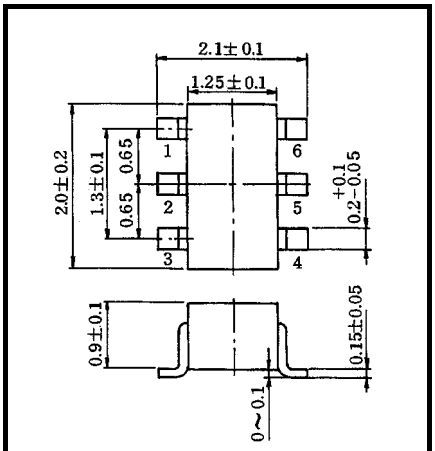
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN1901, RN1902, RN1903
RN1904, RN1905, RN1906

Unit: mm

Switching, Inverter Circuit, Interface Circuit
and Driver Circuit Applications

- Including two devices in US6 (ultra super mini type with 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2901 to RN2906



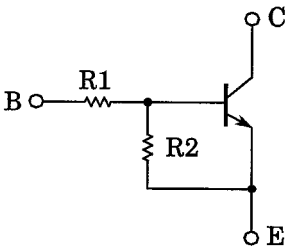
1. EMITTER 1 (E1)
2. BASE 1 (B1)
3. COLLECTOR 2 (C2)
4. EMITTER 2 (E2)
5. BASE 2 (B2)
6. COLLECTOR 1 (C1)

US6

JEDEC	—
JEITA	—
TOSHIBA	2-2J1A

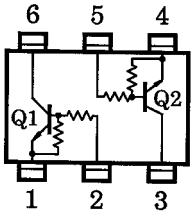
Weight: 6.8mg(typ.)

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1901	4.7	4.7
RN1902	10	10
RN1903	22	22
RN1904	47	47
RN1905	2.2	47
RN1906	4.7	47

Equivalent Circuit (Top View)



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

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1901 to 1906	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1901 to 1904	V_{EBO}	10	V
	RN1905, 1906		5	
Collector current	RN1901 to 1906	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

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).

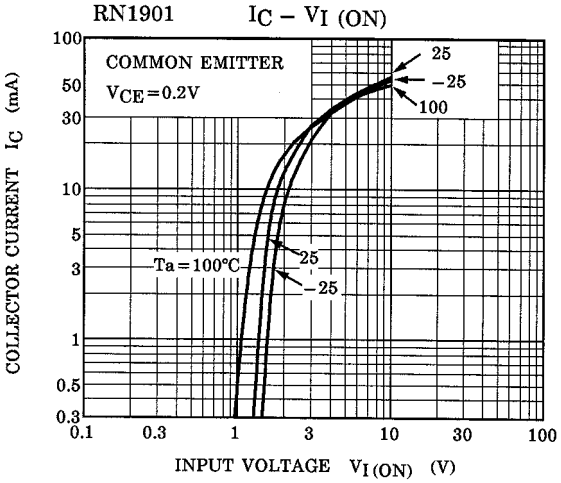
*: Total rating

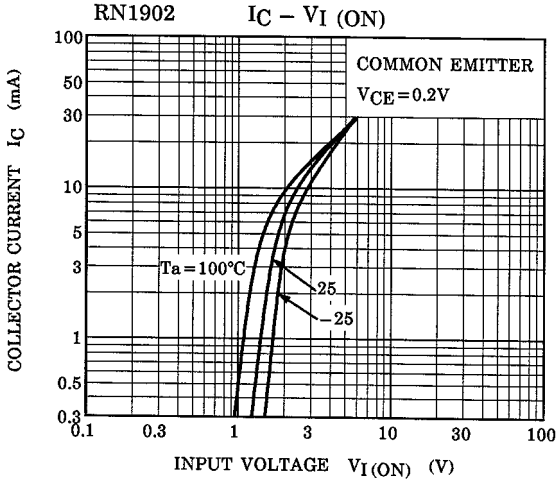
Start of commercial production
1990-12

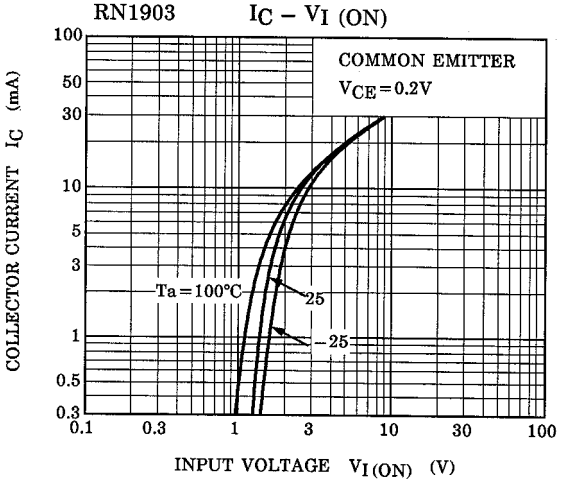
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

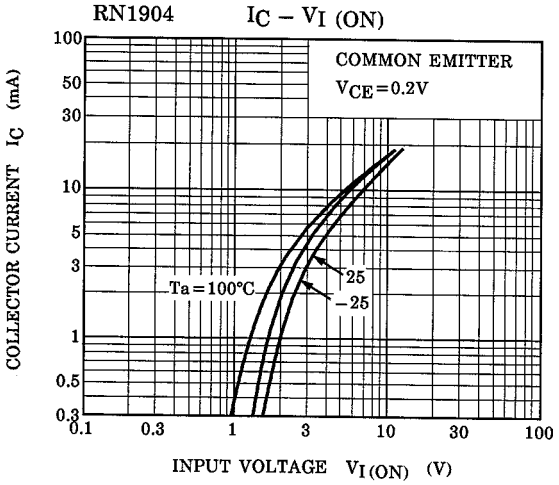
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1901 to 1906	I_{CBO}	—	V_{CB} = 50V, I_E = 0	—	—	100	nA
		I_{CEO}	—	V_{CE} = 50V, I_B = 0	—	—	500	
Emitter cut-off current	RN1901	I_{EBO}	—	V_{EB} = 10V, I_C = 0	0.82	—	1.52	mA
	RN1902		—		0.38	—	0.71	
	RN1903		—		0.17	—	0.33	
	RN1904		—		0.082	—	0.15	
	RN1905		—	V_{EB} = 5V, I_C = 0	0.078	—	0.145	
	RN1906		—		0.074	—	0.138	
DC current gain	RN1901	h_{FE}	—	V_{CE} = 5V, I_C = 10mA	30	—	—	—
	RN1902		—		50	—	—	
	RN1903		—		70	—	—	
	RN1904		—		80	—	—	
	RN1905		—		80	—	—	
	RN1906		—		80	—	—	
Collector-emitter saturation voltage	RN1901 to 1906	$V_{CE\ (sat)}$	—	I_C = 5mA, I_B = 0.25mA	—	0.1	0.3	V
Input voltage (ON)	RN1901	$V_{I\ (ON)}$	—	V_{CE} = 0.2V, I_C = 5mA	1.1	—	2.0	V
	RN1902		—		1.2	—	2.4	
	RN1903		—		1.3	—	3.0	
	RN1904		—		1.5	—	5.0	
	RN1905		—		0.6	—	1.1	
	RN1906		—		0.7	—	1.3	
Input voltage (OFF)	RN1901 to 1904	$V_{I\ (OFF)}$	—	V_{CE} = 5V, I_C = 0.1mA	1.0	—	1.5	V
	RN1905, 1906		—		0.5	—	0.8	
Transition frequency	RN1901 to 1906	f_T	—	V_{CE} = 10V, I_C = 5mA	—	250	—	MHz
Collector output capacitance	RN1901 to 1906	C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1MHz	—	3	6	pF
Input resistor	RN1901	R1	—	—	3.29	4.7	6.11	kΩ
	RN1902		—		7	10	13	
	RN1903		—		15.4	22	28.6	
	RN1904		—		32.9	47	61.1	
	RN1905		—		1.54	2.2	2.86	
	RN1906		—		3.29	4.7	6.11	
Resistor ratio	RN1901 to 1904	R1/R2	—	—	0.9	1.0	1.1	—
	RN1905		—		0.0421	0.0468	0.0515	
	RN1906		—		0.09	0.1	0.11	

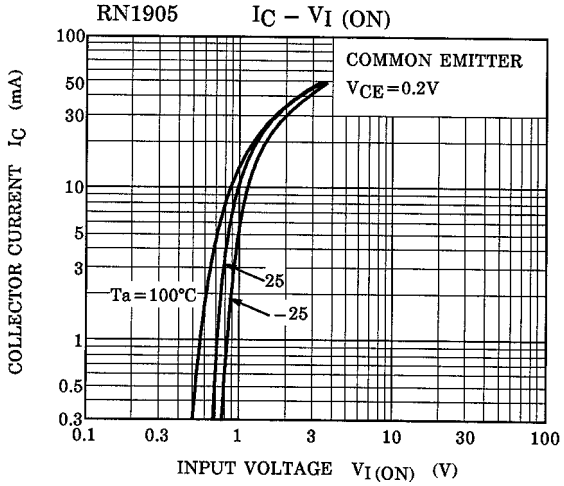
(Q1, Q2 Common)

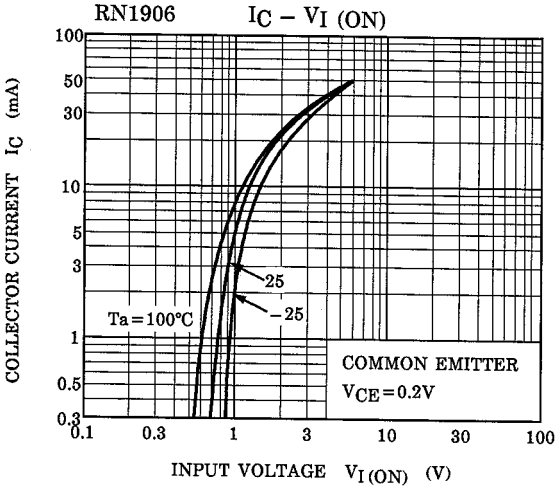

RN1901
$I_C - V_I$ (ON)
COMMON EMITTER
V_{CE} = 0.2V
Ta = 100°C
25
−25
100
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)


RN1902
$I_C - V_I$ (ON)
COMMON EMITTER
V_{CE} = 0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)


RN1903
$I_C - V_I$ (ON)
COMMON EMITTER
V_{CE} = 0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)

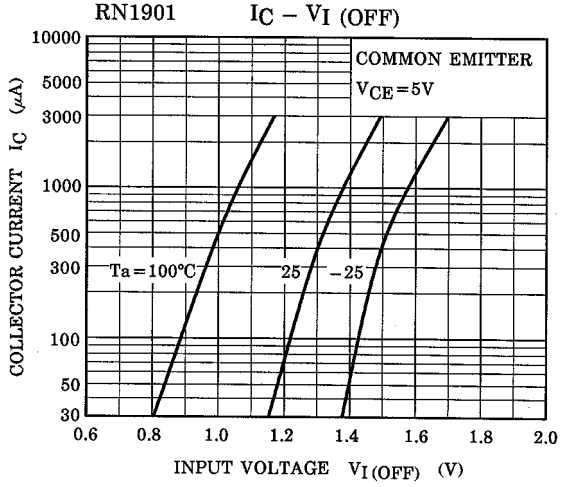

RN1904
$I_C - V_I$ (ON)
COMMON EMITTER
V_{CE} = 0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)


RN1905
$I_C - V_I$ (ON)
COMMON EMITTER
V_{CE} = 0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)

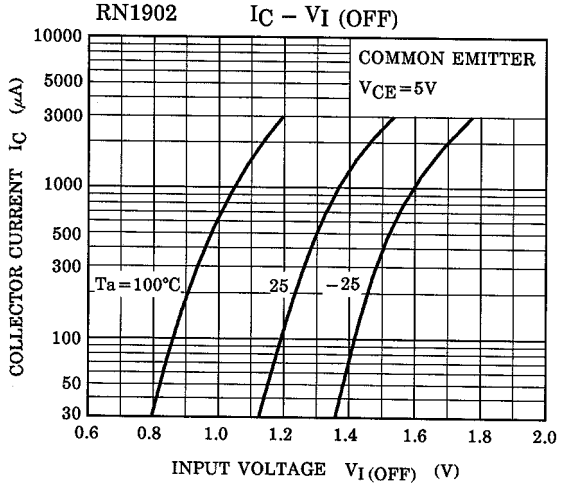

RN1906
$I_C - V_I$ (ON)
COMMON EMITTER
V_{CE} = 0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)

(Q1, Q2 Common)

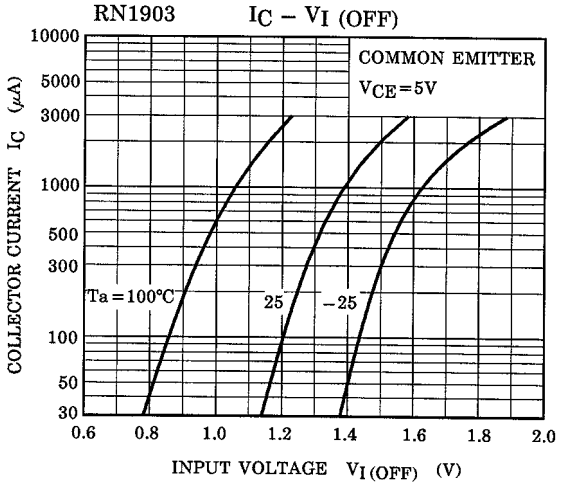
RN1901 $I_C - V_I$ (OFF)



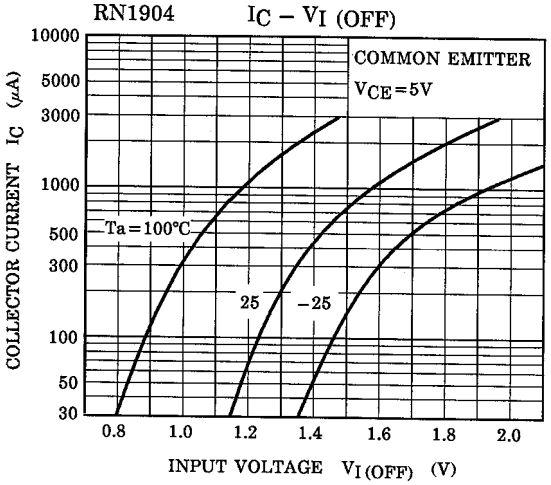
RN1902 $I_C - V_I$ (OFF)



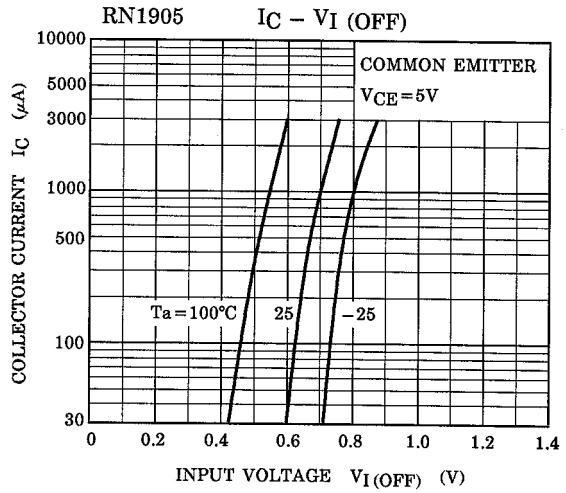
RN1903 $I_C - V_I$ (OFF)



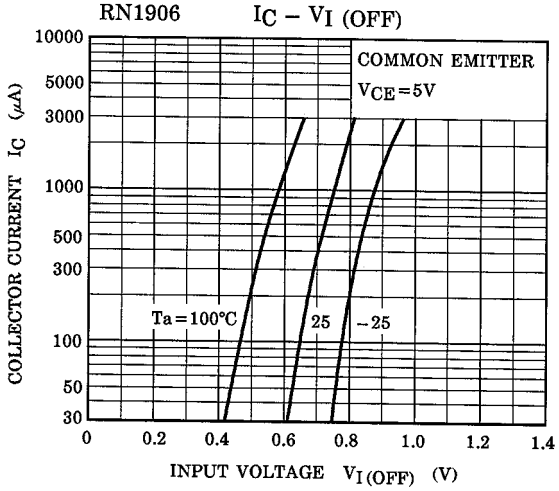
RN1904 $I_C - V_I$ (OFF)



RN1905 $I_C - V_I$ (OFF)

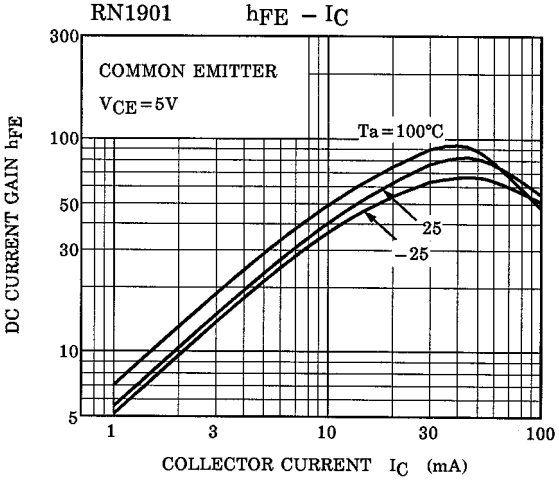


RN1906 $I_C - V_I$ (OFF)

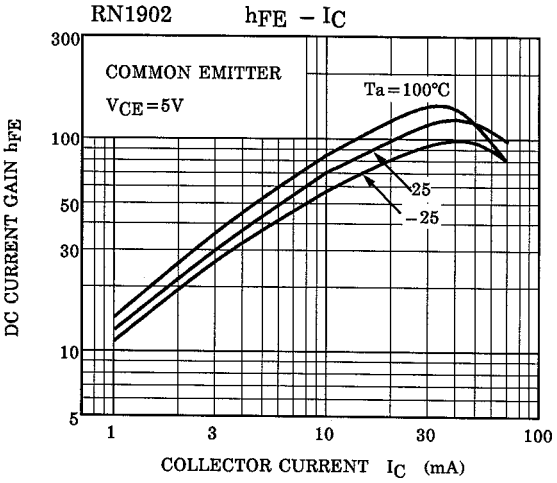


(Q1, Q2 Common)

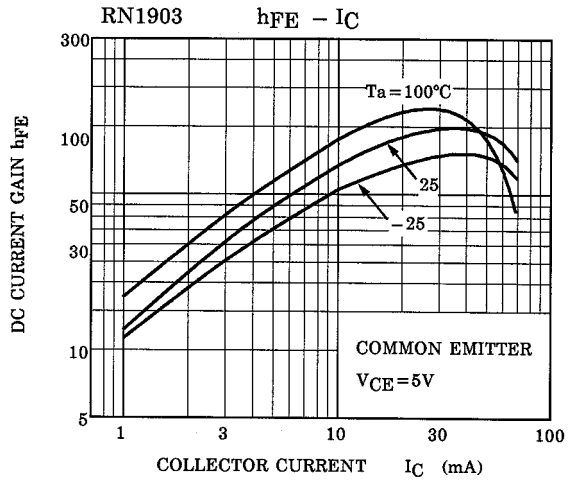
RN1901 h_{FE} – I_C



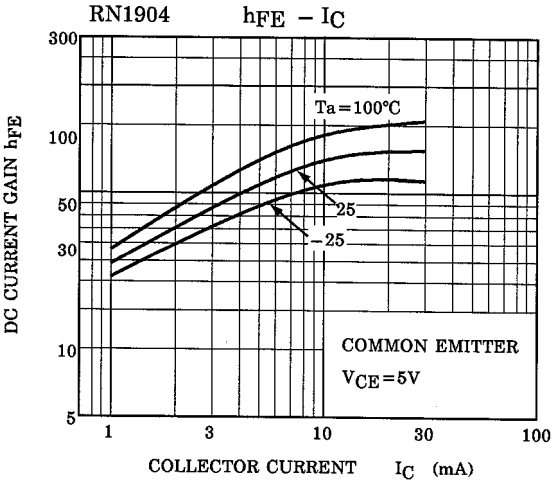
RN1902 h_{FE} – I_C



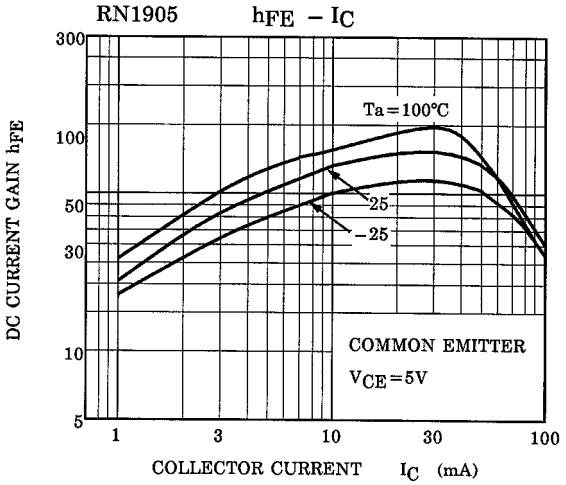
RN1903 h_{FE} – I_C



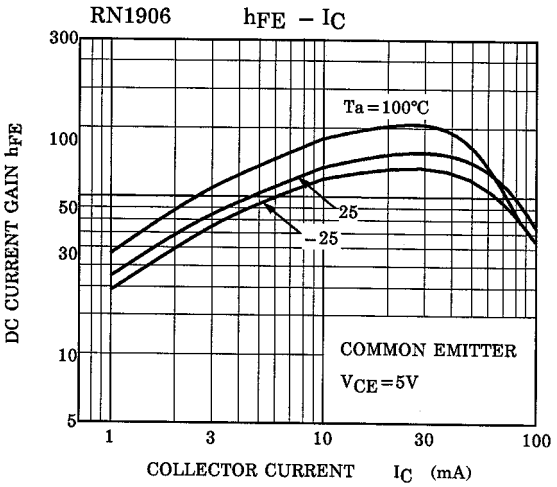
RN1904 h_{FE} – I_C



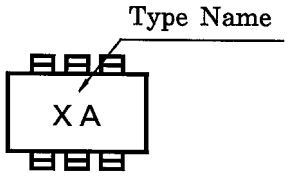
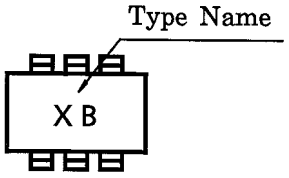
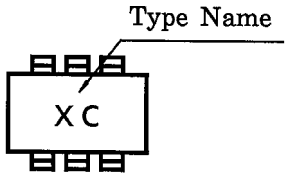
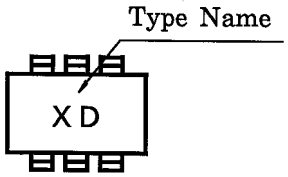
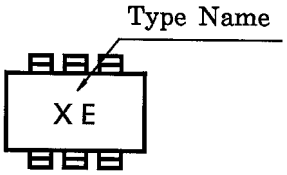
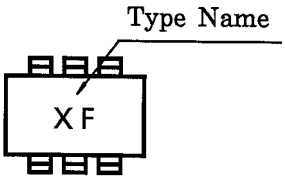
RN1905 h_{FE} – I_C



RN1906 h_{FE} – I_C



Marking

Type Name	Marking
RN1901	
RN1902	
RN1903	
RN1904	
RN1905	
RN1906	

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