



PIMC31PAS-Q

50 V, 500 mA NPN/PNP Resistor-Equipped double Transistor;
R1 = 1 k Ω , R2 = 10 k Ω

31 August 2023

Product data sheet

1. General description

NPN/PNP Resistor-Equipped double Transistor (RET) in a medium power SOT1118D (DFN2020D-6) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks (SWF).

NPN/PNP complement: PIMN31PAS-Q

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2. Features and benefits

- 500 mA output current capability
- Built-in 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 / BC817 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
Per transistor							
V _{CEO}	collector-emitter voltage	open base	[1]	-	-	50	V
I _O	output current		[1]	-	-	500	mA
R1	bias resistor 1 (input)	T _{amb} = 25 °C	[2]	0.7	1	1.3	k Ω
R2/R1	bias resistor ratio		[2]	9	10	11	

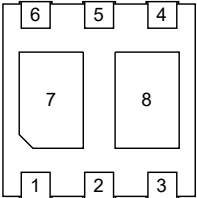
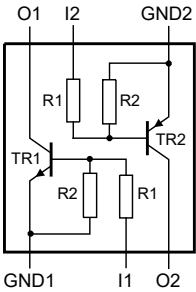
[1] For the PNP transistor with negative polarity.

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

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 Transparent top view DFN2020D-6 (SOT1118D)	 aaa-007379
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		
7	O1	output (collector) TR1		
8	O2	output (collector) TR2		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PIMC31PAS-Q	DFN2020D-6	plastic, leadless thermally enhanced ultra thin and small outline package with side-wettable flanks (SWF); 6 terminals; 0.65 mm pitch; 2 mm x 2 mm x 0.65 mm body	SOT1118D

7. Marking

Table 4. Marking codes

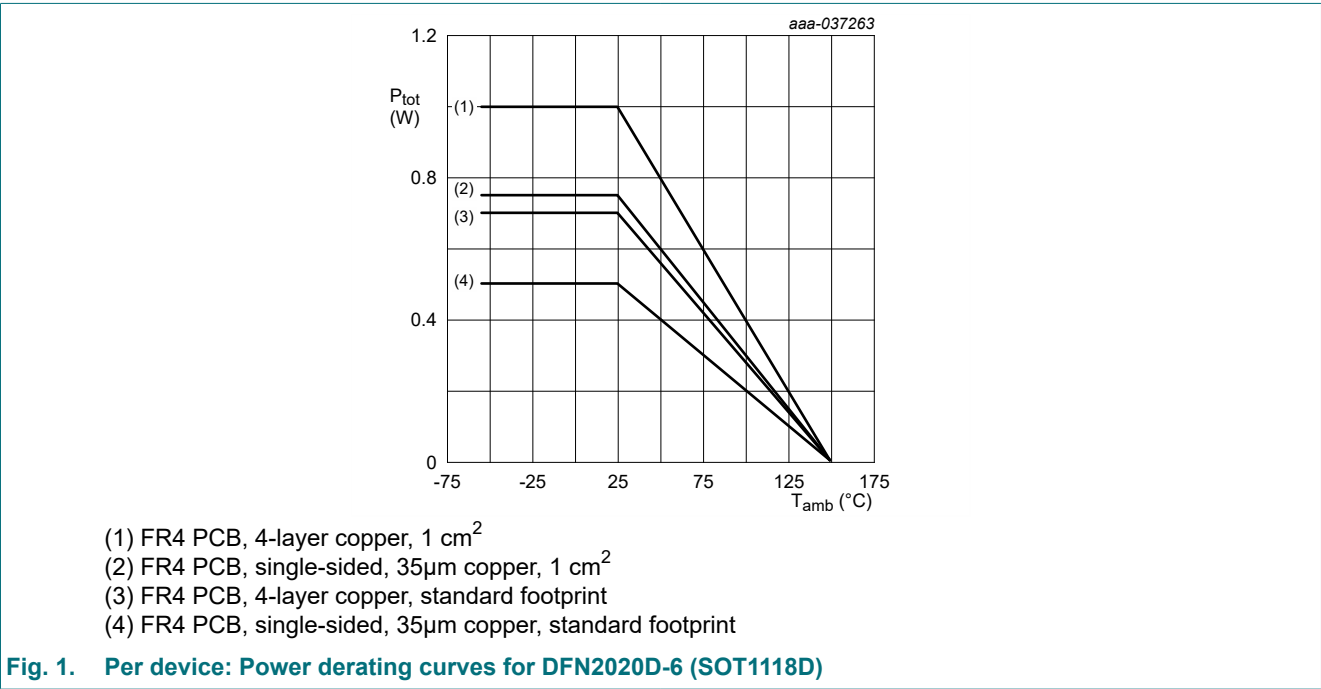
Type number	Marking code
PIMC31PAS-Q	8E

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	[1]	-	50	V
V _{CEO}	collector-emitter voltage	open base	[1]	-	50	V
V _{EBO}	emitter-base voltage	open collector	[1]	-	5	V
V _I	input voltage		[1]	-5	10	V
I _O	output current		[1]	-	500	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[2]	-	360	mW
			[3]	-	550	mW
			[4]	-	510	mW
			[5]	-	730	mW
Per device						
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[2]	-	500	mW
			[3]	-	750	mW
			[4]	-	700	mW
			[5]	-	1	W
T _j	junction temperature			-	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C

- [1] For the PNP transistor with negative polarity.
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided, 35 μm copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided, 35μm copper, tin-plated; mounting pad for collector 1 cm².
- [4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm².

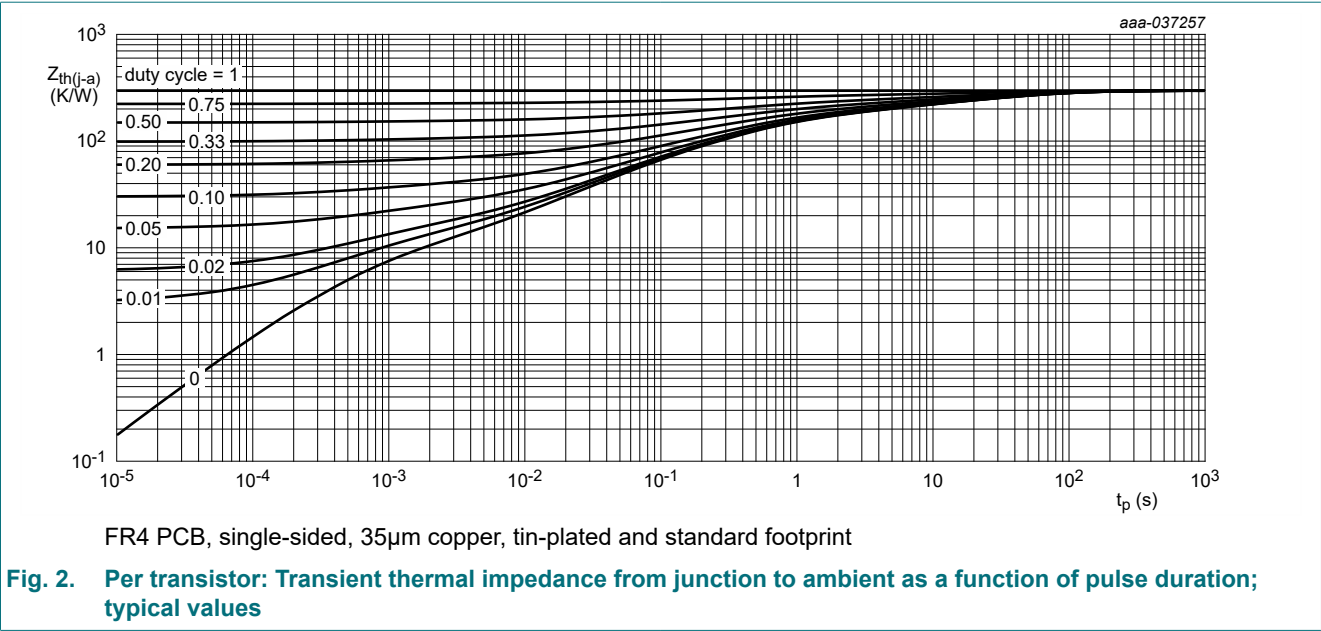


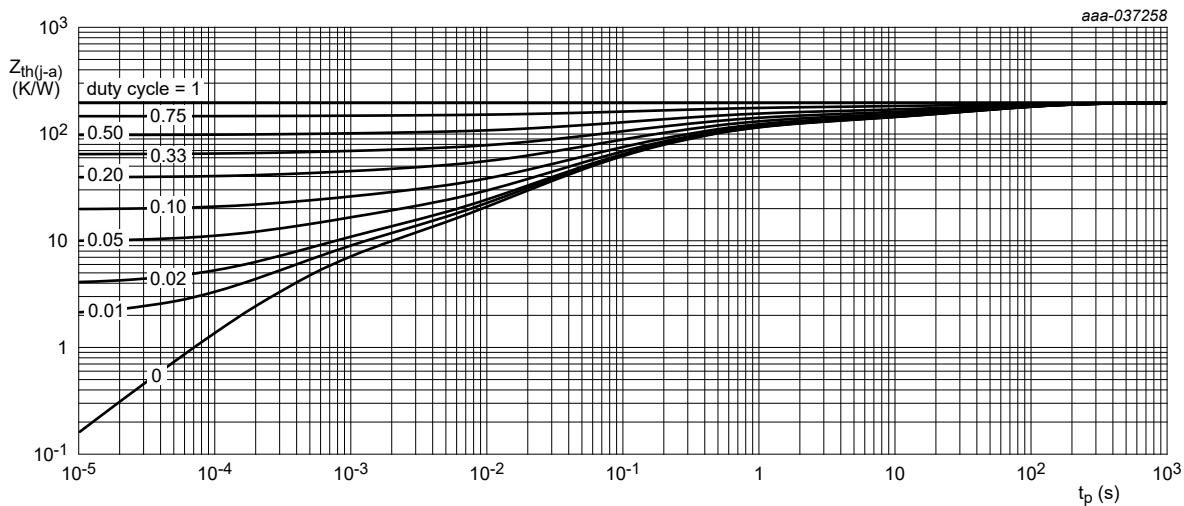
9. Thermal characteristics

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]	-	-	348	K/W
			[2]	-	-	228	K/W
			[3]	-	-	246	K/W
			[4]	-	-	172	K/W
Per device							
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2]	-	-	167	K/W
			[3]	-	-	179	K/W
			[4]	-	-	125	K/W

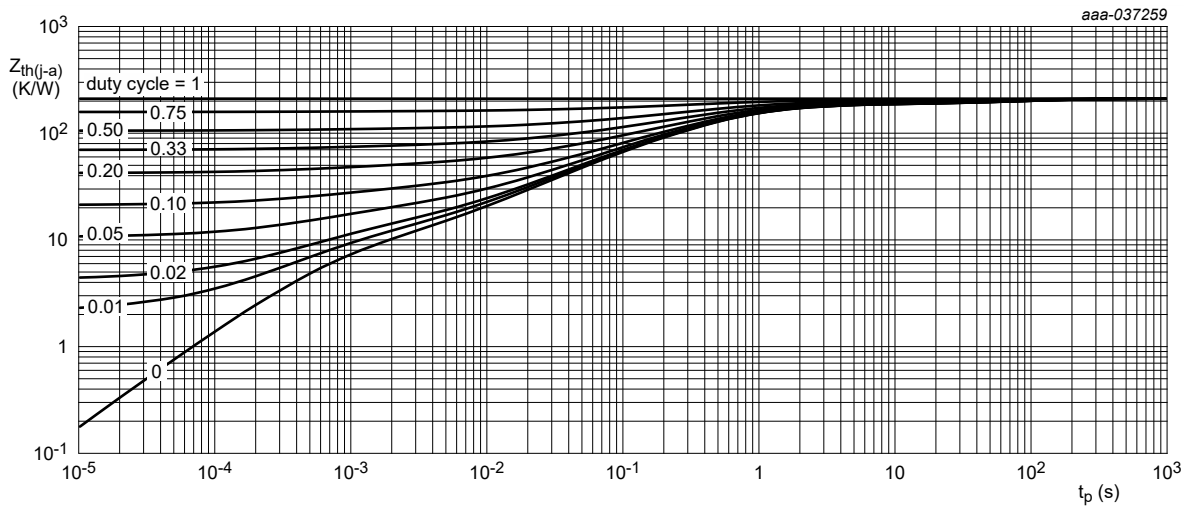
- [1] Device mounted on an FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided, 35μm copper, tin-plated; mounting pad for collector 1 cm².
- [3] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm².





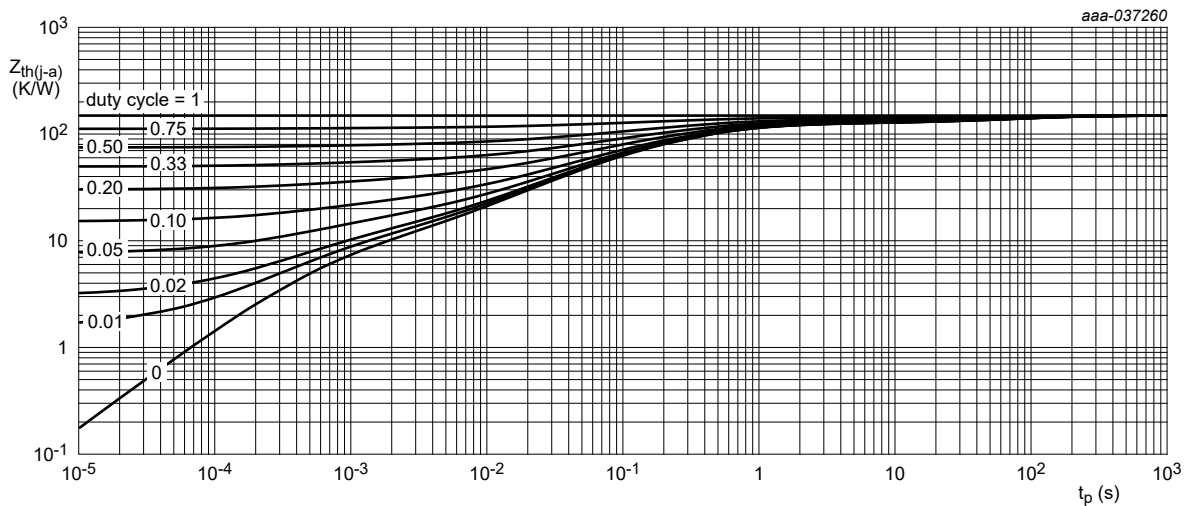
FR4 PCB, single-sided, 35µm copper, tin-plated, mounting pad for collector 1 cm².

Fig. 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, 4-layer copper, tin-plated and standard footprint.

Fig. 4. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm².

Fig. 5. 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
Per transistor							
V _{(BR)CBO}	collector-base breakdown voltage	I _C = 100 μA; I _E = 0 A; T _{amb} = 25 °C	[1]	50	-	-	V
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = 10 mA; I _B = 0 A; T _{amb} = 25 °C	[1]	50	-	-	V
I _{CBO}	collector-base cut-off current	V _{CB} = 50 V; I _E = 0 A; T _{amb} = 25 °C	[1]	-	-	100	nA
I _{CEO}	collector-emitter cut-off current	V _{CE} = 50 V; I _B = 0 A; T _{amb} = 25 °C	[1]	-	-	0.5	μA
I _{EBO}	emitter-base cut-off current	V _{EB} = 5 V; I _C = 0 A; T _{amb} = 25 °C	[1]	-	-	0.72	mA
h _{FE}	DC current gain	V _{CE} = 5 V; I _C = 50 mA; T _{amb} = 25 °C	[1]	70	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 50 mA; I _B = 2.5 mA; T _{amb} = 25 °C	[1]	-	-	100	mV
V _{I(off)}	off-state input voltage	V _{CE} = 5 V; I _C = 100 μA; T _{amb} = 25 °C	[1]	0.3	0.6	1	V
V _{I(on)}	on-state input voltage	V _{CE} = 0.3 V; I _C = 20 mA; T _{amb} = 25 °C	[1]	0.4	0.8	1.4	V
R1	bias resistor 1 (input)	T _{amb} = 25 °C	[2]	0.7	1	1.3	kΩ
R2/R1	bias resistor ratio		[2]	9	10	11	
TR1 (NPN)							
C _c	collector capacitance	V _{CB} = 10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	5	-	pF
f _T	transition frequency	V _{CE} = 5 V; I _C = 50 mA; f = 100 MHz; T _{amb} = 25 °C	[3]	-	210	-	MHz
TR2 (PNP)							
C _c	collector capacitance	V _{CB} = -10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	7	-	pF
f _T	transition frequency	V _{CE} = -5 V; I _C = -50 mA; f = 100 MHz; T _{amb} = 25 °C	[3]	-	150	-	MHz

[1] For the PNP transistor with negative polarity.

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

[3] Characteristics of built-in transistor.

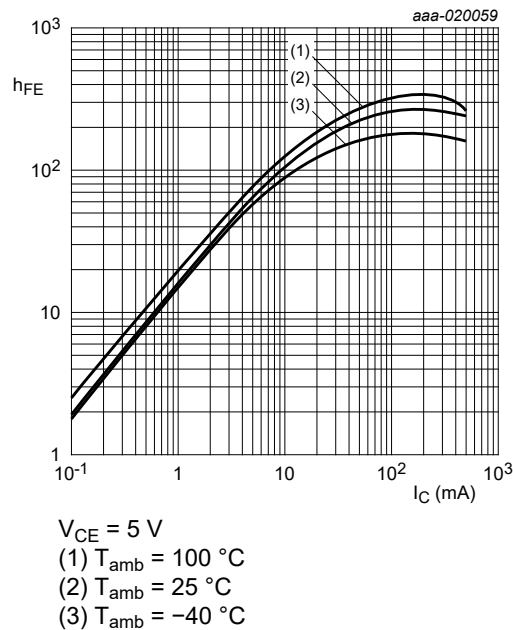


Fig. 6. TR1 (NPN): DC current gain as a function of collector current; typical values

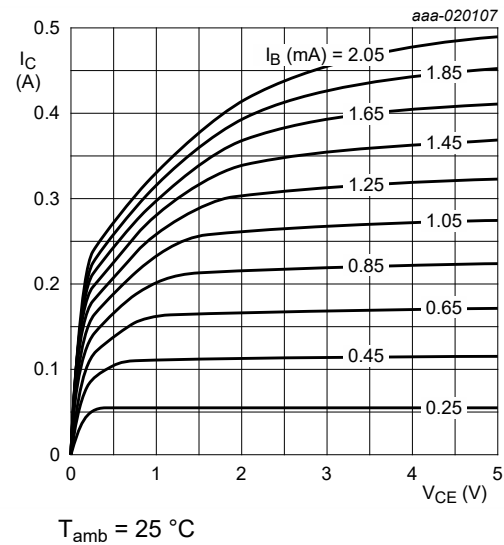


Fig. 7. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values

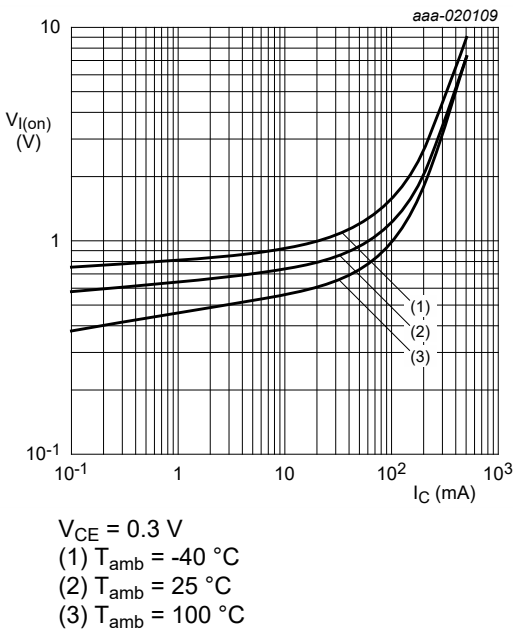


Fig. 8. TR1 (NPN): On-state input voltage as a function of collector current; typical values

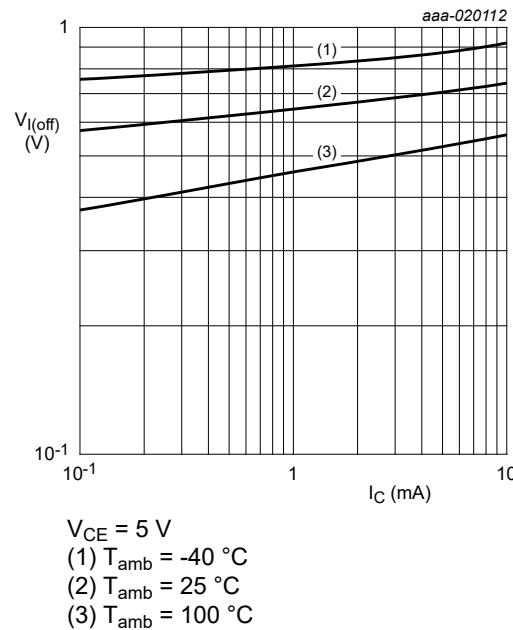


Fig. 9. TR1 (NPN): Off-state input voltage as a function of collector current; typical values

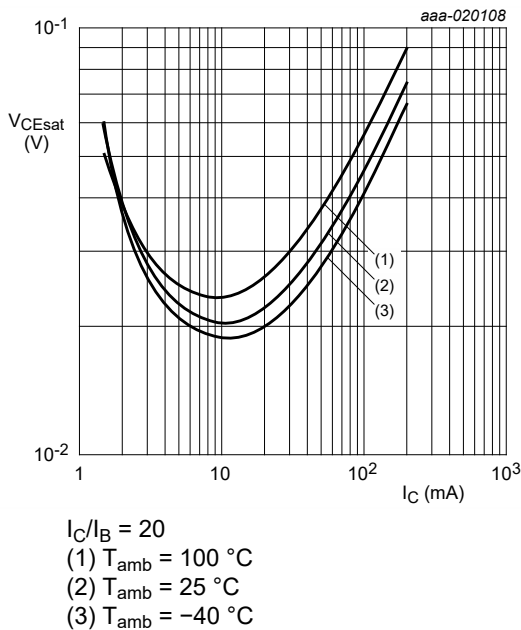


Fig. 10. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values

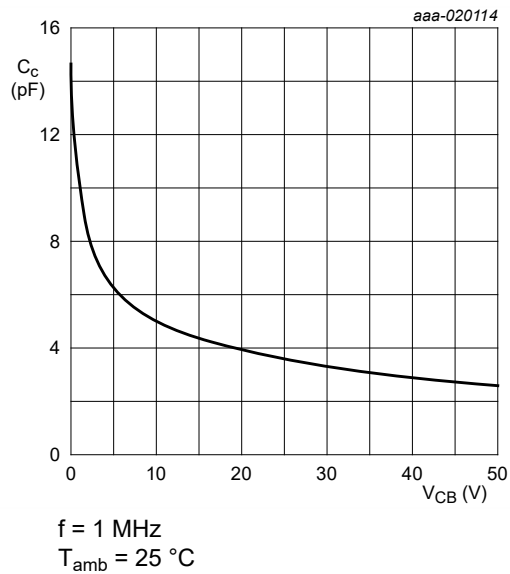


Fig. 11. TR1 (NPN): Collector capacitance as a function of collector-base voltage; typical values

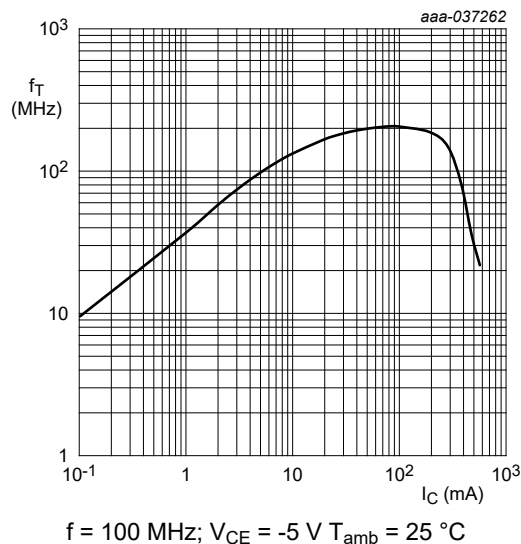


Fig. 12. TR2 (NPN): Transition frequency as a function of collector current; typical values of built-in transistor

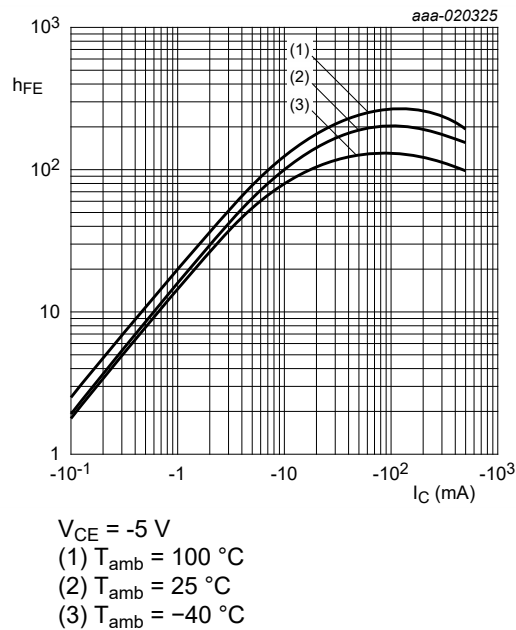


Fig. 13. TR2 (PNP): DC current gain as a function of collector current; typical values

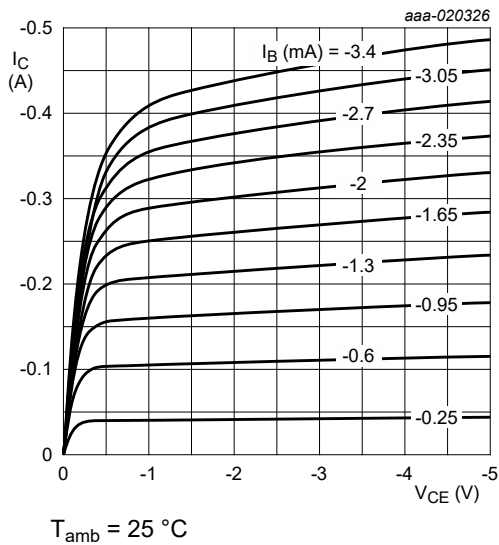


Fig. 14. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values

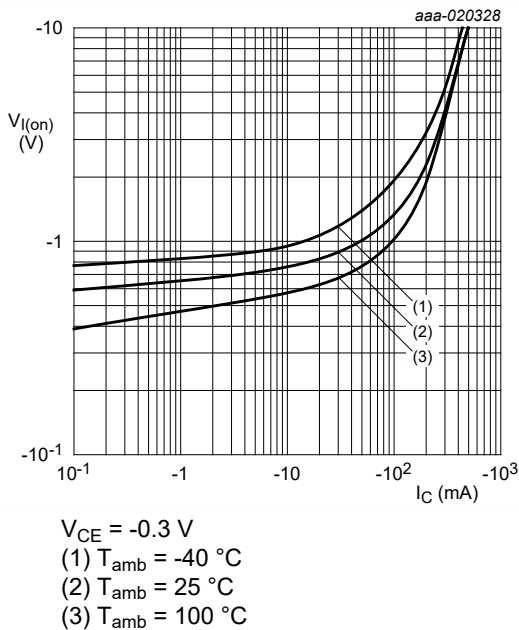


Fig. 15. TR2 (PNP): On-state input voltage as a function of collector current; typical values

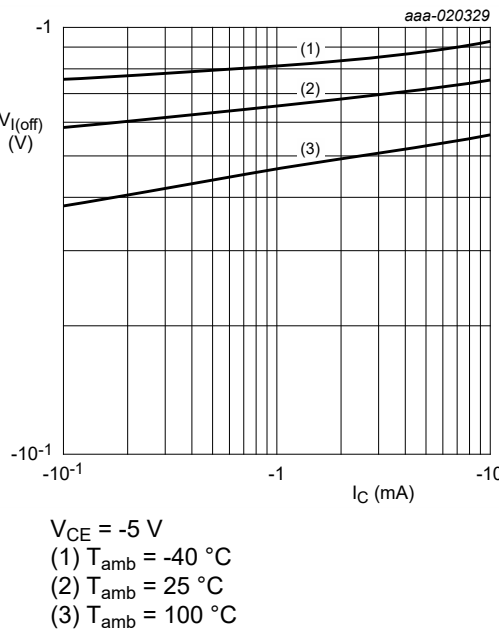


Fig. 16. TR2 (PNP): Off-state input voltage as a function of collector current; typical values

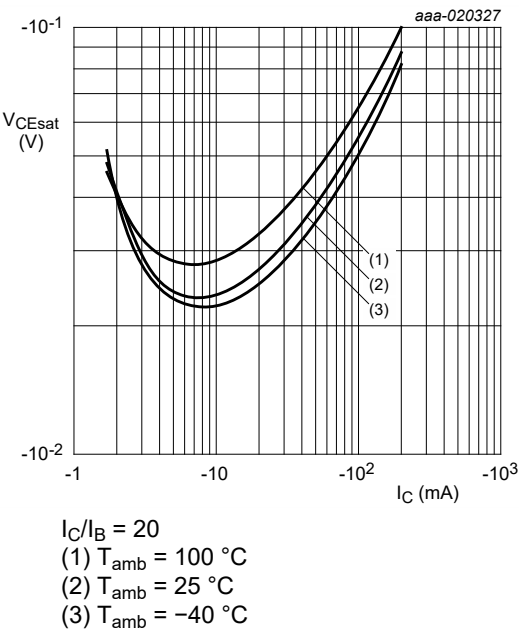


Fig. 17. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

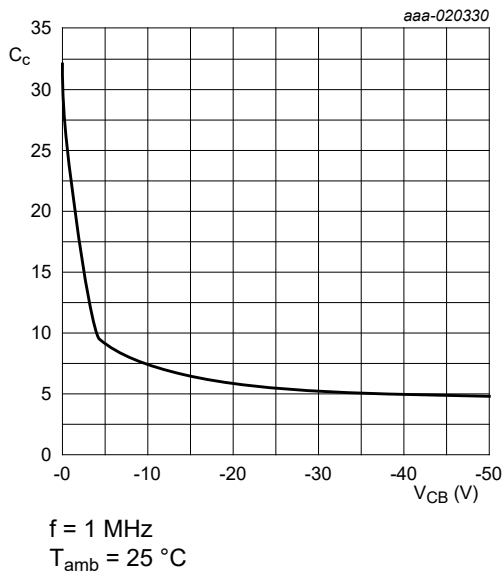


Fig. 18. TR2 (PNP): Collector capacitance as a function of collector-base voltage; typical values

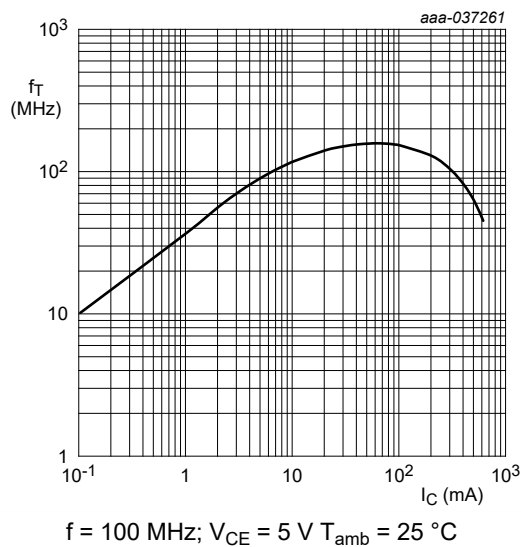


Fig. 19. TR1 (PNP): Transition frequency as a function of collector current; typical values of built-in transistor

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):

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

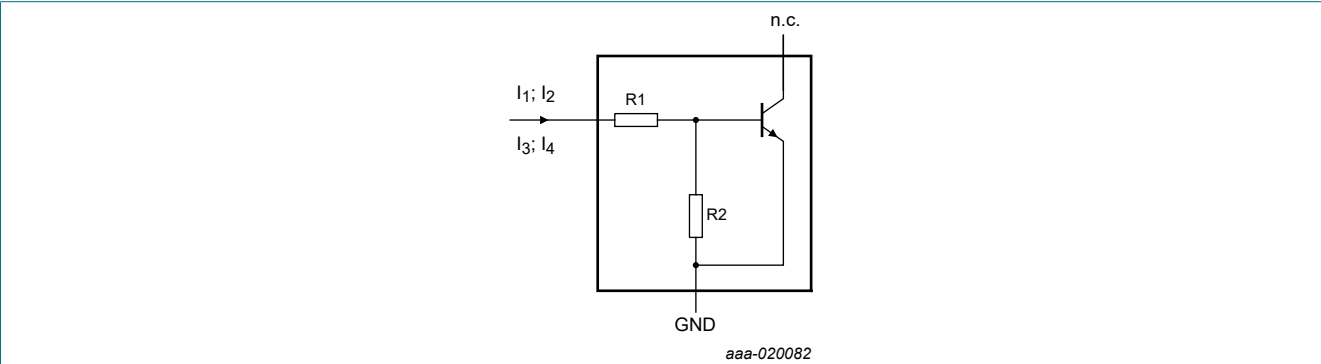


Fig. 20. NPN transistor: Resistor test circuit

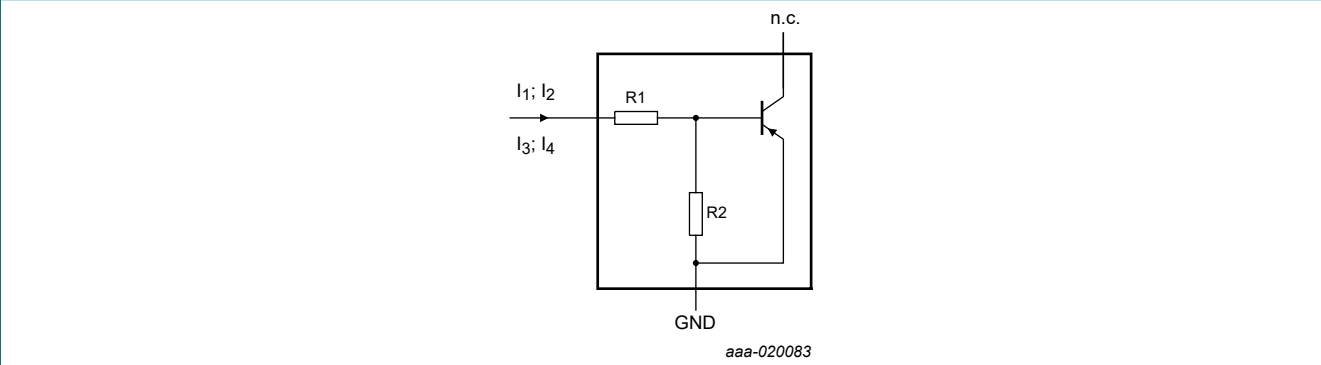


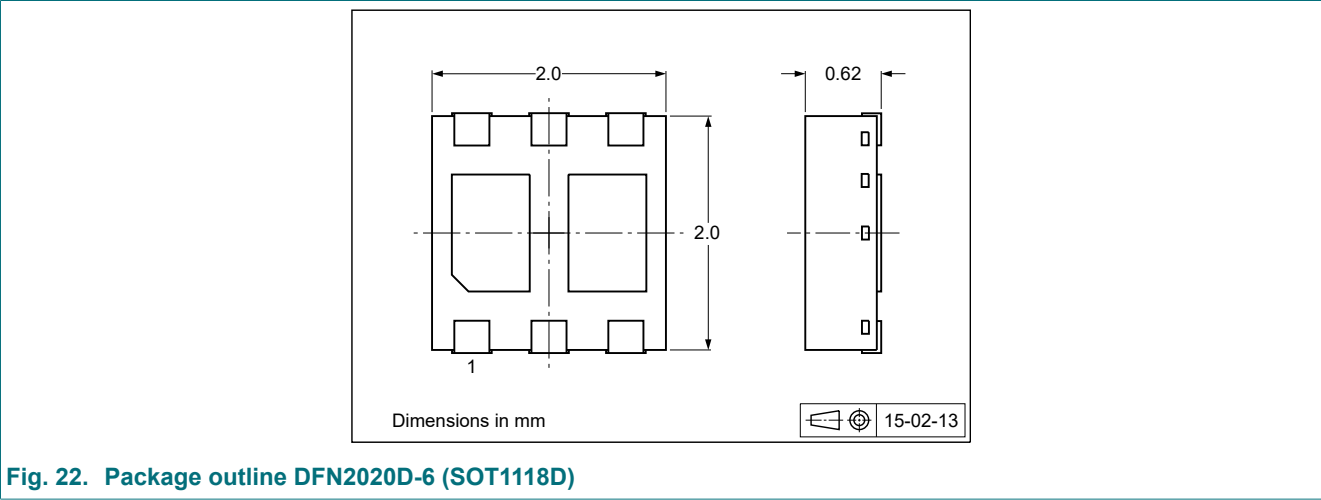
Fig. 21. PNP transistor: Resistor test circuit

Resistor test conditions

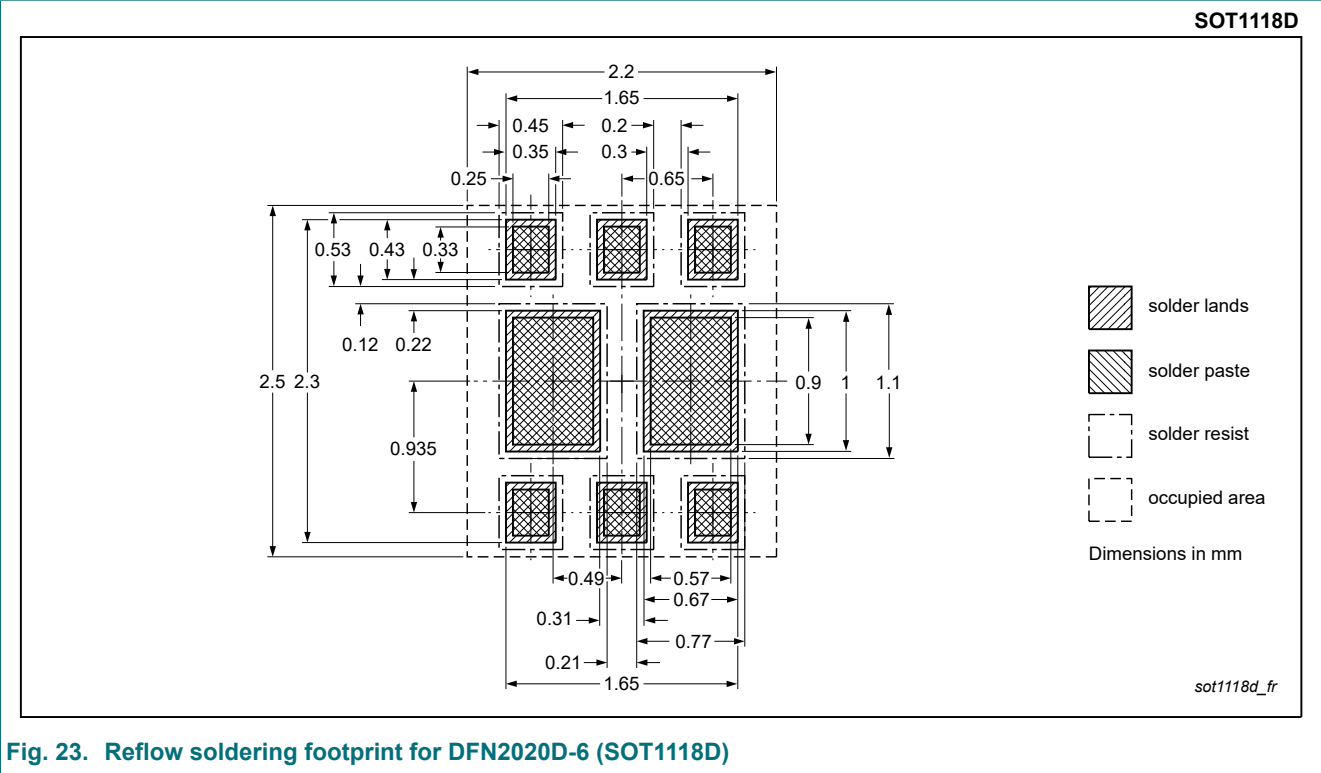
Table 8. Resistor test conditions

PIMC31PAS-Q	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I ₁	I ₂	I ₃	I ₄
TR1 (NPN)	1	10	0.7 mA	0.8 mA	-0.45 mA	-0.55 mA
TR2 (PNP)			-0.7 mA	-0.8 mA	0.45 mA	0.55 mA

12. Package outline



13. Soldering



14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PIMC31PAS-Q v.1	20230831	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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