



# PIMC32-Q

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor (RET); R1 = 2.2 k $\Omega$ , R2 = 10 k $\Omega$

16 February 2022

Product data sheet

## 1. General description

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

NPN/NPN complement: PIMN32-Q

PNP/PNP complement: PIMP32-Q

## 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 / BC817-Q series in digital applications
- Control of IC inputs
- Switching loads

## 4. Quick reference data

Table 1. Quick reference data

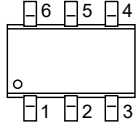
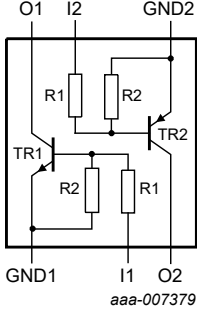
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor (TR2) with negative polarity where applicable</b>						
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	500	mA
R1	bias resistor 1 (input)	[1]	1.54	2.2	2.86	k $\Omega$
R2/R1	bias resistor ratio	[1]	4.1	4.55	5	

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

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor (RET); R1 = 2.2 kΩ, R2 = 10 kΩ

## 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-007379</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
PIMC32-Q	SC-74; TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PIMC32-Q	4H

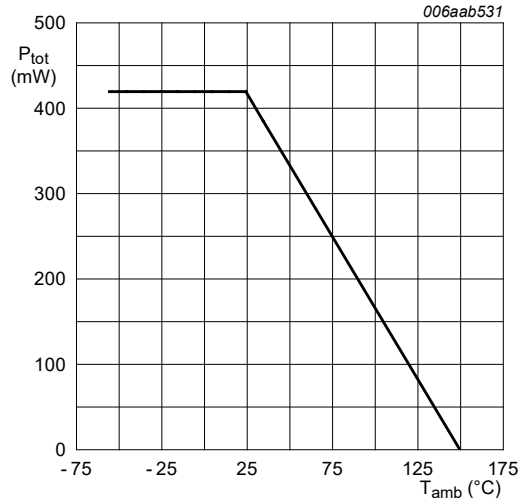
## 8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per transistor; for the PNP transistor (TR2) with negative polarity where applicable</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	12	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.



FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint

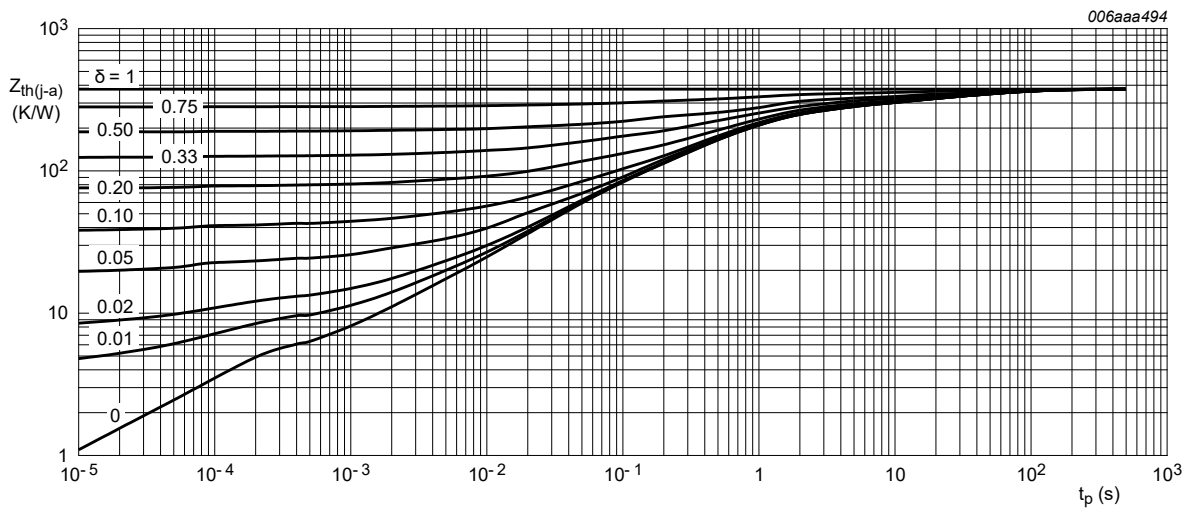
Fig. 1. Per device: Power derating curve

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	432	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point			-	-	105	K/W
<b>Per device</b>							
R <sub>th(j-a)</sub>	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.



FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint

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

## 10. Characteristics

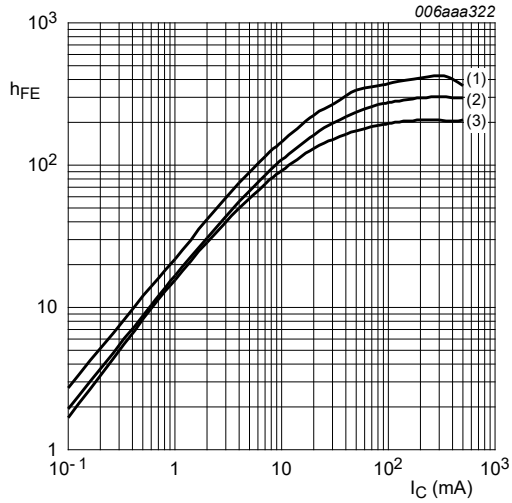
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor (TR2) with negative polarity where applicable</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	$I_C = 10 \text{ mA}$ ; $I_B = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	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	$V_{CE} = 50 \text{ V}$ ; $I_B = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	0.5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$ ; $I_C = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	0.65	mA
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}$ ; $I_C = 50 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	70	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 50 \text{ mA}$ ; $I_B = 2.5 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5 \text{ V}$ ; $I_C = 100 \mu\text{A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	0.4	0.65	1	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3 \text{ V}$ ; $I_C = 20 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	0.5	0.95	1.4	V
R1	bias resistor 1 (input)		[1]	2.2	2.86	kΩ
R2/R1	bias resistor ratio		[1]	4.55	5	
<b>TR1 (NPN)</b>						
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	7	-	pF
$f_T$	transition frequency	$V_{CE} = 5 \text{ V}$ ; $I_C = 50 \text{ mA}$ ; $f = 100 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	225	-	MHz
<b>TR2 (PNP)</b>						
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	11	-	pF
$f_T$	transition frequency	$V_{CE} = -5 \text{ V}$ ; $I_C = -50 \text{ mA}$ ; $f = 100 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	140	-	MHz

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

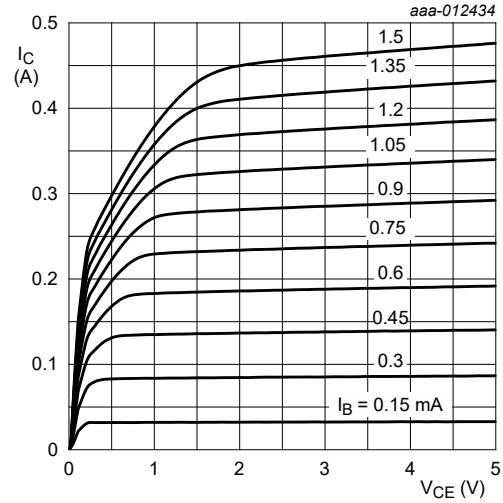
[2] Characteristics of built-in transistor

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor (RET); R1 = 2.2 kΩ, R2 = 10 kΩ



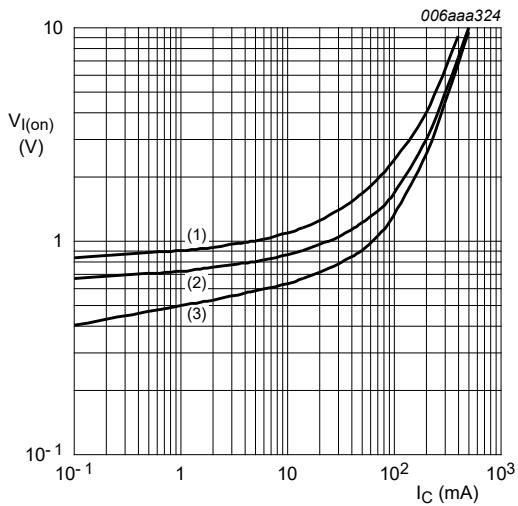
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

**Fig. 3. TR1 (NPN): DC current gain as a function of collector current; typical values**



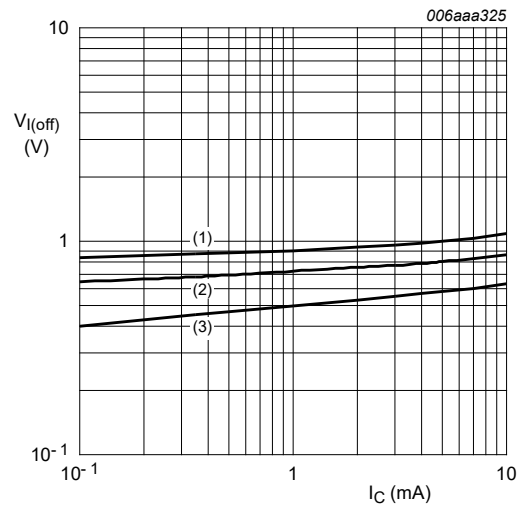
$T_{amb} = 25\text{ °C}$   
 $I_B = 0.15\text{ mA}$

**Fig. 4. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values**



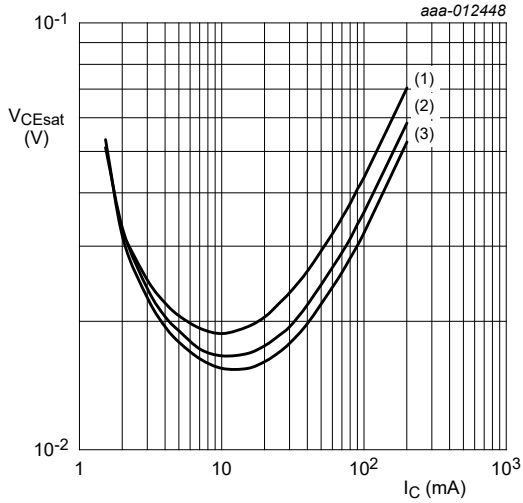
$V_{CE} = 0.3\text{ V}$   
 (1)  $T_{amb} = -40\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig. 5. TR1 (NPN): On-state input voltage as a function of collector current; typical values**



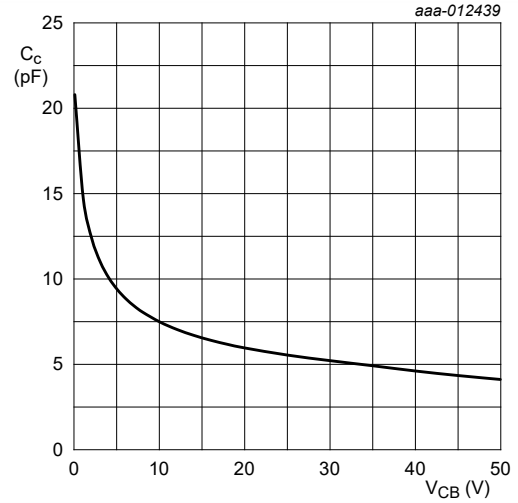
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -40\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig. 6. TR1 (NPN): Off-state input voltage as a function of collector current; typical values**



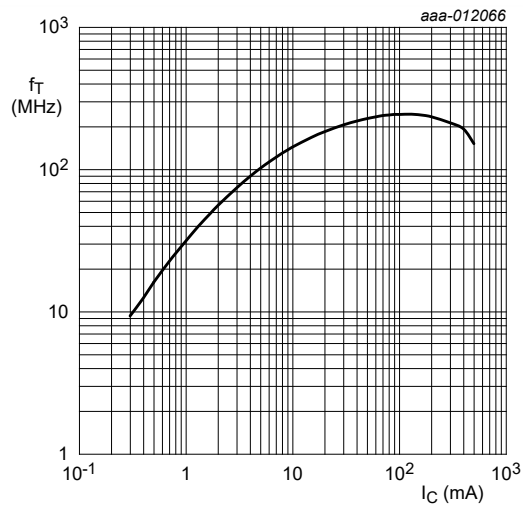
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

**Fig. 7. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values**



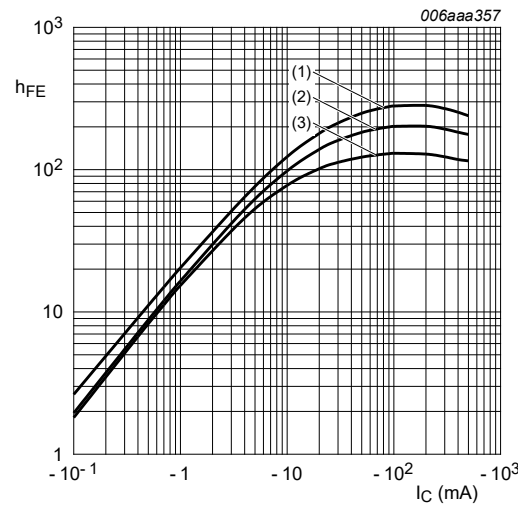
$f = 1\text{ MHz}$   
 $T_{amb} = 25\text{ °C}$

**Fig. 8. TR1 (NPN): Collector capacitance as a function of collector-base voltage; typical values**



$f = 100\text{ MHz}$   
 $T_{amb} = 25\text{ °C}$   
 $V_{CE} = 5\text{ V}$

**Fig. 9. TR1 (NPN): Transition frequency as a function of collector current; typical values of built-in transistor**



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

**Fig. 10. TR2 (PNP): DC current gain as a function of collector current; typical values**

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor (RET); R1 = 2.2 kΩ, R2 = 10 kΩ

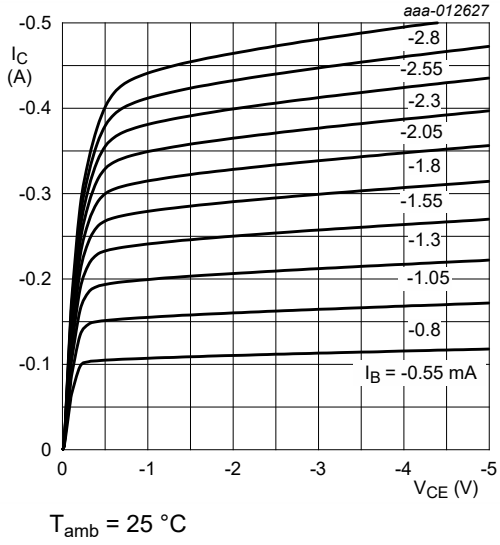


Fig. 11. TR2 (PNP): Collector current as a function of collector-emitter voltage, typical values

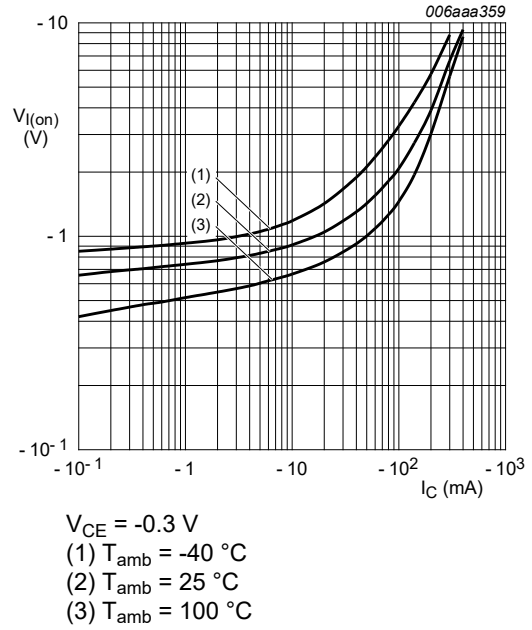


Fig. 12. TR2 (PNP): On-state input voltage as a function of collector current; typical values

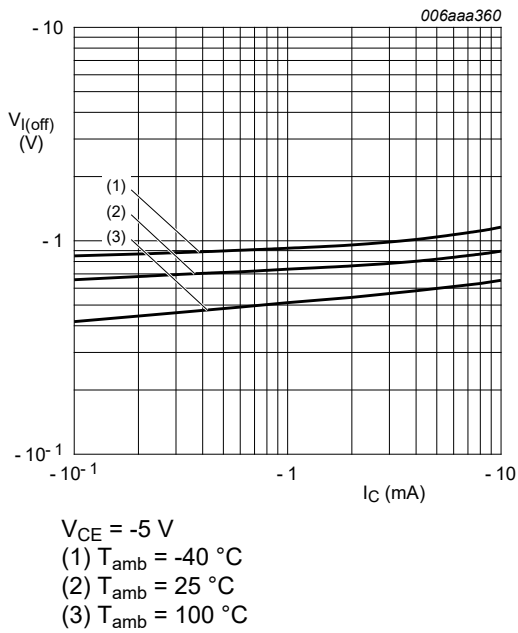


Fig. 13. TR2 (PNP): Off-state input voltage as a function of collector current; typical values

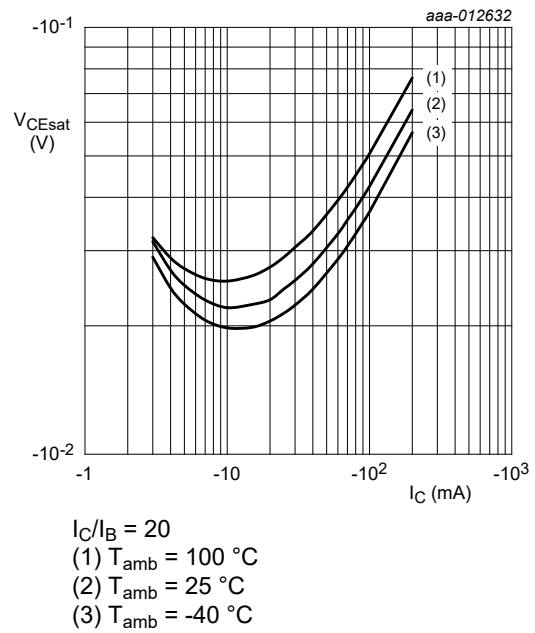
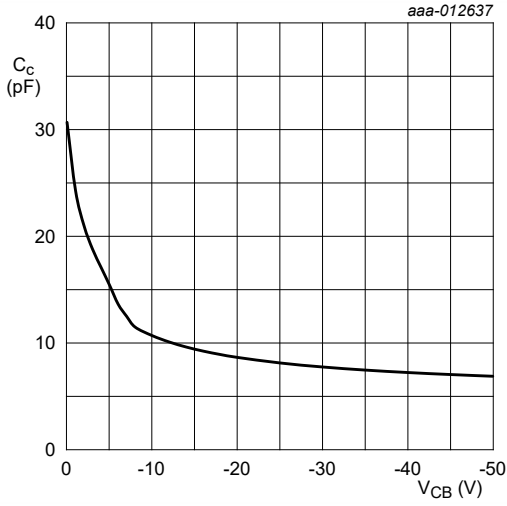


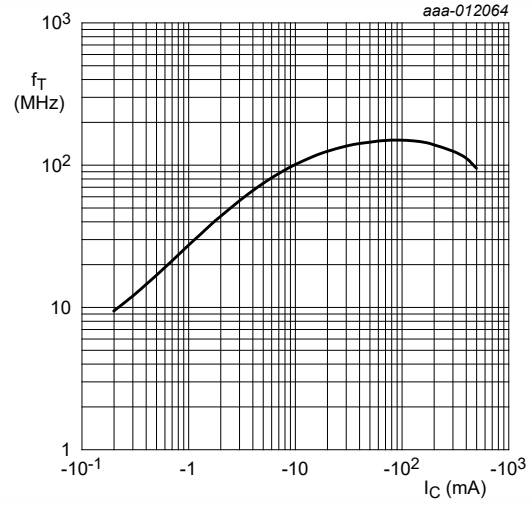
Fig. 14. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor (RET); R1 = 2.2 kΩ, R2 = 10 kΩ



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

Fig. 15. TR2 (PNP): Collector capacitance as a function of collector-base voltage; typical values



$f = 100 \text{ MHz}$   
 $T_{amb} = 25 \text{ }^\circ\text{C}$   
 $V_{CE} = -5 \text{ V}$

Fig. 16. TR2 (PNP): Transition frequency as a function of collector current; typical values of built-in transistor



## 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)

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

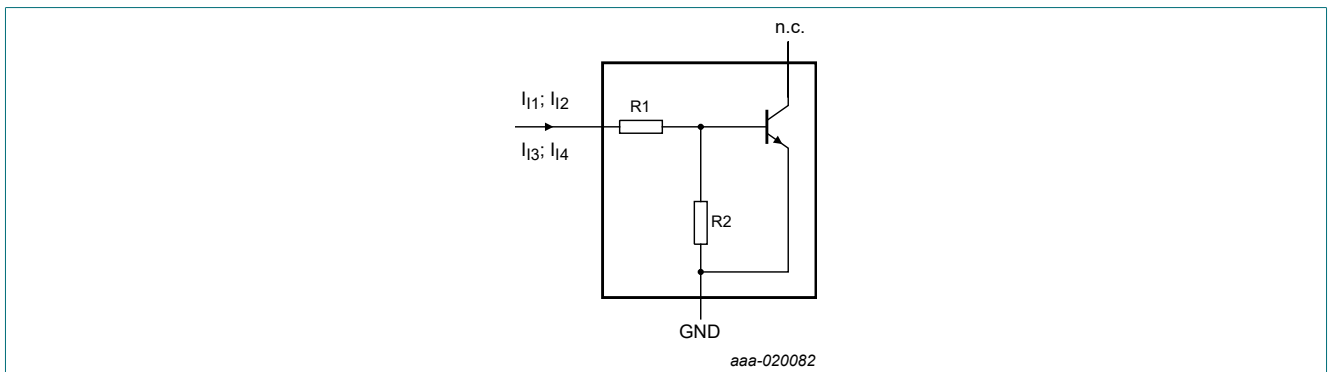


Fig. 17. TR1 (NPN): Resistor test circuit

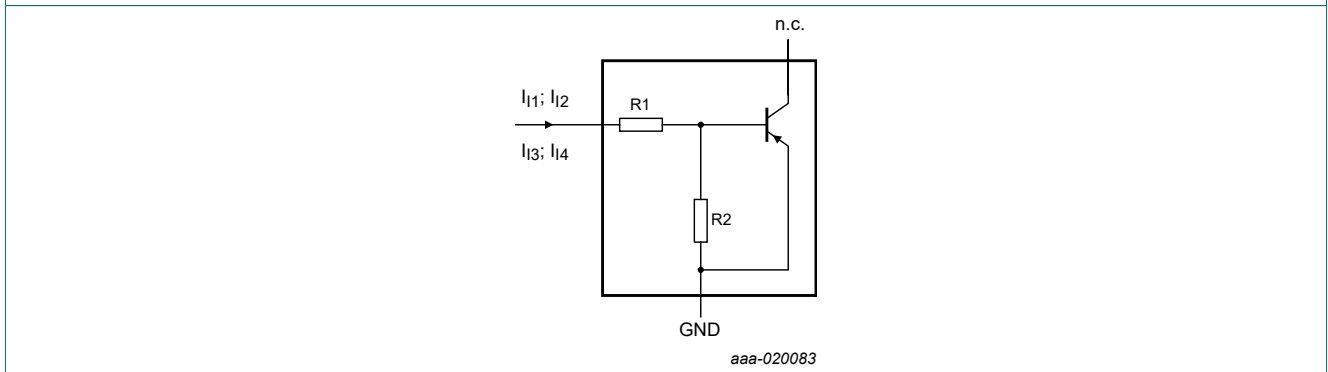


Fig. 18. TR2 (PNP): Resistor test circuit

### Resistor test conditions

Table 8. Resistor test conditions

Per transistor; for the PNP transistor with negative polarity

R1 (kΩ)	R2 (kΩ)	Test conditions			
		I <sub>11</sub>	I <sub>12</sub>	I <sub>13</sub>	I <sub>14</sub>
2.2	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

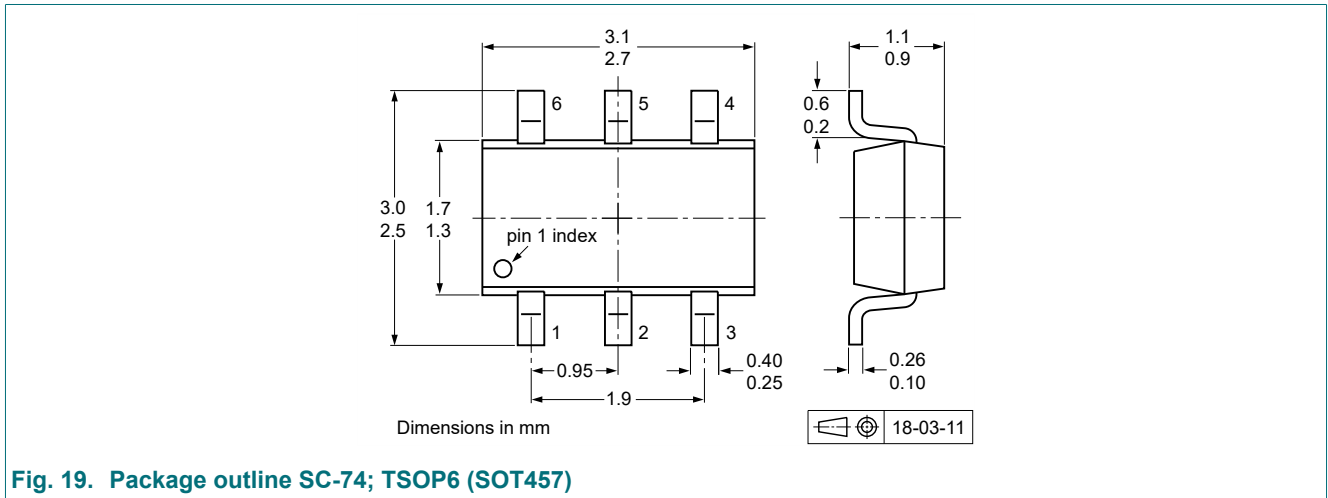


Fig. 19. Package outline SC-74; TSOP6 (SOT457)

## 13. Soldering

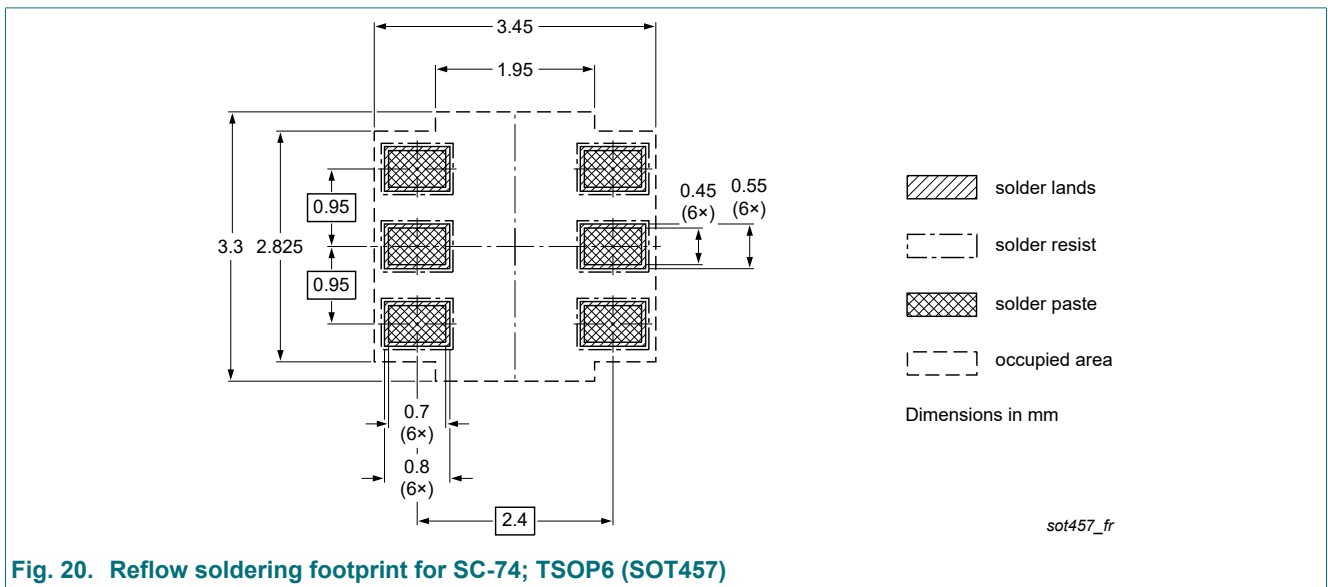


Fig. 20. Reflow soldering footprint for SC-74; TSOP6 (SOT457)

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor (RET); R1 = 2.2 kΩ, R2 = 10 kΩ

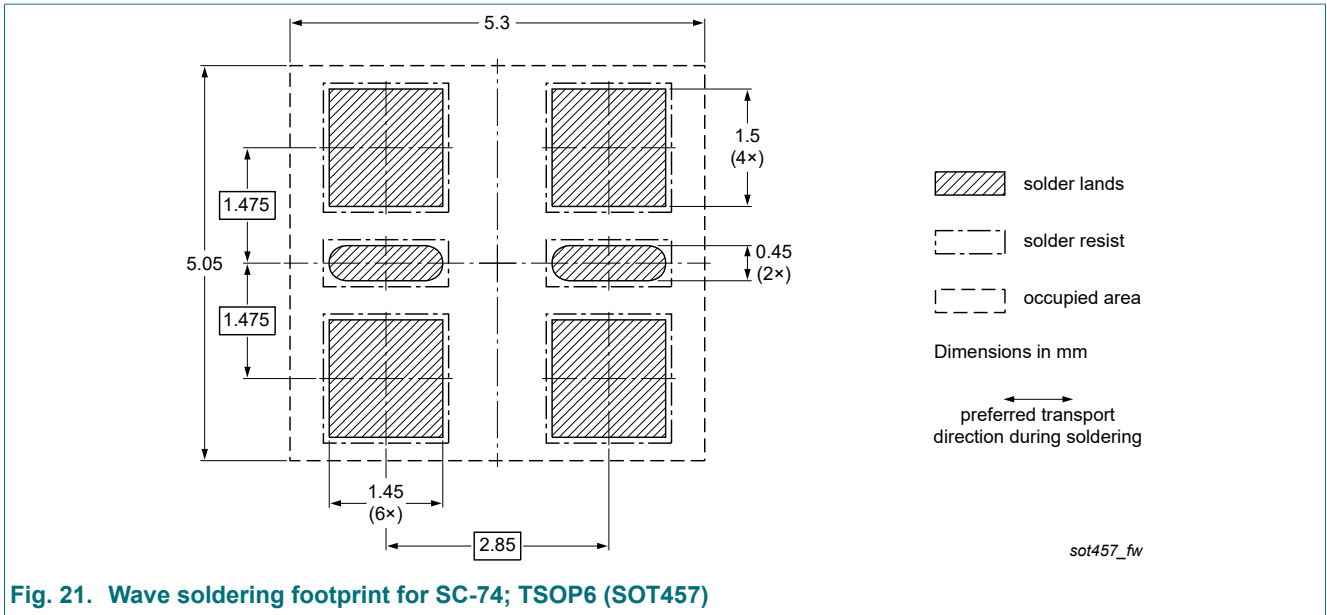


Fig. 21. Wave soldering footprint for SC-74; TSOP6 (SOT457)

## 14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PIMC32-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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Date of release: 16 February 2022

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