



# PMBT3906MB

40 V, 200 mA PNP switching transistor

2 February 2018

Product data sheet

## 1. General description

PNP single switching transistor in a leadless ultra small DFN1006B-3 (SOT883B) Surface-Mounted Device (SMD) plastic package.

NPN complement: PMBT3904MB.

## 2. Features and benefits

- Single general-purpose switching transistor
- AEC-Q101 qualified
- Ultra small SMD plastic package
- Board-space reduction
- Low package height of 0.37 mm

## 3. Applications

- General-purpose switching and amplification
- Mobile applications

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-40	V
$I_C$	collector current		-	-	-200	mA
$h_{FE}$	DC current gain	$V_{CE} = -1\text{ V}; I_C = -10\text{ mA}$	100	180	300	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	<p>Transparent top view DFN1006B-3 (SOT883B)</p>	<p>sym013</p>
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMBT3906MB	DFN1006B-3	plastic, leadless ultra small plastic package; 3 solder lands; 0.35 mm pitch; 1.0 mm x 0.6 mm x 0.37 mm body	SOT883B

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMBT3906MB	0100 1000

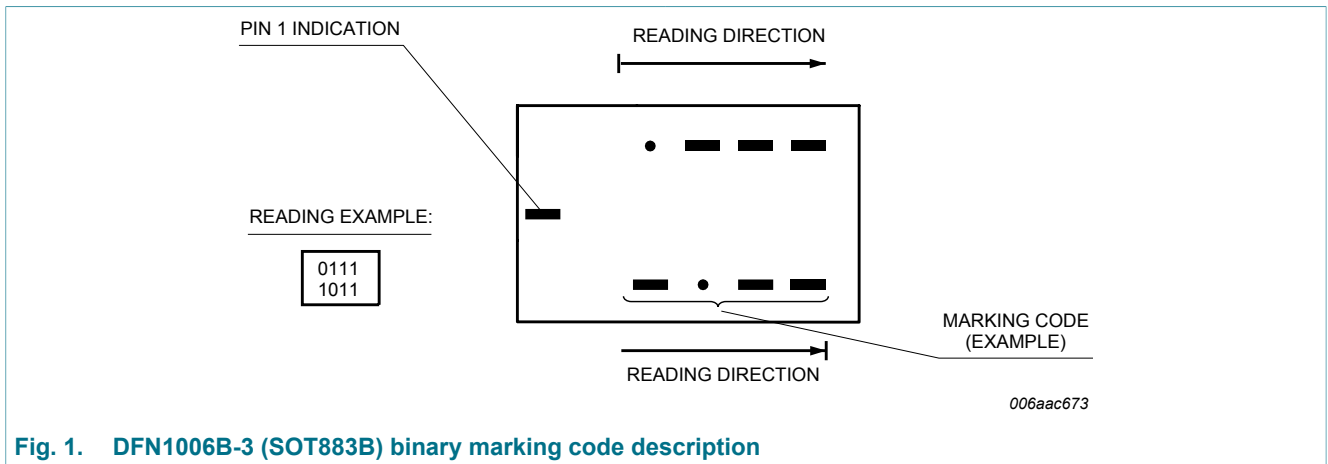


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

## 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		-	-40	V
$V_{CEO}$	collector-emitter voltage	open base		-	-40	V
$V_{EBO}$	emitter-base voltage	open collector		-	-6	V
$I_C$	collector current			-	-200	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	-200	mA
$I_{BM}$	peak base current			-	-100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1] [2]	-	250	mW
			[1] [3]	-	590	mW
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C

[1] Reflow soldering is the only recommended soldering method.

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

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 9. Thermal characteristics

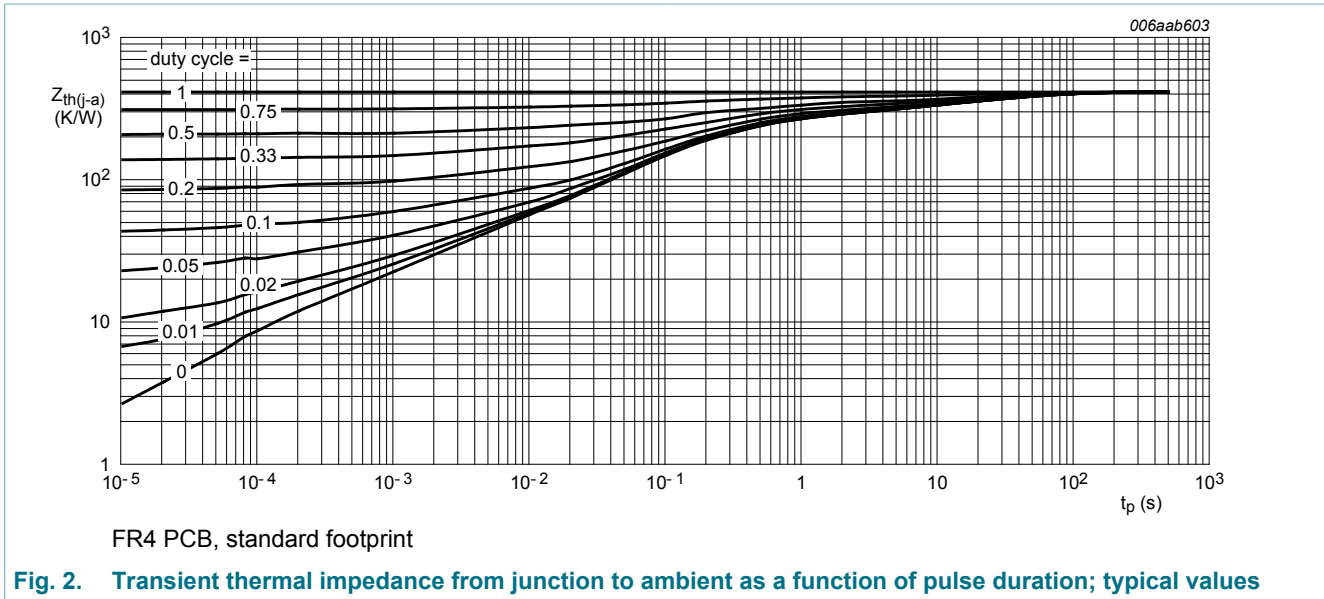
**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	500	K/W
			[1] [3]	-	-	212	K/W

[1] Reflow soldering is the only recommended soldering method.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



## 10. Characteristics

**Table 7. Characteristics**
*T<sub>amb</sub> = 25 °C unless otherwise specified*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = -30 V; I <sub>E</sub> = 0 A	-	-	-50	nA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = -6 V; I <sub>C</sub> = 0 A	-	-	-50	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = -1 V; I <sub>C</sub> = -0.1 mA	60	180	-	
		V <sub>CE</sub> = -1 V; I <sub>C</sub> = -1 mA	80	180	-	
		V <sub>CE</sub> = -1 V; I <sub>C</sub> = -10 mA	100	180	300	
		V <sub>CE</sub> = -1 V; I <sub>C</sub> = -50 mA	60	130	-	
		V <sub>CE</sub> = -1 V; I <sub>C</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02	30	50	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = -10 mA; I <sub>B</sub> = -1 mA	-	-100	-250	mV
		I <sub>C</sub> = -50 mA; I <sub>B</sub> = -5 mA	-	-165	-400	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = -10 mA; I <sub>B</sub> = -1 mA	-	-750	-850	mV
		I <sub>C</sub> = -50 mA; I <sub>B</sub> = -5 mA	-	-850	-950	mV
t <sub>d</sub>	delay time	I <sub>C</sub> = -10 mA; I <sub>Bon</sub> = -1 mA; I <sub>Boff</sub> = 1 mA; V <sub>CC</sub> = -3 V	-	-	35	ns
t <sub>r</sub>	rise time		-	-	35	ns
t <sub>on</sub>	turn-on time		-	-	70	ns
t <sub>s</sub>	storage time		-	-	225	ns
t <sub>f</sub>	fall time		-	-	75	ns
t <sub>off</sub>	turn-off time		-	-	300	ns
C <sub>c</sub>	collector capacitance		V <sub>CB</sub> = -5 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A; f = 1 MHz	-	-	4.5
C <sub>e</sub>	emitter capacitance	V <sub>EB</sub> = -500 mV; I <sub>C</sub> = 0 A; i <sub>c</sub> = 0 A; f = 1 MHz	-	-	10	pF
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = -20 V; I <sub>C</sub> = -10 mA; f = 100 MHz	250	-	-	MHz
NF	noise figure	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -100 μA; R <sub>S</sub> = 1 kΩ; 10 Hz ≤ f ≤ 15700 Hz	-	-	4	dB

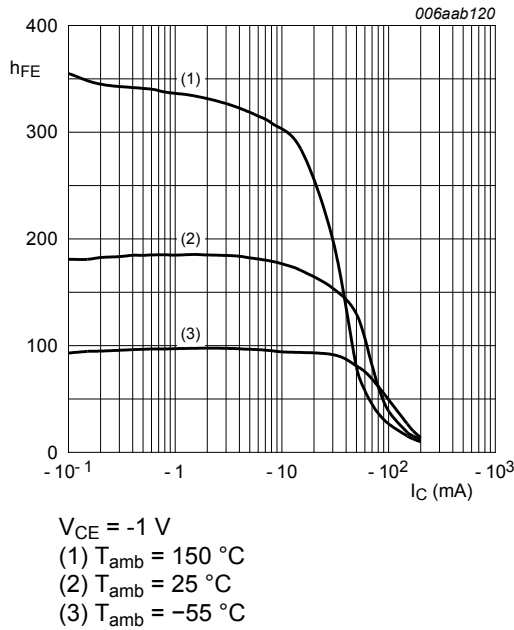


Fig. 3. DC current gain as a function of collector current; typical values

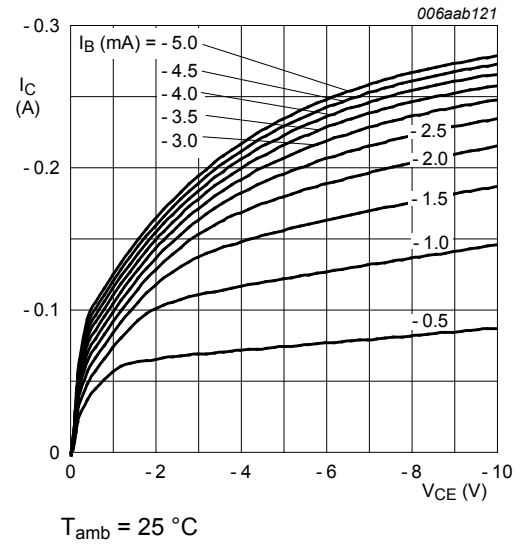


Fig. 4. Collector current as a function of collector-emitter voltage; typical values

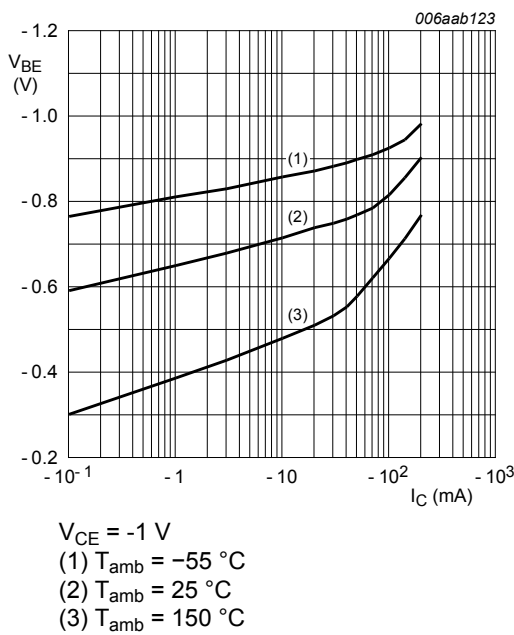


Fig. 5. Base-emitter voltage as a function of collector current; typical values

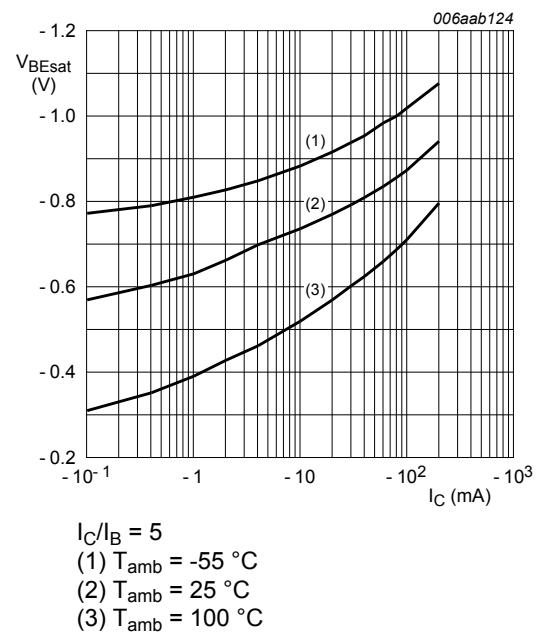
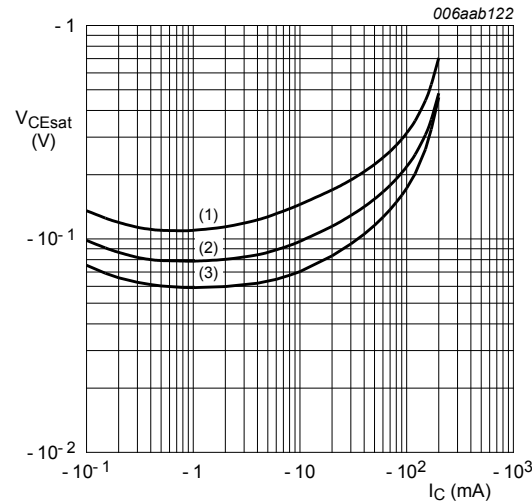


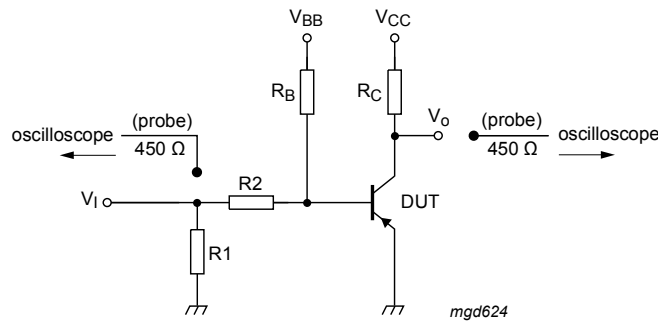
Fig. 6. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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

### 11. Test information



$V_I = -5\text{ V}$ ;  $T = 600\text{ }\mu\text{s}$ ;  $t_p = 10\text{ }\mu\text{s}$ ;  $t_r = t_f \leq 3\text{ ns}$   
 $R_1 = 56\text{ }\Omega$ ;  $R_2 = 2.5\text{ k}\Omega$ ;  $R_B = 3.9\text{ k}\Omega$ ;  $R_C = 270\text{ }\Omega$   
 $V_{BB} = 1.9\text{ V}$ ;  $V_{CC} = -3\text{ V}$   
 Oscilloscope: input impedance  $Z_i = 50\text{ }\Omega$

Fig. 8. Test circuit for switching times

#### 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

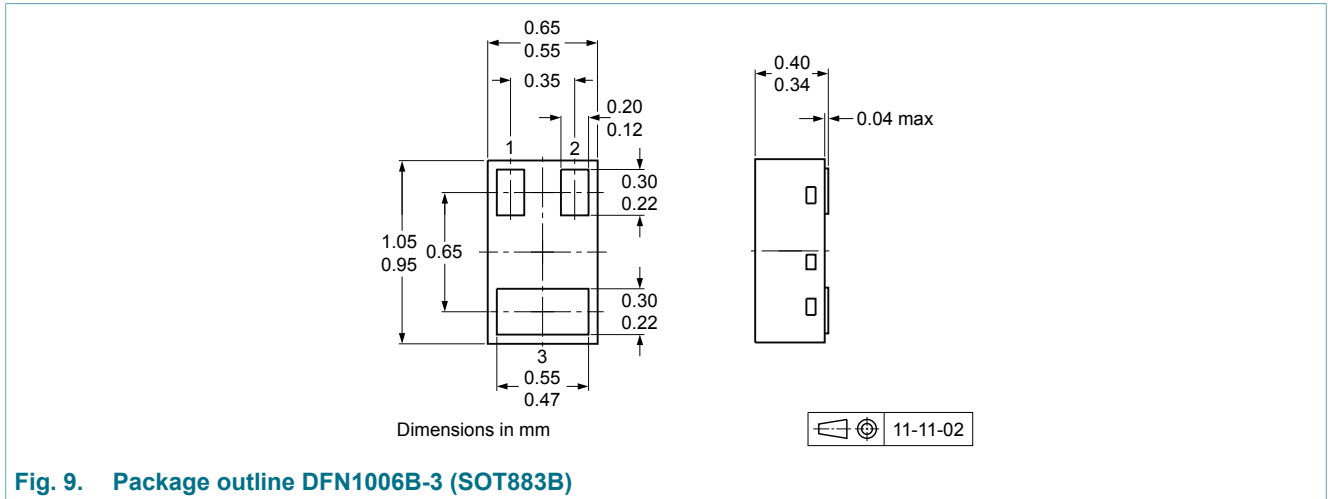


Fig. 9. Package outline DFN1006B-3 (SOT883B)

## 13. Soldering

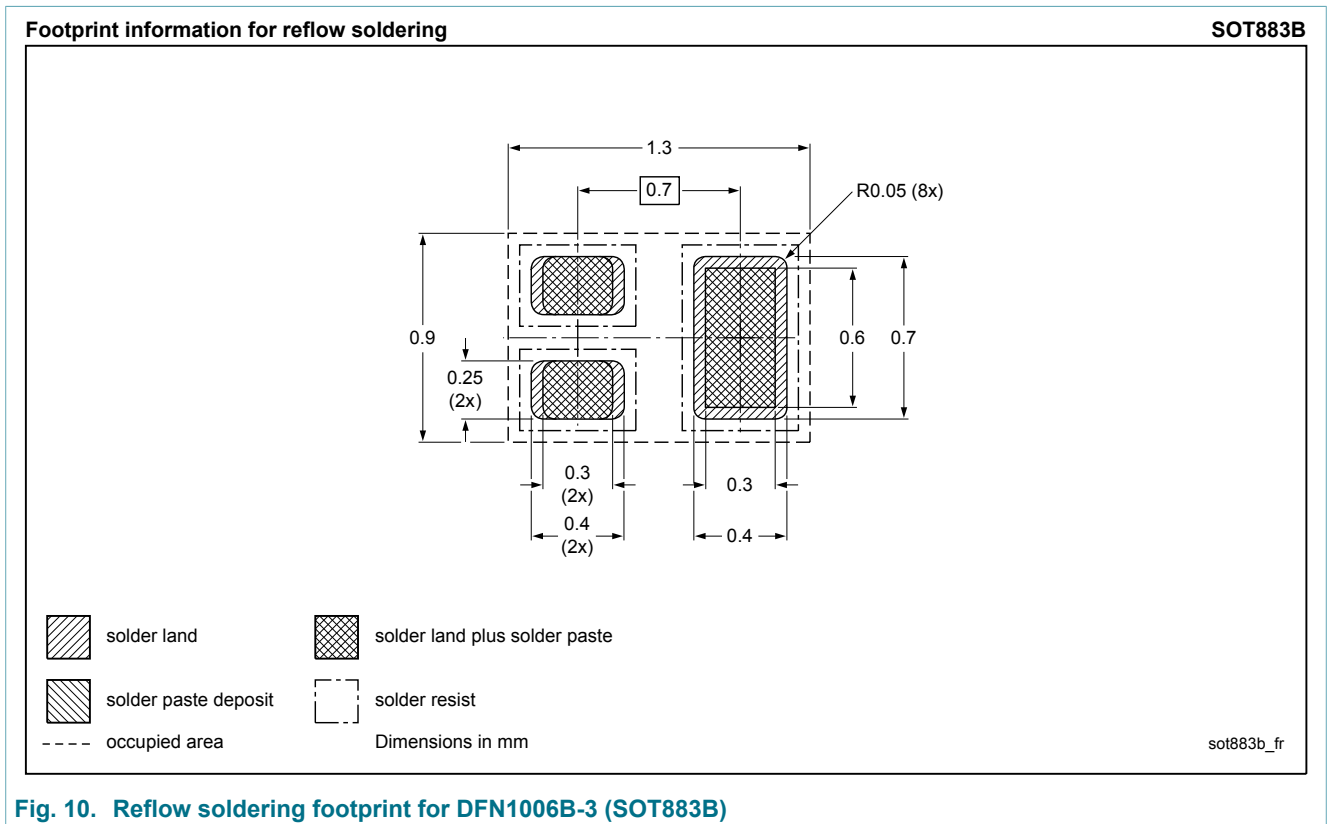


Fig. 10. Reflow soldering footprint for DFN1006B-3 (SOT883B)



## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMBT3906MB v.2	20180202	Product data sheet	-	PMBT3906MB v.1
Modifications:	<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Packing information removed.</li><li>• Test information to PNP-version corrected.</li></ul>			
PMBT3906MB v.1	20120402	Product data sheet	-	-

## 15. Legal information

### 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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Date of release: 2 February 2018

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