



PUMH20

50 V, 100 mA NPN/NPN resistor-equipped double transistor;
R1 = 2.2 k Ω , R2 = 2.2 k Ω

16 May 2023

Product data sheet

1. General description

NPN/NPN double Resistor-Equipped Transistor (RET) in a very small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package.

NPN/PNP complement: PUMD20

PNP/PNP complement: PUMB20

2. Features and benefits

- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified

3. Applications

- Low current peripheral driver
- Control of IC inputs
- Replacement of general-purpose transistors in digital applications

4. Quick reference data

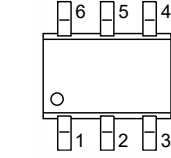
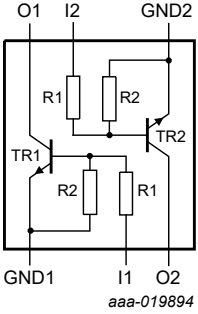
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current		-	-	100	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	

50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1 = 2.2 k Ω , R2 = 2.2 k Ω

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 <p>TSSOP6 (SOT363)</p>	 <p>aaa-019894</p>
2	I1	input (base) TR1		
3	O2	output (collector) TR2		
4	GND2	GND (emitter) TR2		
5	I2	input (base) TR2		
6	O1	output (collector) TR1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PUMH20	TSSOP6	plastic, surface-mounted package; 6 leads; 0.65 mm pitch; 2.1 mm x 1.25 mm x 0.95 mm body	SOT363

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PUMH20	H7%

[1] % = placeholder for manufacturing site code

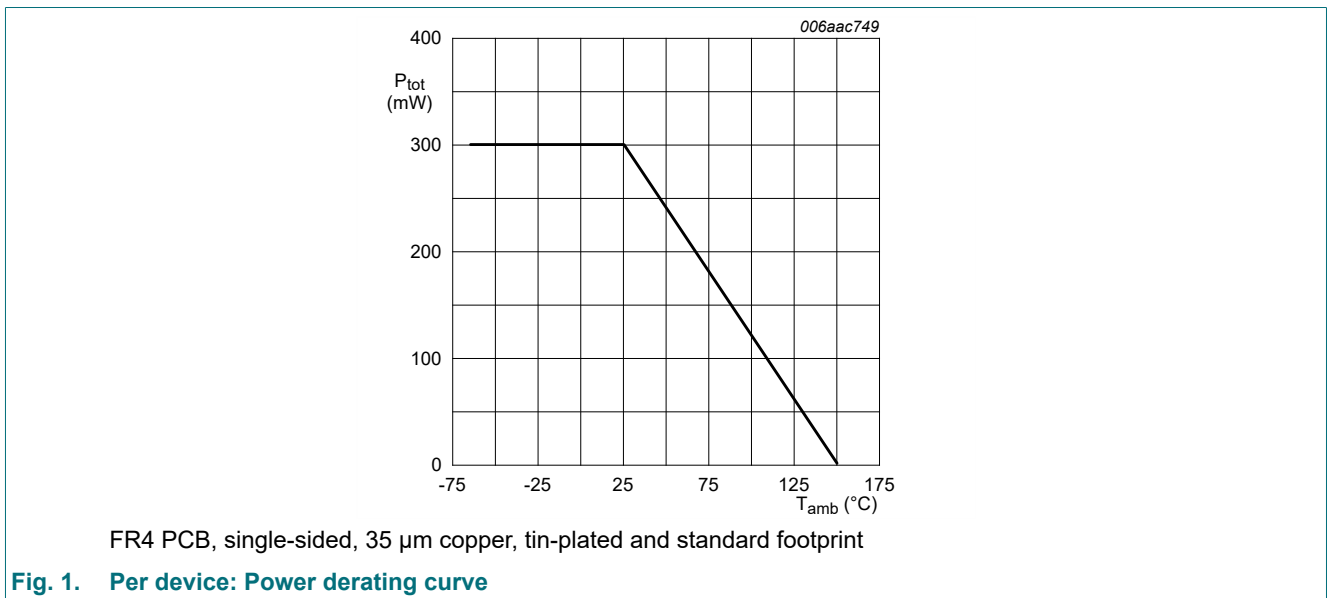
8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
V_{CBO}	collector-base voltage	open emitter		-	50	V
V_{CEO}	collector-emitter voltage	open base		-	50	V
V_{EBO}	emitter-base voltage	open collector		-	10	V
V_I	input voltage			-10	12	V
I_O	output current			-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	200	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	300	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	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.

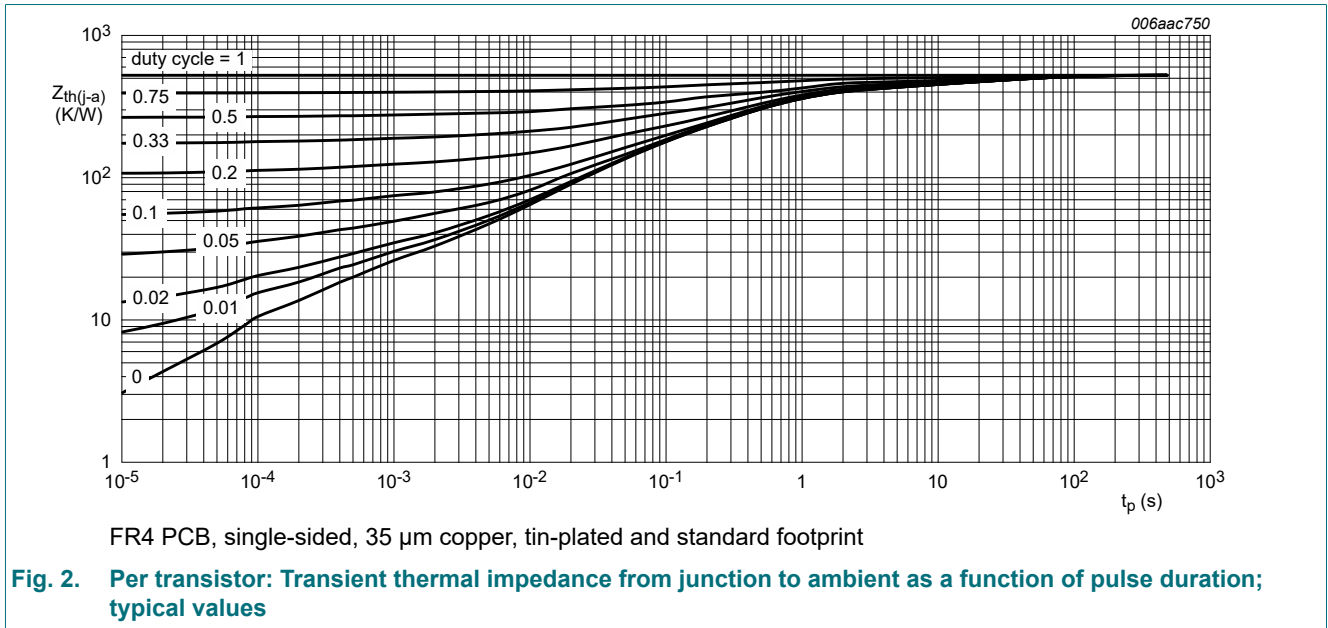


9. Thermal characteristics

Table 6. 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]	-	-	625	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	416	K/W

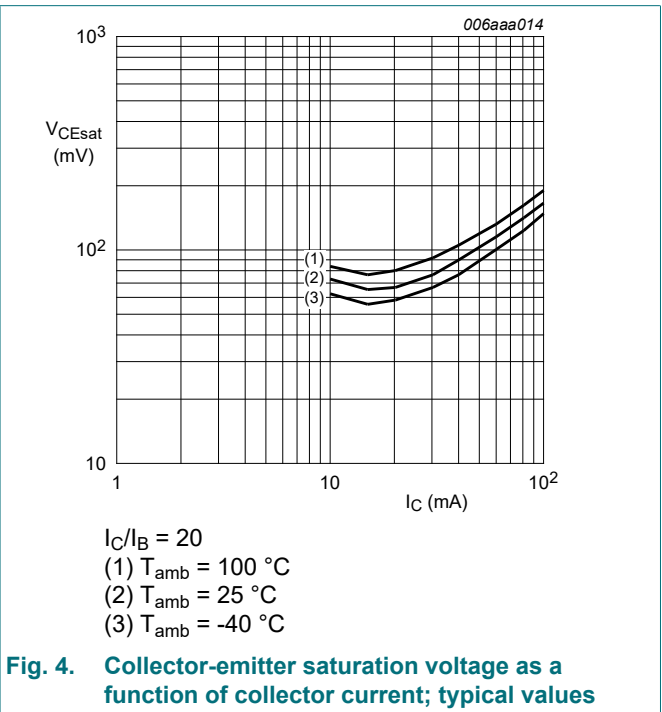
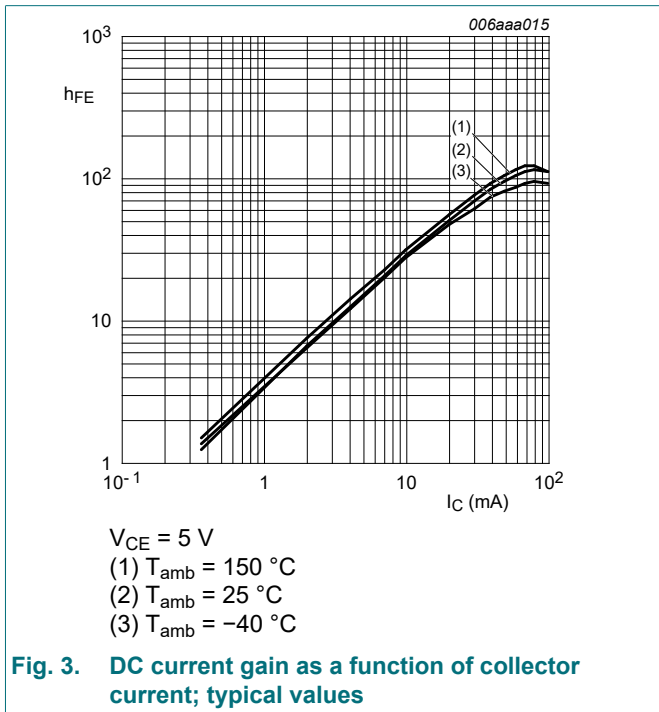
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

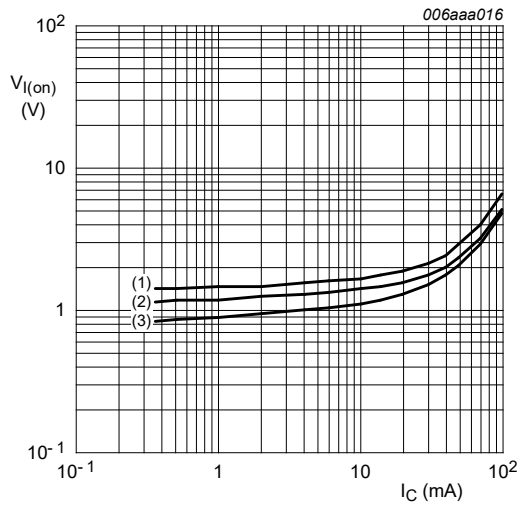


10. Characteristics

Table 7. Characteristics

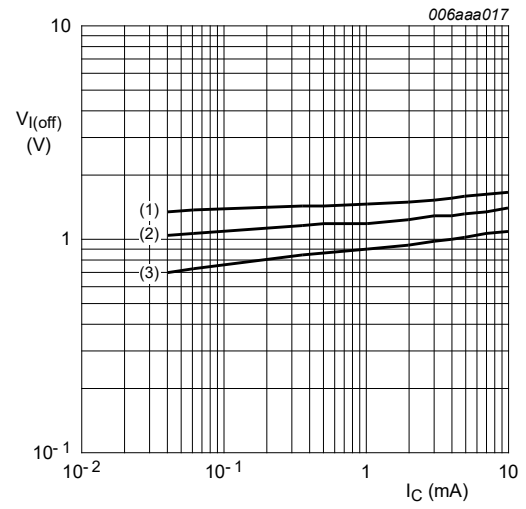
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}$; $I_B = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V
I_{CBO}	collector-base cut-off current	$V_{CB} = 50 \text{ V}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$; $I_B = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{CE} = 30 \text{ V}$; $I_B = 0 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$; $I_C = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	2	mA
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}$; $I_C = 20 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5 \text{ V}$; $I_C = 1 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	1.2	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3 \text{ V}$; $I_C = 20 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	2	1.6	-	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = 10 \text{ V}$; $I_E = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	2.5	pF





$V_{CE} = 0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig. 5. On-state input voltage as a function of collector current; typical values



$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig. 6. Off-state input voltage as a function of collector current; typical values

11. Test information

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.

Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R_1 = \frac{V(I_2) - V(I_1)}{I_2 - I_1}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R_2}{R_1} = \frac{V(I_4) - V(I_3)}{R_1 \cdot (I_4 - I_3)} - 1$$

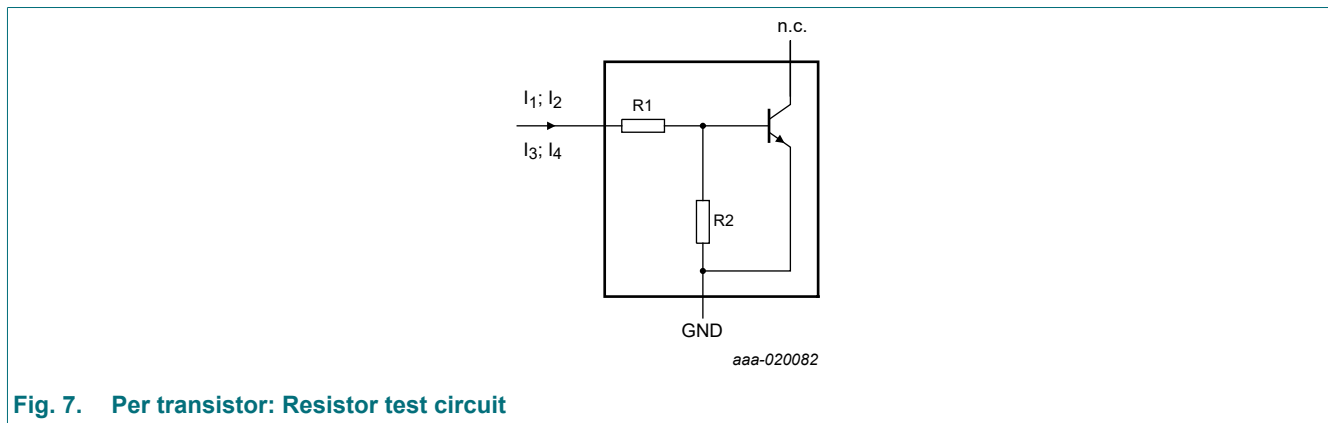


Fig. 7. Per transistor: Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I ₁	I ₂	I ₃	I ₄
PUMH20	2.2	2.2	750 μA	950 μA	-750 μA	-950 μA

12. Package outline

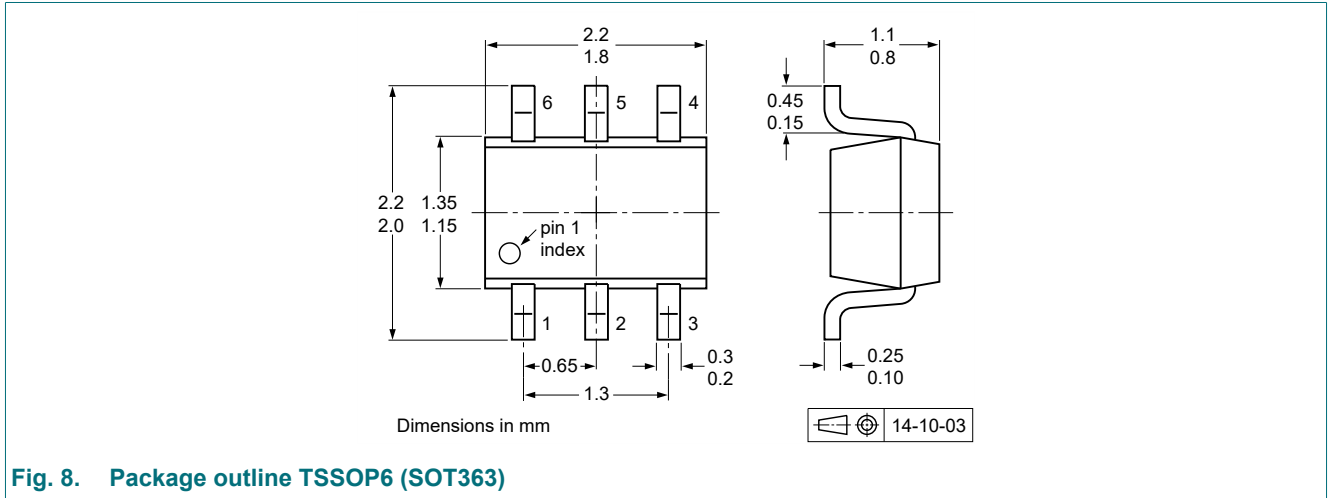


Fig. 8. Package outline TSSOP6 (SOT363)

13. Soldering

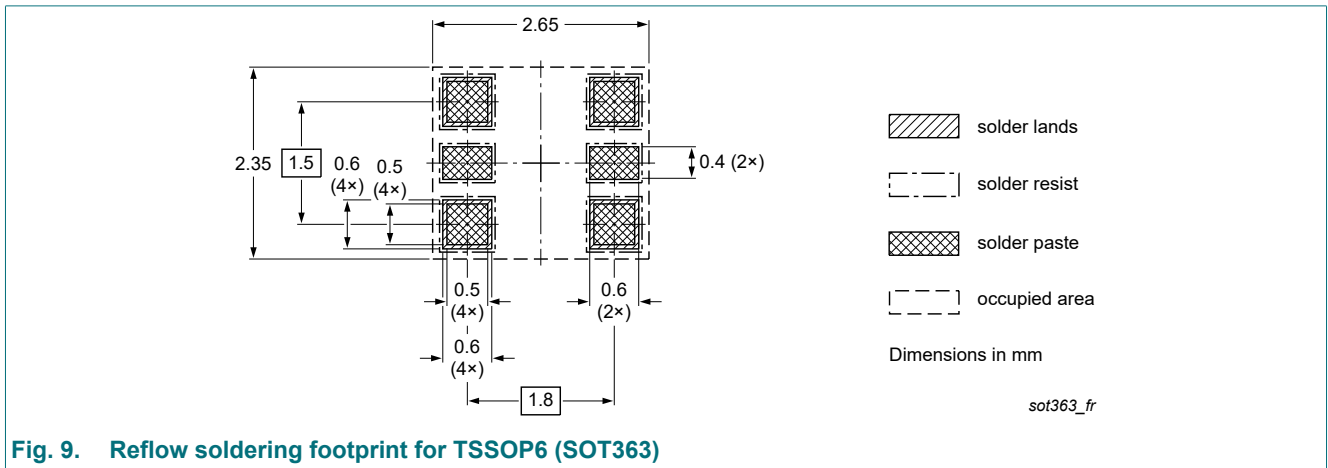


Fig. 9. Reflow soldering footprint for TSSOP6 (SOT363)

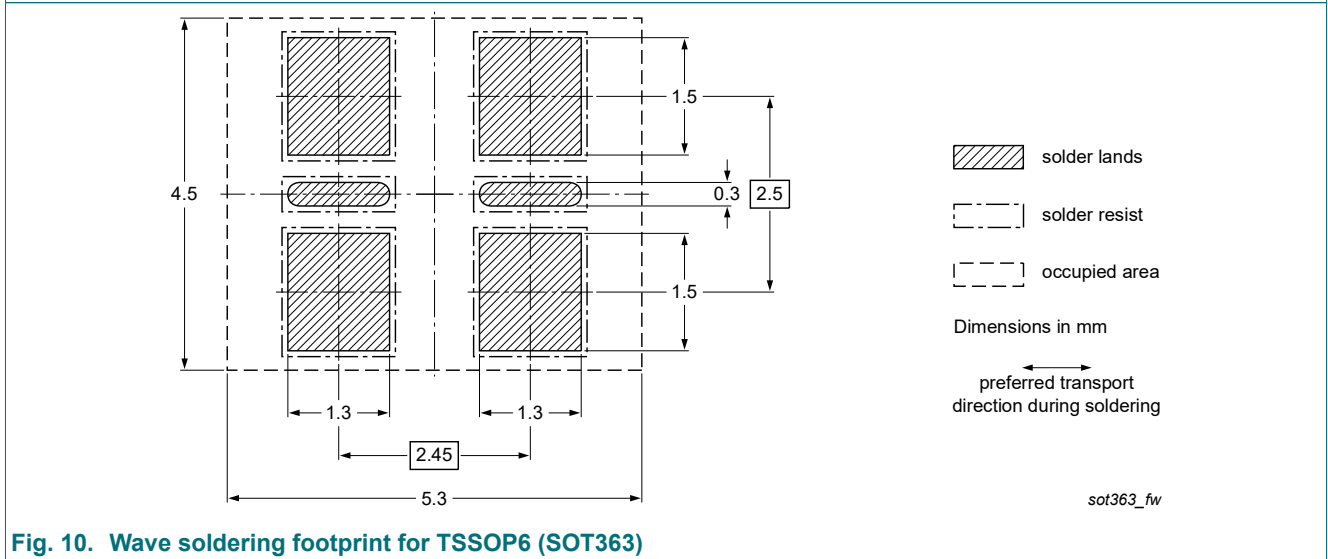


Fig. 10. Wave soldering footprint for TSSOP6 (SOT363)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PUMH20 v.5	20230516	Product data sheet	-	PEMH20_PUMH20_4
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Family data sheet reduced to single type data sheet. Packing information removed. 			
PEMH20_PUMH20_4	20091115	Product data sheet	-	PEMH20_PUMH20_3
PEMH20_PUMH20_3	20050214	Product data sheet	-	PUMH20_2
PUMH20_2	20040414	Product specification	-	PUMH20_1
PUMH20_1	20031016	Product specification	-	-

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".
- [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 <https://www.nexperia.com>.

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