

# BAR64-04W

## Low signal distortion, surface mount RF PIN diode, series pair



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## Product description

This Infineon cost optimized RF PIN diode is designed for low distortion switches that require to hold off large RF voltages, and is best suited for frequencies as high as 3 GHz. Its nominal 50  $\mu\text{m}$  I-region width, combined with the typical 1.55  $\mu\text{s}$  carrier lifetime, result in a diode with low forward resistance and low distortion characteristics.



## Feature list

- Low signal distortion, charge carrier lifetime  $t_{rr} = 1.55 \mu\text{s}$  (typical)
- Very low capacitance  $C = 0.25 \text{ pF}$  (typical) at voltage  $V_R = 0$  and frequencies  $f \geq 1 \text{ GHz}$
- Low forward resistance  $R_F = 2.2 \Omega$  (typical) at forward current  $I_F = 10 \text{ mA}$  and frequency  $f = 100 \text{ MHz}$
- Industry standard SOT323-3 package (2.1 mm x 2 mm x 0.9 mm)
- Pb-free, RoHS compliant and halogen-free

## Product validation

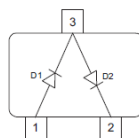
Qualified for industrial applications according to the relevant tests of JEDEC47/20/22.

## Potential applications

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

- Wireless communication
- High speed data networks

## Device information



**Table 1** Part information

| Product name / Ordering code   | Package  | Pin configuration | Marking | Pieces / Reel |
|--------------------------------|----------|-------------------|---------|---------------|
| BAR64-04W / BAR6404WH6327XTSA1 | SOT323-3 | Series pair       | PPs     | 3 k           |

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

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**1 Absolute maximum ratings**

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

| Parameter               | Symbol    | Values |      | Unit             | Note or test condition                             |
|-------------------------|-----------|--------|------|------------------|--|
|                         |           | Min.   | Max. |                  |  |
| Diode reverse voltage   | $V_R$     | -      | 150  | V                |  |
| Forward current         | $I_F$     | -      | 100  | mA               |  |
| Total power dissipation | $P_{TOT}$ | -      | 250  | mW               | $T_S \leq 123\text{ }^\circ\text{C}$ <sup>1)</sup> |
| Junction temperature    | $T_J$     | -      | 150  | $^\circ\text{C}$ |  |
| 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

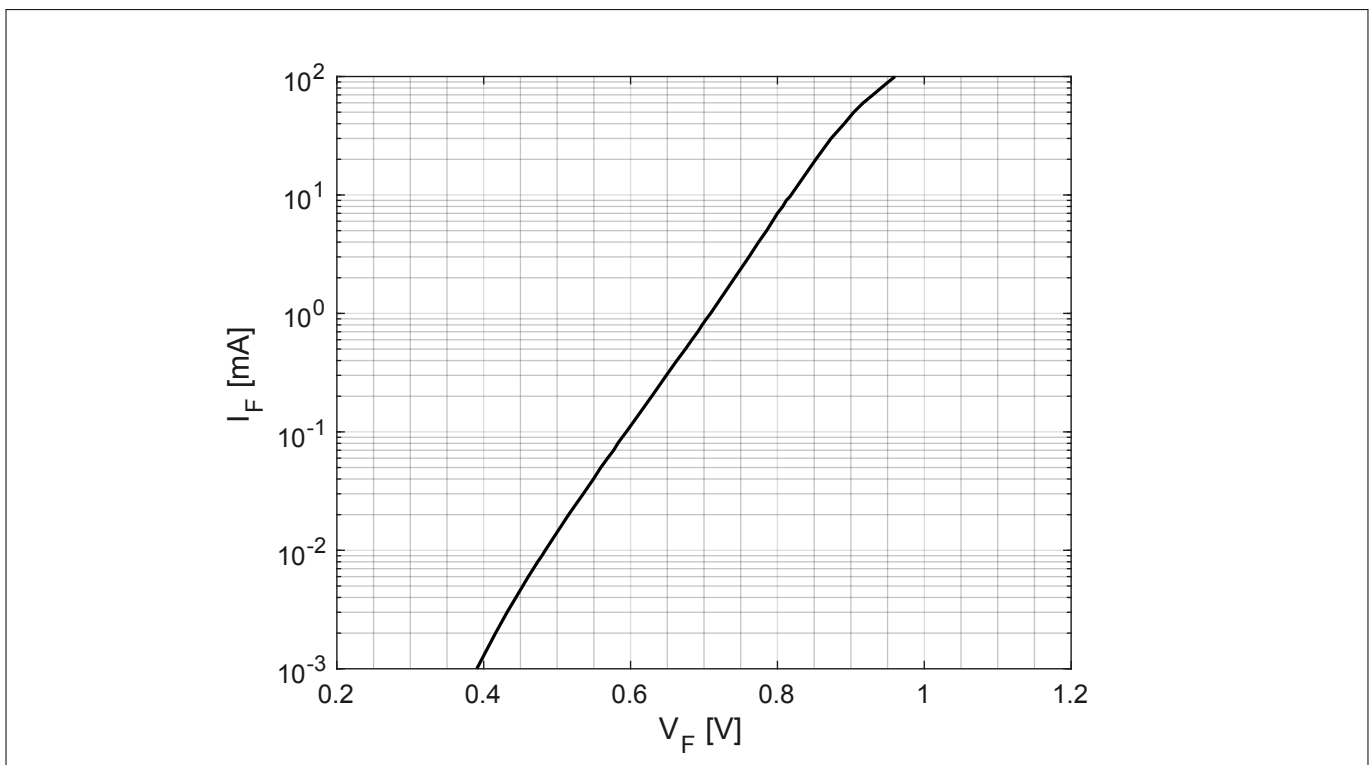
## 2 Electrical performance in test fixture

### 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 | $V_{BR}$ | 150    | –    | –    | V             | $I_R = 5\text{ }\mu\text{A}$ |
| Reverse current   | $I_R$    | –      | –    | 20   | nA            | $V_R = 20\text{ V}$          |
| Forward voltage   | $V_F$    | –      | 0.82 | –    | V             | $I_F = 10\text{ mA}$         |
|                   |          | –      | 0.9  | –    |               | $I_F = 50\text{ mA}$         |
|                   |          | –      | 0.95 | 1.1  |               | $I_F = 100\text{ mA}$        |
| I-region width    | $W_I$    | –      | 50   | –    | $\mu\text{m}$ |                              |



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

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**Electrical performance in test fixture**
**2.2 AC characteristics**

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

**Table 4 Key parameter**

| Parameter               | Symbol      | Values |      |      | Unit | Note or test condition  |
|-------------------------|-------------|--------|------|------|------|---|
|                         |             | Min.   | Typ. | Max. |      |   |
| Capacitance             | C           | –      | 0.65 | –    | pF   | $V_R = 0\text{ V}, f = 1\text{ MHz}$  |
|                         |             | –      | 0.26 | 0.35 |      | $V_R = 20\text{ V}, f = 1\text{ MHz}$   |
| Forward resistance      | $R_F$       | –      | 10.2 | 20   |      | $I_F = 1\text{ mA}, f = 100\text{ MHz}$   |
|                         |             | –      | 4.4  | –    |      | $I_F = 3\text{ mA}, f = 100\text{ MHz}$   |
|                         |             | –      | 3.2  | –    |      | $I_F = 5\text{ mA}, f = 100\text{ MHz}$   |
|                         |             | –      | 2.2  | 2.8  |      | $I_F = 10\text{ mA}, f = 100\text{ MHz}$  |
|                         |             | –      | –    | 1.35 |      | $I_F = 100\text{ mA}, f = 100\text{ MHz}$   |
| Inductance              | $L_S$       | –      | 1.4  | –    | nH   |   |
| Charge carrier lifetime | $\tau_{rr}$ | –      | 1550 | –    | ns   | $I_F = 10\text{ mA}, I_R = 6\text{ mA}$ ,<br>measured at $I_R = 3\text{ mA}$ ,<br>$R_L = 100\ \Omega$ |

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

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or test condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | C        | –      | 0.23 | –    | pF         | $V_R = 0\text{ V}$     |
| Reverse parallel resistance | $R_P$    | –      | 3.5  | –    | k $\Omega$ | $V_R = 0\text{ V}$     |
| Forward resistance          | $R_F$    | –      | 10.2 | –    | $\Omega$   | $I_F = 1\text{ mA}$    |
|                             |          | –      | 4.4  | –    |            | $I_F = 3\text{ mA}$    |
|                             |          | –      | 3.3  | –    |            | $I_F = 5\text{ mA}$    |
|                             |          | –      | 2.4  | –    |            | $I_F = 10\text{ mA}$   |
| Insertion loss              | $I_L$    | –      | 0.84 | –    | dB         | $I_F = 1\text{ mA}$    |
|                             |          | –      | 0.41 | –    |            | $I_F = 3\text{ mA}$    |
|                             |          | –      | 0.31 | –    |            | $I_F = 5\text{ mA}$    |
|                             |          | –      | 0.24 | –    |            | $I_F = 10\text{ mA}$   |
| Isolation                   | $I_{SO}$ | –      | 18.6 | –    |            | $V_R = 0\text{ V}$     |

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

| Parameter                   | Symbol | Values |      |      | Unit       | Note or test condition |
|-----------------------------|--------|--------|------|------|------------|------------------------|
|                             |        | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | C      | –      | 0.23 | –    | pF         | $V_R = 0\text{ V}$     |
| Reverse parallel resistance | $R_P$  | –      | 2.8  | –    | k $\Omega$ | $V_R = 0\text{ V}$     |

**Electrical performance in test fixture**

**Table 6 AC parameter at  $f = 1.8$  GHz (continued)**

| Parameter          | Symbol   | Values |      |      | Unit     | Note or test condition |
|--------------------|----------|--------|------|------|----------|------------------------|
|                    |          | Min.   | Typ. | Max. |          |                        |
| Forward resistance | $R_F$    | -      | 10.2 | -    | $\Omega$ | $I_F = 1$ mA           |
|                    |          | -      | 4.5  | -    |          | $I_F = 3$ mA           |
|                    |          | -      | 3.4  | -    |          | $I_F = 5$ mA           |
|                    |          | -      | 2.5  | -    |          | $I_F = 10$ mA          |
| Insertion loss     | $I_L$    | -      | 0.89 | -    | dB       | $I_F = 1$ mA           |
|                    |          | -      | 0.46 | -    |          | $I_F = 3$ mA           |
|                    |          | -      | 0.37 | -    |          | $I_F = 5$ mA           |
|                    |          | -      | 0.29 | -    |          | $I_F = 10$ mA          |
| Isolation          | $I_{SO}$ | -      | 13.7 | -    |          | $V_R = 0$ V            |

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

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or test condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | $C$      | -      | 0.23 | -    | pF         | $V_R = 0$ V            |
| Reverse parallel resistance | $R_P$    | -      | 2.5  | -    | k $\Omega$ | $V_R = 0$ V            |
| Forward resistance          | $R_F$    | -      | 10.2 | -    | $\Omega$   | $I_F = 1$ mA           |
|                             |          | -      | 4.7  | -    |            | $I_F = 3$ mA           |
|                             |          | -      | 3.5  | -    |            | $I_F = 5$ mA           |
|                             |          | -      | 2.6  | -    |            | $I_F = 10$ mA          |
| Insertion loss              | $I_L$    | -      | 0.94 | -    | dB         | $I_F = 1$ mA           |
|                             |          | -      | 0.53 | -    |            | $I_F = 3$ mA           |
|                             |          | -      | 0.43 | -    |            | $I_F = 5$ mA           |
|                             |          | -      | 0.36 | -    |            | $I_F = 10$ mA          |
| Isolation                   | $I_{SO}$ | -      | 11   | -    |            | $V_R = 0$ V            |

Electrical performance in test fixture

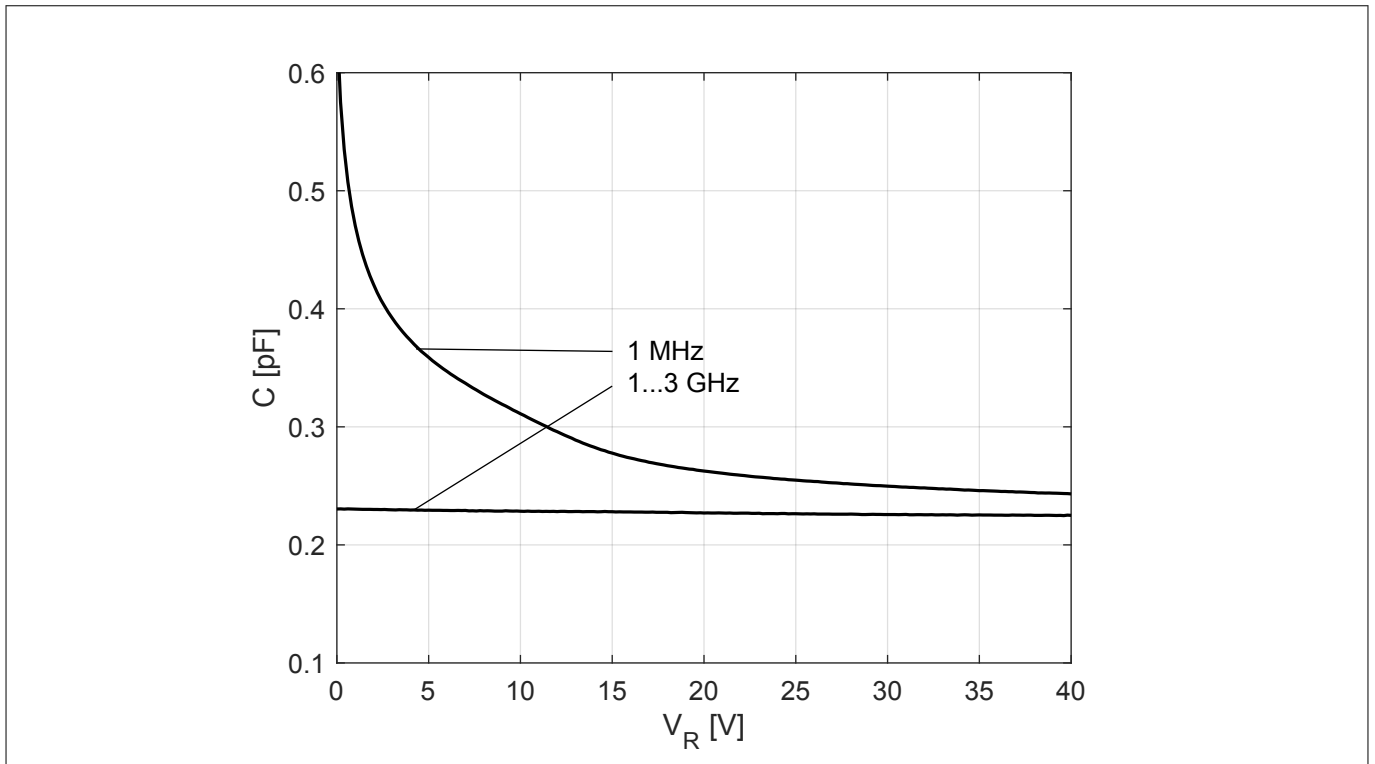


Figure 2 Capacitance C vs. reverse voltage  $V_R$  at different frequencies

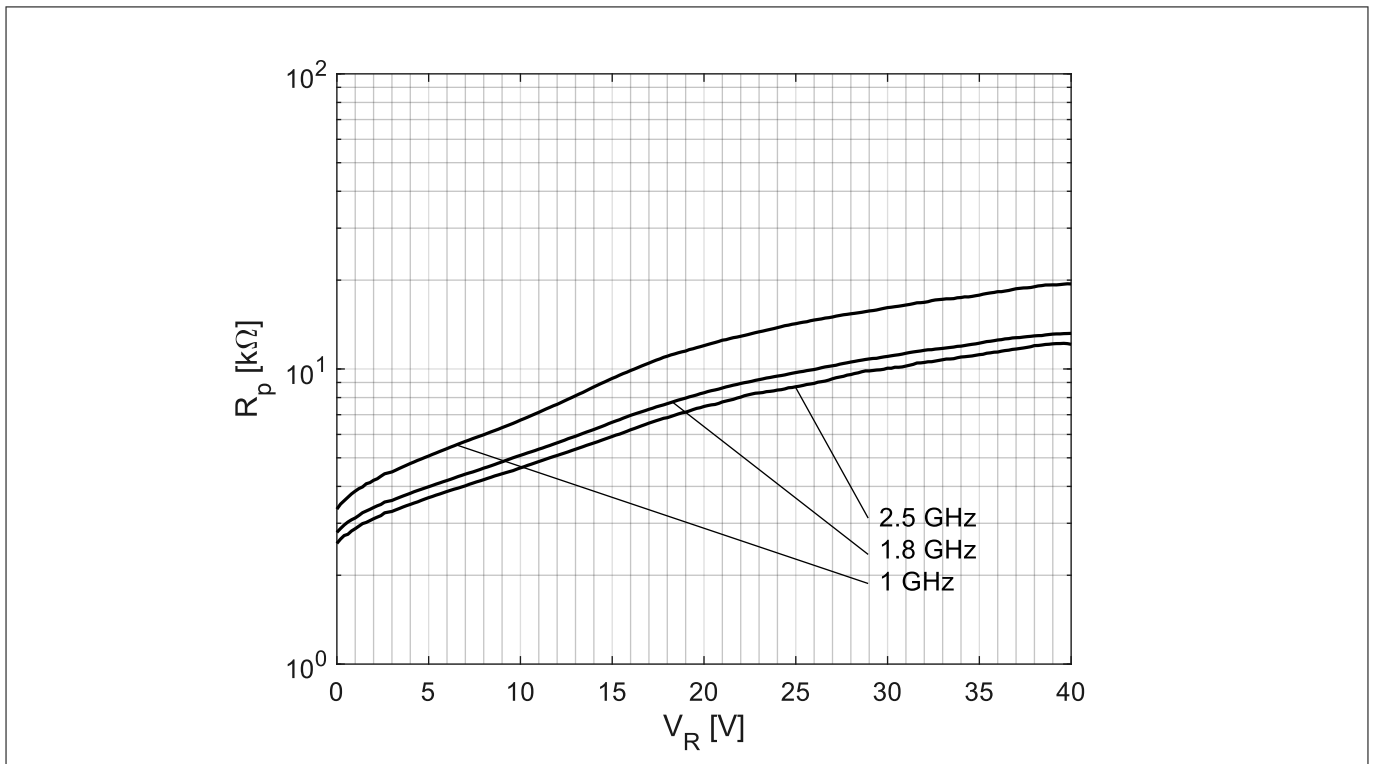


Figure 3 Reverse parallel resistance  $R_p$  vs. reverse voltage  $V_R$  at different frequencies

Electrical performance in test fixture

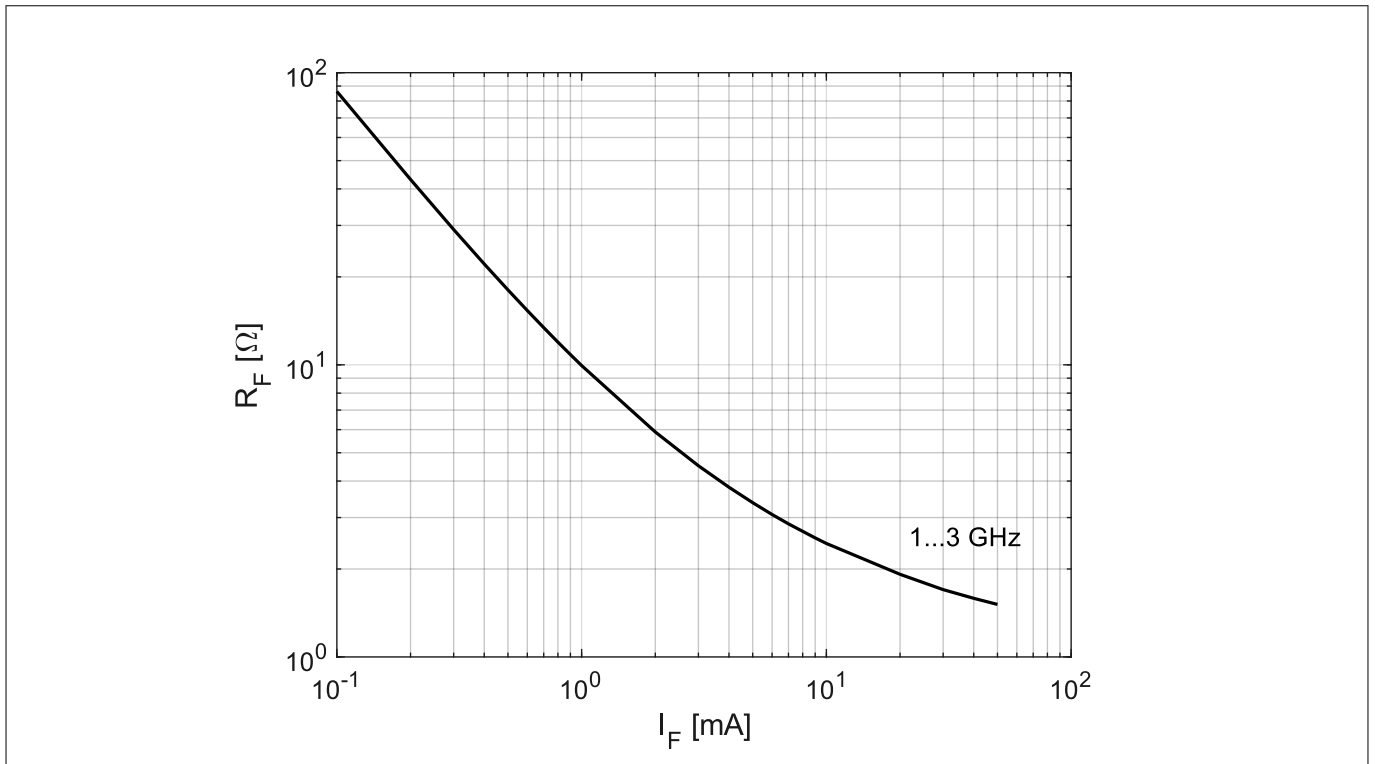


Figure 4 Forward resistance  $R_F$  vs. forward current  $I_F$  at different frequencies

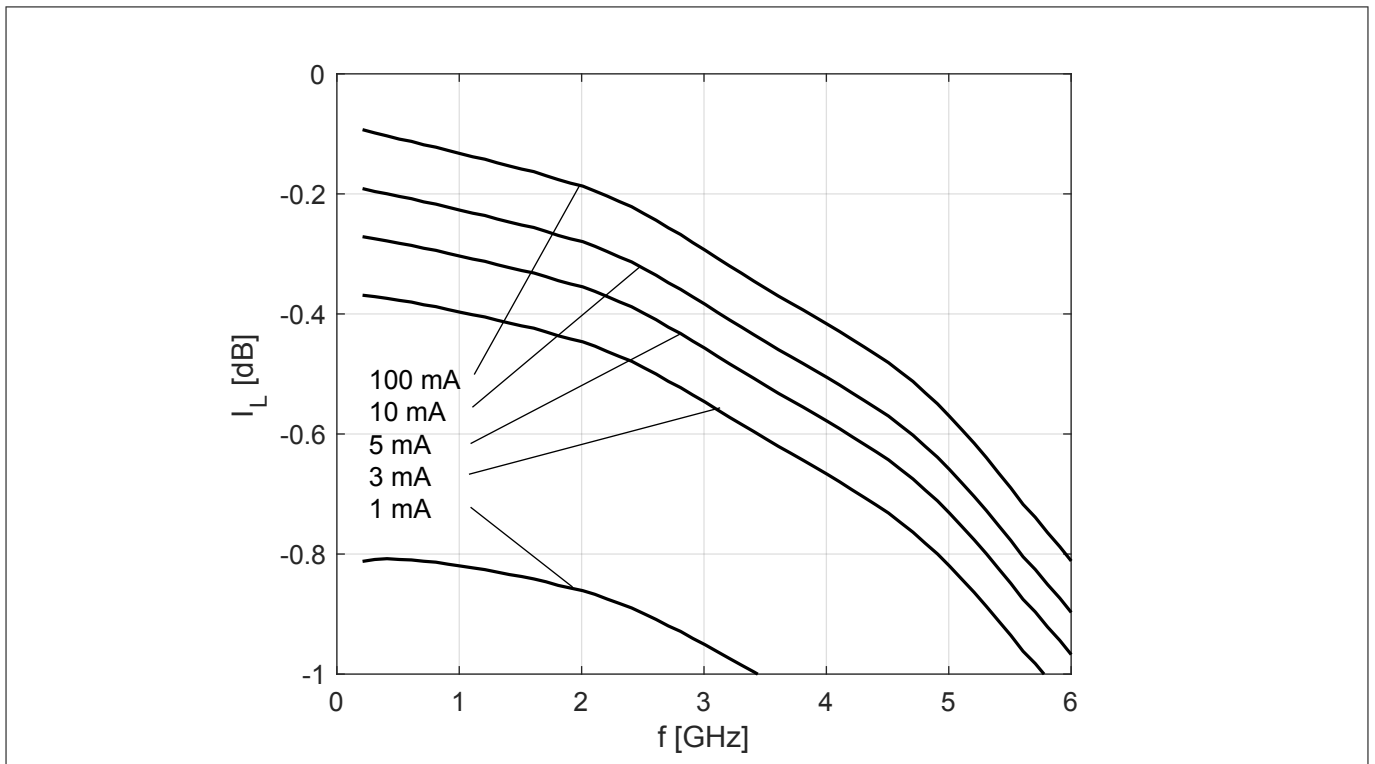
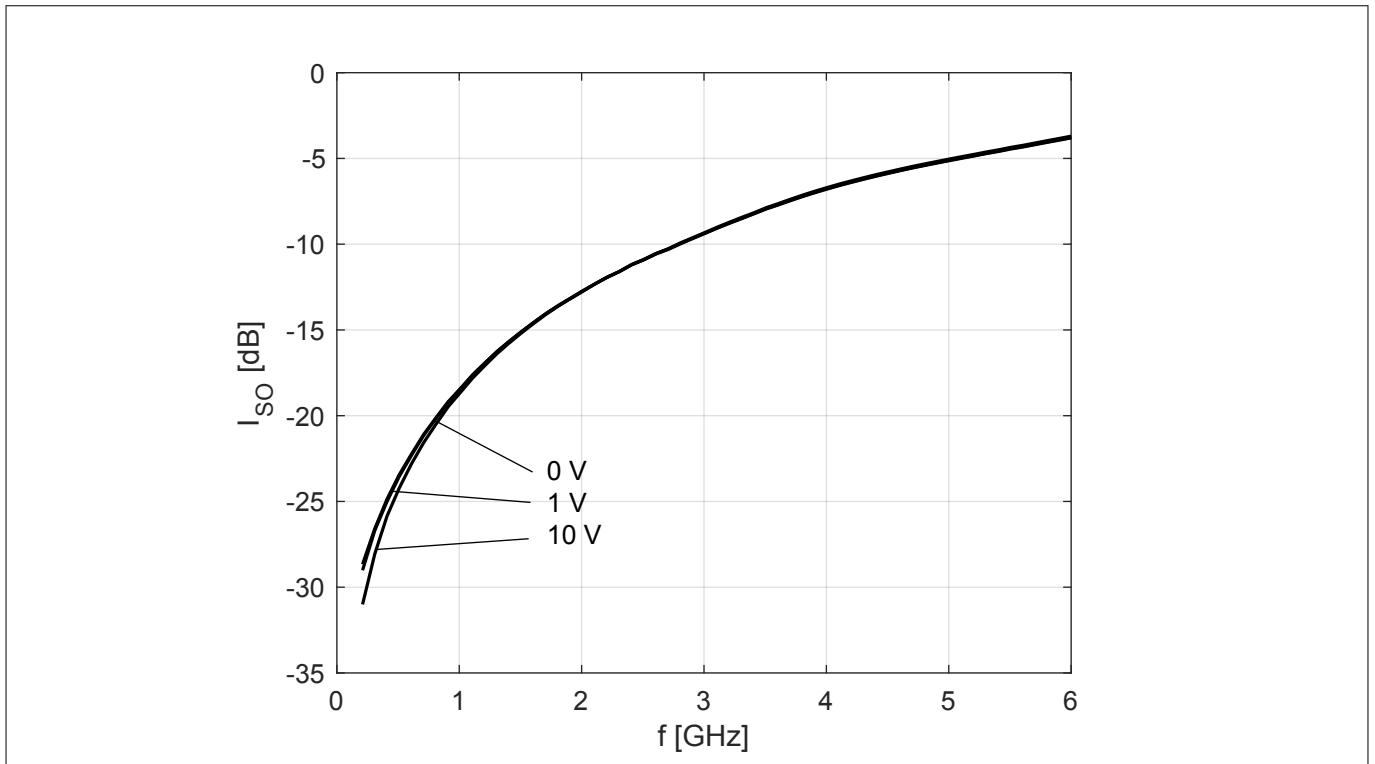


Figure 5 Insertion loss  $I_L$  vs. frequency  $f$  at different forward currents

Electrical performance in test fixture



**Figure 6** Isolation  $I_{50}$  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.

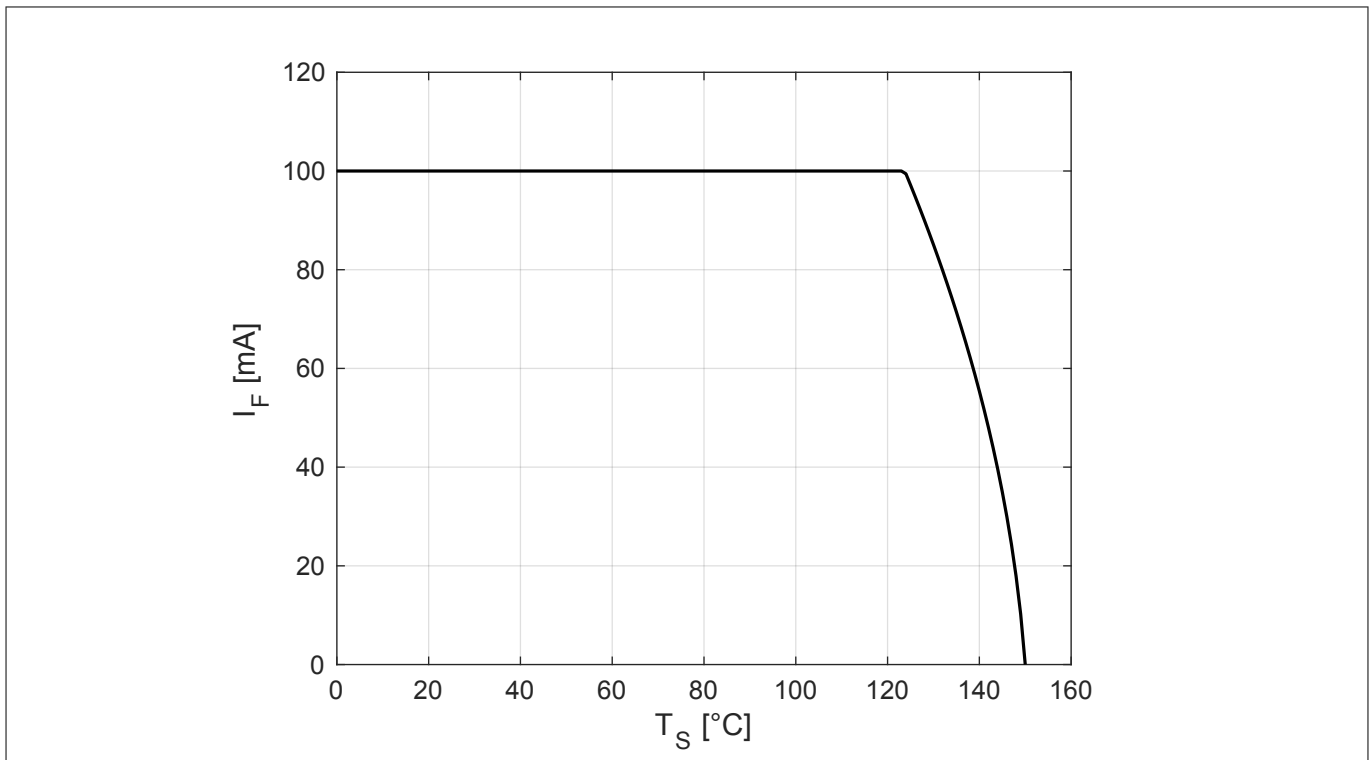


Thermal characteristics

### 3 Thermal characteristics

**Table 8 Thermal resistance**

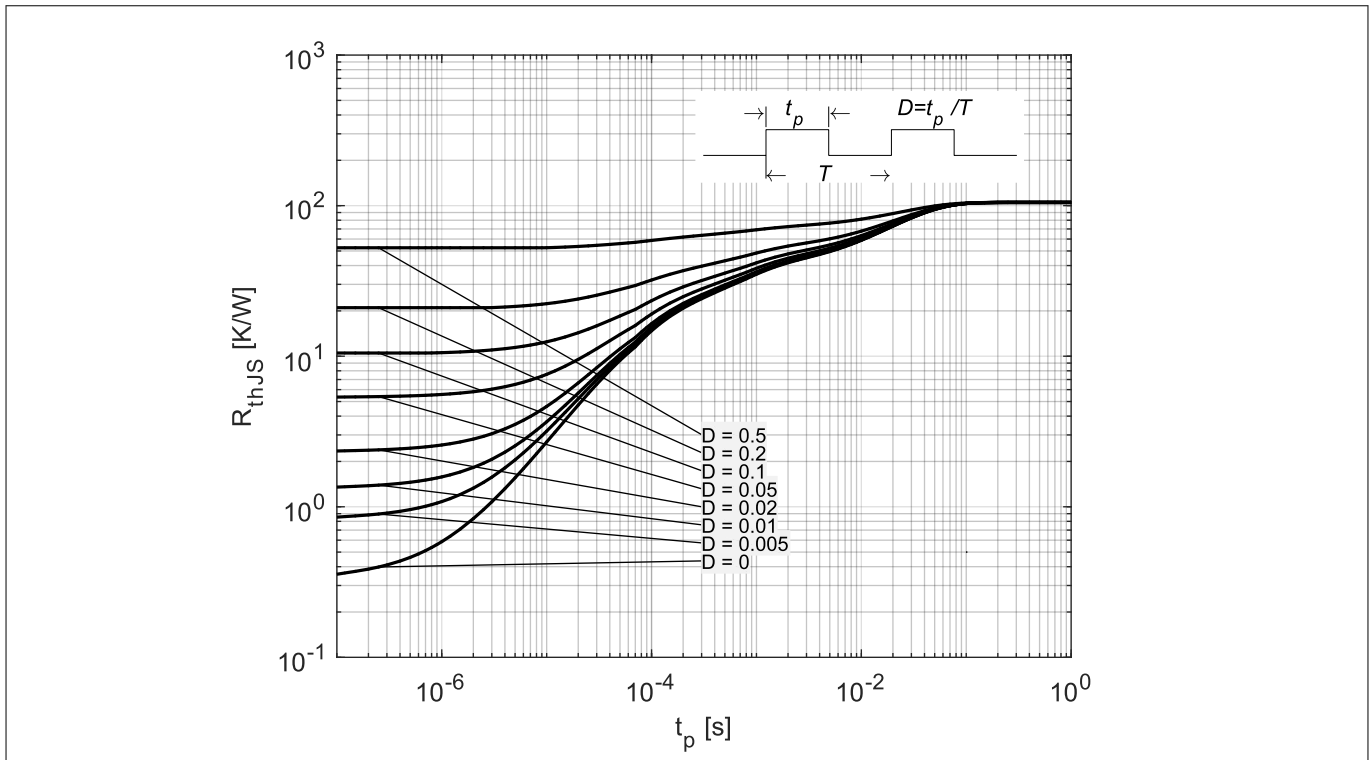
| Parameter                                       | Symbol     | Values |      |      | Unit | Note or test condition              |
|---|------------|--------|------|------|------|-------------------------------------|
|   |            | Min.   | Typ. | Max. |      |                                     |
| Thermal resistance (junction - soldering point) | $R_{thJS}$ | -      | 105  | -    | K/W  | $T_S = 123\text{ °C}$ <sup>2)</sup> |



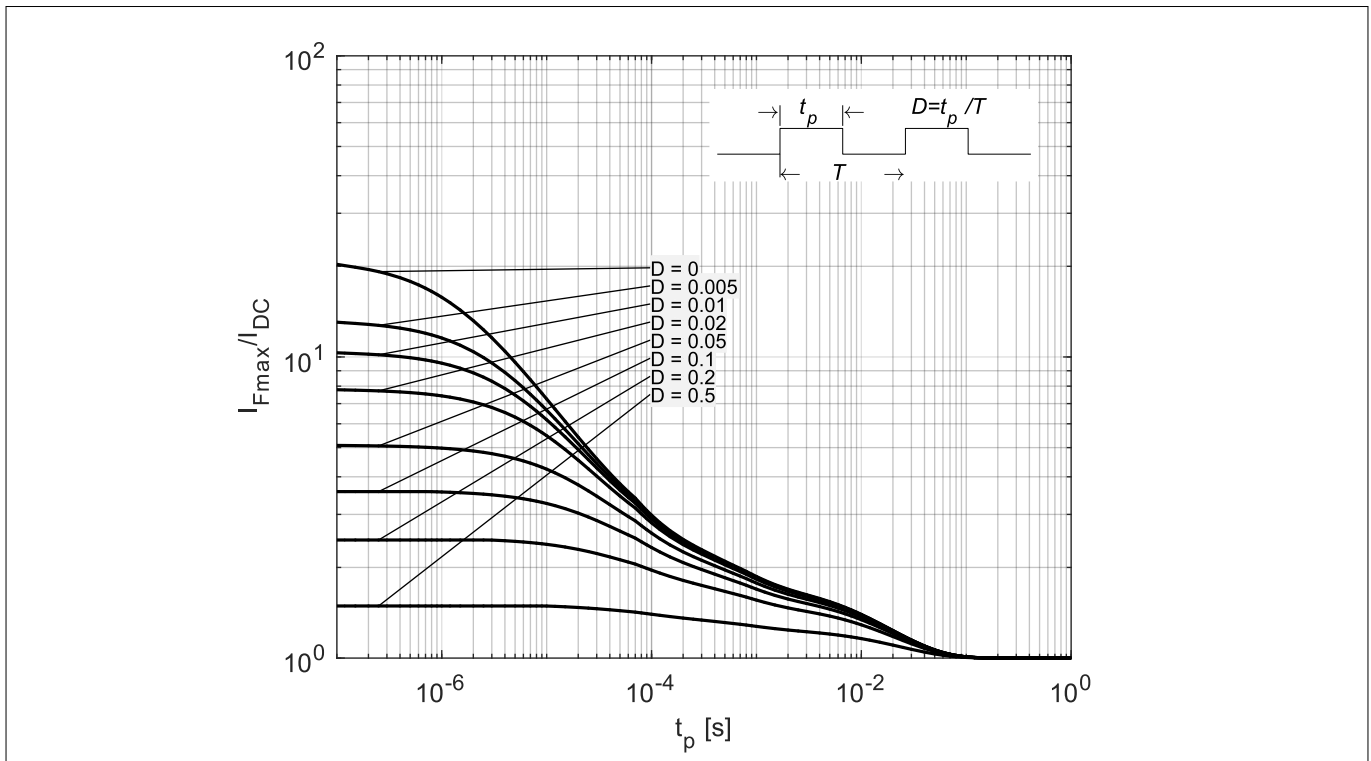
**Figure 7 Permissible forward current  $I_F$  in DC operation**

<sup>2</sup> For  $R_{thJS}$  in other conditions refer to the curves in this chapter.

**Thermal characteristics**



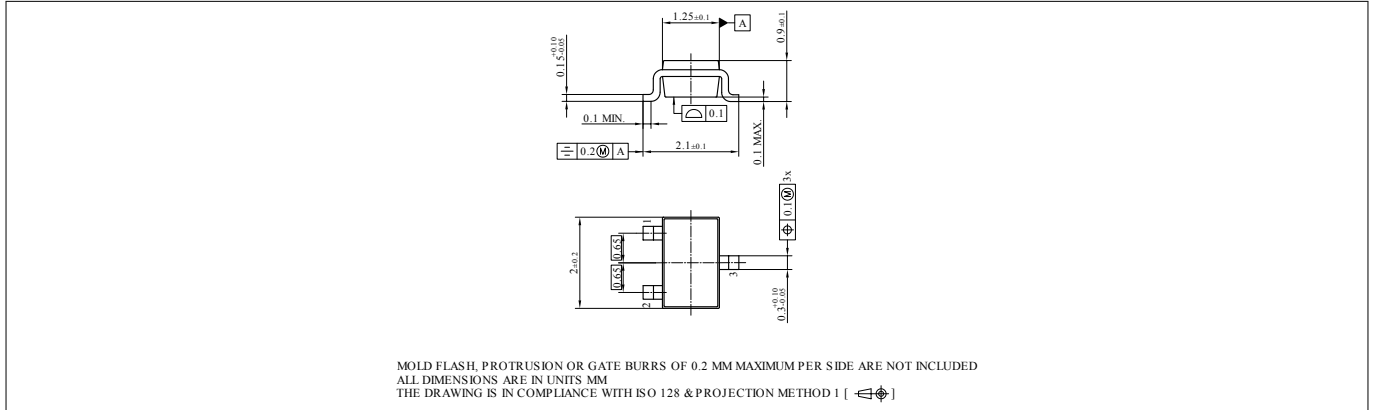
**Figure 8 Thermal resistance  $R_{thJS}$  in pulse operation**



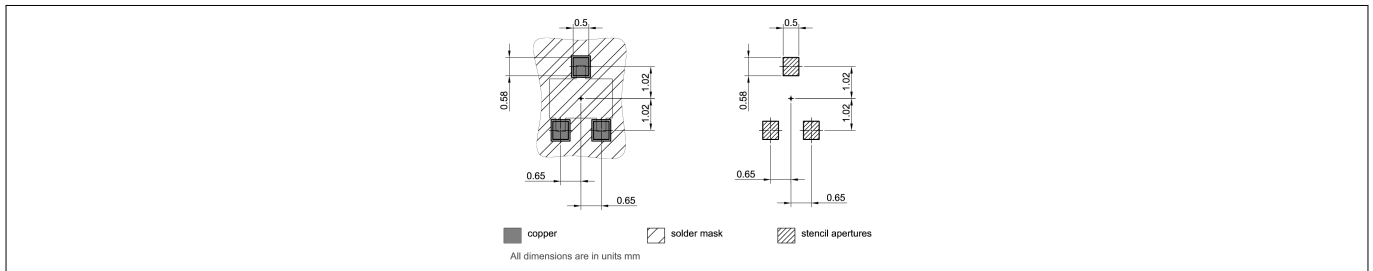
**Figure 9 Permissible forward current ratio  $I_{Fmax}/I_{DC}$  in pulse operation**

**Package information SOT323-3**

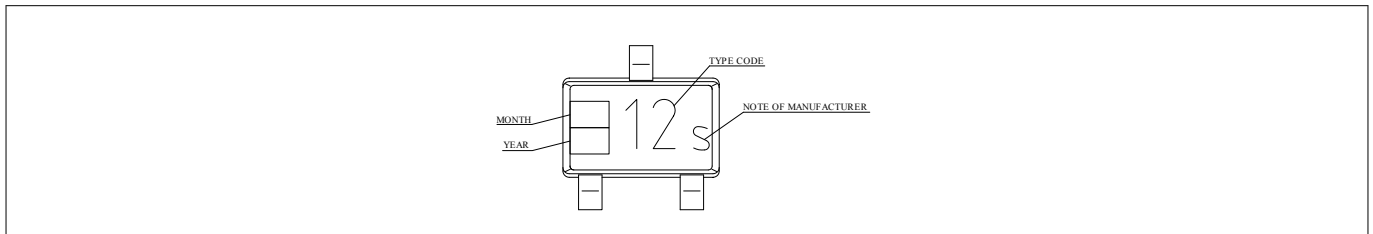
**4 Package information SOT323-3**



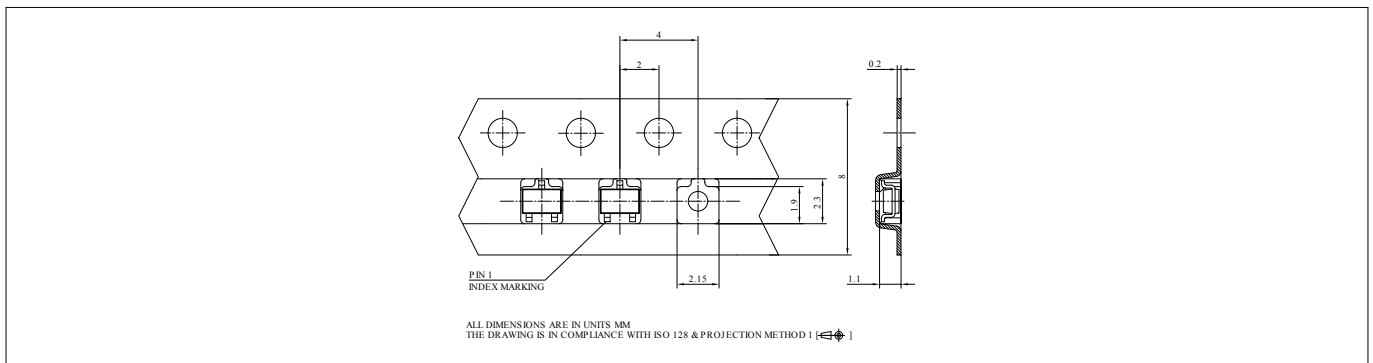
**Figure 10 Package outline**



**Figure 11 Foot print**



**Figure 12 Marking layout example**



**Figure 13 Tape information**

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**Revision history****Revision history**

| <b>Document version</b> | <b>Date of release</b> | <b>Description of changes</b>  |
|-------------------------|------------------------|--|
| 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>• Maximum/typical values added</li><li>• Typical curves/values removed</li></ul> |
| 1.1                     | 2019-01-21             | Product description, feature list and potential application section reworked   |

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