PIMN32PAS-Q

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

1 September 2023 **Product data sheet**

1. General description

NPN/NPN 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: PIMC32PAS-Q

PNP/PNP complement: PIMP32PAS-Q

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 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		-	-	50	V
I_O	output current			-	-	500	mA
R1	bias resistor 1 (input)	T_{amb} = 25 °C	[1]	1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio		[1]	4.1	4.55	5	

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

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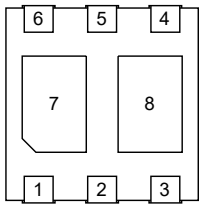
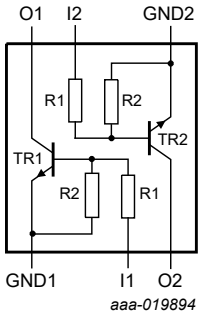
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 Transparent top view **DFN2020D-6 (SOT1118D)**	
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
PIMN32PAS-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
PIMN32PAS-Q	8K

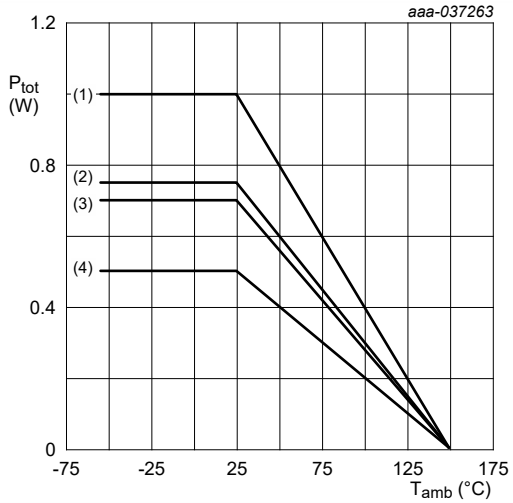
8. Limiting values

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		-	5	V
V_I	input voltage			-5	12	V
I_O	output current			-	500	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	360	mW
			[2]	-	550	mW
			[3]	-	510	mW
			[4]	-	730	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	500	mW
			[2]	-	750	mW
			[3]	-	700	mW
			[4]	-	1	W
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.
[2] Device mounted on an FR4 PCB, single-sided, 35µm copper, tin-plated; mounting pad for collector 1 cm^2.
[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 cm^2.



(1) FR4 PCB, 4-layer copper, 1 cm^2
(2) FR4 PCB, single-sided, 35µm copper, 1 cm^2
(3) FR4 PCB, 4-layer copper, standard footprint
(4) FR4 PCB, single-sided, 35µm copper, standard footprint

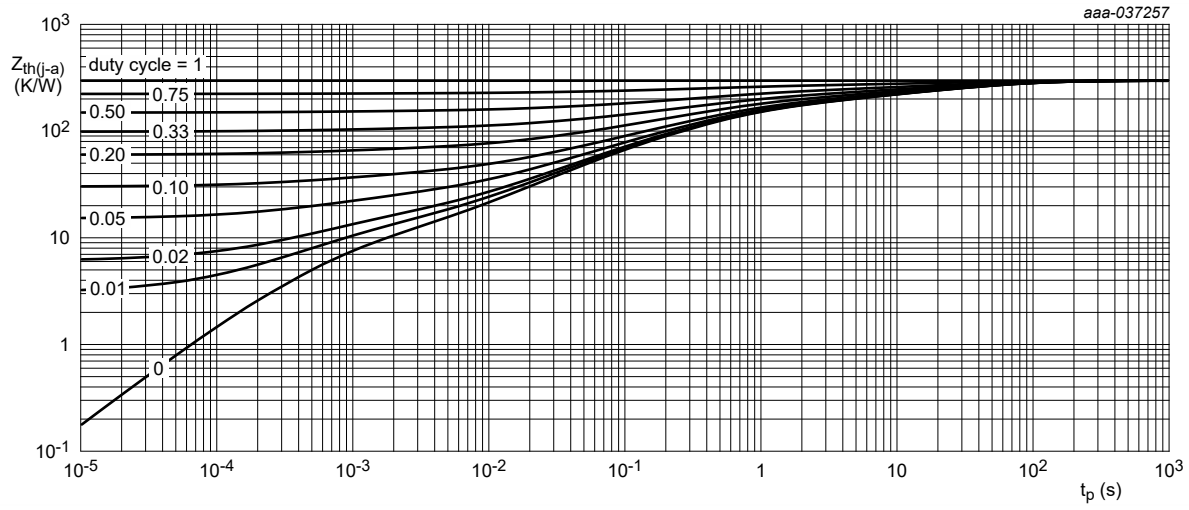
Fig. 1. Per device: Power derating curves for DFN2020D-6 (SOT1118D)

9. Thermal characteristics

Table 6. Thermal characteristics

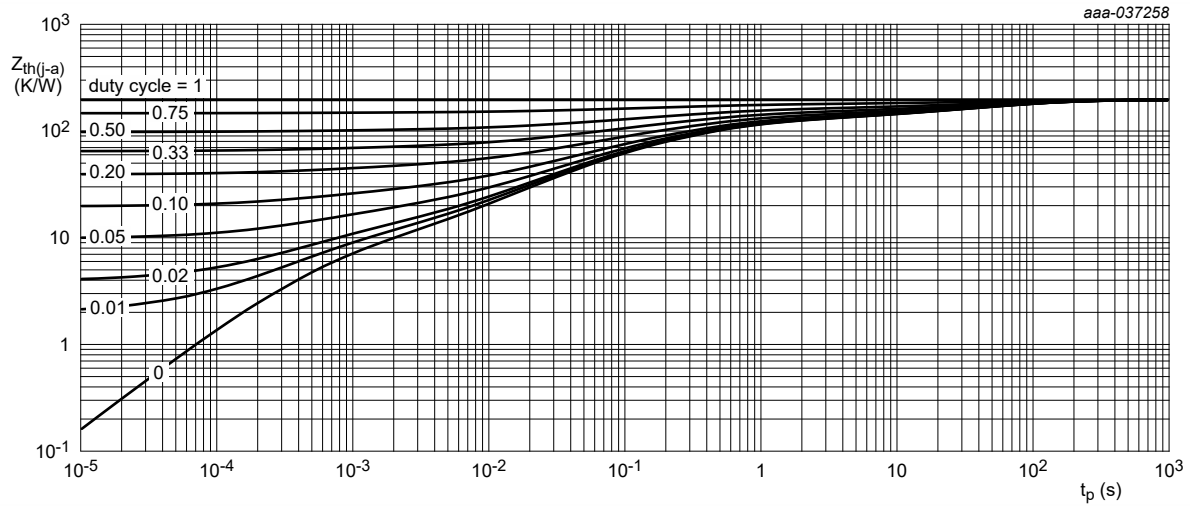
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	348	K/W
			[2]	-	-	228	K/W
			[3]	-	-	246	K/W
			[4]	-	-	172	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	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 cm^2.
[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 cm^2.



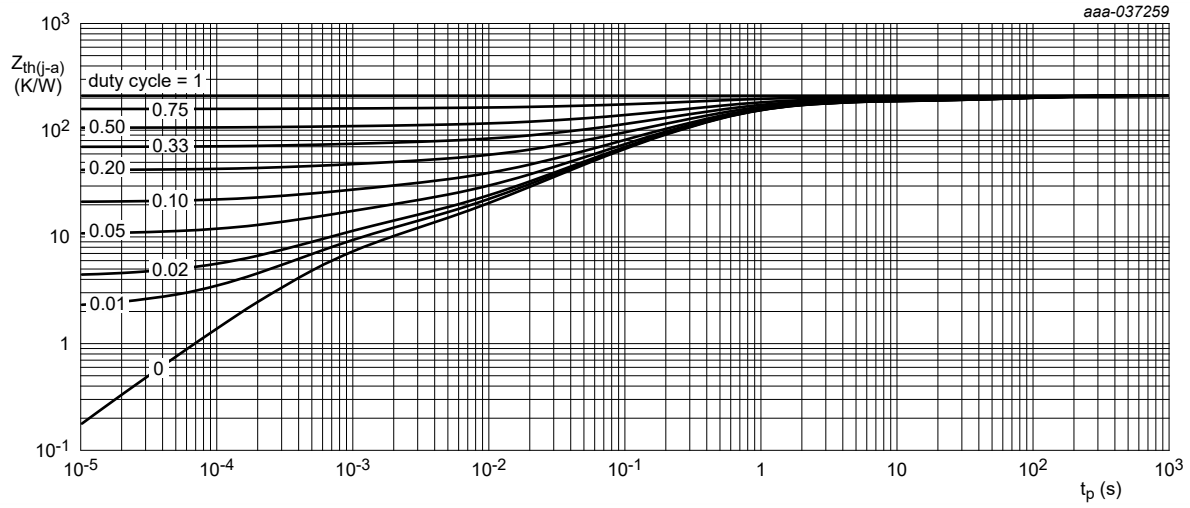
FR4 PCB, single-sided, 35µm copper, tin-plated and standard footprint

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



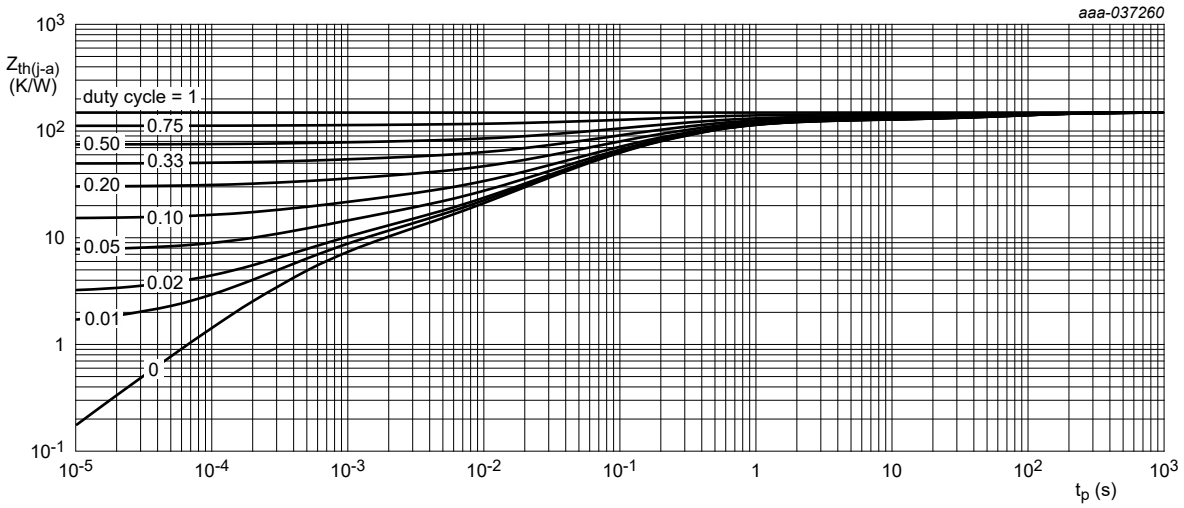
FR4 PCB, single-sided, 35µm copper, tin-plated, mounting pad for collector 1 cm^2.

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 cm^2.

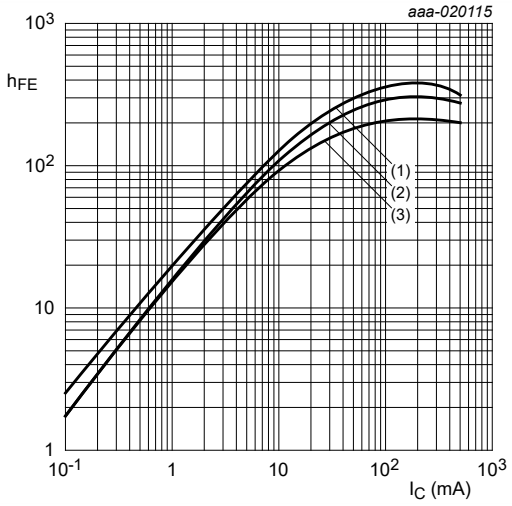
Fig. 5. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

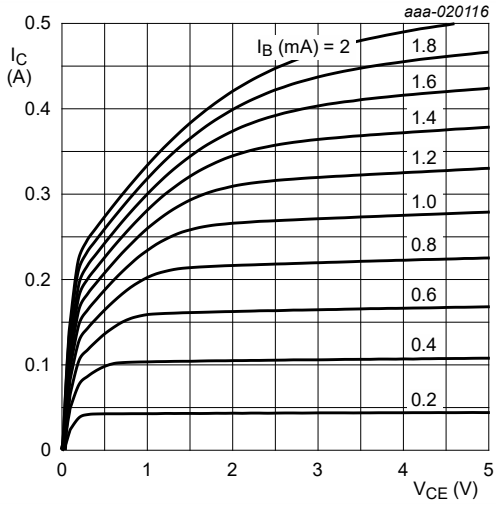
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A; T_{amb} = 25 °C		50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA; I_B = 0 A; T_{amb} = 25 °C		50	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 50 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
I_{CEO}	collector-emitter cut-off current	V_{CE} = 50 V; I_B = 0 A; T_{amb} = 25 °C		-	-	0.5	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	0.65	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 50 mA; T_{amb} = 25 °C		70	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 50 mA; I_B = 2.5 mA; T_{amb} = 25 °C		-	-	100	mV
$V_{I(off)}$	off-state input voltage	V_{CE} = 5 V; I_C = 100 µA; T_{amb} = 25 °C		0.4	0.65	1	V
$V_{I(on)}$	on-state input voltage	V_{CE} = 0.3 V; I_C = 20 mA; T_{amb} = 25 °C		0.5	0.95	1.4	V
R1	bias resistor 1 (input)	T_{amb} = 25 °C	[1]	1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio		[1]	4.1	4.55	5	
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	[2]	-	210	-	MHz

[1] See section "Test information" for resistor calculation and test conditions.
[2] Characteristics of built-in transistor.



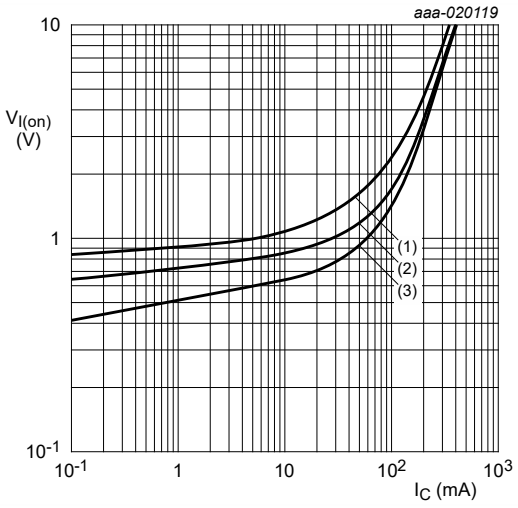
V_{CE} = 5 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −40 °C

Fig. 6. DC current gain as a function of collector current; typical values



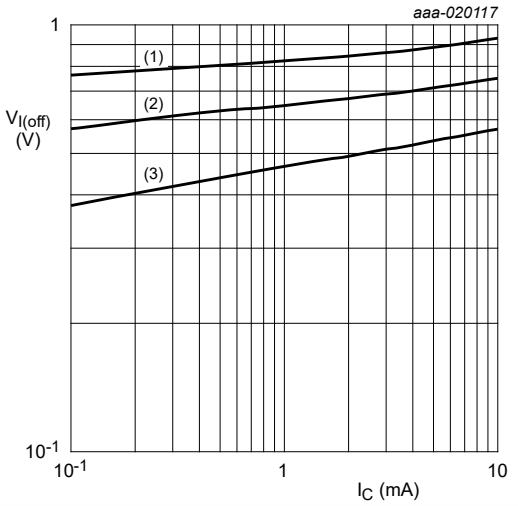
T_{amb} = 25 °C

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



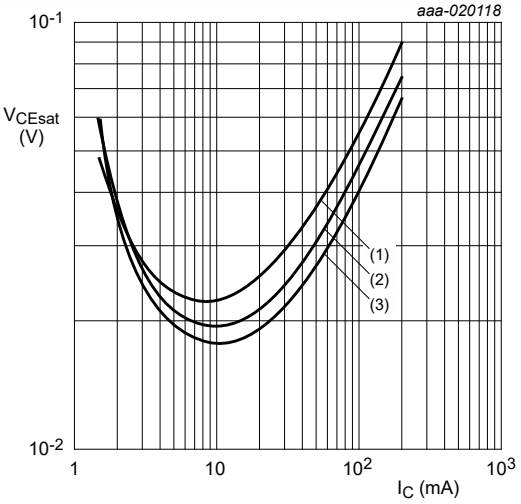
V_{CE} = 0.3 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig. 8. On-state input voltage as a function of collector current; typical values



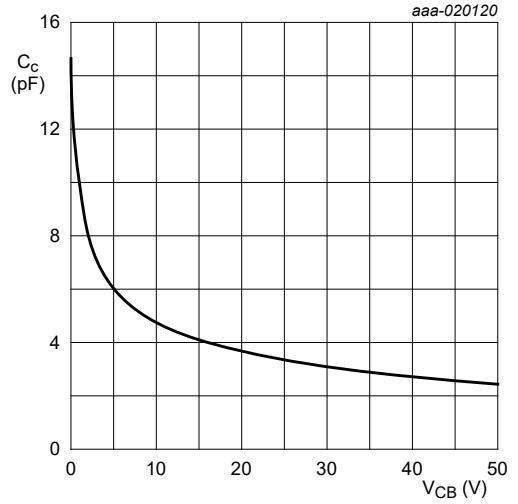
V_{CE} = 5 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig. 9. Off-state input voltage as a function of collector current; typical values



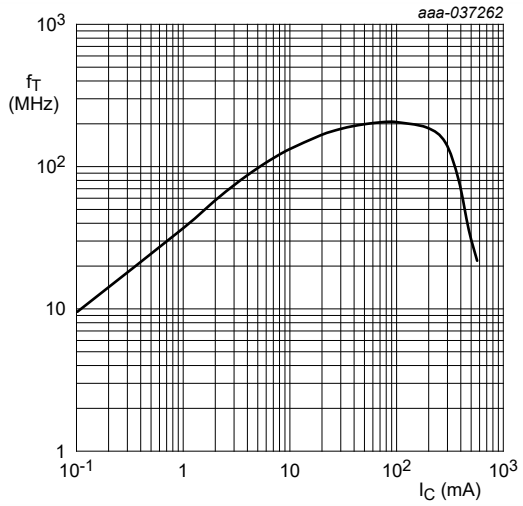
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −40 °C

Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values



f = 1 MHz
T_{amb} = 25 °C

Fig. 11. Collector capacitance as a function of collector-base voltage; typical values



f = 100 MHz; V_{CE} = -5 V T_{amb} = 25 °C

Fig. 12. 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):

$$\frac{R2}{R1} = \frac{V(I_4) - V(I_3)}{R1 \cdot (I_4 - I_3)} - 1$$

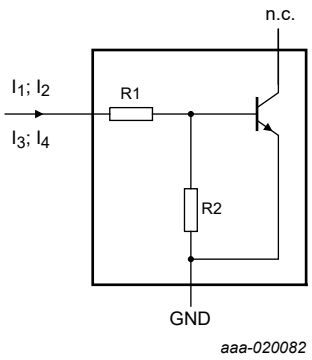


Fig. 13. NPN transistor: Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

PIMN32PAS-Q	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I_1	I_2	I_3	I_4
TR1/TR2 (NPN)	2.2	10	0.7 mA	0.8 mA	-0.45 mA	-0.55 mA

12. Package outline

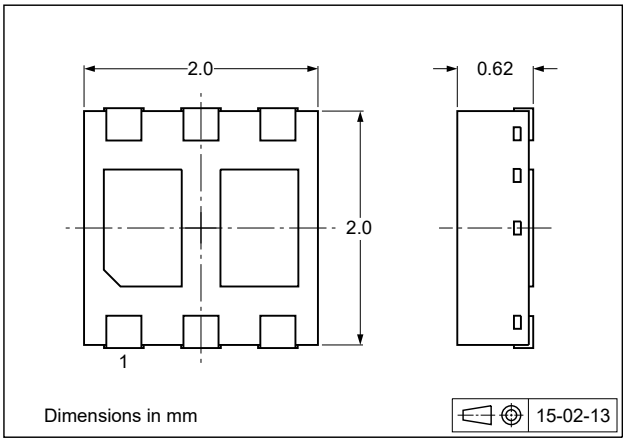


Fig. 14. Package outline DFN2020D-6 (SOT1118D)

13. Soldering

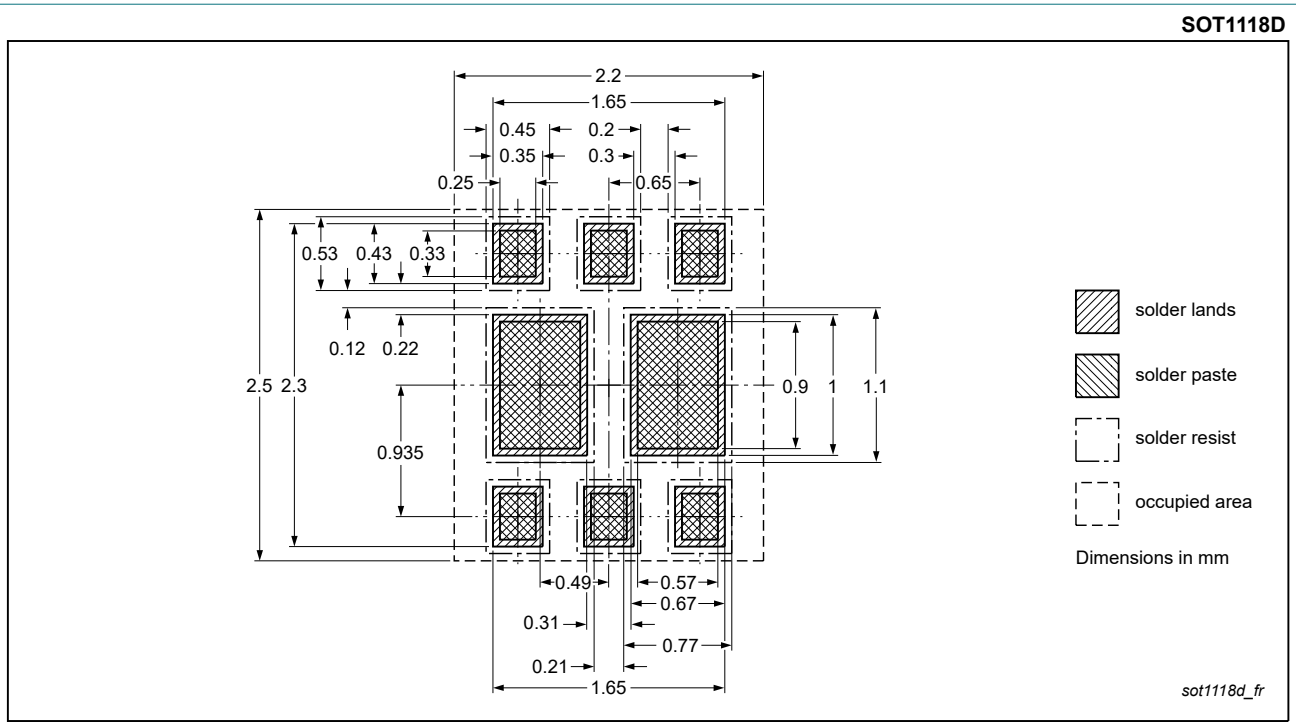


Fig. 15. Reflow soldering footprint for DFN2020D-6 (SOT1118D)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PIMN32PAS-Q v.1	20230901	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.

[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".
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Date of release: 1 September 2023