

HN2E04F

Super High Speed Switching Application
 Audio Frequency Amplifier Application
 Audio Low Noise Amplifier Application

Q1

- High Voltage : $V_{CEO} = 120V$
- High DC Current Gain : $h_{FE} = 200$ to 700
- Good h_{FE} Linearity : $h_{FE}(I_C = 0.1mA) / h_{FE}(I_C = 2mA) = 0.95$

Q2

- Low Forward Voltage Drop : $V_{F(3)} = 0.98V$ (typ.)
- Fast Reverse Recovery Time : $t_{rr} = 1.6ns$ (typ.)
- Low Total Capacitance : $C_T = 0.5pF$ (typ.)

Q1 (Transistor) : 2SA1587 equivalent

Q2 (Diode) : 1SS352 equivalent

Q1 (Transistor) Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	-120	V
Collector-emitter voltage	V_{CEO}	-120	V
Emitter-base voltage	V_{EBO}	-5	V
Collector current	I_C	-100	mA
Base current	I_B	-20	mA

Q2 (Diode) Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Maximum (peak) reverse voltage	V_{RM}	85	V
Reverse voltage	V_R	80	V
Maximum (peak) forward current	I_{FM}	300	mA
Average forward current	I_O	100	mA
Surge current (10ms)	I_{FSM}	1	A

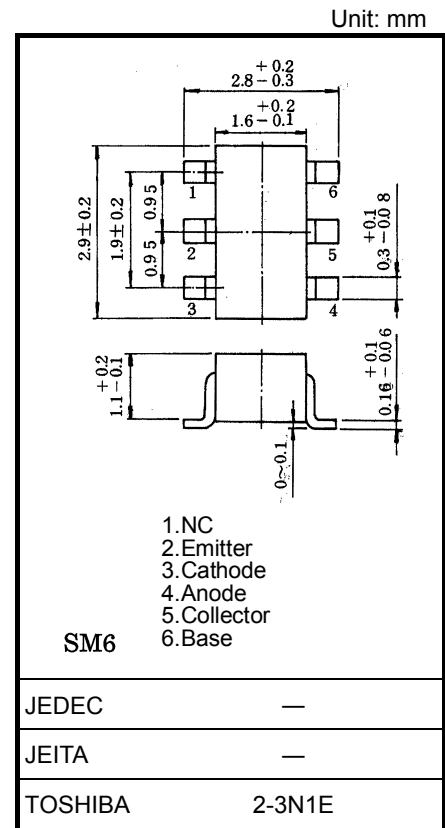
Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C^*	300	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	-55 to 125	°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: Power dissipation per element should not exceed 200mW per element.



Weight: 0.015g (typ.)

Start of commercial production
 2000-02

Q1 (Transistor) Electrical Characteristics (Ta = 25°C)

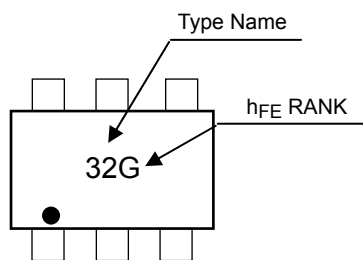
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	$V_{CB} = -120V, I_E = 0$	—	—	-100	nA
Emitter cut-off current	I_{EBO}	—	$V_{EB} = -5V, I_C = 0$	—	—	-100	nA
DC current gain	h_{FE}^*	—	$V_{CE} = -6V, I_C = -2mA$	200	—	700	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	$I_C = -10mA, I_B = -1mA$	—	—	-0.3	V
Transition Frequency	f_T	—	$V_{CE} = -6V, I_C = -1mA$	—	100	—	MHz
Collector Output Capacitance	C_{ob}	—	$V_{CB} = -10V, I_E = 0, f=1MHz$	—	4	—	pF
Noise figure	NF	—	$V_{CE} = -6V, I_C = -0.1mA$ $f = 1kHz, R_g = 10k\Omega$	—	1.0	—	dB

*: h_{FE} Classifications GR(G): 200 to 400, BL(L): 350 to 700 () Marking Symbol

Q2 (Diode) Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Forward voltage	$V_F (1)$	—	$I_F = 1mA$	—	0.62	—	V
	$V_F (2)$	—	$I_F = 10mA$	—	0.75	—	
	$V_F (3)$	—	$I_F = 100mA$	—	0.98	1.20	
Reverse current	$I_R (1)$	—	$V_R = 30V$	—	—	0.1	μA
	$I_R (2)$	—	$V_R = 80V$	—	—	0.5	
Total capacitance	C_T	—	$V_R = 0, f = 1MHz$	—	0.5	—	pF
Reverse recovery time	t_{rr}	—	$I_F = 10mA$ (fig.1)	—	1.6	—	ns

Marking



Equivalent Circuit (Top View)

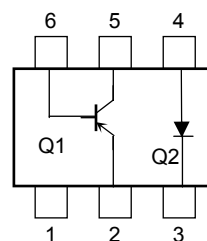
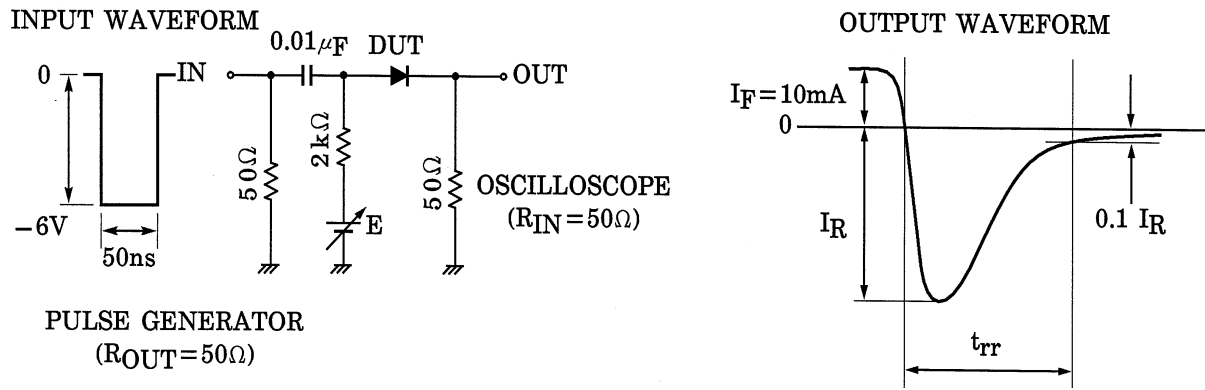
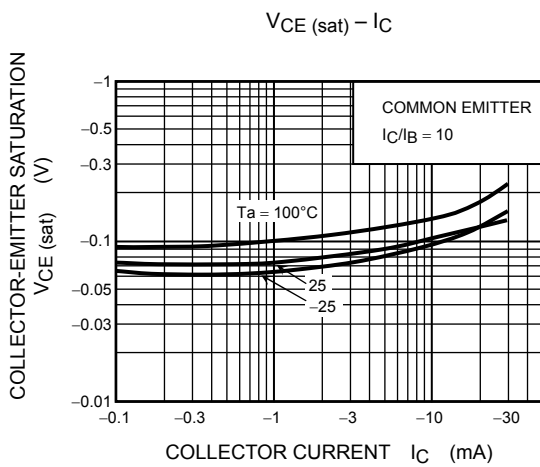
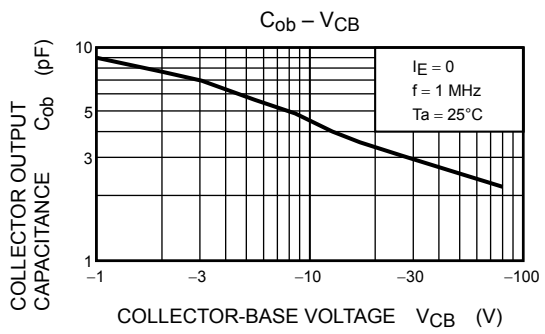
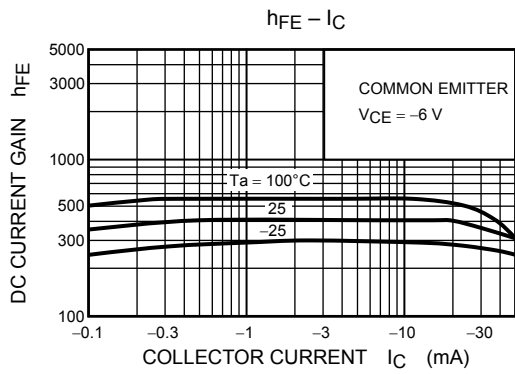
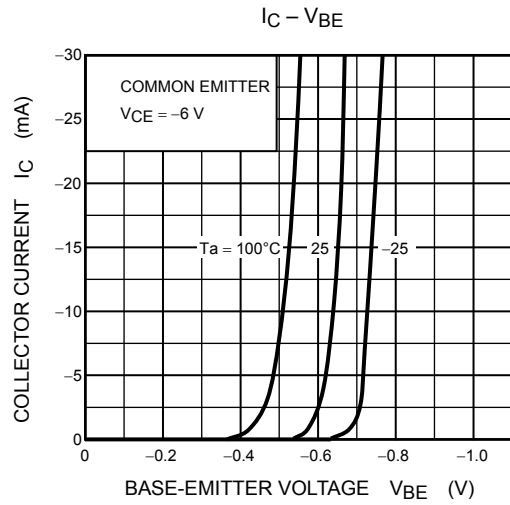
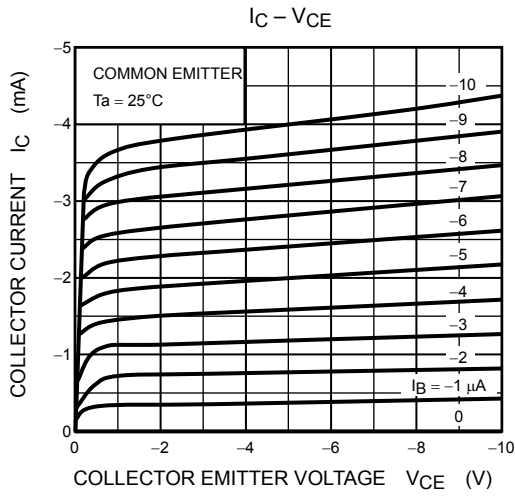
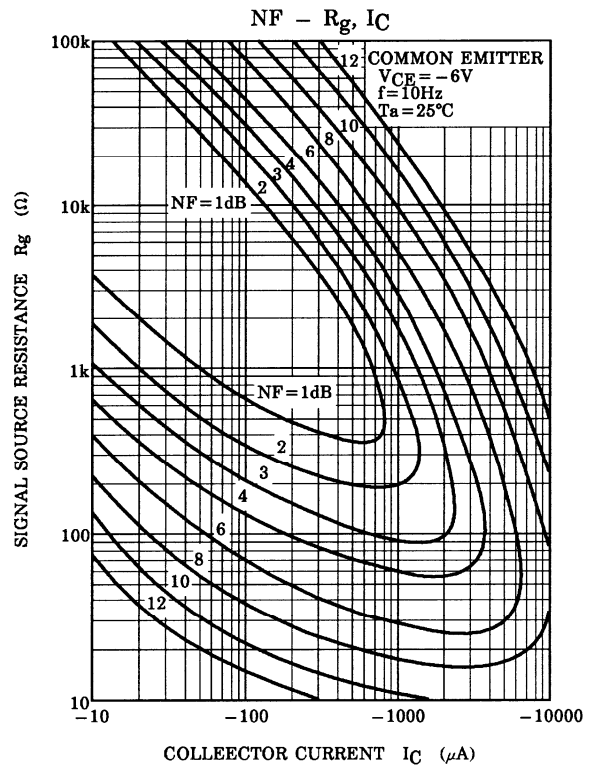
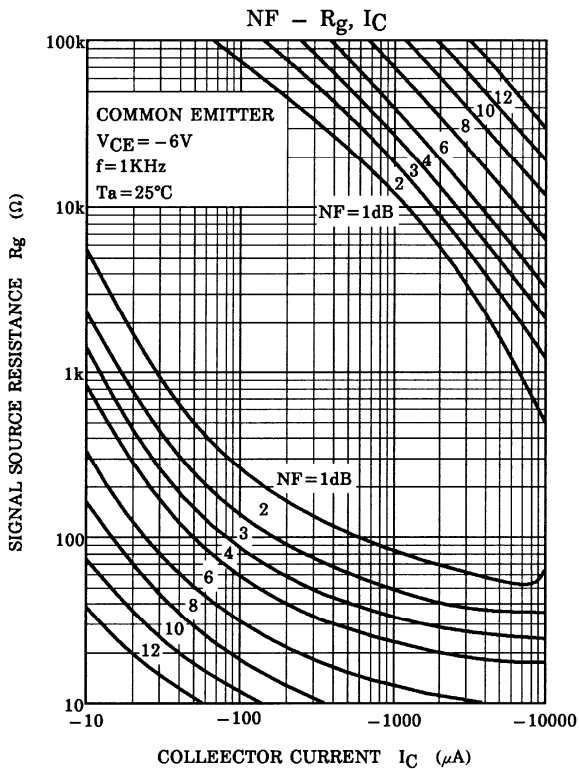
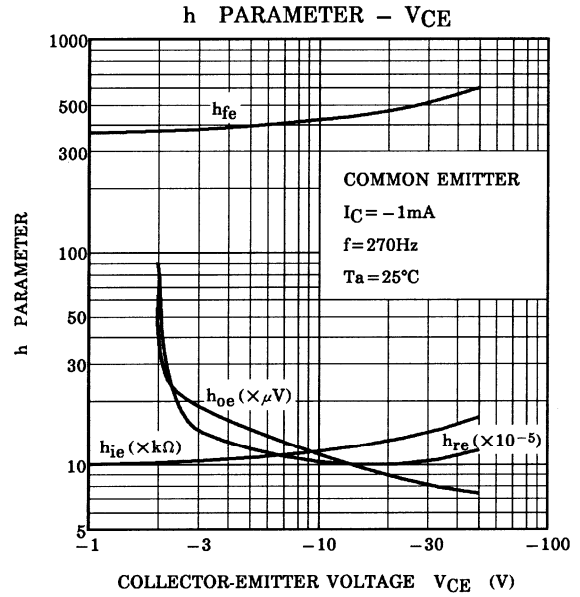
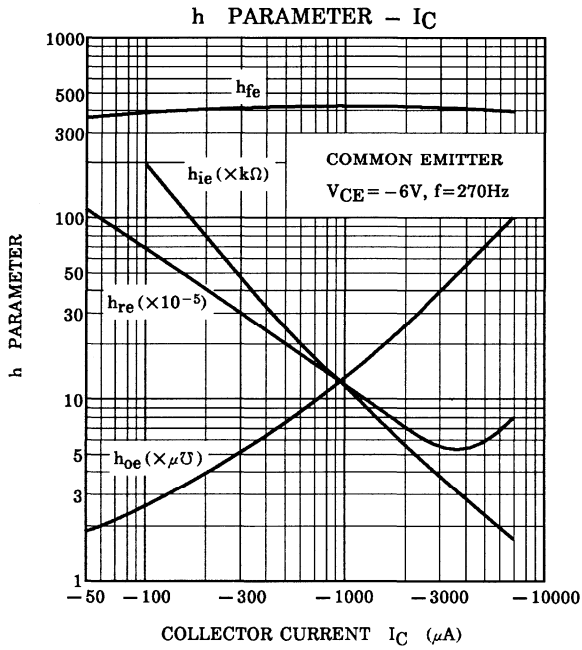


Fig. 1: Reverse Recovery Time (t_{rr}) Test Circuit

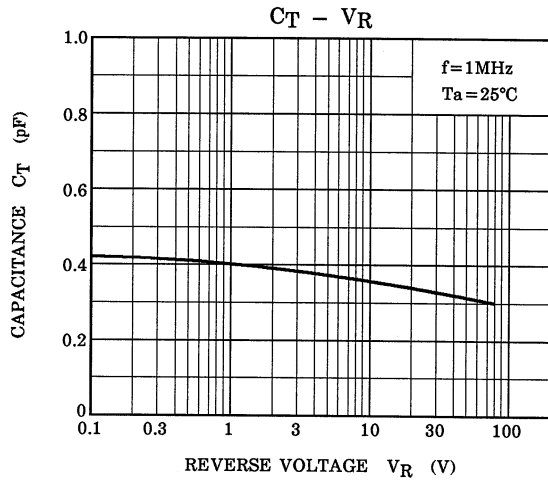
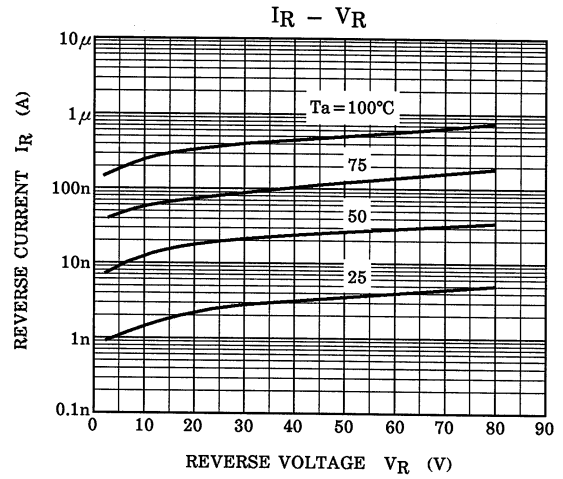
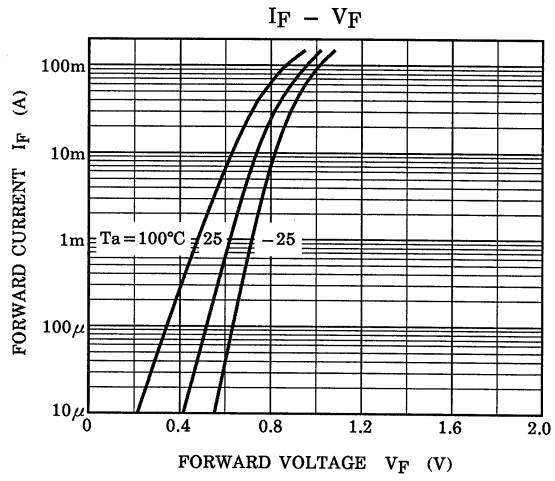


Q1

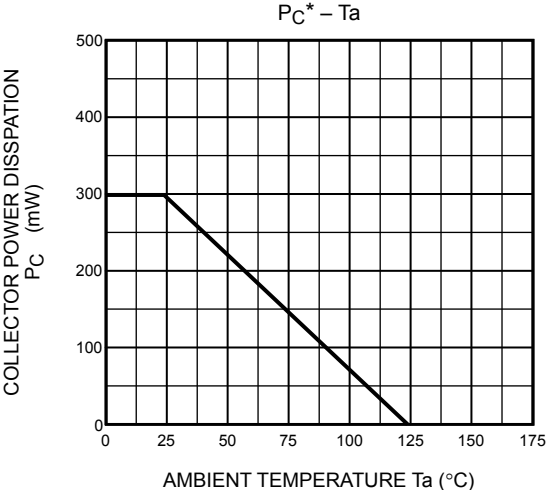




Q2



Q1, Q2 Common



*Total Rating.

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