



# PBSS5160DS-Q

60 V, 1 A PNP/PNP low  $V_{CEsat}$  transistor

6 November 2023

Product data sheet

## 1. General description

PNP/PNP low  $V_{CEsat}$  transistor pair in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4160DS-Q

## 2. Features and benefits

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$
- High efficiency due to less heat generation
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- Dual low power switches (e.g. motors, fans)
- Automotive applications

## 4. Quick reference data

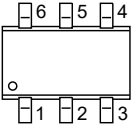
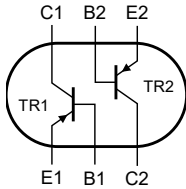
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$V_{CEO}$	collector-emitter voltage	open base		-	-	-60	V
$I_C$	collector current		[1]	-	-	-1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	-2	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -1$ A; $I_B = -100$ mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C		-	250	330	m $\Omega$

[1] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 TSOP6 (SOT457)	 sym138
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
<a href="#">PBSS5160DS-Q</a>	TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	<a href="#">SOT457</a>

7. Marking

Table 4. Marking codes

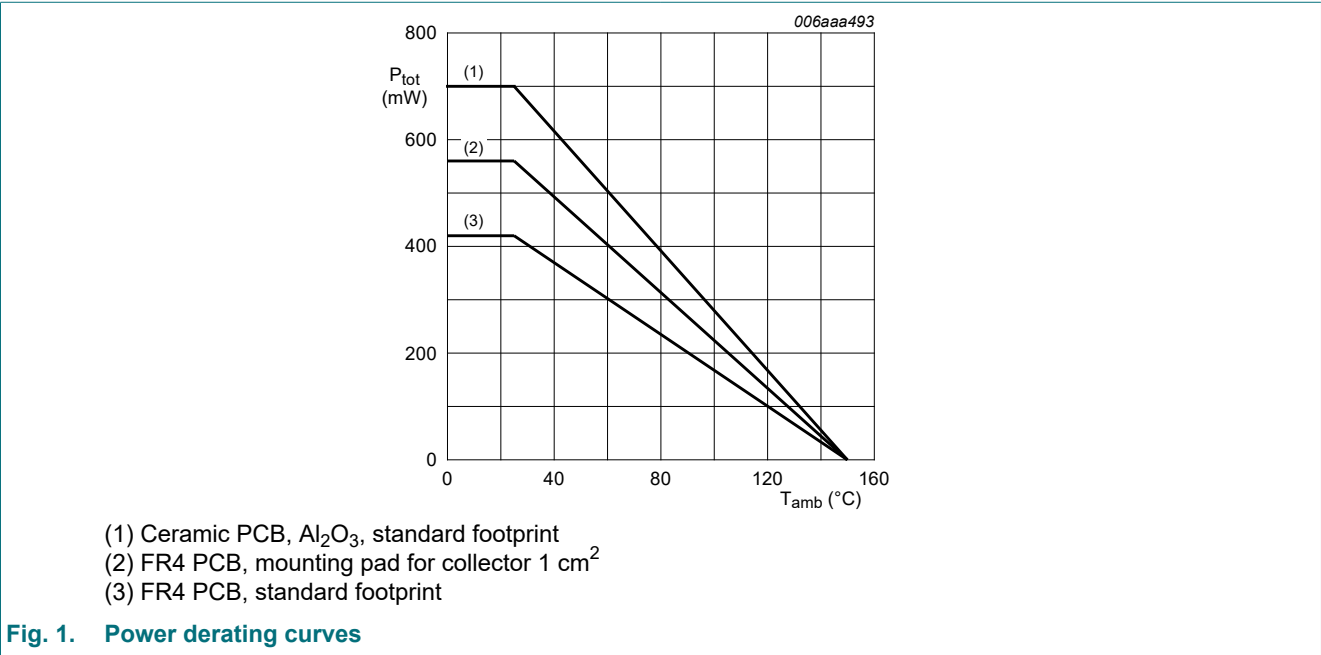
Type number	Marking code
PBSS5160DS-Q	A5

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						
V <sub>CBO</sub>	collector-base voltage	open emitter		-	-80	V
V <sub>CEO</sub>	collector-emitter voltage	open base		-	-60	V
V <sub>EBO</sub>	emitter-base voltage	open collector		-	-5	V
I <sub>C</sub>	collector current		[1]	-	-0.77	A
			[2]	-	-0.9	A
			[3]	-	-1	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms		-	-2	A
I <sub>B</sub>	base current			-	-300	mA
I <sub>BM</sub>	peak base current	single pulse; t <sub>p</sub> ≤ 1 ms		-	-1	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	290	mW
			[2]	-	370	mW
			[3]	-	450	mW
Per device						
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	420	mW
			[2]	-	560	mW
			[3]	-	700	mW
T <sub>j</sub>	junction temperature			-	150	°C
T <sub>amb</sub>	ambient temperature			-65	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.



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]	-	-	431	K/W
			[2]	-	-	338	K/W
			[3]	-	-	278	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	105	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	298	K/W
			[2]	-	-	223	K/W
			[3]	-	-	179	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

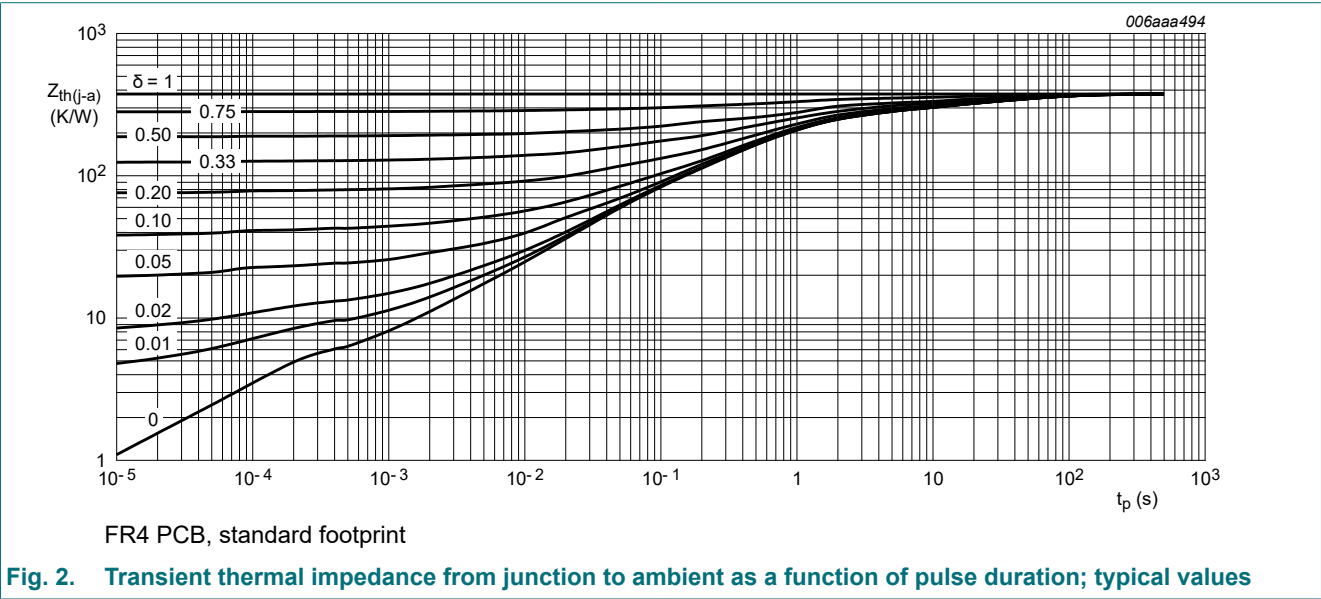


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

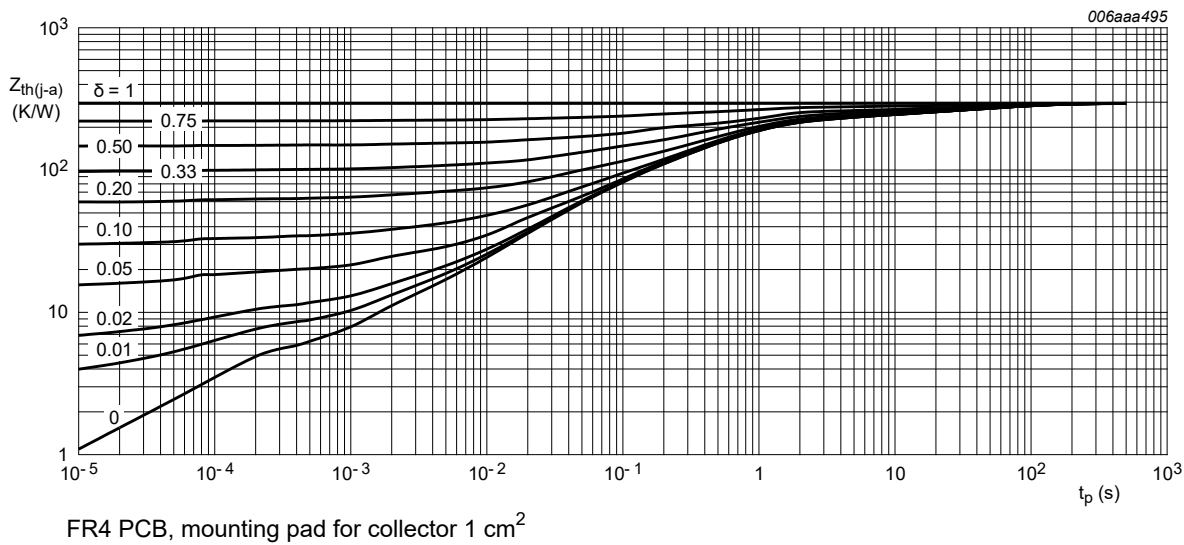


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

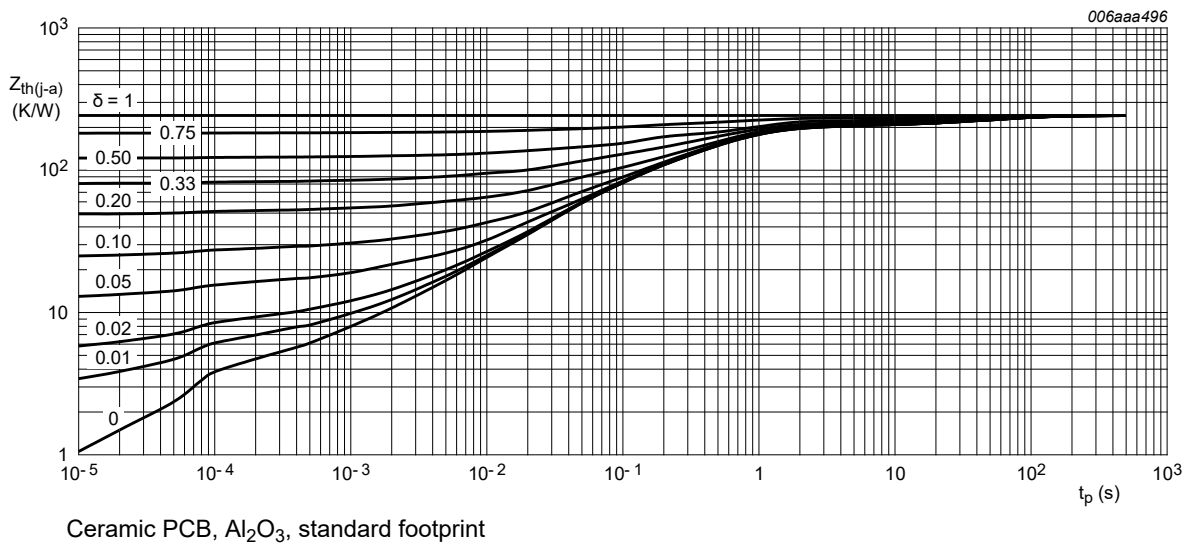


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -60\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-	-100	nA
		$V_{CB} = -60\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$		-	-	-50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-	-100	nA
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -60\text{ V}; V_{BE} = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V}; I_C = -1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$		200	350	-	
		$V_{CE} = -5\text{ V}; I_C = -500\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$		150	250	-	
		$V_{CE} = -5\text{ V}; I_C = -1\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$		100	160	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -100\text{ mA}; I_B = -1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-110	-165	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-120	-175	mV
		$I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-250	-330	mV
$R_{CEsat}$	collector-emitter saturation resistance			-	250	330	m $\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -1\text{ A}; I_B = -50\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-0.95	-1.1	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -5\text{ V}; I_C = -1\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-0.82	-0.9	V
$t_d$	delay time	$I_C = -0.5\text{ A}; I_{B(on)} = -25\text{ mA}; I_{B(off)} = 25\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	11	-	ns
$t_r$	rise time			-	30	-	ns
$t_{on}$	turn-on time			-	41	-	ns
$t_s$	storage time			-	205	-	ns
$t_f$	fall time			-	55	-	ns
$t_{off}$	turn-off time			-	260	-	ns
$f_T$	transition frequency	$V_{CE} = -10\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$		150	185	-	MHz
$C_c$	collector capacitance	$V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$		-	9	15	pF

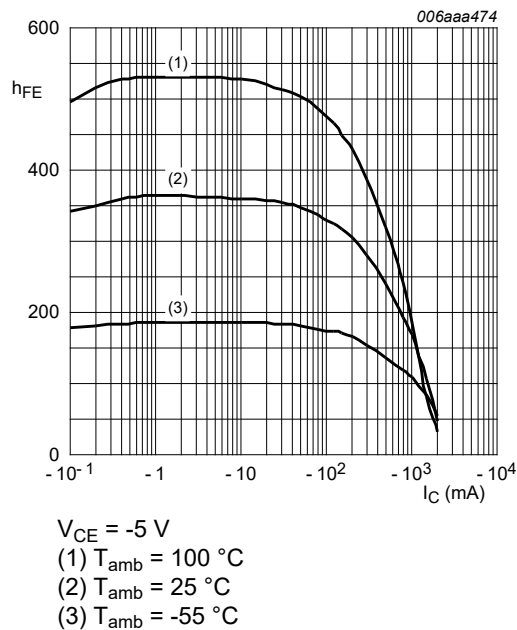


Fig. 5. DC current gain as a function of collector current; typical values

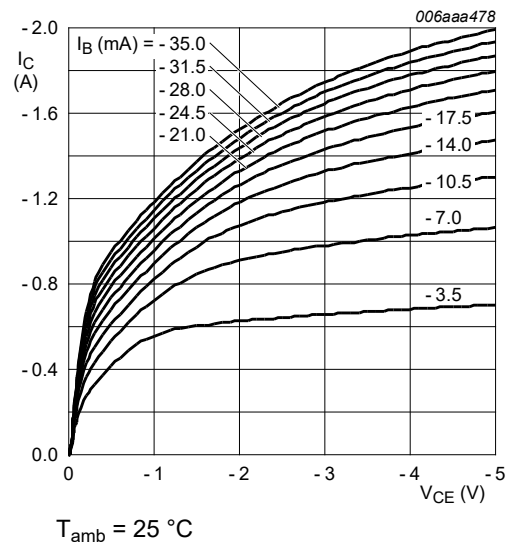


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

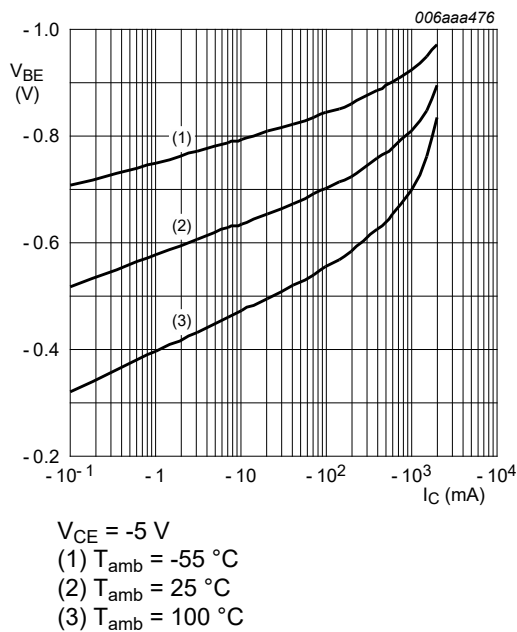


Fig. 7. Base-emitter voltage as a function of collector current; typical values

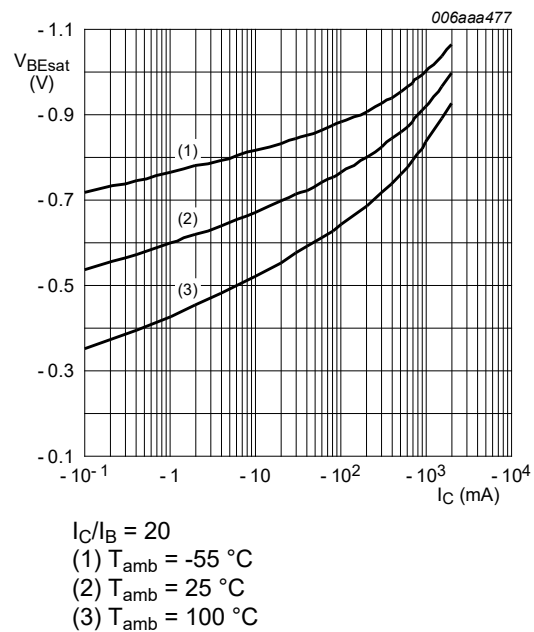


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values

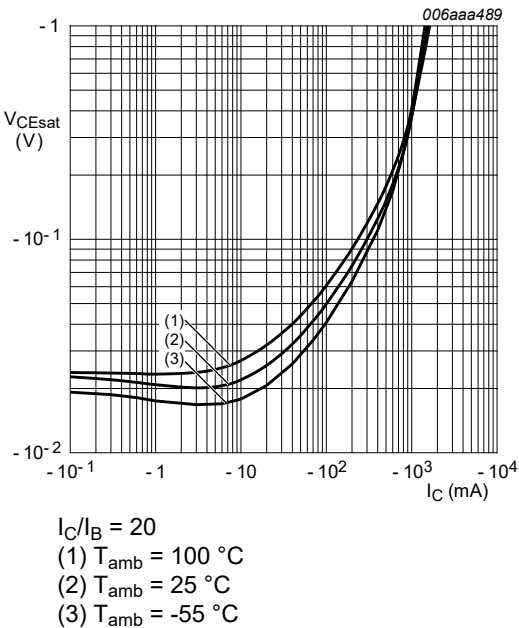


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

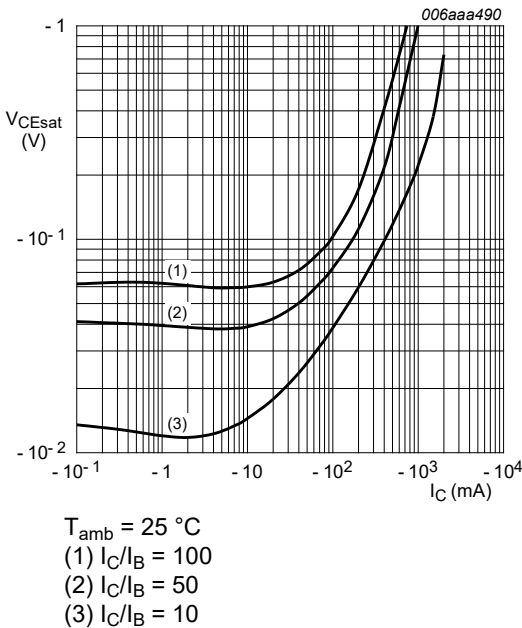


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

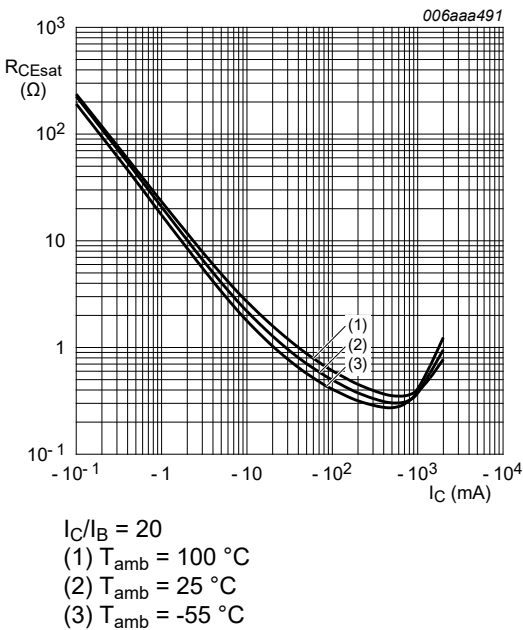


Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values

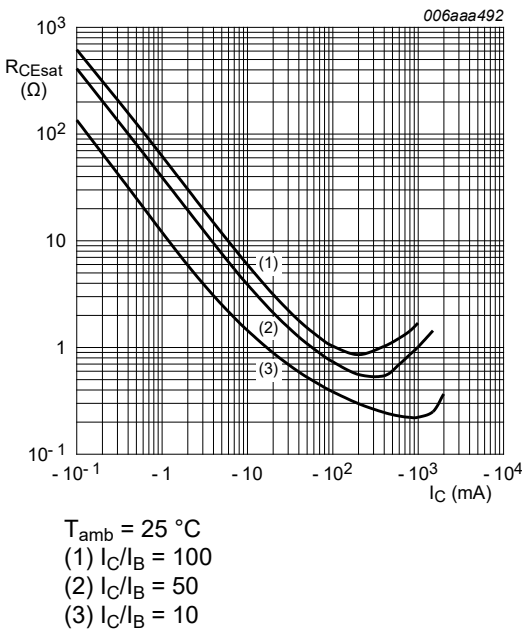


Fig. 12. Collector-emitter saturation resistance as a function of collector current; typical values



11. Test information

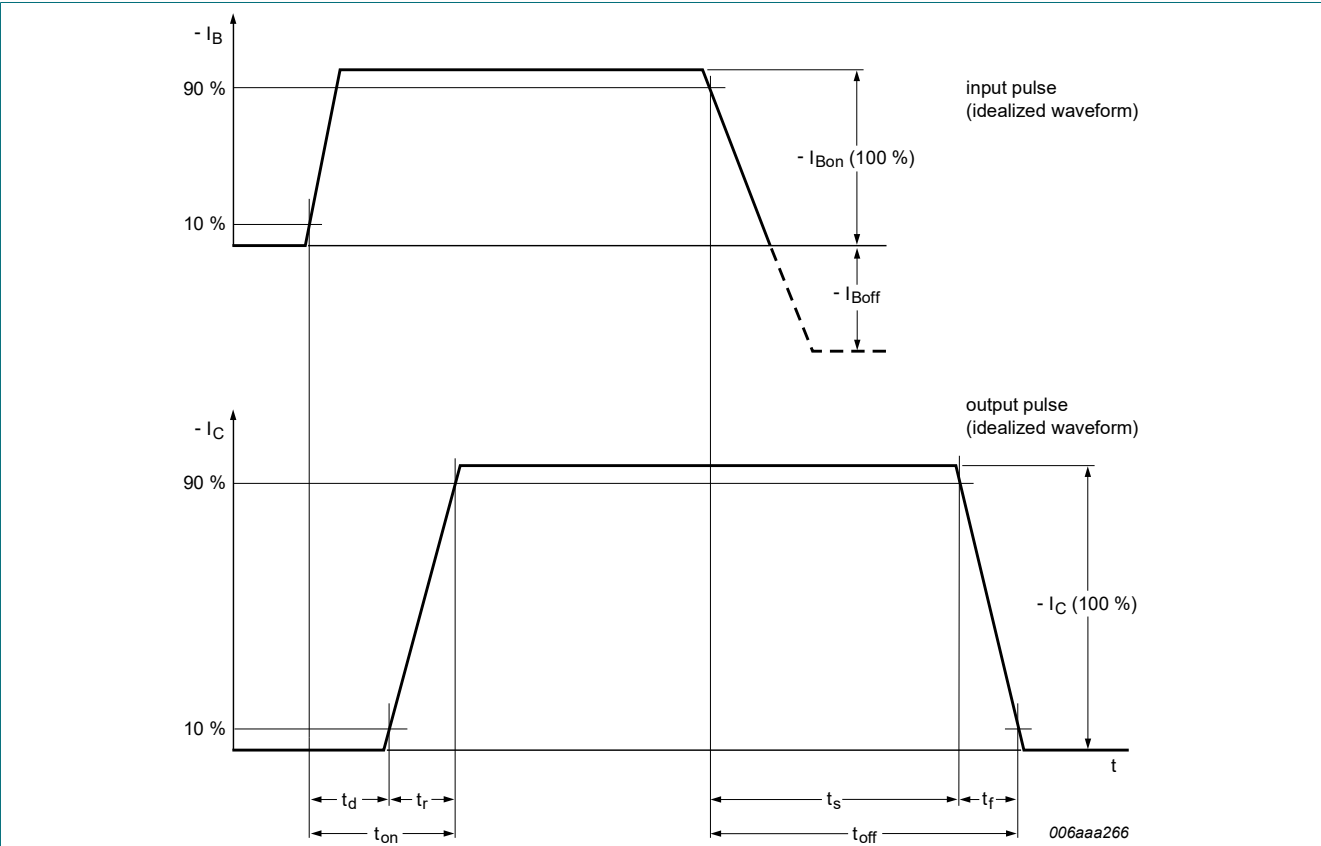
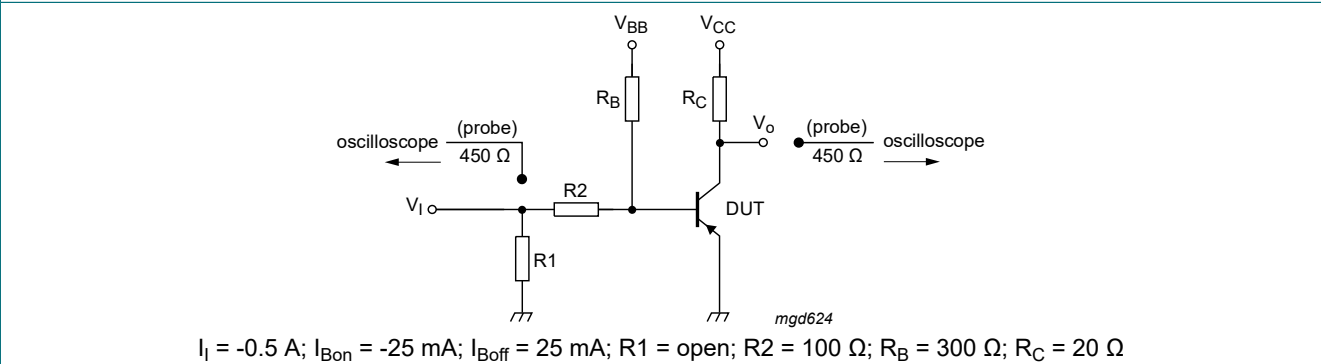


Fig. 13. Transistor switching time definition



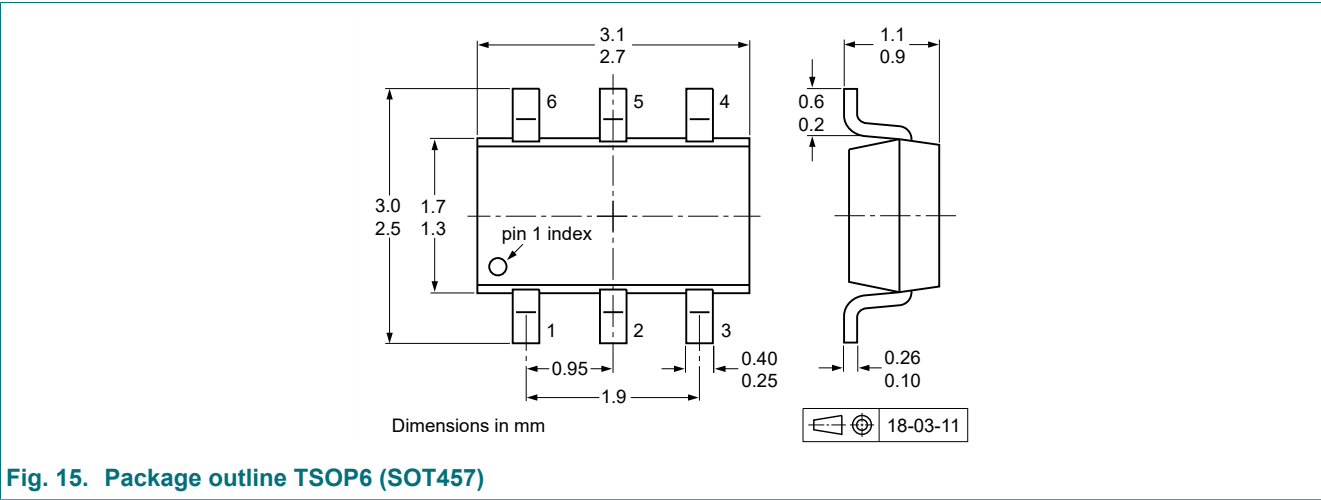
$I_I = -0.5\text{ A}$ ;  $I_{B\text{on}} = -25\text{ mA}$ ;  $I_{B\text{off}} = 25\text{ mA}$ ;  $R_1 = \text{open}$ ;  $R_2 = 100\text{ }\Omega$ ;  $R_B = 300\text{ }\Omega$ ;  $R_C = 20\text{ }\Omega$

Fig. 14. Test circuit for switching times

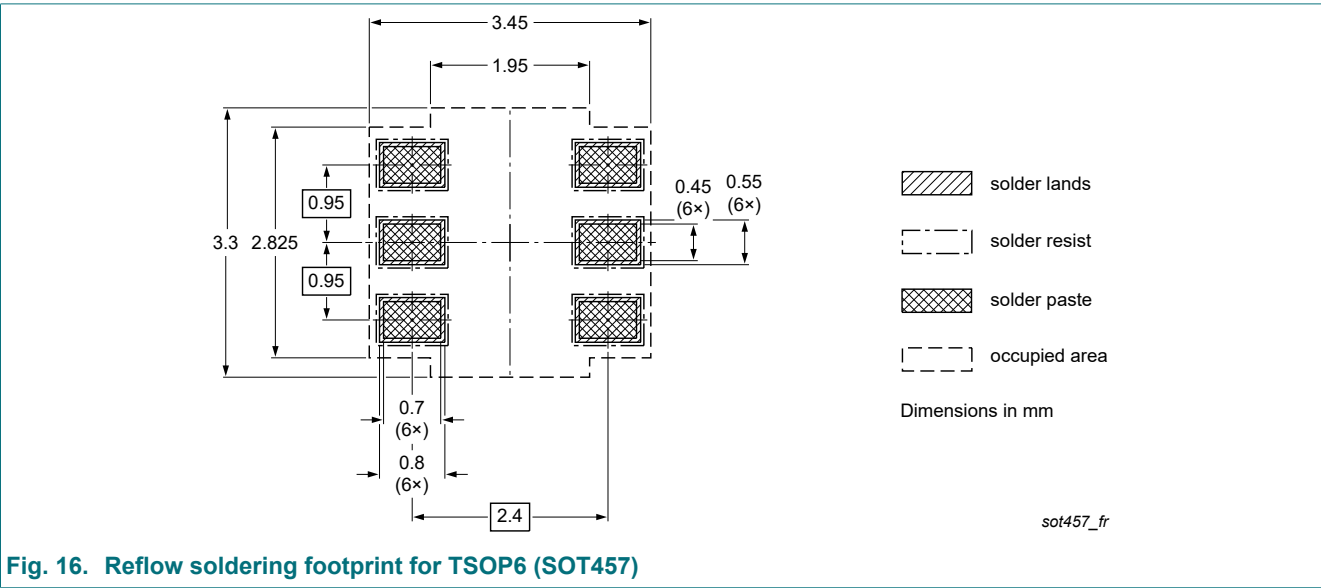
Quality information

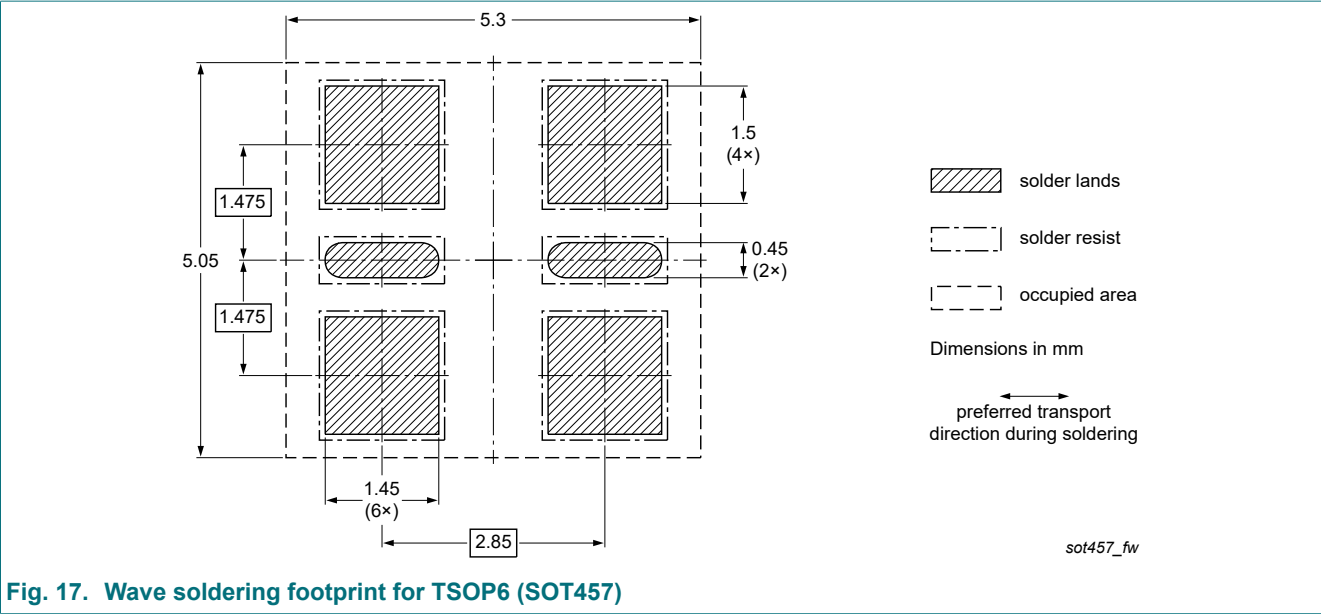
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline



13. Soldering





14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5160DS-Q v.1	20231106	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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