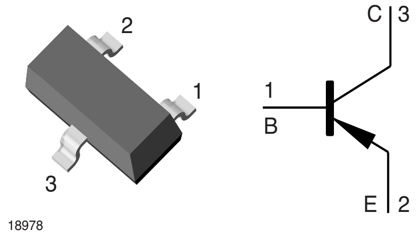
Small Signal Transistors (PNP)

Features

- PNP Silicon Epitaxial Planar Transistors for switching and AF amplifier applications.
- Especially suited for automatic insertion in thick and thin-film circuits.
- These transistors are subdivided into three groups A, B, and C) according to their current gain. The type BC856 is available in groups A and B, however, the types
  BC857, BC558 and BC859 can be supplied in all three groups. The BC849 is a low noise type.



- As complementary types, the NPN transistors BC846...BC849 are recomended.

Mechanical Data

Case: SOT-23 Plastic case

Weight: approx. 8.8 mg

Marking:

BC856A = 3A	BC858A = 3J
BC856B = 3B	BC858B = 3K
	BC858C = 3L
BC857A = 3E	BC859A = 4A
BC857B = 3F	BC859B = 4B
BC857C = 3G	BC859C = 4C

Packaging Codes/Options:

GS18 / 10 k per 13" reel (8 mm tape), 10 k/box

GS08 / 3 k per 7" reel (8 mm tape), 15 k/box

Pinning:

1 = Base, 2 = Emitter, 3 = Collector

Absolute Maximum Ratings

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

Parameter	Test condition	Part	Symbol	Value	Unit
Collector - base voltage		BC856	$- V_{CBO}$	80	V
		BC857	$- V_{CBO}$	50	V
		BC858	$- V_{CBO}$	30	V
		BC859	$- V_{CBO}$	30	V
Collector - emitter voltage (base shorted)		BC856	$- V_{CES}$	80	V
		BC857	$- V_{CES}$	50	V
		BC858	$- V_{CES}$	30	V
		BC859	$- V_{CES}$	30	V
Collector - emitter voltage (base open)		BC856	$- V_{CEO}$	65	V
		BC857	$- V_{CEO}$	45	V
		BC858	$- V_{CEO}$	30	V
		BC859	$- V_{CEO}$	30	V
Emitter - base voltage			$- V_{EBO}$	5	V
Collector current			$- I_C$	100	mA
Peak colector current			$- I_{CM}$	200	mA
Peak base current			$- I_{BM}$	200	mA
Peak emitter current			I_{EM}	200	mA
Power dissipation	T_{amb} = 25 °C		P_{tot}	310[1)]	mW

[1)] Device on fiberglass substrate, see layout on third page.

Maximum Thermal Resistance

Parameter	Test condition	Symbol	Value	Unit
Thermal resistance junction to ambient air		$R_{\theta JA}$	320[1)]	°C/W
Thermal resistance junction to substrate backside		$R_{\theta SB}$	450[1)]	°C/W
Junction temperature		T_j	150	°C
Storage temperature range		T_S	- 65 to + 150	°C

[1)] Device on fiberglass substrate, see layout on third page.

Electrical DC Characteristics

Parameter	Test condition	Part	Symbol	Min	Typ	Max	Unit
Small signal current gain (current gain group A)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{fe}		220		
Small signal current gain (current gain group B)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{fe}		330		
Small signal current gain (current gain group C)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{fe}		600		
Input impedance (current gain group A)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{ie}	1.6	2.7	4.5	kΩ
Input impedance (current gain group B)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{ie}	3.2	4.5	8.5	kΩ
Input impedance (current gain group C)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{ie}	6	8.7	15	kΩ
Output admittance (current gain group A)	$- V_{CE}$ = 5 V, $- I_C$ = 2 mA, f = 1 kHz		h_{oe}		18	30	µS

Parameter	Test condition	Part	Symbol	Min	Typ	Max	Unit
Output admittance (current gain group B)	- V_{CE} = 5 V, - I_C = 2 mA, f = 1 kHz		h_{oe}		30	60	µS
Output admittance (current gain group C)	- V_{CE} = 5 V, - I_C = 2 mA, f = 1 kHz		h_{oe}		60	110	µS
Reverse voltage transfer ratio (current gain group A)	- V_{CE} = 5 V, - I_C = 2 mA, f = 1 kHz		h_{re}		1.5×10^{-4}		
Reverse voltage transfer ratio (current gain group B)	- V_{CE} = 5 V, - I_C = 2 mA, f = 1 kHz		h_{re}		2×10^{-4}		
Reverse voltage transfer ratio (current gain group C)	- V_{CE} = 5 V, - I_C = 2 mA, f = 1 kHz		h_{re}		3×10^{-4}		
DC current gain (current gain group A)	- V_{CE} = 5 V, - I_C = 10 µA		h_{FE}		90		
DC current gain (current gain group B)	- V_{CE} = 5 V, - I_C = 10 µA		h_{FE}		150		
DC current gain (current gain group C)	- V_{CE} = 5 V, - I_C = 10 µA		h_{FE}		270		
DC current gain (current gain group A)	- V_{CE} = 5 V, - I_C = 2 mA		h_{FE}	110	180	220	
DC current gain (current gain group B)	- V_{CE} = 5 V, - I_C = 2 mA		h_{FE}	200	290	450	
DC current gain (current gain group C)	- V_{CE} = 5 V, - I_C = 2 mA		h_{FE}	420	520	800	
Collector saturation voltage	- I_C = 10 mA, - I_B = 0.5 mA		V_{CEsat}		90	300	mV
	- I_C = 100 mA, - I_B = 5 mA		V_{CEsat}		250	650	mV
Base saturation voltage	- I_C = 10 mA, - I_B = 0.5 mA		V_{BEsat}		700		mV
	- I_C = 100 mA, - I_B = 5 mA		V_{BEsat}		900		mV
Base - emiter voltage	- V_{CE} = 5 V, - I_C = 2 mA		V_{BE}	600	660	750	mV
	- V_{CE} = 5 V, - I_C = 10 mA		V_{BE}			820	mV
Collector-emitter cut-off current	- V_{CE} = 80 V	BC856	I_{CES}		0.2	15	nA
	- V_{CE} = 50 V	BC857	I_{CES}		0.2	15	nA
	- V_{CE} = 30 V	BC858	I_{CES}		0.2	15	nA
		BC859	I_{CES}		0.2	15	nA
	- V_{CE} = 80 V, T_j = 125 °C	BC857	I_{CES}			4	µA
	- V_{CE} = 50 V, T_j = 125 °C	BC857	I_{CES}			4	µA
	- V_{CE} = 30 V, T_j = 125 °C	BC858	I_{CES}			4	µA
		BC859	I_{CES}			4	µA
Collector-base cut-off current	- V_{CB} = 30 V		I_{CBO}			15	µA
	- V_{CB} = 30 V, T_j = 150 °C		I_{CBO}			5	µA

Electrical AC Characteristics

Parameter	Test condition	Part	Symbol	Min	Typ	Max	Unit
Gain bandwidth product	- V_{CE} = 5 V, - I_C = 10 mA, f = 100 MHz		f_T		150		MHz
Collector - base capacitance	- V_{CB} = 10 V, f = 1 MHz		C_{CBO}			6	pF
Noise figure	- V_{CE} = 5 V, - I_C = 200 µA, R_G = 2 kΩ, f = 1 kHz, Δf = 200 Hz	BC856	F		2	10	dB
		BC857	F		2	10	dB
		BC858	F		2	10	dB
		BC859	F		1	4	dB
	- V_{CE} = 5 V, - I_C = 200 µA, R_G = 2 kΩ, f = (30 to 15000) Hz	BC859	F		1.2	4	dB

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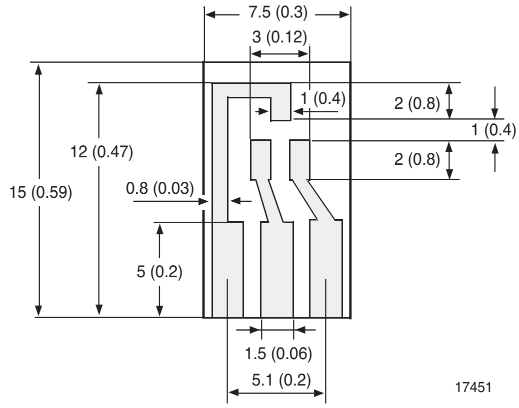
Layout for R_{thJA} test

Thickness: Fiberglass 1.5 mm (0.059 in.)
Copper leads 0.3 mm (0.012 in.)



Typical Characteristics (T_{amb} = 25 °C unless otherwise specified)

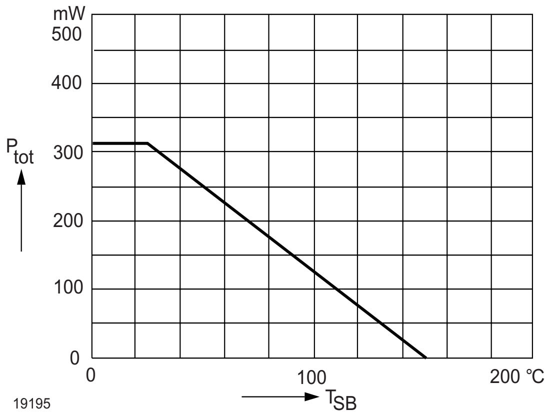


Figure 1. Admissible Power Dissipation vs. Temperature of Substrate Backside

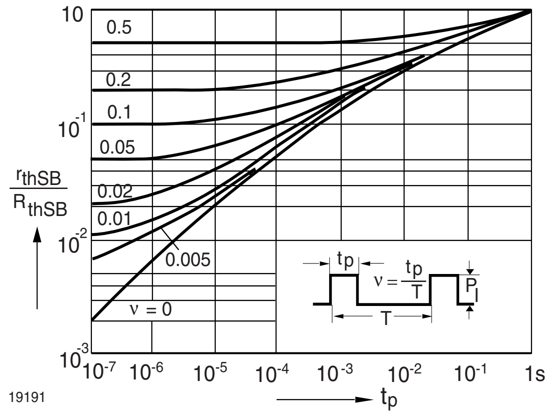


Figure 2. Pulse Thermal Resistance vs. Pulse Duration (normalized)

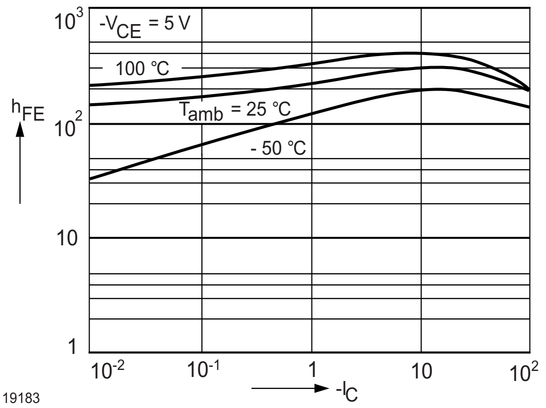


Figure 3. DC Current Gain vs. Collector Current

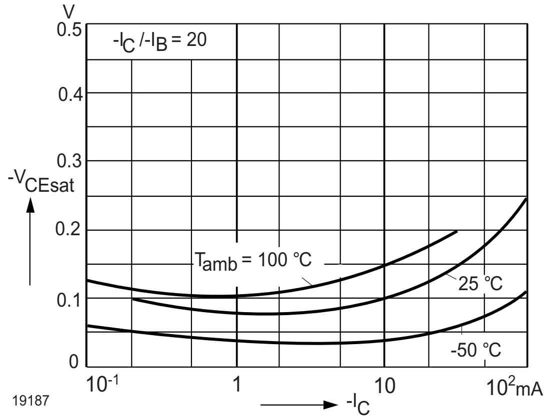


Figure 6. Collector Saturation Voltage vs. Collector Current

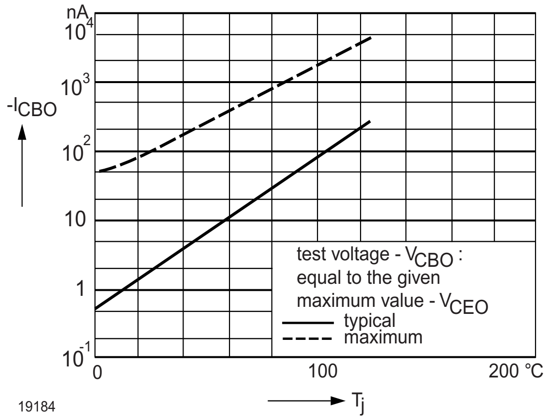


Figure 4. Collector-Base Cutoff Curent vs. Ambient Temperature

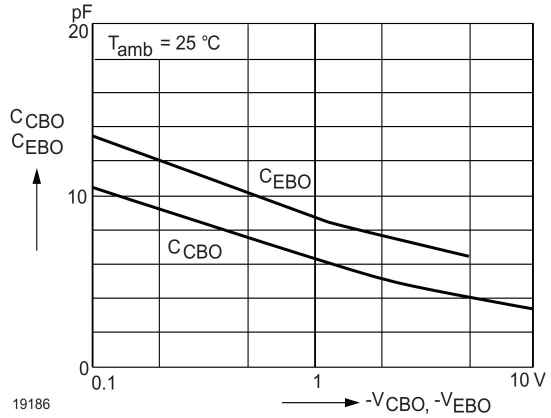


Figure 7. Collector Base Capacitance, Emitter base Capacitance vs. Bias Voltage

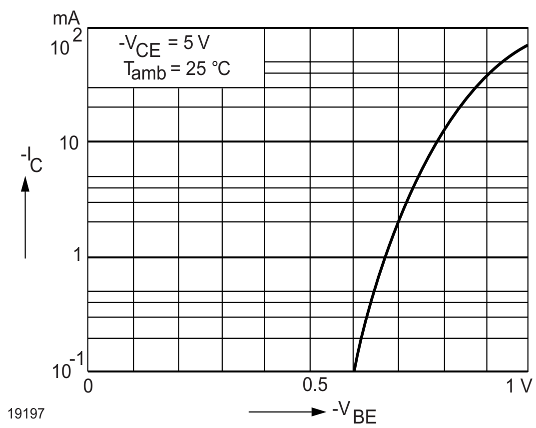


Figure 5. Collector Current vs. Base-Emitter Voltage

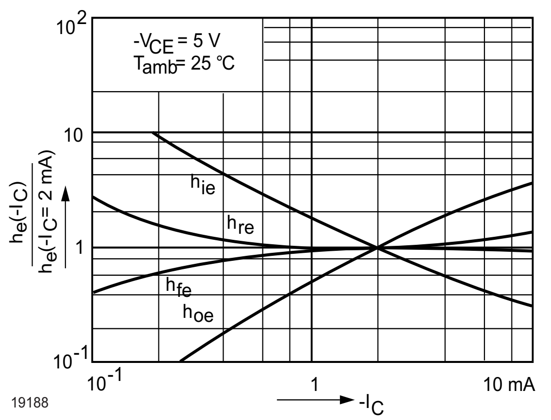


Figure 8. Relative h-Parameters vs. Collector Current

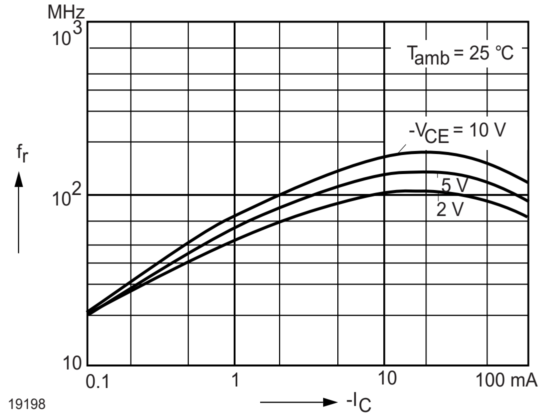


Figure 9. Gain-Bandwidth Product vs. Collector Current

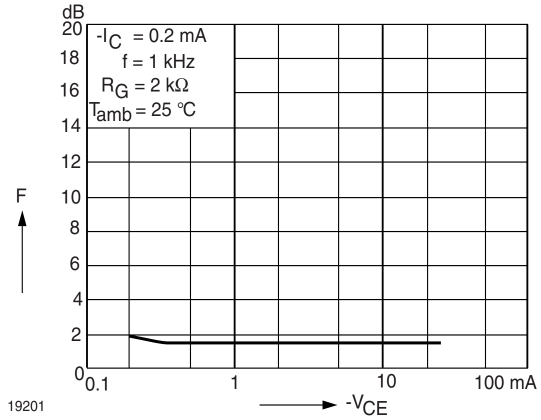


Figure 12. Noise Figure vs. Collector Emitter Voltage

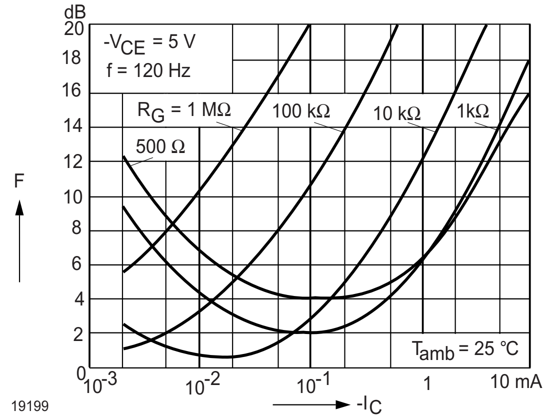


Figure 10. Noise Figure vs. Collector Current

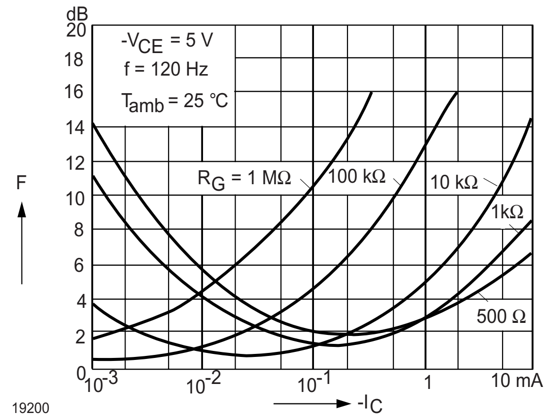
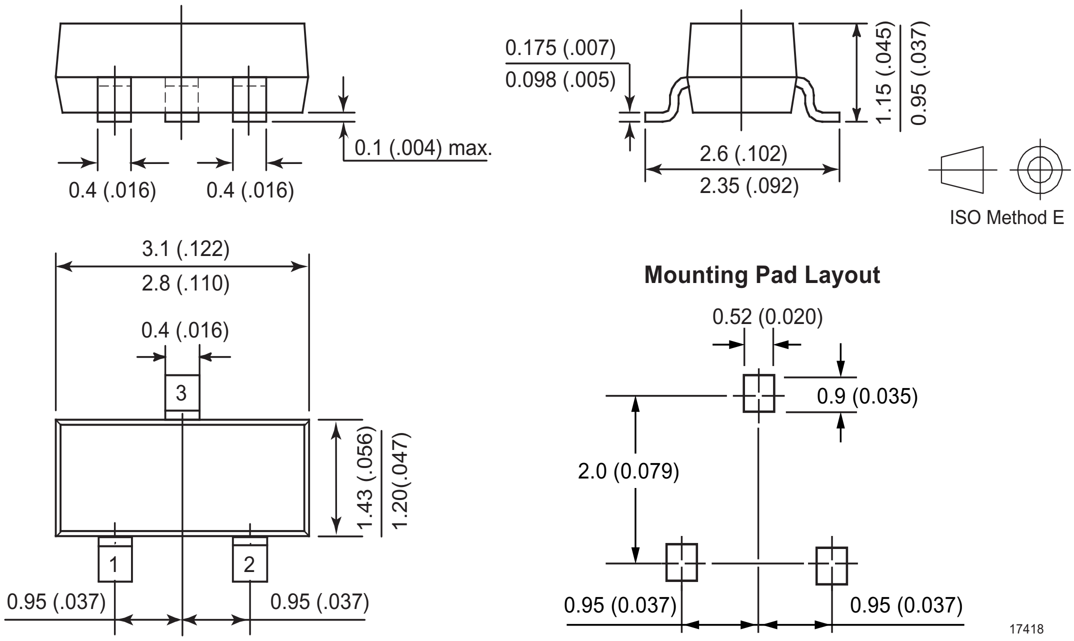


Figure 11. Noise Figure vs. Collector Current

Package Dimensions in mm (Inches)



Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operatingsystems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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