RCA
Solid State
Division

RF Transistors

2N6389

JEDEC TO-72 H-1299

UHF/MATV Low-Noise Silicon N-P-N Transistor

For High-Gain Small-Signal Applications in UHF TV RF Amplifiers and UHF MATV Amplifiers

Features:

- **Low noise figure:**
  NF = 3 dB (typ.) at 450 MHz, 1.5 mA
  = 4 dB (typ.) at 890 MHz, 1.5 mA
  = 6 dB (typ.) at 890 MHz, 10 mA
- **High gain (tuned, unneutralized):**
  G_{PE} = 15 dB (min.) at 890 MHz
- **High gain-bandwidth product**
- **Large dynamic range**
- **Low distortion**
- **Low collector-base capacitance**

RCA 2N6389● is an epitaxial silicon n-p-n planar transistor intended for low-power, small-signal applications where both low noise and high gain are desirable. It utilizes a hermetically sealed four-lead JEDEC TO-72 package. All of the elements of the transistor are insulated from the case, which may be grounded by means of the fourth lead.

●Formerly RCA No. 40989.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

*COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	20	V
*COLLECTOR-TO-EMITTER VOLTAGE	V_{CEO}	12	V
*EMITTER-TO-BASE VOLTAGE	V_{EBO}	2.5	V
*COLLECTOR CURRENT (Continuous)	I_C	40	mA
*TRANSISTOR DISSIPATION:	P_T		
At ambient temperatures up to 25°C		200	mW
At ambient temperatures above 25°C		Derate linearly at 1.14 mW/°C	
*TEMPERATURE RANGE:			
Storage and Operating (Junction)		−65 to +200° C	
*LEAD TEMPERATURE (During soldering):			
At distances ≥ 1/16 in. (1.59 mm) from seating plane for 60 s max.		300° C	

*In accordance with JEDEC registration data format JS-9 RDF-1.

ELECTRICAL CHARACTERISTICS, *At Ambient Temperature (T_A) = 25°C*

	CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS		UNITS
			VOLTAGE V dc		CURRENT mA dc					
			V_{CB}	V_{CE}	I_E	I_B	I_C	MIN.	MAX.	
	STATIC									
*	Collector Cutoff Current	I_{CBO}	15		0			–	20	nA
*	Emitter Cutoff Current	I_{EBO}	(V_{EB}) 1				0	–	1	μA
*	Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$			0		0.001	20	–	V
*	Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$				0	3	12	–	V
*	Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$			0.01		0	2.5	–	V
*	DC Forward Current Transfer Ratio	h_{FE}		1			3	25	250	
	Thermal Resistance: (Junction-to-Case)	$R_{\theta JC}$						–	880	°C/W
	DYNAMIC									
	Device Noise Figure: f = 890 MHz = 890 MHz = 450 MHz	NF	10 10 10				1.5 10 1.5	– – –	4(typ.) 6(typ.) 3(typ.)	dB
	Small-Signal Common-Base Power Gain (f = 890 MHz)	G_{PB}	10				10	15	–	dB
*	Small-Signal, Short Circuit Forward Current Transfer Ratio (f = 1 kHz)	h_{fe}		1			3	25	250	
*	Magnitude of Small-Signal Short Circuit Forward Current Transfer Ratio (f = 200 MHz)	$\lvert h_{fe} \rvert$		10			1.5	5	15	
*	Collector-to-Base Time Constant (f = 31.9 MHz)	$r_b'C_c$	10		1.5			1	15	ps
*	Collector-to-Base Capacitance (f = 1 MHz)	C_{cb}	10		0			0.4	0.55	pF

* In accordance with JEDEC registration data format JS-9 RDF-1.

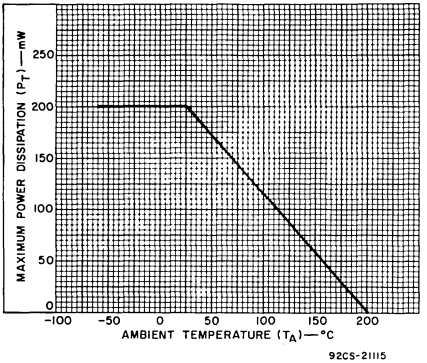


Fig. 1 – Power dissipation vs. ambient temperature.

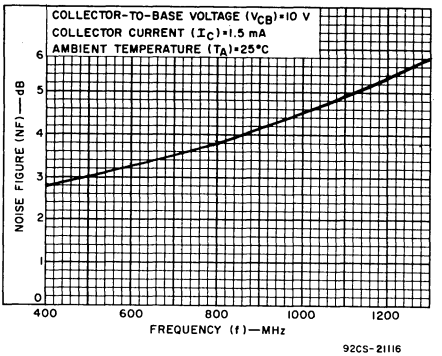


Fig. 2 – Typical common-base noise figure vs. frequency.

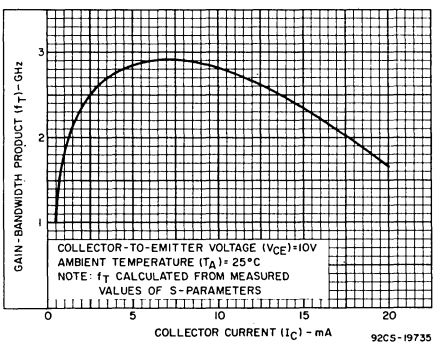
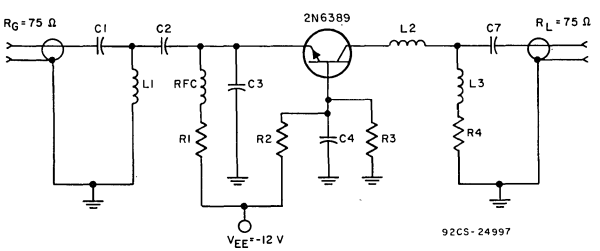


Fig. 3 – Gain-bandwidth product vs. collector current.

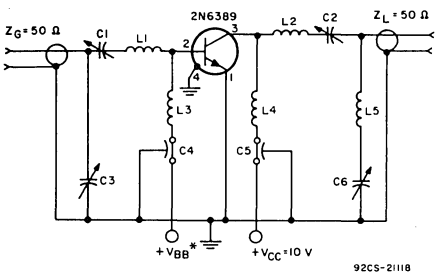


C_1,C_7: 3.3 pF disc ceramic
C_2: 2.7 pF disc ceramic
C_3: 1 pF disc ceramic
C_4: 25 pF, ATC-100 or equivalent

L_1,L_2: 2 turns, No. 18 wire, 0.125 in. (3.175 mm) ID
RFC: 8 turns No. 28 wire, 0.062 in. (1.57 mm) ID

R_1: 270 Ω
R_2: 2.2 kΩ
R_3: 4.7 kΩ
R_4: 4.7 kΩ

Fig. 4–890-MHz common-base test circuit for gain and noise figure.



C_1: 1.0–30 pF
C_2,C_3: 1.0–20 pF
C_4,C_5: 0.04 μF
C_6: 1–10 pF

L_1: 2 turns No. 18 wire, 3/16 in. (0.188 mm) ID, 0.10 in. (2.54 mm) long
L_2: 3 turns No. 18 wire, 3/16 in. (0.188 mm) ID, 0.15 in. (3.81 mm) long
L_3,L_4: 0.22-μH rf choke
L_5: 3 turns No. 18 wire, 3/16 in. (0.188 mm) ID, 0.15 in. (3.81 mm) long

R_1: 200Ω, 1/4 W

* $V_{(BB)}$ adjusted for I_C = 1.5 mA

Fig. 5—Circuit diagram of 450-MHz amplifier used for measurement of noise figure.

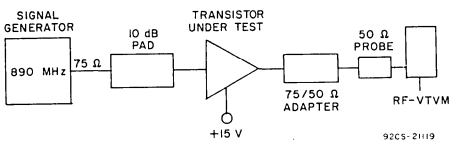


Fig. 6—Block diagram of test setup for measurement of gain.

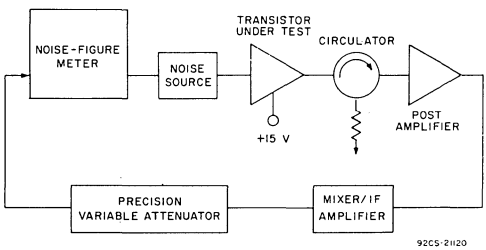


Fig. 7—Block diagram of noise-figure test set.

TERMINAL CONNECTIONS

Lead 1 – Emitter
Lead 2 – Base
Lead 3 – Collector
Lead 4 – Connected to case