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

HN1B04F

Audio Frequency General Purpose Amplifier Applications
Driver Stage Amplifier Applications
Switching application

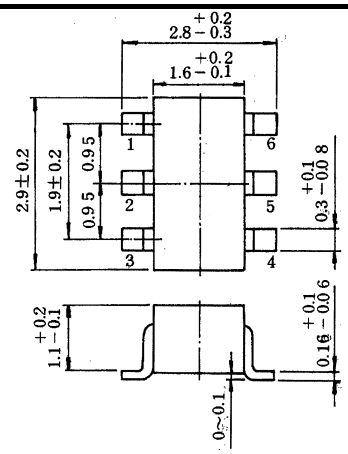
Q1:

- Excellent h_{FE} linearity
  : $h_{FE(2)}$ = 25 (min) at V_{CE} = −6V, I_C = −400mA

Q2:

- Excellent h_{FE} linearity
  : $h_{FE(2)}$ = 25 (min) at V_{CE} = 6V, I_C = 400mA

Unit: mm



1.EMITTER1	(E1)
2.BASE1	(B1)
3.COLLECTOR2	(C2)
4.EMITTER2	(E2)
5.BASE2	(B2)
6.COLLECTOR1	(C1)

SM6

JEDEC	—
JEITA	—
TOSHIBA	2-3N1A

Weight: 0.015g (typ.)

Q1 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	−35	V
Collector-emitter voltage	V_{CEO}	−30	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−500	mA

Q2 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	35	V
Collector-emitter voltage	V_{CEO}	30	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	500	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. 200mW per element must be exceeded.

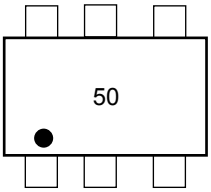
Q1 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = −35V, I_E = 0	—	—	−100	nA
Emitter cut-off current	I_{EBO}	—	V_{EB} = −5V, I_C = 0	—	—	−100	nA
DC current gain	$h_{FE(1)}$	—	V_{CE} = −1V, I_C = −100mA	70	—	400	
	$h_{FE(2)}$	—	V_{CE} = −6V, I_C = −400mA	25	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	I_C = −100mA, I_B = −10mA	—	−0.1	−0.25	V
Base-Emitter Voltage	V_{BE}	—	V_{CE} = −1V, I_C = −100mA	—	−0.8	−1.0	V
Transition frequency	f_T	—	V_{CE} = −6V, I_C = −20mA	—	200	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = −6V, I_E = 0, f = 1MHz	—	7	—	pF

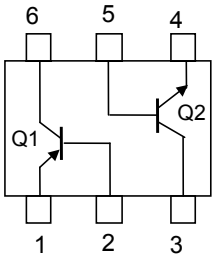
Q2 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = 35V, I_E = 0	—	—	100	nA
Emitter cut-off current	I_{EBO}	—	V_{EB} = 5V, I_C = 0	—	—	100	nA
DC current gain	$h_{FE(1)}$	—	V_{CE} = 1V, I_C = 100mA	70	—	400	
	$h_{FE(2)}$	—	V_{CE} = 6V, I_C = 400mA	25	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	I_C = 100mA, I_B = 10mA	—	0.1	0.25	V
Base-Emitter Voltage	V_{BE}	—	V_{CE} = 1V, I_C = 100mA	—	0.8	1.0	V
Transition frequency	f_T	—	V_{CE} = 6V, I_C = 20mA	—	300	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = 6V, I_E = 0, f = 1MHz	—	7	—	pF

Marking

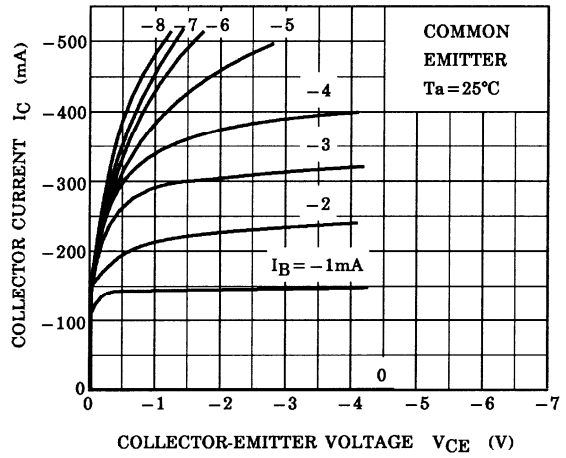


Equivalent Circuit (Top View)

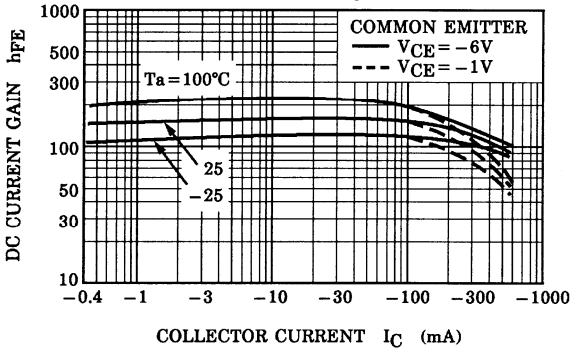


Q1 (PNP transistor)

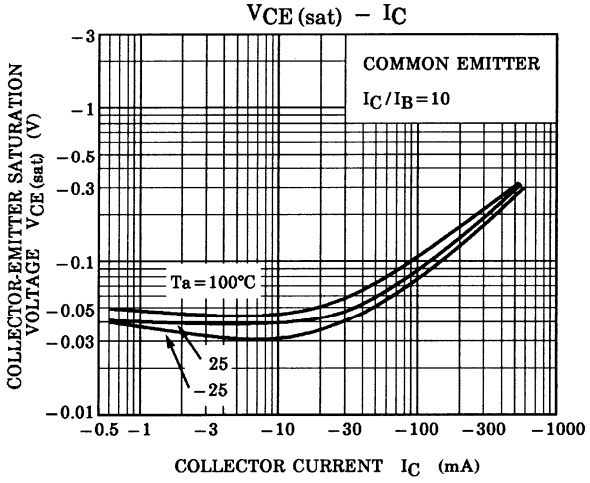
$I_C - V_{CE}$



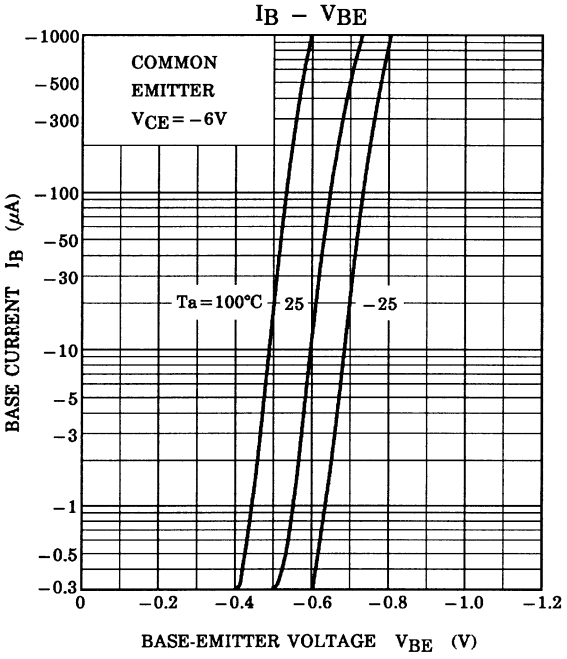
$h_{FE} - I_C$



$V_{CE\,(sat)} - I_C$

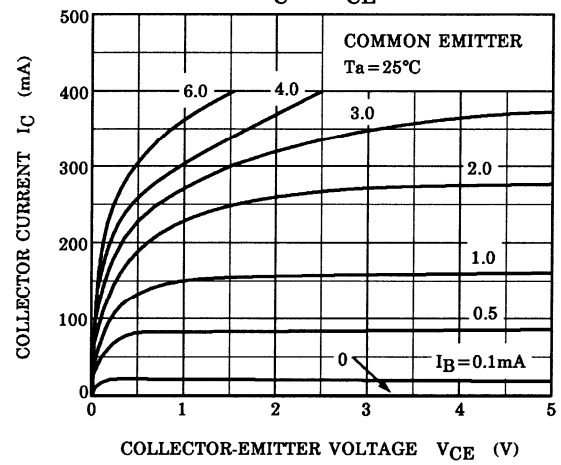


$I_B - V_{BE}$

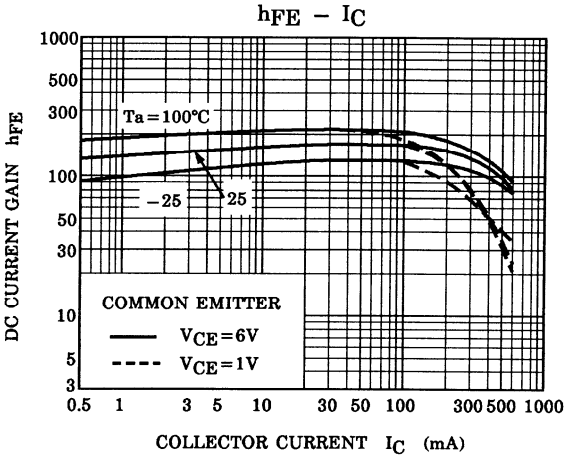


Q2 (NPN transistor)

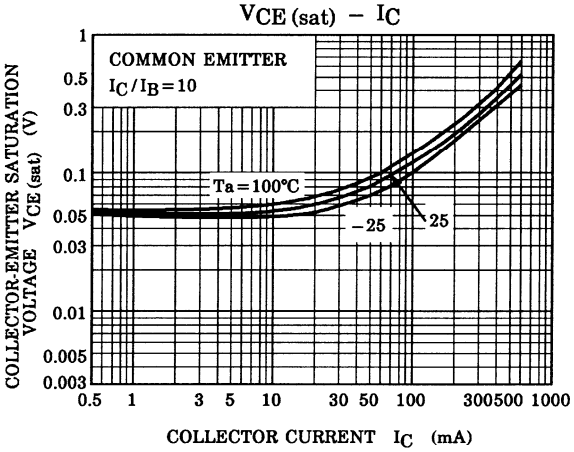
I_C – V_{CE}



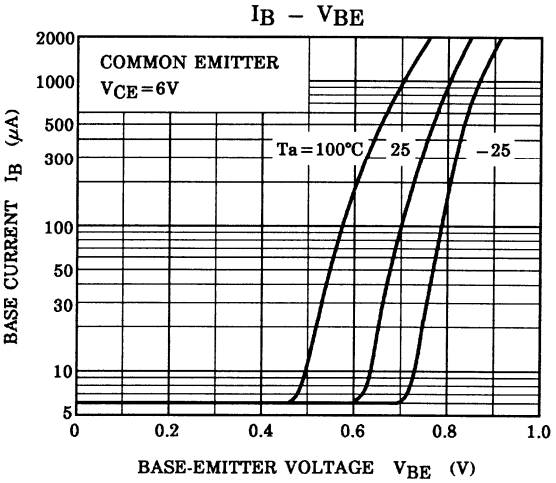
h_{FE} – I_C



$V_{CE\,(sat)}$ – I_C

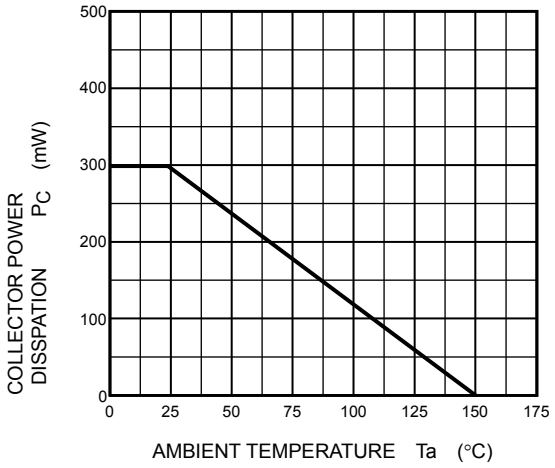


I_B – V_{BE}



(Q1, Q2 Common)

P_{C^*} – Ta



*Total Rating.

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