

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

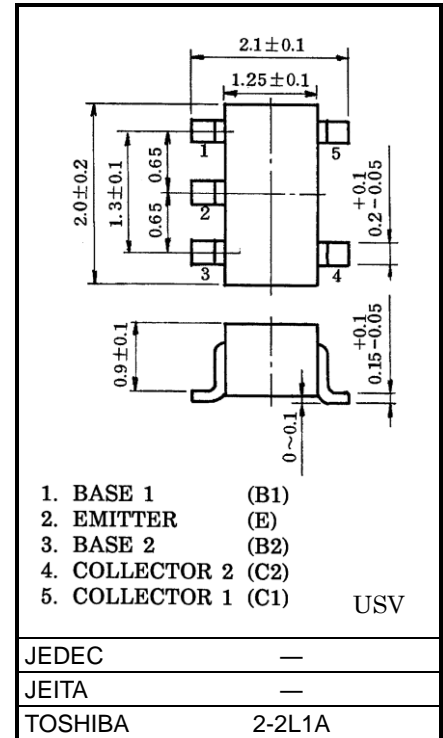
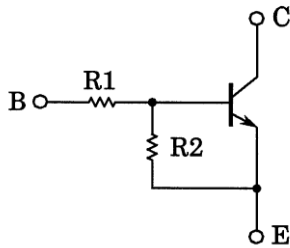
### RN1701, RN1702, RN1703 RN1704, RN1705, RN1706

Unit: mm

Switching, Inverter Circuit,  
Interface Circuit and Driver Circuit

- Including two devices in USV (ultra super mini type with 5 leads)
- With built-in bias resistors.
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process and miniaturize equipment.
- Various resistance values are available to suit various circuit designs.
- Complementary to RN2701 to RN2706

#### Equivalent Circuit and Bias Resistor Values



1. BASE 1 (B1)
  2. EMITTER (E)
  3. BASE 2 (B2)
  4. COLLECTOR 2 (C2)
  5. COLLECTOR 1 (C1)
- USV

Weight: 6.2mg (typ.)

Part No.	R1 (kΩ)	R2 (kΩ)
RN1701	4.7	4.7
RN1702	10	10
RN1703	22	22
RN1704	47	47
RN1705	2.2	47
RN1706	4.7	47

Start of commercial production  
1992-01

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

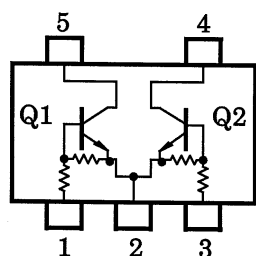
Characteristic	Symbol	Rating	Unit	
Collector-base voltage	RN1701 to 1706	V <sub>CB0</sub>	50	V
Collector-emitter voltage		V <sub>CE0</sub>	50	V
Emitter-base voltage	RN1701 to 1704	V <sub>EB0</sub>	10	V
	RN1705, 1706		5	
Collector current	RN1701 to 1706	I <sub>c</sub>	100	mA
Collector power dissipation		P <sub>C</sub> *	200	mW
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55 to 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).

\*: Total rating

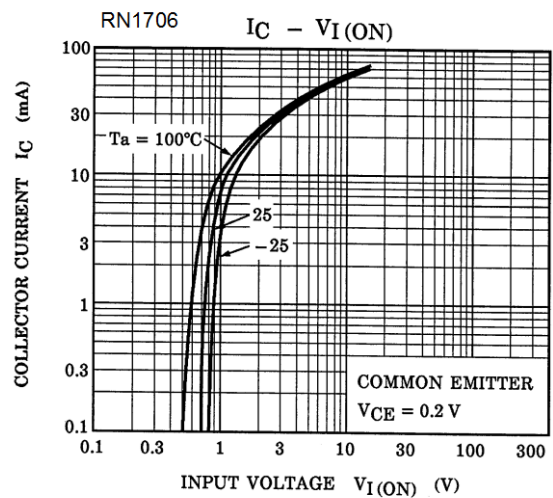
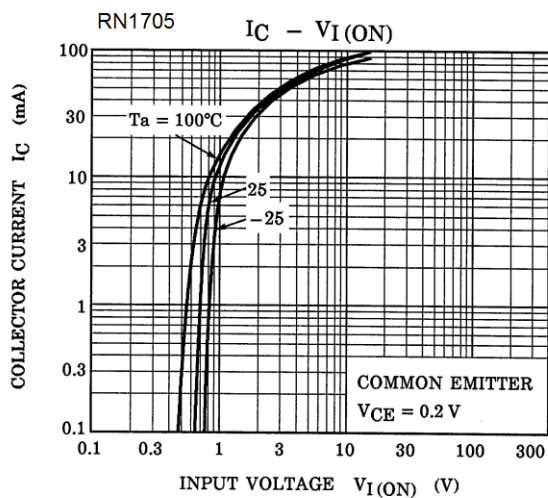
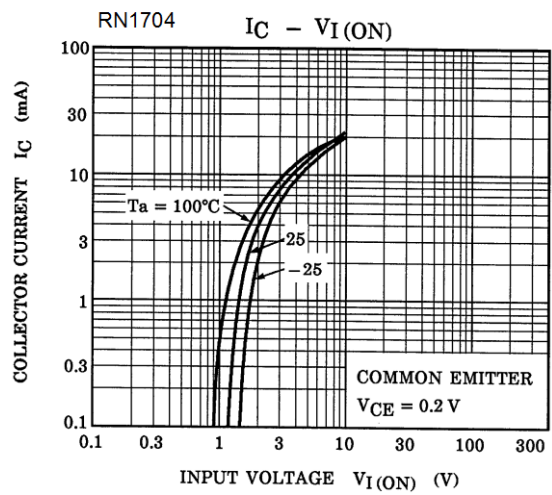
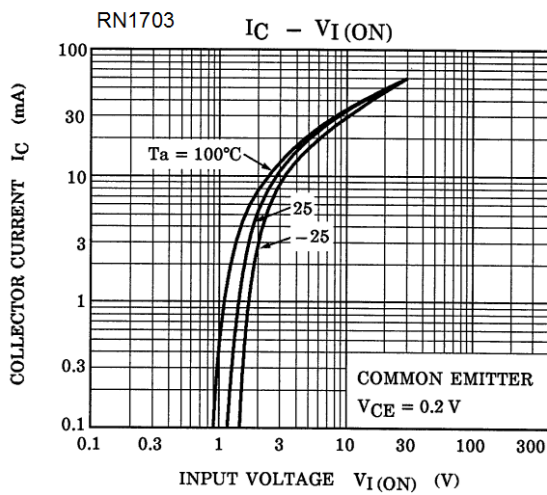
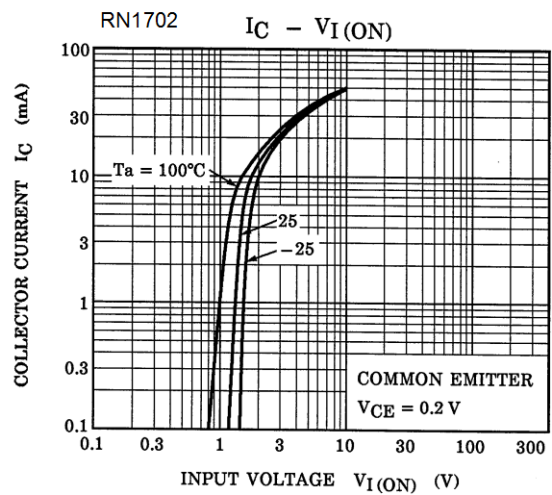
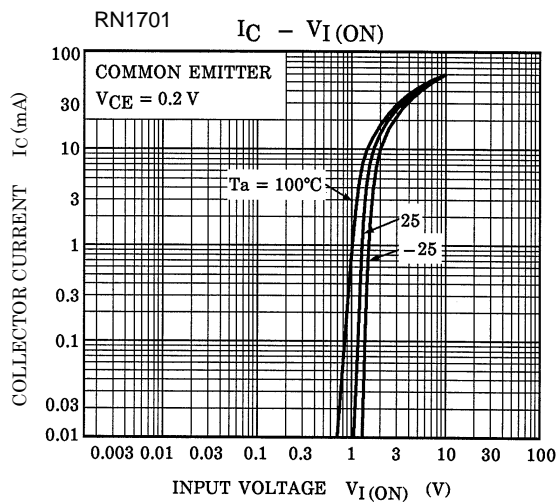
### Equivalent Circuit (Top View)



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

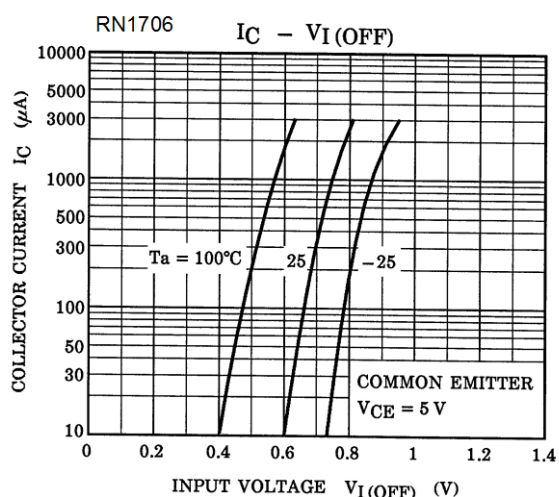
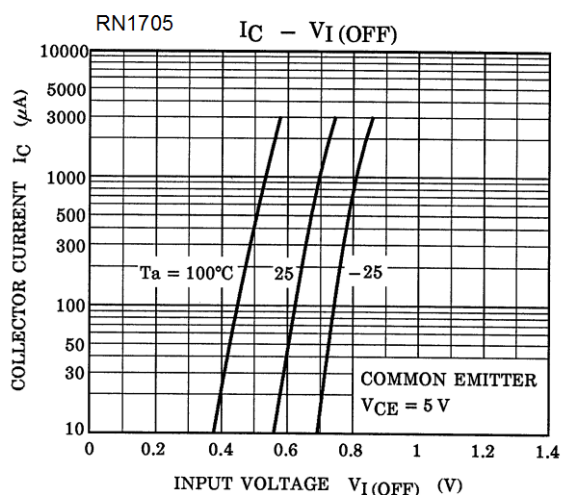
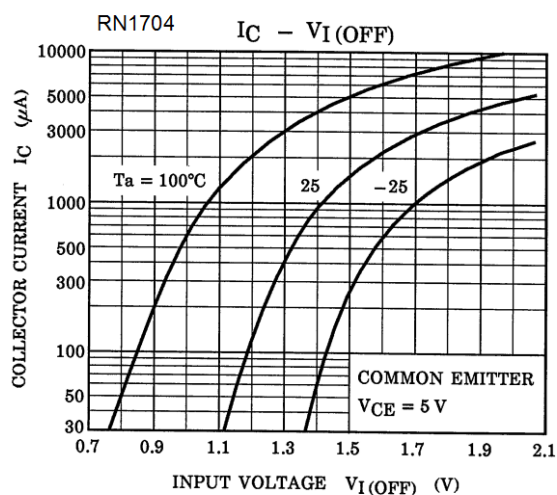
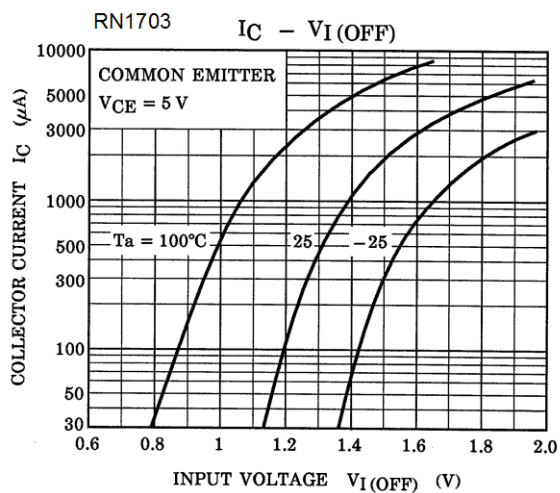
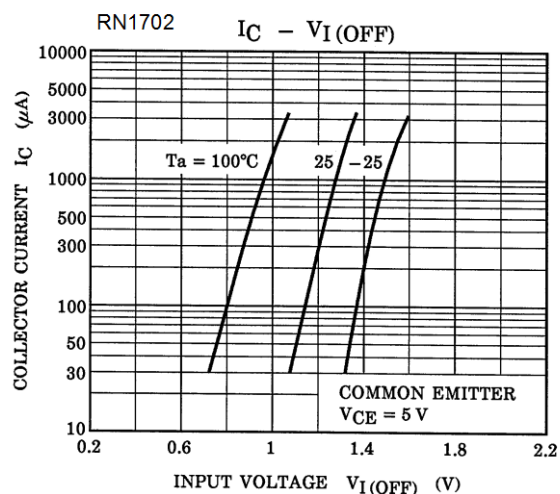
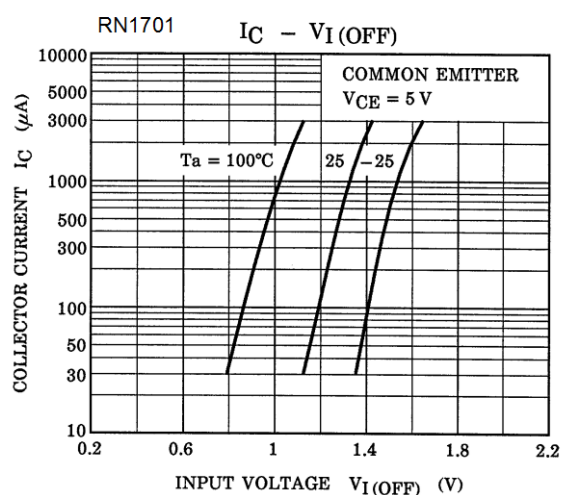
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1701 to 1706	ICBO	—	V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0 mA	—	—	100	nA
		ICEO	—	V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0 mA	—	—	500	
Emitter cut-off current	RN1701	IEBO	—	V <sub>EB</sub> = 10 V, I <sub>C</sub> = 0 mA	0.82	—	1.52	mA
	RN1702		—		0.38	—	0.71	
	RN1703		—		0.17	—	0.33	
	RN1704		—	0.082	—	0.15		
	RN1705		—	V <sub>EB</sub> = 5 V, I <sub>C</sub> = 0 mA	0.078	—	0.145	
	RN1706		—		0.074	—	0.138	
DC current gain	RN1701	hFE	—	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA	30	—	—	—
	RN1702		—		50	—	—	
	RN1703		—		70	—	—	
	RN1704		—		80	—	—	
	RN1705		—		80	—	—	
	RN1706		—		80	—	—	
Collector-emitter saturation voltage	RN1701 to 1706	V <sub>CE (sat)</sub>	—	I <sub>C</sub> = 5 mA, I <sub>B</sub> = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1701	V <sub>I (ON)</sub>	—	V <sub>CE</sub> = 0.2 V, I <sub>C</sub> = 5 mA	1.1	—	2.0	V
	RN1702		—		1.2	—	2.4	
	RN1703		—		1.3	—	3.0	
	RN1704		—		1.5	—	5.0	
	RN1705		—		0.6	—	1.1	
	RN1706		—		0.7	—	1.3	
Input voltage (OFF)	RN1701 to 1704	V <sub>I (OFF)</sub>	—	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.1 mA	1.0	—	1.5	V
	RN1705, 1706		—		0.5	—	0.8	
Transition frequency	RN1701 to 1706	f <sub>T</sub>	—	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5 mA	—	250	—	MHz
Collector output capacitance	RN1701 to 1706	C <sub>ob</sub>	—	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA f = 1 MHz	—	3	6	pF
Input resistor	RN1701	R1	—	—	3.29	4.7	6.11	kΩ
	RN1702		—		7	10	13	
	RN1703		—		15.4	22	28.6	
	RN1704		—		32.9	47	61.1	
	RN1705		—		1.54	2.2	2.86	
	RN1706		—		3.29	4.7	6.11	
Resistor ratio	RN1701 to 1704	R1/R2	—	—	0.9	1.0	1.1	—
	RN1705		—		0.0421	0.0468	0.0515	
	RN1706		—		0.09	0.1	0.11	

(Q1, Q2 Common)



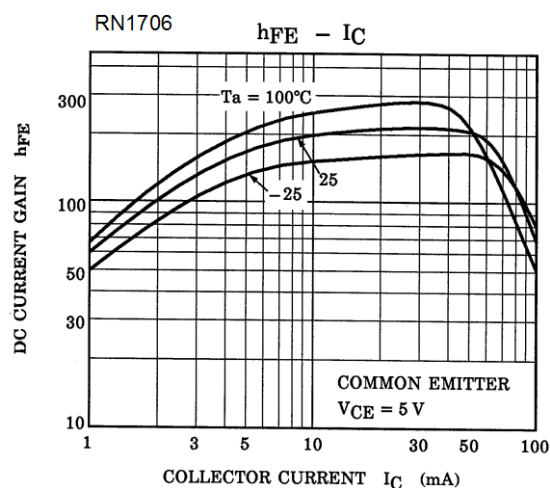
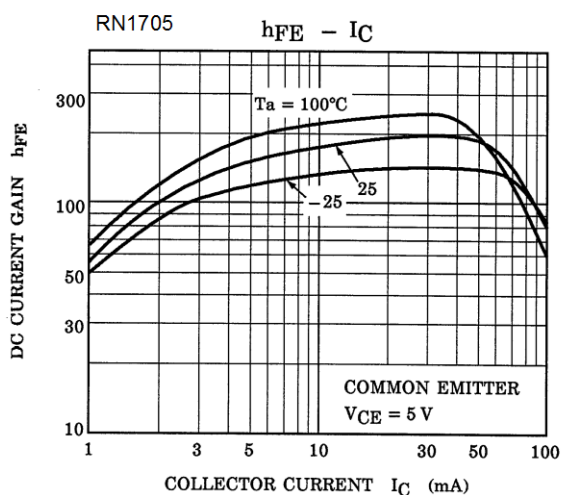
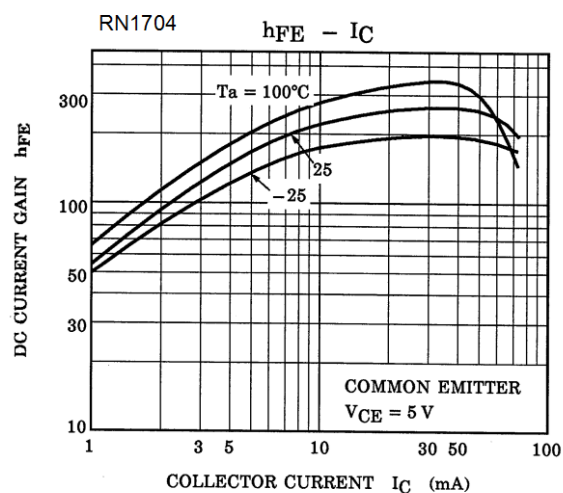
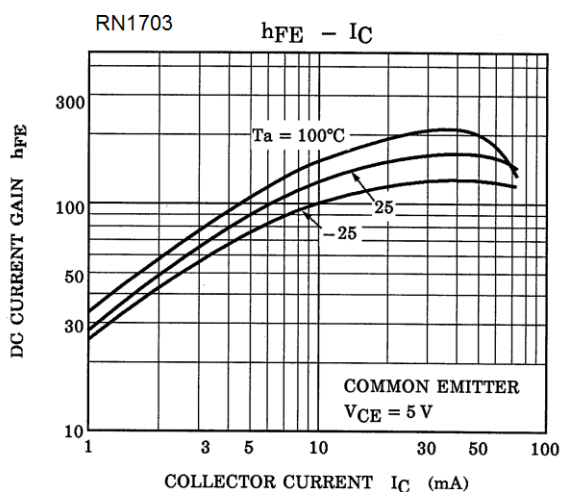
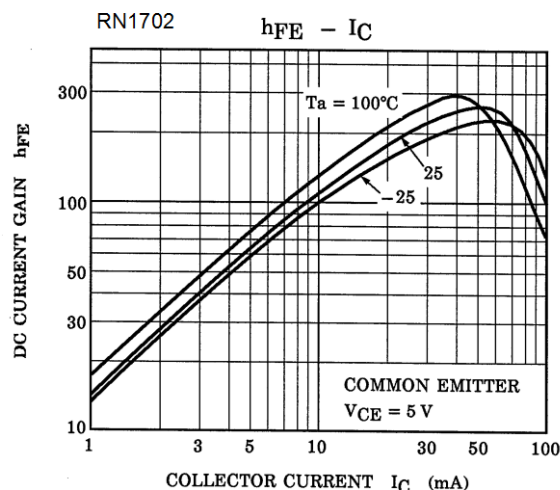
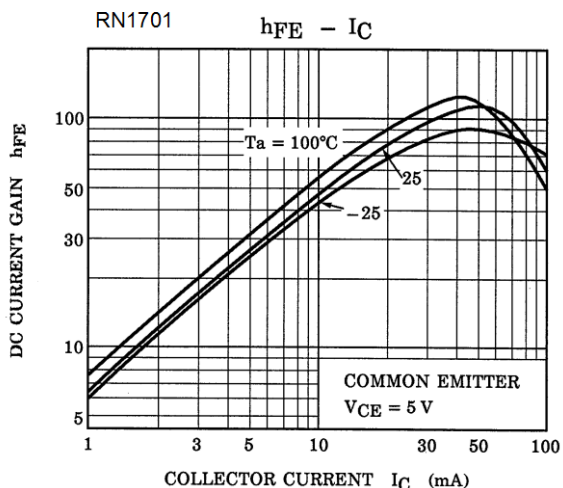
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(Q1, Q2 Common)

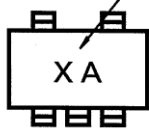
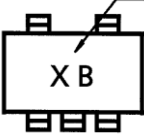
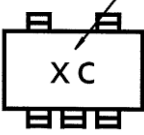
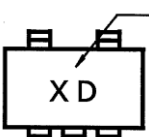
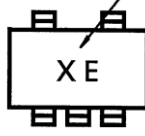
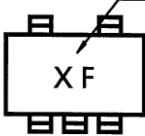


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(Q1, Q2 Common)



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Part No.	Marking
RN1701	<p data-bbox="603 271 868 297">Part No.(abbreviation code)</p> 
RN1702	<p data-bbox="603 517 868 544">Part No.(abbreviation code)</p> 
RN1703	<p data-bbox="603 741 868 768">Part No.(abbreviation code)</p> 
RN1704	<p data-bbox="603 965 868 992">Part No.(abbreviation code)</p> 
RN1705	<p data-bbox="603 1189 868 1216">Part No.(abbreviation code)</p> 
RN1706	<p data-bbox="603 1413 868 1440">Part No.(abbreviation code)</p> 

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