

# 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 @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 12	W 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 (Note 1)	$R_{\theta JA}$	200	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C/W}$

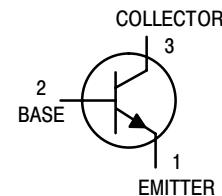
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

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

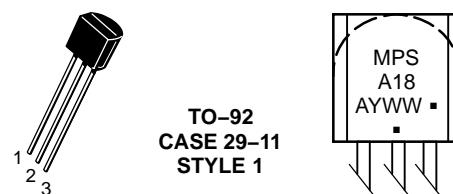


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#### MARKING DIAGRAM



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.

# 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) ( $I_C = 10 \text{ mA}_\text{dc}$ , $I_B = 0$ )	$V_{(\text{BR})\text{CEO}}$	45	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 100 \mu\text{A}_\text{dc}$ , $I_E = 0$ )	$V_{(\text{BR})\text{CBO}}$	45	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \mu\text{A}_\text{dc}$ , $I_C = 0$ )	$V_{(\text{BR})\text{EBO}}$	6.5	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}$ , $I_E = 0$ )	$I_{\text{CBO}}$	—	1.0	50	nA $\text{dc}$

## ON CHARACTERISTICS (Note 2)

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

## SMALL-SIGNAL CHARACTERISTICS

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

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

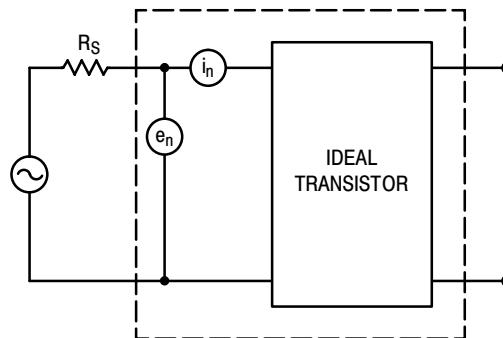
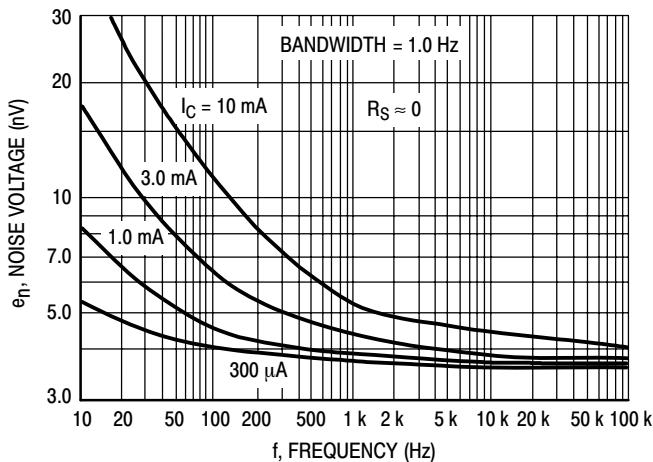


Figure 1. Transistor Noise Model

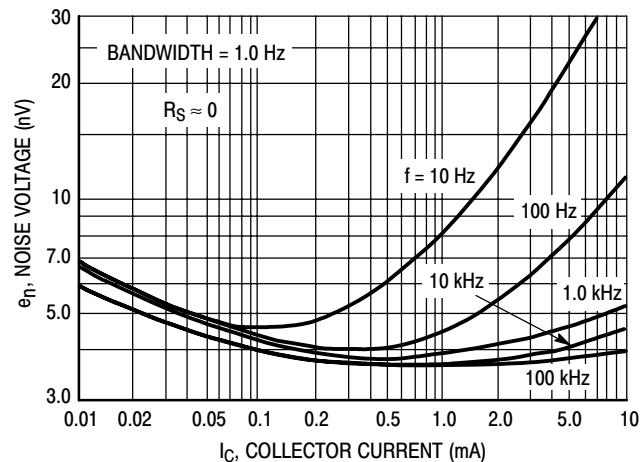
**NOISE CHARACTERISTICS**

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

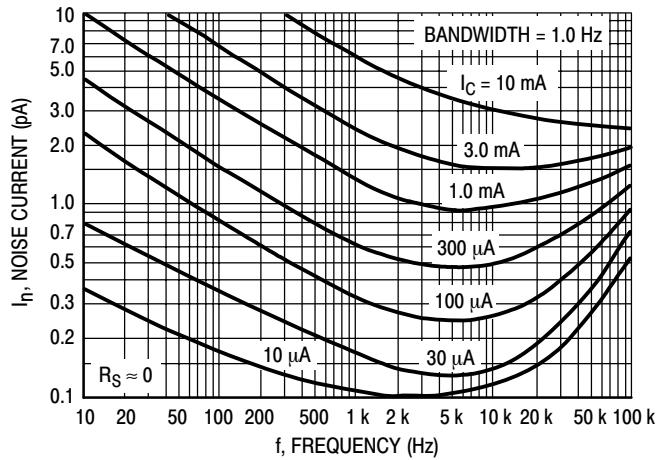
**NOISE VOLTAGE**



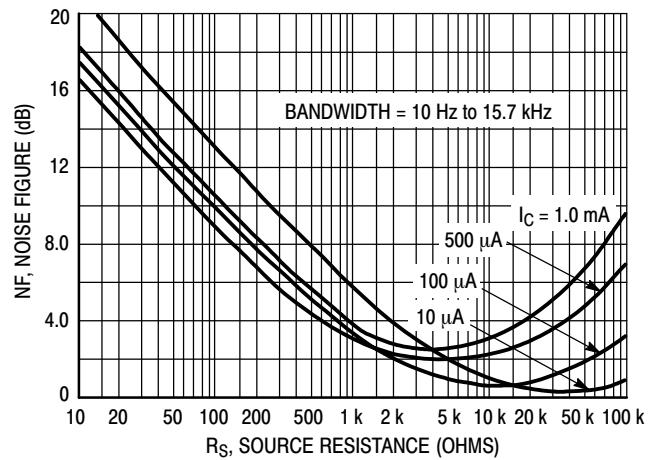
**Figure 2. Effects of Frequency**



**Figure 3. Effects of Collector Current**

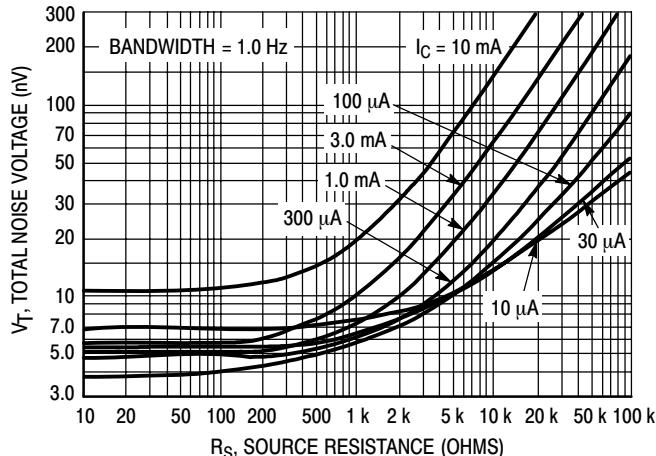


**Figure 4. Noise Current**

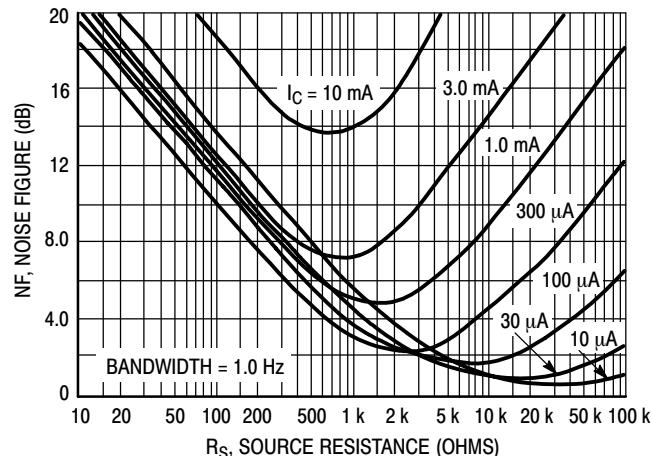


**Figure 5. Wideband Noise Figure**

**100 Hz NOISE DATA**



**Figure 6. Total Noise Voltage**



**Figure 7. Noise Figure**

# MPSA18

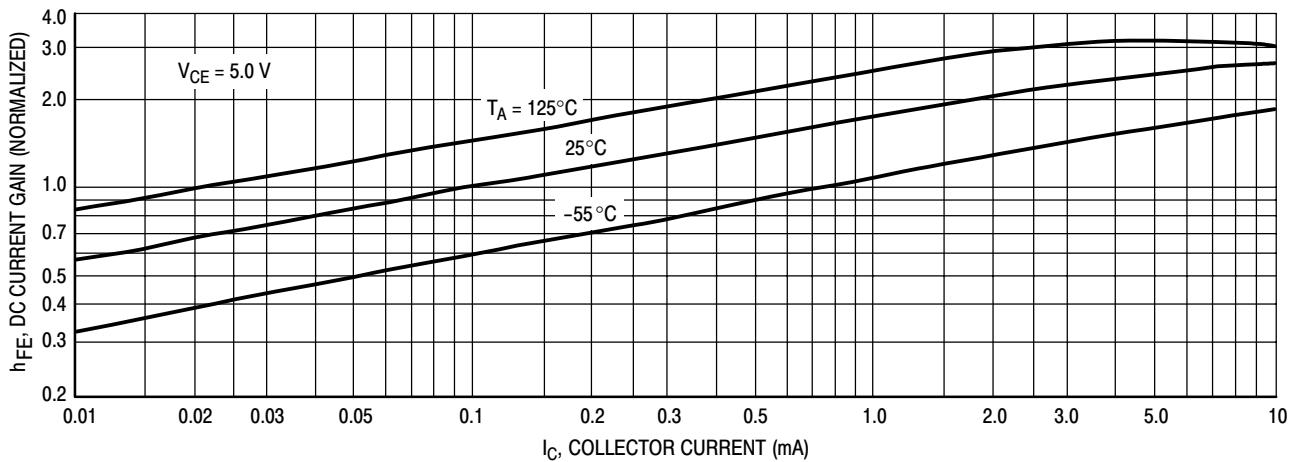


Figure 8. DC Current Gain

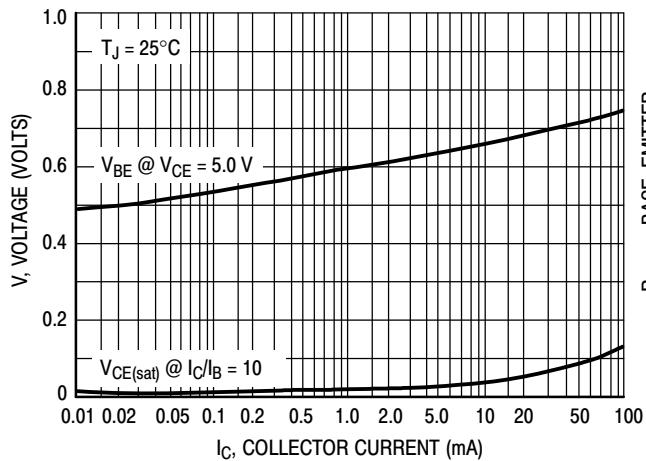


Figure 9. "On" Voltages

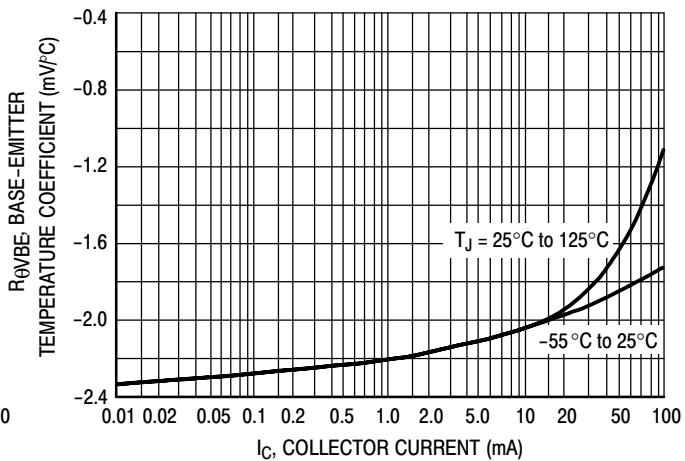


Figure 10. Temperature Coefficients

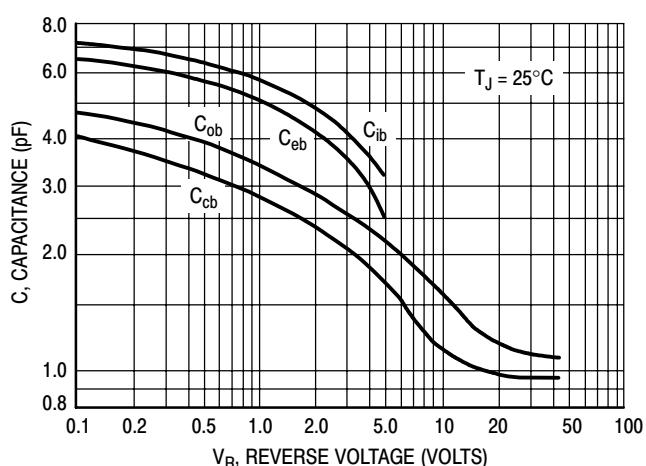


Figure 11. Capacitance

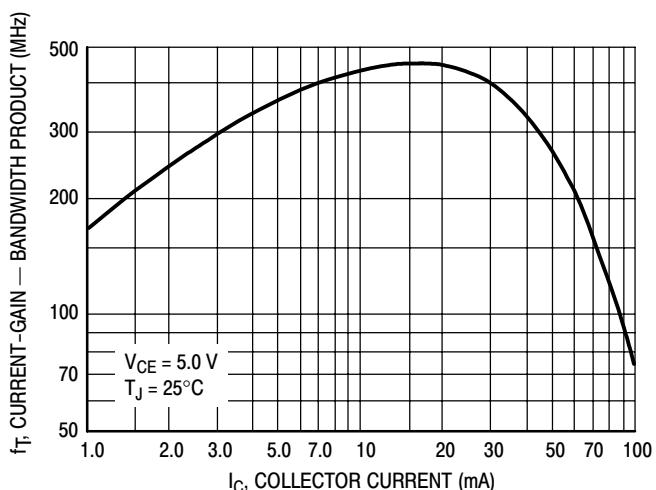
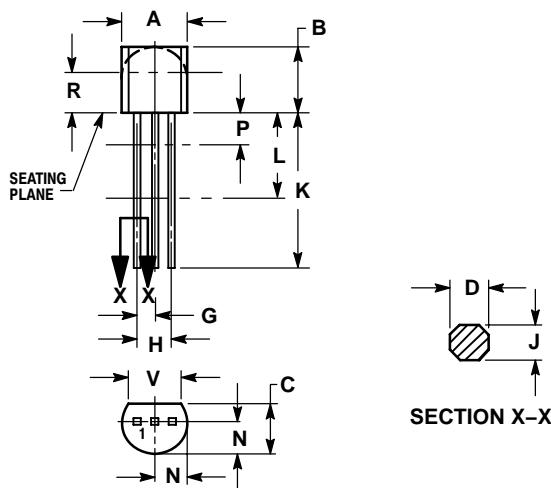


Figure 12. Current-Gain - Bandwidth Product

## 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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