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 BC237.pdf	22-Dec-99 00:02	70K	
 BC237_238_239.pdf	17-Apr-99 00:00	70K	
 BC238.pdf	22-Dec-99 00:02	70K	
 BC239.pdf	22-Dec-99 00:02	70K	
 BC307.pdf	22-Dec-99 00:02	69K	
 BC307_308_309.pdf	17-Apr-99 00:00	69K	
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 BC309.pdf	22-Dec-99 00:02	69K	
 BC327.pdf	22-Dec-99 00:02	92K	
 BC327_BC328.pdf	17-Apr-99 00:00	92K	
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BC237/238/239

NPN EPITAXIAL SILICON TRANSISTOR

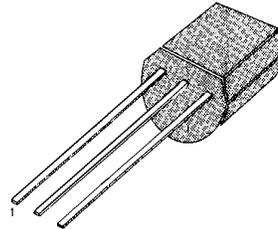
SWITCHING AND AMPLIFIER APPLICATIONS

- LOW NOISE: BC239

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage	V _{CES}		V
: BC237		50	V
: BC238/239		30	
Collector-Emitter Voltage	V _{CEO}		V
: BC237		45	V
: BC238/239		25	V
Emitter-Base Voltage	V _{EBO}		V
: BC237		6	V
: BC238/239		5	V
Collector Current (DC)	I _C	100	mA
Collector Dissipation	P _C	500	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-55 ~ 150	°C

TO-92



1. Collector 2. Base 3. Emitter

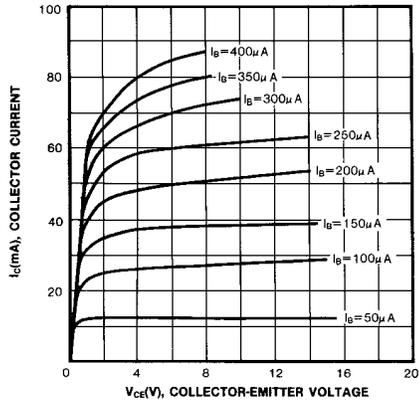
ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2mA, I _B =0	45			V
: BC237			25			V
: BC238/239						
Emitter Base Breakdown Voltage	BV _{EBO}	I _E =1μA, I _C =0	6			V
: BC237			5			V
: BC238/239						
Collector Cut-off Current	I _{CES}	V _{CE} =50V, I _B =0		0.2	15	nA
: BC237		V _{CE} =30V, I _B =0		0.2	15	nA
: BC238/239		V _{CE} =5V, I _C =2mA	120		800	
DC Current Gain	h _{FE}	I _C =10mA, I _B =0.5mA		0.07	0.2	V
Collector-Emitter Saturation Voltage	V _{CE (sat)}	I _C =100mA, I _B =5mA		0.2	0.6	V
Collector Base Saturation Voltage	V _{BE (sat)}	I _C =10mA, I _B =0.5mA		0.73	0.83	V
		I _C =100mA, I _B =5mA		0.87	1.05	V
Base Emitter On Voltage	V _{BE (on)}	V _{CE} =5V, I _C =2mA	0.55	0.62	0.7	V
Current Gain Bandwidth Product	f _T	V _{CE} =3V, I _C =0.5mA		85		MHz
		V _{CE} =5V, I _C =10mA	150	250		MHz
Collector Base Capacitance	C _{CBO}	V _{CB} =10V, f=1MHz		3.5	6	pF
Emitter Base Capacitance	C _{EBO}	V _{EB} =0.5V, f=1MHz		8		pF
Noise Figure	NF	V _{CE} =5V, I _C =0.2mA, f=1KHz R _G =2kohm		2	10	dB
: BC237/238		V _{CE} =5V, I _C =0.2mA, R _G =2kohm, f=30-15KHz			4	dB
: BC239					4	dB

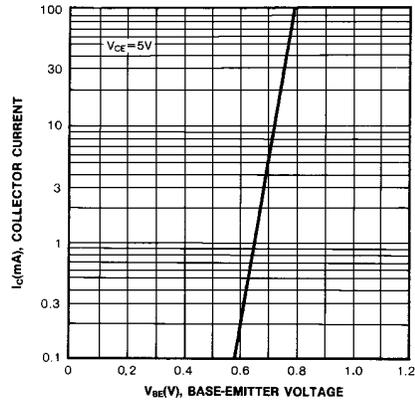
h_{FE} CLASSIFICATION

Classification	A	B	C
h _{FE}	120-220	180-460	380-800

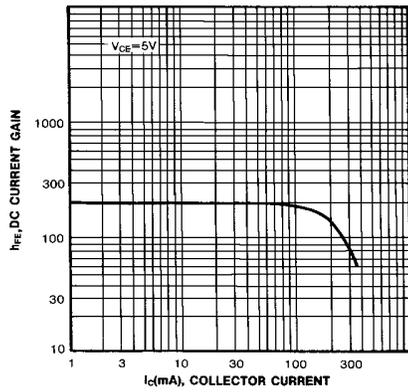
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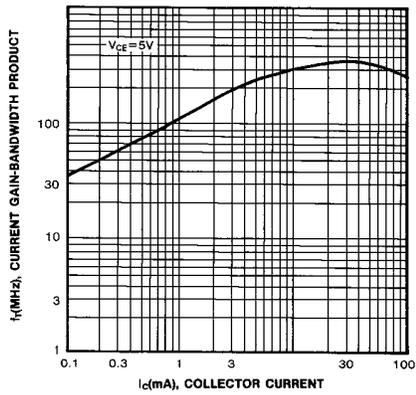
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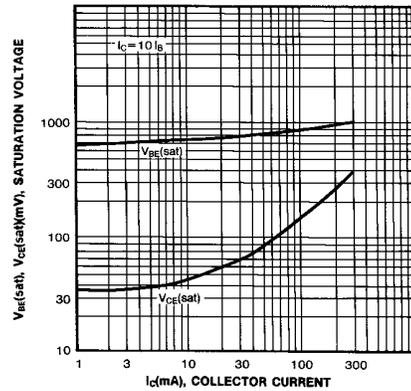
DC CURRENT GAIN



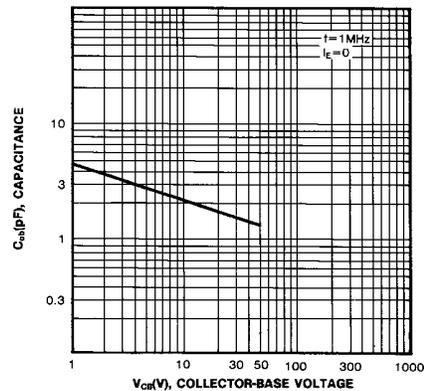
CURRENT GAIN BANDWIDTH PRODUCT



BASE-EMITTER SATURATION VOLTAGE
COLLECTOR-EMITTER SATURATION VOLTAGE



OUTPUT CAPACITANCE



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GTO™	SuperSOT™-8
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

BC307/308/309

PNP EPITAXIAL SILICON TRANSISTOR

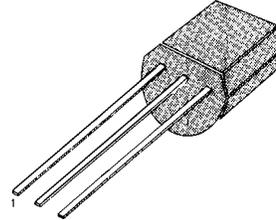
SWITCHING AND AMPLIFIER APPLICATIONS

- LOW NOISE: BC309

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage : BC307	V _{CES}	-50	V
: BC308/309		-30	V
Collector-Emitter Voltage : BC307	V _{CEO}	-45	V
: BC308/309		-25	V
Emitter-Base Voltage	V _{EBO}	-5	V
Collector Current (DC)	I _C	-100	mA
Collector Dissipation	P _C	500	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-55 ~ 150	°C

TO-92



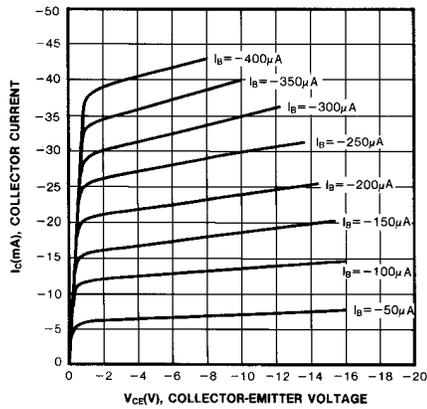
ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Emitter Breakdown Voltage : BC307	BV _{CEO}	I _C = -2mA, I _B =0	-45			V
: BC308/309			-25			V
Collector Emitter Breakdown Voltage : BC307	BV _{CES}	I _C = -10μA, I _B =0	-50			V
: BC308/309			-30			V
Emitter Base Breakdown Voltage	BV _{EBO}	I _E = -10μA, I _B =0	-5			V
Collector Cut-off Current : BC307	I _{CES}	V _{CE} = -45V, I _B =0		-2	-15	nA
: BC238/239		V _{CE} = -25V, I _B =0		-2	-15	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -2mA	120		800	
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -10mA, I _B = -0.5mA			-0.3	V
		I _C = -100mA, I _B = -5mA		-0.5		V
Collector Base Saturation Voltage	V _{BE} (sat)	I _C = -10mA, I _B = -0.5mA		-0.7		V
		I _C = -100mA, I _B = -5mA		-0.85		V
Base Emitter On Voltage	V _{BE} (on)	V _{CE} = -5V, I _C = -2mA	-0.55	-0.62	-0.7	V
Current Gain Bandwidth Product	f _T	V _{CE} = -5V, I _C = -10mA		130		MHz
Collector Base Capacitance	C _{CB0}	V _{CB} = -10V, f=1MHz			6	pF
Emitter Base Capacitance	C _{EB0}	V _{EB} = -0.5V, f=1MHz		12		pF
Noise Figure : BC237/238	NF	V _{CE} = -5V, I _C = -0.2mA, R _G =2KΩ, f=1KHz			10	dB
: BC239		V _{CE} = -5V, I _C = -0.2mA			4	dB
: BC239	NF	V _{CE} = -5V, I _C = -0.2mA, R _G =2KΩ, f=30~15KHz		2	4	dB

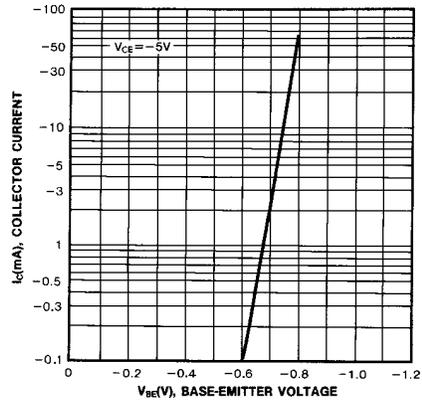
h_{FE} CLASSIFICATION

Classification	A	B	C
h _{FE}	120-220	180-460	380-800

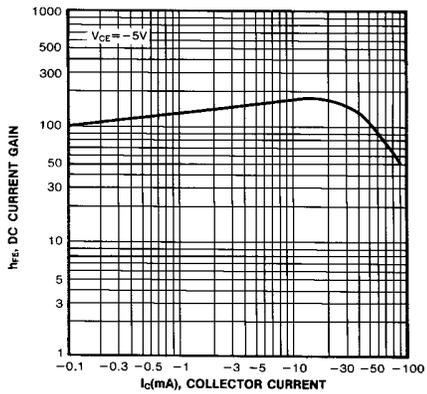
STATIC CHARACTERISTIC



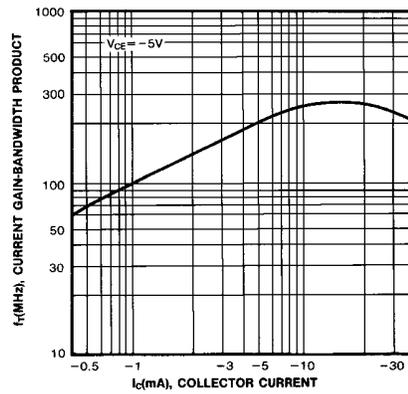
BASE-EMITTER ON VOLTAGE



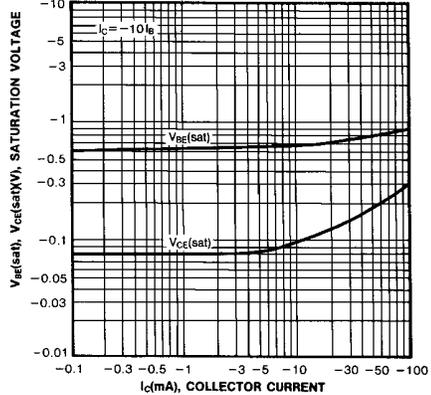
DC CURRENT GAIN



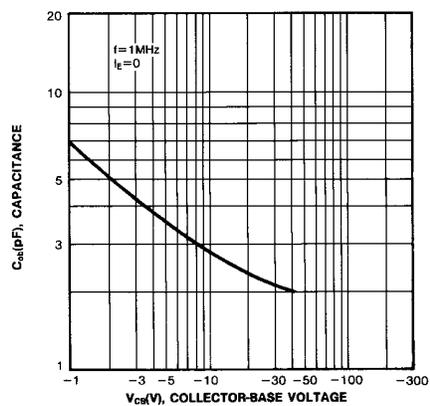
CURRENT GAIN-BANDWIDTH PRODUCT



BASE-EMITTER SATURATION VOLTAGE
COLLECTOR-EMITTER SATURATION VOLTAGE



COLLECTOR OUTPUT CAPACITANCE



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FACT Quiet Series™	Quiet Series™
FAST®	SuperSOT™-3
FASTr™	SuperSOT™-6
GTO™	SuperSOT™-8
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

BC327/328

PNP EPITAXIAL SILICON TRANSISTOR

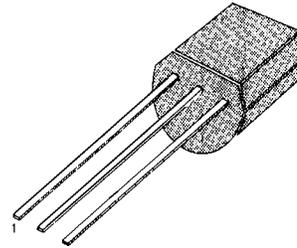
SWITCHING AND AMPLIFIER APPLICATIONS

- Suitable for AF-Driver stages and low power output stages
- Complement to BC337/BC338

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage : BC327	V _{CE}	-50	V
: BC328		-30	V
Collector-Emitter Voltage : BC327	V _{CEO}	-45	V
: BC328		-25	V
Emitter-Base Voltage	V _{EBO}	-5	V
Collector Current (DC)	I _C	-800	mA
Collector Dissipation	P _C	625	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-55 ~ 150	°C

TO-92



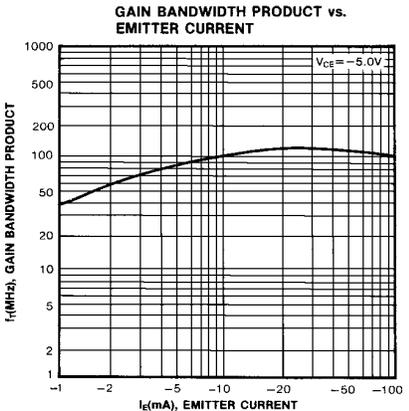
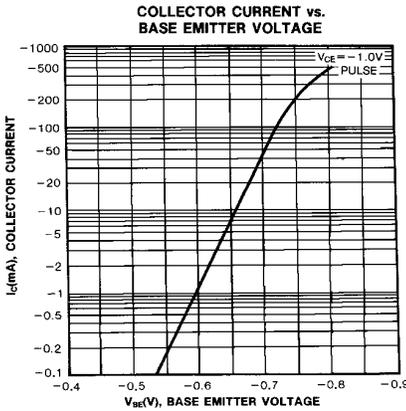
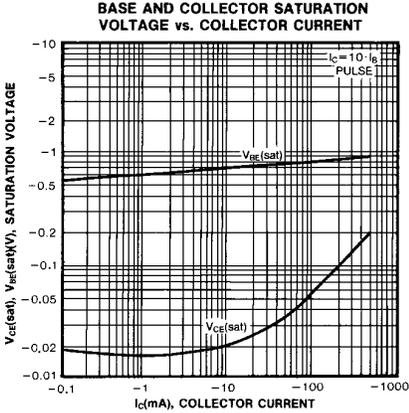
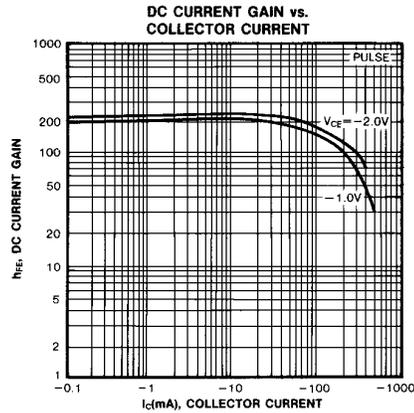
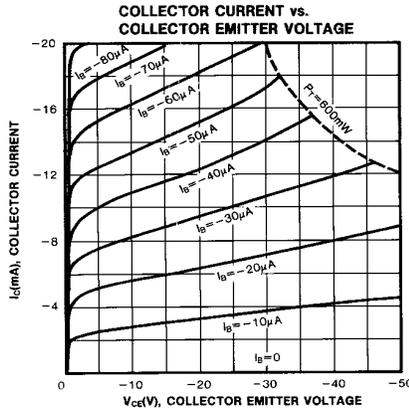
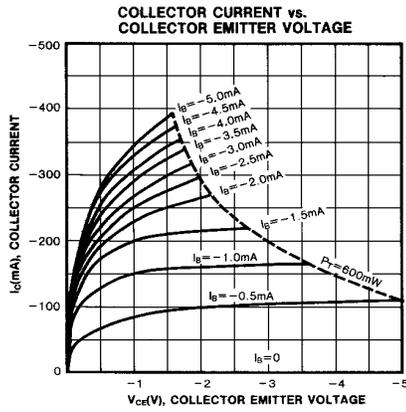
1. Collector 2. Base 3. Emitter

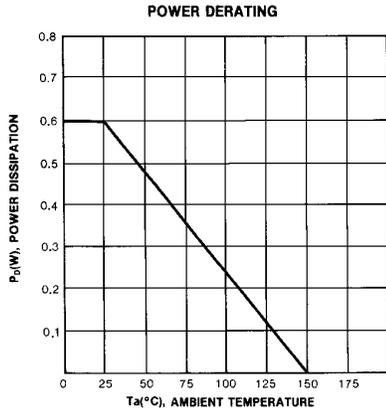
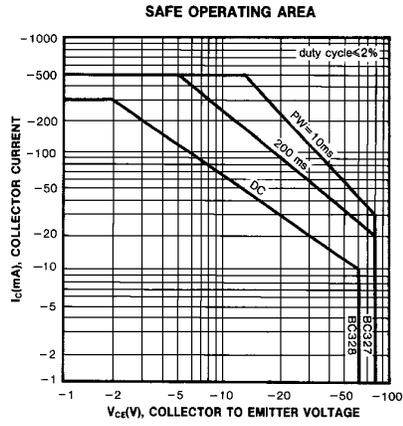
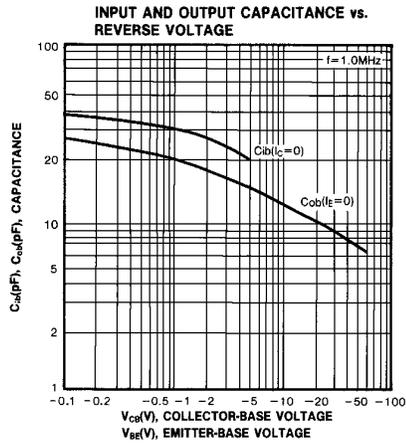
ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Emitter Breakdown Voltage : BC327	BV _{CEO}	I _C = -10mA, I _B =0	-45			V
: BC328			-25			V
Collector Emitter Breakdown Voltage : BC327	BV _{CES}	I _C = -0.1mA, I _B =0	-50			V
: BC328			-30			V
Emitter Base Breakdown Voltage	BV _{EBO}	I _E = -10mA, I _C =0	-5			V
Collector Cut-off Current : BC307	I _{CES}	V _{CE} = -45V, I _B =0		-2	-100	nA
: BC338			V _{CE} = -25V, I _B =0		-2	-100
DC Current Gain	h _{FE}	V _{CE} = -1V, I _C = -100mA	100		630	
	h _{FE2}	V _{CE} = -1V, I _C = -30mA	60			
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -500mA, I _B = -50mA			-0.7	V
Base Emitter On Voltage	V _{BE} (on)	V _{CE} = -1V, I _C = -300mA			-1.2	V
Current Gain Bandwidth Product	f _T	V _{CE} = -5V, I _C = -10mA		100		MHz
Collector Base Capacitance	C _{CBO}	V _{CB} = -10V, f=1MHz		12		pF

h_{FE} CLASSIFICATION

Classification	A	B	C
h _{FE}	100-250	160-400	250-630
h _{FE2}	60-	100-	170-





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FACT™	QS™
FACT Quiet Series™	Quiet Series™
FAST®	SuperSOT™-3
FASTr™	SuperSOT™-6
GTO™	SuperSOT™-8
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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**BC337-16
BC337-25**



NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 500 mA. Sourced from Process 12. See TN3019A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CES}	Collector-Base Voltage	50	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	1.0	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		BC337-16 / BC337-25	
P _D	Total Device Dissipation Derate above 25°C	625	mW
		5.0	mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	83.3	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	200	°C/W

NPN General Purpose Amplifier
(continued)

BC337-16 / BC337-25

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

V _{(BR)CEO}	Collector-Emitter Breakdown Voltage	I _C = 10 mA, I _B = 0	45		V
V _{(BR)CES}	Collector-Base Breakdown Voltage	I _C = 100 μA, I _E = 0	50		V
V _{(BR)EBO}	Emitter-Base Breakdown Voltage	I _E = 100 μA, I _C = 0	5.0		V
I _{CBO}	Collector Cutoff Current	V _{CB} = 20 V, I _E = 0, T _A = +25 °C V _{CB} = 20 V, I _E = 0, T _A = +150 °C		100 5.0	nA μA
I _{EBO}	Emitter Cutoff Current	V _{EB} = 5.0 V, I _C = 0		10	μA

ON CHARACTERISTICS

h _{FE}	DC Current Gain	V _{CE} = 1.0 V, I _C = 100 mA 337-16 337-25	100 160 40	250 400	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = 500 mA, I _B = 50 mA		0.7	V
V _{BE(on)}	Base-Emitter On Voltage	V _{CE} = 1.0 V, I _C = 500 mA		1.2	V

BC337/338

NPN EPITAXIAL SILICON TRANSISTOR

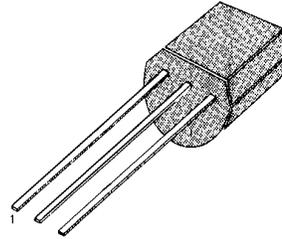
SWITCHING AND AMPLIFIER APPLICATIONS

- Suitable for AF-Driver stages and low power output stages
- Complement to BC337/BC328

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage : BC337 : BC338	V _{CEs}	50 30	V V
Collector-Emitter Voltage : BC337 : BC338	V _{CEO}	45 25	V V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current (DC)	I _C	800	mA
Collector Dissipation	P _C	625	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-55 ~ 150	°C

TO-92



1. Collector 2. Base 3. Emitter

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Emitter Breakdown Voltage : BC337 : BC338	BV _{CEO}	I _C =10mA, I _B =0	45 25			V V
Collector Emitter Breakdown Voltage : BC337 : BC338	BV _{CEs}	I _C =0.1mA, I _B =0	50 30			V V
Emitter Base Breakdown Voltage	BV _{EBO}	I _E =0.1mA, I _C =0	-5			V
Collector Cut-off Current : BC337 : BC338	I _{CEs}	V _{CE} =45V, I _B =0 V _{CE} =25V, I _B =0		2 2	100 100	nA nA
DC Current Gain	h _{FE1} h _{FE2}	V _{CE} =1V, I _C =100mA V _{CE} =1V, I _C =300mA	100 60		630	
Collector-Emitter Saturation Voltage	V _{CE (sat)}	I _C =500mA, I _B =50mA			0.7	V
Base Emitter On Voltage	V _{BE (on)}	V _{CE} =1V, I _C =300mA			1.2	V
Current Gain Bandwidth Product	f _T	V _{CE} =5V, I _C =10mA		100		MHz
Collector Base Capacitance	C _{CBO}	V _{CB} =10V, f=1MHz		12		pF

h_{FE} CLASSIFICATION

Classification	16	25	40
h _{FE}	100-250	160-400	250-630
h _{FE2}	60-	100-	170-

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FACT Quiet Series™	Quiet Series™
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BC368



NPN General Purpose Amplifier

This device is designed for general purpose medium power amplifiers and switches requiring collector currents to 1.5 A. Sourced from Process 37.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	20	V
V _{CES}	Collector-Base Voltage	25	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	2.0	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		BC368	
P _D	Total Device Dissipation Derate above 25°C	625	mW
		5.0	mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	83.3	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	200	°C/W

NPN General Purpose Amplifier

(continued)

BC368

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emmitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	20		V
$V_{(BR)CES}$	Collector-Base Breakdown Voltage	$I_C = 100 \text{ } \mu\text{A}, I_E = 0$	25		V
$V_{(BR)EBO}$	Emmitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 25 \text{ V}, I_E = 0$ $V_{CB} = 25 \text{ V}, I_E = 0, T_A = 150^\circ\text{C}$		10 1.0	μA mA
I_{EBO}	Emmitter-Cutoff Current	$V_{EB} = 5.0 \text{ V}, I_C = 0$		10	μA

ON CHARACTERISTICS

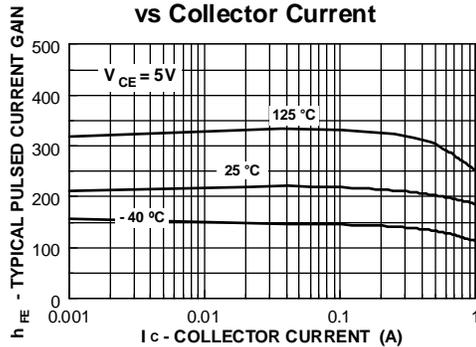
h_{FE}	DC Current Gain	$I_C = 5.0 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 0.5 \text{ A}, V_{CE} = 1.0 \text{ V}$ $I_C = 1.0 \text{ A}, V_{CE} = 1.0 \text{ V}$	50 85 60	375	
$V_{CE(sat)}$	Collector-Emmitter Saturation Voltage	$I_C = 1.0 \text{ A}, I_B = 100 \text{ mA}$		0.5	V
$V_{BE(on)}$	Base-Emmitter On Voltage	$I_C = 1.0 \text{ A}, V_{CE} = 1.0 \text{ V}$		1.0	V

SMALL SIGNAL CHARACTERISTICS

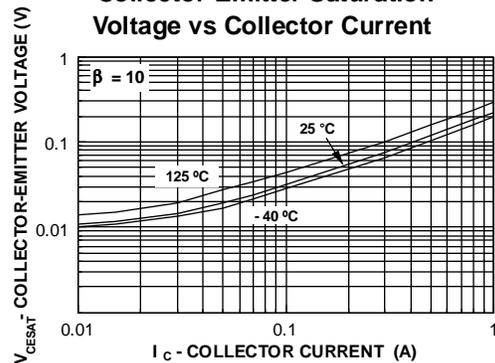
f_T	Current Gain - Bandwidth Product	$I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $f = 35 \text{ MHz}$	45		MHz
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Typical Characteristics

Typical Pulsed Current Gain vs Collector Current

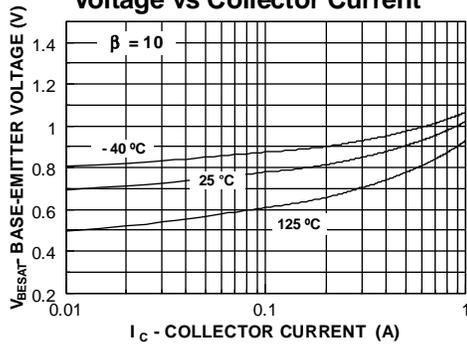


Collector-Emmitter Saturation Voltage vs Collector Current

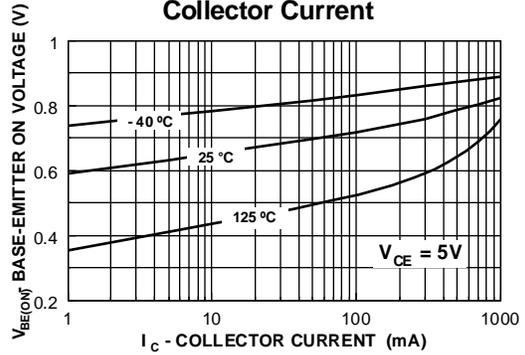


Typical Characteristics (continued)

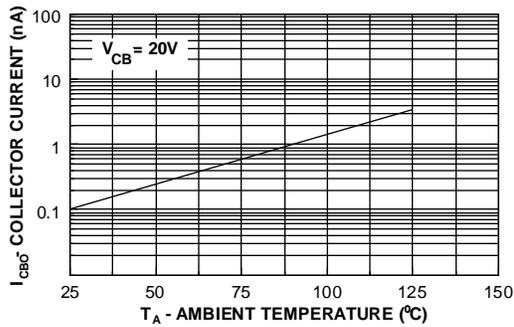
Base-Emitter Saturation Voltage vs Collector Current



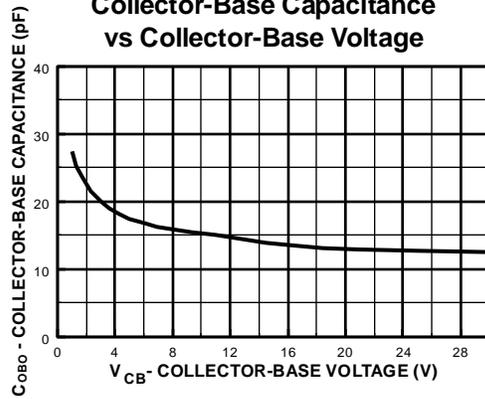
Base-Emitter ON Voltage vs Collector Current



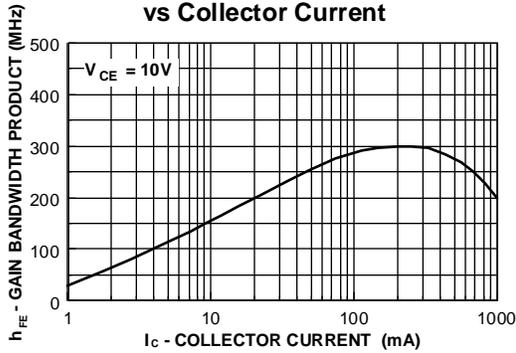
Collector-Cutoff Current vs Ambient Temperature



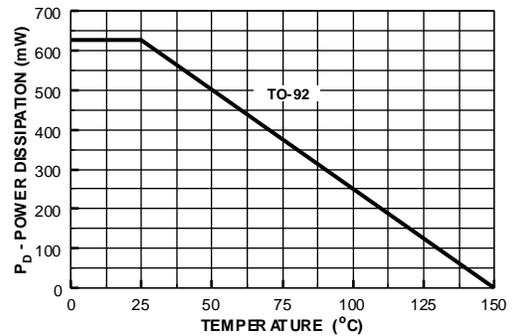
Collector-Base Capacitance vs Collector-Base Voltage



Gain Bandwidth Product vs Collector Current



Power Dissipation vs Ambient Temperature



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BC546/547/548/549/550

NPN EPITAXIAL SILICON TRANSISTOR

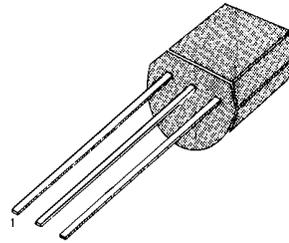
SWITCHING AND AMPLIFIER

- HIGH VOLTAGE: BC546, $V_{CE0}=65V$
- LOW NOISE: BC549, BC550
- Complement to BC556 ... BC560

ABSOLUTE MAXIMUM RATINGS ($T_A=25^{\circ}C$)

Characteristic	Symbol	Rating	Unit
Collector Base Voltage	V_{CBO}	80	V
: BC546		50	V
: BC547/550		30	V
Collector-Emitter Voltage	V_{CEO}	65	V
: BC546		45	V
: BC547/550		30	V
Emitter-Base Voltage	V_{EBO}	6	V
: BC546/547		5	V
: BC548/549/550			
Collector Current (DC)	I_C	100	mA
Collector Dissipation	P_C	500	mW
Junction Temperature	T_J	150	$^{\circ}C$
Storage Temperature	T_{STG}	-65 ~ 150	$^{\circ}C$

TO-92



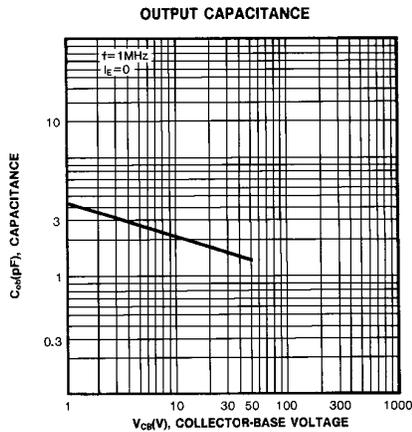
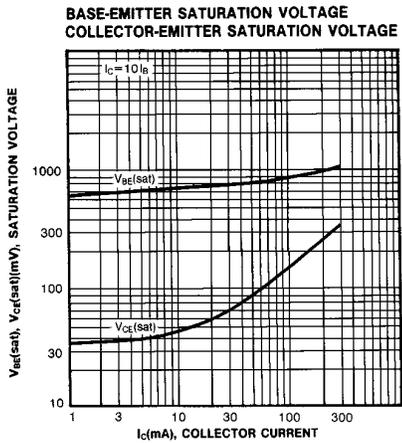
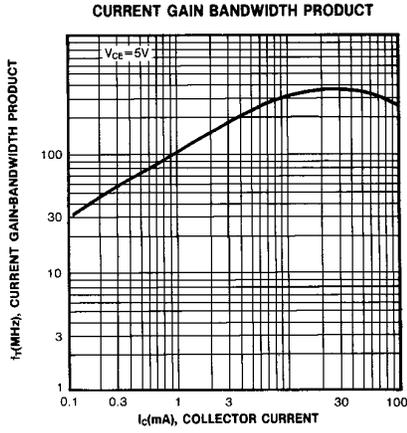
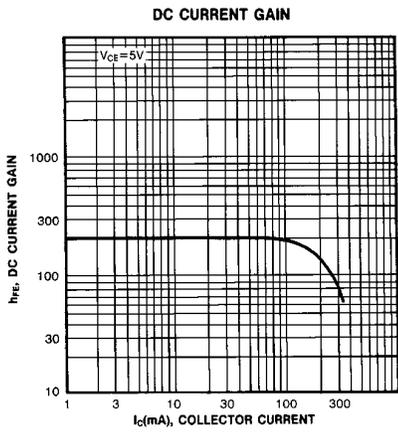
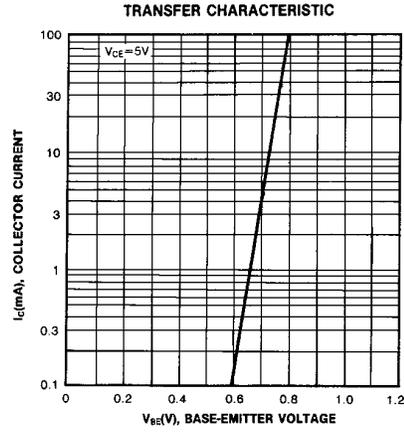
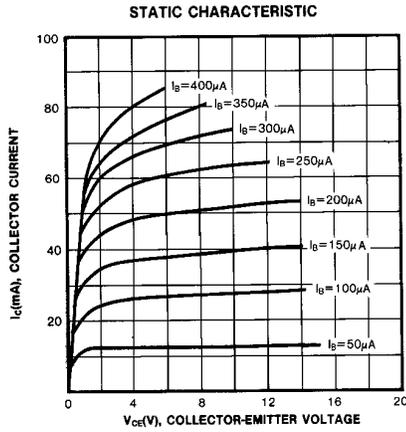
1. Collector 2. Base 3. Emitter

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}C$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Cut-off Current	I_{CBO}	$V_{CB}=30V, I_E=0$			15	nA
DC Current Gain	h_{FE}	$V_{CE}=5V, I_C=2mA$	110		800	
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=10mA, I_B=0.5mA$ $I_C=100mA, I_B=5mA$		90 200	250 600	mA mA
Collector Base Saturation Voltage	$V_{BE(on)}$	$I_C=10mA, I_B=0.5mA$ $I_C=100mA, I_B=5mA$		700 900		mA mA
Base Emitter On Voltage	$V_{BE(on)}$	$V_{CE}=5V, I_C=2mA$ $V_{CE}=5V, I_C=10mA$	580	660	700 720	mA mA
Current Gain Bandwidth Product	f_T	$V_{CE}=5V, I_C=10mA$		300		MHz
Collector Base Capacitance	C_{CBO}	$V_{CB}=10V, f=1MHz$		3.5	6	pF
Emitter Base Capacitance	C_{EBO}	$V_{EB}=0.5V, f=1MHz$		9		pF
Noise Figure	NF	$V_{CE}=5V, I_C=200\mu A$ $f=1KHz, R_G=2K\Omega$		2	10	dB
: BC546/547/548				1.2	4	dB
: BC549/550		$V_{CE}=5V, I_C=200\mu A$ $R_G=2K\Omega, f=30\sim 15000MHz$		1.4	4	dB
: BC549				1.4	3	dB
: BC550						

h_{FE} CLASSIFICATION

Classification	A	B	C
h_{FE}	110-220	200-450	420-800



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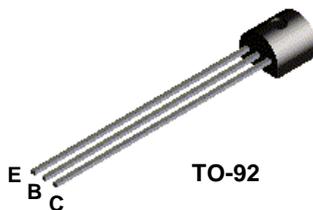
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**BC548
BC548A
BC548B
BC548C**



NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	30	V
V _{CES}	Collector-Base Voltage	30	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	500	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		BC548 / A / B / C	
P _D	Total Device Dissipation Derate above 25°C	625	mW
		5.0	mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	83.3	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	200	°C/W

NPN General Purpose Amplifier

(continued)

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	30		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	30		V
$V_{(BR)CES}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	30		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CB} = 30 \text{ V}, I_E = 0, T_A = +150 \text{ }^\circ\text{C}$		15 5.0	nA μA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$			
		548	110	800	
		548A	110	220	
		548B	200	450	
		548C	420	800	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 0.5 \text{ mA}$ $I_C = 100 \text{ mA}, I_B = 5.0 \text{ mA}$		0.25 0.60	V V
$V_{BE(on)}$	Base-Emitter On Voltage	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$ $V_{CE} = 5.0 \text{ V}, I_C = 10 \text{ mA}$	0.58	0.70 0.77	V V

SMALL SIGNAL CHARACTERISTICS

h_{fe}	Small-Signal Current Gain	$I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $f = 1.0 \text{ kHz}$	125	900	
NF	Noise Figure	$V_{CE} = 5.0 \text{ V}, I_C = 200 \text{ } \mu\text{A},$ $R_S = 2.0 \text{ k}\Omega, f = 1.0 \text{ kHz},$ $B_W = 200 \text{ Hz}$		10	dB

BC548 / BC548A / BC548B / BC548C

BC556/557/558/559/560

PNP EPITAXIAL SILICON TRANSISTOR

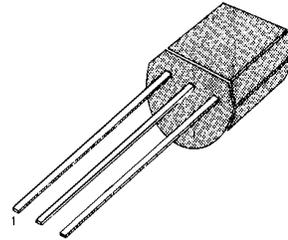
SWITCHING AND AMPLIFIER

- HIGH VOLTAGE: BC556, $V_{CE0} = -65V$
- LOW NOISE: BC559, BC560
- Complement to BC546 ... BC 550

ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ C$)

Characteristic	Symbol	Rating	Unit
Collector-Base Capacitance : BC556 : BC557/560 : BC558/559	V_{CBO}	-80 -50 -30	V V V
Collector-Emitter Voltage : BC556 : BC557/560 : BC558/559	V_{CEO}	-65 -45 -30	V V V
Emitter-Base Voltage	V_{EBO}	-5	V
Collector Current (DC)	I_C	-100	mA
Collector Dissipation	P_C	500	mW
Junction Temperature	T_J	150	$^\circ C$
Storage Temperature	T_{STG}	-65 ~ 150	$^\circ C$

TO-92



1. Collector 2. Base 3. Emitter

ELECTRICAL CHARACTERISTICS ($T_A=25^\circ C$)

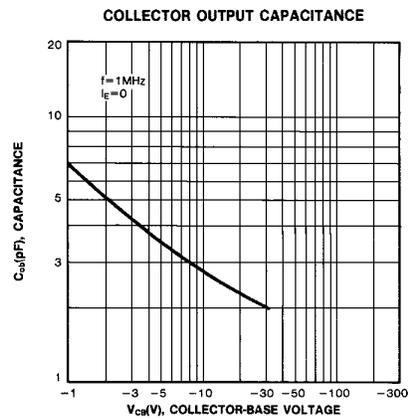
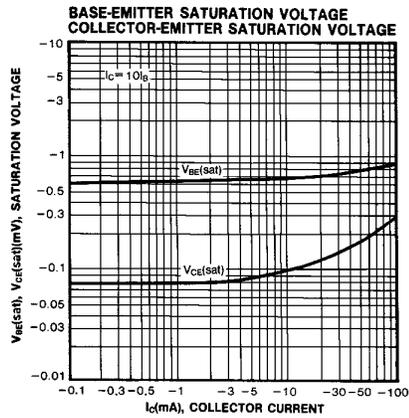
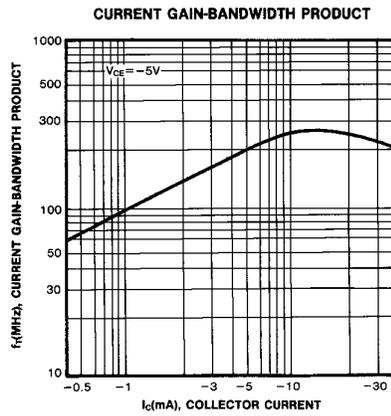
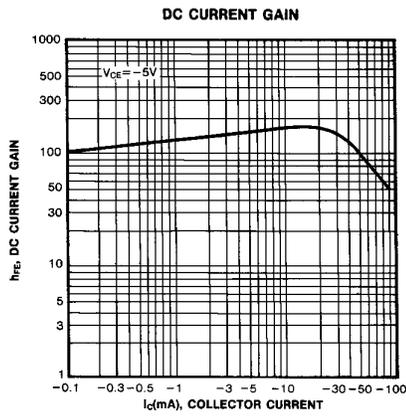
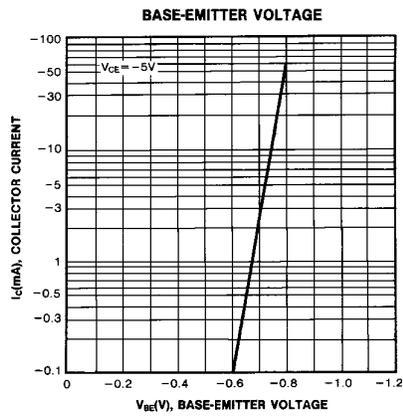
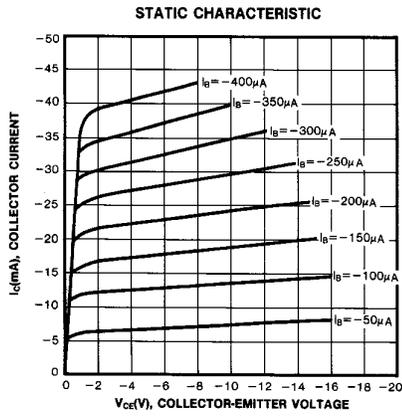
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Cut-off Current	I_{CBO}	$V_{CB} = -30V, I_E = 0$			-15	nA
DC Current Gain	h_{FE}	$V_{CE} = -5V, I_C = 2mA$	110		800	
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -10mA, I_B = -0.5mA$ $I_C = -100mA, I_B = -5mA$		-90 -250	-300 -650	mV mV
Collector Base Saturation Voltage	$V_{BE(on)}$	$I_C = -10mA, I_B = -0.5mA$ $I_C = -100mA, I_B = -5mA$		-700 -900		mV mV
Base Emitter On Voltage	$V_{BE(on)}$	$V_{CE} = -5V, I_C = -2mA$ $V_{CE} = -5V, I_C = -10mA$	-600	-660	-750 -800	mV mV
Current Gain Bandwidth Product	f_T	$V_{CE} = -5V, I_C = -10mA$		150		MHz
Collector Base Capacitance	C_{CBO}	$V_{CB} = -10V, f = 1MHz$			6	pF
Noise Figure	NF	$V_{CE} = -5V, I_C = -200\mu A$ $f = 1KHz, R_G = 2K\Omega$		2 1	10 4	dB dB
	NF	$V_{CE} = -5V, I_C = -200\mu A$ $R_G = 2K\Omega$ $f = 30 \sim 15000MHz$		1.2 1.2	4 2	dB dB

h_{FE} CLASSIFICATION

Classification	A	B	C
h_{FE}	110-220	200-450	420-800

BC556/557/558/559/560

PNP EPITAXIAL SILICON TRANSISTOR



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E ² CMOS™	PowerTrench™
FACT™	QS™
FACT Quiet Series™	Quiet Series™
FAST®	SuperSOT™-3
FASTr™	SuperSOT™-6
GTO™	SuperSOT™-8
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BC635/637/639

NPN EPITAXIAL SILICON TRANSISTOR

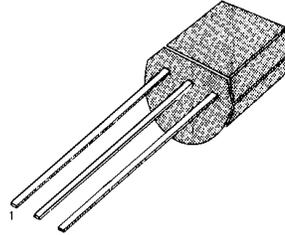
SWITCHING AND AMPLIFIER APPLICATIONS

- Complement to BC635/638/640

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector Emitter Voltage at R _{BE} =1Kohm	: BC635 : BC637 : BC639	V _{CER} 45 60 100	V V V
Collector Emitter Voltage	: BC635 : BC637 : BC639	V _{CES} 45 60 100	V V V
Collector Emitter Voltage	: BC635 : BC637 : BC639	V _{CEO} 45 60 80	V V V
Emitter Base Voltage	V _{EBO}	5	V
Collector Current	I _C	1	A
Peak Collector Current	I _{CP}	1.5	A
Base Current	I _B	100	mA
Collector Dissipation	P _C	1	W
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65 ~ 150	°C

TO-92

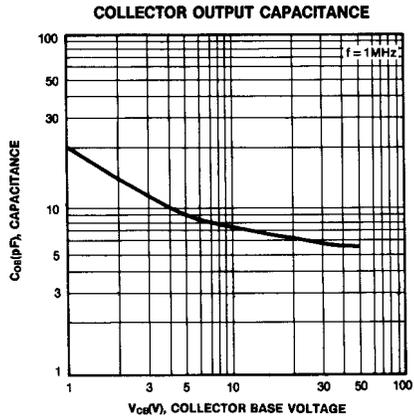
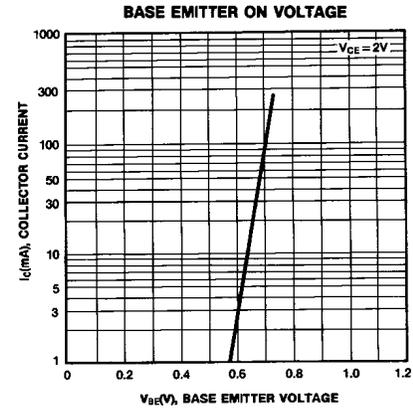
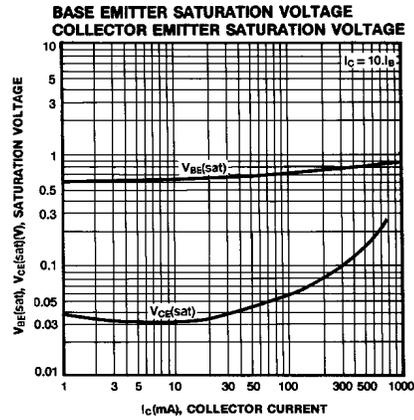
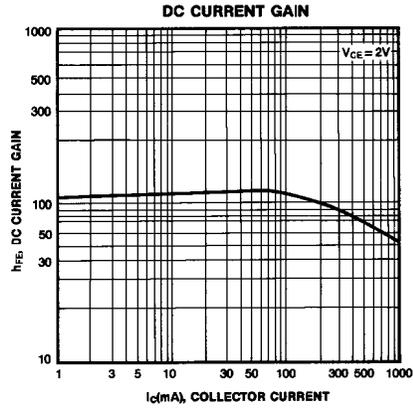
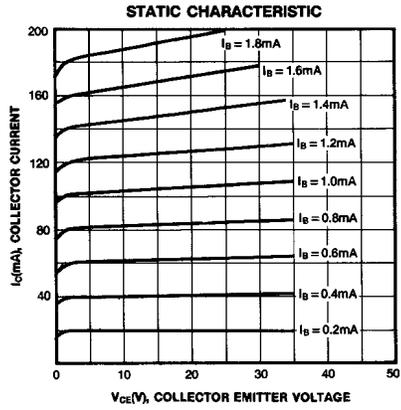


1. Emitter 2. Collector 3. Base

- PW=5ms, Duty Cycle=10%

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =10mA, I _B =0	45			V
: BC635			60			V
: BC736			80			V
: BC639						V
Collector Cut-off Current	I _{CBO}	V _{CB} =30V, I _E =0			0.1	μA
Emitter Cut-off Current	I _{EBO}	V _{EB} =5V, I _C =0			0.1	μA
DC Current Gain	h _{FE}	V _{CE} =2V, I _C =5mA	25			
: BC635		V _{CE} =2V, I _C =150mA	40		250	
: BC637/BC639			40		160	
Collector Emitter Saturation Voltage	V _{CE(sat)}	V _{CE} =2V, I _C =500mA	25			V
Base Emitter On Voltage	V _{BE(on)}	I _C =500mA, I _B =50mA			0.5	V
Current Gain Bandwidth Product	f _T	V _{CE} =2V, I _C =500mA		100	1	MHz
		V _{CE} =5V, I _C =10mA, f=50MHz				MHz



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BC636/638/640

PNP EPITAXIAL SILICON TRANSISTOR

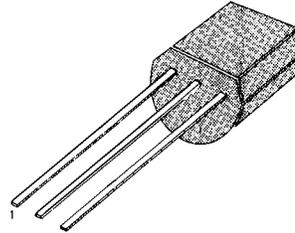
SWITCHING AND AMPLIFIER APPLICATIONS

• Complement to BC635/637/639

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector Emitter Voltage at R _{BE} =1Kohm	V _{CER}	-45 -60 -100	V V V
Collector Emitter Voltage	V _{CES}	-45 -60 -100	V V V
Collector Emitter Voltage	V _{CEO}	-45 -60 -80	V V V
Emitter Base Voltage	V _{EBO}	-5	V
Collector Current	I _C	-1	A
Peak Collector Current	I _{CP}	-1.5	A
Base Current	I _B	-100	mA
Collector Dissipation	P _C	1	W
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65 ~ 150	°C

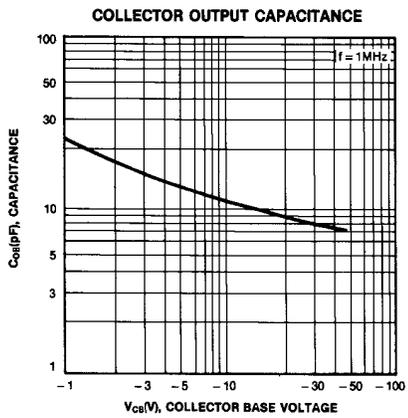
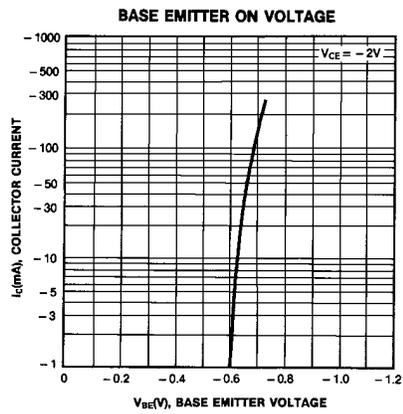
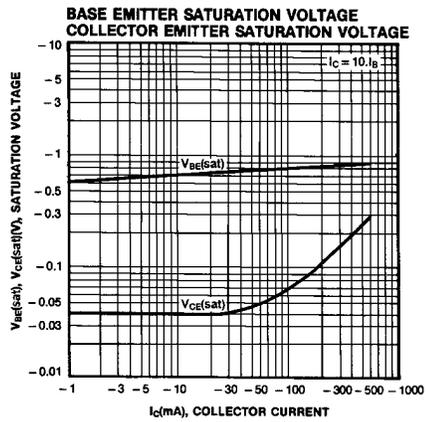
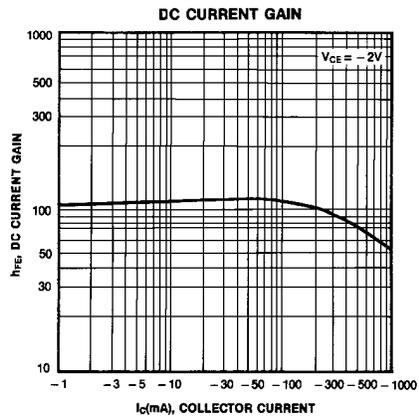
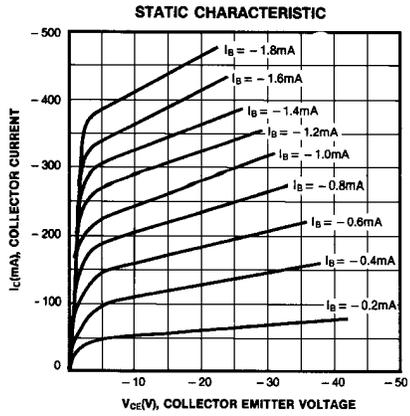
TO-92



1. Emitter 2. Collector 3. Base

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -10mA, I _B =0	-45 -60 -80			V V V
Collector Cut-off Current	I _{CBO}	V _{CB} = -30V, I _E =0			-0.1	μA
Emitter Cut-off Current	I _{EBO}	V _{EB} = -5V, I _C =0			-0.1	μA
DC Current Gain	h _{FE}	V _{CE} = -2V, I _C = -5mA V _{CE} = -2V, I _C = -150mA	25 40 40		250 160	
Collector Emitter Saturation Voltage	V _{CE} (sat)	V _{CE} = -2V, I _C = -500mA I _C = -500mA, I _B = -50mA			-0.5	V
Base Emitter On Voltage	V _{BE} (on)	V _{CE} = -2V, I _C = -500mA			-1	V
Current Gain Bandwidth Product	f _T	V _{CE} = -5V, I _C = -10mA, f=50MHz		100		MHz



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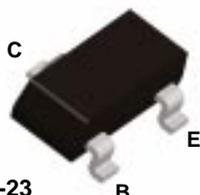
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**BC807-16
BC807-25
BC807-40**



SOT-23
Mark: 5A. / 5B. / 5C.

PNP General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at currents to 1.0 A. Sourced from Process 78.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CES}	Collector-Base Voltage	50	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	1.2	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BC807-16 / -25 / -40	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

*Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

PNP General Purpose Amplifier

(continued)

BC807-16 / BC807-25 / BC807-40

Electrical Characteristics

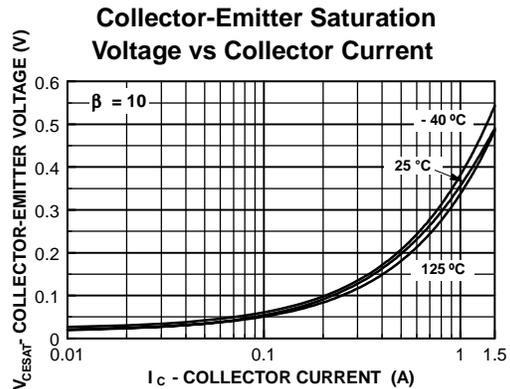
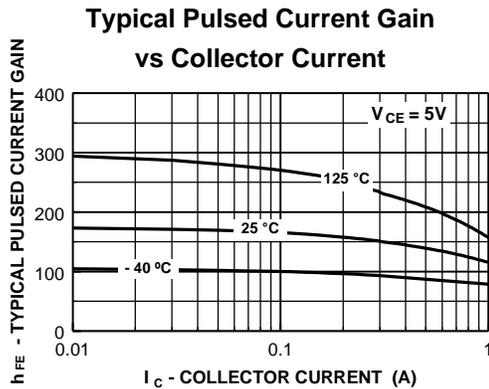
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	45		V
$V_{(BR)CES}$	Collector-Base Breakdown Voltage	$I_C = 100 \text{ }\mu\text{A}, I_E = 0$	50		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ }\mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}, T_A = 150^\circ\text{C}$		100 5.0	nA μA

ON CHARACTERISTICS

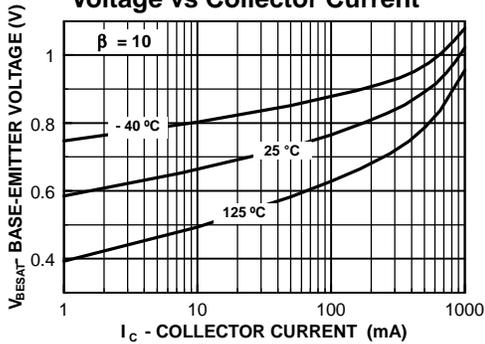
h_{FE}	DC Current Gain	$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$	- 16 - 25 - 40	100 160 250	250 400 600	
		$I_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}$		40		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$			0.7	V
$V_{BE(on)}$	Base-Emitter On Voltage	$I_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}$			1.2	V

Typical Characteristics

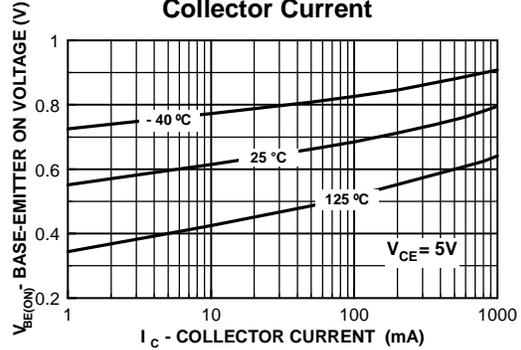


Typical Characteristics (continued)

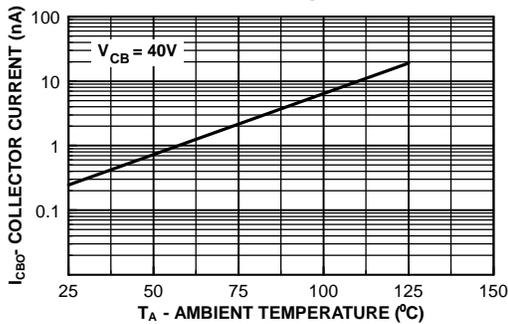
Base-Emitter Saturation Voltage vs Collector Current



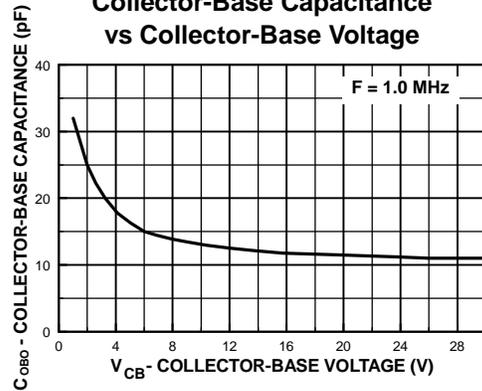
Base-Emitter ON Voltage vs Collector Current



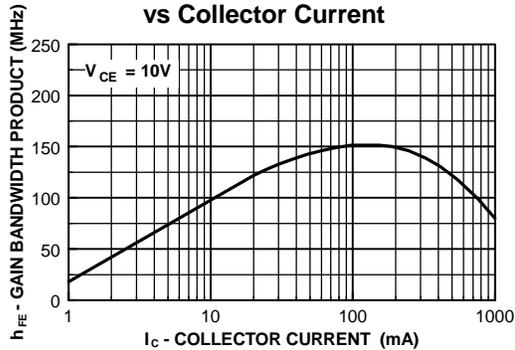
Collector-Cutoff Current vs Ambient Temperature



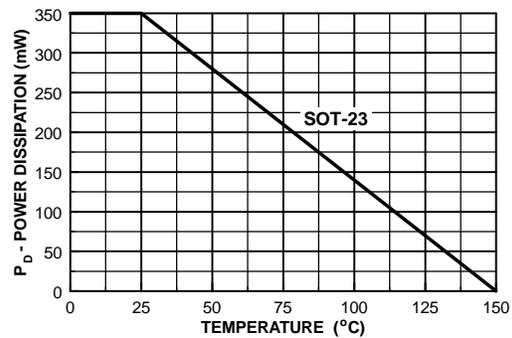
Collector-Base Capacitance vs Collector-Base Voltage



Gain Bandwidth Product vs Collector Current



Power Dissipation vs Ambient Temperature



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E ² CMOS™	PowerTrench™
FACT™	QS™
FACT Quiet Series™	Quiet Series™
FAST®	SuperSOT™-3
FASTr™	SuperSOT™-6
GTO™	SuperSOT™-8
HiSeC™	TinyLogic™

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BC807/BC808

PNP EPITAXIAL SILICON TRANSISTOR

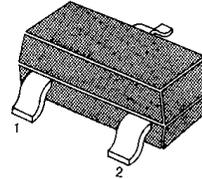
SWITCHING AND AMPLIFIER APPLICATIONS

- Suitable for AF-Driver stages and low power output stages
- Complement to BC817/BC818

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector Emitter Voltage : BC807	V _{CES}	-50	V
: BC808		-30	V
Collector Emitter Voltage : BC807	V _{CEO}	-45	V
: BC808		-25	V
Emitter-Base Voltage	V _{EBO}	-5	V
Collector Current (DC)	I _C	-800	mA
Collector Dissipation	P _C	-310	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65 ~ 150	°C

SOT-23



1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

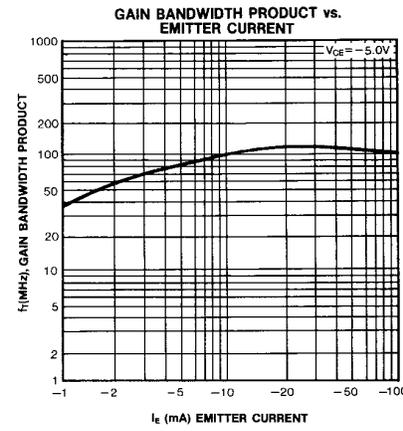
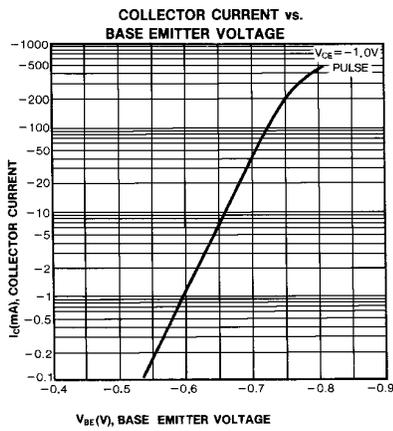
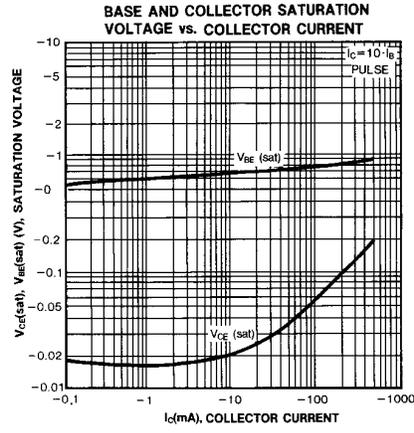
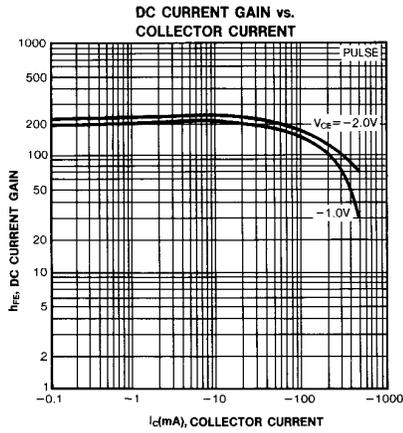
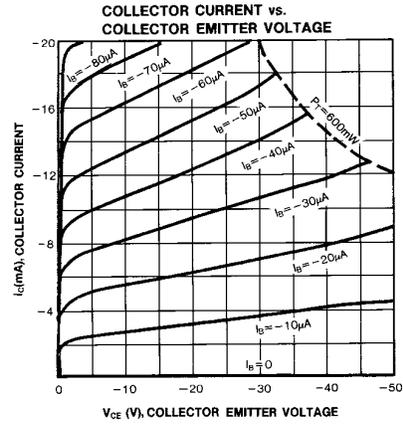
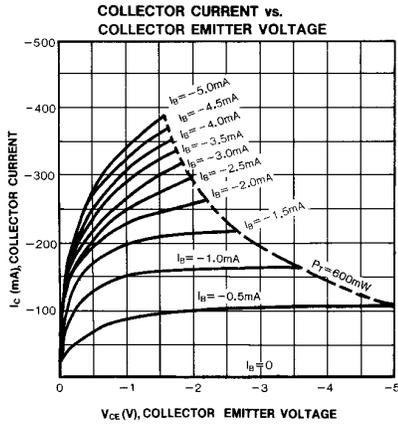
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage : BC807	BV _{CEO}	I _C = -10mA, I _B =0	-45			V
: BC808			-25			V
Collector-Emitter Breakdown Voltage : BC807	BV _{CES}	I _C = -0.1mA, I _B =0	-50			V
: BC808			-30			V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -0.1mA, I _C =0	-5			V
Collector Cut-off Current	I _{CES}	V _{CE} = -25V, I _B =0			-100	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = -4V, I _C =0			-100	nA
DC Current Gain	h _{FE1}	V _{CE} = -1V, I _C = -100mA	100		630	
	h _{FE2}	V _{CE} = -1V, I _C = -300mA	60			
Collector-Emitter Saturation Voltage	V _{CE (sat)}	I _C = -500mA, I _B = -50mA			-0.7	V
Base-Emitter On Voltage	V _{BE (on)}	V _{CE} = -1V, I _C = -300mA			-1.2	V
Current Gain Bandwidth Product	f _T	V _{CE} = -5V, I _C = -10mA f=50MHz		100		MHz
Collector-Base Capacitance	C _{CB0}	V _{CB} = -10V, f=1MHz			12	pF

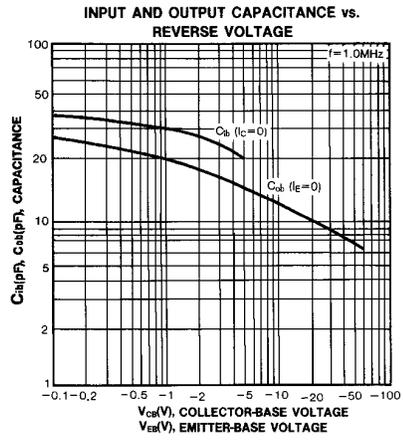
h_{FE} CLASSIFICATION

Classification	16	25	40
h _{FE1}	100-250	160-400	250-630
h _{FE2}	60-	100-	170-

MARKING CODE

TYPE	807-16	807-25	807-40	808-16	808-25	808-40
MARKING	9FA	9FB	9FC	9GA	9GB	9GC





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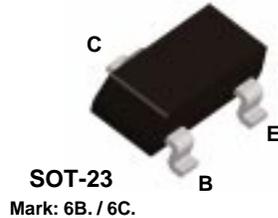
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**BC817-25
BC817-40**



NPN General Purpose Amplifier

This device is designed for general purpose medium power amplifiers and switches requiring collector currents to 1.2 A. Sourced from Process 38.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CES}	Collector-Base Voltage	50	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	1.5	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BC817-25 / BC817-40	
P _D	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

* Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

NPN General Purpose Amplifier

(continued)

BC817-25 / BC817-40

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

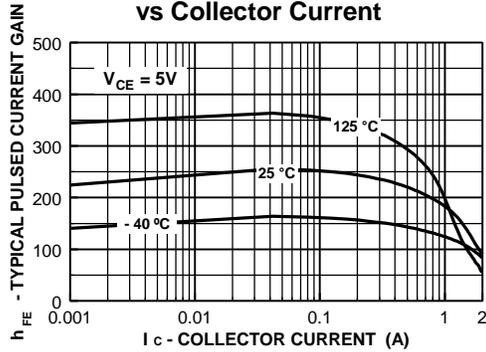
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	45		V
$V_{(BR)CES}$	Collector-Base Breakdown Voltage	$I_C = 100 \mu\text{A}, I_E = 0$	50		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}, T_A = 150^\circ\text{C}$		100 5.0	nA μA

ON CHARACTERISTICS

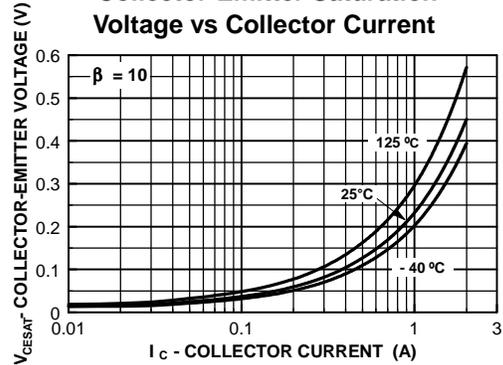
h_{FE}	DC Current Gain	$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$ - 25 - 40	160 250 40	400 600	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}$		0.7	V
$V_{BE(on)}$	Base-Emitter On Voltage	$I_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}$		1.2	V

Typical Characteristics

Typical Pulsed Current Gain vs Collector Current



Collector-Emitter Saturation Voltage vs Collector Current



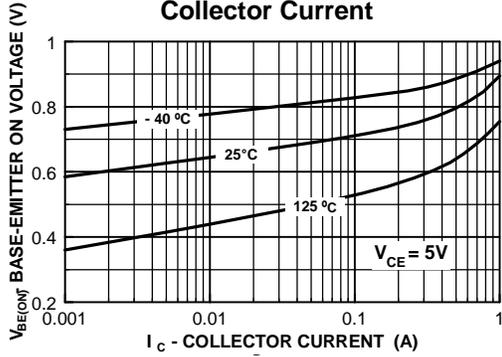
NPN General Purpose Amplifier

(continued)

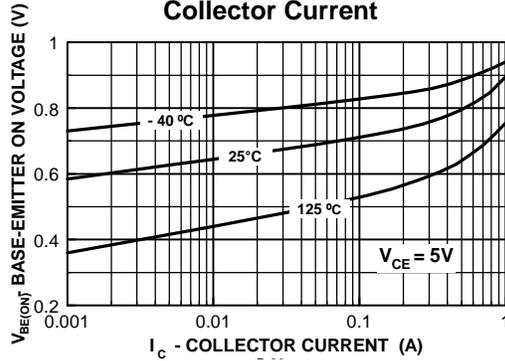
BC817-25 / BC817-40

Typical Characteristics (continued)

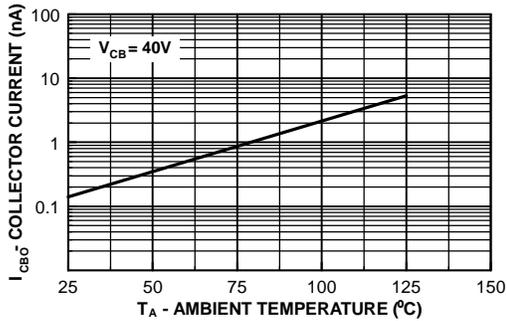
Base-Emitter ON Voltage vs Collector Current



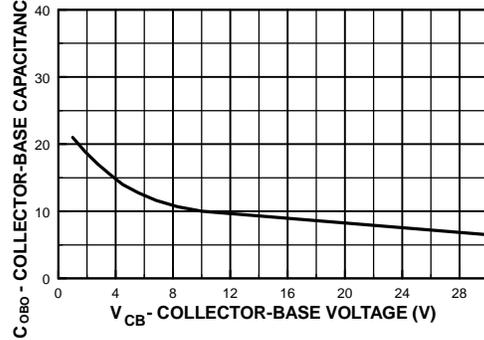
Base-Emitter ON Voltage vs Collector Current



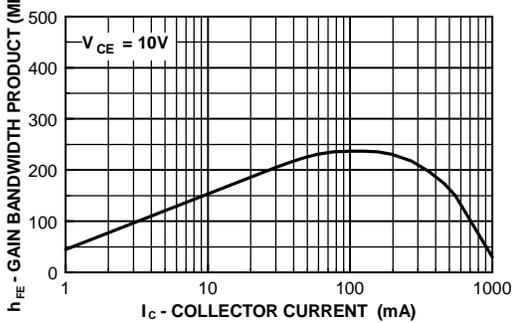
Collector-Cutoff Current vs Ambient Temperature



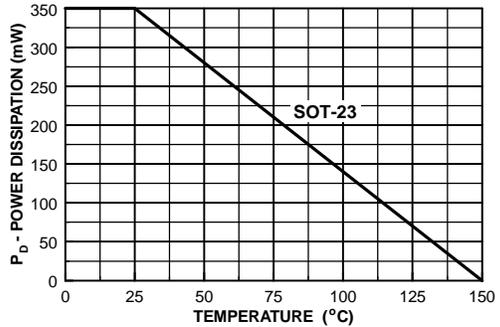
Collector-Base Capacitance vs Collector-Base Voltage



Gain Bandwidth Product vs Collector Current



Power Dissipation vs Ambient Temperature



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BC817/BC818

NPN EPITAXIAL SILICON TRANSISTOR

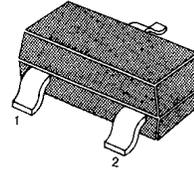
SWITCHING AND AMPLIFIER APPLICATIONS

- Suitable for AF-Driver stages and low power output stages
- Complement to BC807/BC808

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector Emitter Voltage : BC817	V _{CES}	50	V
: BC818		30	V
Collector Emitter Voltage : BC817	V _{CEO}	45	V
: BC818		25	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current (DC)	I _C	800	mA
Collector Dissipation	P _C	310	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65 ~ 150	°C

SOT-23



1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage : BC817	BV _{CEO}	I _C =10mA, I _B =0	45			V
: BC818			25			V
Collector-Emitter Breakdown Voltage : BC817	BV _{CES}	I _C =0.1mA, I _B =0	50			V
: BC818			30			V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =0.1mA, I _C =0	5			V
Collector Cut-off Current	I _{CES}	V _{CE} =25V, I _B =0			100	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} =4V, I _C =0			100	nA
DC Current Gain	h _{FE1}	V _{CE} =1V, I _C =100mA	100		630	
	h _{FE2}	V _{CE} =1V, I _C =300mA	60			
Collector-Emitter Saturation Voltage	V _{CE (sat)}	I _C =500mA, I _B =50mA			0.7	V
Base-Emitter On Voltage	V _{BE (on)}	V _{CE} =1V, I _C =300mA			1.2	V
Current Gain Bandwidth Product	f _T	V _{CE} =5V, I _C =10mA f=50MHz		100		MHz
Collector-Base Capacitance	C _{CB0}	V _{CB} =10V, f=1MHz			12	pF

h_{FE} CLASSIFICATION

Classification	16	25	40
h _{FE1}	100-250	160-400	250-630
h _{FE2}	60-	100-	170-

MARKING CODE

TYPE	817-16	817-25	817-40	818-16	818-25	818-40
MARKING	8FA	8FB	8FC	8GA	8GB	8GC

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BC846/847/848/849/850

NPN EPITAXIAL SILICON TRANSISTOR

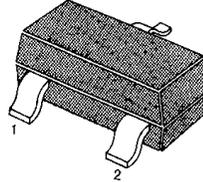
SWITCHING AND AMPLIFIER APPLICATIONS

- Suitable for automatic insertion in thick and thin-film circuits
- LOW NOISE: BC849, BC850
- Complement to BC856 ... BC860

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector Base Voltage	V _{CBO}	80	V
: BC846		50	V
: BC847/850		30	V
Collector Emitter Voltage	V _{CEO}	65	V
: BC846		45	V
: BC848/849		30	V
Emitter-Base Voltage	V _{EBO}	6	V
: BC846/847		5	V
: BC848/849/850			
Collector Current (DC)	I _C	100	mA
Collector Dissipation	P _C	310	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65 ~ 150	°C

SOT-23



1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Cut-off Current	I _{CBO}	V _{CB} =30V, I _E =0			15	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =2mA	110		800	
Collector Emitter Saturation Voltage	V _{CE} (sat)	I _C =10mA, I _B =0.5mA		90	250	mV
Collector Base Saturation Voltage	V _{BE} (sat)	I _C =100mA, I _B =5mA		200	600	mV
		I _C =10mA, I _B =0.5mA		700		mV
Base Emitter On Voltage	V _{BE} (on)	I _C =100mA, I _B =5mA		900		mV
		V _{CE} =5V, I _C =2mA	580	660	700	mV
Current Gain Bandwidth Product	f _T	V _{CE} =5V, I _C =10mA			720	mV
		f=100MHz		300		MHz
Collector Base Capacitance	C _{CBO}	V _{CB} =10V, f=1MHz		3.5	6	pF
Emitter Base Capacitance	C _{EBO}	V _{EB} =0.5V, f=1MHz		9		pF
Noise Figure	NF	V _{CE} =5V, I _C =200μA		2	10	dB
		f=1KHz, R _G =2KΩ		1.2	4	dB
		V _{CE} =5V, I _C =200μA		1.4	4	dB
		R _G =2KΩ		1.4	3	dB
		f=30~15000Hz				

h_{FE} CLASSIFICATION

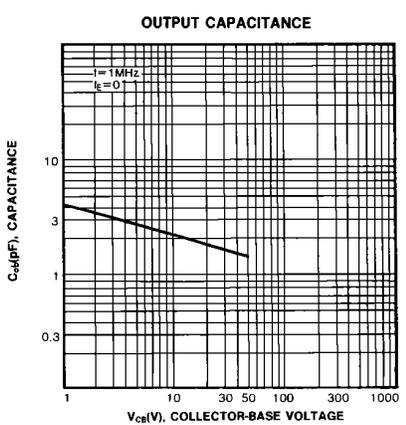
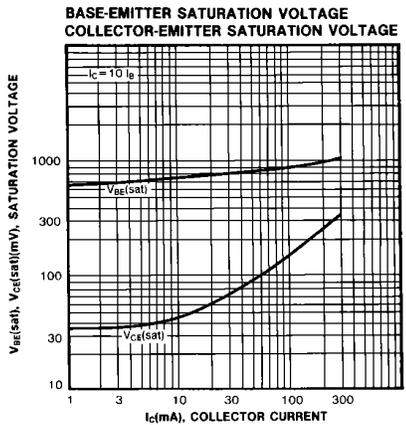
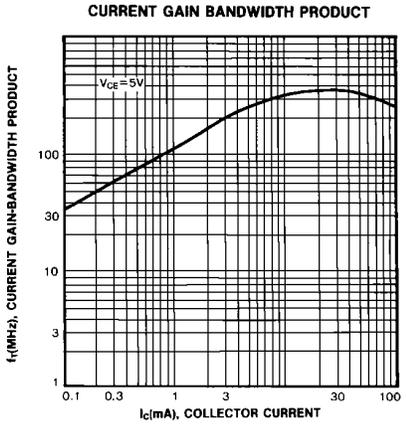
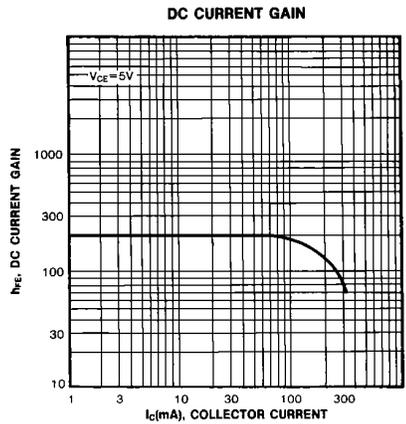
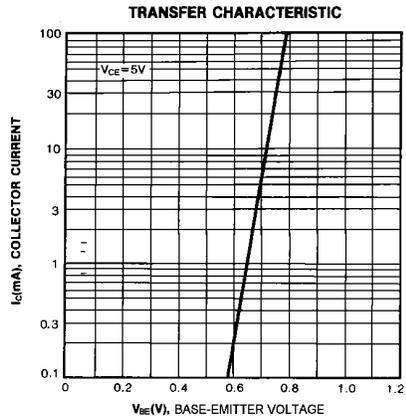
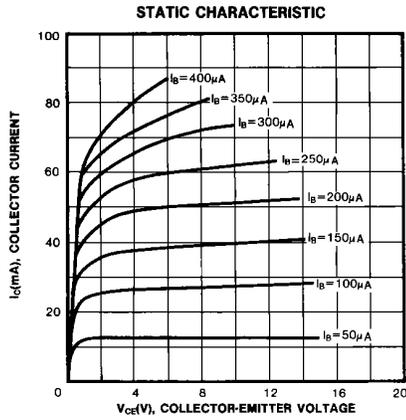
Classification	A	B	C
h _{FE}	110-220	200-450	420-800

MARKING CODE

TYPE	846A	846B	846C	847A	847B	847C	848A	848B	848C	849A	849B	849C	850A	850B	850C
MARK	8AA	8AB	8AC	8BA	8BB	8BC	8CA	8CB	8CC	8DA	8DB	8DC	8EA	8EB	8EC

BC846/847/848/849/850

NPN EPITAXIAL SILICON TRANSISTOR



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FACT™	QS™
FACT Quiet Series™	Quiet Series™
FAST®	SuperSOT™-3
FASTr™	SuperSOT™-6
GTO™	SuperSOT™-8
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BC856/857/858/859/860

PNP EPITAXIAL SILICON TRANSISTOR

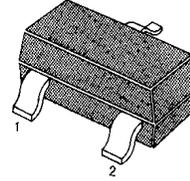
SWITCHING AND AMPLIFIER APPLICATIONS

- Suitable for automatic insertion in thick and thin-film circuits
- LOW NOISE: BC859, BC860
- Complement to BC846 ... BC850

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	-80	V
: BC856		-50	V
: BC857/860		-30	V
Collector-Emitter Voltage	V _{CEO}	-65	V
: BC856		-45	V
: BC857/860		-30	V
Emitter-Base Voltage	V _{EBO}	-5	V
Collector Current (DC)	I _C	-100	mA
Collector Dissipation	P _C	310	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65 ~ 150	°C

SOT-23



1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

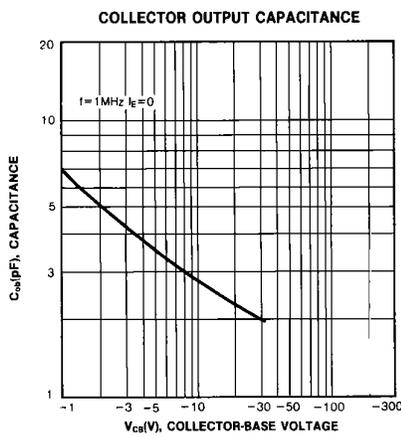
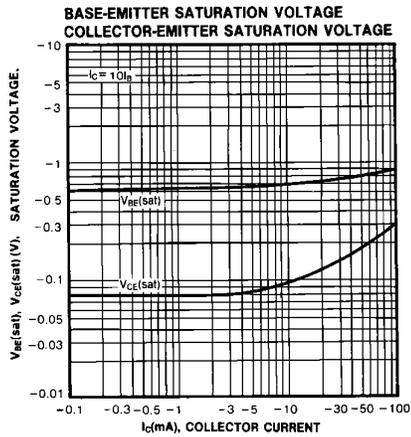
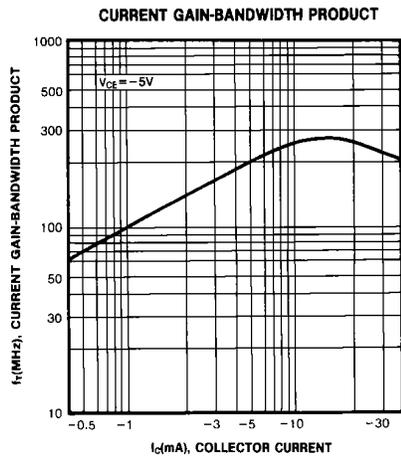
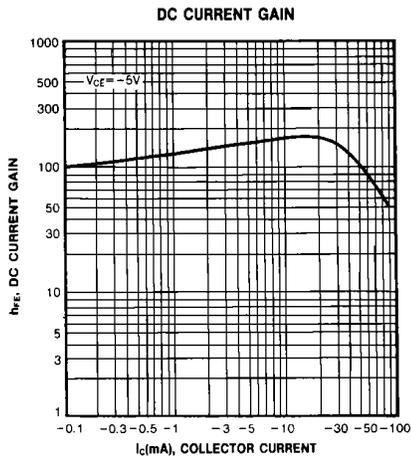
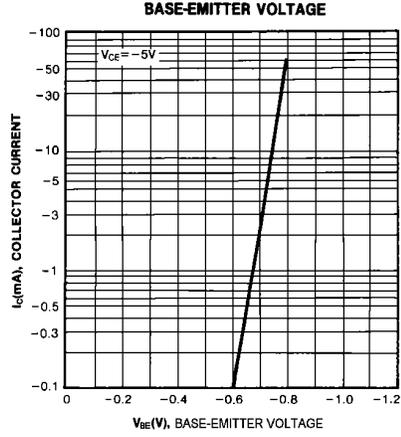
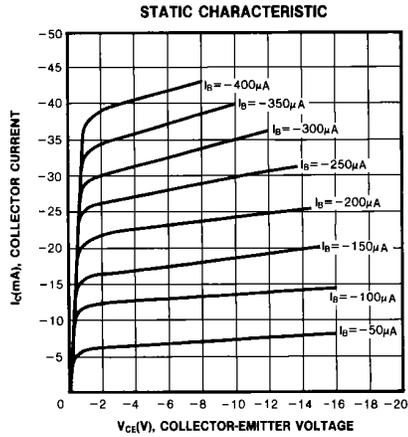
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Cut-off Current	I _{CBO}	V _{CB} = -30V, I _E =0			-15	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -2mA	110		800	
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -10mA, I _B = -0.5mA		-90	-300	mV
Collector-Base Saturation Voltage	V _{BE} (sat)	I _C = -100mA, I _B = -5mA		-250	-650	mV
		I _C = -10mA, I _B = -0.5mA		-700		mV
Base-Emitter On Voltage	V _{BE} (on)	I _C = -100mA, I _B = -5mA		-900		mV
		V _{CE} = -5V, I _C = -2mA	-600	-660	-750	mV
Current Gain Bandwidth Product	f _T	V _{CE} = -5V, I _C = -10mA			-800	mV
		V _{CE} = -5V, I _C = -10mA		150		MHz
Collector-Base Capacitance	C _{CBO}	V _{CB} = -10V, f=1MHz			6	pF
Noise Figure	NF	V _{CE} = -5V, I _C = -200μA		2	10	dB
		f=1KHz, R _G =2KΩ		1	4	dB
	NF	V _{CE} = -5V, I _C = -200μA		1.2	4	dB
		R _G =2KΩ		1.2	2	dB
		f=30~15000Hz				

h_{FE} CLASSIFICATION

Classification	A	B	C
h _{FE}	110-220	200-450	420-800

MARKING CODE

TYPE	856A	856B	856C	857A	857B	857C	858A	858B	858C	859A	859B	859C	860A	860B	860C
MARK	9AA	9AB	9AC	9BA	9BB	9BC	9CA	9CB	9CC	9DA	9DB	9DC	9EA	9EB	9EC



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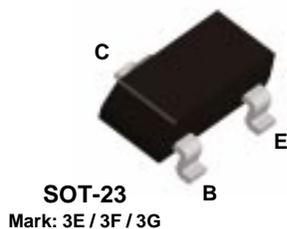
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BC857A
BC857B
BC857C



PNP General Purpose Amplifier

This device is designed for general purpose amplifier applications at collector currents to 300 mA. Sourced from Process 68.

Absolute Maximum Ratings* TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CBO}	Collector-Base Voltage	50	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	500	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BC857A / B / C	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

* Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

PNP General Purpose Amplifier

(continued)

BC857A / BC857B / BC857C

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	45		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	50		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 1.0 \text{ } \mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}$ $V_{CB} = 30 \text{ V}, T_A = 150^\circ\text{C}$		15 4.0	nA μA

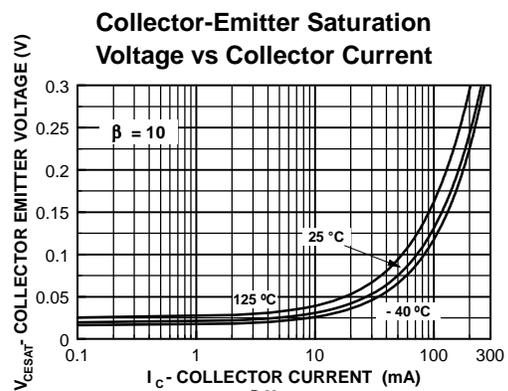
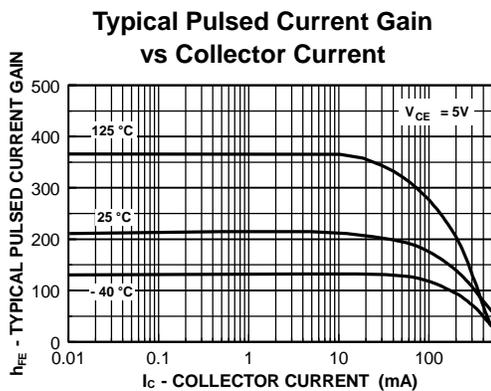
ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$ BC857A BC857B BC857C	125 220 420	250 475 800	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 0.5 \text{ mA}$ $I_C = 100 \text{ mA}, I_B = 5.0 \text{ mA}$		0.3 0.65	V V
$V_{BE(on)}$	Base-Emitter On Voltage	$I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}$	0.6	0.75 0.82	V V

SMALL SIGNAL CHARACTERISTICS

f_T	Current Gain - Bandwidth Product	$I_C = 10 \text{ mA}, V_{CE} = 5.0,$ $f = 100 \text{ MHz}$	100		MHz
C_{obo}	Output Capacitance	$V_{CB} = 10 \text{ V}, f = 1.0 \text{ MHz}$		4.5	pF
NF	Noise Figure	$I_C = 0.2 \text{ mA}, V_{CE} = 5.0,$ $R_S = 2.0 \text{ k}\Omega, f = 1.0 \text{ kHz},$ $BW = 200 \text{ Hz}$		10	dB

Typical Characteristics



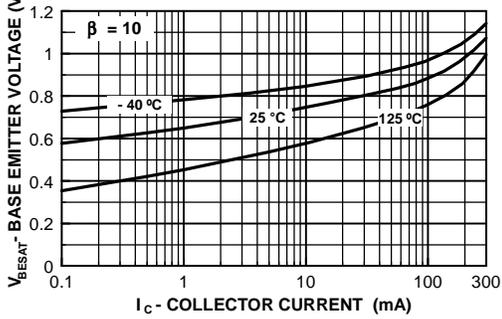
PNP General Purpose Amplifier

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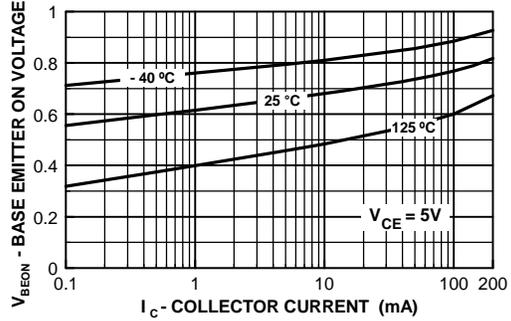
BC857A / BC857B / BC857C

Typical Characteristics (continued)

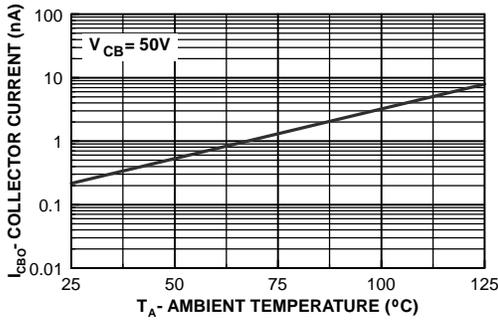
Base-Emitter Saturation Voltage vs Collector Current



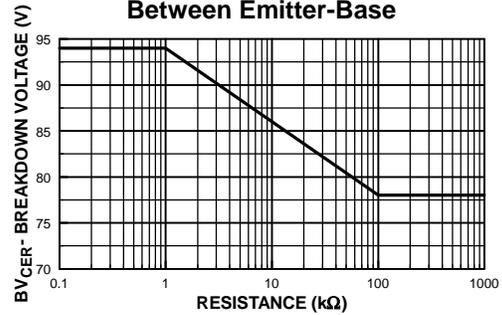
Base Emitter ON Voltage vs Collector Current



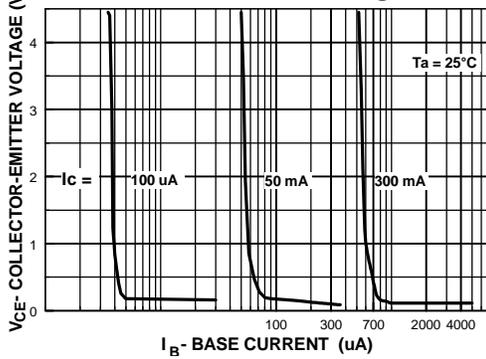
Collector-Cutoff Current vs. Ambient Temperature



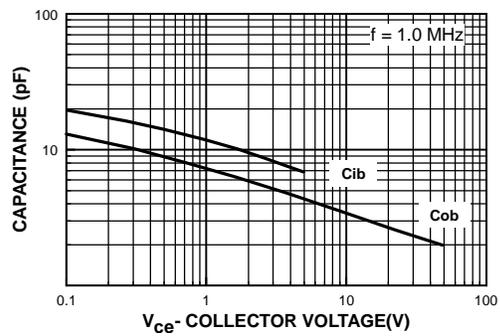
Collector-Emitter Breakdown Voltage with Resistance Between Emitter-Base



Collector Saturation Region



Input and Output Capacitance vs Reverse Voltage

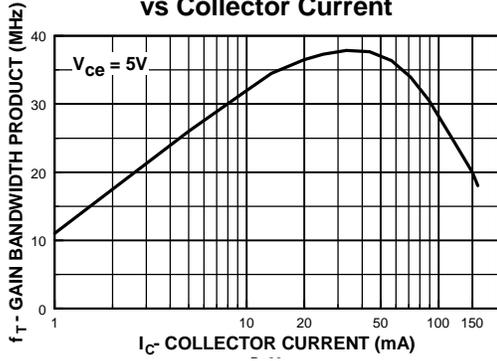


PNP General Purpose Amplifier
(continued)

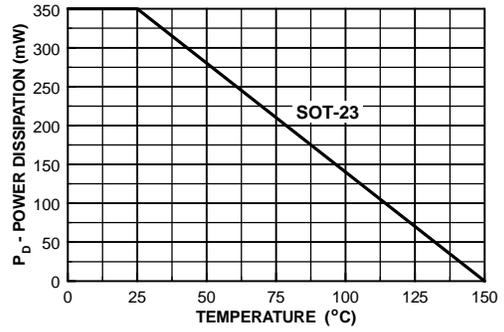
BC857A / BC857B / BC857C

Typical Characteristics (continued)

Gain Bandwidth Product
vs Collector Current



Power Dissipation vs
Ambient Temperature



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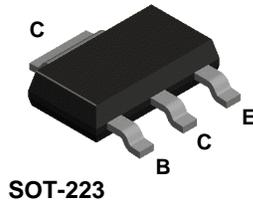
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BCP52



PNP General Purpose Amplifier

This device is designed for general purpose medium power amplifiers and switching circuits requiring collector currents to 1.0 A. Sourced from Process 78.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	60	V
V _{CBO}	Collector-Base Voltage	60	V
V _{EB0}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	1.2	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		BCP52	
P _D	Total Device Dissipation Derate above 25°C	1.5	W
		12	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	83.3	°C/W

PNP General Purpose Amplifier

(continued)

BCP52

Electrical Characteristics

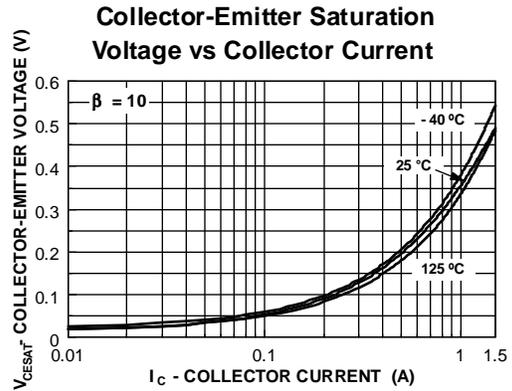
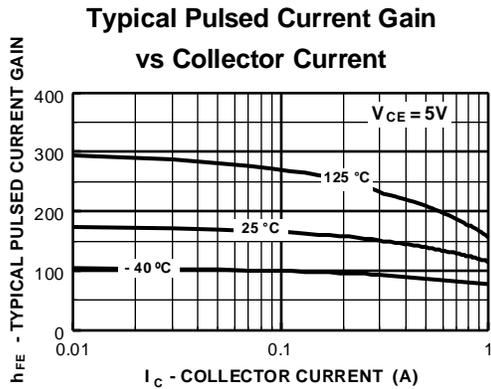
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100 \text{ } \mu\text{A}, I_E = 0$	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CB} = 30 \text{ V}, I_E = 0, T_A = 125^\circ\text{C}$		100 10	nA μA
I_{EBO}	Emitter-Cutoff Current	$V_{EB} = 5.0 \text{ V}, I_C = 0$		10	μA

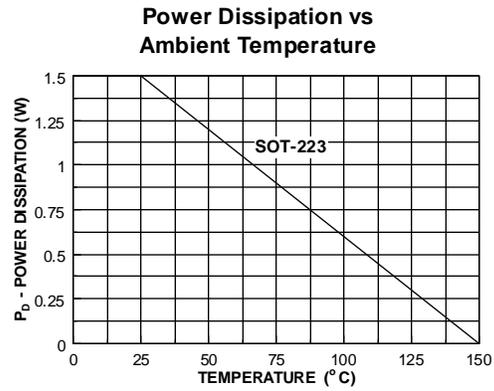
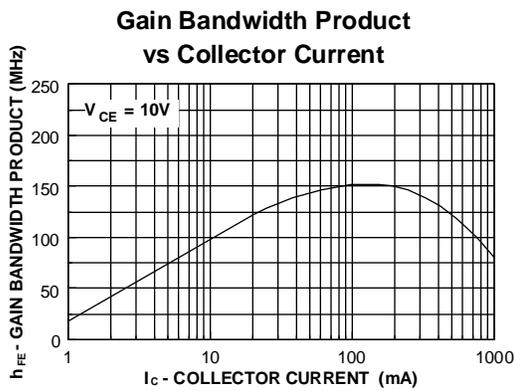
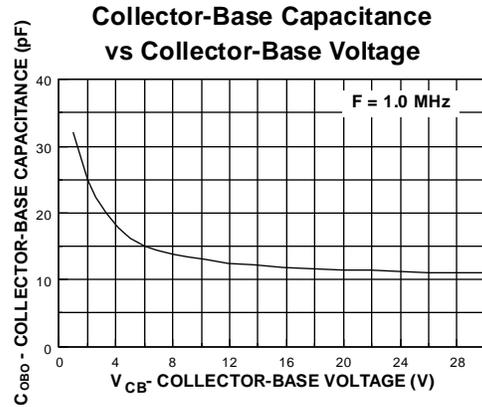
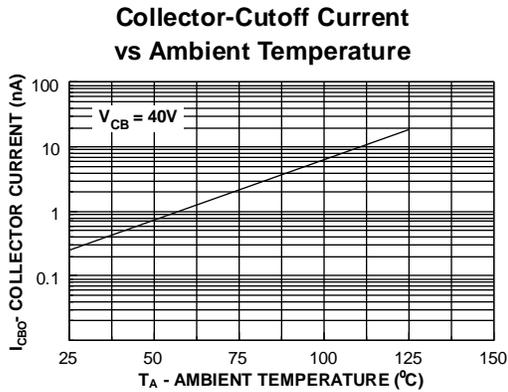
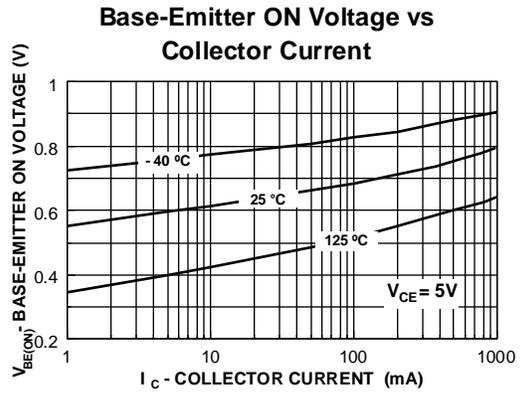
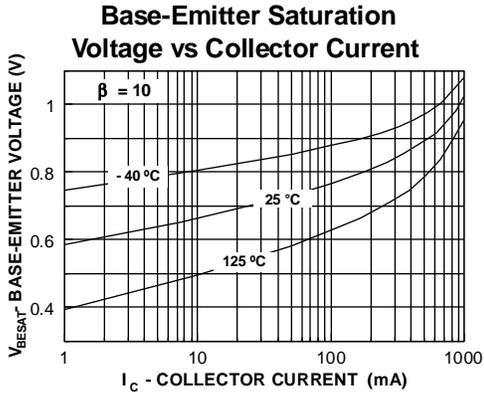
ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 5.0 \text{ mA}, V_{CE} = 2.0 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 2.0 \text{ V}$ $I_C = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}$	25 40 25	250	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		0.5	V
$V_{BE(on)}$	Base-Emitter On Voltage	$I_C = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}$		1.0	V

Typical Characteristics



Typical Characteristics (continued)



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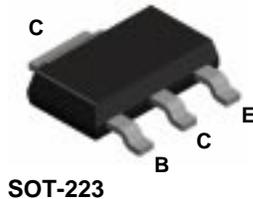
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BCP54



NPN General Purpose Amplifier

This device is designed for general purpose medium power amplifiers and switching circuits requiring collector currents to 1.2 A. Sourced from Process 38.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CBO}	Collector-Base Voltage	45	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	1.5	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		BCP54	
P _D	Total Device Dissipation Derate above 25°C	1.5	W
		12	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	83.3	°C/W

NPN General Purpose Amplifier

(continued)

BCP54

Electrical Characteristics

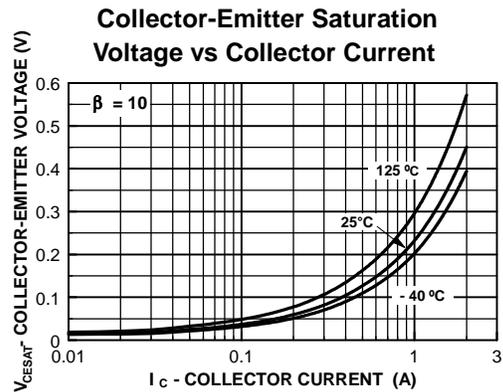
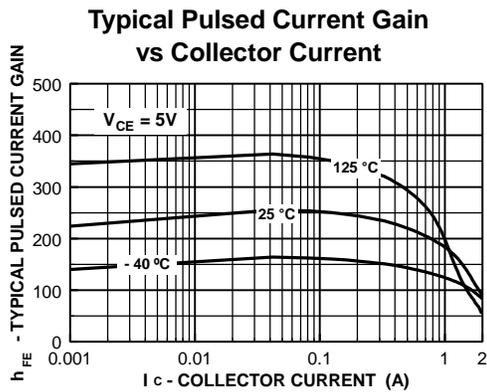
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	45		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100 \text{ } \mu\text{A}, I_E = 0$	45		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CB} = 30 \text{ V}, I_E = 0, T_A = 125^\circ\text{C}$		100 10	nA μA
I_{EBO}	Emitter-Cutoff Current	$V_{EB} = 5.0 \text{ V}, I_C = 0$		10	μA

ON CHARACTERISTICS

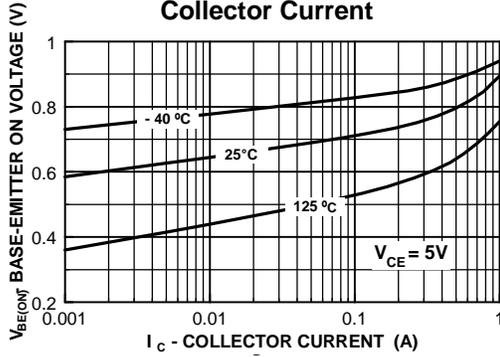
h_{FE}	DC Current Gain	$I_C = 5.0 \text{ mA}, V_{CE} = 2.0 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 2.0 \text{ V}$ $I_C = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}$	25 40 25	250	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		0.5	V
$V_{BE(on)}$	Base-Emitter On Voltage	$I_C = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}$		1.0	V

Typical Characteristics

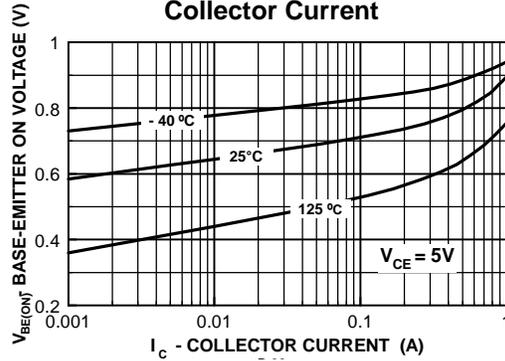


Typical Characteristics (continued)

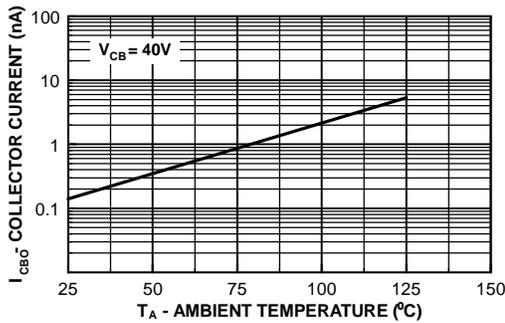
Base-Emitter ON Voltage vs Collector Current



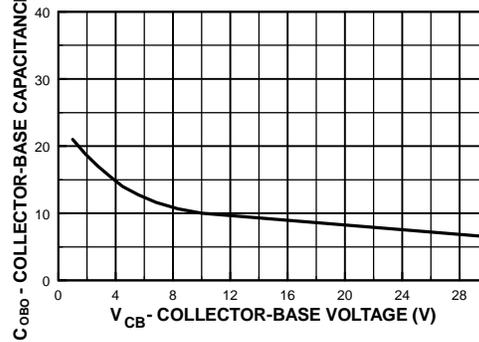
Base-Emitter ON Voltage vs Collector Current



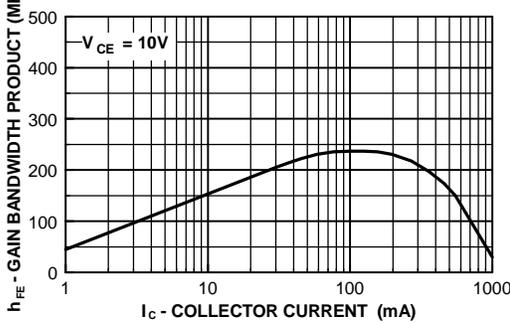
Collector-Cutoff Current vs Ambient Temperature



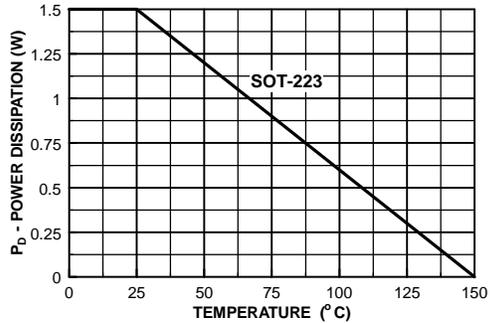
Collector-Base Capacitance vs Collector-Base Voltage



Gain Bandwidth Product vs Collector Current



Power Dissipation vs Ambient Temperature



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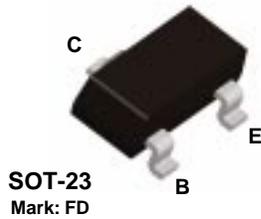
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BCV26



PNP Darlington Transistor

This device is designed for applications requiring extremely high current gain at currents to 800 mA. Sourced from Process 61.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	30	V
V _{CBO}	Collector-Base Voltage	40	V
V _{EBO}	Emitter-Base Voltage	10	V
I _C	Collector Current - Continuous	1.2	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BCV26	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

*Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

PNP Darlington Transistor

(continued)

BCV26

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	30			V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ }\mu\text{A}, I_E = 0$	40			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 100 \text{ nA}, I_C = 0$	10			V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$			0.1	μA
I_{EBO}	Emitter-Cutoff Current	$V_{EB} = 10 \text{ V}, I_C = 0$			0.1	μA

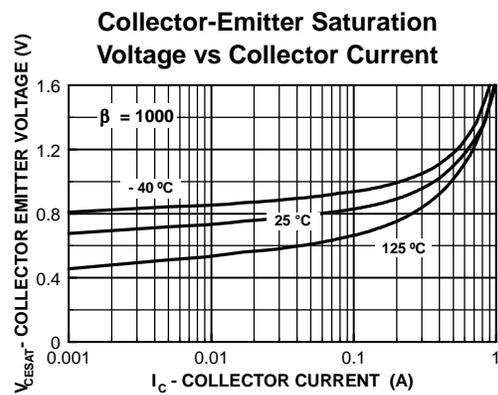
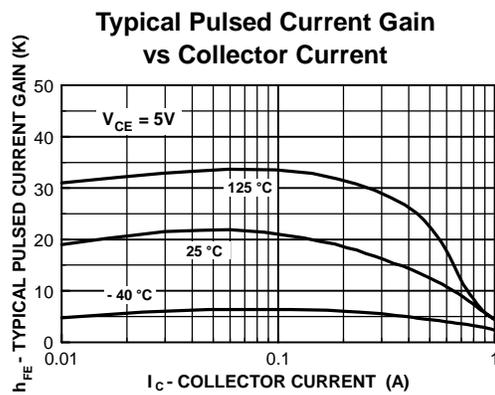
ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 1.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 5.0 \text{ V}$	4,000 10,000 20,000			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 0.1 \text{ mA}$			1.0	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 0.1 \text{ mA}$			1.5	V

SMALL SIGNAL CHARACTERISTICS

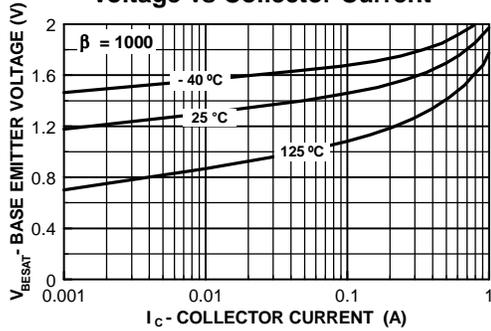
f_T	Current Gain - Bandwidth Product	$I_C = 30 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $f = 100 \text{ MHz}$		220		MHz
C_C	Collector Capacitance	$V_{CB} = 30 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		3.5		pF

Typical Characteristics

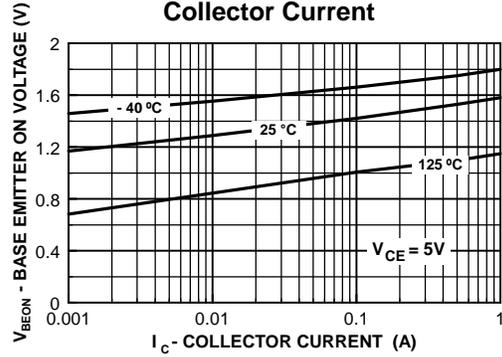


Typical Characteristics (continued)

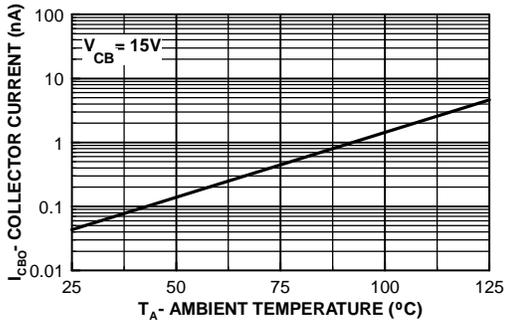
Base-Emitter Saturation Voltage vs Collector Current



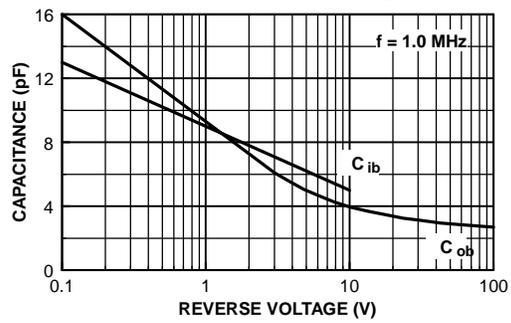
Base Emitter ON Voltage vs Collector Current



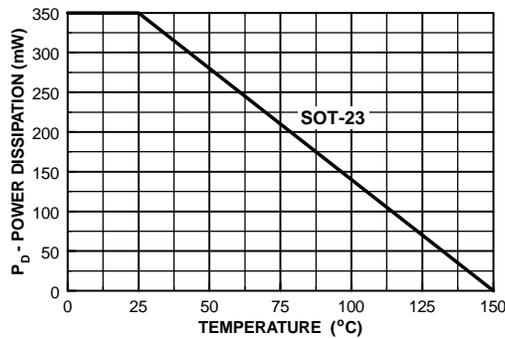
Collector-Cutoff Current vs. Ambient Temperature



Input and Output Capacitance vs Reverse Bias Voltage



Power Dissipation vs Ambient Temperature



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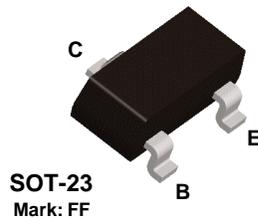
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BCV27



NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at collector currents to 1.0 A. Sourced from Process 05.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	30	V
V _{CB0}	Collector-Base Voltage	40	V
V _{EB0}	Emitter-Base Voltage	10	V
I _C	Collector Current - Continuous	1.2	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BCV27	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

*Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

NPN Darlington Transistor

(continued)

BCV27

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	30			V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	40			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 100 \text{ nA}, I_C = 0$	10			V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$			0.1	μA
I_{EBO}	Emitter-Cutoff Current	$V_{EB} = 10 \text{ V}, I_C = 0$			0.1	μA

ON CHARACTERISTICS

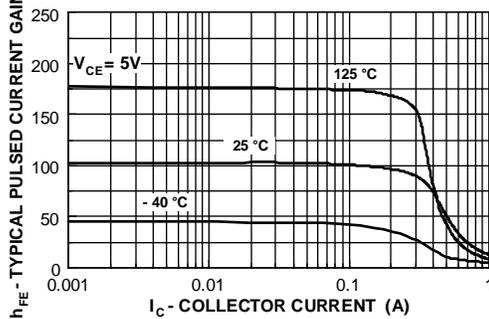
h_{FE}	DC Current Gain	$I_C = 1.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 5.0 \text{ V}$	4,000 10,000 20,000			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 0.1 \text{ mA}$			1.0	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 0.1 \text{ mA}$			1.5	V

SMALL SIGNAL CHARACTERISTICS

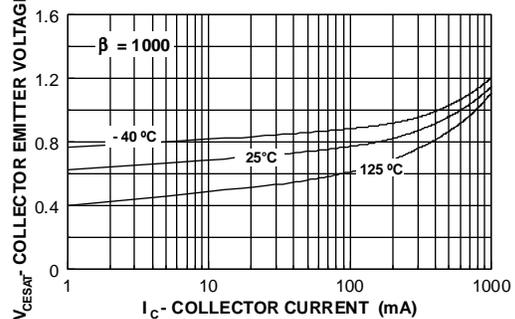
f_T	Current Gain - Bandwidth Product	$I_C = 30 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $f = 100 \text{ MHz}$		220		MHz
C_C	Collector Capacitance	$V_{CB} = 30 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		3.5		pF

Typical Characteristics

Typical Pulsed Current Gain vs Collector Current

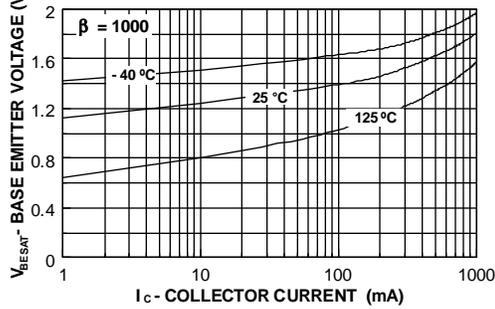


Collector-Emitter Saturation Voltage vs Collector Current

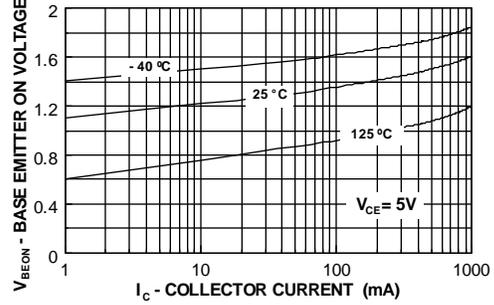


Typical Characteristics (continued)

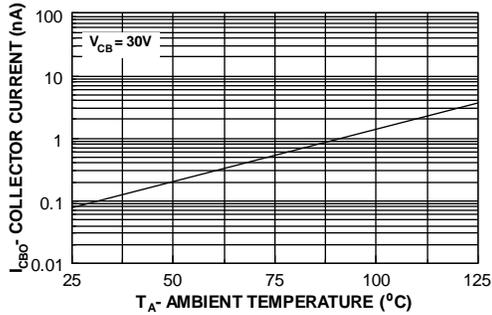
Base-Emitter Saturation Voltage vs Collector Current



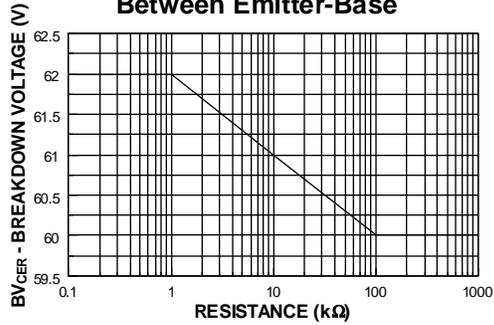
Base Emitter ON Voltage vs Collector Current



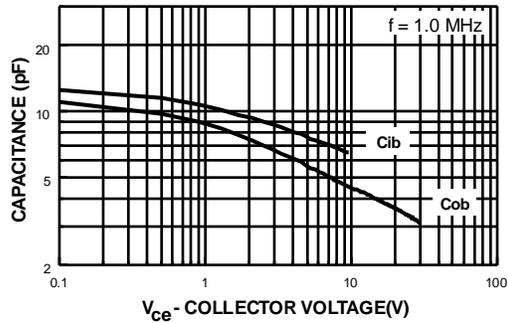
Collector-Cutoff Current vs Ambient Temperature



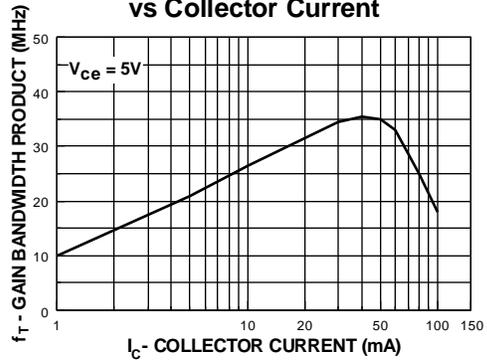
Collector-Emitter Breakdown Voltage with Resistance Between Emitter-Base



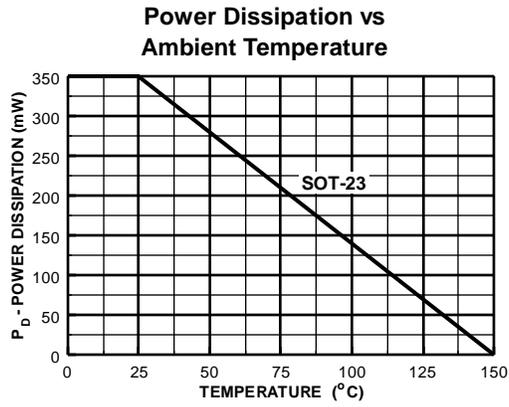
Input and Output Capacitance vs Reverse Voltage



Gain Bandwidth Product vs Collector Current



Typical Characteristics (continued)



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BCW29

PNP EPITAXIAL SILICON TRANSISTOR

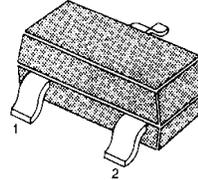
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CB0}	-30	V
Collector-Emitter Voltage	V _{CEO}	-20	V
Emitter-Base Voltage	V _{EBO}	-5.0	V
Collector Current	I _C	-100	mA
Junction Temperature	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KST5088 for graphs

SOT-23

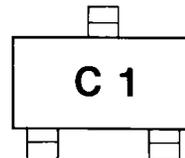


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV _{CB0}	I _C = -10μA, I _E =0	-30			V
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -2mA, I _B =0	-20			V
Collector-Emitter Breakdown Voltage	BV _{CES}	I _C = -100μA, V _{EB} =0	-30			V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -10μA, I _C =0	-5			V
Collector Cut-off Current	I _{CB0}	V _{CB} = -20V, I _E =0			-100	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -2mA	120		260	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C = -10mA, I _B = -0.5mA			-0.3	V
Base-Emitter On Voltage	V _{BE(sat)}	V _{CE} = -5V, I _C = -2mA	-0.6		-0.75	V
Output Capacitance	C _{OB}	V _{CB} = -10V, I _E =0 f=1MHz			7	pF
Noise Figures	NF	V _{CE} = -5V, I _C =0.2mA R _C =2KΩ, f=1KHz			10	dB

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GTO™	SuperSOT™-8
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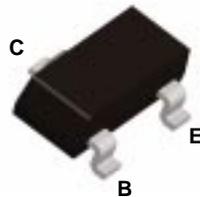
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BCW30



SOT-23
Mark: C2

PNP General Purpose Amplifier

This device is designed for general purpose medium power amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 68. See BC857A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	32	V
V _{CES}	Collector-Emitter Voltage	32	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	500	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BCW30	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

*Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

PNP General Purpose Amplifier

(continued)

BCW30

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \mu A, I_E = 0$	32		V
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 2.0 \text{ mA}, I_B = 0$	32		V
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \mu A, I_E = 0$	32		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \mu A, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 32 \text{ V}, I_E = 0$ $V_{CB} = 32 \text{ V}, I_E = 0, T_A = +100 \text{ }^\circ\text{C}$		100 10	nA μA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$	215	500	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 0.5 \text{ mA}$		0.30	V
$V_{BE(on)}$	Base-Emitter On Voltage	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$	0.60	0.75	V

SMALL SIGNAL CHARACTERISTICS

NF	Noise Figure	$V_{CE} = 5.0 \text{ V}, I_C = 200 \mu A,$ $R_S = 2.0 \text{ k}\Omega, f = 1.0 \text{ kHz},$ $B_W = 200 \text{ Hz}$		10	dB
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BCW31

NPN EPITAXIAL SILICON TRANSISTOR

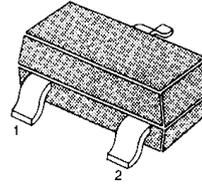
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25 °C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CB0}	30	V
Collector-Emitter Voltage	V _{CE0}	20	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KST5088 for graphs

SOT-23

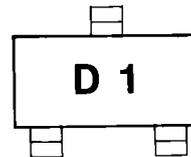


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25 °C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV _{CB0}	I _C =10μA, I _E =0	30			V
Collector-Emitter Breakdown Voltage	BV _{CE0}	I _C =2mA, I _B =0	20			V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =10μA, I _C =0	5			V
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =2mA	110		220	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C =10mA, I _B =0.5mA			0.25	V
Base-Emitter On Voltage	V _{BE(on)}	V _{CE} =5V, I _C =2mA	0.55		0.7	V
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0 f=1MHz			4	pF
Noise Figures	NF	V _{CE} =5V, I _C =0.2mA R _G =2kΩ, f=1KHz			10	dB

Marking



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BCW60A/B/C/D

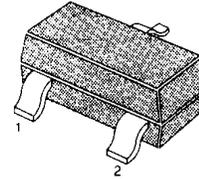
NPN EPITAXIAL SILICON TRANSISTOR

GENERAL PURPOSE TRANSISTOR

SOT-23

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	32	V
Collector-Emitter Voltage	V _{CEO}	32	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C



1. Base 2. Emitter 3. Collector

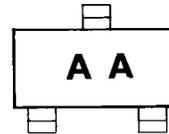
ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2mA, I _B =0	32		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =1μA, I _C =0	5		V
Collector Cut-off Current	I _{CES}	V _{CB} =32V, V _{BE} =0		20	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} =4V, I _C =0		20	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =10μA	20		
			40		
			100		
		V _{CE} =5V, I _C =2mA	120	220	
			180	310	
			250	460	
			380	630	
		V _{CE} =1V, I _C =50mA	60		
			70		
			90		
			100		
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C =50mA, I _B =1.25mA		0.55	V
		I _C =10mA, I _B =0.25mA		0.35	V
Base-Emitter Saturation Voltage	V _{BE(sat)}	I _C =50mA, I _B =1.25mA	0.7	1.05	V
		I _C =10mA, I _B =0.25mA	0.6	0.85	V
Base-Emitter On Voltage	V _{BE(sat)}	V _{CE} =5V, I _C =2mA	0.55	0.75	V
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0 f=1MHz		4.5	pF
Current Gain-Bandwidth Product	f _T	I _C =10mA, V _{CE} =5V	125		MHz
Noise Figure	NF	I _C =0.2mA, V _{CE} =5V R _G =2KΩ, f=1KHz		6	dB
Turn On Time	t _{ON}	I _C =10mA, I _B 1=1mA		150	ns
Turn Off Time	t _{OFF}	V _{BB} =3.6V, I _B 2=1mA R1=R2=5KΩ, R _L =990Ω		800	ns

MARKING CODE

TYPE	BCW60A	BCW60B	BCW60C	BCW60D
MARK.	AA	AB	AC	AD

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BCW61A/B/C/D

PNP EPITAXIAL SILICON TRANSISTOR

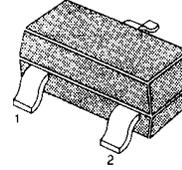
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	-32	V
Collector-Emitter Voltage	V _{CEO}	-32	V
Emitter-Base Voltage	V _{EBO}	-5.0	V
Collector Current	I _C	-100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	-55 ~ 150	°C

• Refer to KS5086 for graphs

SOT-23



1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -2mA, I _B =0	-32		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -1μA, I _C =0	-5		V
Collector Cut-off Current	I _{CES}	V _{CB} = -32V, V _{BE} =0		-20	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -10μA	20		
	: BCW61B		40		
	: BCW61C		100		
	: BCW61D	V _{CE} = -5V, I _C = -2mA	120	220	
	: BCW61A		140	310	
	: BCW61B		250	460	
	: BCW61C		380	630	
	: BCW61D	V _{CE} = -5V, I _C = -50mA	60		
	: BCW61A		80		
	: BCW61B		100		
	: BCW61C		100		
	: BCW61D		100		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -50mA, I _B = -1.25mA		-0.55	V
		I _C = -10mA, I _B = -0.25mA		-0.25	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C = -50mA, I _B = -1.25mA	0.68	1.05	V
		I _C = -10mA, I _B = -0.25mA	0.6	0.85	V
Base-Emitter On Voltage	V _{BE} (on)	V _{CE} = -5V, I _C = -2mA	0.6	0.75	V
Output Capacitance	C _{OB}	V _{CB} = -10V, I _E =0 f=1MHz		6	pF
Noise Figure	NF	I _C = -0.2mA, V _{CE} = -5V R _G =20KΩ, f=1KHz		6	dB
Turn On Time	t _{ON}	I _C = -10mA, I _{B1} = -1mA		150	ns
Turn Off Time	t _{OFF}	V _{BB} = -3.6V, I _{B2} = -1mA R1=R2=50KΩ, R _L =990Ω		800	ns

Marking



BCW61A/B/C/D

PNP EPITAXIAL SILICON TRANSISTOR

MARKING CODE

TYPE	BCW61A	BCW61B	BCW61C	BCW61D
MARK.	BA	BB	BC	BD

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GTO™	SuperSOT™-8
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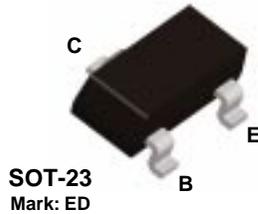
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BCW65C



NPN General Purpose Amplifier

This device is designed for general purpose amplifier applications at collector currents to 500 mA. Sourced from Process 19.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	32	V
V _{CBO}	Collector-Base Voltage	60	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	1.0	A
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BCW65C	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

*Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

NPN General Purpose Amplifier

(continued)

BCW65C

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	32		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	5.0		V
I_{CES}	Collector-Cutoff Current	$V_{CB} = 32 \text{ V}, I_E = 0$ $V_{CB} = 32 \text{ V}, I_E = 0, T_A = 150^\circ\text{C}$		20 20	nA μA
I_{EBO}	Emitter-Cutoff Current	$V_{EB} = 4.0 \text{ V}, I_C = 0$		20	nA

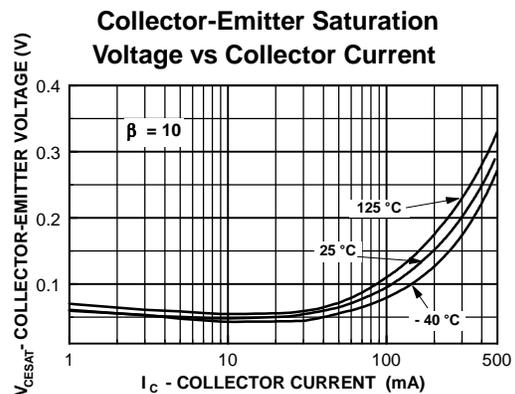
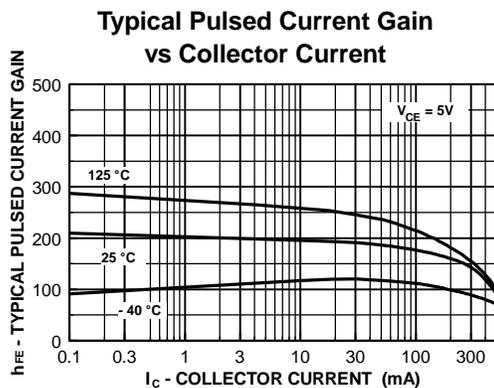
ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 100 \text{ } \mu\text{A}, V_{CE} = 10 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}$	80 180 250 50	630	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 10 \text{ mA}$ $I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		0.3 0.7	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		2.0	V

SMALL SIGNAL CHARACTERISTICS

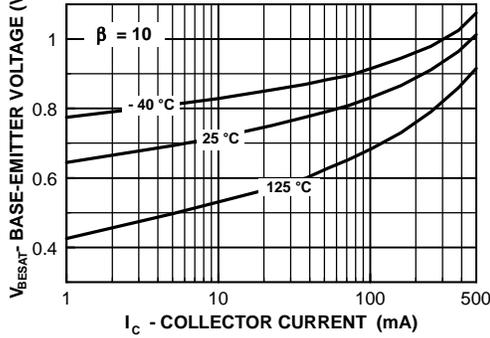
f_T	Current Gain - Bandwidth Product	$I_C = 20 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 100 \text{ MHz}$	100		MHz
C_{obo}	Output Capacitance	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		12	pF
C_{ibo}	Input Capacitance	$V_{EB} = 0.5 \text{ V}, I_C = 0, f = 1.0 \text{ MHz}$		80	pF
NF	Noise Figure	$I_C = 0.2 \text{ mA}, V_{CE} = 5.0,$ $R_S = 1.0 \text{ k}\Omega, f = 1.0 \text{ kHz},$ $BW = 200 \text{ Hz}$		10	dB

Typical Characteristics

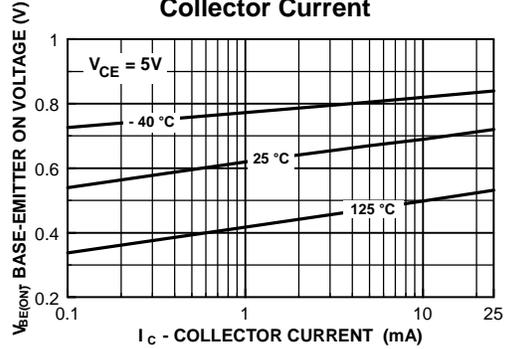


Typical Characteristics

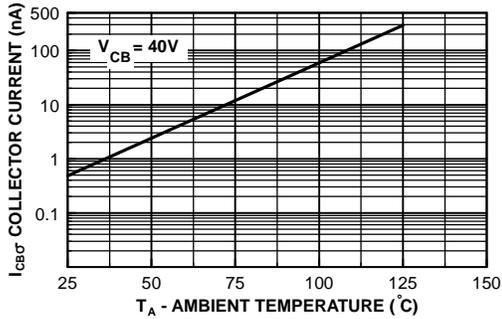
Base-Emitter Saturation Voltage vs Collector Current



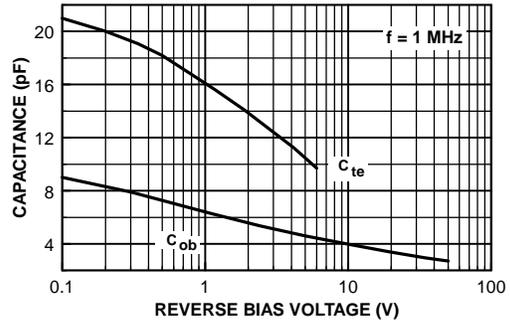
Base-Emitter ON Voltage vs Collector Current



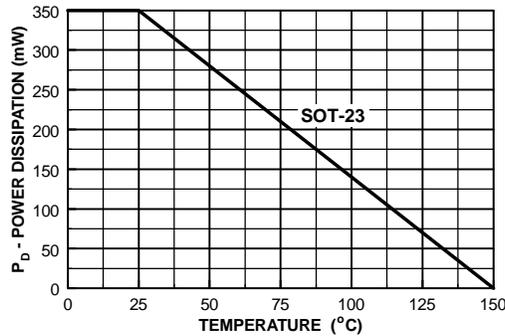
Collector-Cutoff Current vs Ambient Temperature



Emitter Transition and Output Capacitance vs Reverse Bias Voltage



Power Dissipation vs Ambient Temperature



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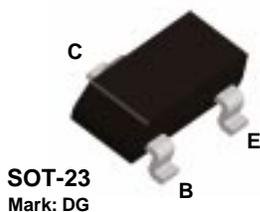
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BCW68G



PNP General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at currents to 500 mA. Sourced from Process 63.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CBO}	Collector-Base Voltage	60	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	800	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BCW68C	
P _D	Total Device Dissipation Derate above 25°C	350	mW
		2.8	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	357	°C/W

*Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

PNP General Purpose Amplifier

(continued)

BCW68G

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$		45	V
$V_{(BR)CES}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}$		60	V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100 \text{ } \mu\text{A}, I_E = 0$		60	V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$		5.0	V
I_{CES}	Collector-Cutoff Current	$V_{CE} = 45 \text{ V}$ $V_{CE} = 45 \text{ V}, T_A = 150 \text{ }^\circ\text{C}$		20 10	nA μA
I_{EBO}	Emitter-Cutoff Current	$V_{EB} = 4.0 \text{ V}$		20	nA

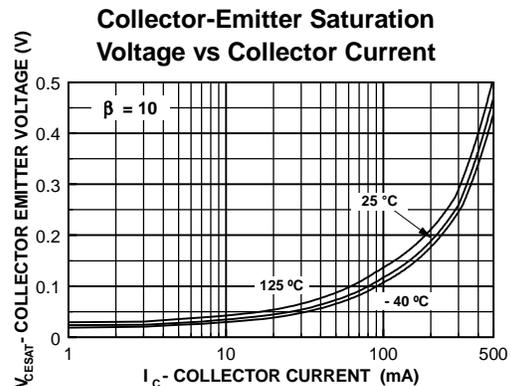
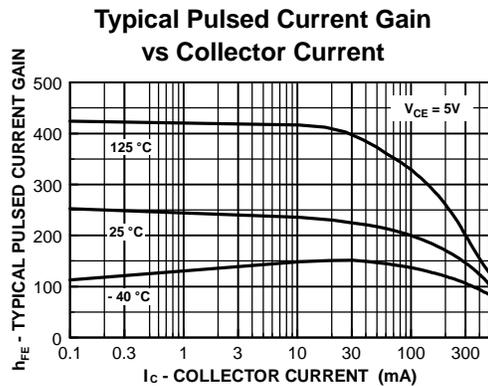
ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 300 \text{ mA}, V_{CE} = 1.0 \text{ V}$	120 160 60	400	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 300 \text{ mA}, I_B = 30 \text{ mA}$		1.5	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		2.0	V

SMALL SIGNAL CHARACTERISTICS

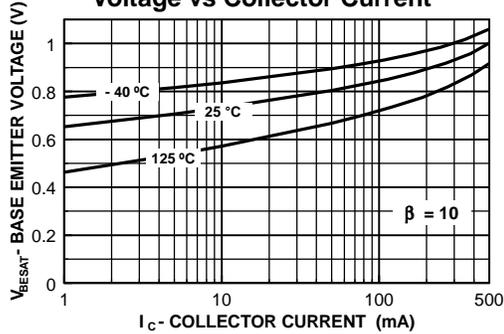
f_T	Current Gain - Bandwidth Product	$I_C = 20 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 100 \text{ MHz}$	100		MHz
C_{obo}	Output Capacitance	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		18	pF
C_{ibo}	Input Capacitance	$V_{EB} = 0.5 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		105	pF
NF	Noise Figure	$I_C = 0.2 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $R_S = 1.0 \text{ k}\Omega, f = 1.0 \text{ kHz},$ $B_W = 200 \text{ Hz}$		10	dB

Typical Characteristics

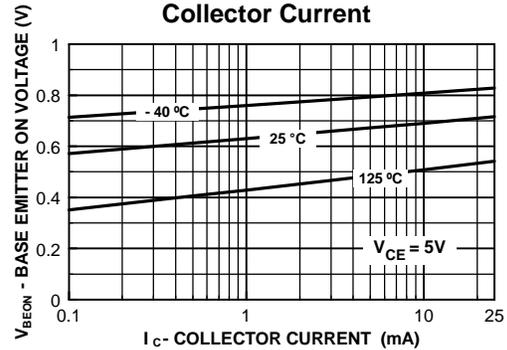


Typical Characteristics (continued)

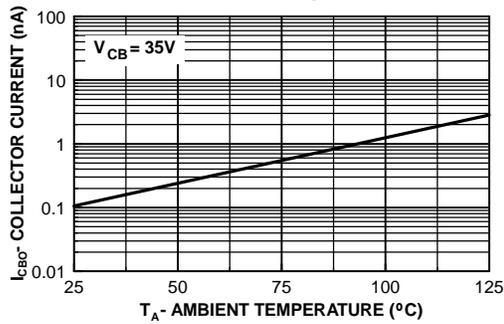
Base-Emitter Saturation Voltage vs Collector Current



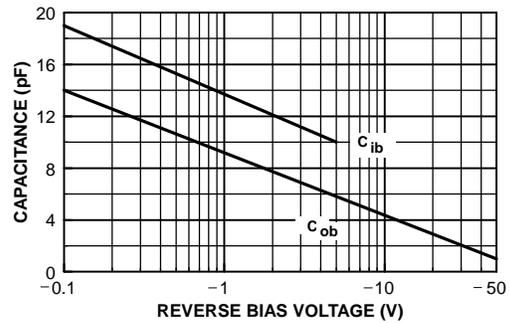
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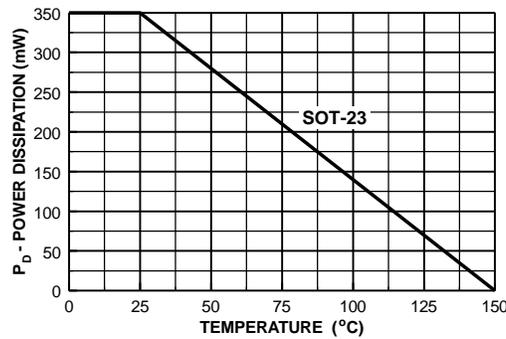
Collector-Cutoff Current vs. Ambient Temperature



Input and Output Capacitance vs Reverse Bias Voltage



Power Dissipation vs Ambient Temperature



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BCW71

NPN EPITAXIAL SILICON TRANSISTOR

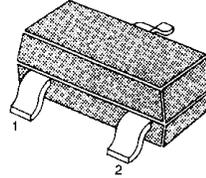
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	50	V
Collector-Emitter Voltage	V _{CEO}	45	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KST2222 for graphs

SOT-23

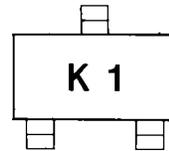


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV _{CBO}	I _C =10μA, I _E =0	50			V
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2mA, I _B =0	45			V
Collector-Emitter Breakdown Voltage	BV _{CES}	I _C =2mA, V _{EB} =0	45			V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =10μA, I _C =0	5			V
Collector Cut-off Current	I _{CBO}	V _{CB} =20V, I _E =0			100	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =2mA	110		220	
Collector-Emitter Saturation Voltage	V _{CE (sat)}	I _C =10mA, I _B =0.5mA		0.21	0.25	V
		I _C =50mA, I _B =2.5mA		0.85		V
Base-Emitter Saturation Voltage	V _{BE (sat)}	I _C =50mA, I _B =2.5mA				V
Base-Emitter On Voltage	V _{BE (on)}	I _C =2mA, V _{CE} =5V	0.6		0.75	V
Current Gain Bandwidth Product	f _T	V _{CE} =5V, I _C =10mA		300		MHz
		f=35MHz				
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0				pF
		f=1MHz			4	
Noise Figures	NF	V _{CE} =5V, I _C =2.0mA			10	dB
		R _G =2KΩ, f=1KHz				

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BCX70G

NPN EPITAXIAL SILICON TRANSISTOR

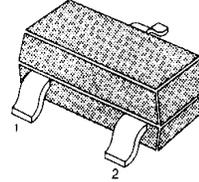
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	45	V
Collector-Emitter Voltage	V _{CEO}	45	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	200	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS5088 for graphs

SOT-23

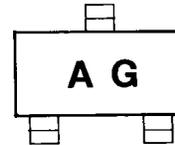


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2mA, I _B =0	45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =1μA, I _C =0	5		V
Collector Cut-off Current	I _{CES}	V _{CE} =32V, V _{BE} =0		20	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} =4V, I _C =0		20	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =2mA	120	220	
		V _{CE} =1V, I _C =50mA	60		
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C =10mA, I _B =0.25mA		0.35	V
		I _C =50mA, I _B =1.25mA		0.55	V
Base-Emitter Saturation Voltage	V _{BE(sat)}	I _C =10mA, I _B =0.25mA	0.6	0.85	V
		I _C =50mA, I _B =1.25mA	0.7	1.05	V
Base-Emitter On Voltage	V _{BE(on)}	I _C =2mA, V _{CE} =5V	0.55	0.75	V
Current Gain Bandwidth Product	f _T	V _{CE} =5V, I _C =10mA	125		MHz
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0 f=1MHz		4.5	pF
Noise Figure	NF	I _C =0.2mA, V _{CE} =5V f=1KHz, R _S =2KΩ		6	dB
Turn On Time	T _{ON}	I _C =10mA, I _{B1} =1mA		150	ns
Turn Off Time	T _{OFF}	I _{B2} =1mA, V _{BB} =3.6V R _L =990Ω R ₁ =R ₂ =5KΩ		800	ns

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BCX70H

NPN EPITAXIAL SILICON TRANSISTOR

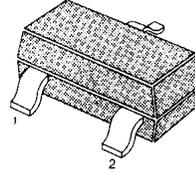
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	45	V
Collector-Emitter Voltage	V _{CEO}	45	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	200	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS3904 for graphs

SOT-23

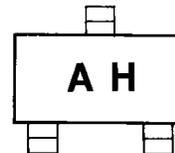


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2.0mA, I _B =0	45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =1.0μA, I _C =0	5		V
Collector Cut-off Current	I _{CES}	V _{CE} =32V, V _{BE} =0		20	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} =4V, I _C =0		20	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =10μA	120		
		V _{CE} =5V, I _C =2.0mA	180	310	
		V _{CE} =1V, I _C =50mA	70		
Collector-Emitter Saturation Voltage	V _{CE (sat)}	I _C =10mA, I _B =0.25mA		0.35	V
		I _C =50mA, I _B =1.25mA		0.55	V
Base-Emitter Saturation Voltage	V _{BE (sat)}	I _C =10mA, I _B =0.25mA	0.6	0.85	V
		I _C =50mA, I _B =1.25mA	0.7	1.05	V
Base-Emitter On Voltage	V _{BE (on)}	I _C =2.0mA, V _{CE} =5V	0.55	0.75	V
Current Gain Bandwidth Product	f _T	I _C =10mA, V _{CE} =5V	125		MHz
Output Capacitance	C _{OB}	V _{CE} =10V, I _E =0 f=1MHz		4.5	pF
Noise Figure	NF	V _{CE} =5V, I _C =0.2mA R _S =2KΩ, f=1KHz		6	dB
Turn On Time	T _{ON}	I _C =10mA, I _{B1} =1.0mA		150	ns
Turn Off Time	T _{OFF}	V _{BB} =3.6V, I _{B2} =1.0mA R ₁ =R ₂ =5KΩ, R _L =990Ω		800	ns

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BCX70J

NPN EPITAXIAL SILICON TRANSISTOR

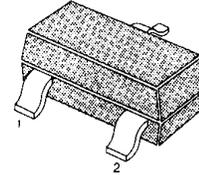
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	45	V
Collector-Emitter Voltage	V _{CEO}	45	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	200	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS3904 for graphs

SOT-23

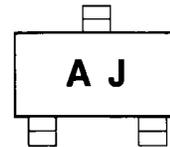


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2.0mA, I _B =0	45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =1.0μA, I _C =0	5		V
Collector Cut-off Current	I _{CES}	V _{CE} =32V, V _{BE} =0		20	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} =4V, I _C =0		20	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =10μA	40		
		V _{CE} =5V, I _C =2.0mA	250	460	
		V _{CE} =1V, I _C =50mA	90		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C =10mA, I _B =0.25mA		0.35	V
		I _C =50mA, I _B =1.25mA		0.55	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C =10mA, I _B =0.25mA	0.6	0.85	V
		I _C =50mA, I _B =1.25mA	0.7	1.05	V
Base-Emitter On Voltage	V _{BE} (on)	I _C =2.0mA, V _{CE} =5V	0.55	0.75	V
Current Gain Bandwidth Product	f _T	I _C =10mA, V _{CE} =5V	125		MHz
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0 f=1MHz		4.5	pF
Noise Figure	NF	V _{CE} =5V, I _C =0.2mA R _S =2KΩ, f=1KHz		6	dB
Turn On Time	T _{ON}	I _C =10mA, I _{B1} =1.0mA		150	ns
Turn Off Time	T _{OFF}	V _{BB} =3.6V, I _{B2} =1.0mA R ₁ =R ₂ =5KΩ, R _L =990Ω		800	ns

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BCX70K

NPN EPITAXIAL SILICON TRANSISTOR

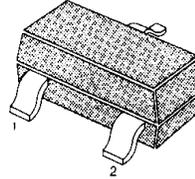
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	45	V
Collector-Emitter Voltage	V _{CEO}	45	V
Emitter-Base Voltage	V _{EBO}	5	V
Collector Current	I _C	200	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS3904 for graphs

SOT-23



1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =2.0mA, I _B =0	45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =1.0μA, I _C =0	5		V
Collector Cut-off Current	I _{CES}	V _{CE} =32V, V _{BE} =0		20	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} =4V, I _C =0		20	nA
DC Current Gain	h _{FE}	V _{CE} =5V, I _C =10μA	100		
		V _{CE} =5V, I _C =2.0mA	380	630	
		V _{CE} =1V, I _C =50mA	100		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C =10mA, I _B =0.25mA		0.35	V
		I _C =50mA, I _B =1.25mA		0.55	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C =10mA, I _B =0.25mA	0.6	0.85	V
		I _C =50mA, I _B =1.25mA	0.7	1.05	V
Base-Emitter On Voltage	V _{BE} (on)	I _C =2.0mA, V _{CE} =5V	0.55	0.75	V
Current Gain Bandwidth Product	f _T	I _C =10mA, V _{CE} =5V	125		MHz
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0 f=1MHz		4.5	pF
Noise Figure	NF	V _{CE} =5V, I _C =0.2mA R _S =2KΩ, f=1KHz		6	dB
Turn On Time	T _{ON}	I _C =10mA, I _{B1} =1.0mA		150	ns
Turn Off Time	T _{OFF}	V _{BB} =3.6V, I _{B2} =1.0mA R ₁ =R ₂ =5KΩ, R _L =990Ω		800	ns

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BCX71G

PNP EPITAXIAL SILICON TRANSISTOR

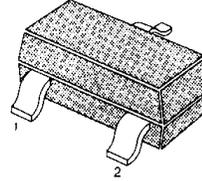
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	-45	V
Collector-Emitter Voltage	V _{CEO}	-45	V
Emitter-Base Voltage	V _{EBO}	-5.0	V
Collector Current	I _C	-100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS5086 for graphs

SOT-23

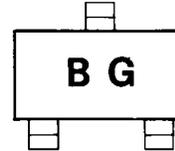


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -2mA, I _B =0	-45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -1μA, I _C =0	-5		V
Collector Cut-off Current	I _{CES}	V _{CE} = -32V, V _{BE} =0		-20	nA
DC Current Gain	h _{FE}	V _{EB} = -5V, I _C = -2mA	120	220	
		V _{CE} = -1V, I _C = -50μA	60		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -10mA, I _B = -0.25mA		-0.25	V
		I _C = -50mA, I _B = -1.25mA		-0.55	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C = -10mA, I _B = -0.25mA	-0.6	-0.85	V
		I _C = -50mA, I _B = -1.25mA	-0.68	-1.05	V
Base-Emitter On Voltage	V _{BE} (on)	I _C = -2mA, V _{CE} = -5V	-0.68	-0.75	V
Current Gain Bandwidth Product	C _{OB}	V _{CB} = -10V, I _E =0	-0.6	6	pF
		f=1MHz			
Noise Figure	NF	I _C =0.2mA, V _{CE} =5V		6	dB
		R _S =2KΩ, f=1KHz			
Turn On Time	T _{ON}	I _C = -10mA, I _{B1} = -1mA		150	ns
Turn Off Time	T _{OFF}	I _{B2} = -1mA, V _{BB} =3.6V		800	ns
		R _L =990Ω			

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BCX71H

PNP EPITAXIAL SILICON TRANSISTOR

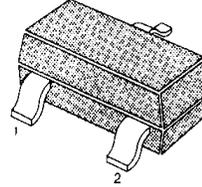
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	-45	V
Collector-Emitter Voltage	V _{CEO}	-45	V
Emitter-Base Voltage	V _{EBO}	-5	V
Collector Current	I _C	-100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS5086 for graphs

SOT-23

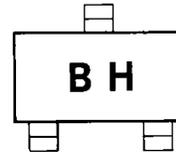


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -2mA, I _B =0	-45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -1μA, I _C =0	-5		V
Collector Cut-off Current	I _{CES}	V _{CE} = -32V, V _{BE} =0		-20	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -10μA	30		
		V _{CE} = -5V, I _C = -2mA	140	310	
		V _{CE} = -1V, I _C = -50mA	80		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -10mA, I _B = -0.25mA		-0.25	V
		I _C = -50mA, I _B = -1.25mA		-0.55	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C = -10mA, I _B = -0.25mA	-0.6	-0.85	V
		I _C = -50mA, I _B = -1.25mA	-0.68	-1.05	V
Base-Emitter On Voltage	V _{BE} (on)	I _C = -2mA, V _{CE} = -5V	-0.6	-0.75	V
Current Gain Bandwidth Product	C _{OB}	V _{CB} = -10V, I _E =0 f=1MHz		6	pF
Noise Figure	NF	I _C = -0.2mA, V _{CE} = -5V f=1KHz, R _S =2KΩ		6	dB
Turn On Time	T _{ON}	I _C = -10mA, I _{B1} = -1mA		150	ns
Turn Off Time	T _{OFF}	I _{B2} = -1mA, V _{BB} = -3.6V R _L =990Ω		800	ns

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BCX71J

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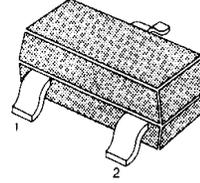
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CBO}	-45	V
Collector-Emitter Voltage	V _{CEO}	-45	V
Emitter-Base Voltage	V _{EBO}	-5	V
Collector Current	I _C	-100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KS5086 for graphs

SOT-23

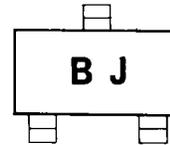


1. Base 2. Emitter 3. Collector

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Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -2mA, I _B =0	-45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -1μA, I _C =0	-5		V
Collector Cut-off Current	I _{CES}	V _{CE} = -32V, V _{BE} =0		-20	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -10μA	40		
		V _{CE} = -5V, I _C = -2mA	250	460	
		V _{CE} = -1V, I _C = -50mA	100		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -10mA, I _B = -0.25mA		-0.25	V
		I _C = -50mA, I _B = -1.25mA		-0.55	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C = -10mA, I _B = -0.25mA	-0.6	-0.85	V
		I _C = -50mA, I _B = -1.25mA	-0.68	-1.05	V
Base-Emitter On Voltage	V _{DE} (on)	I _C = -2mA, V _{CE} = -5V	-0.6	-0.75	V
Current Gain Bandwidth Product	C _{OB}	V _{CB} = -10V, I _E =0		6	pF
		f=1MHz			
Noise Figure	NF	I _C = -0.2mA, V _{CE} = -5V f=1KHz, R _S =2KΩ		6	dB
Turn On Time	T _{ON}	I _C = -10mA, I _{B1} = -1mA		150	ns
Turn Off Time	T _{OFF}	I _{B2} = -1mA, V _{BB} = -3.6V R _L =990Ω		800	ns

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BCX71K

PNP EPITAXIAL SILICON TRANSISTOR

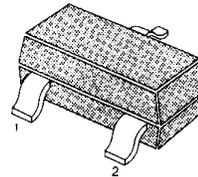
GENERAL PURPOSE TRANSISTOR

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V _{CB0}	-45	V
Collector-Emitter Voltage	V _{CEO}	-45	V
Emitter-Base Voltage	V _{EBO}	-5.0	V
Collector Current	I _C	-100	mA
Collector Dissipation	P _C	350	mW
Storage Temperature	T _{STG}	150	°C

• Refer to KST5086 for graphs

SOT-23

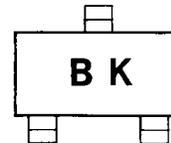


1. Base 2. Emitter 3. Collector

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C = -2mA, I _B =0	-45		V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E = -1μA, I _C =0	-5		V
Collector Cut-off Current	I _{CES}	V _{CE} = -32V, V _{BE} =0		-20	nA
DC Current Gain	h _{FE}	V _{CE} = -5V, I _C = -10μA	100		
		V _{CE} = -5V, I _C = -2mA	380	630	
		V _{CE} = -1V, I _C = -50mA	110		
Collector-Emitter Saturation Voltage	V _{CE} (sat)	I _C = -10mA, I _B = -0.25mA		-0.25	V
		I _C = -50mA, I _B = -1.25mA		-0.55	V
Base-Emitter Saturation Voltage	V _{BE} (sat)	I _C = -10mA, I _B = -0.25mA	-0.6	-0.85	V
		I _C = -50mA, I _B = -1.25mA	-0.68	-1.05	V
Base-Emitter On Voltage	V _{BE} (on)	I _C = -2mA, V _{CE} = -5V	-0.6	-0.75	V
Current Gain Bandwidth Product	C _{OB}	V _{CB} = -10V, I _E =0		6	pF
		f=1MHz			
Noise Figure	NF	I _C = -0.2mA, V _{CE} = -5V R _S =2KΩ, f=1KHz		6	dB
Turn On Time	T _{ON}	I _C = -10mA, I _{B1} = -1mA		150	ns
Turn Off Time	T _{OFF}	I _{B2} = -1mA, V _{BB} = -3.6V R _L =990Ω		800	ns

Marking



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FASTr™	SuperSOT™-6
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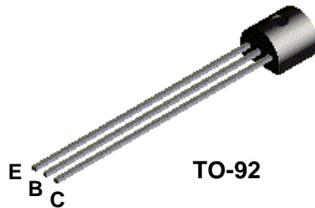
1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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BCX79



PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 68. See PN200A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	45	V
V _{CES}	Collector-Base Voltage	45	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	500	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		BCX79	
P _D	Total Device Dissipation Derate above 25°C	625	mW
		5.0	mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	83.3	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	200	°C/W

PNP General Purpose Amplifier

(continued)

BCX79

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0$	45		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 1.0 \mu\text{A}, I_C = 0$	5.0		V
I_{CEX}	Collector Cutoff Current	$V_{CE} = 45 \text{ V}, V_{BE} = 0.2 \text{ V}, T_A = +100 \text{ }^\circ\text{C}$		20	μA
I_{CES}	Collector Cutoff Current	$V_{CE} = 45 \text{ V}, I_E = 0,$ $V_{CE} = 45 \text{ V}, I_E = 0, T_A = +125 \text{ }^\circ\text{C}$		10 2.5	nA μA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 4.0 \text{ V}, I_C = 0$		20	nA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 10 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 100 \text{ mA}$	120 80 40	630 1,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 2.5 \text{ mA}$		0.6	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 100 \text{ mA}, I_B = 2.5 \text{ mA}$		1.0	V
$V_{BE(on)}$	Base-Emitter On Voltage	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 100 \text{ mA}$	0.6	0.7 0.9	V V

SMALL SIGNAL CHARACTERISTICS

C_{cb}	Collector-Base Capacitance	$V_{CB} = 10 \text{ V}, f = 1.0 \text{ MHz}$		4.5	pF
C_{eb}	Emitter-Base Capacitance	$V_{EB} = 0.5 \text{ V}, f = 1.0 \text{ MHz}$		15	pF
h_{ie}	Input Impedance	$I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $f = 1.0 \text{ kHz}$	1.6	8.5	k Ω
h_{oe}	Output Admittance	$I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V},$ $f = 1.0 \text{ kHz}$		100	μmhos
NF	Noise Figure	$V_{CE} = 5.0 \text{ V}, I_C = 0.2 \text{ mA},$ $R_S = 2.0 \text{ k}\Omega, f = 1.0 \text{ kHz}$		6.0	dB

SWITCHING CHARACTERISTICS

t_{on}	Turn-on Time	$V_{CC} = 10 \text{ V}, I_C = 10 \text{ mA},$ $V_{BB} = 3.6 \text{ V}, I_{B1} = I_{B2} = 1.0 \text{ mA}$		150	ns
t_{on}	Turn-on Time	$V_{CC} = 10 \text{ V}, I_C = 100 \text{ mA},$ $V_{BB} = 5.0 \text{ V}, I_{B1} = I_{B2} = 10 \text{ mA}$		150	ns
t_{off}	Turn-off Time	$V_{CC} = 10 \text{ V}, I_C = 10 \text{ mA},$ $V_{BB} = 3.6 \text{ V}, I_{B1} = I_{B2} = 1.0 \text{ mA}$		800	ns
t_{off}	Turn-off Time	$V_{CC} = 10 \text{ V}, I_C = 100 \text{ mA},$ $V_{BB} = 5.0 \text{ V}, I_{B1} = I_{B2} = 10 \text{ mA}$		800	ns