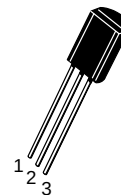
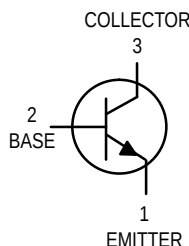


# One Watt High Voltage Transistor

## NPN Silicon

**MPSW42**

Motorola Preferred Device



CASE 29-05, STYLE 1  
TO-92 (TO-226AE)

### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value       | Unit                          |
|----------------------------------------------------------------------------------------|----------------|-------------|-------------------------------|
| Collector–Emitter Voltage                                                              | $V_{CEO}$      | 300         | Vdc                           |
| Collector–Base Voltage                                                                 | $V_{CBO}$      | 300         | Vdc                           |
| Emitter–Base Voltage                                                                   | $V_{EBO}$      | 6.0         | Vdc                           |
| Collector Current — Continuous                                                         | $I_C$          | 500         | mA <sub>dc</sub>              |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.0<br>8.0  | Watt<br>mW/ $^\circ\text{C}$  |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 2.5<br>20   | Watts<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | –55 to +150 | $^\circ\text{C}$              |

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max | Unit               |
|-----------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 125 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case    | $R_{\theta JC}$ | 50  | $^\circ\text{C/W}$ |

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                   |               |     |     |                    |
|---------------------------------------------------------------------------------------------------|---------------|-----|-----|--------------------|
| Collector–Emitter Breakdown Voltage <sup>(1)</sup><br>( $I_C = 1.0 \text{ mA}_{dc}$ , $I_E = 0$ ) | $V_{(BR)CEO}$ | 300 | —   | Vdc                |
| Collector–Base Breakdown Voltage<br>( $I_C = 100 \mu\text{A}_{dc}$ , $I_E = 0$ )                  | $V_{(BR)CBO}$ | 300 | —   | Vdc                |
| Emitter–Base Breakdown Voltage<br>( $I_E = 100 \mu\text{A}_{dc}$ , $I_C = 0$ )                    | $V_{(BR)EBO}$ | 6.0 | —   | Vdc                |
| Collector Cutoff Current<br>( $V_{CB} = 200 \text{ Vdc}$ , $I_E = 0$ )                            | $I_{CBO}$     | —   | 0.1 | $\mu\text{A}_{dc}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 6.0 \text{ Vdc}$ , $I_C = 0$ )                              | $I_{EBO}$     | —   | 0.1 | $\mu\text{A}_{dc}$ |

1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

Preferred devices are Motorola recommended choices for future use and best overall value.

ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (Continued)

| Characteristic                                                                                                                                                                        | Symbol        | Min            | Max         | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|-------------|------|
| <b>ON CHARACTERISTICS</b>                                                                                                                                                             |               |                |             |      |
| DC Current Gain<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 30\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ ) | $h_{FE}$      | 25<br>40<br>40 | —<br>—<br>— | —    |
| Collector–Emitter Saturation Voltage<br>( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ )                                                                                              | $V_{CE(sat)}$ | —              | 0.5         | Vdc  |
| Base–Emitter Saturation Voltage<br>( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ )                                                                                                   | $V_{BE(sat)}$ | —              | 0.9         | Vdc  |
| <b>SMALL–SIGNAL CHARACTERISTICS</b>                                                                                                                                                   |               |                |             |      |
| Current–Gain — Bandwidth Product<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 20\text{ MHz}$ )                                                                         | $f_T$         | 50             | —           | MHz  |
| Collector Capacitance<br>( $V_{CB} = 20\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                                                                              | $C_{cb}$      | —              | 3.0         | pF   |

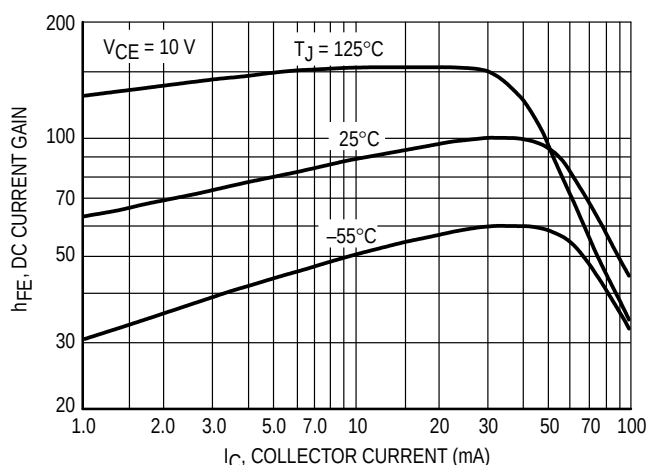


Figure 1. DC Current Gain

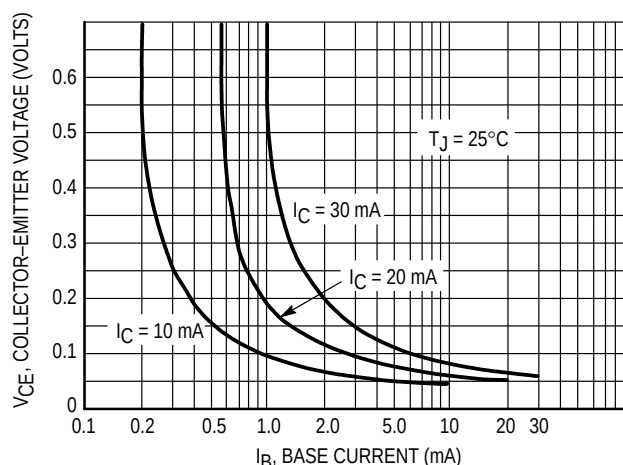


Figure 2. Collector Saturation Region

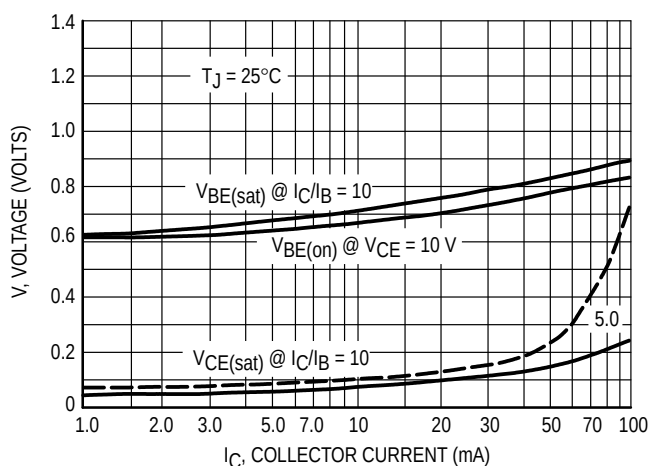


Figure 3. "On" Voltages

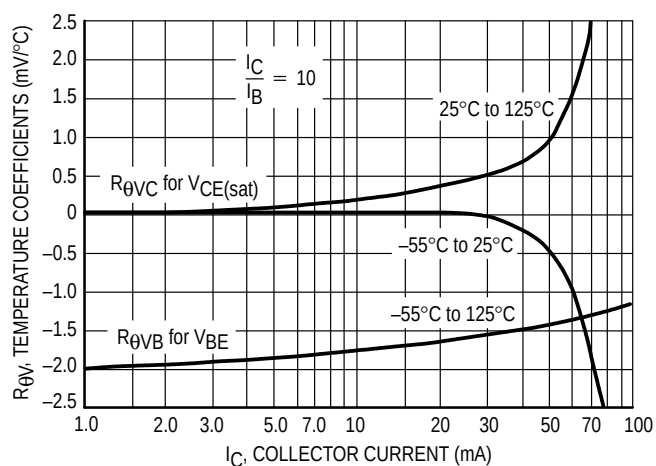


Figure 4. Temperature Coefficients

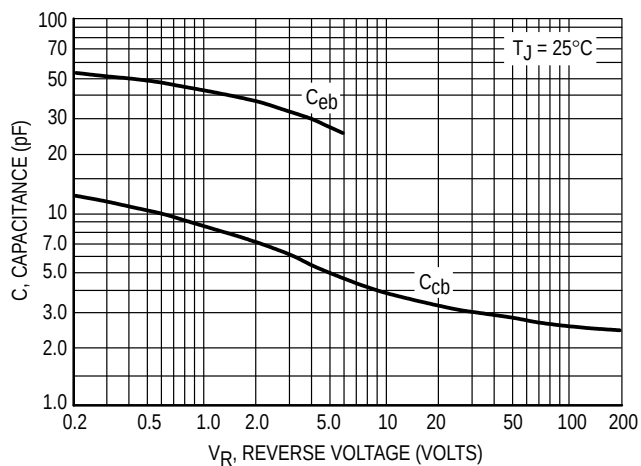


Figure 5. Capacitance

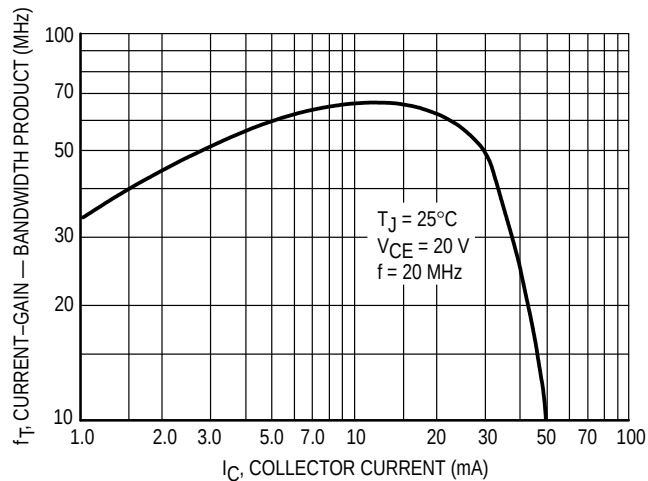


Figure 6. Current-Gain — Bandwidth Product

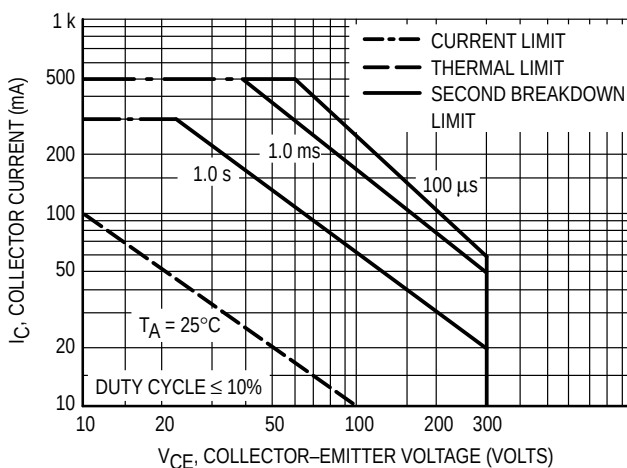
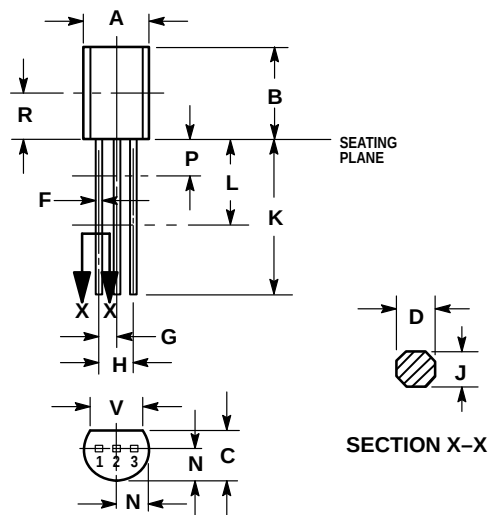


Figure 7. Active Region — Safe Operating Area

## PACKAGE DIMENSIONS



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSIONS D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.175  | 0.205 | 4.44        | 5.21 |
| B   | 0.290  | 0.310 | 7.37        | 7.87 |
| C   | 0.125  | 0.165 | 3.18        | 4.19 |
| D   | 0.018  | 0.022 | 0.46        | 0.56 |
| F   | 0.016  | 0.019 | 0.41        | 0.48 |
| G   | 0.045  | 0.055 | 1.15        | 1.39 |
| H   | 0.095  | 0.105 | 2.42        | 2.66 |
| J   | 0.018  | 0.024 | 0.46        | 0.61 |
| K   | 0.500  | —     | 12.70       | —    |
| L   | 0.250  | —     | 6.35        | —    |
| N   | 0.080  | 0.105 | 2.04        | 2.66 |
| P   | —      | 0.100 | —           | 2.54 |
| R   | 0.135  | —     | 3.43        | —    |
| V   | 0.135  | —     | 3.43        | —    |

## STYLE 1:

1. PIN 1. EMITTER
2. BASE
3. COLLECTOR

**CASE 029-05  
(TO-226AE)  
ISSUE AD**

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