

BF1118; BF1118R; BF1118W; BF1118WR

Silicon RF switches

Rev. 3 — 14 November 2014

Product data sheet

1. Product profile

1.1 General description

These switches are a combination of a depletion type Field-Effect Transistor (FET) and a band-switching diode. The BF1118, BF1118R, BF1118W and BF1118WR are encapsulated in the SOT143B, SOT143R, SOT343N and SOT343R respectively. The low loss and high isolation capabilities of these devices provide excellent RF switching functions. The gate of the MOSFET can be isolated from ground with the diode, resulting in low losses. Integrated diodes between gate and source and between gate and drain protect against excessive input voltage surges.

1.2 Features and benefits

- Specially designed for low loss RF switching up to 1 GHz

1.3 Applications

- Various RF switching applications such as:
 - ◆ Passive loop through for VCR tuner
 - ◆ Transceiver switching

1.4 Quick reference data

Table 1. Quick reference data

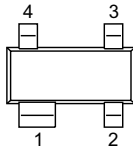
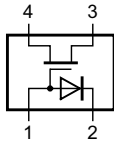
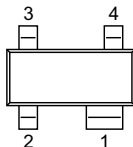
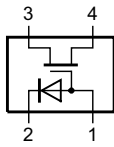
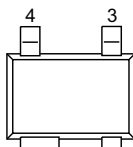
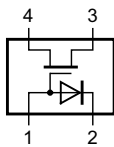
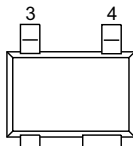
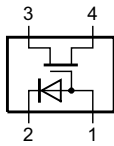
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|--|-----|-----|-------|----------|
| $L_{ins(on)}$ | on-state insertion loss | $R_S = R_L = 50\ \Omega$; $f \leq 1\ \text{GHz}$; $V_{SK} = V_{DK} = 0\ \text{V}$; $I_F = 0\ \text{mA}$ [1] | - | - | 2.5 | dB |
| ISL_{off} | off-state isolation | $R_S = R_L = 50\ \Omega$; $f \leq 1\ \text{GHz}$; $V_{SK} = V_{DK} = 3.3\ \text{V}$; $I_F = 1\ \text{mA}$ | 30 | - | - | dB |
| R_{DSon} | drain-source on-state resistance | $V_{KS} = 0\ \text{V}$; $I_D = 1\ \text{mA}$ | - | 15 | 23.3 | Ω |
| $V_{GS(p)}$ | gate-source pinch-off voltage | $V_{DS} = 1\ \text{V}$; $I_D = 20\ \mu\text{A}$ | - | -2 | -2.44 | V |

[1] I_F = diode forward current.



2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|--------------------|----------------------------|--|--|
| BF1118 (SOT143B) | | | |
| 1 | FET gate; diode anode |  |  001aai042 |
| 2 | diode cathode | | |
| 3 | source [1] | | |
| 4 | drain [1] | | |
| BF1118R (SOT143R) | | | |
| 1 | FET gate; diode anode |  |  001aai043 |
| 2 | diode cathode | | |
| 3 | source [1] | | |
| 4 | drain [1] | | |
| BF1118W (SOT343N) | | | |
| 1 | FET gate; diode anode |  |  001aai042 |
| 2 | diode cathode | | |
| 3 | source [1] | | |
| 4 | drain [1] | | |
| BF1118WR (SOT343R) | | | |
| 1 | FET gate; diode anode |  |  001aai043 |
| 2 | diode cathode | | |
| 3 | source [1] | | |
| 4 | drain [1] | | |

[1] Drain and source are interchangeable.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BF1118 | - | plastic surface-mounted package; 4 leads | SOT143B |
| BF1118R | - | plastic surface-mounted package; reverse pinning; 4 leads | SOT143R |
| BF1118W | - | plastic surface-mounted package; 4 leads | SOT343N |
| BF1118WR | - | plastic surface-mounted package; reverse pinning; 4 leads | SOT343R |

4. Marking

Table 4. Marking

| Type number | Marking code |
|-------------|--------------|
| BF1118 | VC% |
| BF1118R | VD% |
| BF1118W | VB |
| BF1118WR | VC |

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|----------------------|----------------------|------------|-----|------|------|
| FET | | | | | |
| V_{DS} | drain-source voltage | | - | 3 | V |
| V_{SD} | source-drain voltage | | - | 3 | V |
| V_{DG} | drain-gate voltage | | - | 7 | V |
| V_{SG} | source-gate voltage | | - | 7 | V |
| I_D | drain current | | - | 10 | mA |
| Diode | | | | | |
| V_R | reverse voltage | | - | 35 | V |
| I_F | forward current | | - | 100 | mA |
| FET and diode | | | | | |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 150 | °C |

6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|----------------|--|------------|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | [1] | 250 | K/W |

[1] Soldering point of FET gate and diode anode lead.

7. Static characteristics

Table 7. Static characteristics

$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|---|-----|-----|-------|---------------|
| FET | | | | | | |
| $V_{(BR)GSS}$ | gate-source breakdown voltage | $V_{DS} = 0\text{ V}; I_{GS} = 0.1\text{ mA}$ | - | - | -7 | V |
| $V_{GS(p)}$ | gate-source pinch-off voltage | $V_{DS} = 1\text{ V}; I_D = 20\text{ }\mu\text{A}$ | - | -2 | -2.44 | V |
| I_{DSX} | drain cut-off current | $V_{GS} = -3.3\text{ V}; V_{DS} = -1\text{ V}$ | - | - | 16 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = -3.3\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 100 | nA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 0\text{ V}; I_D = 1\text{ mA}$ | - | 15 | 23.3 | Ω |
| Diode | | | | | | |
| V_F | forward voltage | $I_F = 10\text{ mA}$ | - | - | 1 | V |
| I_R | reverse current | $V_R = 25\text{ V}$ | - | - | 50 | nA |
| | | $V_R = 20\text{ V}; T_{amb} = 75\text{ }^{\circ}\text{C}$ | - | - | 1 | μA |

8. Dynamic characteristics

Table 8. Dynamic characteristics

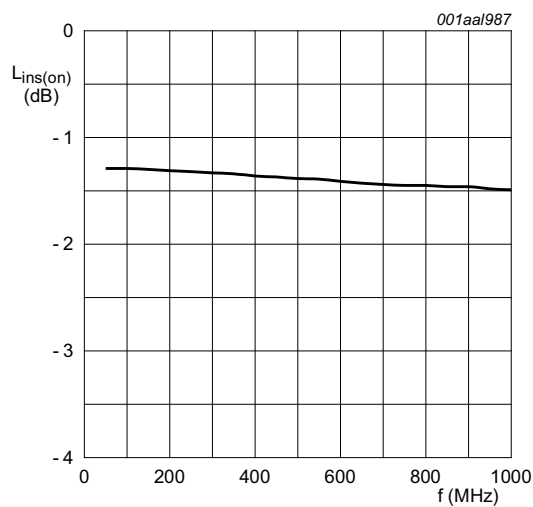
Common cathode; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------------|----------------------------------|--|-----|------|------|------|
| FET and diode | | | | | | |
| L _{ins(on)} | on-state insertion loss | V _{SK} = V _{DK} = 0 V; I _F = 0 mA [1] | | | | |
| | | R _S = R _L = 50 Ω; f ≤ 1 GHz | - | - | 2.5 | dB |
| | | R _S = R _L = 50 Ω; f = 1 GHz | - | 1.5 | - | dB |
| | | R _S = R _L = 75 Ω; f ≤ 1 GHz | - | - | 2.5 | dB |
| ISL _{off} | off-state isolation | V _{SK} = V _{DK} = 3.3 V; I _F = 1 mA | | | | |
| | | R _S = R _L = 50 Ω; f ≤ 1 GHz | 30 | - | - | dB |
| | | R _S = R _L = 50 Ω; f = 1 GHz | - | 35 | - | dB |
| | | R _S = R _L = 75 Ω; f ≤ 1 GHz | 30 | - | - | dB |
| R _{DSon} | drain-source on-state resistance | V _{KS} = 0 V; I _D = 1 mA | - | 15 | 23.3 | Ω |
| C _i | input capacitance | f = 1 MHz [2] | | | | |
| | | V _{SK} = V _{DK} = 3.3 V; I _F = 1 mA | - | 1 | - | pF |
| | | V _{SK} = V _{DK} = 0 V; I _F = 0 mA | - | 0.65 | 0.9 | pF |
| C _o | output capacitance | f = 1 MHz [2] | | | | |
| | | V _{SK} = V _{DK} = 3.3 V; I _F = 1 mA | - | 1 | - | pF |
| | | V _{SK} = V _{DK} = 0 V; I _F = 0 mA | - | 0.65 | 0.9 | pF |
| Diode | | | | | | |
| C _d | diode capacitance | f = 1 MHz; V _R = 0 V | - | 1.1 | - | pF |
| r _D | diode forward resistance | I _F = 2 mA; f = 100 MHz [3] | - | - | 0.9 | Ω |

[1] I_F = diode forward current.

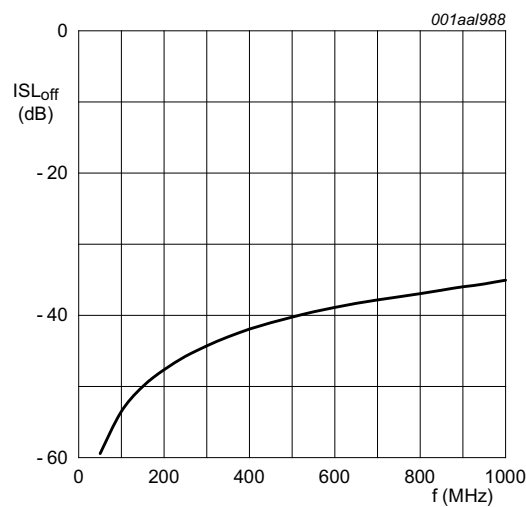
[2] C_i is the series connection of C_{GS} and C_{GK} ; C_o is the series connection of C_{GD} and C_{GK} .

[3] Guaranteed on AQL basis; inspection level S4, AQL 1.0.



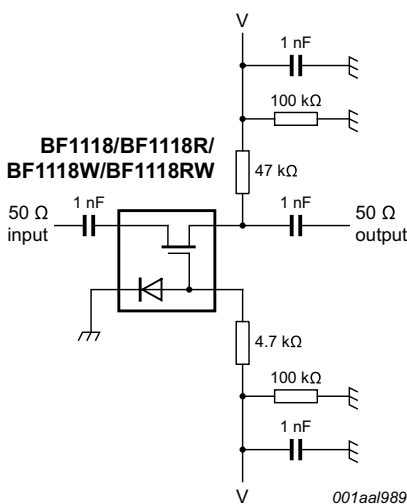
$V_{SK} = V_{DK} = 0\text{ V}$; $R_S = R_L = 50\text{ }\Omega$; $I_F = 0\text{ mA}$ (diode forward current).
Measured in test circuit; see [Figure 3](#).

Fig 1. On-state insertion loss as a function of frequency; typical values



$V_{SK} = V_{DK} = 3.3\text{ V}$; $R_S = R_L = 50\text{ }\Omega$; $I_F = 1\text{ mA}$ (diode forward current).
Measured in test circuit; see [Figure 3](#).

Fig 2. Off-state isolation as a function of frequency; typical values



On-state: $V = 0\text{ V}$.
Off-state: $V = 3.3\text{ V}$.

Fig 3. Test circuit

9. Package outline

Plastic surface-mounted package; 4 leadsSOT143B

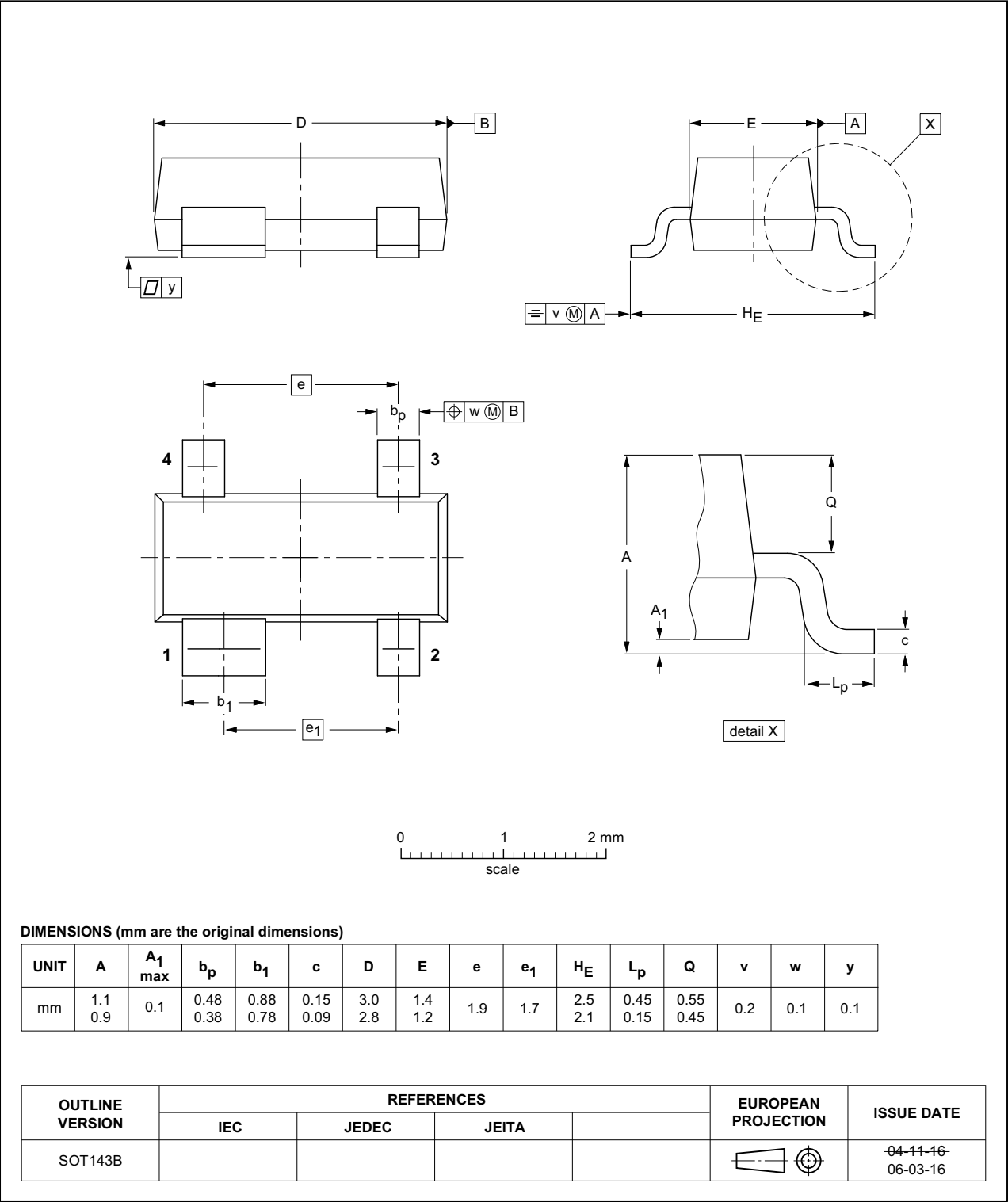


Fig 4. Package outline SOT143B

Plastic surface-mounted package; reverse pinning; 4 leads

SOT143R

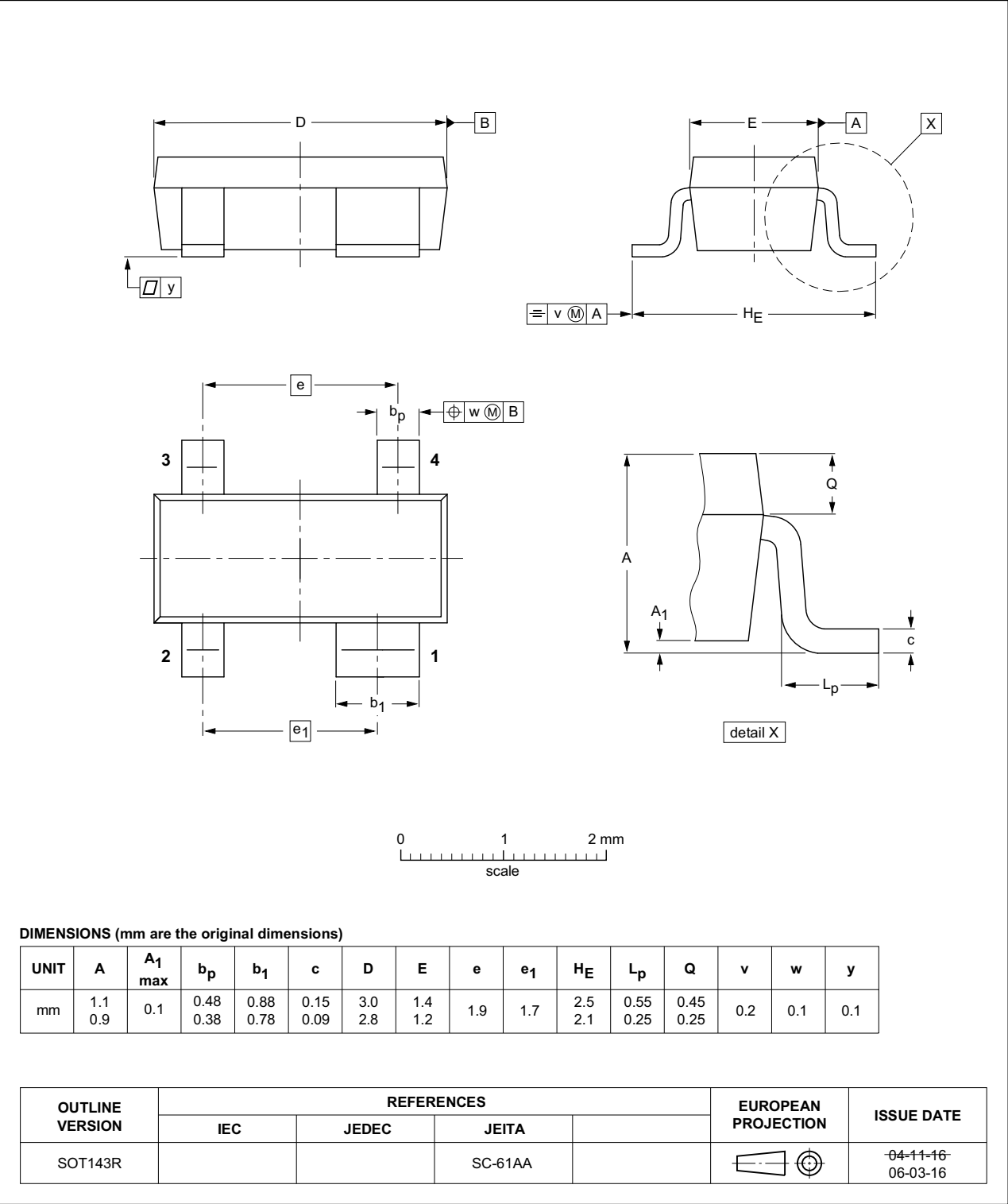


Fig 5. Package outline SOT143R

Plastic surface-mounted package; 4 leads

SOT343N

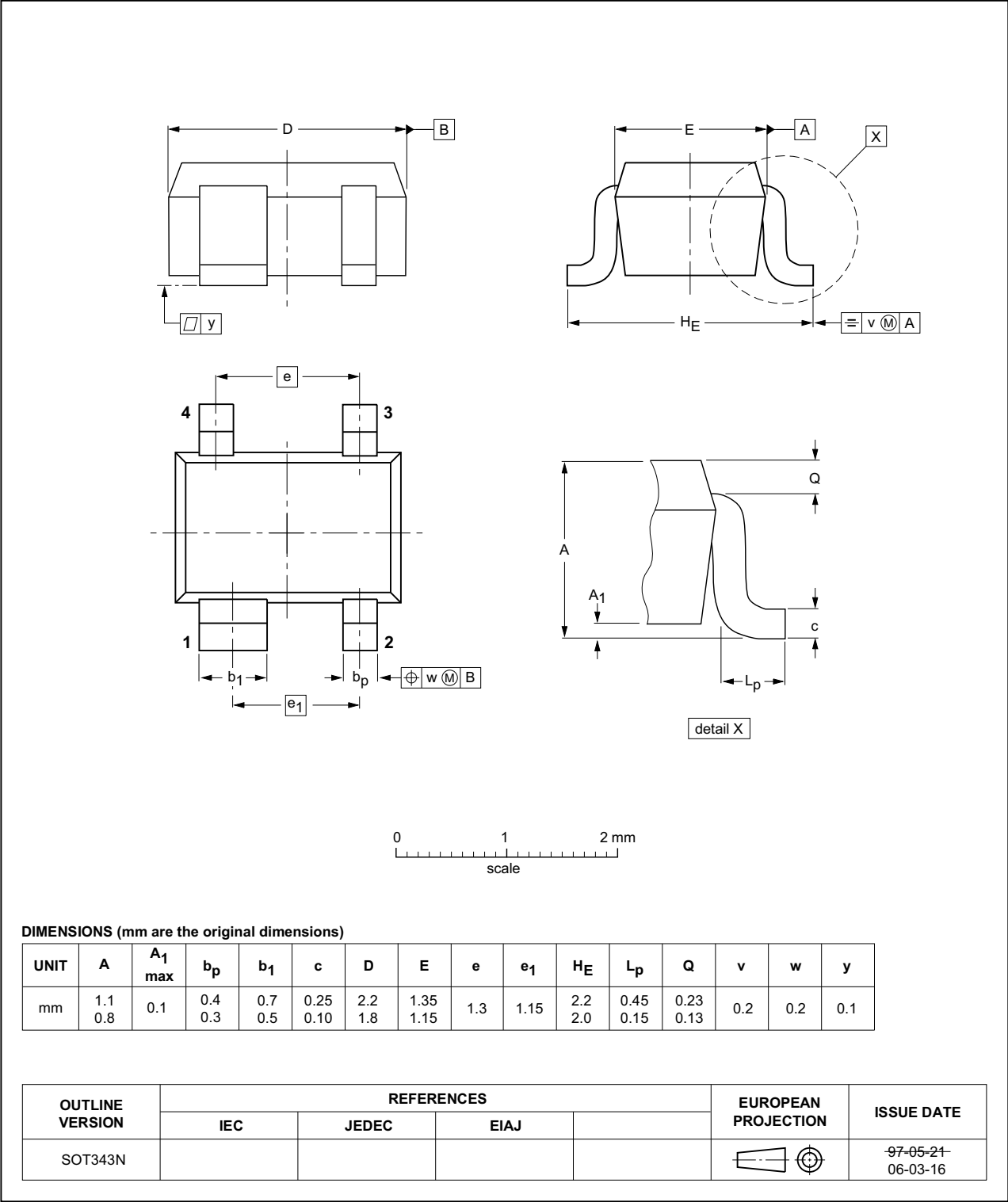


Fig 6. Package outline SOT343N

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R

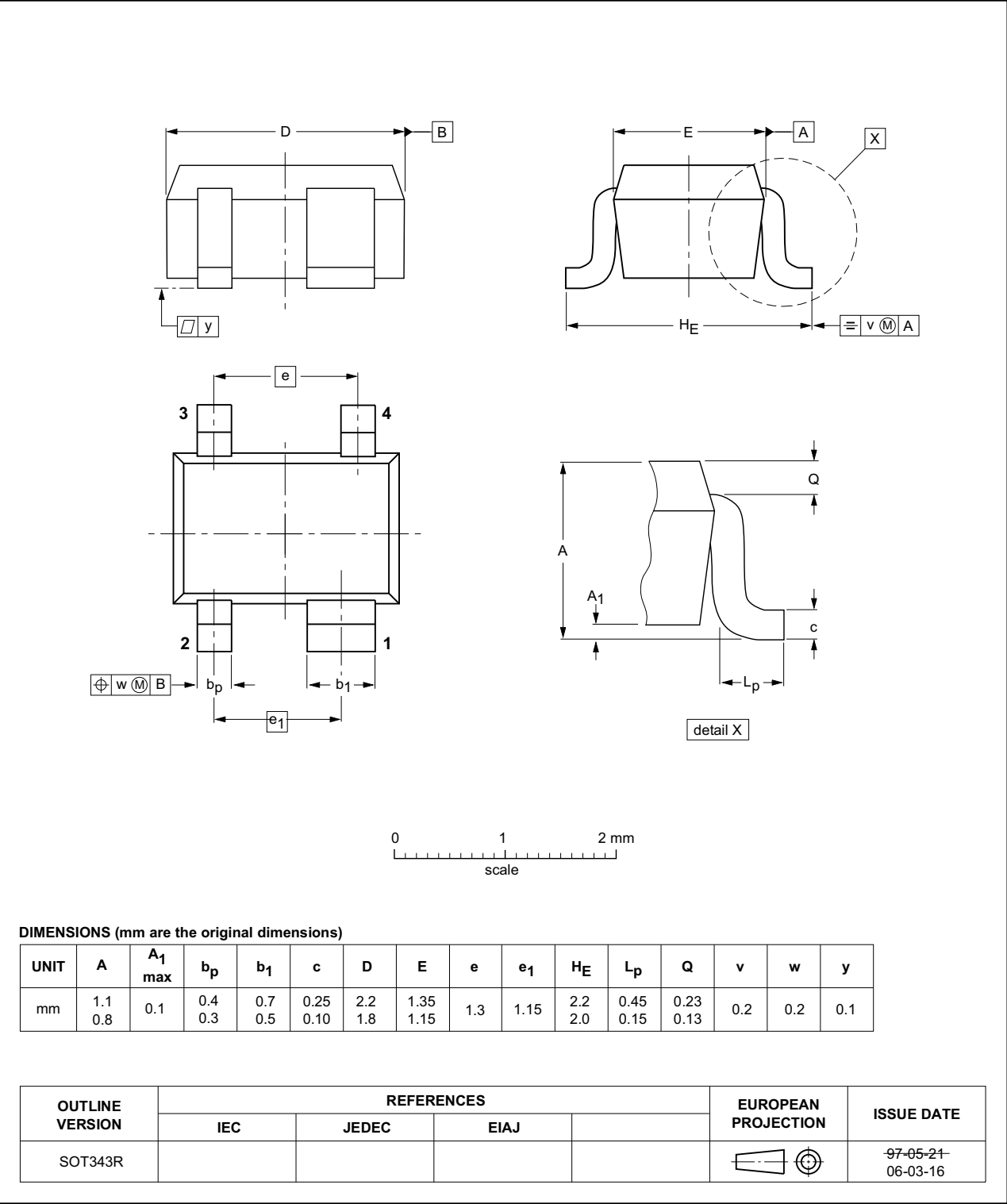


Fig 7. Package outline SOT343R

10. Handling information

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

11. Abbreviations

Table 9. Abbreviations

| Acronym | Description |
|---------|---|
| AQL | Acceptable Quality Level |
| MOSFET | Metal-Oxide Semiconductor Field-Effect Transistor |
| RF | Radio Frequency |
| S4 | Special inspection level 4 |
| VCR | Video Cassette Recorder |

12. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------------------|--|--------------------|---------------|-------------------------------|
| BF1118_1118R_1118W_1118WR v.3 | 20141114 | Product data sheet | - | BF1118_1118R_1118W_1118WR v.2 |
| Modifications: | <ul style="list-style-type: none">Section 10 on page 10: The information has been moved from Section 1.1 to this section.Table 7 on page 4: The minimum value for $V_{(BR)GSS}$ has been removed and a maximum value has been set instead. | | | |
| BF1118_1118R_1118W_1118WR v.2 | 20120111 | Product data sheet | - | BF1118_1118R_1118W_1118WR v.1 |
| BF1118_1118R_1118W_1118WR v.1 | 20100629 | Product data sheet | - | - |

13. Legal information

13.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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