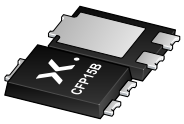


MJPE31CH-Q

100 V, 3 A NPN high power bipolar transistor

22 April 2025 Product data sheet

1. General description

NPN high power bipolar transistor in a power SOT1289B (CFP15B) flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- High thermal power dissipation capability
- High energy efficiency due to less heat generation
- High current gain at V_{CE} = 60 V
- Electrically similar to popular MJD31 series
- Low collector emitter saturation voltage
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Power management
- Load switch
- Linear mode voltage regulator
- Constant current drive backlighting application
- Motor drive
- Relay replacement

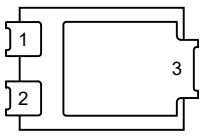
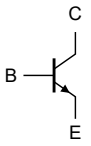
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	100	V
I_C	collector current			-	-	3	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	5	A
h_{FE}	DC current gain	V_{CE} = 60 V; I_C = 20 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		120	-	-	
		V_{CE} = 4 V; I_C = 0.5 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		100	-	-	
		V_{CE} = 4 V; I_C = 1 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		25	-	-	
		V_{CE} = 4 V; I_C = 3 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		10	-	-	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 CFP15B (SOT1289B)	 sym123
2	B	base		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
MJPE31CH-Q	CFP15B	plastic, thermal enhanced ultra thin SMD package; 3 leads; 2.13 mm pitch; 5.8 x 4.3 x 0.95 mm body	SOT1289B

7. Marking

Table 4. Marking codes

Type number	Marking code
MJPE31CH-Q	MJPE31CH

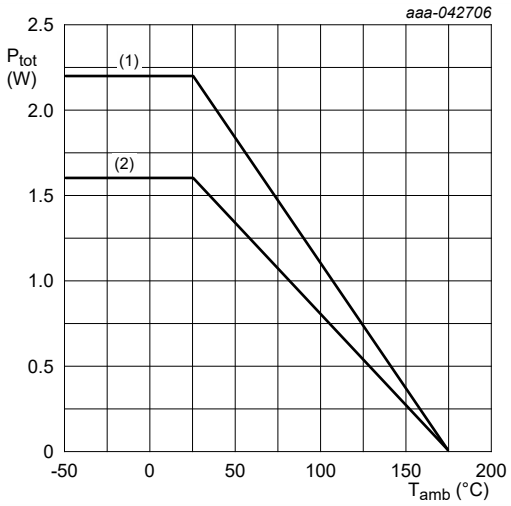
8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	100	V
V_{EBO}	emitter-base voltage	open collector		-	6	V
I_C	collector current			-	3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	1.6	W
		$T_{amb} \leq 25$ °C	[2]	-	2.2	W
T_j	junction temperature			-	175	°C
T_{amb}	ambient temperature			-55	175	°C
T_{stg}	storage temperature			-65	175	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), 140 µm single-sided copper, standard footprint.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), 140 µm single-sided copper, mounting pad for collector 1 cm^2.



(1) FR4 PCB, single-sided 140 µm copper, 1 cm^2
(2) FR4 PCB, single-sided 140 µm copper, standard footprint

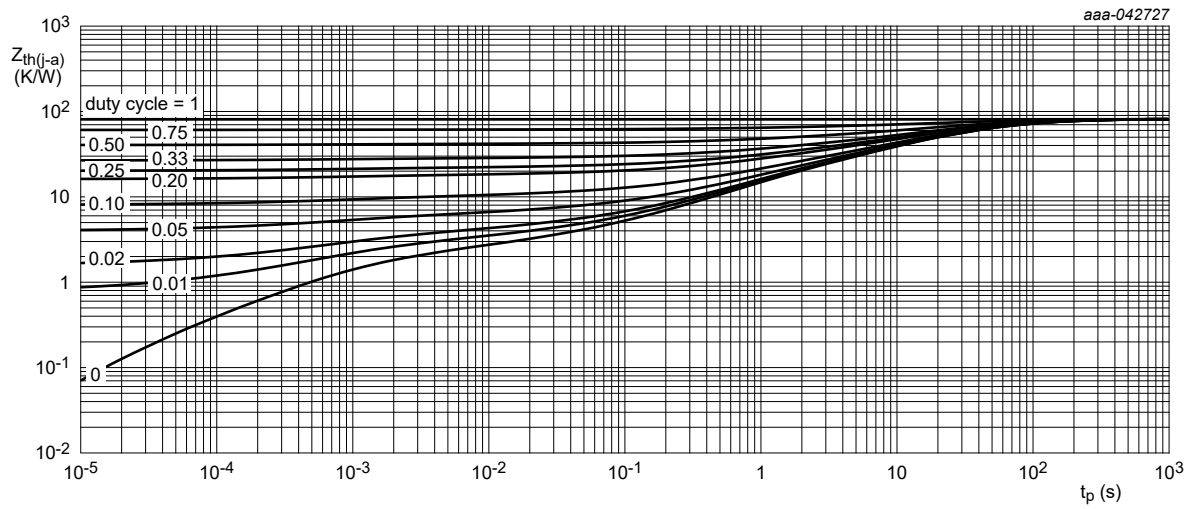
Fig. 1. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

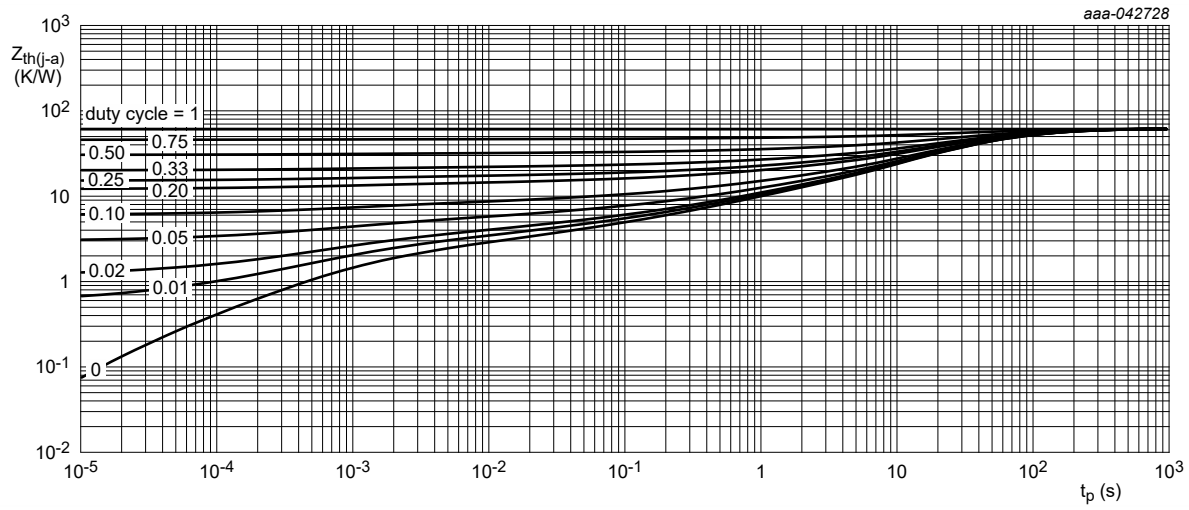
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	94	K/W
			[2]	-	-	69	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	4.5	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), 140 µm single-sided copper, standard footprint.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), 140 µm single-sided copper, mounting pad for collector 1cm ^{2}.



FR4 PCB, single-sided 140 µm copper, standard footprint

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



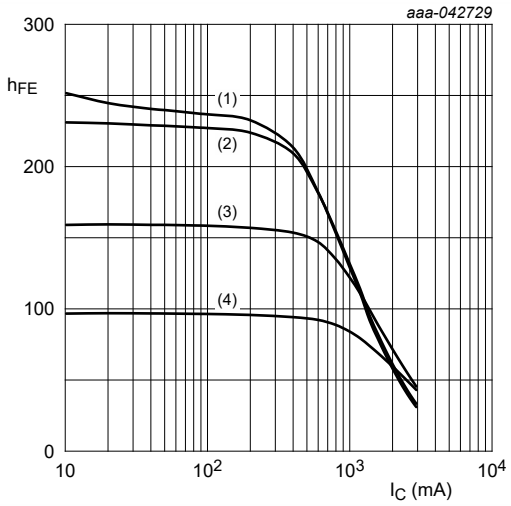
FR4 PCB, single-sided 140 µm copper, mounting pad for collector 1 cm^2

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

10. Characteristics

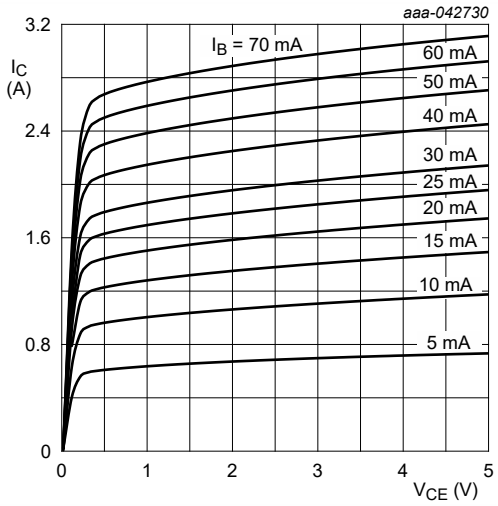
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 2 mA; I_B = 0 A; T_{amb} = 25 °C		100	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_C = 0 A; I_E = 100 µA; T_{amb} = 25 °C		6	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 80 V; I_E = 0 A; T_{amb} = 25 °C		-	-	1	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 80 V; V_{BE} = 0 V; T_{amb} = 25 °C		-	-	1	µA
		V_{CE} = 80 V; V_{BE} = 0 V; T_j = 150 °C		-	-	50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	1	µA
h_{FE}	DC current gain	V_{CE} = 60 V; I_C = 20 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		120	-	-	
		V_{CE} = 4 V; I_C = 0.5 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		100	-	-	
		V_{CE} = 4 V; I_C = 1 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		25	-	-	
		V_{CE} = 4 V; I_C = 3 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		10	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 3 A; I_B = 375 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	-	1.2	V
V_{BE}	base-emitter voltage	V_{CE} = 4 V; I_C = 3 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	-	1.8	V
h_{fe}	small-signal current gain	V_{CE} = 10 V; I_C = 500 mA; f = 1 kHz; T_{amb} = 25 °C		20	-	-	
f_T	transition frequency	V_{CE} = 10 V; I_C = 500 mA; f = 100 MHz; T_{amb} = 25 °C		3	130	-	MHz



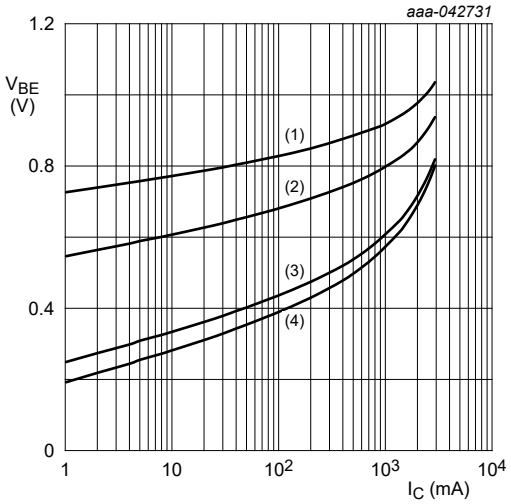
V_{CE} = 4 V
(1) T_{amb} = 175 °C
(2) T_{amb} = 150 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −55 °C

Fig. 4. DC current gain as a function of collector current; typical values



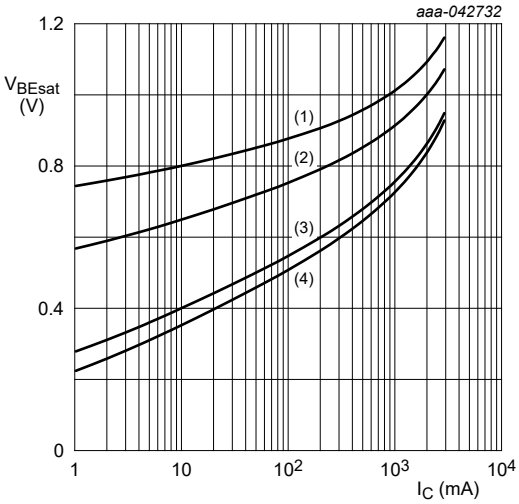
T_{amb} = 25 °C

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



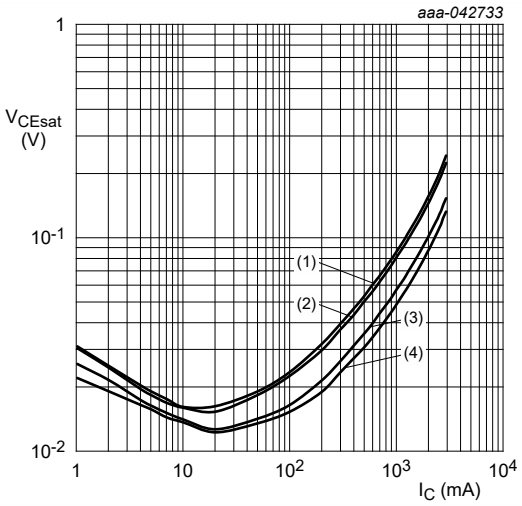
V_{CE} = 4 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C
(4) T_{amb} = 175 °C

Fig. 6. Base-emitter voltage as a function of collector current; typical values



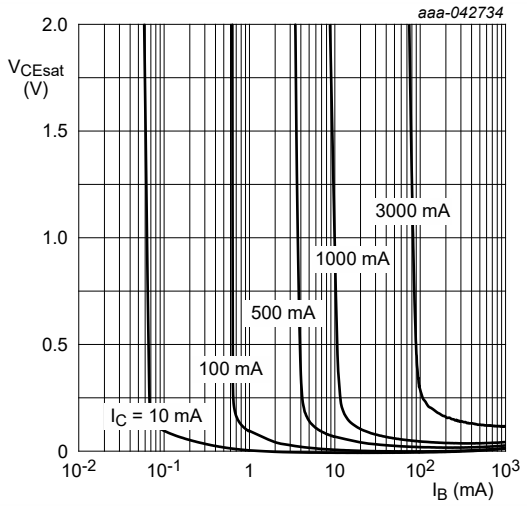
I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C
(3) T_{amb} = 175 °C

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



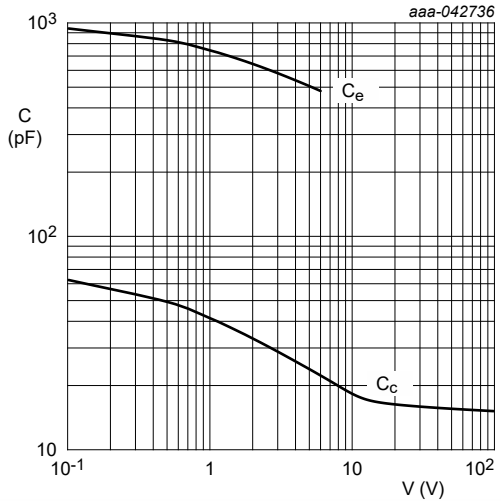
I_C/I_B = 10
(1) T_{amb} = 175 °C
(2) T_{amb} = 150 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −55 °C

Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C

Fig. 9. Collector-emitter saturation region as a function of base current; typical values



T_{amb} = 25 °C

Fig. 10. Input/output capacitance as a function of input/output voltage

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.

12. Package outline

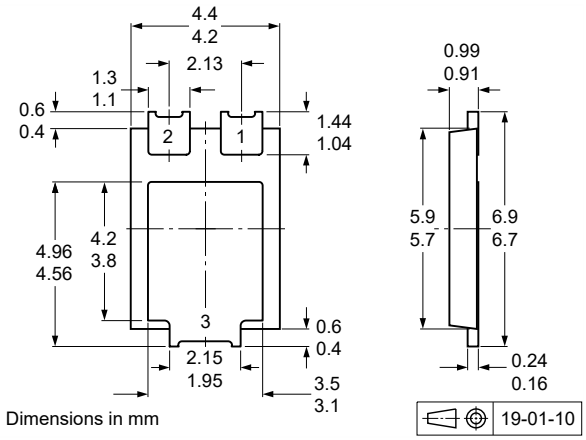


Fig. 11. Package outline CFP15B (SOT1289B)

13. Soldering

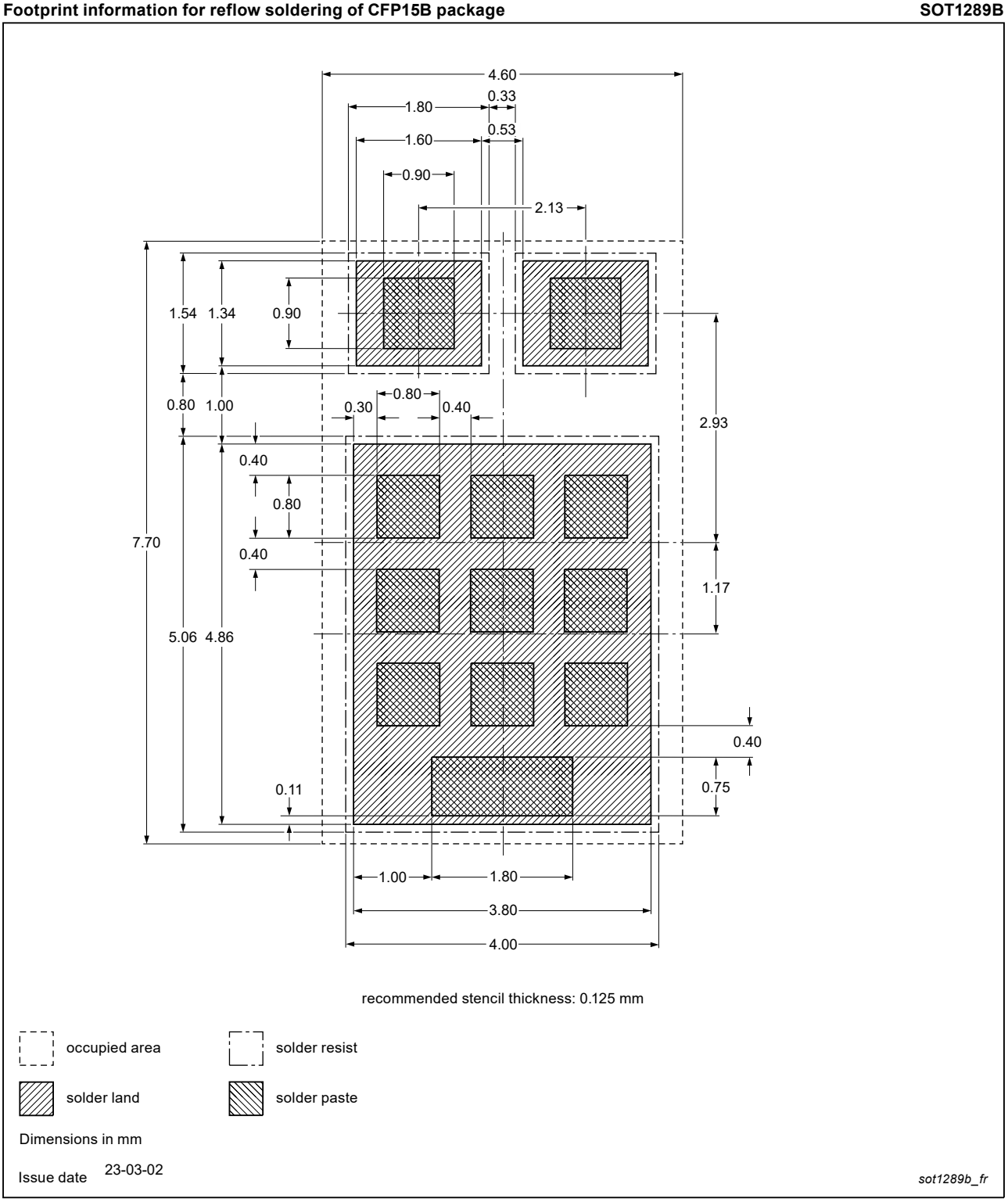


Fig. 12. Reflow soldering footprint for CFP15B (SOT1289B)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
MJPE31CH-Q v.2	20250422	Product data sheet	-	MJPE31CH-Q v.1
Modifications:	• Product status changed			
MJPE31CH-Q v.1	20250402	Preliminary 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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Contents

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Date of release: 22 April 2025