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

# **RN4987FS**

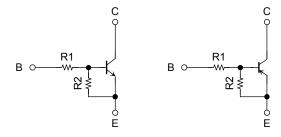
# Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- 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 saves assembly cost.

#### **Equivalent Circuit and Bias Resistor Values**

Q1

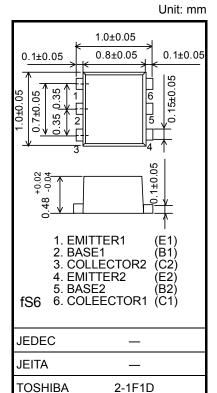
Q2



R1: 10  $k\Omega$ 

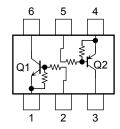
R2: 47 kΩ

(Q1, Q2 common)

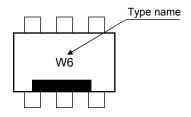


Weight: 0.001g (typ.)

#### **Equivalent Circuit (top view)**



#### Marking



**RN4987FS** 

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	20	V
Collector-emitter voltage	V <sub>CEO</sub>	20	V
Emitter-base voltage	V <sub>EBO</sub>	6	V
Collector current	IC	50	mA

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	-20	V
Collector-emitter voltage	V <sub>CEO</sub>	-20	V
Emitter-base voltage	V <sub>EBO</sub>	-6	V
Collector current	IC	-50	mA

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

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P <sub>C</sub> (Note 1)	50	mW
Junction temperature	Tj	150	°C
Storage temperature range	T <sub>stg</sub>	-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	Тур.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	$V_{CB} = 20 \text{ V}, I_E = 0$	_	_	100	nA
	I <sub>CEO</sub>	$V_{CE} = 20 \text{ V}, I_{B} = 0$	_		500	ш
Emitter cut-off current	I <sub>EBO</sub>	$V_{EB} = 6 \text{ V}, I_{C} = 0$	0.088	_	0.131	mA
DC current gain	h <sub>FE</sub>	$V_{CE} = 5 \text{ V}, I_{C} = 10 \text{ mA}$	120	_	_	
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	$I_C = 5 \text{ mA}, I_B = 0.25 \text{ mA}$	_	_	0.15	V
Input voltage (ON)	V <sub>I (ON)</sub>	$V_{CE} = 0.2 \text{ V}, I_{C} = 5 \text{ mA}$	0.7	_	1.5	V
Input voltage (OFF)	V <sub>I (OFF)</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.1 mA	0.5	_	1.0	V
Collector output capacitance	C <sub>ob</sub>	$V_{CB} = 10 \text{ V}, I_{E} = 0, f = 1 \text{ MHz}$	_	1.2	_	pF

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

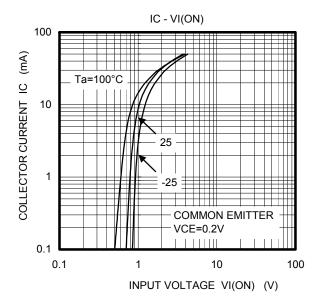
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	$V_{CB} = -20 \text{ V}, I_{E} = 0$	_	_	-100	nA
	I <sub>CEO</sub>	$V_{CE} = -20 \text{ V}, I_B = 0$	_		-500	ш
Emitter cut-off current	I <sub>EBO</sub>	$V_{EB} = -6 \text{ V}, I_{C} = 0$	-0.088	_	-0.131	mA
DC current gain	h <sub>FE</sub>	$V_{CE} = -5 \text{ V}, I_{C} = -10 \text{ mA}$	120	_	_	
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	$I_C = -5 \text{ mA}, I_B = -0.25 \text{ mA}$	_	_	-0.15	٧
Input voltage (ON)	V <sub>I (ON)</sub>	$V_{CE} = -0.2 \text{ V}, I_{C} = -5 \text{ mA}$	-0.7	_	-1.5	٧
Input voltage (OFF)	V <sub>I (OFF)</sub>	$V_{CE} = -5 \text{ V}, I_{C} = -0.1 \text{ mA}$	-0.5	_	-1.0	٧
Collector output capacitance	C <sub>ob</sub>	$V_{CB} = -10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	_	1.2	_	pF

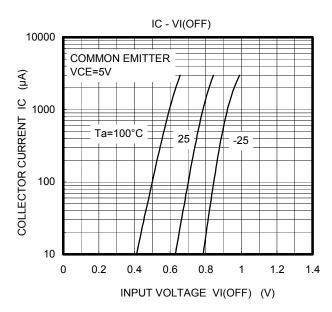
# Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

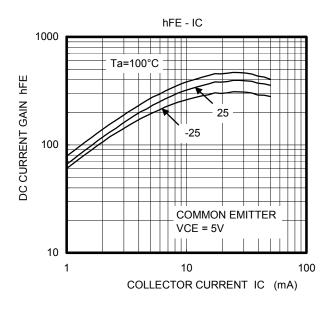
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input resistor	R1	_	8	10	12	kΩ
Resistor ratio	R1/R2		0.17	0.213	0.255	

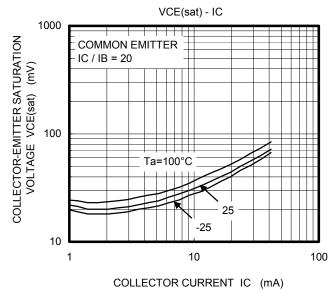
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Q1

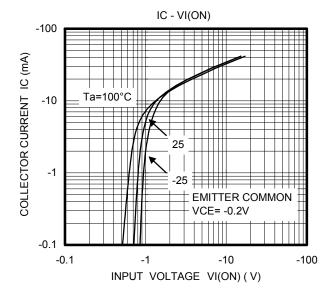


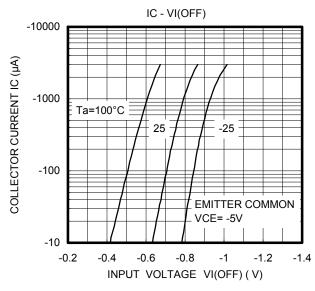


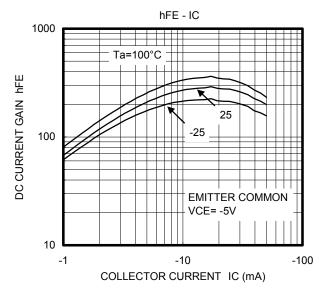


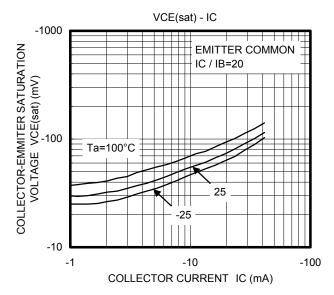


Q2









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# **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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