

# BAR64-05

Low signal distortion, surface mount RF PIN diode, common cathode pair



## 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  $C = 0.22 \text{ pF}$  (typical) at voltage  $V_R = 0$  and frequencies  $f \geq 1 \text{ GHz}$
- Low forward resistance  $R_F = 2.3 \Omega$  (typical) at forward current  $I_F = 10 \text{ mA}$  and frequency  $f = 100 \text{ MHz}$
- Industry standard SOT23-3 package (2.9 mm x 2.4 mm x 1 mm)
- Pb-free, RoHS compliant and halogen-free

## Product validation

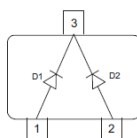
Qualified for industrial applications according to the relevant tests of JEDEC47/20/22.

## 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 |
|------------------------------|---------|---------------------|---------|---------------|
| BAR64-05 / BAR6405E6327HTSA1 | SOT23-3 | Common cathode pair | PRs     | 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  $T_A = 25^\circ\text{C}$ , 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               | $T_S \leq 126^\circ\text{C}$ <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

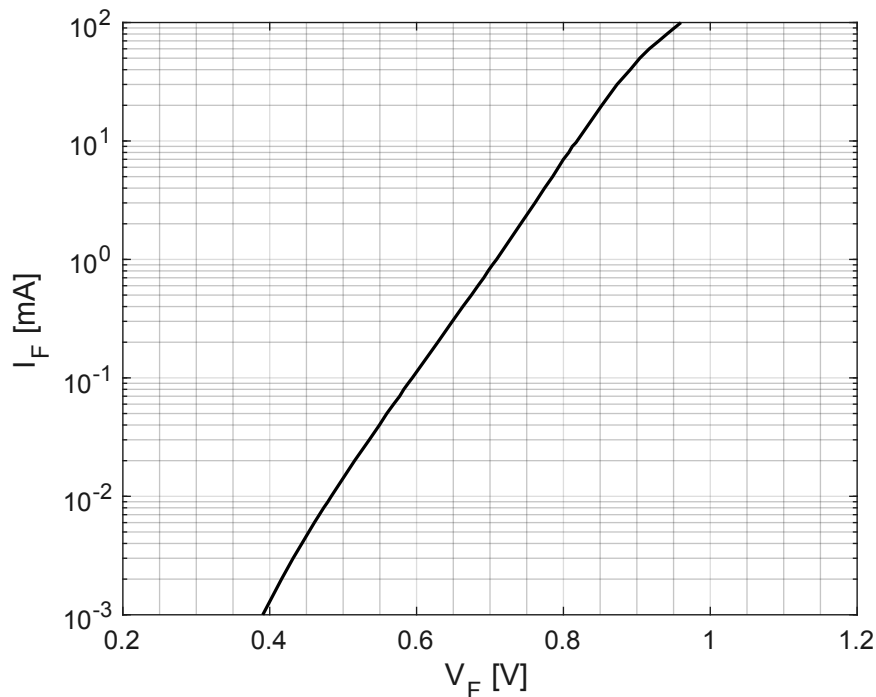
## 2 Electrical performance in test fixture

### 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  $V_F$

## 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           | –      | 0.6  | –    | pF   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                                                                        |
|                         |             | –      | 0.23 | 0.35 |      | $V_R = 20\text{ V}$ , $f = 1\text{ MHz}$                                                                       |
| Forward resistance      | $R_F$       | –      | 11   | 20   |      | $I_F = 1\text{ mA}$ , $f = 100\text{ MHz}$                                                                     |
|                         |             | –      | 4.6  | –    |      | $I_F = 3\text{ mA}$ , $f = 100\text{ MHz}$                                                                     |
|                         |             | –      | 3.3  | –    |      | $I_F = 5\text{ mA}$ , $f = 100\text{ MHz}$                                                                     |
|                         |             | –      | 2.3  | 2.8  |      | $I_F = 10\text{ mA}$ , $f = 100\text{ MHz}$                                                                    |
|                         |             | –      | –    | 1.35 |      | $I_F = 100\text{ mA}$ , $f = 100\text{ MHz}$                                                                   |
| Inductance              | $L_S$       | –      | 1.8  | –    | 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>$R_L = 100\text{ }\Omega$ |

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

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or test condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | C        | –      | 0.22 | –    | pF         | $V_R = 0\text{ V}$     |
| Reverse parallel resistance | $R_P$    | –      | 3.3  | –    | k $\Omega$ | $V_R = 0\text{ V}$     |
| Forward resistance          | $R_F$    | –      | 10   | –    | $\Omega$   | $I_F = 1\text{ mA}$    |
|                             |          | –      | 4.7  | –    |            | $I_F = 3\text{ mA}$    |
|                             |          | –      | 3.4  | –    |            | $I_F = 5\text{ mA}$    |
|                             |          | –      | 2.4  | –    |            | $I_F = 10\text{ mA}$   |
| Insertion loss              | $I_L$    | –      | 0.86 | –    | dB         | $I_F = 1\text{ mA}$    |
|                             |          | –      | 0.42 | –    |            | $I_F = 3\text{ mA}$    |
|                             |          | –      | 0.32 | –    |            | $I_F = 5\text{ mA}$    |
|                             |          | –      | 0.24 | –    |            | $I_F = 10\text{ mA}$   |
| Isolation                   | $I_{SO}$ | –      | 17   | –    |            | $V_R = 0\text{ V}$     |

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

| Parameter                   | Symbol | Values |      |      | Unit       | Note or test condition |
|-----------------------------|--------|--------|------|------|------------|------------------------|
|                             |        | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | C      | –      | 0.22 | –    | pF         | $V_R = 0\text{ V}$     |
| Reverse parallel resistance | $R_P$  | –      | 2.6  | –    | k $\Omega$ | $V_R = 0\text{ V}$     |

## Electrical performance in test fixture

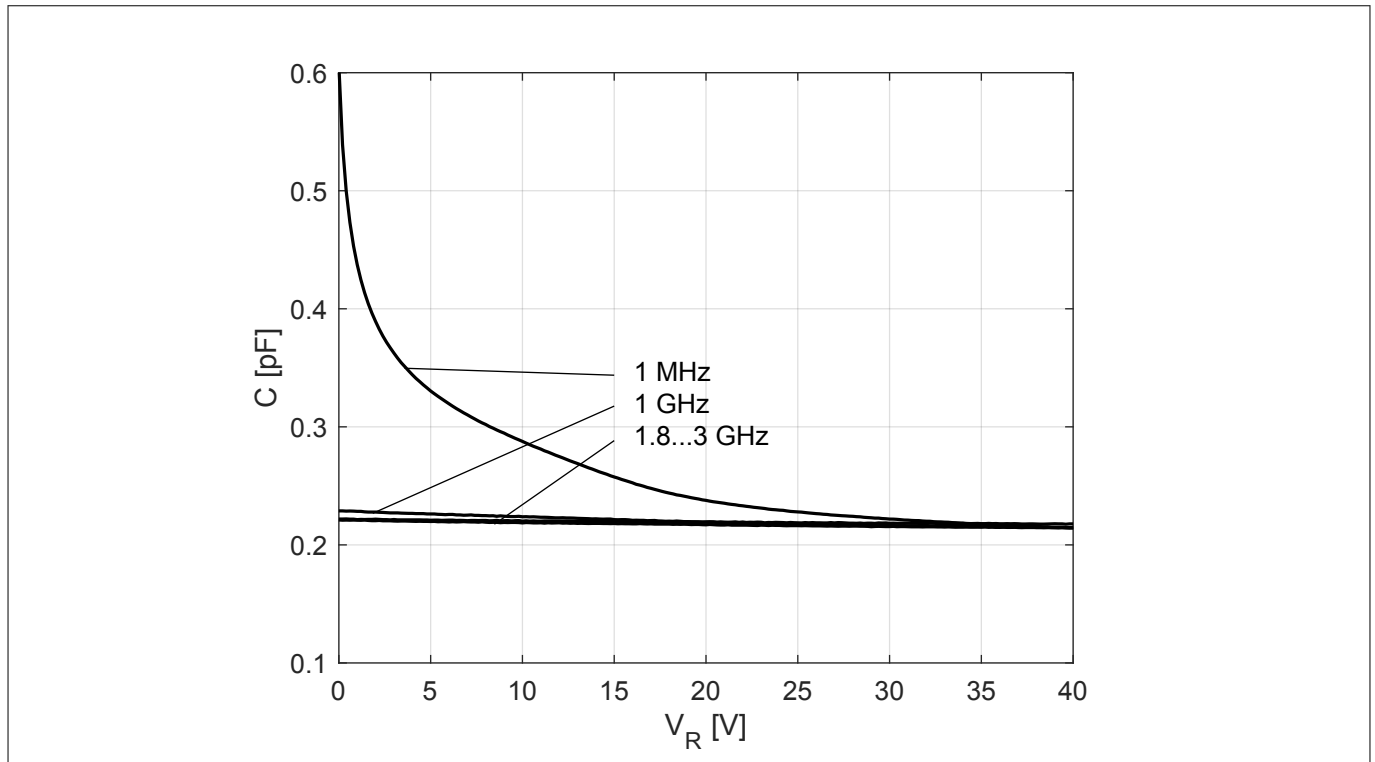
Table 6 AC parameter at  $f = 1.8$  GHz (continued)

| Parameter          | Symbol   | Values |      |      | Unit     | Note or test condition |
|--------------------|----------|--------|------|------|----------|------------------------|
|                    |          | Min.   | Typ. | Max. |          |                        |
| Forward resistance | $R_F$    | –      | 10   | –    | $\Omega$ | $I_F = 1$ mA           |
|                    |          | –      | 4.7  | –    |          | $I_F = 3$ mA           |
|                    |          | –      | 3.5  | –    |          | $I_F = 5$ mA           |
|                    |          | –      | 2.5  | –    |          | $I_F = 10$ mA          |
| Insertion loss     | $I_L$    | –      | 0.92 | –    | dB       | $I_F = 1$ mA           |
|                    |          | –      | 0.48 | –    |          | $I_F = 3$ mA           |
|                    |          | –      | 0.38 | –    |          | $I_F = 5$ mA           |
|                    |          | –      | 0.3  | –    |          | $I_F = 10$ mA          |
| Isolation          | $I_{SO}$ | –      | 12.4 | –    |          | $V_R = 0$ V            |

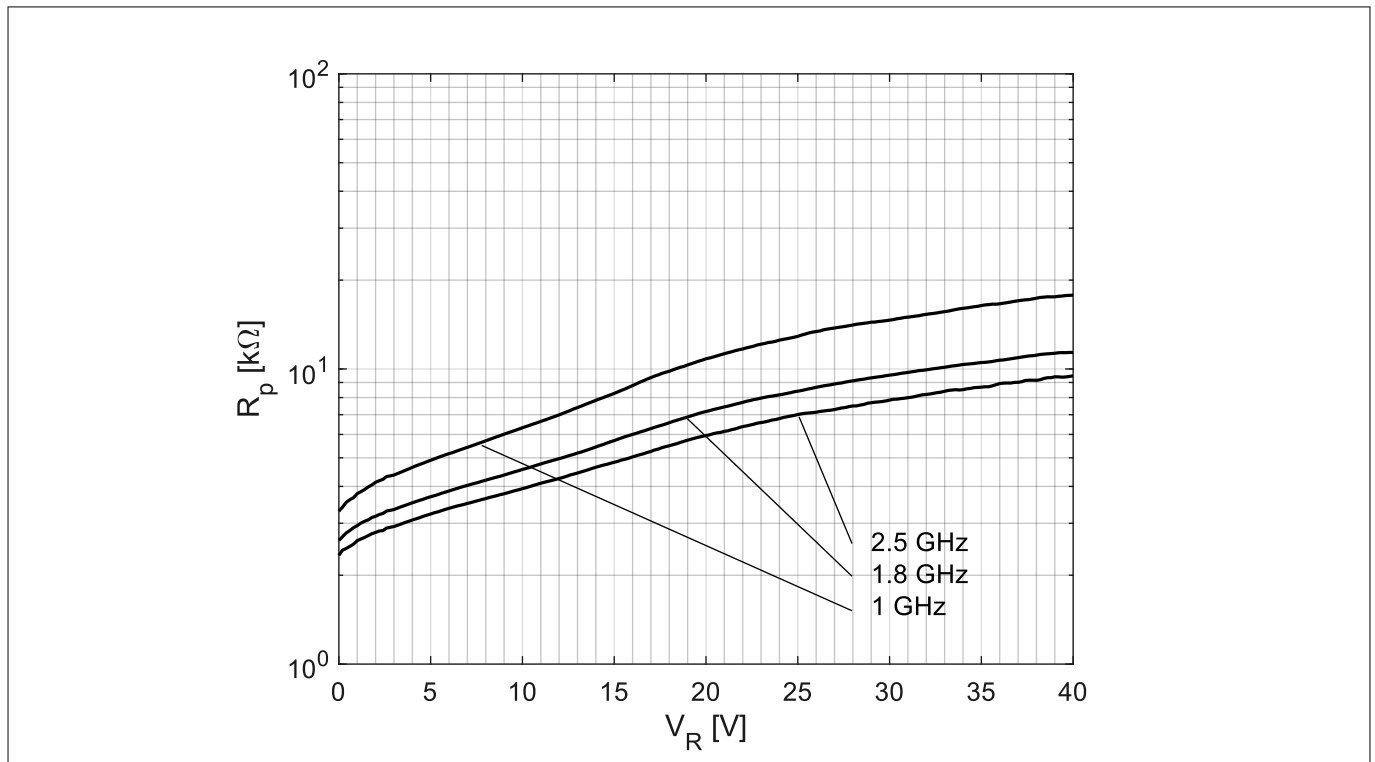
Table 7 AC parameter at  $f = 2.5$  GHz

| Parameter                   | Symbol   | Values |      |      | Unit       | Note or test condition |
|-----------------------------|----------|--------|------|------|------------|------------------------|
|                             |          | Min.   | Typ. | Max. |            |                        |
| Capacitance                 | $C$      | –      | 0.22 | –    | pF         | $V_R = 0$ V            |
| Reverse parallel resistance | $R_P$    | –      | 2.3  | –    | k $\Omega$ | $V_R = 0$ V            |
| Forward resistance          | $R_F$    | –      | 10   | –    | $\Omega$   | $I_F = 1$ mA           |
|                             |          | –      | 5    | –    |            | $I_F = 3$ mA           |
|                             |          | –      | 3.7  | –    |            | $I_F = 5$ mA           |
|                             |          | –      | 2.7  | –    |            | $I_F = 10$ mA          |
| Insertion loss              | $I_L$    | –      | 0.98 | –    | dB         | $I_F = 1$ mA           |
|                             |          | –      | 0.55 | –    |            | $I_F = 3$ mA           |
|                             |          | –      | 0.45 | –    |            | $I_F = 5$ mA           |
|                             |          | –      | 0.37 | –    |            | $I_F = 10$ mA          |
| Isolation                   | $I_{SO}$ | –      | 10   | –    |            | $V_R = 0$ V            |

## Electrical performance in test fixture

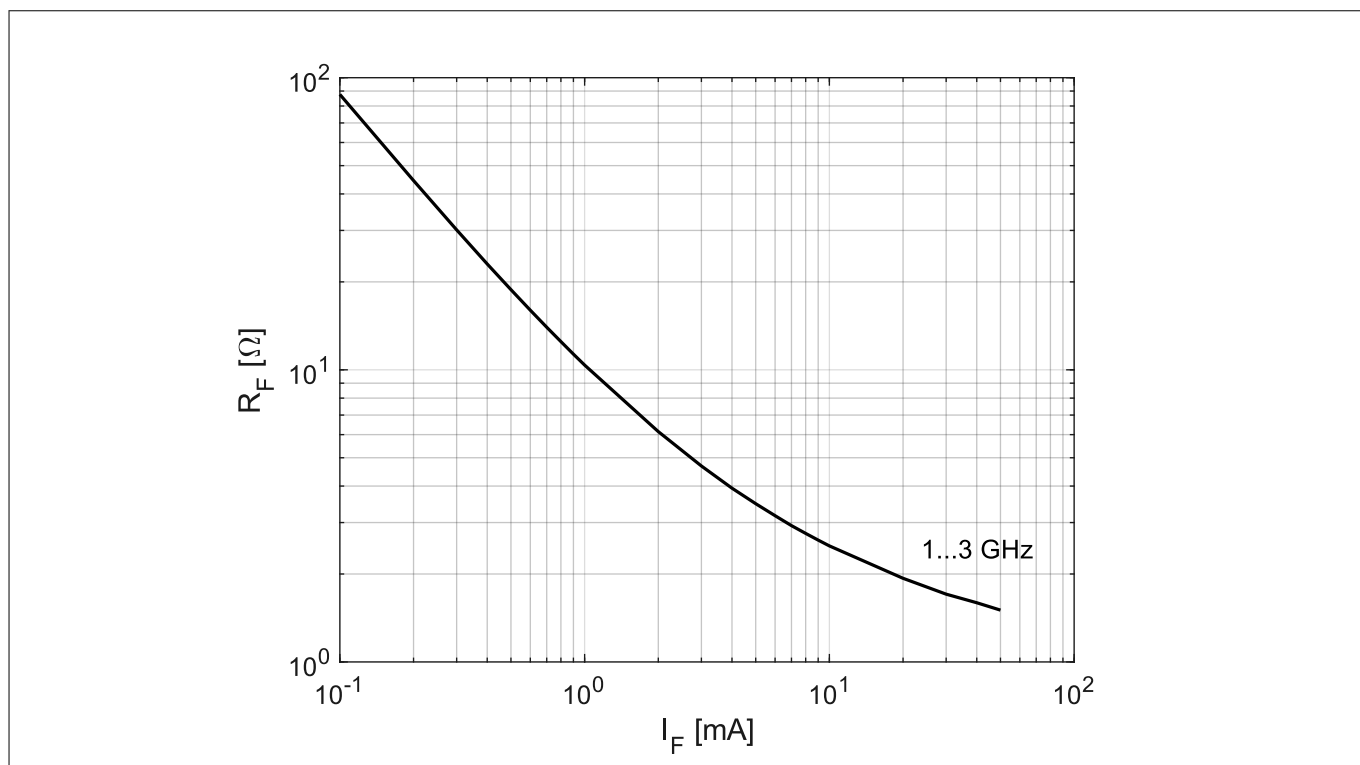


**Figure 2** Capacitance  $C$  vs. reverse voltage  $V_R$  at different frequencies

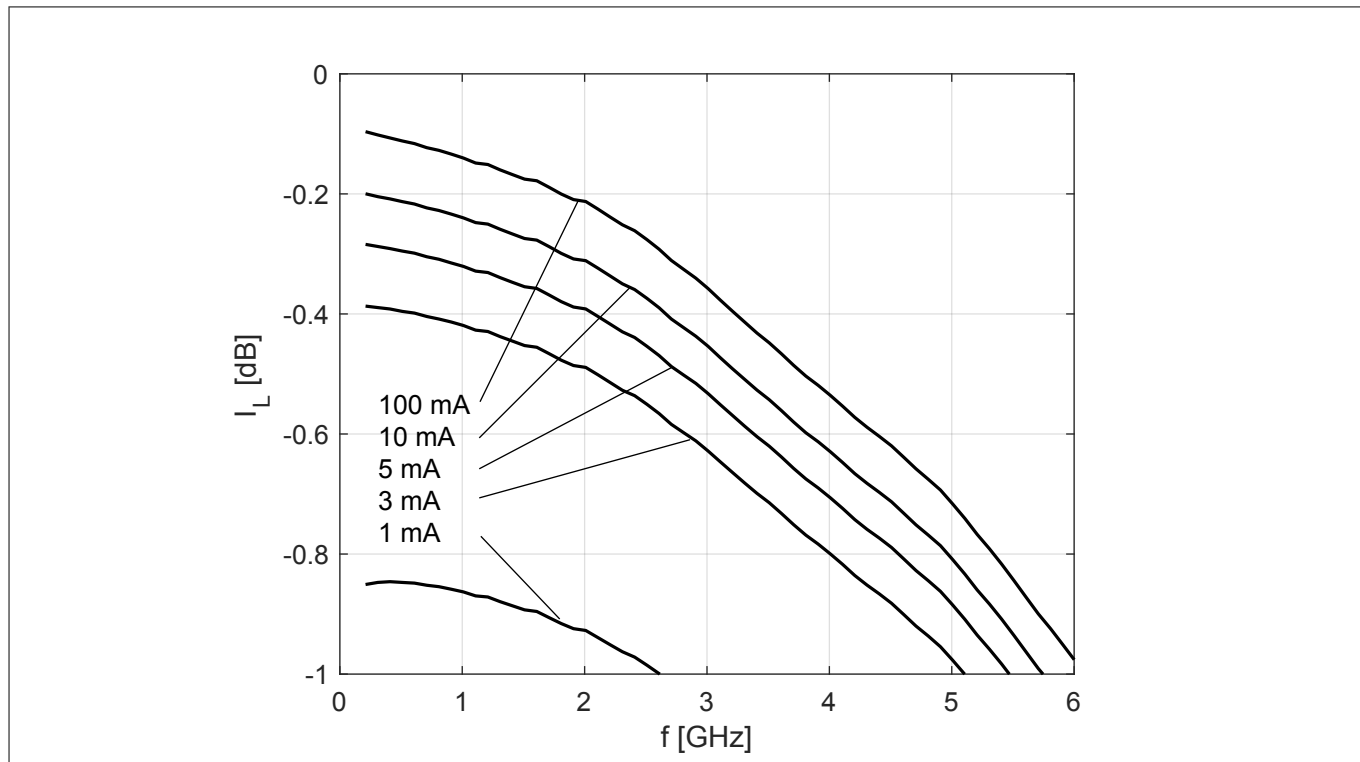


**Figure 3** Reverse parallel resistance  $R_p$  vs. reverse voltage  $V_R$  at different frequencies

## Electrical performance in test fixture

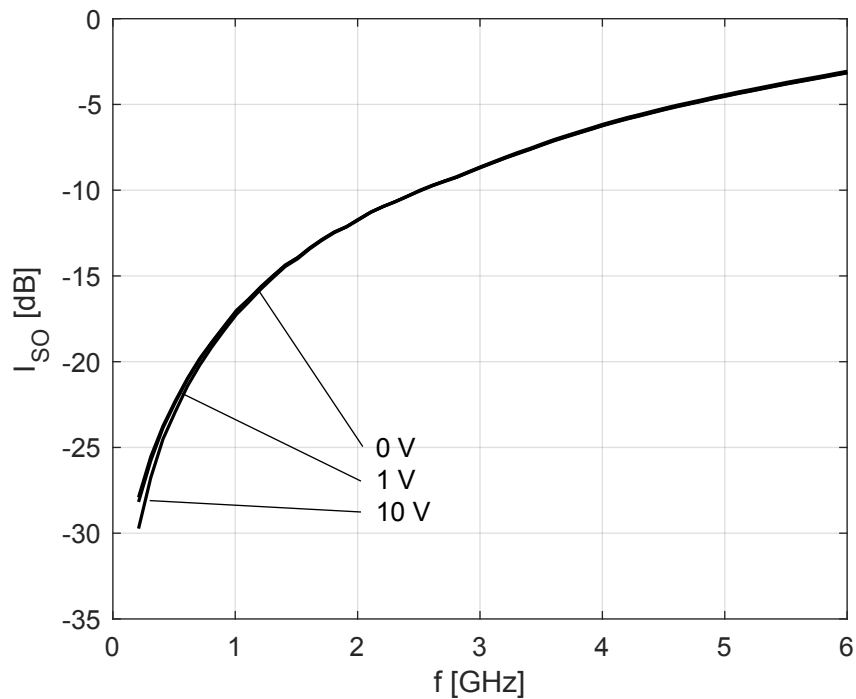


**Figure 4** Forward resistance  $R_F$  vs. forward current  $I_F$  at different frequencies



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

## Electrical performance in test fixture



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

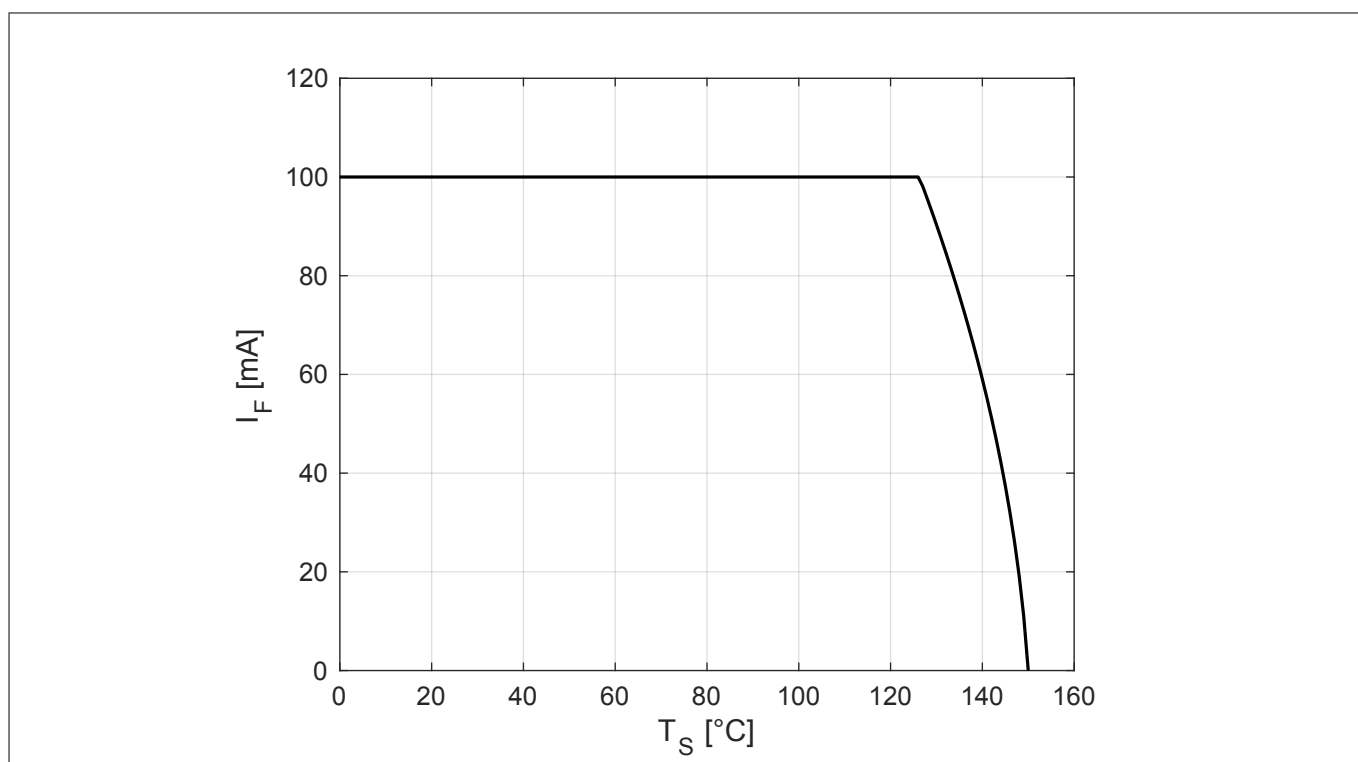
*Note:* The curves shown in this chapter have been generated using typical devices but shall not be understood as a guarantee that all devices have identical characteristic curves.

## Thermal characteristics

### 3 Thermal characteristics

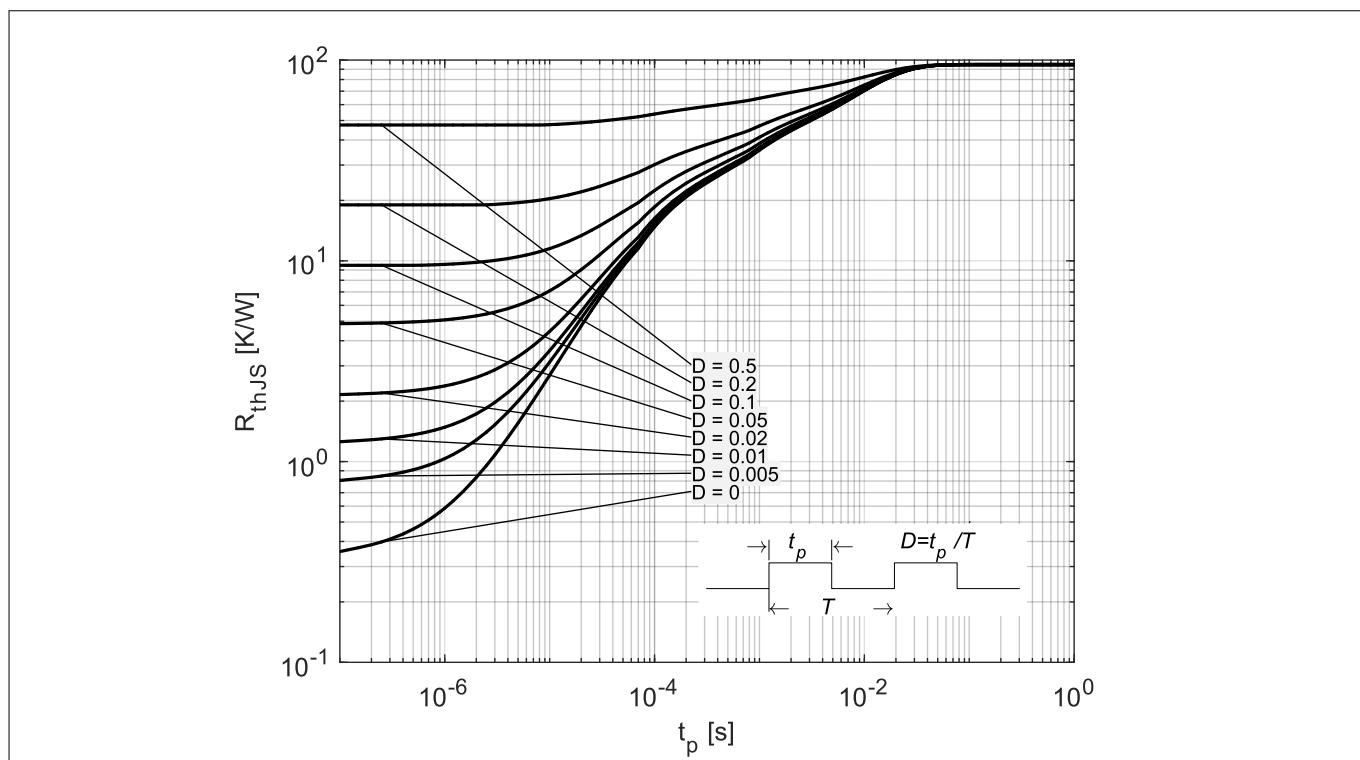
Table 8 Thermal resistance

| Parameter                                          | Sym<br>bol | Values |      |      | Unit | Note or test condition              |
|----------------------------------------------------|------------|--------|------|------|------|-------------------------------------|
|                                                    |            | Min.   | Typ. | Max. |      |                                     |
| Thermal resistance<br>(junction - soldering point) | $R_{thJS}$ | –      | 95   | –    | K/W  | $T_S = 126\text{ °C}$ <sup>2)</sup> |

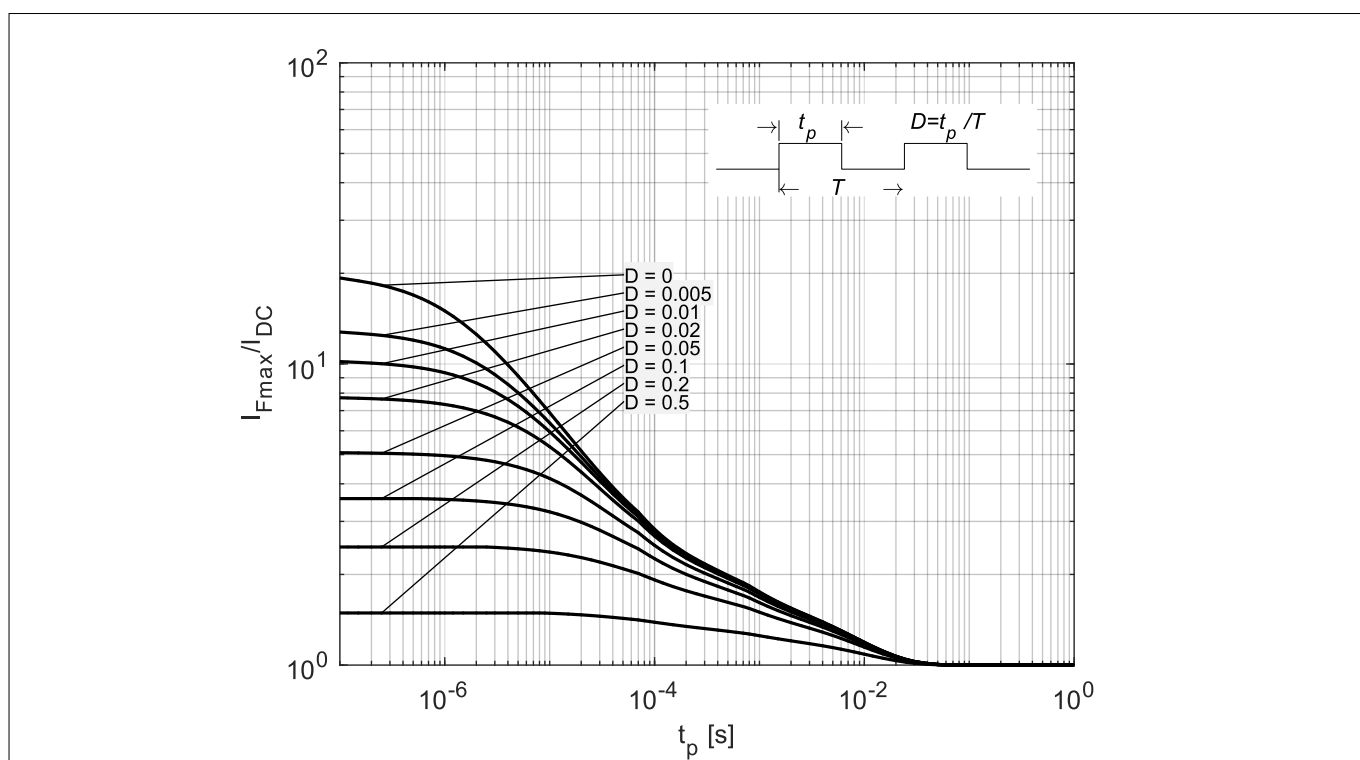
Figure 7 Permissible forward current  $I_F$  in DC operation

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

## Thermal characteristics



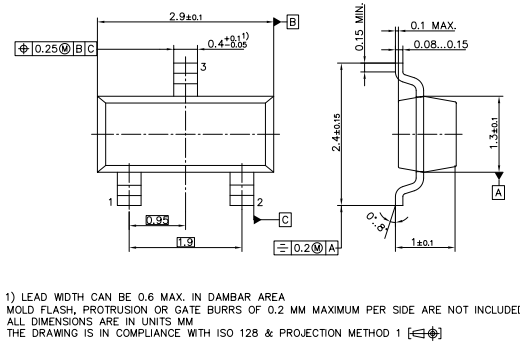
**Figure 8** Thermal resistance  $R_{thJS}$  in pulse operation



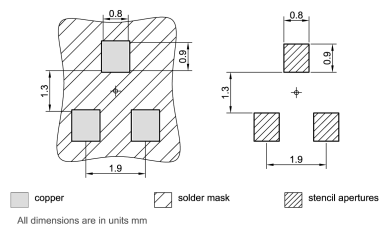
**Figure 9** Permissible forward current ratio  $I_{Fmax}/I_{DC}$  in pulse operation

### Package information SOT23-3

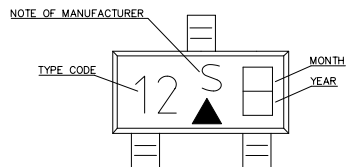
## 4 Package information SOT23-3



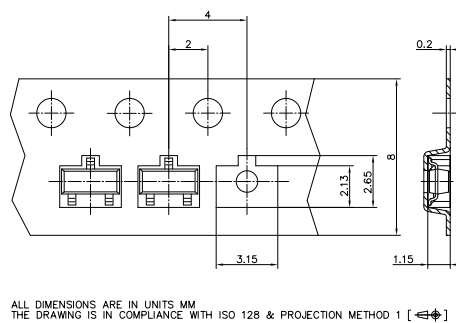
**Figure 10**                      **Package outline**



**Figure 11**                      **Foot print**



**Figure 12**                      **Marking layout example**



**Figure 13**                      **Tape dimensions**

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**Revision history****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>• 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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**Edition 2018-06-30**

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

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