

# MPSA18

Preferred Device

## Low Noise Transistor

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

| Rating   | Symbol         | Value       | Unit                       |
|--|----------------|-------------|----------------------------|
| Collector-Emitter Voltage  | $V_{CEO}$      | 45          | Vdc                        |
| Collector-Base Voltage   | $V_{CBO}$      | 45          | Vdc                        |
| Emitter-Base Voltage   | $V_{EBO}$      | 6.5         | Vdc                        |
| Collector Current - Continuous   | $I_C$          | 200         | mAdc                       |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625<br>5.0  | mW<br>mW/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.5<br>12   | W<br>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<br>(Note 1) | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case                | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |

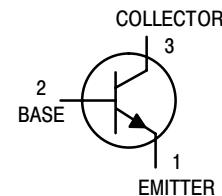
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

1.  $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board.

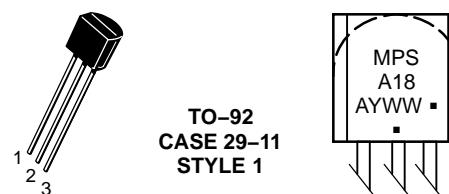


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#### MARKING DIAGRAM



MPSA18 = 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> |
|-------------|-----------------|-----------------------|
| MPSA18      | TO-92           | 5000 Units/Box        |
| MPSA18G     | TO-92 (Pb-Free) | 5000 Units/Box        |
| MPSA18RLRA  | TO-92           | 2000/Tape & Reel      |
| MPSA18RLRAG | TO-92 (Pb-Free) | 2000/Tape & Reel      |
| MPSA18RLRM  | TO-92           | 2000/Ammo Pack        |
| MPSA18RLRMG | TO-92 (Pb-Free) | 2000/Ammo Pack        |
| MPSA18RLRP  | TO-92           | 2000/Ammo Pack        |
| MPSA18RLRPG | TO-92 (Pb-Free) | 2000/Ammo Pack        |

<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.

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

# MPSA18

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

| Characteristic  | Symbol                      | Min | Typ | Max | Unit           |
|---|-----------------------------|-----|-----|-----|----------------|
| <b>OFF CHARACTERISTICS</b>  |                             |     |     |     |                |
| Collector-Emitter Breakdown Voltage (Note 2)<br>( $I_C = 10 \text{ mA}_\text{dc}$ , $I_B = 0$ ) | $V_{(\text{BR})\text{CEO}}$ | 45  | —   | —   | Vdc            |
| Collector-Base Breakdown Voltage<br>( $I_C = 100 \mu\text{A}_\text{dc}$ , $I_E = 0$ )           | $V_{(\text{BR})\text{CBO}}$ | 45  | —   | —   | Vdc            |
| Emitter-Base Breakdown Voltage<br>( $I_E = 10 \mu\text{A}_\text{dc}$ , $I_C = 0$ )              | $V_{(\text{BR})\text{EBO}}$ | 6.5 | —   | —   | Vdc            |
| Collector Cutoff Current<br>( $V_{CB} = 30 \text{ Vdc}$ , $I_E = 0$ )                           | $I_{\text{CBO}}$            | —   | 1.0 | 50  | nA $\text{dc}$ |

## ON CHARACTERISTICS (Note 2)

|   |                      |                          |                            |                     |                  |
|---|----------------------|--------------------------|----------------------------|---------------------|------------------|
| DC Current Gain<br>( $I_C = 10 \mu\text{A}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )<br>( $I_C = 100 \mu\text{A}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )<br>( $I_C = 1.0 \text{ mA}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )<br>( $I_C = 10 \text{ mA}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ ) | $h_{\text{FE}}$      | 400<br>500<br>500<br>500 | 580<br>850<br>1100<br>1150 | —<br>—<br>—<br>1500 | —<br>—<br>—<br>— |
| Collector-Emitter Saturation Voltage<br>( $I_C = 10 \text{ mA}_\text{dc}$ , $I_B = 0.5 \text{ mA}_\text{dc}$ )<br>( $I_C = 50 \mu\text{A}_\text{dc}$ , $I_B = 5.0 \mu\text{A}_\text{dc}$ )  | $V_{CE(\text{sat})}$ | —<br>—                   | —<br>0.08                  | 0.2<br>0.3          | Vdc              |
| Base-Emitter On Voltage<br>( $I_C = 1.0 \text{ mA}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )  | $V_{BE(\text{on})}$  | —                        | 0.6                        | 0.7                 | Vdc              |

## SMALL-SIGNAL CHARACTERISTICS

|  |          |        |            |          |                        |
|--|----------|--------|------------|----------|------------------------|
| Current-Gain – Bandwidth Product<br>( $I_C = 1.0 \text{ mA}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )  | $f_T$    | 100    | 160        | —        | MHz                    |
| Collector-Base Capacitance<br>( $V_{CB} = 5.0 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )   | $C_{cb}$ | —      | 1.7        | 3.0      | pF                     |
| Emitter-Base Capacitance<br>( $V_{EB} = 0.5 \text{ Vdc}$ , $I_C = 0$ , $f = 1.0 \text{ MHz}$ )   | $C_{eb}$ | —      | 5.6        | 6.5      | pF                     |
| Noise Figure<br>( $I_C = 100 \mu\text{A}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 10 \text{ k}\Omega$ , $f = 1.0 \text{ kHz}$ )<br>( $I_C = 100 \mu\text{A}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 1.0 \text{ k}\Omega$ , $f = 100 \text{ Hz}$ ) | NF       | —<br>— | 0.5<br>4.0 | 1.5<br>— | dB                     |
| Equivalent Short Circuit Noise Voltage<br>( $I_C = 100 \mu\text{A}_\text{dc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 1.0 \text{ k}\Omega$ , $f = 100 \text{ Hz}$ )  | $V_T$    | —      | 6.5        | —        | nV/ $\sqrt{\text{Hz}}$ |

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

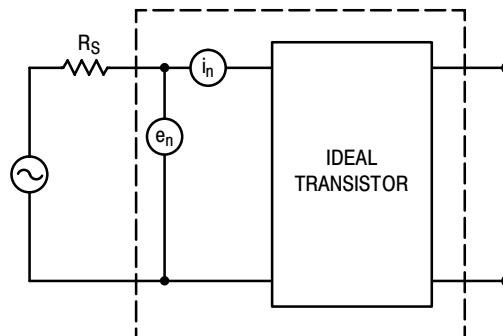
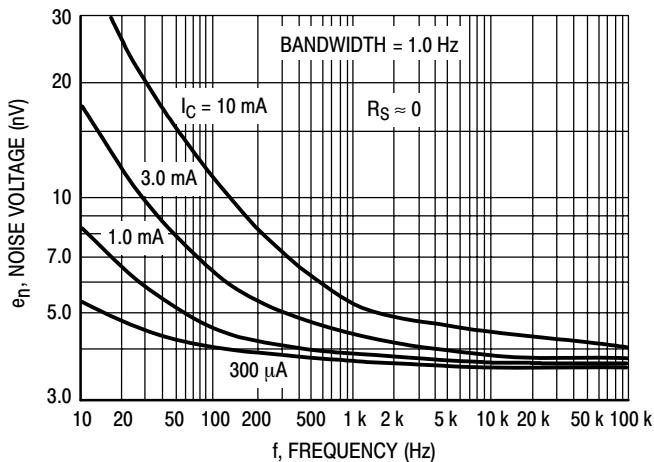


Figure 1. Transistor Noise Model

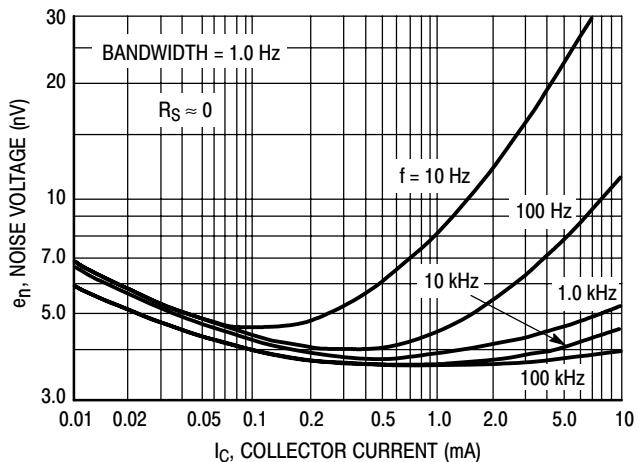
**NOISE CHARACTERISTICS**

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

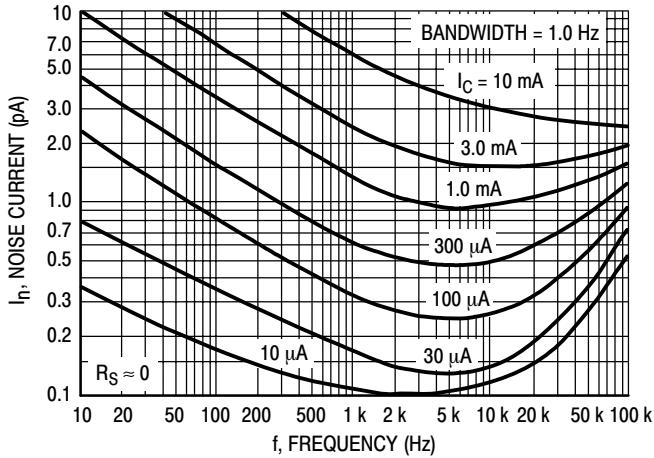
**NOISE VOLTAGE**



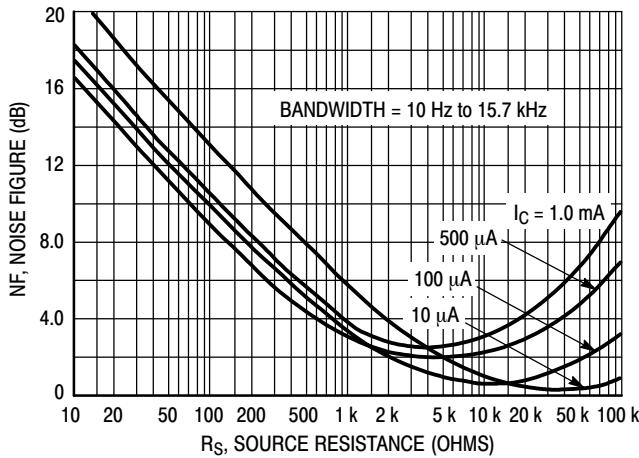
**Figure 2. Effects of Frequency**



**Figure 3. Effects of Collector Current**

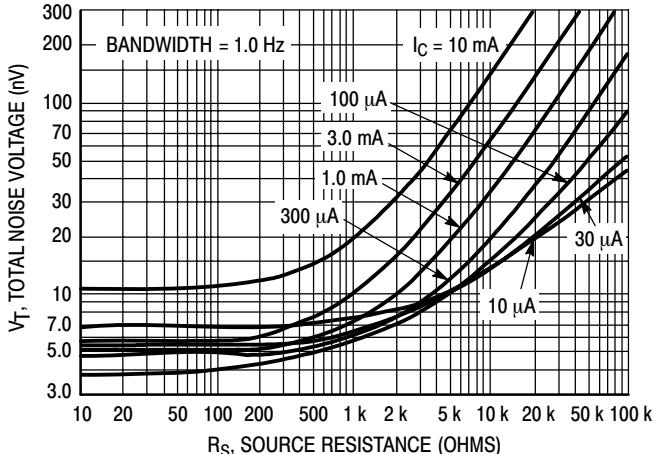


**Figure 4. Noise Current**

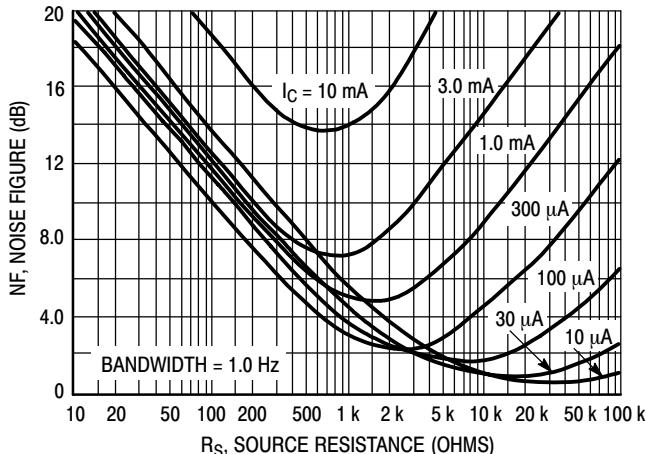


**Figure 5. Wideband Noise Figure**

**100 Hz NOISE DATA**



**Figure 6. Total Noise Voltage**



**Figure 7. Noise Figure**

# MPSA18

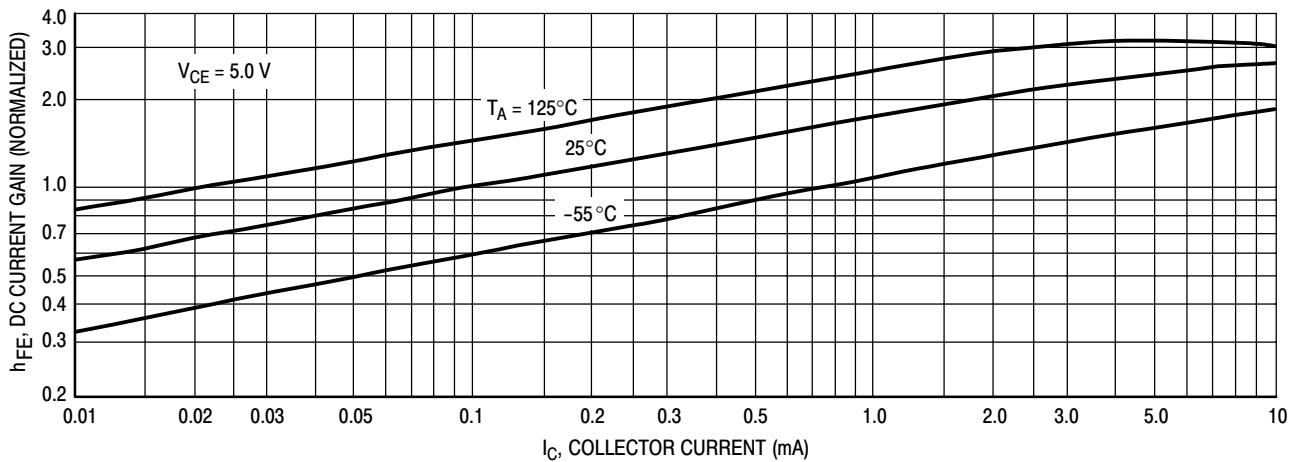


Figure 8. DC Current Gain

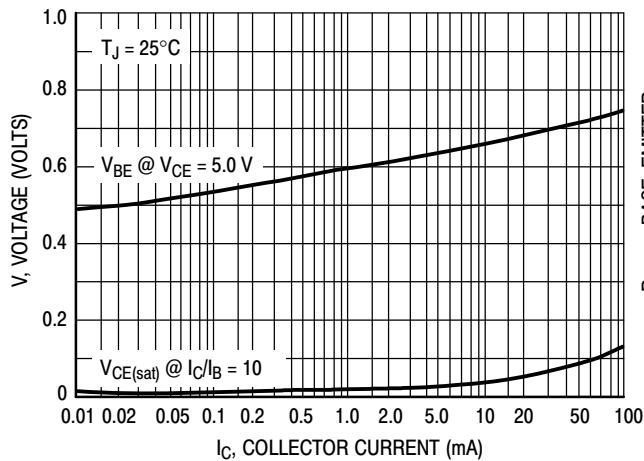


Figure 9. "On" Voltages

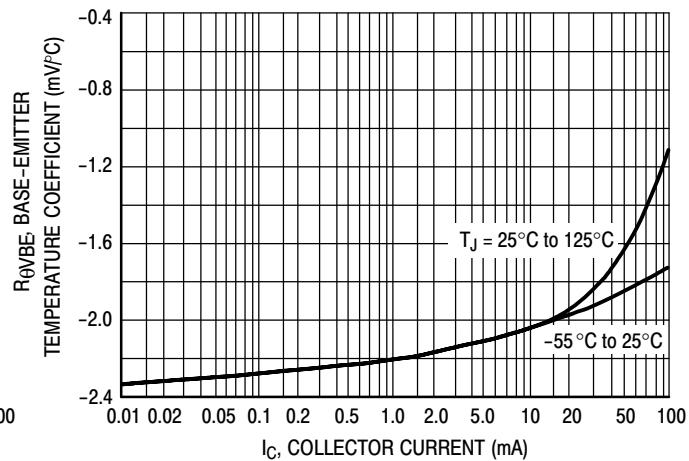


Figure 10. Temperature Coefficients

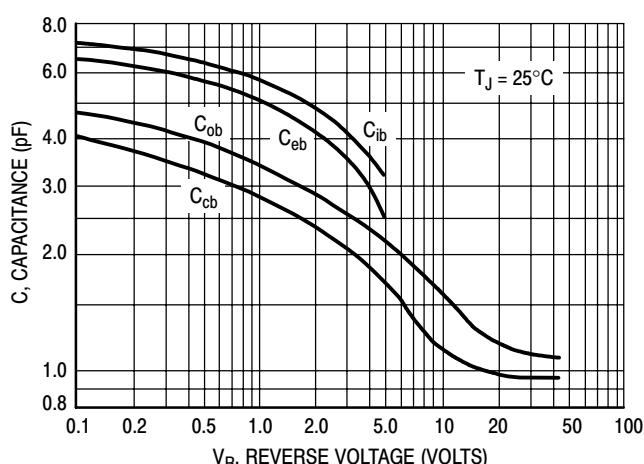


Figure 11. Capacitance

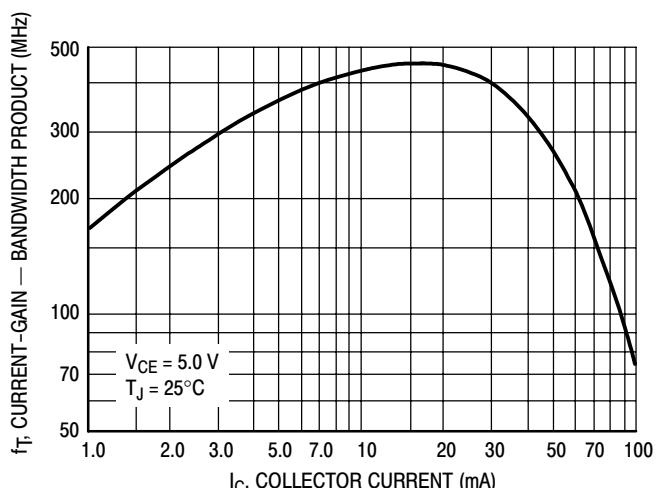
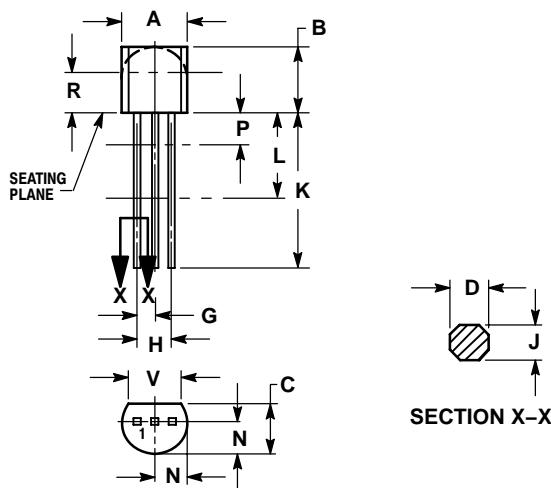


Figure 12. Current-Gain - Bandwidth Product

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-11  
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. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.175  | 0.205 | 4.45        | 5.20  |
| B   | 0.170  | 0.210 | 4.32        | 5.33  |
| C   | 0.125  | 0.165 | 3.18        | 4.19  |
| D   | 0.016  | 0.021 | 0.407       | 0.533 |
| G   | 0.045  | 0.055 | 1.15        | 1.39  |
| H   | 0.095  | 0.105 | 2.42        | 2.66  |
| J   | 0.015  | 0.020 | 0.39        | 0.50  |
| 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   | 0.115  | ---   | 2.93        | ---   |
| V   | 0.135  | ---   | 3.43        | ---   |

STYLE 1:  
 PIN 1. Emitter  
 2. Base  
 3. Collector

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