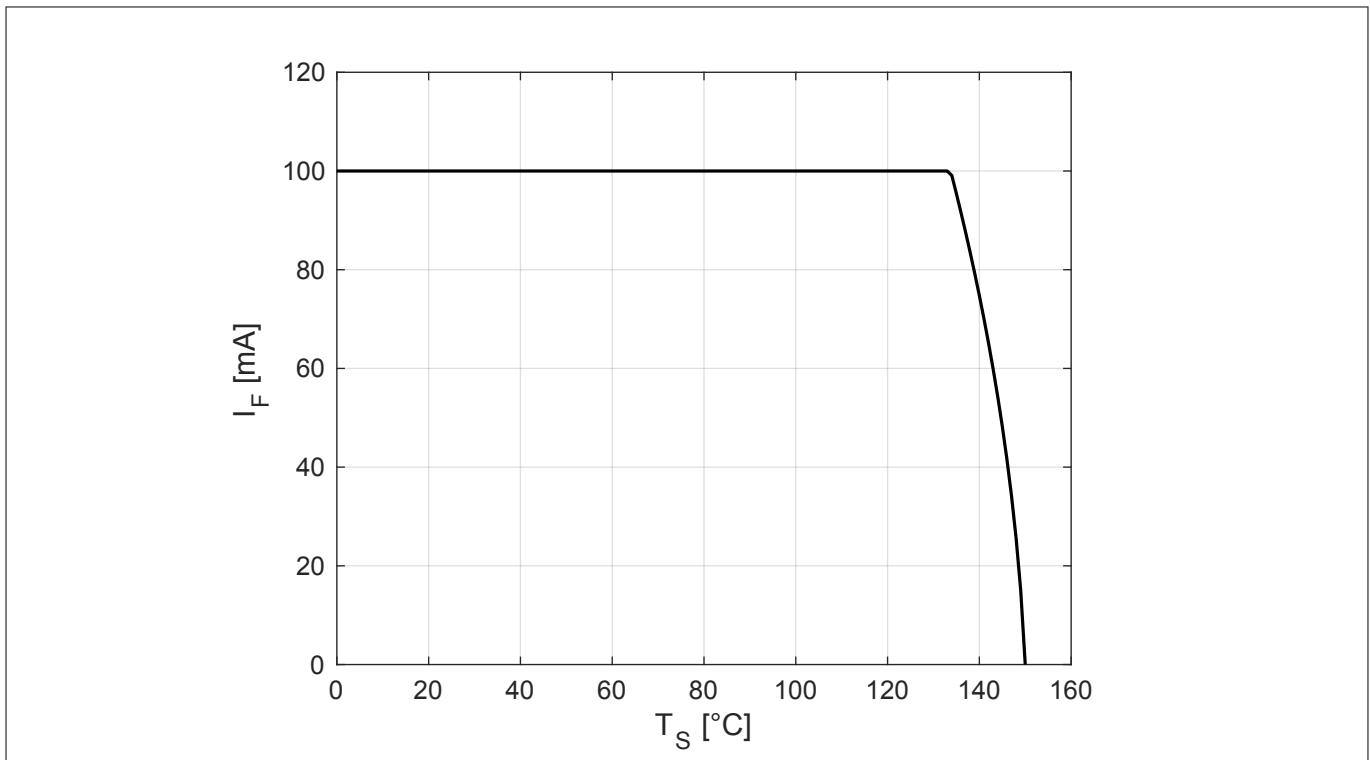
*Note:* The curves shown in this chapter have been generated using typical devices but shall not be understood as a guarantee that all devices have identical characteristic curves.

**Thermal characteristics**

**3 Thermal characteristics**

**Table 9 Thermal resistance**

| Parameter  | Symbol     | Values |      |      | Unit | Note or test condition              |
|--|------------|--------|------|------|------|-------------------------------------|
|  |            | Min.   | Typ. | Max. |      |                                     |
| Thermal resistance<br>(junction - soldering point) | $R_{thJS}$ | -      | 65   | -    | K/W  | $T_S = 133\text{ °C}$ <sup>1)</sup> |

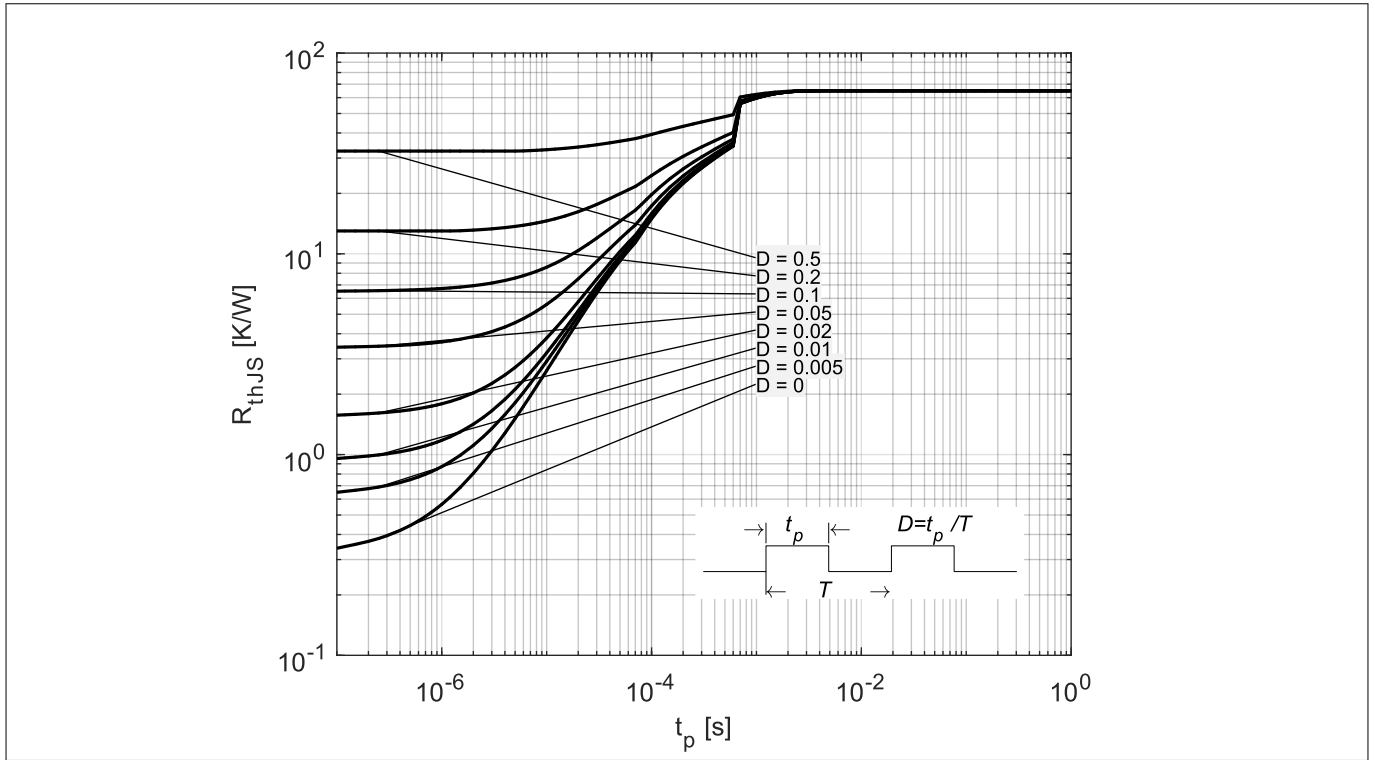


**Figure 7 Permissible forward current  $I_F$  in DC operation**

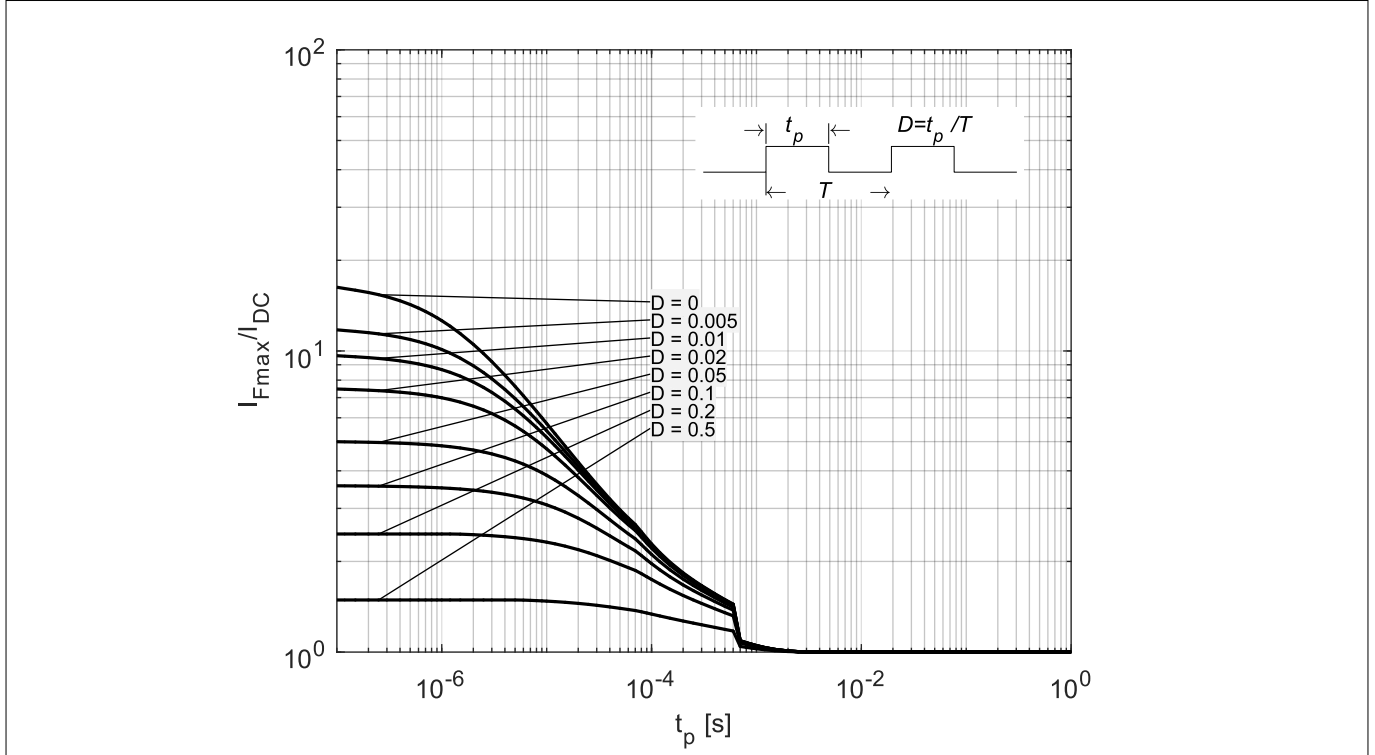
<sup>1</sup> For  $R_{thJS}$  in other conditions refer to the curves in this chapter.



**Thermal characteristics**

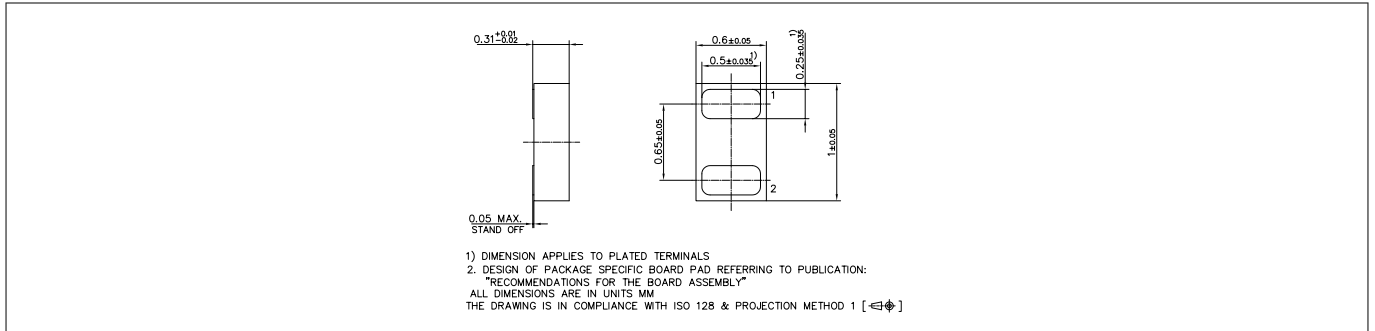


**Figure 8 Thermal resistance  $R_{thJS}$  in pulse operation**

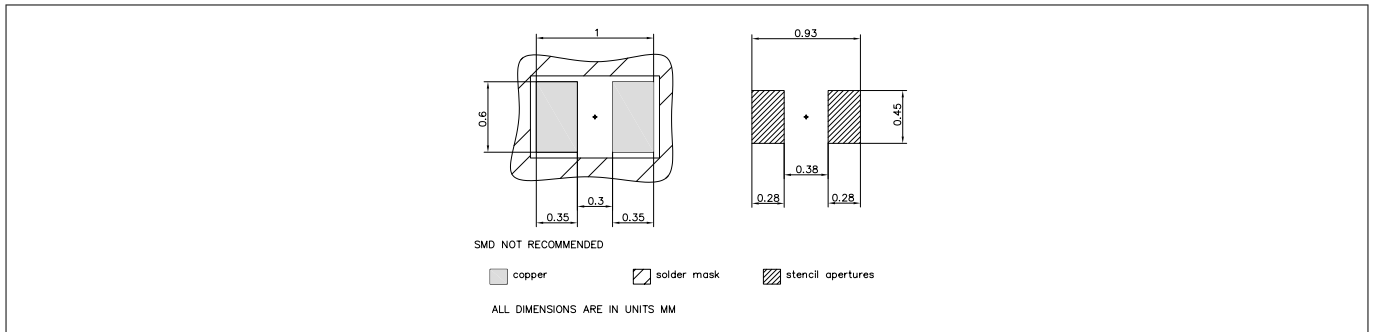


**Figure 9 Permissible forward current ratio  $I_{Fmax}/I_{DC}$  in pulse operation**

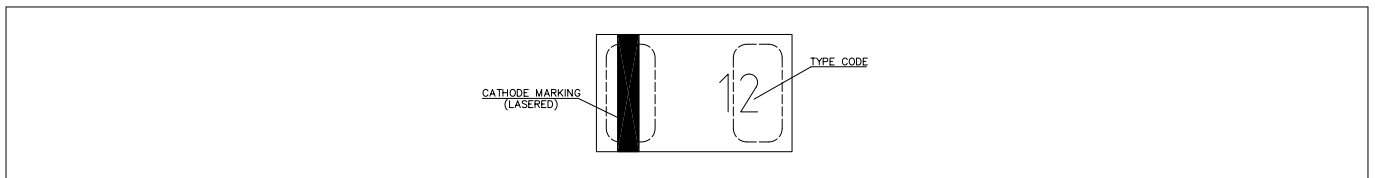
## 4 Package information TSLP-2-19



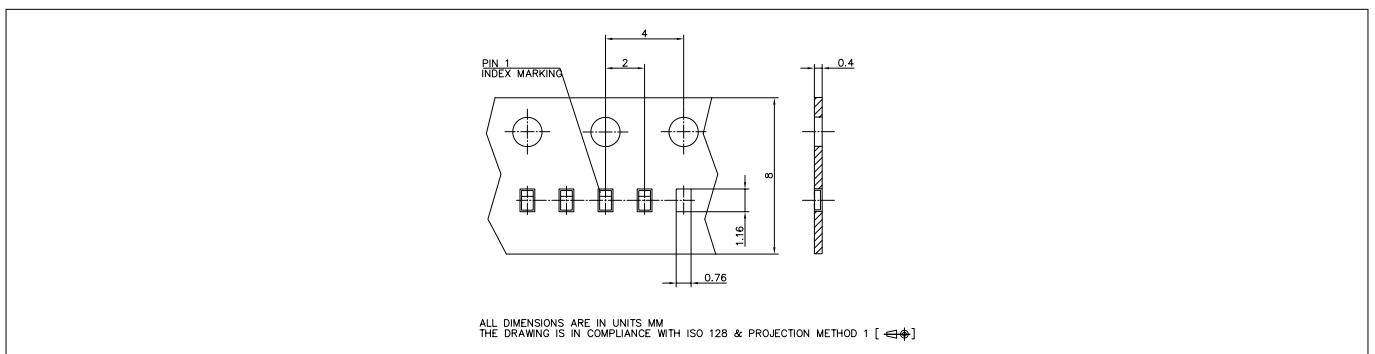
**Figure 10** Package outline



**Figure 11** Foot print



**Figure 12** Marking layout example



**Figure 13** Tape dimensions

*Note:* See our [Recommendations for Printed Circuit Board Assembly of TSLP/TSSLP/TSNP Packages](#). The marking layout is an example. For the real marking code refer to the device information on the first page. The number of characters shown in the layout example is not necessarily the real one. The marking layout can consist of less characters.

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References

## 5 References

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|     |  |
|-----|--|
| [1] | Infineon AG - <i>Recommendations for Printed Circuit Board Assembly of Infineon TSLP/TSSLP/TSNP Packages</i> |
|-----|--|

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## Revision history

| Document version | Date of release | Description of changes   |
|------------------|-----------------|--|
| 1.0              | 2018-09-07      | <ul style="list-style-type: none"><li>• Change from series datasheet to individual one</li><li>• Initial release of datasheet</li><li>• Typical values and curves updated to the values of the production (No product or process change behind)</li><li>• Minimum/typical values added</li><li>• Typical curves/values removed</li></ul> |

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**Edition 2018-06-30**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

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