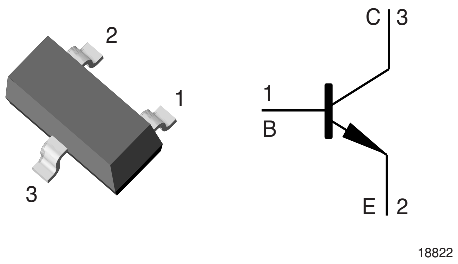
Small Signal Transistors (NPN)

Features

- These transistors are subdivided into three groups (A, B, and C) according to their current gain. The type BC846 is available in groups A and B, however, the types BC847 and BC848 can be supplied in all three groups. The BC849 is a low noise type available in groups B and C. As complementary types, the PNP transistors BC856...BC859 are recommended.
- NPN Silicon Epitaxial Planar Transistors for switching and AF amplifier applications.



- Especially suited for automatic insertion in thick and thin-film circuits.

Mechanical Data

Case: SOT-23 Plastic Package
Weight: approx. 8 mg
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

Parts Table

Part	Ordering code	Marking	Remarks
BC846A	BC846A-GS18 or BC846A-GS08	1A	Tape and Reel
BC846B	BC846B-GS18 or BC846B-GS08	1B	Tape and Reel
BC847A	BC847A-GS18 or BC847A-GS08	1E	Tape and Reel
BC847B	BC847B-GS18 or BC847B-GS08	1F	Tape and Reel
BC847C	BC847C-GS18 or BC847C-GS08	1G	Tape and Reel
BC848A	BC848A-GS18 or BC848A-GS08	1J	Tape and Reel
BC848B	BC848B-GS18 or BC848B-GS08	1K	Tape and Reel
BC848C	BC848C-GS18 or BC848C-GS08	1L	Tape and Reel
BC849B	BC849B-GS18 or BC849B-GS08	2B	Tape and Reel
BC849C	BC849C-GS18 or BC849C-GS08	2C	Tape and Reel

Absolute Maximum Ratings

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

Parameter	Test condition	Part	Symbol	Value	Unit
Collector - base voltage		BC846	V_{CBO}	80	V
		BC847	V_{CBO}	50	V
		BC848	V_{CBO}	30	V
		BC849	V_{CBO}	30	V
Collector - emitter voltage		BC846	V_{CES}	80	V
		BC847	V_{CES}	50	V
		BC848	V_{CES}	30	V
		BC849	V_{CES}	30	V
		BC846	V_{CEO}	65	V
		BC847	V_{CEO}	45	V
		BC848	V_{CEO}	30	V
		BC849	V_{CEO}	30	V
Emitter - base voltage		BC846	V_{EBO}	6	V
		BC847	V_{EBO}	6	V
		BC848	V_{EBO}	5	V
		BC849	V_{EBO}	5	V
Collector current			I_C	100	mA
Collector peak 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		$R_{\theta JA}$	450[1)]	°C/W
Thermal resistance junction to substrate backside		$R_{\theta SB}$	320[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	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

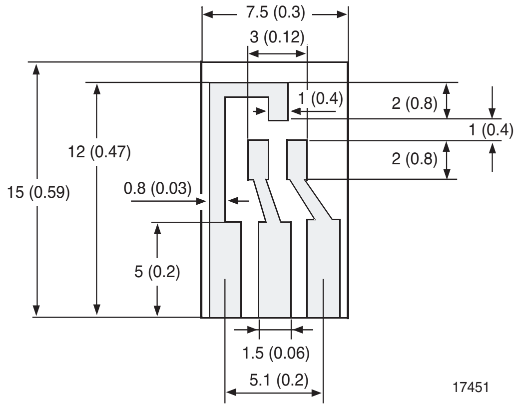
Parameter	Test condition	Symbol	Min	Typ.	Max.	Unit
Input impedance (current gain group C)	V_{CE} = 5 V, I_C = 2 mA, f = 1 kHz	h_{ie}	6	8.7	15	kΩ
Output admittance (current gain group A)	V_{CE} = 5 V, I_C = 2 mA, f = 1 kHz	h_{oe}		18	30	µS
Output admittance (current gain group B)	V_{CE} = 5 V, I_C = 2 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	250	mV
	I_C = 100 mA, I_B = 5 mA	V_{CEsat}		200	600	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-emitter voltage	V_{CE} = 5 V, I_C = 2 mA	V_{BEon}	580	660	700	mV
	V_{CE} = 5 V, I_C = 10 mA	V_{BE}			770	mV
Collector-base cut-off current	V_{CB} = 30 V	I_{CBO}			15	nA
	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		300		MHz
Collector-base capacitance	V_{CB} = 10 V, f = 1 MHz		C_{CBO}		3.5	6	pF
Emitter - base capacitance	V_{EB} = 0.5 V, f = 1 MHz		C_{EBO}		9		pF
Noise figure	V_{CE} = 5 V, I_C = 200 µA, R_G = 2 kΩ, f = 1 kHz, Δf = 200 Hz	BC846	F		2	10	dB
	V_{CE} = 5 V, I_C = 200 µA, R_G = 2 kΩ, f = 1 kHz, Δf = 200 Hz	BC847	F		2	10	dB
		BC848	F		2	10	dB
		BC849	F		1.2	4	dB
	V_{CE} = 5 V, I_C = 200 µA, R_G = 2 kΩ, f = (30 to 15000) Hz	BC849	F		1.4	4	dB

Layout for $R_{\theta JA}$ 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)

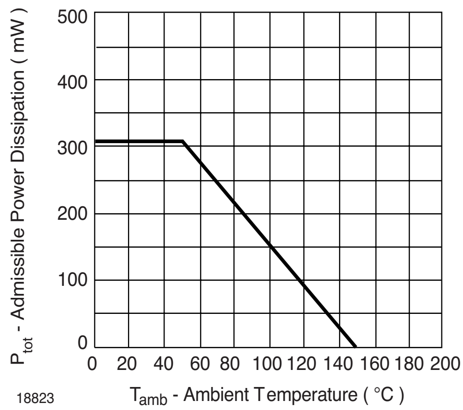


Fig. 1 Admissible Power Dissipation vs. Temperature of Substrate Backside

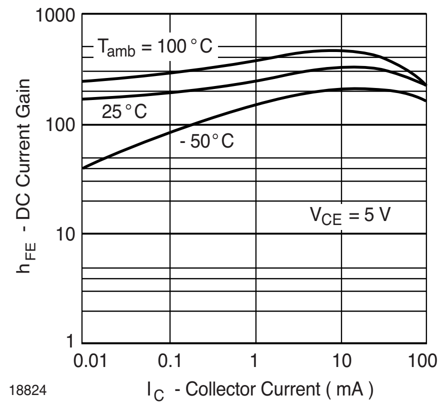


Fig. 2 DC Current Gain vs. Collector Current

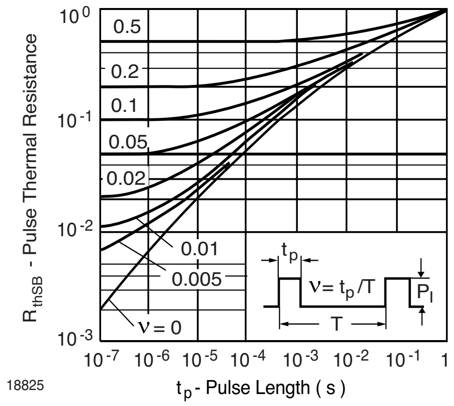


Fig. 3 Pulse Thermal Resistance vs. Pulse Duration (normalized)

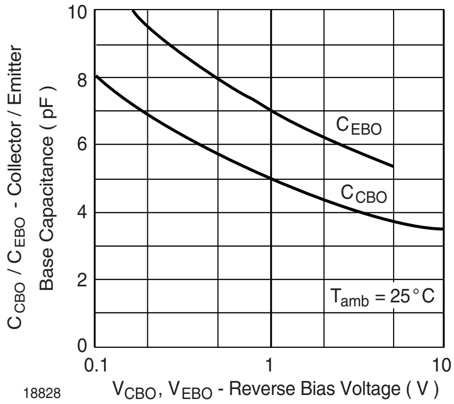


Fig. 6 Collector Base Capacitance, Emitter base Capacitance vs. Bias Voltage

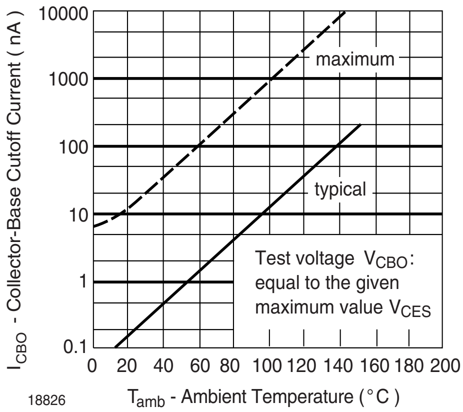


Fig. 4 Collector-Base Cutoff Curent vs. Ambient Temperature

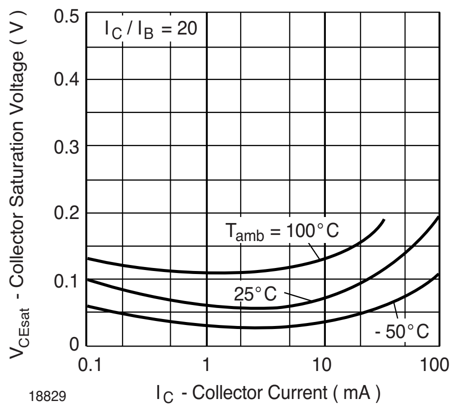


Fig. 7 Collector Saturation Voltage vs. Collector Current

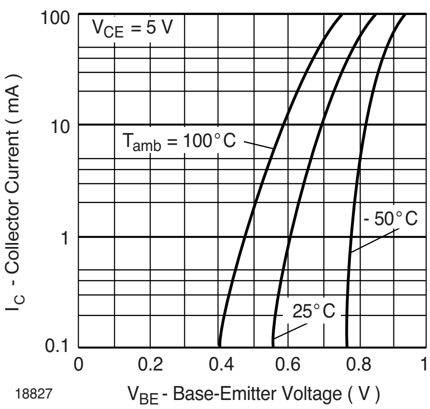


Fig. 5 Collector Current vs. Base-Emitter Voltage

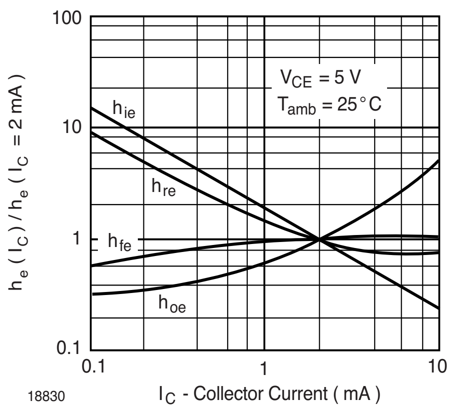


Fig. 8 Relative h-Parameters vs. Collector Current

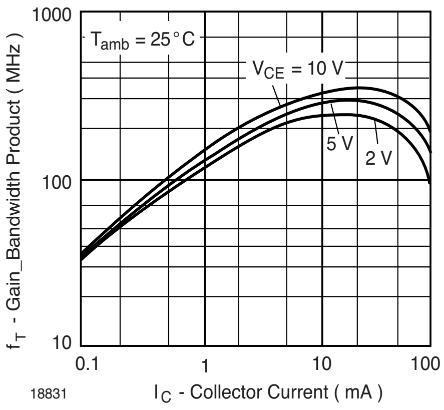


Fig. 9 Gain-Bandwidth Product vs. Collector Current

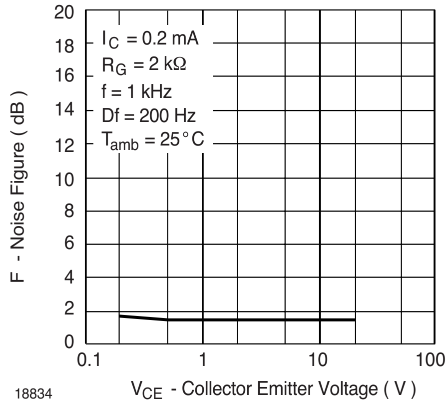


Fig. 12 Noise Figure vs. Collector Emitter Voltage

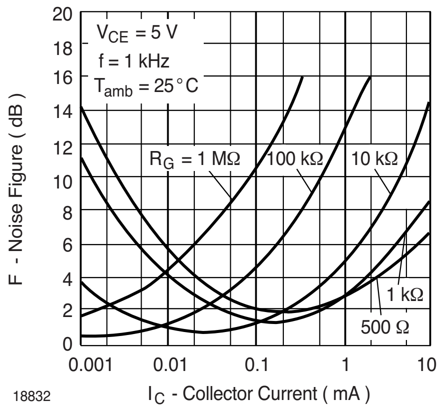


Fig. 10 Noise Figure vs. Collector Current

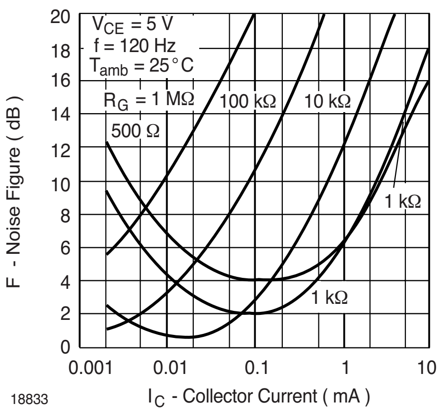
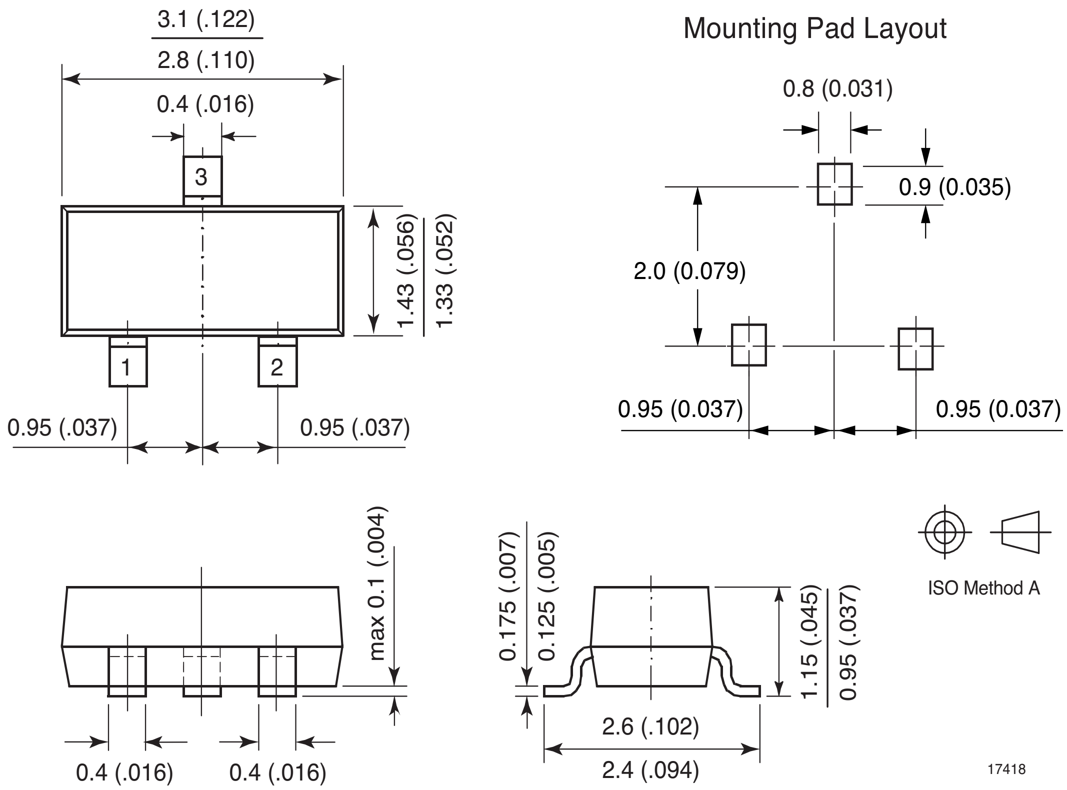


Fig. 11 Noise Figure vs. Collector Current

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.

We reserve the right to make changes to improve technical design and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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