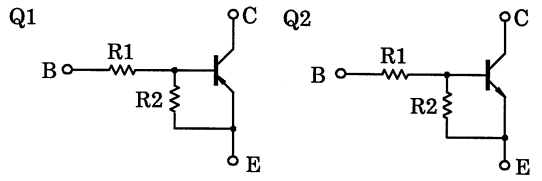
TOSHIBA Transistor
Silicon PNP Epitaxial Type (PCT Process) Silicon NPN Epitaxial Type (PCT Process)

RN46A1

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

Equivalent Circuit and Bias Resister Values



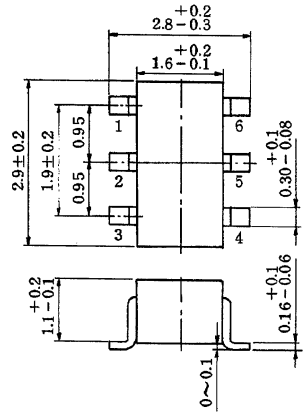
Q1 Q2

R1: 22kΩ R1: 10kΩ

R2: 22kΩ R2: 10kΩ

Q1: RN2403 Equivalent
Q2: RN1402 Equivalent

Unit in 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)

SM6

JEDEC	—
JEITA	SC-74
TOSHIBA	2-3N1A

Weight: 0.015g (typ.)

Q1 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−10	V
Collector current	I_C	−100	mA

Q2 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	10	V
Collector current	I_C	100	mA

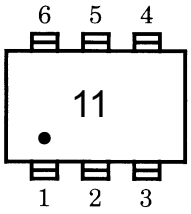
Q1, Q2 Common Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C *	300	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°C

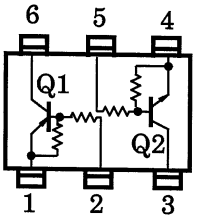
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

* : Total rating

Marking



Equivalent Circuit (Top View)



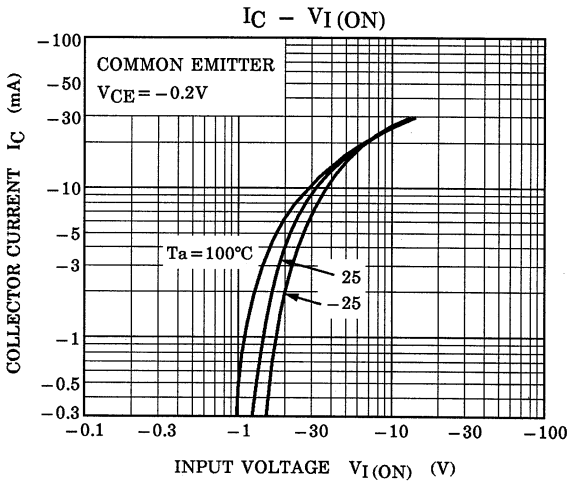
Q1 Electrical Characteristics (Ta = 25°C)

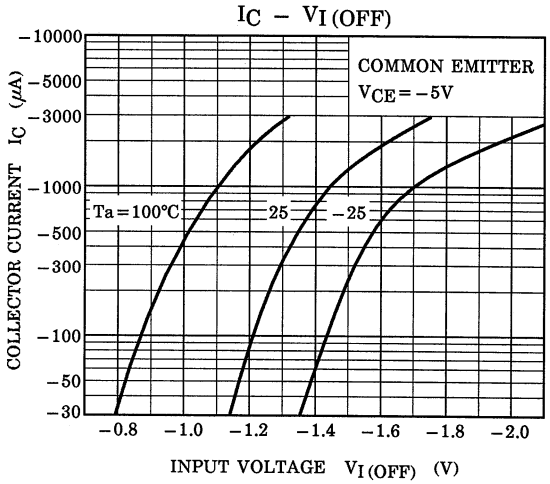
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = –50V, I_E = 0	—	—	–100	nA
	I_{CEO}	—	V_{CE} = –50V, I_B = 0	—	—	–500	
Emitter cut-off current	I_{EBO}	—	V_{EB} = –10V, I_C = 0	–0.17	—	–0.33	mA
DC current gain	h_{FE}	—	V_{CE} = –5V, I_C = –10mA	70	—	—	—
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	I_C = –5mA, I_B = –0.25mA	—	–0.1	–0.3	V
Input voltage (ON)	$V_{I\ (ON)}$	—	V_{CE} = –0.2V, I_C = –5mA	–1.3	—	–3.0	V
Input voltage (OFF)	$V_{I\ (OFF)}$	—	V_{CE} = –5V, I_C = –0.1mA	–1.0	—	–1.5	V
Transition frequency	f_T	—	V_{CE} = –10V, I_C = –5mA	—	200	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = –10V, I_E = 0, f = 1MHz	—	3	—	pF
Input resistor	R1	—	—	15.4	22	28.6	kΩ
Resistor ratio	R1/R2	—	—	0.9	1.0	1.1	—

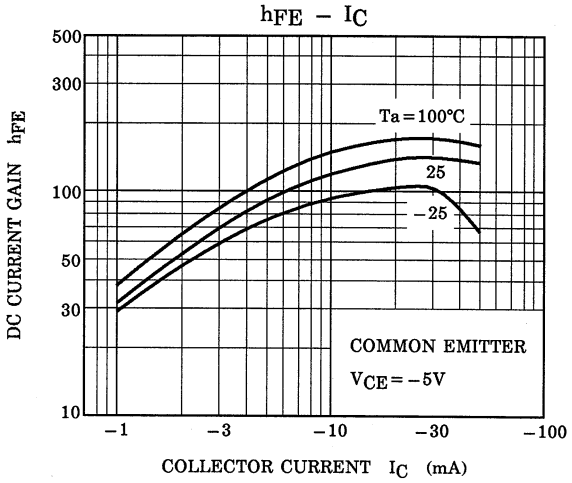
Q2 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = 50V, I_E = 0	—	—	100	nA
	I_{CEO}	—	V_{CE} = 50V, I_B = 0	—	—	500	
Emitter cut-off current	I_{EBO}	—	V_{EB} = 10V, I_C = 0	0.38	—	0.71	mA
DC current gain	h_{FE}	—	V_{CE} = 5V, I_C = 10mA	50	—	—	—
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	I_C = 5mA, I_B = 0.25mA	—	0.1	0.3	V
Input voltage (ON)	$V_{I\ (ON)}$	—	V_{CE} = 0.2V, I_C = 5mA	1.2	—	2.4	V
Input voltage (OFF)	$V_{I\ (OFF)}$	—	V_{CE} = 5V, I_C = 0.1mA	1.0	—	1.5	V
Transition frequency	f_T	—	V_{CE} = 10V, I_C = 5mA	—	250	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1 MHz	—	3	—	pF
Input resistor	R1	—	—	7	10	13	kΩ
Resistor ratio	R1/R2	—	—	0.9	1.0	1.1	—

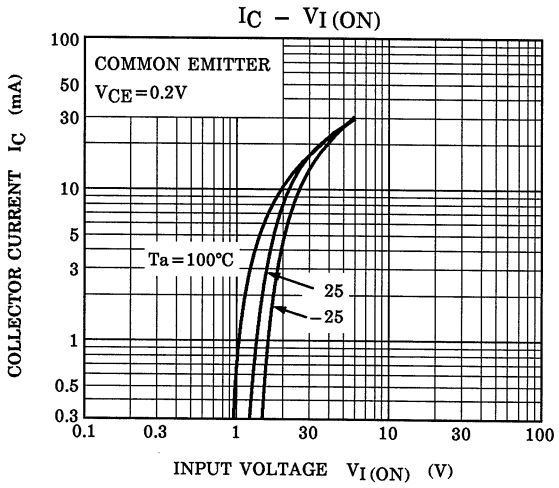
Q1

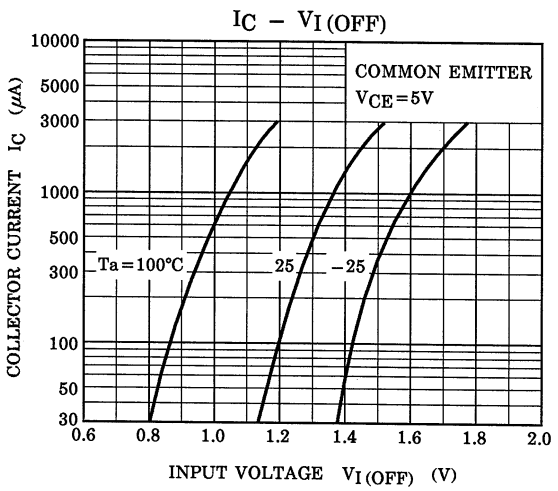

I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE} = −0.2V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
−100
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−30
−10
−30
−100

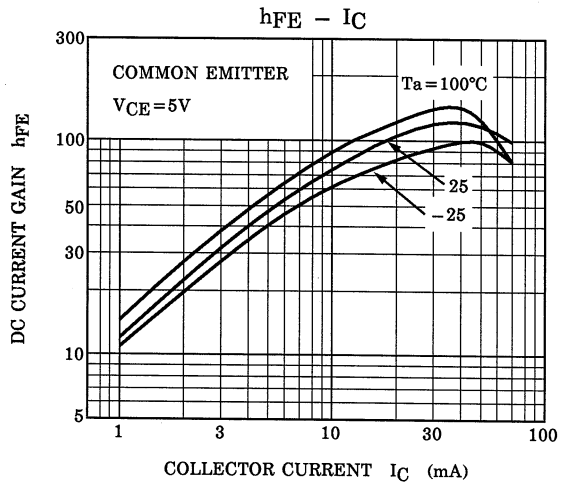

I_C – $V_{I(OFF)}$
COMMON EMITTER
V_{CE} = −5V
Ta = 100°C
25
−25
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)
−10000
−5000
−3000
−1000
−500
−300
−100
−50
−30
−0.8
−1.0
−1.2
−1.4
−1.6
−1.8
−2.0


h_{FE} – I_C
COMMON EMITTER
V_{CE} = −5V
Ta = 100°C
25
−25
DC CURRENT GAIN h_{FE}
COLLECTOR CURRENT I_C (mA)
500
300
100
50
30
10
−1
−3
−10
−30
−100

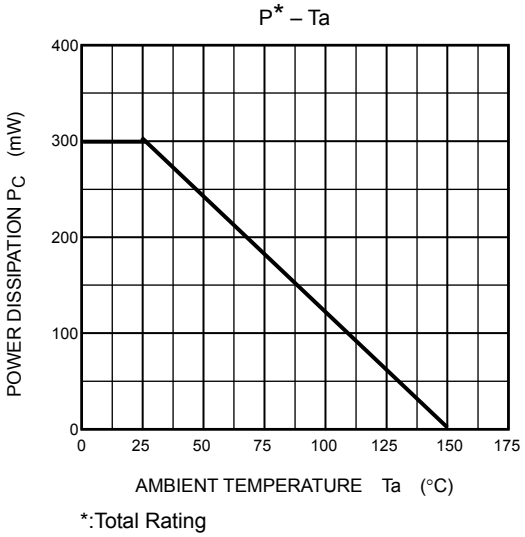
Q2


I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE}=0.2V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
100
50
30
10
5
3
1
0.5
0.3
0.1
0.3
1
3
10
30
100


I_C – $V_{I(OFF)}$
COMMON EMITTER
V_{CE}=5V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)
10000
5000
3000
1000
500
300
100
50
30
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0


h_{FE} – I_C
COMMON EMITTER
V_{CE}=5V
Ta=100°C
25
−25
DC CURRENT GAIN h_{FE}
COLLECTOR CURRENT I_C (mA)
300
100
50
30
10
5
1
3
10
30
100

Q1,Q2 Common



*:Total Rating

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