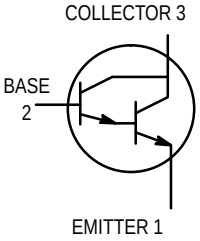
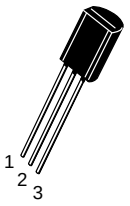
# One Watt Darlington Transistors

## NPN Silicon

**MPS6724**
**MPS6725**




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

### MAXIMUM RATINGS

| Rating | Symbol | MPS6724 | MPS6725 | Unit |
|---|---|---|---|---|
| Collector–Emitter Voltage | $V_{CES}$ | 40 | 50 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 50 | 60 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 12 | | Vdc |
| Collector Current — Continuous | $I_C$ | 1000 | | mAdc |
| Total Device Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 1.0<br>8.0 | | Watts<br>mW/°C |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 2.5<br>20 | | Watts<br>mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | –55 to +150 | | °C |

### THERMAL CHARACTERISTICS

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

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

| Characteristic | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage (1)<br>($I_C$ = 1.0 mAdc, $I_B$ = 0) | <br>MPS6724<br>MPS6725 | $V_{(BR)CES}$ | <br>40<br>50 | <br>—<br>— | Vdc |
| Collector–Base Breakdown Voltage<br>($I_C$ = 1.0 μAdc, $I_E$ = 0) | <br>MPS6724<br>MPS6725 | $V_{(BR)CBO}$ | <br>50<br>60 | <br>—<br>— | Vdc |
| Emitter–Base Breakdown Voltage<br>($I_E$ = 10 μAdc, $I_C$ = 0) | | $V_{(BR)EBO}$ | 12 | — | Vdc |
| Collector Cutoff Current<br>($V_{CB}$ = 30 Vdc, $I_E$ = 0)<br>($V_{CB}$ = 40 Vdc, $I_E$ = 0) | <br>MPS6724<br>MPS6725 | $I_{CBO}$ | <br>—<br>— | <br>100<br>100 | nAdc |
| Emitter Cutoff Current<br>($V_{EB}$ = 10 Vdc, $I_C$ = 0) | | $I_{EBO}$ | — | 100 | nAdc |

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

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **ON CHARACTERISTICS(1)** | | | | |
| DC Current Gain<br>($I_C$ = 200 mAdc, $V_{CE}$ = 5.0 Vdc)<br>($I_C$ = 1000 mAdc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | <br>25,000<br>4,000 | <br>—<br>40,000 | — |
| Collector–Emitter Saturation Voltage<br>($I_C$ = 1000 mAdc, $I_B$ = 2.0 mAdc) | $V_{CE(sat)}$ | — | 1.5 | Vdc |
| Base–Emitter On Voltage<br>($I_C$ = 1000 mAdc, $V_{CE}$ = 5.0 Vdc) | $V_{BE(on)}$ | — | 2.0 | Vdc |
| **SMALL–SIGNAL CHARACTERISTICS** | | | | |
| Current–Gain – Bandwidth Product<br>($I_C$ = 200 mAdc, $V_{CE}$ = 5.0 Vdc, f = 100 MHz) | $f_T$ | 100 | 1000 | MHz |
| Collector–Base Capacitance<br>($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{cb}$ | — | 10 | pF |

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

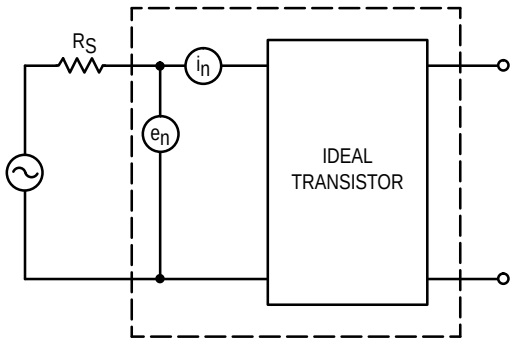



**Figure 1. Transistor Noise Model**

## NOISE CHARACTERISTICS

($V_{CE}$ = 5.0 Vdc, $T_A$ = 25°C)

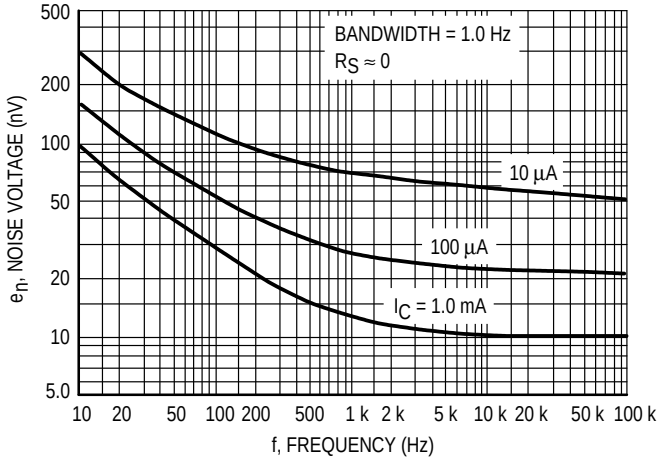



**Figure 2. Noise Voltage**

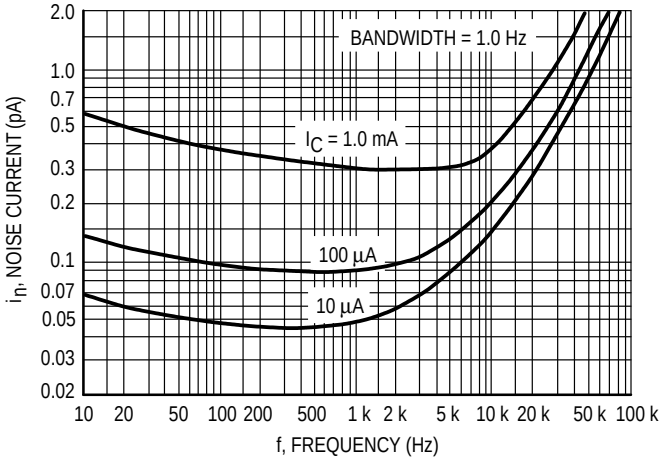



**Figure 3. Noise Current**

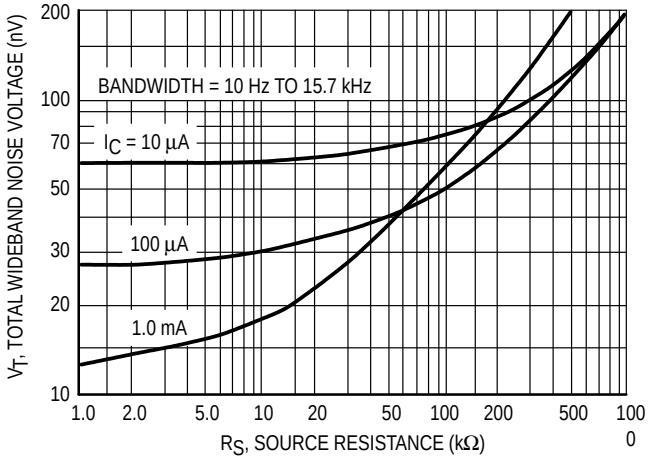



**Figure 4. Total Wideband Noise Voltage**

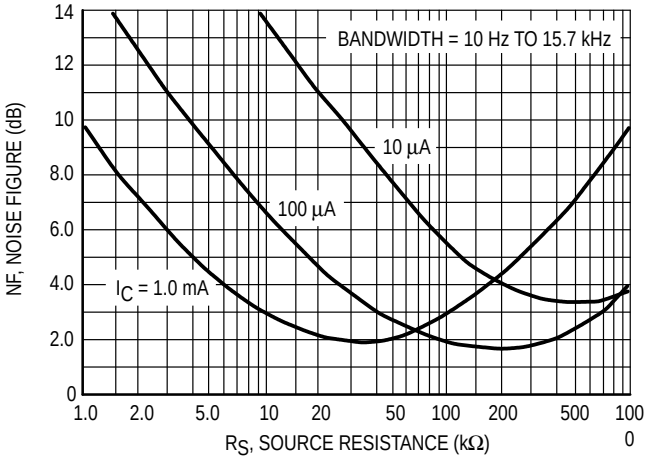



**Figure 5. Wideband Noise Figure**

## SMALL–SIGNAL CHARACTERISTICS

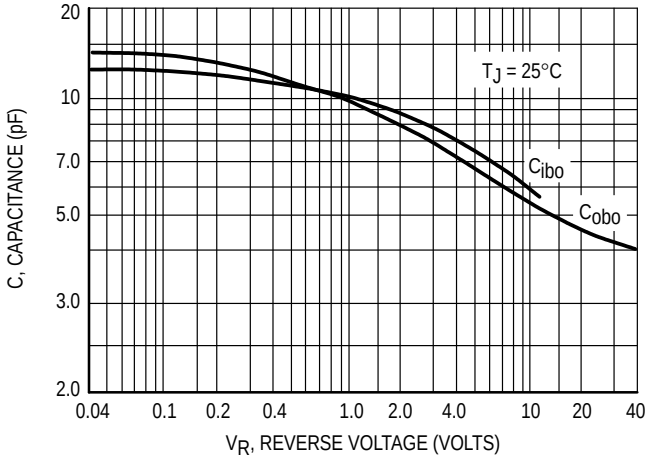



**Figure 6. Capacitance**

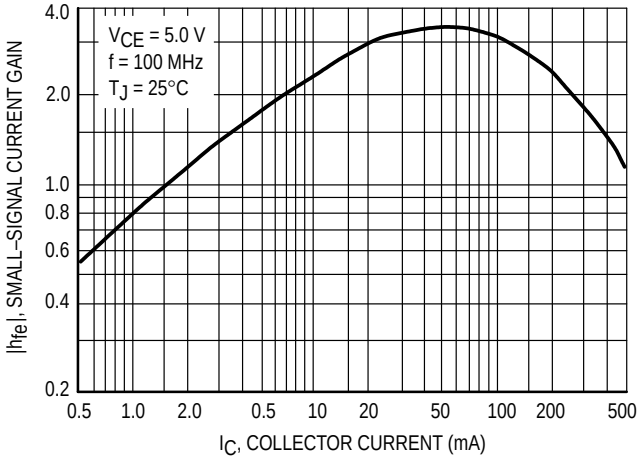



**Figure 7. High Frequency Current Gain**

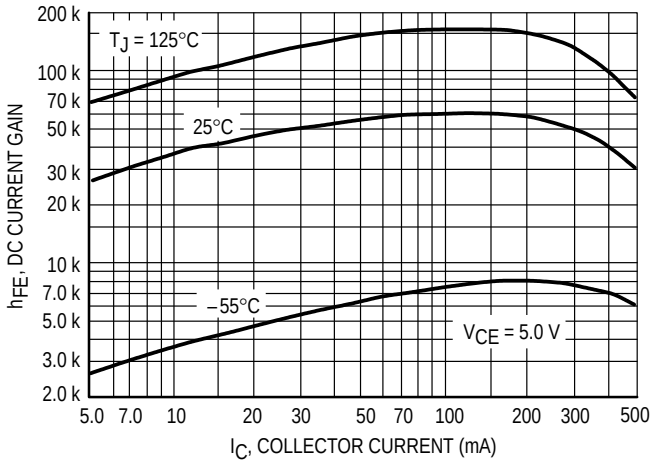



**Figure 8. DC Current Gain**

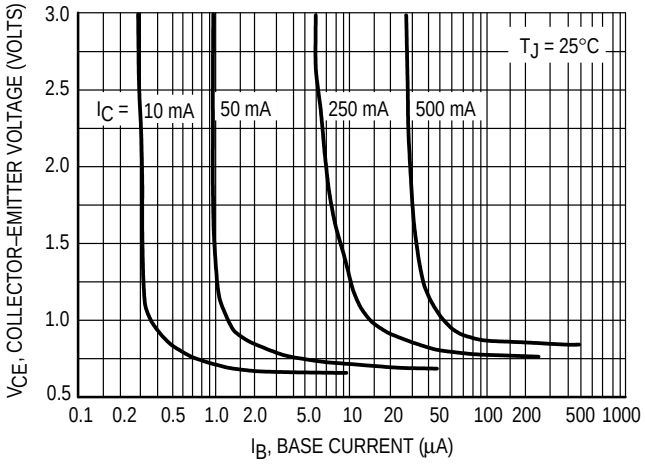



**Figure 9. Collector Saturation Region**

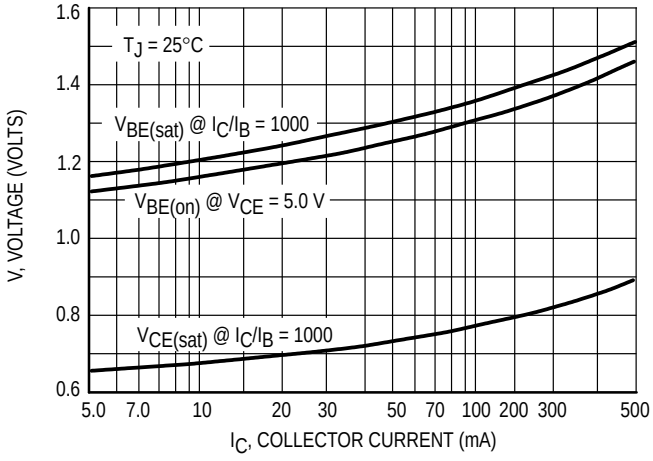



**Figure 10. “On” Voltages**

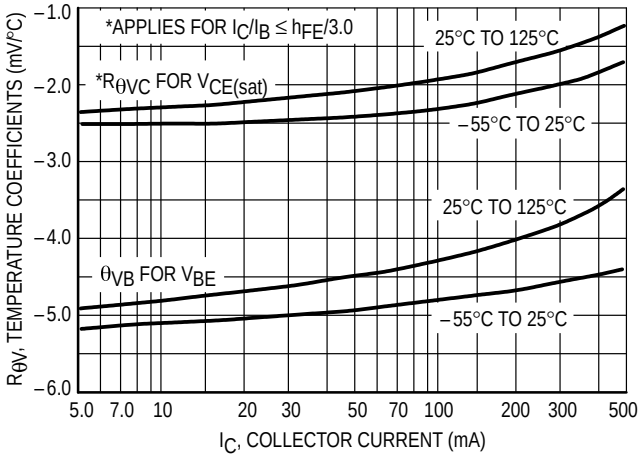



**Figure 11. Temperature Coefficients**

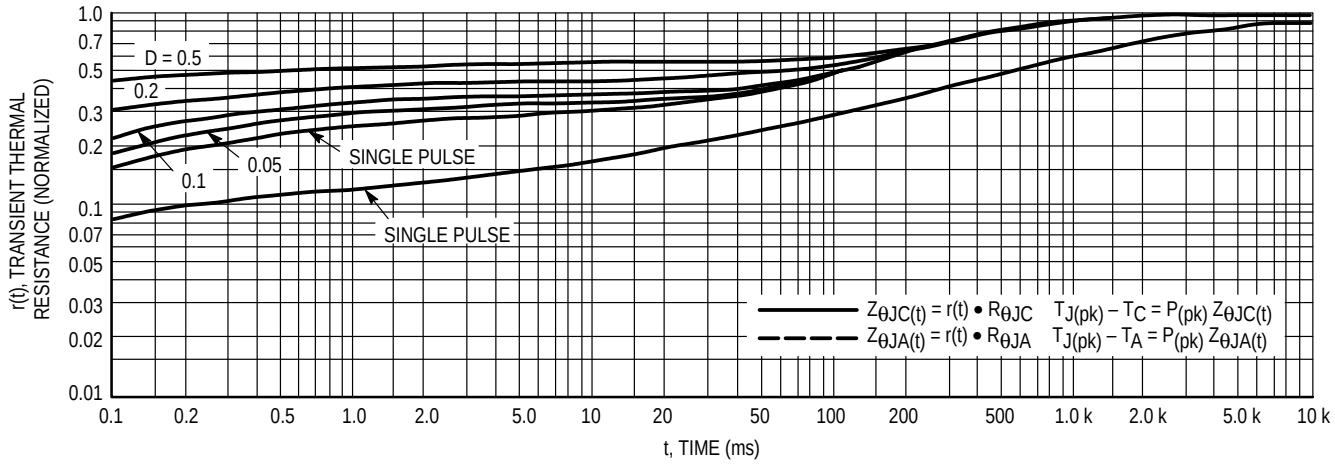



**Figure 12. Thermal Response**

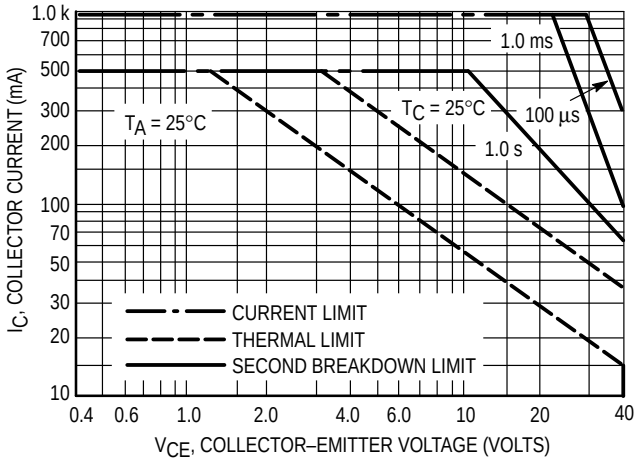
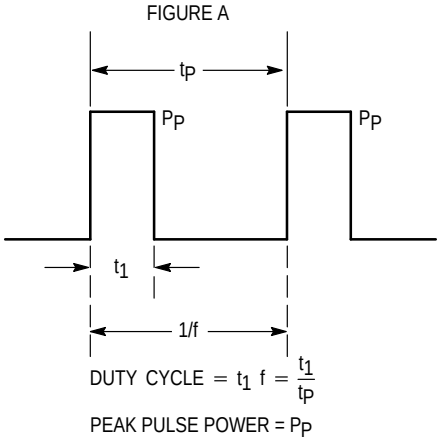
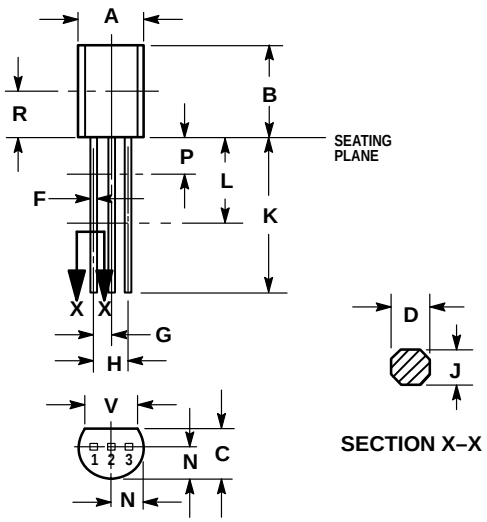



**Figure 13. Active Region Safe Operating Area**




**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 MIMIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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
2. BASE
3. COLLECTOR



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