NEC

SILICON TRANSISTOR
2SC4093

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

DESCRIPTION

The 2SC4093 is an NPN silicon epitaxial transistor designed for low noise amplifier at VHF, UHF and CATV band.

It has large dynamic range and good current characteritics, and is contatined in a 4 pins mini-mold package which enables high-isolation gain.

FEATURES

- Low Noise
  NF = 1.1 dB TYP. @ V_{CE} = 10 V, I_C = 7 mA, f = 1.0 GHz
- High Power Gains
  $|S_{21e}|^2$ = 13 dB TYP. @ V_{CE} = 10 V, I_C = 20 mA, f = 1.0 GHz

ORDERING INFORMATION

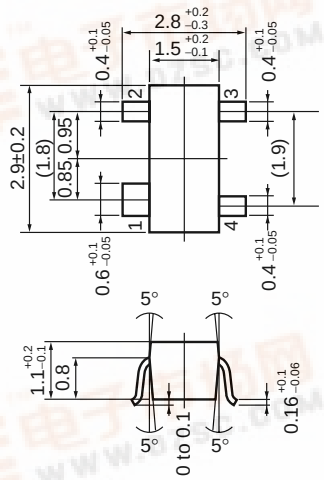
PART NUMBER	QUANTITY	PACKING STYLE
2SC4093-T1	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin3 (Base), Pin4 (Emitter) face to perforation side of the tape.
2SC4093-T2	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin1 (Collector), Pin2 (Emitter) face to perforation side of the tape.

* Please contact with responsible NEC person, if you require evaluation sample.
Unit sample quantity shall be 50 pcs. (Part No.: 2SC4093)

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	12	V
Emitter to Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	100	mA
Total Power Dissipation	P_T	200	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

PACKAGE DIMENSIONS
(Units: mm)



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

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} = 10 V, I_C = 0
DC Current Gain	h_{FE}	50	120	250		V_{CE} = 10 V, I_C = 20 mA
Gain Bandwidth Product	f_T		7.0		GHz	V_{CE} = 10 V, I_C = 20 mA
Feed-Back Capacitance	C_{re}		0.6	0.95	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
Insertion Power Gain	$\lvert S_{21e} \rvert^2$	11	13		dB	V_{CE} = 10 V, I_C = 20 mA, f = 1.0 GHz
Noise Figure	NF		1.1	2.0	dB	V_{CE} = 10 V, I_C = 7 mA, f = 1.0 GHz

Classification of h_{FE}

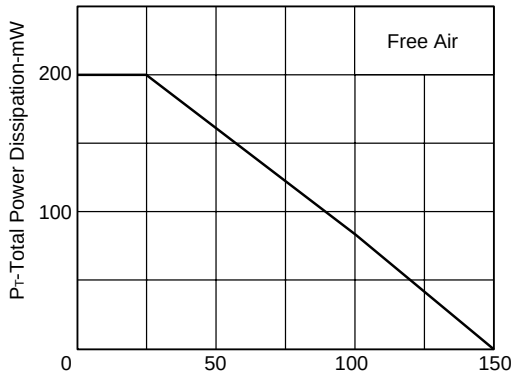
Rank	R26/RBF *	R27/RBG *	R28/RBH *
Marking	R26	R27	R28
Range	50 to 100	80 to 160	125 to 250

* Old Specification / New Specification

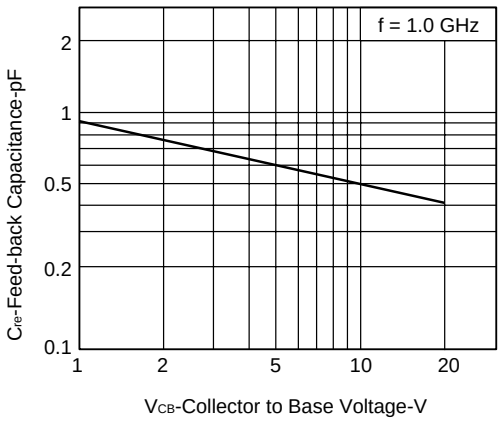
h_{EF} Test Condtitions: V_{CE} = 10 V, I_C = 20 mA

TYPICAL CHARACTERISTICS (T_A = 25 °C)

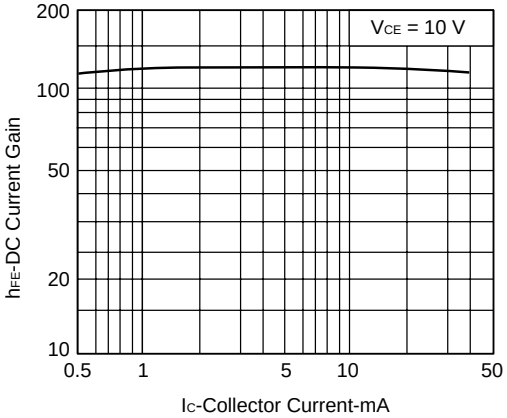
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



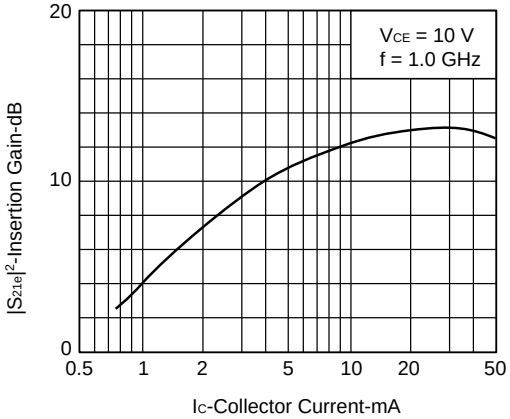
FEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



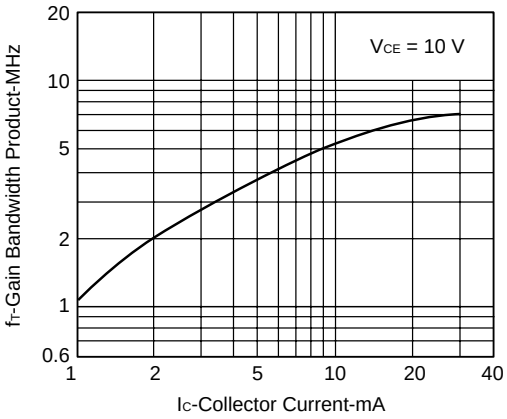
DC CURRENT GAIN vs.
COLLECTOR CURRENT



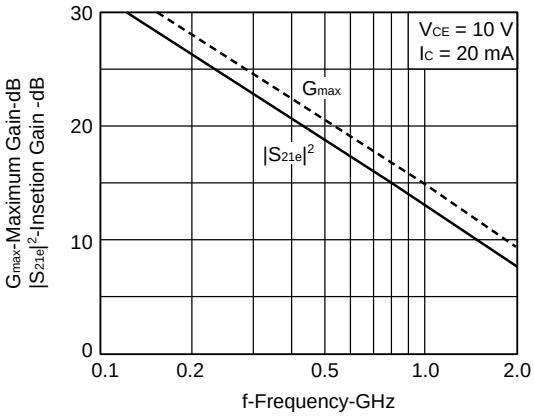
INSERTION GAIN vs.
COLLECTOR CURRENT

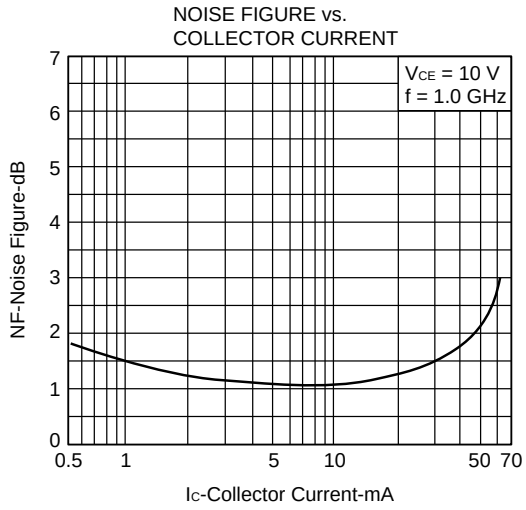


GAIN BANDWIDTH PRODUUT vs.
COLLECTOR CURRENT



INSERTION GAIN, MAXIMUM GAIN
vs. FREQUENCY





S-PARAMETER

V_{CE} =10 V, I_C = 5 mA, Z_O = 50 Ω

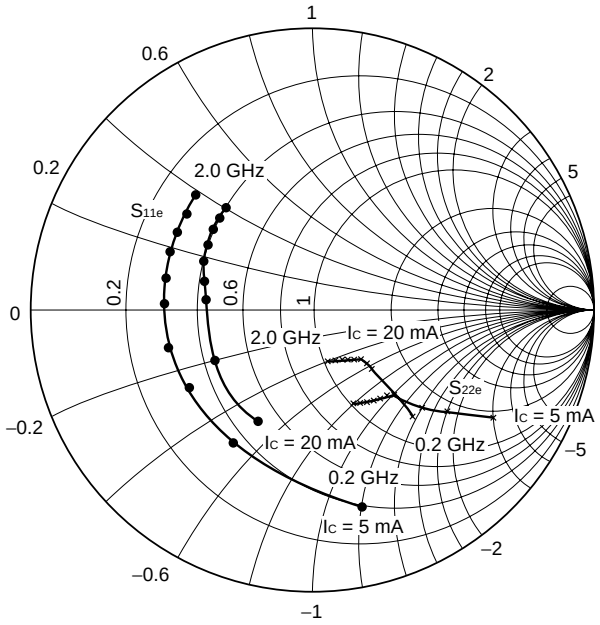
f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.730	−76.5	11.712	129.6	0.048	47.2	0.772	−28.1
400	0.583	−118.8	7.379	105.6	0.056	43.2	0.600	−34.9
600	0.522	−146.2	5.551	92.2	0.072	38.6	0.526	−37.7
800	0.518	−166.5	4.026	80.8	0.072	40.5	0.471	−39.8
1000	0.519	178.3	3.406	71.9	0.088	40.5	0.441	−41.6
1200	0.539	166.6	2.744	63.1	0.089	44.3	0.428	−45.4
1400	0.552	157.4	2.512	55.2	0.106	45.6	0.406	−49.4
1600	0.555	149.0	2.122	48.5	0.111	44.8	0.388	−56.1
1800	0.570	140.9	2.028	41.9	0.134	49.3	0.380	−61.8
2000	0.582	134.0	1.740	36.4	0.135	47.3	0.367	−68.0

V_{CE} = 10 V, I_C = 20 mA, Z_O = 50 Ω

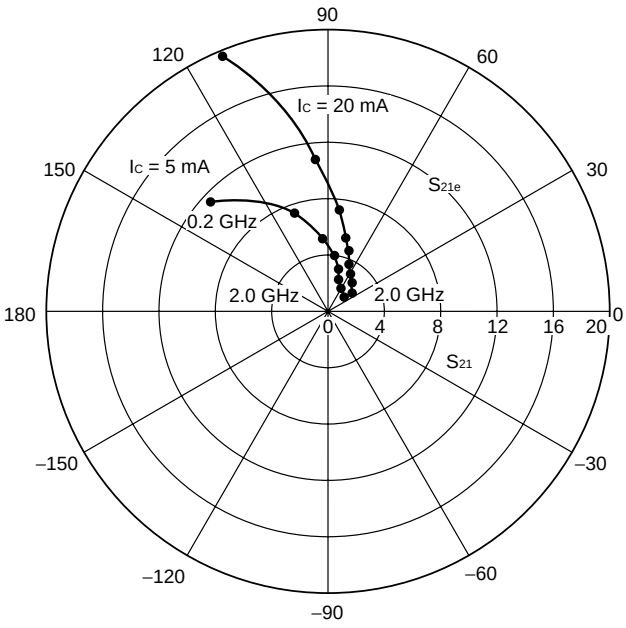
f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.454	−114.9	19.635	111.0	0.033	46.1	0.497	−42.5
400	0.395	−153.0	10.412	93.3	0.041	58.1	0.359	−41.2
600	0.384	−172.8	7.454	84.4	0.060	55.6	0.315	−41.0
800	0.408	173.4	5.318	75.5	0.073	61.1	0.283	−42.5
1000	0.420	162.6	4.450	68.8	0.094	58.2	0.256	−43.2
1200	0.442	154.7	3.571	61.4	0.103	58.7	0.247	−47.8
1400	0.455	147.7	3.253	54.6	0.127	55.3	0.227	−53.0
1600	0.468	141.2	2.737	49.0	0.137	53.1	0.212	−62.2
1800	0.486	133.9	2.618	43.0	0.165	52.1	0.198	−67.4
2000	0.502	128.7	2.237	38.4	0.170	48.4	0.186	−75.5

S-PARAMETER

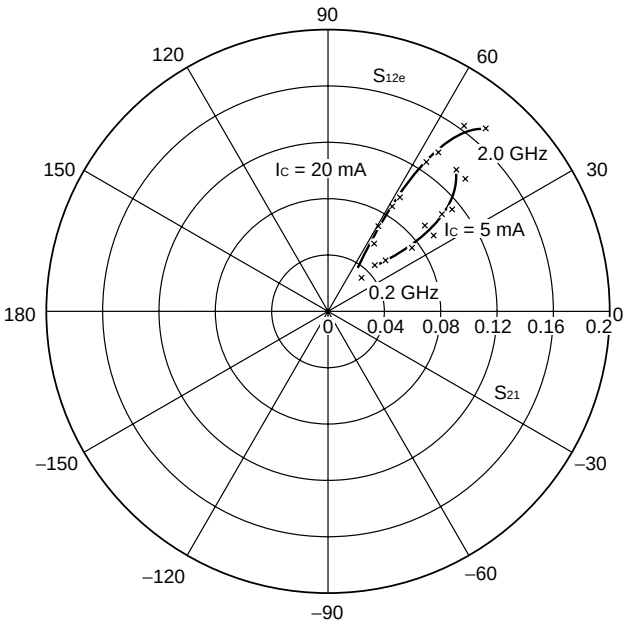
S_{11e}, S_{22e}-FREQUENCY
V_{CE} = 10 V
freq. = 0.2 to 2 GHz (Step 200 MHz)



S_{21e}-FREQUENCY
V_{CE} = 10 V
freq. = 0.2 to 2 GHz (Step 200 MHz)



S_{12e}-FREQUENCY
V_{CE} = 10 V
freq. = 0.2 to 2 GHz (Step 200 MHz)



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M4 96.5