

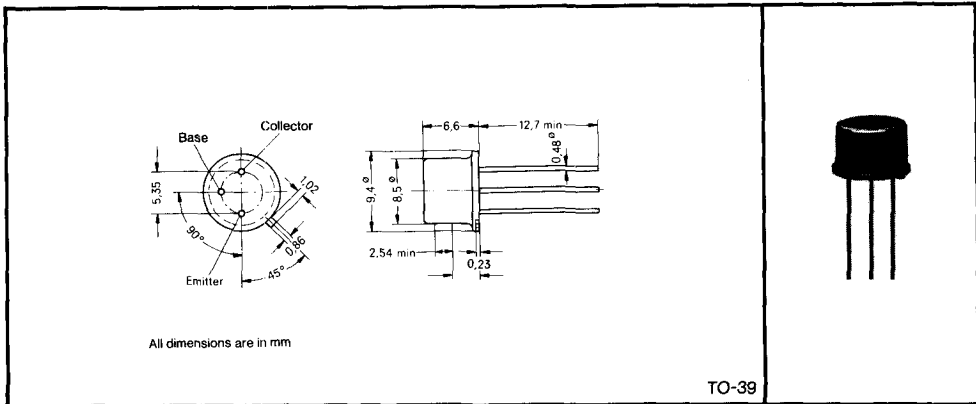
# 2N5109

## SILICON NPN VHF POWER TRANSISTOR

873

- Ideal for CATV Applications
- Minimum Gain-Bandwidth Product 1.2 GHz
- 11 dB at 200 MHz
- Low Distortion
- Low Noise

### mechanical data



### absolute maximum ratings ( $T_{case} = 25\text{ }^{\circ}\text{C}$ )

Collector-Base Voltage	40 V
Collector-Emitter Voltage ( $I_B = 0$ )	20 V
Emitter-Base Voltage	3 V
Continuous Collector Current	0.4 A
Continuous Base Current	0.4 A
Continuous Dissipation	3.5 W
Operating Temperature Range	$-65\text{ }^{\circ}\text{C}$ to $+200\text{ }^{\circ}\text{C}$

### TYPICAL LINEARITY

Cross Modulation Distortion — 70 dB at 50 dB mV output  
 Intermodulation Distortion — 50 dB at 50 dB mV output

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electrical characteristics at 25 °C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	MAX	UNIT
$V_{(BR)CER}$	Collector-Emitter Breakdown Voltage $I_C = 5 \text{ mA}$ , $R_{BE} = 10 \Omega$	40		V
$I_{EBO}$	Emitter-Base Cutoff Current $V_{EB} = 3.5 \text{ V}$ , $I_C = 0$		0.1	mA
$V_{CEO}$	Collector-Emitter Breakdown Voltage $I_C = 5 \text{ mA}$ , $I_B = 0$	20		V
$I_{CEO}$	Collector-Emitter Cutoff Current $V_{CE} = 15 \text{ V}$ , $I_B = 0$		20	$\mu\text{A}$
$h_{FE}$	Static Forward Current Transfer Ratio $I_C = 50 \text{ mA}$ , $V_{CE} = 15 \text{ V}$	70	210	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage $I_C = 100 \text{ mA}$ , $I_B = 10 \text{ mA}$		0.5	V
$C_{obo}$	Common-Base Output-Circuit Output Capacitance $V_{CB} = 15 \text{ V}$ , $I_E = 0$ , $f = 1 \text{ MHz}$		3.5	pF
$ h_{fe} $	Small Signal Common-Emitter Forward Current Transfer Ratio $I_C = 50 \text{ mA}$ , $V_{CE} = 15 \text{ V}$ , $f = 200 \text{ MHz}$	6		
$\theta_{j-c}$	Junction-to-Case Thermal Resistance		35	°C/W
$P_{OUT}$	RF Power Output $f = 200 \text{ MHz}$ , $V_{CC} = 15 \text{ V}$ , $P_{IN} = 0.1 \text{ mW}$ See Note 3	1.26		mW

- NOTES: 1. Pulse Test. Pulse Duration 5 - 10  $\mu\text{s}$ . Duty Cycle  $\leq 2\%$ .  
 2. Pulse Test. Pulse Duration  $\leq 300 \mu\text{s}$ . Duty Cycle  $\leq 2\%$ .  
 3. Power gain is measured in uncompensated broadband circuit.

TYPICAL SERIES INPUT RESISTANCE vs FREQUENCY

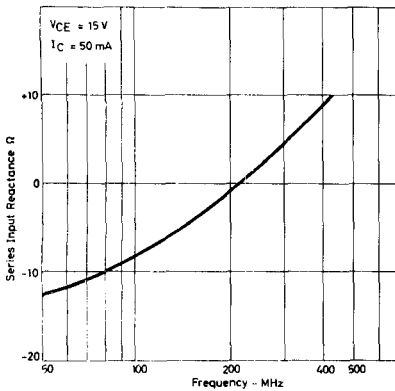


FIGURE 1

TYPICAL SERIES INPUT REACTANCE vs FREQUENCY

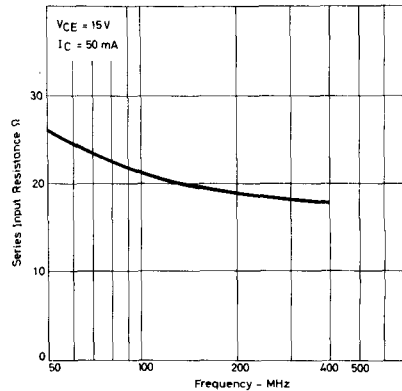


FIGURE 2

# 2N5109

## SILICON NPN VHF POWER TRANSISTOR

TYPICAL POWER GAIN )  
NOISE FIGURE ) vs COLLECTOR CURRENT

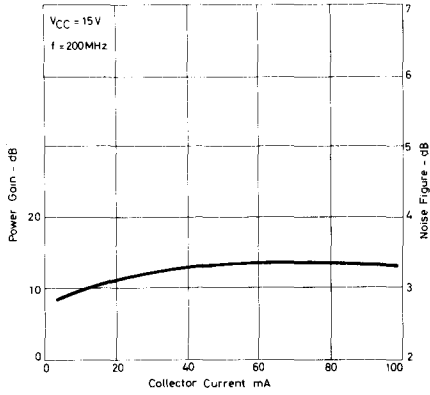


FIGURE 3

TYPICAL PARALLEL OUTPUT RESISTANCE  
vs FREQUENCY

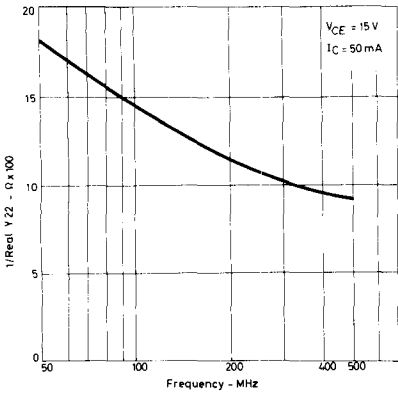


FIGURE 4

TYPICAL PARALLEL OUTPUT CAPACITANCE  
vs FREQUENCY

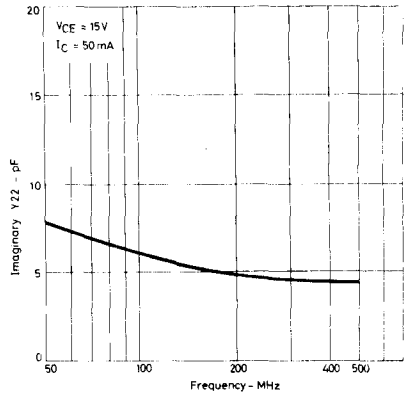


FIGURE 5

# 2N5109 SILICON NPN VHF POWER TRANSISTOR

## ABSOLUTE MAXIMUM AREA OF OPERATION

SAFE AREA OF OPERATION  $T_{CASE} 25^{\circ}C$

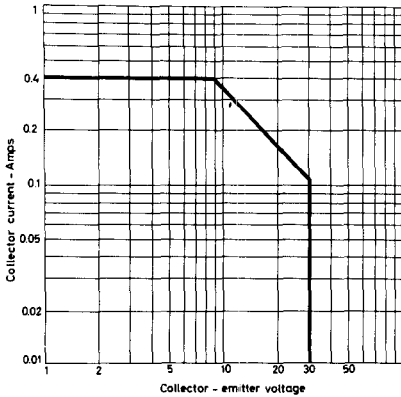


FIGURE 6

THERMAL DERATING

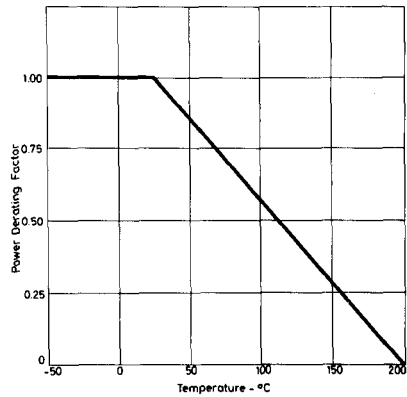


FIGURE 7

To establish the absolute maximum area of operation for this device it is necessary to apply deratings both for case temperature and voltage, proceed as follows:

- (1) Establish mean device dissipation and heat sink dimensions to determine the device working case temperature.
- (2) Read off the Power Derating Factor from Fig. 2.
- (3) Multiply either voltage or current rating given by Fig. 1 by the Power Derating Factor. This gives the volt-amp. (i.e. power) rating under the given conditions.

NOTE: Where the device is subjected to power pulses of shorter duration than the thermal time constant, operation is safe at peak power levels greater than the DC safe area of operation. In particular under class B or C RF operation, when power pulse widths are a small fraction of the thermal time constant, dissipation is limited only by the maximum thermal resistance.

TYPICAL  $|h_{fe}|$  vs COLLECTOR CURRENT

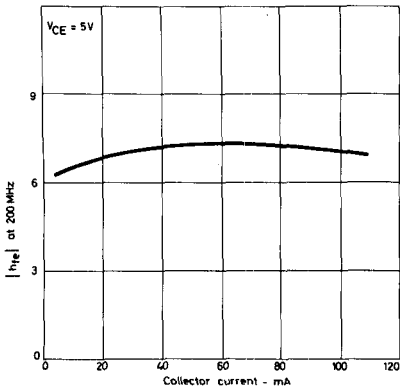


FIGURE 8

TYPICAL  $C_{ob0}$  vs COLLECTOR-BASE VOLTAGE

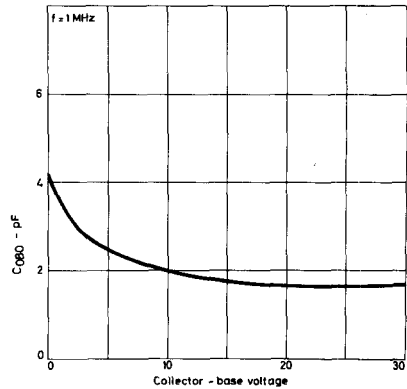


FIGURE 9

TEXAS INSTRUMENTS

Typ type	f MHz	VCC	P <sub>in</sub>	P <sub>out</sub>	BU <sub>CBO</sub>	BU <sub>CEO</sub>	Gehäuse package
2N 3137 T	250	20	0,1	0,4	40	20	TO-39
	50	50	2	15	105	60	TO-60
2N 3309	250	25	0,4	2	50	30	TO-39
2N 3375	400	28	1	3	65	40	TO-60
2N 3553	175	28	0,25	2,5	60	40	TO-39
2N 3632	175	28	3,5	13,5	65	40	TO-60
2N 3733	400	28	4,0	10,0	65	40	TO-60
2N 3866	400	28	0,1	1,0	55	30	TO-39
2N 3924	175	13,6	1	4	36	18	TO-39
2N 3926	175	13,6	2	7	36	18	TO-60
2N 3927	175	13,6	4	12	36	18	TO-60
2N 4040	400	28	3	8	60	40	TO-117
2N 4041	400	28	1	3,3	60	40	TO-117
2N 4127	175	25	2,5	13,5	60	40	TO-117
2N 4128	175	25	6	24	60	40	TO-117
2N 4427	175	12	0,1	1,0	40	20	TO-39
2N 4428	500	28	0,075	0,75	55	35	TO-39
2N 4429	1000	28	0,3	1,0	55	35	TO-117
2N 4430	1000	28	0,795	2,5	55	40	TO-129
2N 4431	1000	28	1,57	5,0	55	40	TO-129
2N 4440	400	28	1,7	5	65	40	TO-60
2N 4933	70	24	3,5	20	70	35	TO-60CE
2N 5016	400	28	5	15	65	30	TO-60CE
2N 5026	50	28	2,5	25	90	50	TO-60CE
2N 5070	30	28		25PEP	65	30	TO-60CE
2N 5071	70	28	3	24	65	30	TO-60CE
2N 5090	400	28	0,2	1,2	55	30	TO-60
2N 5102	136	24	6	15	90	50	TO-60CE
2N 5109	CATV				40	20	TO-39
2N 5179	CATV				20	12	TO-72
2N 5687	50	12,5	0,1	1,5	40	20	TO-39
2N 5688	50	12,5	0,25	5	40	20	TO-117
2N 5689	50	12,5	1,0	10	60	40	TO-117
2N 5690	50	12,5	2,5	25	50	30	TO-128
2N 5691	50	12,5	6,3	40	50	30	DIA-4L
2N 5697	470	12,5	0,05	0,25	40	18	TO-39
2N 5698	470	12,5	0,25	1,0	40	18	TO-131
2N 5699	470	12,5	1,0	3,5	40	18	TO-129
2N 5702	175	12,5	0,38	1,5	36	18	TO-39
2N 5703	175	12,5	0,475	3,0	36	18	TO-117
2N 5704	175	12,5	3,75	12,0	36	18	TO-117
2N 5705	175	12,5	10	25	36	18	TO-128
2N 5707	28	28		20PEP	70	50	TO-128
2N 5708	28	28		40PEP	70	50	TO-128
2N 5709	28	28		80PEP	70	50	DIA-4L
2N 5710	150	12,5	0,024	0,3	40	20	TO-39
2N 5711	150	12,5	0,15	1,5	60	36	TO-117
2N 5712	150	12,5	1,25	5,0	60	40	TO-117