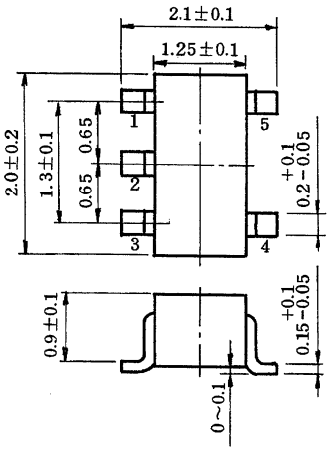
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN2701, RN2702, RN2703
RN2704, RN2705, RN2706

Unit: mm

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 RN1701 to RN1706



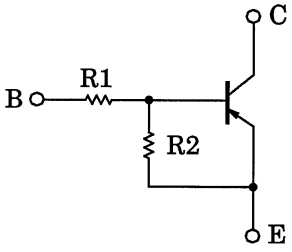
1. BASE 1 (B1)
2. EMITTER (E)
3. BASE 2 (B2)
4. COLLECTOR 2 (C2)
5. COLLECTOR 1 (C1)

USV

JEDEC	—
JEITA	—
TOSHIBA	2-2L1A

Weight: 6.2 mg (typ.)

Equivalent Circuit and Bias Resistor Values

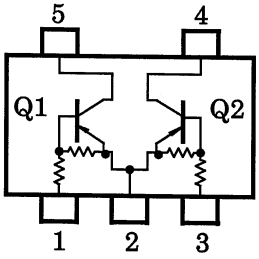


Type No.	R1 (kΩ)	R2 (kΩ)
RN2701	4.7	4.7
RN2702	10	10
RN2703	22	22
RN2704	47	47
RN2705	2.2	47
RN2706	4.7	47

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN2701 to 2706	V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage	RN2701 to 2704	V_{EBO}	−10	V
	RN2705, 2706		−5	
Collector current	RN2701 to 2706	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).

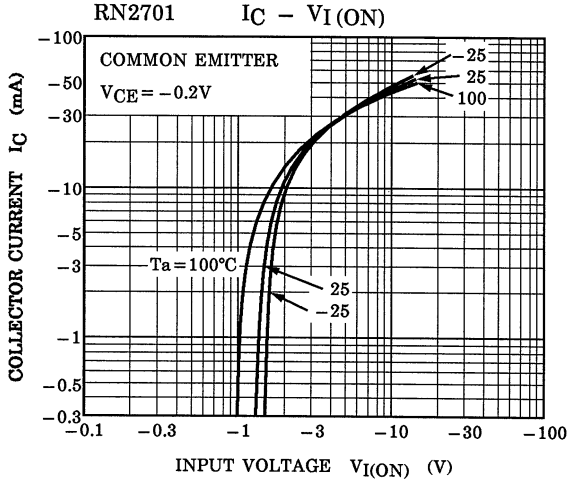
* Total rating

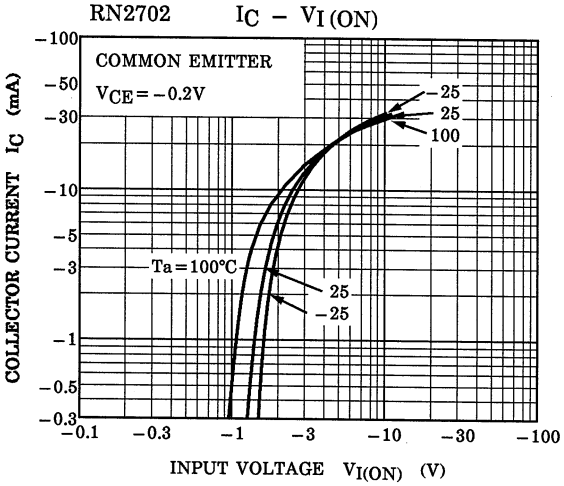
Start of commercial production
1992-01

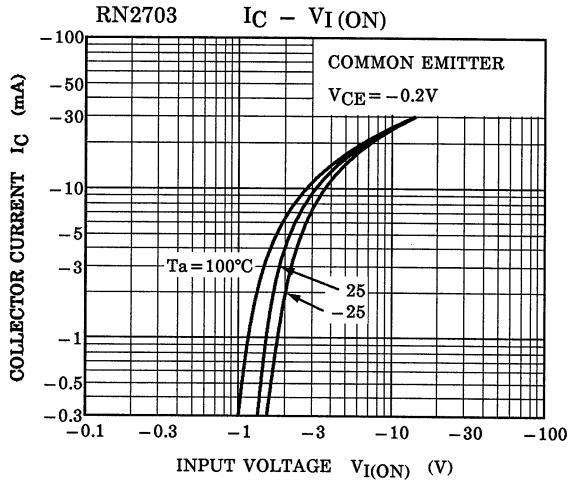
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

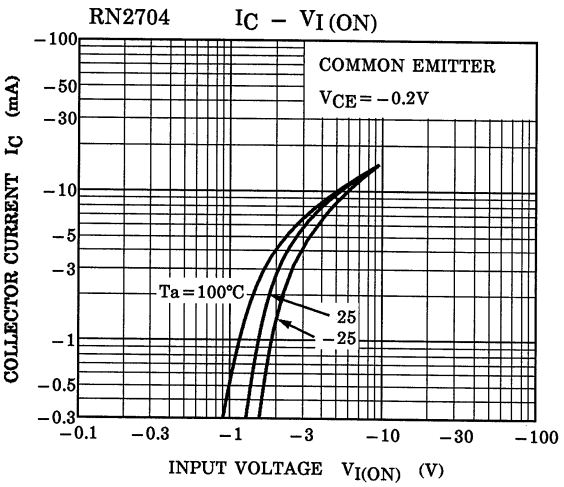
Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2701 to 2706	I_{CBO}	—	V_{CB} = −50V, I_E = 0	—	—	−100	nA
		I_{CEO}	—	V_{CE} = −50V, I_B = 0	—	—	−500	
Emitter cut-off current	RN2701	I_{EBO}	—	V_{EB} = −10V, I_C = 0	−0.82	—	−1.52	mA
	RN2702		—		−0.38	—	−0.71	
	RN2703		—		−0.17	—	−0.33	
	RN2704		—		−0.082	—	−0.15	
	RN2705		—	V_{EB} = −5V, I_C = 0	−0.078	—	−0.145	
	RN2706		—		−0.074	—	−0.138	
DC current gain	RN2701	h_{FE}	—	V_{CE} = −5V, I_C = −10mA	30	—	—	—
	RN2702		—		50	—	—	
	RN2703		—		70	—	—	
	RN2704		—		80	—	—	
	RN2705		—		80	—	—	
	RN2706		—		80	—	—	
Collector-emitter saturation voltage	RN2701 to 2706	$V_{CE\ (sat)}$	—	I_C = −5mA, I_B = −0.25mA	—	−0.1	−0.3	V
Input voltage (ON)	RN2701	$V_{I\ (ON)}$	—	V_{CE} = −0.2V, I_C = −5mA	−1.1	—	−2.0	V
	RN2702		—		−1.2	—	−2.4	
	RN2703		—		−1.3	—	−3.0	
	RN2704		—		−1.5	—	−5.0	
	RN2705		—		−0.6	—	−1.1	
	RN2706		—		−0.7	—	−1.3	
Input voltage (OFF)	RN2701 to 2704	$V_{I\ (OFF)}$	—	V_{CE} = −5V, I_C = −0.1mA	−1.0	—	−1.5	V
	RN2705, 2706		—		−0.5	—	−0.8	
Transition frequency	RN2701 to 2706	f_T	—	V_{CE} = −10V, I_C = −5mA	—	200	—	MHz
Collector output capacitance	RN2701 to 2706	C_{ob}	—	V_{CB} = −10V, I_E = 0 f = 1MHz	—	3	6	pF
Input resistor	RN2701	R1	—	—	3.29	4.7	6.11	kΩ
	RN2702		—		7	10	13	
	RN2703		—		15.4	22	28.6	
	RN2704		—		32.9	47	61.1	
	RN2705		—		1.54	2.2	2.86	
	RN2706		—		3.29	4.7	6.11	
Resistor ratio	RN2701 to 2704	R1/R2	—	—	0.9	1.0	1.1	—
	RN2705		—		0.0421	0.0468	0.0515	
	RN2706		—		0.09	0.1	0.11	

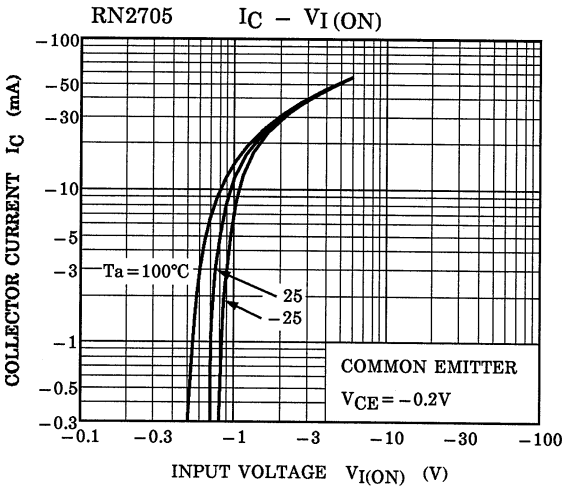
(Q1, Q2 Common)

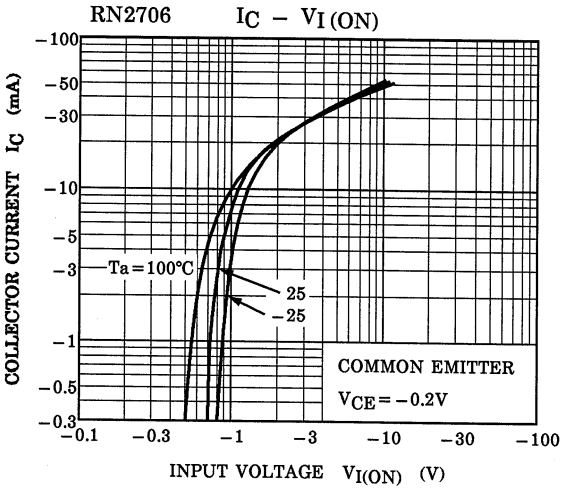

RN2701 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE} = −0.2V
Ta = 100°C
25
−25
25
100
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30
−100


RN2702 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE} = −0.2V
Ta = 100°C
25
−25
25
100
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30
−100


RN2703 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE} = −0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30
−100

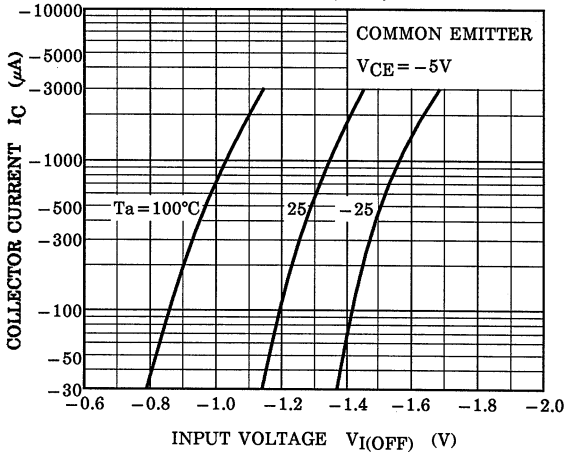

RN2704 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE} = −0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30
−100


RN2705 I_C – $V_{I(ON)}$
Ta = 100°C
25
−25
COMMON EMITTER
V_{CE} = −0.2V
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30
−100

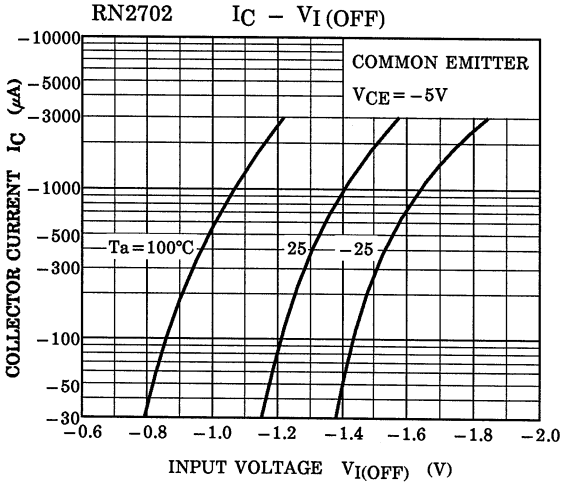

RN2706 I_C – $V_{I(ON)}$
Ta = 100°C
25
−25
COMMON EMITTER
V_{CE} = −0.2V
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30
−100

(Q1, Q2 Common)

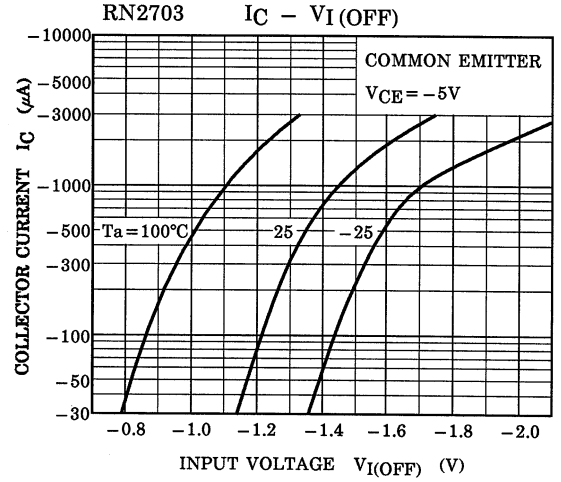
RN2701 I_C – $V_{I(OFF)}$



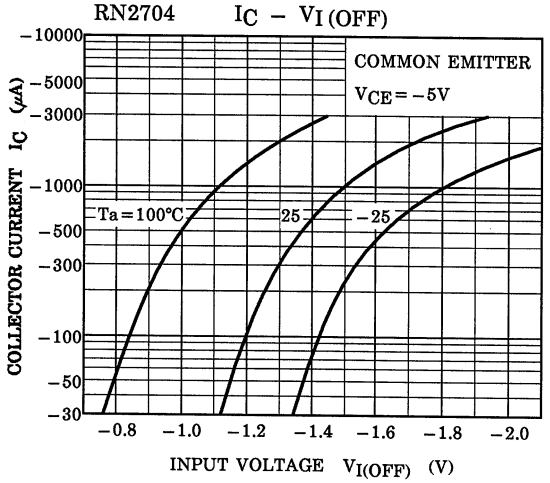
RN2702 I_C – $V_{I(OFF)}$



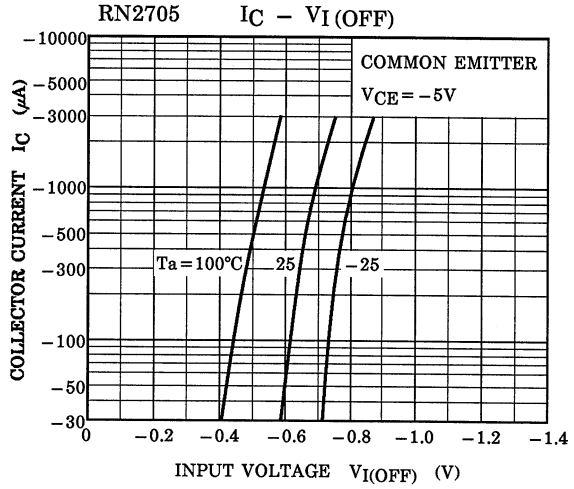
RN2703 I_C – $V_{I(OFF)}$



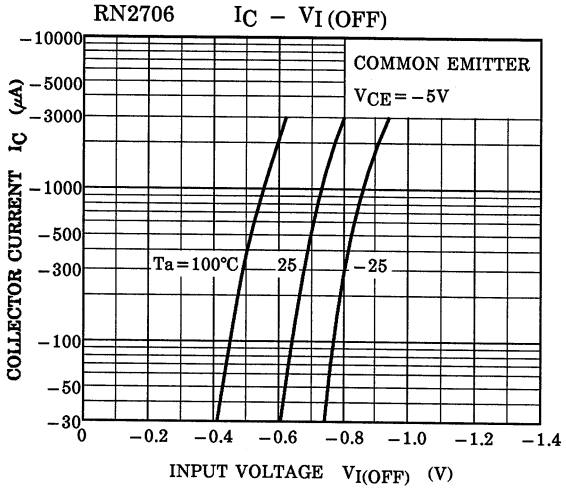
RN2704 I_C – $V_{I(OFF)}$



RN2705 I_C – $V_{I(OFF)}$

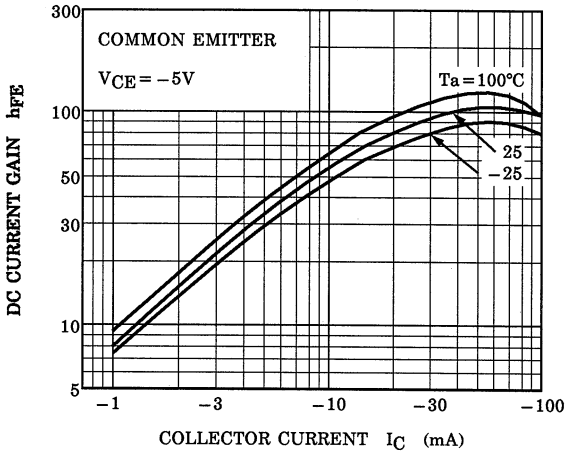


RN2706 I_C – $V_{I(OFF)}$

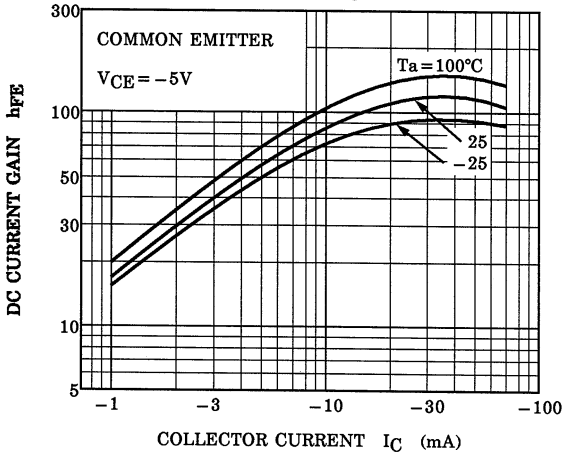


(Q1, Q2 Common)

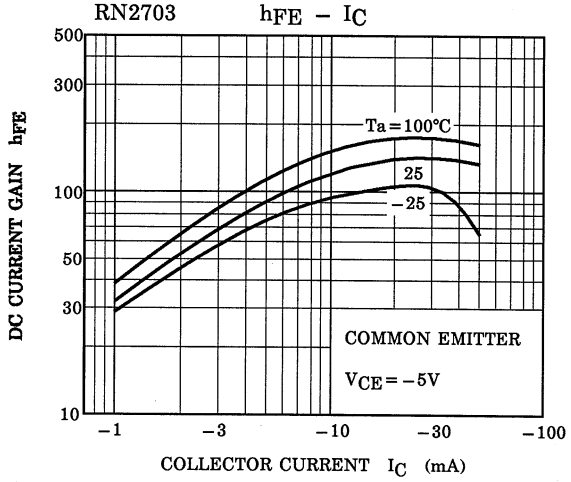
RN2701 h_{FE} – I_C



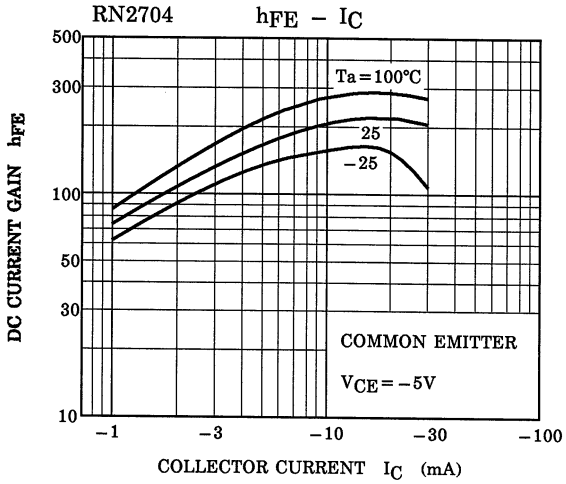
RN2702 h_{FE} – I_C



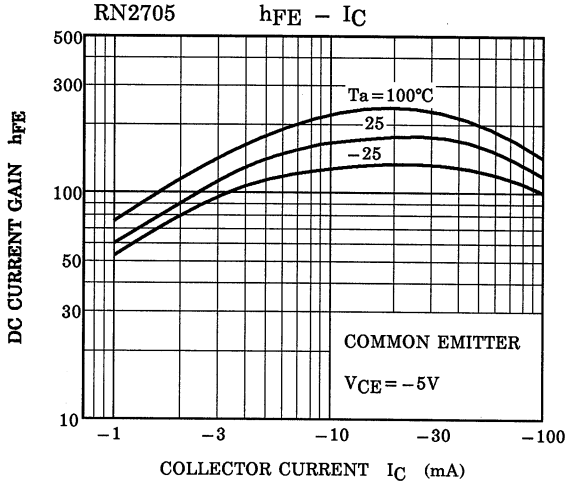
RN2703 h_{FE} – I_C



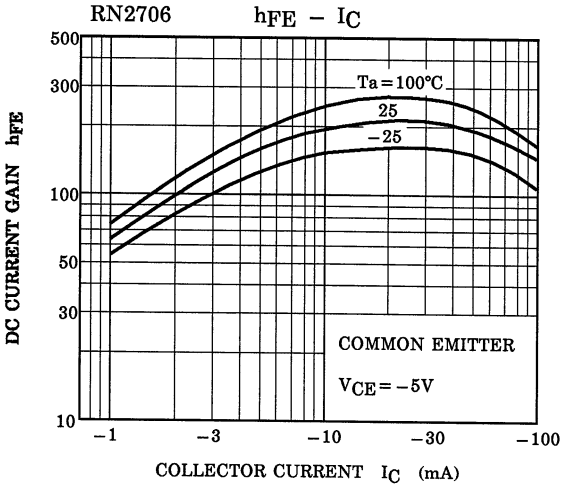
RN2704 h_{FE} – I_C



RN2705 h_{FE} – I_C



RN2706 h_{FE} – I_C



Marking

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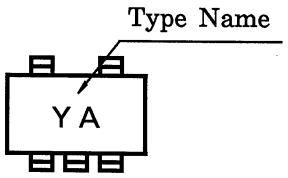
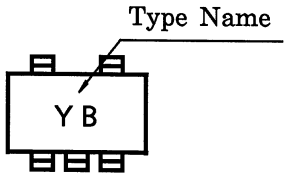
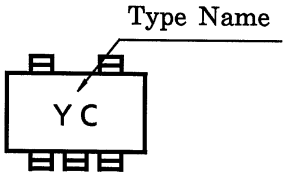
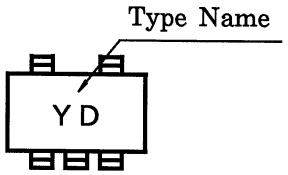
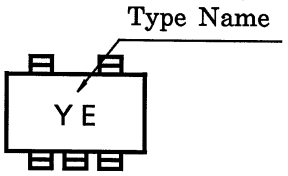
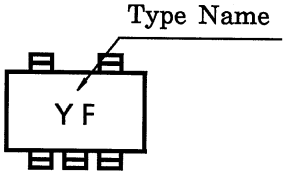
RN2701	
RN2702	
RN2703	
RN2704	
RN2705	
RN2706	

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