SEMICONDUCTOR

TOSHIBA

TECHNICAL DATA

TOSHIBA PHOTOCOUPLER

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

GaAs IRED & PHOTO-TRANSISTOR

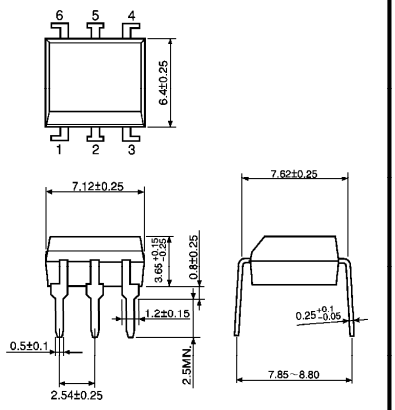
(4N35(Short))

AC LINE / DIGITAL LOGIC ISOLATOR.
DIGITAL LOGIC/DIGITAL LOGIC ISOLATOR.
TELEPHONE LINE RECEIVER.
TWISTED PAIR 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.

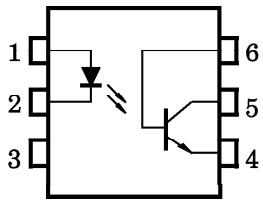
- Switching Speeds : 3μs (Typ.)
- DC Current Transfer Ratio : 100% (Min.)
- Isolation Resistance : $10^{11}\Omega$ (Min.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	11-7A8

PIN CONFIGURATIONS (TOP VIEW)



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

(4N35(Short))

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)		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 10s)		T_{sold}	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 : 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.

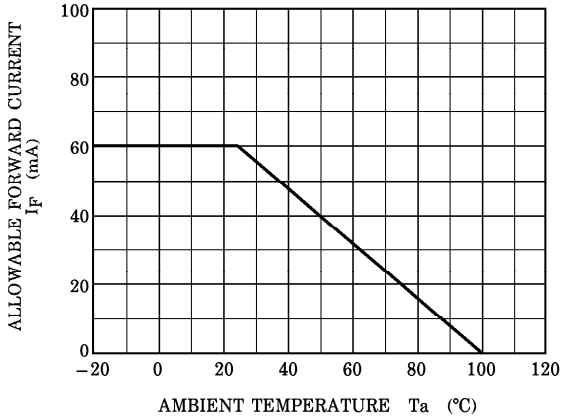
(4N35(Short))

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

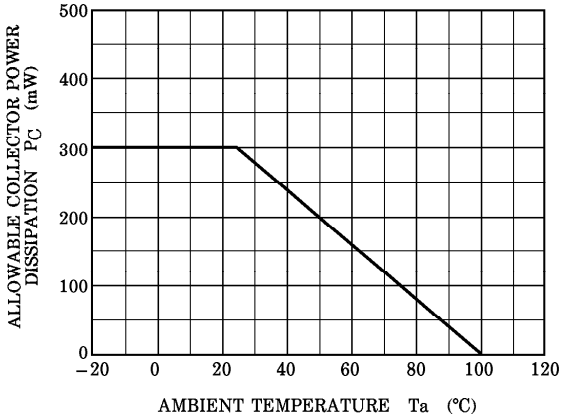
	CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage		V_F	I_F = 10mA	0.8	1.15	1.5	V
				I_F = 10mA, Ta = −55°C	0.9	—	1.7	
				I_F = 10mA, Ta = 100°C	0.7	—	1.4	
	Reverse Current		I_R	V_R = 6V	—	—	10	μA
	Capacitance		C_D	V = 0, f = 1MHz	—	30	100	pF
DETECTOR	DC Forward Current Gain		h_{FE}	V_{CE} = 5V, I_C = 500μA	—	200	—	—
	Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$	I_C = 10mA	30	—	—	V
	Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	I_C = 100μA	70	—	—	V
	Emitter-Collector Breakdown Voltage		$V_{(BR)ECO}$	I_E = 100μA	7	—	—	V
	Collector Dark Current		I_{CEO}	V_{CE} = 10V	—	1	50	nA
	Collector Dark Current		I_{CEO}	V_{CE} = 30V, Ta = 100°C	—	—	500	μA
	Collector-Emitter Capacitance		C_{CE}	V = 0, f = 1MHz	—	10	—	pF
COUPLED	Current Transfer Ratio		I_C / I_F	I_F = 10mA, V_{CE} = 10V	100	—	—	%
				I_F = 10mA, V_{CE} = 10V, Ta = −55°C	40	—	—	
				I_F = 10mA, V_{CE} = 10V, Ta = 100°C	40	—	—	
	Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	I_F = 10mA, I_C = 0.5mA	—	0.1	0.3	V
	Capacitance Input to Output		C_S	V_S = 0, f = 1MHz	—	0.8	2.5	pF
	Isolation Resistance		R_S	V_S = 500V, R. H. ≦ 60%	10^{11}	—	—	Ω
	Input to Output Isolation Current (Pulse Widtn = 8ms)	4N35	I_{IO}	V_{io} = 3550Vpk	—	—	100	μA
		4N36		V_{io} = 2500Vpk	—	—	100	
		4N37		V_{io} = 1500Vpk	—	—	100	
	Turn-on Time		t_{on}	V_{CC} = 10V, I_C = 2mA, R_L = 100Ω	—	3	10	μs
	Turn-off Time		t_{off}		—	3	10	

(4N35(Short))

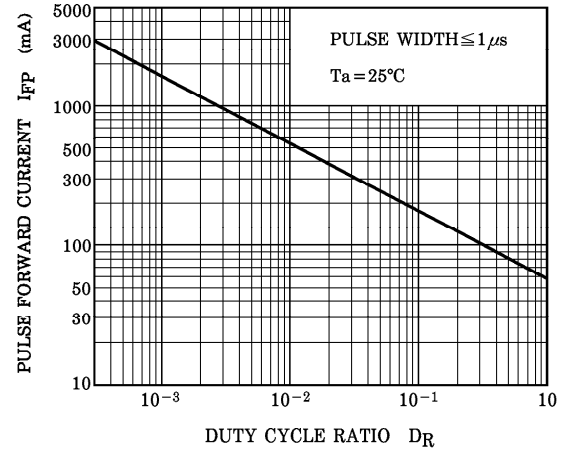
$I_F - T_a$



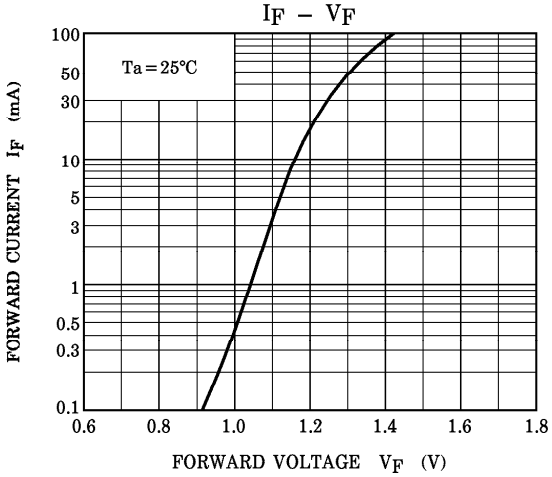
$P_C - T_a$



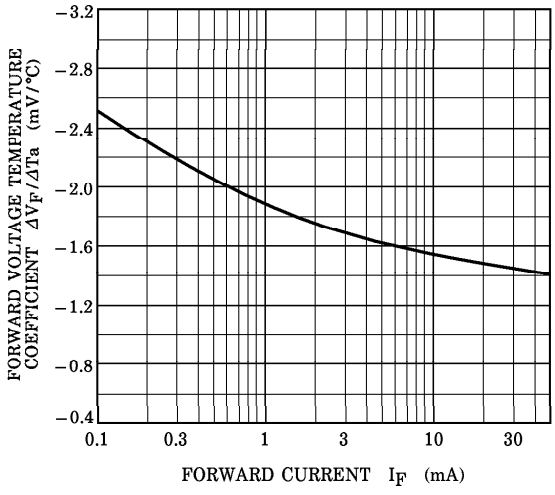
$I_{FP} - D_R$



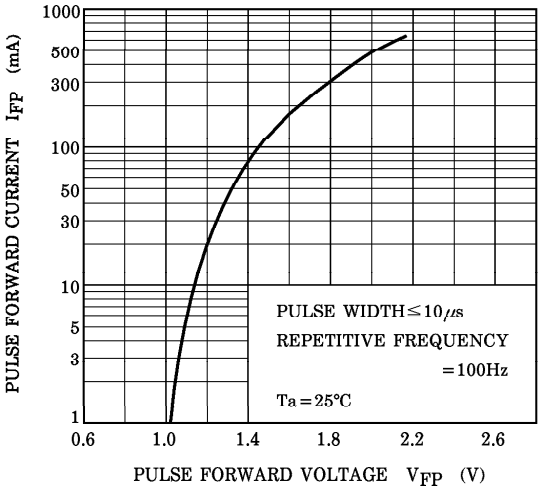
$I_F - V_F$



$\Delta V_F / \Delta Ta - I_F$

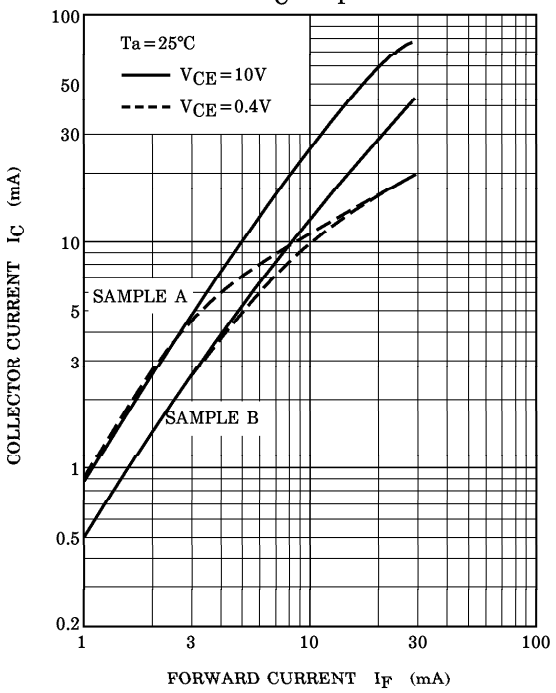


$I_{FP} - V_{FP}$

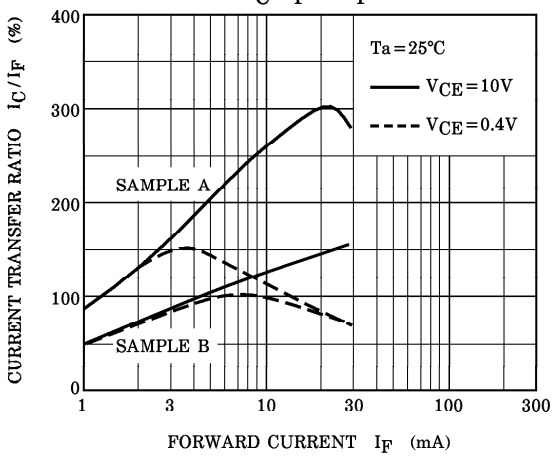


(4N35(Short))

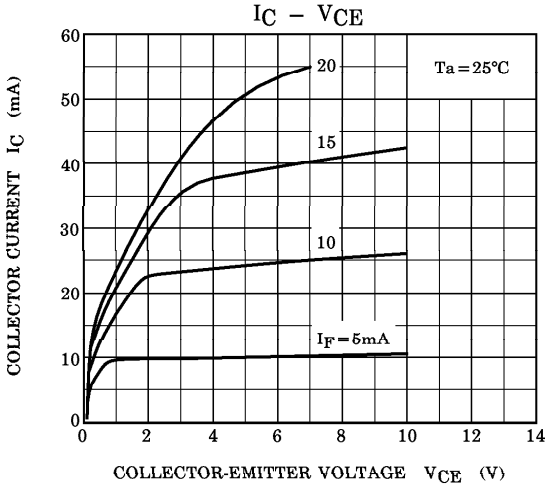
$I_C - I_F$



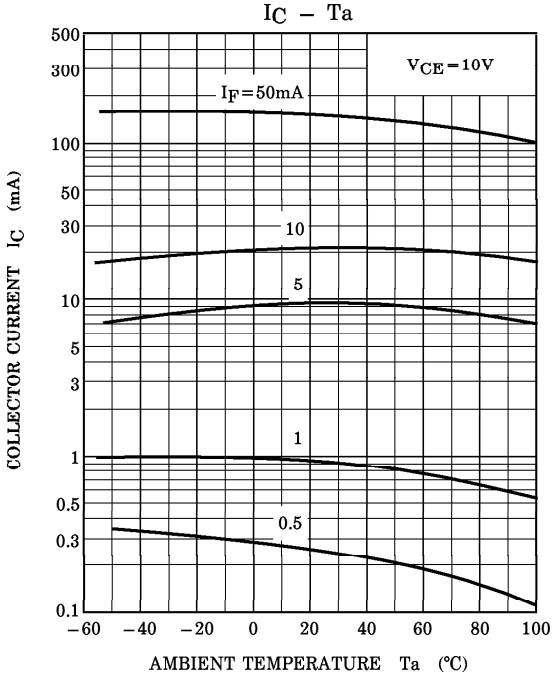
$I_C / I_F - I_F$



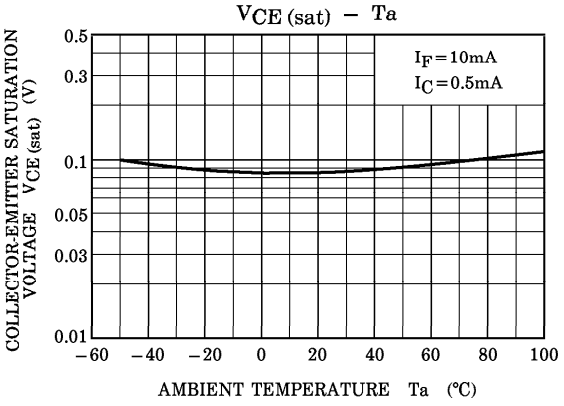
$I_C - V_{CE}$



$I_C - Ta$

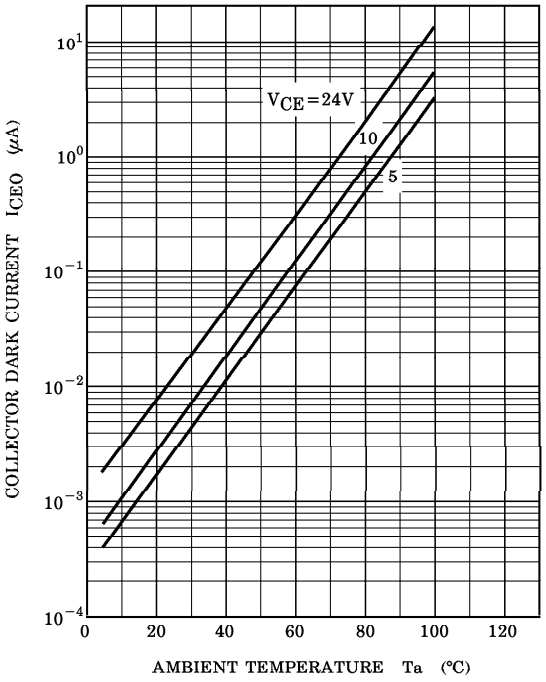


$V_{CE\,(sat)} - Ta$

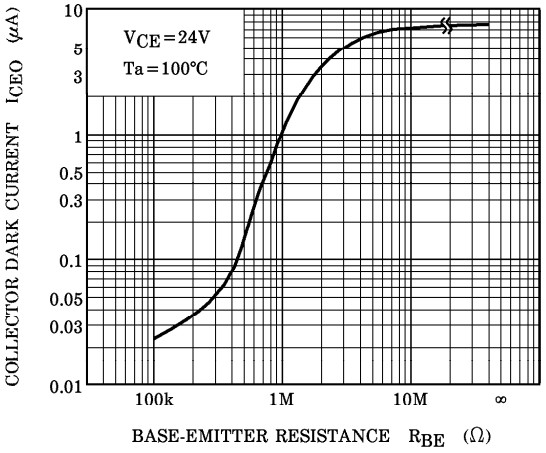


(4N35(Short))

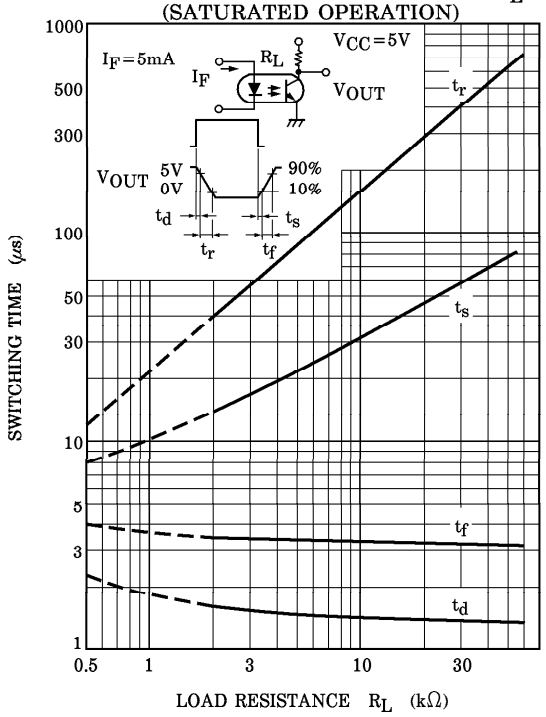
I_{CEO} – Ta



I_{CEO} – R_{BE}



SWITCHING CHARACTERISTICS – R_L
(SATURATED OPERATION)



SWITCHING CHARACTERISTICS – R_{BE}
(SATURATED OPERATION)