TOSHIBA Photocoupler GaAs IRed & Photo−Transistor

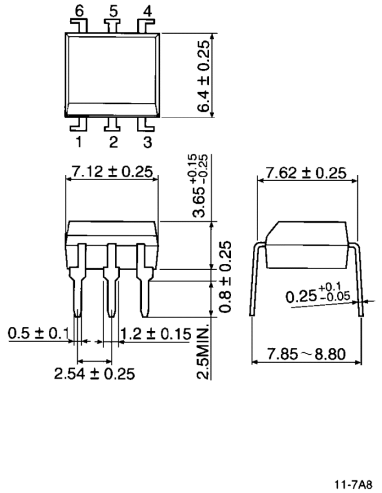
4N35(Short), 4N36(Short), 4N37(Short)

AC Line / Digital Logic Isolator.
Digital Logic / Digital Logic Isolator.
Telephone Line Receiver.
High Frequency Power Supply Feedback Control.
Relay Contact Monitor.

The TOSHIBA 4N35 (short) through 4N37 (short) consists of a gallium arsenide infrared emitting diode coupled with a silicon phototransistor in a dual in−line package.

- Switching speeds: 3μs (typ.)
- DC current transfer ratio: 100% (min.)
- Isolation resistance: $10^{11}\Omega$ (min.)
- Isolation voltage: 2500Vrms (min.)
- UL recognized: UL1577, file no. E67349

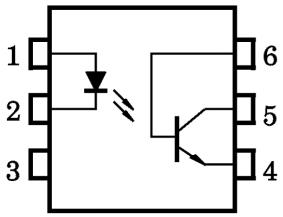
Unit in mm



TOSHIBA 11−7A8

Weight: 0.4 g

Pin Configurations(top view)



1 : ANODE
2 : CATHODE
3 : N.C.
4 : EMITTER
5 : COLLECTOR
6 : BASE

Maximum Ratings (Ta = 25°C)

	Characteristic		Symbol	Rating	Unit
LED	Forward current (continuous)		I_F	60	mA
	Forward current derating		ΔI_F/°C	0.8 (*)	mA / °C
	Peak forward current	(Note 1)	I_{PF}	3	A
	Power dissipation		P_D	100	mW
	Power dissipation derating		ΔP_D / °C	1.33 (*)	mW / °C
	Reverse voltage		V_R	6	V
Detector	Collector−emitter voltage		BV_{CEO}	30	V
	Collector−base voltage		BV_{CBO}	70	V
	Emitter−collector voltage		BV_{ECO}	7	V
	Collector current (continuous)		I_C	100	mA
	Power dissipation		P_C	300	mW
	Power dissipation derating		ΔP_C / °C	4.0 (*)	mW / °C
Coupled	Storage temperature		T_{stg}	−55~150	°C
	Operating temperature		T_{opr}	−55~100	°C
	Lead soldering temperature (at 10 s)		T_{sol}	260	°C
	Total package power dissipation		P_T	300	mW
	Total package power dissipation derating		ΔP_T / °C	3.3 (*)	mW / °C
	Input to output isolation voltage (AC, 1 minute)		BV_S	2500	Vrms
		4N35	BV_S (**)	2500 / 3550	Vrms / Vpk
		4N36		1750 / 2500	
		4N37		1050 / 1500	

(Note 1) Pulse width 1μs, 300pps

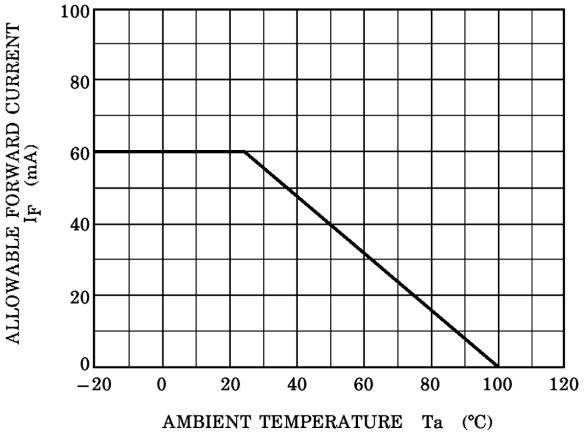
(*) Above 25°C ambient.

(**) JEDEC registered maximum BV_S, however, TOSHIBA specifies a maxium BV_S of 2500V_{rms}, 1 minute.

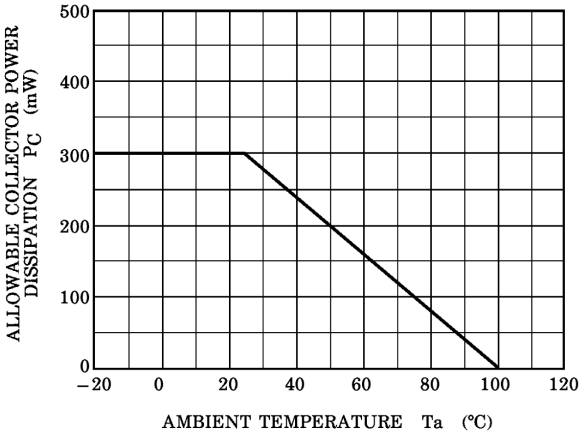
Electrical Characteristics (Ta = 25°C)

	Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage		V_F	I_F = 10 mA	0.8	1.15	1.5	V
				I_F = 10 mA, Ta = −55°C	0.9	—	1.7	
				I_F = 10 mA, Ta = 100°C	0.7	—	1.4	
	Reverse current		I_R	V_R = 6 V	—	—	10	μA
	Capacitance		C_D	V = 0, f = 1 MHz	—	30	100	pF
Detector	DC forward current gain		h_{FE}	V_{CE} = 5V, I_C = 500 μA	—	200	—	—
	Collector−emitter breakdown voltage		$V_{(BR)\ CEO}$	I_C = 10 mA	30	—	—	V
	Collector−base breakdown voltage		$V_{(BR)\ CBO}$	I_C = 100 μA	70	—	—	V
	Emitter−collector breakdown voltage		$V_{(BR)\ ECO}$	I_E = 100 μA	7	—	—	V
	Collector dark current		I_{CEO}	V_{CE} = 10 V	—	1	50	nA
	Collector dark current		I_{CEO}	V_{CE} = 30 V, Ta = 100°C	—	—	500	μA
	Collector−emitter capacitance		C_{CE}	V = 0, f = 1 MHz	—	10	—	pF
Coupled	Current transfer ratio		I_C / I_F	I_F = 10 mA, V_{CE} = 10 V	100	—	—	%
				I_F = 10 mA, V_{CE} = 10 V Ta = −55°C	40	—	—	
				I_F = 10 mA, V_{CE} = 10 V Ta = 100°C	40	—	—	
	Collector−emitter saturation voltage		$V_{CE\ (sat)}$	I_F = 10 mA, I_C = 0.5 mA	—	0.1	0.3	V
	Capacitance input to output		C_S	V_S = 0, f = 1 MHz	—	0.8	2.5	pF
	Isolation resistance		R_S	V_S = 500 V, R.H.≤ 60 %	10^{11}	—	—	Ω
	Input to output isolation current (pulse width = 8ms)	4N35	I_{IO}	V_{io} = 3550 Vpk	—	—	100	μA
		4N36		V_{io} = 2500 Vpk	—	—	100	
		4N37		V_{io} = 1500 Vpk	—	—	100	
	Turn−on time		t_{ON}	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	3	10	μs
	Turn−off time		t_{OFF}		—	3	10	

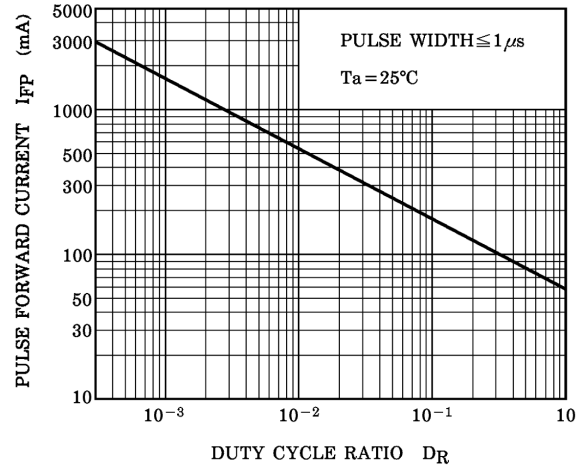
$I_F - T_a$



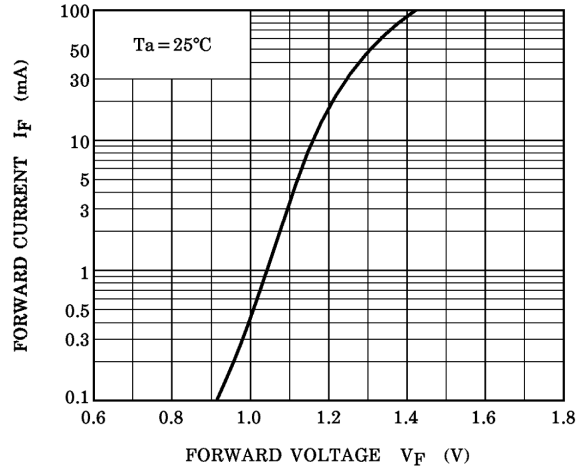
$P_C - T_a$



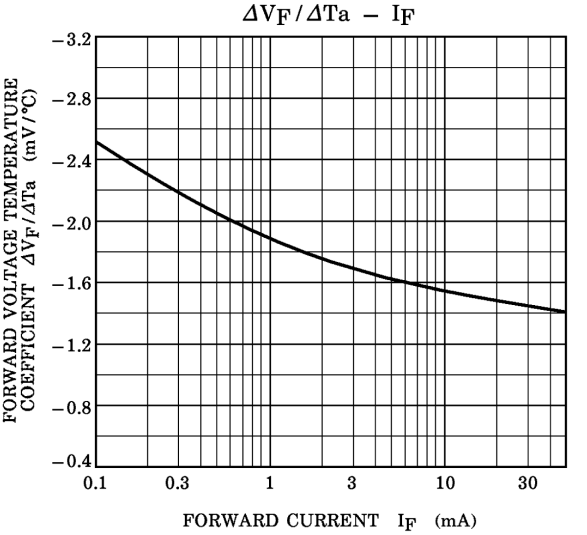
$I_{FP} - D_R$



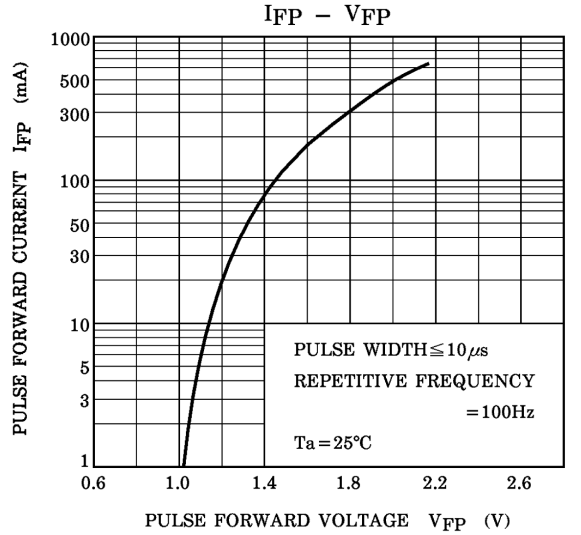
$I_F - V_F$



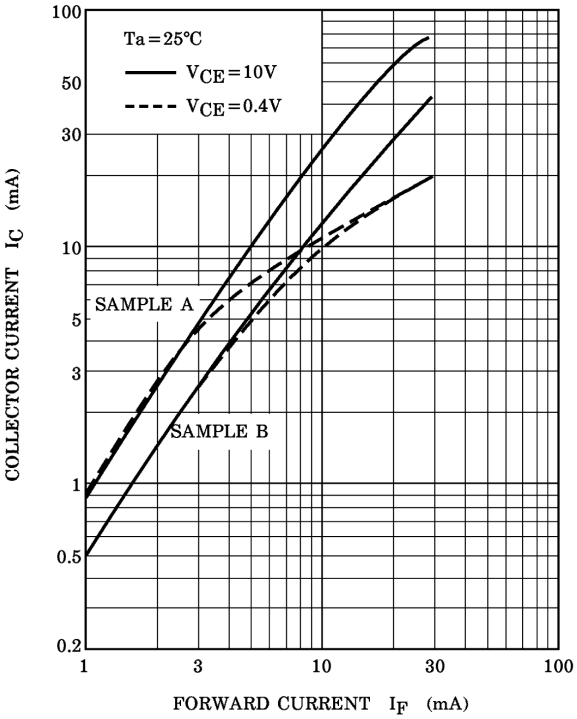
$\Delta V_F / \Delta Ta - I_F$



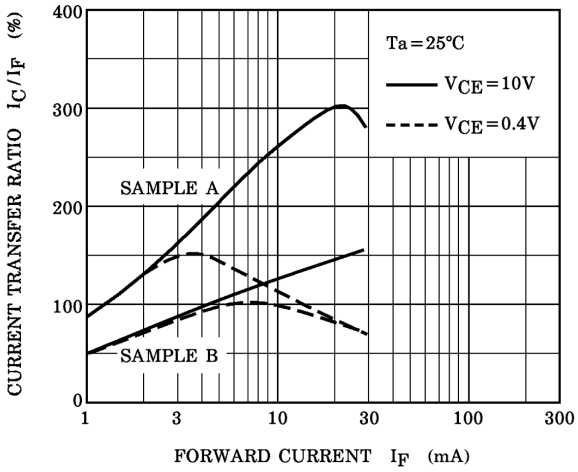
$I_{FP} - V_{FP}$



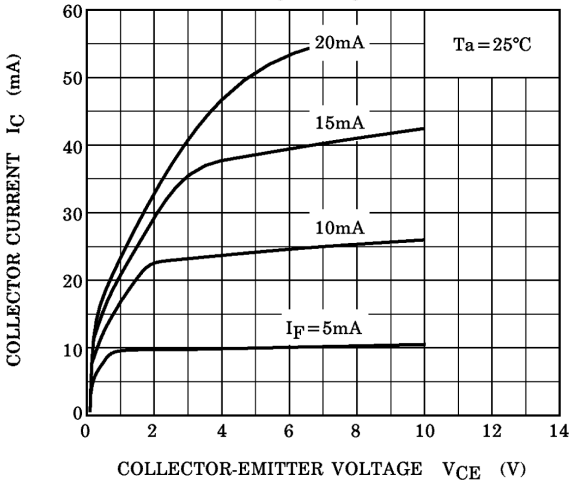
$I_C - I_F$



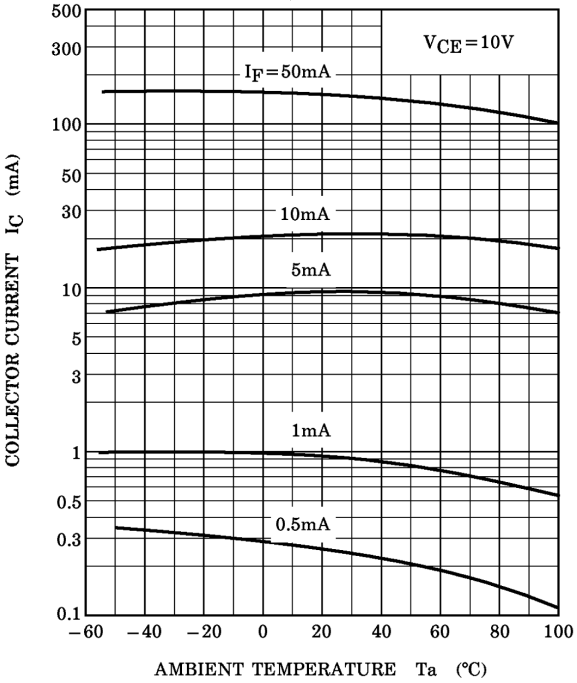
$I_C / I_F - I_F$



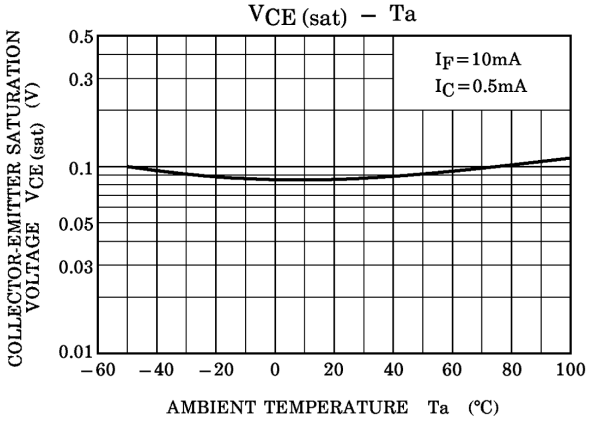
$I_C - V_{CE}$



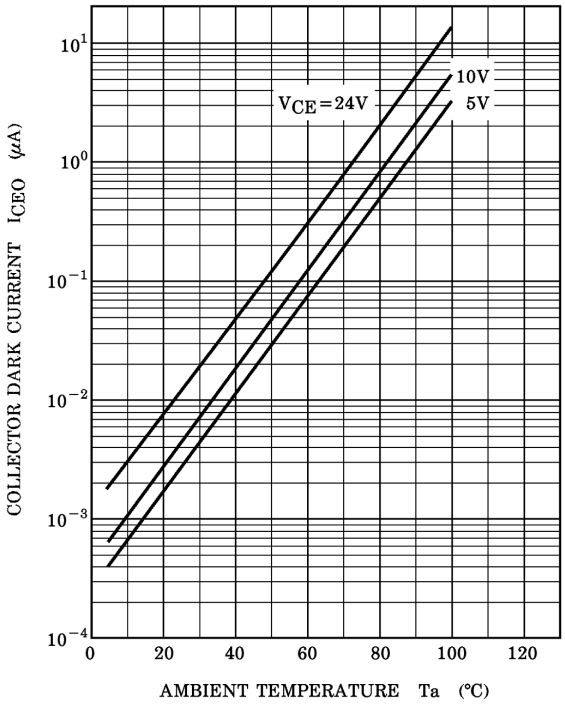
$I_C - Ta$



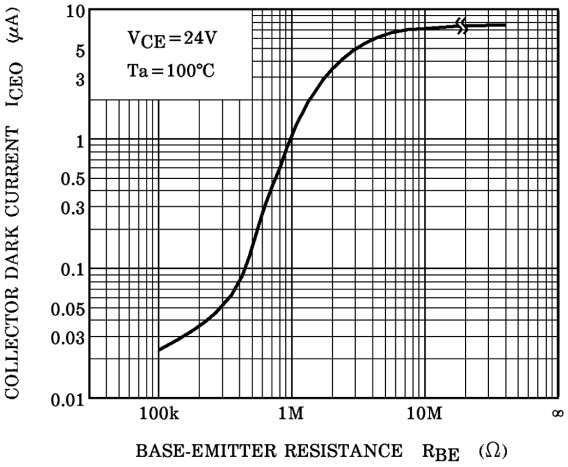
$V_{CE}\,(sat) - Ta$



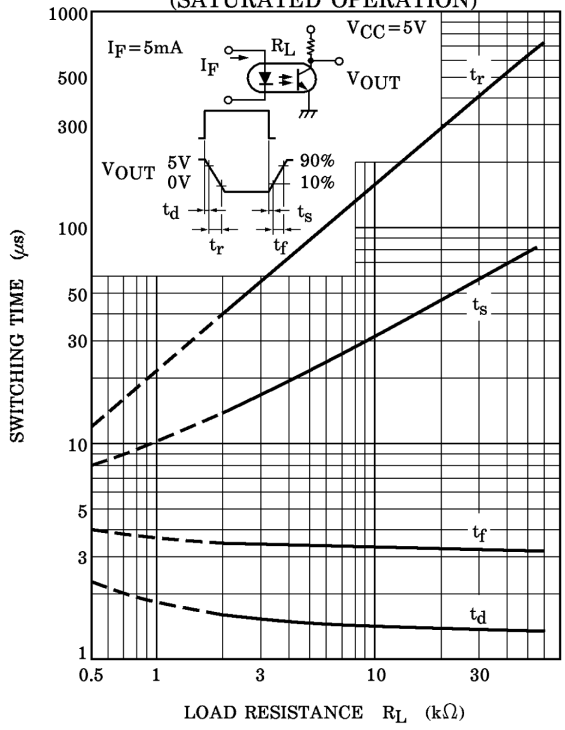
I_{CEO} – Ta



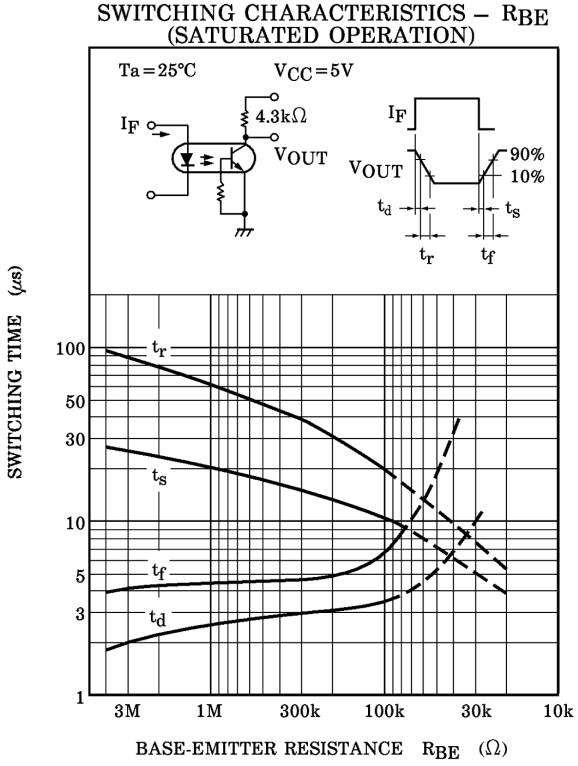
I_{CEO} – R_{BE}



SWITCHING CHARACTERISTICS – R_L
(SATURATED OPERATION)



SWITCHING CHARACTERISTICS – R_{BE}
(SATURATED OPERATION)



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