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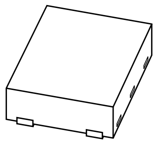


PBSS4560PA

60 V, 6 A NPN low V_{CEsat} (BISS) transistor

Rev. 1 — 19 May 2010 Product data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} Breakthrough In Small Signal (BISS) transistor, encapsulated in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package with medium power capability.

PNP complement: PBSS5560PA.

1.2 Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- Exposed heat sink for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with medium power capability

1.3 Applications

- Loadswitch
- Battery-driven devices
- Power management
- Charging circuits
- Power switches (e.g. motors, fans)

1.4 Quick reference data

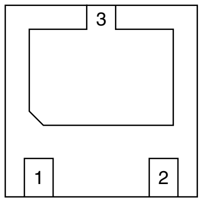
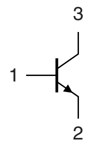
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	60	V
I_C	collector current			-	-	6	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	7	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 6$ A; $I_B = 300$ mA	[1]	-	34	48	mΩ

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base	 Transparent top view	 *sym021*
2	emitter		
3	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4560PA	HUSON3	plastic thermal enhanced ultra thin small outline package; no leads; three terminals; body 2 × 2 × 0.65 mm	SOT1061

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4560PA	A8

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	60	V
V_{CEO}	collector-emitter voltage	open base		-	60	V
V_{EBO}	emitter-base voltage	open collector		-	6	V
I_C	collector current			-	6	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	7	A
I_B	base current			-	600	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	500	mW
			[2]	-	1	W
			[3]	-	1.4	W
			[4]	-	2.1	W

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Table 5. Limiting values *…continued*

In accordance with the Absolute Maximum Rating System (IEC 60134).

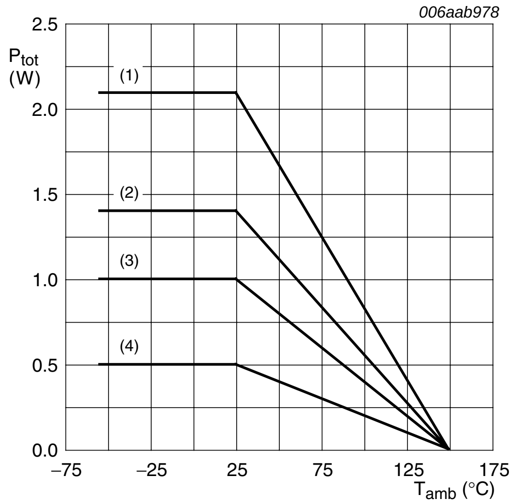
Symbol	Parameter	Conditions	Min	Max	Unit
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		–55	+150	°C
T_{stg}	storage temperature		–65	+150	°C

[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^2.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

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



(1) Ceramic PCB, Al_2O_3, standard footprint

(2) FR4 PCB, mounting pad for collector 6 cm^2

(3) FR4 PCB, mounting pad for collector 1 cm^2

(4) FR4 PCB, standard footprint

Fig 1. Power derating curves

6. 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]	-	-	250	K/W
			[2]	-	-	125	K/W
			[3]	-	-	90	K/W
			[4]	-	-	60	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^2.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

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

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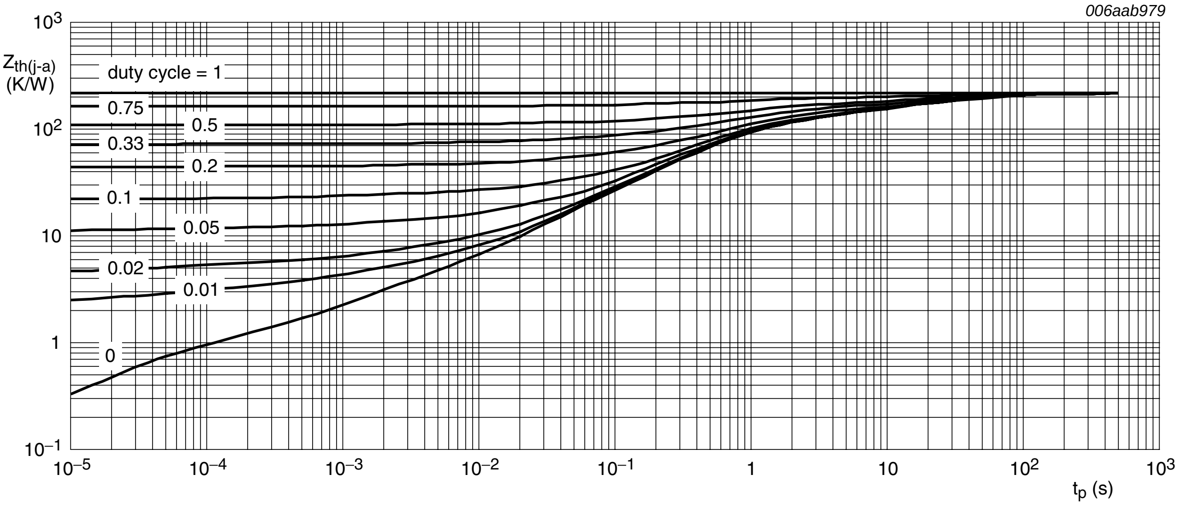
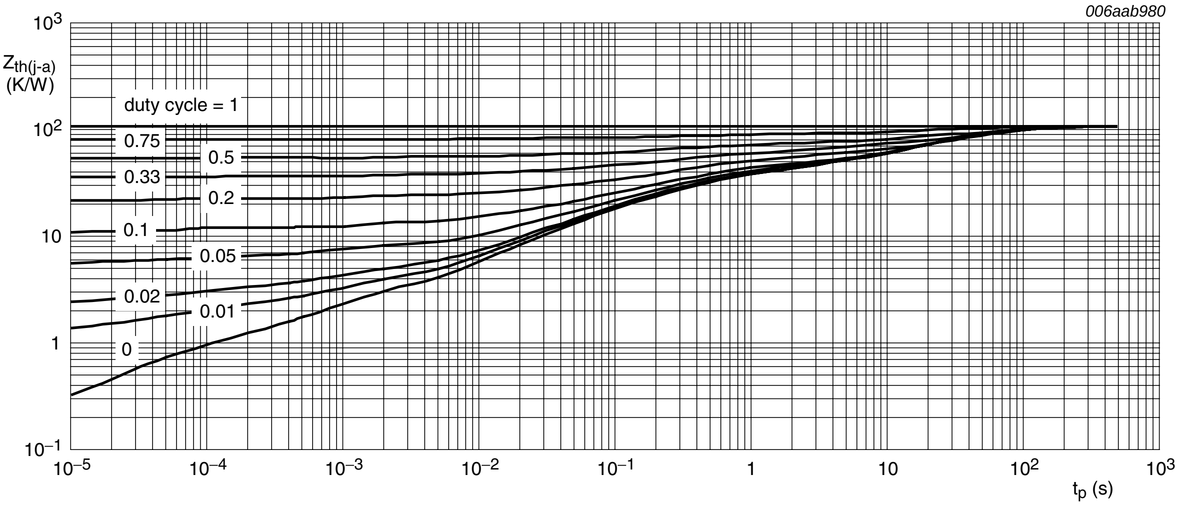


FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm^2

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

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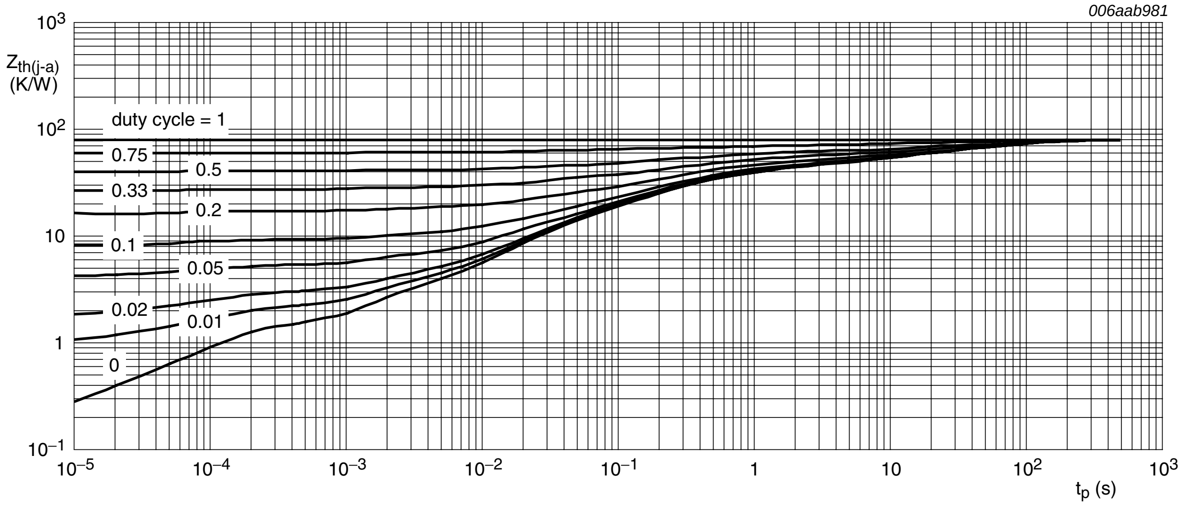
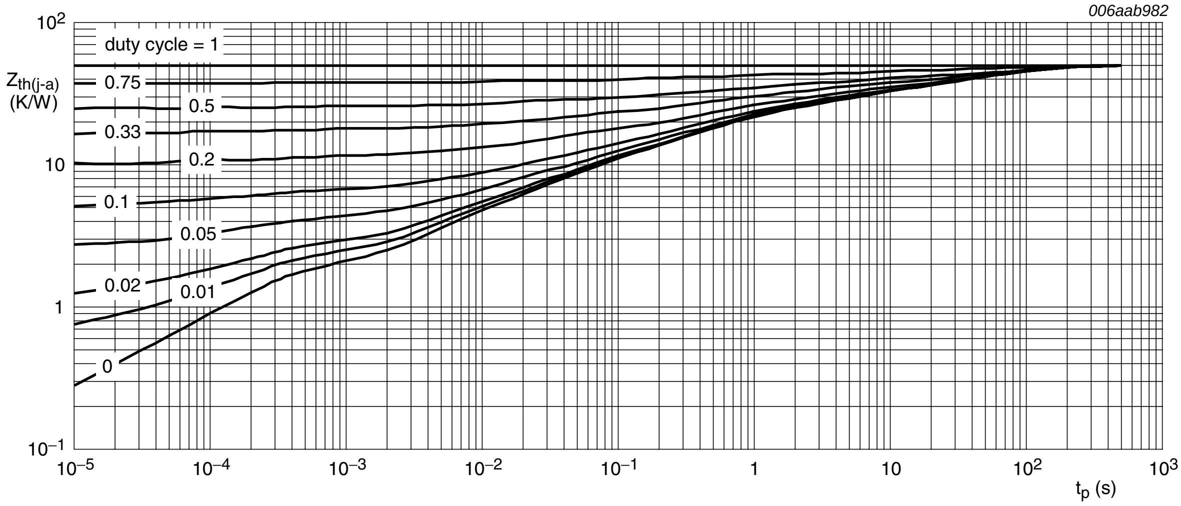


FR4 PCB, mounting pad for collector 6 cm^2

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



Ceramic PCB, Al_2O_3, standard footprint

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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7. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 48 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 48 V; I_E = 0 A; T_j = 150 °C		-	-	50	μA
I_{CES}	collector-emitter cut-off current	V_{CE} = 48 V; V_{BE} = 0 V		-	-	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V	[1]				
		I_C = 0.5 A		280	440	-	
		I_C = 1 A		260	420	-	
		I_C = 2 A		210	325	-	
		I_C = 6 A		70	120	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 0.5 A; I_B = 50 mA	[1]	-	22	30	mV
		I_C = 1 A; I_B = 50 mA	[1]	-	45	60	mV
		I_C = 1 A; I_B = 10 mA	[1]	-	70	95	mV
		I_C = 2 A; I_B = 20 mA	[1]	-	115	170	mV
		I_C = 3 A; I_B = 30 mA	[1]	-	165	250	mV
		I_C = 4 A; I_B = 400 mA	[1]	-	130	200	mV
		I_C = 6 A; I_B = 300 mA	[1]	-	200	290	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 6 A; I_B = 300 mA	[1]	-	34	48	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 10 mA	[1]	-	0.75	0.9	V
		I_C = 6 A; I_B = 300 mA	[1]	-	0.97	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 2 A	[1]	-	0.75	0.9	V
t_d	delay time	V_{CC} = 9 V; I_C = 2 A; I_{Bon} = 0.1 A; I_{Boff} = −0.1 A		-	22	-	ns
t_r	rise time			-	101	-	ns
t_{on}	turn-on time			-	123	-	ns
t_s	storage time			-	635	-	ns
t_f	fall time			-	145	-	ns
t_{off}	turn-off time			-	780	-	ns
f_T	transition frequency	V_{CE} = 10 V; I_C = 100 mA; f = 100 MHz		90	150	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	23	30	pF

[1] Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

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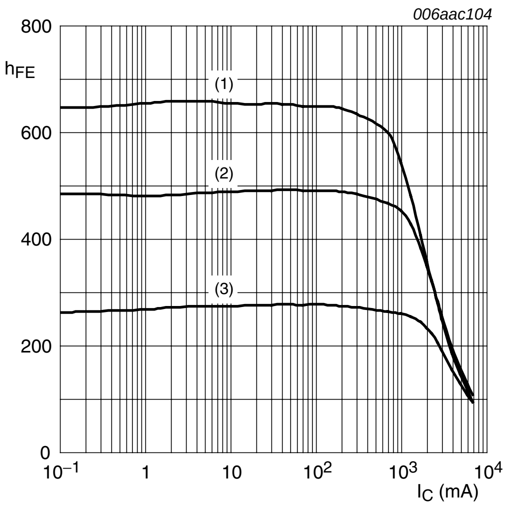


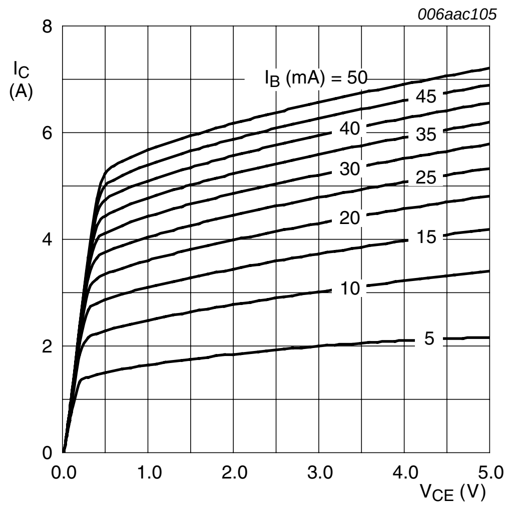
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

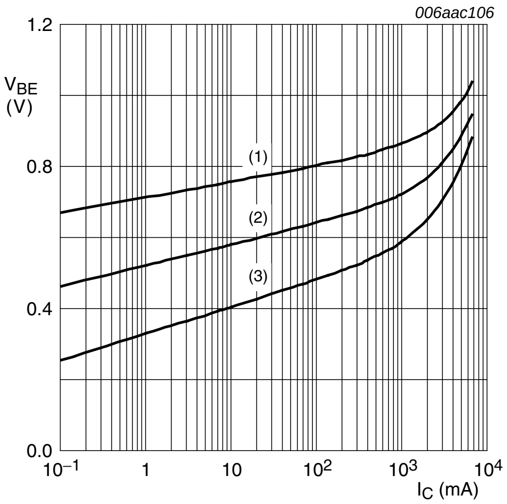
(3) T_{amb} = −55 °C

Fig 6. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

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



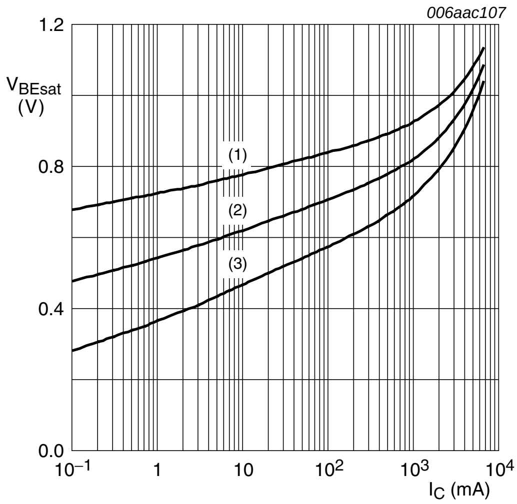
V_{CE} = 2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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

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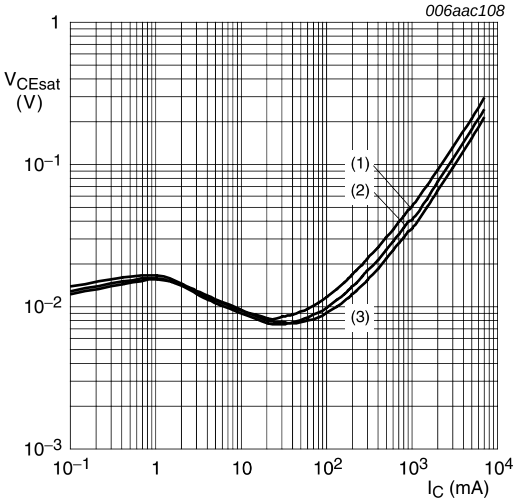


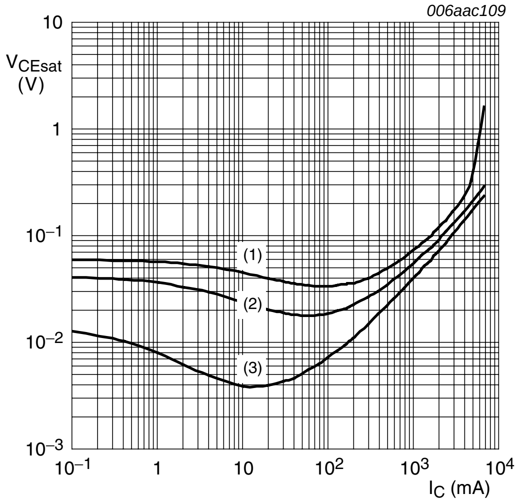
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



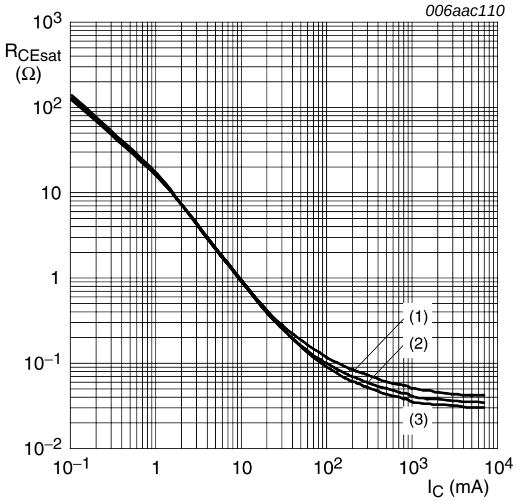
$T_{amb} = 25$ °C

(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

(3) $I_C/I_B = 10$

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



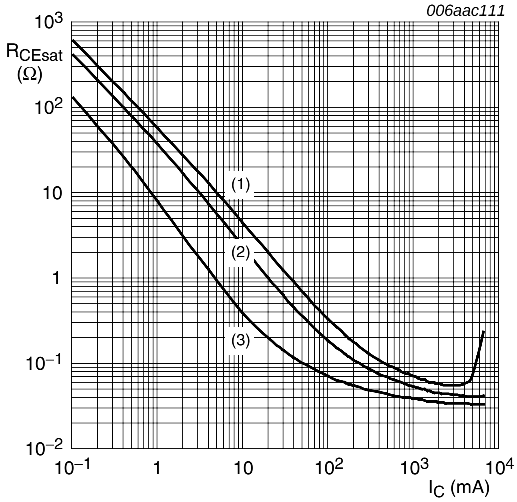
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



$T_{amb} = 25$ °C

(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

(3) $I_C/I_B = 10$

Fig 13. Collector-emitter saturation resistance as a function of collector current; typical values

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8. Test information

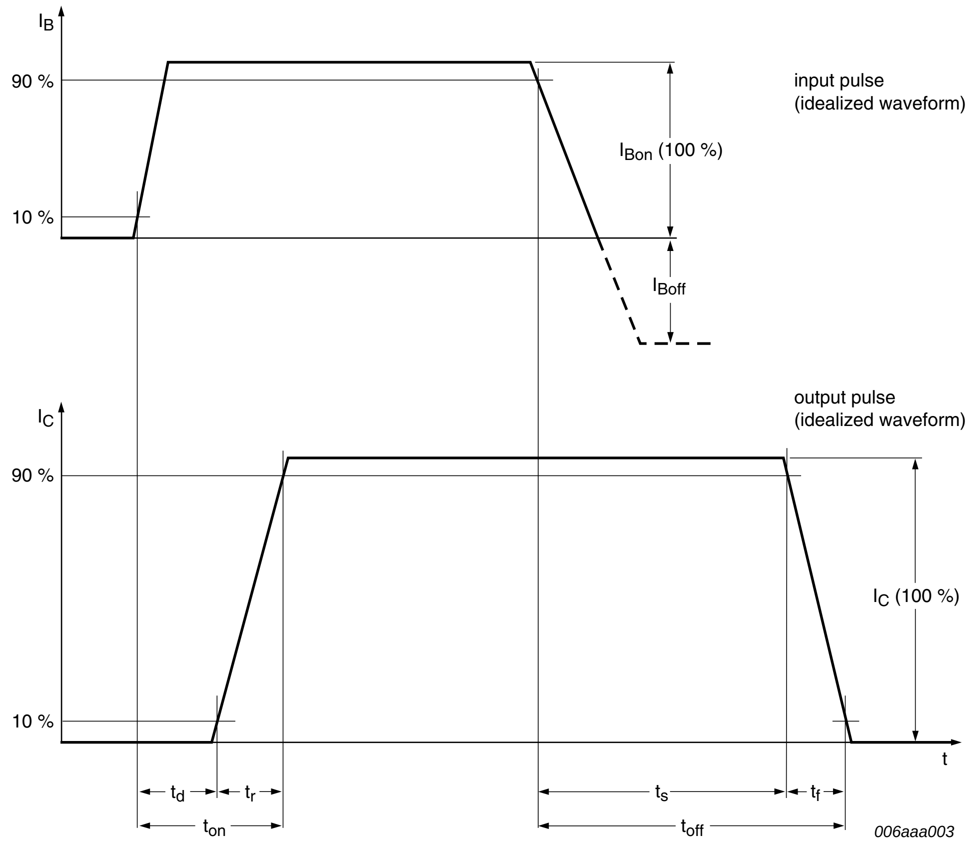
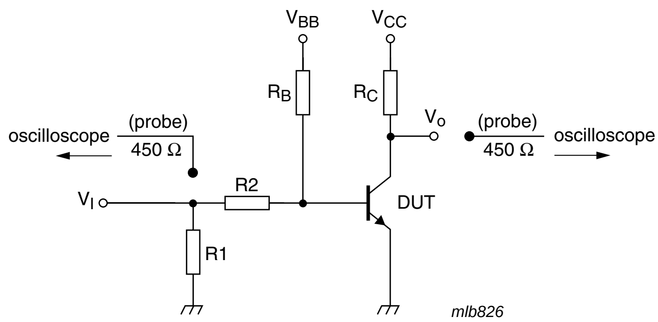


Fig 14. BISS transistor switching time definition



V_{CC} = 9 V; I_C = 2 A; I_{Bon} = 0.1 A; I_{Boff} = −0.1 A

Fig 15. Test circuit for switching times

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9. Package outline

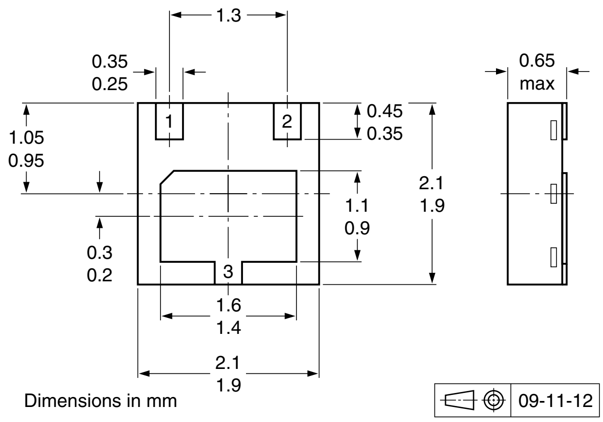

Fig 16. Package outline SOT1061 (HUSON3)

10. Packing information

Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity
			3000
PBSS4560PA	SOT1061	4 mm pitch, 8 mm tape and reel	-115

[1] For further information and the availability of packing methods, see Section 14.

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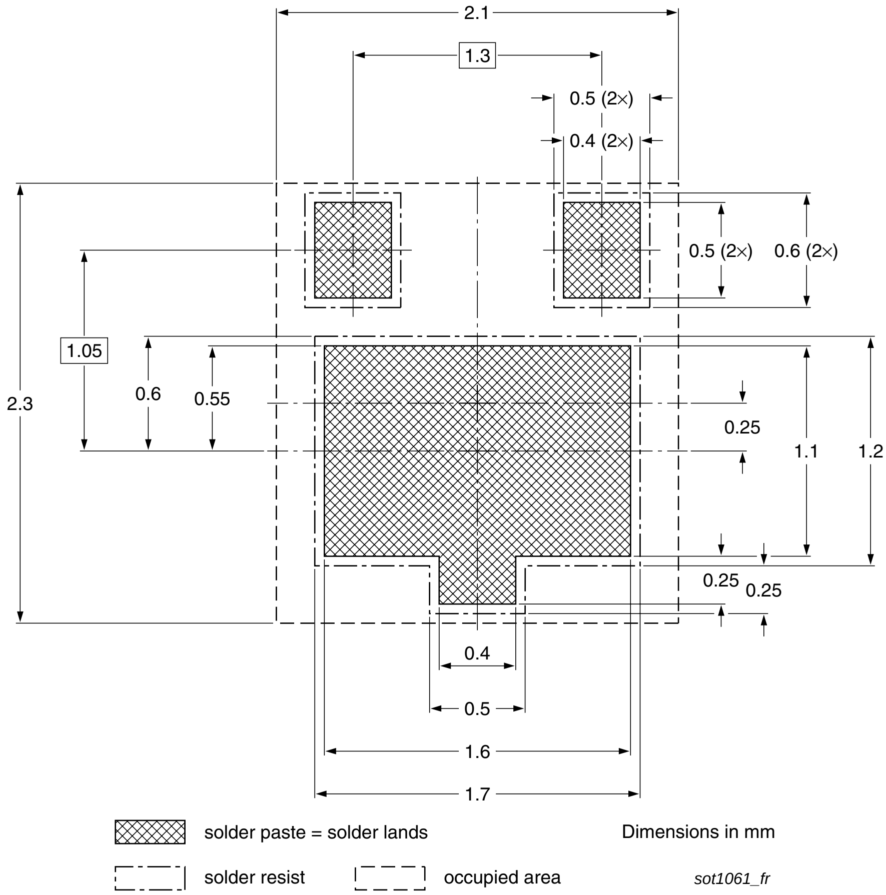
11. Soldering



Reflow soldering is the only recommended soldering method.

Fig 17. Reflow soldering footprint SOT1061 (HUSON3)

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12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4560PA v.1	20100519	Product data sheet	-	-

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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.
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