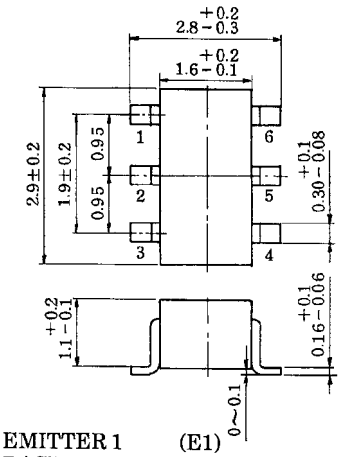
TOSHIBA Transistor Silicon Npn Epitaxial Type (PCT Process)

RN1610,RN1611

Switching, Inverter Circuit, Interface Circuit
And Driver Circuit Applications

- Including two devices in SM6 (super mini type with 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2610, RN2611

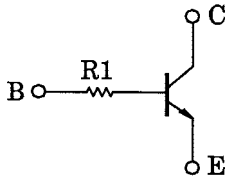
Unit: mm



1. EMITTER 1	(E1)
2. BASE 1	(B1)
3. COLLECTOR 2	(C2)
4. EMITTER 2	(E2)
5. BASE 2	(B2)
6. COLLECTOR 1	(C1)
JEDEC	—
EIAJ	—
TOSHIBA	2-3N1A

Weight: 0.015g

Equivalent Circuit

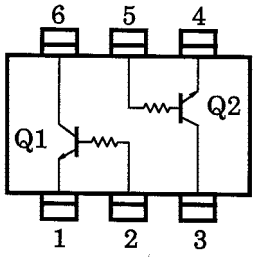


Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

Characterisstic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA
Collector power dissipation	P_C*	300	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°C

* Total rating

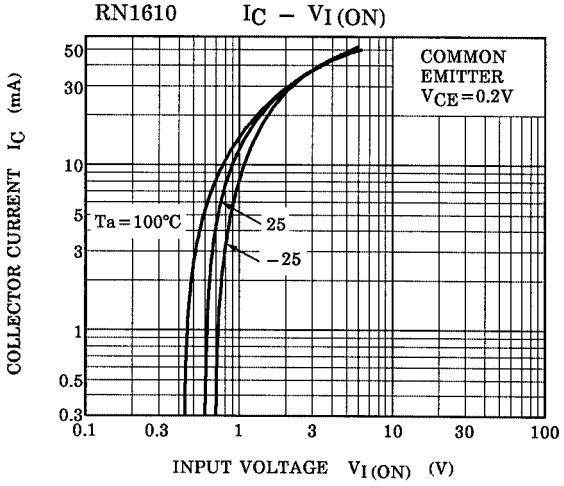
Equivalent Circuit (Top View)

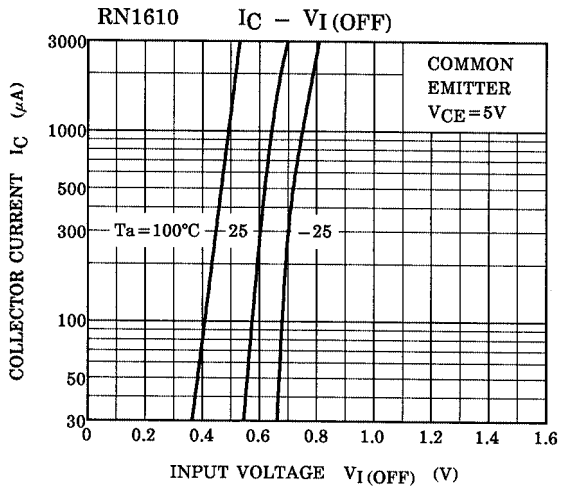


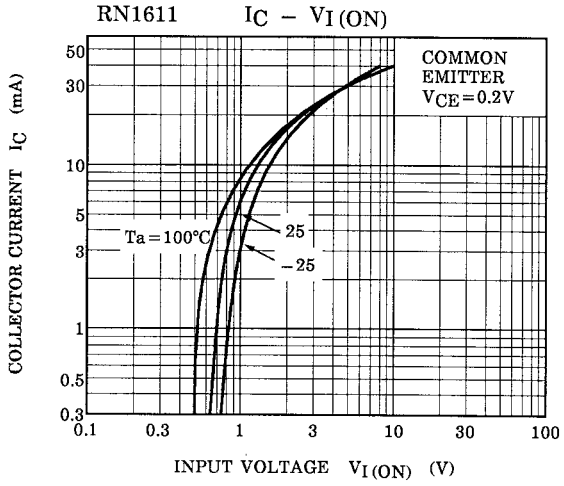
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

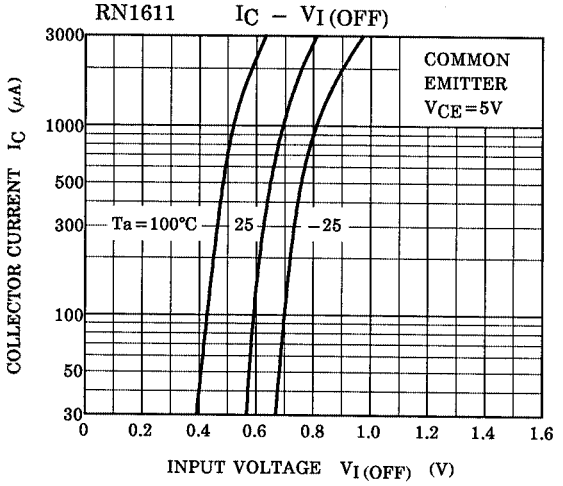
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	—	V_{CB} = 50V, I_E = 0	—	—	100	nA
Emitter cut-off current		I_{EBO}	—	V_{EB} = 50V, I_C = 0	—	—	100	nA
DC current gain		h_{FE}	—	V_{CE} = 50V, I_C = 1mA	120	—	700	—
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	—	I_C = 5mA, I_B = 0.25mA	—	0.1	0.3	V
Translation frequency		f_T	—	V_{CE} = 10V, I_C = 5mA	—	250	—	MHz
Collector output capacitance		C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1MHz	—	3	6	pF
Input resistor	RN1610	R1	—	—	3.29	4.7	6.11	kΩ
	RN1611				7	10	13	

(Q1, Q2 Common)

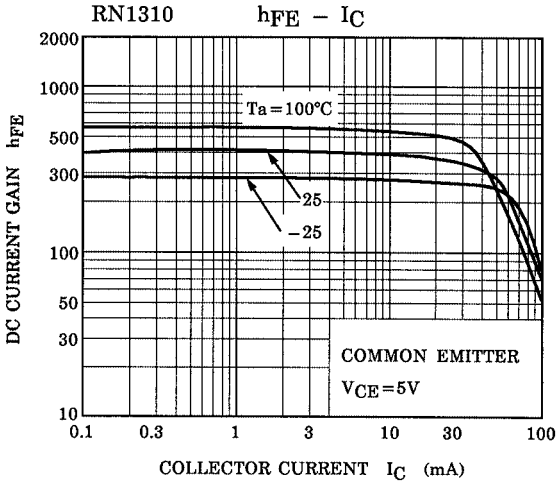


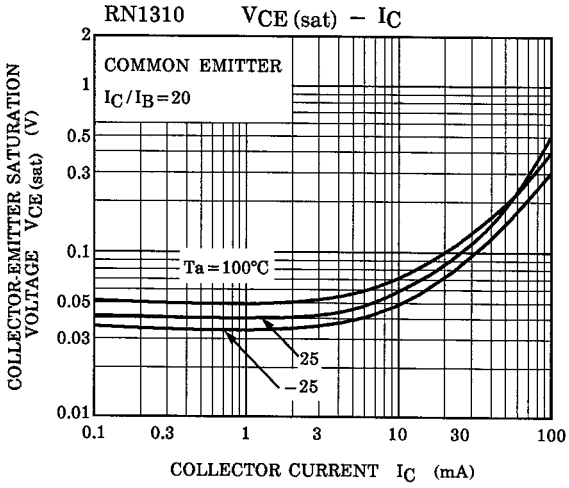


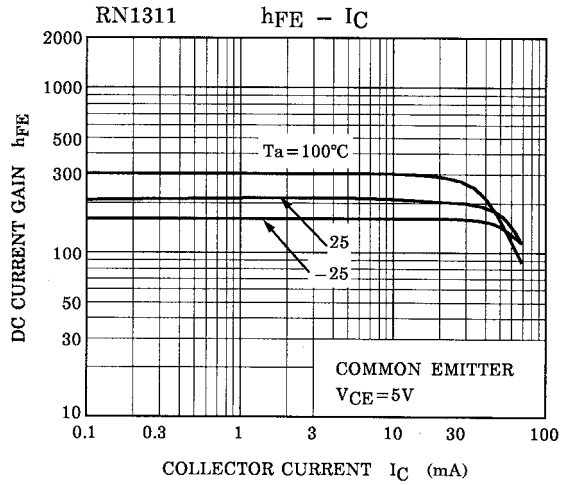


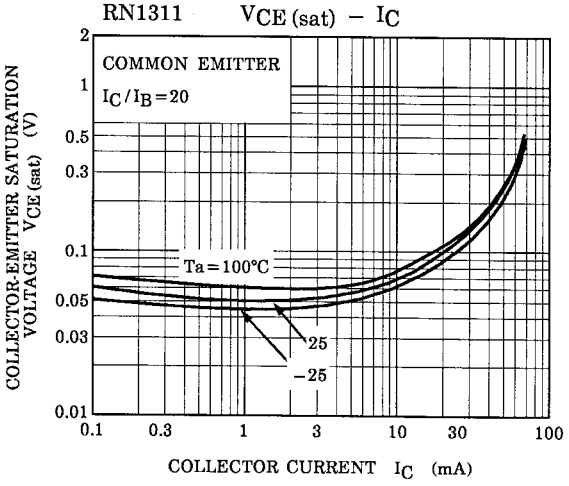


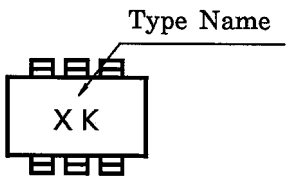
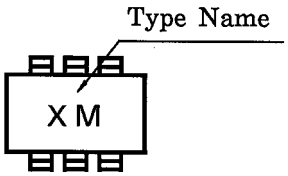
(Q1, Q2 Common)


RN1310 hFE – IC
DC CURRENT GAIN hFE
2000
1000
500
300
100
50
30
10
Ta = 100°C
25
−25
COMMON EMITTER
VCE = 5V
0.1
0.3
1
3
10
30
100
COLLECTOR CURRENT IC (mA)


RN1310 VCE (sat) – IC
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
2
1
0.5
0.3
0.1
0.05
0.03
0.01
COMMON EMITTER
IC / IB = 20
Ta = 100°C
25
−25
0.1
0.3
1
3
10
30
100
COLLECTOR CURRENT IC (mA)


RN1311 hFE – IC
DC CURRENT GAIN hFE
2000
1000
500
300
100
50
30
10
Ta = 100°C
25
−25
COMMON EMITTER
VCE = 5V
0.1
0.3
1
3
10
30
100
COLLECTOR CURRENT IC (mA)


RN1311 VCE (sat) – IC
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
2
1
0.5
0.3
0.1
0.05
0.03
0.01
COMMON EMITTER
IC / IB = 20
Ta = 100°C
25
−25
0.1
0.3
1
3
10
30
100
COLLECTOR CURRENT IC (mA)

Type Name	Marking
RN1610	
RN1611	

RESTRICTIONS ON PRODUCT USE

000707EAA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.