# SOT23 NPN SILICON PLANAR SMALL SIGNAL TRANSISTORS

# BCW60

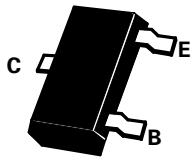
**ISSUE 2 – AUGUST 1995**

PARTMARKING DETAILS

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

COMPLEMENTARY TYPE

BCW61




SOT23

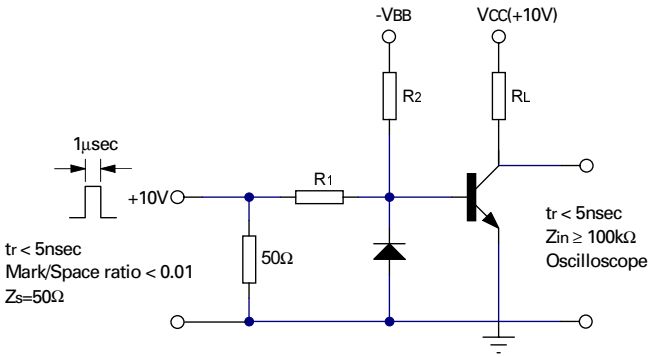
## ABSOLUTE MAXIMUM RATINGS.

| 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°C | $P_{TOT}$ | 330 | mW |
| Operating and Storage Temperature Range | tj:tstg | -55 to +150 | °C |

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

| | $h_{FE}$ Group A | | | $h_{FE}$ Group B | | | $h_{FE}$ Group C | | | $h_{FE}$ Group D | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| $h_{11e}$ | 1.6 | 2.7 | 4.5 | 2.5 | 3.6 | 6.0 | 3.2 | 4.5 | 8.5 | 4.5 | 7.5 | 12 | kΩ |
| $h_{12e}$ | | 1.5 | | | 2 | | | 2 | | | 3 | | $10^{-4}$ |
| $h_{21e}$ | | 200 | | | 260 | | | 330 | | | 520 | | |
| $h_{22e}$ | | 18 | 30 | | 24 | 50 | | 30 | 60 | | 50 | 100 | µS |

## SWITCHING CIRCUIT



# BCW60

## ELECTRICAL CHARACTERISTICS (at $T_{amb}$ = 25°C unless otherwise stated).

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS. |
|---|---|---|---|---|---|---|
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | 32 | | | V | $I_C$=2mA |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | 5 | | | V | $I_{EBO}$=1μA |
| Collector-Emitter Cut-off Current | $I_{CES}$ | | | 20<br>20 | nA<br>μA | $V_{CES}$=32V<br>$V_{CES}$=32V ,$T_{amb}$=150°C |
| Emitter-Base Cut-Off Current | $I_{EBO}$ | | | 20 | nA | $V_{EBO}$=4V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | | 0.12<br>0.20 | 0.35<br>0.55 | V<br>V | $I_C$=10mA, $I_B$ = 0.25mA<br>$I_C$= 50mA, $I_B$ =1.25mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | 0.60<br>0.70 | 0.70<br>0.83 | 0.85<br>1.05 | V<br>V | $I_C$=10mA, $I_B$=0.25mA<br>$I_C$ =50mA, $I_B$=1.25mA |
| Base - Emitter Voltage | $V_{BE}$ | 0.55 | 0.52<br>0.65<br>0.78 | 0.75 | V<br>V<br>V | $I_C$=10μA, $V_{CE}$=5V<br>$I_C$=2mA, $V_{CE}$=5V<br>$I_C$=50mA, $V_{CE}$=1V |
| Static BCW60A Forward Current Transfer BCW60B Ratio | $h_{FE}$ | 120<br>50 | 78<br>170 | 220 | | $I_C$=10μA, $V_{CE}$=5V<br>$I_C$=2mA, $V_{CE}$=5V<br>$I_C$=50mA, $V_{CE}$=1V |
| | | 20<br>180<br>70 | 145<br>250 | 310 | | $I_C$=10μA, $V_{CE}$=5V<br>$I_C$=2mA, $V_{CE}$=5V<br>$I_C$=50mA, $V_{CE}$=1V |
| BCW60C | | 40<br>250<br>90 | 220<br>350 | 460 | | $I_C$=10μA, $V_{CE}$=5V<br>$I_C$=2mA, $V_{CE}$=5V<br>$I_C$=50mA, $V_{CE}$=1V |
| BCW60D | | 100<br>380<br>100 | 300<br>500 | 630 | | $I_C$=10μA, $V_{CE}$=5V<br>$I_C$=2mA, $V_{CE}$=5V<br>$I_C$=50mA, $V_{CE}$=1V |
| Transition Frequency | $f_T$ | 125 | 250 | | MHz | $I_C$ =10mA, $V_{CE}$ =5V<br>f = 100MHz |
| Emitter-Base Capacitance | $C_{ebo}$ | | 8 | | pF | $V_{EBO}$=0.5V, f =1MHz |
| Collector-Base Capacitance | $C_{cbo}$ | | | 4.5 | pF | $V_{CBO}$=10V, f =1MHz |
| Noise Figure | N | | 2 | 6 | dB | $I_C$= 0.2mA, $V_{CE}$ = 5V<br>$R_G$ =2KΩ, f=1KH<br>Δf=200Hz |
| Switching times:<br>Delay Time<br>Rise Time<br>Turn-on Time<br>Storage Time<br>Fall Time<br>Turn-Off Time | <br>$t_d$<br>$t_r$<br>$t_{on}$<br>$t_s$<br>$t_f$<br>$t_{off}$ | | <br>35<br>50<br>85<br>400<br>80<br>480 | <br><br><br>150<br><br><br>800 | <br>ns<br>ns<br>ns<br>ns<br>ns<br>ns | $I_C$:$I_{B1}$:- $I_{B2}$=10:1:1mA<br>$R_1$=5KΩ, $R_2$=5KΩ<br>$V_{BB}$=3.6V, $R_L$=990Ω |

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