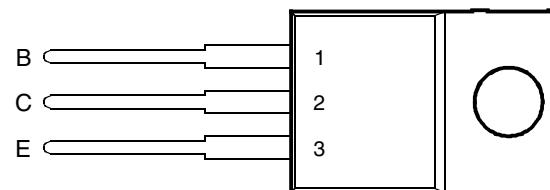


- Designed for Complementary Use with BDW54, BDW54A, BDW54B, BDW54C and BDW54D
- 40 W at 25°C Case Temperature
- 4 A Continuous Collector Current
- Minimum  $h_{FE}$  of 750 at 3V, 1.5 A

TO-220 PACKAGE  
(TOP VIEW)

Pin 2 is in electrical contact with the mounting base.

MDTRACA

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

| RATING   |                      | SYMBOL    | VALUE       | UNIT |
|--|----------------------|-----------|-------------|------|
| Collector-base voltage ( $I_E = 0$ )   | BDW53                | $V_{CBO}$ | 45          | V    |
|  | BDW53A               |           | 60          |      |
|  | BDW53B               |           | 80          |      |
|  | BDW53C               |           | 100         |      |
|  | BDW53D               |           | 120         |      |
| Collector-emitter voltage ( $I_B = 0$ ) (see Note 1)                               | BDW53                | $V_{CEO}$ | 45          | V    |
|  | BDW53A               |           | 60          |      |
|  | BDW53B               |           | 80          |      |
|  | BDW53C               |           | 100         |      |
|  | BDW53D               |           | 120         |      |
| Emitter-base voltage   | $V_{EBO}$            |           | 5           | V    |
| Continuous collector current   | $I_C$                |           | 4           | A    |
| Continuous base current  | $I_B$                |           | 50          | mA   |
| Continuous device dissipation at (or below) 25°C case temperature (see Note 2)     | $P_{tot}$            |           | 40          | W    |
| Continuous device dissipation at (or below) 25°C free air temperature (see Note 3) | $P_{tot}$            |           | 2           | W    |
| Unclamped inductive load energy (see Note 4)                                       | $\frac{1}{2}L I_C^2$ |           | 25          | 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 0.32 W/°C.

3. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.

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

## PRODUCT INFORMATION

**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)              | BDW53<br>BDW53A<br>BDW53B<br>BDW53C<br>BDW53D | 45<br>60<br>80<br>100<br>120 |       | V  |
| $I_{CEO}$     | Collector-emitter cut-off current    | $V_{CE} = 30 \text{ V}$  | $I_B = 0$             |                           | BDW53   |                              | 0.5   |    |
|               |                                      | $V_{CE} = 30 \text{ V}$  | $I_B = 0$             |                           | BDW53A  |                              | 0.5   |    |
|               |                                      | $V_{CE} = 40 \text{ V}$  | $I_B = 0$             |                           | BDW53B  |                              | 0.5   |    |
|               |                                      | $V_{CE} = 50 \text{ V}$  | $I_B = 0$             |                           | BDW53C  |                              | 0.5   |    |
|               |                                      | $V_{CE} = 60 \text{ V}$  | $I_B = 0$             |                           | BDW53D  |                              | 0.5   |    |
| $I_{CBO}$     | Collector cut-off current            | $V_{CB} = 45 \text{ V}$  | $I_E = 0$             |                           | BDW53   |                              | 0.2   |    |
|               |                                      | $V_{CB} = 60 \text{ V}$  | $I_E = 0$             |                           | BDW53A  |                              | 0.2   |    |
|               |                                      | $V_{CB} = 80 \text{ V}$  | $I_E = 0$             |                           | BDW53B  |                              | 0.2   |    |
|               |                                      | $V_{CB} = 100 \text{ V}$ | $I_E = 0$             |                           | BDW53C  |                              | 0.2   |    |
|               |                                      | $V_{CB} = 120 \text{ V}$ | $I_E = 0$             |                           | BDW53D  |                              | 0.2   |    |
|               |                                      | $V_{CB} = 45 \text{ V}$  | $I_E = 0$             | $T_C = 150^\circ\text{C}$ | BDW53   |                              | 5     |    |
|               |                                      | $V_{CB} = 60 \text{ V}$  | $I_E = 0$             | $T_C = 150^\circ\text{C}$ | BDW53A  |                              | 5     |    |
|               |                                      | $V_{CB} = 80 \text{ V}$  | $I_E = 0$             | $T_C = 150^\circ\text{C}$ | BDW53B  |                              | 5     |    |
|               |                                      | $V_{CB} = 100 \text{ V}$ | $I_E = 0$             | $T_C = 150^\circ\text{C}$ | BDW53C  |                              | 5     |    |
|               |                                      | $V_{CB} = 120 \text{ V}$ | $I_E = 0$             | $T_C = 150^\circ\text{C}$ | BDW53D  |                              | 5     |    |
| $I_{EBO}$     | Emitter cut-off current              | $V_{EB} = 5 \text{ V}$   | $I_C = 0$             |                           |   |                              | 2     | mA |
| $h_{FE}$      | Forward current transfer ratio       | $V_{CE} = 3 \text{ V}$   | $I_C = 1.5 \text{ A}$ | (see Notes 5 and 6)       | 750   |                              | 20000 |    |
|               |                                      | $V_{CE} = 3 \text{ V}$   | $I_C = 4 \text{ A}$   |                           | 100   |                              |       |    |
| $V_{BE(on)}$  | Base-emitter voltage                 | $V_{CE} = 3 \text{ V}$   | $I_C = 1.5 \text{ A}$ | (see Notes 5 and 6)       |   |                              | 2.5   | V  |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $I_B = 30 \text{ mA}$    | $I_C = 1.5 \text{ A}$ | (see Notes 5 and 6)       |   |                              | 2.5   | V  |
|               |                                      | $I_B = 40 \text{ mA}$    | $I_C = 4 \text{ A}$   |                           |   |                              | 4     |    |
| $V_{EC}$      | Parallel diode forward voltage       | $I_E = 4 \text{ A}$      | $I_B = 0$             |                           |   |                              | 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     |     |     | 3.125 | °C/W |
| $R_{\theta JA}$ Junction to free air thermal resistance |     |     | 62.5  | °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                 | $I_C = 2 \text{ A}$          | $I_{B(on)} = 8 \text{ mA}$ | $I_{B(off)} = -8 \text{ mA}$           |     | 1   |      | μs |
| $t_{off}$ | Turn-off time                | $V_{BE(off)} = -5 \text{ V}$ | $R_L = 15 \Omega$          | $t_p = 20 \mu\text{s}$ , dc $\leq 2\%$ |     | 4.5 |      | μs |

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

TYPICAL CHARACTERISTICS

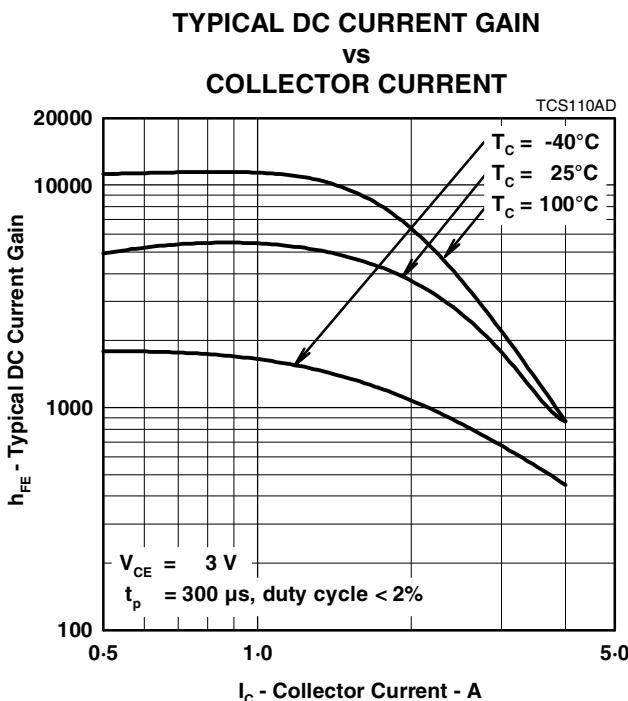


Figure 1.

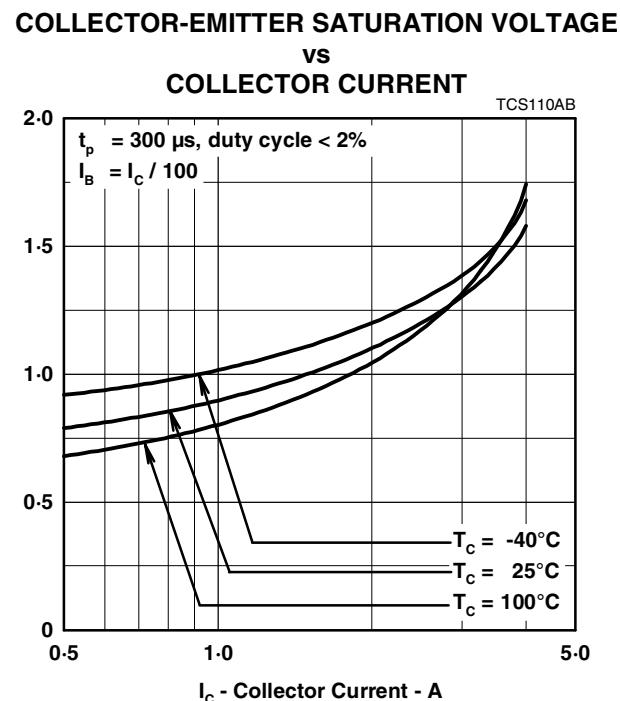


Figure 2.

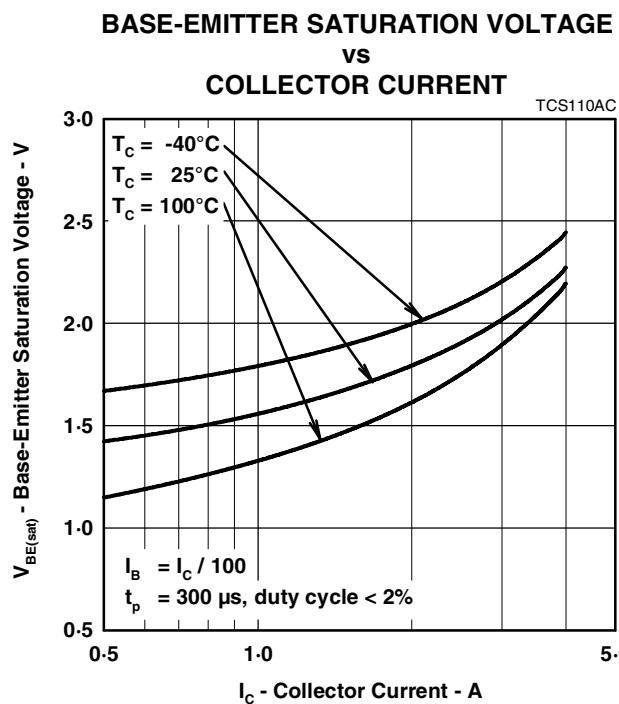


Figure 3.

**PRODUCT INFORMATION**

### MAXIMUM SAFE OPERATING REGIONS

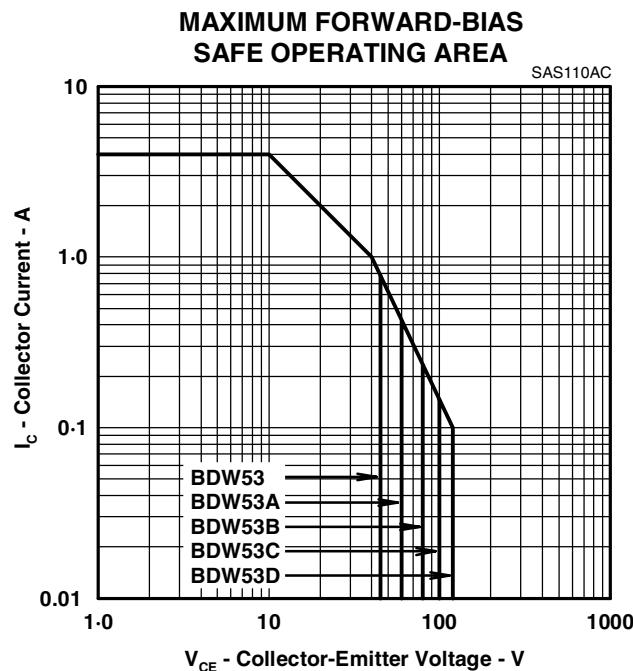


Figure 4.

### THERMAL INFORMATION

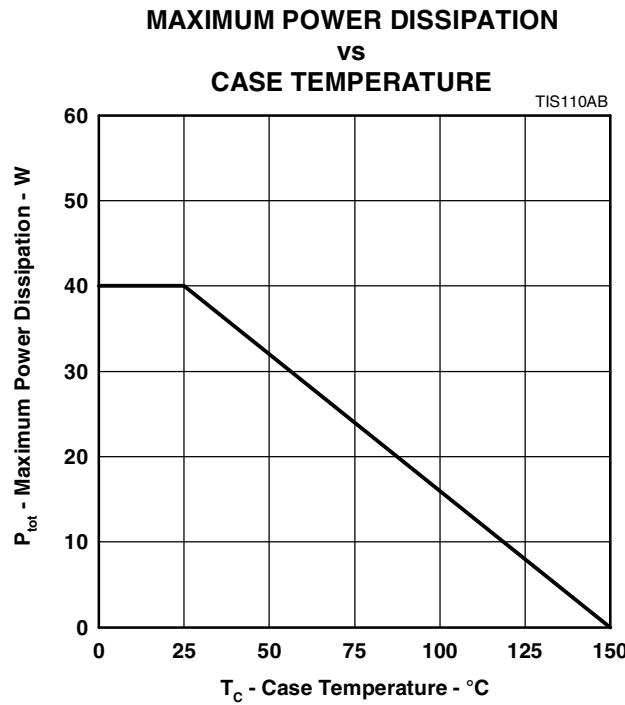


Figure 5.

### PRODUCT INFORMATION

AUGUST 1978 - REVISED SEPTEMBER 2002  
Specifications are subject to change without notice.