PBSS4140DPN-Q

40 V low VCEsat NPN/PNP transistor

9 November 2023 **Product data sheet**

1. General description

NPN/PNP low V_{CEsat} transistor pair in an SC-74 (SOT457) plastic package.

2. Features and benefits

- 600 mW total power dissipation
- Low collector-emitter saturation voltage
- High current capability
- Improved device reliability due to reduced heat generation
- Replaces two SOT23 packaged low V_{CEsat} transistors on same PCB area
- Reduces required PCB area
- Reduced pick and place costs
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General purpose switching and muting
- LCD backlighting
- Supply line switching circuits
- Battery driven equipment (mobile phones, video cameras and hand-held devices)

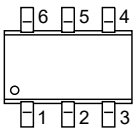
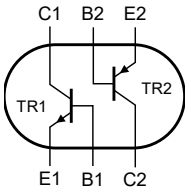
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor unless otherwise specified; for the PNP transistor with negative polarity							
V_{CEO}	collector-emitter voltage	open base		-	-	40	V
I_C	collector current			-	-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	2	A
TR1 (NPN)							
R_{CEsat}	collector-emitter saturation resistance	I_C = 500 mA; I_B = 50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	260	500	mΩ
TR2 (PNP)							
R_{CEsat}	collector-emitter saturation resistance	I_C = -500 mA; I_B = -50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	300	500	mΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 TSOP6 (SOT457)	 sym139
2	B1	base TR1		
3	C2	collector TR2		
4	E2	emitter TR2		
5	B2	base TR2		
6	C1	collector TR1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4140DPN-Q	TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4140DPN-Q	M2

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 unless otherwise specified; for the PNP transistor with negative polarity						
V_{CBO}	collector-base voltage	open emitter		-	40	V
V_{CEO}	collector-emitter voltage	open base		-	40	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current			-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	2	A
I_{BM}	peak base current			-	1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	370	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	600	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	150	°C
T_{stg}	storage temperature			-65	150	°C

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

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]	-	-	208	K/W

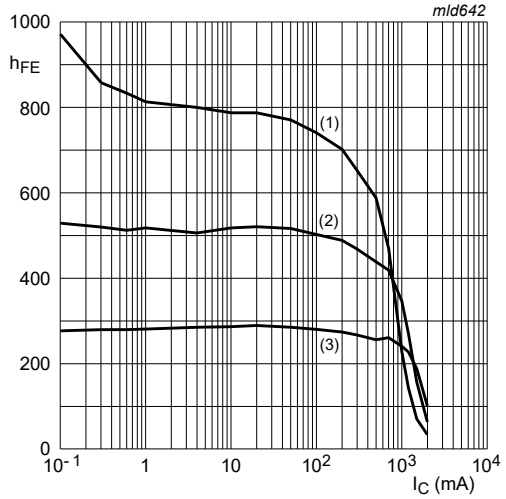
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

10. Characteristics

Table 7. Characteristics

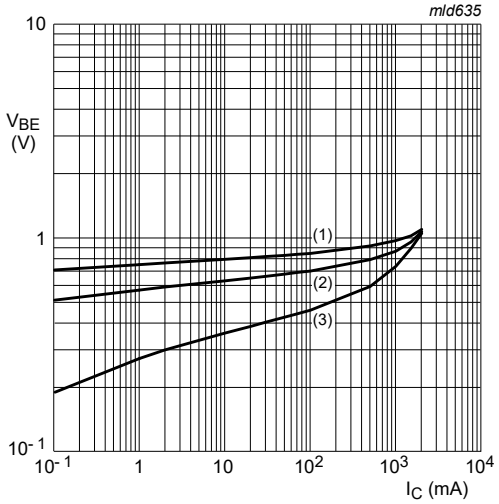
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor unless otherwise specified; for the PNP transistor with negative polarity							
I_{CBO}	collector-base cut-off current	V_{CB} = 40 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
		V_{CB} = 40 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{CEO}	collector-emitter cut-off current (base open)	I_B = 0 A; V_{CE} = 30 V		-	-	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	100	nA
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA; T_{amb} = 25 °C		-	-	200	mV
		I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 °C		-	-	250	mV
		I_C = 1 A; I_B = 100 mA; T_{amb} = 25 °C		-	-	500	mV
TR1 (NPN)							
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA; T_{amb} = 25 °C		300	-	-	
		V_{CE} = 5 V; I_C = 500 mA; T_{amb} = 25 °C		300	-	900	
		V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C		200	-	-	
R_{CEsat}	collector-emitter saturation resistance	I_C = 500 mA; I_B = 50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	260	500	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 100 mA; T_{amb} = 25 °C		-	-	1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C		-	-	1.1	V
f_T	transition frequency	V_{CE} = 10 V; I_C = 50 mA; f = 100 MHz; T_{amb} = 25 °C		150	-	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	10	pF
TR2 (PNP)							
h_{FE}	DC current gain	V_{CE} = -5 V; I_C = -1 mA; T_{amb} = 25 °C		300	-	-	
		V_{CE} = -5 V; I_C = -100 mA; T_{amb} = 25 °C		300	-	800	
		V_{CE} = -5 V; I_C = -500 mA; T_{amb} = 25 °C		250	-	-	
		V_{CE} = -5 V; I_C = -1 A; T_{amb} = 25 °C		160	-	-	
R_{CEsat}	collector-emitter saturation resistance	I_C = -500 mA; I_B = -50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	300	500	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = -1 A; I_B = -50 mA; T_{amb} = 25 °C		-	-	-1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = -5 V; I_C = -1 A; T_{amb} = 25 °C		-	-	-1	V

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f_T	transition frequency	V_{CE} = -10 V; I_C = -50 mA; f = 100 MHz; T_{amb} = 25 °C		150	-	-	MHz
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	12	pF



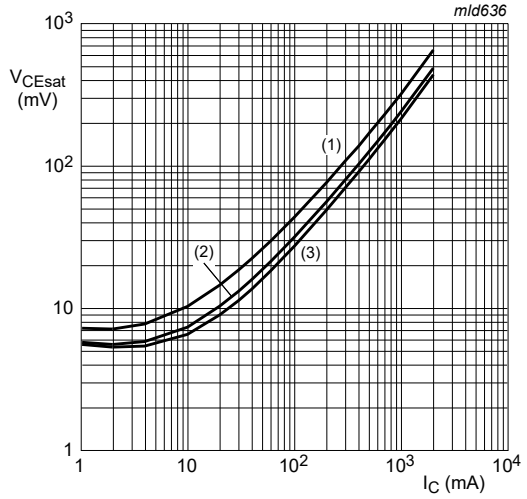
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 1. TR1 (NPN): DC current gain as a function of collector current; typical values



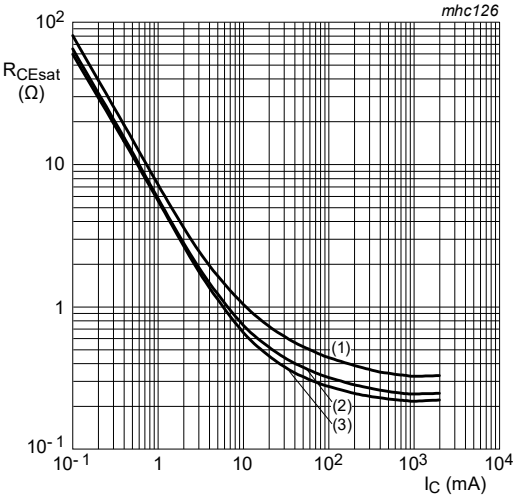
V_{CE} = 5 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 2. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values



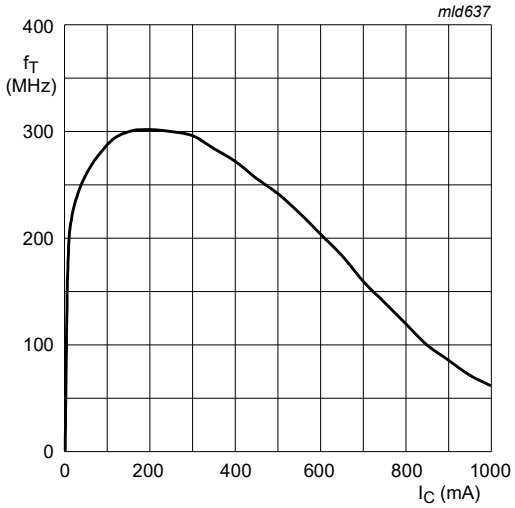
I_C/I_B = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 3. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values



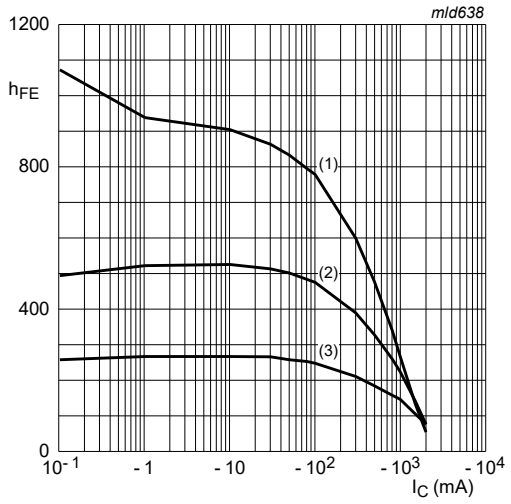
I_C/I_B = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 4. TR1 (NPN): Equivalent on-resistance as a function of collector current; typical values



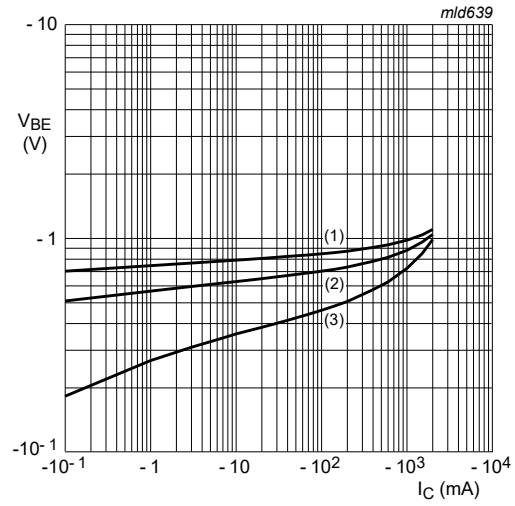
V_{CE} = 10 V

Fig. 5. TR1 (NPN): Transition frequency as a function of collector current; typical values



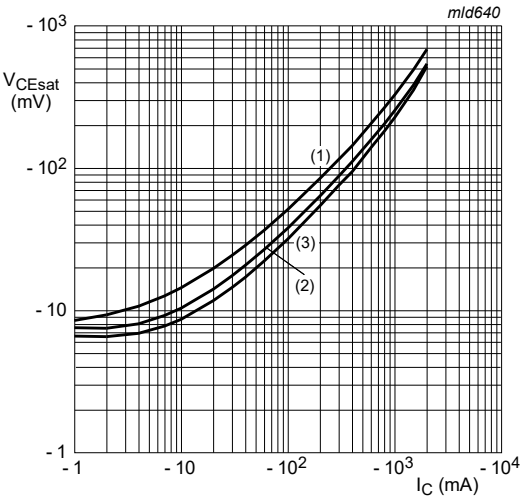
V_{CE} = −5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 6. TR2 (PNP): DC current gain as a function of collector current; typical values



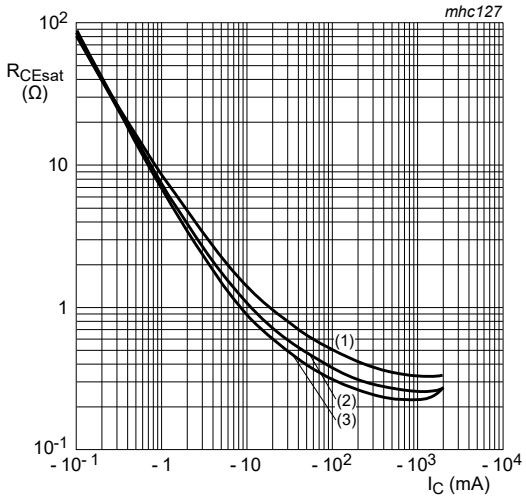
V_{CE} = −5 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 7. TR2 (PNP): Base-emitter voltage as a function of collector current; typical values



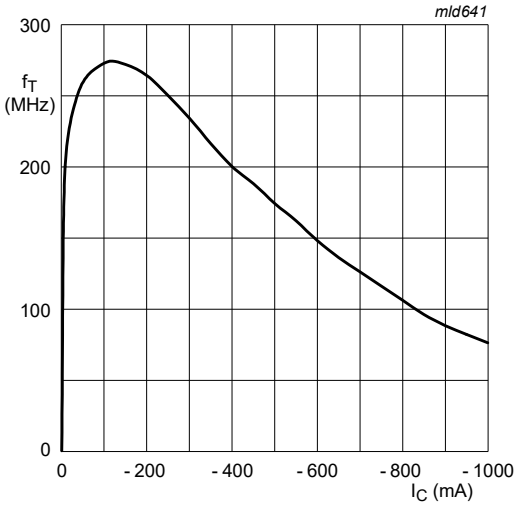
I_C/I_B = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 8. TR2 (PNP): Collector-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. 9. TR2 (PNP): Equivalent on-resistance as a function of collector current; typical values



V_{CE} = -10 V

Fig. 10. TR2 (PNP): Transition frequency as a function of collector 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

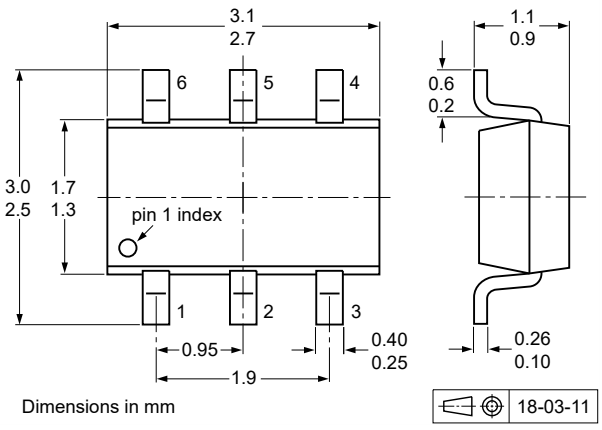


Fig. 11. Package outline TSOP6 (SOT457)

13. Soldering

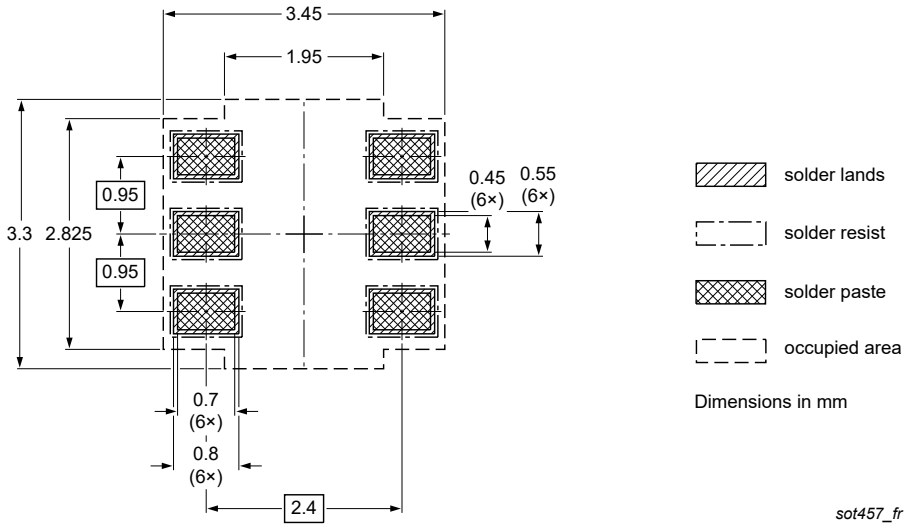


Fig. 12. Reflow soldering footprint for TSOP6 (SOT457)

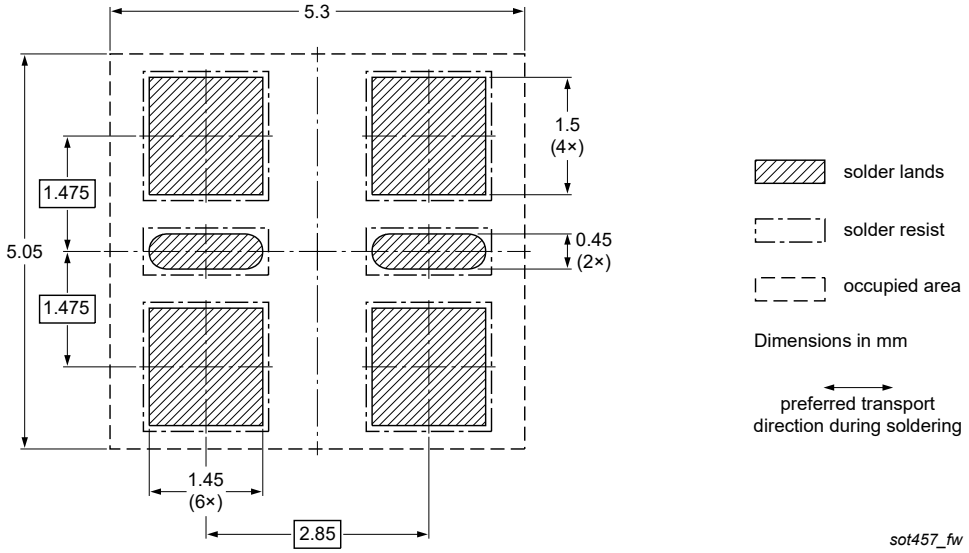


Fig. 13. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4140DPN-Q v.1	20231109	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: 9 November 2023