

# MPSW13

## One Watt Darlington Transistor

### NPN Silicon

#### Features

- Pb-Free Package is Available\*

#### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value       | Unit                      |
|----------------------------------------------------------------------------------------|----------------|-------------|---------------------------|
| Collector – Emitter Voltage                                                            | $V_{CES}$      | 30          | Vdc                       |
| Collector – Base Voltage                                                               | $V_{CBO}$      | 30          | Vdc                       |
| Emitter – Base Voltage                                                                 | $V_{EBO}$      | 10          | Vdc                       |
| Collector Current – Continuous                                                         | $I_C$          | 1.0         | Adc                       |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.0<br>8.0  | W<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   | W<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | -55 to +150 | $^\circ\text{C}$          |

#### THERMAL CHARACTERISTICS

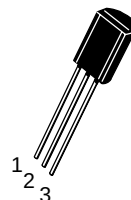
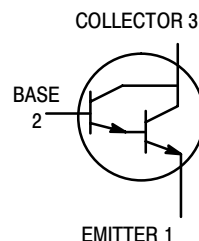
| Characteristic                          | Symbol          | Max | Unit               |
|-----------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 125 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.



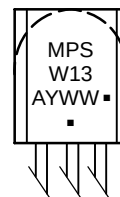
ON Semiconductor®

<http://onsemi.com>



TO-92 (TO-226)  
CASE 29-10  
STYLE 1

#### MARKING DIAGRAM



MPSW13 = Device Code

A = Assembly Location

Y = Year

WW = Work Week

▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device      | Package            | Shipping <sup>†</sup> |
|-------------|--------------------|-----------------------|
| MPSW13RLRA  | TO-92              | 2,000/Tape & Reel     |
| MPSW13RLRAG | TO-92<br>(Pb-Free) | 2,000/Tape & Reel     |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MPSW13

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

| Characteristic                                                                                                                       | Symbol        | Min             | Max    | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|--------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                           |               |                 |        |      |
| Collector–Emitter Breakdown Voltage<br>( $I_C = 100\ \mu\text{A}$ , $V_{BE} = 0$ )                                                   | $V_{(BR)CES}$ | 30              | –      | Vdc  |
| Collector Cutoff Current<br>( $V_{CB} = 30\ \text{Vdc}$ , $I_E = 0$ )                                                                | $I_{CBO}$     | –               | 100    | nA   |
| Emitter Cutoff Current<br>( $V_{EB} = 10\ \text{Vdc}$ , $I_C = 0$ )                                                                  | $I_{EBO}$     | –               | 100    | nA   |
| <b>ON CHARACTERISTICS (Note 1)</b>                                                                                                   |               |                 |        |      |
| DC Current Gain<br>( $I_C = 10\ \text{mA}$ , $V_{CE} = 5.0\ \text{Vdc}$ )<br>( $I_C = 100\ \text{mA}$ , $V_{CE} = 5.0\ \text{Vdc}$ ) | $h_{FE}$      | 5,000<br>10,000 | –<br>– | –    |
| Collector–Emitter Saturation Voltage<br>( $I_C = 100\ \text{mA}$ , $I_B = 0.1\ \text{mA}$ )                                          | $V_{CE(sat)}$ | –               | 1.5    | Vdc  |
| Base–Emitter On Voltage<br>( $I_C = 100\ \text{mA}$ , $V_{CE} = 5.0\ \text{Vdc}$ )                                                   | $V_{BE(on)}$  | –               | 2.0    | Vdc  |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>                                                                                                  |               |                 |        |      |
| Current–Gain – Bandwidth Product (Note 2)<br>( $I_C = 10\ \text{mA}$ , $V_{CE} = 5.0\ \text{Vdc}$ , $f = 100\ \text{MHz}$ )          | $f_T$         | 125             | –      | MHz  |

1. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .
2.  $f_T = |h_{fe}| \cdot f_{test}$ .

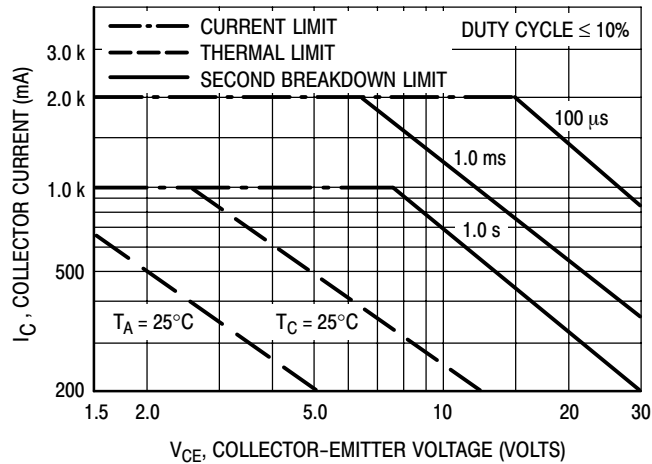


Figure 1. Active Region – Safe Operating Area

# MPSW13

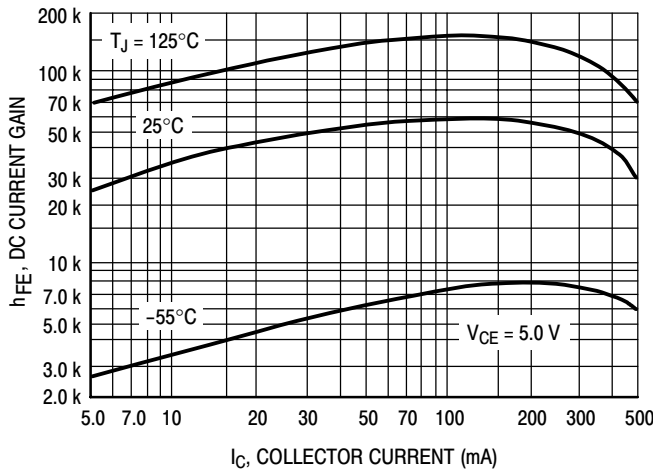


Figure 2. DC Current Gain

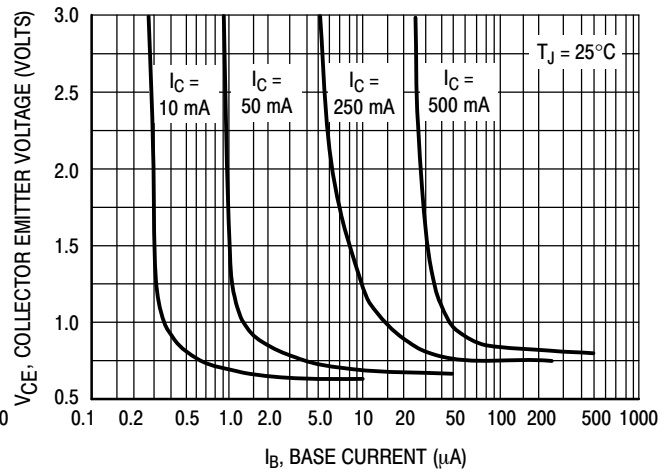


Figure 3. Collector Saturation Region

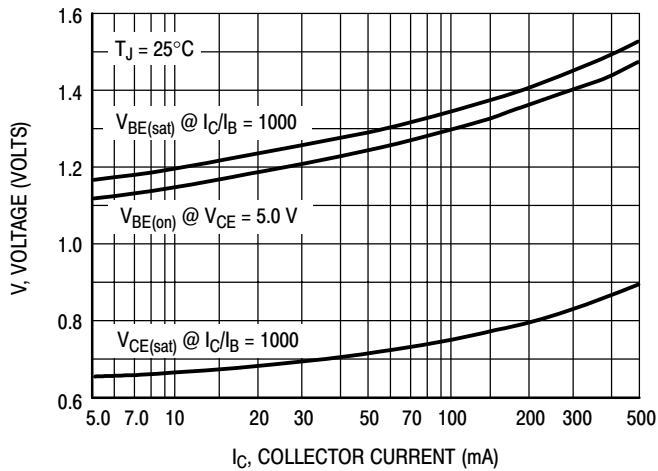


Figure 4. "ON" Voltages

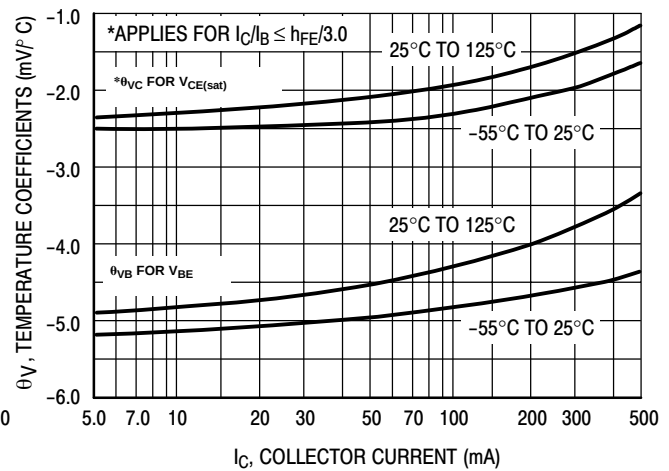


Figure 5. Temperature Coefficients

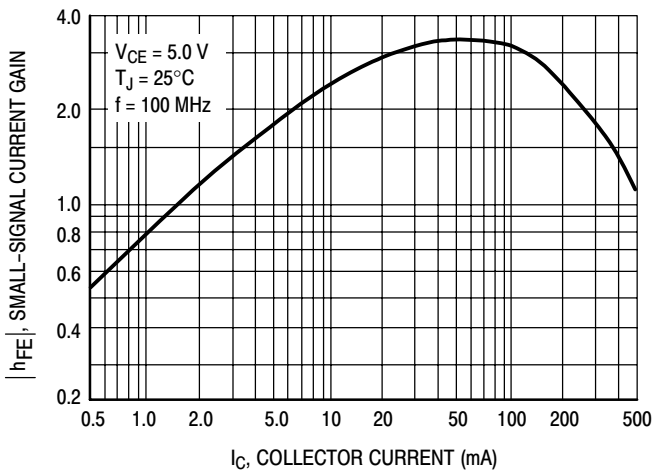


Figure 6. High Frequency Current Gain

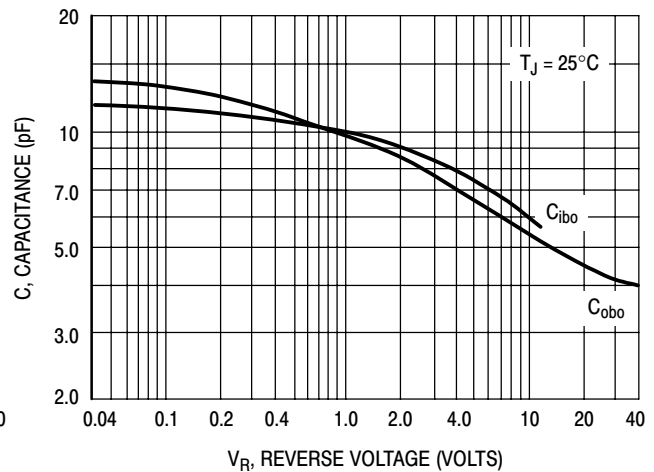
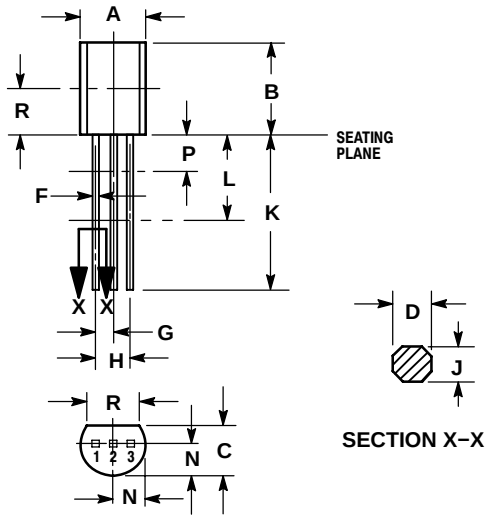


Figure 7. Capacitance

# MPSW13

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-10  
ISSUE AL



### 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  | 0.021 | 0.457       | 0.533 |
| F   | 0.016  | 0.019 | 0.407       | 0.482 |
| 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        | ---   |

### STYLE 1:

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

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