

## NPN General Purpose Amplifier

## BCW60

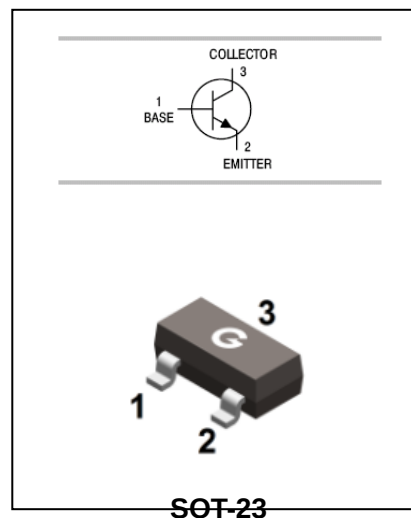
### FEATURES

- Low current
- Low voltage
- RoHS compliant with Halogen-free

HF

### APPLICATIONS

- General purpose medium power amplifier
- Switching application



### ORDERING INFORMATION

| Type No. | Marking | Package Code |
|----------|---------|--------------|
| BCW60A   | AA      | SOT-23       |
| BCW60B   | AB      | SOT-23       |
| BCW60C   | AC      | SOT-23       |
| BCW60D   | AD      | SOT-23       |

### MAXIMUM RATING @ Ta=25°C unless otherwise specified

| Symbol          | Parameter                 | Value       | Unit |
|-----------------|---------------------------|-------------|------|
| $V_{CBO}$       | Collector-Base Voltage    | 32          | V    |
| $V_{CEO}$       | Collector-Emitter Voltage | 32          | V    |
| $V_{EBO}$       | Emitter-Base Voltage      | 5           | V    |
| $I_C$           | DC Collector Current      | 100         | mA   |
| $I_{CM}$        | Peak Collector Current    | 200         | mA   |
| $I_{BM}$        | Peak base Current         | 200         | mA   |
| $P_C$           | Collector Dissipation     | 330         | mW   |
| $T_J$           | Junction Temperature      | -55 to +150 | °C   |
| $T_{STG}$       | Storage Temperature       | -65 to +150 |      |
| $R_{\theta JA}$ | Junction ambient          | 310         | °C/W |
| $R_{\theta JS}$ | Junction-soldering point  | 240         |      |

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### ELECTRICAL CHARACTERISTICS @ Ta=25°C unless otherwise specified

| Parameter                            | Symbol                               | Test conditions                                                           | MIN                      | TYP                      | MAX                      | UNIT |
|--------------------------------------|--------------------------------------|---------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|------|
| Collector-base breakdown voltage     | $V_{(BR)CBO}$                        | $I_C=10\mu A, I_E=0$                                                      | 32                       | -                        | -                        | V    |
| Collector-emitter breakdown voltage  | $V_{(BR)CEO}$                        | $I_C=10mA, I_B=0$                                                         | 32                       | -                        | -                        | V    |
| Emitter-base breakdown voltage       | $V_{(BR)EBO}$                        | $I_E=1\mu A, I_C=0$                                                       | 5                        | -                        | -                        | V    |
| Collector cut-off current            | $I_{CBO}$                            | $V_{CB}=32V, I_E=0$<br>$V_{CB}=32V, I_E=0, T_a=150^\circ C$               | -                        | -                        | 20                       | nA   |
| Emitter cut-off current              | $I_{EBO}$                            | $V_{EB}=4V, I_C=0$                                                        | -                        | -                        | 20                       | nA   |
| DC current gain                      | BCW60A<br>BCW60B<br>BCW60C<br>BCW60D | $h_{FE}$<br>$V_{CE}=5V, I_C=10\mu A$                                      | 20<br>20<br>40<br>100    | 140<br>200<br>300<br>460 | -<br>-<br>-<br>-         | -    |
| DC current gain                      | BCW60A<br>BCW60B<br>BCW60C<br>BCW60D | $h_{FE}$<br>$V_{CE}=5V, I_C=2mA$                                          | 120<br>180<br>250<br>380 | 170<br>250<br>350<br>500 | 220<br>310<br>460<br>630 | -    |
| DC current gain                      | BCW60A<br>BCW60B<br>BCW60C<br>BCW60D | $h_{FE}$<br>$V_{CE}=1V, I_C=50mA$                                         | 50<br>70<br>90<br>100    | -                        | -                        | -    |
| Collector-emitter saturation voltage | $V_{CE(sat)}$                        | $I_C=10mA, I_B=0.25mA$<br>$I_C=50mA, I_B=1.25mA$                          | -<br>-                   | 0.12<br>0.2              | 0.25<br>0.55             | V    |
| Base-emitter saturation voltage      | $V_{BE(sat)}$                        | $I_C=10mA, I_B=0.25mA$<br>$I_C=50mA, I_B=1.25mA$                          | -<br>-                   | 0.7<br>0.83              | 0.85<br>1.05             | V    |
| Base-emitter voltage                 | $V_{BE(on)}$                         | $I_C=10\mu A, V_{CE}=5V$<br>$I_C=2mA, V_{CE}=5V$<br>$I_C=50mA, V_{CE}=1V$ | -<br>0.55<br>-           | 0.52<br>0.65<br>0.78     | -<br>0.75<br>-           | V    |
| Transition frequency                 | $f_T$                                | $V_{CE}=5V, I_C=20mA, f=100MHz$                                           | -                        | 250                      | -                        | MHz  |
| Collector-base Capacitance           | $C_{cb}$                             | $V_{CB}=10V, f=1MHz$                                                      | -                        | 3                        | -                        | pF   |
| Emitter-base Capacitance             | $C_{eb}$                             | $V_{EB}=0.5V, f=1MHz$                                                     | -                        | 8                        | -                        |      |

### CLASSIFICATION OF $h_{FE}$

| Rank     | A       | B       | C       | D       |
|----------|---------|---------|---------|---------|
| Marking  | AA      | AB      | AC      | AD      |
| $h_{FE}$ | 120-220 | 180-310 | 250-460 | 380-630 |

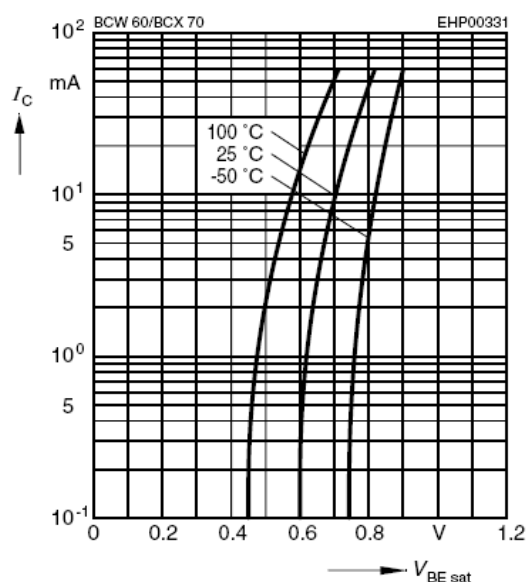
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TYPICAL CHARACTERISTICS @  $T_a=25^\circ\text{C}$  unless otherwise specified

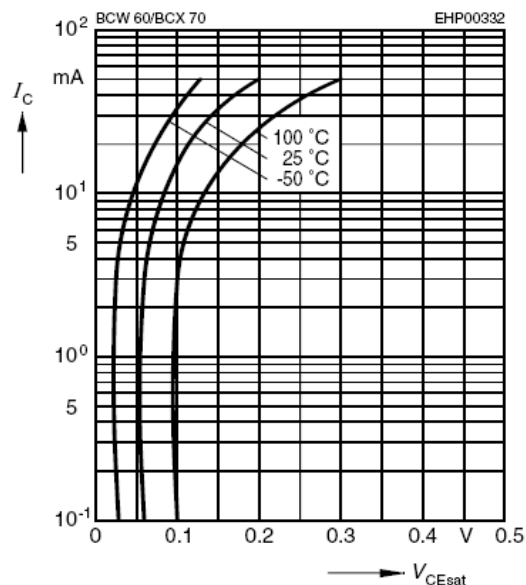
### Base-emitter saturation voltage

$$I_C = f(V_{BEsat}), h_{FE} = 40$$



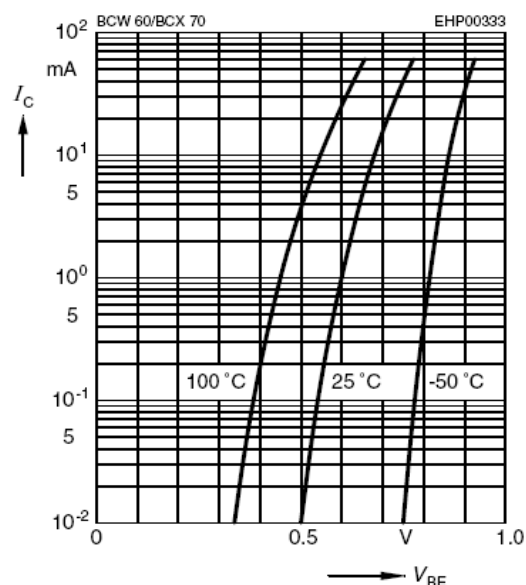
### Collector-emitter saturation voltage

$$I_C = f(V_{CEsat}), h_{FE} = 40$$



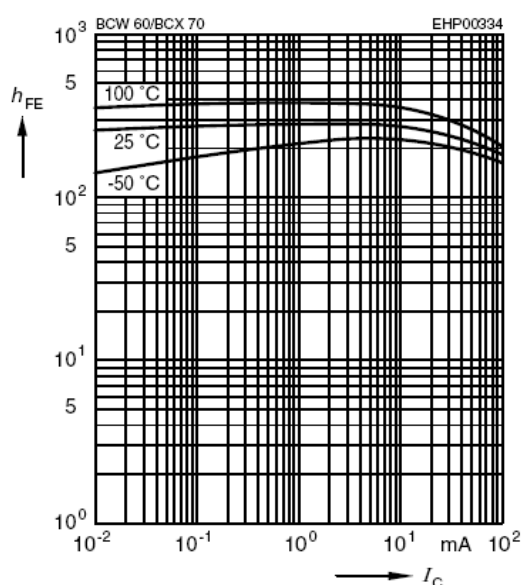
### Collector current $I_C = f(V_{BE})$

$$V_{CE} = 5V$$



### DC current gain $h_{FE} = f(I_C)$

$$V_{CE} = 5V$$

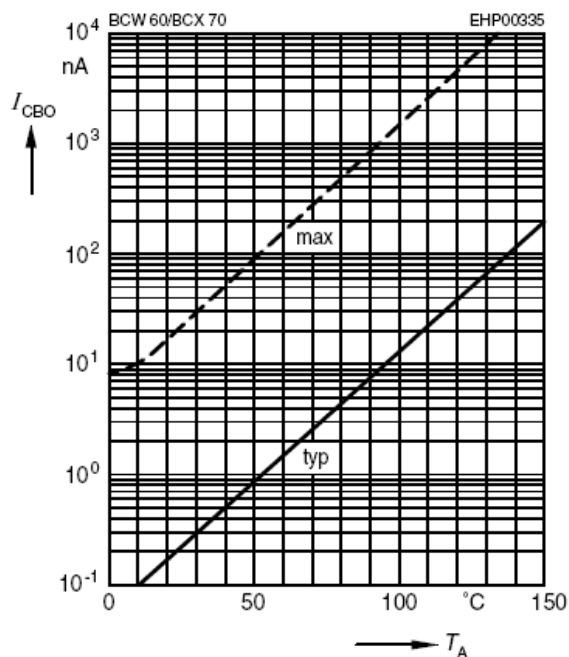


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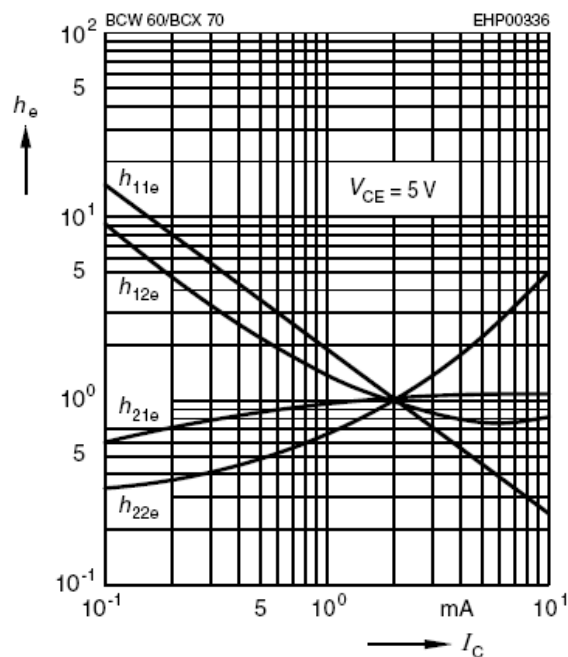
Collector cutoff current  $I_{CBO} = f(T_A)$

$V_{CB} = V_{CEmax}$



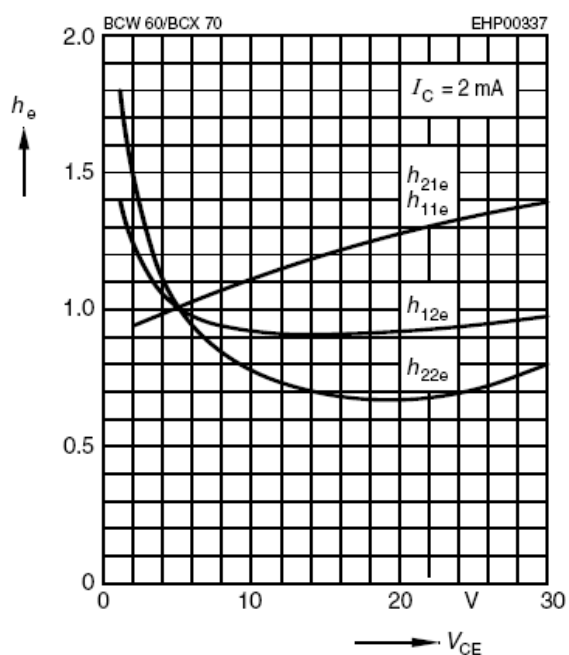
h parameter  $h_e = f(I_C)$  normalized

$V_{CE} = 5V$



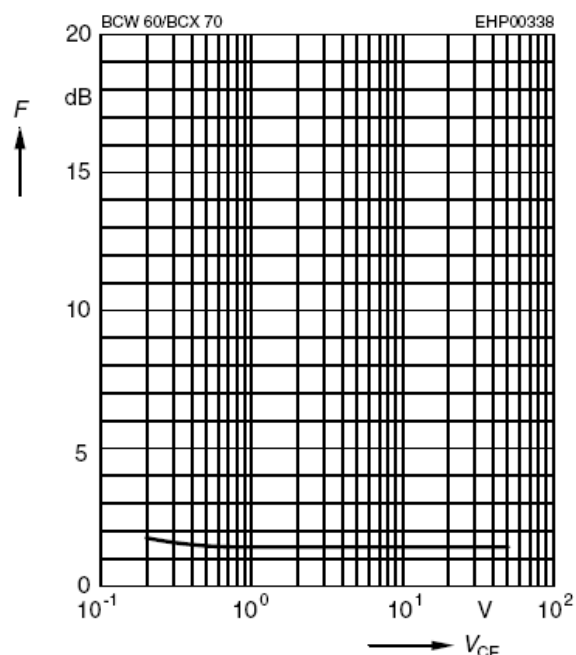
h parameter  $h_e = f(V_{CE})$  normalized

$I_C = 2mA$



Noise figure  $F = f(V_{CE})$

$I_C = 0.2mA, R_S = 2k\Omega, f = 1kHz$



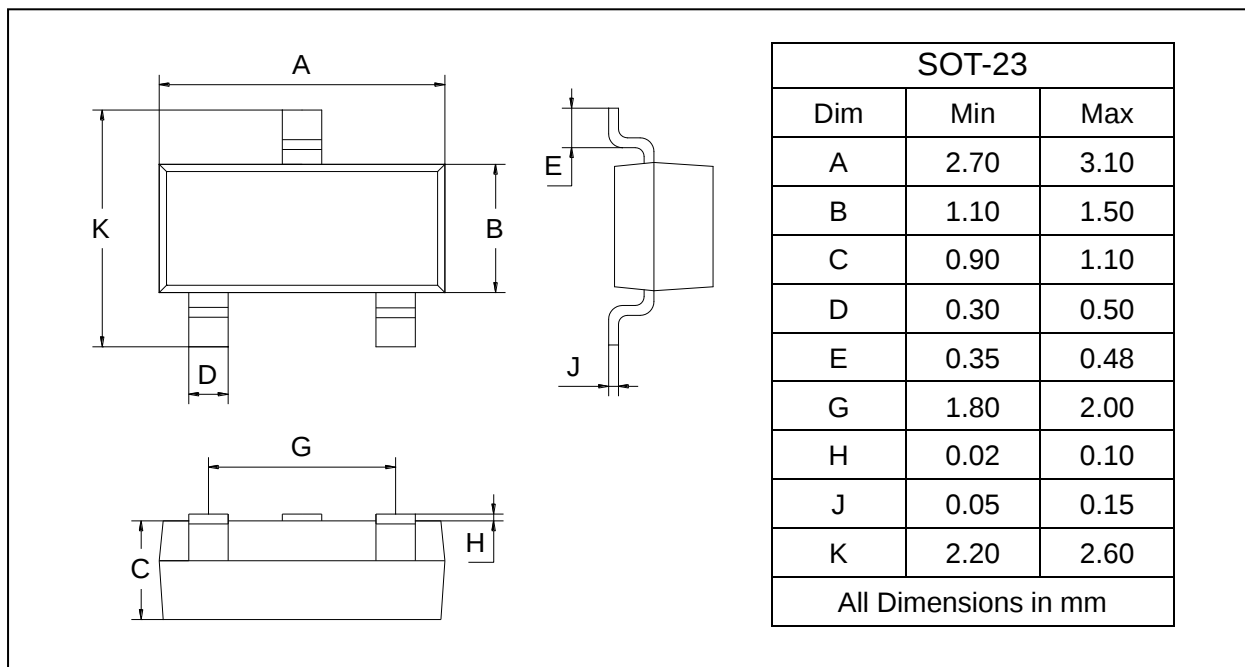
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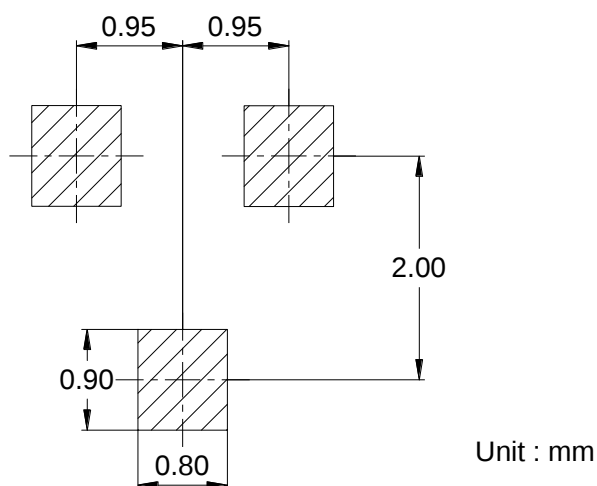
### PACKAGE OUTLINE

Plastic surface mounted package

SOT-23



### SOLDERING FOOTPRINT



### PACKAGE INFORMATION

| Device | Package | Shipping               |
|--------|---------|------------------------|
| BCW60  | SOT-23  | 3000 pcs / Tape & Reel |