

# 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	$\Omega$
$V_{GS(p)}$	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
<b>BF1118 (SOT143B)</b>			
1	FET gate; diode anode		
2	diode cathode		
3	source [1]		
4	drain [1]		
<b>BF1118R (SOT143R)</b>			
1	FET gate; diode anode		
2	diode cathode		
3	source [1]		
4	drain [1]		
<b>BF1118W (SOT343N)</b>			
1	FET gate; diode anode		
2	diode cathode		
3	source [1]		
4	drain [1]		
<b>BF1118WR (SOT343R)</b>			
1	FET gate; diode anode		
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
<b>FET</b>					
$V_{DS}$	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
<b>Diode</b>					
$V_R$	reverse voltage		-	35	V
$I_F$	forward current		-	100	mA
<b>FET and diode</b>					
$T_{stg}$	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**

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

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

## 8. Dynamic characteristics

**Table 8. Dynamic characteristics**

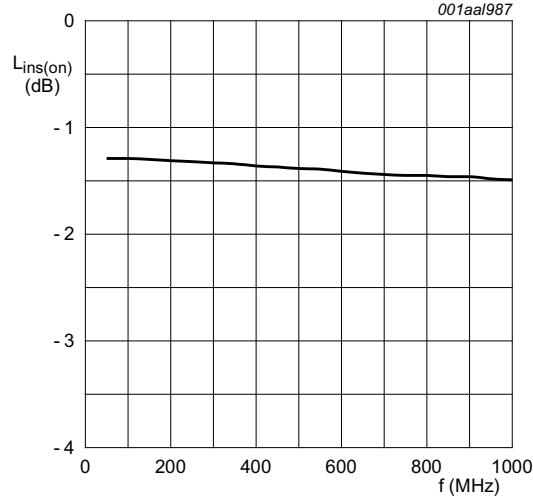
Common cathode;  $T_{\text{amb}} = 25^\circ\text{C}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>FET and diode</b>						
$L_{\text{ins}(\text{on})}$	on-state insertion loss	$V_{\text{SK}} = V_{\text{DK}} = 0 \text{ V}; I_F = 0 \text{ mA}$	[1]			
		$R_S = R_L = 50 \Omega; f \leq 1 \text{ GHz}$	-	-	2.5	dB
		$R_S = R_L = 50 \Omega; f = 1 \text{ GHz}$	-	1.5	-	dB
		$R_S = R_L = 75 \Omega; f \leq 1 \text{ GHz}$	-	-	2.5	dB
$ISL_{\text{off}}$	off-state isolation	$V_{\text{SK}} = V_{\text{DK}} = 3.3 \text{ V}; I_F = 1 \text{ mA}$				
		$R_S = R_L = 50 \Omega; f \leq 1 \text{ GHz}$	30	-	-	dB
		$R_S = R_L = 50 \Omega; f = 1 \text{ GHz}$	-	35	-	dB
		$R_S = R_L = 75 \Omega; f \leq 1 \text{ GHz}$	30	-	-	dB
$R_{\text{DSon}}$	drain-source on-state resistance	$V_{\text{KS}} = 0 \text{ V}; I_D = 1 \text{ mA}$	-	15	23.3	$\Omega$
$C_i$	input capacitance	$f = 1 \text{ MHz}$	[2]			
		$V_{\text{SK}} = V_{\text{DK}} = 3.3 \text{ V}; I_F = 1 \text{ mA}$	-	1	-	pF
		$V_{\text{SK}} = V_{\text{DK}} = 0 \text{ V}; I_F = 0 \text{ mA}$	-	0.65	0.9	pF
$C_o$	output capacitance	$f = 1 \text{ MHz}$	[2]			
		$V_{\text{SK}} = V_{\text{DK}} = 3.3 \text{ V}; I_F = 1 \text{ mA}$	-	1	-	pF
		$V_{\text{SK}} = V_{\text{DK}} = 0 \text{ V}; I_F = 0 \text{ mA}$	-	0.65	0.9	pF
<b>Diode</b>						
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}$	-	1.1	-	pF
$r_D$	diode forward resistance	$I_F = 2 \text{ mA}; f = 100 \text{ MHz}$	[3]	-	-	$\Omega$

[1]  $I_F$  = diode forward current.

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

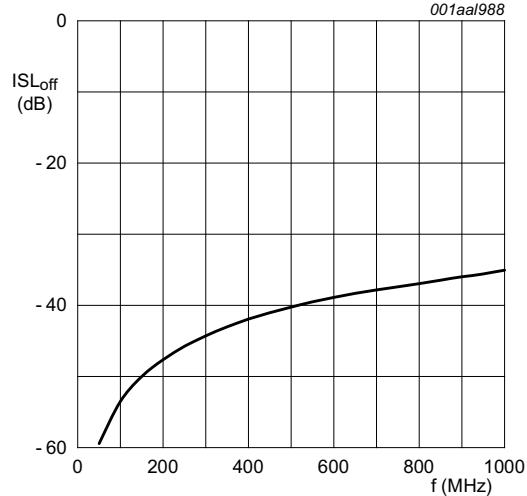
[3] Guaranteed on AQL basis; inspection level S4, AQL 1.0.



$V_{SK} = V_{DK} = 0$  V;  $R_S = R_L = 50$   $\Omega$ ;  $I_F = 0$  mA (diode forward current).

Measured in test circuit; see [Figure 3](#).

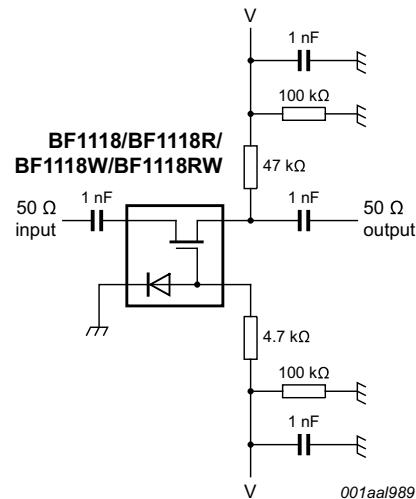
**Fig 1. On-state insertion loss as a function of frequency; typical values**



$V_{SK} = V_{DK} = 3.3$  V;  $R_S = R_L = 50$   $\Omega$ ;  $I_F = 1$  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:  $V = 0$  V.

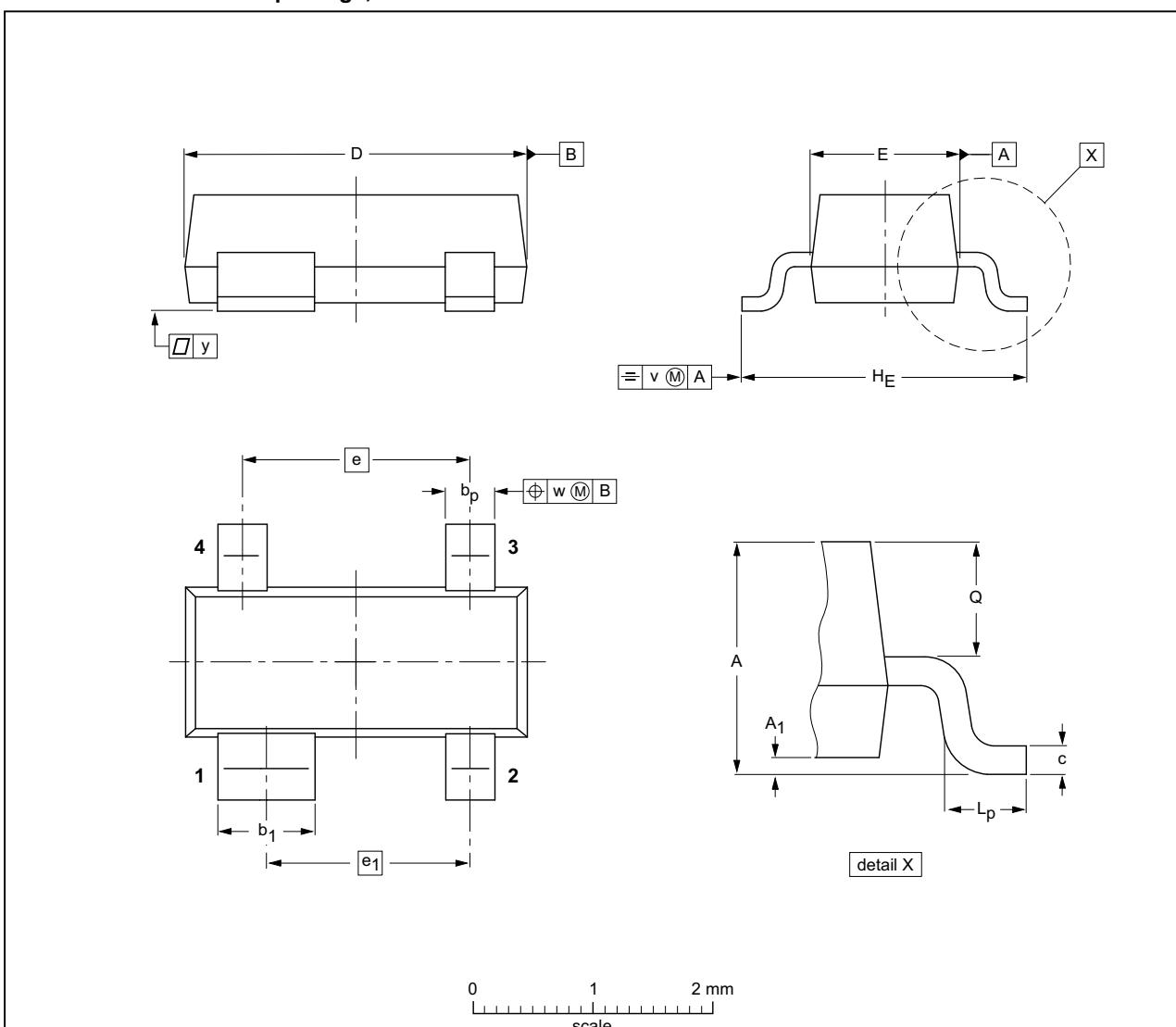
Off-state:  $V = 3.3$  V.

**Fig 3. Test circuit**

## 9. Package outline

Plastic surface-mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.1 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT143B						04-11-16 06-03-16

Fig 4. Package outline SOT143B

Plastic surface-mounted package; reverse pinning; 4 leads

SOT143R

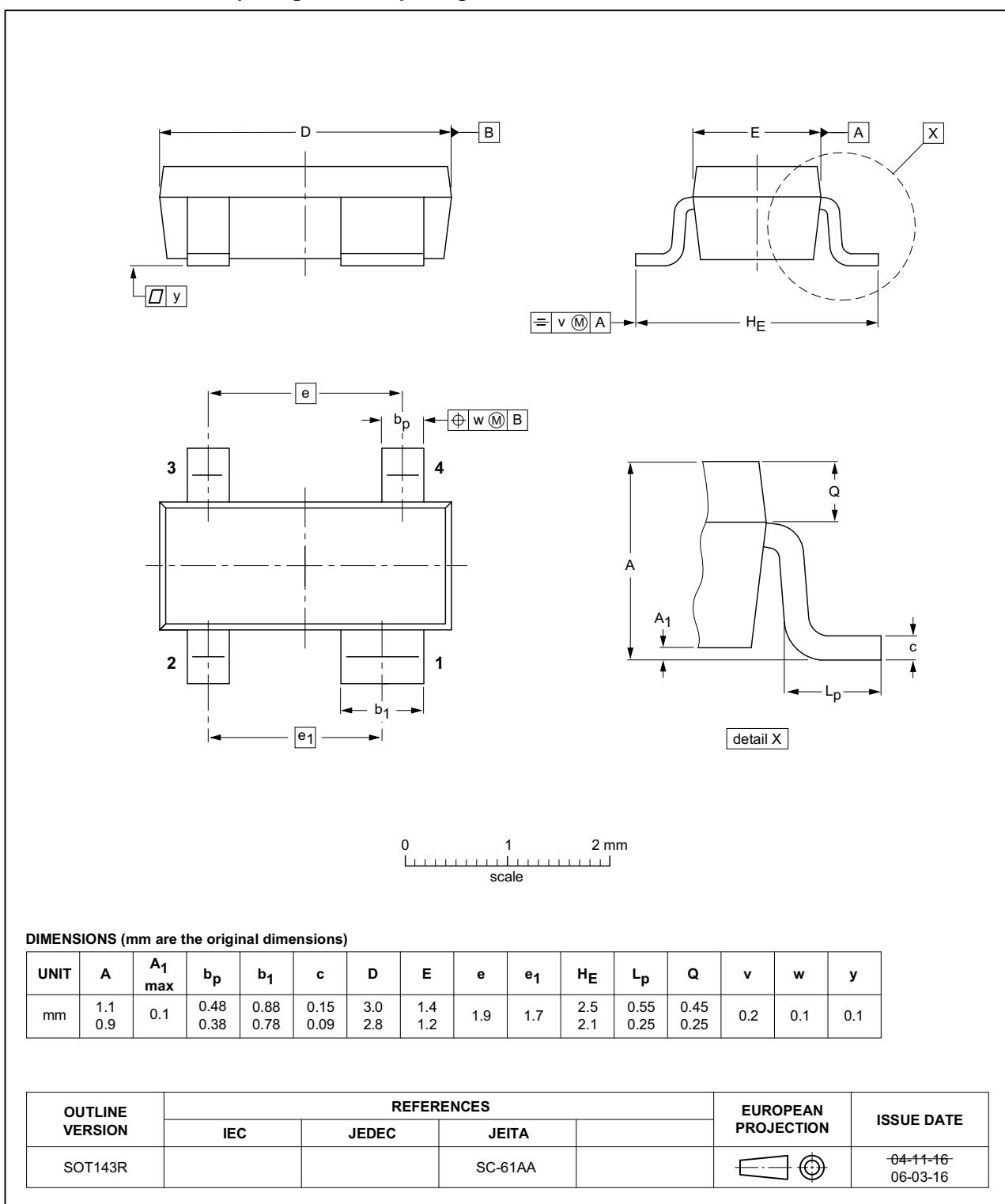


Fig 5. Package outline SOT143R

## Plastic surface-mounted package; 4 leads

SOT343N

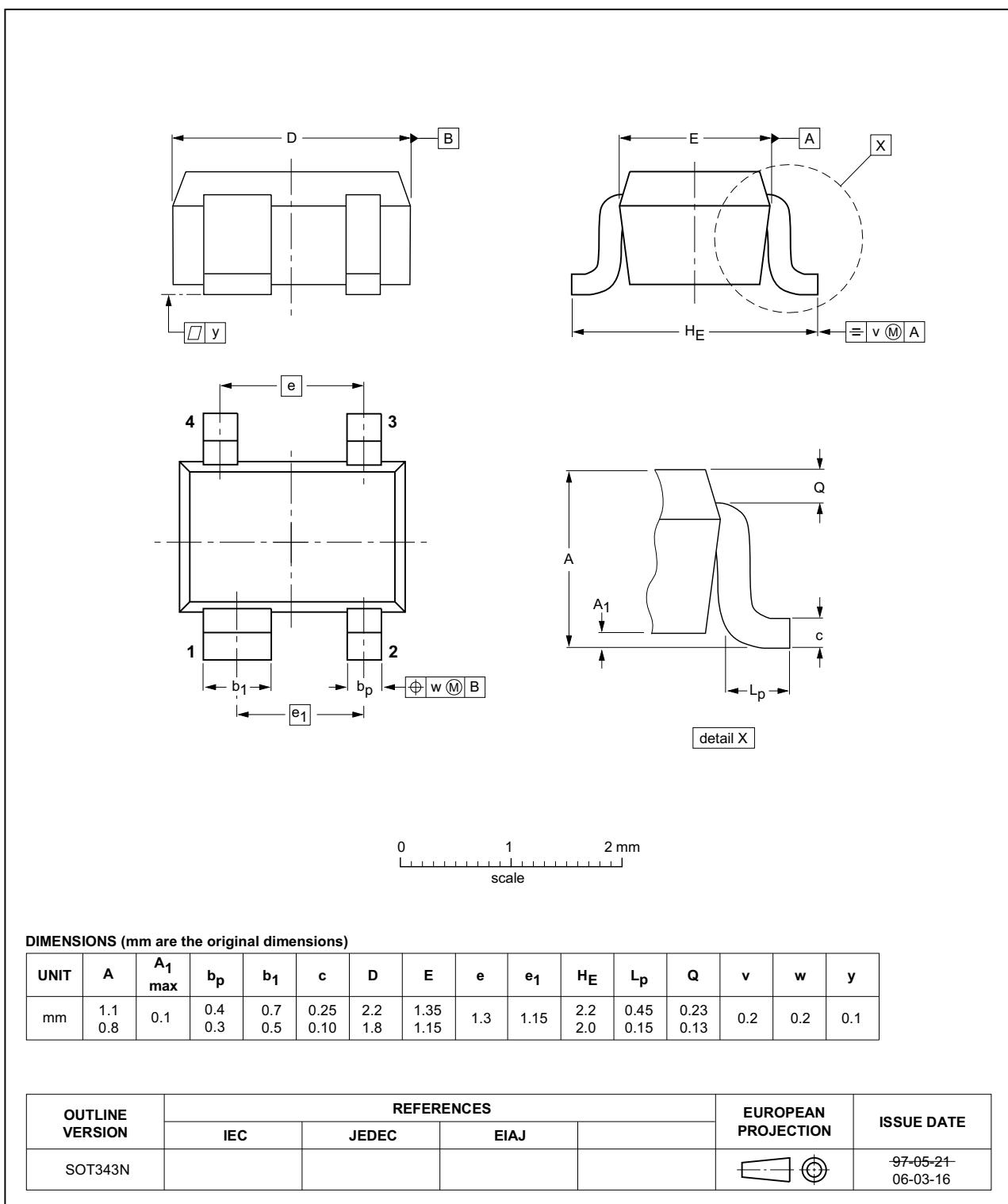


Fig 6. Package outline SOT343N

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R

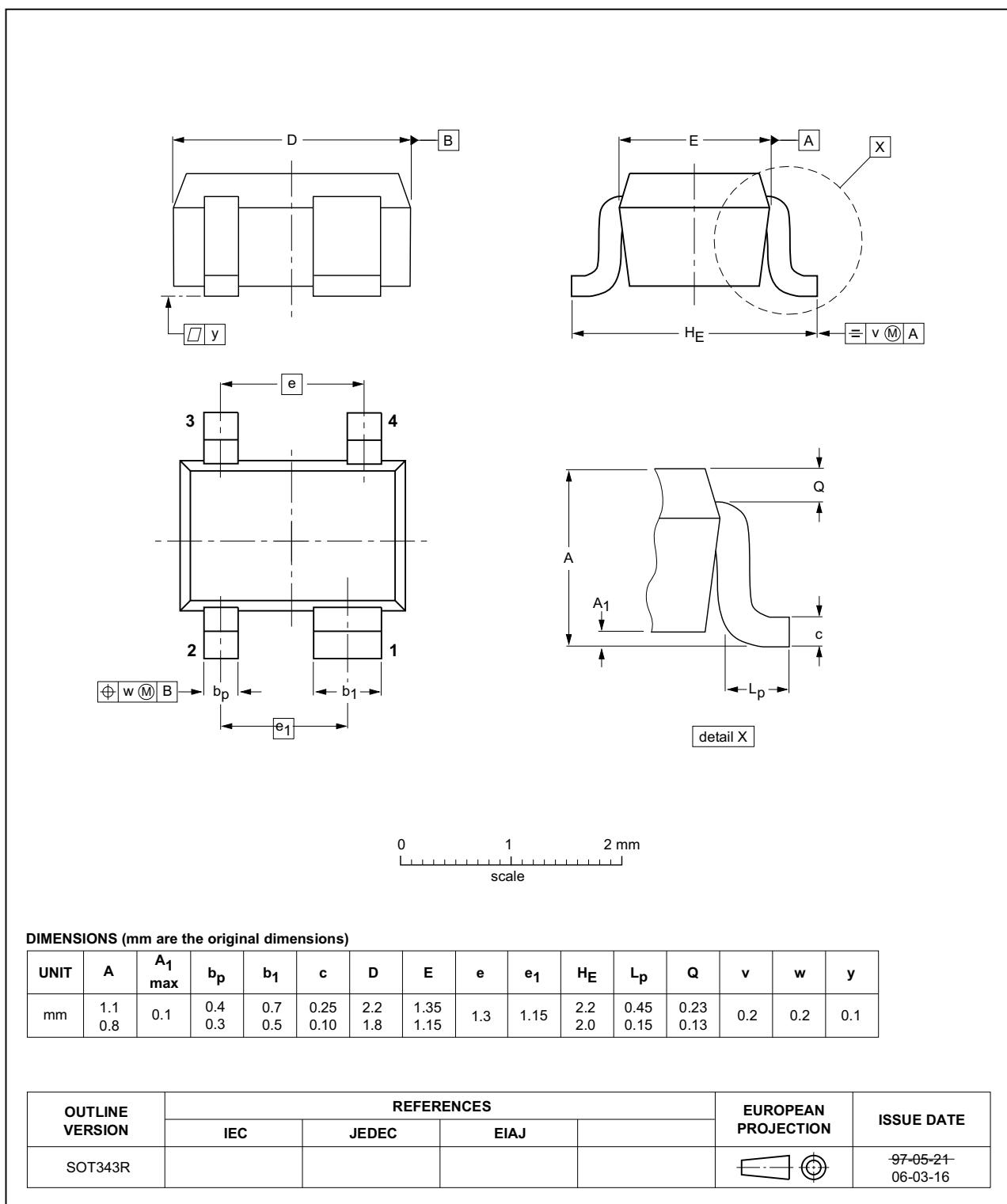


Fig 7. Package outline SOT343R

## 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"> <li>• <a href="#">Section 10 on page 10</a>: The information has been moved from <a href="#">Section 1.1</a> to this section.</li> <li>• <a href="#">Table 7 on page 4</a>: The minimum value for <math>V_{(BR)GSS}</math> has been removed and a maximum value has been set instead.</li> </ul>			
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	-	-

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Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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