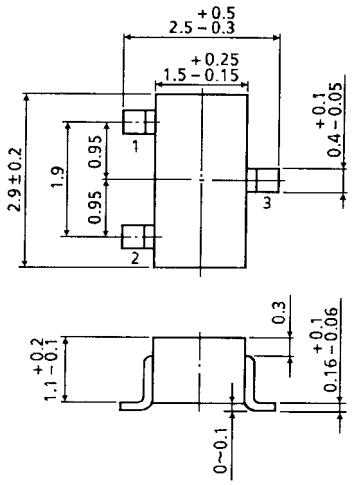
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5106

For VCO Application

Unit: mm



JEDEC	—
JEITA	SC-59
TOSHIBA	2-3F1A

Weight: 0.012 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	150	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

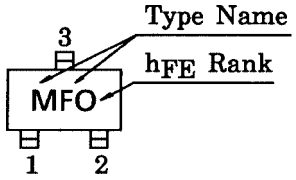
Electrical Characteristics (Ta = 25°C)

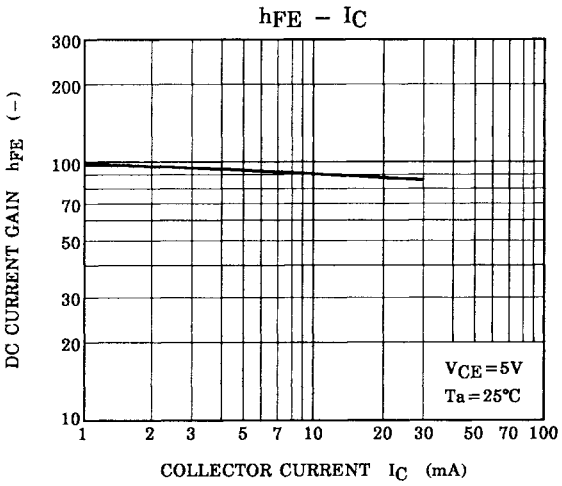
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 10 V, I_E = 0	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	0.1	μA
DC current gain	h_{FE} (Note 1)	V_{CE} = 5 V, I_C = 5 mA	80	—	240	
Transition frequency	f_T	V_{CE} = 5 V, I_C = 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} = 15 V, I_C = 3 mA, f = 30 MHz	—	5.5	10	ps

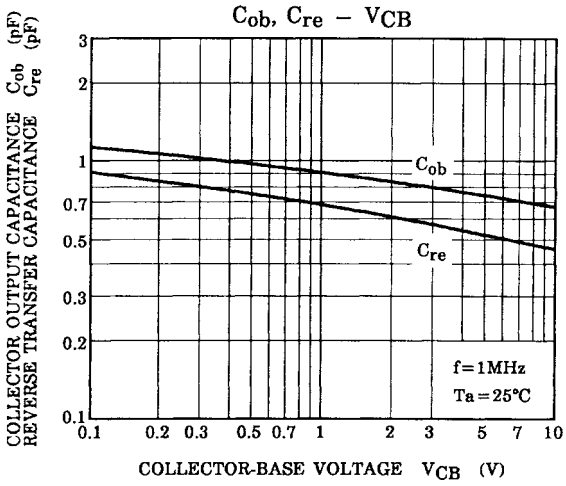
Note 1: h_{FE} classification O: 80~160, Y: 120~240

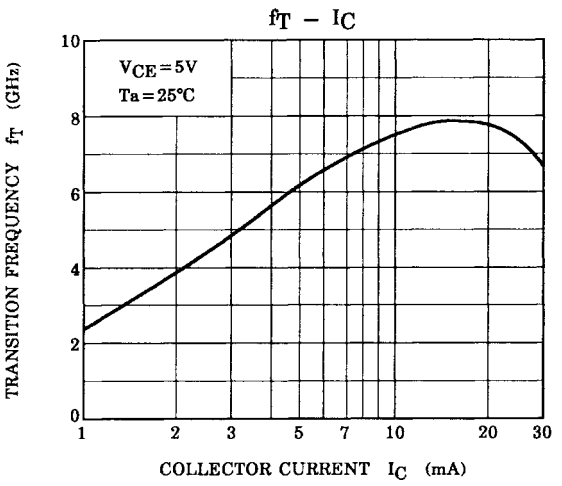
Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

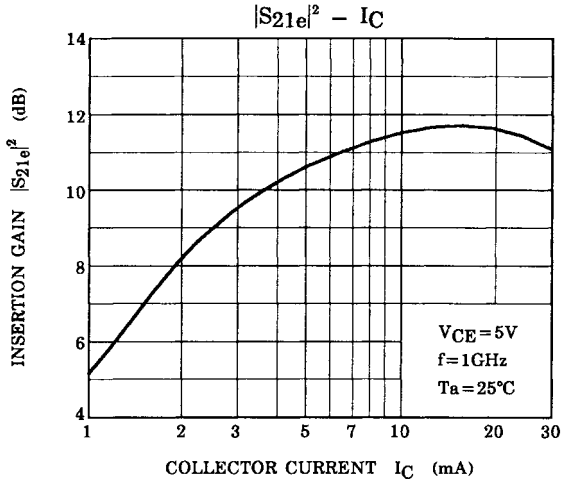
Marking

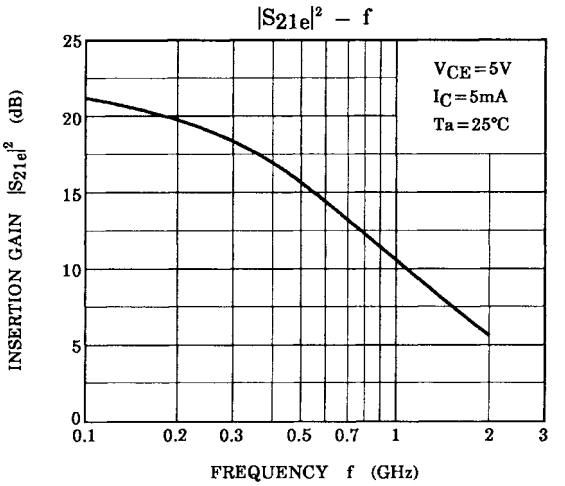


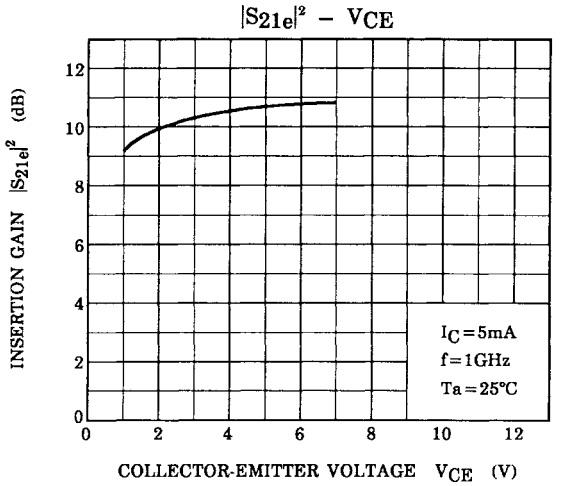

h_{FE} – I_C
DC CURRENT GAIN h_{FE} (–)
300
200
100
70
50
30
20
10
1 2 3 5 7 10 20 30 50 70 100
V_{CE} = 5V
Ta = 25°C
COLLECTOR CURRENT I_C (mA)

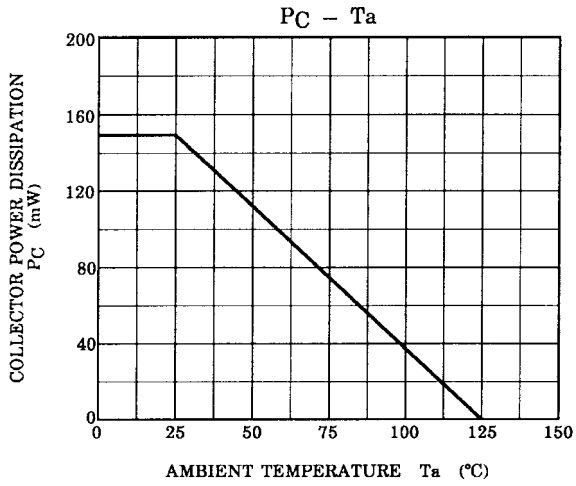

C_{ob}, C_{re} – V_{CB}
COLLECTOR OUTPUT CAPACITANCE C_{ob} (pF)
REVERSE TRANSFER CAPACITANCE C_{re} (pF)
3
2
1
0.7
0.5
0.3
0.2
0.1
C_{ob}
C_{re}
0.1 0.2 0.3 0.5 0.7 1 2 3 5 7 10
f = 1MHz
Ta = 25°C
COLLECTOR-BASE VOLTAGE V_{CB} (V)


f_T – I_C
TRANSITION FREQUENCY f_T (GHz)
10
8
6
4
2
0
V_{CE} = 5V
Ta = 25°C
1 2 3 5 7 10 20 30
COLLECTOR CURRENT I_C (mA)


$|S_{21e}|^2$ – I_C
INSERTION GAIN $|S_{21e}|^2$ (dB)
14
12
10
8
6
4
V_{CE} = 5V
f = 1GHz
Ta = 25°C
1 2 3 5 7 10 20 30
COLLECTOR CURRENT I_C (mA)


$|S_{21e}|^2$ – f
INSERTION GAIN $|S_{21e}|^2$ (dB)
25
20
15
10
5
0
V_{CE} = 5V
I_C = 5mA
Ta = 25°C
0.1 0.2 0.3 0.5 0.7 1 2 3
FREQUENCY f (GHz)


$|S_{21e}|^2$ – V_{CE}
INSERTION GAIN $|S_{21e}|^2$ (dB)
12
10
8
6
4
2
0
I_C = 5mA
f = 1GHz
Ta = 25°C
0 2 4 6 8 10 12
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)

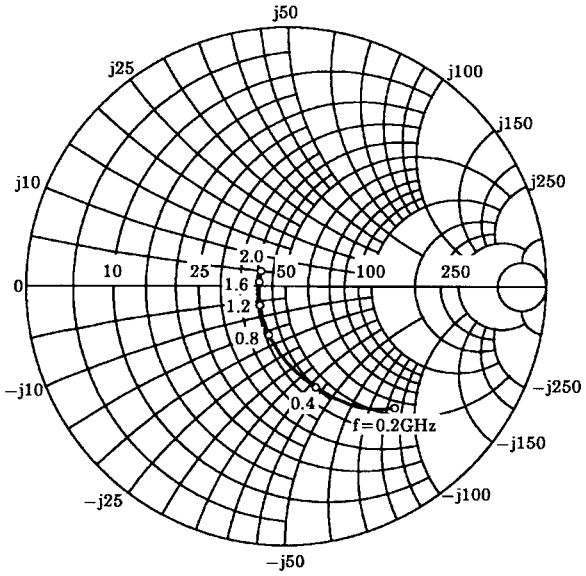


S-Parameter Z_O = 50 Ω, Ta = 25°C

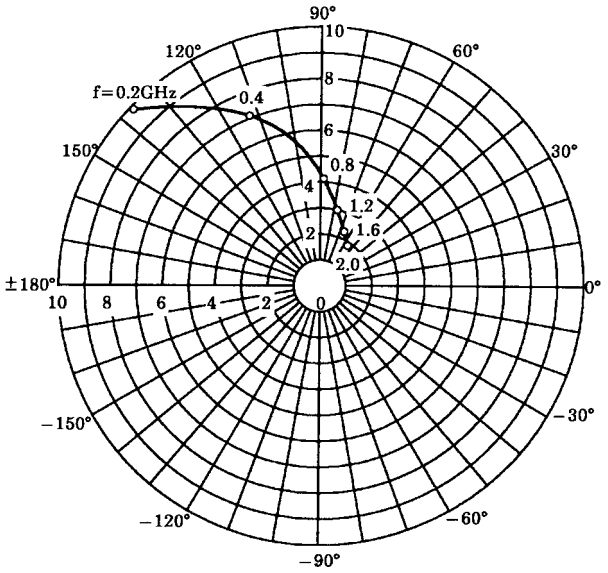
V_{CE} = 5 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.654	–45.3	9.794	136.6	0.047	64.8	0.775	–27.8
400	0.414	–75.6	7.062	112.6	0.071	58.7	0.570	–35.0
600	0.273	–94.9	5.232	98.7	0.090	58.5	0.472	–35.8
800	0.193	–111.7	4.118	89.4	0.108	59.5	0.424	–35.5
1000	0.146	–128.1	3.412	82.0	0.127	60.4	0.398	–35.5
1200	0.116	–147.4	2.927	75.5	0.147	61.0	0.381	–36.2
1400	0.101	–169.6	2.571	69.8	0.169	60.7	0.373	–37.9
1600	0.098	171.6	2.299	64.4	0.189	59.5	0.363	–40.4
1800	0.105	155.8	2.079	59.8	0.208	58.6	0.351	–43.5
2000	0.118	142.1	1.928	55.4	0.230	58.4	0.338	–46.1

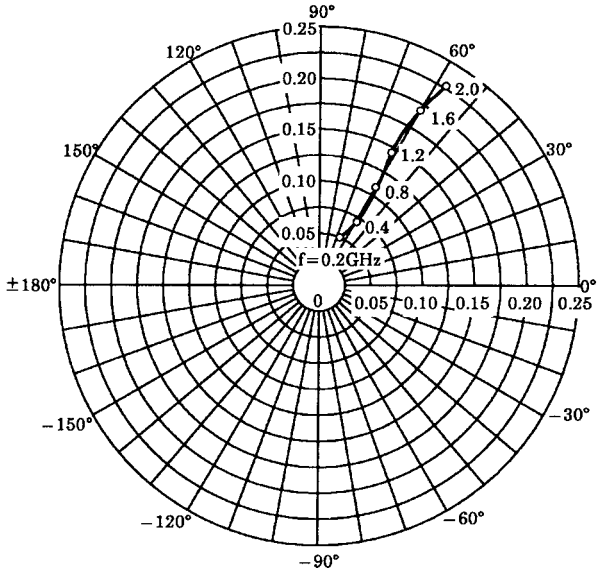
S_{11e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



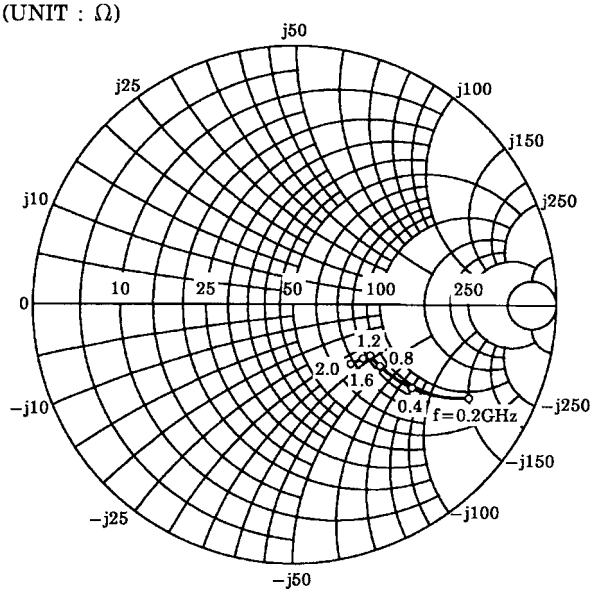
S_{21e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C



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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