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Low Noise Transistor

NPN Silicon

MPSA18

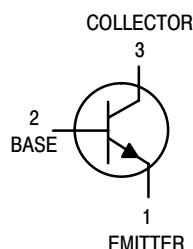
ON Semiconductor Preferred Device

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

CASE 29-11, STYLE 1
TO-92 (TO-226AA)

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 ⁽²⁾ ($I_C = 10$ mAdc, $I_B = 0$)	$V_{(BR)CEO}$	45	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 100$ μ Adc, $I_E = 0$)	$V_{(BR)CBO}$	45	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10$ μ Adc, $I_C = 0$)	$V_{(BR)EBO}$	6.5	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30$ Vdc, $I_E = 0$)	I_{CBO}	—	1.0	50	nAdc

1. $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.2. Pulse Test: Pulse Width ≤ 300 μ s, Duty Cycle $\leq 2.0\%$.

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

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS⁽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_{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 $\leq 2.0\%$.

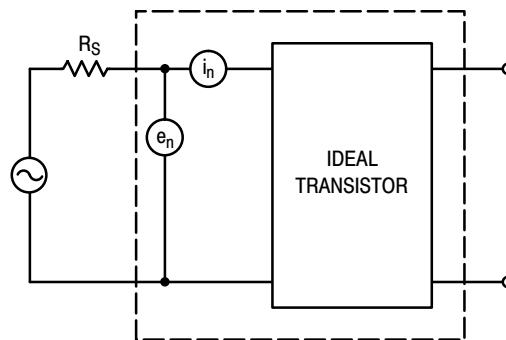


Figure 1. Transistor Noise Model

NOISE CHARACTERISTICS

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

NOISE VOLTAGE

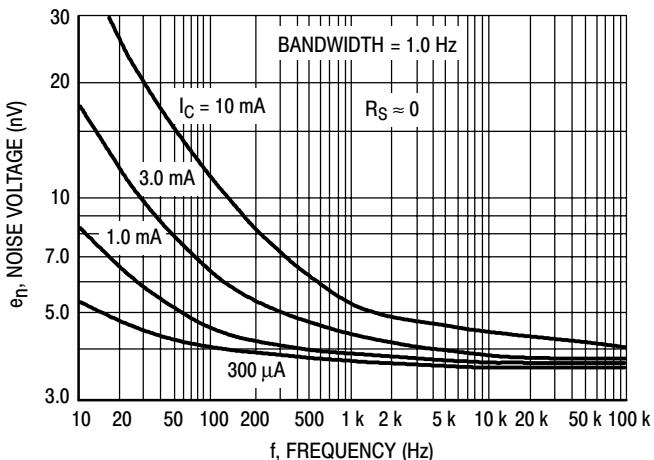


Figure 2. Effects of Frequency

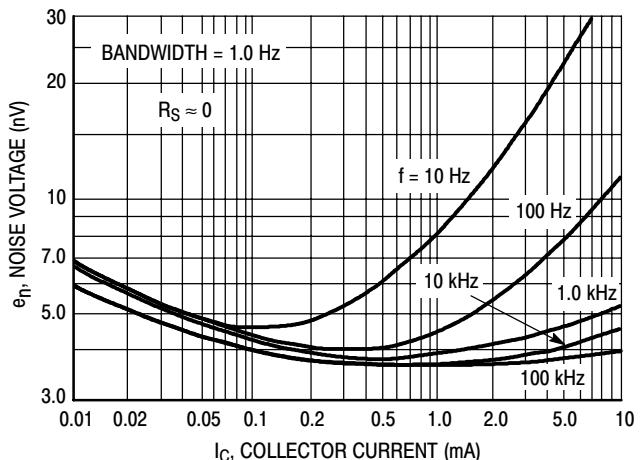


Figure 3. Effects of Collector Current

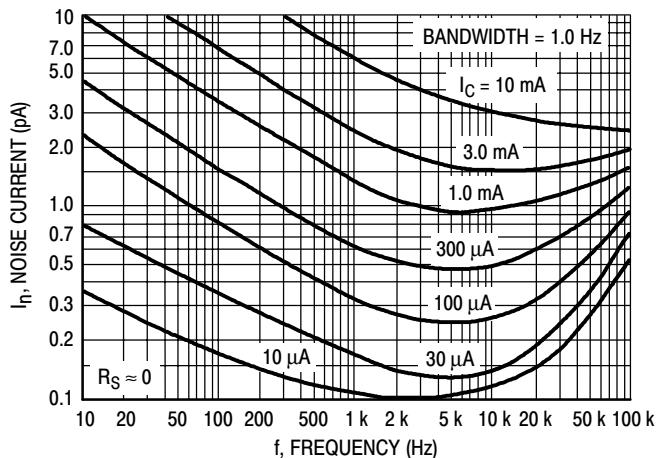


Figure 4. Noise Current

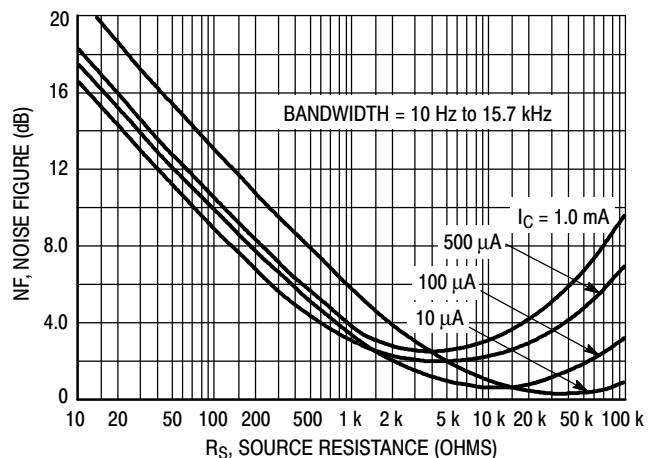


Figure 5. Wideband Noise Figure

100 Hz NOISE DATA

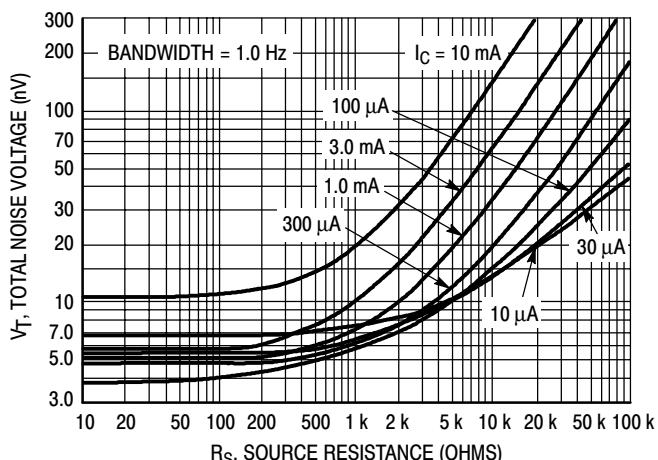


Figure 6. Total Noise Voltage

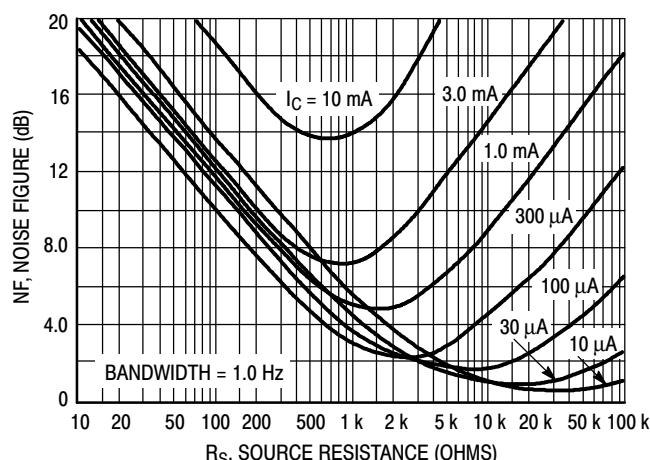


Figure 7. Noise Figure

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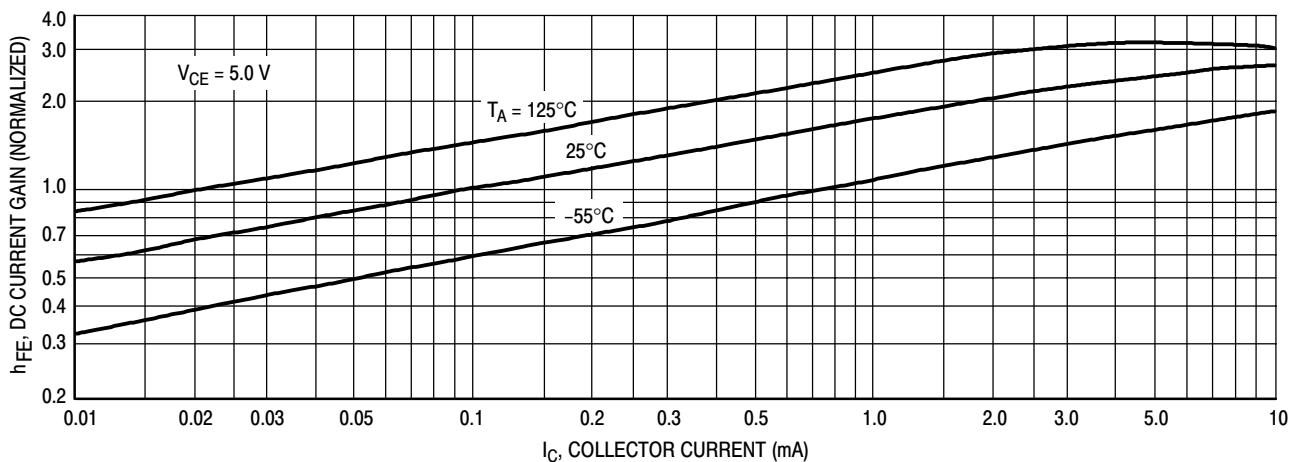


Figure 8. DC Current Gain

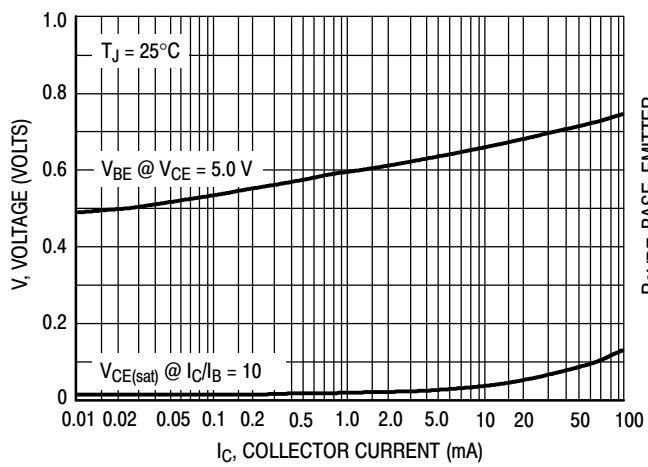


Figure 9. "On" Voltages

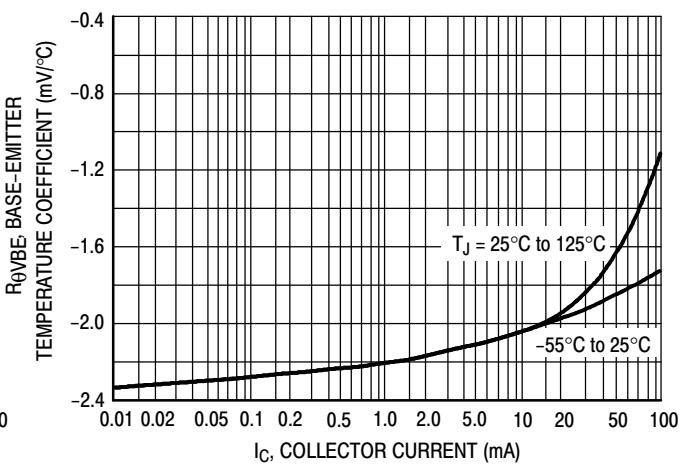


Figure 10. Temperature Coefficients

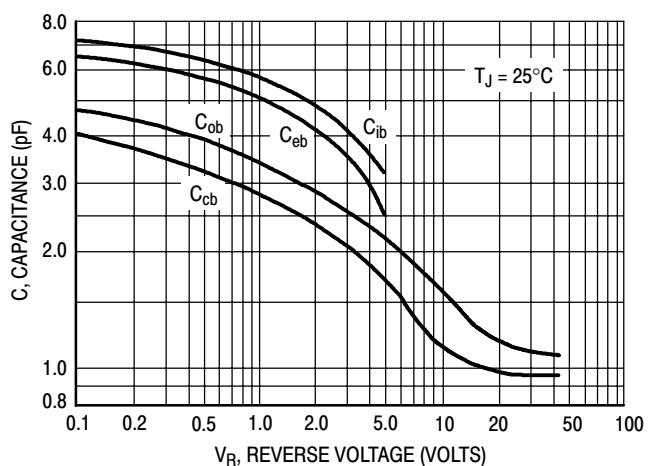


Figure 11. Capacitance

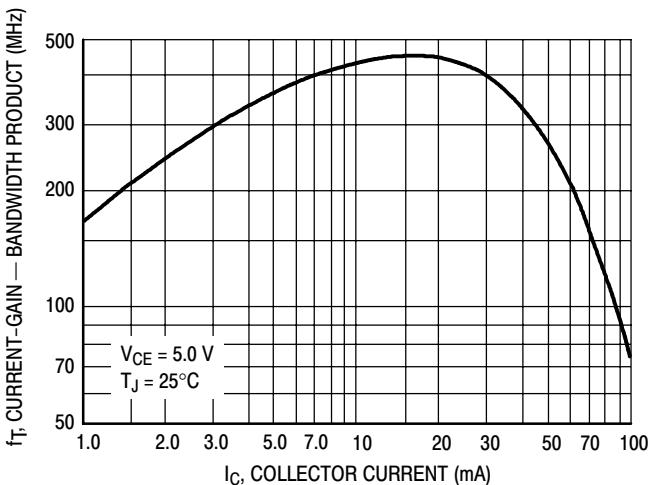
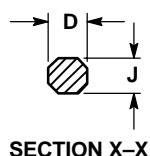
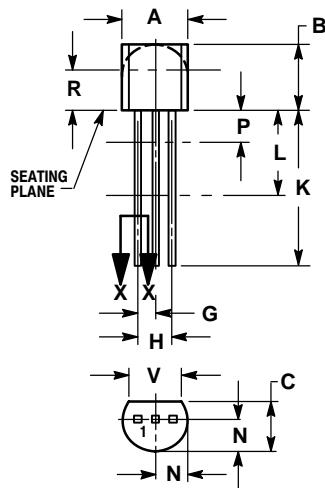


Figure 12. Current-Gain — Bandwidth Product

PACKAGE DIMENSIONS

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



SECTION X-X

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

Notes

Notes

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