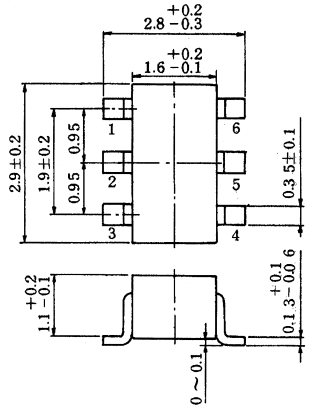
TOSHIBA MULTI CHIP DISCRETE DEVICE

HN2E02F

Super High Speed Switching Application
Audio Frequency Amplifier Application
AM Amplifier Application

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3N1D

Weight: 0.015g (typ.)

Q1

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.)

Q2

High Voltage	:V_{CEO}=50V
High Collector Current	:I_C=150mA(max.)
Good h_{FE} Linearity	
	:$h_{FE(I_C=0.1mA)}$/ $h_{FE(I_C=2mA)}$ =0.95

Q1 (Diode) : 1SS352 Equivalent
Q2 (Transistor) : 2SC4738 Equivalent

Q1 (Diode) 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

Q2 (Transistor) 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

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}	−55~125	°C

*Total rating: Power dissipation per element should not exceed 200 mW.

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

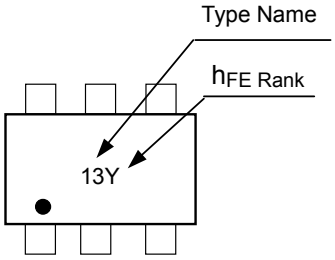
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Forward voltage	$V_{F\ (1)}$	—	I_F = 1mA	—	0.62	—	V
	$V_{F\ (2)}$	—	I_F = 10mA	—	0.75	—	
	$V_{F\ (3)}$	—	I_F = 100mA	—	0.98	1.2	
Reverse current	$I_{R\ (1)}$	—	V_R = 30V	—	—	0.1	μA
	$I_{R\ (2)}$	—	V_R = 80V	—	—	0.5	
Total capacitance	C_T	—	V_R = 0, f = 1MHz	—	0.5	—	pF
Reverse recovery time	t_{rr}	—	I_F = 10mA (fig.1)	—	1.6	—	ns

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

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = 60V, 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	120	—	700	
Collector-emittersaturation voltage	$V_{CE(sat)}$	—	I_C =100mA, I_B =10mA	—	0.1	0.25	V
Transition Frequency	f_T	—	V_{CE} = 10V, I_C =10mA	60	—	—	MHz
Collector Output Capacitance	C_{ob}	—	V_{CB} = 10V, I_E = 0,f=1MHz	—	2.0	—	pF

* h_{FE} Rank Y(Y) : 120~240, GR(G) : 200~400,BL(L) : 350~700 ( ) Marking Symbol

Marking



Equivalent Circuit (Top View)

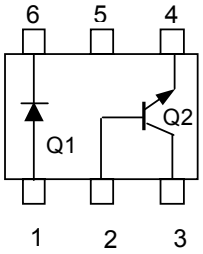
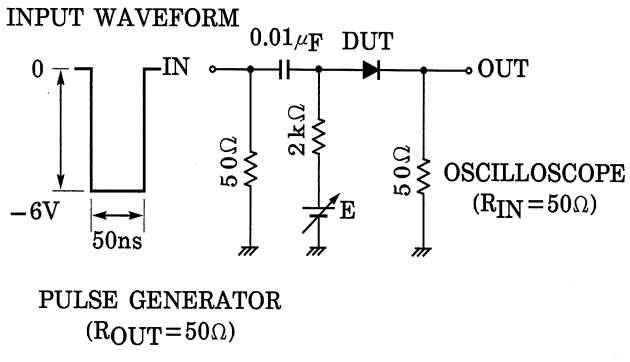
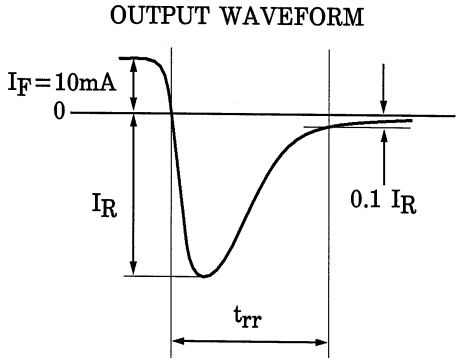
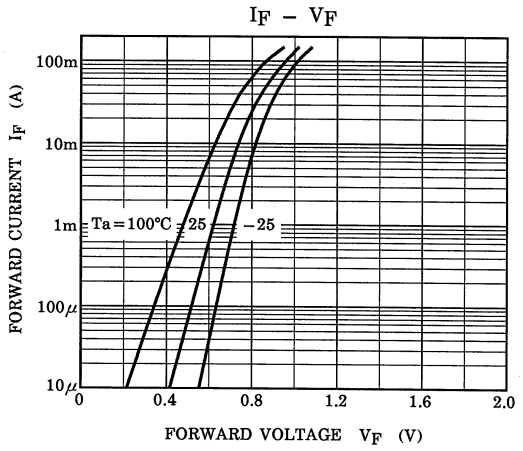


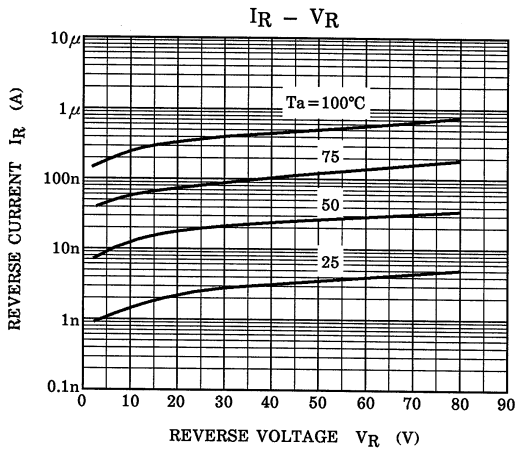
Fig. 1 : Reverse Recovery Time (t_{rr}) Test Circuit

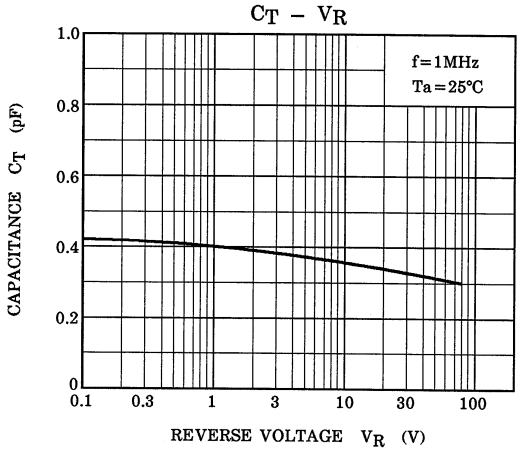




Q1

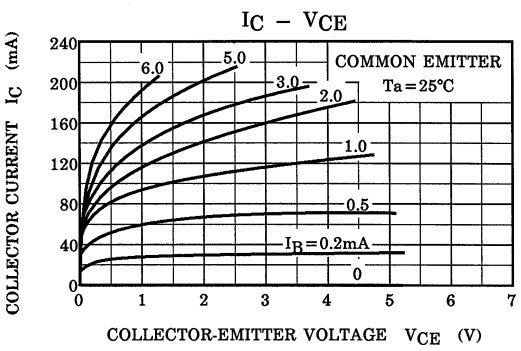




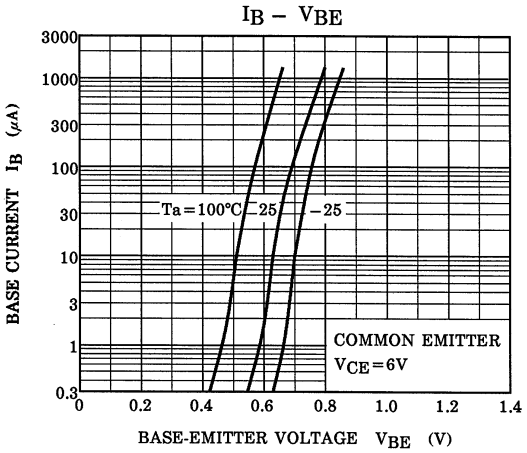


Q2

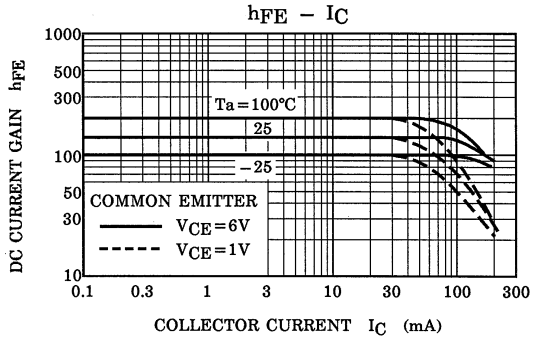
I_C – V_{CE}



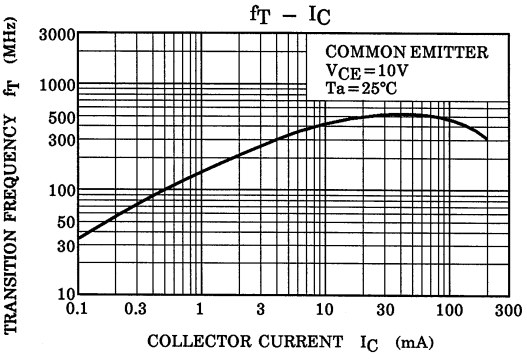
I_B – V_{BE}



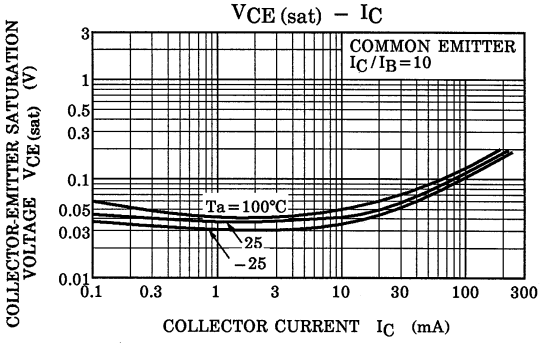
h_{FE} – I_C



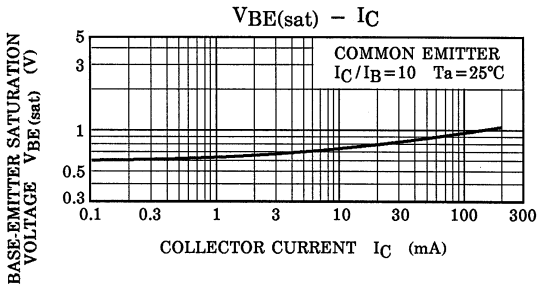
f_T – I_C



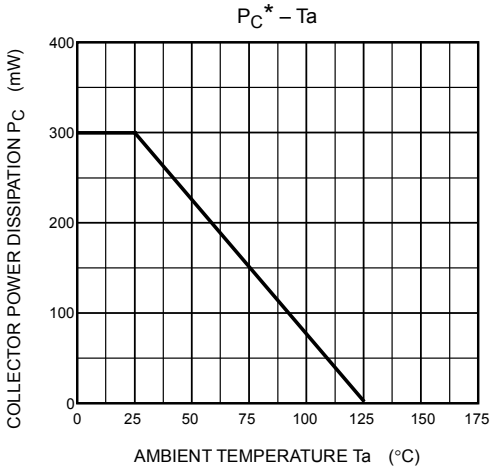
$V_{CE\,(sat)}$ – I_C



$V_{BE(sat)}$ – I_C



Q1, Q2 Common



*:Total Rating

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