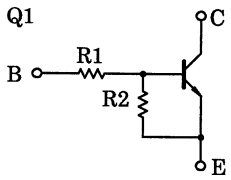
TOSHIBA Transistor
Silicon NPN Epitaxial Type (PCT Process) Silicon PNP Epitaxial Type (PCT Process)

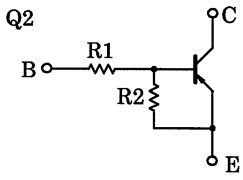
RN4988

Switching, Inverter Circuit, Interface Circuit And Driver Circuit Applications

- Includeing two devices in US6 (ultra super mini type with 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process

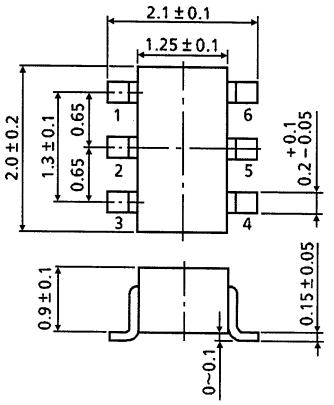
Equivalent Circuit and Bias Resister Values





R1: 22kΩ
R2: 47kΩ
(Q1, Q2 Common)

Unit: mm



US6

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	2-2J1A

Weight: 6.8mg

Q1 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}	7	V
Collector current	I_C	100	mA

Q2 Maximum Ratings (Ta = 25°C)

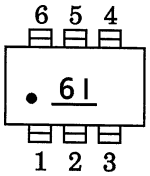
Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−100	mA

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

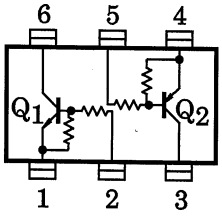
Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C *	200	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°C

* : 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} = 7V, I_C = 0	0.078	—	0.145	mA
DC current gain	h_{FE}	—	V_{CE} = 5V, I_C = 10mA	80	—	—	—
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	1.0	—	2.6	V
Input voltage (OFF)	$V_{I\ (OFF)}$	—	V_{CE} = 5V, I_C = 0.1mA	0.6	—	1.16	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	6	pF

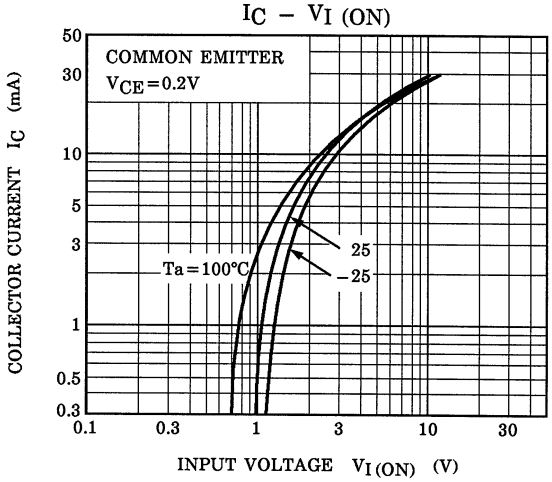
Q2 Electrical Characteristics (Ta = 25°C)

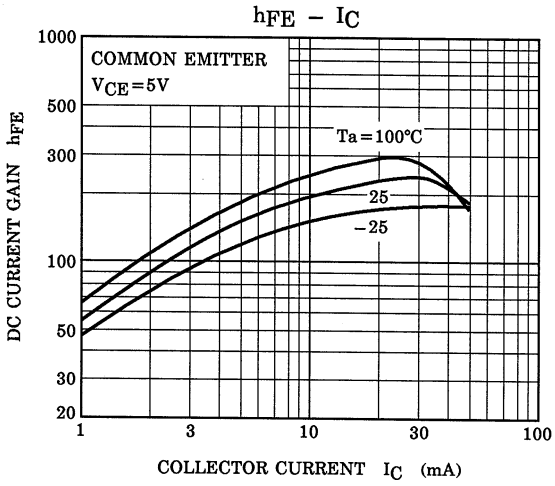
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = −50V, I_E = 0	—	—	−100	nA
	I_{CEO}	—	V_{CE} = −50V, I_B = 0	—	—	−500	
Emitter cut-off current	I_{EBO}	—	V_{EB} = −7V, I_C = 0	−0.078	—	−0.145	mA
DC current gain	h_{FE}	—	V_{CE} = −5V, I_C = −10mA	80	—	—	—
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	−1.0	—	−2.6	V
Input voltage (OFF)	$V_{I\ (OFF)}$	—	V_{CE} = −5V, I_C = −0.1mA	−0.6	—	−1.16	V
Transition frequency	f_T	—	V_{CE} = −10V, I_C = −5mA	—	200	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = −10V, I_E = 0	—	3	6	pF

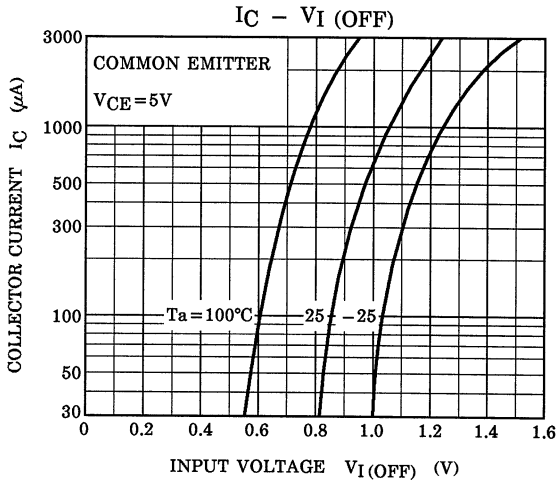
Q1, Q2 Common Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input resistor	R1	—	—	15.4	22	28.6	kΩ
Resistor ratio	R1/R2	—	—	0.421	0.468	0.515	—

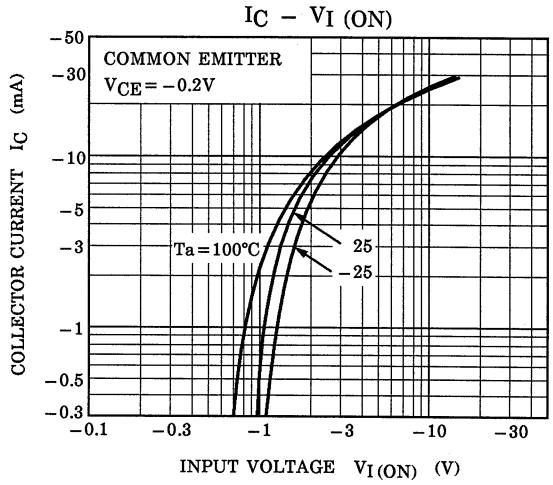
Q1

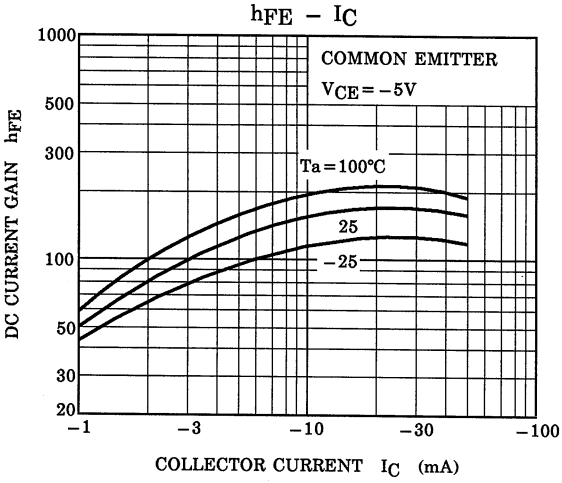

I_C – V_I (ON)
COMMON EMITTER
V_{CE}=0.2V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
50
30
10
5
3
1
0.5
0.3
0.1
0.3
1
3
10
30

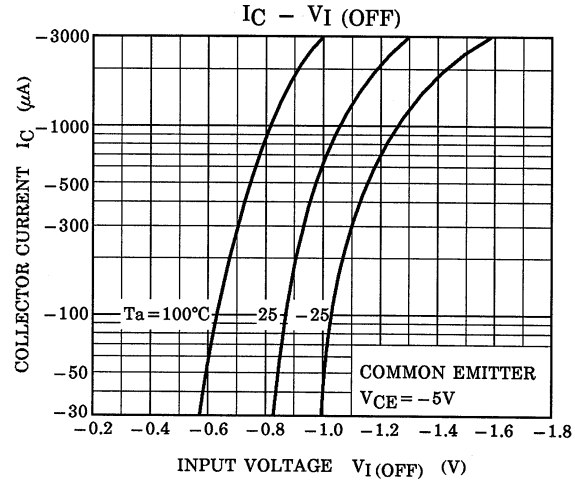

h_{FE} – I_C
COMMON EMITTER
V_{CE}=5V
Ta=100°C
25
−25
DC CURRENT GAIN h_{FE}
COLLECTOR CURRENT I_C (mA)
1000
500
300
100
50
30
20
1
3
10
30
100


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)
3000
1000
500
300
100
50
30
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

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)
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
−0.3
−1
−3
−10
−30


h_{FE} – I_C
COMMON EMITTER
V_{CE} = −5V
Ta = 100°C
25
−25
DC CURRENT GAIN h_{FE}
COLLECTOR CURRENT I_C (mA)
1000
500
300
100
50
30
20
−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)
−3000
−1000
−500
−300
−100
−50
−30
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
−1.4
−1.6
−1.8

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000707EAA

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