MJD148

45 V, 4 A NPN high power bipolar transistor

26 April 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

3. Applications

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

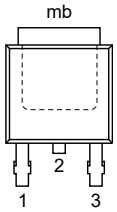
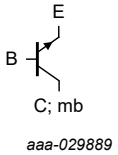
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	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 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		85	-	375	
		V_{CE} = 1 V; I_C = 3 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		30	-	-	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 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
MJD148	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	MJD148

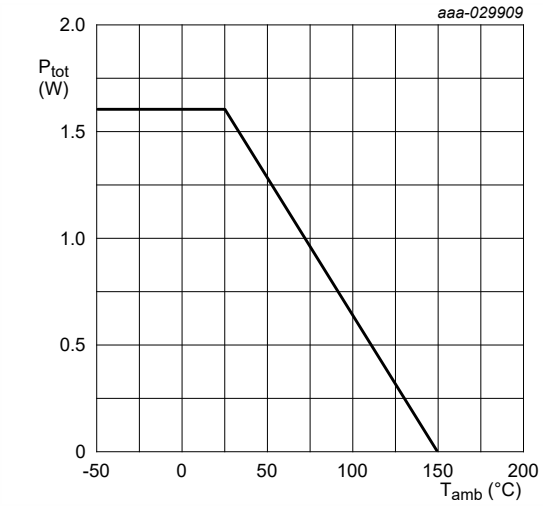
8. Limiting values

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^2.



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

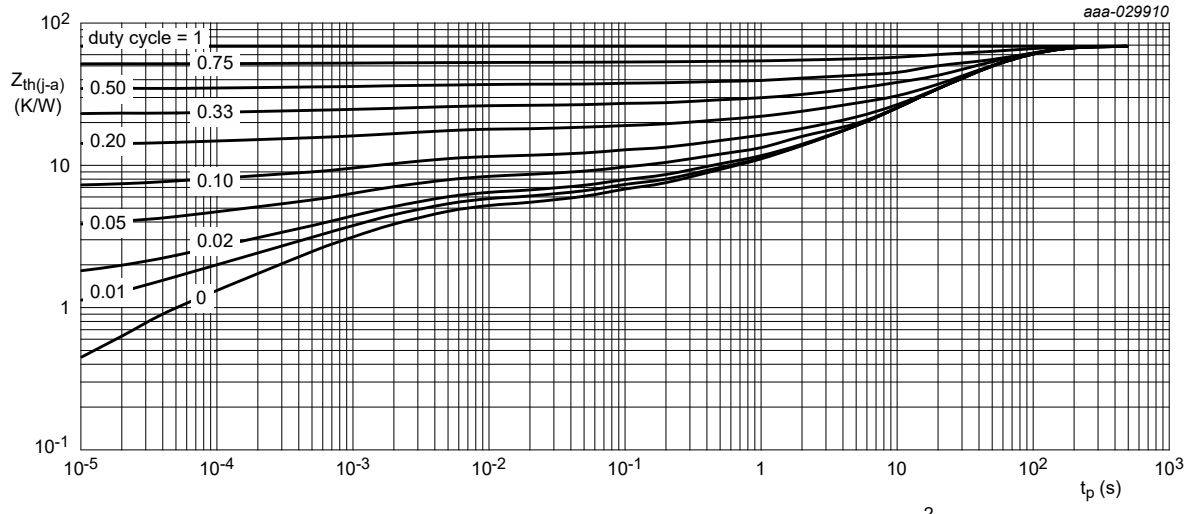
Fig. 1. Power derating curves SOT428C

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



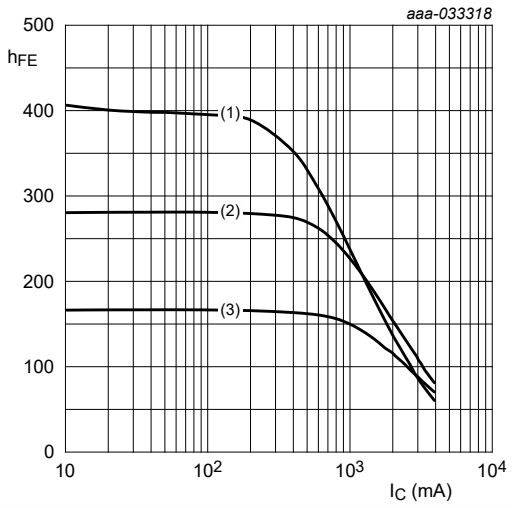
FR4 PCB, single-sided 70 µm copper, tin-plated, mounting pad for collector 1 cm^2.

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

10. Characteristics

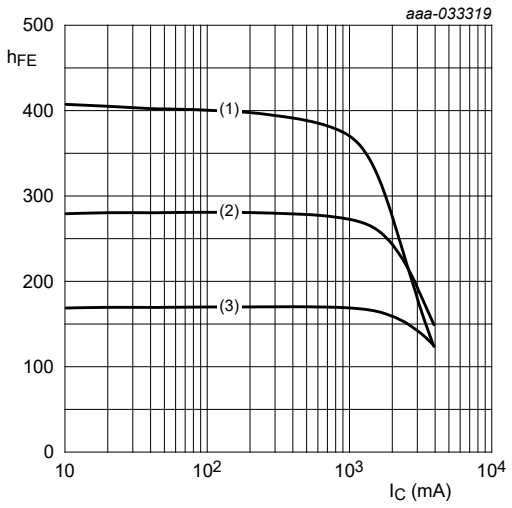
Table 7. Characteristics

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



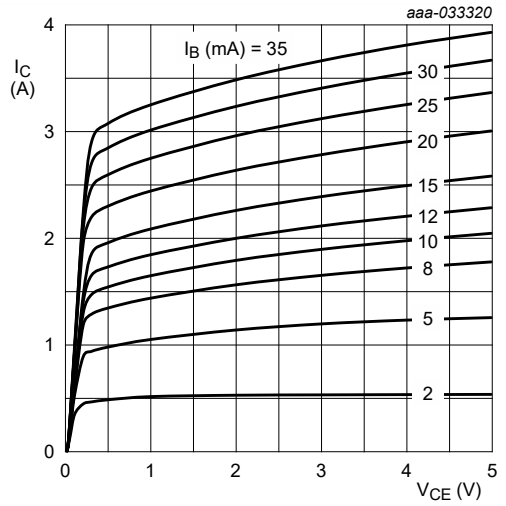
V_{CE} = 1 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



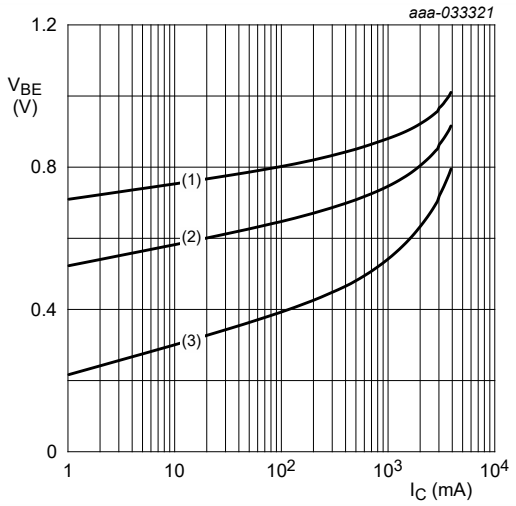
V_{CE} = 10 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



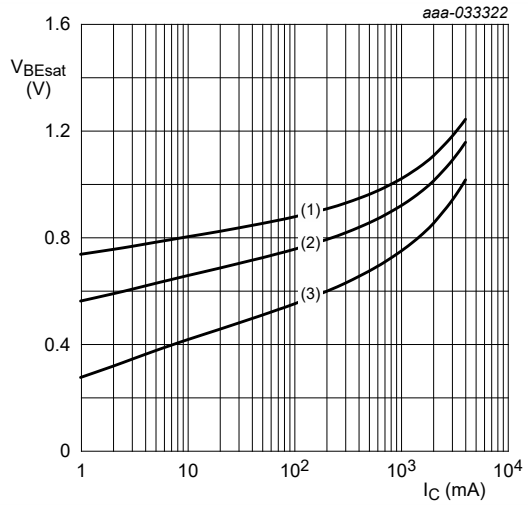
T_{amb} = 25 °C

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



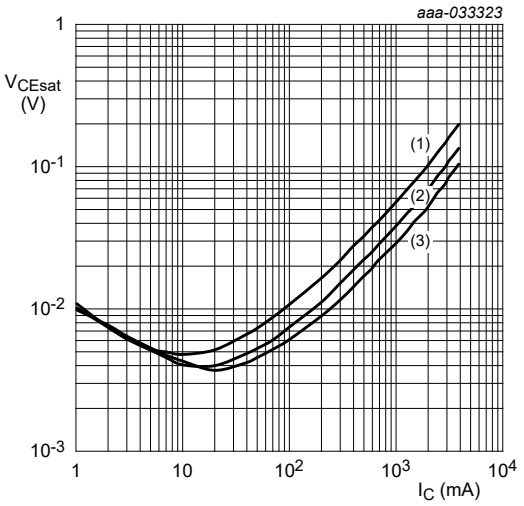
V_{CE} = 2 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



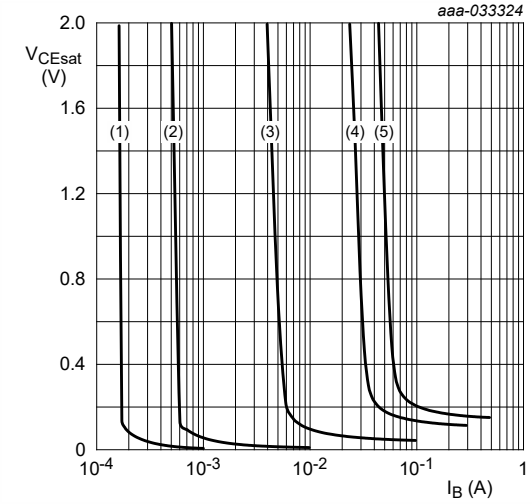
I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 7. 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. 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. Package outline

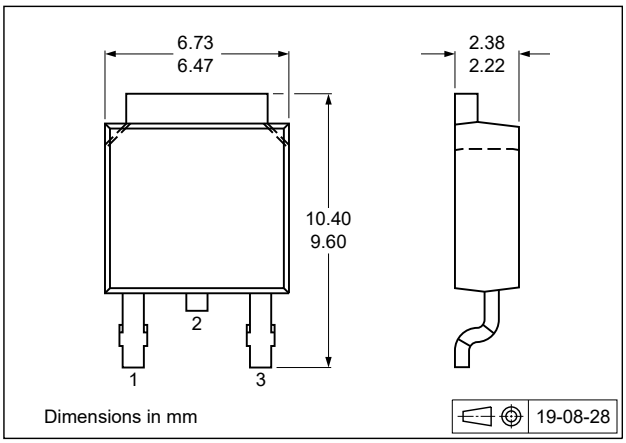


Fig. 10. Package outline DPAK (SOT428C)

12. Soldering

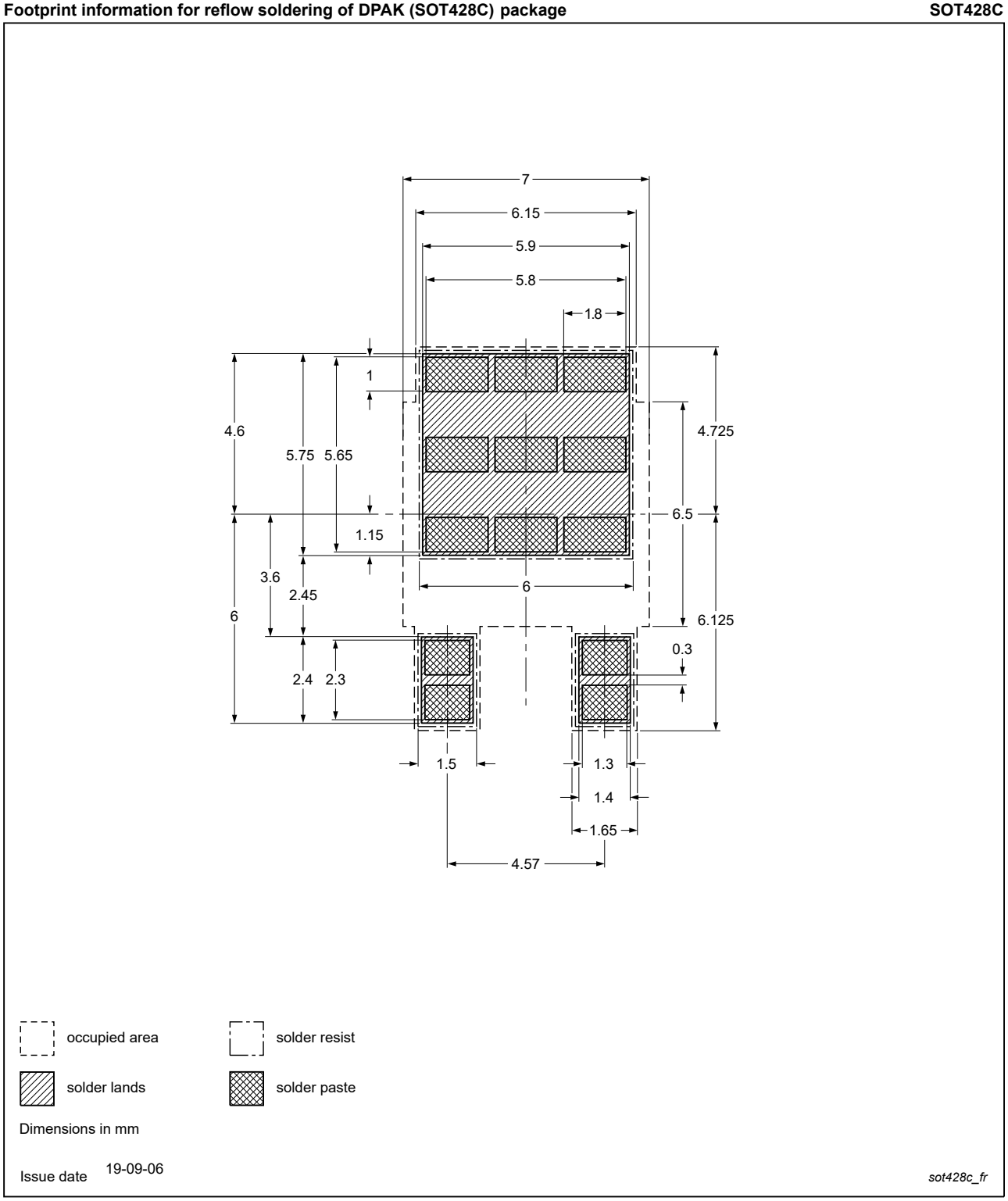


Fig. 11. Reflow soldering footprint for DPAK (SOT428C)

13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
MJD148 v.1	20210426	Product data sheet	-	-

14. 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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