

# MT3S20R

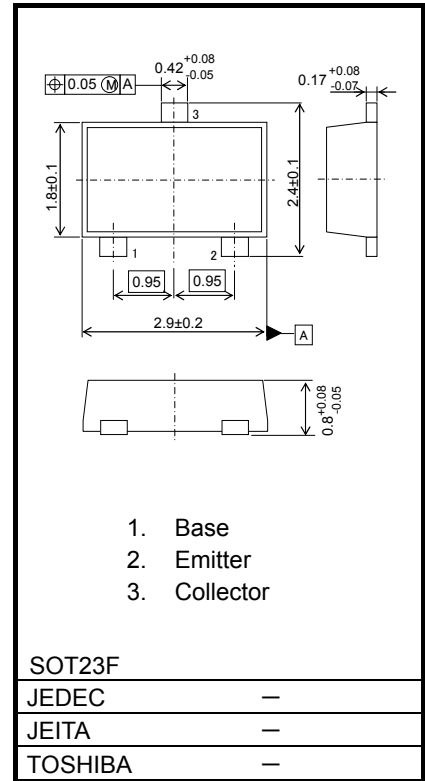
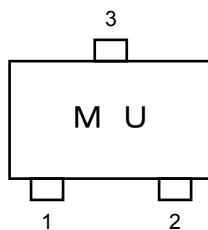
VHF-UHF Band Low-Noise, Low-Distortion Amplifier Applications

Unit: mm

## FEATURES

- Low Noise Figure:  $NF=1.45\text{dB(Typ.)}$  (@  $f=1\text{GHz}$ )
- High Gain:  $|S_{21e}|^2=12\text{dB(Typ.)}$  (@  $f=1\text{GHz}$ )

## Marking



## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	20	V
Collector-emitter voltage	$V_{CEO}$	12	V
Emitter-base voltage	$V_{EBO}$	1.5	V
Collector-current	$I_C$	80	mA
Base-current	$I_B$	10	mA
Collector power dissipation	$P_C(\text{Note1})$	320	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55~150	$^\circ\text{C}$

Note.1 : The device is mounted on a FR4 board (20 mm x 25 mm x 1.55 mm (t))

Note.2 : 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).

## Microwave Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Transition frequency	$f_T$	$V_{CE}=5V, I_C=30mA$	5.5	7.5	—	GHz
Insertion gain	$ S_{21e} ^2(1)$	$V_{CE}=5V, I_C=50mA, f=500MHz$	—	17.5	—	dB
	$ S_{21e} ^2(2)$	$V_{CE}=5V, I_C=50mA, f=1GHz$	10	12	—	
Noise figure	NF	$V_{CE}=5V, I_C=20mA, f=1GHz$	—	1.45	2	dB
3 <sup>rd</sup> order intermodulation distortion output intercept point	OIP3	$V_{CE}=5V, I_C=50mA, f=500MHz,$ $\Delta f=1MHz$	26	30	—	dBmW

## Electrical Characteristics (Ta = 25°C)

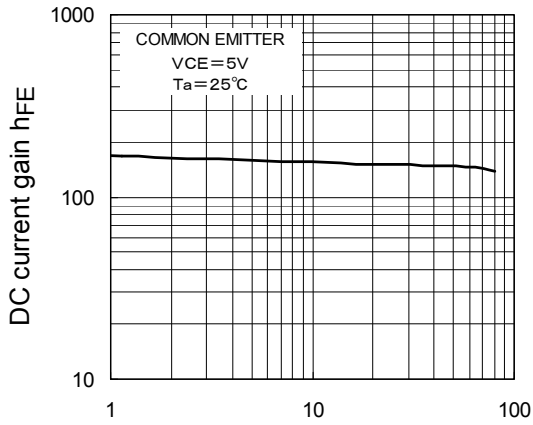
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB}=10V, I_E=0$	—	—	0.1	$\mu A$
Emitter cut-off current	$I_{EBO}$	$V_{EB}=1V, I_C=0$	—	—	0.5	$\mu A$
DC current gain	$h_{FE}$	$V_{CE}=5V, I_C=50mA$	100	—	200	—
Reverse transfer capacitance	$C_{re}$	$V_{CB}=5V, I_E=0, f=1MHz$ (Note 3)	—	0.75	1	pF

Note.3 :  $C_{re}$  is measured using a 3-terminal method with capacitance bridge

### Caution:

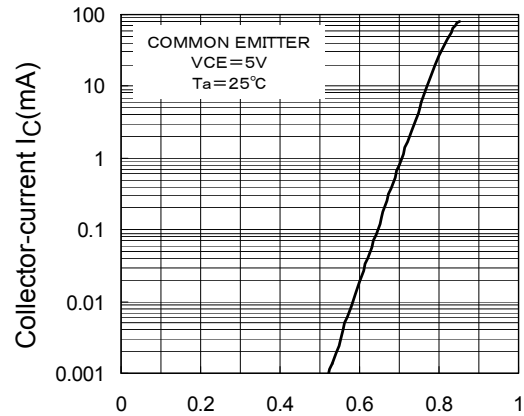
This device is sensitive to electrostatic discharge. Ensure that tools and equipment are sufficiently grounded before handling. When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.

$h_{FE}-I_C$



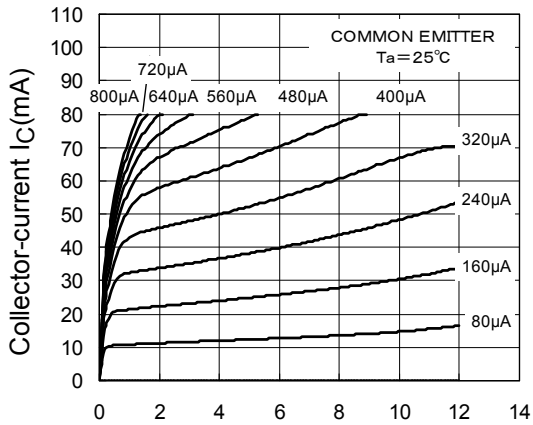
Collector-current  $I_C$ (mA)

$I_C-V_{BE}$



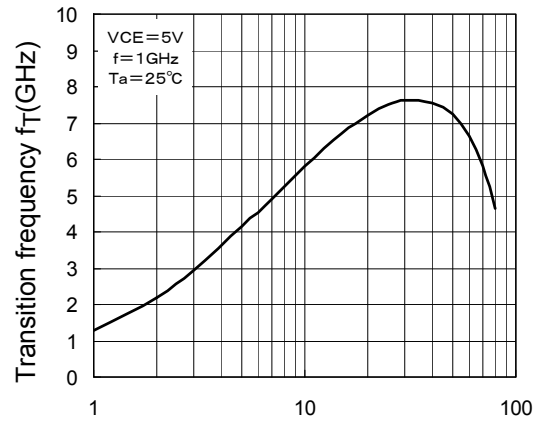
Base-emitter voltage  $V_{BE}$ (V)

$I_C-V_{CE}$



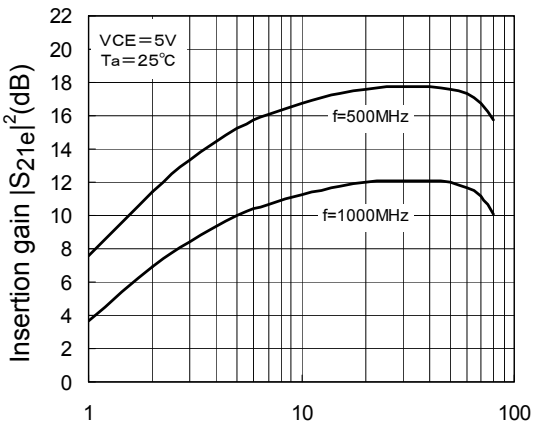
Collector-emitter voltage  $V_{CE}$ (V)

$f_T-I_C$



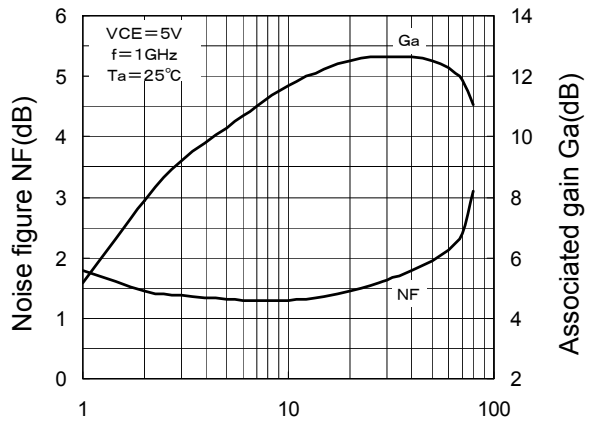
Collector-current  $I_C$ (mA)

$|S_{21e}|^2-I_C$



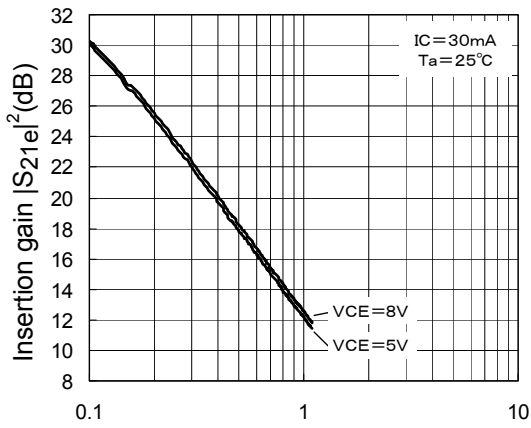
Collector-current  $I_C$ (mA)

NF,  $G_a - I_C$



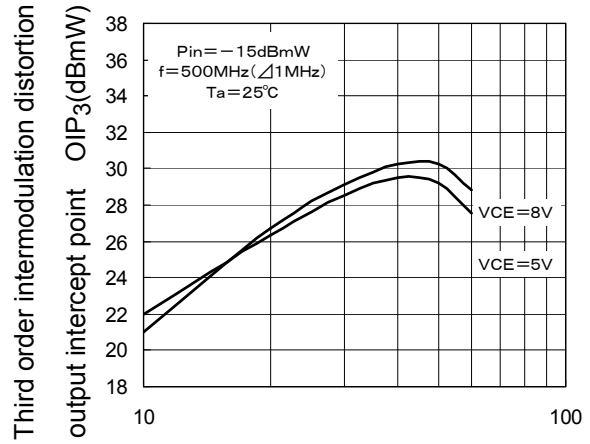
Collector-current  $I_C$ (mA)

$|S_{21e}|^2$ -Freq.



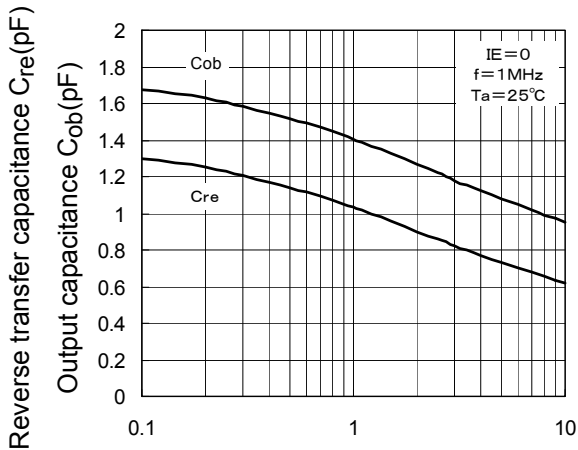
Frequency (GHz)

OIP<sub>3</sub>-I<sub>C</sub>



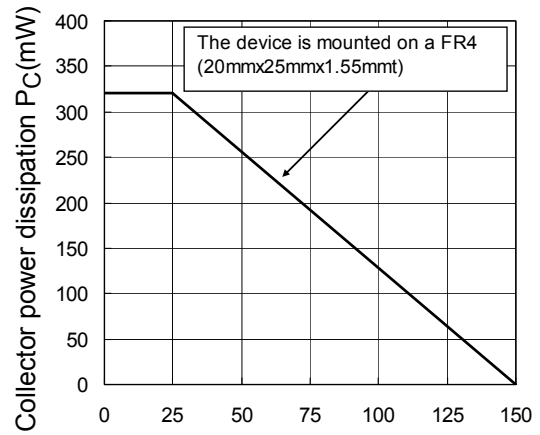
Collector-current I<sub>C</sub>(mA)

C<sub>re</sub>, C<sub>ob</sub>-V<sub>CB</sub>



Collector-base voltage V<sub>CB</sub>(V)

P<sub>C</sub>-T<sub>a</sub>



Ambient temperature T<sub>a</sub>(°C )

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