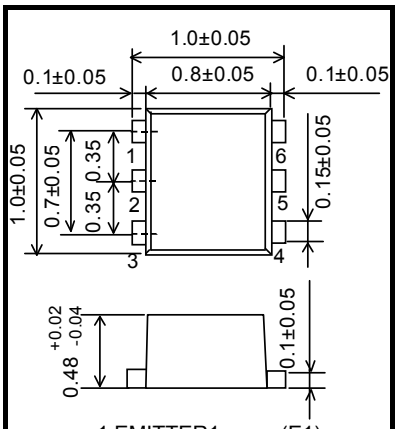
TOSHIBA Transistor Silicon NPN・PNP Epitaxial Type
(PCT process) (Bias Resistor Built-in Transistor)

RN4984FS

Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

- Two devices are incorporated into a fine pitch Small Mold (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.

Unit: mm



1.EMITTER1 (E1)
2.BASE1 (B1)
3.COLLECTOR2 (C2)
4.EMITTER2 (E2)
5.BASE2 (B2)
6.COLLECTOR1 (C1)

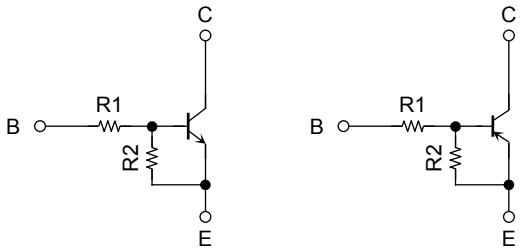
fS6

JEDEC	—
JEITA	—
TOSHIBA	2-1F1D

Weight: 0.001g (typ.)

Equivalent Circuit and Bias Resistor Values

Q1 **Q2**

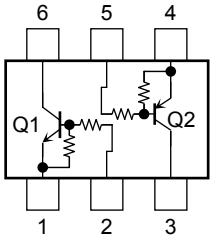


R1: 47 kΩ

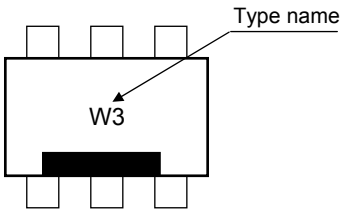
R2: 47 kΩ

(Q1, Q2 common)

Equivalent Circuit (top view)



Marking



Absolute Maximum Ratings (Ta = 25°C) (Q1)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	10	V
Collector current	I_C	50	mA

Absolute Maximum Ratings (Ta = 25°C) (Q2)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	−20	V
Collector-emitter voltage	V_{CEO}	−20	V
Emitter-base voltage	V_{EBO}	−10	V
Collector current	I_C	−50	mA

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P_C (Note 1)	50	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: Total rating

Electrical Characteristics (Ta = 25°C) (Q1)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 20 V, I_E = 0	—	—	100	nA
	I_{CEO}	V_{CE} = 20 V, I_B = 0	—	—	500	
Emitter cut-off current	I_{EBO}	V_{EB} = 10 V, I_C = 0	0.088	—	0.133	mA
DC current gain	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	120	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	—	0.15	V
Input voltage (ON)	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.2	—	3.6	V
Input voltage (OFF)	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	0.8	—	1.5	V
Collector output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	1.2	—	pF

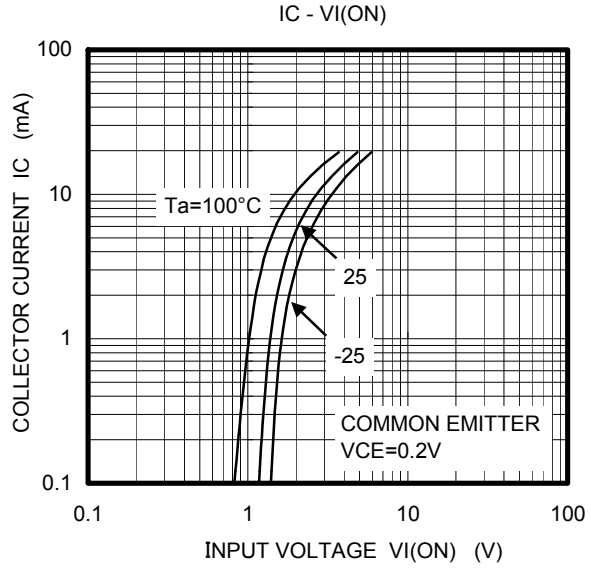
Electrical Characteristics (Ta =25°C) (Q2)

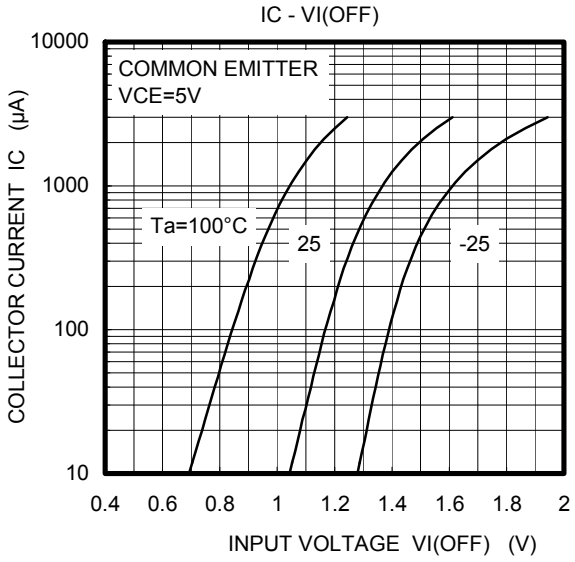
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = −20 V, I_E = 0	—	—	−100	nA
	I_{CEO}	V_{CE} = −20 V, I_B = 0	—	—	−500	
Emitter cut-off current	I_{EBO}	V_{EB} = −10 V, I_C = 0	−0.088	—	−0.133	mA
DC current gain	h_{FE}	V_{CE} = −5 V, I_C = −10 mA	120	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = −5 mA, I_B = −0.25 mA	—	—	−0.15	V
Input voltage (ON)	$V_{I\ (ON)}$	V_{CE} = −0.2 V, I_C = −5 mA	−1.2	—	−3.6	V
Input voltage (OFF)	$V_{I\ (OFF)}$	V_{CE} = −5 V, I_C = −0.1 mA	−0.8	—	−1.5	V
Collector output capacitance	C_{ob}	V_{CB} = −10 V, I_E = 0, f = 1 MHz	—	1.2	—	pF

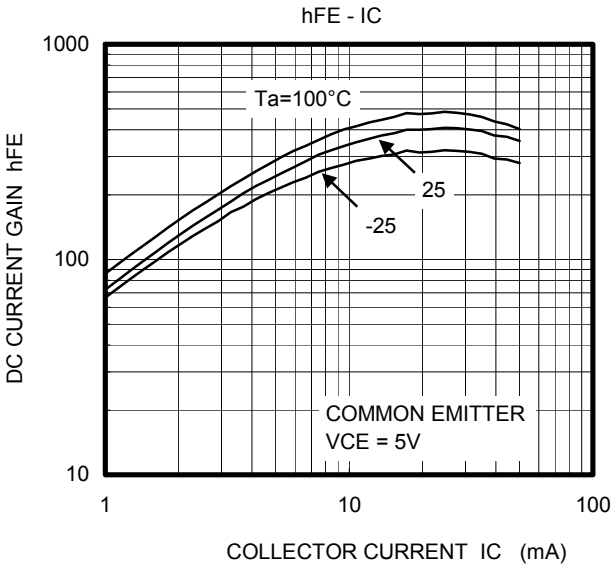
Electrical Characteristics (Ta =25°C) (Q1, Q2 common)

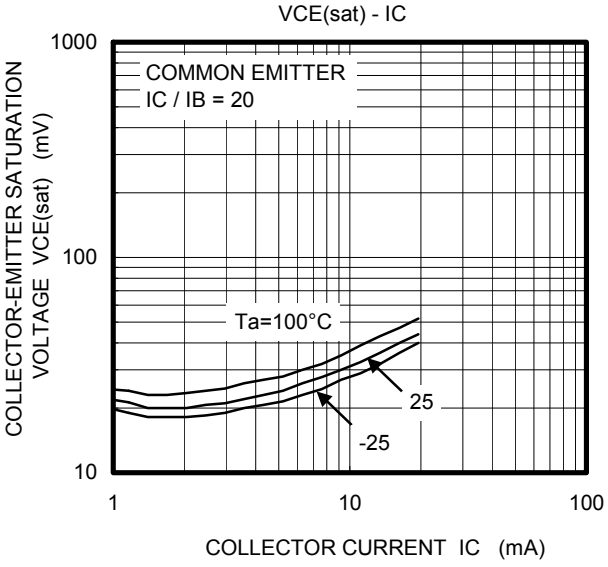
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input resistor	R1	—	37.6	47	56.4	kΩ
Resistor ratio	R1/R2	—	0.8	1.0	1.2	

Q1

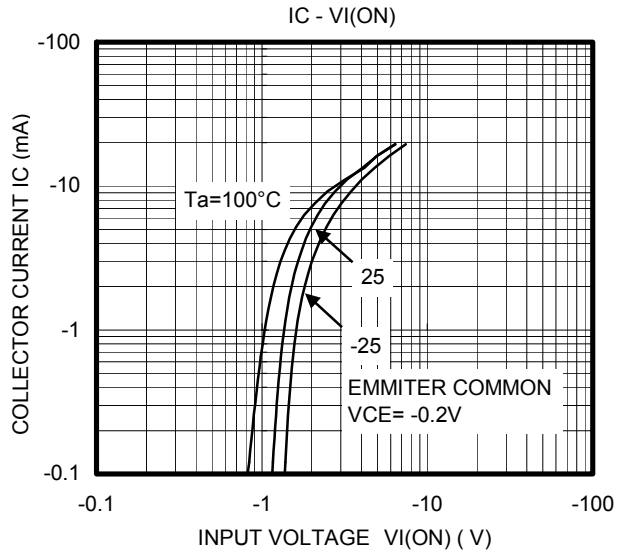

IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
COMMON EMITTER
VCE=0.2V
100
10
1
0.1
0.1
1
10
100

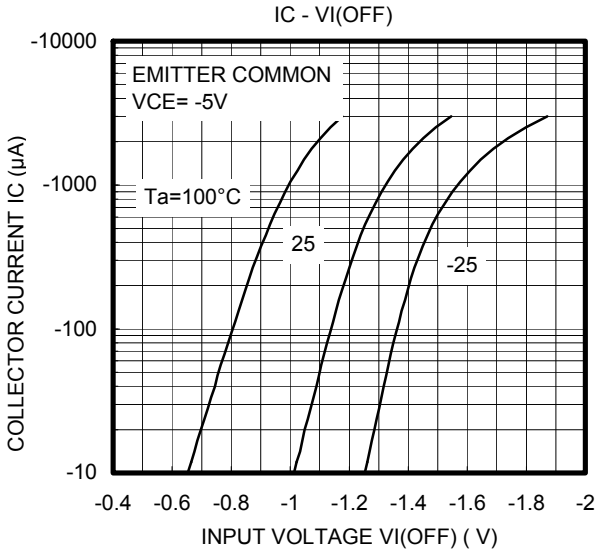

IC - VI(OFF)
COLLECTOR CURRENT IC (μA)
INPUT VOLTAGE VI(OFF) (V)
COMMON EMITTER
VCE=5V
Ta=100°C
25
-25
10000
1000
100
10
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

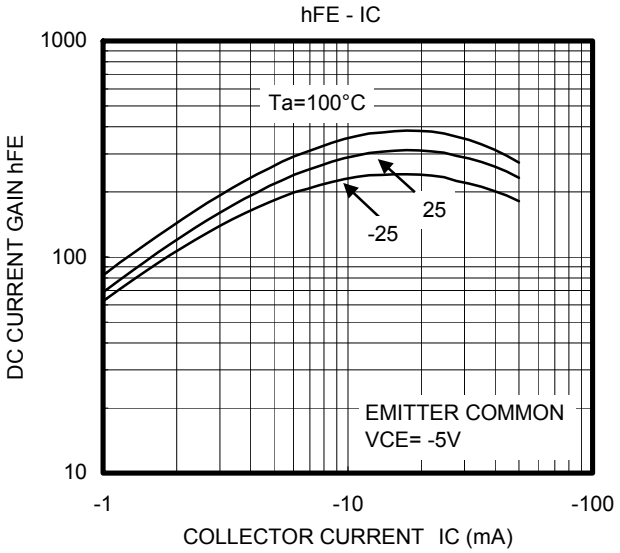

hFE - IC
DC CURRENT GAIN hFE
COLLECTOR CURRENT IC (mA)
Ta=100°C
25
-25
COMMON EMITTER
VCE = 5V
1000
100
10
1
10
100

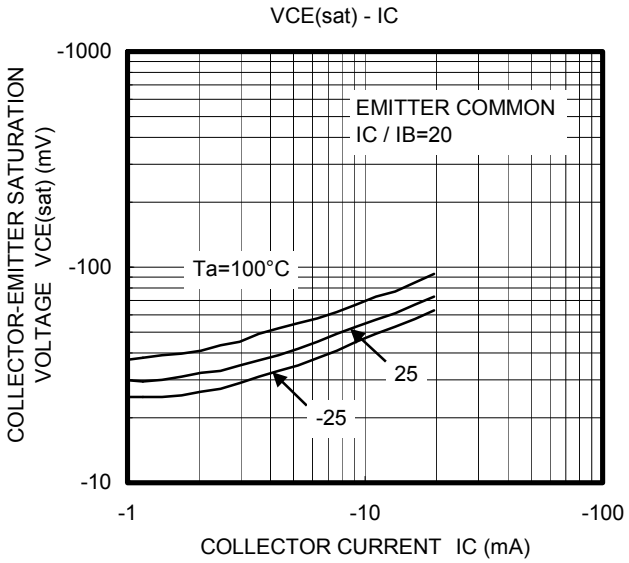

VCE(sat) - IC
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
COLLECTOR CURRENT IC (mA)
COMMON EMITTER
IC / IB = 20
Ta=100°C
25
-25
1000
100
10
1
10
100

Q2


IC - VI(ON)
COLLECTOR CURRENT IC (mA)
-100
-10
-1
-0.1
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-0.1
-1
-10
-100
INPUT VOLTAGE VI(ON) (V)


IC - VI(OFF)
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
EMITTER COMMON
VCE= -5V
Ta=100°C
25
-25
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
-2
INPUT VOLTAGE VI(OFF) (V)


hFE - IC
DC CURRENT GAIN hFE
1000
100
10
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)


VCE(sat) - IC
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
-1
-10
-100
COLLECTOR CURRENT IC (mA)

Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic discharge. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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