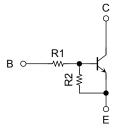
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

# RN1967FE,RN1968FE,RN1969FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Two devices are incorporated into an Extreme-Super-Mini (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN2967FE to RN2969FE

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



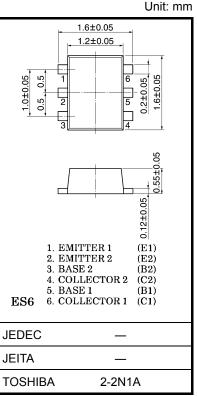
Type No.	R1 (kΩ)	R2 (kΩ)
RN1967FE	10	47
RN1968FE	22	47
RN1969FE	47	22

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

Characteristics		Symbol	Rating	Unit	
Collector-base voltage		V <sub>CBO</sub>	50	V	
Collector-emitter voltage		V <sub>CEO</sub>	50	V	
Emitter-base voltage	RN1967FE		6	V	
	RN1968FE	V <sub>EBO</sub>	7		
	RN1969FE		15		
Collector current		ΙC	100	mA	
Collector power dissipation		P <sub>C</sub> (Note 1)	100	mW	
Junction temperature		Tj	150	°C	
Storage temperature range		T <sub>stg</sub>	-55 to150	°C	

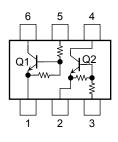
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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



Weight: 3mg (typ.)

## Equivalent Circuit (top view)

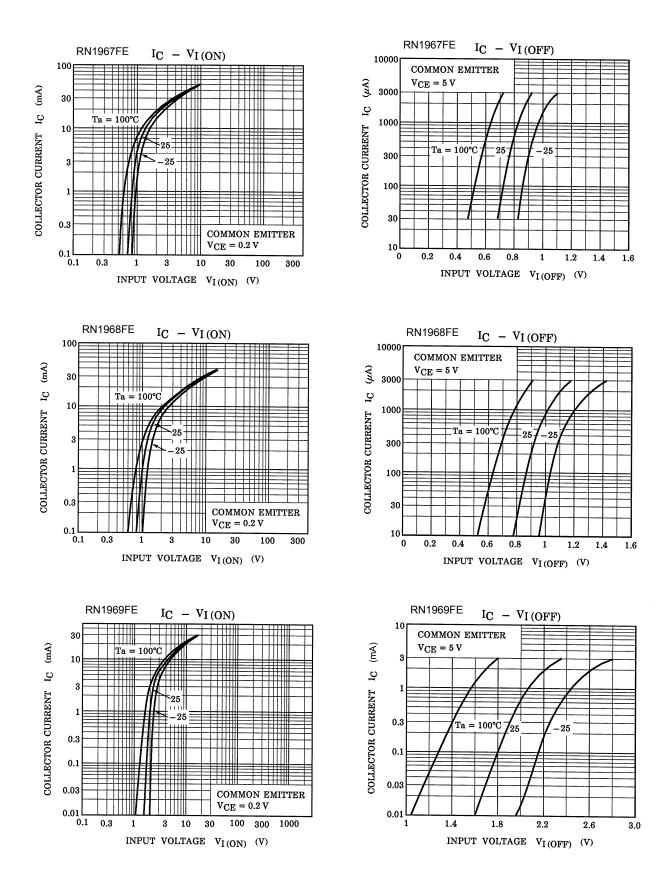


### Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Charac	teristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	RN1967FE to 1969FE	I <sub>CBO</sub>	$V_{CB} = 50 \text{ V}, \text{ I}_{E} = 0$	_		100	nA
		ICEO	$V_{CE} = 50 \text{ V}, \text{ I}_{B} = 0$	_	_	500	
	RN1967FE		$V_{EB} = 6 V, I_{C} = 0$	0.081	_	0.15	mA
Emitter cut-off current	RN1968FE	I <sub>EBO</sub>	$V_{EB}=7~V,~I_C=0$	0.078	_	0.145	
	RN1969FE		$V_{EB} = 15 \text{ V}, \text{ I}_{C} = 0$	0.167		0.311	
	RN1967FE	h <sub>FE</sub>	$V_{CE} = 5 V, I_{C} = 10 mA$	80		_	
DC current gain	RN1968FE			80		_	
	RN1969FE			70			
Collector-emitter saturation voltage	RN1967FE to 1969FE	V <sub>CE (sat)</sub>	$I_C = 5 \text{ mA},$ $I_B = 0.25 \text{ mA}$	_	0.1	0.3	V
Input voltage (ON)	RN1967FE	V <sub>I (ON)</sub>	$V_{CE} = 0.2 \text{ V}, \text{ I}_{C} = 5 \text{ mA}$	0.7		1.8	v
	RN1968FE			1.0		2.6	
	RN1969FE			2.2		5.8	
Input voltage (OFF)	RN1967FE	VI (OFF)	$V_{CE} = 5 V, I_C = 0.1 mA$	0.5		1.0	v
	RN1968FE			0.6		1.16	
	RN1969FE			1.5		2.6	
Transition frequency	RN1967FE to 1969FE	fT	$V_{CE} = 10 \text{ V}, \text{ I}_{C} = 5 \text{ mA}$	_	250	_	MHz
Collector output capacitance	RN1967FE to 1969FE	C <sub>ob</sub>	$\label{eq:VCB} \begin{array}{l} V_{CB} = 10 \ V, \ I_E = 0, \\ f = 1 \ MHz \end{array}$	_	3	6	pF
Input resistor	RN1967FE	R1	_	7	10	13	kΩ
	RN1968FE			15.4	22	28.6	
	RN1969FE			32.9	47	61.1	
Resistor ratio	RN1967FE	R1/R2	_	0.191	0.213	0.232	
	RN1968FE			0.421	0.468	0.515	
	RN1969FE			1.92	2.14	2.35	

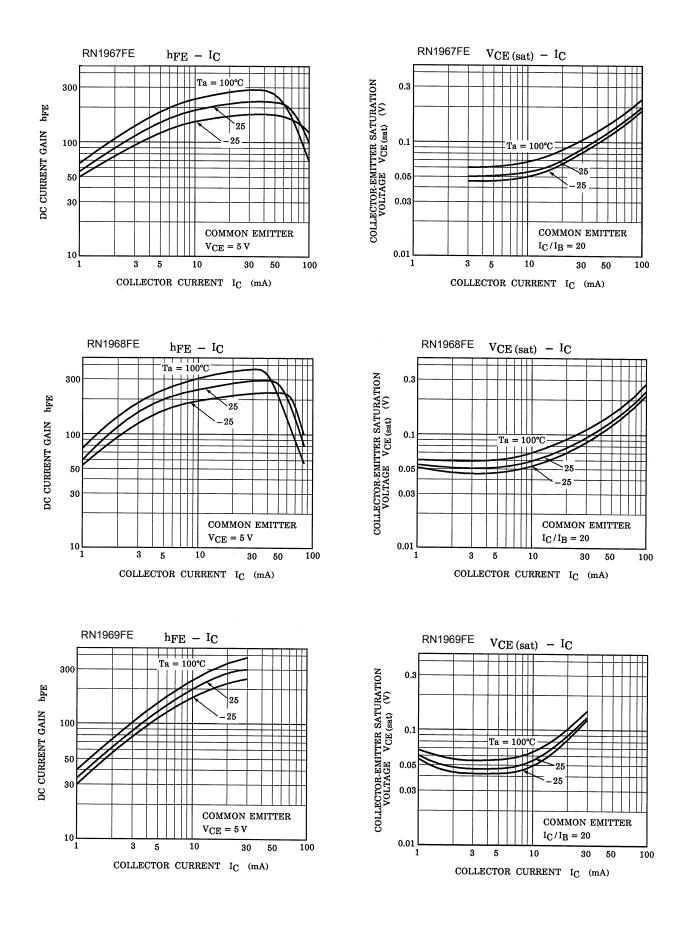
## **TOSHIBA**

#### Q1, Q2 Common



## **TOSHIBA**

#### Q1, Q2 Common



## **TOSHIBA**

#### Marking

Type Name	Marking	
RN1967FE	X X H	
RN1968FE	X X I	
RN1969FE	X X J	

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