



# BDW93C BDW94B/BDW94C

## COMPLEMENTARY SILICON POWER DARLINGTON TRANSISTORS

- STMicroelectronics PREFERRED SALESTYPES
- COMPLEMENTARY PNP - NPN DEVICES
- INTEGRATED ANTIPARALLEL COLLECTOR-EMITTER DIODE

### APPLICATIONS

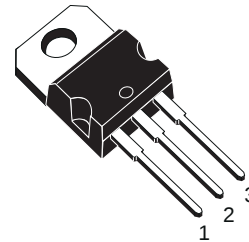
- LINEAR AND SWITCHING INDUSTRIAL EQUIPMENT

### DESCRIPTION

The BDW93C is a silicon Epitaxial-Base NPN power transistor in monolithic Darlington configuration mounted in Jedec TO-220 plastic package. It is intended for use in power linear and switching applications.

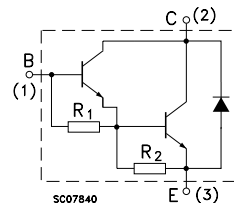
The complementary PNP type is BDW94C.

Also BDW94B is a PNP type.

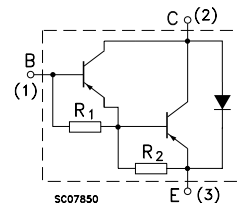


TO-220

### INTERNAL SCHEMATIC DIAGRAM



R<sub>1</sub> Typ. = 10 KΩ



R<sub>2</sub> Typ. = 150 Ω

### ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter                                      | Value      |        | Unit |
|------------------|------------------------------------------------|------------|--------|------|
|                  |                                                | NPN        | BDW93C |      |
|                  |                                                | PNP        | BDW94B |      |
| V <sub>CBO</sub> | Collector-Base Voltage (I <sub>E</sub> = 0)    | 80         | 100    | V    |
| V <sub>CEO</sub> | Collector-Emitter Voltage (I <sub>B</sub> = 0) | 80         | 100    | V    |
| I <sub>C</sub>   | Collector Current                              | 12         |        | A    |
| I <sub>CM</sub>  | Collector Peak Current                         | 15         |        | A    |
| I <sub>B</sub>   | Base Current                                   | 0.2        |        | A    |
| P <sub>tot</sub> | Total Dissipation at T <sub>c</sub> ≤ 25 °C    | 80         |        | W    |
| T <sub>stg</sub> | Storage Temperature                            | -65 to 150 |        | °C   |
| T <sub>j</sub>   | Max. Operating Junction Temperature            | 150        |        | °C   |

For PNP types voltage and current values are negative.

**BDW93C/BDW94B/BDW94C****THERMAL DATA**

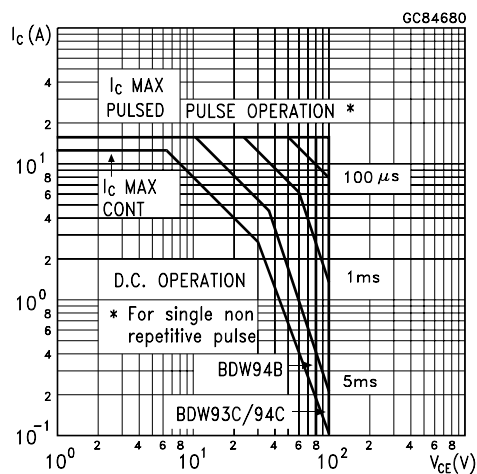
|                       |                                  |      |      |
|-----------------------|----------------------------------|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case | 1.56 | °C/W |
|-----------------------|----------------------------------|------|------|

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

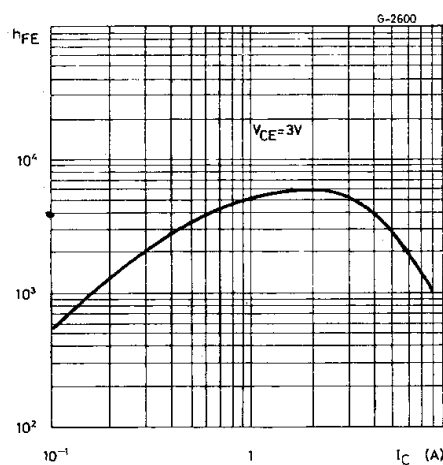
| Symbol                 | Parameter                                                 | Test Conditions                                                                                                                                                                                                      | Min.               | Typ.       | Max.                 | Unit                 |
|------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|----------------------|----------------------|
| I <sub>CBO</sub>       | Collector Cut-off Current (I <sub>E</sub> = 0)            | for <b>BDW94B</b> V <sub>CB</sub> = 80 V<br>for <b>BDW93C/94C</b> V <sub>CB</sub> = 100 V<br>T <sub>case</sub> = 150 °C<br>for <b>BDW94B</b> V <sub>CB</sub> = 80 V<br>for <b>BDW93C/94C</b> V <sub>CB</sub> = 100 V |                    |            | 100<br>100<br>5<br>5 | μA<br>μA<br>mA<br>mA |
| I <sub>CEO</sub>       | Collector Cut-off Current (I <sub>B</sub> = 0)            | for <b>BDW94B</b> V <sub>CE</sub> = 80 V<br>for <b>BDW93C/94C</b> V <sub>CE</sub> = 100 V                                                                                                                            |                    |            | 1<br>1               | mA<br>mA             |
| I <sub>EBO</sub>       | Emitter Cut-off Current (I <sub>C</sub> = 0)              | V <sub>EB</sub> = 5 V                                                                                                                                                                                                |                    |            | 2                    | mA                   |
| V <sub>CEO(sus)*</sub> | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 100 mA<br>for <b>BDW94B</b><br>for <b>BDW93C/94C</b>                                                                                                                                                | 80<br>100          |            |                      | V<br>V               |
| V <sub>CE(sat)*</sub>  | Collector-Emitter Saturation Voltage                      | I <sub>C</sub> = 5 A I <sub>B</sub> = 20 mA<br>I <sub>C</sub> = 10 A I <sub>B</sub> = 100 mA                                                                                                                         |                    |            | 2<br>3               | V<br>V               |
| V <sub>BE(sat)*</sub>  | Base-Emitter Saturation Voltage                           | I <sub>C</sub> = 5 A I <sub>B</sub> = 20 mA<br>I <sub>C</sub> = 10 A I <sub>B</sub> = 100 mA                                                                                                                         |                    |            | 2.5<br>4             | V<br>V               |
| h <sub>FE*</sub>       | DC Current Gain                                           | I <sub>C</sub> = 3 A V <sub>CE</sub> = 3 V<br>I <sub>C</sub> = 5 A V <sub>CE</sub> = 3 V<br>I <sub>C</sub> = 10 A V <sub>CE</sub> = 3 V                                                                              | 1000<br>750<br>100 |            | 20K                  |                      |
| V <sub>F*</sub>        | Parallel-diode Forward Voltage                            | I <sub>F</sub> = 5 A<br>I <sub>F</sub> = 10 A                                                                                                                                                                        |                    | 1.3<br>1.8 | 2<br>4               | V<br>V               |
| h <sub>fe</sub>        | Small Signal Current Gain                                 | I <sub>C</sub> = 1 A V <sub>CE</sub> = 10 V<br>f = 1 MHz                                                                                                                                                             | 20                 |            |                      |                      |

\* Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %  
For PNP types voltage and current values are negative.

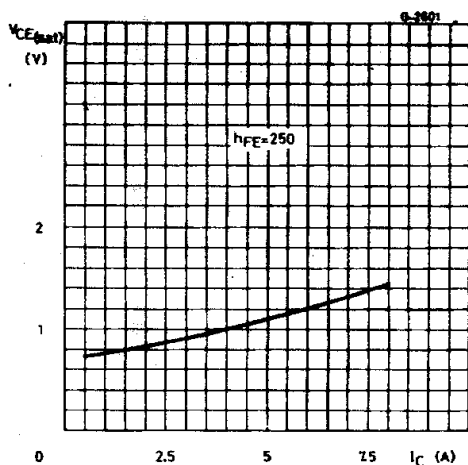
Safe Operating Area



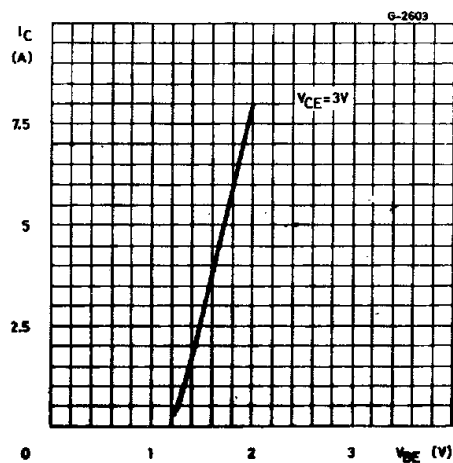
DC Current Gain (NPN types)



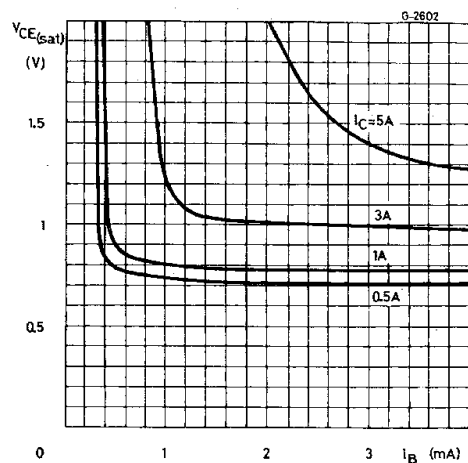
Collector Emitter Saturation Voltage (NPN types)



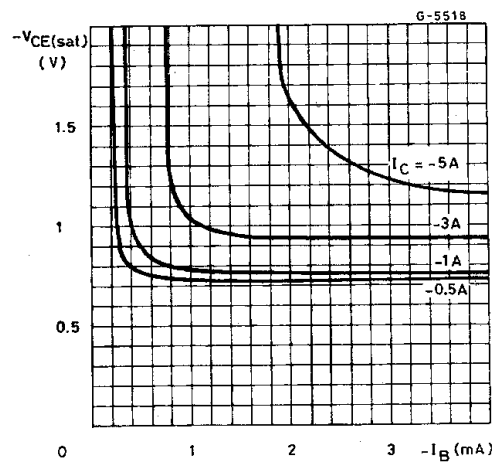
DC Transconductance (NPN types)



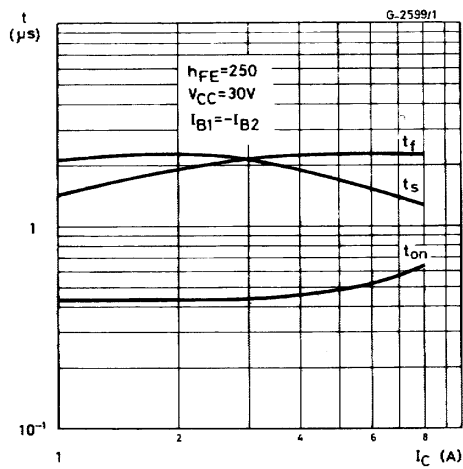
Collector Emitter Saturation Voltage (NPN types)



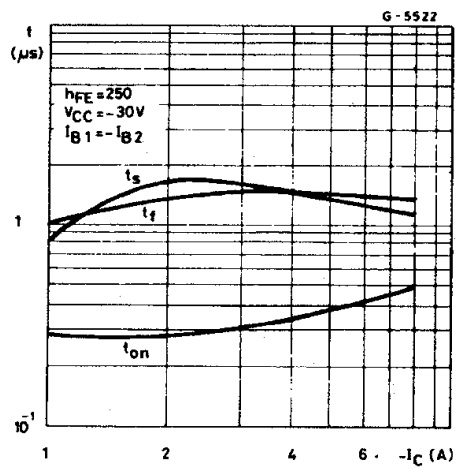
Collector Emitter Saturation Voltage (PNP types)



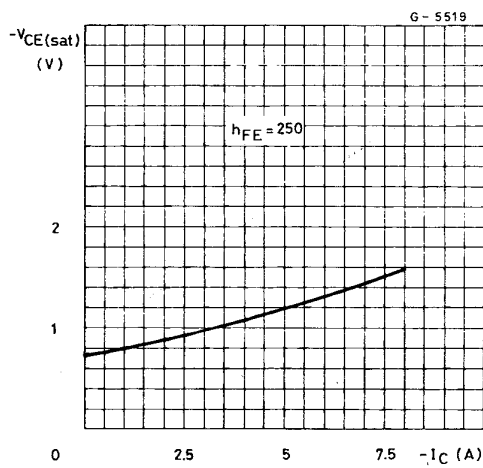
Saturated Switching Characteristics (NPN types)



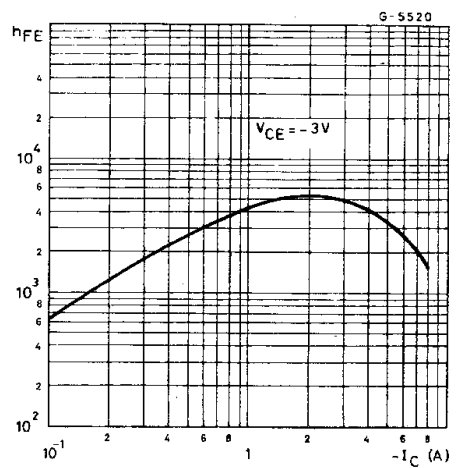
Saturated Switching Characteristics (PNP types)



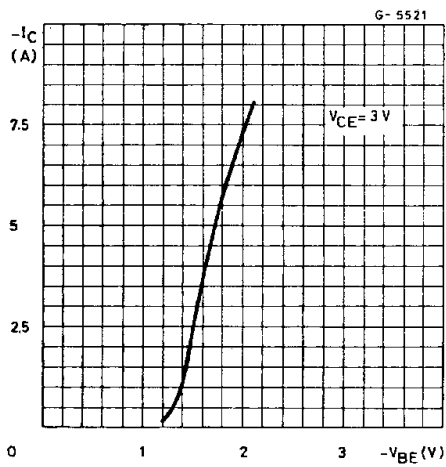
Collector Emitter Saturation Voltage (PNP types)



DC Current Gain (PNP types)

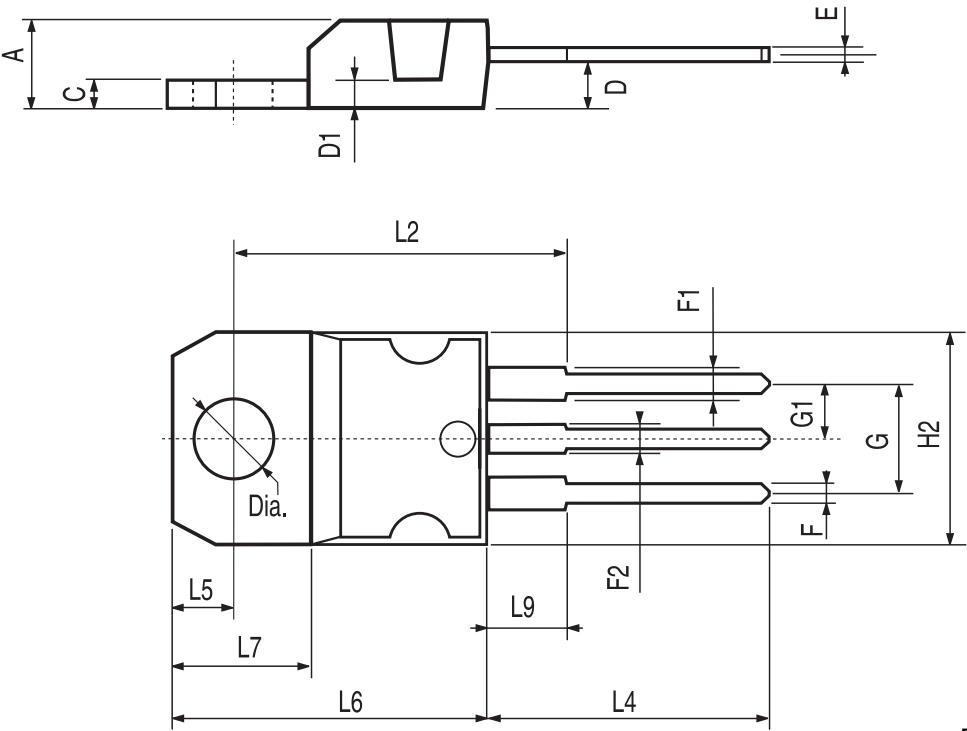


DC Transconductance (PNP types)



TO-220 MECHANICAL DATA

| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



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