

PMBT3904YS

40 V, 200 mA NPN/NPN general-purpose double transistor

Rev. 01 — 12 May 2009

Product data sheet

1. Product profile

1.1 General description

NPN/NPN general-purpose double transistor in a SOT363 (SC-88) very small Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP/PNP complement	NPN/PNP complement	Package configuration
	NXP	JEITA			
PMBT3904YS	SOT363	SC-88	PMBT3906YS	PMBT3946YPN	very small

1.2 Features

- General-purpose double transistor
- Board-space reduction

1.3 Applications

- General-purpose switching and amplification

1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
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	

2. Pinning information

Table 3. Pinning			
Pin	Description	Simplified outline	Graphic symbol
1	emitter TR1		
2	base TR1		
3	collector TR2		
4	emitter TR2		
5	base TR2		
6	collector TR1		
sym020			

3. Ordering information

Table 4. Ordering information			
Type number	Package		
	Name	Description	Version
PMBT3904YS	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes	
Type number	Marking code ^[1]
PMBT3904YS	BC*

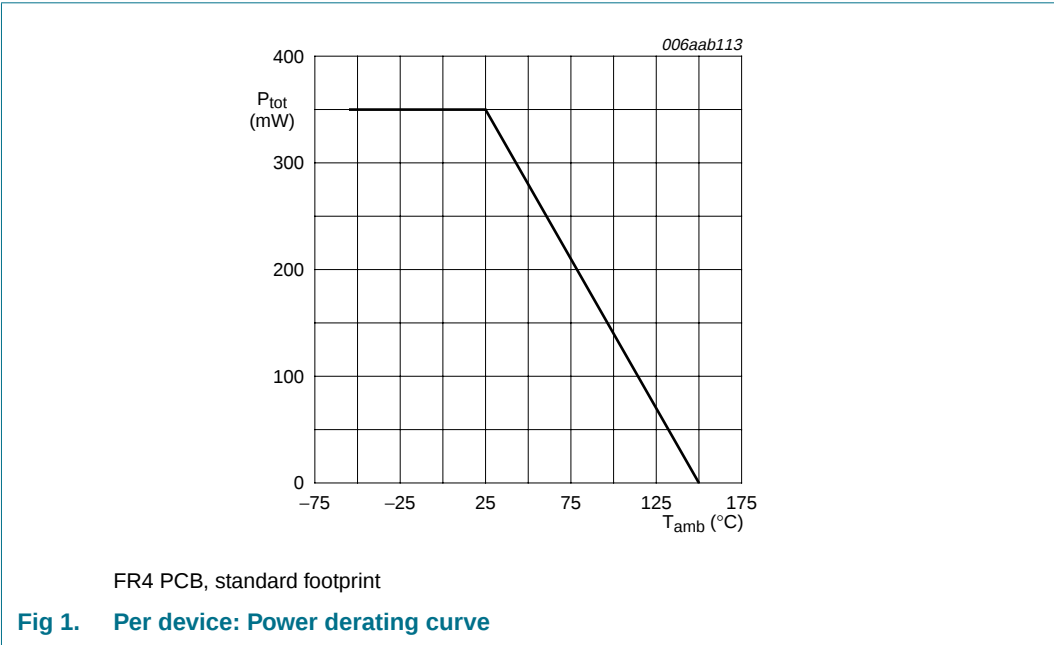
[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

5. Limiting values

Table 6. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
Per transistor					
V _{CBO}	collector-base voltage	open emitter	-	60	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 ≤ 1 ms	-	200	mA
I _{BM}	peak base current	single pulse; t _p ≤ 1 ms	-	100	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1] -	230	mW
Per device					
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1] -	350	mW
T _j	junction temperature		-	150	°C
T _{amb}	ambient temperature		-55	+150	°C
T _{stg}	storage temperature		-65	+150	°C

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

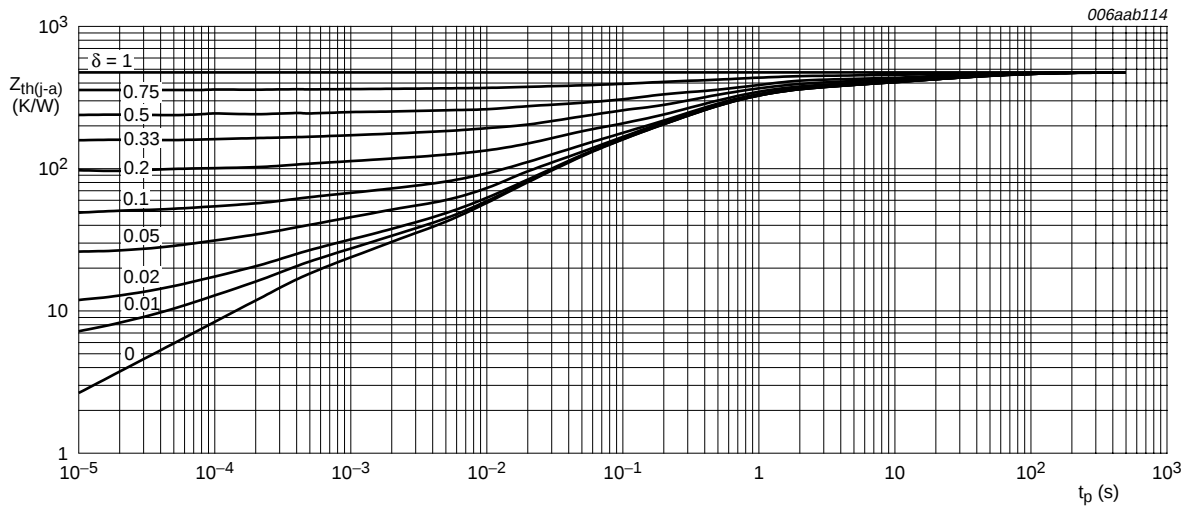


6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	543	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	290	K/W
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	357	K/W

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



FR4 PCB, standard footprint

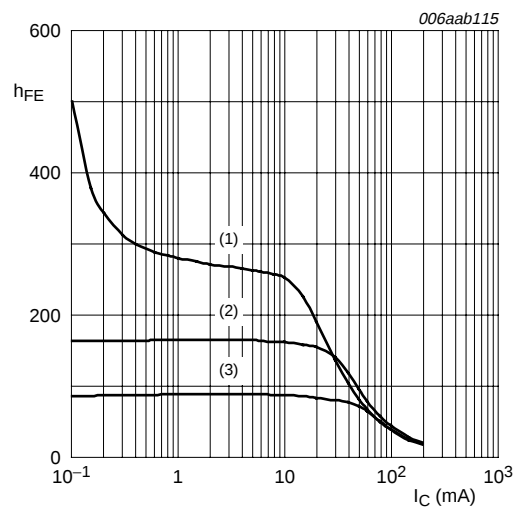
Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 8. Characteristics

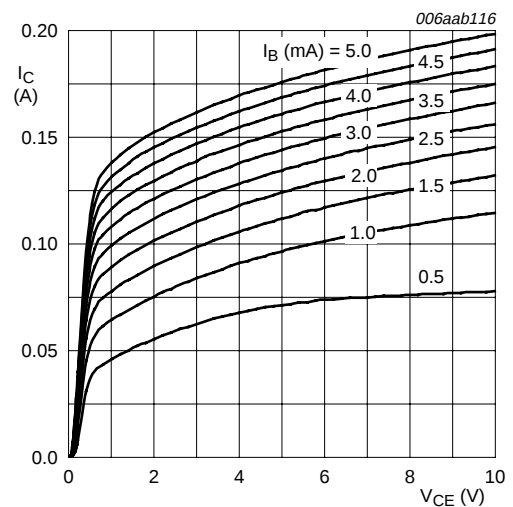
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	50	nA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 6\text{ V}; I_C = 0\text{ A}$	-	-	50	nA
h_{FE}	DC current gain	$V_{CE} = 1\text{ V}$				
		$I_C = 0.1\text{ mA}$	60	180	-	
		$I_C = 1\text{ mA}$	80	180	-	
		$I_C = 10\text{ mA}$	100	180	300	
		$I_C = 50\text{ mA}$	60	105	-	
		$I_C = 100\text{ mA}$	30	50	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	-	75	200	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	-	120	300	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	650	750	850	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	-	850	950	mV
f_T	transition frequency	$V_{CE} = 20\text{ V}; I_C = 10\text{ mA};$ $f = 100\text{ MHz}$	300	-	-	MHz
C_C	collector capacitance	$V_{CB} = 5\text{ V}; I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	-	4	pF
C_e	emitter capacitance	$V_{BE} = 0.5\text{ V}; I_C = i_c = 0\text{ A};$ $f = 1\text{ MHz}$	-	-	8	pF
NF	noise figure	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A};$ $R_S = 1\text{ k}\Omega;$ $f = 10\text{ Hz to }15.7\text{ kHz}$	-	-	5	dB
t_d	delay time	$V_{CC} = 3\text{ V}; I_C = 10\text{ mA};$	-	-	35	ns
t_r	rise time	$I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$	-	-	35	ns
t_{on}	turn-on time		-	-	70	ns
t_s	storage time		-	-	200	ns
t_f	fall time		-	-	50	ns
t_{off}	turn-off time		-	-	250	ns



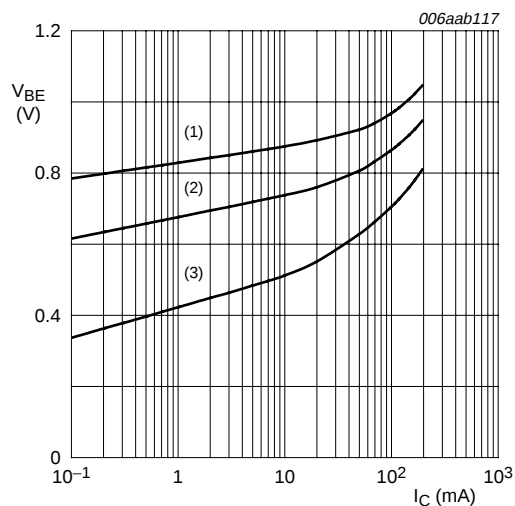
- $V_{CE} = 1\text{ V}$
- (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



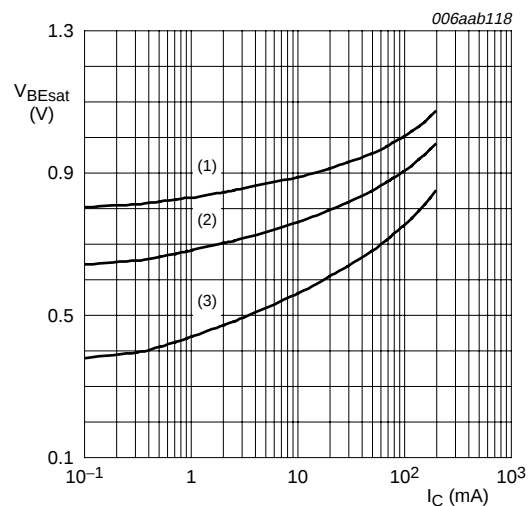
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



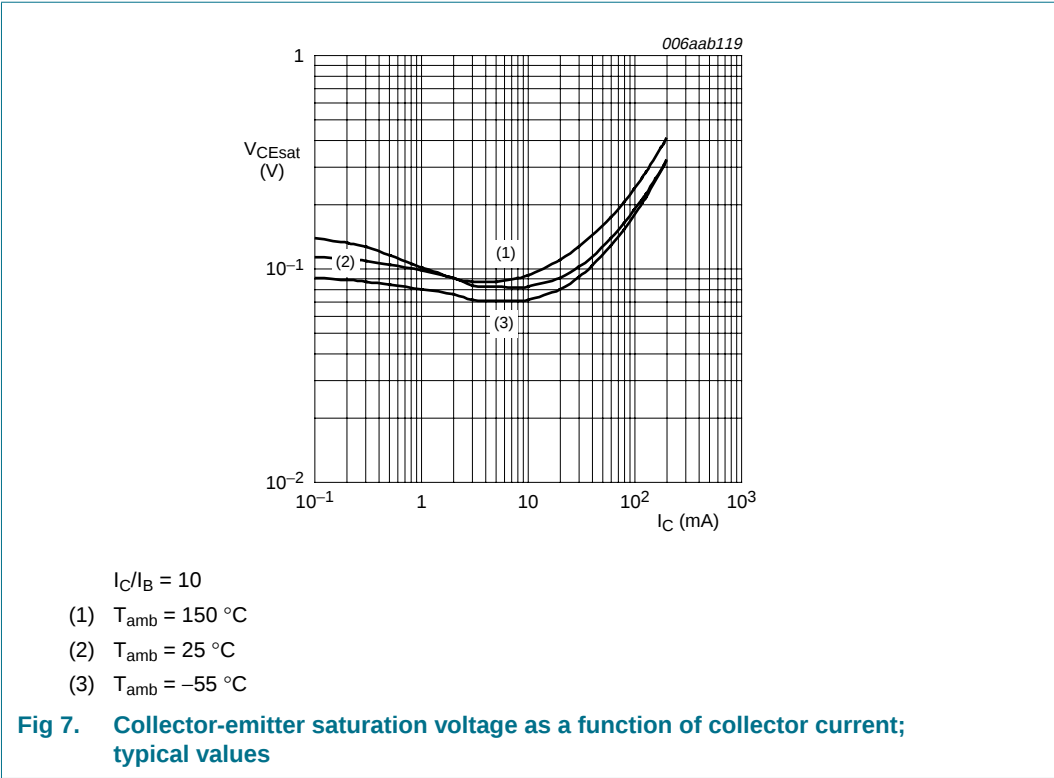
- $V_{CE} = 1\text{ V}$
- (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = 150\text{ }^{\circ}\text{C}$

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

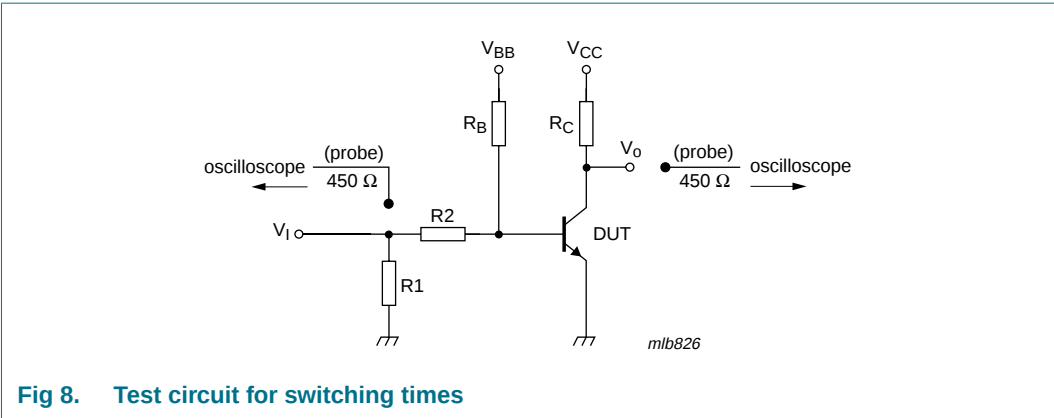


- $I_C/I_B = 10$
- (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = 150\text{ }^{\circ}\text{C}$

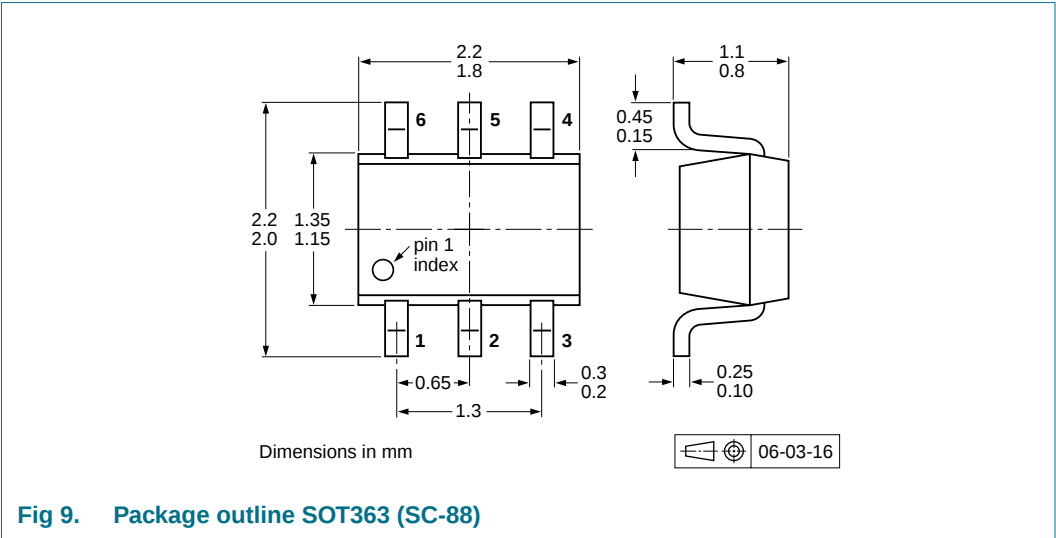
Fig 6. Base-emitter saturation voltage as a function of collector current; typical values



8. Test information



9. Package outline



10. Packing information

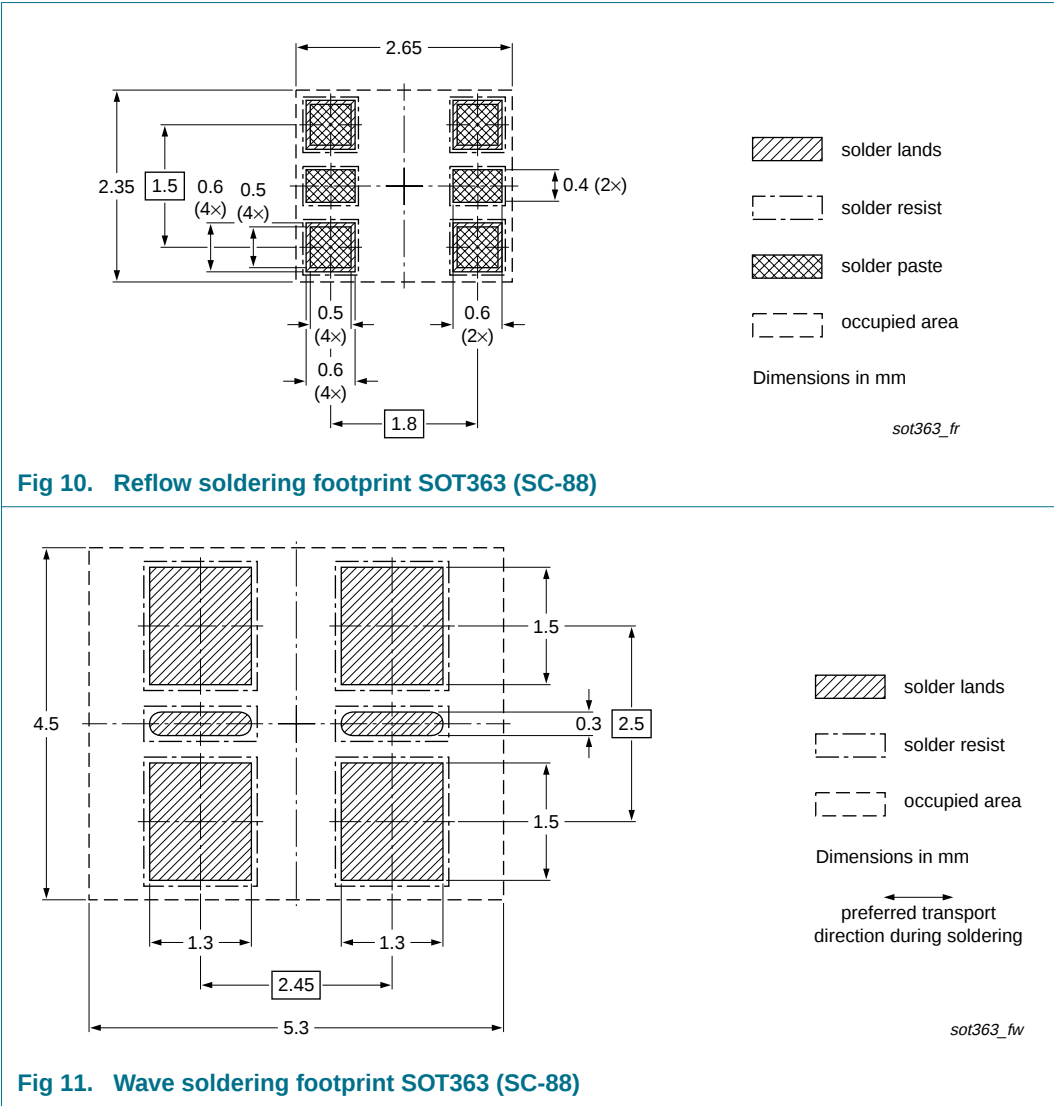
Table 9. Packing methods					
The indicated -xxx are the last three digits of the 12NC ordering code. ^[1]					
Type number	Package	Description	Packing quantity		
			3000	10000	
PMBT3904YS	SOT363	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-135	
		4 mm pitch, 8 mm tape and reel; T2	^[3] -125	-165	

[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMBT3904YS_1	20090512	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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