

# BCX70

# SOT23 NPN SILICON PLANAR SMALL SIGNAL TRANSISTOR

ISSUE 2 – FEBRUARY 95

# BCX70

## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	45			V	$I_C=2\text{mA}$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	$I_{EBO}=1\mu\text{A}$
Collector-Emitter Cut-off Current	$I_{CES}$	20			nA	$V_{CES}=45\text{V}$
		20			$\mu\text{A}$	$V_{CES}=45\text{V}$ , $T_{amb}=150^{\circ}\text{C}$
Emitter-Base Cut-Off Current	$I_{EBO}$	20			nA	$V_{EBO}=4\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	0.12	0.12	0.35	V	$I_C=10\text{mA}$ , $I_B=0.25\text{mA}$
		0.20	0.20	0.55	V	$I_C=50\text{mA}$ , $I_B=1.25\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.60	0.70	0.85	V	$I_C=10\text{mA}$ , $I_B=0.25\text{mA}$
		0.70	0.83	1.05	V	$I_C=50\text{mA}$ , $I_B=1.25\text{mA}$
Base - Emitter Voltage	$V_{BE}$	0.52	0.65	0.75	V	$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		0.55	0.78	0.78	V	$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
Static Forward Current Transfer Ratio	$h_{FE}$	120	170	220		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		50				$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
BCX70H	$h_{FE}$	20	145	310		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		180	250			$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
BCX70J	$h_{FE}$	40	220	460		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		250	350			$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
BCX70K	$h_{FE}$	100	300	630		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		380	500			$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
Transition Frequency	$f_T$	125	250		MHz	$I_C=10\text{mA}$ , $V_{CE}=5\text{V}$ , $f=100\text{MHz}$
						$V_{EBO}=0.5\text{V}$ , $f=1\text{MHz}$
Emitter-Base Capacitance	$C_{ebo}$		8		pF	$V_{CBO}=10\text{V}$ , $f=1\text{MHz}$
Collector-Base Capacitance	$C_{cbo}$		2	4.5	pF	$I_C=0.2\text{mA}$ , $V_{CE}=5\text{V}$ , $R_G=2\text{K}\Omega$ , $f=1\text{KH}$
Noise Figure	N		6		dB	$\Delta f=200\text{Hz}$
Switching times:	$t_d$ $t_r$ $t_{on}$ $t_s$ $t_f$ $t_{off}$		35		ns	$I_C=10\text{mA}$ , $I_B=10:1:1\text{mA}$ $R_1=5\text{K}\Omega$ , $R_2=5\text{K}\Omega$ , $V_{BB}=3.6\text{V}$ , $R_L=990\Omega$
			50		ns	
			85	150	ns	
			400		ns	
			80		ns	
			480	800	ns	

\*Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  
Spice parameter data is available upon request for this device

PARTMARKING DETAIL – BCX70G – AG

- BCX70H – AH
- BCX70J – AJ
- BCX70K – AK
- BCX70GR – AW
- BCX70HR – 9P
- BCX70JR – AX
- BCX70KR – P9

COMPLEMENTARY TYPE – BCX71

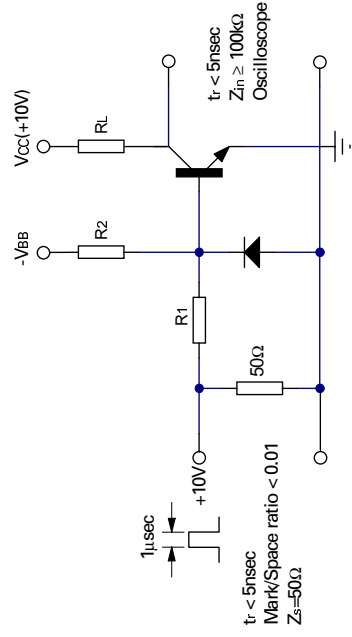
## ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Emitter Voltage	$V_{CES}$	45	V
Collector-Emitter Voltage	$V_{CEO}$	45	V
Emitter-Base Voltage	$V_{EBO}$	5	V
Continuous Collector Current	$I_C$	200	mA
Base Current	$I_B$	50	mA
Power Dissipation at $T_{amb}=25^{\circ}\text{C}$	$P_{TOT}$	330	mW
Operating and Storage Temperature Range	$t_j$ :stg	-55 to +150	$^{\circ}\text{C}$

## FOUR TERMINAL NETWORK DATA ( $I_C=2\text{mA}$ , $V_{CE}=5\text{V}$ , $f=1\text{kHz}$ )

	$h_{FE}$ Group G		$h_{FE}$ Group H		$h_{FE}$ Group J		$h_{FE}$ Group K	
	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Max.
$h_{11e}$	1.6	2.7	2.5	3.6	4.5	8.5	4.5	12
$h_{12e}$	1.5		2		2		3	$10^{-4}$
$h_{21e}$	200	260	24	260	330	520		
$h_{22e}$	18	30	50	24	30	60	50	100

## SWITCHING CIRCUIT



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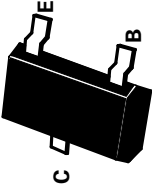
## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	45			V	$I_C=2\text{mA}$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	$I_{EBO}=1\mu\text{A}$
Collector-Emitter Cut-off Current	$I_{CES}$	20			nA	$V_{CES}=45\text{V}$
		20			$\mu\text{A}$	$V_{CES}=45\text{V}$ , $T_{amb}=150^{\circ}\text{C}$
Emitter-Base Cut-Off Current	$I_{EBO}$	20			nA	$V_{EBO}=4\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	0.12	0.12	0.35	V	$I_C=10\text{mA}$ , $I_B=0.25\text{mA}$
		0.20	0.20	0.55	V	$I_C=50\text{mA}$ , $I_B=1.25\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.60	0.70	0.85	V	$I_C=10\text{mA}$ , $I_B=0.25\text{mA}$
		0.70	0.83	1.05	V	$I_C=50\text{mA}$ , $I_B=1.25\text{mA}$
Base - Emitter Voltage	$V_{BE}$	0.52	0.65	0.75	V	$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		0.55	0.65	0.78	V	$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
Static Forward Current Transfer Ratio	$h_{FE}$	120	170	220		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		50	170	220		$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
BCX70H	$h_{FE}$	20	145	310		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		180	250	310		$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
BCX70J	$h_{FE}$	40	220	460		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		250	350	460		$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
BCX70K	$h_{FE}$	100	300	630		$I_C=10\mu\text{A}$ , $V_{CE}=5\text{V}$
		380	500	630		$I_C=2\text{mA}$ , $V_{CE}=5\text{V}$
Transition Frequency	$f_T$	125	250		MHz	$I_C=10\text{mA}$ , $V_{CE}=5\text{V}$ , $f=100\text{MHz}$
						$V_{EBO}=0.5\text{V}$ , $f=1\text{MHz}$
Emitter-Base Capacitance	$C_{ebo}$		8		pF	$V_{CBO}=10\text{V}$ , $f=1\text{MHz}$
Collector-Base Capacitance	$C_{cbo}$		2	4.5	pF	$I_C=0.2\text{mA}$ , $V_{CE}=5\text{V}$ , $R_G=2\text{K}\Omega$ , $f=1\text{KH}$
Noise Figure	N		2	6	dB	$\Delta f=200\text{Hz}$
Switching times:	$t_d$ $t_r$ $t_{on}$ $t_s$ $t_f$ $t_{off}$		35		ns	$I_C=10\text{mA}$ , $I_B=10:1:1\text{mA}$ , $R_1=5\text{K}\Omega$ , $R_2=5\text{K}\Omega$ , $V_{BB}=3.6\text{V}$ , $R_L=990\Omega$
			50		ns	
			85	150	ns	
			400		ns	
			80		ns	
			480	800	ns	

\*Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  
Spice parameter data is available upon request for this device

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BCX70KR – P9



COMPLEMENTARY TYPE – BCX71

## ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Emitter Voltage	$V_{CES}$	45	V
Collector-Emitter Voltage	$V_{CEO}$	45	V
Emitter-Base Voltage	$V_{EBO}$	5	V
Continuous Collector Current	$I_C$	200	mA
Base Current	$I_B$	50	mA
Power Dissipation at $T_{amb}=25^{\circ}\text{C}$	$P_{TOT}$	330	mW
Operating and Storage Temperature Range	$t_j$ :stg	-55 to +150	$^{\circ}\text{C}$

## FOUR TERMINAL NETWORK DATA ( $I_C=2\text{mA}$ , $V_{CE}=5\text{V}$ , $f=1\text{kHz}$ )

	$h_{FE}$ Group G		$h_{FE}$ Group H		$h_{FE}$ Group J		$h_{FE}$ Group K	
	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Max.
$h_{11e}$	1.6	2.7	2.5	3.6	4.5	8.5	4.5	12
$h_{12e}$	1.5		2		2		3	$10^{-4}$
$h_{21e}$	200	260	24	260	330	520	50	100
$h_{22e}$	18	30	50	30	60	100		

## SWITCHING CIRCUIT

