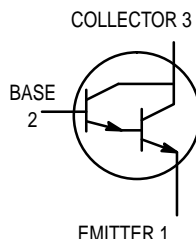


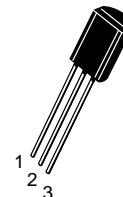
One Watt Darlington Transistors

NPN Silicon



MPSW45
MPSW45A*

*Motorola Preferred Device



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

MAXIMUM RATINGS

| Rating | Symbol | MPSW45 | MPSW45A | Unit |
|--|----------------|-------------|---------|-------------------------------|
| Collector–Emitter Voltage | V_{CES} | 40 | 50 | Vdc |
| Collector–Base Voltage | V_{CBO} | 50 | 60 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 12 | 12 | Vdc |
| Collector Current — Continuous | I_C | 1.0 | 1.0 | Adc |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.0 | 8.0 | Watts mW/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 2.5 | 20 | Watts mW/ $^\circ\text{C}$ |
| Operating and Storage Junction 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 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 50 | $^\circ\text{C}/\text{W}$ |

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

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

OFF CHARACTERISTICS

| | | | | | |
|--|-------------------|---------------|----------|------------|------|
| Collector–Emitter Breakdown Voltage ($I_C = 100 \mu\text{Adc}$, $V_{BE} = 0$) | MPSW45 MPSW45A | $V_{(BR)CES}$ | 40 50 | — — | Vdc |
| Collector–Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}$, $I_E = 0$) | MPSW45 MPSW45A | $V_{(BR)CBO}$ | 50 60 | — — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}$, $I_C = 0$) | | $V_{(BR)EBO}$ | 12 | — | Vdc |
| Collector Cutoff Current ($V_{CB} = 30 \text{Vdc}$, $I_E = 0$) ($V_{CB} = 40 \text{Vdc}$, $I_E = 0$) | MPSW45 MPSW45A | I_{CBO} | — — | 100 100 | nAdc |
| Emitter Cutoff Current ($V_{EB} = 10 \text{Vdc}$, $I_C = 0$) | | I_{EBO} | — | 100 | nAdc |

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

MPSW45 MPSW45A

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

| Characteristic | Symbol | Min | Max | Unit |
|--|----------------------|---------------------------|-------------------|-----------------|
| ON CHARACTERISTICS(1) | | | | |
| DC Current Gain (I _C = 200 mA _{dc} , V _{CE} = 5.0 V _{dc}) (I _C = 500 mA _{dc} , V _{CE} = 5.0 V _{dc}) (I _C = 1.0 A _{dc} , V _{CE} = 5.0 V _{dc}) | h _{FE} | 25,000 15,000 4,000 | 150,000 — — | — |
| Collector–Emitter Saturation Voltage (I _C = 1.0 A _{dc} , I _B = 2.0 mA _{dc}) | V _{CE(sat)} | — | 1.5 | V _{dc} |
| Base–Emitter Saturation Voltage (I _C = 1.0 A _{dc} , I _B = 2.0 mA _{dc}) | V _{BE(sat)} | — | 2.0 | V _{dc} |
| Base–Emitter On Voltage (I _C = 1.0 A _{dc} , V _{CE} = 5.0 V _{dc}) | V _{BE(on)} | — | 2.0 | V _{dc} |

SMALL–SIGNAL CHARACTERISTICS

| | | | | |
|---|-----------------|-----|-----|-----|
| Current–Gain – Bandwidth Product (I _C = 200 mA _{dc} , V _{CE} = 5.0 V _{dc} , f = 100 MHz) | f _T | 100 | — | MHz |
| Collector–Base Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f = 1.0 MHz) | C _{cb} | — | 6.0 | pF |

1. Pulse Test: Pulse Width ≤ 300 μs; Duty Cycle ≤ 2.0%.

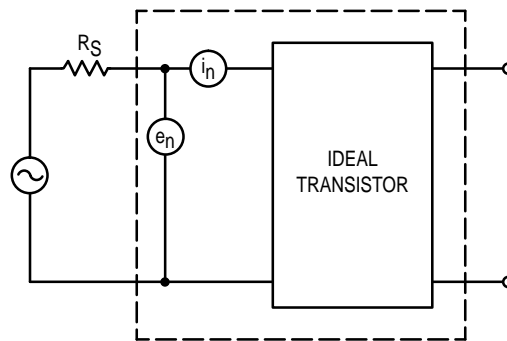


Figure 1. Transistor Noise Model

NOISE CHARACTERISTICS

($V_{CE} = 5.0 \text{ Vdc}$, $T_A = 25^\circ\text{C}$)

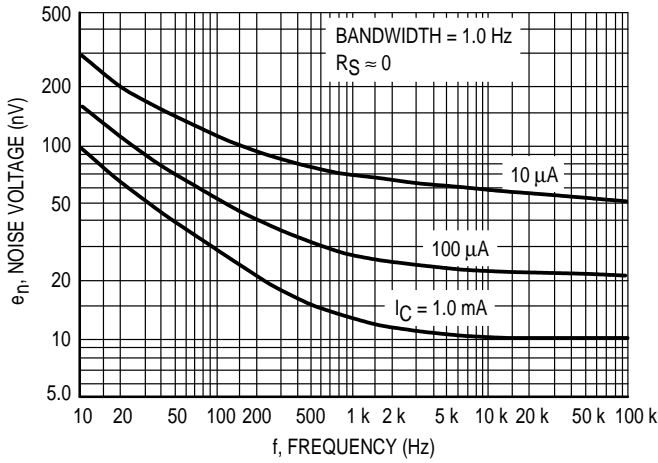


Figure 2. Noise Voltage

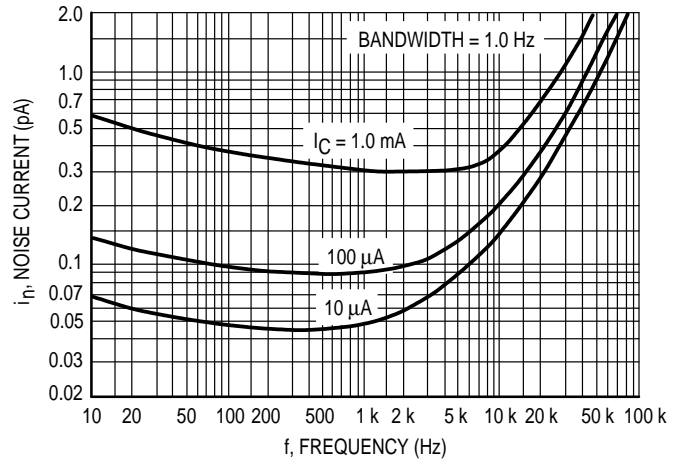


Figure 3. Noise Current

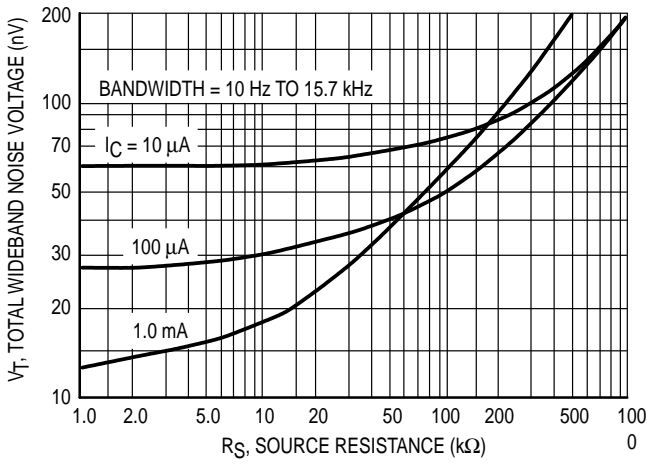


Figure 4. Total Wideband Noise Voltage

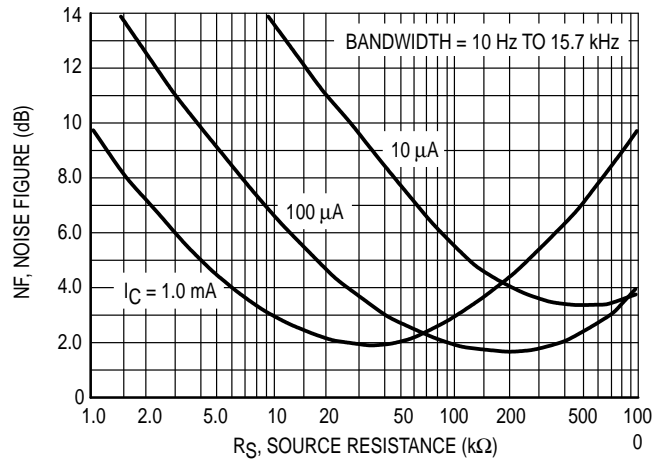


Figure 5. Wideband Noise Figure

SMALL-SIGNAL CHARACTERISTICS

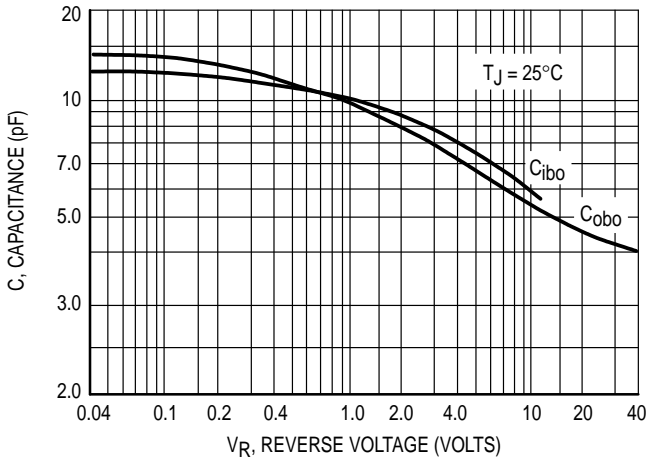


Figure 6. Capacitance

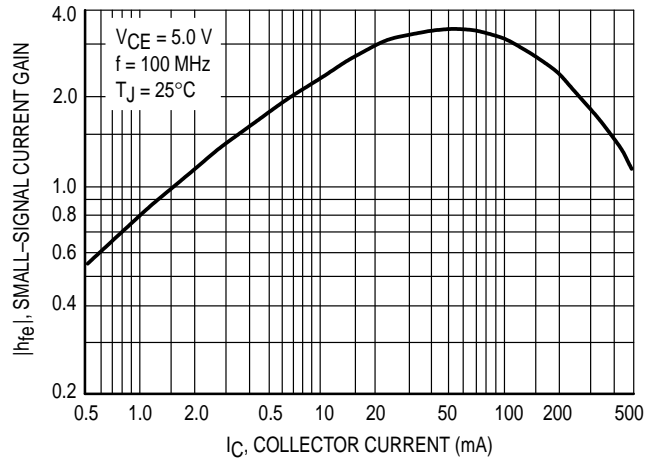


Figure 7. High Frequency Current Gain

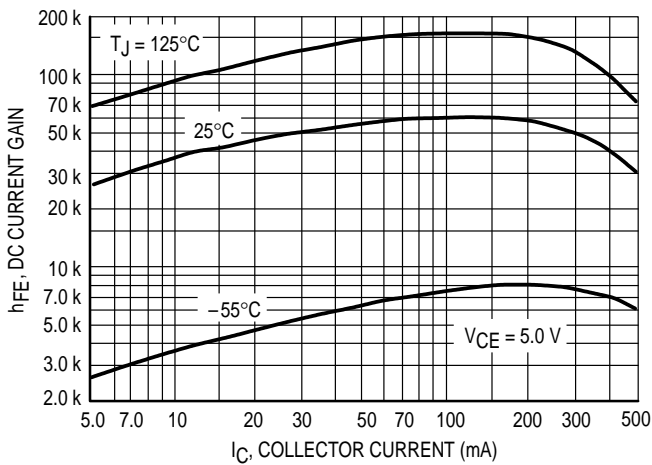


Figure 8. DC Current Gain

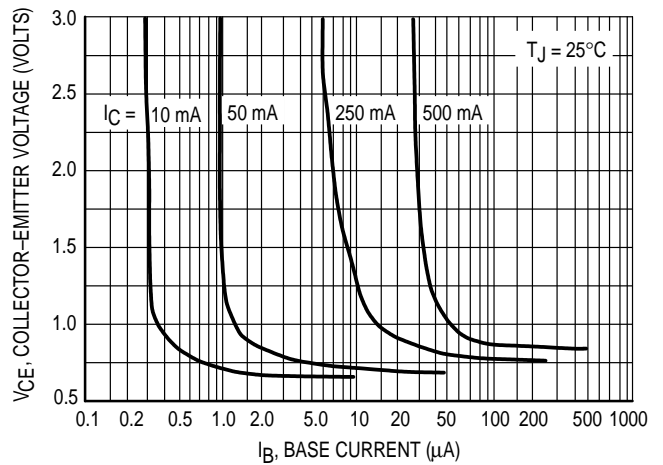


Figure 9. Collector Saturation Region

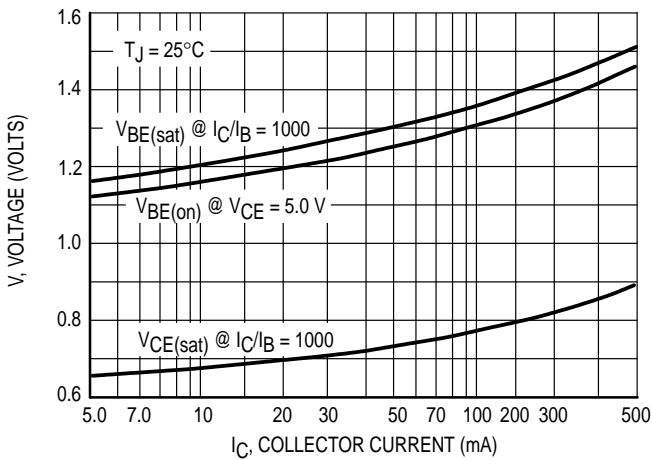


Figure 10. "On" Voltages

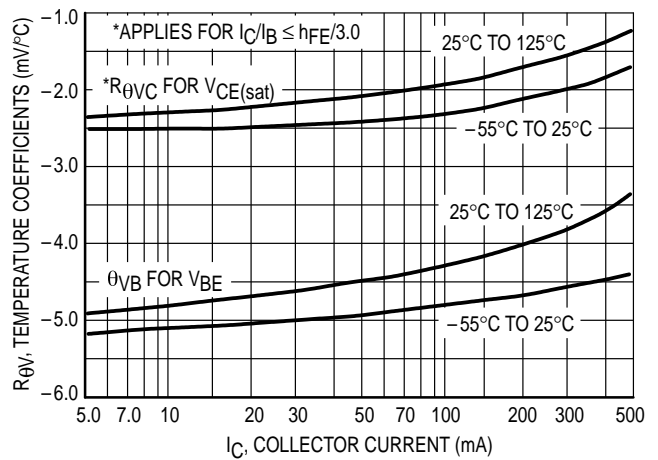


Figure 11. Temperature Coefficients

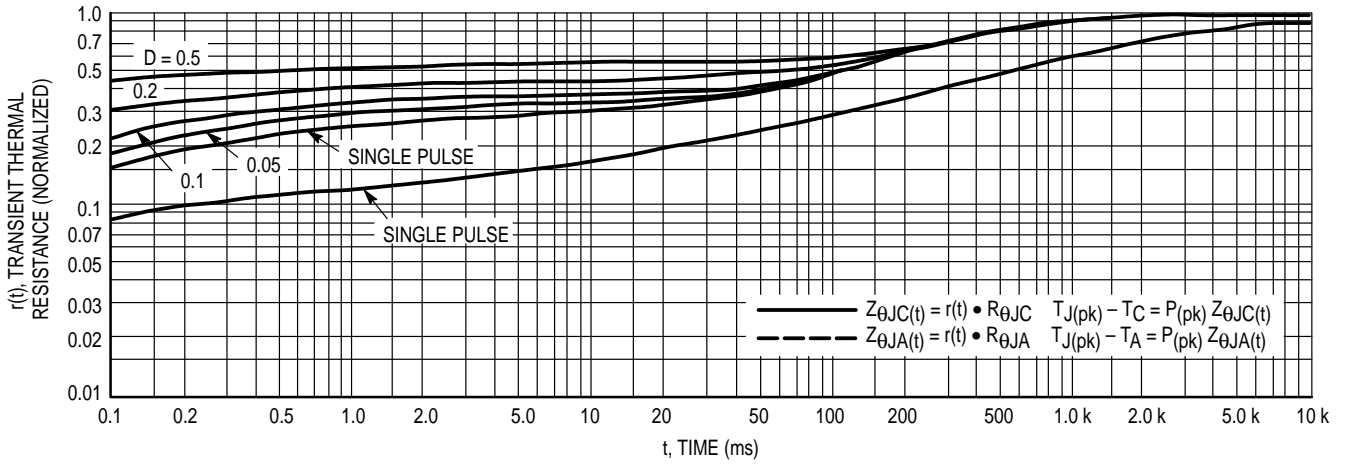


Figure 12. Thermal Response

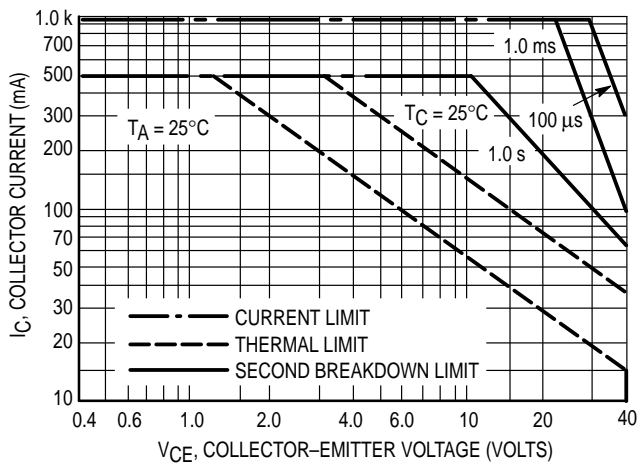
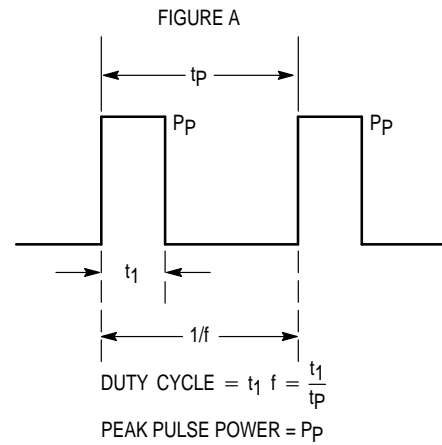
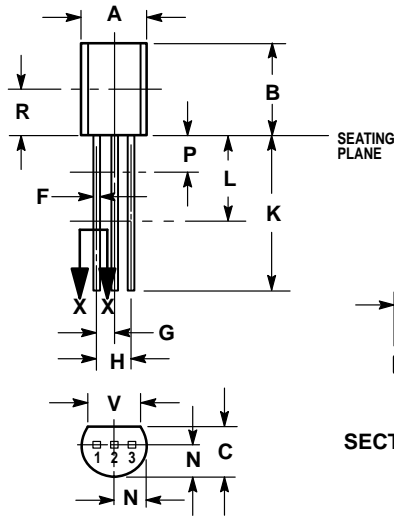


Figure 13. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

PACKAGE DIMENSIONS



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

- 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:
- PIN 1. EMITTER
 - BASE
 - COLLECTOR

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