The RF Line

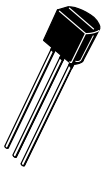
NPN Silicon High-Frequency Transistors

LP1001 LP1001A

LOW NOISE HIGH–FREQUENCY TRANSISTORS

The LP1001 is designed for CATV and other Broadband linear applications. This Motorola series of small–signal plastic transistors offers superior quality and performance at low cost.

- High Current Gain–Bandwidth Product
  f_T = 5 GHz (Typ) @ I_C = 10 mAdc
- High Power Gain
  G_{pe} = 12.5 dB (Typ) @ 1 GHz
- Low Noise Figure
  NF = 3 dB (Typ) @ 1 GHz
- Low Feedback Capacitance
  C_{ob} = 0.5 pF (Typ) @ V_{CB} = 10 Volts



CASE 29–04, STYLE 2
TO–226AA
(TO–92)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Base Voltage	V_{CEO}	15	Vdc
Collector–Base Voltage	V_{CBO}	20	Vdc
Emitter–Base Voltage	V_{EBO}	2	Vdc
Total Device Dissipation @ T_A = 25°C	P_D	625	mW

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance — Junction to Ambient — Junction to Case	$R_{\theta JA}$ $R_{\theta JC}$	200 83.3	°C/W

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector–Emitter Breakdown Voltage (I_C = 1 mA, I_B = 0)		$V_{(BR)CEO}$	15	—	—	Vdc
Collector–Base Breakdown Voltage (I_C = 0.1 mA, I_E = 0)		$V_{(BR)CBO}$	20	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 10 μA, I_C = 0)		$V_{(BR)EBO}$	2	—	—	Vdc
Collector Cutoff Current (V_{CB} = 10 Vdc, I_E = 0)		I_{CBO}	—	—	50	nA
ON CHARACTERISTICS						
DC Current Gain (I_C = 10 mAdc, V_{CE} = 10 Vdc)	LP1001 LP1001A	h_{FE}	25 50	80 —	— —	—

(continued)

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

Characteristic		Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS						
Collector–Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1 MHz)		C_{ob}	—	—	0.7	pF
Current Gain–Bandwidth Product (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 500 MHz)		f_τ	—	5	—	GHz
FUNCTIONAL TESTS						
Gain @ Noise Figure (I_C = 10 mAdc, V_{CE} = 10 Vdc)	f = 500 MHz f = 1 GHz	G_{NF}	— —	14 12.5	— —	dB
Noise Figure (I_C = 10 mAdc, V_{CE} = 10 Vdc)	f = 500 MHz f = 1 GHz	NF	— —	2.7 3.2	— —	dB

V_{CE}	I_C	f	S_{11}		S_{21}		S_{12}		S_{22}	
(Volts)	(mA)	(MHz)	$\lvert S_{11}\rvert$	$\angle\phi$	$\lvert S_{21}\rvert$	$\angle\phi$	$\lvert S_{12}\rvert$	$\angle\phi$	$\lvert S_{22}\rvert$	$\angle\phi$
10	3	100	0.75	–25	8.56	152	0.03	70	0.94	–12
		200	0.61	–47	7.06	132	0.05	62	0.84	–21
		300	0.47	–61	5.79	116	0.07	60	0.75	–25
		400	0.37	–74	4.81	105	0.08	58	0.70	–28
		500	0.30	–84	4.11	96	0.09	58	0.66	–30
		600	0.22	–94	3.51	86	0.10	58	0.63	–31
		700	0.16	–155	3.15	78	0.11	57	0.59	–34
		800	0.16	–128	2.85	72	0.13	55	0.57	–38
		900	0.12	–144	2.60	67	0.14	53	0.56	–41
		1000	0.12	–169	2.41	61	0.15	52	0.53	–44
		1100	0.12	179	2.26	56	0.17	51	0.52	–51
		1200	0.12	155	2.10	54	0.18	51	0.52	–51
10	10	100	0.48	–36	16.23	137	0.02	69	0.82	–18
		200	0.33	–55	10.98	115	0.04	68	0.68	–23
		300	0.22	–62	8.05	102	0.06	68	0.60	–25
		400	0.16	–70	6.33	93	0.07	67	0.57	–26
		500	0.12	–73	5.21	87	0.09	68	0.55	–27
		600	0.07	–72	4.39	81	0.10	67	0.53	–27
		700	0.04	–117	3.89	74	0.12	64	0.50	–29
		800	0.04	–142	3.45	67	0.13	61	0.48	–34
		900	0.02	–169	3.14	63	0.14	60	0.47	–37
		1000	0.05	127	2.87	58	0.16	58	0.45	–41
		1100	0.06	130	2.68	53	0.18	56	0.44	–47
		1200	0.08	112	2.49	52	0.19	54	0.44	–47

Table 1. Common Emitter S–Parameters

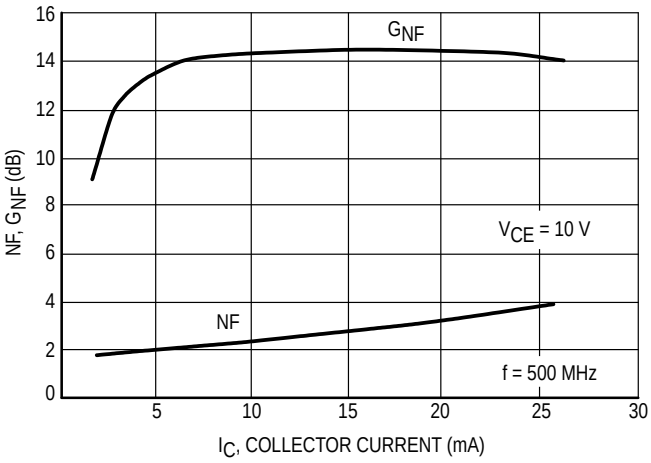


Figure 1. Gain at Noise Figure and Noise Figure versus Collector Current

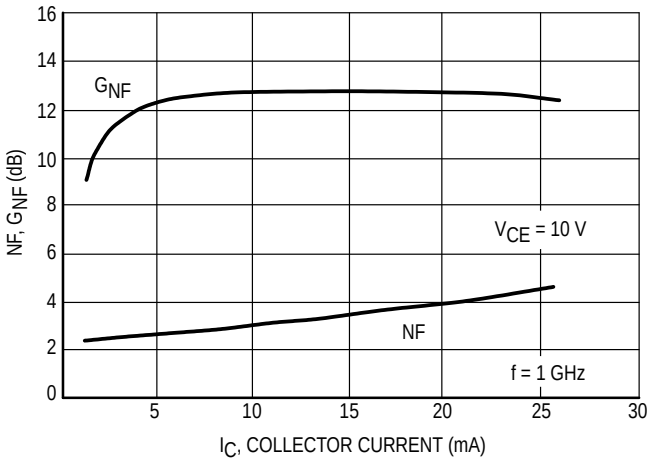


Figure 2. Gain at Noise Figure and Noise Figure versus Collector Current

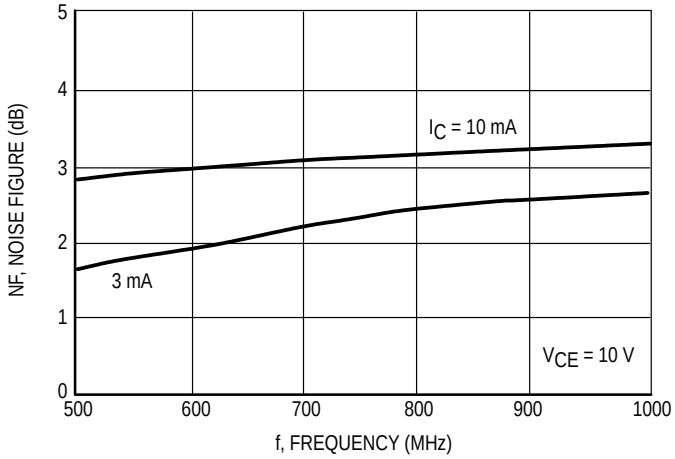
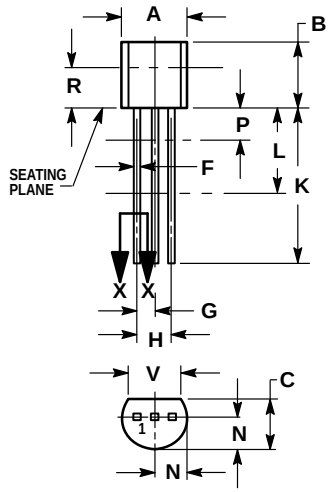
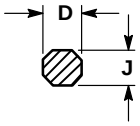


Figure 3. Noise Figure versus Frequency

PACKAGE DIMENSIONS





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. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. 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	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
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 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

CASE 29–04
ISSUE AD

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