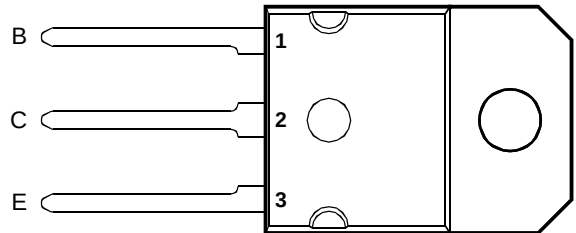


# BDW84, BDW84A, BDW84B, BDW84C, BDW84D PNP SILICON POWER DARLINGTONS

**BOURNS®**

- Designed for Complementary Use with BDW83, BDW83A, BDW83B, BDW83C and BDW83D
- 125 W at 25°C Case Temperature
- 15 A Continuous Collector Current
- Minimum  $h_{FE}$  of 750 at 3 V, 6 A

SOT-93 PACKAGE  
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDTRAAA

## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

| RATING                                                                             |        | SYMBOL              | VALUE       | UNIT |
|------------------------------------------------------------------------------------|--------|---------------------|-------------|------|
| Collector-base voltage ( $I_E = 0$ )                                               | BDW84  | $V_{CBO}$           | -45         | V    |
|                                                                                    | BDW84A |                     | -60         |      |
|                                                                                    | BDW84B |                     | -80         |      |
|                                                                                    | BDW84C |                     | -100        |      |
|                                                                                    | BDW84D |                     | -120        |      |
| Collector-emitter voltage ( $I_B = 0$ ) (see Note 1)                               | BDW84  | $V_{CEO}$           | -45         | V    |
|                                                                                    | BDW84A |                     | -60         |      |
|                                                                                    | BDW84B |                     | -80         |      |
|                                                                                    | BDW84C |                     | -100        |      |
|                                                                                    | BDW84D |                     | -120        |      |
| Emitter-base voltage                                                               |        | $V_{EBO}$           | -5          | V    |
| Continuous collector current                                                       |        | $I_C$               | -15         | A    |
| Continuous base current                                                            |        | $I_B$               | -0.5        | A    |
| Continuous device dissipation at (or below) 25°C case temperature (see Note 2)     |        | $P_{tot}$           | 125         | W    |
| Continuous device dissipation at (or below) 25°C free air temperature (see Note 3) |        | $P_{tot}$           | 3.5         | W    |
| Unclamped inductive load energy (see Note 4)                                       |        | $\frac{1}{2}LI_C^2$ | 100         | mJ   |
| Operating junction temperature range                                               |        | $T_j$               | -65 to +150 | °C   |
| Operating temperature range                                                        |        | $T_{stg}$           | -65 to +150 | °C   |
| Operating free-air temperature range                                               |        | $T_A$               | -65 to +150 | °C   |

NOTES: 1. These values apply when the base-emitter diode is open circuited.

2. Derate linearly to 150°C case temperature at the rate of 1 W/°C.

3. Derate linearly to 150°C free air temperature at the rate of 28 mW/°C.

4. This rating is based on the capability of the transistor to operate safely in a circuit of:  $L = 20$  mH,  $I_{B(on)} = -5$  mA,  $R_{BE} = 100 \Omega$ ,  $V_{BE(off)} = 0$ ,  $R_S = 0.1 \Omega$ ,  $V_{CC} = -20$  V.

## PRODUCT INFORMATION

AUGUST 1978 - REVISED JUNE 2011

Specifications are subject to change without notice.

**electrical characteristics at 25°C case temperature (unless otherwise noted)**

| PARAMETER                                          | TEST CONDITIONS                                                                                                                                                                                                                                                                          |                                                                                                                                |                                                                                                                                               | MIN                                                                                            | TYP                               | MAX                                                                | UNIT |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------|------|
| $V_{(BR)CEO}$ Collector-emitter breakdown voltage  | $I_C = -30 \text{ mA}$                                                                                                                                                                                                                                                                   | $I_B = 0$                                                                                                                      | (see Note 5)                                                                                                                                  | BDW84<br>BDW84A<br>BDW84B<br>BDW84C<br>BDW84D                                                  | -45<br>-60<br>-80<br>-100<br>-120 |                                                                    | V    |
| $I_{CEO}$ Collector-emitter cut-off current        | $V_{CE} = -30 \text{ V}$<br>$V_{CE} = -30 \text{ V}$<br>$V_{CE} = -40 \text{ V}$<br>$V_{CE} = -50 \text{ V}$<br>$V_{CE} = -60 \text{ V}$                                                                                                                                                 | $I_B = 0$<br>$I_B = 0$<br>$I_B = 0$<br>$I_B = 0$<br>$I_B = 0$                                                                  |                                                                                                                                               | BDW84<br>BDW84A<br>BDW84B<br>BDW84C<br>BDW84D                                                  |                                   | -1<br>-1<br>-1<br>-1<br>-1                                         | mA   |
| $I_{CBO}$ Collector cut-off current                | $V_{CB} = -45 \text{ V}$<br>$V_{CB} = -60 \text{ V}$<br>$V_{CB} = -80 \text{ V}$<br>$V_{CB} = -100 \text{ V}$<br>$V_{CB} = -120 \text{ V}$<br>$V_{CB} = -45 \text{ V}$<br>$V_{CB} = -60 \text{ V}$<br>$V_{CB} = -80 \text{ V}$<br>$V_{CB} = -100 \text{ V}$<br>$V_{CB} = -120 \text{ V}$ | $I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$<br>$I_E = 0$ | $T_C = 150^\circ\text{C}$<br>$T_C = 150^\circ\text{C}$<br>$T_C = 150^\circ\text{C}$<br>$T_C = 150^\circ\text{C}$<br>$T_C = 150^\circ\text{C}$ | BDW84<br>BDW84A<br>BDW84B<br>BDW84C<br>BDW84D<br>BDW84<br>BDW84A<br>BDW84B<br>BDW84C<br>BDW84D |                                   | -0.5<br>-0.5<br>-0.5<br>-0.5<br>-0.5<br>-5<br>-5<br>-5<br>-5<br>-5 | mA   |
| $I_{EBO}$ Emitter cut-off current                  | $V_{EB} = -5 \text{ V}$                                                                                                                                                                                                                                                                  | $I_C = 0$                                                                                                                      |                                                                                                                                               |                                                                                                |                                   | -2                                                                 | mA   |
| $h_{FE}$ Forward current transfer ratio            | $V_{CE} = -3 \text{ V}$<br>$V_{CE} = -3 \text{ V}$                                                                                                                                                                                                                                       | $I_C = -6 \text{ A}$<br>$I_C = -15 \text{ A}$                                                                                  | (see Notes 5 and 6)                                                                                                                           | 750<br>100                                                                                     |                                   | 20000                                                              |      |
| $V_{BE(on)}$ Base-emitter voltage                  | $V_{CE} = -3 \text{ V}$                                                                                                                                                                                                                                                                  | $I_C = -6 \text{ A}$                                                                                                           | (see Notes 5 and 6)                                                                                                                           |                                                                                                |                                   | -2.5                                                               | V    |
| $V_{CE(sat)}$ Collector-emitter saturation voltage | $I_B = -12 \text{ mA}$<br>$I_B = -150 \text{ mA}$                                                                                                                                                                                                                                        | $I_C = -6 \text{ A}$<br>$I_C = -15 \text{ A}$                                                                                  | (see Notes 5 and 6)                                                                                                                           |                                                                                                |                                   | -2.5<br>-4                                                         | V    |
| $V_{EC}$ Parallel diode forward voltage            | $I_E = -15 \text{ A}$                                                                                                                                                                                                                                                                    | $I_B = 0$                                                                                                                      |                                                                                                                                               |                                                                                                |                                   | -3.5                                                               | V    |

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

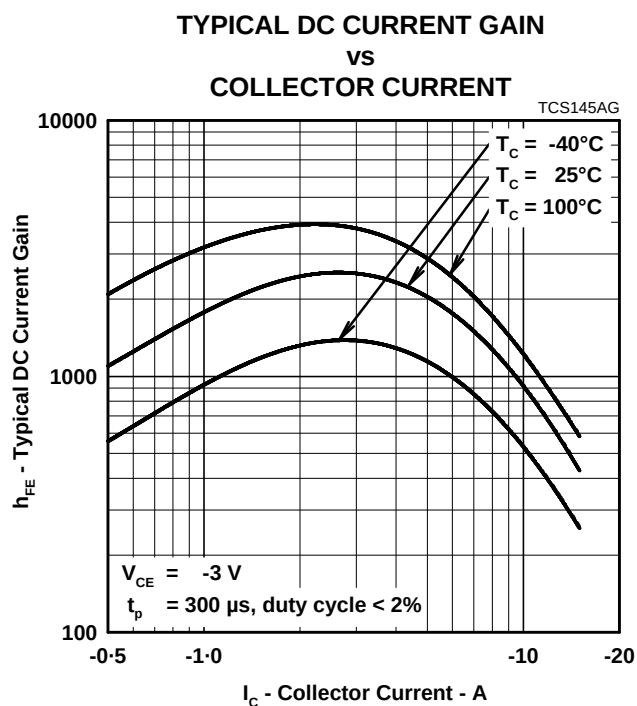
| PARAMETER                                               | MIN | TYP | MAX  | UNIT               |
|---------------------------------------------------------|-----|-----|------|--------------------|
| $R_{\theta JC}$ Junction to case thermal resistance     |     |     | 1    | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ Junction to free air thermal resistance |     |     | 35.7 | $^\circ\text{C/W}$ |

**resistive-load-switching characteristics at 25°C case temperature**

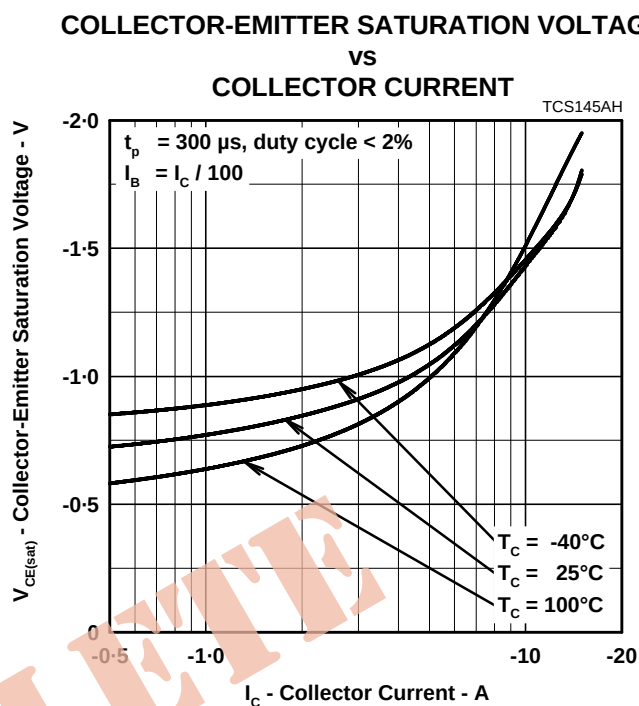
| PARAMETER               | TEST CONDITIONS <sup>†</sup>  |                              |                                        | MIN | TYP | MAX | UNIT          |
|-------------------------|-------------------------------|------------------------------|----------------------------------------|-----|-----|-----|---------------|
| $t_{on}$ Turn-on time   | $I_C = -10 \text{ A}$         | $I_{B(on)} = -40 \text{ mA}$ | $I_{B(off)} = 40 \text{ mA}$           |     | 0.9 |     | $\mu\text{s}$ |
| $t_{off}$ Turn-off time | $V_{BE(off)} = 4.2 \text{ V}$ | $R_L = 3 \Omega$             | $t_p = 20 \mu\text{s}$ , dc $\leq 2\%$ |     | 7   |     | $\mu\text{s}$ |

<sup>†</sup> Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

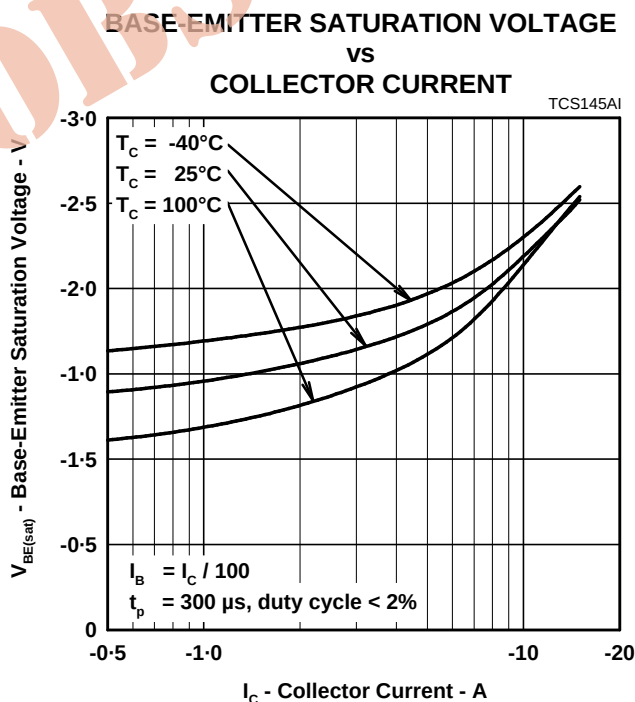
**TYPICAL CHARACTERISTICS**



**Figure 1.**



**Figure 2.**

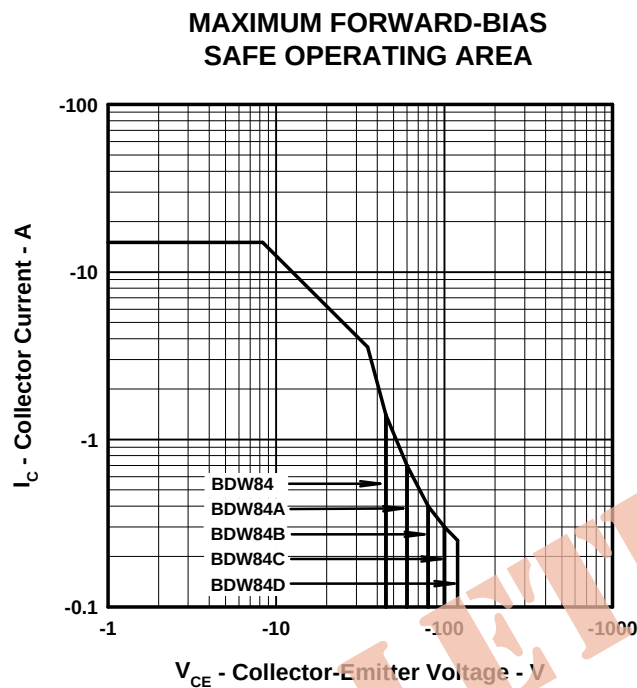


**Figure 3.**

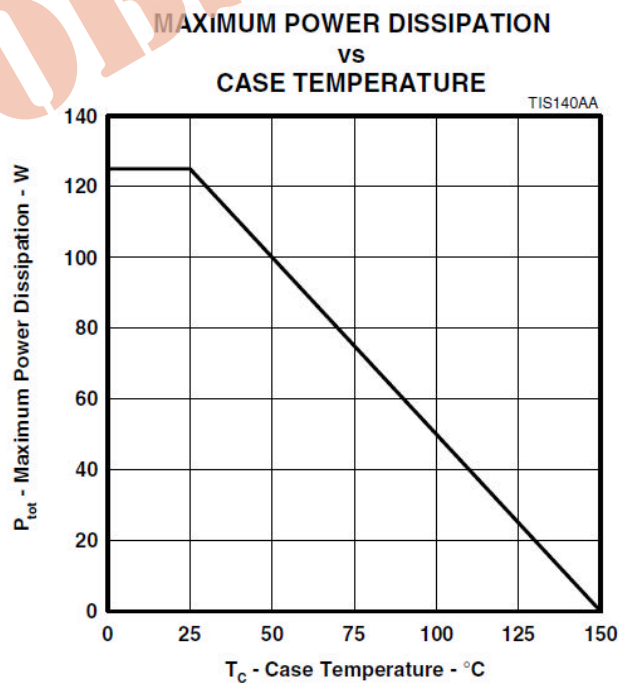
**PRODUCT INFORMATION**

AUGUST 1978 - REVISED JUNE 2011  
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MAXIMUM SAFE OPERATING REGIONS



THERMAL INFORMATION



PRODUCT INFORMATION

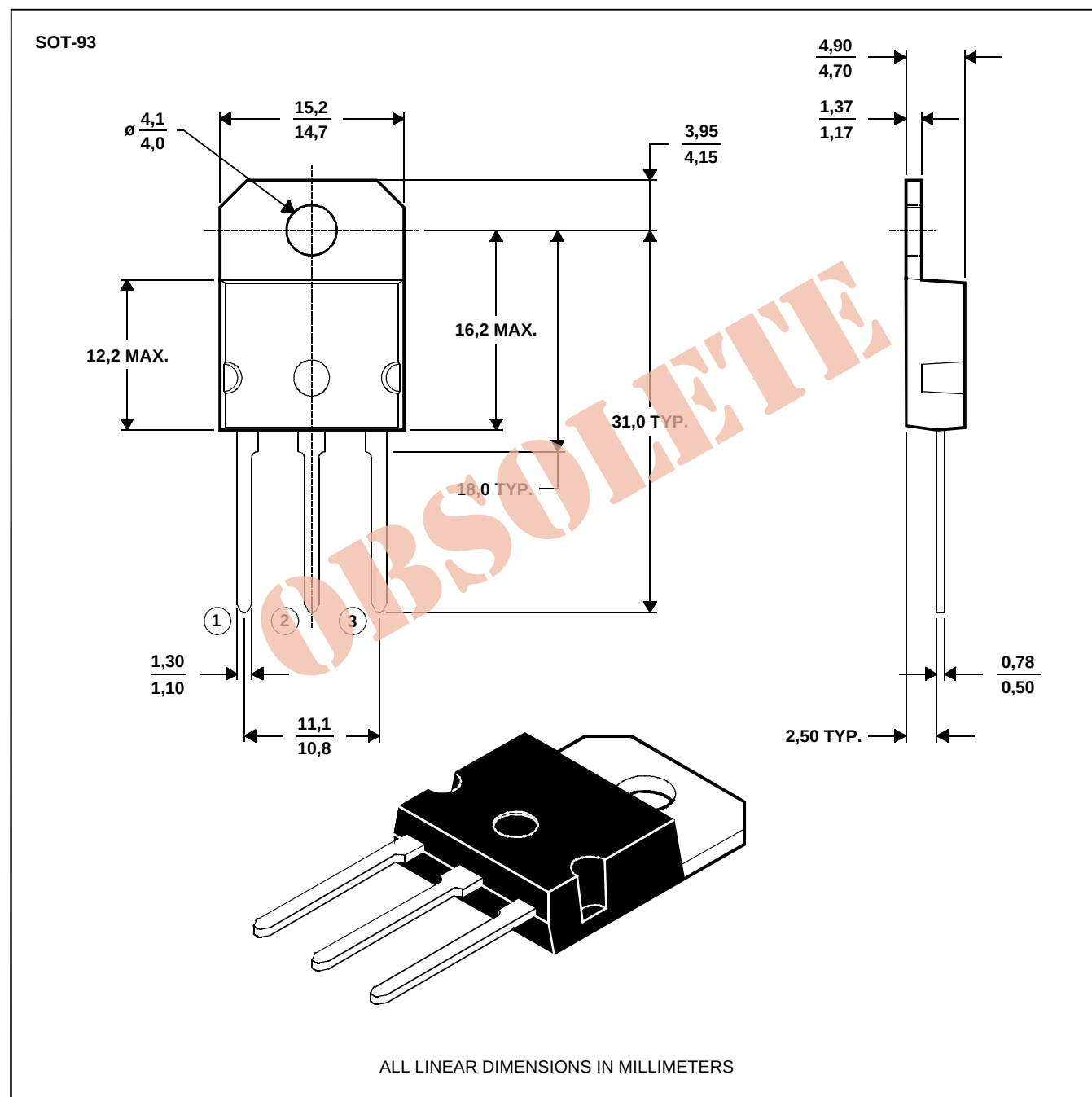
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**MECHANICAL DATA**

**SOT-93**

**3-pin plastic flange-mount package**

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



NOTE A: The centre pin is in electrical contact with the mounting tab.

MDXXAW

**PRODUCT INFORMATION**