BSR16

60V, 600 mA, PNP switching transistor

24 April 2015 **Product data sheet**

1. General description

PNP switching transistor in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complement: BSR14

2. Features and benefits

- Single general-purpose switching transistor
- AEC-Q101 qualified

3. Applications

- Switching and linear amplification

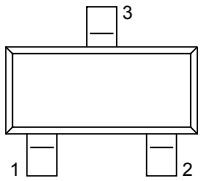
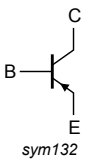
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-60	V
I_C	collector current			-	-	-600	mA
h_{FE}	DC current gain	V_{CE} = -10 V; I_C = -150 mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; T_{amb} = 25 °C		100	-	300	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-236AB (SOT23)	
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSR16	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code [1]
BSR16	T8%

[1] % = placeholder for manufacturing site code

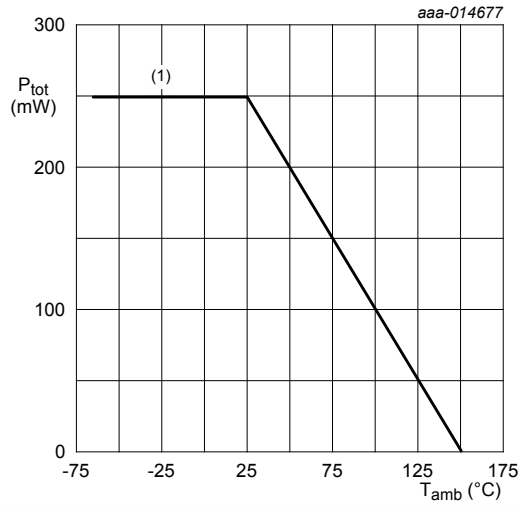
8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-60	V
V_{CEO}	collector-emitter voltage	open base		-	-60	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
I_C	collector current			-	-600	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-800	mA
I_{BM}	peak base current			-	-200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	250	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	150	°C
T_{stg}	storage temperature			-65	150	°C

[1] Transistor mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



(1) FR4 PCB; standard footprint

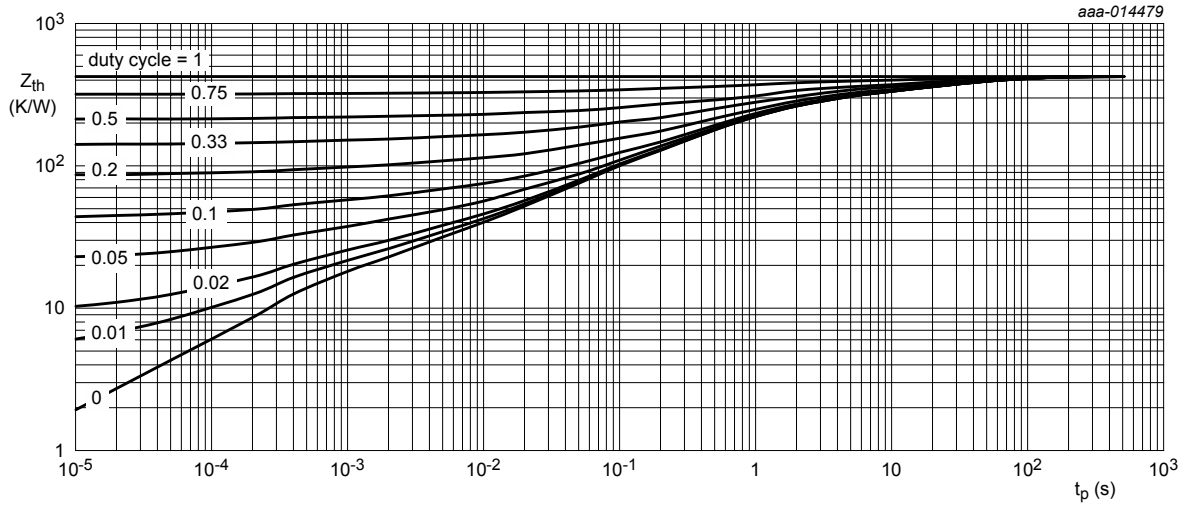
Fig. 1. Power derating curve

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	500	K/W

[1] Transistor mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and standard footprint.



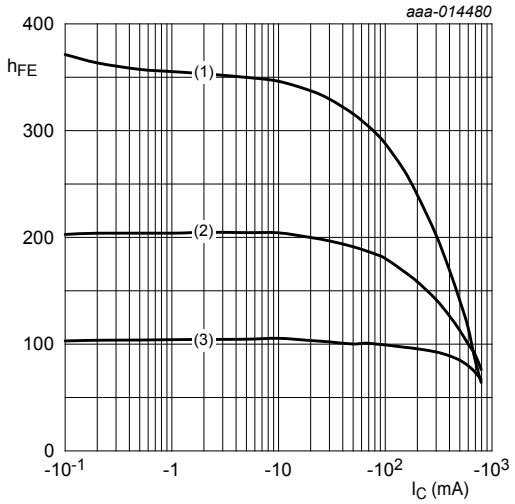
Mounted on FR4 PCB; standard footprint.

Fig. 2. Transient thermal impedance as a function of pulse time; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -50 V; I_E = 0 A; T_{amb} = 25 °C		-	-	-10	nA
		V_{CB} = -50 V; I_E = 0 A; T_j = 150 °C		-	-	-10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	-50	nA
h_{FE}	DC current gain	V_{CE} = -10 V; I_C = -0.1 mA; T_{amb} = 25 °C		75	-	-	
		V_{CE} = -10 V; I_C = -1 mA; T_{amb} = 25 °C		100	-	-	
		V_{CE} = -10 V; I_C = -10 mA; T_{amb} = 25 °C		100	-	-	
		V_{CE} = -10 V; I_C = -150 mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; T_{amb} = 25 °C		100	-	300	
		V_{CE} = -10 V; I_C = -500 mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; T_{amb} = 25 °C		50	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -150 mA; I_B = -15 mA; T_{amb} = 25 °C		-	-	-400	mV
		I_C = -500 mA; I_B = -50 mA; T_{amb} = 25 °C		-	-	-1.6	V
V_{BEsat}	base-emitter saturation voltage	I_C = -150 mA; I_B = -15 mA; T_{amb} = 25 °C		-	-	-1.3	V
		I_C = -500 mA; I_B = -50 mA; T_{amb} = 25 °C		-	-	-2.6	V
t_d	delay time	I_C = -150 mA; I_{Bon} = -15 mA; I_{Boff} = 15 mA; T_{amb} = 25 °C		-	-	12	ns
t_r	rise time			-	-	30	ns
t_{on}	turn-on time			-	-	40	ns
t_s	storage time			-	-	300	ns
t_f	fall time			-	-	65	ns
t_{off}	turn-off time			-	-	365	ns
C_C	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	8	pF
C_E	emitter capacitance	V_{EB} = -2 V; I_C = 0 A; i_c = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	30	pF
f_T	transition frequency	V_{CE} = -20 V; I_C = -50 mA; f = 100 MHz; T_{amb} = 25 °C		200	-	-	MHz



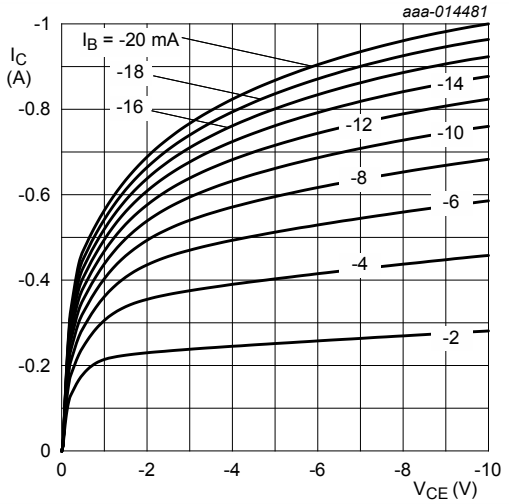
V_{CE} = -10 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

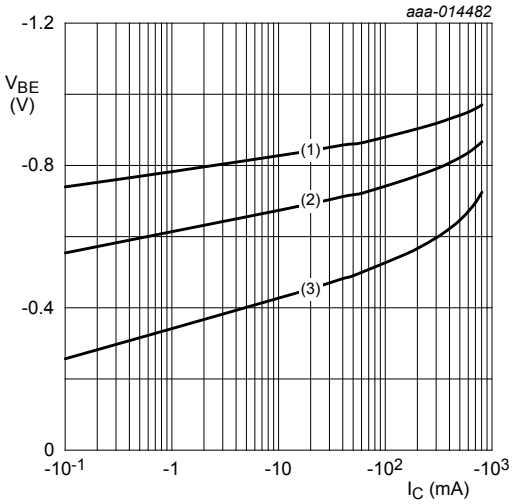
(3) T_{amb} = −55 °C

Fig. 3. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig. 4. Collector current as a function of collector-emitter voltage; typical values



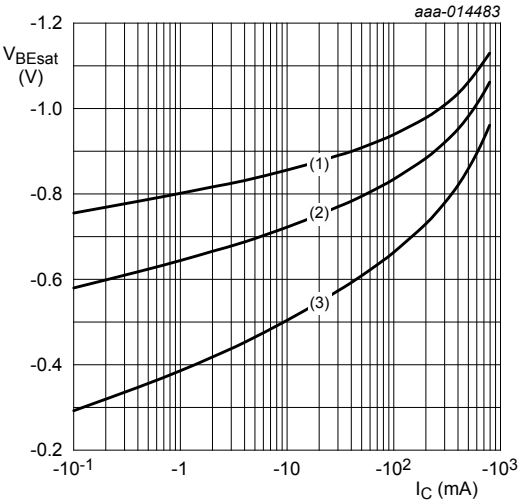
V_{CE} = -10 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig. 5. Base-emitter voltage as a function of collector current; typical values



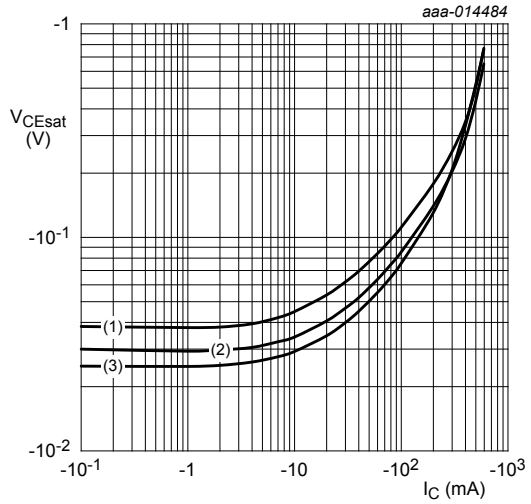
I_C/I_B = 10

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig. 6. Base-emitter saturation voltage as a function of collector current; typical values



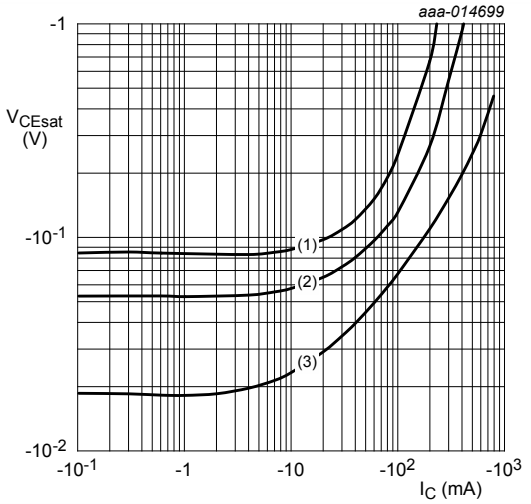
I_C/I_B = 20

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig. 7. Collector-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

11. Test information

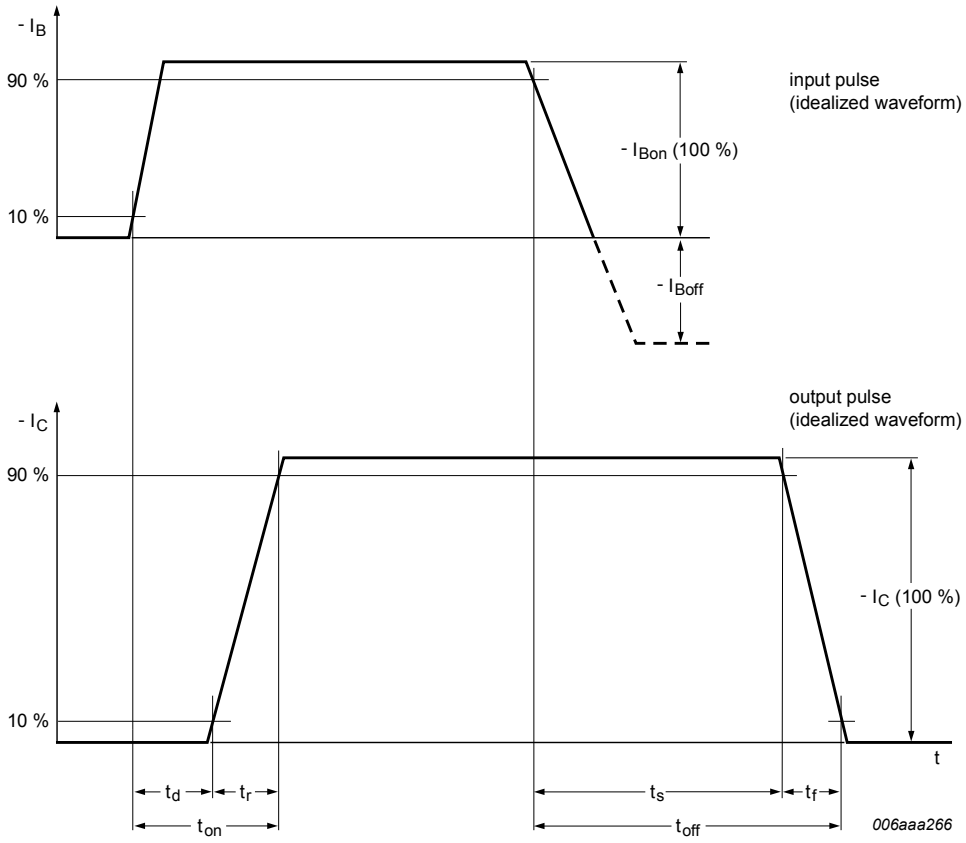


Fig. 9. BISS transistor switching time definition

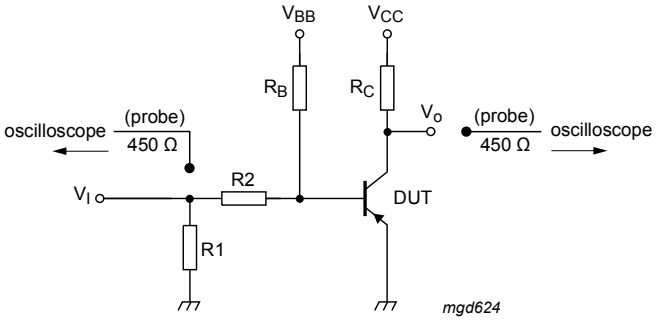


Fig. 10. Test circuit for switching times

11.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

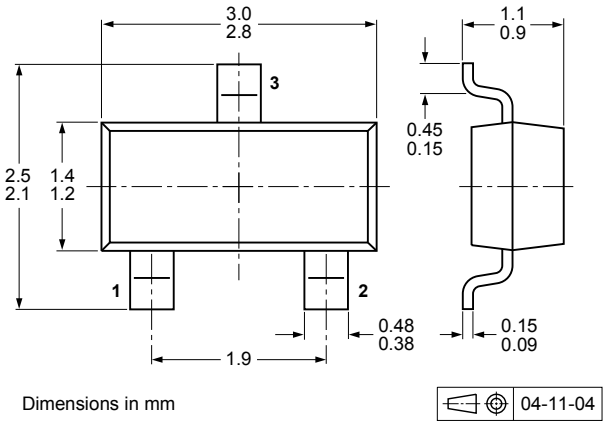


Fig. 11. Package outline TO-236AB (SOT23)

13. Soldering

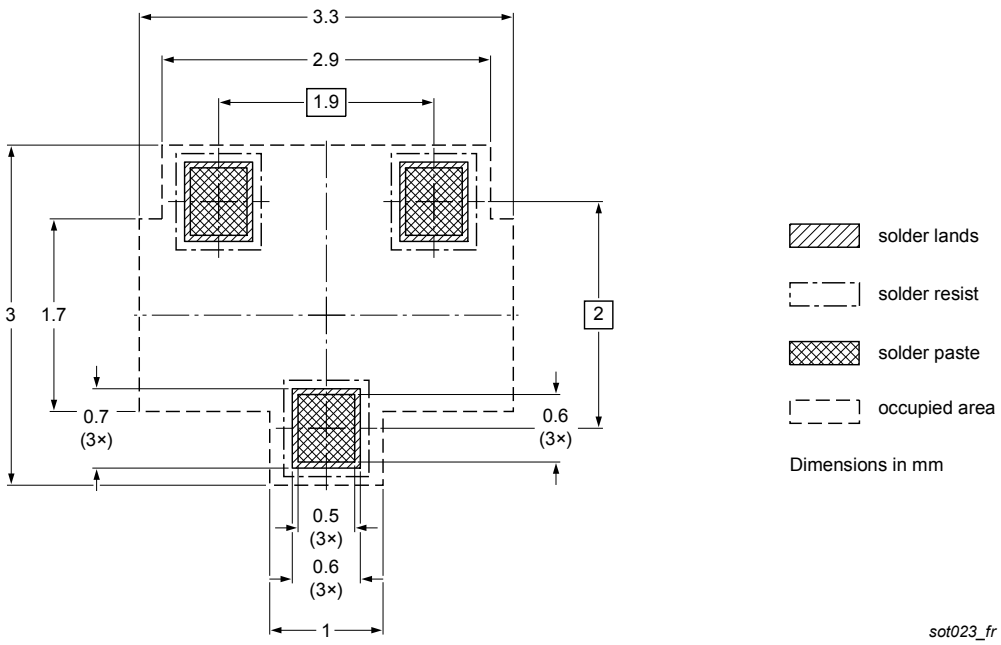


Fig. 12. Reflow soldering footprint for TO-236AB (SOT23)

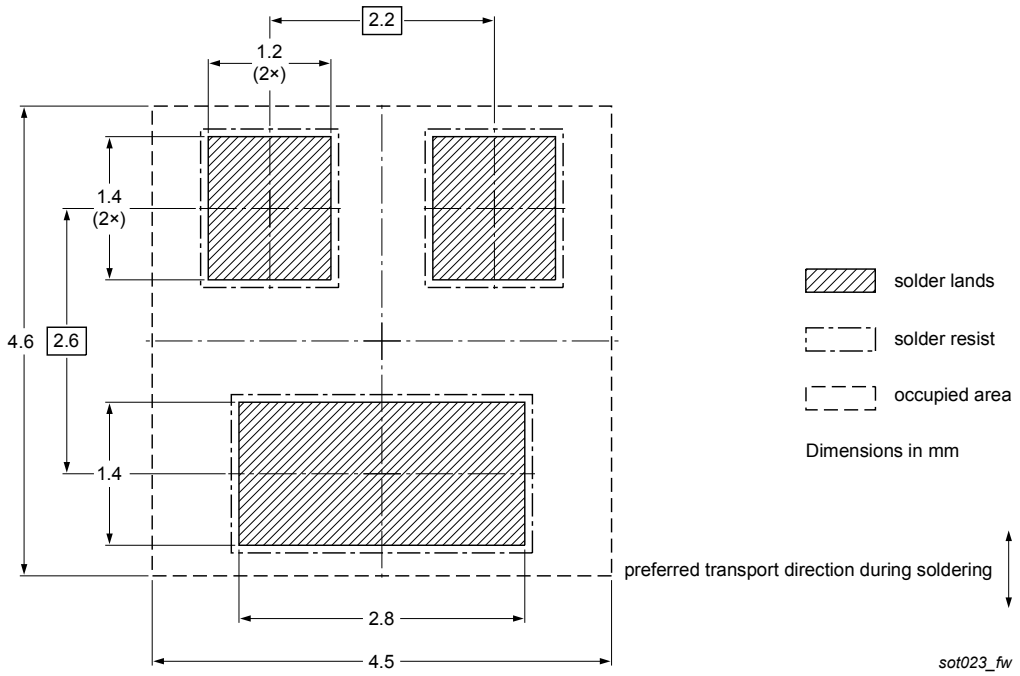


Fig. 13. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSR16 v.5	20150424	Product data sheet	-	BSR15; BSR16 v.4
Modifications:	• Type BSR15 removed • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors • Legal texts have been adapted to the new company name where appropriate			
BSR15; BSR16 v.4	20040113	Product data sheet	-	BSR15; BSR16 v.3
BSR15; BSR16 v.3	19990415	Product data sheet	-	-

15. Legal information

15.1 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.nexperia.com.

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16. Contents

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Date of release: 24 April 2015

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