2N5088, 2N5089

Amplifier Transistors

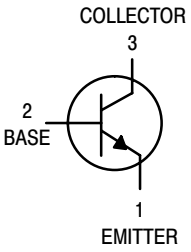
NPN Silicon

ON Semiconductor®

http://onsemi.com

Features

- Pb−Free Packages are Available*



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector − Emitter Voltage 2N5088 2N5089	V_{CEO}	 30 25	Vdc
Collector − Base Voltage 2N5088 2N5089	V_{CBO}	 35 30	Vdc
Emitter − Base Voltage	V_{EBO}	3.0	Vdc
Collector Current − Continuous	I_C	50	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	 625 5.0	 mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	 1.5 12	 W mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	°C

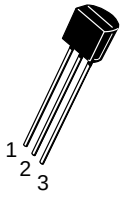
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, (Note 1) Junction−to−Ambient	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	83.3	°C/W

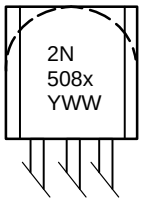
1. $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



TO−92
CASE 29
STYLE 1

MARKING DIAGRAM



x 8 or 9
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
2N5088	TO−92	5000 Units/Box
2N5088RLRA	TO−92	5000 Units/Box
2N5089	TO−92	5000 Units/Box
2N5089G	TO−92 (Pb−Free)	5000 Units/Box
2N2089RLRA	TO−92	2000/Tape & Reel
2N2089RLRAG	TO−92 (Pb−Free)	2000/Tape & Reel
2N2089RLRE	TO−92	2000/Tape & Reel
2N2089RLREG	TO−92 (Pb−Free)	2000/Tape & Reel

†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.

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (Note 2)		$V_{(BR)CEO}$			Vdc
(I_C = 1.0 mAdc, I_B = 0)	2N5088		30	−	
	2N5089		25	−	
Collector−Base Breakdown Voltage		$V_{(BR)CBO}$			Vdc
(I_C = 100 μAdc, I_E = 0)	2N5088		35	−	
	2N5089		30	−	
Collector Cutoff Current		I_{CBO}			nAdc
(V_{CB} = 20 Vdc, I_E = 0)	2N5088		−	50	
(V_{CB} = 15 Vdc, I_E = 0)	2N5089		−	50	
Emitter Cutoff Current		I_{EBO}			nAdc
($V_{EB(off)}$ = 3.0 Vdc, I_C = 0)			−	50	
($V_{EB(off)}$ = 4.5 Vdc, I_C = 0)			−	100	
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			−
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)	2N5088		300	900	
	2N5089		400	1200	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	2N5088		350	−	
	2N5089		450	−	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc) (Note 2)	2N5088		300	−	
	2N5089		400	−	
Collector−Emitter Saturation Voltage		$V_{CE(sat)}$	−	0.5	Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)					
Base−Emitter On Voltage		$V_{BE(on)}$	−	0.8	Vdc
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc) (Note 2)					
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product		f_T	50	−	MHz
(I_C = 500 μAdc, V_{CE} = 5.0 Vdc, f = 20 MHz)					
Collector−Base Capacitance		C_{cb}	−	4.0	pF
(V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)					
Emitter−Base Capacitance		C_{eb}	−	10	pF
(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)					
Small−Signal Current Gain		h_{fe}			−
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	2N5088		350	1400	
	2N5089		450	1800	
Noise Figure		NF			dB
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, R_S = 1.0 kΩ,	2N5088		−	3.0	
f = 1.0 kHz)	2N5089		−	2.0	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

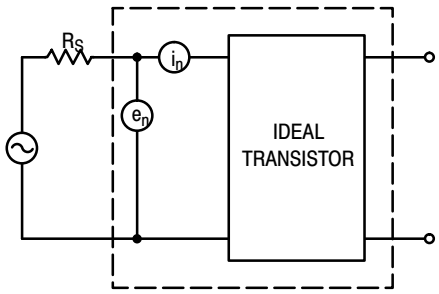


Figure 1. Transistor Noise Model

NOISE CHARACTERISTICS

(V_{CE} = 5.0 Vdc, T_A = 25°C)

NOISE VOLTAGE

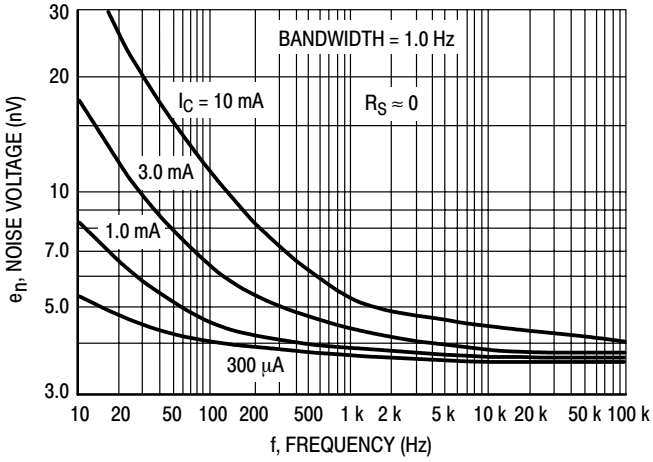


Figure 2. Effects of Frequency

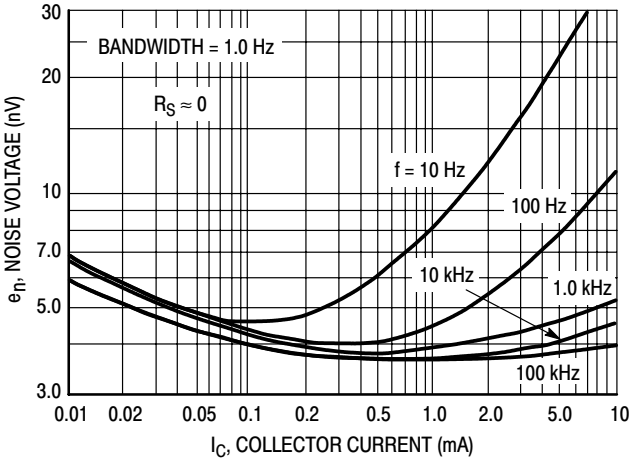


Figure 3. Effects of Collector Current

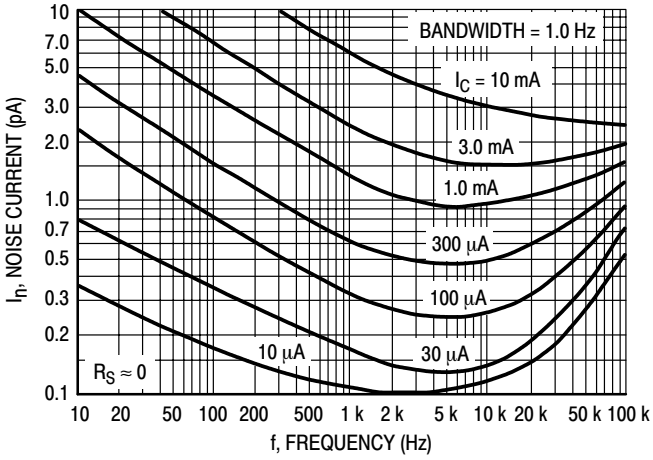


Figure 4. Noise Current

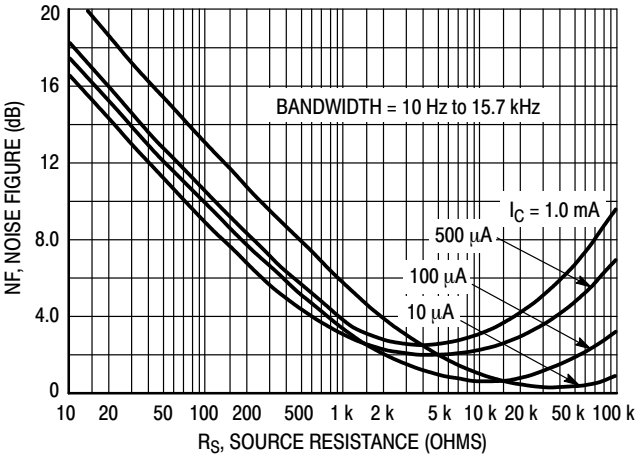


Figure 5. Wideband Noise Figure

100 Hz NOISE DATA

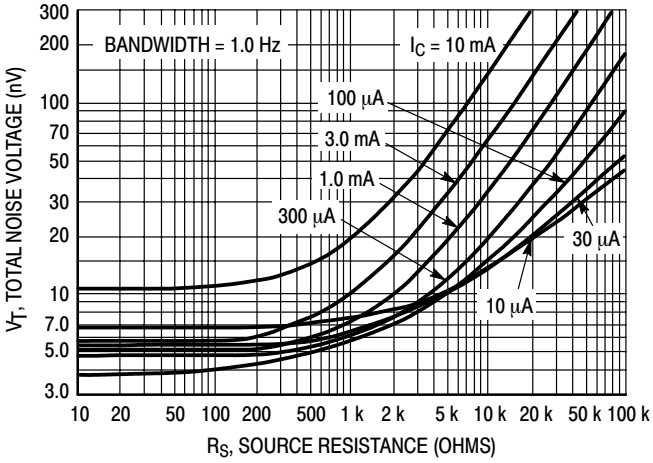


Figure 6. Total Noise Voltage

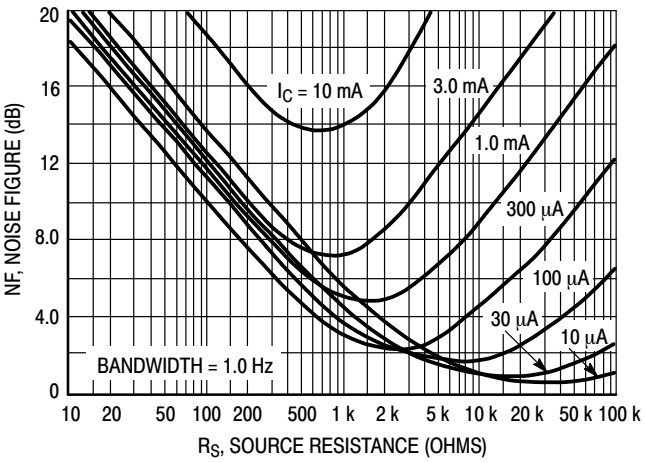


Figure 7. Noise Figure

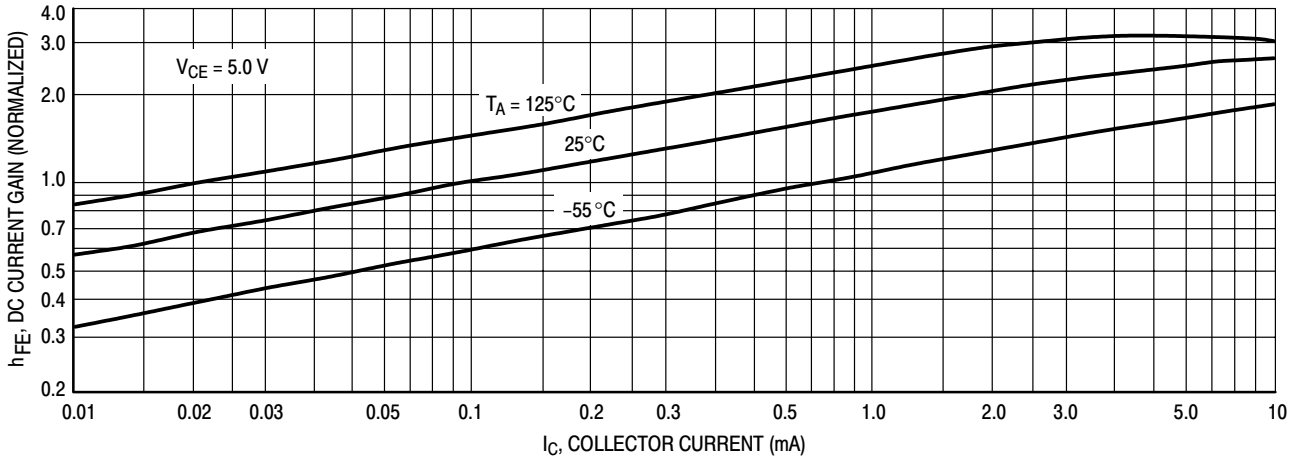


Figure 8. DC Current Gain

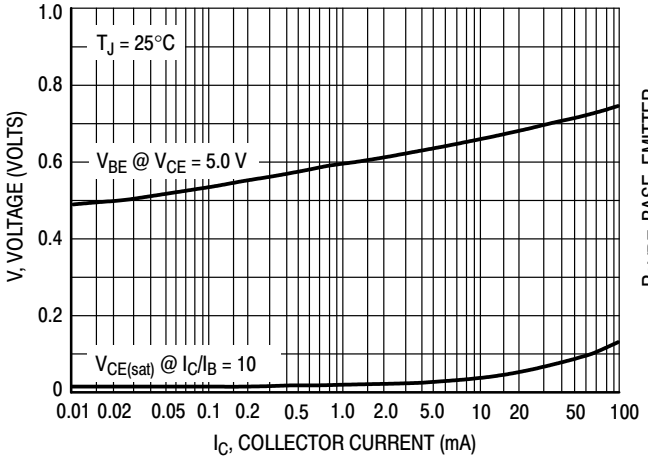


Figure 9. “On” Voltages

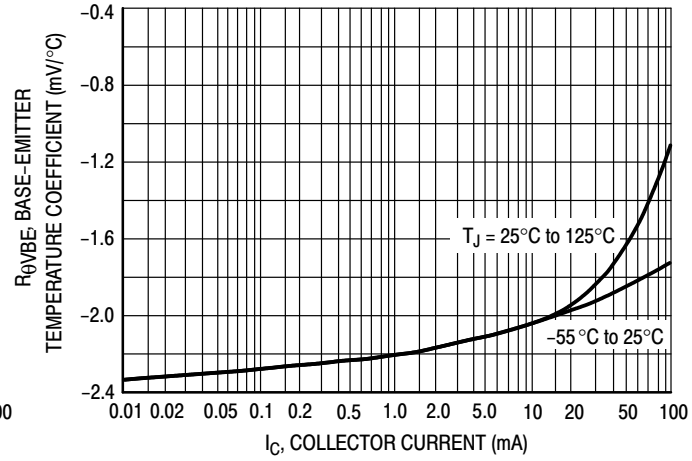


Figure 10. Temperature Coefficients

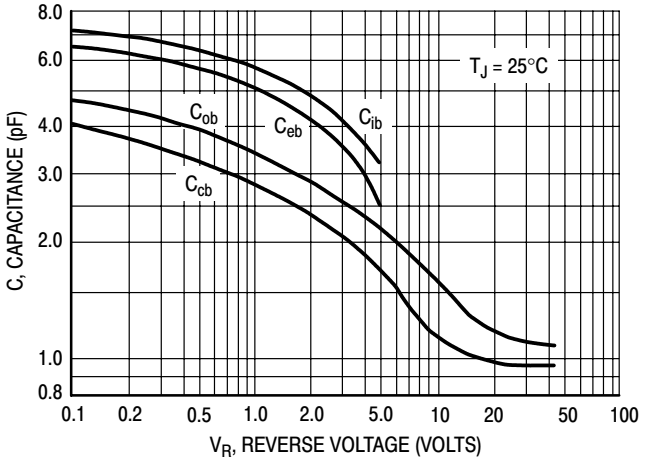


Figure 11. Capacitance

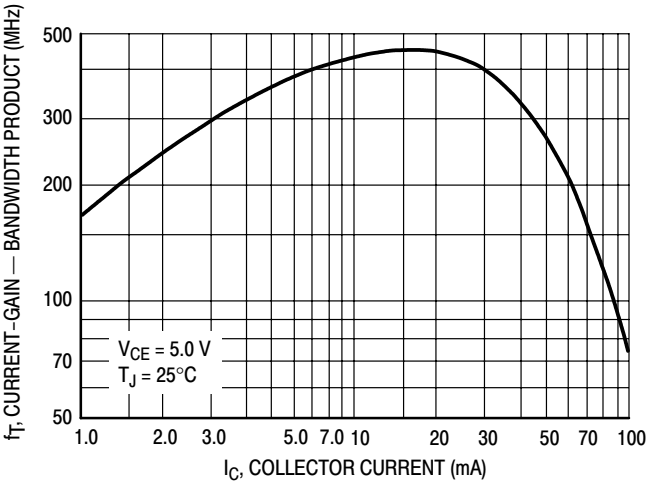
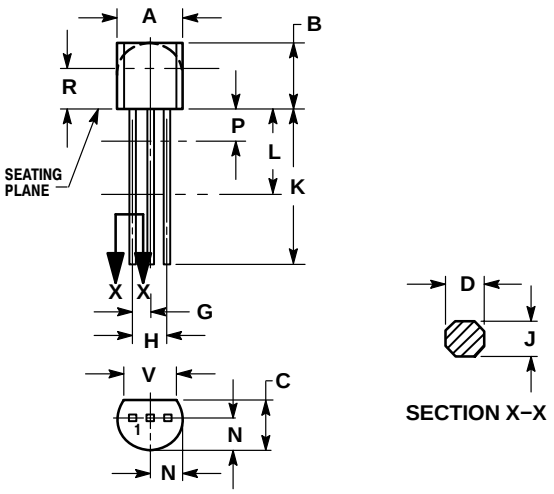


Figure 12. Current−Gain — Bandwidth Product

PACKAGE DIMENSIONS

TO−92
TO−226AA
CASE 29−11
ISSUE AL



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.

	INCHES		MILLIMETERS	
DIM	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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
Phone: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.

2N5088/D