NEC

SILICON TRANSISTOR
2SC4095R

MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
4 PINS MINI MOLD

DESCRIPTION

2SC4095R is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. 2SC4095R features excellent power gain with very low-noise figures. 2SC4095R employs direct nitride passivated base surface process (NESAT process) which is an NEC proprietary new fabrication technique which provides excellent noise figures at high current values. This allows excellent associated gain and very wide dynamic range.

FEATURES

- NF = 1.8 dB TYP. @ f = 2.0 GHz, V_{CE} = 6 V, I_C = 5 mA
- $|S_{21e}|^2$ = 9.5 dB TYP. @ f = 2.0 GHz, V_{CE} = 6 V, I_C = 10 mA

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE	QUALITY GRADE
2SC4095R-T1	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin 3 (Emitter), Pin 4 (Base) face to perforation side of the tape.	Standard
2SC4095R-T2	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin 1 (Emitter), Pin 2 (Collector) face to perforation side of the tape.	

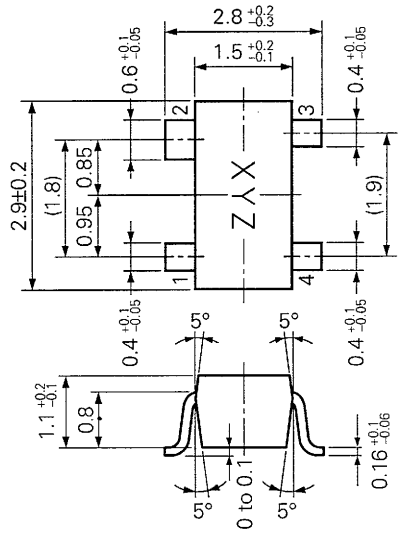
* Please contact with responsible NEC person, if you require evaluation sample. Unit sample quantity shall be 50 pcs. (Part No. : 2SC4095R)

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	10	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_C	35	mA
Total Power Dissipation	P_T	200	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−65 to +150	°C

PACKAGE DIMENSIONS
in millimeters



PIN CONNECTIONS

1. Emitter
2. Collector
3. Emitter
4. Base

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Printed in Japan

ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

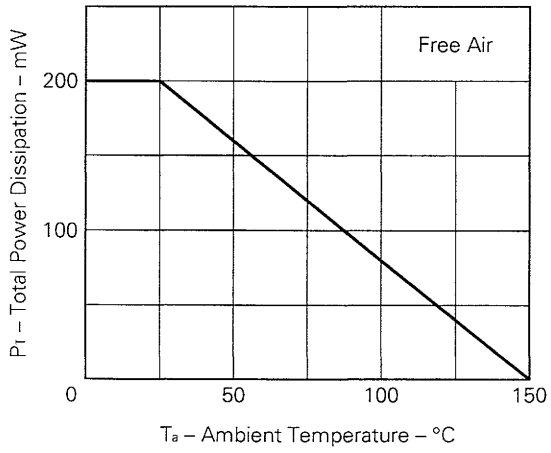
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CBO}			1.0	μA	V_{CB} = 10 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			1.0	μA	V_{EB} = 1 V, I_C = 0
DC Current Gain	h_{FE}	50	100	250		V_{CE} = 6 V, I_C = 10 mA
Gain Bandwidth Product	f_T		10		GHz	V_{CE} = 6 V, I_C = 10 mA, f = 1.0 GHz
Feed-Back Capacitance	C_{re}		0.25	0.8	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
Insertion Power Gain	$\|S_{21e}\|^2$	7.5	9.5		dB	V_{CE} = 6 V, I_C = 10 mA, f = 2.0 GHz
Maximum Available Gain	MAG		12		dB	V_{CE} = 6 V, I_C = 10 mA, f = 2.0 GHz
Noise Figure	NF		1.8	3.0	dB	V_{CE} = 6 V, I_C = 5 mA, f = 2.0 GHz

h_{FE} Classification

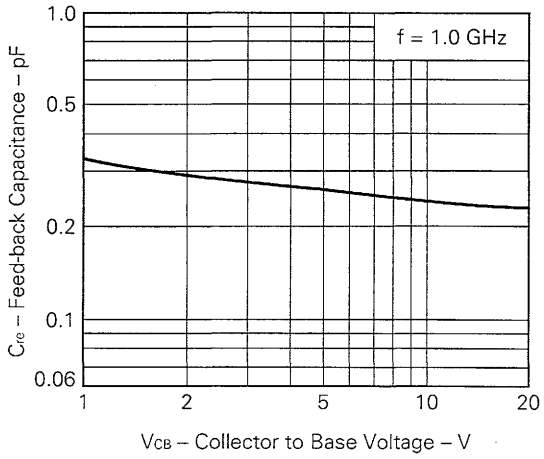
Rank	EB	FB	GB
Marking	46R	47R	48R
h_{FE}	50 to 100	80 to 160	125 to 250

TYPICAL CHARACTERISTICS (T_a = 25 °C)

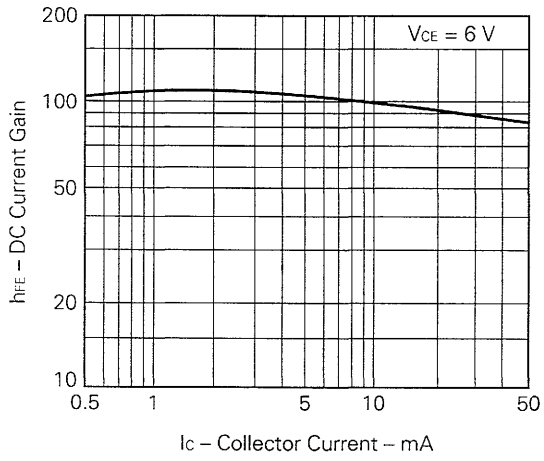
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



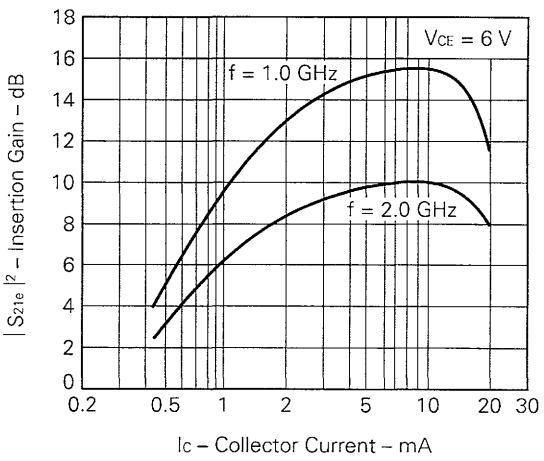
FEED-BACK CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



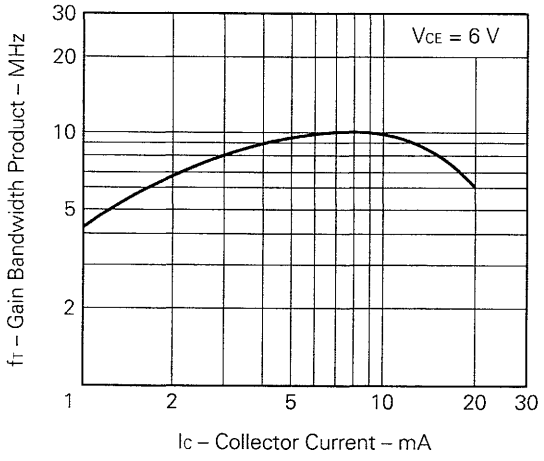
DC CURRENT GAIN vs. COLLECTOR CURRENT



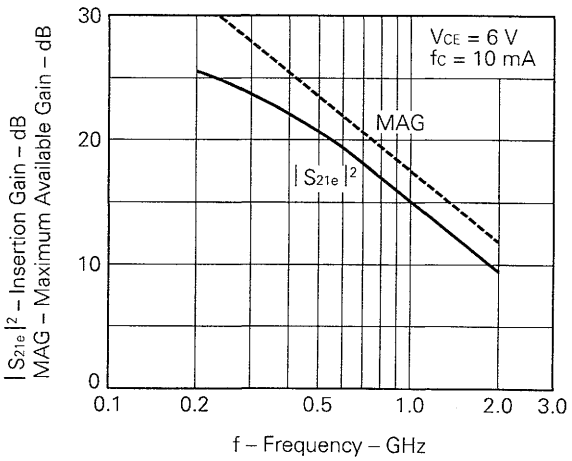
INSERTION GAIN vs. COLLECTOR CURRENT



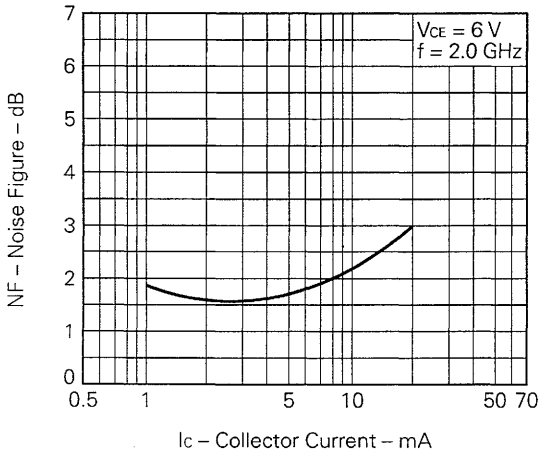
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN, INSERTION GAIN vs. FREQUENCY



NOISE FIGURE vs.
COLLECTOR CURRENT



S-PARAMETER

V_{CE} = 6.0 V, I_C = 3.0 mA, Z_O = 50 Ω

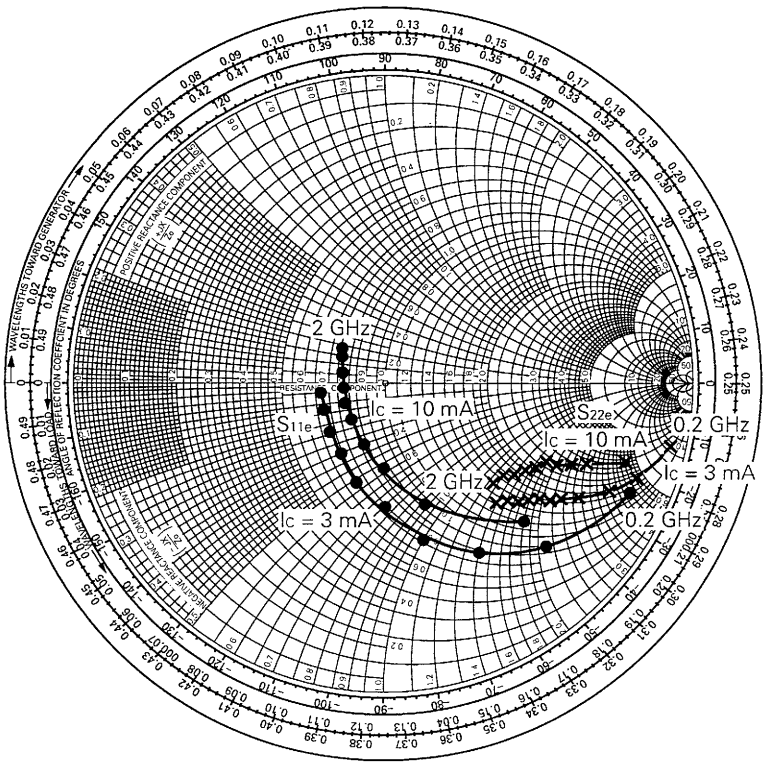
f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.870	–24.2	9.193	155.6	0.031	53.6	0.946	–12.8
400	0.747	–44.6	7.789	136.6	0.040	66.2	0.876	–20.7
600	0.628	–59.8	7.058	122.1	0.064	54.7	0.816	–26.4
800	0.516	–75.1	5.675	109.4	0.066	56.0	0.743	–30.9
1000	0.400	–87.7	5.180	99.6	0.090	49.4	0.689	–33.0
1200	0.327	–103.4	4.269	89.8	0.084	47.9	0.654	–35.7
1400	0.262	–118.7	3.950	81.7	0.106	48.5	0.604	–37.7
1600	0.231	–135.5	3.406	74.0	0.105	42.1	0.581	–41.5
1800	0.205	–155.3	3.290	66.4	0.126	46.4	0.548	–43.9
2000	0.196	–170.6	2.867	60.8	0.124	40.9	0.529	–47.1

V_{CE} = 6.0 V, I_C = 10.0 mA, Z_O = 50 Ω

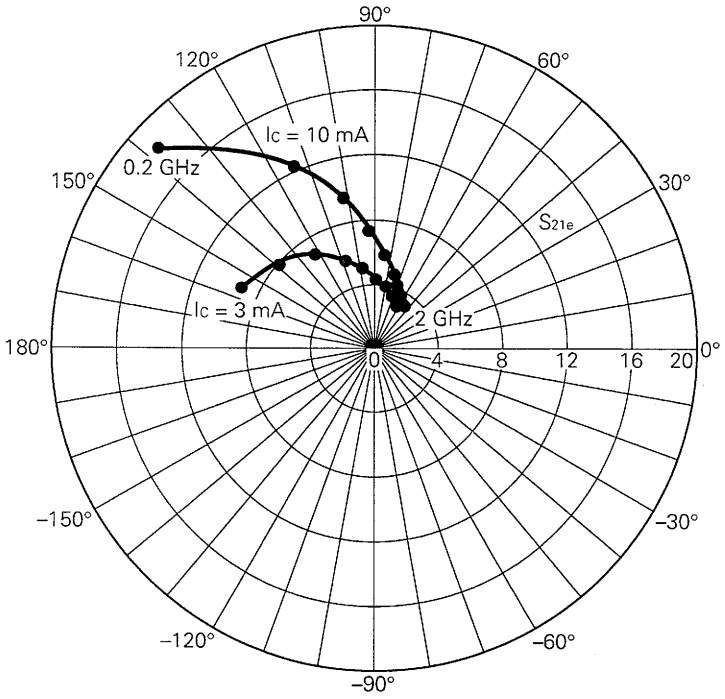
f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.671	–43.5	18.685	137.9	0.023	52.1	0.832	–19.0
400	0.458	–68.7	12.702	115.2	0.029	62.2	0.710	–23.9
600	0.319	–83.7	9.895	102.8	0.046	54.4	0.649	–26.0
800	0.239	–101.9	7.275	92.3	0.049	63.1	0.600	–27.5
1000	0.172	–119.3	6.261	85.1	0.067	58.6	0.578	–28.4
1200	0.149	–141.4	5.038	77.4	0.070	57.9	0.559	–30.3
1400	0.131	–163.0	4.597	71.0	0.088	56.1	0.527	–32.5
1600	0.132	179.6	3.927	64.8	0.094	54.0	0.514	–35.7
1800	0.150	160.0	3.743	58.8	0.113	55.3	0.494	–38.1
2000	0.163	150.1	3.233	54.5	0.115	50.0	0.478	–41.6

S-PARAMETER

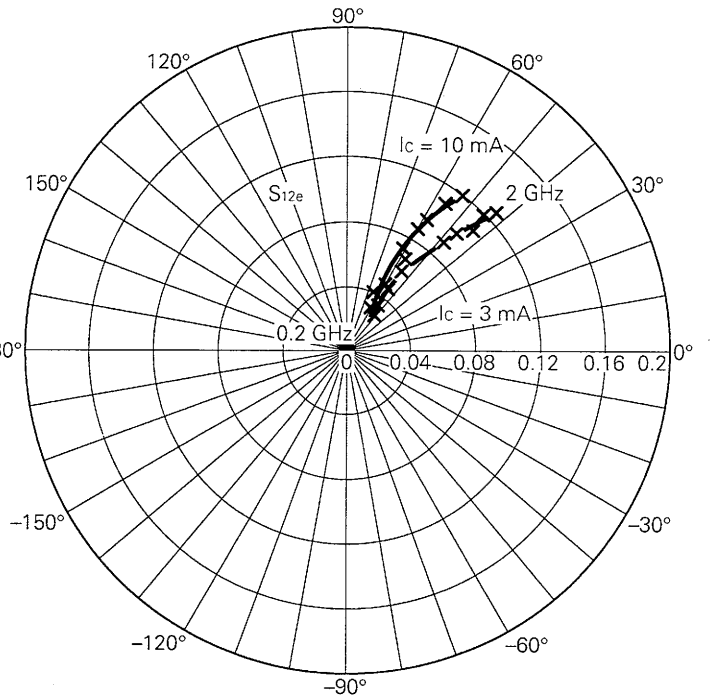
S_{11e}, S_{22e} – FREQUENCY CONDITION V_{CE} = 6 V, I_C = 10/3 mA, freq. = 0.2 to 2 GHz (Step 200 MHz)



S_{21e} – FREQUENCY
CONDITION V_{CE} = 6 V
I_C = 10/3 mA
freq. = 0.2 to 2 GHz (Step 200 MHz)



S_{12e} – FREQUENCY
CONDITION V_{CE} = 6 V
I_C = 10/3 mA
freq. = 0.2 to 2 GHz (Step 200 MHz)



RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product. Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

2SC4095R

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature : 230 °C or below, Reflow time : 30 seconds or below (210 °C or higher), Number of reflow process : 1, Exposure limit* : None	IR30-00
VPS	Peak package's surface temperature : 215 °C or below, Reflow time : 40 seconds or below (200 °C or higher), Number of reflow process : 1, Exposure limit* : None	VP15-00
Wave soldering	Solder temperature : 260 °C or below, Flow time : 10 seconds or below, Number of flow process : 1, Exposure limit* : None	WS60-00
Partial heating method	Terminal temperature : 300 °C or below, Flow time : 10 seconds or below, Exposure limit* : None	

* : Exposure limit before soldering after dry-pack package is opened.
Storage conditions : 25 °C and relative humidity at 65 % or less.

Note : Do not apply more than a single process at once, except for "Partial heating method".

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