

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	$R_S = R_L = 50 \Omega$; $f \leq 1 \text{ GHz}$; $V_{SK} = V_{DK} = 0 \text{ V}$; $I_F = 0 \text{ mA}$	-	-	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

$T_j = 25\text{ °C}$ 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
		$V_R = 20\text{ V}; T_{amb} = 75\text{ °C}$	-	-	1	μA

8. Dynamic characteristics

Table 8. Dynamic characteristics

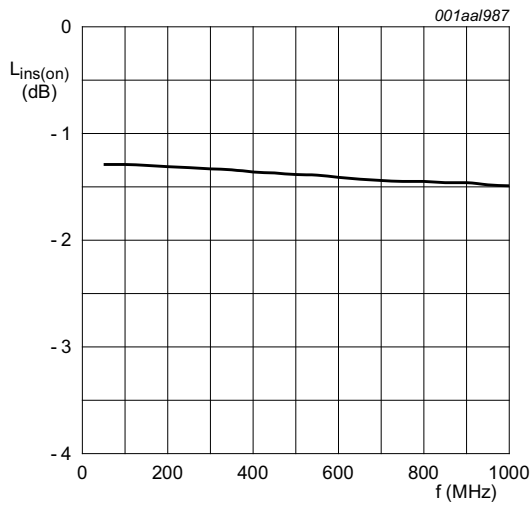
Common cathode; $T_{amb} = 25\text{ °C}$.

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

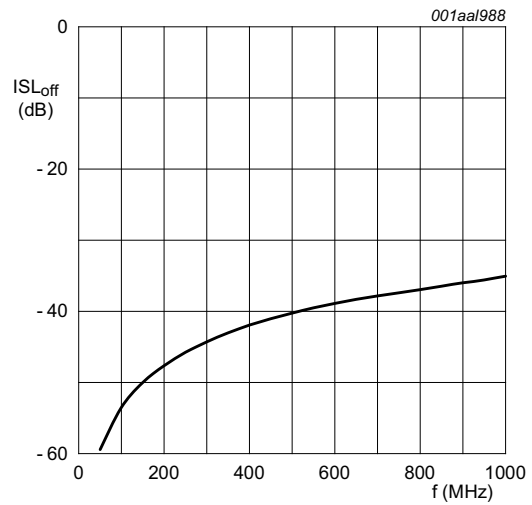
[3] Guaranteed on AQL basis; inspection level S4, AQL 1.0.



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

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

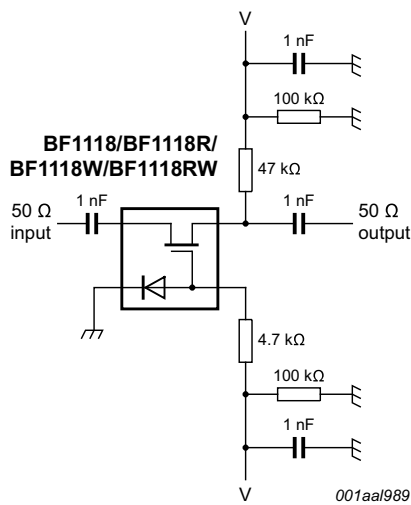
Fig 1. On-state insertion loss as a function of frequency; typical values



$V_{SK} = V_{DK} = 3.3$ V; $R_S = R_L = 50$ Ω ; $I_F = 1$ 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

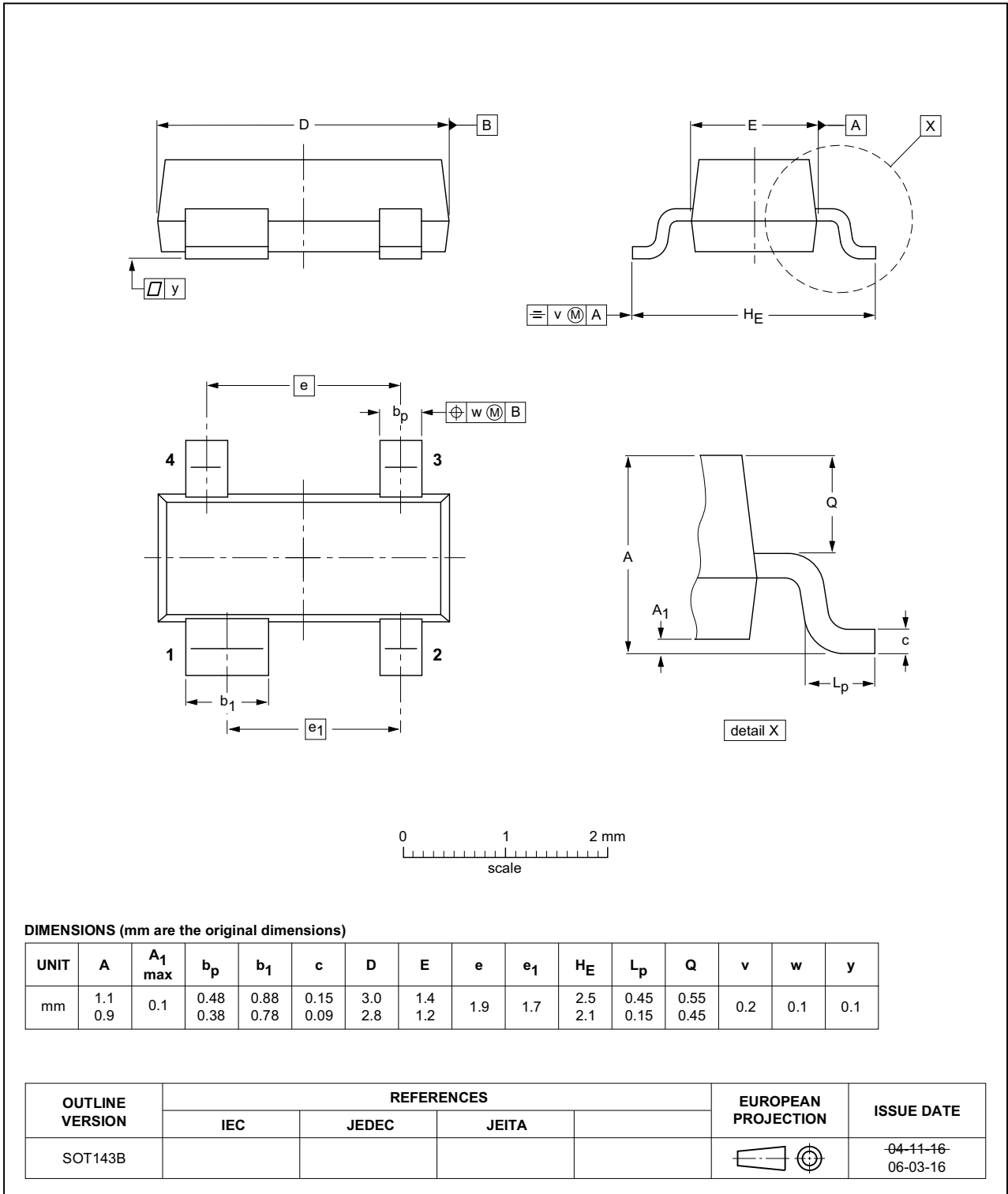


Fig 4. Package outline SOT143B

Plastic surface-mounted package; reverse pinning; 4 leads

SOT143R

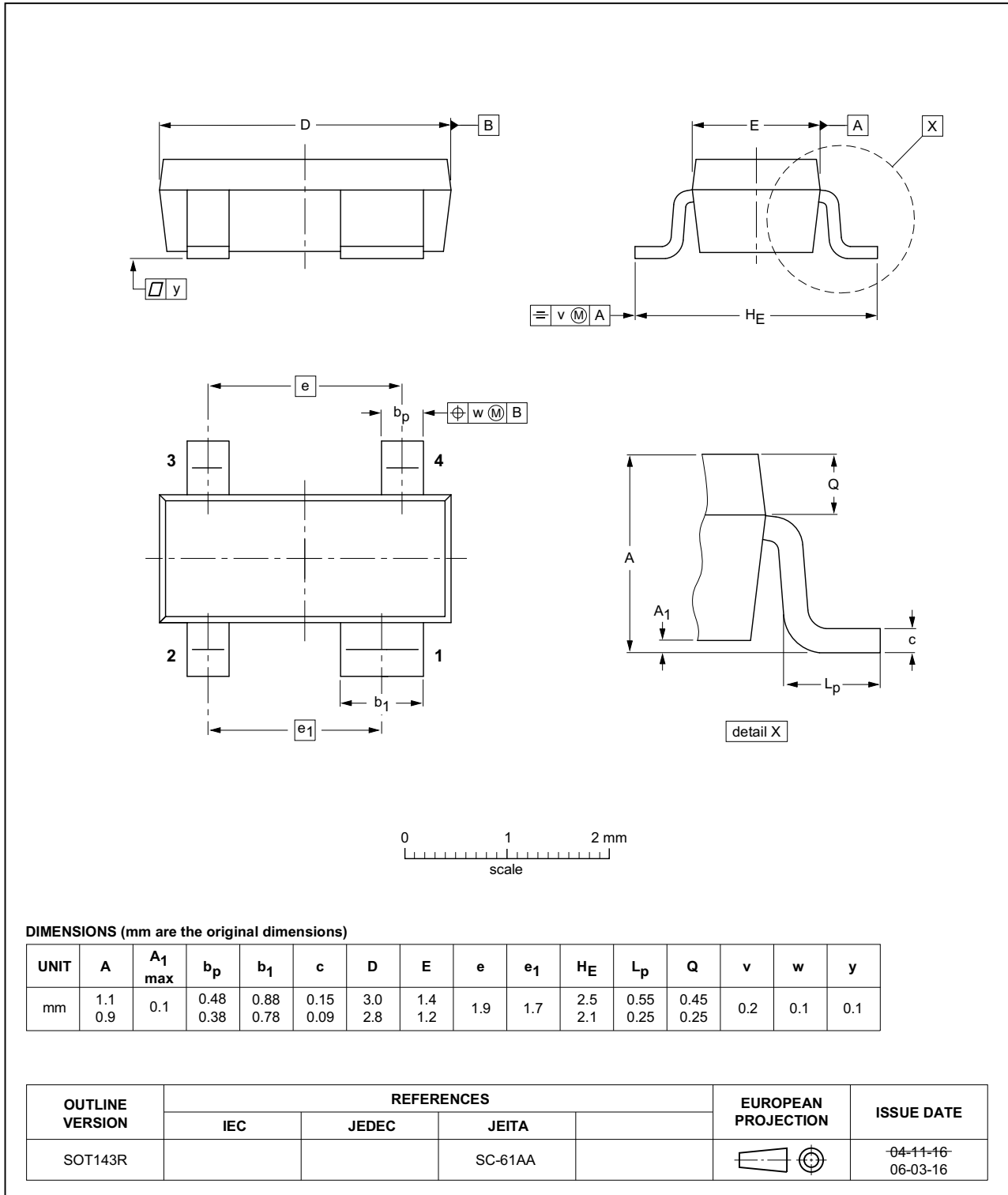


Fig 5. Package outline SOT143R

Plastic surface-mounted package; 4 leads

SOT343N

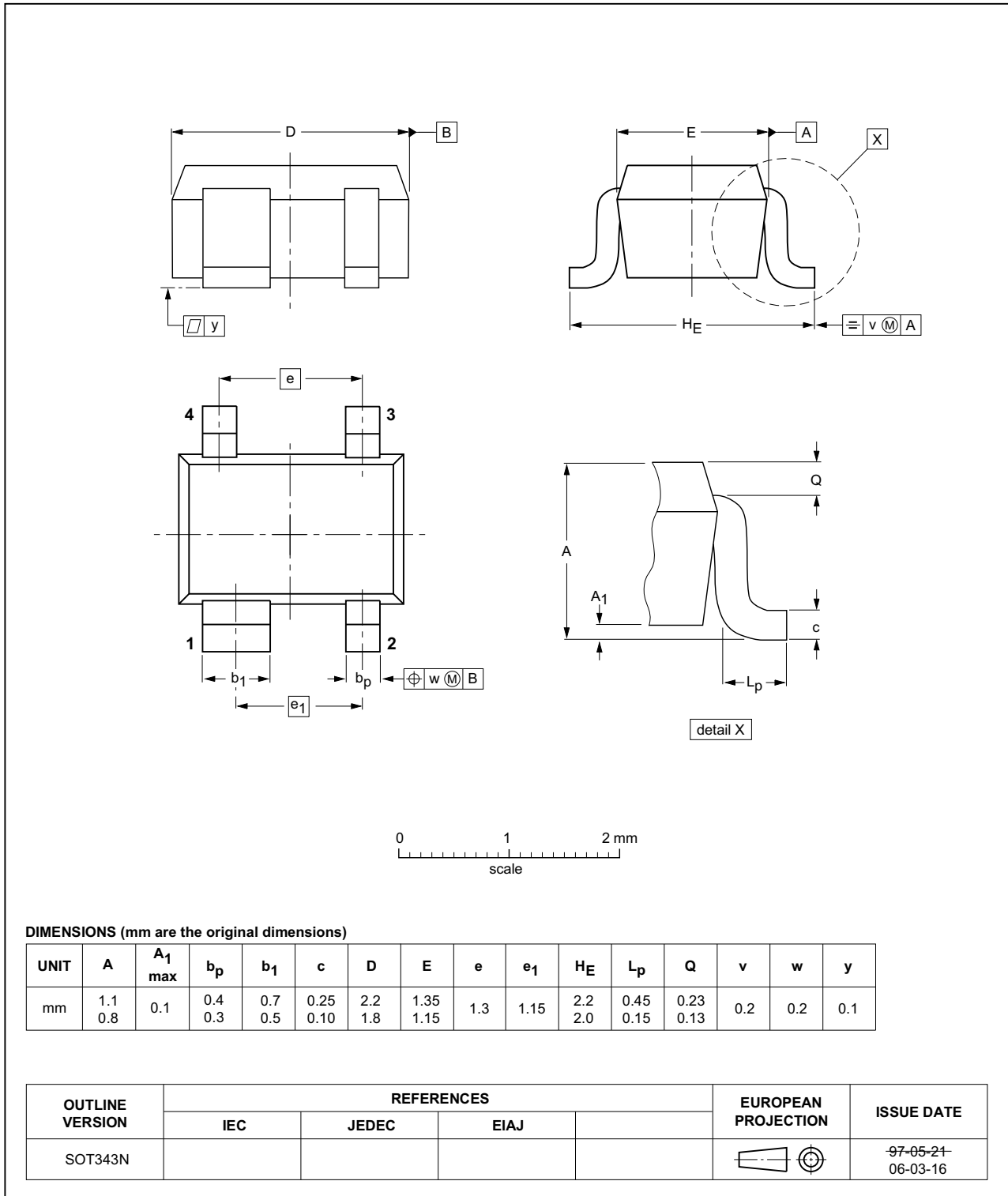


Fig 6. Package outline SOT343N

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R

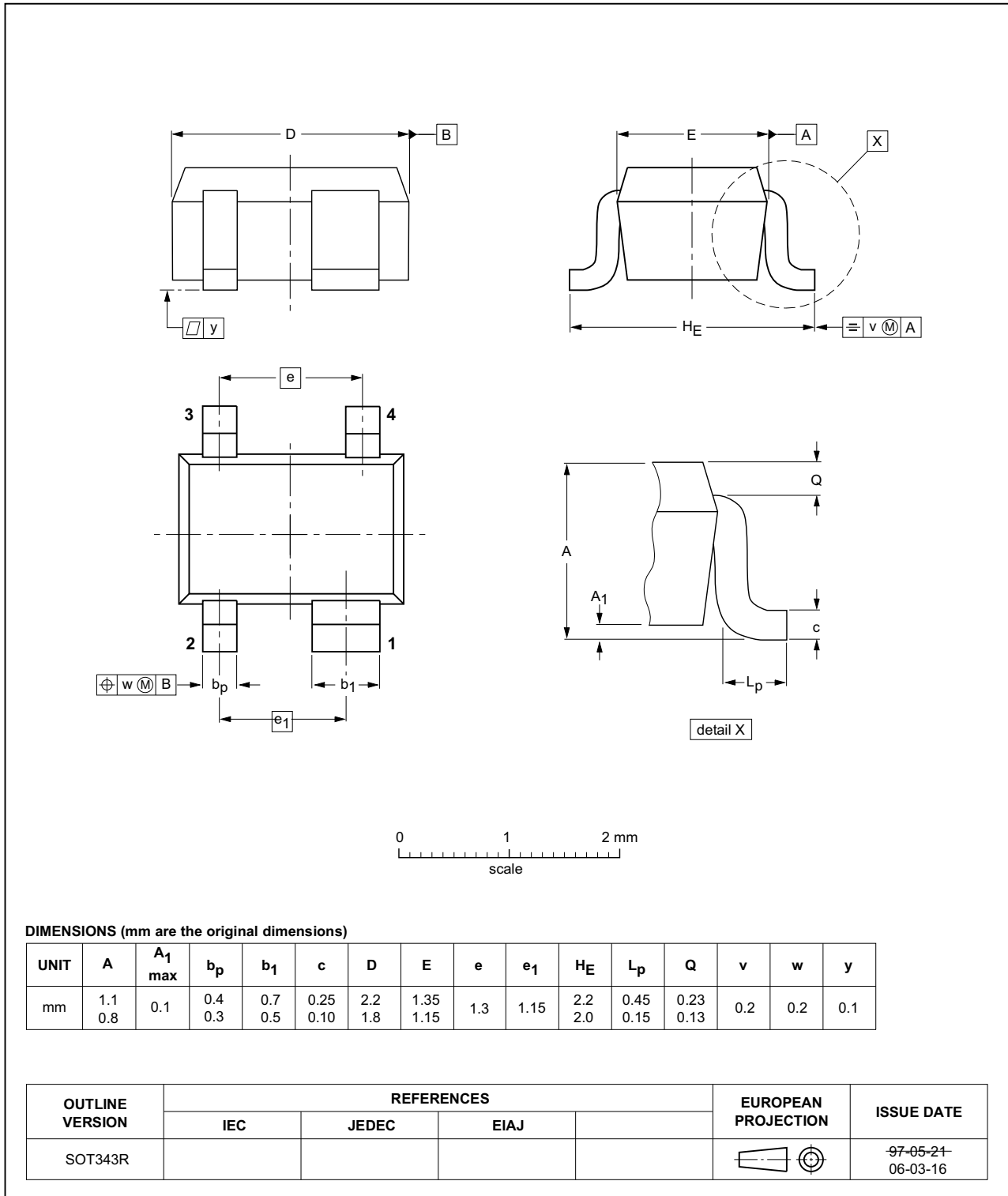


Fig 7. Package outline SOT343R

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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

13.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

13.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the

product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

13.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

14. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

15. Contents

1 Product profile 1

1.1 General description 1

1.2 Features and benefits 1

1.3 Applications 1

1.4 Quick reference data 1

2 Pinning information 2

3 Ordering information 2

4 Marking 3

5 Limiting values 3

6 Thermal characteristics 3

7 Static characteristics 4

8 Dynamic characteristics 4

9 Package outline 6

10 Handling information 10

11 Abbreviations 10

12 Revision history 10

13 Legal information 11

13.1 Data sheet status 11

13.2 Definitions 11

13.3 Disclaimers 11

13.4 Trademarks 12

14 Contact information 12

15 Contents 13

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP Semiconductors N.V. 2014. All rights reserved.

For more information, please visit: <http://www.nxp.com>
 For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 14 November 2014
 Document identifier: BF1118_1118R_1118W_1118WR