



BCW60

SOT23 NPN SILICON PLANAR
SMALL SIGNAL TRANSISTORS

ISSUE 2 – AUGUST 1995

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CE}$	32			V	$I_C=2\text{mA}$
Emitter-Base Breakdown Voltage	$V_{(BR)EB}$	5			V	$I_{EBO}=1\mu\text{A}$
Collector-Emitter Cut-off Current	I_{CES}			20 20	nA μA	$V_{CES}=32\text{V}$ $V_{CES}=32\text{V}$, $T_{amb}=150^{\circ}\text{C}$
Emitter-Base Cut-Off Current	I_{EBO}			20	nA	$V_{EBO}=4\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12 0.20	0.35 0.55	V V	$I_C=10\text{mA}$, $I_B=0.25\text{mA}$ $I_C=50\text{mA}$, $I_B=1.25\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.60 0.70	0.70 0.83	0.85 1.05	V V	$I_C=10\text{mA}$, $I_B=0.25\text{mA}$ $I_C=50\text{mA}$, $I_B=1.25\text{mA}$
Base - Emitter Voltage	V_{BE}	0.55	0.52 0.65 0.78	0.75	V V V	$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
Static Forward Current Transfer Ratio	h_{FE}	120 50	78 170	220		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
BCW60C		20 180 70	145 250	310		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
		40 250 90	220 350	460		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
		100 380 100	300 500	630		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
Transition Frequency	f_T	125	250		MHz	$I_C=10\text{mA}$, $V_{CE}=5\text{V}$ $f=100\text{MHz}$
Emitter-Base Capacitance	C_{ebo}		8		pF	$V_{EBO}=0.5\text{V}$, $f=1\text{MHz}$
Collector-Base Capacitance	C_{cbo}		2	4.5	pF	$V_{CBO}=10\text{V}$, $f=1\text{MHz}$
Noise Figure	N			6	dB	$I_C=0.2\text{mA}$, $V_{CE}=5\text{V}$ $R_G=2\text{K}\Omega$, $f=1\text{KH}$ $\Delta f=200\text{Hz}$
Switching times:	t_d		35		ns	$I_C:I_B:I_{B2}=10:1:1\text{mA}$ $R_1=5\text{K}\Omega$, $R_2=5\text{K}\Omega$ $V_{BB}=3.6\text{V}$, $R_L=990\Omega$
	t_r		50		ns	
	t_{on}		85	150	ns	
	t_s		400		ns	
	t_f		80		ns	
	t_{off}		480	800	ns	

Measured under pulsed conditions. Pulse width=300 μ s. Duty cycle
parameter data is available upon request for this device

PARTMARKING DETAILS

BCW60A – AA	BCW60AR – CR
BCW60B – AB	BCW60BR – DR
BCW60C – AC	BCW60CR – AR
BCW60D – AD	BCW60DR – BR

COMPLEMENTARY TYPE

BCW61

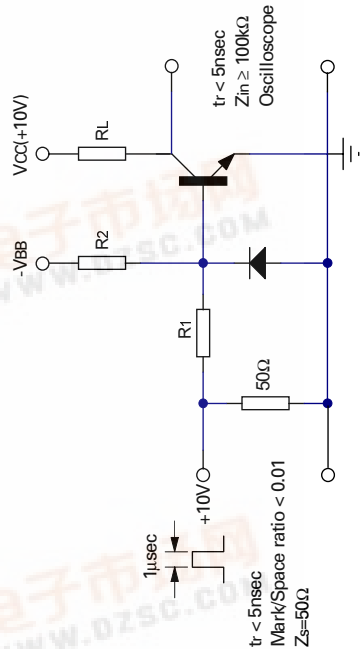
ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	32	V
Collector-Emitter Voltage	V_{CEO}	32	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	$tj:stg$	-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 A		h_{FE} Group B		h_{FE} Group C		h_{FE} Group D	
	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.
h_{11e}	1.6	2.7	2.5	3.6	6.0	3.2	4.5	7.5
h_{12e}		1.5		2			2	3
h_{21e}		200		260			330	520
h_{22e}		18		24	50	30	60	100
		30					50	100
								10^{-4}
								μS

SWITCHING CIRCUIT



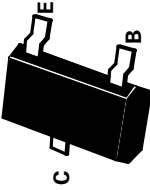
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PARTMARKING DETAILS

- BCW60A – AA
BCW60B – AB
BCW60C – AC
BCW60D – AD
- BCW60AR – CR
BCW60BR – DR
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COMPLEMENTARY TYPE

BCW61



SOT23

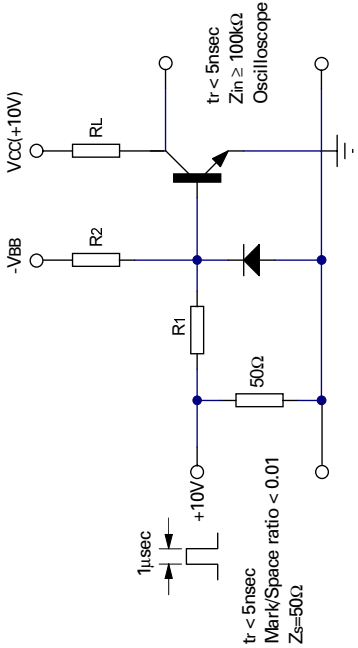
ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	32	V
Collector-Emitter Voltage	V_{CEO}	32	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	$tj:stg$	-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 A		h _{FE} Group B		h _{FE} Group C		h _{FE} Group D	
	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.
h _{11e}	1.6	2.7	2.5	3.6	6.0	8.5	4.5	7.5
h _{12e}		1.5		2		2		3
h _{21e}		200		260		330		520
h _{22e}		18		24	50	60		100
								12
								10 ⁻⁴
								520
								100
								μS

SWITCHING CIRCUIT



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PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	V_{BRCEO}	32			V	$I_C=2\text{mA}$
Emitter-Base Breakdown Voltage	V_{BREBO}	5			V	$I_{EBO}=1\mu\text{A}$
Collector-Emitter Cut-off Current	I_{CES}			20 20	nA μA	$V_{CES}=32\text{V}$, $T_{amb}=150^{\circ}\text{C}$ $V_{CES}=32\text{V}$, $T_{amb}=150^{\circ}\text{C}$
Emitter-Base Cut-Off Current	I_{EBO}			20	nA	$V_{EBO}=4\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12 0.20	0.35 0.55	V V	$I_C=10\text{mA}$, $I_B=0.25\text{mA}$ $I_C=50\text{mA}$, $I_B=1.25\text{mA}$
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Base - Emitter Voltage	V_{BE}	0.55	0.52 0.65 0.78	0.75	V V V	$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
Static Forward Current Transfer Ratio	h_{FE}	120 50	78 170	220		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
BCW60C		20 180 70	145 250	310		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
		40 250 90	220 350	460		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
		100 380 100	300 500	630		$I_C=10\mu\text{A}$, $V_{CE}=5\text{V}$ $I_C=2\text{mA}$, $V_{CE}=5\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1\text{V}$
Transition Frequency	f_T	125	250		MHz	$I_C=10\text{mA}$, $V_{CE}=5\text{V}$, $f=100\text{MHz}$
Emitter-Base Capacitance	C_{ebo}		8		pF	$V_{EBO}=0.5\text{V}$, $f=1\text{MHz}$
Collector-Base Capacitance	C_{cbo}			4.5	pF	$V_{CBO}=10\text{V}$, $f=1\text{MHz}$
Noise Figure	N		2	6	dB	$I_C=0.2\text{mA}$, $V_{CE}=5\text{V}$, $R_G=2\text{K}\Omega$, $f=1\text{KH}$, $\Delta f=200\text{Hz}$
Switching times:	Delay Time		35		ns	$I_C:I_B=10:1$, $I_{B2}=1\text{mA}$ $R_1=5\text{K}\Omega$, $R_2=5\text{K}\Omega$ $V_{BB}=3.6\text{V}$, $R_L=990\Omega$
	Rise Time		50		ns	
	Turn-on Time		85	150	ns	
	Storage Time		400		ns	
	Fall Time		80		ns	
	Turn-Off Time		480	800	ns	

Measured under pulsed conditions. Pulse width=300μs. Duty cycle
parameter data is available upon request for this device