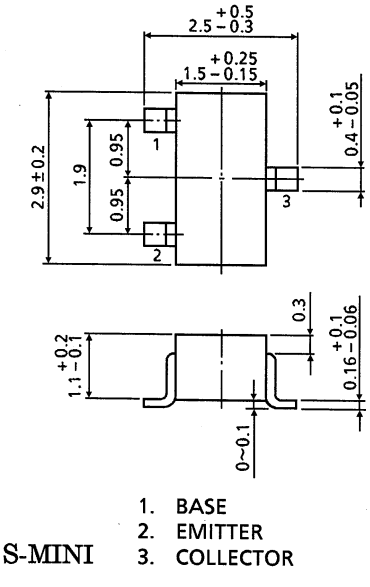
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

RN1414, RN1415, RN1416, RN1417, RN1418

Switching, Inverter Circuit, Interface Circuit
and Driver Circuit Applications

- With built-in bias resistors
- Simplified circuit design
- Reduced number of parts and simplified manufacturing process
- Complementary to RN2414 to RN2418

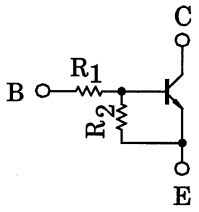
Unit: mm



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)
RN1414	1	10
RN1415	2.2	10
RN1416	4.7	10
RN1417	10	4.7
RN1418	47	10

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1414 to 1418	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1414	V_{EBO}	5	V
	RN1415		6	
	RN1416		7	
	RN1417		15	
	RN1418		25	
Collector current	RN1414 to 1418	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

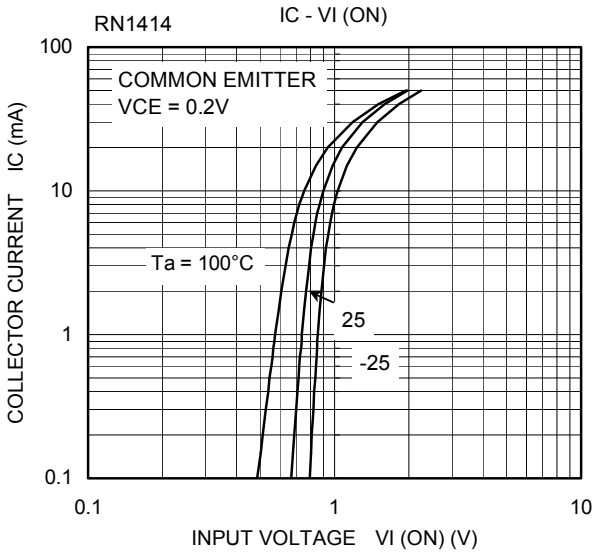
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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
1994-08

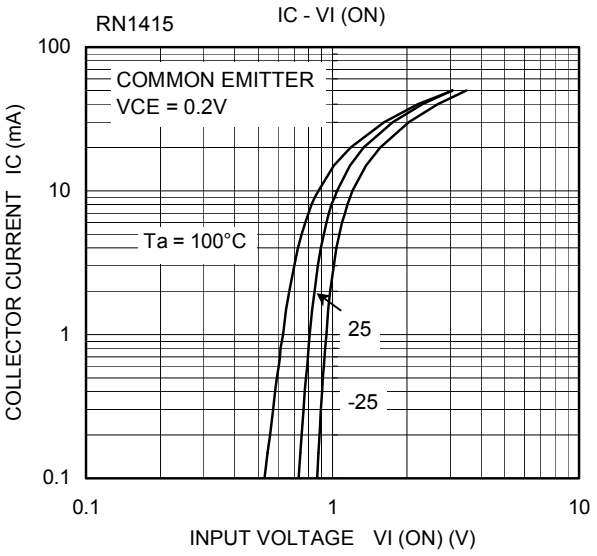
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1414 to 1418	I_{CBO}	—	V_{CB} = 50V, I_E = 0	—	—	100	nA
	RN1414 to 1418	I_{CEO}		V_{CE} = 50V, I_B = 0	—	—	500	nA
Emitter cut-off current	RN1414	I_{EBO}	—	V_{EB} = 5V, I_C = 0	0.35	—	0.65	mA
	RN1415			V_{EB} = 6V, I_C = 0	0.37	—	0.71	
	RN1416			V_{EB} = 7V, I_C = 0	0.36	—	0.68	
	RN1417			V_{EB} = 15V, I_C = 0	0.78	—	1.46	
	RN1418			V_{EB} = 25V, I_C = 0	0.33	—	0.63	
DC current gain	RN1414 to 16,18	h_{FE}	—	V_{CE} = 5V, I_C = 10mA	50	—	—	
	RN1417				30	—	—	
Collector-emitter saturation voltage	RN1414 to 1418	$V_{CE\ (sat)}$	—	I_C = 5mA, I_B = 0.25mA	—	0.1	0.3	V
Input voltage (ON)	RN1414	$V_{I\ (ON)}$	—	V_{CE} = 0.2V, I_C = 5mA	0.6	—	2.0	V
	RN1415				0.7	—	2.5	
	RN1416				0.8	—	2.5	
	RN1417				1.5	—	3.5	
	RN1418				2.5	—	10.0	
Input voltage (OFF)	RN1414	$V_{I\ (OFF)}$	—	V_{CE} = 5V, I_C = 0.1mA	0.3	—	0.9	V
	RN1415				0.3	—	1.0	
	RN1416				0.3	—	1.1	
	RN1417				0.3	—	2.3	
	RN1418				0.5	—	5.7	
Transition frequency	RN1414 to 1418	f_T	—	V_{CE} = 10V, I_C = 5mA	—	250	—	MHz
Collector Output capacitance	RN1414 to 1418	C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1MHz	—	3.0	6.0	pF
Input resistor	RN1414	R1	—	—	0.7	1.0	1.3	kΩ
	RN1415				1.54	2.2	2.86	
	RN1416				3.29	4.7	6.11	
	RN1417				7.0	10.0	13.0	
	RN1418				32.9	47.0	61.1	
Resistor ratio	RN1414	R1/R2	—	—	—	0.1	—	
	RN1415				—	0.22	—	
	RN1416				—	0.47	—	
	RN1417				—	2.13	—	
	RN1418				—	4.7	—	

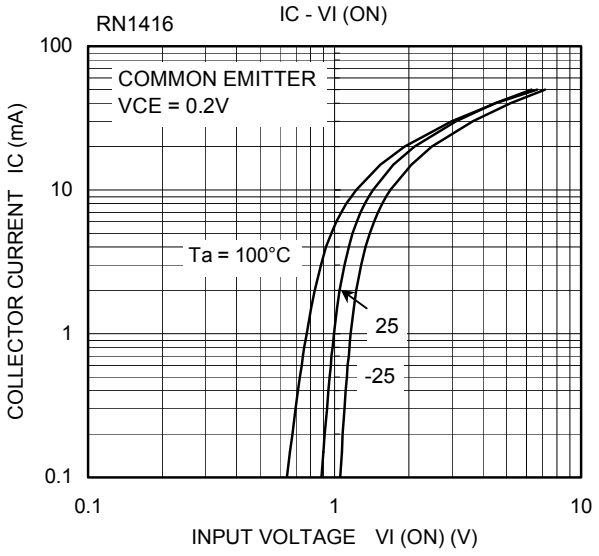
RN1414



RN1415



RN1416



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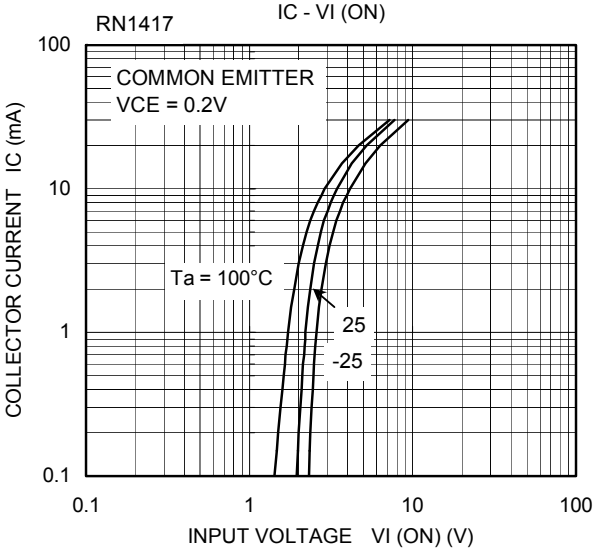
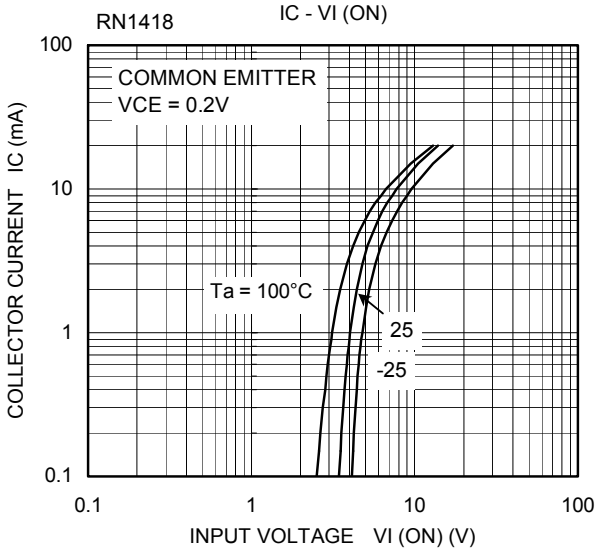
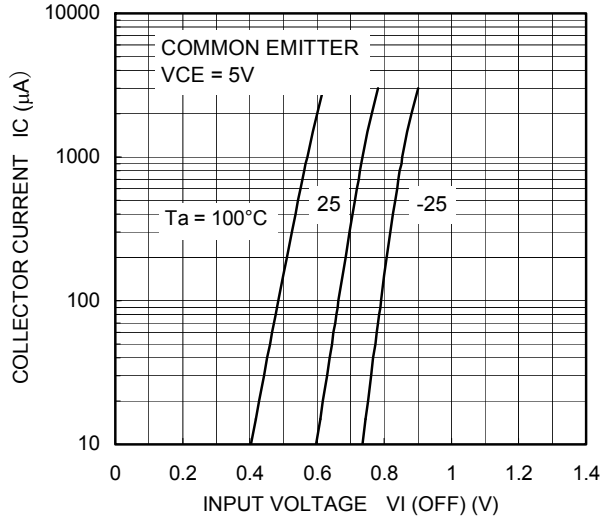


RN1418



RN1414 IC - VI (OFF)



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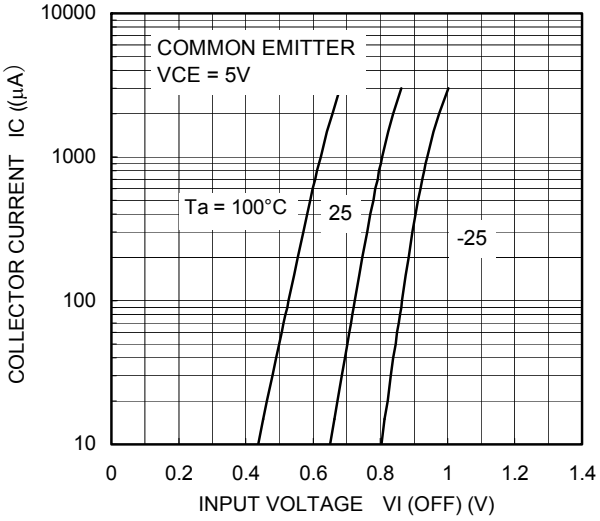

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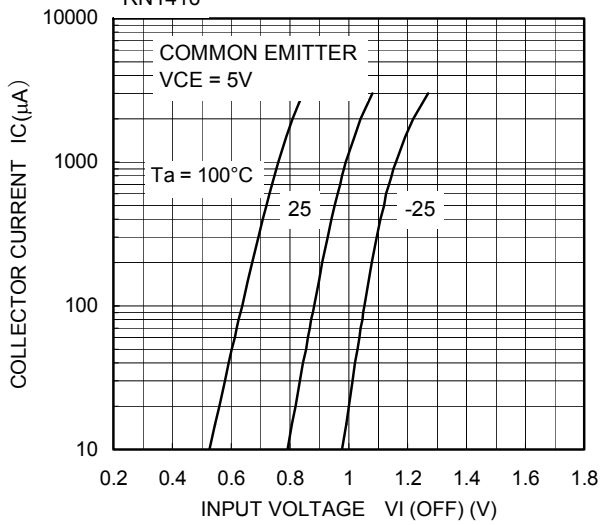

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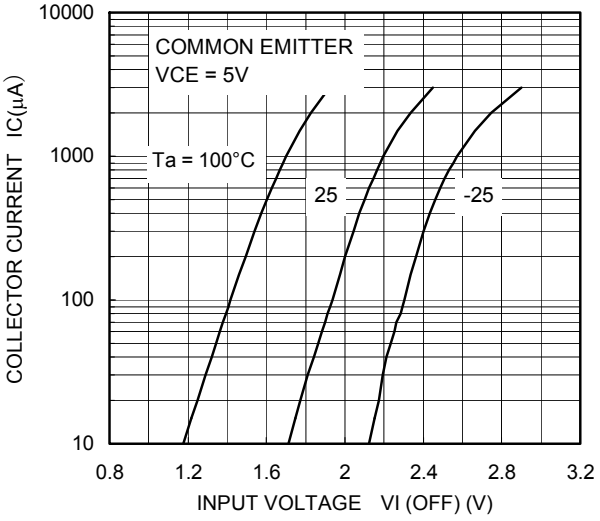

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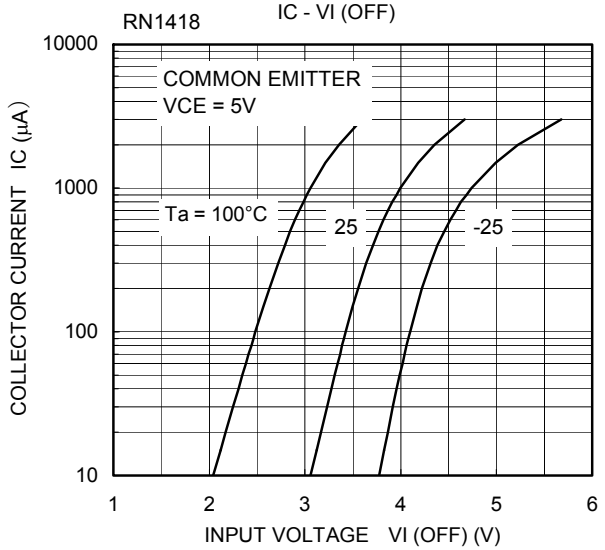

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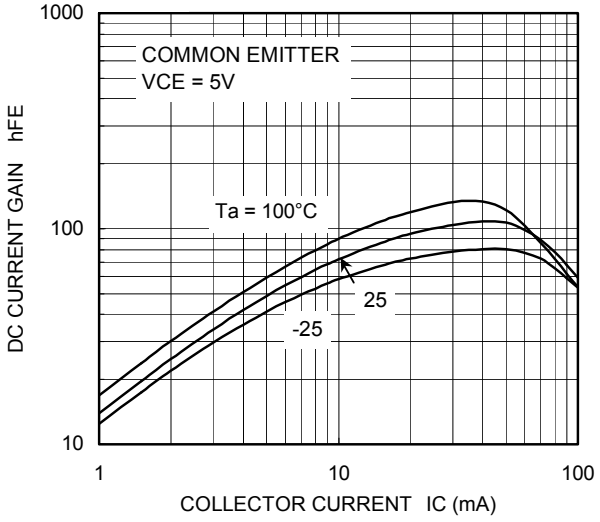

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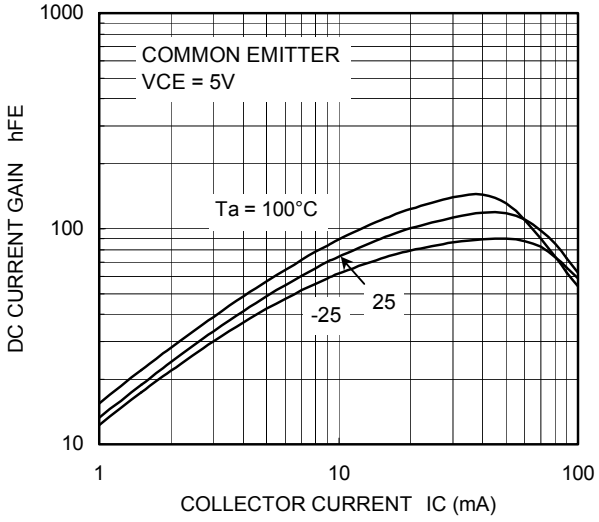

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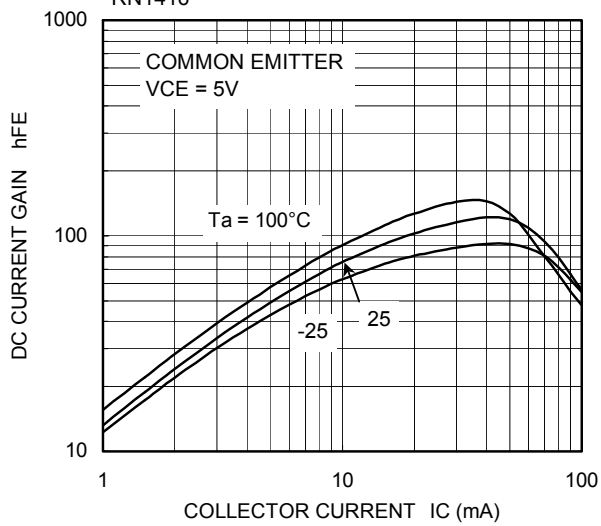

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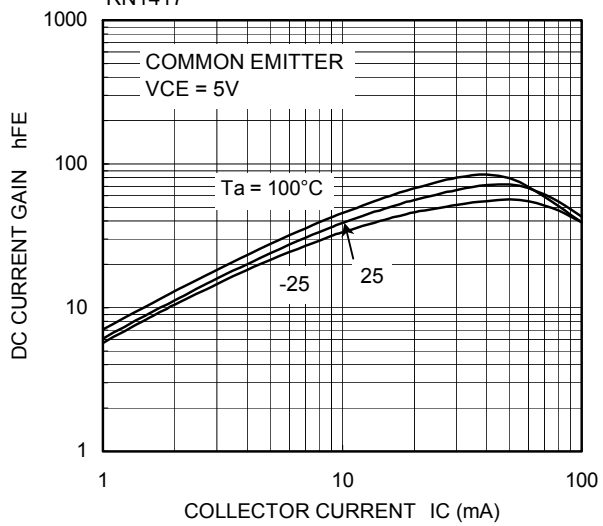

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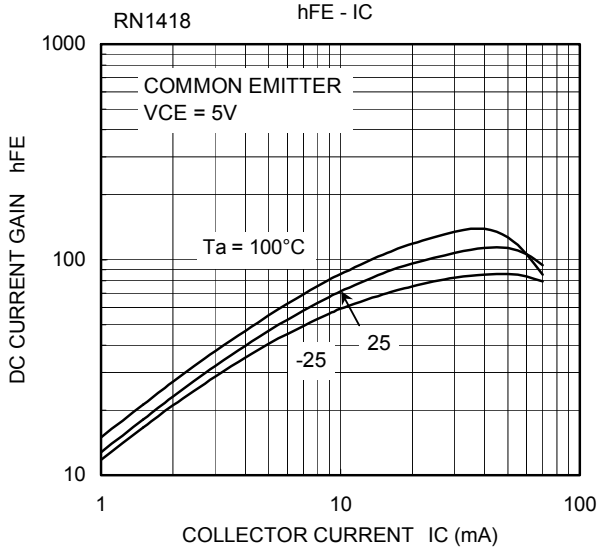
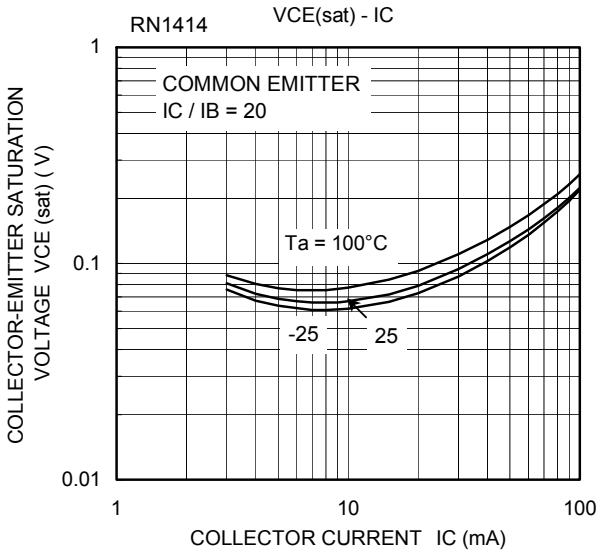
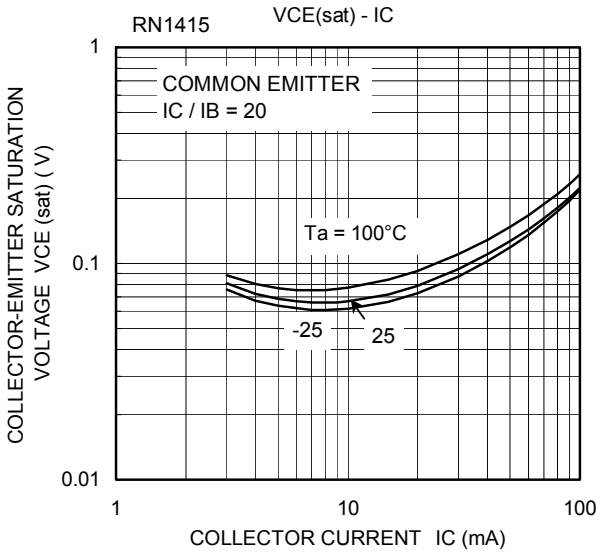
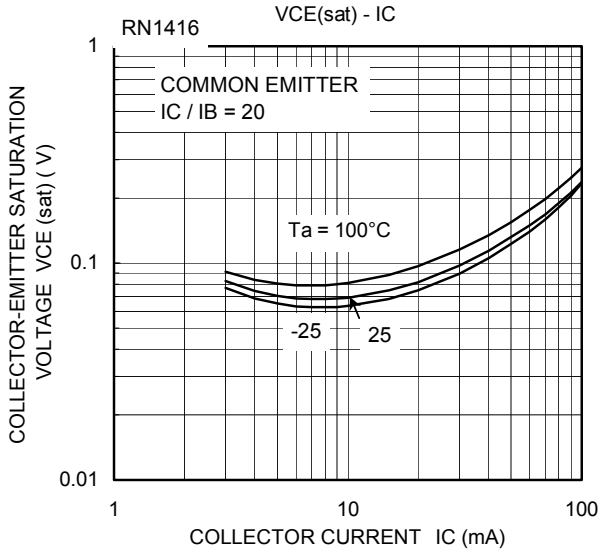
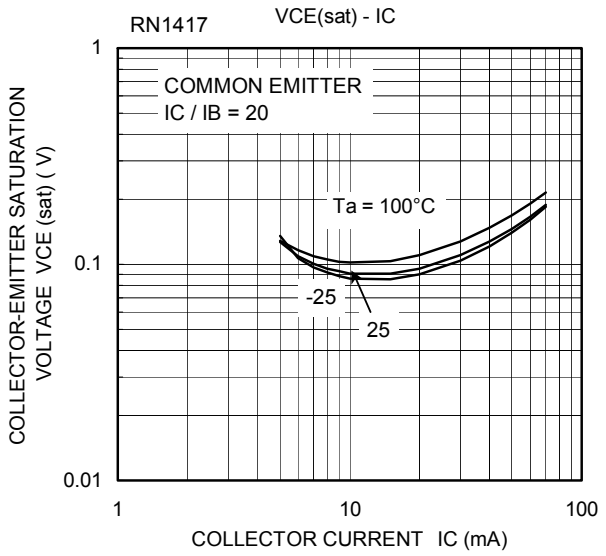



RN1414
VCE(sat) - IC
COMMON EMITTER
IC / IB = 20
Ta = 100°C
-25
25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
COLLECTOR CURRENT IC (mA)
1
0.1
0.01
1
10
100


RN1415
VCE(sat) - IC
COMMON EMITTER
IC / IB = 20
Ta = 100°C
-25
25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
COLLECTOR CURRENT IC (mA)
1
0.1
0.01
1
10
100


RN1416
VCE(sat) - IC
COMMON EMITTER
IC / IB = 20
Ta = 100°C
-25
25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
COLLECTOR CURRENT IC (mA)
1
0.1
0.01
1
10
100


RN1417
VCE(sat) - IC
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COLLECTOR CURRENT IC (mA)
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0.1
0.01
1
10
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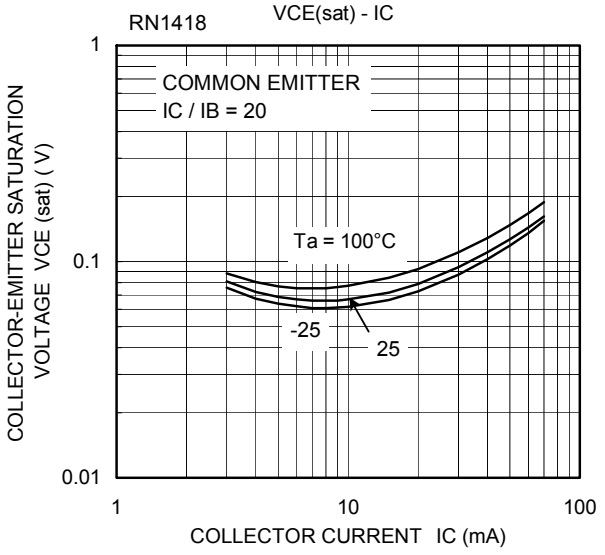
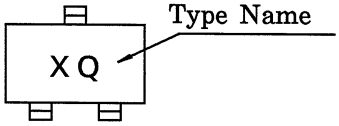
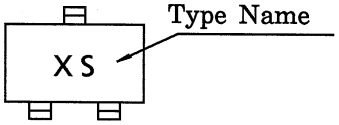
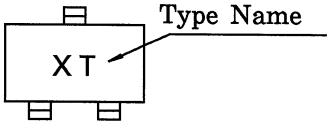
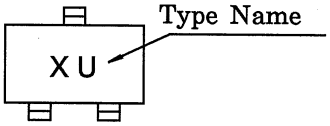
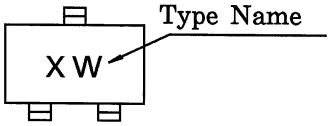

RN1418
VCE(sat) - IC
COMMON EMITTER
IC / IB = 20
Ta = 100°C
-25
25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
COLLECTOR CURRENT IC (mA)
1
0.1
0.01
1
10
100

Type Name	Marking
RN1414	
RN1415	
RN1416	
RN1417	
RN1418	

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