



# PIMP31-Q

50 V, 500 mA PNP/PNP Resistor-Equipped double Transistor (RET); R1 = 1 k $\Omega$ , R2 = 10 k $\Omega$

16 February 2022

Product data sheet

## 1. General description

PNP/PNP Resistor-Equipped double Transistor (RET) in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

NPN/NPN complement: PIMN31

NPN/PNP complement: PIMC31

## 2. Features and benefits

- 500 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- Digital applications
- Cost-saving alternative to BC807-Q series in digital applications
- Control of IC inputs
- Switching loads

## 4. Quick reference data

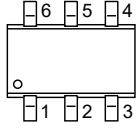
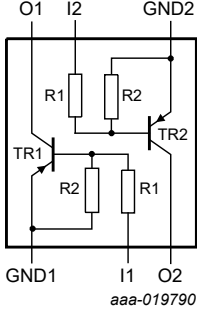
Table 1. Quick reference data

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		-	-	-500	mA	
R1	bias resistor 1 (input)		[1]	0.7	1	1.3	k $\Omega$
R2/R1	bias resistor ratio		[1]	9	10	11	

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

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 <p>SC-74; TSOP6 (SOT457)</p>	 <p>aaa-019790</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
PIMP31-Q	SC-74; TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PIMP31-Q	4F

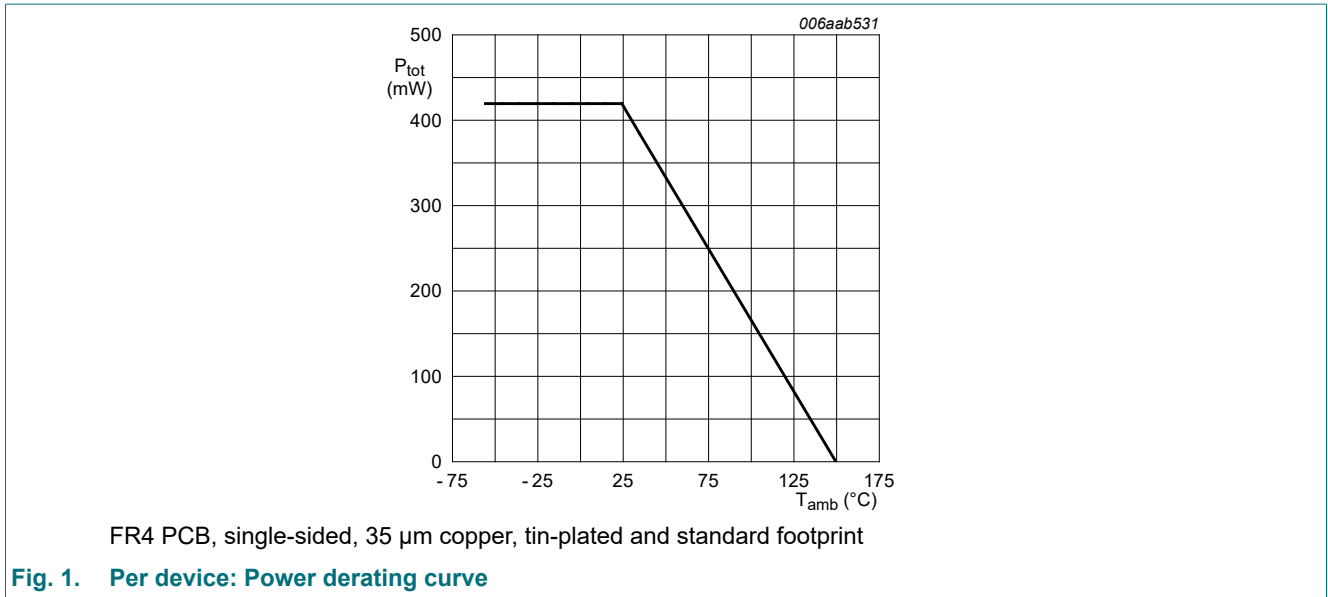
## 8. Limiting values

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		-10	5	V
$I_o$	output current		-	-500	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	290	mW
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	420	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, 35 μm copper, tin-plated and standard footprint.

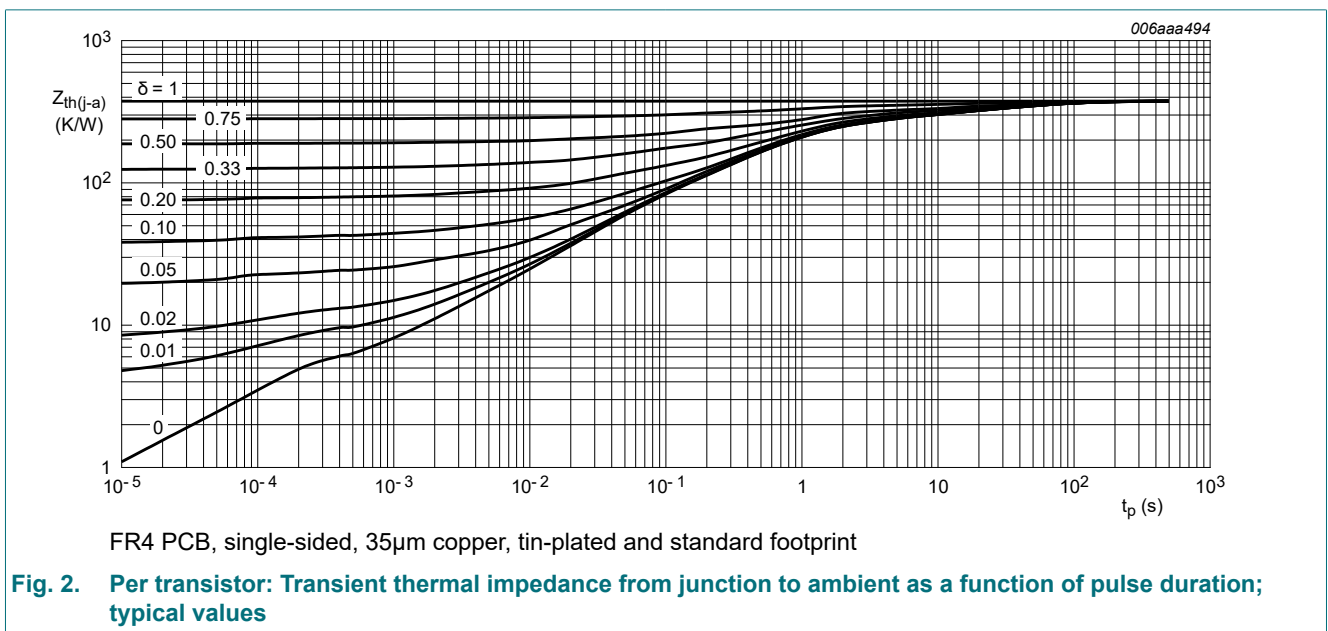


## 9. Thermal characteristics

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]	-	-	432	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	105	K/W
<b>Per device</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	298	K/W

[1] Device mounted on an FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint.



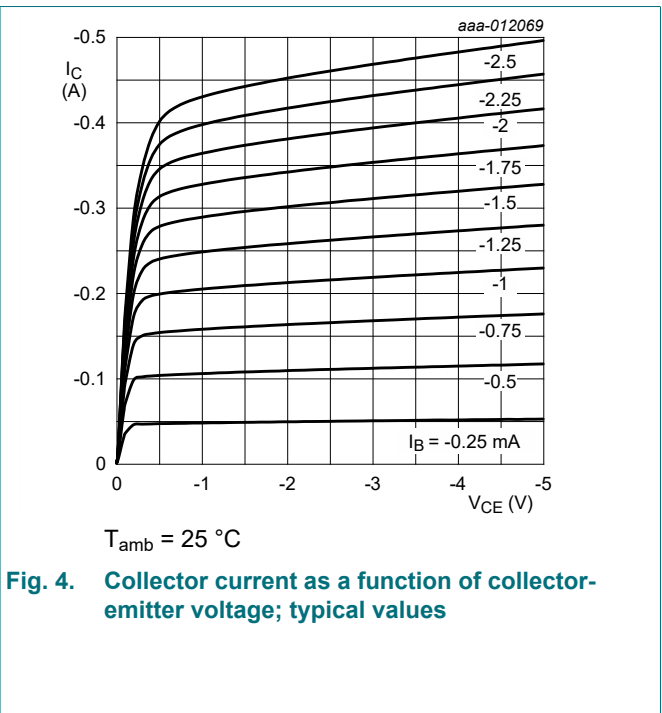
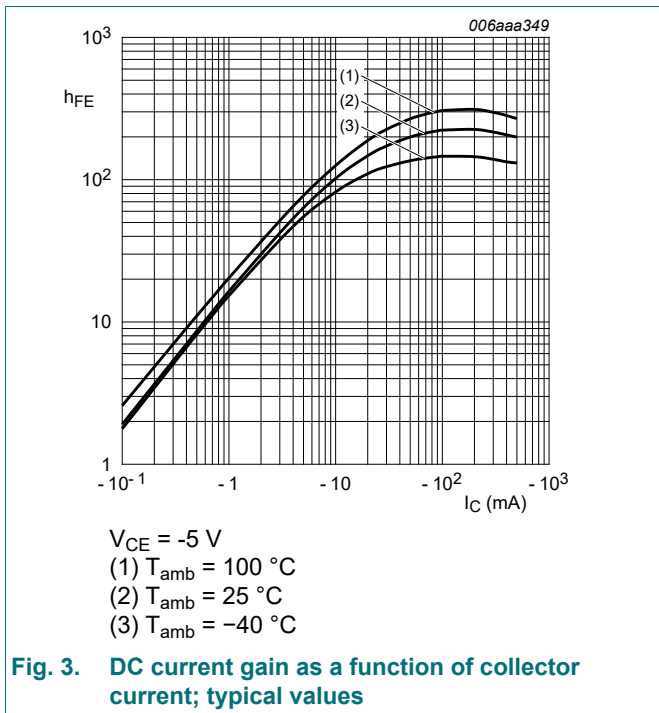
## 10. Characteristics

Table 7. Characteristics

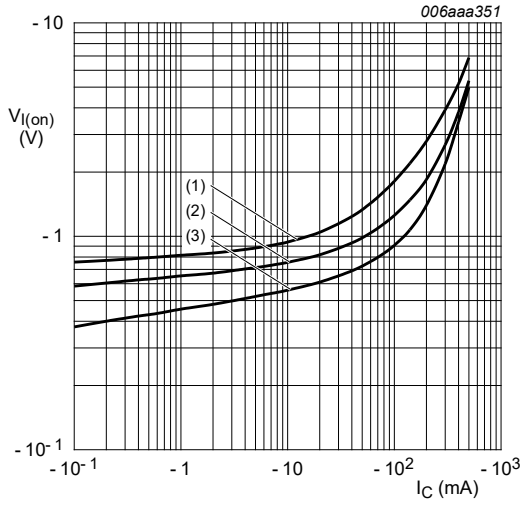
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per transistor</b>							
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100 \mu A; I_E = 0 A; T_{amb} = 25 \text{ }^\circ C$	-50	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -10 \text{ mA}; I_B = 0 A; T_{amb} = 25 \text{ }^\circ C$	-50	-	-	V	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -50 \text{ V}; I_E = 0 A; T_{amb} = 25 \text{ }^\circ C$	-	-	-100	nA	
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = -50 \text{ V}; I_B = 0 A; T_{amb} = 25 \text{ }^\circ C$	-	-	-0.5	$\mu A$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5 \text{ V}; I_C = 0 A; T_{amb} = 25 \text{ }^\circ C$	-	-	-0.72	mA	
$h_{FE}$	DC current gain	$V_{CE} = -5 \text{ V}; I_C = -50 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$	70	-	-		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -50 \text{ mA}; I_B = -2.5 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$	-	-	-100	mV	
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5 \text{ V}; I_C = -100 \mu A; T_{amb} = 25 \text{ }^\circ C$	-0.3	-0.6	-1	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = -0.3 \text{ V}; I_C = -20 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$	-0.4	-0.8	-1.4	V	
R1	bias resistor 1 (input)		[1]	0.7	1	1.3	kΩ
R2/R1	bias resistor ratio		[1]	9	10	11	
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}; I_E = 0 A; i_e = 0 A; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ C$	-	11	-	pF	
$f_T$	transition frequency	$V_{CE} = -5 \text{ V}; I_C = -50 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ C$	[2]	-	140	-	MHz

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

[2] Characteristics of built-in transistor

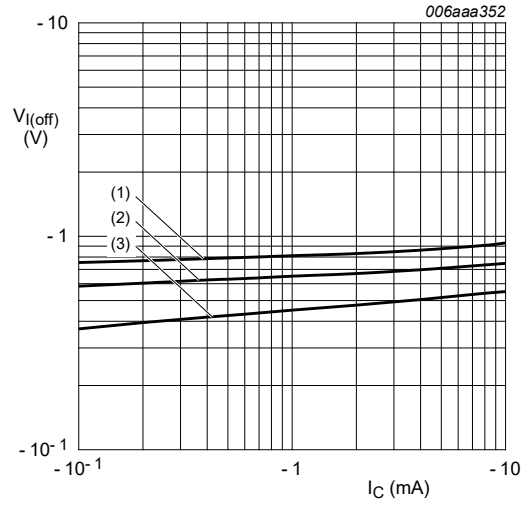


50 V, 500 mA PNP/BJT Resistor-Equipped double Transistor (RET); R1 = 1 kΩ, R2 = 10 kΩ



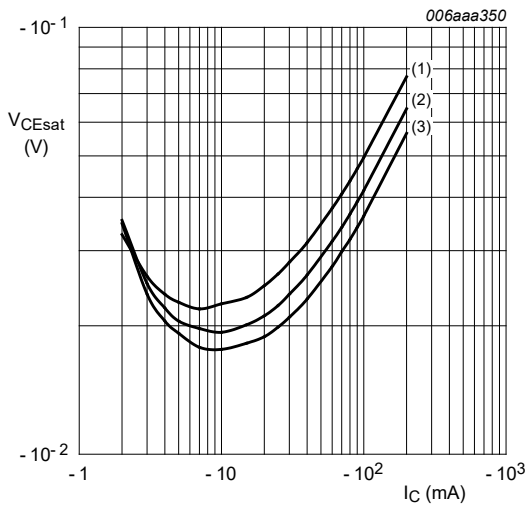
$V_{CE} = -0.3\text{ V}$   
 (1)  $T_{amb} = -40^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = 100^\circ\text{C}$

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



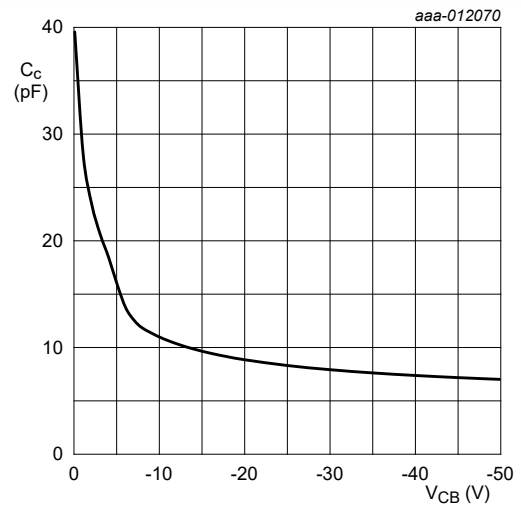
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = -40^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = 100^\circ\text{C}$

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



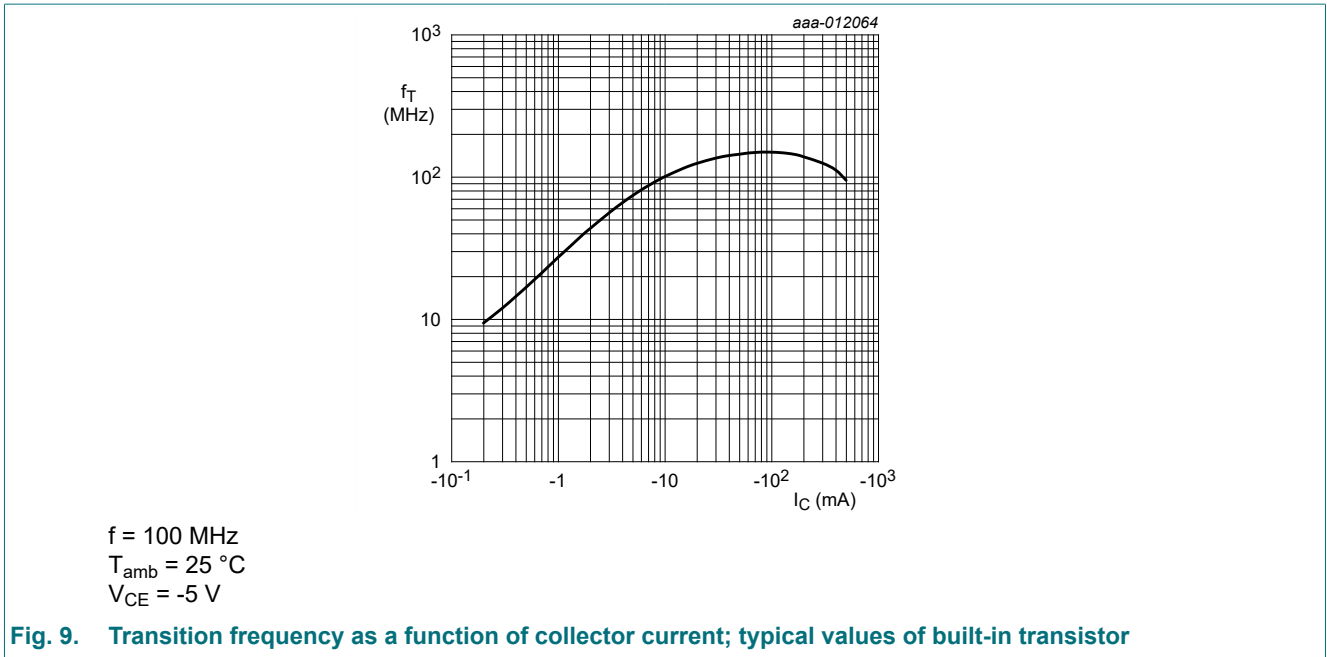
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = -40^\circ\text{C}$

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



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

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



## 11. Test information

### Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R1 = \frac{V(I12) - V(I11)}{I12 - I11}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R2}{R1} = \frac{V(I14) - V(I13)}{R1 \cdot (I14 - I13)} - 1$$

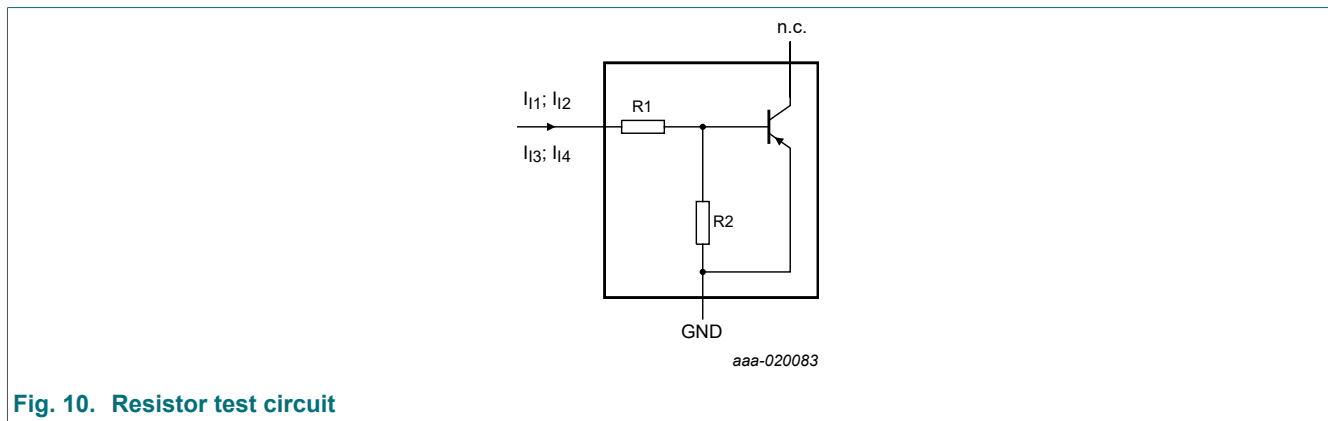


Fig. 10. Resistor test circuit

### Resistor test conditions

Table 8. Resistor test conditions

R1 (kΩ)	R2 (kΩ)	Test conditions			
		I <sub>11</sub>	I <sub>12</sub>	I <sub>13</sub>	I <sub>14</sub>
1	10	-0.7 mA	-0.8 mA	0.45 mA	0.55 mA

### 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

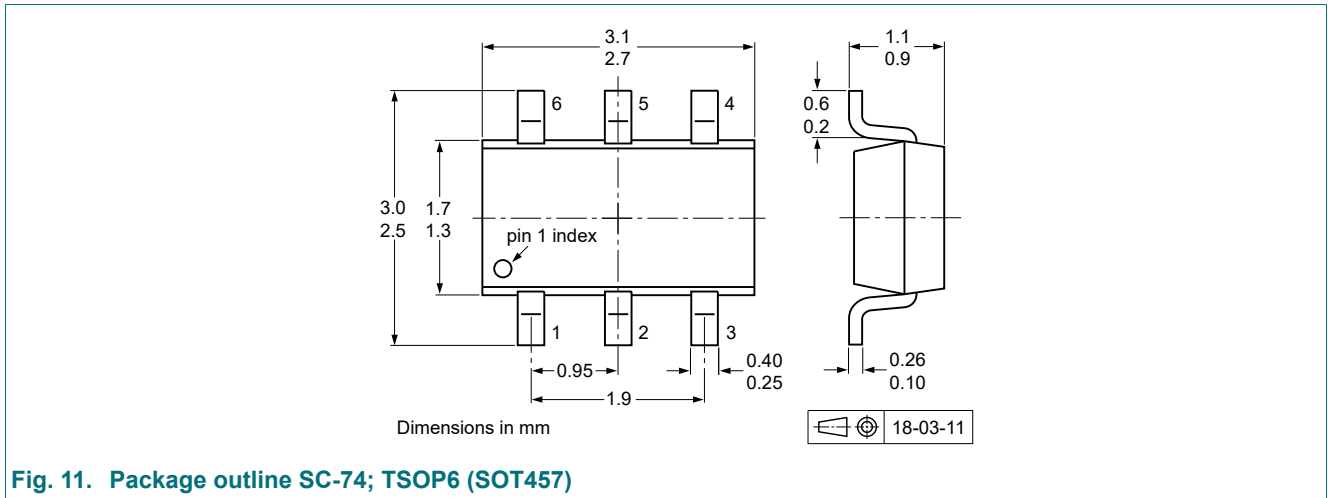


Fig. 11. Package outline SC-74; TSOP6 (SOT457)

## 13. Soldering

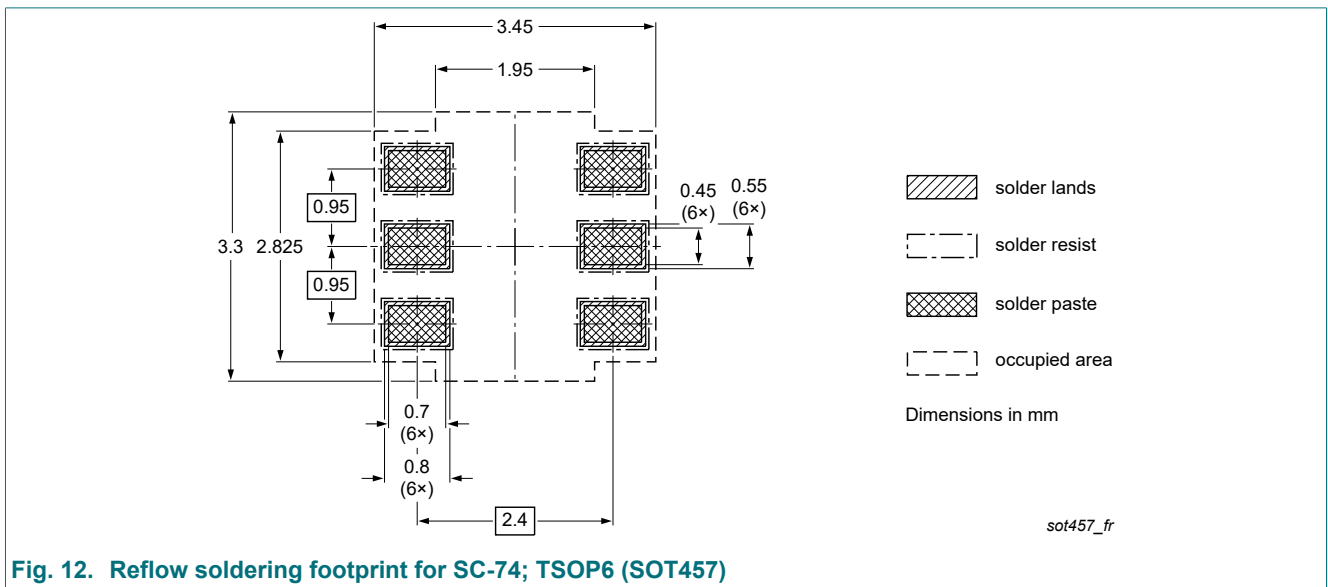


Fig. 12. Reflow soldering footprint for SC-74; TSOP6 (SOT457)



50 V, 500 mA PNP/PNP Resistor-Equipped double Transistor (RET); R1 = 1 kΩ, R2 = 10 kΩ

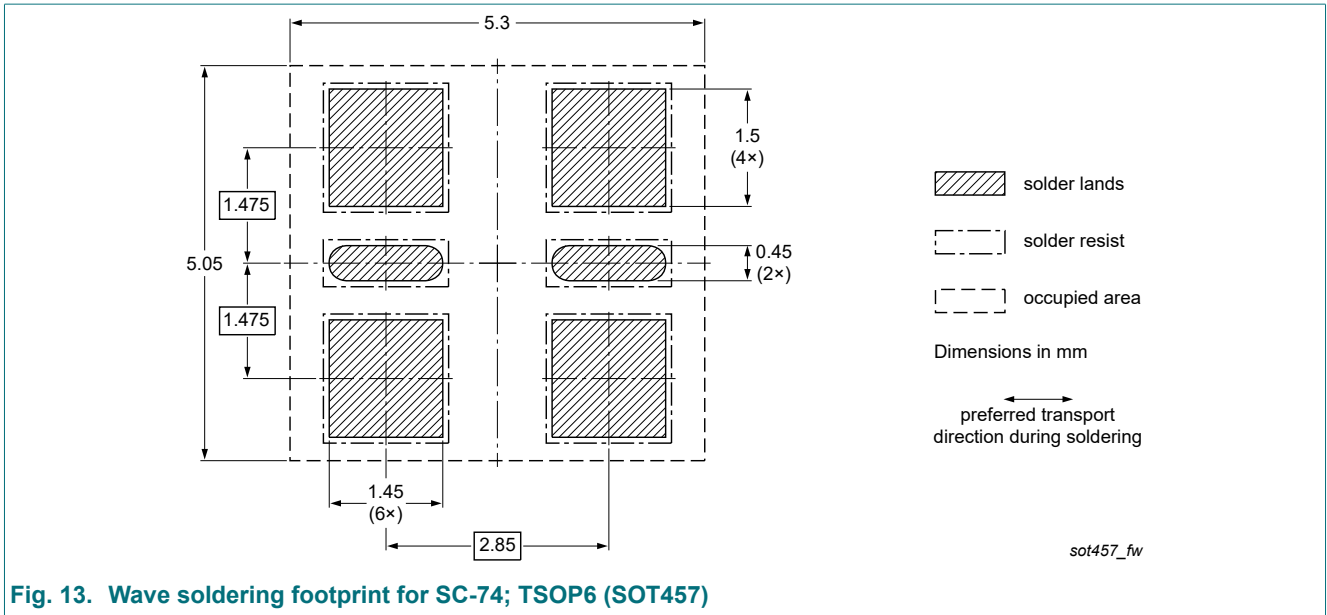


Fig. 13. Wave soldering footprint for SC-74; TSOP6 (SOT457)

## 14. Revision history

**Table 9. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PIMP31-Q v.1	20220216	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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## Contents

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1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	2
9. Thermal characteristics.....	3
10. Characteristics.....	4
11. Test information.....	7
12. Package outline.....	8
13. Soldering.....	8
14. Revision history.....	10
15. Legal information.....	11

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