

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

MOTOROLA SC XSTRS/R F

LT4746
 $I_C = 50 \text{ mA}$
HIGH FREQUENCY
TRANSISTOR
NPN SILICON
2
TO-46
CASE 26-03, STYLE 1
The RF Line
NPN Silicon
High Frequency Transistor

... designed primarily for use in low noise, small-signal amplifiers in satellite down conversion links, microwave radio relays, communication links, ECM receivers, oscillators, mixers and multipliers.

Use of ion implantation techniques, arsenic emitters, gold metallization and a hermetic package results in an ultra-reliable transistor with low noise, high gain and wide dynamic range.

- Fully Implanted Base and Emitter Structure
- High Cutoff Frequency — 6 GHz Typ
- High Gain — 12.5 dB Typ @ $f = 500 \text{ MHz}$
- Gold Metallization

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CBO}	20	Vdc
Emitter-Base Voltage	V_{EBO}	3	Vdc
Collector Current — Continuous	I_C	50	mA dc
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = 1 \text{ mA}$, $I_E = 0$)	$V_{(BR)CEO}$	12	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 0.1 \text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	3	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 10 \text{ V}$, $I_E = 0$)	I_{CBO}	—	—	1	$\mu\text{A dc}$

ON CHARACTERISTICS

DC Current Gain ($I_C = 25 \text{ mA}$, $V_{CE} = 5 \text{ V}$)	h_{FE}	70	150	300	—
--	----------	----	-----	-----	---

DYNAMIC CHARACTERISTICS

Collector-Base Capacitance ($V_{CB} = 8 \text{ V}$, $I_E = 0$, $f = 1 \text{ MHz}$)	C_{cb}	—	1	—	pF
---	----------	---	---	---	----

(continued)

LT4746

MOTOROLA SC XSTRS/R F

T-31-23

ELECTRICAL CHARACTERISTICS — continued

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS					
Noise Figure, Minimum ($V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$)	NF _{MIN}	—	1.3	—	dB
$f = 300\text{ MHz}$			1.6	—	
$f = 500\text{ MHz}$			2.7	—	
Cutoff Frequency ($V_{CE} = 8\text{ V}$, $I_C = 25\text{ mA}$)	f_T	—	6	—	GHz
Maximum Unilateral Gain ($V_{CE} = 8\text{ V}$, $I_C = 25\text{ mA}$)	G _{UMAX}	—	17	—	dB
			13	—	
			7.5	—	
Insertion Gain ($V_{CE} = 8\text{ V}$, $I_C = 25\text{ mA}$)	$ S_{21} ^2$	—	16.5	—	dB
			12.5	—	
			7	—	
Gain at Associated Noise Figure ($V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$)	G _{ANF}	—	18	—	dB
			11.5	—	
			6.5	—	

2

TYPICAL CHARACTERISTICS

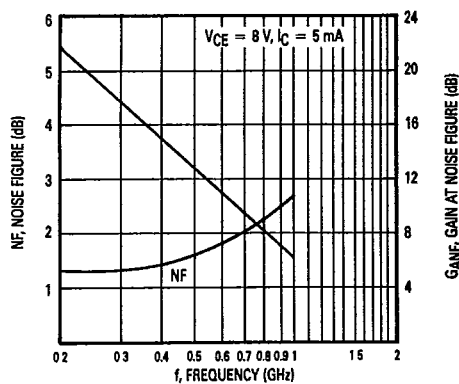


Figure 1. Noise Figure and Associated Gain versus Frequency

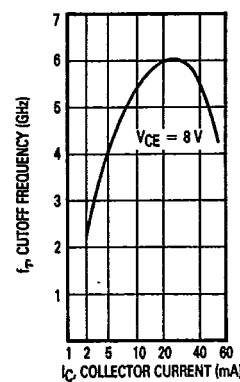


Figure 2. Gain-Bandwidth Product versus Collector Current

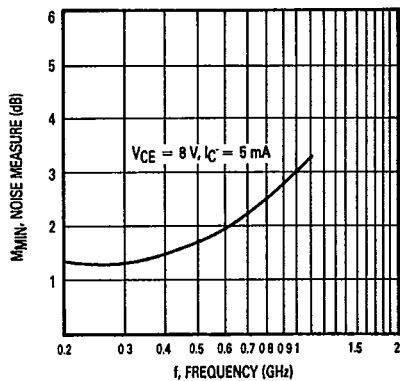


Figure 3. Noise Measure versus Frequency

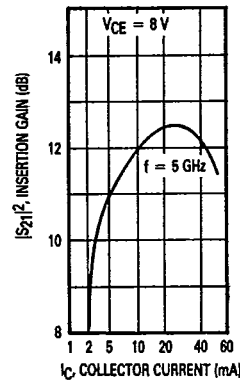


Figure 4. Insertion Gain versus Collector Current

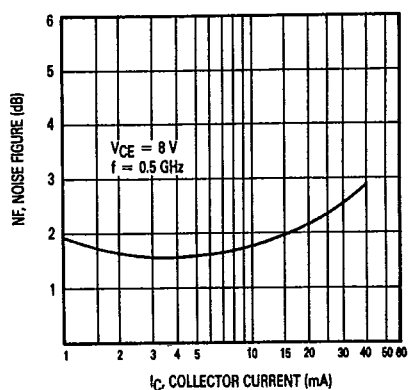


Figure 5. Noise Figure versus Collector Current

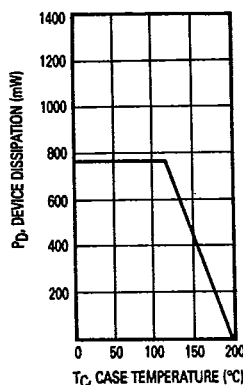


Figure 6. Device Dissipation Operating Range

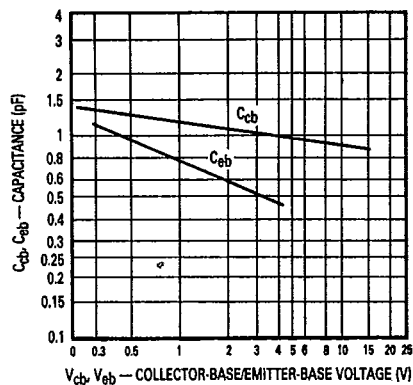


Figure 7. Junction Capacitance versus Voltage

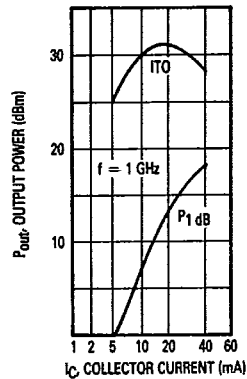


Figure 8. Typical Third Order Intercept versus Collector Current

T-31-23

2

Frequency (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		k
V _{CE} = 8 V, I _C = 5 mA									
100	- 2.59	- 40.1	20.17	139.2	-24.64	66.8	- 2.27	-33.3	0.358
200	- 6.05	- 64.3	17.28	118.1	-21.02	61.7	- 5.20	-47.8	0.627
300	- 8.99	- 80.1	14.68	106.5	-19.12	62.7	- 7.36	-53.2	0.813
400	-11.50	- 90.4	12.60	99.0	-17.68	65.4	- 8.84	-55.8	0.941
500	-13.74	- 99.7	10.95	94.0	-16.47	68.4	- 9.84	-56.6	1.025
600	-15.60	-108.9	9.53	89.4	-15.45	70.5	-10.61	-57.4	1.090
700	-17.56	-116.6	8.38	86.2	-14.47	72.8	-11.10	-58.7	1.128
800	-19.19	-126.7	7.50	83.5	-13.63	74.8	-11.41	-59.5	1.146
900	-20.86	-140.4	6.62	81.0	-12.88	76.7	-11.61	-60.1	1.169
1000	-22.84	-153.2	5.89	79.5	-12.22	79.0	-12.03	-61.4	1.190
1100	-22.60	-165.0	5.25	78.2	-11.70	81.1	-12.38	-62.2	1.207
1200	-22.39	-170.8	4.59	77.6	-11.19	83.4	-12.48	-65.4	1.227

V_{CE} = 8 V, I_C = 25 mA

100	-8.38	-70.8	23.92	115.8	-27.49	68.7	-6.46	-47.0	0.733
200	-13.65	-96.8	19.76	101.8	-23.04	72.8	-10.39	-51.1	0.927
300	-16.74	-117.5	16.53	95.3	-20.17	75.9	-12.39	-50.3	0.997
400	-19.03	-135.2	14.22	91.0	-18.06	77.7	-13.58	-48.9	1.032
500	-20.61	-155.5	12.35	88.0	-16.37	79.3	-14.31	-47.5	1.055
600	-21.01	-173.0	10.92	85.0	-15.06	79.8	-14.72	-47.0	1.067
700	-21.62	-168.6	9.77	82.9	-13.88	80.7	-15.04	-47.2	1.073
800	-21.18	-154.5	8.78	81.2	-12.85	81.5	-15.13	-47.8	1.073
900	-20.13	-142.6	7.85	79.4	-12.09	82.2	-15.11	-48.1	1.082
1000	-19.75	-130.3	7.11	78.5	-11.32	83.6	-15.50	-48.6	1.086
1100	-18.95	-129.5	6.44	77.7	-10.79	84.8	-15.94	-49.2	1.094
1200	-17.19	-121.8	5.77	77.6	-10.25	86.3	-16.12	-52.6	1.101

Figure 9. Common Emitter S-Parameters

Freq.	NFOPT.	Γ _S OPT.	R _n
0.3 GHz	1.3 dB	0.452 / +39°	0.81 Ω
0.5 GHz	1.6 dB	0.385 / +36°	0.32 Ω
0.7 GHz	2.0 dB	0.153 / +94°	0.38 Ω
1.0 GHz	2.7 dB	0.186 / +97°	0.88 Ω

Reflection coefficient of source and the noise resistance at optimum noise figure for V_{CE} = 8 V, I_C = 5 mA

Figure 10. Noise Parameters