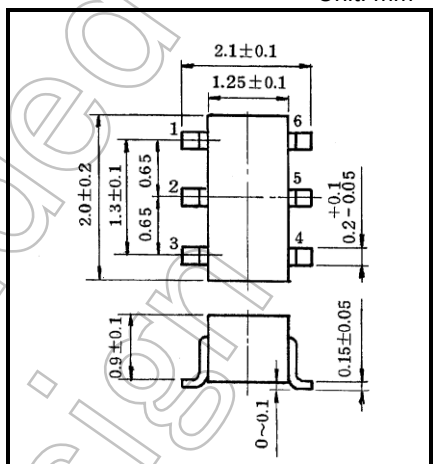
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN1961, RN1962, RN1963
RN1964, RN1965, RN1966

Switching, Inverter Circuit, Interface Circuit and Driver Circuit

- Including two devices in US6 (ultra super mini type 6 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 RN2961 to RN2966

Unit: mm



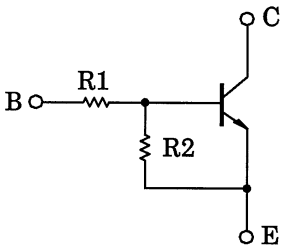
1. EMITTER 1	(E1)
2. EMITTER 2	(E2)
3. BASE 2	(B2)
4. COLLECTOR 2	(C2)
5. BASE 1	(B1)
6. COLLECTOR 1	(C1)

US6

JEDEC	—
JEITA	—
TOSHIBA	2-2J1B

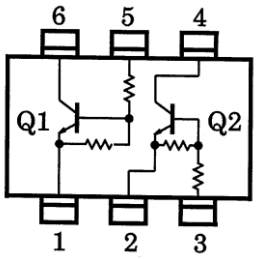
Weight: 6.8 mg (typ.)

Equivalent Circuit and Bias Resistor Values



Part No.	R1 (kΩ)	R2 (kΩ)
RN1961	4.7	4.7
RN1962	10	10
RN1963	22	22
RN1964	47	47
RN1965	2.2	47
RN1966	4.7	47

Equivalent Circuit (Top View)



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

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1961 to 1966	V_{CBO}	50	V
Collector-emitter voltage	RN1961 to 1966	V_{CEO}	50	V
Emitter-base voltage	RN1961 to 1964	V_{EBO}	10	V
	RN1965, 1966		5	
Collector current	RN1961 to 1966	I_C	100	mA
Collector power dissipation		P_C*	200	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to150	°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

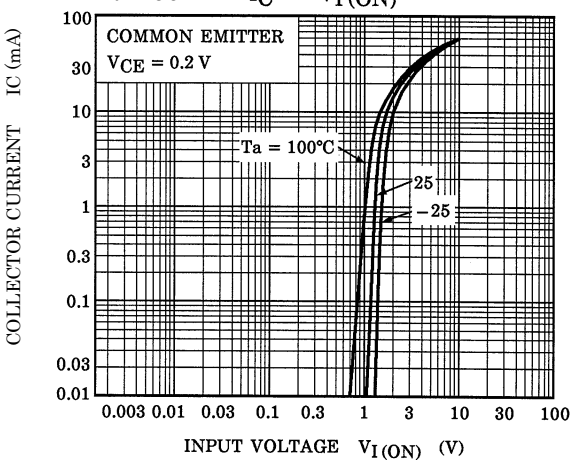
Start of commercial production
1992-01

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

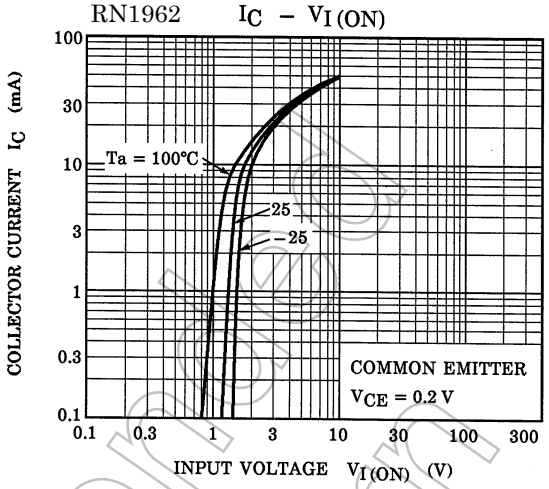
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1961 to 1966	I_{CBO}	V_{CB} = 50 V, I_E = 0 mA	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0 mA	—	—	500	
Emitter cut-off current	RN1961	I_{EBO}	V_{EB} = 10 V, I_C = 0 mA	0.82	—	1.52	mA
	RN1962			0.38	—	0.71	
	RN1963			0.17	—	0.33	
	RN1964			0.082	—	0.15	
	RN1965		V_{EB} = 5 V, I_C = 0 mA	0.078	—	0.145	
	RN1966			0.074	—	0.138	
DC current gain	RN1961	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	30	—	—	—
	RN1962			50	—	—	
	RN1963			70	—	—	
	RN1964			80	—	—	
	RN1965			80	—	—	
	RN1966			80	—	—	
Collector-emitter saturation voltage	RN1961 to 1966	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1961	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.1	—	2.0	V
	RN1962			1.2	—	2.4	
	RN1963			1.3	—	3.0	
	RN1964			1.5	—	5.0	
	RN1965			0.6	—	1.1	
	RN1966			0.7	—	1.3	
Input voltage (OFF)	RN1961 to 1964	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	V
	RN1965, 1966			0.5	—	0.8	
Transition frequency	RN1961 to 1966	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1961 to 1966	C_{ob}	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	3	6	pF
Input resistor	RN1961	R1	—	3.29	4.7	6.11	kΩ
	RN1962			7	10	13	
	RN1963			15.4	22	28.6	
	RN1964			32.9	47	61.1	
	RN1965			1.54	2.2	2.86	
	RN1966			3.29	4.7	6.11	
Resistor ratio	RN1961 to 1964	R1/R2	—	0.9	1.0	1.1	—
	RN1965			0.0421	0.0468	0.0515	
	RN1966			0.09	0.1	0.11	

Characteristics Curves (Q1, Q2 Common)

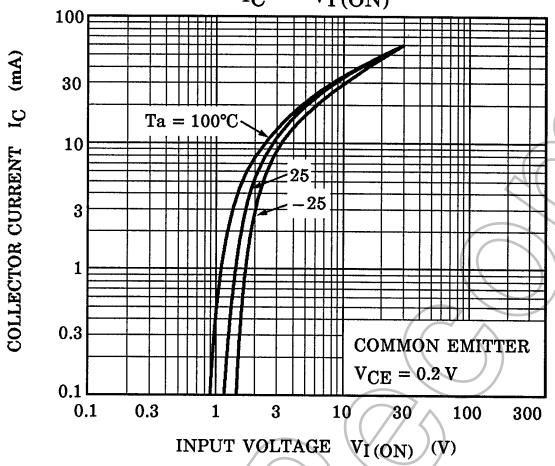
RN1961 $I_C - V_{I(ON)}$



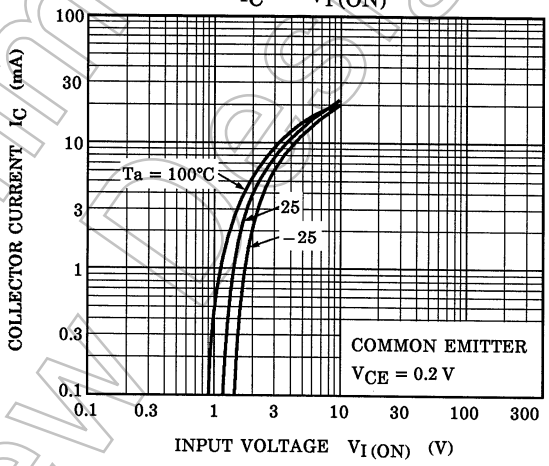
RN1962 $I_C - V_{I(ON)}$



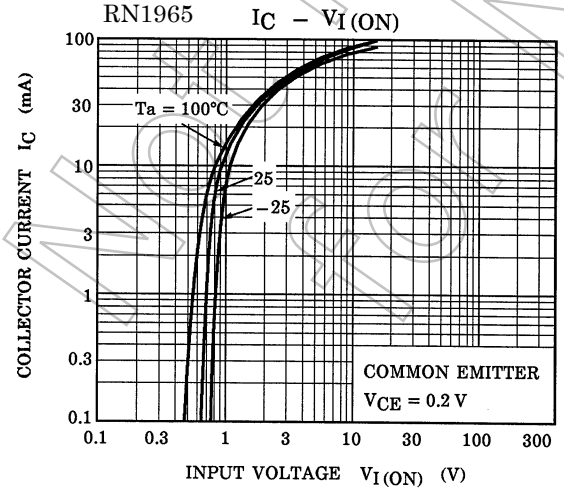
RN1963 $I_C - V_{I(ON)}$



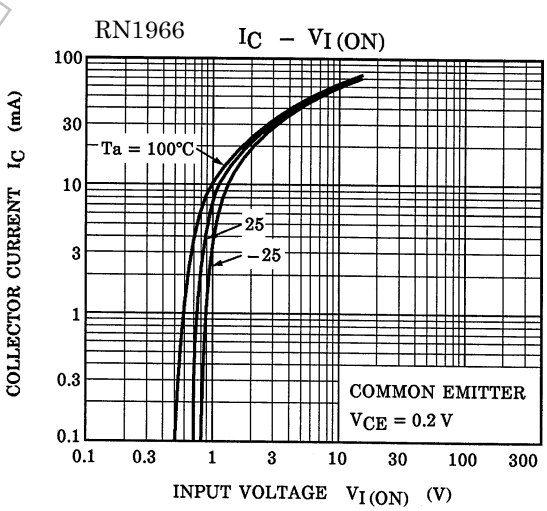
RN1964 $I_C - V_{I(ON)}$



RN1965 $I_C - V_{I(ON)}$



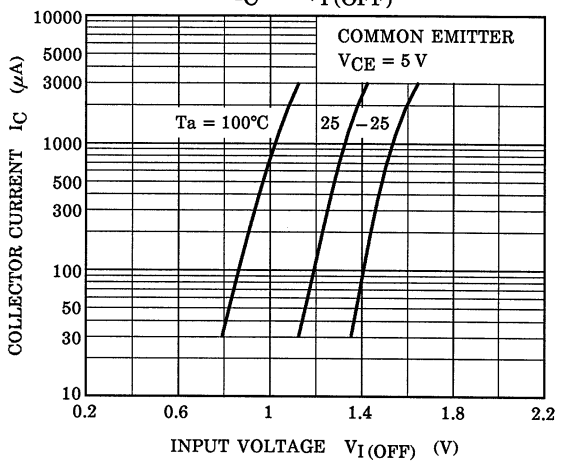
RN1966 $I_C - V_{I(ON)}$



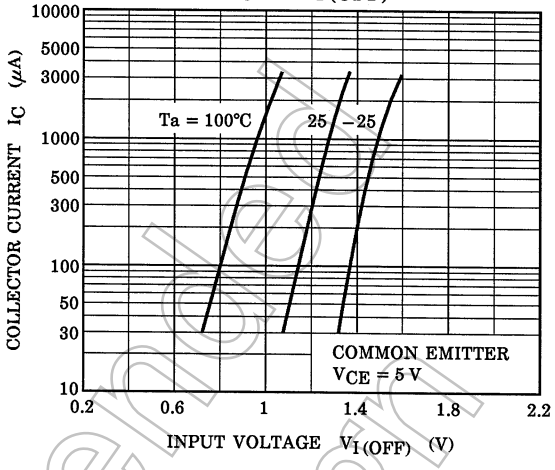
The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Characteristics Curves (Q1, Q2 Common)

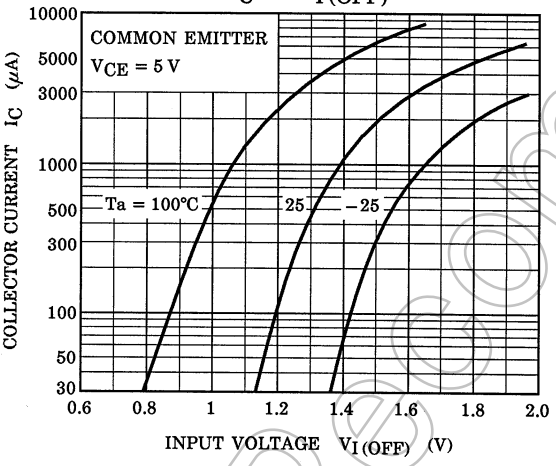
RN1961 I_C – $V_{I(OFF)}$



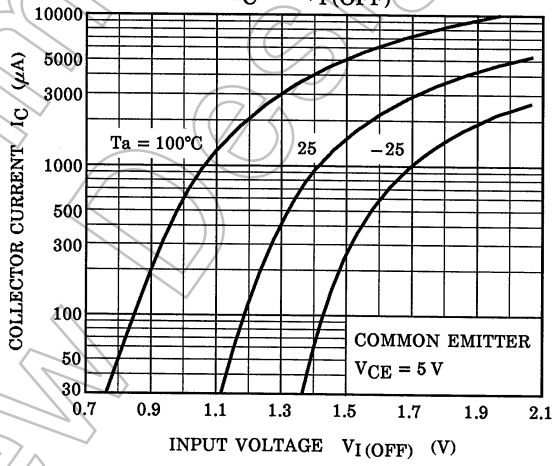
RN1962 I_C – $V_{I(OFF)}$



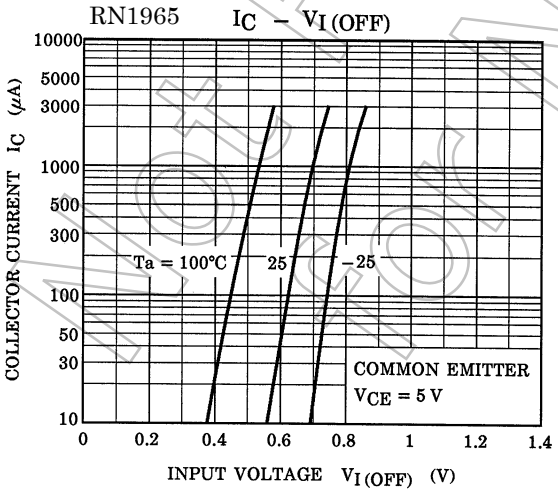
RN1963 I_C – $V_{I(OFF)}$



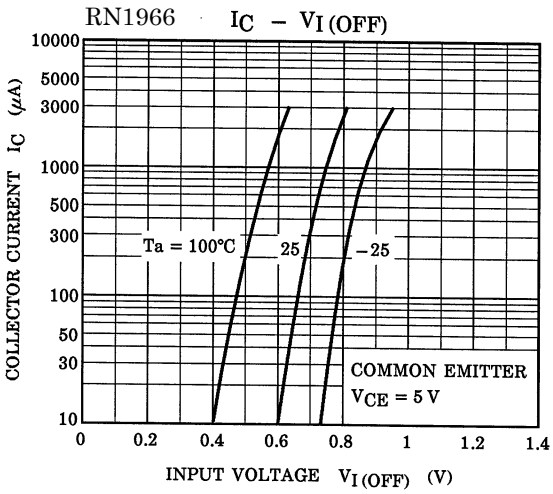
RN1964 I_C – $V_{I(OFF)}$



RN1965 I_C – $V_{I(OFF)}$



RN1966 I_C – $V_{I(OFF)}$



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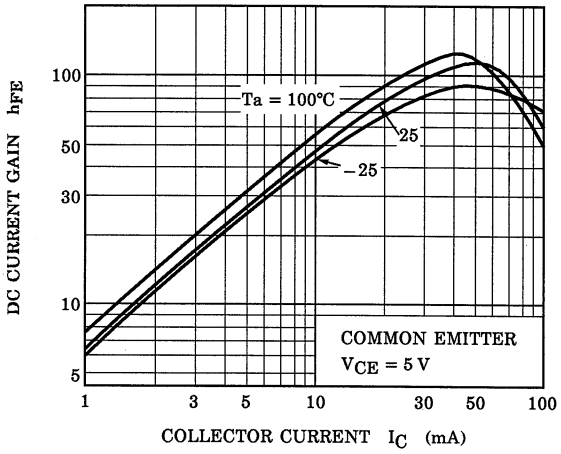
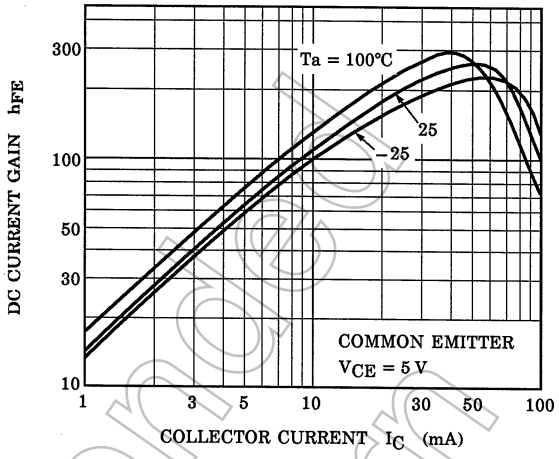
Characteristics Curves (Q1, Q2 Common)

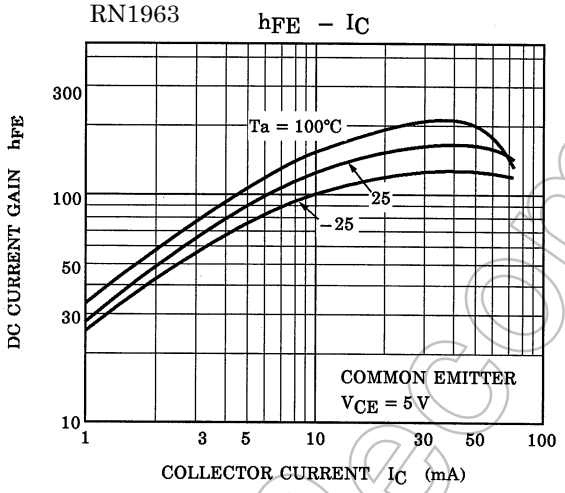
RN1961 h_{FE} – I_C



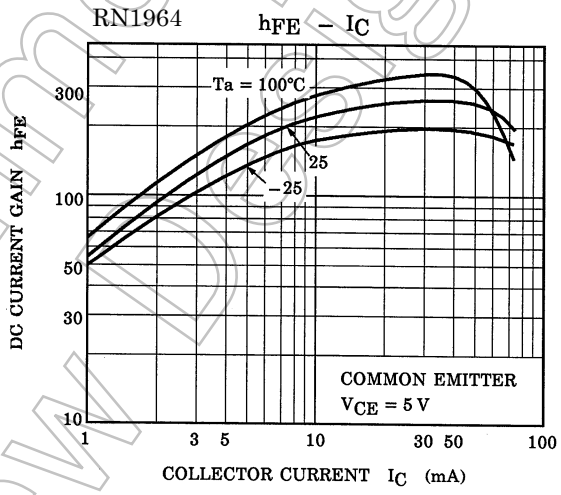
RN1962 h_{FE} – I_C



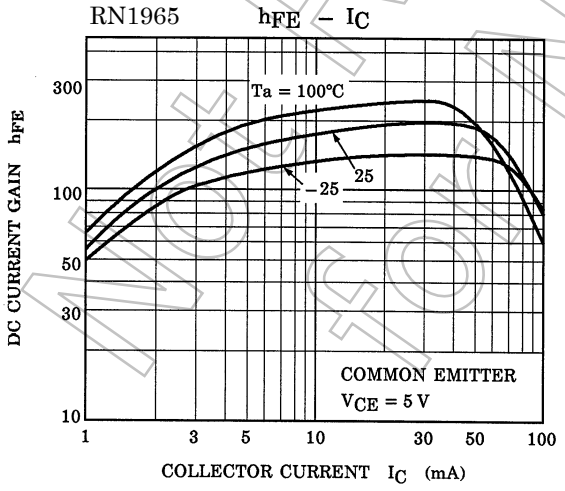
RN1963 h_{FE} – I_C



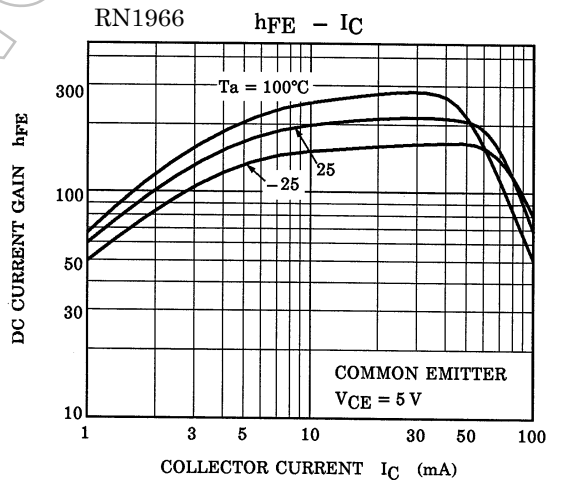
RN1964 h_{FE} – I_C



RN1965 h_{FE} – I_C



RN1966 h_{FE} – I_C



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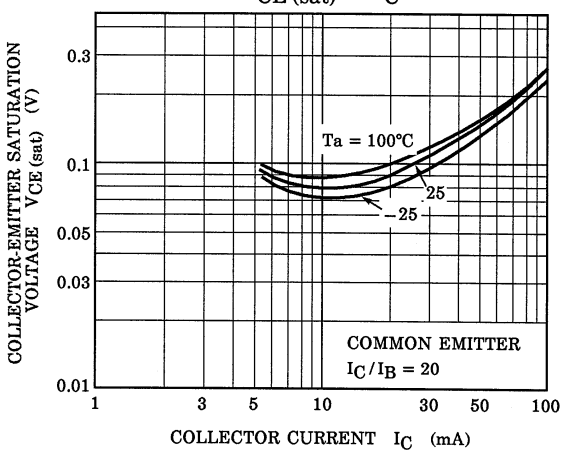
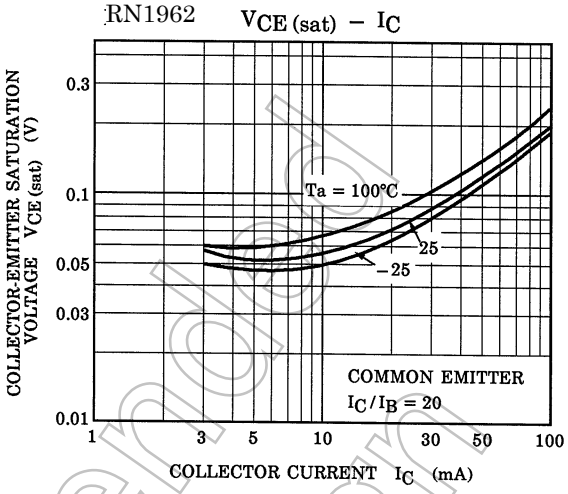
Characteristics Curves (Q1, Q2 Common)

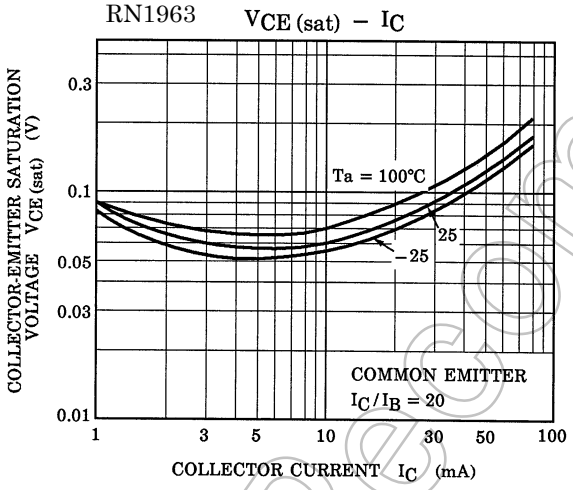
RN1961 $V_{CE\,(sat)} - I_C$



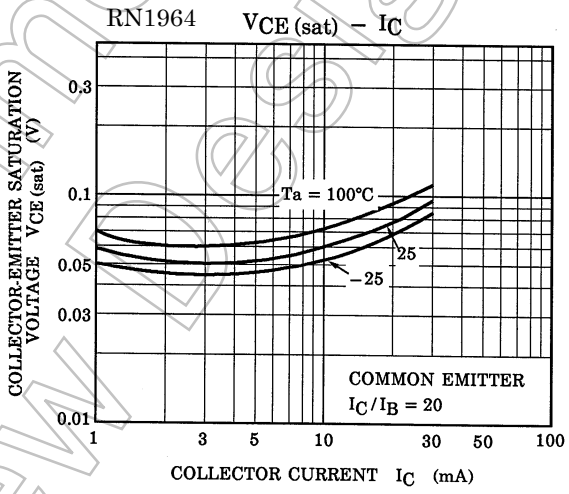
RN1962 $V_{CE\,(sat)} - I_C$



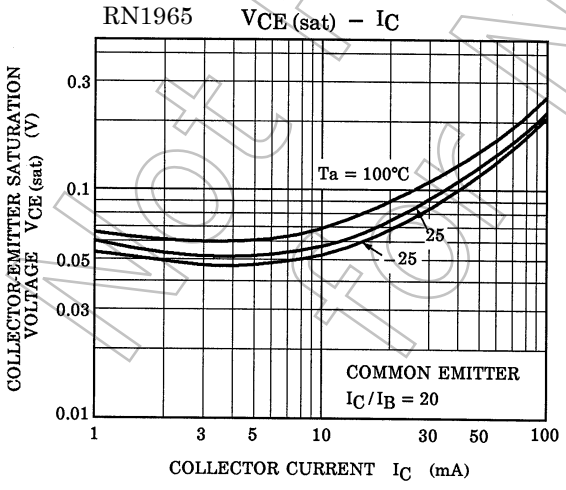
RN1963 $V_{CE\,(sat)} - I_C$



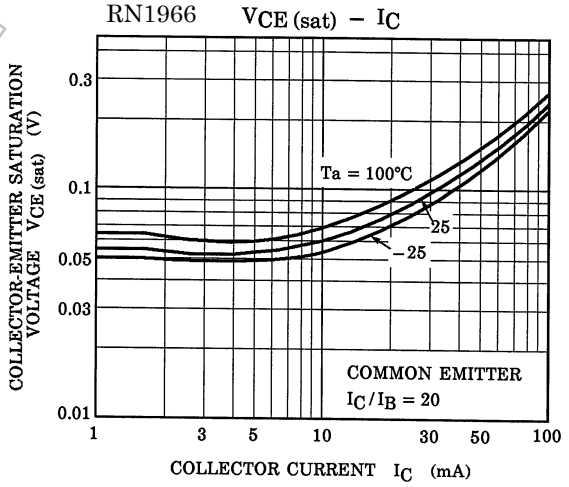
RN1964 $V_{CE\,(sat)} - I_C$



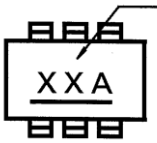
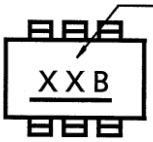
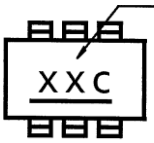
RN1965 $V_{CE\,(sat)} - I_C$



RN1966 $V_{CE\,(sat)} - I_C$



Marking

Part No.	Marking
RN1961	Part No.(abbreviation code) 
RN1962	Part No.(abbreviation code) 
RN1963	Part No.(abbreviation code) 
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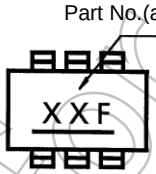
RN1965	Part No.(abbreviation code) 
RN1966	Part No.(abbreviation code) 

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