H11AA1,2,3,4

TENTATIVE DATA

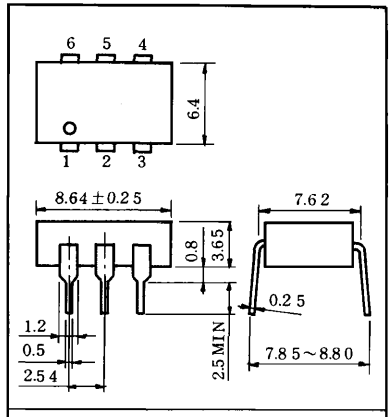
OFFICE MACHINE.
HOUSEHOLD USE EQUIPMENT.
PROGRAMMABLE CONTROLLERS.
AC/DC-INPUT MODULE.
TELECOMMUNICATION.

The TOSHIBA H11AA series consists of two gallium arsenide infrared emitting diode connected inverse parallel, optically coupled to a photo-transistor in a six lead plastic DIP package.

- Collector-Emitter Voltage : 55V Min.
- Current Transfer Ratio : H11AA1: 20% Min.
  H11AA2: 10% Min.
  H11AA3: 50% Min.
  H11AA4: 100% Min.
- Isolation Voltage : 5000Vrms Min.
- Guaranteed Requirements of IEC380/VDE0806
- Climatic Test Class : 55/150/21
- Isolation Creepage Path : 8.0mm Min.
- Isolation Clearance : 7.3mm Min.
- Isolation Operating Voltage
  : 500Vac or 600Vdc for Isolation Group C.*1
- Creeping Current Resistance: Group I.*2

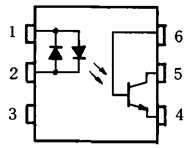
*1 : According to VDE0110, table 4
*2 : According to VDE0110, table 3

Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	11-9A1

PIN CONFIGURATIONS (TOP VIEW)



1 : ANODE, CATHODE
2 : CATHODE, ANODE
3 : NC
4 : EMITTER
5 : COLLECTOR
6 : BASE

MAXIMUM RATINGS (Ta=25°C)

	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current	$I_{F(RMS)}$	60	mA
	Forward Current Derating (Ta≧39°C)	ΔI_F/°C	-0.7	mA/°C
	Peak Forward Current (100μs pulse, 100pps)	I_{FP}	1	A
	Junction Temperature	T_j	125	°C
DETECTOR	Collector-Emitter Voltage	V_{CEO}	55	V
	Collector-Base Voltage	V_{CBO}	80	V
	Emitter-Collector Voltage	V_{ECO}	7	V
	Emitter-Base Voltage	V_{EBO}	7	V
	Collector Current	I_C	50	mA
	Power Dissipation	P_C	150	mW
	Power Dissipation Derating (Ta≧25°C)	ΔP_C/°C	-1.5	mW/°C
	Junction Temperature	T_j	125	°C
Storage Temperature Range		T_{stg}	-55∿150	°C
Operating Temperature Range		T_{opr}	-55∿100	°C
Lead Soldering Temperature (10 sec.)		T_{sold}	260	°C
Total Package Power Dissipation		P_T	250	mW
Total Package Power Dissipation Derating(Ta≧25°C)		ΔP_T/°C	-2.5	mW/°C
Isolation Voltage (AC, 1 min., RH≦60%)		BV_S	5000	V_{rms}

INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta=25°C)

	CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V_F	I_F=±10mA	1.0	1.15	1.3	V
	Forward Current	I_F	V_F=±0.7V	-	2.5	10	μA
	Capacitance	C_T	V=0, f=1MHz	-	60	-	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=0.5mA	55	-	-	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	I_E=0.1mA	7	-	-	V
	Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=0.1mA	80	-	-	V
	Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=0.1mA	7	-	-	V
	Collector Dark Current	I_{CEO}	V_{CE}=24V	-	10	100	nA
			V_{CE}=24V, Ta=85°C	-	2	50	μA
	Collector Dark Current	I_{CER}	V_{CE}=24V, Ta=85°C R_{BE}=1MΩ	-	0.5	10	μA
	Collector Dark Current	I_{CBO}	V_{CB}=10V	-	0.1	-	nA
	DC Forward Current Gain	h_{FE}	V_{CE}=5V, I_C=0.5mA	-	400	-	-
	Capacitance Collector to Emitter	C_{CE}	V=0, f=1MHz	-	10	-	pF

COUPLED ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio	I_C/I_F	I_F=±10mA, V_{CE}=10V	H11AA1	20	-	-	%
			H11AA2	10	-	-	
			H11AA3	50	-	-	
			H11AA4	100	-	-	
Base Photo-Current	I_{PB}	I_F=±5mA, V_{CB}=5V		-	10	-	μA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=0.5mA, I_F=±10mA		-	-	0.4	V
Off-State Collector Current	$I_{C(off)}$	V_F=±0.7V, V_{CE}=24V		-	1	10	μA
CRT Symmetry	$I_{C(ratio)}$	$I_C(I_F$=-5mA)/$I_C(I_F$=5mA)		0.5	1	2	-

ISOLATION CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance (Input to Output)	C_S	V_S=0, f=1MHz	-	0.8	-	pF
Isolation Resistance	R_S	V_S=500V	5×10^{10}	10^{14}	-	Ω
Isolation Voltage	BV_S	AC, 1 minute	5000	-	-	V_{rms}
		AC, 1 second	-	10000	-	V_{rms}
		DC, 1 minute	-	10000	-	V_{dc}

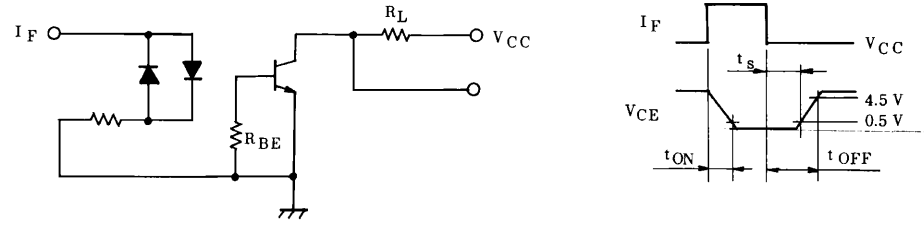
SWITCHING CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	t_r	V_{CC}=10V, I_C=2mA, R_L=100Ω	-	2	-	μs
Fall Time	t_f		-	3	-	
Turn-on Time	t_{on}		-	3	10	
Turn-off Time	t_{off}		-	3	10	
Turn-on Time	t_{ON}	R_L=1.9kΩ (Fig. 1), R_{BE}=OPEN, V_{CC}=5V, I_F=±16mA	-	2	-	μs
Storage Time	t_S		-	15	-	
Turn-off Time	t_{OFF}		-	25	-	
Turn-on Time	t_{ON}	R_L=1.9kΩ (Fig. 1), R_{BE}=220kΩ, V_{CC}=5V, I_F=±16mA	-	2	-	μs
Storage Time	t_S		-	12	-	
Turn-off Time	t_{OFF}		-	20	-	

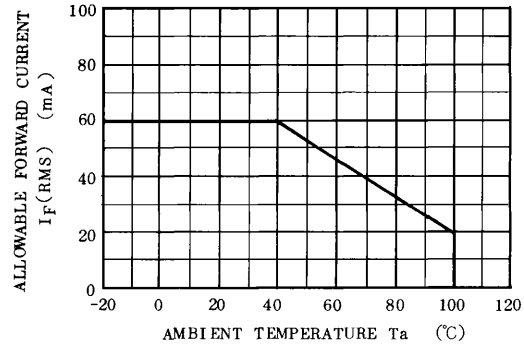
RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	-	5	24	V
Forward Current	$I_{F(RMS)}$	-	16	25	mA
Collector Current	I_C	-	1	10	mA
Operating Temperature	T_{opr}	-25	-	85	°C

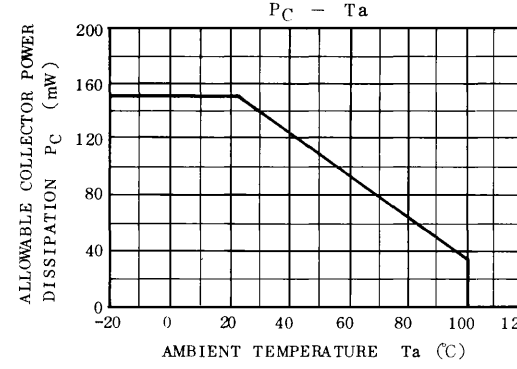
Fig. 1 SWITCHING TIME TEST CIRCUIT



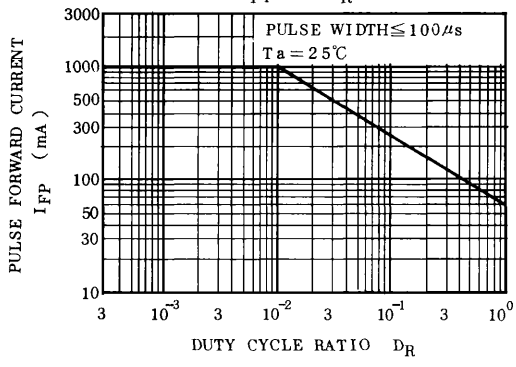
I_F(RMS) – Ta



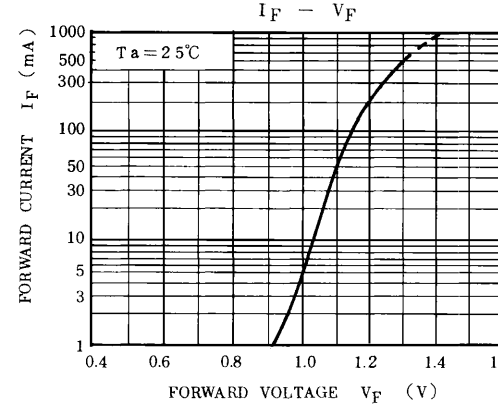
P_C – Ta



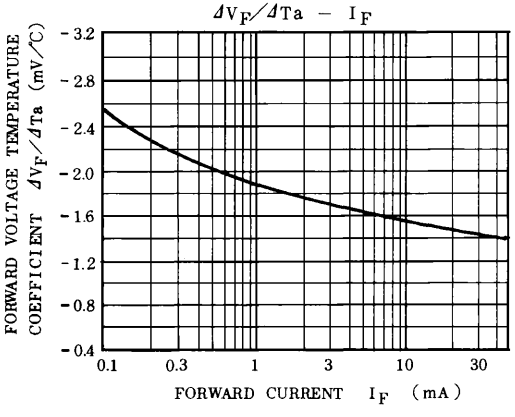
I_{FP} – D_R



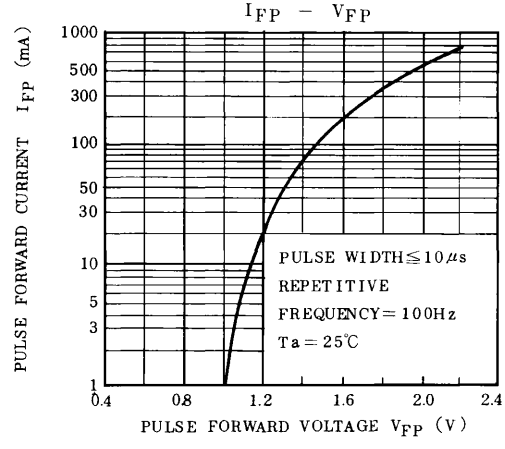
I_F – V_F

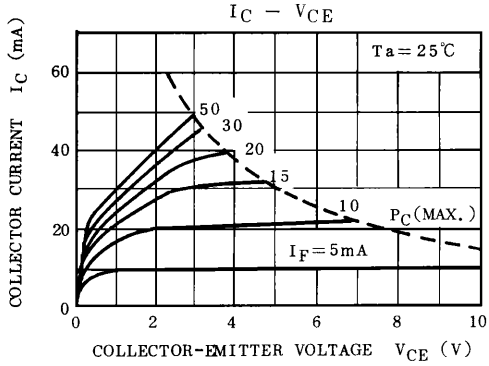


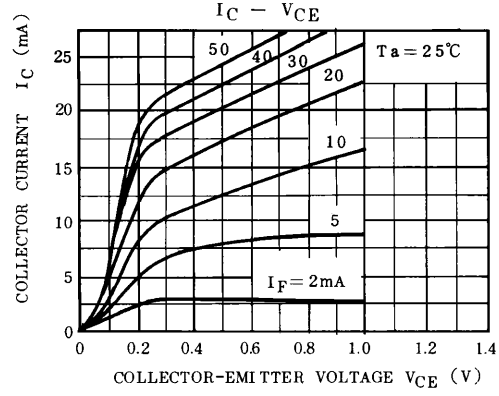
$\Delta V_F/\Delta Ta$ – I_F

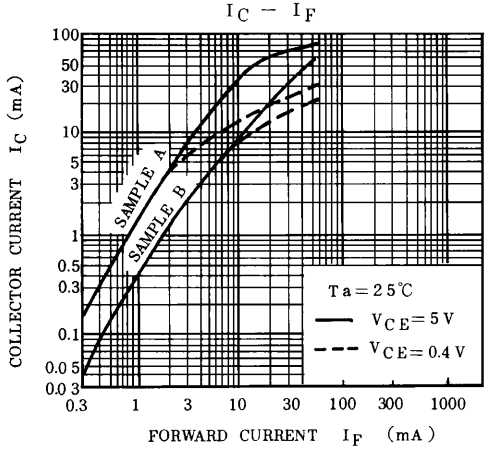


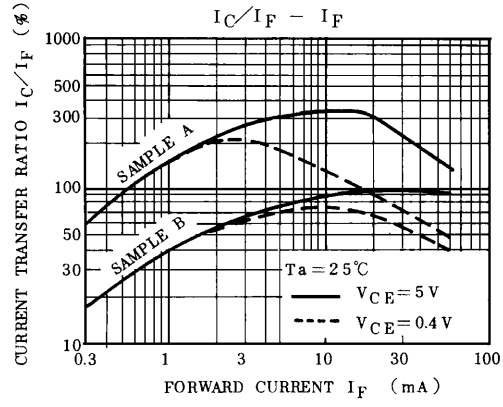
I_{FP} – V_{FP}

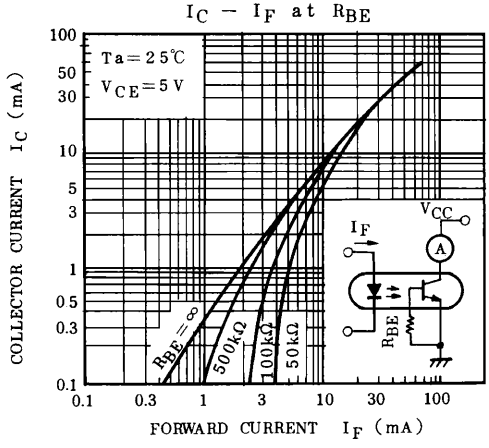


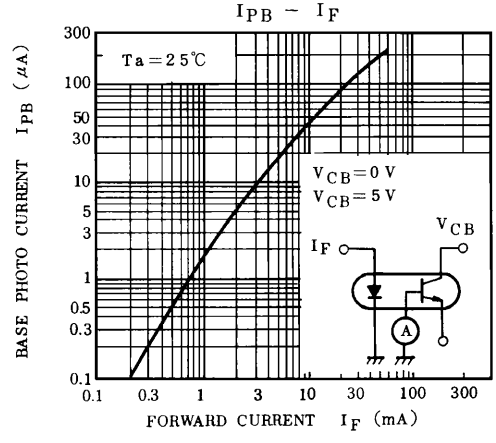

$I_C - V_{CE}$
Ta = 25℃
50
30
20
15
10
P_C(MAX.)
I_F = 5mA
COLLECTOR CURRENT I_C (mA)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)


$I_C - V_{CE}$
Ta = 25℃
50
40
30
20
10
5
I_F = 2mA
COLLECTOR CURRENT I_C (mA)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)

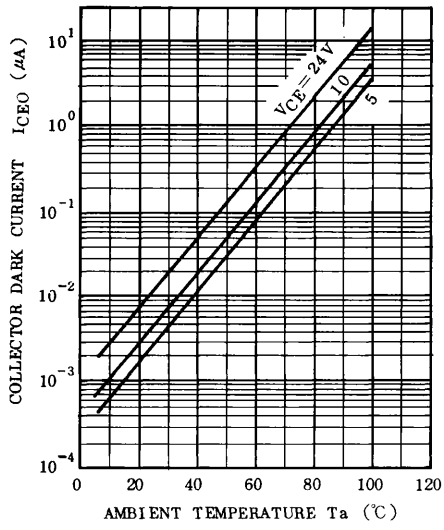

$I_C - I_F$
SAMPLE A
SAMPLE B
Ta = 25℃
V_{CE} = 5 V
V_{CE} = 0.4 V
COLLECTOR CURRENT I_C (mA)
FORWARD CURRENT I_F (mA)


$I_C/I_F - I_F$
SAMPLE A
SAMPLE B
Ta = 25℃
V_{CE} = 5 V
V_{CE} = 0.4 V
CURRENT TRANSFER RATIO I_C/I_F (%)
FORWARD CURRENT I_F (mA)

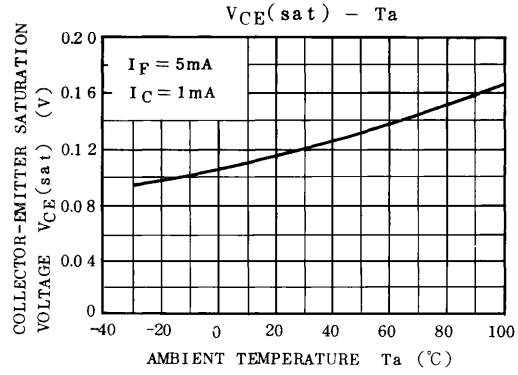

$I_C - I_F$ at R_{BE}
Ta = 25℃
V_{CE} = 5 V
R_{BE} = ∞
500kΩ
100kΩ
50kΩ
V_{CC}
I_F
R_{BE}
COLLECTOR CURRENT I_C (mA)
FORWARD CURRENT I_F (mA)


$I_{PB} - I_F$
Ta = 25℃
V_{CB} = 0 V
V_{CB} = 5 V
V_{CB}
I_F
BASE PHOTO CURRENT I_{PB} (μA)
FORWARD CURRENT I_F (mA)

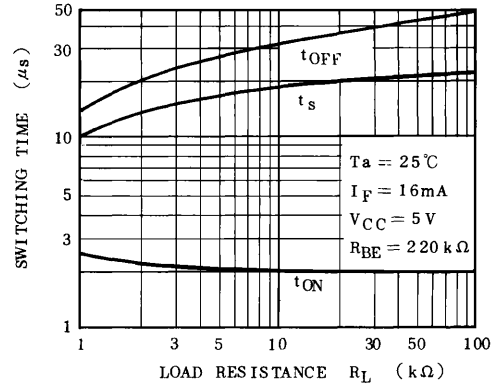
I_{CEO} – Ta



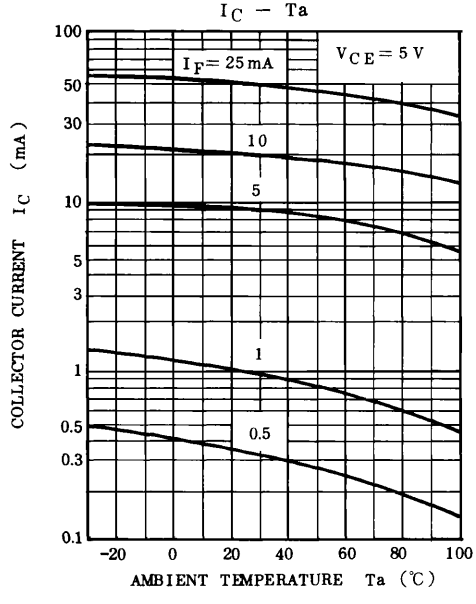
$V_{CE}(sat)$ – Ta



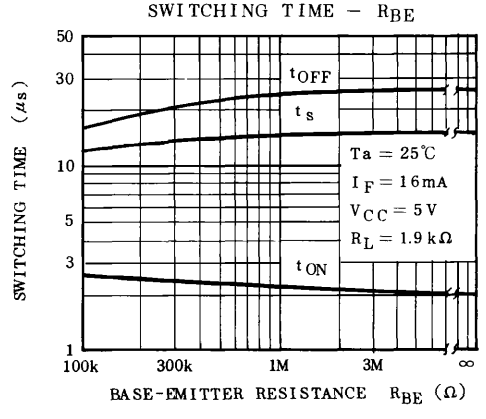
SWITCHING TIME $-R_L$



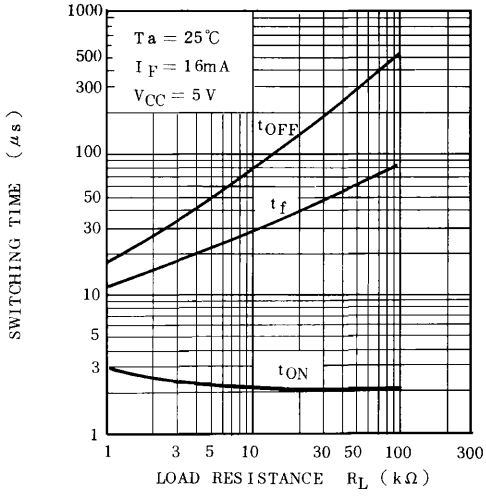
I_C – Ta



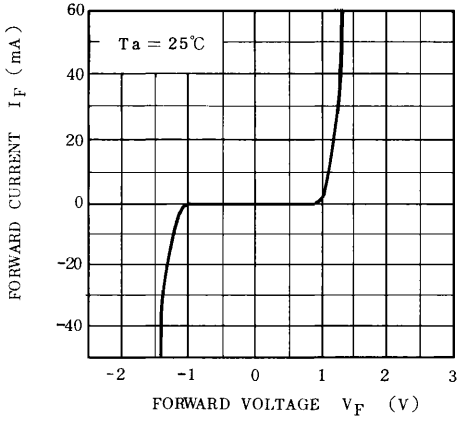
SWITCHING TIME – R_{BE}



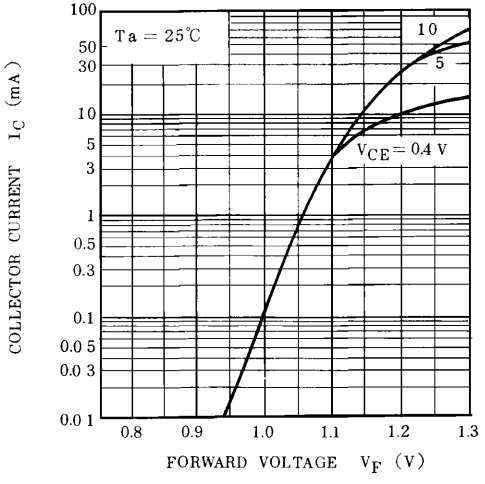
SWITCHING TIME – R_L



I_F – V_F



I_C – V_F



I_F – V_F