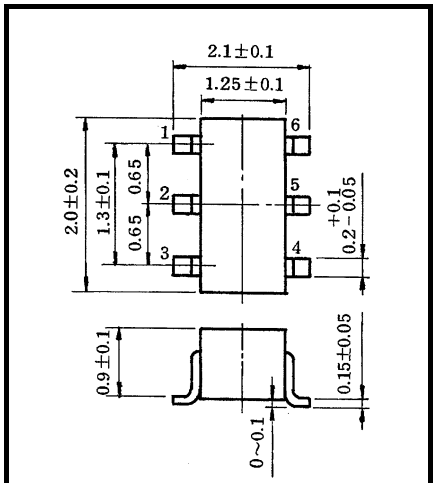
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process) (Bias Resistor Built-in Transistor)

RN2961, RN2962, RN2963
RN2964, RN2965, RN2966

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 RN1961 to RN1966



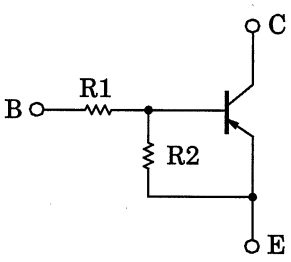
1. EMITTER 1 (E1)
2. EMITTER 2 (E2)
3. BASE 2 (B2)
4. COLLECTOR 2 (C2)
5. BASE 1 (B1)
6. COLLECTOR 1 (C1)

US6

JEDEC	—
JEITA	—
TOSHIBA	2-2J1B

Weight: 6.8mg (typ.)

Equivalent Circuit and Bias Resistor Values

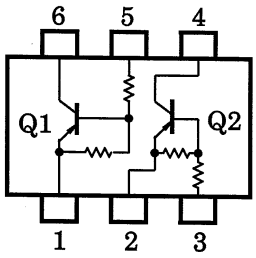


Type No.	R1 (kΩ)	R2 (kΩ)
RN2961	4.7	4.7
RN2962	10	10
RN2963	22	22
RN2964	47	47
RN2965	2.2	47
RN2966	4.7	47

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

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN2961 to 2966	V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage	RN2961 to 2964	V_{EBO}	−10	V
	RN2965, 2966		−5	
Collector current	RN2961 to 2966	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

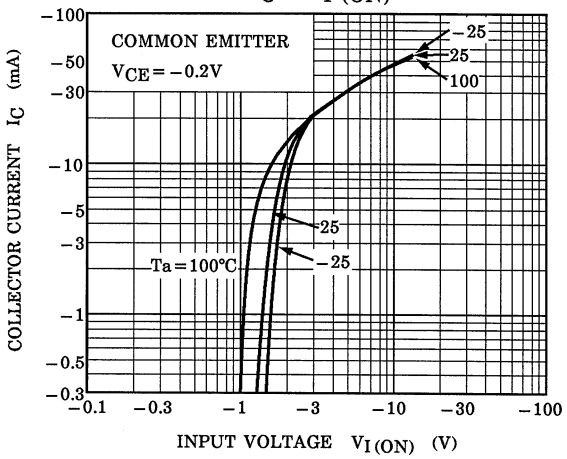
Start of commercial production
1998-02

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

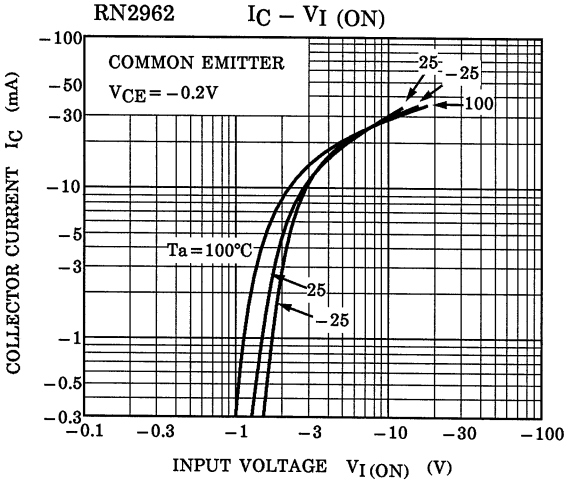
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2961 to 2966	I_{CBO}	—	V_{CB} = −50V, I_E = 0	—	—	−100	nA
		I_{CEO}	—	V_{CE} = −50V, I_B = 0	—	—	−500	
Emitter cut-off current	RN2961	I_{EBO}	—	V_{EB} = −10V, I_C = 0	−0.82	—	−1.52	mA
	RN2962		—		−0.38	—	−0.71	
	RN2963		—		−0.17	—	−0.33	
	RN2964		—		−0.082	—	−0.15	
	RN2965		—	V_{EB} = −5V, I_C = 0	−0.078	—	−0.145	
	RN2966		—		−0.074	—	−0.138	
DC current gain	RN2961	h_{FE}	—	V_{CE} = −5V, I_C = −10mA	30	—	—	—
	RN2962		—		50	—	—	
	RN2963		—		70	—	—	
	RN2964		—		80	—	—	
	RN2965		—		80	—	—	
	RN2966		—		80	—	—	
Collector-emitter saturation voltage	RN2961 to 2966	$V_{CE\ (sat)}$	—	I_C = −5mA, I_B = −0.25mA	—	−0.1	−0.3	V
Input voltage (ON)	RN2961	$V_{I\ (ON)}$	—	V_{CE} = −0.2V, I_C = −5mA	−1.1	—	−2.0	V
	RN2962		—		−1.2	—	−2.4	
	RN2963		—		−1.3	—	−3.0	
	RN2964		—		−1.5	—	−5.0	
	RN2965		—		−0.6	—	−1.1	
	RN2966		—		−0.7	—	−1.3	
Input voltage (OFF)	RN2961 to 2964	$V_{I\ (OFF)}$	—	V_{CE} = −5V, I_C = −0.1mA	−1.0	—	−1.5	V
	RN2965, 2966		—		−0.5	—	−0.8	
Transition frequency	RN2961 to 2966	f_T	—	V_{CE} = −10V, I_C = −5mA	—	200	—	MHz
Collector output capacitance	RN2961 to 2966	C_{ob}	—	V_{CB} = −10V, I_E = 0 f = 1MHz	—	3	6	pF
Input resistor	RN2961	R1	—	—	3.29	4.7	6.11	kΩ
	RN2962		—		7	10	13	
	RN2963		—		15.4	22	28.6	
	RN2964		—		32.9	47	61.1	
	RN2965		—		1.54	2.2	2.86	
	RN2966		—		3.29	4.7	6.11	
Resistor ratio	RN2961 to 2964	R1/R2	—	—	0.9	1.0	1.1	—
	RN2965		—		0.0421	0.0468	0.0515	
	RN2966		—		0.09	0.1	0.11	

(Q1, Q2 Common)

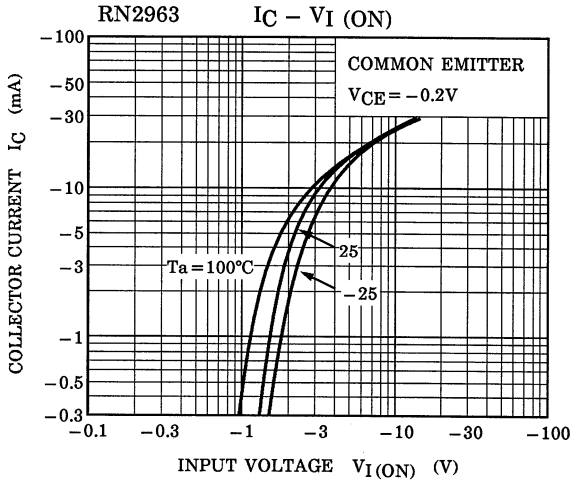
RN2961 $I_C - V_I$ (ON)



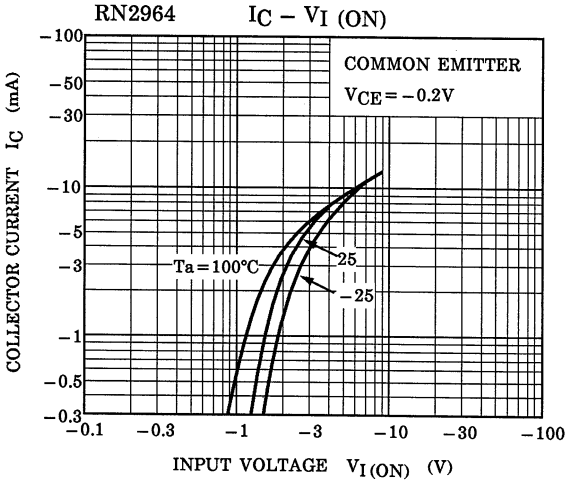
RN2962 $I_C - V_I$ (ON)



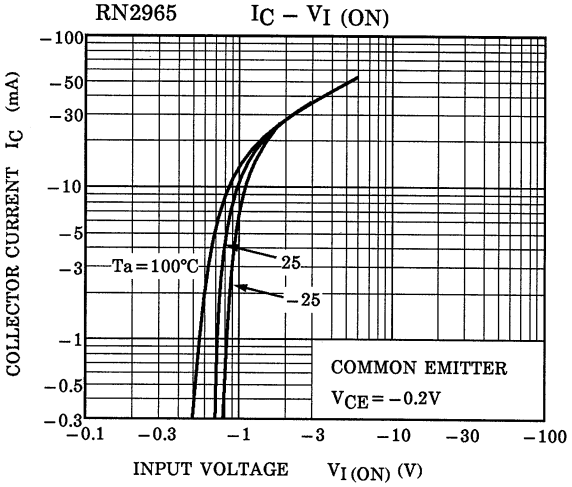
RN2963 $I_C - V_I$ (ON)



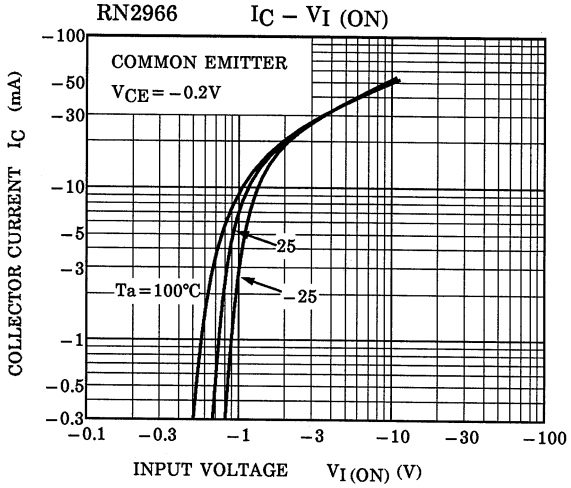
RN2964 $I_C - V_I$ (ON)



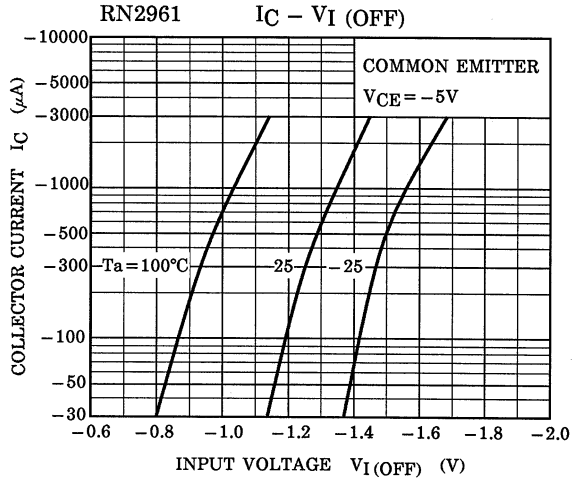
RN2965 $I_C - V_I$ (ON)

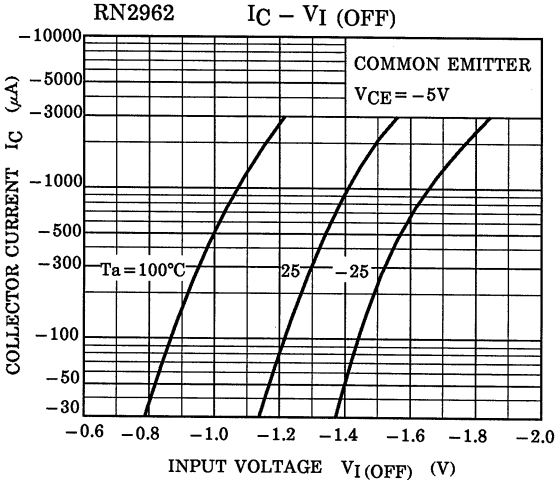


RN2966 $I_C - V_I$ (ON)



(Q1, Q2 Common)


RN2961
$I_C - V_{I\,(OFF)}$
COMMON EMITTER
$V_{CE} = -5V$
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I\,(OFF)}$ (V)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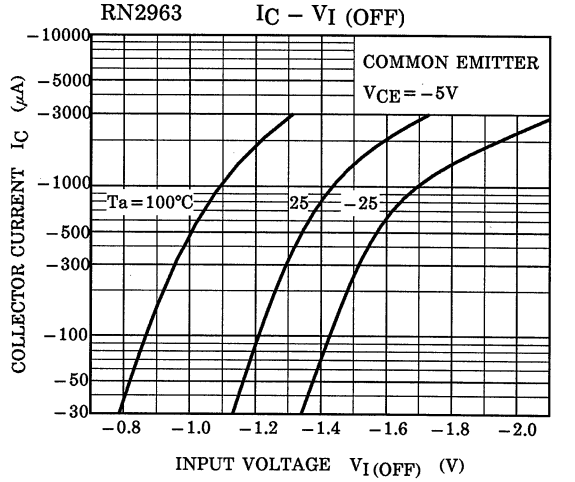
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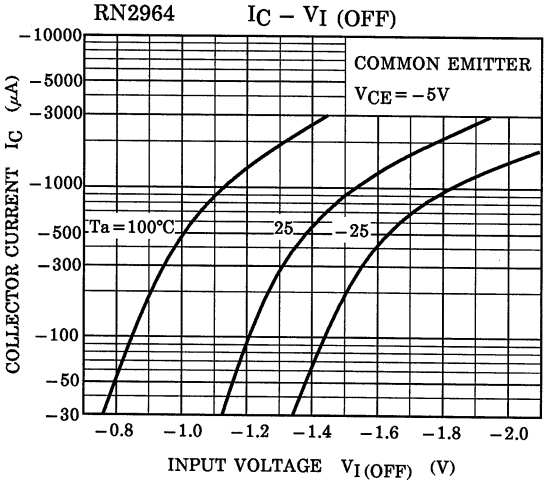
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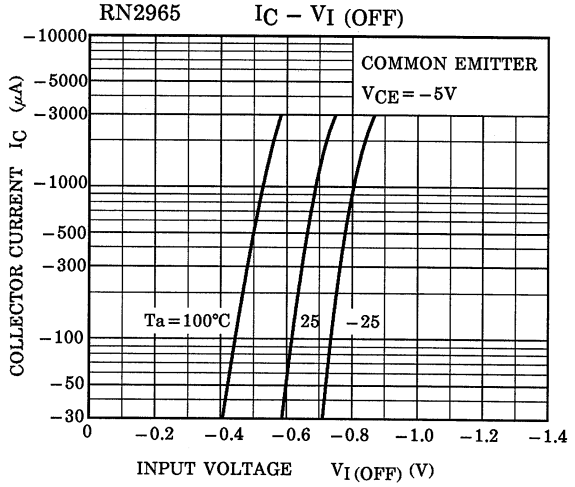
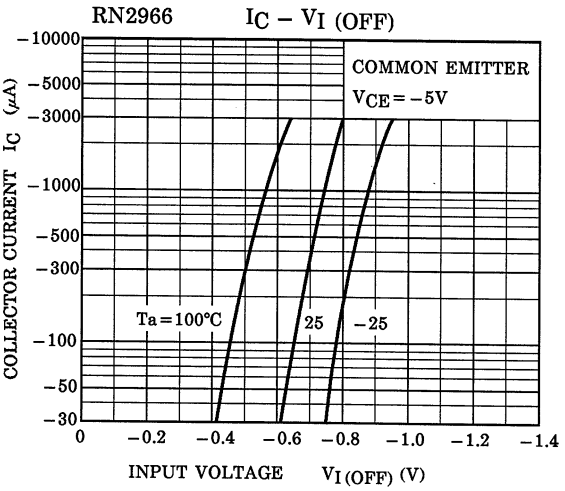
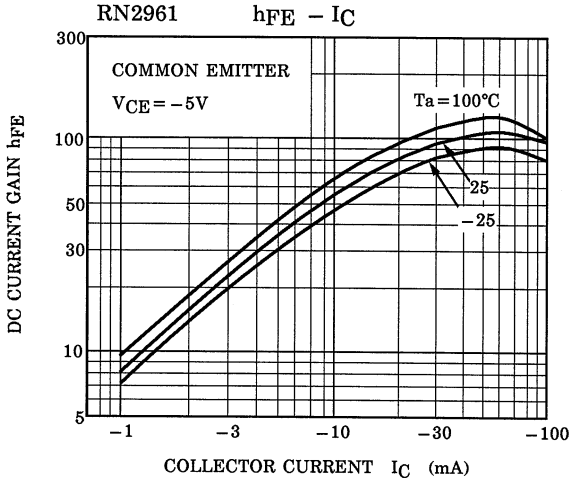

RN2965
$I_C - V_{I\,(OFF)}$
COMMON EMITTER
$V_{CE} = -5V$
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I\,(OFF)}$ (V)

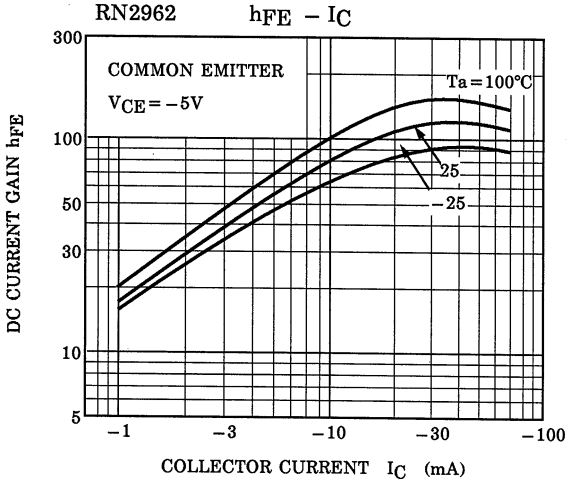

RN2966
$I_C - V_{I\,(OFF)}$
COMMON EMITTER
$V_{CE} = -5V$
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I\,(OFF)}$ (V)

(Q1, Q2 Common)

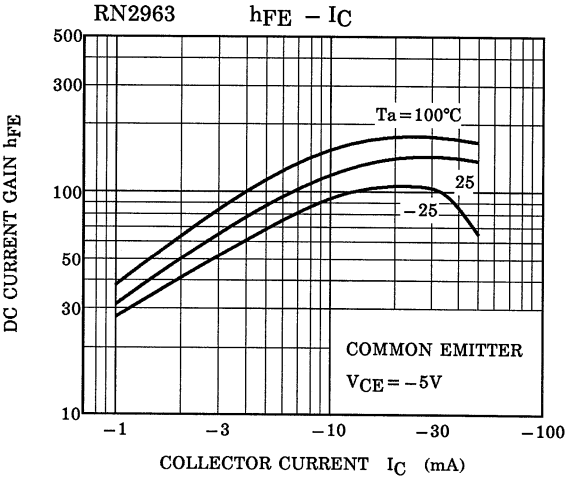
RN2961 h_{FE} – I_C



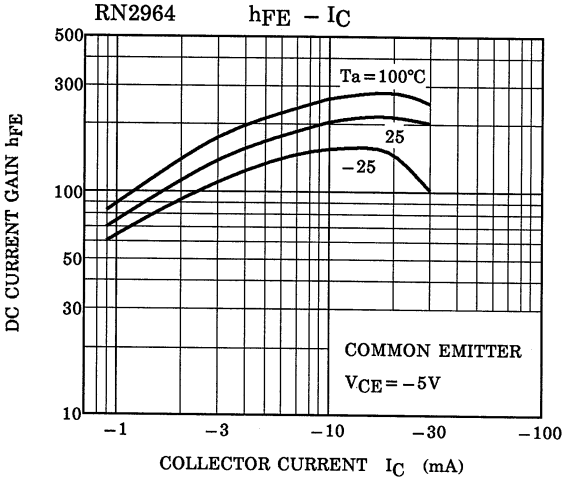
RN2962 h_{FE} – I_C



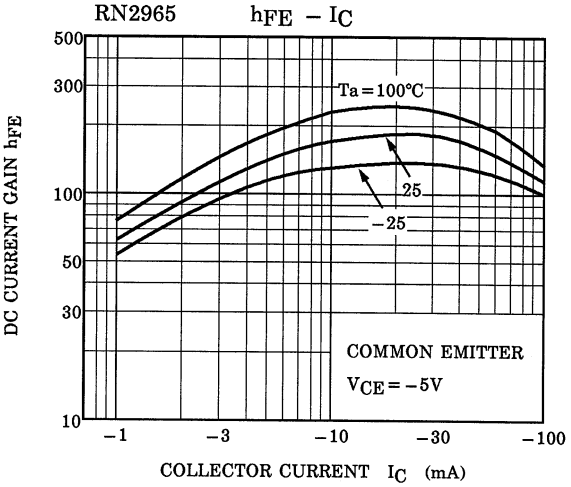
RN2963 h_{FE} – I_C



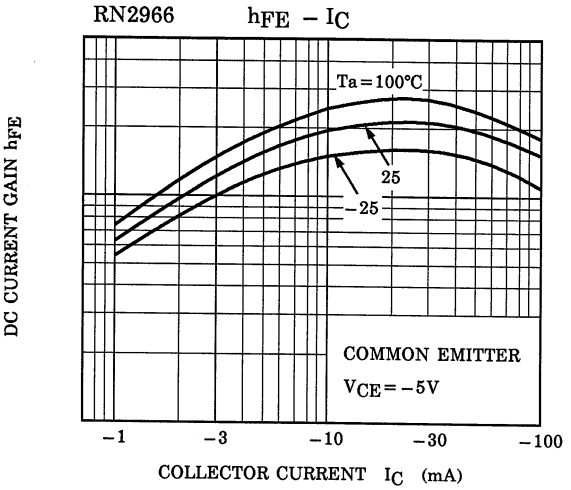
RN2964 h_{FE} – I_C



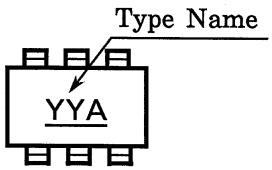
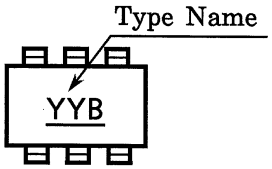
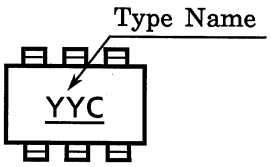
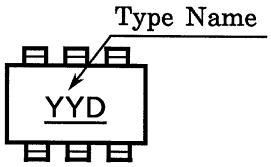
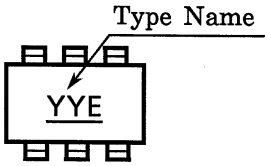
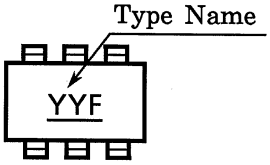
RN2965 h_{FE} – I_C



RN2966 h_{FE} – I_C



Marking

Type Name	Marking
RN2961	
RN2962	
RN2963	
RN2964	
RN2965	
RN2966	

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