

# PUMH13/ZLX Datasheet



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DiGi Electronics Part Number	PUMH13/ZLX-DG
Manufacturer	<a href="#">Nexperia USA Inc.</a>
Manufacturer Product Number	PUMH13/ZLX
Description	TRANS PREBIAS
Detailed Description	Pre-Biased Bipolar Transistor (BJT) 2 NPN - Pre-Biased (Dual) 50V 100mA 230MHz 300mW Surface Mount 6-TSSOP



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## Purchase and inquiry

Manufacturer Product Number:

PUMH13/ZLX

Series:

-

Transistor Type:

2 NPN - Pre-Biased (Dual)

Voltage - Collector Emitter Breakdown (Max):

50V

Resistor - Emitter Base (R2):

47kOhms

Vce Saturation (Max) @ Ib, Ic:

100mV @ 250µA, 5mA

Frequency - Transition:

230MHz

Grade:

Automotive

Mounting Type:

Surface Mount

Supplier Device Package:

6-TSSOP

Manufacturer:

Nexperia USA Inc.

Product Status:

Obsolete

Current - Collector (Ic) (Max):

100mA

Resistor - Base (R1):

4.7kOhms

DC Current Gain (hFE) (Min) @ Ic, Vce:

100 @ 10mA, 5V

Current - Collector Cutoff (Max):

1µA

Power - Max:

300mW

Qualification:

AEC-Q101

Package / Case:

6-TSSOP, SC-88, SOT-363

Base Product Number:

PUMH13

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

0000.00.0000

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

OBSOLETE



# PUMH13

50 V, 100 mA NPN/NPN resistor-equipped double transistor;  
R1= 4.7 k $\Omega$ , R2 = 47 k $\Omega$

5 June 2023

Product data sheet

## 1. General description

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

NPN/PNP complement: PUMD13

PNP/PNP complement: PUMB13

## 2. Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

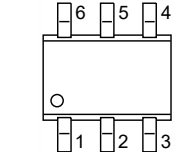
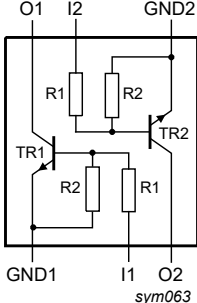
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	100	mA
R1	bias resistor 1 (input)		[1]	4.7	6.1	k $\Omega$
R2/R1	bias resistor ratio		[1]	10	12	

[1] See section "Test information" for resistor calculation and test conditions.

50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 k $\Omega$ , R2 = 47 k $\Omega$ 

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 <p><b>TSSOP6 (SOT363)</b></p>	 <p><i>sym063</i></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
<a href="#">PUMH13</a>	TSSOP6	plastic, surface-mounted package; 6 leads; 0.65 mm pitch; 2.1 mm x 1.25 mm x 0.95 mm body	<a href="#">SOT363</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PUMH13	H0%

[1] % = placeholder for manufacturing site code

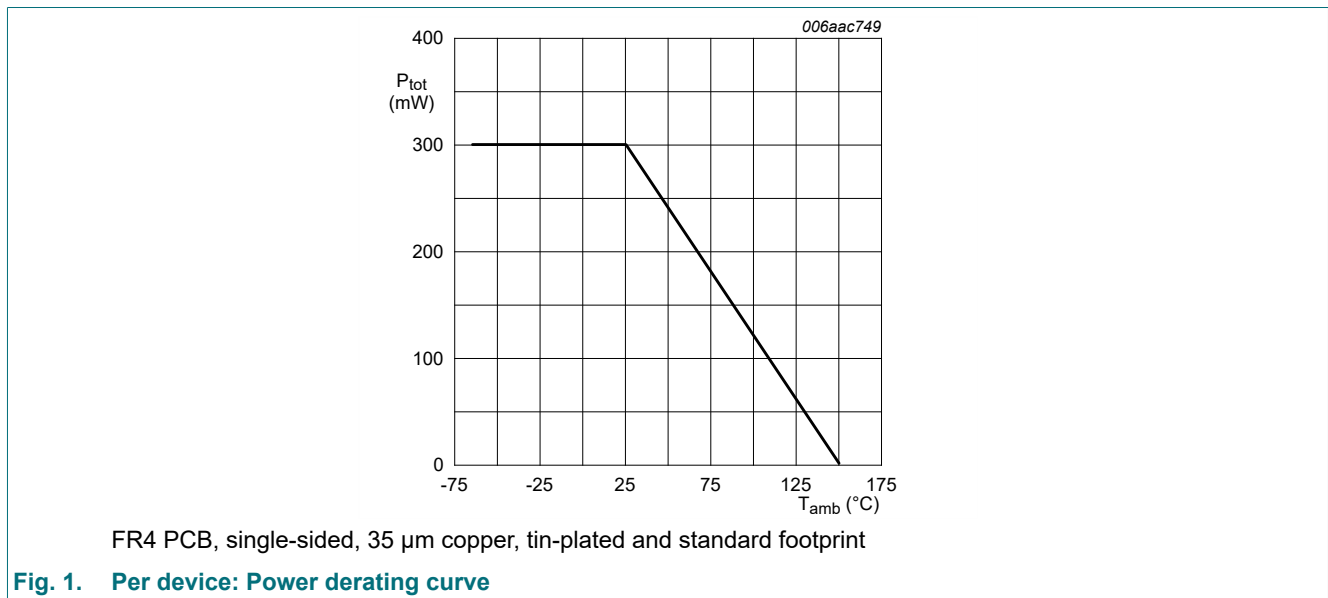
50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 kΩ, R2 = 47 kΩ

## 8. Limiting values

**Table 5. Limiting values**
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions		Min	Max	Unit
<b>Per transistor</b>						
$V_{CBO}$	collector-base voltage	open emitter		-	50	V
$V_{CEO}$	collector-emitter voltage	open base		-	50	V
$V_{EBO}$	emitter-base voltage	open collector		-	5	V
$V_I$	input voltage			-5	30	V
$I_O$	output current			-	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	200	mW
<b>Per device</b>						
$P_{tot}$	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.

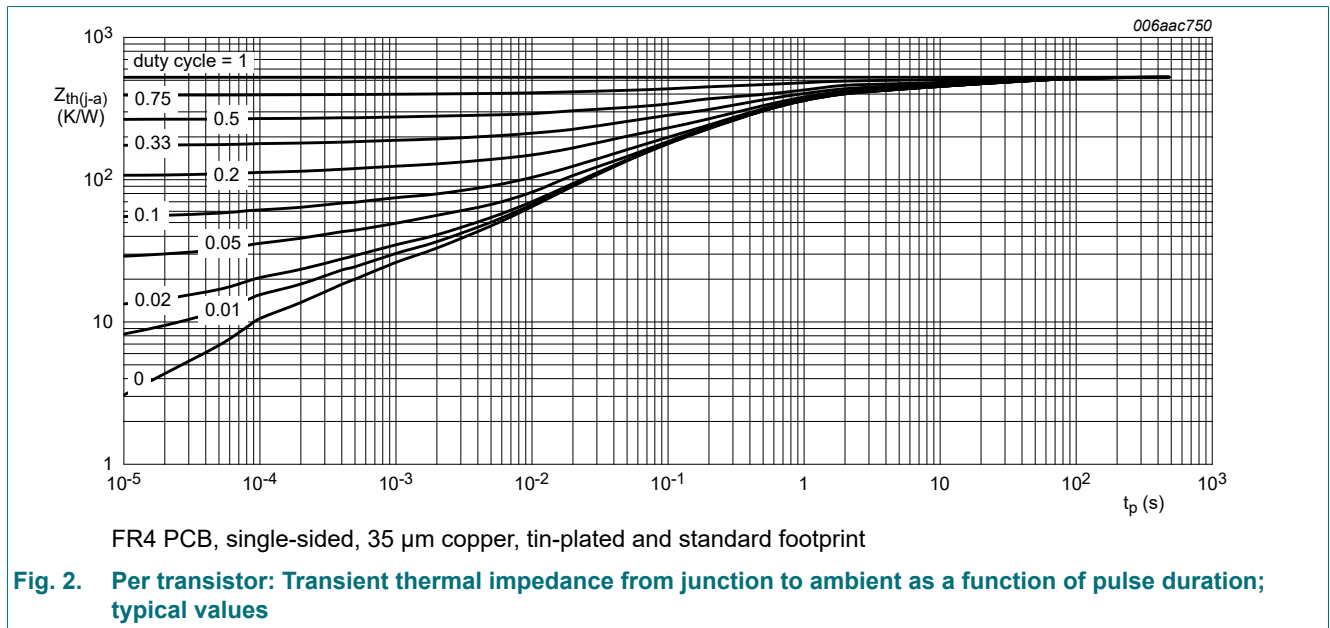


## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	625	K/W
<b>Per device</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W

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



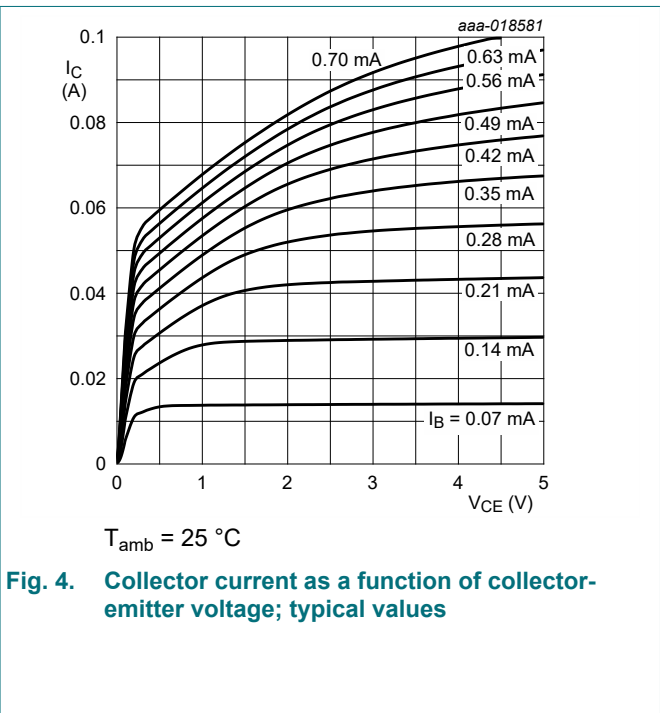
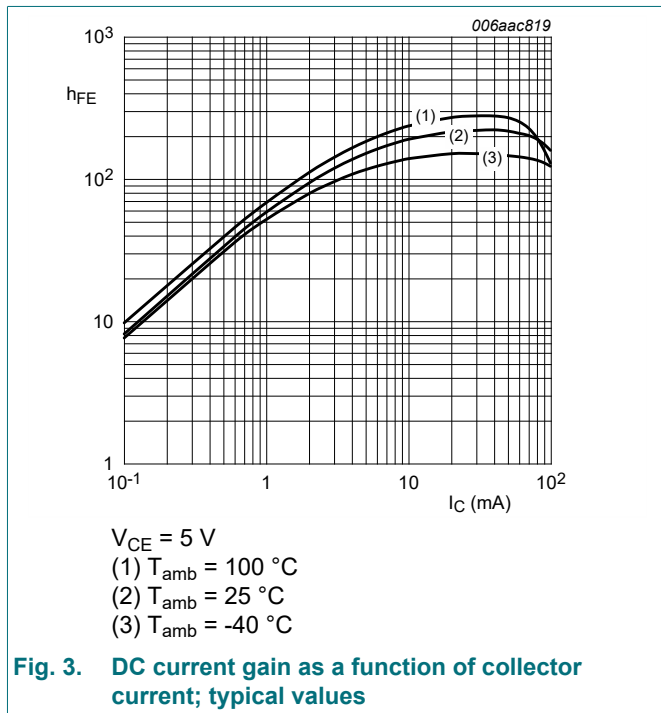
## 10. Characteristics

**Table 7. Characteristics**

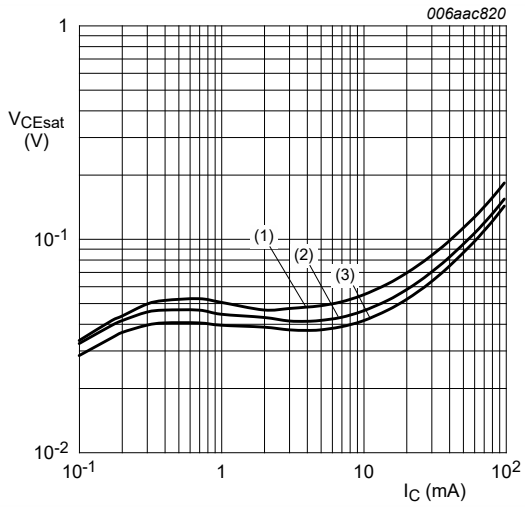
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per transistor</b>							
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}$ ; $I_E = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}$ ; $I_B = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	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	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$ ; $I_C = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	170	$\mu\text{A}$	
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}$ ; $I_C = 10 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 5 \text{ mA}$ ; $I_B = 0.25 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	mV	
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5 \text{ V}$ ; $I_C = 100 \mu\text{A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	0.6	0.5	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3 \text{ V}$ ; $I_C = 5 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	1.3	0.9	-	V	
R1	bias resistor 1 (input)		[1]	3.3	4.7	6.1	kΩ
R2/R1	bias resistor ratio		[1]	8	10	12	
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	2.5	pF	
$f_T$	transition frequency	$V_{CE} = 5 \text{ V}$ ; $I_C = 10 \text{ mA}$ ; $f = 100 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	-	230	-	MHz

[1] See section "Test information" for resistor calculation and test conditions.

[2] Characteristics of built-in transistor

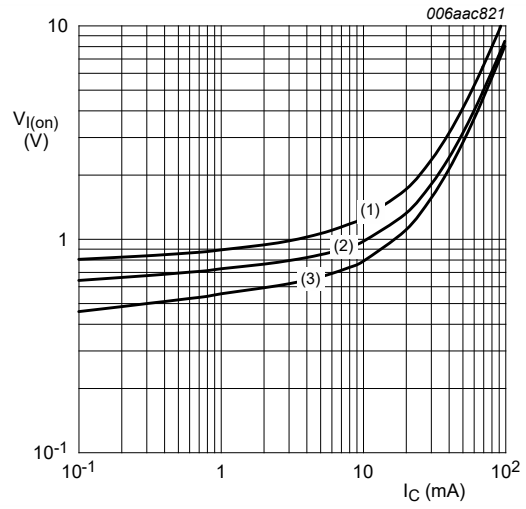


50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 kΩ, R2 = 47 kΩ



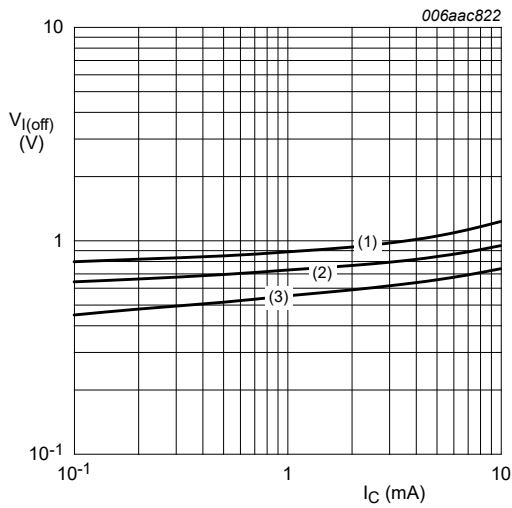
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = -40^\circ C$

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



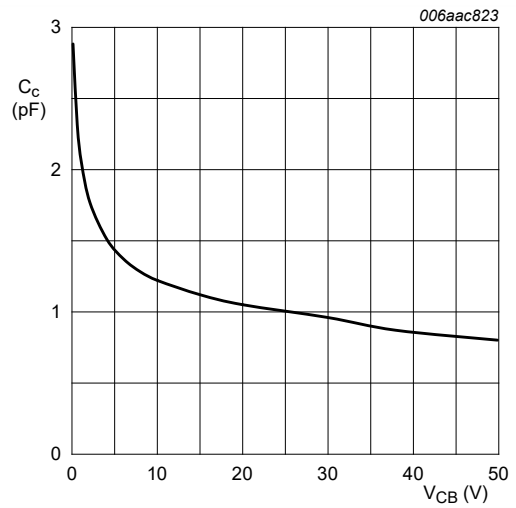
$V_{CE} = 0.3 V$   
 (1)  $T_{amb} = -40^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



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

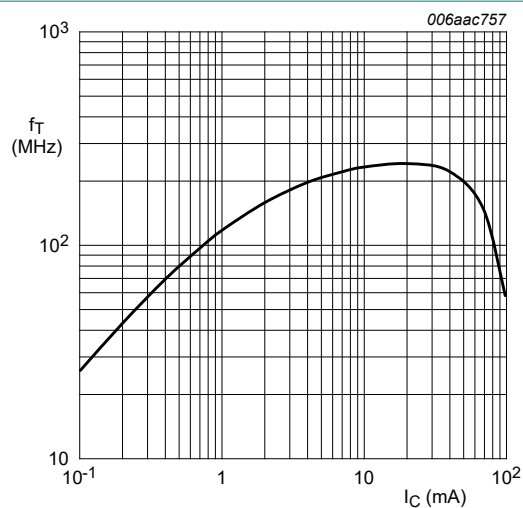
Fig. 7. Off-state input voltage as a function of collector current; typical values



$f = 1 MHz; T_{amb} = 25^\circ C$

Fig. 8. Collector capacitance as a function of collector-base voltage; typical values



**50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 kΩ, R2 = 47 kΩ****Fig. 9. Transition frequency as a function of collector current; typical values of built-in transistor**

50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 kΩ, R2 = 47 kΩ

## 11. Test information

### 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)

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

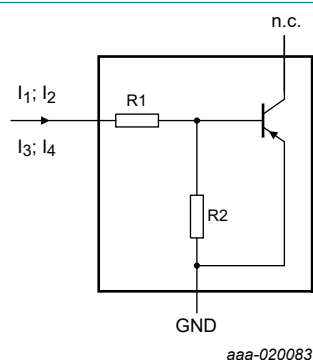


Fig. 10. Per transistor: Resistor test circuit

### Resistor test conditions

Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>
PUMH13	4.7	47	90 μA	140 μA	-55 μA	-105 μA

## 12. Package outline

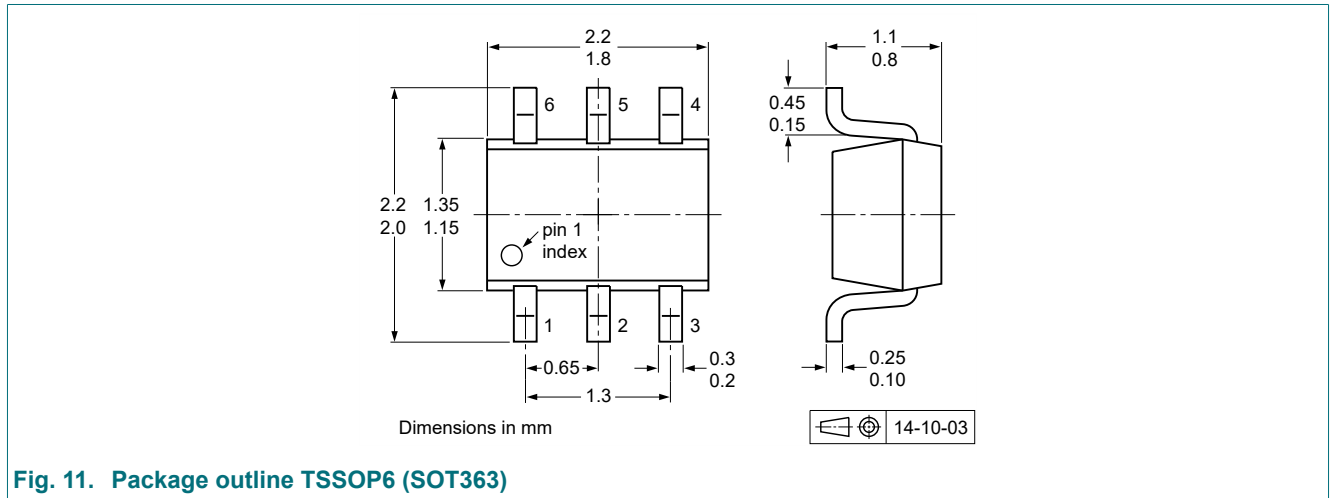


Fig. 11. Package outline TSSOP6 (SOT363)

## 13. Soldering

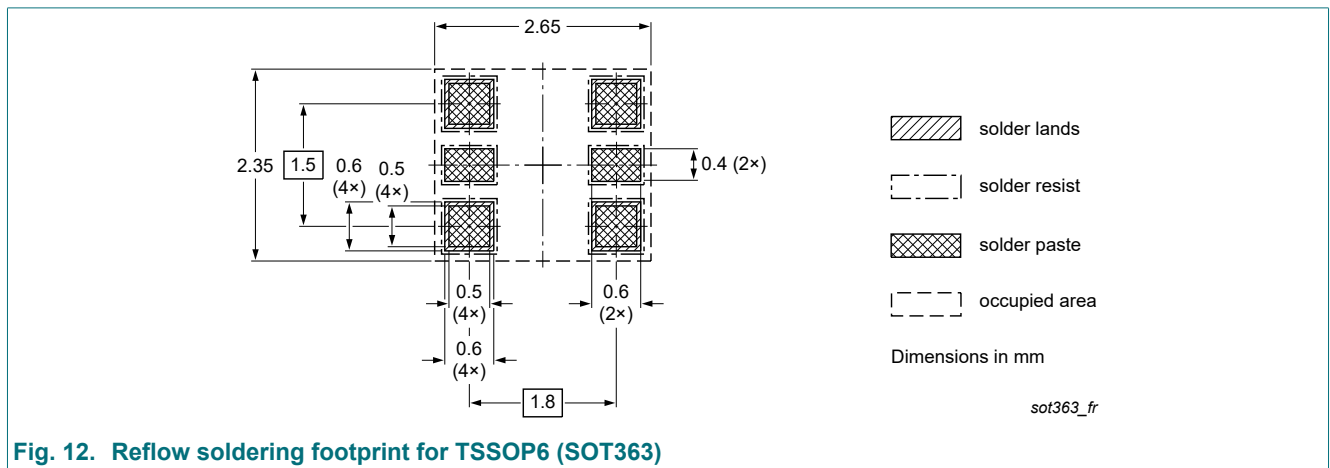


Fig. 12. Reflow soldering footprint for TSSOP6 (SOT363)

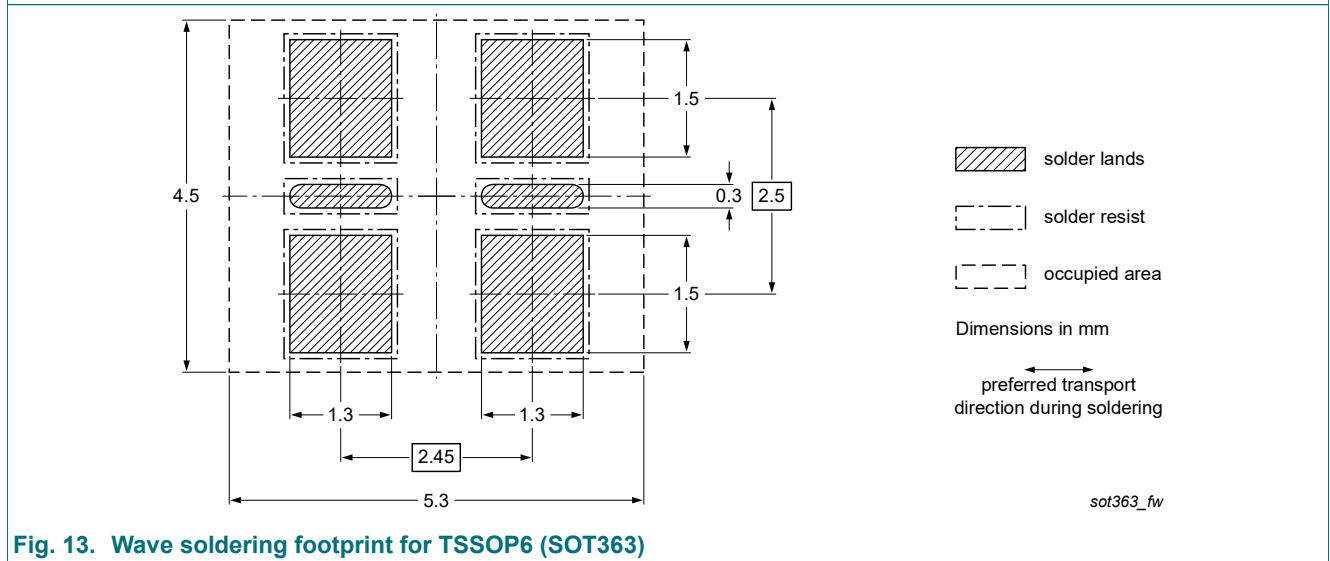


Fig. 13. Wave soldering footprint for TSSOP6 (SOT363)

50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 kΩ, R2 = 47 kΩ

## 14. Revision history

**Table 9. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PUMH13 v.5	20230605	Product data sheet	-	PEMH13_PUMH13 v.4
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>Family data sheet reduced to single type data sheet.</li> <li>Product changed to non automotive. Please refer to the automotive product(s) with -Q.</li> </ul>			
PEMH13_PUMH13 v.4	20111206	Product data sheet	-	PEMH13_PUMH13 v.3
PEMH13_PUMH13 v.3	20040414	Product data sheet	-	PEMH13_PUMH13 v.2
PEMH13_PUMH13 v.2	20031107	Product data sheet	-	PEMH13 v.1
PEMH13 v.1	20011213	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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50 V, 100 mA NPN/NPN resistor-equipped double transistor; R1= 4.7 kΩ, R2 = 47 kΩ

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