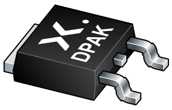


MJD31CH-Q

100 V, 3 A NPN high power bipolar transistor

18 May 2021 — Product data sheet

1. General description

NPN high power bipolar transistor in a power DPAK, TO-252 (SOT428C) 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
- Fast switching speeds
- 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

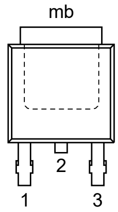
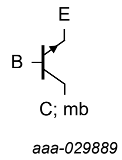
4. Quick reference data

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 = 1 A; pulsed; t_p = 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		25	-	-	
		V_{CE} = 4 V; I_C = 3 A; continuous; $t_p \leq$ 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	B	base	 DPAK (SOT428C)	
2	C	collector		
3	E	emitter		
mb	C	mounting base; connected to collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
MJD31CH-Q	DPAK	Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428C

7. Marking

Table 4. Marking codes

Type number	Marking code
MJD31CH-Q	MJD31CAH

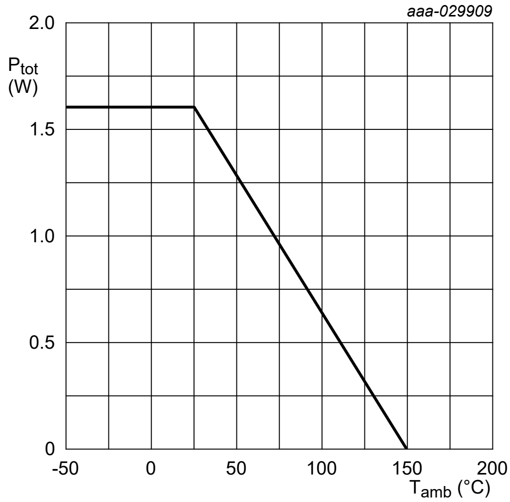
8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC601134).

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	$T_{mb} \leq 25$ °C	[1]	-	15	W
		$T_{amb} \leq$ 25 °C	[2]	-	1.6	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C

[1] Total power dissipation junction to mounting base.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated mounting pad for collector 1 cm^2.



FR4 PCB, single-sided 70 µm copper, tin-plated, mounting pad for collector 1 cm^2.

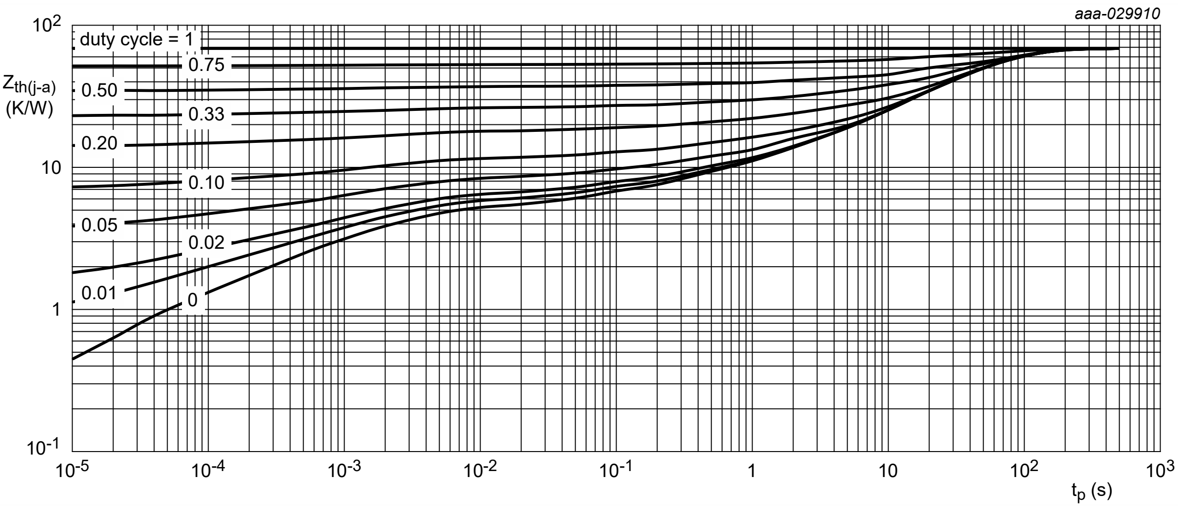
Fig. 1. Power derating curves SOT428C

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]	-	-	79	K/W
$R_{th(j-mb)}$	thermal resistance from junction to mounting base			-	-	9	K/W

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



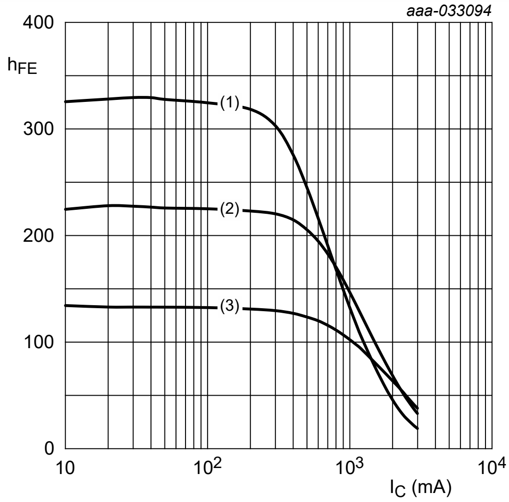
FR4 PCB, single-sided 70 µm copper, tin-plated, mounting pad for collector 1 cm^2.

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

10. Characteristics

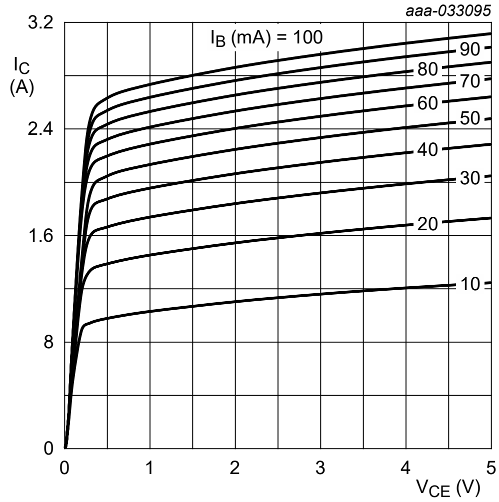
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CES}	collector-emitter cut-off current	V_{CE} = 80 V; V_{BE} = 0 V; T_{amb} = 25 °C	-	-	1	µA
		V_{CE} = 64 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 ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	120	-	-	
		V_{CE} = 4 V; I_C = 0.5 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	100	-	-	
		V_{CE} = 4 V; I_C = 1 A; pulsed; t_p = 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	25	-	-	
		V_{CE} = 4 V; I_C = 3 A; continuous; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	10	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 3 A; I_B = 375 mA; pulsed; t_p ≤ 300 µs; δ ≤ 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 ≤ 300 µs; δ ≤ 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; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; 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	-	-	MHz



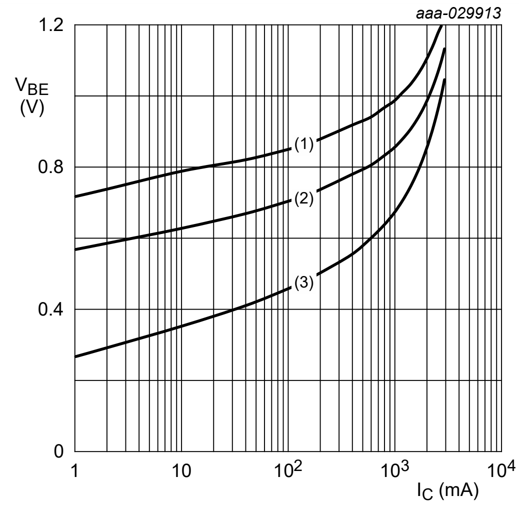
V_{CE} = 4 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 3. DC current gain as a function of collector current; typical values



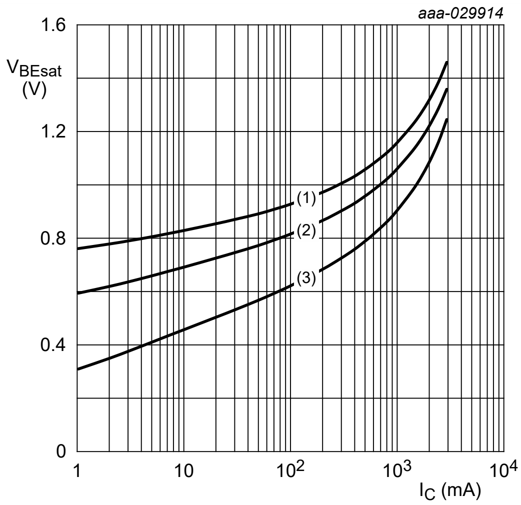
T_{amb} = 25 °C

Fig. 4. Collector current as a function of collector-emitter voltage; typical values



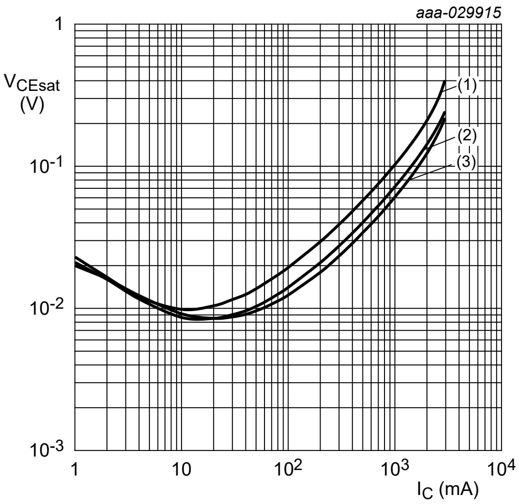
V_{CE} = 4 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



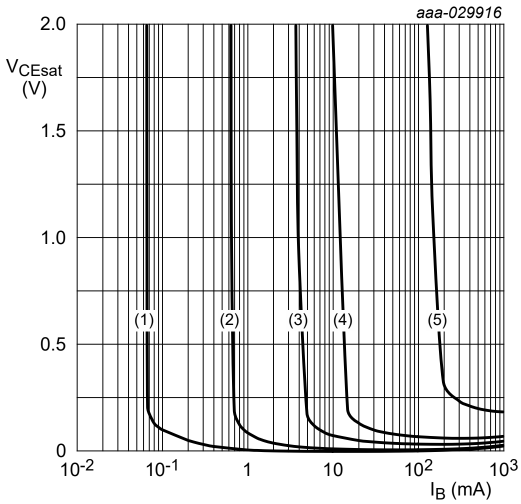
I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



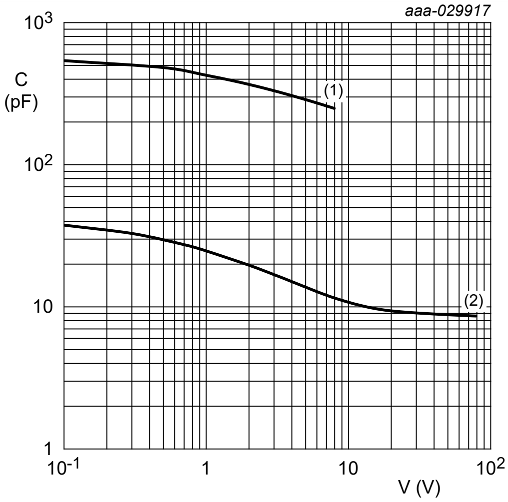
I_C/I_B = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



(1) I_C = 10 mA
(2) I_C = 100 mA
(3) I_C = 500 mA
(4) I_C = 1000 mA
(5) I_C = 3000 mA

Fig. 8. Collector-emitter saturation region as a function of base current; typical values



T_{amb} = 25 °C
(1) C_e
(2) C_c

Fig. 9. Input/output capacitance as a function of input/output voltage

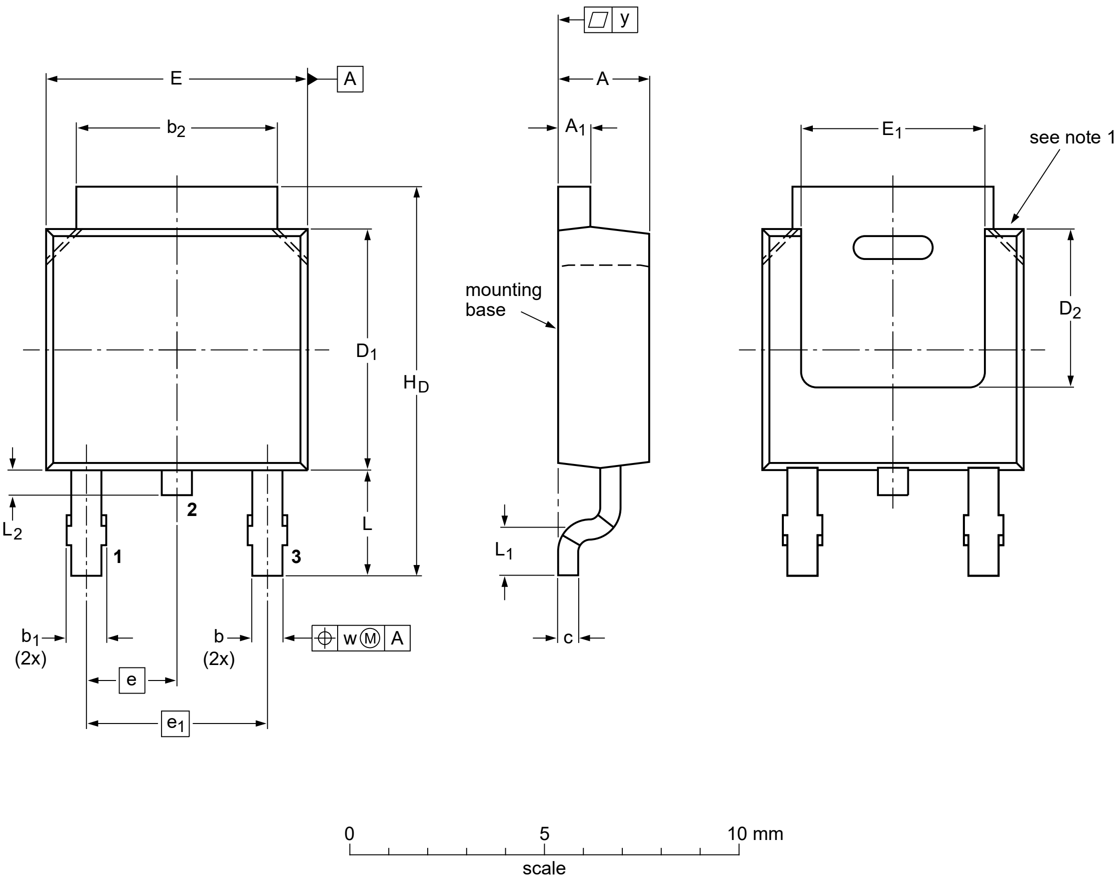
11. Test information

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

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) **SOT428C**



Dimensions (mm are the original dimensions)

Unit		A	A_1	b	b_1	b_2	c	D_1	D_2	E	E_1	e	e_1	H_D	L	L_1	L_2	w	y
mm	max	2.38	0.93	0.89	1.10	5.46	0.60	6.22		6.73				10.4	2.95		1.0		0.2
	nom											2.285	4.57					0.2	
	min	2.22	0.46	0.71	0.72	5.00	0.20	5.98	4.0	6.47	4.45			9.6	2.55	0.5	0.5		

Note

1. Plastic body may have 45° chamfer.

sot428c_po

Outline version	References: IEC	References: JEDEC	References: JEITA		European projection	Issue date
SOT428C		TO-252	SC-63			19-08-28

Fig. 10. Package outline DPAK (SOT428C)

13. Soldering

Footprint information for reflow soldering of DPAK (SOT428C) package **SOT428C**

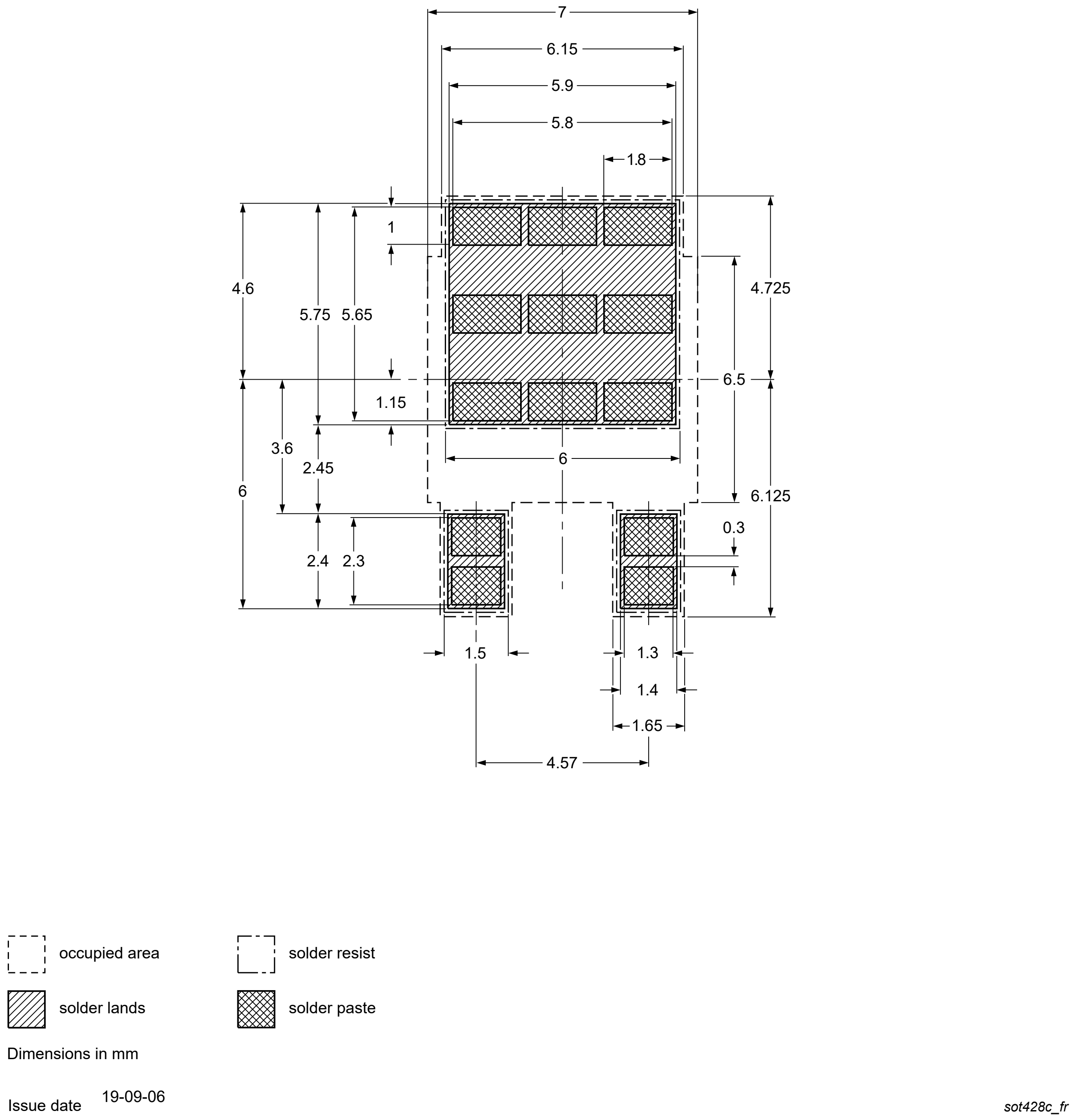


Fig. 11. Reflow soldering footprint for DPAK (SOT428C)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
MJD31CH-Q v.3	20210518	Product data sheet	-	MJD31CH-Q v.2
Modifications:	• Features and benefits: added recommendation for automotive applications			
MJD31CH-Q v.2	20210303	Product data sheet	-	MJD31CH-Q v.1
MJD31CH-Q v.1	20210126	Objective 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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