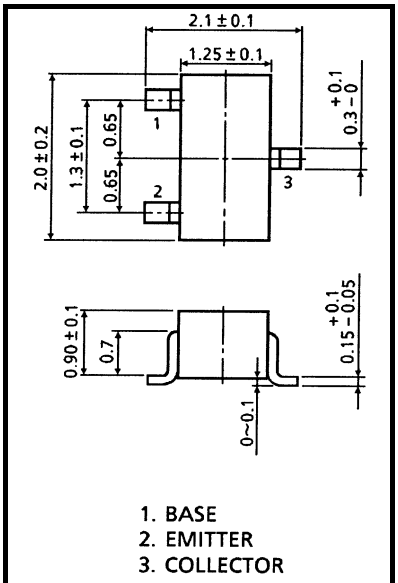
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC4215

High Frequency Amplifier Applications
FM, RF, MIX, IF Amplifier Applications

- Small reverse transfer capacitance: C_{re} = 0.55 pF (typ.)
- Low noise figure: NF = 2dB (typ.) (f = 100 MHz)

Unit: mm



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}	40	V
Collector-emitter voltage	V_{CEO}	30	V
Emitter-base voltage	V_{EBO}	4	V
Collector current	I_C	20	mA
Base current	I_B	4	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55 to 125	°C

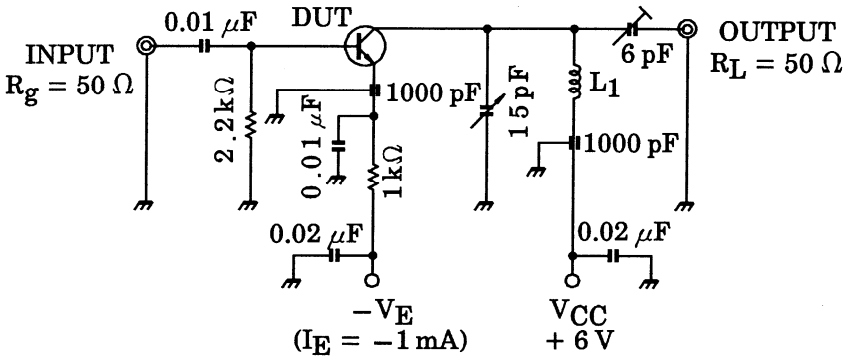
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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} = 40 V, I_E = 0	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 4 V, I_C = 0	—	—	0.5	μA
DC current gain	h_{FE} (Note)	V_{CE} = 6 V, I_C = 1 mA	40	—	200	
Reverse transfer capacitance	C_{re}	V_{CB} = 10 V, f = 1 MHz	—	0.55	—	pF
Transition frequency	f_T	V_{CE} = 6 V, I_C = 1 mA	260	550	—	MHz
Collector-base time constant	$C_c \cdot r_{bb'}$	V_{CE} = 6 V, I_E = −1 mA, f = 30 MHz	—	—	25	ps
Noise figure	NF	V_{CC} = 6 V, I_E = −1 mA, f = 100 MHz, Figure 1	—	2	5.0	dB
Power gain	G_{pe}		17	23	—	dB

Note: h_{FE} classification R: 40 to 80, O: 70 to 140, Y: 100 to 200

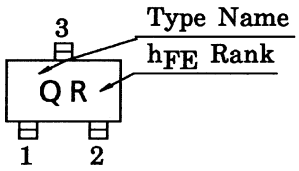
Start of commercial production
1987-06

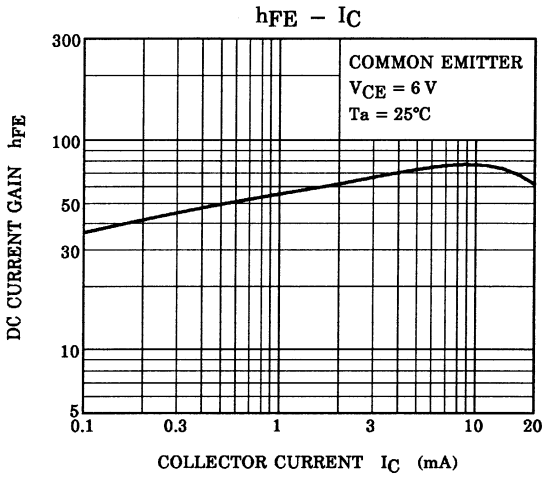


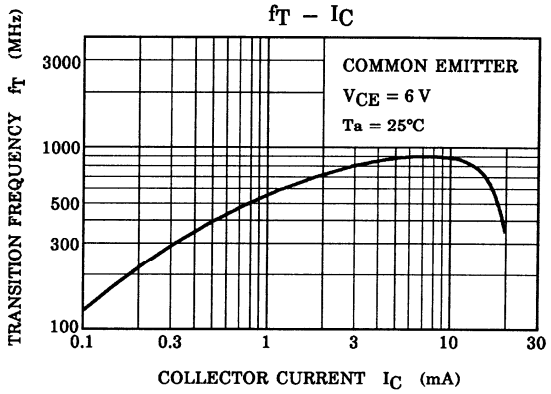
L_1: 0.8 mmϕ silver plated copper wire, 4 T, 10 mm ID, 8 mm length

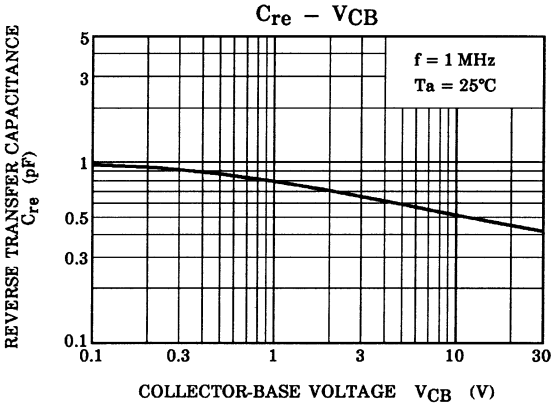
Figure 1 NF, G_{pe} Test Circuit

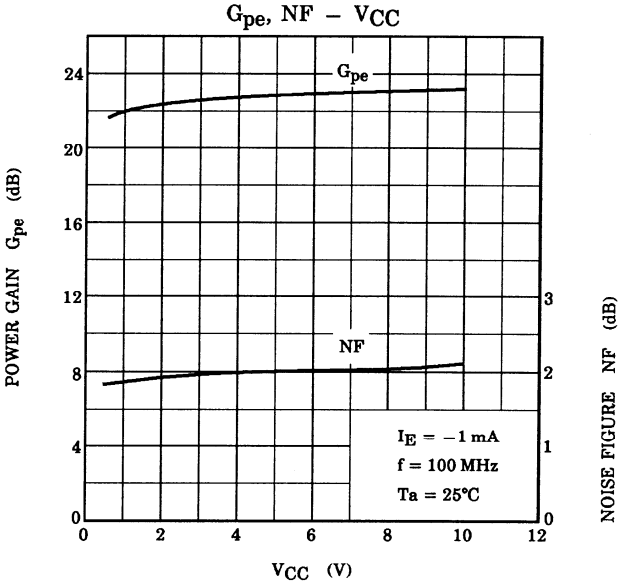
Marking

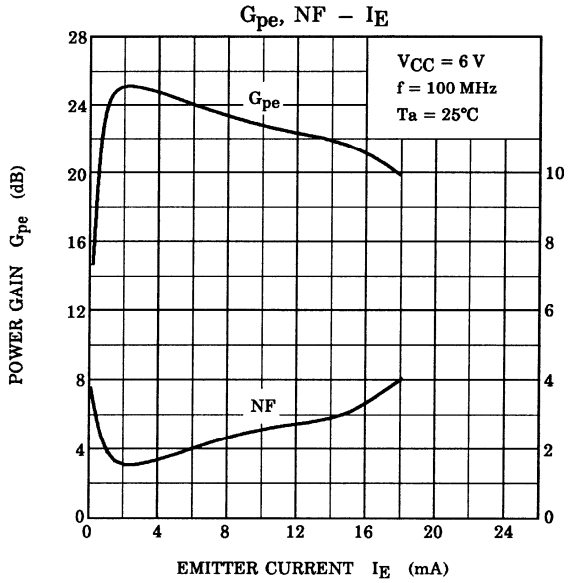


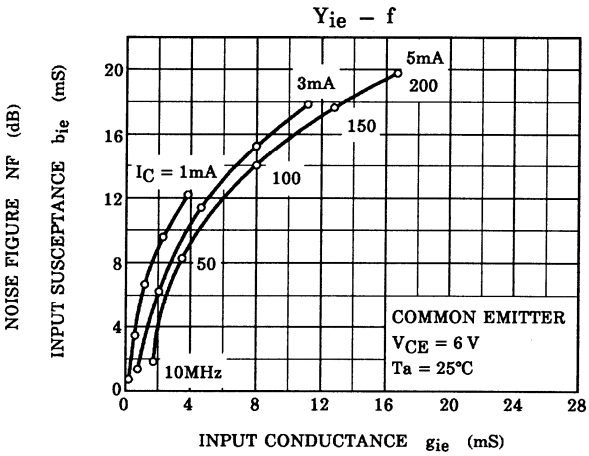

hFE – IC
COMMON EMITTER
VCE = 6 V
Ta = 25°C
DC CURRENT GAIN hFE
300
100
50
30
10
5
0.1
0.3
1
3
10
20
COLLECTOR CURRENT IC (mA)

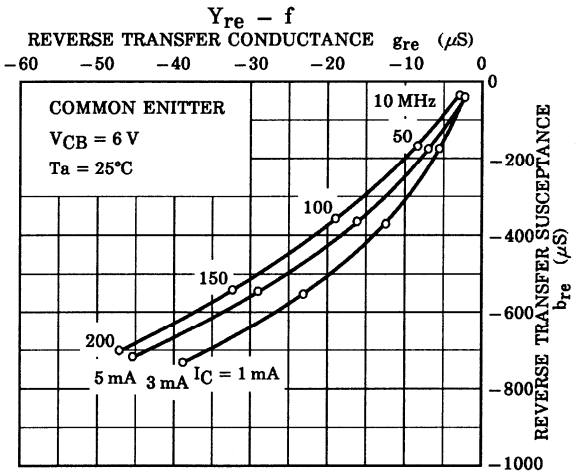

fT – IC
COMMON EMITTER
VCE = 6 V
Ta = 25°C
TRANSITION FREQUENCY fT (MHz)
3000
1000
500
300
100
0.1
0.3
1
3
10
30
COLLECTOR CURRENT IC (mA)

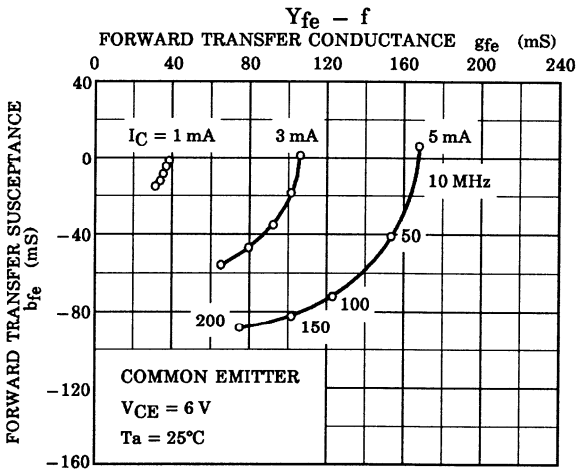

Cre – VCB
f = 1 MHz
Ta = 25°C
REVERSE TRANSFER CAPACITANCE Cre (pF)
5
3
1
0.5
0.3
0.1
0.1
0.3
1
3
10
30
COLLECTOR-BASE VOLTAGE VCB (V)

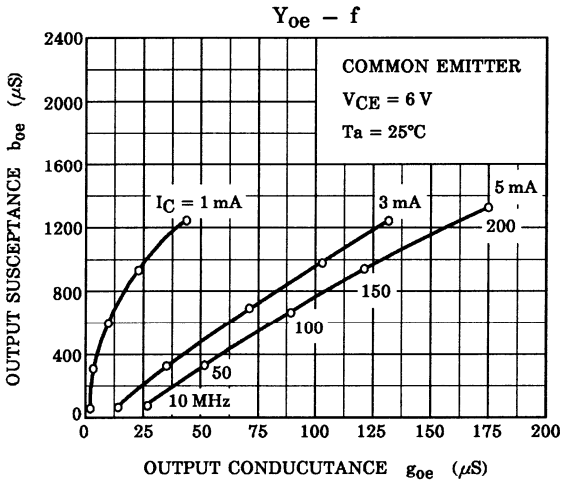

Gpe, NF – VCC
Gpe
NF
IE = –1 mA
f = 100 MHz
Ta = 25°C
POWER GAIN Gpe (dB)
NOISE FIGURE NF (dB)
24
20
16
12
8
4
0
3
2
1
0
0
2
4
6
8
10
12
VCC (V)


Gpe, NF – IE
VCC = 6 V
f = 100 MHz
Ta = 25°C
Gpe
NF
POWER GAIN Gpe (dB)
NOISE FIGURE NF (dB)
28
24
20
16
12
8
4
0
10
8
6
4
2
0
0
4
8
12
16
20
24
EMITTER CURRENT IE (mA)


Yie – f
5mA
200
3mA
150
IC = 1mA
100
50
10MHz
COMMON EMITTER
VCE = 6 V
Ta = 25°C
INPUT SUSCEPTANCE bie (mS)
20
16
12
8
4
0
0
4
8
12
16
20
24
28
INPUT CONDUCTANCE gie (mS)


Yre − f
REVERSE TRANSFER CONDUCTANCE gre (μS)
−60 −50 −40 −30 −20 −10 0
COMMON ENITTER
VCB = 6 V
Ta = 25°C
10 MHz
50
100
150
200
5 mA
3 mA
IC = 1 mA
0
−200
−400
−600
−800
−1000
REVERSE TRANSFER SUSCEPTANCE bre (μS)


Yfe − f
FORWARD TRANSFER CONDUCTANCE gfe (mS)
0 40 80 120 160 200 240
40
0
−40
−80
−120
−160
IC = 1 mA
3 mA
5 mA
10 MHz
50
100
150
200
COMMON EMITTER
VCE = 6 V
Ta = 25°C
FORWARD TRANSFER SUSCEPTANCE bfe (mS)


Yoe − f
2400
2000
1600
1200
800
400
0
COMMON EMITTER
VCE = 6 V
Ta = 25°C
IC = 1 mA
3 mA
5 mA
200
150
100
50
10 MHz
0 25 50 75 100 125 150 175 200
OUTPUT CONDUCUTANCE goe (μS)
OUTPUT SUSCEPTANCE boe (μS)

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