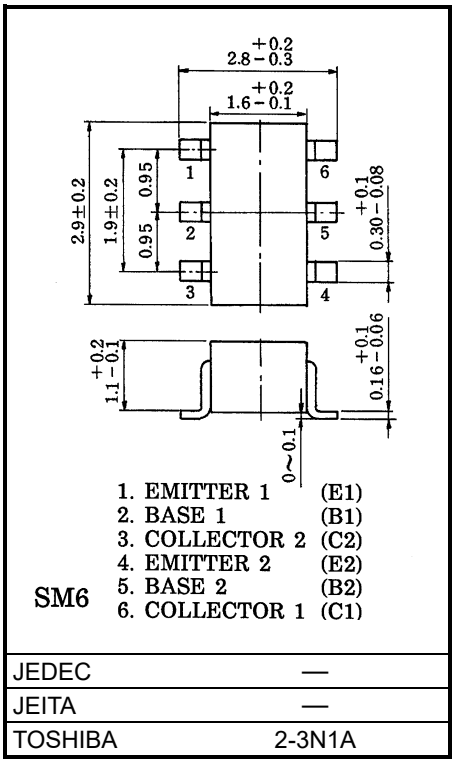
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process) Silicon NPN Epitaxial Type (PCT Process)

HN1B01F

Audio Frequency General Purpose Amplifier Applications

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3N1A

Weight: 0.015 g (typ.)

Q1:

- High voltage and high current
  : V_{CEO} = −50 V, I_C = −150 mA (max)
- High h_{FE} : h_{FE} = 120 to 400
- Excellent h_{FE} linearity
  : h_{FE} (I_C = −0.1 mA) / h_{FE} (I_C = −2 mA) = 0.95 (typ.)

Q2:

- High voltage and high current
  : V_{CEO} = 50 V, I_C = 150 mA (max)
- High h_{FE} : h_{FE} = 120 to 400
- Excellent hFE linearity
  : h_{FE} (I_C = 0.1 mA) / h_{FE} (I_C = 2 mA) = 0.95 (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}	−5	V
Collector current	I_C	−150	mA
Base current	I_B	−50	mA

Q2 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	60	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	150	mA
Base current	I_B	30	mA

Start of commercial production
1989-02

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

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C*	300	mW
Junction temperature	T_j (Note 1)	150	°C
	T_j (Note 2)	125	
Storage temperature range	T_{stg} (Note 1)	−55 to 150	°C
	T_{stg} (Note 2)	−55 to 125	

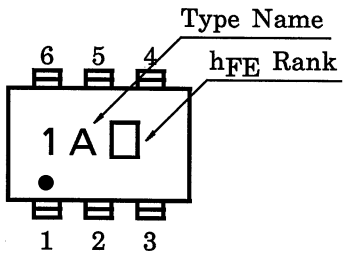
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

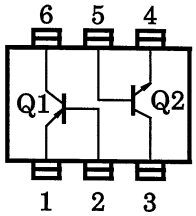
Note 1: For devices with the ordering part number ending in LF(T.

Note 2: For devices with the ordering part number in other than LF(T.

Marking



Equivalent Circuit (Top View)



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Q1 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = −50 V, I_E = 0 A	—	—	−0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = −5 V, I_C = 0 A	—	—	−0.1	μA
DC current gain	h_{FE} (Note)	V_{CE} = −6 V, I_C = −2 mA	120	—	400	—
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = −100 mA, I_B = −10 mA	—	−0.1	−0.3	V
Transition frequency	f_T	V_{CE} = −10 V, I_C = −1 mA	—	120	—	MHz
Collector output capacitance	C_{ob}	V_{CB} = −10 V, I_E = 0 A, f = 1 MHz	—	4	—	pF

Q2 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 60 V, I_E = 0 A	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 5 V, I_C = 0 A	—	—	0.1	μA
DC current gain	h_{FE} (Note)	V_{CE} = 6 V, I_C = 2 mA	120	—	400	—
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 100 mA, I_B = 10 mA	—	0.1	0.25	V
Transition frequency	f_T	V_{CE} = 10 V, I_C = 1 mA	—	150	—	MHz
Collector output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0 A, f = 1 MHz	—	2	—	pF

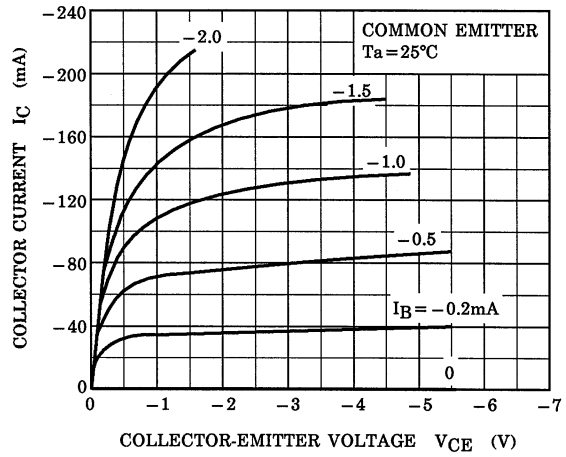
Note: h_{FE} Classification Y (Y): 120 to 240, GR (G): 200 to 400

( ) Marking symbol

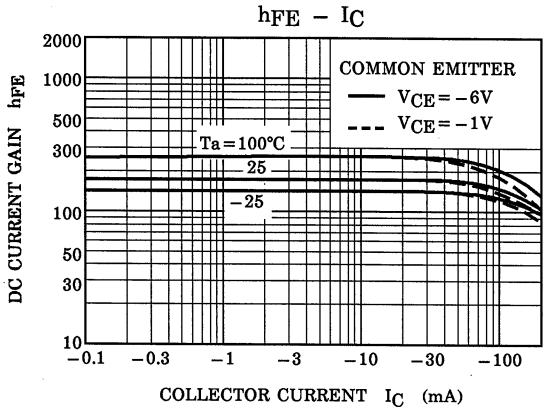
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Characteristics Curves Q1 (PNP Transistor)

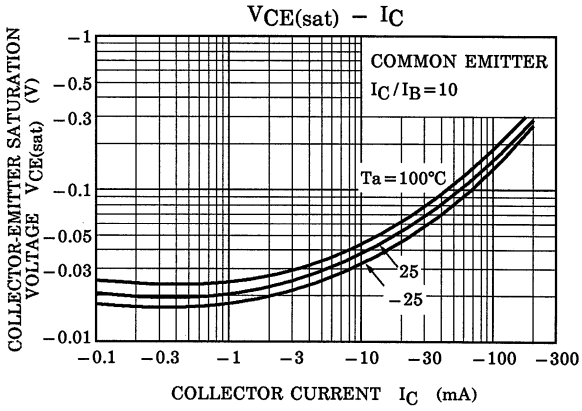
I_C – V_{CE}



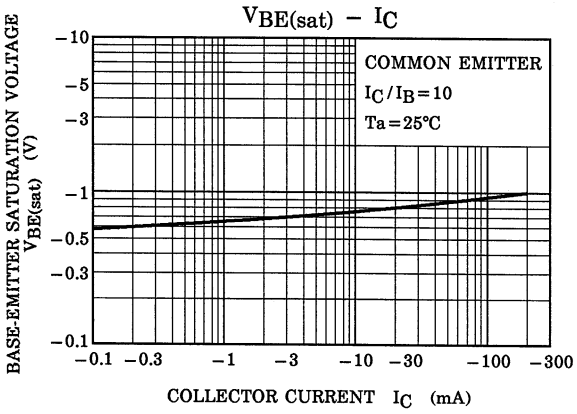
h_{FE} – I_C



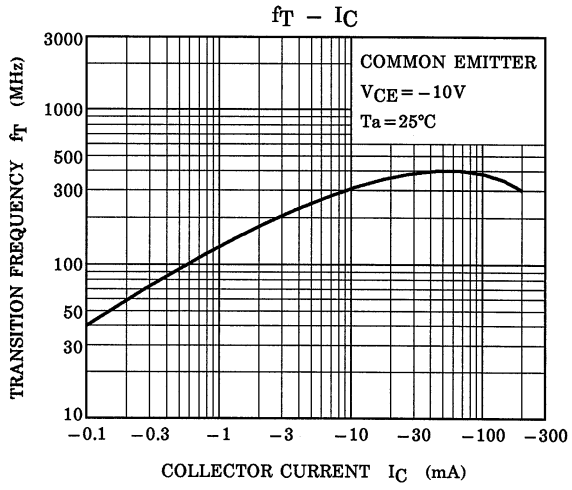
$V_{CE(sat)}$ – I_C



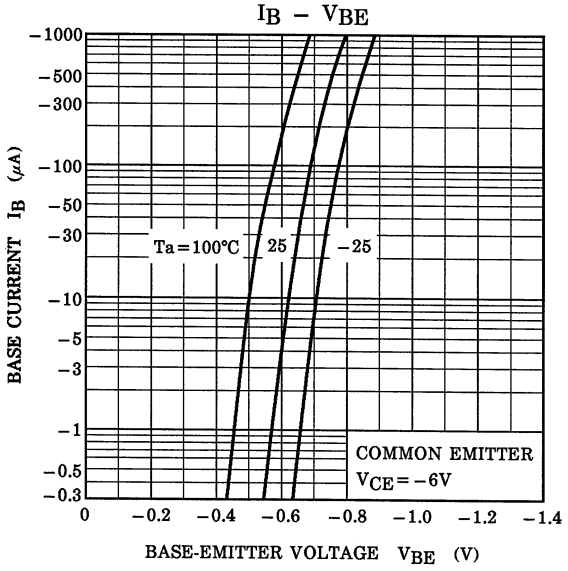
$V_{BE(sat)}$ – I_C



f_T – I_C



I_B – V_{BE}



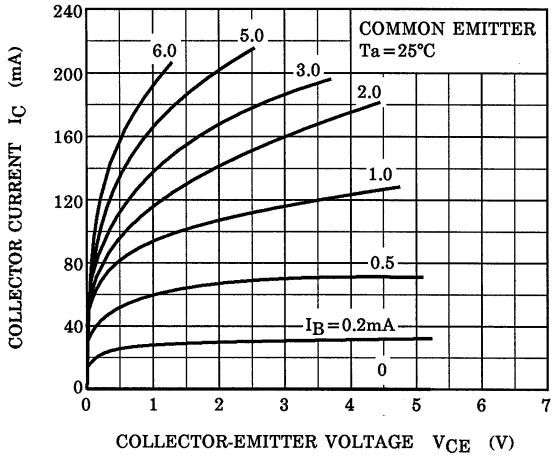
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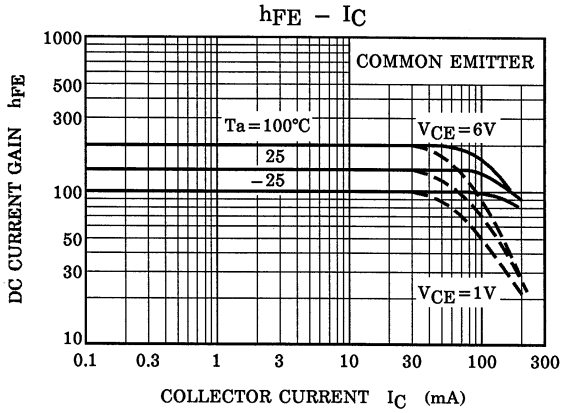
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Characteristics Curves Q2 (NPN Transistor)

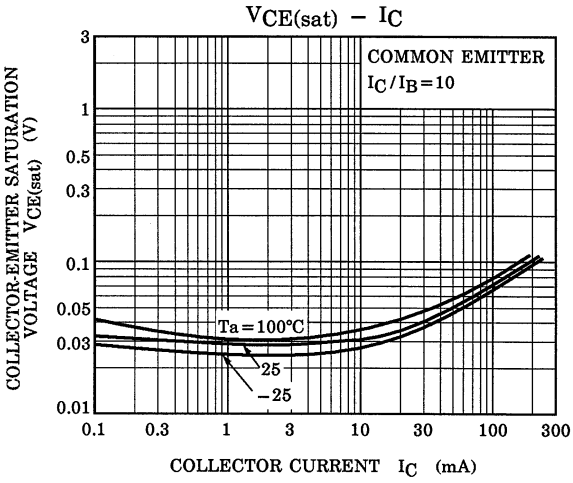
I_C – V_{CE}



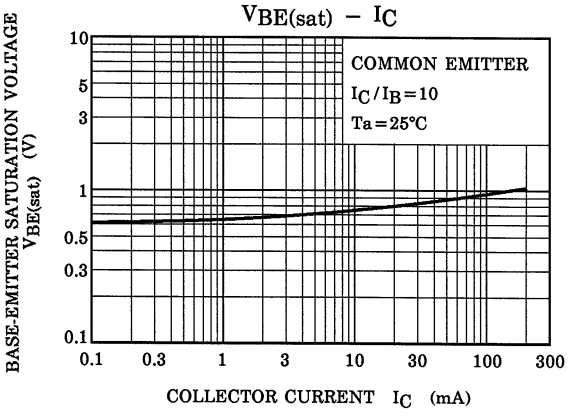
h_{FE} – I_C



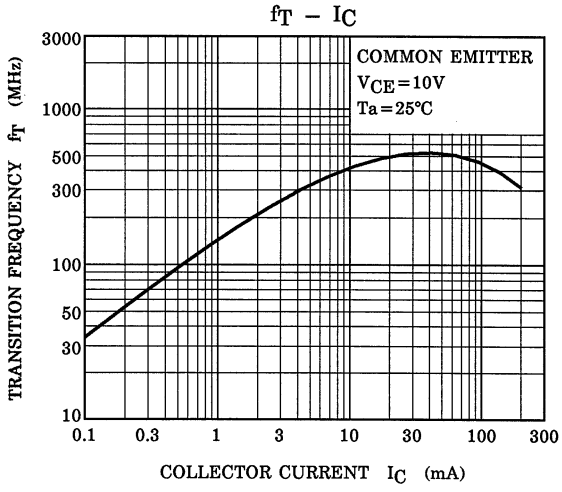
$V_{CE(sat)}$ – I_C



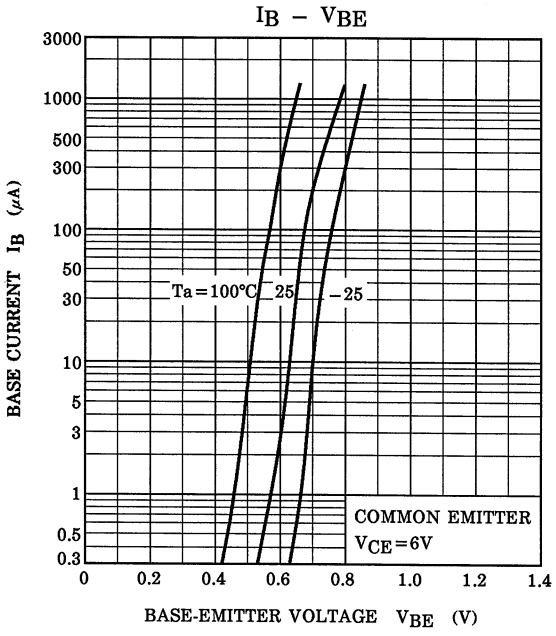
$V_{BE(sat)}$ – I_C



f_T – I_C



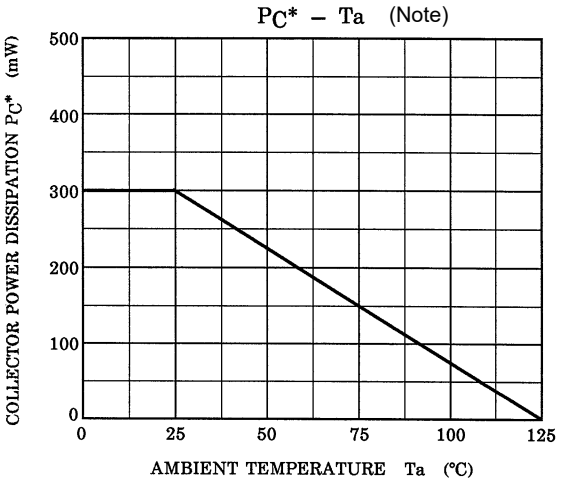
I_B – V_{BE}



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Characteristics Curves (Q1, Q2 Common)



* : Total Rating

Note: Reference only with T_j of 125 ℃.

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