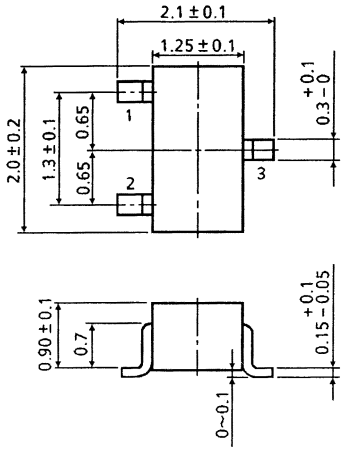
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5110

For VCO Application

Unit: mm



1. BASE
2. EMITTER
3. COLLECTOR

USM

JEDEC	—
JEITA	SC-70
TOSHIBA	2-2E1A

Weight: 0.006 g (typ.)

Absolute 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	30	mA
Collector current	I_C	60	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

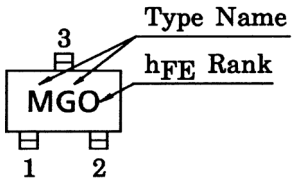
Electrical Characteristics (Ta = 25°C)

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	3	5	—	GHz
Insertion gain	$\|S_{21e}\|^2$	V_{CE} = 5 V, I_C = 5 mA, f = 1 GHz	6	10	—	dB
Output capacitance	C_{ob}	V_{CB} = 5 V, I_E = 0, f = 1 MHz (Note 2)	—	0.9	—	pF
Reverse transfer capacitance	C_{re}		—	0.7	1.1	pF
Collector-base time constant	C_c.rbb’	V_{CB} = 5 V, I_C = 3 mA, f = 30 MHz	—	6	11	ps

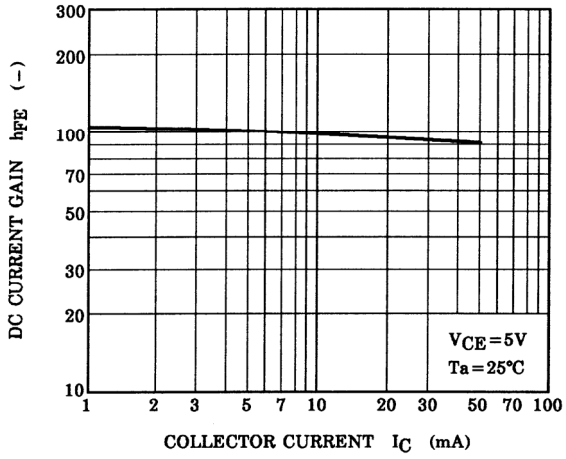
Note 1: h_{FE} classification O: 80~160, Y: 120~240

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

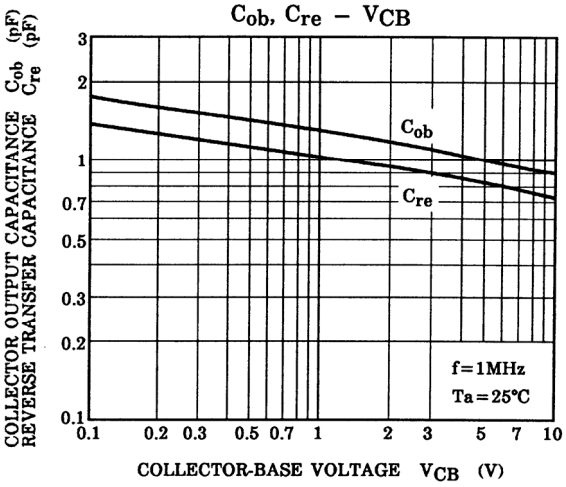
Marking



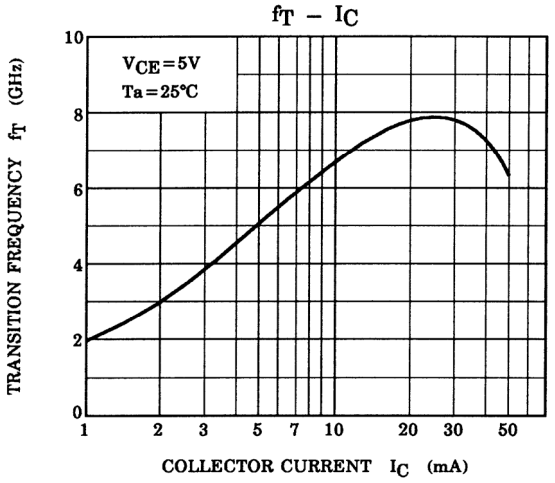
h_{FE} – I_C



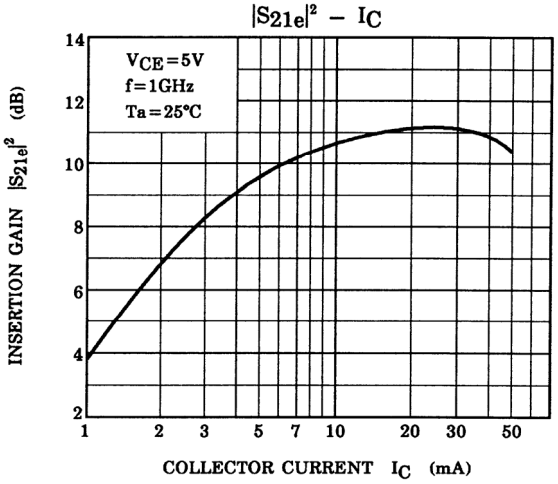
C_{ob}, C_{re} – V_{CB}



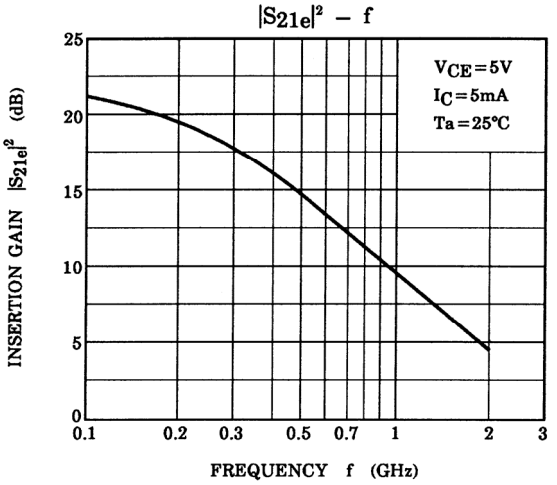
f_T – I_C



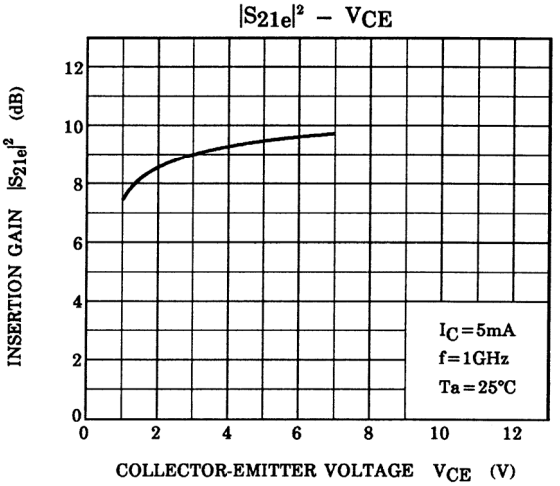
$|S_{21e}|^2$ – I_C

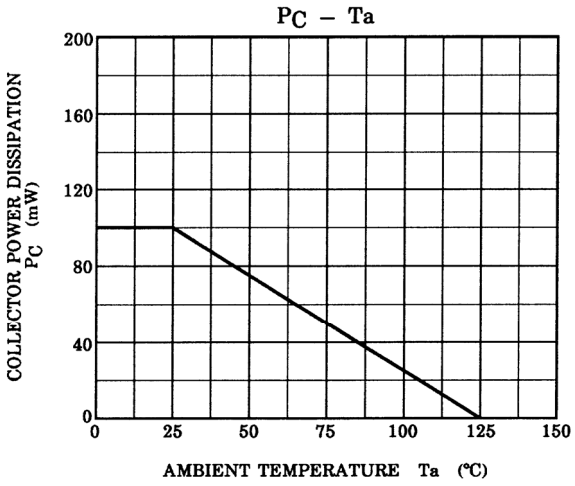


$|S_{21e}|^2$ – f



$|S_{21e}|^2$ – V_{CE}



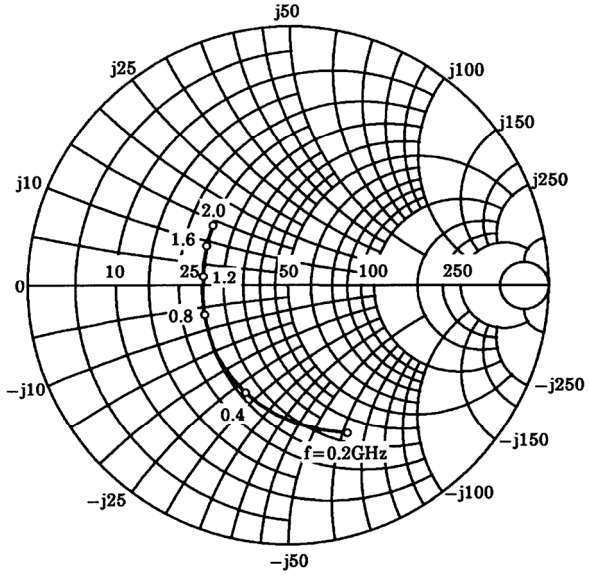


S-Parameter $Z_O = 50\ \Omega$, Ta = 25°C

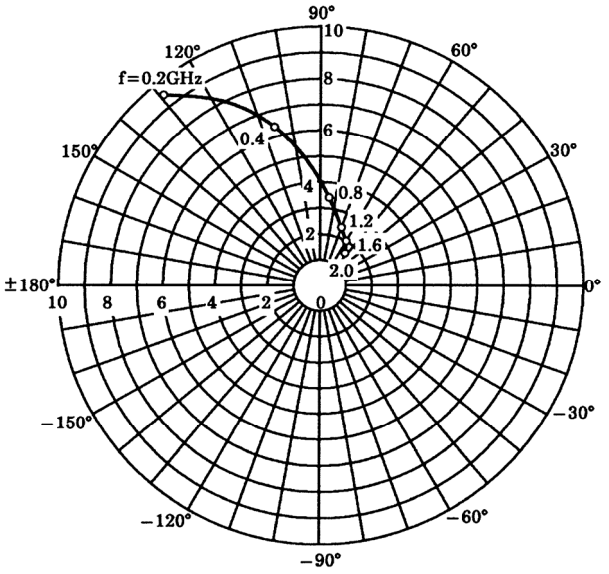
$V_{CE} = 5$ V, $I_C = 5$ mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.631	–67.7	9.526	129.8	0.062	55.9	0.687	–38.7
400	0.441	–111.7	6.393	106.3	0.084	49.5	0.459	–48.5
600	0.363	–139.8	4.611	93.6	0.100	50.6	0.360	–50.6
800	0.338	–159.8	3.599	84.6	0.117	52.9	0.312	–51.1
1000	0.331	–175.0	2.990	77.5	0.134	55.1	0.286	–51.6
1200	0.337	171.9	2.556	71.2	0.152	57.2	0.271	–53.0
1400	0.344	161.7	2.252	65.3	0.174	58.6	0.265	–55.7
1600	0.359	152.1	2.011	60.3	0.196	58.5	0.259	–59.5
1800	0.373	144.6	1.845	55.4	0.217	57.9	0.254	–63.6
2000	0.391	138.5	1.691	50.8	0.238	58.3	0.249	–68.8

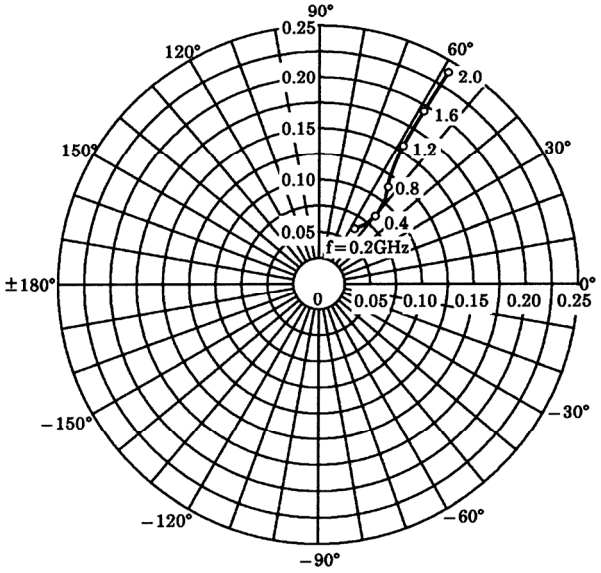
S_{11e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



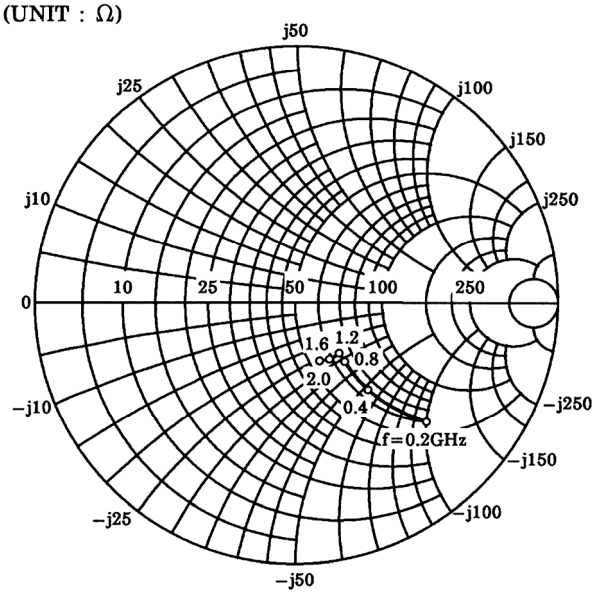
S_{21e}
V_{CE} = 5V
I_C = 5mA
Ta = 25°C



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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20070701-EN GENERAL

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