



# MJD148-Q

45 V, 4 A NPN high power bipolar transistor

17 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
- Electrically similar to popular MJD148 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

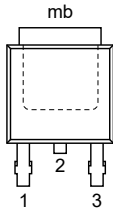
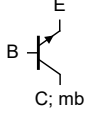
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE0}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current		-	-	4	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	7	A
$h_{FE}$	DC current gain	$V_{CE} = 1$ V; $I_C = 0.5$ A; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C	85	-	375	
		$V_{CE} = 1$ V; $I_C = 3$ A; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C	30	-	-	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p style="text-align: center;">DPAK (SOT428C)</p>	 <p style="text-align: center;">aaa-029889</p>
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
MJD148-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
MJD148-Q	MJD148A

## 8. Limiting values

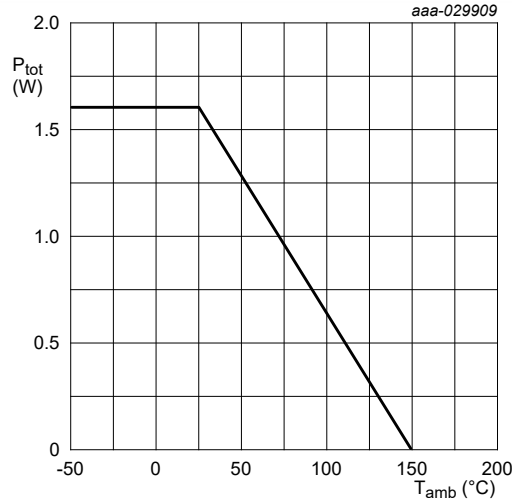
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	45	V
$V_{EBO}$	emitter-base voltage	open collector	-	6	V
$I_C$	collector current		-	4	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	7	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 70 µm copper, tin-plated mounting pad for collector 1 cm<sup>2</sup>.



FR4 PCB, single-sided 70 µm copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

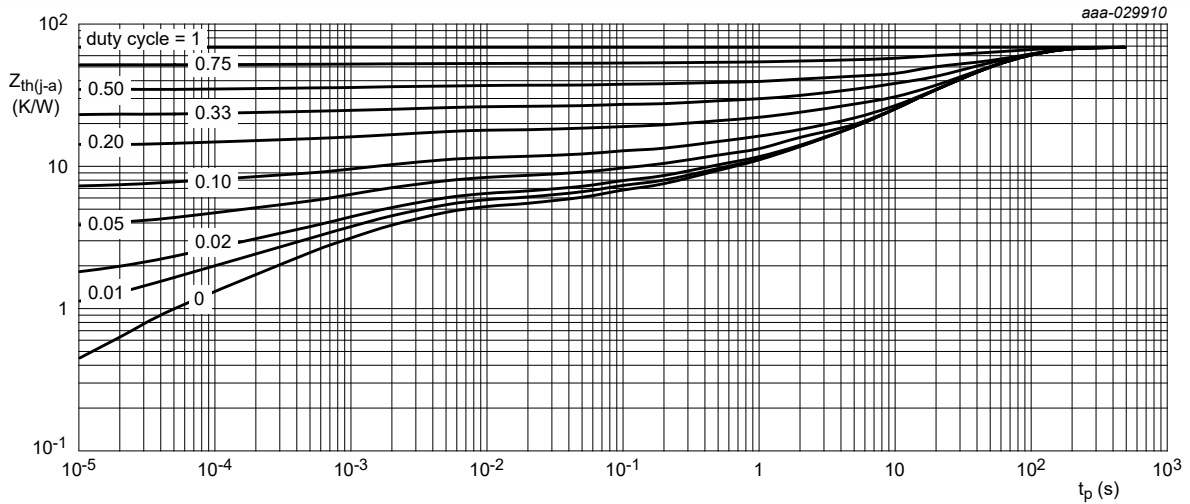
Fig. 1. Power derating curves SOT428C

### 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	79	K/W
R <sub>th(j-mb)</sub>	thermal resistance from junction to mounting base			-	-	9	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided 70 µm copper, tin-plated mounting pad for collector 1 cm<sup>2</sup>.



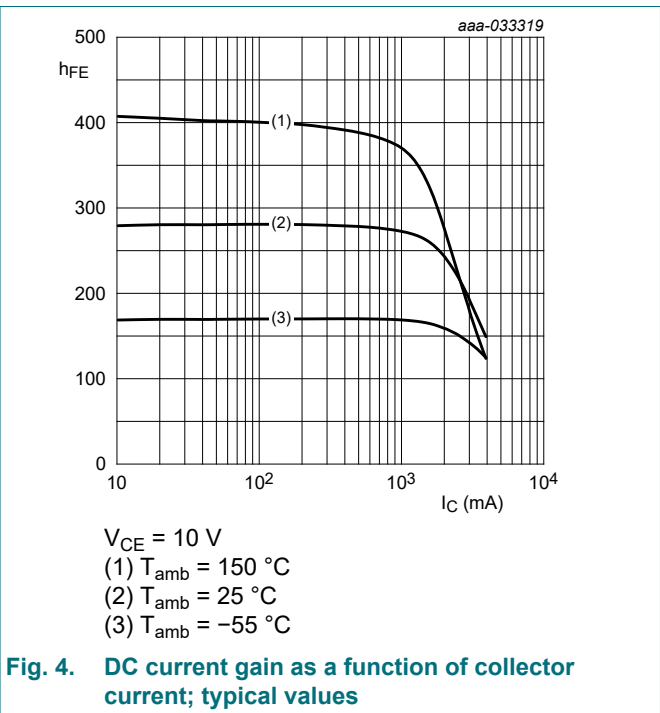
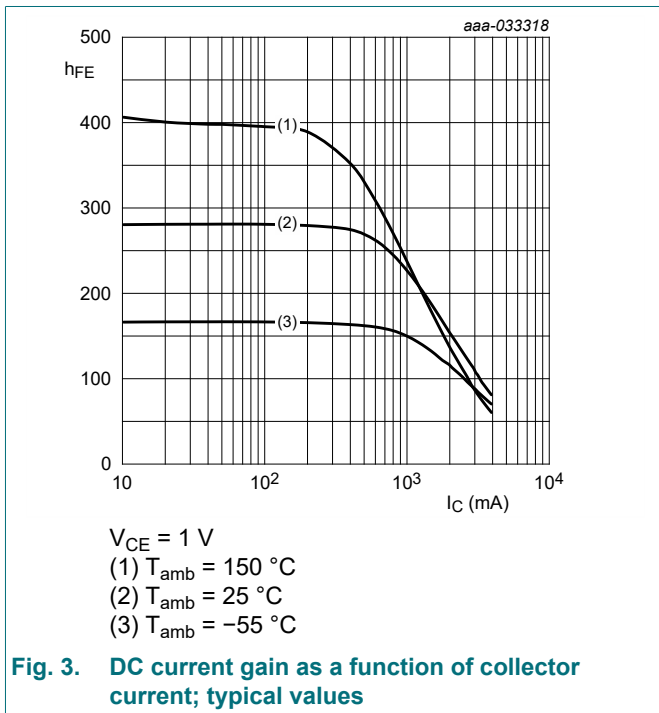
FR4 PCB, single-sided 70 µm copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

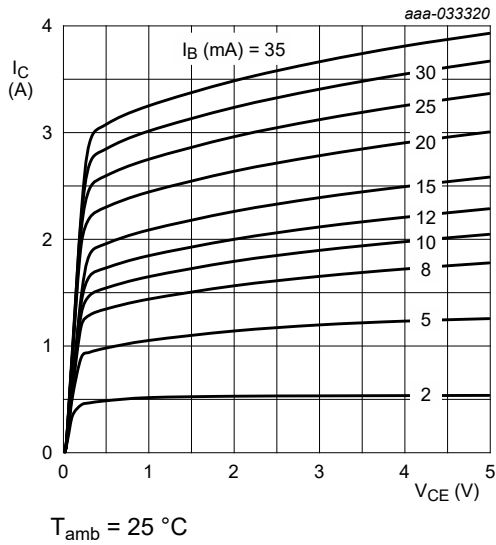
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

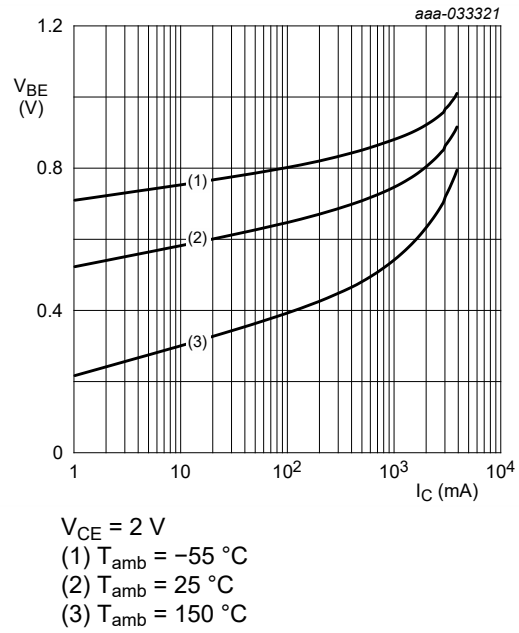
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 45\text{ V}; V_{BE} = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	1	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	1	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	40	-	-	
		$V_{CE} = 1\text{ V}; I_C = 0.5\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	85	-	375	
		$V_{CE} = 1\text{ V}; I_C = 2\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	50	-	-	
		$V_{CE} = 1\text{ V}; I_C = 3\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	30	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 2\text{ A}; I_B = 0.2\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	0.5	V
$V_{BE}$	base-emitter voltage	$V_{CE} = 1\text{ V}; I_C = 2\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	1.1	V
$f_T$	transition frequency	$V_{CE} = 1\text{ V}; I_C = 250\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$	3	-	-	MHz

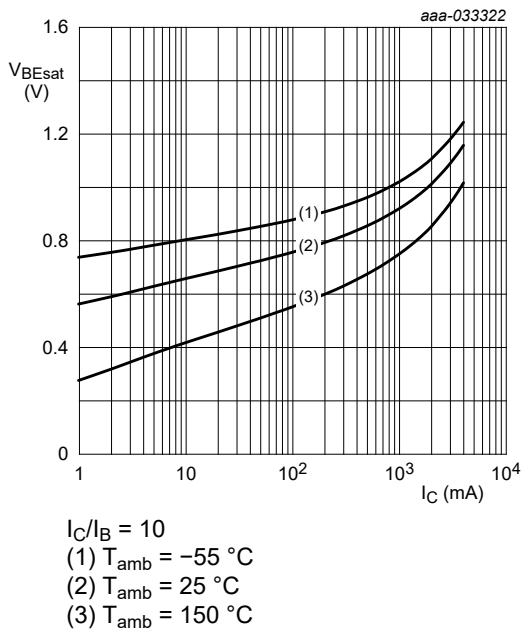




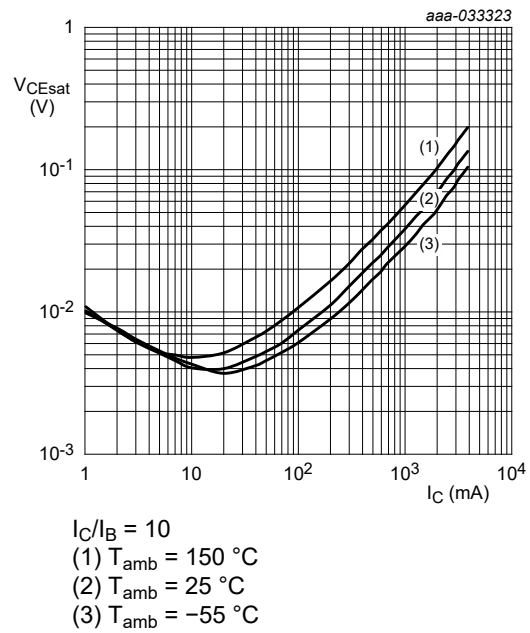
**Fig. 5. Collector current as a function of collector-emitter voltage; typical values**



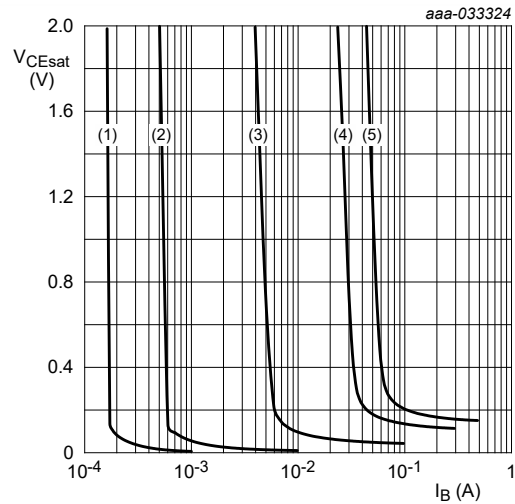
**Fig. 6. Base-emitter voltage as a function of collector current; typical values**



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



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



- (1)  $I_C = 0.01$  A
- (2)  $I_C = 0.10$  A
- (3)  $I_C = 1$  A
- (4)  $I_C = 3$  A
- (5)  $I_C = 4$  A

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

## 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

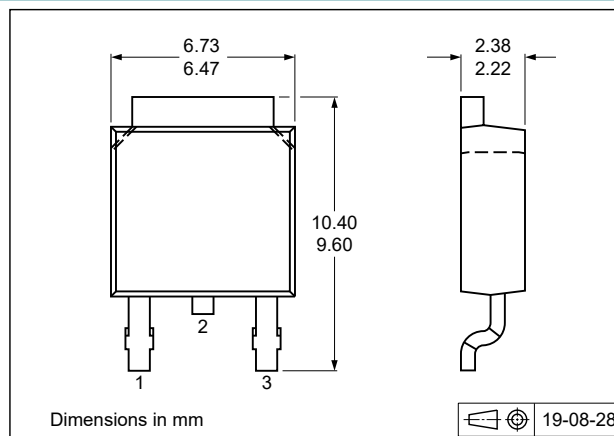


Fig. 10. Package outline DPAK (SOT428C)

### 13. Soldering

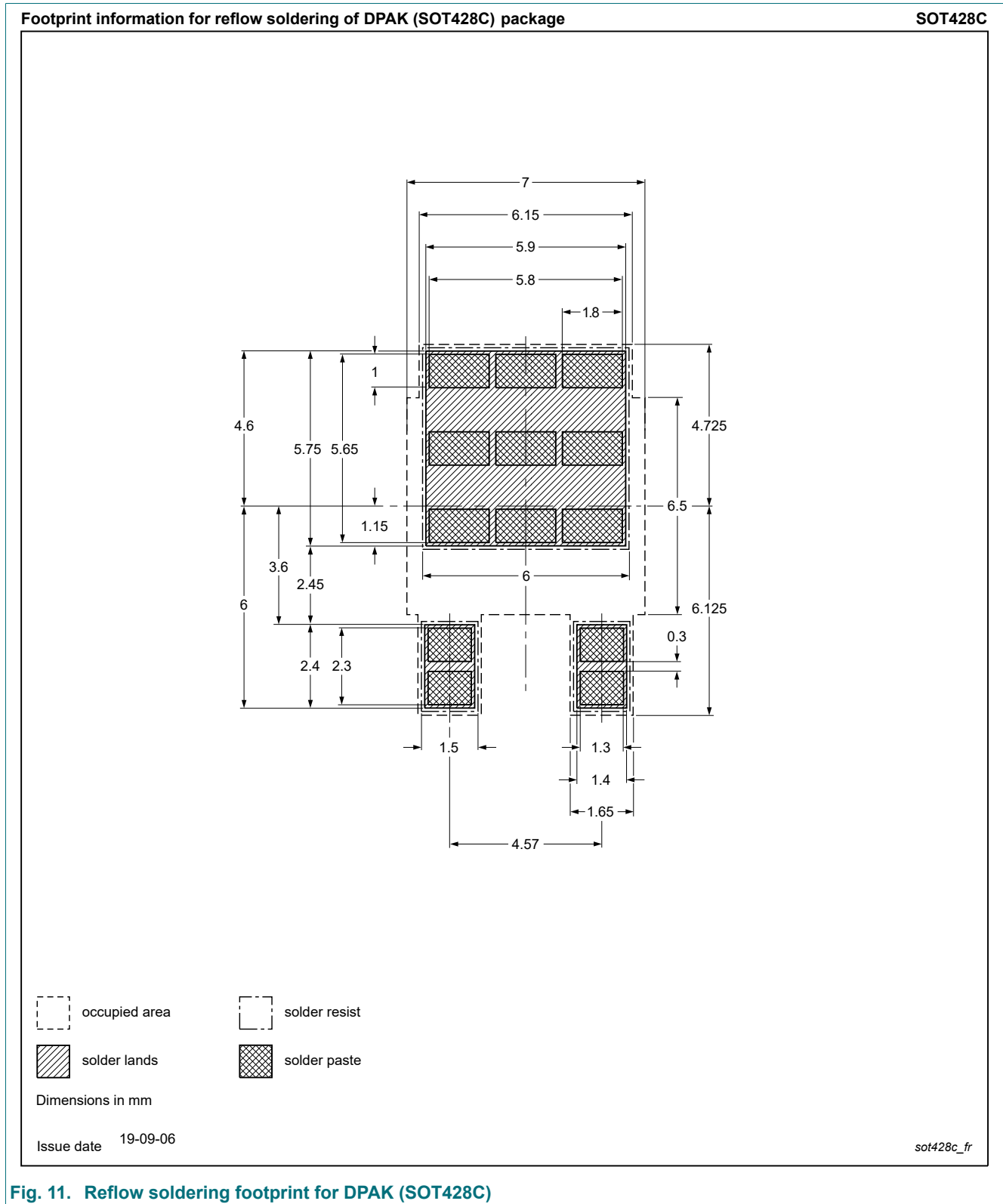


Fig. 11. Reflow soldering footprint for DPAK (SOT428C)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
MJD148-Q v.1	20210517	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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