

# Low Noise Transistor

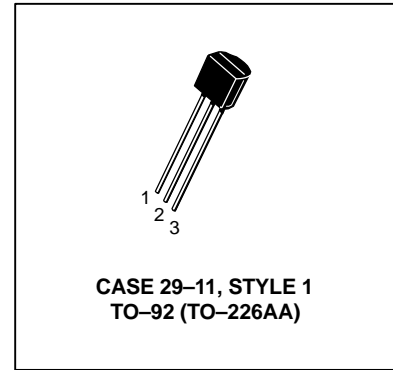
## NPN Silicon

# MPSA18

ON Semiconductor Preferred Device

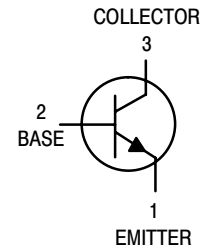
### MAXIMUM RATINGS

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



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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage <sup>(2)</sup> ( $I_C = 10 \text{ mAdc}, I_E = 0$ )	$V_{(BR)CEO}$	45	—	—	Vdc
Collector–Base Breakdown Voltage ( $I_C = 100 \mu\text{Adc}, I_E = 0$ )	$V_{(BR)CBO}$	45	—	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	6.5	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}, I_E = 0$ )	$I_{CBO}$	—	1.0	50	nAdc

- $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board.
- Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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

# MPSA18

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS<sup>(2)</sup></b>					
DC Current Gain ( $I_C = 10 \mu\text{Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ ) ( $I_C = 100 \mu\text{Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ ) ( $I_C = 1.0 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ ) ( $I_C = 10 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	400 500 500 500	580 850 1100 1150	— — — 1500	—
Collector–Emitter Saturation Voltage ( $I_C = 10 \text{ mAdc}$ , $I_B = 0.5 \text{ mAdc}$ ) ( $I_C = 50 \text{ mAdc}$ , $I_B = 5.0 \text{ mAdc}$ )	$V_{CE(\text{sat})}$	— —	— 0.08	0.2 0.3	Vdc
Base–Emitter On Voltage ( $I_C = 1.0 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$V_{BE(\text{on})}$	—	0.6	0.7	Vdc

## SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ( $I_C = 1.0 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	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 ( $I_C = 100 \mu\text{Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 10 \text{ k}\Omega$ , $f = 1.0 \text{ kHz}$ ) ( $I_C = 100 \mu\text{Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 1.0 \text{ k}\Omega$ , $f = 100 \text{ Hz}$ )	NF	— —	0.5 4.0	1.5 —	dB
Equivalent Short Circuit Noise Voltage ( $I_C = 100 \mu\text{Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 1.0 \text{ k}\Omega$ , $f = 100 \text{ Hz}$ )	$V_T$	—	6.5	—	$\text{nV}/\sqrt{\text{Hz}}$

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

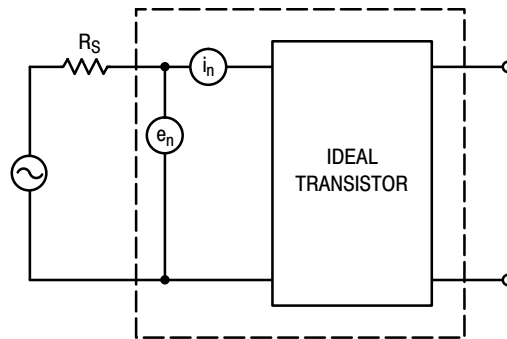
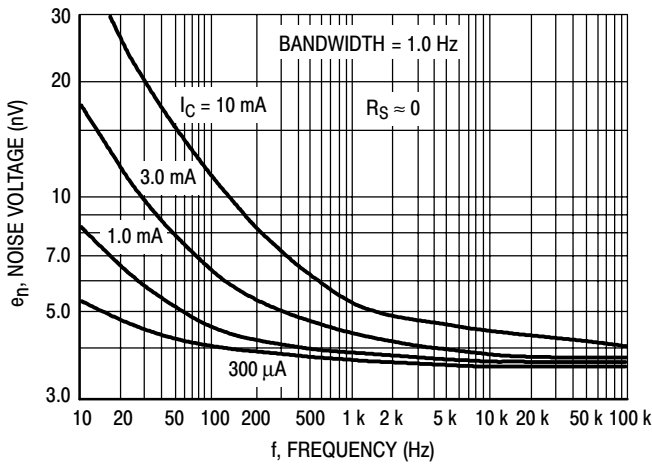


Figure 1. Transistor Noise Model

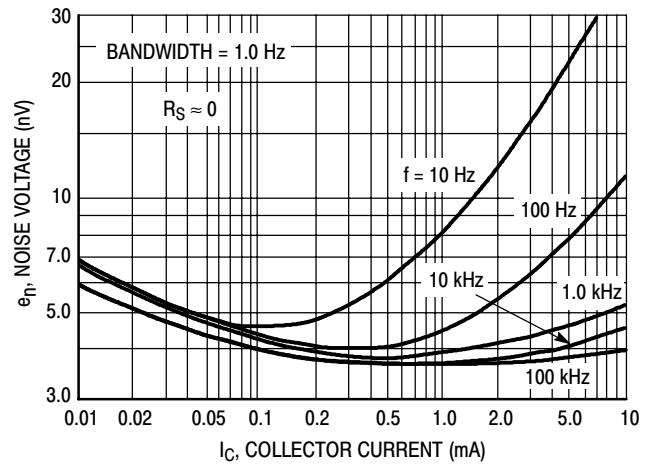
## NOISE CHARACTERISTICS

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

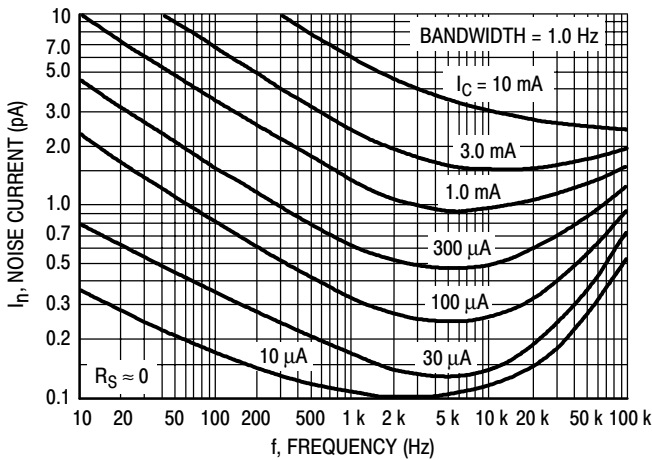
### NOISE VOLTAGE



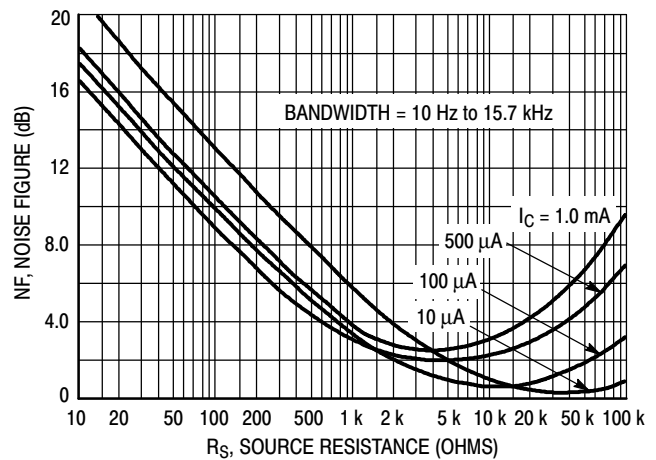
**Figure 2. Effects of Frequency**



**Figure 3. Effects of Collector Current**

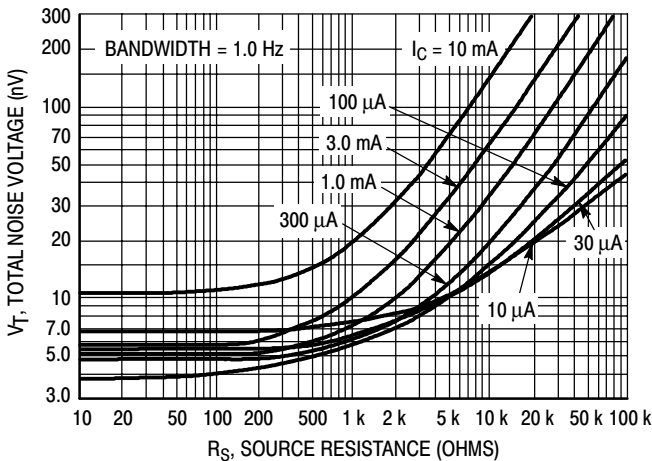


**Figure 4. Noise Current**

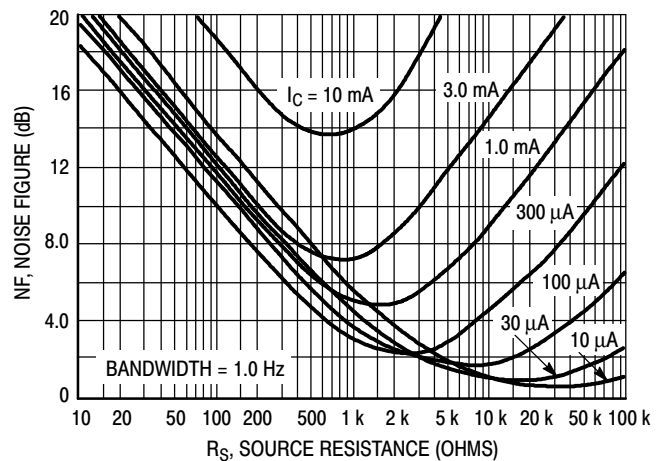


**Figure 5. Wideband Noise Figure**

### 100 Hz NOISE DATA



**Figure 6. Total Noise Voltage**



**Figure 7. Noise Figure**

# MPSA18

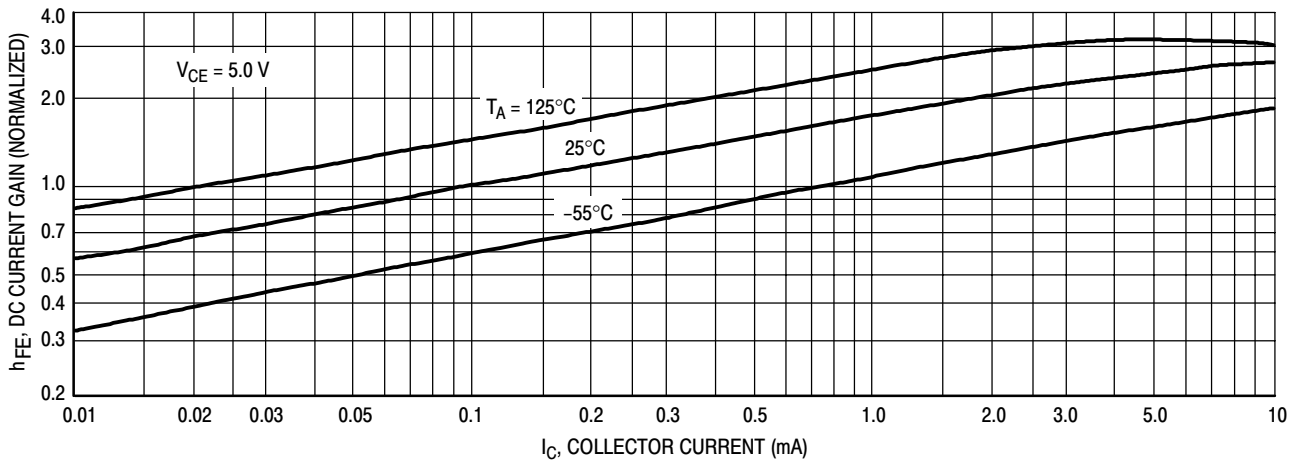


Figure 8. DC Current Gain

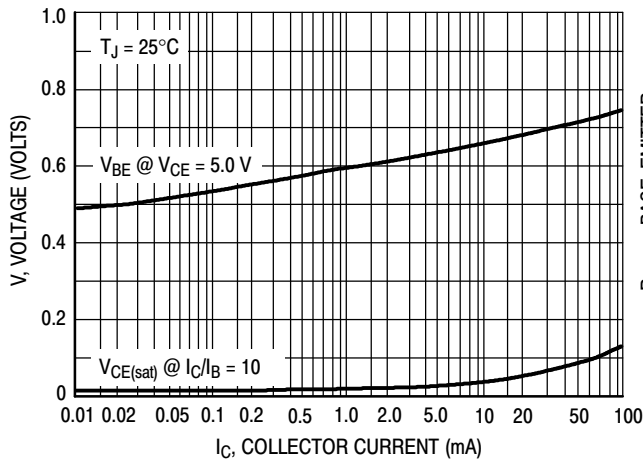


Figure 9. "On" Voltages

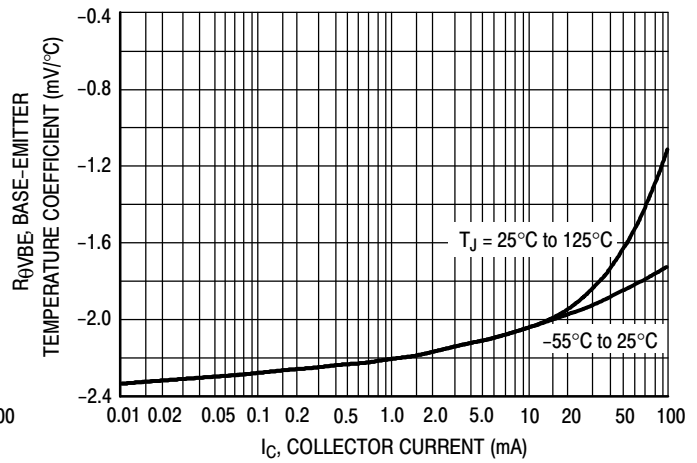


Figure 10. Temperature Coefficients

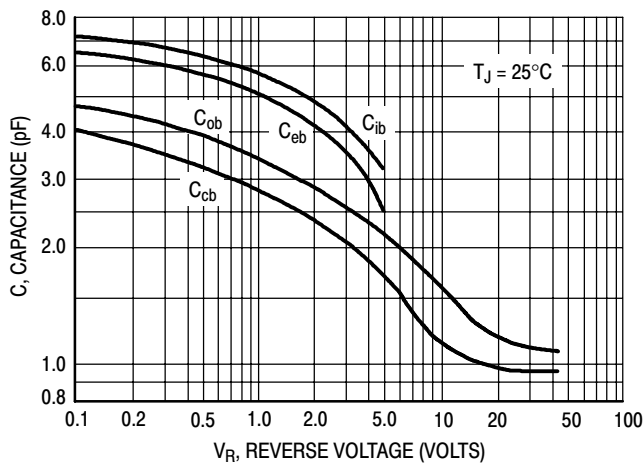


Figure 11. Capacitance

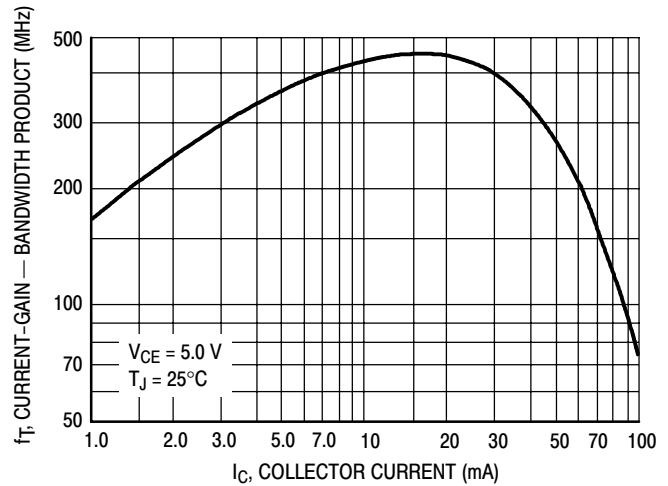
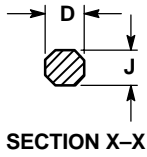
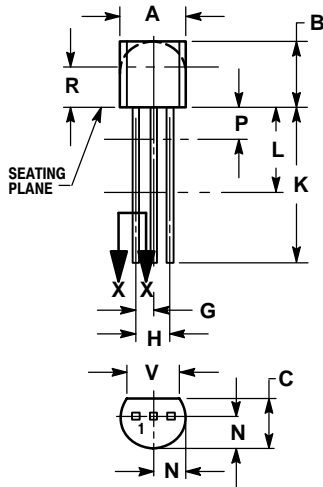


Figure 12. Current-Gain — Bandwidth Product

# PACKAGE DIMENSIONS

## TO-92 (TO-226AA) CASE 29-11 ISSUE AL



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


### 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	---

**Notes**

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