

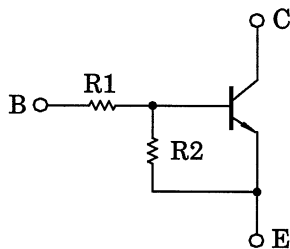
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

## RN1707, RN1708, RN1709

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

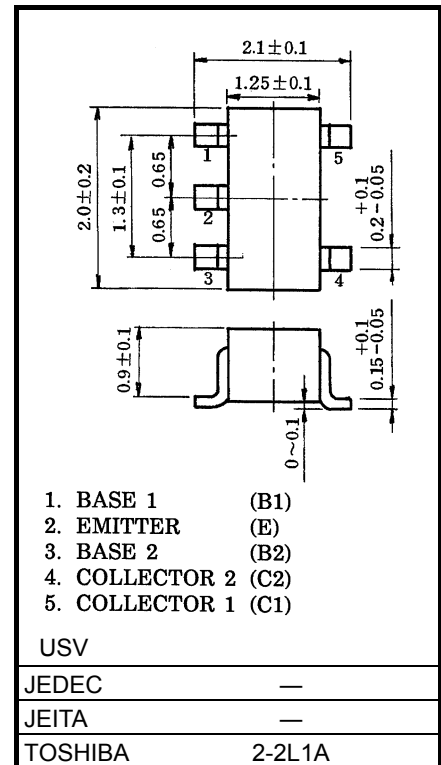
- Including two devices in USV (ultra super mini type with 5 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2707 to RN2709

### Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1707	10	47
RN1708	22	47
RN1709	47	22

Unit: mm



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

USV

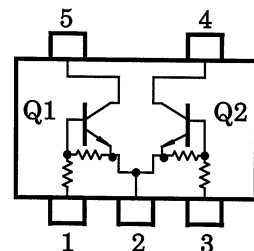
JEDEC	—
JEITA	—
TOSHIBA	2-2L1A

Weight: 6.2mg (typ.)

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

Characteristic	Symbol	Rating	Unit	
Collector-base voltage	RN1707 to 1709	$V_{CBO}$	50	V
Collector-emitter voltage		$V_{CEO}$	50	V
Emitter-base voltage	RN1707	$V_{EBO}$	6	V
	RN1708		7	
	RN1709		15	
Collector current	RN1707 to 1709	$I_C$	100	mA
Collector power dissipation		$P_C^*$	200	mW
Junction temperature		$T_j$	150	°C
Storage temperature range		$T_{stg}$	-55 to 150	°C

### Equivalent Circuit (Top View)



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).

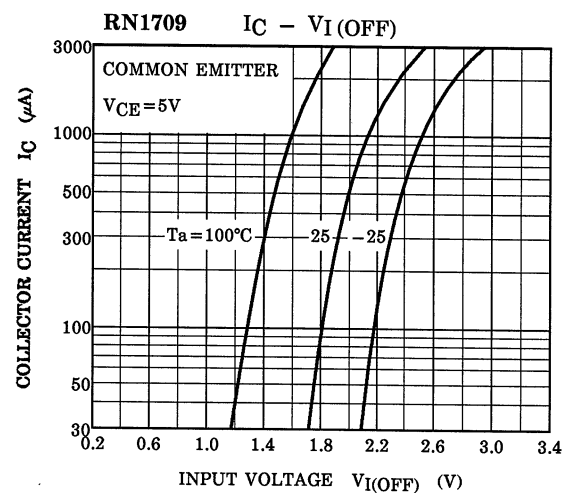
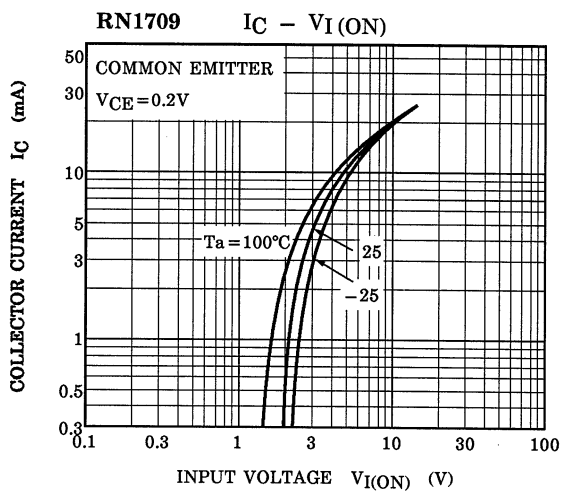
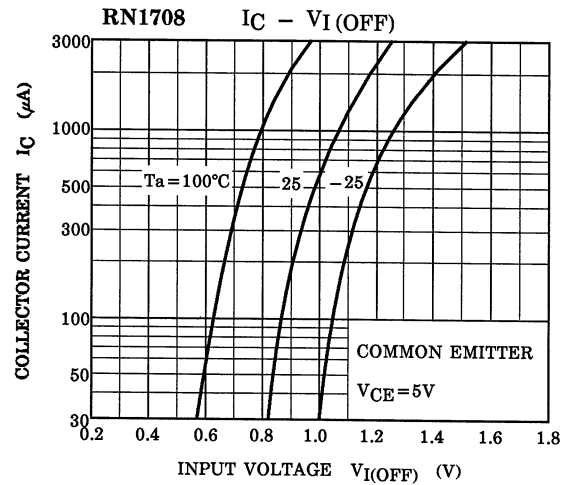
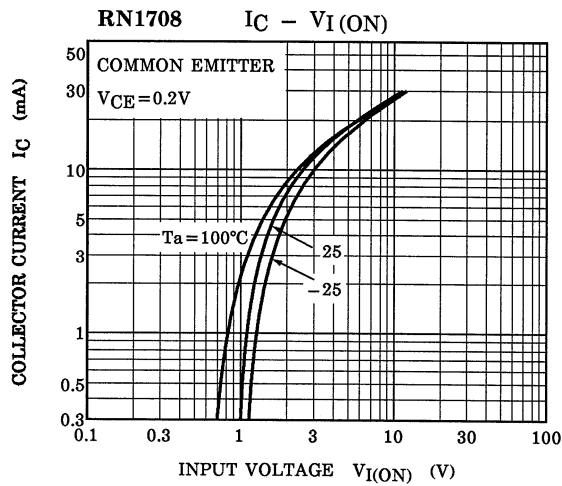
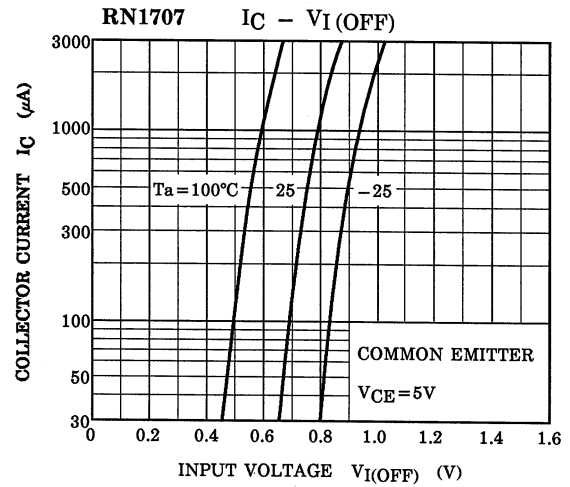
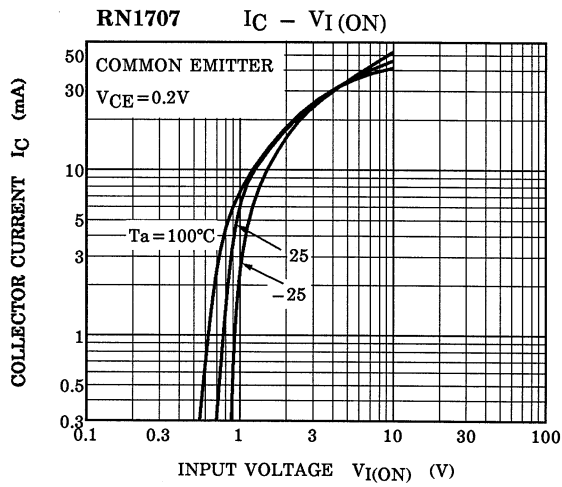
\*: Total rating

Start of commercial production  
1992-01

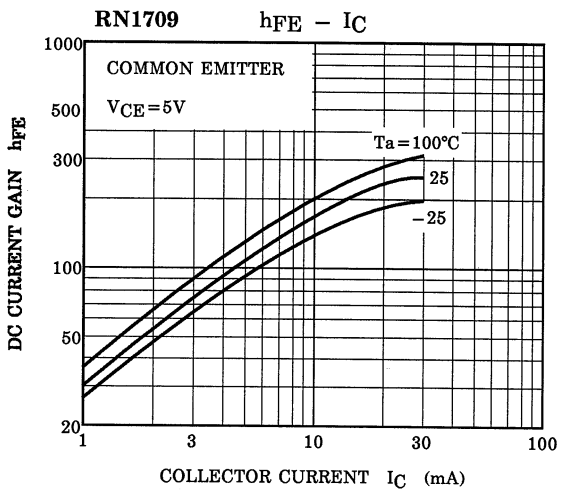
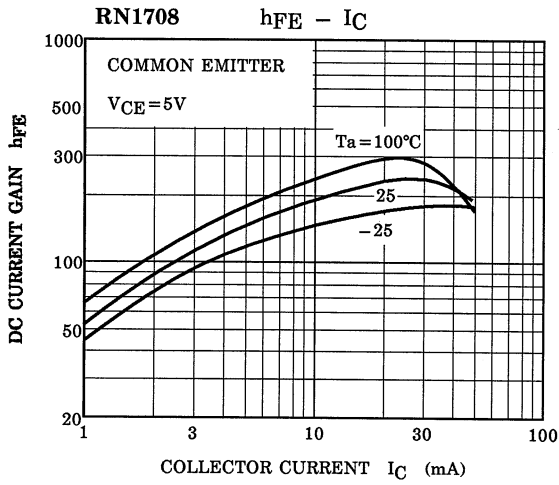
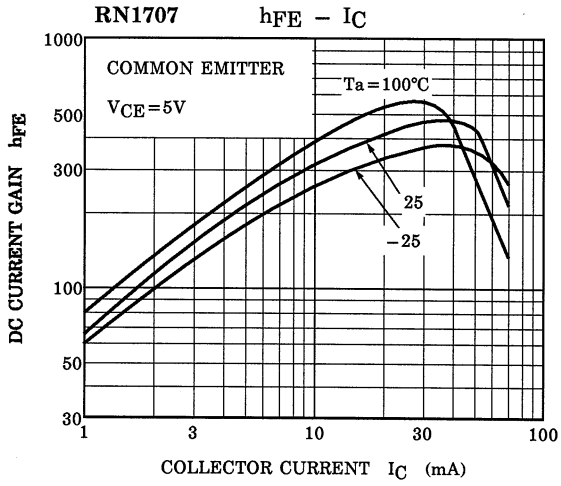
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1707 to 1709	$I_{CBO}$	—	$V_{CB} = 50V, I_E = 0$	—	—	100	nA
		$I_{CEO}$	—	$V_{CE} = 50V, I_B = 0$	—	—	500	nA
Emitter cut-off current	RN1707	$I_{EBO}$	—	$V_{EB} = 6V, I_C = 0$	0.081	—	0.15	mA
	RN1708		—	$V_{EB} = 7V, I_C = 0$	0.078	—	0.145	
	RN1709		—	$V_{EB} = 15V, I_C = 0$	0.167	—	0.311	
DC current gain	RN1707	$h_{FE}$	—	$V_{CE} = 5V, I_C = 10mA$	80	—	—	—
	RN1708		—		80	—	—	
	RN1709		—		70	—	—	
Collector-emitter saturation voltage	RN1707 to 1709	$V_{CE(sat)}$	—	$I_C = 5mA, I_B = 0.25mA$	—	0.1	0.3	V
Input voltage (ON)	RN1707	$V_{I(ON)}$	—	$V_{CE} = 0.2V, I_C = 5mA$	0.7	—	1.8	V
	RN1708		—		1.0	—	2.6	
	RN1709		—		2.2	—	5.8	
Input voltage (OFF)	RN1707	$V_{I(OFF)}$	—	$V_{CE} = 5V, I_C = 0.1mA$	0.5	—	1.0	V
	RN1708		—		0.6	—	1.16	
	RN1709		—		1.5	—	2.6	
Transition frequency	RN1707 to 1709	$f_T$	—	$V_{CE} = 10V, I_C = 5mA$	—	250	—	MHz
Collector output capacitance	RN1707 to 1709	$C_{ob}$	—	$V_{CB} = 10V, I_E = 0, f = 1MHz$	—	3	6	pF
Input resistor	RN1707	R1	—	—	7	10	13	kΩ
	RN1708		—		15.4	22	28.6	
	RN1709		—		32.9	47	61.1	
Resistor ratio	RN1707	R1/R2	—	—	0.191	0.213	0.232	—
	RN1708		—		0.421	0.468	0.515	
	RN1709		—		1.92	2.14	2.35	

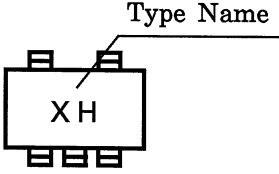
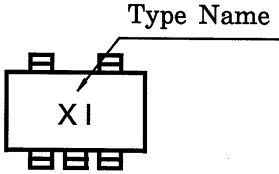
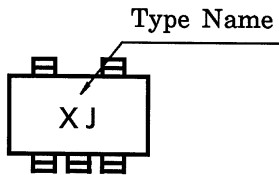
(Q1, Q2 Common)



(Q1, Q2 Common)



## Marking

Type Name	Marking
RN1707	 <p>The diagram shows a rectangular component with two pins on top and four pins on the bottom. The letters 'X H' are printed in the center. A line points from the text 'Type Name' above to the 'X' in the marking.</p>
RN1708	 <p>The diagram shows a rectangular component with two pins on top and four pins on the bottom. The letters 'X I' are printed in the center. A line points from the text 'Type Name' above to the 'X' in the marking.</p>
RN1709	 <p>The diagram shows a rectangular component with two pins on top and four pins on the bottom. The letters 'X J' are printed in the center. A line points from the text 'Type Name' above to the 'X' in the marking.</p>

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