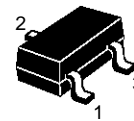


## SMALL SIGNAL NPN TRANSISTORS

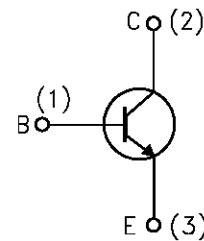
Type	Marking
BCW60A	AA
BCW60B	AB
BCW60C	AC
BCX70G	AG
BCX70H	AH
BCX70J	AJ

- SILICON EPITAXIAL PLANAR NPN TRANSISTORS
- MINIATURE PLASTIC PACKAGE FOR APPLICATION IN SURFACE MOUNTING CIRCUITS
- LOW LEVEL AF AMPLIFICATION AND SWITCHING
- NPN COMPLEMENTS ARE RESPECTIVELY BCW61 AND BCX71



**SOT-23**

### INTERNAL SCHEMATIC DIAGRAM



SC08960

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BCW60	BCX70	
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	-32	-45	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	-32	-45	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	-5		V
$I_C$	Collector Current	-0.2		A
$I_B$	Base Current	-0.05		A
$P_{tot}$	Total Dissipation at $T_C = 25^\circ\text{C}$	310		mW
$T_{stg}$	Storage Temperature	-65 to 150		$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150		$^\circ\text{C}$

## BCW60/BCX70

### THERMAL DATA

$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	450	$^{\circ}\text{C/W}$
$R_{thj-SR}$	Thermal Resistance Junction-Substrate	Max	320	$^{\circ}\text{C/W}$

• Mounted on a ceramic substrate area = 0.7 mm x 2.5 cm<sup>2</sup>

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = \text{Rated } V_{CES}$ $V_{CE} = \text{Rated } V_{CES}$ $T_{amb} = 150\text{ }^{\circ}\text{C}$			20 20	nA $\mu\text{A}$
$I_{EBO}$	Collector Cut-off Current ( $I_E = 0$ )	$V_{EB} = 4\text{ V}$			20	nA
$V_{(BR)CEO}^*$	Collector-Emitter Breakdown Voltage ( $I_B = 0$ )	$I_C = 2\text{ mA}$ for <b>BCW60</b> for <b>BCX70</b>	32 45			V V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ( $I_C = 0$ )	$I_C = 1\text{ }\mu\text{A}$	5			V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}$ $I_B = 0.25\text{ mA}$ $I_C = 50\text{ mA}$ $I_B = 1.25\text{ mA}$			0.35 0.55	V V
$V_{BE(sat)}^*$	Collector-Base Saturation Voltage	$I_C = 10\text{ mA}$ $I_B = 0.25\text{ mA}$ $I_C = 50\text{ mA}$ $I_B = 1.25\text{ mA}$			0.85 1.05	V V
$V_{BE(on)}$	Collector-Base On Voltage	$I_C = 2\text{ mA}$ $V_{CE} = 5\text{ V}$	0.55		0.75	V
$h_{FE}^*$	DC Current Gain	$I_C = 0.01\text{ mA}$ $V_{CE} = 5\text{ V}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b> $I_C = 2\text{ mA}$ $V_{CE} = 5\text{ V}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b> $I_C = 50\text{ mA}$ $V_{CE} = 1\text{ V}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b>	20 40	80 145 220	220 310 460	
$f_T$	Transition Frequency	$I_C = 10\text{ mA}$ $V_{CE} = 5\text{ V}$ $f = 100\text{ MHz}$	125			MHz
$C_{CB}$	Collector Base Capacitance	$I_E = 0$ $V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$			4.5	pF
$C_{EB}$	Emitter Base Capacitance	$I_C = 0$ $V_{CE} = 0.5\text{ V}$ $f = 1\text{ MHz}$		8		pF
NF	Noise Figure	$V_{CE} = 5\text{ V}$ $I_C = 0.2\text{ mA}$ $f = 1\text{ KHz}$ $\Delta f = 200\text{ Hz}$ $R_G = 2\text{ K}\Omega$		2	6	dB
$h_{ie}$	Input Impedance	$V_{CE} = 5\text{ V}$ $I_C = 2\text{ mA}$ $f = 1\text{ KHz}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b>	1.6 2.5 3.2	2.7 3.6 4.5	4.5 6 8.5	$\text{K}\Omega$ $\text{K}\Omega$ $\text{K}\Omega$
$h_{re}$	Reverse Voltage Ratio	$V_{CE} = 5\text{ V}$ $I_C = 2\text{ mA}$ $f = 1\text{ KHz}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b>		1.5 2 2		$10^{-4}$ $10^{-4}$ $10^{-4}$

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$

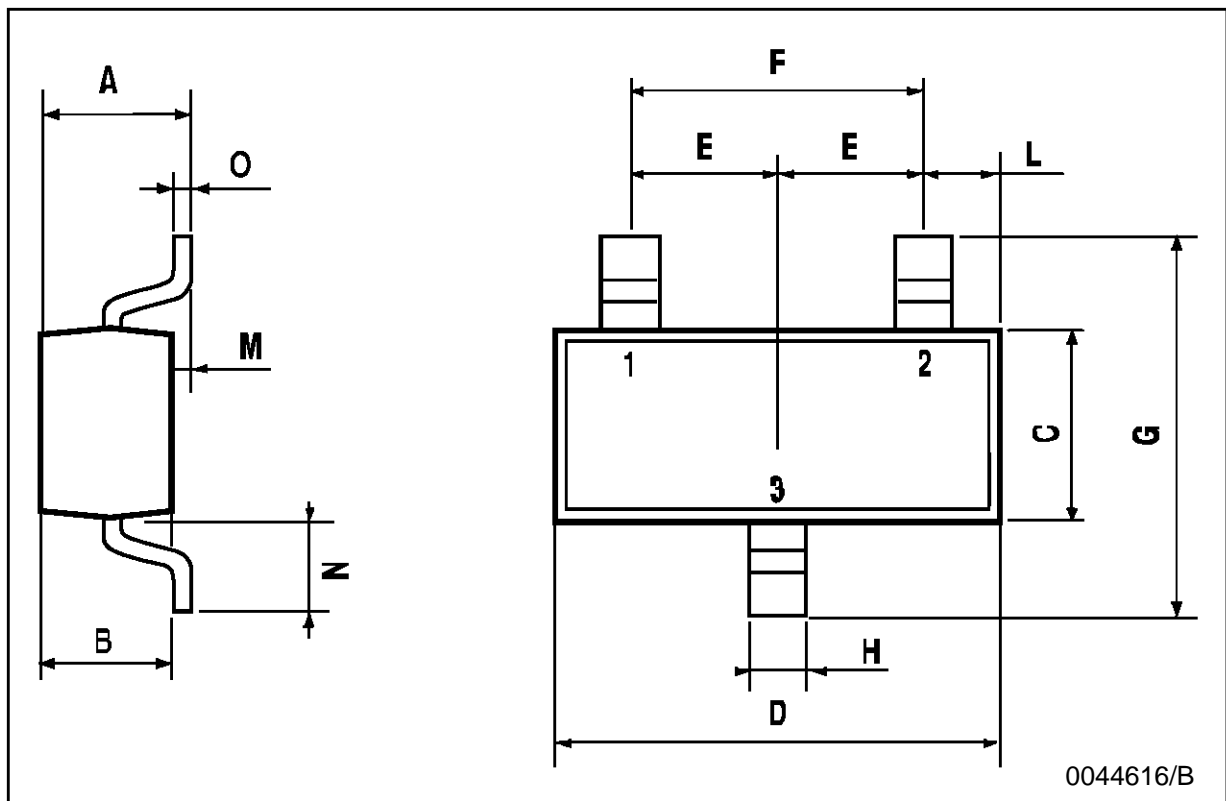
## ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$h_{fe}$	Small Signal Current Gain	$V_{CE} = 5\text{ V}$ $I_C = 2\text{ mA}$ $f = 1\text{ KHz}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b>		200 260 330		
$h_{oe}$	Output Admittance	$V_{CE} = 5\text{ V}$ $I_C = 2\text{ mA}$ $f = 1\text{ KHz}$ for <b>group A, G</b> for <b>group B, H</b> for <b>group C, J</b>		18 24 30	30 50 60	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_d$	Delay Time	$I_C = 10\text{ mA}$ $I_{B1} = I_{B2} = 1\text{ mA}$ $V_{BB} = 3.6\text{ V}$ $R_1 = R_2 = 5\text{ K}\Omega$ $R_L = 990\ \Omega$		35		ns
$t_r$	Rise Time			50		ns
$t_{on}$	Switching On Time			85	150	ns
$t_s$	Storage Time			400		ns
$t_f$	Fall Time			80		ns
$t_{off}$	Switching Off Time			480	800	ns

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$

**SOT-23 MECHANICAL DATA**

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.85		1.1	33.4		43.3
B	0.65		0.95	25.6		37.4
C	1.20		1.4	47.2		55.1
D	2.80		3	110.2		118
E	0.95		1.05	37.4		41.3
F	1.9		2.05	74.8		80.7
G	2.1		2.5	82.6		98.4
H	0.38		0.48	14.9		18.8
L	0.3		0.6	11.8		23.6
M	0		0.1	0		3.9
N	0.3		0.65	11.8		25.6
O	0.09		0.17	3.5		6.7



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