

TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

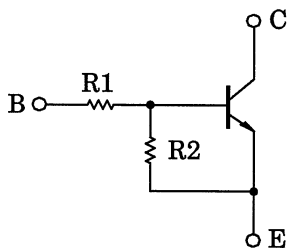
## RN1401, RN1402, RN1403 RN1404, RN1405, RN1406

Switching, Inverter Circuit, Interface Circuit  
And Driver Circuit Applications

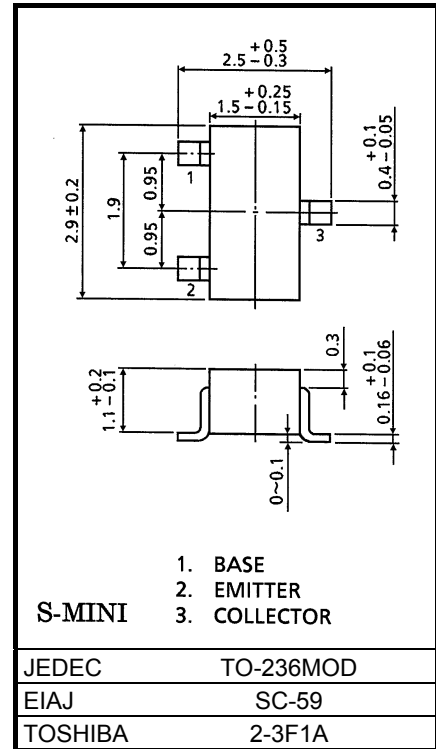
Unit: mm

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

### 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



Weight: 0.012g

### Absolute Maximum Ratings (Ta = 25°C)

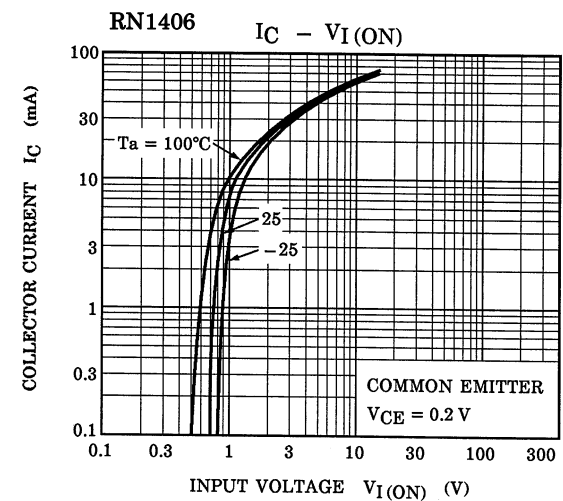
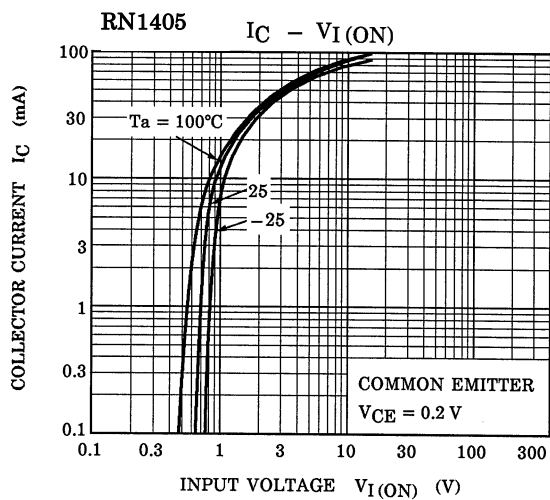
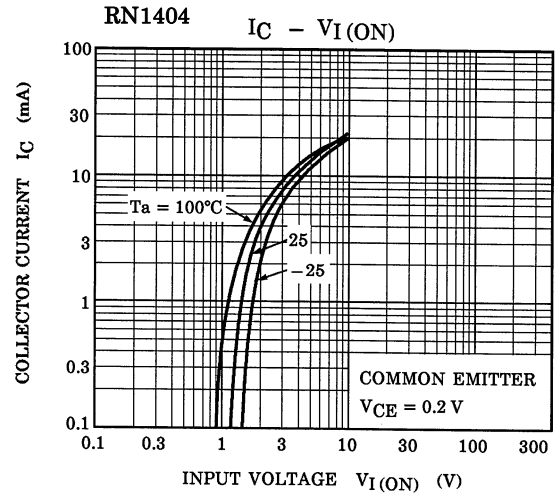
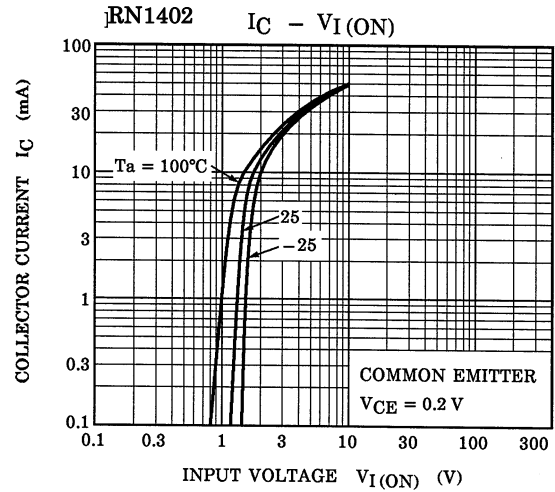
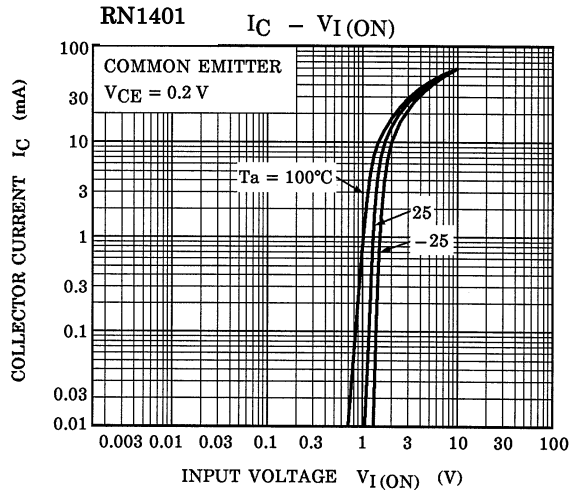
Characteristic	Symbol	Rating	Unit
Collector-base voltage	V <sub>CB0</sub>	50	V
Collector-emitter voltage			
Emitter-base voltage	V <sub>EBO</sub>	10	V
		5	
Collector current	I <sub>C</sub>	100	mA
Collector power dissipation	P <sub>C</sub>	200	mW
Junction temperature	T <sub>j</sub>	150	°C
Storage temperature range	T <sub>stg</sub>	-55~150	°C

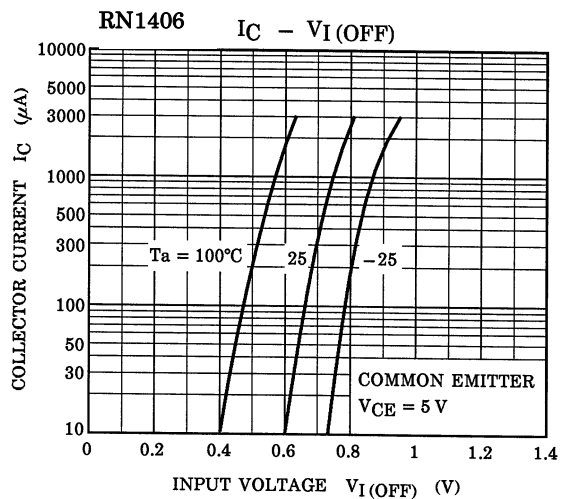
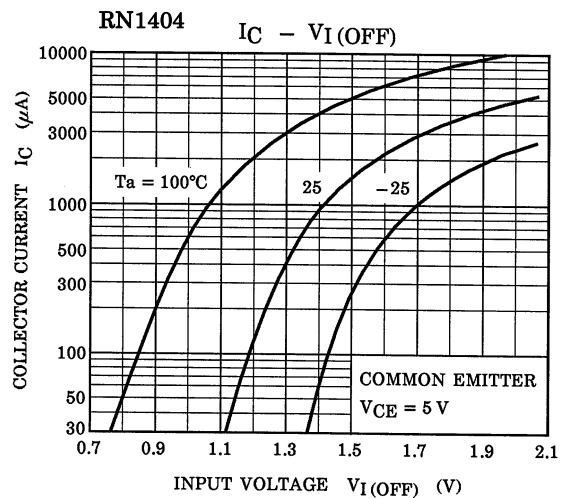
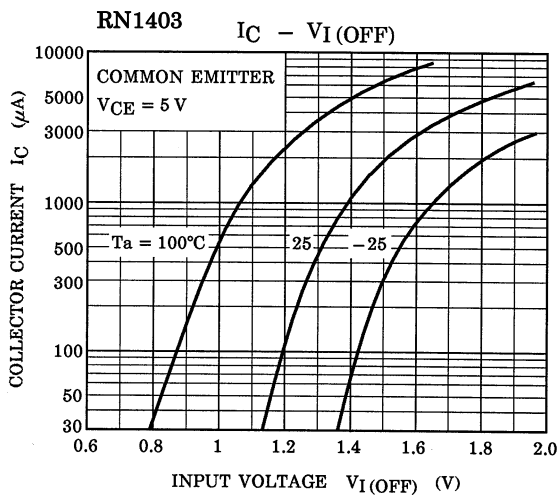
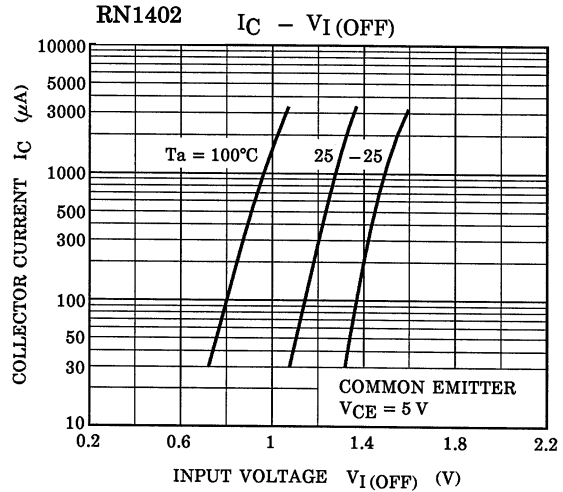
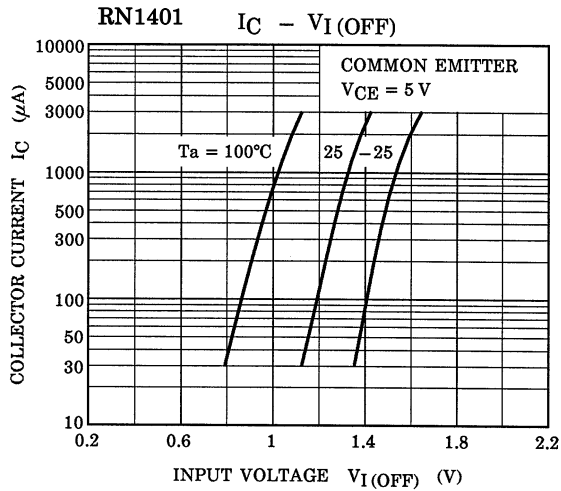
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

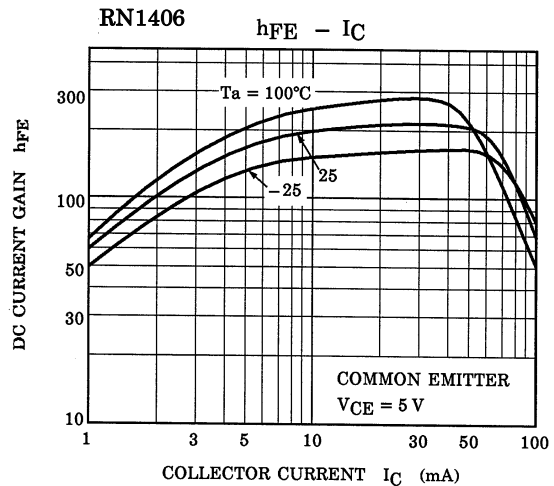
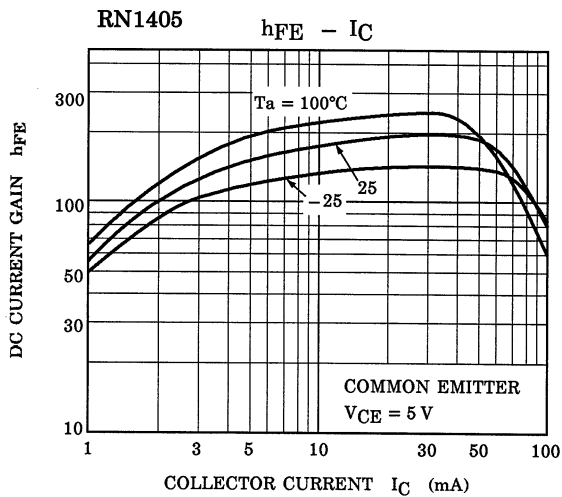
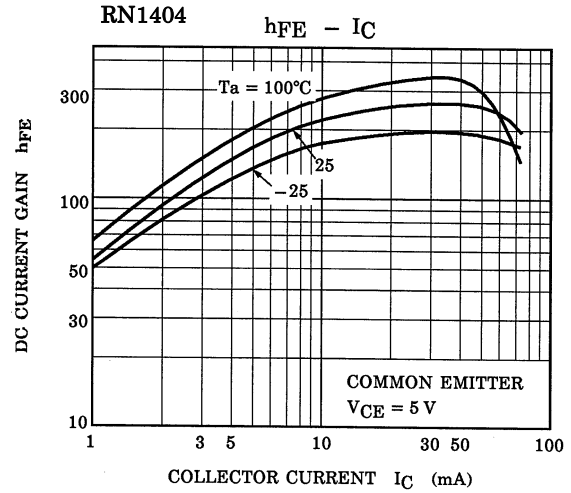
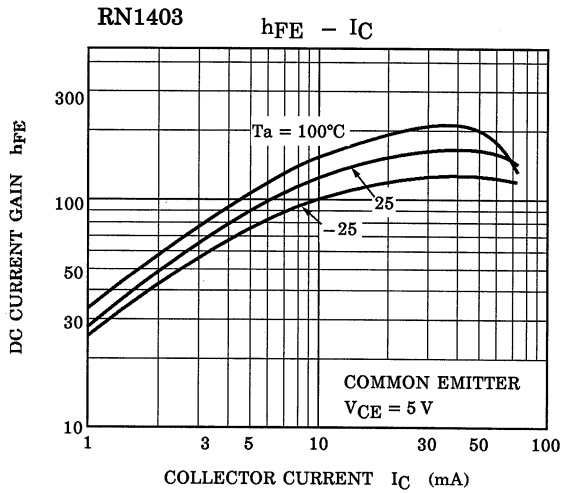
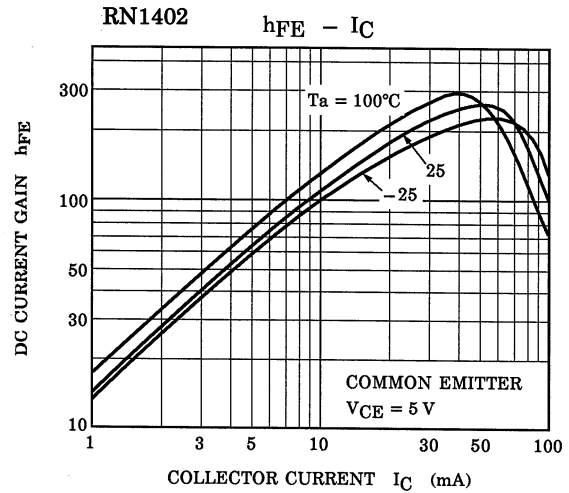
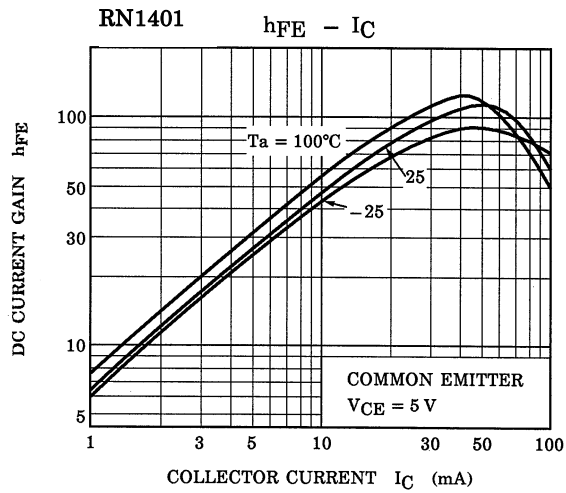
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

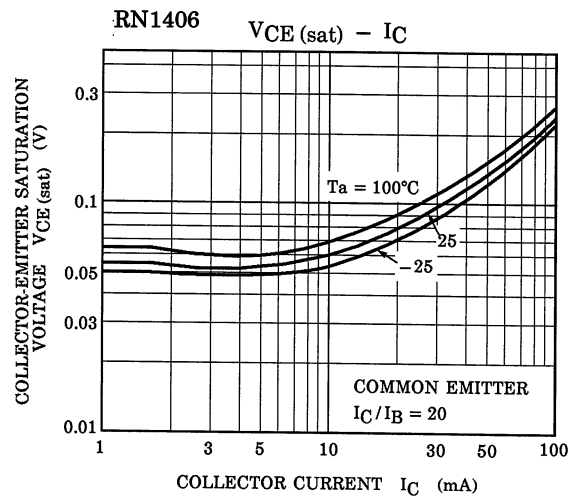
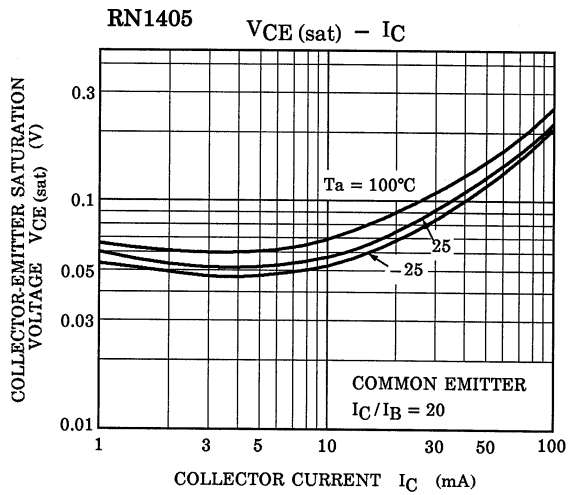
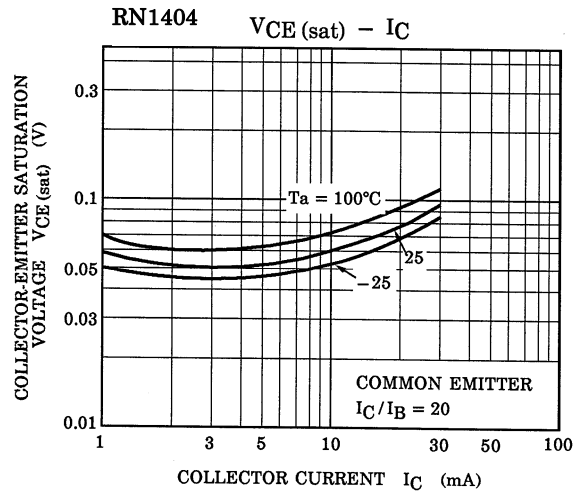
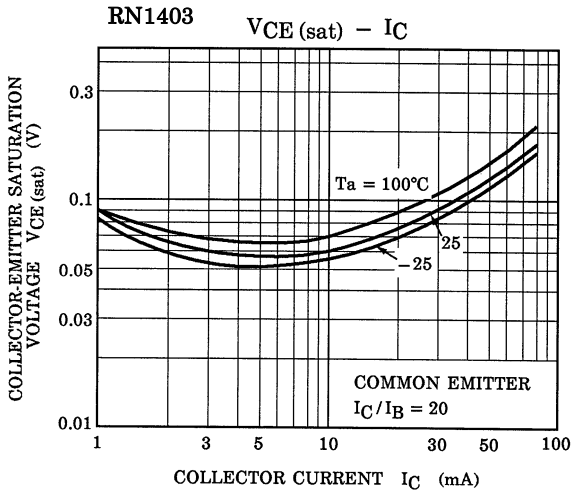
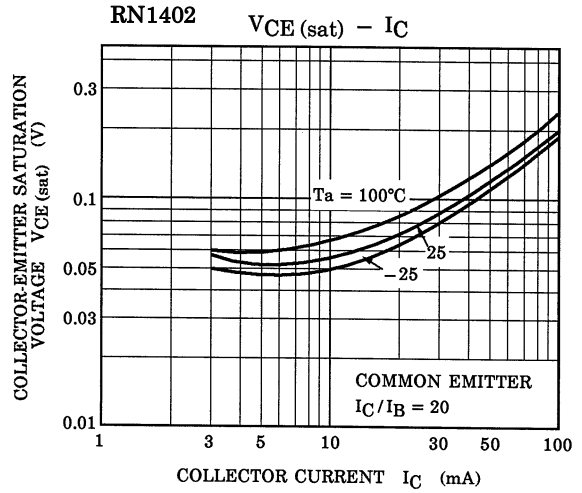
## Electrical Characteristics (Ta = 25°C)

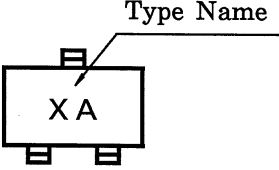
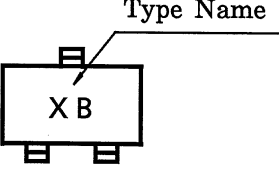
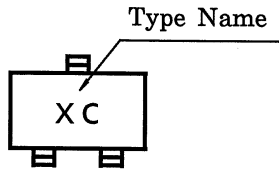
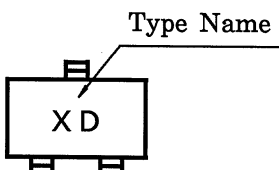
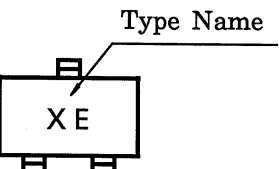
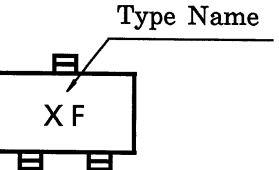
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1401~1406	$I_{CBO}$	—	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$		$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1401	$I_{EBO}$	—	$V_{EB} = 10\text{ V}, I_C = 0$	0.82	—	1.52	mA
	RN1402				0.38	—	0.71	
	RN1403				0.17	—	0.33	
	RN1404				0.082	—	0.15	
	RN1405			$V_{EB} = 5\text{ V}, I_C = 0$	0.078	—	0.145	
	RN1406				0.074	—	0.138	
DC current gain	RN1401	$h_{FE}$	—	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	30	—	—	—
	RN1402				50	—	—	
	RN1403				70	—	—	
	RN1404				80	—	—	
	RN1405				80	—	—	
	RN1406				80	—	—	
Collector-emitter saturation voltage	RN1401~1406	$V_{CE(sat)}$	—	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1401	$V_{I(ON)}$	—	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	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)	RN1401~1404	$V_{I(OFF)}$	—	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	1.0	—	1.5	V
	RN1405, 1406				0.5	—	0.8	
Transition frequency	RN1401~1406	$f_T$	—	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector Output capacitance	RN1401~1406	$C_{ob}$	—	$V_{CB} = 10\text{ V}, I_E = 0,$ $f = 1\text{ MHz}$	—	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	RN1401~1404	R1/R2	—	—	0.9	1.0	1.1	—
	RN1405				0.0421	0.0468	0.0515	
	RN1406				0.09	0.1	0.11	









Type Name	Marking
RN1401	
RN1402	
RN1403	
RN1404	
RN1405	
RN1406	

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20070701-EN GENERAL

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