TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

MT3S35FS

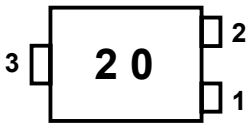
VCO Oscillator Stage

UHF Low-Noise Amplifier Application

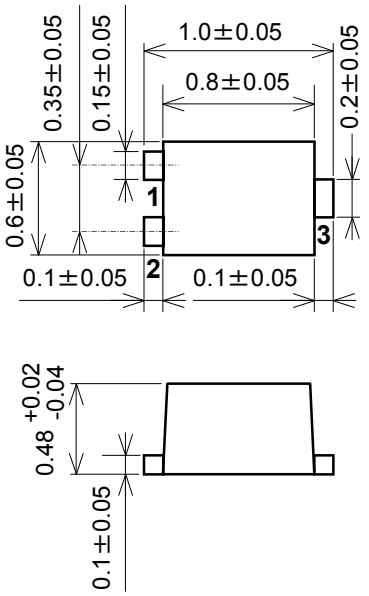
FEATURES

- Low Noise Figure: NF = 1.4 dB (@ f = 2 GHz)
- High Gain: $|S21e|^2$ = 13.0 dB (@ f = 2 GHz)

Marking



Unit: mm



1.BASE
2.EMITTER
3.COLLECTOR

fSM	
JEDEC	-
JEITA	-
TOSHIBA	2-1E1A

Weight: 0.0006 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	8	V
Collector-emitter voltage	V_{CEO}	4.5	V
Emitter-base voltage	V_{EBO}	1.5	V
Collector-current	I_C	24	mA
Base-current	I_B	12	mA
Collector power dissipation	P_C (Note 1)	100	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°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).

Note 1: Device mounted on a glass-epoxy PCB (1.0 cm^2 x 0.8 mm (t))

Microwave Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	fT	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	16	20	-	GHz
Insertion gain	$\|S21e\|^2$ (1)	V_{CE} = 3 V, I_C = 10 mA, f = 1 GHz	16	18	-	dB
	$\|S21e\|^2$ (2)	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	11	13	-	dB
Noise figure	NF (1)	V_{CE} = 3 V, I_C = 2 mA, f = 1 GHz	-	1.1	-	dB
	NF (2)	V_{CE} = 3 V, I_C = 2 mA, f = 2 GHz	-	1.4	1.9	dB

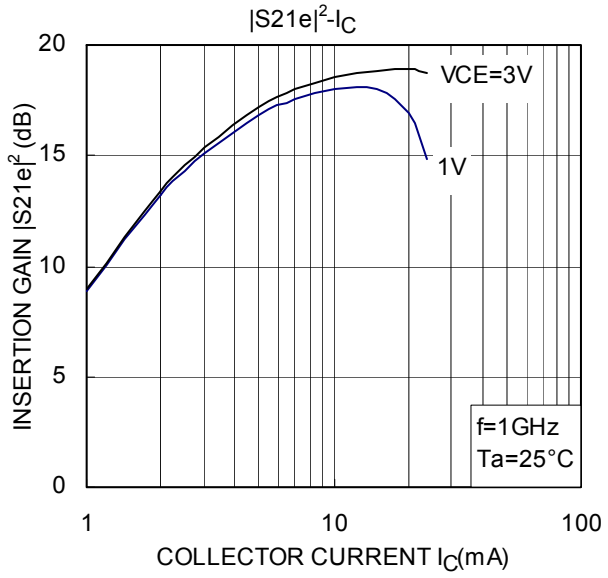
Electrical Characteristics (Ta = 25°C)

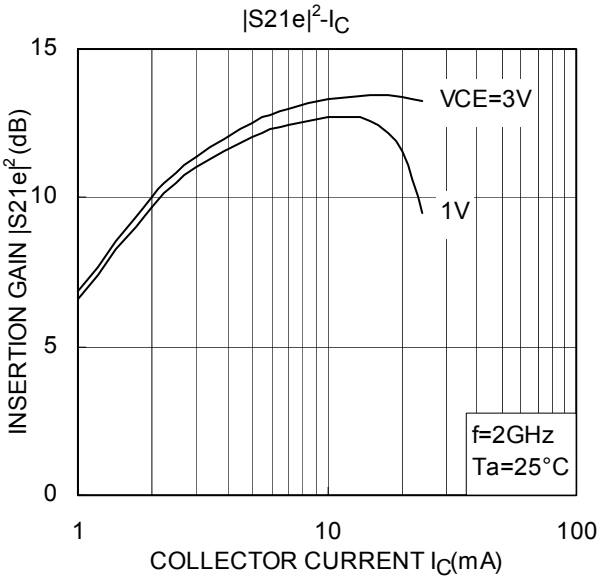
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 8 V, I_E = 0	-	-	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	-	-	1	μA
DC current gain	hFE	V_{CE} = 3 V, I_C = 10 mA	70	-	140	-
Output capacitance	C_{ob}	V_{CB} = 1 V, I_E = 0, f = 1 MHz	-	0.30	0.50	pF
Reverse transistor capacitance	C_{re}	V_{CB} = 1 V, I_E = 0, f = 1 MHz (Note 1)	-	0.15	0.28	pF

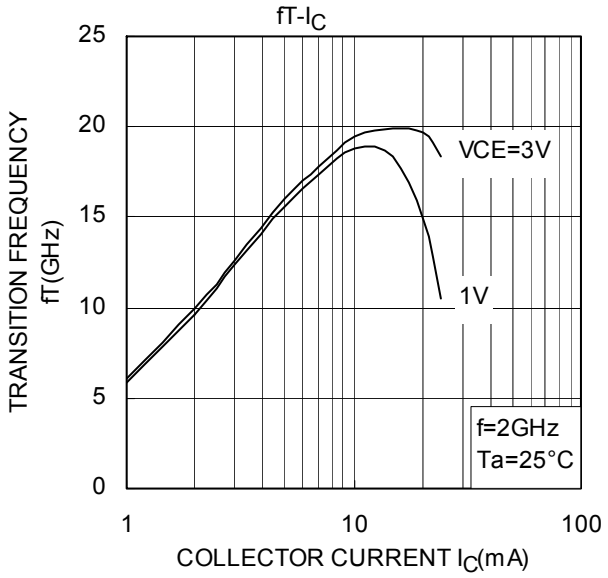
Note 1: C_{re} is measured using a three-terminal method with a capacitance bridge.

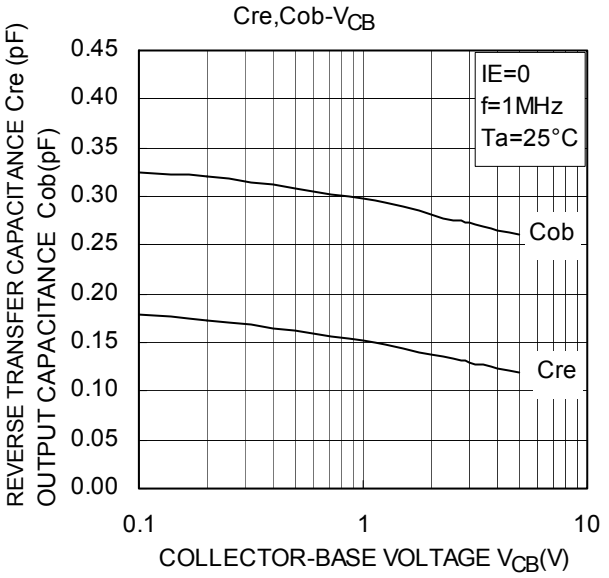
Note 2: This product is a lead-free article.

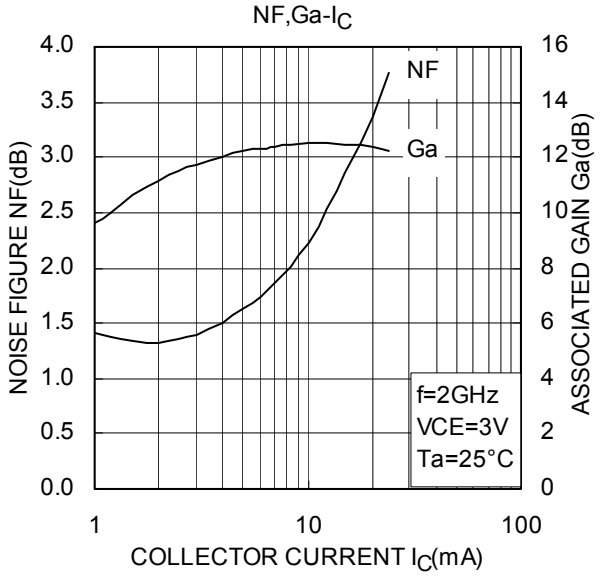
Caution: This device is sensitive to electrostatic discharge. Be sure to provide all tools and equipment with adequate grounding.

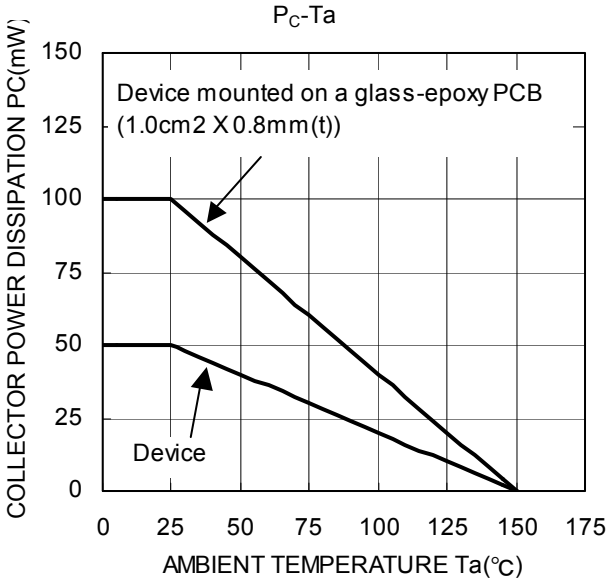

|S21e|²-IC
INSERTION GAIN |S21e|² (dB)
COLLECTOR CURRENT IC(mA)
VCE=3V
1V
f=1GHz
Ta=25°C
20
15
10
5
0
1
10
100


|S21e|²-IC
INSERTION GAIN |S21e|² (dB)
COLLECTOR CURRENT IC(mA)
VCE=3V
1V
f=2GHz
Ta=25°C
15
10
5
0
1
10
100


fT-IC
TRANSITION FREQUENCY fT(GHz)
COLLECTOR CURRENT IC(mA)
VCE=3V
1V
f=2GHz
Ta=25°C
25
20
15
10
5
0
1
10
100


Cre,Cob-VCB
REVERSE TRANSFER CAPACITANCE Cre (pF)
OUTPUT CAPACITANCE Cob(pF)
COLLECTOR-BASE VOLTAGE VCB(V)
IE=0
f=1MHz
Ta=25°C
Cob
Cre
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.1
1
10


NF,Ga-IC
NOISE FIGURE NF(dB)
ASSOCIATED GAIN Ga(dB)
COLLECTOR CURRENT IC(mA)
NF
Ga
f=2GHz
VCE=3V
Ta=25°C
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
16
14
12
10
8
6
4
2
0
1
10
100


PC-Ta
COLLECTOR POWER DISSIPATION PC(mW)
AMBIENT TEMPERATURE Ta(°C)
Device mounted on a glass-epoxy PCB
(1.0cm2 X 0.8mm(t))
Device
150
125
100
75
50
25
0
0
25
50
75
100
125
150
175

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20070701-EN GENERAL

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