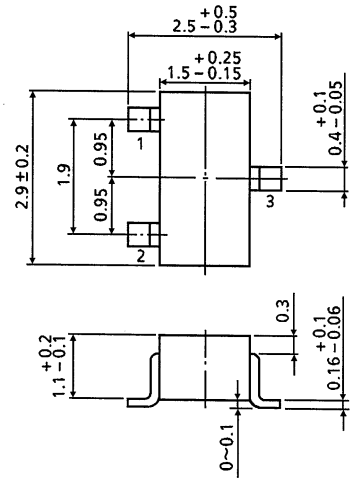
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

RN1401, RN1402, RN1403
RN1404, RN1405, RN1406

Switching, Inverter Circuit, Interface Circuit
and Driver Circuit Applications

- With built-in bias resistors
- Simplified circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2401 to RN2406

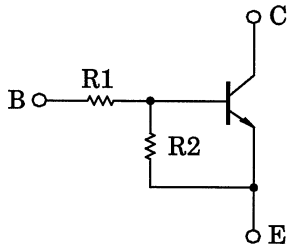
Unit: mm



JEDEC	TO-236MOD
JEITA	SC-59
TOSHIBA	2-3F1A

Weight: 0.012g (typ.)

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ	R2 (kΩ
RN1401	4.7	4.7
RN1402	10	10
RN1403	22	22
RN1404	47	47
RN1405	2.2	47
RN1406	4.7	47

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1401 to 1406	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1401 to 1404	V_{EBO}	10	V
	RN1405, 1406		5	
Collector current	RN1401 to 1406	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

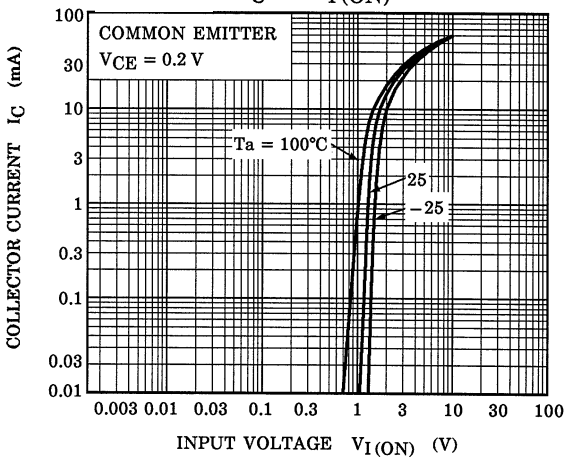
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

Start of commercial production
1983-06

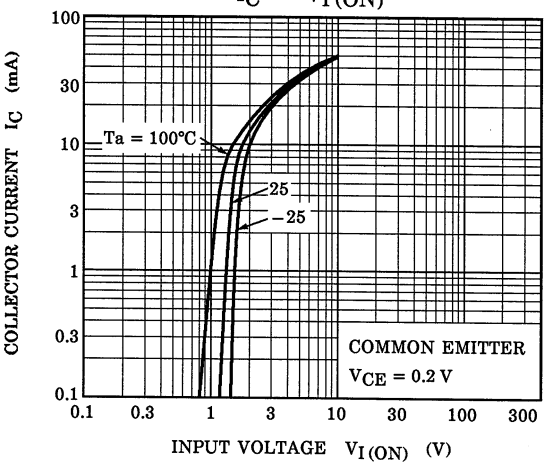
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1401 to 1406	I_{CBO}	—	V_{CB} = 50 V, I_E = 0	—	—	100	nA
		I_{CEO}		V_{CE} = 50 V, I_B = 0	—	—	500	
Emitter cut-off current	RN1401	I_{EBO}	—	V_{EB} = 10 V, I_C = 0	0.82	—	1.52	mA
	RN1402				0.38	—	0.71	
	RN1403				0.17	—	0.33	
	RN1404				0.082	—	0.15	
	RN1405			V_{EB} = 5 V, I_C = 0	0.078	—	0.145	
	RN1406				0.074	—	0.138	
DC current gain	RN1401	h_{FE}	—	V_{CE} = 5 V, I_C = 10 mA	30	—	—	—
	RN1402				50	—	—	
	RN1403				70	—	—	
	RN1404				80	—	—	
	RN1405				80	—	—	
	RN1406				80	—	—	
Collector-emitter saturation voltage	RN1401 to 1406	$V_{CE\ (sat)}$	—	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1401	$V_{I\ (ON)}$	—	V_{CE} = 0.2 V, I_C = 5 mA	1.1	—	2.0	V
	RN1402				1.2	—	2.4	
	RN1403				1.3	—	3.0	
	RN1404				1.5	—	5.0	
	RN1405				0.6	—	1.1	
	RN1406				0.7	—	1.3	
Input voltage (OFF)	RN1401 to 1404	$V_{I\ (OFF)}$	—	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	V
	RN1405, 1406				0.5	—	0.8	
Transition frequency	RN1401 to 1406	f_T	—	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector Output capacitance	RN1401 to 1406	C_{ob}	—	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	3	6	pF
Input resistor	RN1401	R1	—	—	3.29	4.7	6.11	kΩ
	RN1402				7	10	13	
	RN1403				15.4	22	28.6	
	RN1404				32.9	47	61.1	
	RN1405				1.54	2.2	2.86	
	RN1406				3.29	4.7	6.11	
Resistor ratio	RN1401 to 1404	R1/R2	—	—	0.9	1.0	1.1	—
	RN1405				0.0421	0.0468	0.0515	
	RN1406				0.09	0.1	0.11	

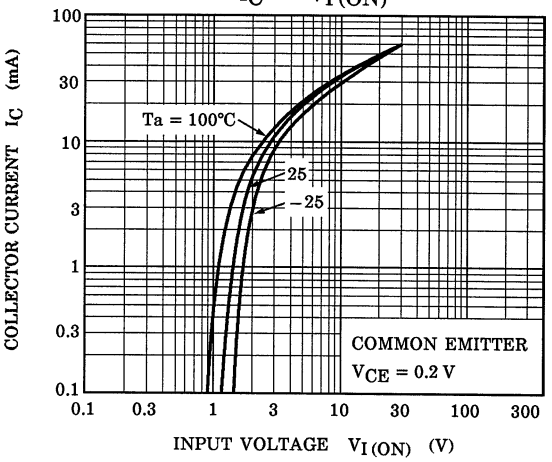
RN1401 $I_C - V_{I(ON)}$



RN1402 $I_C - V_{I(ON)}$



RN1403 $I_C - V_{I(ON)}$



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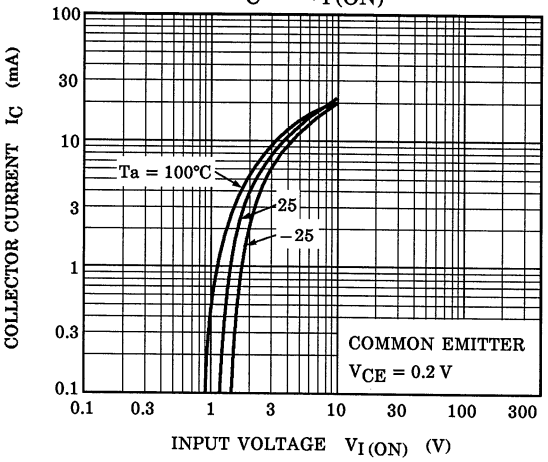
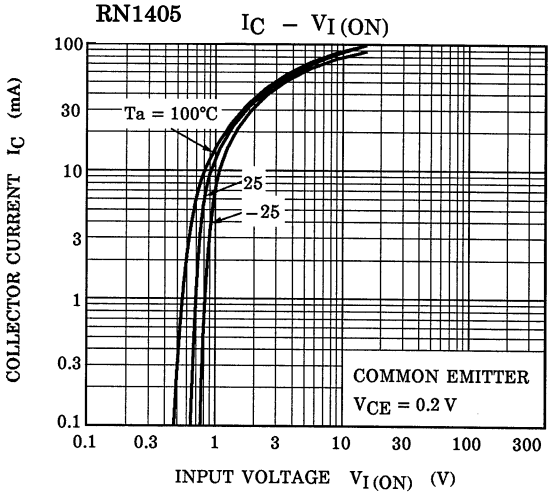


RN1405 $I_C - V_{I(ON)}$



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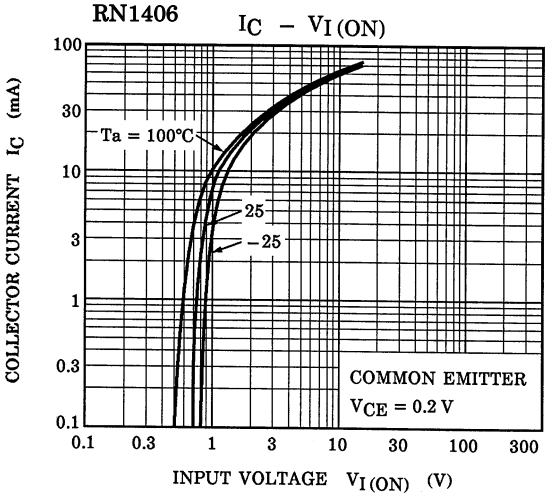
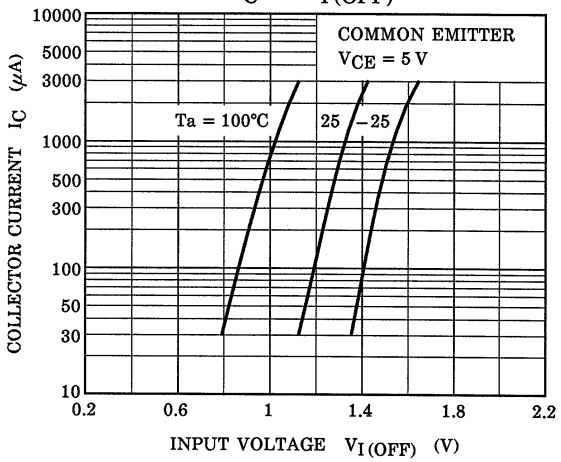


RN1401 I_C – $V_{I(OFF)}$



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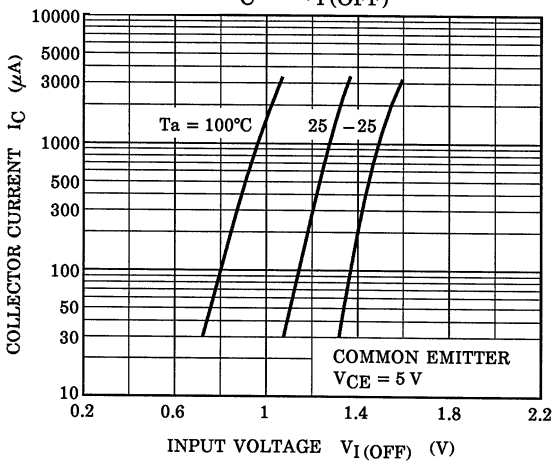

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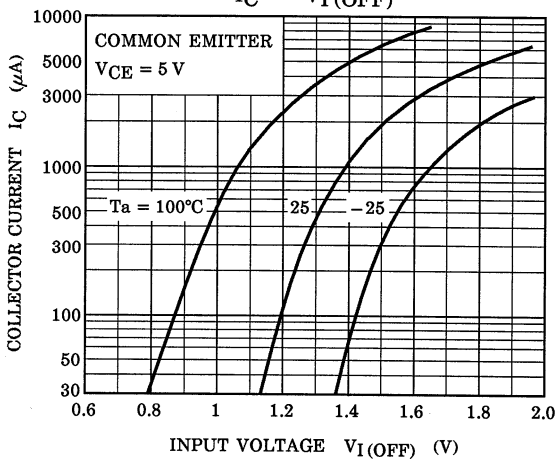

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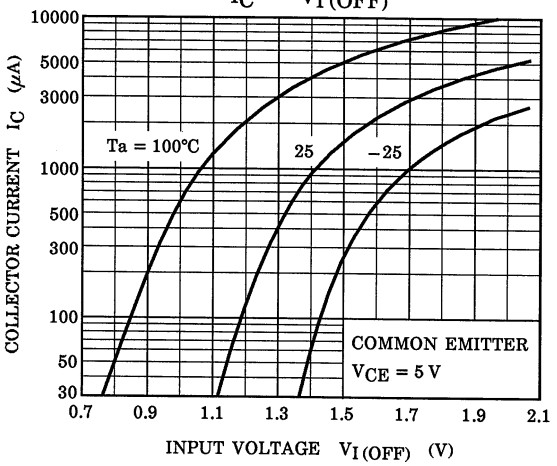

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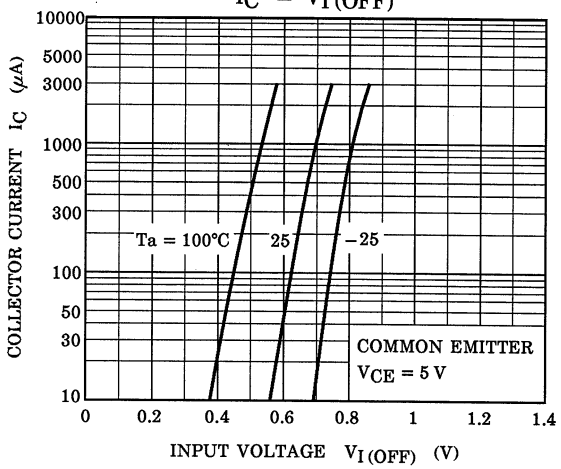

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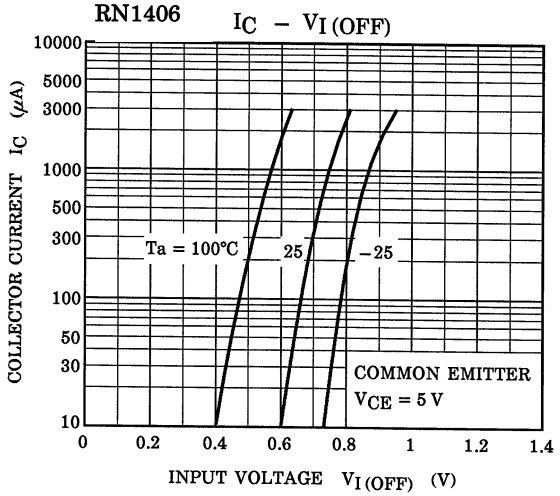
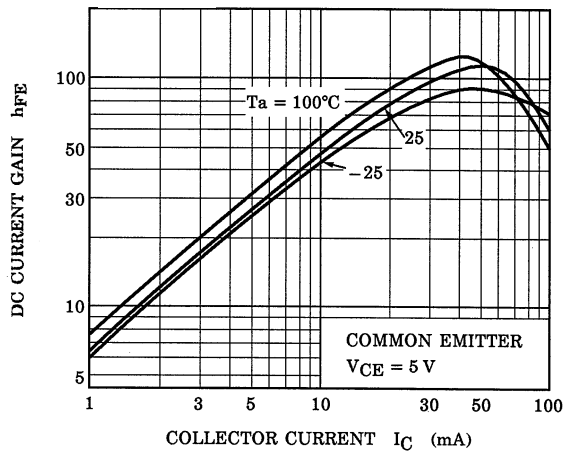


RN1401 h_{FE} – I_C



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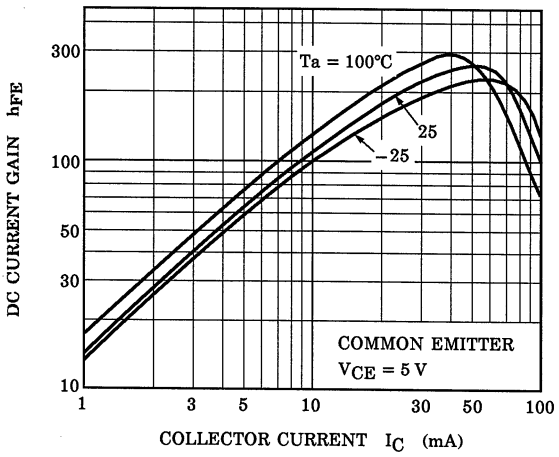

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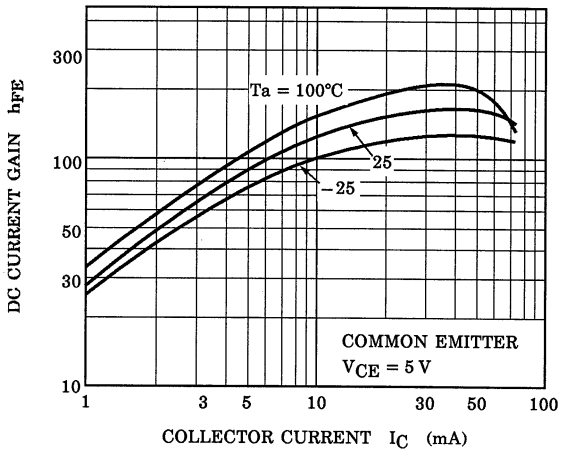

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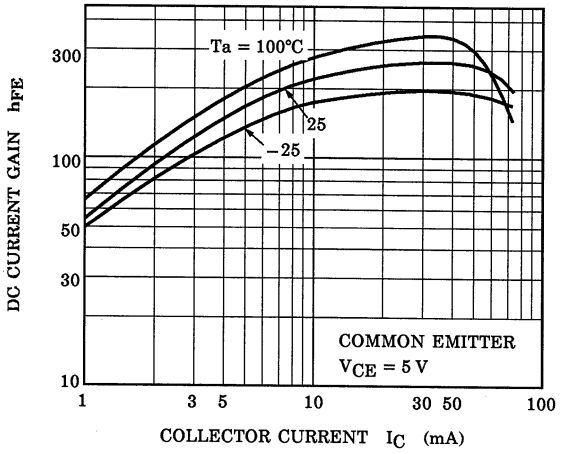

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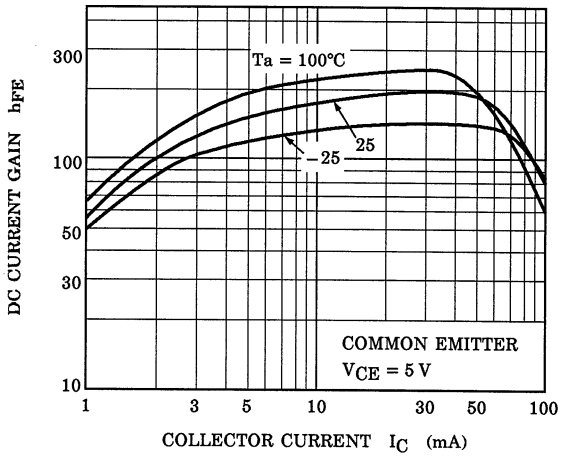

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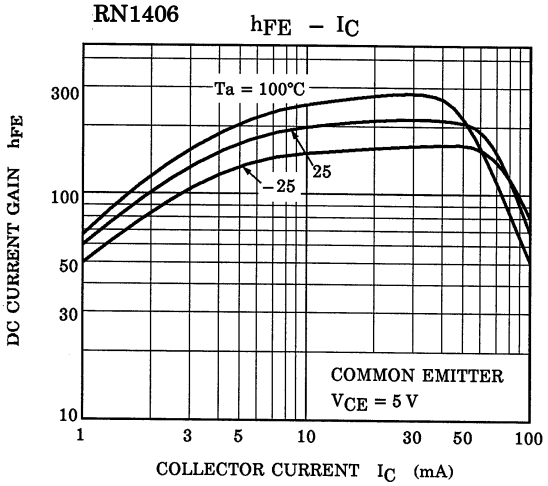
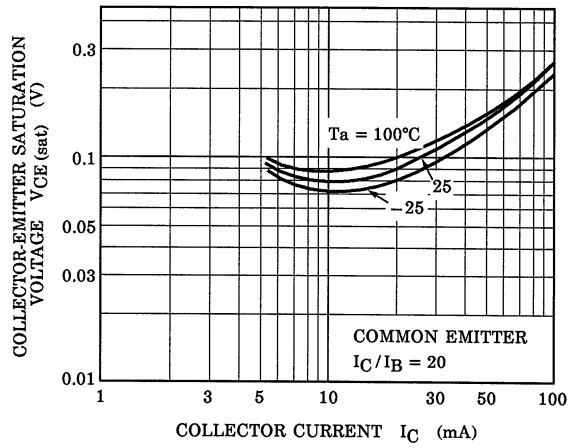


RN1401 $V_{CE\,(sat)}$ – I_C



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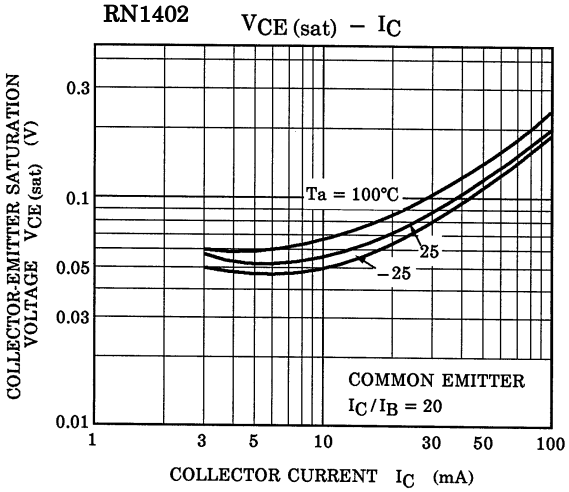

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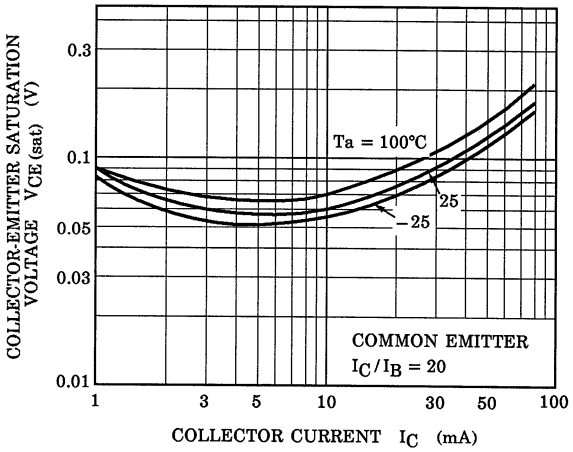

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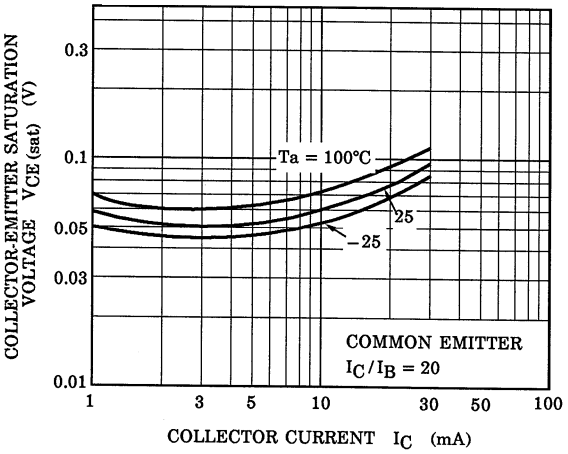

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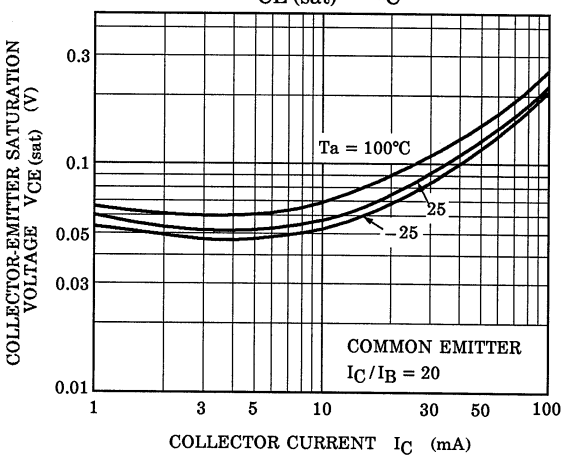
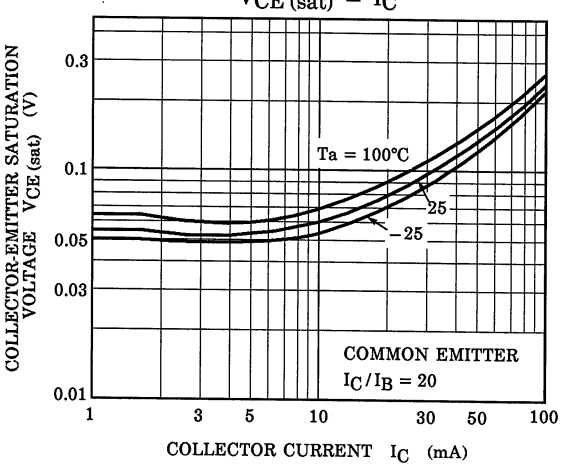


RN1406 $V_{CE\,(sat)}$ – I_C



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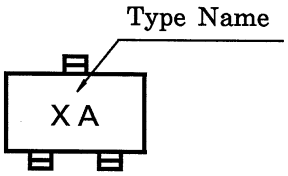
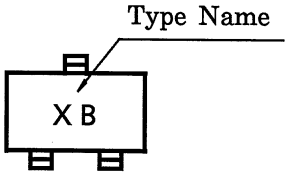
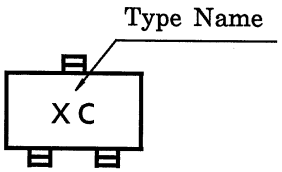
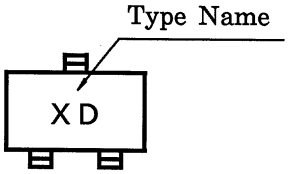
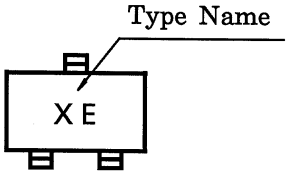
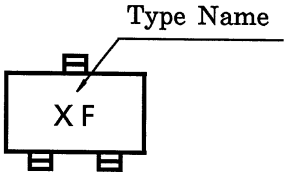
RN1401	
RN1402	
RN1403	
RN1404	
RN1405	
RN1406	

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