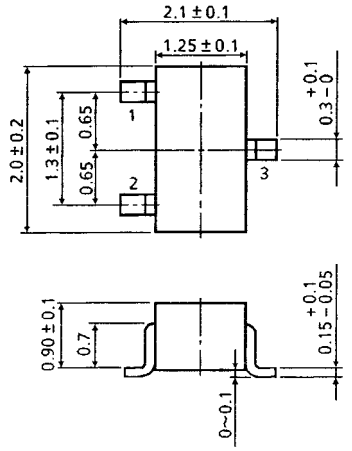
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5107

For VCO Application

Unit: mm



1. BASE
2. EMITTER
3. COLLECTOR

USM

JEDEC	—
JEITA	SC-70
TOSHIBA	2-2E1A

Weight: 0.006 g (typ.)

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	10	V
Emitter-base voltage	V_{EBO}	3	V
Base current	I_B	15	mA
Collector current	I_C	30	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

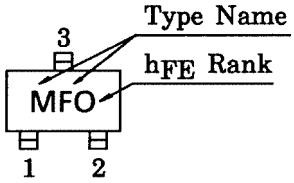
Electrical Characteristics (Ta = 25°C)

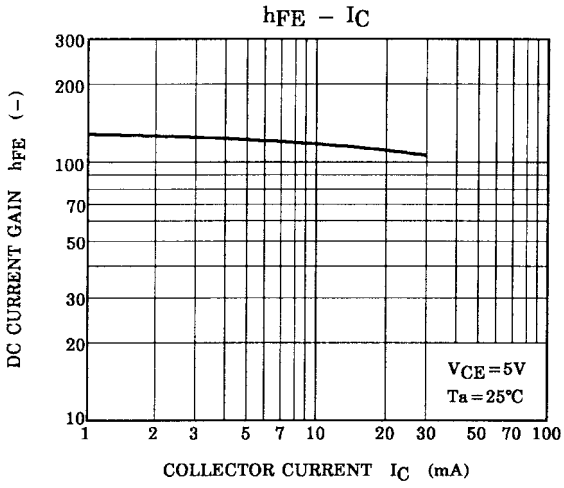
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 10 V, I_E = 0	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	0.1	μA
DC current gain	h_{FE} (Note 1)	V_{CE} = 5 V, I_C = 5 mA	80	—	240	
Transition frequency	f_T	V_{CE} = 5 V, I_C = 5 mA	4	6	—	GHz
Insertion gain	$\|S_{21e}\|^2$	V_{CE} = 5 V, I_C = 5 mA, f = 1 GHz	7	11	—	dB
Output capacitance	C_{ob}	V_{CB} = 5 V, I_E = 0, f = 1 MHz (Note 2)	—	0.7	—	pF
Reverse transfer capacitance	C_{re}		—	0.5	0.9	pF
Collector-base time constant	$C_c.rbb'$	V_{CB} = 5 V, I_C = 3 mA, f = 30 MHz	—	5.5	10	ps

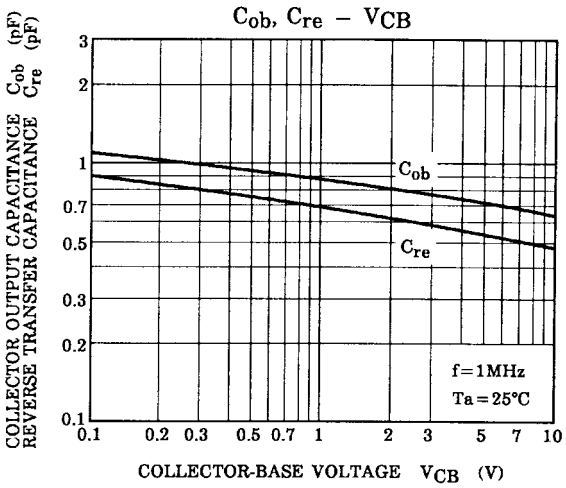
Note 1: h_{FE} classification O: 80~160, Y: 120~240

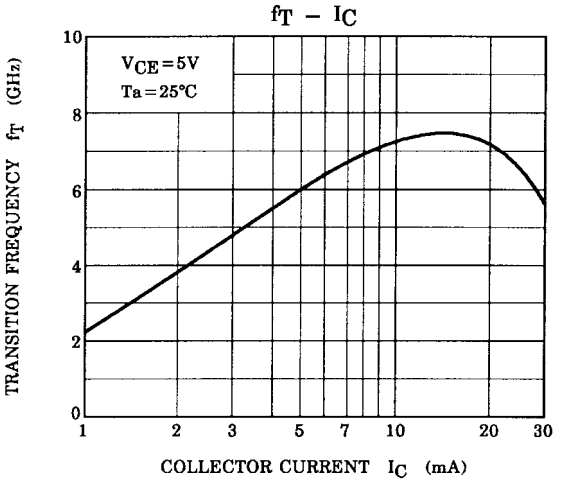
Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

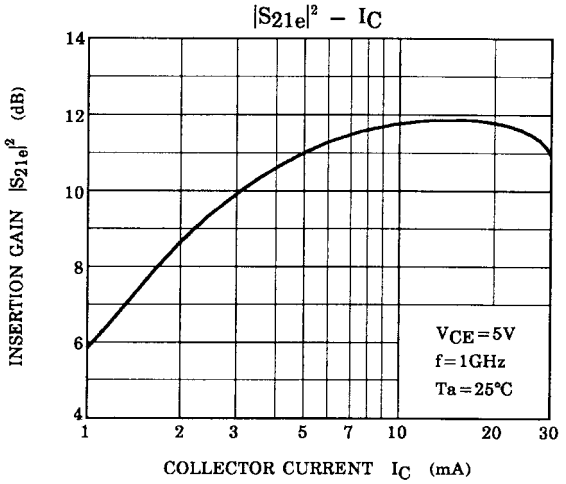
Marking

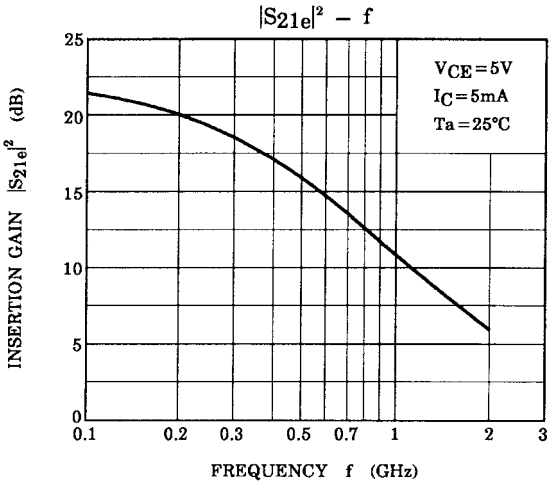


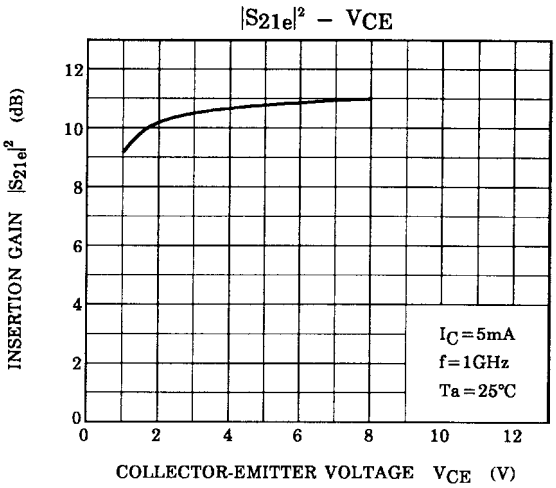

hFE – IC
DC CURRENT GAIN hFE (–)
300
200
100
70
50
30
20
10
1 2 3 5 7 10 20 30 50 70 100
VCE = 5V
Ta = 25°C
COLLECTOR CURRENT IC (mA)

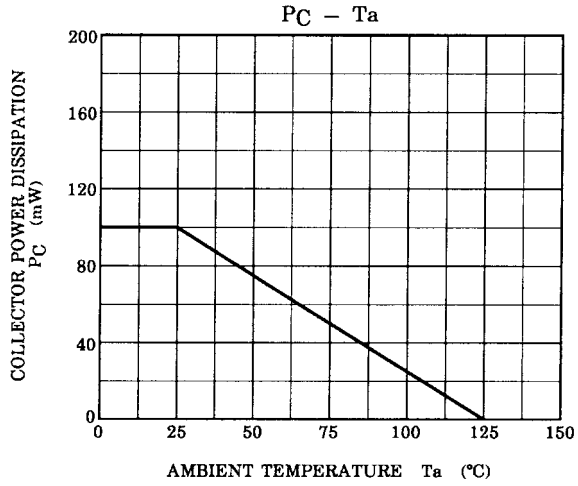

Cob, Cre – VCB
COLLECTOR OUTPUT CAPACITANCE Cob (pF)
REVERSE TRANSFER CAPACITANCE Cre (pF)
3
2
1
0.7
0.5
0.3
0.2
0.1
Cob
Cre
f = 1MHz
Ta = 25°C
0.1 0.2 0.3 0.5 0.7 1 2 3 5 7 10
COLLECTOR-BASE VOLTAGE VCB (V)


fT – IC
TRANSITION FREQUENCY fT (GHz)
10
8
6
4
2
0
VCE = 5V
Ta = 25°C
1 2 3 5 7 10 20 30
COLLECTOR CURRENT IC (mA)


|S21e|2 – IC
INSERTION GAIN |S21e|2 (dB)
14
12
10
8
6
4
VCE = 5V
f = 1GHz
Ta = 25°C
1 2 3 5 7 10 20 30
COLLECTOR CURRENT IC (mA)


|S21e|2 – f
INSERTION GAIN |S21e|2 (dB)
25
20
15
10
5
0
VCE = 5V
IC = 5mA
Ta = 25°C
0.1 0.2 0.3 0.5 0.7 1 2 3
FREQUENCY f (GHz)


|S21e|2 – VCE
INSERTION GAIN |S21e|2 (dB)
12
10
8
6
4
2
0
IC = 5mA
f = 1GHz
Ta = 25°C
0 2 4 6 8 10 12
COLLECTOR-EMITTER VOLTAGE VCE (V)

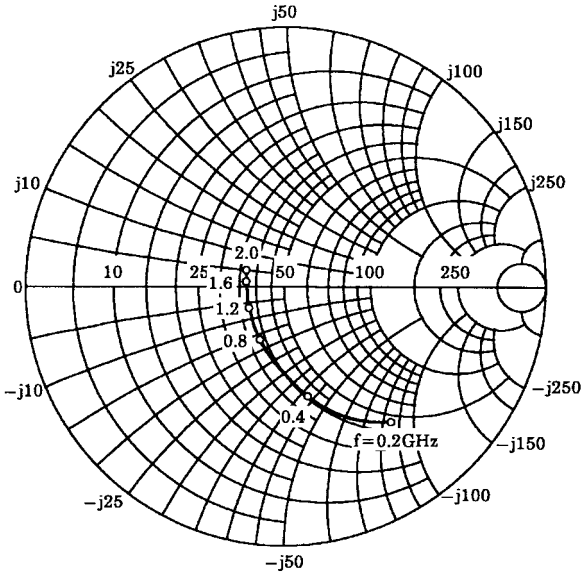


S-Parameter Z_O = 50 Ω, Ta = 25°C

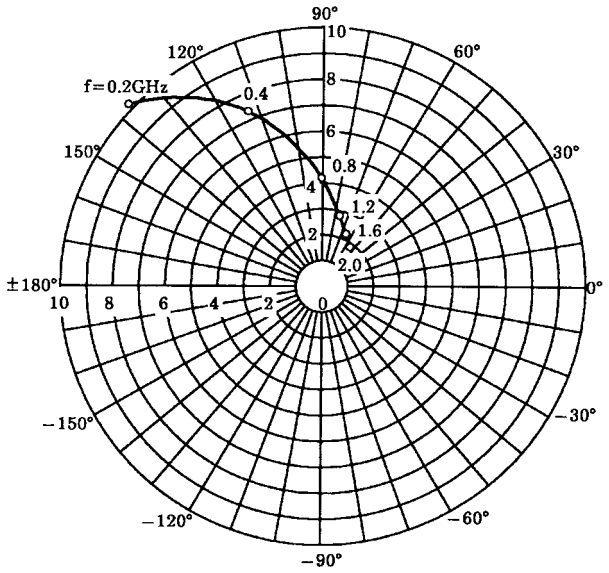
V_{CE} = 5 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.684	−47.0	10.116	136.8	0.049	63.1	0.765	−29.5
400	0.438	−79.2	7.260	112.9	0.072	56.5	0.553	−37.8
600	0.301	−101.2	5.388	99.1	0.090	56.5	0.452	−39.1
800	0.226	−119.2	4.227	90.0	0.107	57.6	0.402	−39.0
1000	0.182	−136.2	3.494	82.7	0.124	58.8	0.374	−38.9
1200	0.159	−153.3	2.988	76.9	0.142	59.6	0.359	−39.4
1400	0.147	−170.3	2.632	71.2	0.163	59.9	0.348	−40.7
1600	0.145	174.4	2.345	66.0	0.182	59.2	0.339	−43.2
1800	0.149	162.6	2.128	61.4	0.200	58.4	0.329	−46.3
2000	0.161	150.9	1.967	57.1	0.219	58.1	0.318	−49.5

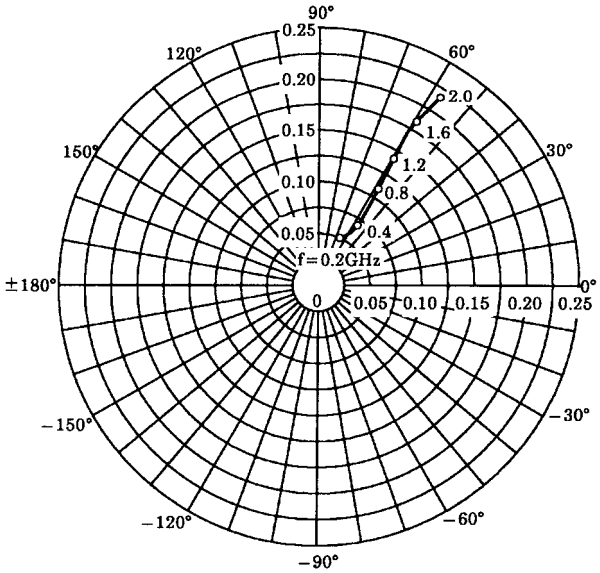
S_{11e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



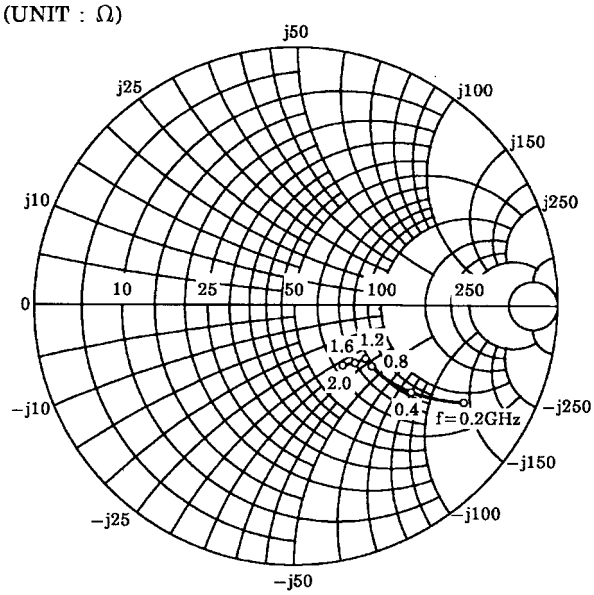
S_{21e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C



S_{12e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C



S_{22e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



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