

BCW60

SOT23 NPN SILICON PLANAR
SMALL SIGNAL TRANSISTORS

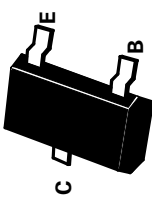
ISSUE 2 – AUGUST 1995

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	32			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 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 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 BCW60A 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		$I_C = 10\mu\text{A}$, $V_{CE} = 5\text{V}$ $I_C = 2\text{mA}$, $V_{CE} = 5\text{V}$ $I_C = 50\text{mA}$, $V_{CE} = 1\text{V}$
BCW60D		100 380 100	300 500	630		$I_C = 10\mu\text{A}$, $V_{CE} = 5\text{V}$ $I_C = 2\text{mA}$, $V_{CE} = 5\text{V}$ $I_C = 50\text{mA}$, $V_{CE} = 1\text{V}$
		125	250		MHz	$I_C = 10\text{mA}$, $V_{CE} = 5\text{V}$ $f = 100\text{MHz}$
Transition Frequency	f_T					
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:	t_d		35		ns	$I_C = 1\text{mA}$, $I_B = 10:1$, 1mA $R_1 = 5\text{K}\Omega$, $R_2 = 5\text{K}\Omega$ $V_{BB} = 3.6\text{V}$, $R_L = 990\Omega$
	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 μs . Duty cycle
Spice parameter data is available upon request for this device

BCW60



SOT23

BCW60A – AA
BCW60B – AB
BCW60C – AC
BCW60D – AD

PARTMARKING DETAILS

COMPLEMENTARY TYPE

BCW61

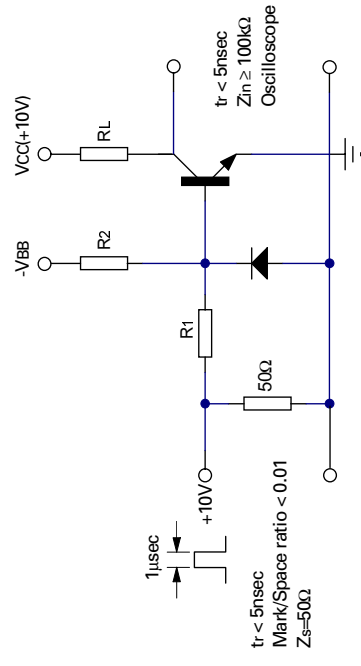
ABSOLUTE MAXIMUM RATINGS.

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	t_j, tstg	-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	4.5	2.5	3.6	6.0	4.5	7.5
h_{12e}	1.5		2		2		3	
h_{21e}	200		260		330		520	
h_{22e}	18	30	24	50	30	60	50	100

SWITCHING CIRCUIT



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BCW60

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	32			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 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 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 BCW60A 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 BCW60D		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		$I_C = 10\mu\text{A}$, $V_{CE} = 5\text{V}$ $I_C = 2\text{mA}$, $V_{CE} = 5\text{V}$ $I_C = 50\text{mA}$, $V_{CE} = 1\text{V}$
		125	250		MHz	$I_C = 10\text{mA}$, $V_{CE} = 5\text{V}$ $f = 100\text{MHz}$
Transition Frequency	f_T					
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 Rise Time Turn-on Time Storage Time Fall Time Turn-Off Time	t_d		35		ns	$I_C = 10\text{mA}$, $I_B = 10:1$, 1mA $R_1 = 5\text{K}\Omega$, $R_2 = 5\text{K}\Omega$ $V_{BB} = 3.6\text{V}$, $R_L = 990\Omega$
	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 μs . Duty cycle
Spice parameter data is available upon request for this device

PARTMARKING DETAILS

BCW60A – AA
BCW60B – AB
BCW60C – AC
BCW60D – AD

BCW60AR – CR
BCW60BR – DR
BCW60CR – AR
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	t_j ; t_{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	4.5	2.5	3.6	6.0	4.5	7.5
h_{12e}		1.5		2				
h_{21e}		200		260				
h_{22e}		18	30		24	50	30	60
							50	100
								10 μS

SWITCHING CIRCUIT

