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## BC237/238/239

## NPN EPITAXIAL SILICON TRANSISTOR

#### SWITCHING AND AMPLIFIER APPLICATIONS

LOW NOISE: BC239

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

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



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic		Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Emitter Breakdown Emitter Base Breakdown Volt	Voltage :BC237 : BC238/239 age : BC237 : BC238/239	BV <sub>CEO</sub> BV <sub>EBO</sub>	I <sub>C</sub> =2mA, I <sub>B</sub> =0 I <sub>E</sub> =1μA, I <sub>C</sub> =0	45 25 6 5			V V V
Collector Cut-off Current DC Current Gain Collector-Emitter Saturation V Collector Base Saturation Vol Base Emitter On Voltage Current Gain Bandwidth Prod	: BC237 : BC238/239 /oltage ltage	$I_{CES}$ $h_{FE}$ $V_{CE}$ (sat) $V_{BE}$ (sat) $V_{BE}$ (on) $f_{T}$	$\begin{array}{l} V_{CE}{=}50V, \ I_{B}{=}0 \\ V_{CE}{=}30V, \ I_{B}{=}0 \\ V_{CE}{=}5V, \ I_{C}{=}2mA \\ I_{C}{=}10mA, \ I_{B}{=}0.5mA \\ I_{C}{=}10mA, \ I_{B}{=}5mA \\ I_{C}{=}100mA, \ I_{B}{=}5mA \\ V_{CE}{=}5V, \ I_{C}{=}2mA \\ V_{CE}{=}3V, \ I_{C}{=}0.5mA \end{array}$	120 0.55	0.2 0.2 0.7 0.2 0.73 0.87 0.62 85	15 15 800 0.2 0.6 0.83 1.05 0.7	nA nA V V V V MHz
Collector Base Capacitance Emitter Base Capacitance Noise Figure	: BC237/238 : BC239 : BC239	C <sub>CBO</sub> C <sub>EBO</sub> NF NF	$\label{eq:VcE} \begin{split} V_{CE} = & 5V, \ I_{C} = & 10mA \\ V_{CB} = & 0.5V, \ f = & 1MHz \\ V_{EB} = & 0.5V, \ f = & 1MHz \\ V_{CE} = & 5V, \ I_{C} = & 0.2mA, \\ f = & 1KHz \ R_{G} = & 2kohm \\ V_{CE} = & 5V, \ I_{C} = & 0.2mA \\ R_{G} = & 2kohm, \ f = & 30 - & 15KHz \end{split}$	150	250 3.5 8 2	6 10 4 4	MHz pF dB dB dB

#### hFE CLASSIFICATION

Classification	Α	В	с	
h <sub>FE</sub>	120-220	180-460	380-800	



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## BC307/308/309

## PNP EPITAXIAL SILICON TRANSISTOR

#### SWITCHING AND AMPLIFIER APPLICATIONS

• LOW NOISE: BC309

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage	V <sub>CES</sub>	50	V
: BC307 : BC308/309		-30	V
Collector-Emitter Voltage	V <sub>CEO</sub>		
: BC307		-45	V
Emitter-Base Voltage	Vene	-25	V
Collector Current (DC)	IC EBO	-100	mĂ
Collector Dissipation	Pc	500	mW
Junction Temperature	TJ	150	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ 150	°C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Emitter Breakdown Voltage : BC307 : BC308/309 Collector Emitter Breakdown Voltage : BC307 : BC308/309 Emitter Base Breakdown Voltage	BV <sub>CEO</sub> BV <sub>CES</sub> BV <sub>EBO</sub>	I <sub>C</sub> = -2mA, I <sub>B</sub> =0 I <sub>C</sub> = -10μA, I <sub>B</sub> =0 I <sub>E</sub> = -10μA, I <sub>B</sub> =0	-45 -25 -50 -30 -5			V V V V V
Collector Cut-off Current : BC307 : BC238/239 DC Current Gain Collector-Emitter Saturation Voltage Collector Base Saturation Voltage Base Emitter On Voltage Current Gain Bandwidth Product	$I_{CES}$ $h_{FE}$ $V_{CE}$ (sat) $V_{BE}$ (sat) $V_{BE}$ (on) $f_{T}$	$\begin{array}{l} V_{CE} = -45V, \ I_B = 0 \\ V_{CE} = -25V, \ I_B = 0 \\ V_{CE} = -5V, \ I_C = -2mA \\ I_C = -10mA, \ I_B = -0.5mA \\ I_C = -10mA, \ I_B = -5mA \\ I_C = -10mA, \ I_B = -0.5mA \\ I_C = -100mA, \ I_B = -5mA \\ V_{CE} = -5V, \ I_C = -2mA \\ V_{CE} = -5V, \ I_C = -10mA \end{array}$	-0.55	-2 -2 -0.5 -0.7 -0.85 -0.62 130	-15 -15 800 -0.3	nA nA V V V V MHz
Collector Base Capacitance Emitter Base Capacitance Noise Figure : BC237/238 : BC239 : BC239	С <sub>сво</sub> С <sub>ЕВО</sub> NF NF	$\begin{array}{l} V_{CB} = -10V, \ f = 1MHz \\ V_{EB} = -0.5V, \ f = 1MHz \\ V_{CE} = -5V, \ l = -0.2mA, \\ R_G = 2K\Omega, \ f = 1KHz \\ V_{CE} = -5V, \ l _C = -0.2mA \\ R_G = 2K\Omega, \ f = 30 \sim 15KHz \end{array}$		12 2	6 10 4 4	pF pF dB dB dB

#### h<sub>FE</sub> CLASSIFICATION

Classification	Α	В	С	
h <sub>FE</sub>	120-220	180-460	380-800	



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### BC307/308/309

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## 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<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage : BC327 : BC328 Collector-Emitter Voltage : BC327 : BC327 : BC328 Emitter-Base Voltage Collector Current (DC) Collector Dissipation Junction Temperature Storage Temperature	V <sub>CES</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>J</sub> T <sub>STG</sub>	-50 -30 -45 -25 -5 -800 625 150 -55 ~ 150	∨∨ ∨∨∨ mA w℃ °C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Emitter Breakdown Voltage : BC327 : BC328	BV <sub>CEO</sub>	I <sub>C</sub> = -10mA, I <sub>B</sub> =0	-45 -25			V V
Collector Emitter Breakdown Voltage BC327 BC328	BV <sub>CES</sub>	I <sub>C</sub> = -0.1mA, I <sub>B</sub> =0	-50 -30			V V
Emitter Base Breakdown Voltage Collector Cut-off Current	BV <sub>EBO</sub> I <sub>CES</sub>	$I_{E}$ -10mA, $I_{C}$ =0	-5			V
: BC307 : BC338	h	$V_{CE} = -45V, I_B = 0$ $V_{CE} = -25V, I_B = 0$ $V_{CE} = -1V, I_B = -100mA$	100	-2 -2	-100 -100 630	nA nA
Collector-Emitter Saturation Voltage Base Emitter On Voltage	h <sub>FE</sub> 2 V <sub>CE</sub> (sat) V <sub>BE</sub> (on)	$V_{CE} = -1V$ , $I_C = -30mA$ $I_C = -500mA$ , $I_B = -50mA$ $V_{CE} = -1V$ , $I_C = -300mA$	60		-0.7 -1.2	V V
Current Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = -5V, I <sub>C</sub> = -10mA		100		MHz
Collector Base Capacitance	C <sub>CBO</sub>	$V_{CB}$ = -10V, f=1MHz		12		pF

#### hFE CLASSIFICATION

Classification	Α	В	С
h <sub>FE</sub>	100-250	160-400	250-630
h <sub>FE2</sub>	60-	100-	170-



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## PNP EPITAXIAL SILICON TRANSISTOR

###

-2 -5 -10 -20 -50 Vce(V), COLLECTOR TO EMITTER VOLTAGE

-1000

-500

-200 -100

-50 COLLECTOR

-20

-10

-6

-2

-1

-1

I<sub>c</sub>(mA),

SAFE OPERATING AREA

duty cycle≼29

-100





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BC337-16 / BC337-25

Discrete POWER & Signal **Technologies** 



## 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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CES</sub>	Collector-Base Voltage	50	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	1.0	A
T <sub>J</sub> , T <sub>stg</sub>	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

Therm	al Characteristics TA = 25°C unless other	rwise noted	
Symbol	Characteristic	Max	Units
		BC337-16 / BC337-25	
P <sub>D</sub>	Total Device Dissipation	625	mW
	Derate above 25°C	5.0	mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{ ext{ hetaJA}}$	Thermal Resistance, Junction to Ambient	200	°C/W

		NPN Gene	ral Pur	pose A	mplifie (continued
Electri	cal Characteristics	= 25°C unless otherwise noted			
Symbol	Parameter	Test Conditions	Min	Max	Units
	RACTERISTICS		45	1	
V (BR)CEO	Voltage		40		V
V (BR)CES	Collector-Base Breakdown Voltage	$I_{\rm C} = 100 \mu{\rm A},  I_{\rm E} = 0$	50		V
V (BR)EBO	Emitter-Base Breakdown Voltage	$I_{\rm E} = 100 \ \mu {\rm A}, \ I_{\rm C} = 0$	5.0		V
Ісво	Collector Cutoff Current	$ \begin{array}{l} V_{CB} = 20 \ V, \ I_E = 0, \ T_A = +25 \ ^\circ C \\ V_{CB} = 20 \ V, \ I_E = 0, \ T_A = +150 \\ ^\circ C \end{array} $		100 5.0	nA μA
I <sub>EBO</sub>	Emitter Cutoff Current	$V_{EB} = 5.0 V, I_{C} = 0$		10	μΑ
ON CHAR	ACTERISTICS			•	<u>.</u>
h <sub>FE</sub>	DC Current Gain	$V_{CE} = 1.0 \text{ V}, \text{ I}_{C} = 100 \text{ mA} \\ \textbf{337-16} \\ \textbf{337-25} \\ \end{array}$	100 160	250 400	

 $V_{CE} = 1.0 \text{ V}, \text{ I}_{C} = 500 \text{ mA}$  $I_{C} = 500 \text{ mA}, \text{ I}_{B} = 50 \text{ mA}$ 

 $V_{CE} = 1.0 \text{ V}, I_{C} = 500 \text{ mA}$ 

Collector-Emitter Saturation Voltage

Base-Emitter On Voltage

 $\frac{V_{\text{CE(sat)}}}{V_{\text{BE(on)}}}$ 

40

V

V

0.7

1.2

## 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<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage : BC337 : BC338 Collector-Emitter Voltage : BC337 : BC337 : BC338 Emitter-Base Voltage Collector Current (DC)	V <sub>CES</sub> V <sub>CEO</sub> V <sub>EBO</sub>	50 30 45 25 5 800	V V V V MA
Collector Dissipation Junction Temperature Storage Temperature	Pc TJ T <sub>STG</sub>	625 150 -55 ~ 150	mW °C °C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =0	45			.,
: BC337			40 25			V
Collector Emitter Breakdown Voltage	BV <sub>CES</sub>	I <sub>C</sub> =0.1mA, I <sub>B</sub> =0	20			v
: BC337 : BC338			50 30			V V
Emitter Base Breakdown Voltage	BV <sub>EBO</sub>	I <sub>E</sub> =0.1mA, I <sub>C</sub> =0	-5			V
Collector Cut-off Current	I <sub>CES</sub>					
: BC337		V <sub>CE</sub> =45V, I <sub>B</sub> =0		2	100	nA
: BC338		V <sub>CE</sub> =25V, I <sub>B</sub> =0		2	100	nA
DC Current Gain	h <sub>FE</sub> 1	$V_{CE}=1V$ , $I_{C}=100mA$	100		630	
	N <sub>FE</sub> 2	$V_{CE}=1V$ , $I_C=300mA$	60		07	V
Collector-Emitter Saturation Voltage	$V_{CE}$ (sat)	$I_{C}=500$ mA, $I_{B}=50$ mA			0.7	V
Base Emitter On Voltage	v <sub>BE</sub> (OII)	$V_{CE}=1V$ , $I_C=300$ mA		400	1.2	
Current Gain Bandwidth Product	т	$V_{CE}=5V, I_{C}=10mA$		100		IVIHZ
Collector Base Capacitance	С <sub>сво</sub>	V <sub>CB</sub> =10V, f=1MHz		12		pF

#### h<sub>FE</sub> CLASSIFICATION

Classification	16	25	40
h <sub>FE</sub>	100-250	160-400	250-630
h <sub>FE2</sub>	60-	100-	170-



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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 <sub>CEO</sub>	Collector-Emitter Voltage	20	V
V <sub>CES</sub>	Collector-Base Voltage	25	V
$V_{\text{EBO}}$	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	2.0	A
T <sub>J</sub> , T <sub>stg</sub>	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 <sub>D</sub>	Total Device Dissipation	625	mW	
	Derate above 25°C	5.0	mW/°C	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W	

## NPN General Purpose Amplifier (continued)

BC368

0		Task On 194			
Symbol	Parameter	Test Conditions	Min	Мах	Units
	RACTERISTICS		00		
V <sub>(BR)CEO</sub>	Collector-Emitter Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	20		V
V <sub>(BR)CES</sub>	Collector-Base Breakdown Voltage	$I_{\rm C} = 100 \mu\text{A}, I_{\rm E} = 0$	25		V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown voltage	$I_{\rm E} = 10 \ \mu A, I_{\rm C} = 0$	5.0	10	V
CBO	Collector-Cutoff Current	$V_{CB} = 25 \text{ V}, I_E = 0$ $V_{CR} = 25 \text{ V}, I_E = 0, T_A = 150^{\circ}\text{C}$		1.0	μA mA
I <sub>EBO</sub>	Emitter-Cutoff Current	$V_{EB} = 5.0 \text{ V}, I_C = 0$		10	μA
hee		$I_0 = 5.0 \text{ mA}$ $V_{05} = 10 \text{ V}$	50		1
•••••		$I_{\rm C} = 0.5$ A, $V_{\rm CE} = 1.0$ V	85	375	
		$I_{\rm C} = 1.0$ A, $V_{\rm CE} = 1.0$ V	60	0.5	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 1.0$ A, $I_{\rm B} = 100$ mA		0.5	V
V <sub>BE(on)</sub>	Base-Emitter On Voltage	$I_{C} = 1.0 \text{ A}, V_{CE} = 1.0 \text{ V}$		1.0	V
SMALL SI	GNAL CHARACTERISTICS				
f <sub>T</sub>	Current Gain - Bandwidth Product	$I_{\rm C} = 10 \text{ mA}, V_{\rm CE} = 5.0 \text{ V},$	45		MHz
Туріса	I Characteristics				
4	Typical Pulsed Current Gain vs Collector Current	Collector- S Voltage vs	Emitter S Collecto	aturatior r Current	1
อั <sub>500</sub>					
	V <sub>CE</sub> = 5V				
CUR	125 °C	<u> </u>	25 °	c	
₿ <sup>300</sup>		<b>E 125 °C</b>			
STN 200		K-E	-10.00		
AL P	=+-40 °C ++++ + + + + + + + + + + + + + + + +	<b>P</b> 0.01	- 40 °C		
<u>ମ</u> ୍ଚ 100 –					
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لا 0.001 م	0.01 0.1	1 5 0.01	0.1	DDENT (A)	1

BC368

### NPN General Purpose Amplifier (continued)



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## NPN EPITAXIAL SILICON TRANSISTOR

#### SWITCHING AND AMPLIFIER

- HIGH VOLTAGE: BC546, V<sub>CEO</sub>=65V
- LOW NOISE: BC549, BC550
- Complement to BC556 ... BC560

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector Base Voltage	V <sub>CBO</sub>	80	V
: BC547/550		50	v
: BC548/549		30	V
Collector-Emitter Voltage	V <sub>CEO</sub>		
: BC546		65	V
: BC547/550		45	V
: BC548/549/550		30	V
Emitter-Base Voltage	V <sub>EBO</sub>		V
: BC546/547		6	V
: BC548/549/550		5	V
Collector Current (DC)	I <sub>C</sub>	100	mA
Collector Dissipation	Pc	500	mW
Junction Temperature	TJ	150	°C
Storage Temperature	T <sub>STG</sub>	-65 ~ 150	°C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Cut-off Current DC Current Gain Collector Emitter Saturation Voltage Collector Base Saturation Voltage Base Emitter On Voltage Current Gain Bandwidth Product	$\begin{array}{l} I_{CBO} \\ h_{FE} \\ V_{CE} \left( sat \right) \\ V_{BE} \left( on \right) \\ V_{BE} \left( on \right) \\ f_{T} \end{array}$	$\begin{array}{l} V_{CB}{=}30V, \ I_{E}{=}0 \\ V_{CE}{=}5V, \ I_{C}{=}2mA \\ I_{C}{=}10mA, \ I_{B}{=}0.5mA \\ I_{C}{=}10mA, \ I_{B}{=}5mA \\ I_{C}{=}10mA, \ I_{B}{=}0.5mA \\ I_{C}{=}10mA, \ I_{B}{=}5mA \\ V_{CE}{=}5V, \ I_{C}{=}2mA \\ V_{CE}{=}5V, \ I_{C}{=}10mA \\ V_{CE}{=}5V, \ I_{C}{=}10mA \end{array}$	110 580	90 200 700 900 660 300	15 800 250 600 700 720	nA mA mA mA mA MHz
Collector Base Capacitance Emitter Base Capacitance Noise Figure : BC546/547/548 : BC549/550 : BC549 : BC550	C <sub>CBO</sub> C <sub>EBO</sub> NF	$\begin{array}{l} V_{CB}{=}10V, f{=}1MHz \\ V_{EB}{=}0.5V, f{=}1MHz \\ V_{CE}{=}5V, l_{C}{=}200\mu\text{A} \\ f{=}1KHz, R_{G}{=}2K\Omega \\ V_{CE}{=}5V, l_{C}{=}200\mu\text{A} \\ R_{G}{=}2K\Omega, \\ f{=}30{\sim}15000MHz \end{array}$		3.5 9 2 1.2 1.4 1.4	6 10 4 3	pF pF dB dB dB dB

#### h<sub>FE</sub> CLASSIFICATION

Classification	Α	В	С
h <sub>FE</sub>	110-220	200-450	420-800



Rev. B

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### BC546/547/548/549/550

## NPN EPITAXIAL SILICON TRANSISTOR



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Discrete POWER & Signal **Technologies** 



## **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 <sub>CEO</sub>	Collector-Emitter Voltage	30	V
V <sub>CES</sub>	Collector-Base Voltage	30	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	500	mA
T <sub>J</sub> , T <sub>stg</sub>	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:

These ratings are based on a maximum junction temperature of 150 degrees C.
 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	Мах	Units
		BC548 / A / B / C	
P <sub>D</sub>	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/∘C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

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## NPN General Purpose Amplifier

OFF CHARA					
V <sub>(BR)CEO</sub> CO V <sub>(BR)CBO</sub> CO	Ollactor-Emittar Braskdow/D Voltada	1 - 10  m $1 - 0$	30	1	V
(BR)CBO		$I_{\rm C} = 10$ mA, $I_{\rm B} = 0$	30		v
		$I_{\rm C} = 10 \mu\text{A}, I_{\rm E} = 0$	30	-	V
(BR)CES		$I_{\rm C} = 10 \mu{\rm A}, I_{\rm E} = 0$	5.0		V
V <sub>(BR)EBO</sub> Er	mitter-Base Breakdown Voltage	$I_{\rm E} = 10 \mu {\rm A},  I_{\rm C} = 0$	5.0	45	V
сво Со	ollector Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CR} = 30 \text{ V}, I_E = 0, T_A = +150 \text{ °C}$		15 5.0	nA uA
					por t
ON CHARAC	TERISTICS				
h <sub>FE</sub> D	C Current Gain	$V_{CE} = 5.0 \text{ V}, I_{C} = 2.0 \text{ mA}$ 548	110	800	
		548A	110	220	
		548B	200	450	
	Collector-Emitter Saturation Voltage	548C	420	800	V
V <sub>CE(sat)</sub>	onector-Enniter Saturation voltage	$I_{\rm C} = 100 \text{ mA}, I_{\rm B} = 0.5 \text{ mA}$		0.23	v
V <sub>BE(OD)</sub> B	ase-Emitter On Voltage	$V_{CE} = 5.0 \text{ V}, I_{C} = 2.0 \text{ mA}$	0.58	0.70	V
		$V_{CE} = 5.0 \text{ V}, I_{C} = 10 \text{ mA}$		0.77	V
SMALL SIGN	NAL CHARACTERISTICS				T
h <sub>fe</sub> S	mall-Signal Current Gain	$I_{c} = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V},$ f = 1.0 kHz	125	900	
NF N	loise Figure	$V_{CE} = 5.0 \text{ V}, I_C = 200 \mu\text{A},$		10	dB
		$R_{s} = 2.0 \text{ k}\Omega$ , f = 1.0 kHz,			
		B <sub>W</sub> = 200 Hz			

BC548 / BC548A / BC548B / BC548C

## BC556/557/558/559/560

## PNP EPITAXIAL SILICON TRANSISTOR

#### SWITCHING AND AMPLIFIER

- HIGH VOLTAGE: BC556, V<sub>CEO</sub>= -65V
- LOW NOISE: BC559, BC560
- Complement to BC546 ... BC 550

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Capacitance : BC556 : BC557/560 : BC558/559 Collector-Emitter Voltage : BC556	V <sub>CBO</sub>	-80 -50 -30	V V V
EDC557/560 EDC557/560 EDC558/559 Emitter-Base Voltage Collector Current (DC) Collector Dissipation Junction Temperature Storage Temperature	V <sub>EBO</sub> Ic P <sub>C</sub> T <sub>J</sub> T <sub>STG</sub>	-45 -30 -5 -100 500 150 -65 ~ 150	V V MA mW °C °C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Cut-off Current DC Current Gain Collector Emitter Saturation Voltage Collector Base Saturation Voltage Base Emitter On Voltage Current Gain Bandwidth Product	$\begin{array}{l} I_{CBO} \\ h_{FE} \\ V_{CE} \left( sat \right) \\ V_{BE} \left( on \right) \\ V_{BE} \left( on \right) \\ f_{T} \end{array}$	$\begin{array}{l} V_{CB} = -30V, \ I_E = 0 \\ V_{CE} = -5V, \ I_C = 2mA \\ I_C = -10mA, \ I_B = -0.5mA \\ I_C = -100mA, \ I_B = -5mA \\ I_C = -10mA, \ I_B = -5mA \\ I_C = -100mA, \ I_B = -5mA \\ V_{CE} = -5V, \ I_C = -2mA \\ V_{CE} = -5V, \ I_C = -10mA \\ V_{CE} = -5V, \ I_C = -10mA \end{array}$	-600	-90 -250 -700 -900 -660 150	-15 800 -300 -650 -750 -800	nA mV mV mV mV mV MHz
Collector Base Capacitance Noise Figure : BC556/557/558 : BC559/560 : BC559 : BC560	C <sub>CBO</sub> NF NF	$\begin{array}{l} V_{CB} = -10V, \mbox{ f=1MHz} \\ V_{CE} = -5V, \mbox{ lc=} -200 \mu A \\ \mbox{ f=1KHz}, \mbox{ R}_{G} = 2K\Omega \\ V_{CE} = -5V, \mbox{ lc=} -200 \mu A \\ \mbox{ R}_{G} = 2K\Omega \\ \mbox{ f=30~15000MHz} \end{array}$		2 1 1.2 1.2	6 10 4 4 2	pF dB dB dB dB

#### h<sub>FE</sub> CLASSIFICATION

Classification	Α	В	С
h <sub>FE</sub>	110-220	200-450	420-800



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## BC556/557/558/559/560

## **PNP EPITAXIAL** SILICON TRANSISTOR

-1.2

-300



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## BC635/637/639

## NPN EPITAXIAL SILICON TRANSISTOR

## SWITCHING AND AMPLIFIER APPLICATIONS

## Complement to BC635/638/640

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit	
Collector Emitter Voltage at $R_{BE}$ =1Kohm	: BC635 : BC637 : BC639	V <sub>CER</sub>	45 60 100	V V V
Collector Emitter Voltage Collector Emitter Voltage	: BC635 : BC637 : BC639 : BC635 : BC637 : BC637 : BC639	V <sub>CES</sub> V <sub>CEO</sub>	45 60 100 45 60 80	
Emitter Base Voltage Collector Current Peak Collector Current Base Current Collector Dissipation Junction Temperature Storage Temperature		V <sub>EBO</sub> I <sub>C</sub> I <sub>CP</sub> I <sub>B</sub> PC T <sub>J</sub> T <sub>STG</sub>	5 1 1.5 100 1 150 -65 ~ 150	V A MA W °C °C



• PW=5ms, Duty Cycle=10%

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	$I_{\rm C}$ =10mA, $I_{\rm B}$ =0				.,
: BC635			45			V
: BC736			60			V
: BC639			80			V
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> =30V, I <sub>E</sub> =0			0.1	μΑ
Emitter Cut-off Current	I <sub>EBO</sub>	$V_{EB}=5V, I_{C}=0$			0.1	μA
DC Current Gain	h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =5mA	25			
:BC635		V <sub>CE</sub> =2V, I <sub>C</sub> =150mA	40		250	
: BC637/BC639			40		160	
		V <sub>CE</sub> =2V, I <sub>C</sub> =500mA	25			
Collector Emitter Saturation Voltage	V <sub>CE</sub> (sat)	$I_{c}=500$ mA, $I_{B}=50$ mA			0.5	V
Base Emitter On Voltage	V <sub>BE</sub> (on)	$V_{CE}=2V, I_{C}=500mA$			1	V
Current Gain Bandwidth Product	f⊤	$V_{CE}$ =5V, I <sub>C</sub> =10mA, f=50MHz		100	-	MHz



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Rev. B



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## BC636/638/640

## PNP EPITAXIAL SILICON TRANSISTOR

#### SWITCHING AND AMPLIFIER APPLICATIONS

Complement to BC635/637/639

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit	
Collector Emitter Voltage	: BC636	V <sub>CER</sub>	-45	V
at R <sub>BE</sub> =1Kohm	: BC638		-60	V
	: BC640		-100	V
Collector Emitter Voltage	: BC636	V <sub>CES</sub>	-45	V
	: BC638		-60	V
	: BC640		-100	V
Collector Emitter Voltage	: BC636	V <sub>CEO</sub>	-45	V
	: BC638		-60	V
	: BC640		-80	V
Emitter Base Voltage		V <sub>EBO</sub>	-5	V
Collector Current		I <sub>C</sub>	-1	Α
Peak Collector Current		I <sub>CP</sub>	-1.5	А
Base Current		IB	-100	mA
Collector Dissipation		Pc	1	W
Junction Temperature		TJ	150	°C
Storage Temperature		T <sub>STG</sub>	-65 ~ 150	°C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Emitter Breakdown Voltage : BC636 : BC638 : BC640 Collector Cut-off Current Emitter Cut-off Current DC Current Gain : BC635 : BC637/BC639 Collector Emitter Saturation Voltage Base Emitter On Voltage Current Gain Bandwidth Product	$\begin{array}{c} BV_{CEO}\\ \\ I_{CBO}\\ I_{EBO}\\ h_{FE} \end{array}\\ \\ V_{CE} \mbox{ (sat)}\\ V_{BE} \mbox{ (on)}\\ f_T \end{array}$	$\begin{split} I_{C} = -10 \text{mA}, \ I_{B} = 0 \\ \\ V_{CB} = -50 \text{, } I_{C} = 0 \\ V_{CE} = -2V \text{, } I_{C} = -5 \text{mA} \\ V_{CE} = -2V \text{, } I_{C} = -150 \text{mA} \\ \\ V_{CE} = -2V \text{, } I_{C} = -500 \text{mA} \\ I_{C} = -500 \text{mA}, \ I_{B} = -50 \text{mA} \\ \\ V_{CE} = -2V \text{, } I_{C} = -500 \text{mA} \\ \\ V_{CE} = -5V \text{, } I_{C} = -10 \text{mA}, \ f = 50 \text{MHz} \end{split}$	-45 -60 -80 25 40 40 25	100	-0.1 -0.1 250 160 -0.5 -1	V V μA μA V MHz



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### BC636/638/640

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BC807-16 / BC807-25 / BC807-40

Discrete POWER & Signal **Technologies** 



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



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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CES</sub>	Collector-Base Voltage	50	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
Ic	Collector Current - Continuous	1.2	A
T <sub>J</sub> , T <sub>stg</sub>	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	Мах	Units
		*BC807-16 / -25 / -40	
P <sub>D</sub>	Total Device Dissipation	350	mW
	Derate above 25°C	2.0	
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	357	°C/W

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

Electr	PNP General Purpose Amplifie (continue				
Electrical Characteristics TA = 25°C unless otherwise noted					
Symbol	Parameter	Test Conditions	Min	Max	Units
	DACTEDISTICS				
	Collector-Emitter Breakdown Voltage	$l_{0} = 10 \text{ mA}$ $l_{0} = 0$	45		V
	Collector-Base Breakdown Voltage	$L_{\rm c} = 100  \mu A_{\rm c} = 0$	50		V
	Emitter-Base Breakdown Voltage	$I_{c} = 100 \mu A, I_{c} = 0$	50		V
(BR)EBO		$V_{cc} = 20 V$	0.0	100	nΑ
СВО		$V_{CB} = 20 V$ $V_{CB} = 20 V$ , $T_A = 150^{\circ}C$		5.0	μA
ON CHAR	ACTERISTICS				
) <sup>EE</sup>	DC Current Gain	$I_{\rm C} = 100 \text{ mA}, V_{\rm CE} = 1.0 \text{ V}$ - 16	100	250	
		- 25	160	400	
		- 40	250	600	
/ <i>i</i>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 500 \text{ mA}, V_{\rm CE} = 1.0 \text{ V}$	40	0.7	V
CE(sat)	Page Emitter On Voltage	$1_{\rm C} = 500 \text{ mA}, \text{ I}_{\rm B} = 50 \text{ mA}$		1.2	V
Туріса	al Characteristics				
Typica	al Characteristics Typical Pulsed Current Gain	Collector-E	Emitter S	aturation	1
Typica	al Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-E ᢓ Voltage vs	Emitter S Collecto	aturation r Current	<b>I</b>

BC807-16 / BC807-25 / BC807-40



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### SWITCHING AND AMPLIFIER APPLICATIONS

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

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

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



ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> = -10mA, I <sub>B</sub> =0	45			N
: BC807			-45 25			V
Collector-Emitter Breakdown Voltage	BVore	$l_{0} = -0.1 \text{mA}$ $l_{0} = -0.0 \text{mA}$	-25			v
BC807	D CES	IC0.1117A, IB-0	-50			V
: BC808			-30			V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	I <sub>E</sub> = -0.1mA, I <sub>C</sub> =0	-5			V
Collector Cut-off Current	ICES	V <sub>CE</sub> = -25V, I <sub>B</sub> =0			-100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	$V_{EB} = -4V, I_{C} = 0$			-100	nA
DC Current Gain	h <sub>FE</sub> 1	$V_{CE}$ = -1V, $I_{C}$ = -100mA	100		630	
	h <sub>FE</sub> 2	V <sub>CE</sub> = -1V, I <sub>C</sub> = -300mA	60			
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA			-0.7	V
Base-Emitter On Voltage	V <sub>BE</sub> (on)	V <sub>CE</sub> = -1V, I <sub>C</sub> = -300mA			-1.2	V
Current Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = -5V, I <sub>C</sub> = -10mA		100		MHz
		f=50MHz				
Collector-Base Capacitance	Ссво	V <sub>CB</sub> = -10V, f=1MHz			12	pF

### **h**<sub>FE</sub> CLASSIFICATION

Classification	16	25	40
h <sub>FE</sub> 1	100-250	160-400	250-630
h <sub>FE</sub> 2	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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Rev. B

### BC807/BC808

### PNP EPITAXIAL SILICON TRANSISTOR





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Discrete POWER & Signal **Technologies** 



# 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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CES</sub>	Collector-Base Voltage	50	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
l <sub>c</sub>	Collector Current - Continuous	1.5	A
T <sub>J</sub> , T <sub>stg</sub>	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

Symbol	Characteristic	Мах	Units
		*BC817-25 / BC817-40	
PD	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/∘C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	°C/W

TA = 25°C unless otherwise noted

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

Electrical CharacteristicsTA = 25°C unless otherwise notedSymbolParameterTest ConditionsMinOFF CHARACTERISTICS $V_{(BR)CE0}$ Collector-Emitter Breakdown Voltage $I_C = 10 \text{ mA}, I_B = 0$ 45 $V_{(BR)CES}$ Collector-Base Breakdown Voltage $I_C = 100 \mu A, I_E = 0$ 50 $V_{(BR)EB0}$ Emitter-Base Breakdown Voltage $I_E = 10 \mu A, I_C = 0$ 5.0CBOCollector-Cutoff Current $V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}, T_A = 150°C50ON CHARACTERISTICSNFEDC Current GainI_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}25V_{CE(sat)}Collector-Emitter Saturation VoltageI_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}40V_{dE(on)}Base-Emitter On VoltageI_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}10$	(co	ontinue
DFF CHARACTERISTICS $V_{(BR)CEO}$ Collector-Emitter Breakdown Voltage $I_C = 10 \text{ mA}, I_B = 0$ 45 $V_{(BR)CES}$ Collector-Base Breakdown Voltage $I_C = 100 \mu A, I_E = 0$ 50 $V_{(BR)EBO}$ Emitter-Base Breakdown Voltage $I_E = 10 \mu A, I_C = 0$ 5.0 $C_{BO}$ Collector-Cutoff Current $V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}$ $CBO$ Collector-Cutoff Current $V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}, T_A = 150^{\circ}\text{C}$ To the second	Max	Units
DF CHARACTERISTICS $V_{(BR)CEO}$ Collector-Emitter Breakdown Voltage       I <sub>c</sub> = 10 mA, I <sub>B</sub> = 0       45 $V_{(BR)CES}$ Collector-Base Breakdown Voltage       I <sub>c</sub> = 10 $\mu$ A, I <sub>c</sub> = 0       50 $V_{(BR)EBO}$ Emitter-Base Breakdown Voltage       I <sub>e</sub> = 10 $\mu$ A, I <sub>c</sub> = 0       5.0 $C_{BO}$ Collector-Cutoff Current $V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}$ $C_{BO}$ Collector-Cutoff Current $V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V}$ $ON$ CHARACTERISTICS       DC Current Gain       I <sub>c</sub> = 100 mA, V <sub>CE</sub> = 1.0 V       -25       160 $I_{FE}$ DC Current Gain       I <sub>c</sub> = 500 mA, V <sub>CE</sub> = 1.0 V       -25       160 $I_{CE(sat)}$ Collector-Emitter Saturation Voltage       I <sub>c</sub> = 500 mA, V <sub>CE</sub> = 1.0 V       40 $I_{DE(On)}$ Base-Emitter On Voltage       I <sub>c</sub> = 500 mA, V <sub>CE</sub> = 1.0 V       40		
$V_{(BR)CEO}$ Collector-Emitter Breakdown VoltageIc = 10 mA, I_B = 043 $V_{(BR)CES}$ Collector-Base Breakdown VoltageIc = 100 $\mu$ A, Ic = 050 $V_{(BR)EBO}$ Emitter-Base Breakdown VoltageIe = 10 $\mu$ A, Ic = 050 $CBO$ Collector-Cutoff Current $V_{CB} = 20 V$ $V_{CB} = 20 V, T_A = 150°C50ON CHARACTERISTICSDC Current GainIc = 100 mA, V_{CE} = 1.0 V-2540Ico Collector-Emitter Saturation VoltageI_C = 500 mA, V_{CE} = 1.0 V40V_{CE(sat)}Collector-Emitter Saturation VoltageIc = 500 mA, V_{CE} = 1.0 VV_{BE(OI)}Base-Emitter On VoltageIc = 500 mA, V_{CE} = 1.0 V$		1/
$f_{(BR)CES}$ Collector-Base Breakdown Voltage $I_C = 100 \ \mu A, I_E = 0$ 50 $M_{(BR)EBO}$ Emitter-Base Breakdown Voltage $I_E = 10 \ \mu A, I_C = 0$ 5.0 $CBO$ Collector-Cutoff Current $V_{CB} = 20 \ V$ $V_{CB} = 20 \ V, T_A = 150^{\circ}C$ 5.0ON CHARACTERISTICSIFEDC Current Gain $I_C = 100 \ mA, V_{CE} = 1.0 \ V$ $-25$ $40$ $I_{FE}$ DC Current Gain $I_C = 500 \ mA, V_{CE} = 1.0 \ V$ $40$ $I_{CE(sat)}$ Collector-Emitter Saturation Voltage $I_C = 500 \ mA, I_B = 50 \ mA$ $40$ $I_{BE(OI)}$ Base-Emitter On Voltage $I_C = 500 \ mA, V_{CE} = 1.0 \ V$ $40$		
$V_{(BR)EBO}$ Emitter-Base Breakdown Voltage $I_E = 10 \ \mu$ A, $I_C = 0$ 5.0 $CBO$ Collector-Cutoff Current $V_{CB} = 20 \ V$ $V_{CB} = 20 \ V$ , $T_A = 150^{\circ}C$ $V_{CB} = 20 \ V$ , $T_A = 150^{\circ}C$ ON CHARACTERISTICS $N_{FE}$ DC Current Gain $I_C = 100 \ mA$ , $V_{CE} = 1.0 \ V$ $-25 \ 250 \ I_C = 500 \ mA$ , $V_{CE} = 1.0 \ V$ $40 \ 250 \ I_C = 500 \ mA$ , $I_B = 50 \ mA$ $I_{CE(sat)}$ Collector-Emitter Saturation Voltage $I_C = 500 \ mA$ , $I_B = 50 \ mA$ $I_{BE(On)}$		V
CBOCollector-Cutoff Current $V_{CB} = 20 V$ $V_{CB} = 20 V, T_A = 150°CON CHARACTERISTICSIFEDC Current GainI_C = 100 mA, V_{CE} = 1.0 V- 25- 4016025040ICE(sat)Collector-Emitter Saturation VoltageI_C = 500 mA, V_{CE} = 1.0 V40ICE(sat)Collector-Emitter On VoltageI_C = 500 mA, V_{CE} = 1.0 V40$		
VCB = 20 V, 1A = 150 CON CHARACTERISTICS $h_{FE}$ DC Current GainIc = 100 mA, $V_{CE} = 1.0$ V- 25 - 40160 250 40 $I_{CE(sat)}$ Collector-Emitter Saturation VoltageIc = 500 mA, $I_B = 50$ mA	100	nA
	1.2	V
Typical Pulsed Current Gain vs Collector Current vs Collector Current	Saturation for Current	
$ \begin{array}{c c} & & & \\ $	125 °C	

# BC817-25 / BC817-40



BC817-25 / BC817-40

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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<sub>A</sub>=25°C)

Characteristic		Symbol	Rating	Unit
Collector Emitter Voltage	: BC817 : BC818	V <sub>CES</sub>	50 30	V V
Collector Emitter Voltage	: BC817 : BC818	$V_{CEO}$	45 25	V V
Emitter-Base Voltage		V <sub>EBO</sub>	5 800	V mA
Collector Dissipation		P <sub>C</sub>	310	mW ∘C
Storage Temperature		T <sub>STG</sub>	-65 ~ 150	°C



### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =0				
: BC817			45			V
: BC818			25			V
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	I <sub>C</sub> =0.1mA, I <sub>B</sub> =0				
: BC817			50			V
: BC818			30			V
Emitter-Base Breakdown Voltage	BV <sub>FBO</sub>	I <sub>E</sub> =0.1mA, I <sub>C</sub> =0	5			V
Collector Cut-off Current	ICES	$V_{CE}=25V, I_{B}=0$			100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	$V_{EB}=4V, I_{C}=0$			100	nA
DC Current Gain	h <sub>FE</sub> 1	$V_{CE}=1V$ , $I_{C}=100mA$	100		630	
	h <sub>FE</sub> 2	V <sub>CE</sub> =1V, I <sub>C</sub> =300mA	60			
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> =500mA, I <sub>B</sub> =50mA			0.7	V
Base-Emitter On Voltage	V <sub>BE</sub> (on)	V <sub>CE</sub> =1V, I <sub>C</sub> =300mA			1.2	V
Current Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =10mA		100		MHz
		f=50MHz				
Collector-Base Capacitance	Ссво	V <sub>CB</sub> =10V, f=1MHz			12	pF

### **h**<sub>FE</sub> CLASSIFICATION

Classification	16	25	40	
h <sub>FE</sub> 1	h <sub>FE</sub> 1 100-250		250-630	
h <sub>FE</sub> 2	h <sub>FE</sub> 2 60-		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<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector Base Voltage	V <sub>CBO</sub>	80	V
: BC847/850 : BC848/849		50 30	V V
Collector Emitter Voltage	V <sub>CEO</sub>	65	V
: BC847/850		45	V
Emitter-Base Voltage	V <sub>EBO</sub>	50	v
: BC848/849/850		5	V
Collector Current (DC) Collector Dissipation	l <sub>c</sub> Pc	100 310	mA mW
Junction Temperature Storage Temperature	T <sub>J</sub> T <sub>STG</sub>	150 -65 ~ 150	°C °C



### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Charae	cteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Cut-off Cur	rent	I <sub>CBO</sub>	V <sub>CB</sub> =30V, I <sub>E</sub> =0			15	nA
DC Current Gain		h <sub>FE</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =2mA	110		800	
Collector Emitter Sat	uration Voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> =10mA, I <sub>B</sub> =0.5mA		90	250	mV
			I <sub>C</sub> =100mA, I <sub>B</sub> =5mA		200	600	mV
Collector Base Satur	ation Voltage	V <sub>BE</sub> (sat)	I <sub>C</sub> =10mA, I <sub>B</sub> =0.5mA		700		mV
			I <sub>C</sub> =100mA, I <sub>B</sub> =5mA		900		mV
Base Emitter On Vol	tage	V <sub>BE</sub> (on)	V <sub>CE</sub> =5V, I <sub>C</sub> =2mA	580	660	700	mV
			V <sub>CE</sub> =5V, I <sub>C</sub> =10mA			720	mV
Current Gain Bandw	idth Product	f <sub>T</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =10mA		300		MHz
			f=100MHz				
Collector Base Capa	icitance	C <sub>CBO</sub>	V <sub>CB</sub> =10V, f=1MHz		3.5	6	pF
Emitter Base Capaci	tance	C <sub>EBO</sub>	V <sub>EB</sub> =0.5V, f=1MHz		9		pF
Noise Figure	: BC846/847/848	NF	V <sub>CE</sub> =5V, I <sub>C</sub> =200μA		2	10	dB
-	: BC849/850		f=1KHz, R <sub>G</sub> =2KΩ		1.2	4	dB
	: BC849	NF	V <sub>CE</sub> =5V, I <sub>C</sub> =200μA		14	4	dB
	· BC850		R <sub>G</sub> =2KΩ		14	3	dB
			f=30~15000Hz		1.4	Ŭ	űD

### h<sub>FE</sub> CLASSIFICATION

Classification	Α	В	с	
h <sub>FE</sub>	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



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### BC846/847/848/849/850

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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<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage : BC856 : BC857/860 : BC858/859 Collector-Emitter Voltage : BC856 : BC857/860 : BC857/860 : BC858/859 Emitter-Base Voltage Collector Current (DC) Collector Dissipation	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub>	-80 -50 -30 -65 -45 -30 -5 -100 310	> > > > > > = = = = = = = = = = = = = =
Junction Temperature Storage Temperature	T <sub>J</sub> T <sub>STG</sub>	150 -65 ~ 150	°C ℃



### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage	I <sub>CBO</sub> h <sub>FE</sub> V <sub>CE</sub> (sat)	V <sub>CB</sub> = -30V, I <sub>E</sub> =0 V <sub>CE</sub> = -5V, I <sub>C</sub> = -2mA I <sub>C</sub> = -10mA, I <sub>B</sub> = -0.5mA	110	-90	-15 800 -300	nA mV
Collector-Base Saturation Voltage	V <sub>BE</sub> (sat)	I <sub>C</sub> = -100mA, I <sub>B</sub> = -5mA I <sub>C</sub> = -10mA, I <sub>B</sub> = -0.5mA I <sub>C</sub> = -100mA, I <sub>B</sub> = -5mA		-250 -700 -900	-650	mV mV mV
Base-Emitter On Voltage	$V_{\text{BE}}$ (on)	$V_{CE}$ = -5V, I <sub>C</sub> = -2mA $V_{CE}$ = -5V, I <sub>C</sub> = -10mA	-600	-660	-750 -800	mV mV
Current Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = -5V, I <sub>C</sub> = -10mA f=100MHz		150		MHz
Collector-Base Capacitance Noise Figure : BC856/857/858	С <sub>сво</sub> NF	$V_{CB}$ = -10V, f=1MHz $V_{CE}$ = -5V, I <sub>C</sub> = -200 $\mu$ A f=1KHz R = -2KO		2	6 10	pF dB
: BC859/860 : BC859 : BC860	NF	$V_{CE}$ = -5V, $I_C$ = -200 $\mu$ A $R_G$ = 2K $\Omega$ f=30~15000Hz		1 1.2 1.2	4 4 2	aB dB dB

### **h**<sub>FE</sub> CLASSIFICATION

Classification	А	В	С
h <sub>FE</sub>	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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Rev. B

### BC856/857/858/859/860

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# **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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CBO</sub>	Collector-Base Voltage	50	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	500	mA
T <sub>J</sub> , T <sub>stg</sub>	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	Мах	Units	
		*BC857A / B / C		
P <sub>D</sub>	Total Device Dissipation	350	mW	
	Derate above 25°C	2.8	mW/ºC	
$R_{ extsf{ heta}JA}$	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)

Electrical Characteristics TA = 25°C unless otherwise noted								
Symbol	Parameter	Test Conditions	Min	Max	Units			
OFF CHARACTERISTICS								
V <sub>(BR)CEO</sub>	Collector-Emitter Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	45		V			
V <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage	$I_{\rm C} = 10 \ \mu {\rm A}, \ I_{\rm E} = 0$	50		V			
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage	$I_{E} = 1.0 \ \mu A, \ I_{C} = 0$	5.0		V			
I <sub>CBO</sub>	Collector-Cutoff Current	V <sub>CB</sub> = 30 V V <sub>CB</sub> = 30 V, T <sub>A</sub> = 150°C		15 4.0	nA μA			

BC857A / BC857B / BC857C

### **ON CHARACTERISTICS**

h <sub>FE</sub>	DC Current Gain	$I_{\rm C} = 2.0 \text{ mA}, V_{\rm CE} = 5.0 \text{ V}$			
		BC857A	125	250	
		BC857B	220	475	
		BC857C	420	800	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0.5 \text{ mA}$		0.3	V
		$I_{\rm C} = 100 \text{ mA}, I_{\rm B} = 5.0 \text{ mA}$		0.65	V
V <sub>BE(on)</sub>	Base-Emitter On Voltage	$I_{\rm C} = 2.0 \text{ mA}, V_{\rm CE} = 5.0 \text{ V}$	0.6	0.75	V
x7		$I_{C} = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}$		0.82	V

### SMALL SIGNAL CHARACTERISTICS

f <sub>T</sub>	Current Gain - Bandwidth Product	$I_{C} = 10 \text{ mA}, V_{CE} = 5.0,$ f = 100 mHz	100		MHz
C <sub>obo</sub>	Output Capacitance	V <sub>CB</sub> = 10 V, f = 1.0 MHz		4.5	pF
NF	Noise Figure	$    I_{C} = 0.2 \text{ mA}, V_{CE} = 5.0, \\ R_{S} = 2.0 \text{ k}\Omega, \text{ f} = 1.0 \text{ kHz}, \\ BW = 200 \text{ Hz} $		10	dB

### **Typical Characteristics**





BC857A / BC857B / BC857C



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Discrete POWER & Signal **Technologies** 



**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 <sub>CEO</sub>	Collector-Emitter Voltage	60	V
V <sub>CBO</sub>	Collector-Base Voltage	60	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	1.2	A
T <sub>J</sub> , T <sub>stg</sub>	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

Symbol	Characteristic	Мах	Units	
		BCP52		
PD	Total Device Dissipation	1.5	W	
	Derate above 25°C	12	mW/°C	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	83.3	°C/W	

TA = 25°C unless otherwise noted

# PNP General Purpose Amplifier (continued)

BCP52

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHA	RACTERISTICS				
V <sub>(BR)CEO</sub>	Collector-Emitter Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	60		V
V <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage	$I_{\rm C} = 100 \ \mu {\rm A}, I_{\rm E} = 0$	60		V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage	$I_E = 10 \ \mu A, I_C = 0$	5.0		V
сво	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$		100	nA
EBO	Emitter-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0, I_A = 125^{\circ}\text{C}$ $V_{EB} = 5.0 \text{ V}, I_C = 0$		10	μA μA
		$L = 50 \text{ mA} \text{ V}_{} = 20 \text{ V}_{}$	25	1	1
ΓE	De current Gam	$I_{c} = 5.0 \text{ mA}, V_{cE} = 2.0 \text{ V}$ $I_{c} = 150 \text{ mA}, V_{cE} = 2.0 \text{ V}$ $I_{c} = 500 \text{ mA}, V_{cE} = 2.0 \text{ V}$	40 25	250	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{C} = 500 \text{ mA}, I_{B} = 50 \text{ mA}$		0.5	V
/ <sub>BE(on)</sub>	Base-Emitter On Voltage	$I_{\rm C}$ = 500 mA, $V_{\rm CE}$ = 2.0 V		1.0	V
Туріса	al Characteristics				
Typica 1	al Characteristics Typical Pulsed Current Gain vs Collector Current	Collector- ≳ Voltage vs	Emitter S Collecto	aturation r Current	I.
	Al Characteristics	Collector- Voltage vs 0.6 $\beta = 10$ 0.3 0.2 0.1 0.1	Emitter S Collecto	aturation r Current	

BCP52



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**Discrete POWER & Signal Technologies** 



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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CBO</sub>	Collector-Base Voltage	45	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	1.5	A
T <sub>J</sub> , T <sub>stg</sub>	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

Symbol	Characteristic	Мах	Units
		BCP54	
P <sub>D</sub>	Total Device Dissipation	1.5	W
	Derate above 25°C	12	mW/∘C
$R_{ extsf{ heta}JA}$	Thermal Resistance, Junction to Ambient	83.3	°C/W

TA = 25°C unless otherwise noted

### NPN General Purpose Amplifier (continued)

d)

	Falameter	lest Conditions	Min	Мах	Units
	DACTEDISTICS				
	Collector Emitter Brookdown Voltage	1 - 10 - 10 - 0	45		V
(BR)CEO	Collector-Base Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	45		V
(BR)CBO	Emitter-Base Breakdown Voltage	$I_{\rm C} = 100 \mu\text{A}, I_{\rm E} = 0$	4J 5.0		V
(BR)EBO		$I_{\rm E} = 10 \mu {\rm A}, I_{\rm C} = 0$	5.0	100	v nA
СВО		$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CB} = 30 \text{ V}, I_E = 0, T_A = 125^{\circ}\text{C}$		100	μA
EBO	Emitter-Cutoff Current	$V_{EB} = 5.0 \text{ V}, I_{C} = 0$		10	μA
ON CHAR	ACTERISTICS				
	DC Current Gain	$l_{0} = 50 \text{ mA}$ $V_{05} = 20 \text{ V}$	25		
Έ		$I_{\rm C} = 150$ mA, $V_{\rm CE} = 2.0$ V	40	250	
		$I_{\rm C} = 500 \text{ mA}, V_{\rm CE} = 2.0 \text{ V}$	25		
/ <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 500 \text{ mA}, I_{\rm B} = 50 \text{ mA}$		0.5	V
BE(ON)	Base-Emitter On Voltage	$I_{\rm C} = 500 \text{ mA}, V_{\rm CE} = 2.0 \text{ V}$		1.0	V
Туріса	al Characteristics				
Typica	al Characteristics	Collector- E Voltage vs	Emitter S	Saturation	n
Typica Typica	al Characteristics Typical Pulsed Current Gain vs Collector Current	Collector- کی Voltage vs	Emitter S Collecto	Saturation r Curren	n t
	al Characteristics	$\sum_{B \\ B \\ B \\ B \\ B \\ C \\ C \\ C \\ C \\ C \\ $	Emitter S Collecto	Saturation r Curren	n t
	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{CE} = 5V$	$\sum_{\substack{\substack{\textbf{S}\\ \textbf{S}\\ S$	Emitter S Collecto	Saturation r Curren	n t
	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{cE} = 5V$	Collector- S S S S S S S S S S S S S	Emitter S Collecto	Saturation r Curren	n t
Isep CURRENT GAIN	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{CE} = 5V$ 125  °C	Collector- Voltage vs 0.6 $\beta = 10$ 0.4 0.3 $\beta = 10$	Emitter S Collecto	Saturation r Curren	n t
	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{CE} = 5V$ 125 °C 125 °C 125 °C	Collector- Voltage vs 0.6 $\beta = 10$ 0.3 0.3 0.3 0.3 0.3 0.4 0.3 0.3 0.4 0.3 0.3	Emitter S Collecto	Saturation r Curren	n t
	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{CE} = 5V$ $V_{CE} =$	Collector- Voltage vs 0.6 $-\beta = 10$ 0.5 0.4 0.4 0.3 0.2 0.2 0.1	Emitter S Collecto	Saturation r Curren	n t
Typical Duckent Gain	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{CE} = 5V$ $-40 ^{\circ}C$ $-40 ^{\circ}C$	Collector- Voltage vs $\beta = 10$ 0.6 $\beta = 10$ 0.7 0.7 0.6 $\beta = 10$ 0.6 0.6 $\beta = 10$ 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.7 0.6 0.7 0.6 0.7	Emitter S Collecto	Saturation r Curren	n t •c
	al Characteristics Typical Pulsed Current Gain vs Collector Current $V_{CE} = 5V$ 125 °C -40 °C 0.01 0.1 0.1 0.1 1	$\sum_{\substack{\boldsymbol{0},\boldsymbol{0},\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0},\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0},\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0},\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0},\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\\boldsymbol{0}\\$	Emitter S Collecto	Saturation r Curren	n t •c

BCP54

BCP54

### **NPN General Purpose Amplifier** (continued) Typical Characteristics (continued) **Base-Emitter ON Voltage vs Base-Emitter ON Voltage vs Collector Current Collector Current** Vector 1 Provided (V) 40 °C 40 °C 25°Ċ 25°Ċ 25 ℃ |||| П V<sub>CE</sub>= 5V V<sub>CE</sub>=5V 0.01 0.1 0.01 0.1 I c - COLLECTOR CURRENT (A) I<sub>c</sub> - COLLECTOR CURRENT (A) **Collector-Base Capacitance Collector-Cutoff Current** C<sub>0B0</sub> - COLLECTOR-BASE CAPACITANCE (pF) vs Collector-Base Voltage vs Ambient Temperature 40 I CBO COLLECTOR CURRENT (nA) 100 V<sub>CB</sub> = 40V 10 30 1 20 0.1 10 0 L 0 25 75 150 50 100 125 4 8 12 16 20 24 V<sub>CB</sub>- COLLECTOR-BASE VOLTAGE (V) 28 T<sub>A</sub> - AMBIENT TEMPERATURE (°C) Power Dissipation vs **Gain Bandwidth Product Ambient Temperature** vs Collector Current $h_{\rm FE}$ - Gain Bandwidth Product (MHz) 1.5 500 <sub>CE</sub> = 10V P<sub>D</sub> - POWER DISSIPATION (W) 1.25 400 SOT-223 1 300 Ш 0.75 Ш HT 200 0.5 100 0.25 0 0 1000 10 100 25 50 75 100 TEMPERATURE (°C) 125 150 Ic - COLLECTOR CURRENT (mA)

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Discrete POWER & Signal **Technologies** 



**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 <sub>CEO</sub>	Collector-Emitter Voltage	30	V
V <sub>CBO</sub>	Collector-Base Voltage	40	V
V <sub>EBO</sub>	Emitter-Base Voltage	10	V
Ι <sub>C</sub>	Collector Current - Continuous	1.2	A
T <sub>J</sub> , T <sub>stg</sub>	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	Мах	Units
		*BCV26	
P <sub>D</sub>	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/∘C
$R_{ heta JA}$	Thermal Resistance, Junction to Ambient	357	°C/W

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

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# PNP Darlington Transistor (continued)

BCV26

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
	Collector-Emitter Breakdown Voltage	$ _{c} = 10 \text{ mA},  _{B} = 0$	30			V
	Collector-Base Breakdown Voltage	$l_{c} = 10 \ \mu A. \ l_{E} = 0$	40			V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage	$I_{\rm E} = 100 \text{ nA}, I_{\rm C} = 0$	10			V
I <sub>CBO</sub>	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, I_E = 0$			0.1	μA
I <sub>EBO</sub>	Emitter-Cutoff Current	$V_{EB} = 10 \text{ V}, I_{C} = 0$			0.1	μA
	RACTERISTICS					
	DC Current Gain	$l_{c} = 1.0 \text{ mA}$ , $V_{cr} = 5.0 \text{ V}$	4,000			
'FE		$I_{\rm C} = 10$ mA, $V_{\rm CE} = 5.0$ V	10,000			
		$I_{\rm C} = 100 \text{ mA}, V_{\rm CE} = 5.0 \text{ V}$	20,000		1.0	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 100 \text{ mA}, I_{\rm B} = 0.1 \text{ mA}$			1.0	V
V <sub>BE(sat)</sub>	Base-Emitter Saturation Voltage	$I_{\rm C} = 100$ mA, $I_{\rm B} = 0.1$ mA			1.5	V
SMALL S	Current Gain - Bandwidth Product	$I_{\rm C} = 30$ mA, $V_{\rm CE} = 5.0$ V,		220		MHz
f <sub>T</sub> C <sub>C</sub>	Current Gain - Bandwidth Product Collector Capacitance	$I_{C} = 30 \text{ mA}, V_{CE} = 5.0 \text{ V},$ f = 100 MHz $V_{CB} = 30 \text{ V}, I_{E} = 0, f = 1.0 \text{ MHz}$		220 3.5		MHz pF
SMALL S f⊤ C <sub>C</sub> Typic	Current Gain - Bandwidth Product Collector Capacitance al Characteristics Typical Pulsed Current Gain	$I_{C} = 30 \text{ mA}, V_{CE} = 5.0 \text{ V},$ f = 100  MHz $V_{CB} = 30 \text{ V}, I_{E} = 0, f = 1.0 \text{ MHz}$ <b>Collector</b> -	Emitter	220 3.5 Satura	ation	MHz pF
	Current Gain - Bandwidth Product         Collector Capacitance         al Characteristics         Typical Pulsed Current Gain vs Collector Current	$I_{C} = 30 \text{ mA}, V_{CE} = 5.0 \text{ V},$ f = 100 MHz $V_{CB} = 30 \text{ V}, I_{E} = 0, \text{ f} = 1.0 \text{ MHz}$ Collector- S Voltage vs	Emitter	220 3.5 Satura tor Cu	ation	MHz pF

PNP Darlington Transistor (continued)

# BCV26


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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 <sub>CBO</sub>	Collector-Base Voltage	40	V
V <sub>EBO</sub>	Emitter-Base Voltage	10	V
I <sub>C</sub>	Collector Current - Continuous	1.2	A
T <sub>J</sub> , T <sub>stg</sub>	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	Мах	Units
		*BCV27	
PD	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/°C
R <sub>θJA</sub>	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)

Symbol	Parameter	Test Conditions	Min	Тур	Мах	Unit
OFF CHA	RACTERISTICS					
/ <sub>(BR)CEO</sub>	Collector-Emitter Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	30			V
/ <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage	$I_{\rm C} = 10 \ \mu {\rm A}, I_{\rm E} = 0$	40			V
/ <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage	$I_{\rm E} = 100 \text{ nA}, I_{\rm C} = 0$	10			V
СВО	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, \text{ I}_{E} = 0$			0.1	μA
EBO	Emitter-Cutoff Current	$V_{EB} = 10 \text{ V}, \text{ I}_{C} = 0$			0.1	μA
	ACTERISTICS					
		$l_0 = 1.0 \text{ mA}$ $V_{05} = 5.0 \text{ V}$	4 000			
E		$I_c = 10 \text{ mA}, V_{cE} = 5.0 \text{ V}$	10,000			
		$I_{\rm C} = 100 \text{ mA}, V_{\rm CE} = 5.0 \text{ V}$	20,000			
E(sat)	Collector-Emitter Saturation Voltage	$I_{\rm C} = 100 \text{ mA}, I_{\rm B} = 0.1 \text{ mA}$	_		1.0	V
E(sat)	Base-Emitter Saturation Voltage	$I_{\rm C} = 100 \text{ mA}, I_{\rm B} = 0.1 \text{ mA}$			1.5	V
	Current Gain - Bandwidth Product	$I_{\rm C} = 30 \text{ mA}, V_{\rm CE} = 5.0 \text{ V},$		220		MH
		f = 100 MHz				
C C	Collector Capacitance	$V_{CB} = 30 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		3.5		р⊦
Typic	I Characteristics		<u>.</u>			
Typica	Il Characteristics	Collector-	Emitter	Satura	tion	
Typica	Il Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-l ᢓੑੑੑੑ Voltage vs	Emitter Collect	Satura or Cur	tion	
Typica (y) NY 250	al Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-I کی Voltage vs	Emitter Collect	Satura or Cur	ntion rent	
Typica (x) (x) (x) (x) (x) (x) (x) (x) (x) (x)	al Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-I	Emitter Collect	Satura or Cur	tion rent	
Typica 025 002 025 02 02 02 02 02 02 02 02 02 02	al Characteristics Typical Pulsed Current Gain vs Collector Current $\mu = 5V$	Collector-I	Emitter Collect	Satura or Cur	tion rent	
Typica 250 002 150 002 002 002 002 002 002 002 0	al Characteristics Typical Pulsed Current Gain vs Collector Current $\mu = 50$	$\sum_{\substack{u=1}^{n}} Collector-I$ $\sum_{\substack{u=1\\u=1}^{n}} Voltage vs$ $1.6$ $\beta = 1000$	Emitter Collect	Satura or Cur	ition rent	
SED CURRENT GAIN (K) 002 010 020 021 021 021 021 021	Al Characteristics Typical Pulsed Current Gain vs Collector Current $\epsilon = 5V$ $\epsilon = 5V$ $25 \circ C$	Collector- S Understand S Voltage vs 1.6 $\beta = 1000$ 1.2 $-\beta = 1000$ 1.2 $-\beta = 1000$ 1.2 $-\beta = 1000$ 1.2 $-\beta = 1000$ 1.2 $-\beta = 1000$		Satura or Cur	ition rent	
DULSED CURRENT GAIN (K) 002 AIN (K) 012 AI	Al Characteristics Typical Pulsed Current Gain vs Collector Current $\epsilon = 5V$ $125 °C$ $125 °C$ $125 °C$	Collector- S S Voltage vs 1.6 $\beta = 1000$ 1.2 1.2 $-40  ^{\circ}C$		Satura or Cur	tion rent	
<b>Typica</b> <b>Typica</b> <b>D</b> <b>S</b> <b>Typical</b> <b>S</b> <b>S</b> <b>S</b> <b>S</b> <b>S</b> <b>S</b> <b>S</b> <b>S</b>	Al Characteristics Typical Pulsed Current Gain vs Collector Current $E^{=} 5V$ $125 °C$ $125 °C$ $-40 °C$	Collector-I S 99 1.6 -β = 1000 1.2 -40 °C -40 °C	Emitter Collect	Satura or Cur	tion rent	
Pical Pulseb Current         Mix           002         007           001         007           001         007           001         007           001         007	Al Characteristics Typical Pulsed Current Gain vs Collector Current $\epsilon = 5V$ $125 °C$ $-40 °C$ $-40 °C$	Collector-I $\sum_{i=1}^{i=1}$ Voltage vs 1.6 $\beta = 1000$ 1.2 $-40 \circ c$ 1.6 $-40 \circ c$ 1.6 $-40 \circ c$ 1.6 $-40 \circ c$ $-40 \circ c$		Satura or Cur	tion rent	
TYPICAL PULSED CURRENT GAIN (K) 200 001 001 001 001 001 001 001	Al Characteristics Typical Pulsed Current Gain vs Collector Current $\epsilon = 5V$ $125 \circ c$ $0.01$ $0.1$	Collector-I S Voltage vs 1.6 $\beta = 1000$ $\beta = 1000$ $\beta = 1000$ $\beta = -40 \circ C$ $\beta = -40 \circ $		Satura or Cur	tion rent ℃	1000
here - TYPICAL PULSED CURRENT GAIN (K)	Al Characteristics Typical Pulsed Current Gain vs Collector Current $\mu = 5V$ $125 \circ C$ $125 \circ C$ $-40 \circ C$ $25 \circ C$ $0.01$ $0.1$ $I_c - COLLECTOR CURRENT (A)$	Collector-I Voltage vs 1.6 $\beta = 1000$ 1.2 $-40 \circ C$ 1 $0.4$ 1 -100 1 -100 1 -100 1 -100 1 -100 1 -100 -100 -100		Satura or Cur	ntion rent	1000
рани и страни и стра	Al Characteristics Typical Pulsed Current Gain vs Collector Current = 5V = 5V 25 °C 125 °C	Collector-I Voltage vs 1.6 $\beta = 1000$ 1.2 $-40 \circ C$ 1 100 1 0 1 0 1 0 1 0 1 0 1 0 1 0		Satura or Cur	ntion rent	1000
Provide a contract of the second seco	Al Characteristics Typical Pulsed Current Gain vs Collector Current = 5V = 5V = 25 °C = 25 °C = 40 °C = 0.01 $I_c$ - COLLECTOR CURRENT (A)	Collector-I Voltage vs 1.6 $\beta = 1000$ 1.2 $-40 \circ C$ 1 1 1 1 1 1 1 1 1 1		Satura cor Cur	ntion rent °c mA)	1000
Typical Pursed Current Gain (K)	Al Characteristics Typical Pulsed Current Gain vs Collector Current = 5V = 5V = 25 °C = 25 °C = 100 125 °C	Collector-I Voltage vs 1.6 $\beta = 1000$ 1.2 $-40 \circ C$ 1 1 1 1 1 1 1 1 1 1		Satura cor Cur	ntion rent °c (mA)	1000
Public arrived and the second arrived and the second arrived a	Al Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-I Voltage vs 1.6 $\beta = 1000$ H $1.2-40 \circ C1111111111$		Satura for Cur	ntion rent °c (mA)	1000
Туріса 200 002 002 001 150 0 001 150 0 001 150	Al Characteristics Typical Pulsed Current Gain vs Collector Current	$ \begin{array}{c}                                     $	Emitter Collect		ntion rent °C	1000
Туріса 002 сик кем дам (к) 002 годана (к) 000 годана (к)	Al Characteristics Typical Pulsed Current Gain us Collector Current	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i$		Satura or Cur	ntion rent °C	1000
Typica 002 сиктемт сам (к) 002 состати сам 001 состати сам 001 состати сам 001 состати сам 001 состати сам 001 состати сам 001 состати сам 002 состати сам 002 состати сам 003 состати сам 004 состати сам 005 состат	Al Characteristics Typical Pulsed Current Gain vs Collector Current $ \frac{5}{25^{\circ}C} + \frac{1125^{\circ}C}{1125^{\circ}C} + 1125$	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i$		Satura or Cur	tion rent °C mA)	1000
<b>Typica</b> <b>D</b> <b>D</b> <b>D</b> <b>D</b> <b>D</b> <b>D</b> <b>D</b> <b>D</b>	Al Characteristics Typical Pulsed Current Gain vs Collector Current	$ \begin{array}{c}                                     $		Satura or Cur	tion rent °C (mA)	1000

BCV27

NPN Darlington Transistor (continued)

# BCV27



# **NPN Darlington Transistor**



BCV27

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# PNP EPITAXIAL SILICON TRANSISTOR

#### GENERAL PURPOSE TRANSISTOR

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Junction Temperature Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	-30 -20 -5.0 -100 350 150	∨ ∨ mA mW °C

• Refer to KST5088 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Base Breakdown Voltage Collector-Emitter Breakdown Voltage Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter On Voltage Output Capacitance Noise Figures	$BV_{CBO} \\ BV_{CEO} \\ BV_{CES} \\ BV_{EBO} \\ I_{CBO} \\ h_{FE} \\ V_{CE}(sat) \\ V_{BE}(sat) \\ C_{OB} \\ NF$	$\begin{array}{l}  _{C}=-10\mu A,  _{E}=0 \\  _{C}=-2m A,  _{B}=0 \\  _{C}=-10\mu A,  _{C}=0 \\  _{E}=-10\mu A,  _{C}=0 \\  _{C}=-20V,  _{E}=0 \\  _{C}=-20V,  _{C}=-2m A \\  _{C}=-10m A,  _{B}=-0.5m A \\  _{C}=-10m A,  _{B}=-0.5m A \\  _{C}=-5V,  _{C}=-2m A \\  _{C}=-10V,  _{E}=0 \\ f=1MHz \\  _{C}=-5V,  _{C}=0.2m A \\  _{C}=-5V,  _{C}=0.2m A \\  _{C}=-2K\Omega, f=1KHz \end{array}$	-30 -20 -30 -5 120 -0.6		-100 260 -0.3 -0.75 7 10	∨∨∨ NA V PF dB

Marking





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Discrete POWER & Signal Technologies

# **BCW30**



# **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 <sub>CEO</sub>	Collector-Emitter Voltage	32	V
V <sub>CES</sub>	Collector-Emitter Voltage	32	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
Ic	Collector Current - Continuous	500	mA
T <sub>J</sub> , T <sub>stq</sub>	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	Мах	Units
		*BCW30	
PD	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/∘C
$R_{\theta JA}$	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)

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
CBO Collector-Cutoff Current $V_{CB} = 32 V, I_E = 0$ $V_{CB} = 32 V, I_E = 0, T_A = \pm 100 \text{ °C}$	100 10	nA μA

h <sub>FE</sub>	DC Current Gain	$V_{CE} = 5.0 \text{ V}, I_{C} = 2.0 \text{ mA}$	215	500	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C}$ = 10 mA, $I_{\rm B}$ = 0.5 mA		0.30	V
V <sub>BE(on)</sub>	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	$V_{CE} = 5.0 \text{ V}, I_{C} = 200 \ \mu\text{A},$	10	dB
		$R_s = 2.0 \text{ k}\Omega$ , f = 1.0 kHz,		
		B <sub>w</sub> = 200 Hz		

## NPN EPITAXIAL SILICON TRANSISTOR

#### **GENERAL PURPOSE TRANSISTOR**

#### ABSOLUTE MAXIMUM RATINGS (TA=25 °C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V <sub>CBO</sub>	30	<pre></pre>
Collector-Emitter Voltage	V <sub>CEO</sub>	20	
Emitter-Base Voltage	V <sub>EBO</sub>	5	
Collector Current	Ic	100	
Collector Dissipation	P <sub>C</sub>	350	
Storage Temperature	T <sub>STG</sub>	150	

Refer to KST5088 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25 °C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Base Breakdown Voltage Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter On Voltage Output Capacitance Noise Figures	$\begin{array}{c} BV_{CBO}\\ BV_{CEO}\\ BV_{EBO}\\ h_{FE}\\ V_{CE} \left(sat\right)\\ V_{BE} \left(on\right)\\ C_{OB}\\ NF \end{array}$	$\begin{array}{l} l_{c} = 10 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	30 20 5 110 0.55		220 0.25 0.7 4 10	V V V pF dB





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#### GENERAL PURPOSE TRANSISTOR

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	32 32 5 100 350 150	V V mA mW °C



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =2mA, I <sub>B</sub> =0	32		V
Emitter-Base Breakdown Voltage	BV <sub>FBO</sub>	$I_E=1\mu A$ , $I_C=0$	5		V
Collector Cut-off Current	ICES	V <sub>CB</sub> =32V, V <sub>BE</sub> =0		20	nA
Emitter Cut-off Current	I <sub>EBO</sub>	$V_{EB}=4V, I_{C}=0$		20	nA
DC Current Gain	h <sub>FE</sub>				
: BCW60B		$V_{CE}=5V$ , $I_{C}=10\mu A$	20		
: BCW60C			40		
: BCW60D			100		
: BCW60A		V <sub>CE</sub> =5V, I <sub>C</sub> =2mA	120	220	
: BCW60B			180	310	
: BCW60C			250	460	
: BCW60D			380	630	
: BCW60A		V <sub>CE</sub> =1V, I <sub>C</sub> =50mA	60		
: BCW60B			70		
: BCW60C			90		
: BCW60D			100		
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> =50mA, I <sub>B</sub> =1.25mA		0.55	V
		I <sub>C</sub> =10mA, I <sub>B</sub> =0.25mA		0.35	V
Base-Emitter Saturation Voltage	V <sub>BE</sub> (sat)	I <sub>C</sub> =50mA, I <sub>B</sub> =1.25mA	0.7	1.05	V
		I <sub>C</sub> =10mA, I <sub>B</sub> =0.25mA	0.6	0.85	V
Base-Emitter On Voltage	V <sub>BE</sub> (sat)	V <sub>CE</sub> =5V, I <sub>C</sub> =2mA	0.55	0.75	V
Output Capacitance	COB	$V_{CB}=10V, I_{E}=0$		4.5	pF
		f=1MHz			
Current Gain-Bandwidth Product	f <sub>T</sub>	I <sub>C</sub> =10mA, V <sub>CE</sub> =5V	125		MHz
Noise Figure	NF	I <sub>C</sub> =0.2mA, V <sub>CE</sub> =5V		6	dB
-		$R_G=2K\Omega$ , f=1KHz			
Turn On Time	t <sub>ON</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> 1=1mA		150	ns
Turn Off Time	t <sub>OFF</sub>	$V_{BB}=3.6V, I_B2=1mA$		800	ns
		$R1=R2=5K\Omega, R_{L}=990\Omega$			

#### 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<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-32	V
Emitter-Base Voltage	V <sub>CEO</sub> V <sub>EBO</sub>	-52	v
Collector Current	lc	-100	mA
Collector Dissipation	Pc	350	mW
Storage Temperature	T <sub>STG</sub>	-55 ~ 150	°C

• Refer to KS5086 for graphs



1. Base 2. Emitter 3. Collector

#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> = -2mA, I <sub>B</sub> =0	-32		V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	I <sub>E</sub> = -1μΑ, I <sub>C</sub> =0	-5		V
Collector Cut-off Current	ICES	V <sub>CB</sub> = -32V, V <sub>BE</sub> =0		-20	nA
DC Current Gain	h <sub>FE</sub>				
: BCW61B		$V_{CE}$ = -5V, $I_{C}$ = -10 $\mu$ A	20		
: BCW61C			40		
: BCW61D			100		
: BCW61A		$V_{CE}$ = -5V, $I_{C}$ = -2mA	120	220	
: BCW61B			140	310	
: BCW61C			250	460	
: BCW61D			380	630	
: BCW61A		$V_{CE}$ = -5V, $I_{C}$ = -50mA	60		
: BCW61B			80		
: BCW61C			100		
: BCW61D			100		
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (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 <sub>BE</sub> (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 <sub>BE</sub> (on)	$V_{CE} = -5V, I_{C} = -2MA$	0.6	0.75	V
Output Capacitance	C <sub>OB</sub>	$V_{CB}$ = -10V, I <sub>E</sub> =0		6	pF
Noise Figure	NF	$I_{C} = -0.2 \text{ mA}, V_{CE} = -5 \text{ V}$		6	dB
		$R_G=20K\Omega$ , f=1KHZ			
Turn On Time	t <sub>ON</sub>	$I_{C}$ = -10mA, $I_{B}$ 1= -1mA		150	ns
Turn Off Time	t <sub>OFF</sub>	$V_{BB} = -3.6V, I_B 2 = -1 mA$		800	ns
		R1=R2=50KΩ, R <sub>L</sub> =990Ω			







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Rev. B

# BCW61A/B/C/D

# PNP EPITAXIAL SILICON TRANSISTOR

#### MARKING CODE

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# BCW65C



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 <sub>CEO</sub>	Collector-Emitter Voltage	32	V
V <sub>CBO</sub>	Collector-Base Voltage	60	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
Ic	Collector Current - Continuous	1.0	A
T <sub>J</sub> , T <sub>stg</sub>	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**

5	TA = 25°C unless otherwise noted	

Symbol	Characteristic	Мах	Units
		*BCW65C	
P <sub>D</sub>	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/∘C
$R_{ heta JA}$	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)

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHAI	RACTERISTICS				
V <sub>(BR)CEO</sub>	Collector-Emitter Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	32		V
V <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage	$I_{\rm C} = 10 \ \mu {\rm A}, \ I_{\rm E} = 0$	60		V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage	$I_{E} = 10 \ \mu A, \ I_{C} = 0$	5.0		V
I <sub>CES</sub>	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 <sub>EBO</sub>	Emitter-Cutoff Current	$V_{EB} = 4.0 \text{ V}, I_{C} = 0$		20	nA
ON CHAR	ACTERISTICS	$I_{\rm C} = 100 \ \mu A, V_{\rm CE} = 10 \ V$	80		
		$I_{c} = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_{c} = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_{c} = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}$	180 250 50	630	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{C} = 100 \text{ mA}, I_{B} = 10 \text{ mA}$ $I_{C} = 500 \text{ mA}, _{B} = 50 \text{ mA}$		0.3 0.7	V
V <sub>BE(sat)</sub>	Base-Emitter Saturation Voltage	$I_{\rm C} = 500 \text{ mA}, I_{\rm B} = 50 \text{ mA}$		2.0	V
f <sub>T</sub> C <sub>obo</sub>	Current Gain - Bandwidth Product Output Capacitance	$I_{C} = 20 \text{ mA}, V_{CE} = 10 \text{ V},$ f = 100 MHz $V_{CB} = 10 \text{ V}, I_{E} = 0, f = 1.0 \text{ MHz}$	100	12	MHz pF
Cobo		$V_{CB} = 10$ V, $I_E = 0$ , $I = 1.0$ MHz		12	pr pF
	Noise Figure	$V_{EB} = 0.3 \text{ V}, 10 = 0, 1 = 1.0 \text{ With } 2$		10	dB
1 1 1	i toise i igure	$10 = 0.2 \text{ m/r}, \text{ v}_{\text{CE}} = 0.0,$		10	uD
		$R_s = 1.0 \text{ k}\Omega$ , $t = 1.0 \text{ kHz}$ , BW = 200 Hz			
Туріса	al Characteristics	R <sub>s</sub> = 1.0 κΩ, τ = 1.0 κHz, BW = 200 Hz Collector-E	Emitter S	aturation	<u> </u>
Typica z	al Characteristics Typical Pulsed Current Gain vs Collector Current	$R_s = 1.0 \text{ k}\Omega, T = 1.0 \text{ kHz},$ BW = 200  Hz Collector-E	Emitter S	aturation r Current	1 
	al Characteristics Typical Pulsed Current Gain vs Collector Current	R <sub>s</sub> = 1.0 kΩ, t = 1.0 kHz, BW = 200 Hz Collector-E Voltage vs $\beta = 10$ $\beta = 10$ $\beta = 10$ $\beta = 10$ $\beta = 10$ $\beta = 10$ $\beta = 10$	Emitter S Collecto	aturation r Current	

BCW65C

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Discrete POWER & Signal **Technologies** 

# BCW68G



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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CBO</sub>	Collector-Base Voltage	60	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
Ic	Collector Current - Continuous	800	mA
T <sub>J</sub> , T <sub>stg</sub>	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:

These ratings are based on a maximum junction temperature of 150 degrees C.
 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	Мах	Units
		*BCW68C	
PD	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/∘C
$R_{\theta JA}$	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)

	Parameter	Test Conditions	Min	Max	Units
	Collector Emitter Breckdown Voltogo	1 10 1 0		45	V
V <sub>(BR)CEO</sub>	Collector Page Breakdown Voltage	$I_{\rm C} = 10$ mA, $I_{\rm B} = 0$		40	V
V <sub>(BR)CES</sub>	Collector Base Breakdown Voltage	$I_{\rm C} = 10 \mu{\rm A}$		60	V
V (BR)CBO	Emitter Base Breakdown Voltage	$I_{\rm C} = 100 \mu{\rm A}, I_{\rm E} = 0$		5.0	V
V (BR)EBO		$I_E = 10 \ \mu A, I_C = 0$		20	v nA
CES	Collector-Cuton Current	V <sub>CE</sub> = 45 V V <sub>CE</sub> = 45 V, T <sub>A</sub> = 150 °C		10	μA
I <sub>EBO</sub>	Emitter-Cutoff Current	V <sub>EB</sub> = 4.0 V		20	nA
ON CHAR	ACTERISTICS				
	DC Current Gain	$I_{c} = 10 \text{ mA}$ , $V_{cc} = 1.0 \text{ V}$	120		
		$I_{\rm C} = 100 \text{ mA}, V_{\rm CE} = 1.0 \text{ V}$	160	400	
.,		$I_{\rm C} = 300 \text{ mA}, V_{\rm CE} = 1.0 \text{ V}$	60	4 -	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 300$ mA, $I_{\rm B} = 30$ mA		1.5	V
V <sub>BE(sat)</sub>	Base-Emitter Saturation Voltage	$I_{\rm C} = 500 {\rm mA},  I_{\rm B} = 50 {\rm mA}$		2.0	V
C <sub>obo</sub> C <sub>ibo</sub> NF	Input Capacitance Input Capacitance Noise Figure	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$ $V_{EB} = 0.5 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$ $I_C = 0.2 \text{ mA V}, V_{CE} = 5.0 \text{ V},$ $R_{-} = 1.0 \text{ kO}, f = 1.0 \text{ kHz}$		18 105 10	pF pF dB
		$R_{S} = 1.0 \text{ K}\Omega$ , $f = 1.0 \text{ KHZ}$ , $B_{W} = 200 \text{ Hz}$			
Туріса	I Characteristics				
Typica	Il Characteristics	Collector-E	mitter Sa	aturation	
Typica	Il Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-E ຂັ້Voltage vs	mitter Sa Collector	aturation r Current	1 1
	Il Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-E Voltage vs 0.5 $\beta = 10$ 0.4 0.3 0.2 0.2 0.1	Emitter Sa Collector	aturation r Current	
Typical PULSED CURRENT GAIN	Il Characteristics Typical Pulsed Current Gain vs Collector Current	Collector-E Voltage vs $\beta = 10$ 0.1 0.1 0.1	Emitter Sa Collector	aturation r Current	

BCW68G

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#### GENERAL PURPOSE TRANSISTOR

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V <sub>CBO</sub>	50	V
Collector-Emitter Voltage	V <sub>CEO</sub>	45	V
Emitter-Base Voltage	V <sub>EBO</sub>	5	V
Collector Current	I <sub>C</sub>	100	mA
Collector Dissipation	Pc	350	mW
Storage Temperature	T <sub>STG</sub>	150	°C

Refer to KST2222 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Collector-Base Breakdown Voltage Collector-Emitter Breakdown Voltage Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product	$BV_{CBO}$ $BV_{CEO}$ $BV_{CES}$ $BV_{EBO}$ $I_{CBO}$ $h_{FE}$ $V_{CE} (sat)$ $V_{BE} (sat)$ $V_{BE} (on)$ $f_{T}$	$\begin{split} & _{C}=10\mu A, \ l_{E}=0 \\ & _{C}=2mA, \ l_{B}=0 \\ & _{C}=2mA, \ V_{EB}=0 \\ & _{E}=10\mu A, \ l_{C}=0 \\ &V_{CE}=20V, \ l_{E}=0 \\ &V_{CE}=5V, \ l_{C}=2mA \\ & _{C}=10mA, \ l_{B}=0.5mA \\ & _{C}=50mA, \ l_{B}=2.5mA \\ & _{C}=50mA, \ l_{B}=2.5mA \\ & _{C}=2mA, \ V_{CE}=5V \\ &V_{CE}=5V, \ l_{C}=10mA \\ &f=35MHz \\ &V_{CD}=10V \\ &l_{E}=0 \end{split}$	50 45 45 5 110 0.6	0.21 0.85 300	100 220 0.25 0.75	V V V NA V V V V MHz
Noise Figures	NF	$r_{CE}$ f=1MHz $V_{CE}$ =5V, I <sub>C</sub> =2.0mA $R_{G}$ =2K $\Omega$ , f=1KHz			4 10	pF dB





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# NPN EPITAXIAL SILICON TRANSISTOR

#### **GENERAL PURPOSE TRANSISTOR**

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	45 45 5 200 350 150	∨ ∨ mA mW °C

Refer to KS5088 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =2mA, I <sub>B</sub> =0	45		V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	$I_E=1\mu A$ , $I_C=0$	5		V
Collector Cut-off Current	ICES	V <sub>CE</sub> =32V, V <sub>BE</sub> =0		20	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> =4V, I <sub>C</sub> =0		20	nA
DC Current Gain	h <sub>FE</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =2mA	120	220	
		V <sub>CE</sub> =1V, I <sub>C</sub> =50mA	60		
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> =10mA, I <sub>B</sub> =0.25mA		0.35	V
		I <sub>C</sub> =50mA, I <sub>B</sub> =1.25mA		0.55	V
Base-Emitter Saturation Voltage	V <sub>BE</sub> (sat)	I <sub>C</sub> =10mA, I <sub>B</sub> =0.25mA	0.6	0.85	V
C C		I <sub>C</sub> =50mA, I <sub>B</sub> =1.25mA	0.7	1.05	V
Base-Emitter On Voltage	V <sub>BE</sub> (on)	I <sub>C</sub> =2mA, V <sub>CE</sub> =5V	0.55	0.75	V
Current Gain Bandwidth Product	f <sub>T</sub>	$V_{CE}$ =5V, I <sub>C</sub> =10mA	125		MHz
Output Capacitance	C <sub>OB</sub>	V <sub>CB</sub> =10V, I <sub>E</sub> =0 f=1MHz		4.5	pF
Noise Figure	NF	$I_{c}=0.2$ mA, $V_{cE}=5V$ f=1KHz, $R_{s}=2K\Omega$		6	dB
Turn On Time	T <sub>ON</sub>	I <sub>C</sub> =10mA, I <sub>B1</sub> =1mA		150	ns
Turn Off Time	TOFF	I <sub>B2</sub> =1mA, V <sub>BB</sub> =3.6V		800	ns
		$R_L=990\Omega R_1=R_2=5K\Omega$			

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#### GENERAL PURPOSE TRANSISTOR

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	45 45 5 200 350 150	V V mA mW °C

• Refer to KS3904 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =2.0mA, I <sub>B</sub> =0	45		V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	$I_{E}=1.0\mu A, I_{C}=0$	5		V
Collector Cut-off Current	CES	$V_{CE}=32V, V_{BE}=0$		20	nA nA
DC Current Gain	I <sub>EBO</sub>	$V_{EB}=4V, I_{C}=0$	120	20	nA
De current Gain	11FE	$V_{CE}=5V$ , $I_{C}=10\mu A$	120	310	
		$V_{CE}=1V$ , $I_{C}=50$ mA	70	010	
Collector-Emitter Saturation Voltage	Vor (sat)	I <sub>c</sub> =10mA, I <sub>B</sub> =0.25mA	10	0.35	V
Concetor Enniter Catalation Voltage	VCE (Sat)	I <sub>C</sub> =50mA, I <sub>B</sub> =1.25mA		0.55	v
Base-Emitter Saturation Voltage	V <sub>BF</sub> (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 <sub>BE</sub> (on)	$I_{C}=2.0$ mA, $V_{CE}=5V$	0.55	0.75	V
Current Gain Bandwidth Product	f⊤	$I_{C}=10MA$ , $V_{CE}=5V$	125		MHz
Output Capacitance	C <sub>OB</sub>	$V_{CE}=10V, I_{E}=0$		4.5	pF
Noise Figure	NF	$V_{CE}=5V, I_{C}=0.2mA$		6	dB
Turn On Time Turn Off Time	T <sub>ON</sub> T <sub>OFF</sub>	$\begin{array}{l} R_{S}=2 n \Omega_{2}, \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$		150 800	ns ns





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# NPN EPITAXIAL SILICON TRANSISTOR

#### **GENERAL PURPOSE TRANSISTOR**

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	45 45 5 200 350 150	V V mA mW °C

Refer to KS3904 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current Emitter Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product	$\begin{array}{c} BV_{CEO}\\ BV_{BBO}\\ I_{CES}\\ I_{BBO}\\ h_{FE} \end{array}$	$\begin{array}{l} I_{C}{=}2.0mA, \ I_{B}{=}0\\ I_{E}{=}1.0\muA, \ I_{C}{=}0\\ V_{CE}{=}32V, \ V_{BE}{=}0\\ V_{CE}{=}5V, \ I_{C}{=}10\muA\\ V_{CE}{=}5V, \ I_{C}{=}2.0mA\\ V_{CE}{=}1V, \ I_{C}{=}50mA\\ I_{C}{=}10mA, \ I_{B}{=}0.25mA\\ I_{C}{=}10mA, \ I_{B}{=}1.25mA\\ I_{C}{=}10mA, \ I_{B}{=}1.25mA\\ I_{C}{=}50mA, \ I_{B}{=}1.25mA\\ I_{C}{=}5VmA, \ I_{B}{=}1.25mA\\ I_{C}{=}5VmA, \ I_{B}{=}1.25mA\\ I_{C}{=}5VmA, \ I_{C}{=}5V\\ I_{C}{=}10mA, \ V_{CE}{=}5V\\ I_{C}{=}10mA, \ V_{CE}{=}5V\\ \end{array}$	45 5 40 250 90 0.6 0.7 0.55 125	20 20 460 0.35 0.55 0.85 1.05 0.75	V NA NA V V V V MHz
Output Capacitance Noise Figure Turn On Time Turn Off Time	C <sub>OB</sub> NF T <sub>ON</sub> T <sub>OFF</sub>	$\begin{array}{l} V_{CB} = 10V, \ I_E = 0 \\ f = 1MHz \\ V_{CE} = 5V, \ I_C = 0.2mA \\ R_S = 2K\Omega, \ f = 1KHz \\ I_C = 10mA, \ I_{B1} = 1.0mA \\ V_{BB} = 3.6V, \ I_{B2} = 1.0mA \\ R_1 = R_2 = 5K\Omega, \ R_L = 990\Omega \end{array}$		4.5 6 150 800	pF dB ns ns





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# NPN EPITAXIAL SILICON TRANSISTOR

#### **GENERAL PURPOSE TRANSISTOR**

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	45 45 5 200 350 150	V V mA mW °C

Refer to KS3904 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current Emitter Cut-off Current DC Current Gain	BV <sub>CEO</sub> BV <sub>EBO</sub> I <sub>CES</sub> I <sub>EBO</sub> h <sub>FE</sub>	$\begin{array}{l}  _{C}=2.0\text{mA},  _{B}=0 \\  _{E}=1.0\mu\text{A},  _{C}=0 \\ \text{V}_{CE}=32\text{V}, \text{V}_{BE}=0 \\ \text{V}_{EB}=4\text{V},  _{C}=0 \\ \text{V}_{CE}=5\text{V},  _{C}=10\mu\text{A} \\ \text{V}_{CE}=5\text{V},  _{C}=2.0\text{mA} \end{array}$	45 5 100 380	20 20 630	V V nA nA
Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product	$V_{CE}$ (sat) $V_{BE}$ (sat) $V_{BE}$ (on) $f_{T}$	$\begin{array}{l} V_{CE}{=}1V,\ l_{c}{=}50mA \\ l_{c}{=}10mA,\ l_{B}{=}0.25mA \\ l_{c}{=}50mA,\ l_{B}{=}1.25mA \\ l_{c}{=}10mA,\ l_{B}{=}1.25mA \\ l_{C}{=}50mA,\ l_{B}{=}1.25mA \\ l_{C}{=}2.0mA,\ V_{CE}{=}5V \\ l_{C}{=}10mA,\ V_{CE}{=}5V \end{array}$	100 0.6 0.7 0.55 125	0.35 0.55 0.85 1.05 0.75	V V V V MHz
Output Capacitance	Сов	V <sub>CB</sub> =10V, I <sub>E</sub> =0 f=1MHz		4.5	pF
Noise Figure	NF	$V_{CE}$ =5V, I <sub>C</sub> =0.2mA R <sub>S</sub> =2K $\Omega$ , f=1KHz		6	dB
Turn On Time Turn Off Time	T <sub>ON</sub> T <sub>OFF</sub>	$\begin{array}{l} I_{C}{=}10mA,\ I_{B1}{=}1.0mA \\ V_{BB}{=}3.6V,\ I_{B2}{=}1.0mA \\ R_{1}{=}R_{2}{=}5K\Omega,\ R_{L}{=}990\Omega \end{array}$		150 800	ns ns





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# PNP EPITAXIAL SILICON TRANSISTOR

#### **GENERAL PURPOSE TRANSISTOR**

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	-45 -45 -5.0 -100 350 150	∨ ∨ mA mW °C

Refer to KS5086 for graphs



#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

	Characteristic	Symbol	Test Conditions	Min	Max	Unit
Noise Figure $F$ I_c=0.2mA, V_{CE}=5V R_S=2K\Omega, f=1KHz         6           Turn On Time         ToN         I_c= -10mA, I_{B1}= -1mA         150           Turn Off Time         ToFF         I_{B2}= -1mA, V_{BB}=3.6V         800	Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product Noise Figure Turn On Time Turn Of Time	BV <sub>CEO</sub> BV <sub>EBO</sub> I <sub>CES</sub> h <sub>FE</sub> V <sub>CE</sub> (sat) V <sub>BE</sub> (sat) V <sub>BE</sub> (on) C <sub>OB</sub> NF T <sub>ON</sub> T <sub>OFF</sub>	$\begin{array}{c} I_{C} = -2mA, \ I_{B} = 0 \\ I_{E} - 1\muA, \ I_{C} = 0 \\ V_{CE} = -32V, \ V_{BE} = 0 \\ V_{EB} = -5V, \ I_{C} = -2mA \\ V_{CE} = -1V, \ I_{C} = -50\muA \\ I_{C} = -10mA, \ I_{B} = -0.25mA \\ I_{C} = -50mA, \ I_{B} = -1.25mA \\ I_{C} = -50mA, \ I_{B} = -1.25mA \\ I_{C} = -50mA, \ I_{B} = -1.25mA \\ I_{C} = -2mA, \ V_{CE} = -5V \\ V_{CB} = -10V, \ I_{E} = 0 \\ f = 1MHz \\ I_{C} = 0.2mA, \ V_{CE} = 5V \\ R_{S} = 2K\Omega, \ f = 1KHz \\ I_{C} = -10mA, \ I_{B} = -1mA \\ I_{B2} = -1mA, \ V_{BB} = 3.6V \end{array}$	-45 -5 120 60 -0.6 -0.68 -0.6	-20 220 -0.25 -0.55 -0.85 -1.05 -0.75 6 6 150 800	V NA V V V V PF dB ns ns





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## GENERAL PURPOSE TRANSISTOR

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage Collector-Emitter Voltage Emitter-Base Voltage Collector Current Collector Dissipation Storage Temperature	V <sub>CBO</sub> V <sub>CEO</sub> V <sub>EBO</sub> I <sub>C</sub> P <sub>C</sub> T <sub>STG</sub>	-45 -45 -5 -100 350 150	∨ ∨ mA mW °C

• Refer to KS5086 for graphs



## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product Noise Figure Turn On Time Turn Off Time	$BV_{CEO} \\ BV_{EBO} \\ I_{CES} \\ h_{FE} \\ V_{CE} (sat) \\ V_{BE} (sat) \\ V_{BE} (on) \\ C_{OB} \\ NF \\ T_{ON} \\ T_{OFF} \\ \end{array}$	$\begin{array}{l} l_{C}=-2mA, \ l_{B}=0\\ l_{E}=-1\muA, \ l_{C}=0\\ V_{CE}=-32V, \ V_{BE}=0\\ V_{CE}=-5V, \ l_{C}=-10\muA\\ V_{CE}=-5V, \ l_{C}=-2mA\\ V_{CE}=-1V, \ l_{C}=-50mA\\ l_{C}=-10mA, \ l_{B}=-0.25mA\\ l_{C}=-50mA, \ l_{B}=-1.25mA\\ l_{C}=-50mA, \ l_{B}=-1.25mA\\ l_{C}=-50mA, \ l_{B}=-1.25mA\\ l_{C}=-50mA, \ l_{C}=-5V\\ V_{CB}=-10V, \ l_{E}=0\\ f=1MHz\\ l_{C}=-0.2mA, \ V_{CE}=-5V\\ f=1KHz, \ R_{S}=2K\Omega\\ l_{C}=-10mA, \ l_{B}=-1mA\\ l_{B}=-1mA, \ V_{BB}=-3.6V\\ R_{L}=990\Omega\\ \end{array}$	-45 -5 30 140 80 -0.6 -0.68 -0.6	-20 310 -0.25 -0.55 -0.85 -1.05 -0.75 6 6 6 150 800	V NA V V V V PF dB ns ns





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• Refer to KS5086 for graphs



## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product Noise Figure Turn On Time Turn Off Time	$\begin{array}{c} BV_{CEO}\\ BV_{EBO}\\ l_{CES}\\ h_{FE} \end{array}$ $V_{CE} (sat)$ $V_{BE} (sat)$ $V_{DE} (on)\\ C_{OB}\\ NF\\ T_{ON}\\ T_{OFF} \end{array}$	$\begin{array}{l}  _{C^{=}} - 2mA,  I_{B} = 0 \\  _{E^{=}} - 1\muA,  I_{C} = 0 \\ V_{CE^{=}} - 32V,  V_{BE} = 0 \\ V_{CE^{=}} - 5V,  I_{C^{=}} - 10\muA \\ V_{CE^{=}} - 5V,  I_{C^{=}} - 2mA \\ V_{CE^{=}} - 1V,  I_{C^{=}} - 50mA \\ I_{C^{=}} - 10mA,  I_{B^{=}} - 0.25mA \\ I_{C^{=}} - 50mA,  I_{B^{=}} - 1.25mA \\ I_{C^{=}} - 50mA,  I_{B^{=}} - 1.25mA \\ I_{C^{=}} - 50mA,  I_{B^{=}} - 1.25mA \\ I_{C^{=}} - 50mA,  V_{CE^{=}} - 5V \\ V_{CB^{=}} - 10V,  I_{E^{=}} 0 \\ f_{E^{=}} 1MHz \\ I_{C^{=}} - 0.2mA,  V_{CE^{=}} - 5V \\ f_{E^{=}} 1KHz,  R_{S} = 2K\Omega \\ I_{C^{=}} - 10mA,  I_{B^{=}} - 1mA \\ I_{B^{2^{=}}} - 1mA,  V_{BB^{=}} - 3.6V \\ R_{1} = 990\Omega \end{array}$	-45 -5 40 250 100 -0.6 -0.68 -0.6	-20 460 -0.25 -0.55 -0.85 -1.05 -0.75 6 6 6 150 800	V NA V V V V PF dB ns ns







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• Refer to KST5086 for graphs



## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Emitter Breakdown Voltage Emitter-Base Breakdown Voltage Collector Cut-off Current DC Current Gain Collector-Emitter Saturation Voltage Base-Emitter Saturation Voltage Base-Emitter On Voltage Current Gain Bandwidth Product Noise Figure Turn On Time Turn Of Time	$BV_{CEO} \\ BV_{EBO} \\ I_{CES} \\ h_{FE} \\ V_{CE} (sat) \\ V_{BE} (sat) \\ V_{BE} (on) \\ C_{OB} \\ NF \\ T_{ON} \\ T_{OFF} \\ \end{bmatrix}$	$\begin{split} I_{C} &= -2mA, \ I_{B} = 0 \\ I_{E} &= -1\muA, \ I_{C} = 0 \\ V_{CE} &= -32V, \ V_{BE} = 0 \\ V_{CE} &= -5V, \ I_{C} = -10\muA \\ V_{CE} &= -5V, \ I_{C} = -2mA \\ V_{CE} &= -10mA, \ I_{B} = -0.25mA \\ I_{C} &= -10mA, \ I_{B} = -0.25mA \\ I_{C} &= -10mA, \ I_{B} = -1.25mA \\ I_{C} &= -50mA, \ I_{B} = -1.25mA \\ I_{C} &= -50mA, \ I_{B} = -1.25mA \\ I_{C} &= -2mA, \ V_{CE} = -5V \\ V_{CB} &= -10V, \ I_{E} = 0 \\ f = 1MHz \\ I_{C} &= -0.2mA, \ V_{CE} = -5V \\ R_{S} = 2K\Omega, \ f = 1KHz \\ I_{C} &= -10mA, \ I_{B1} = -1mA \\ I_{B2} &= -1mA, \ V_{BB} = -3.6V \\ R_{S} = 9000 \end{split}$	-45 -5 100 380 110 -0.6 -0.68 -0.6	-20 630 -0.25 -0.55 -0.85 -1.05 -0.75 6 6 6 150 800	V NA V V V V V PF dB ns ns





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Discrete POWER & Signal **Technologies** 



**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 <sub>CEO</sub>	Collector-Emitter Voltage	45	V
V <sub>CES</sub>	Collector-Base Voltage	45	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current - Continuous	500	mA
T <sub>J</sub> , T <sub>stg</sub>	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 Character**

ICTIVE .	TA OFFOO subless stills multiple method
iailu a	$IA = 25^{\circ}I$ , Unless otherwise noted

Symbol	Characteristic	Мах	Units
		BCX79	
P <sub>D</sub>	Total Device Dissipation	625	mW
	Derate above 25°C	5.0	mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{ ext{ hetaJA}}$	Thermal Resistance, Junction to Ambient	200	°C/W

# PNP General Purpose Amplifier (continued)

Symbol	Electrical Characteristics TA = 25°C unless otherwise noted								
	Parameter	Test Conditions	Min	Max	Units				
	Collector-Emitter Breakdown Voltage	$L_{2} = 10 \text{ mA}$ $L_{2} = 0$	45		V				
V (BR)CEO	Emitter-Base Breakdown Voltage	$I_{\rm C} = 10 \text{ mA}, I_{\rm B} = 0$	5.0		V				
I <sub>CEX</sub>	Collector Cutoff Current	$V_{CE} = 45 \text{ V}, V_{BE} = 0.2 \text{ V},$ $T_{A} = \pm 100 \text{ °C}.$	0.0	20	μA				
I <sub>CES</sub>	Collector Cutoff Current	$V_{CE} = 45 \text{ V}, I_E = 0,$ $V_{CE} = 45 \text{ V}, I_F = 0, T_A = +125 \text{ °C}$		10 2.5	nA uA				
I <sub>EBO</sub>	Emitter Cutoff Current	$V_{EB} = 4.0 \text{ V}, \text{ I}_{C} = 0$		20	nA				
ON CHAR/	ACTERISTICS								
h <sub>FE</sub>	DC Current Gain	$V_{CE} = 5.0 \text{ V}, I_C = 2.0 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 10 \text{ mA}$ $V_{CF} = 1.0 \text{ V}, I_C = 100 \text{ mA}$	120 80 40	630 1,000					
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	$I_{\rm C} = 100 \text{ mA}, I_{\rm B} = 2.5 \text{ mA}$		0.6	V				
V <sub>BE(sat)</sub>	Base-Emitter Saturation Voltage	$I_{\rm C}$ = 100 mA, $I_{\rm B}$ = 2.5 mA		1.0	V				
V <sub>BE(on)</sub>	Base-Emitter On Voltage	$V_{CE} = 5.0 \text{ V}, I_{C} = 2.0 \text{ mA}$	0.6	0.7	V				
SMALL SI	GNAL CHARACTERISTICS	Vop = 10 V f = 1 0 MHz		4.5	pF				
Cat	Emitter-Base Capacitance	$V_{CB} = 0.5 \text{ V} \text{ f} = 1.0 \text{ MHz}$		15	pF				
h <sub>ie</sub>	Input Impedance	$V_{EB} = 0.0 \text{ V}, 1 = 1.0 \text{ Im } 12$ $I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V},$ f = 1.0  kHz	1.6	8.5	kΩ				
h <sub>oe</sub>	Output Admittance	$I_{c} = 2.0 \text{ mA}, V_{cE} = 5.0 \text{ V},$ f = 1.0 kHz		100	μmhos				
NF	Noise Figure	$ \begin{array}{l} {\sf V}_{\sf CE} = 5.0 \; {\sf V}, \; {\sf I}_{\sf C} = 0.2 \; {\sf mA}, \\ {\sf R}_{\sf S} = 2.0 \; {\sf k}\Omega, \; \; {\sf f} = 1.0 \; {\sf kHz} \end{array} $		6.0	dB				
SWITCHIN	NG CHARACTERISTICS								
t <sub>on</sub>	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				
	Turn-on Time	$V_{CC} = 10 \text{ V}, \text{ I}_{C} = 100 \text{ mA},$ $V_{DD} = 5.0 \text{ V}, \text{ I}_{D4} = \text{ I}_{D2} = 10 \text{ mA}$		150	ns				
t <sub>on</sub>		$v_{BB} = 0.0 v_1 v_1 v_{B1} = v_{B2} = 10 m v_1$							
t <sub>off</sub>	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				

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