TOSHIBA PHOTOCOUPLER GaAℓAs IRED & PHOTO-IC

TLP651

DIGITAL LOGIC GROUND ISOLATION

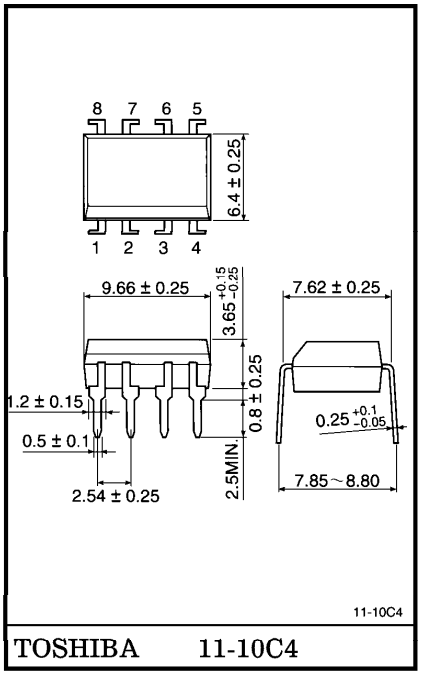
LINE RECEIVER

MICROPROCESSOR SYSTEM INTERFACES

SWITCHING POWER SUPPLY FEEDBACK CONTROL

ANALOG SIGNAL ISOLATION

Unit in mm



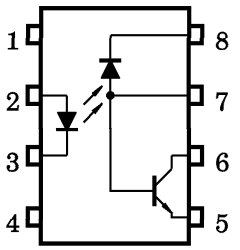
TOSHIBA 11-10C4

Weight : 0.54g

The TOSHIBA TLP651 consists of a GaAℓAs high-output light emitting diode and a high speed detector of one chip photo diode-transistor.
This unit is 8-lead DIP.
TLP651 has internal base connection. This base pin should be used for analog application or enable operation. If base pin is open, output signal will be noisy by environmental condition. For this case, TLP650 is suitable.

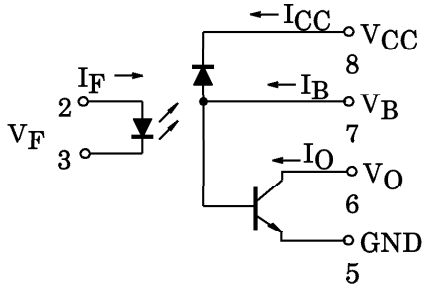
- Isolation Voltage : $5000V_{rms}$ (MIN.)
- Switching Speed : $t_{pHL}=0.3\mu s$ (TYP.)
  $t_{pLH}=0.5\mu s$ (TYP.) ($R_L=1.9k\Omega$)
- TTL Compatible
- UL Recognized : UL1577, File No. E67349
- BSI Approved : BS EN60065 : 1994
  Certificate No. 7613
  BS EN60950 : 1992
  Certificate No. 7614

PIN CONFIGURATION (TOP VIEW)



1 : N.C.
2 : ANODE
3 : CATHODE
4 : N.C.
5 : EMITTER
6 : COLLECTOR
7 : BASE
8 : V_{CC}

SCHEMATIC



MAXIMUM RATINGS (Ta = 25°C)

	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current (Note 1)	I_F	25	mA
	Pulse Forward Current (Note 2)	I_{FP}	50	mA
	Peak Transient Forward Current (Note 3)	I_{FPT}	1	A
	Reverse Voltage	V_R	5	V
	Diode Power Dissipation (Note 4)	P_D	45	mW
DETECTOR	Output Current	I_O	8	mA
	Peak Output Current	I_{OP}	16	mA
	Output Voltage	V_O	−0.5~15	V
	Supply Voltage	V_{CC}	−0.5~15	V
	Base Current	I_B	5	mA
	Emitter-Base Reverse Voltage	V_{EB}	5	V
	Output Power Dissipation (Note 5)	P_O	100	mW
Operating Temperature Range		T_{opr}	−55~100	°C
Storage Temperature Range		T_{stg}	−55~125	°C
Lead Solder Temperature (10s) (Note 6)		T_{sol}	260	°C
Isolation Voltage (AC, 1min., R.H≦60%) (Note 7)		BV_S	5000	V_{rms}

(Note 1) Derate 0.8mA above 70°C.
(Note 2) 50% duty cycle, 1ms pulse width.
Derate 1.6mA / °C above 70°C.
(Note 3) Pulse width≦1μs, 300pps.
(Note 4) Derate 0.9mW / °C above 70°C.
(Note 5) Derate 2mW / °C above 70°C.
(Note 6) Soldering portion of lead : up to 2mm from the body of the device.
(Note 7) Device considered a two terminal device : Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

	CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V_F	I_F = 16mA		—	1.65	1.85	V
	Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta Ta$	I_F = 16mA		—	−2	—	mV / °C
	Reverse Current	I_R	V_R = 5V		—	—	10	μA
	Capacitance Between Terminal	C_T	V_F = 0, f = 1MHz		—	45	—	pF
DETECTOR	High Level Output Current	I_{OH} (1)	I_F = 0mA, V_{CC} = V_O = 5.5V		—	3	500	nA
		I_{OH} (2)	I_F = 0mA, V_{CC} = V_O = 15V		—	—	5	μA
		I_{OH}	I_F = 0mA, V_{CC} = V_O = 15V, Ta = 70°C		—	—	250	μA
	High Level Supply Voltage	I_{CCH}	I_F = 0mA, V_{CC} = 15V		—	0.01	1	μA
COUPLED	Current Transfer Ratio	I_O / I_F	I_F = 16 mA, V_{CC} = 4.5V, V_O = 0.4V	Ta = 25°C	10	30	—	%
				Rank : O	19	30	—	
				Ta = 0~70°C	5	—	—	
				Rank : O	15	—	—	
	Low Level Output Voltage	V_{OL}	I_F = 16mA, V_{CC} = 4.5V, I_O = 1.1mA (Rank 0 : I_O = 2.4mA)		—	—	0.4	V
	Isolation Resistance	R_S	R.H. ≦ 60%, V_S = 500V_{DC} (Note 7)		5×10^{10}	10^{14}	—	Ω
	Capacitance Between Input to Output	C_S	V_S = 0, f = 1MHz (Note 7)		—	0.8	—	pF

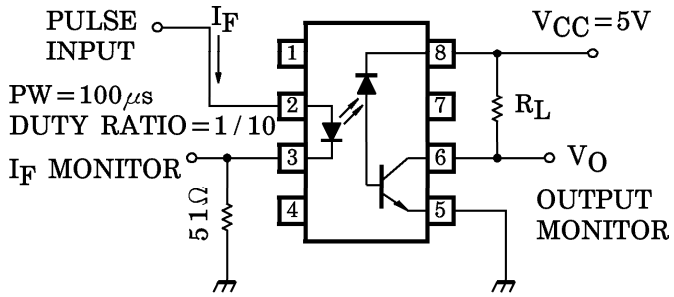
SWITCHING CHARACTERISTICS (Ta = 25°C, V_{CC} = 5V)

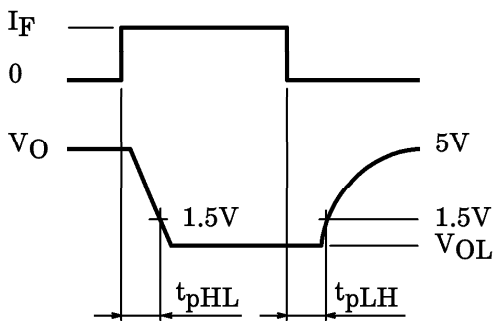
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (H→L)	t_{pHL}	1	I_F = 0→16mA, V_{CC} = 5V,		—	0.2	0.8	μs
			R_L = 4.1kΩ	Rank O : R_L = 1.9kΩ	—	0.3	0.8	
Propagation Delay Time (L→H)	t_{pLH}		I_F = 16→0mA, V_{CC} = 5V,		—	1.0	2.0	μs
			R_L = 4.1kΩ	Rank O : R_L = 1.9kΩ	—	0.5	1.2	
Common Mode Transient Immunity at Logic High Output (Note8)	C_{MH}	2	I_F = 0mA, V_{CM} = 200Vp-p, R_L = 4.1kΩ (Rank O : R_L = 1.9kΩ)		—	400	—	V / μs
Common Mode Transient Immunity at Logic Low Output (Note8)	C_{ML}		I_F = 16mA, V_{CM} = 200Vp-p, R_L = 4.1kΩ (Rank O : R_L = 1.9kΩ)		—	−1000	—	V / μs

(Note 8) CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O<0.8V).
CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O>2.0V).

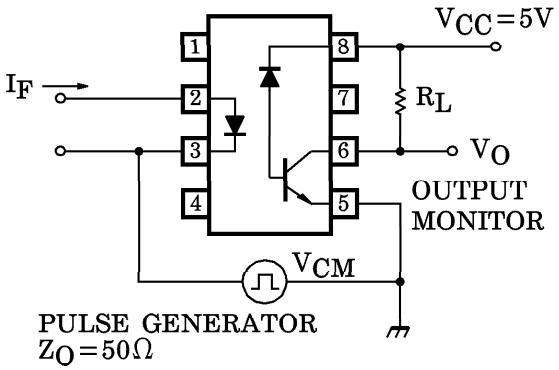
(Note 9) Maximum electrostatic discharge voltage for any pins : 100V (C=200pF, R=0).

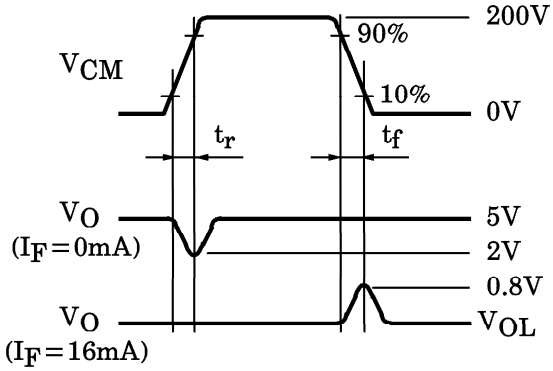
TEST CIRCUIT 1 : Switching Time Test Circuit





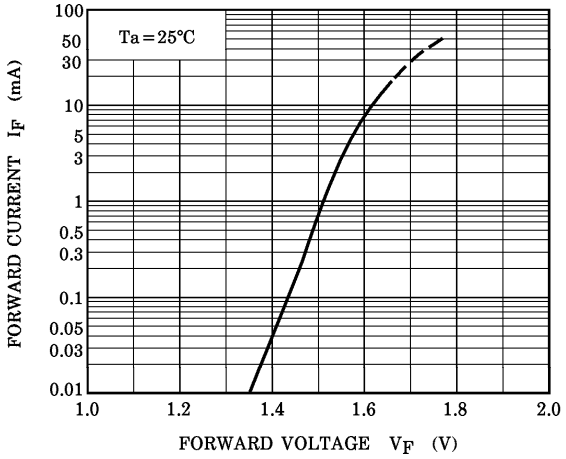
TEST CIRCUIT 2 : Common Mode Noise Immunity Test Circuit



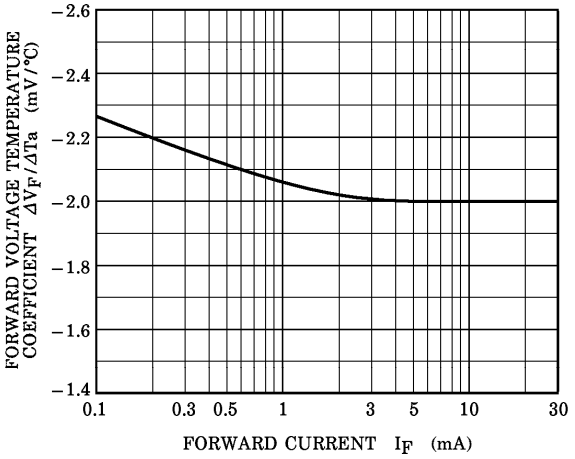


$$CM_H = \frac{160\,(V)}{t_r\,(\mu s)},\ CM_L = \frac{160\,(V)}{t_f\,(\mu s)}$$

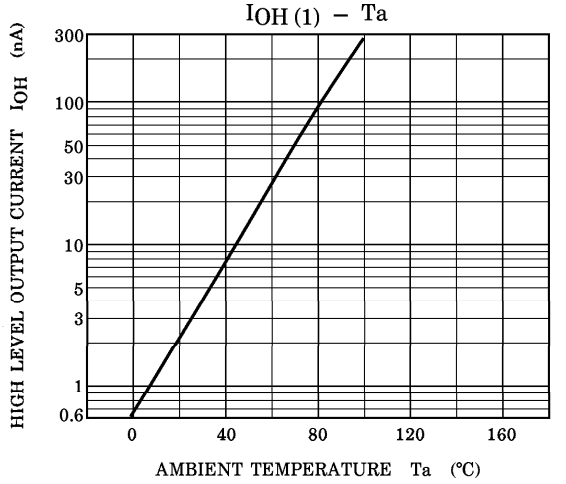
$I_F - V_F$



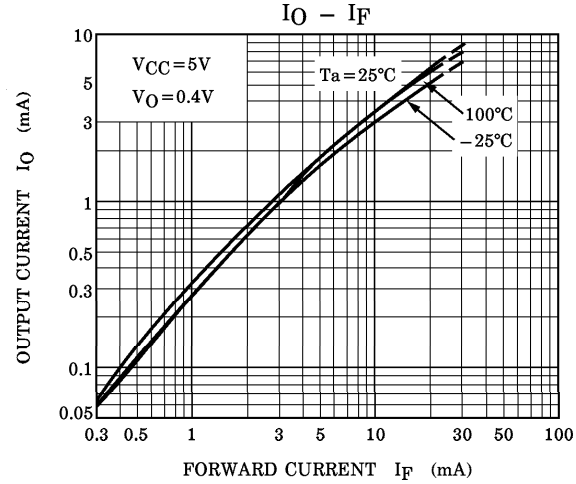
$\Delta V_F / \Delta Ta - I_F$



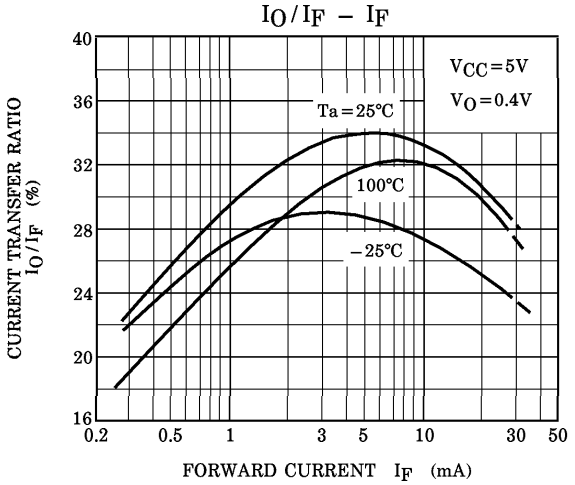
$I_{OH\ (1)} - Ta$



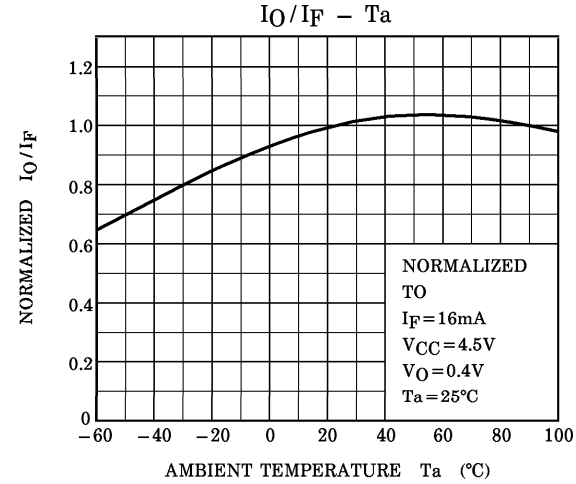
$I_O - I_F$



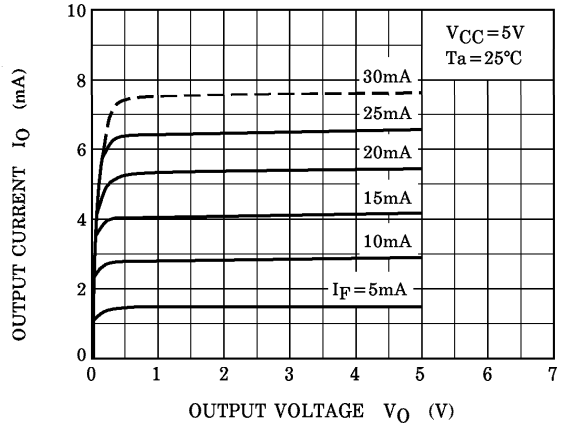
$I_O / I_F - I_F$



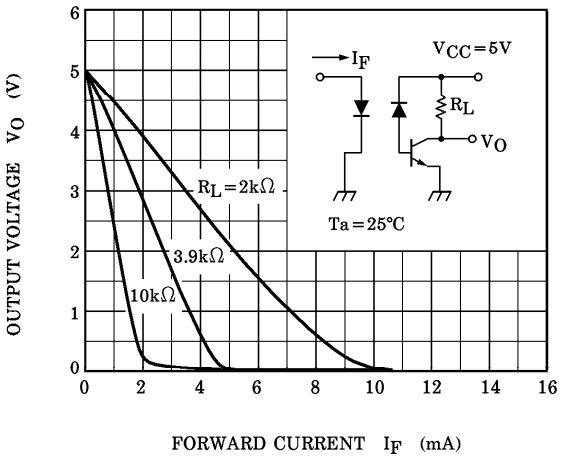
$I_O / I_F - Ta$



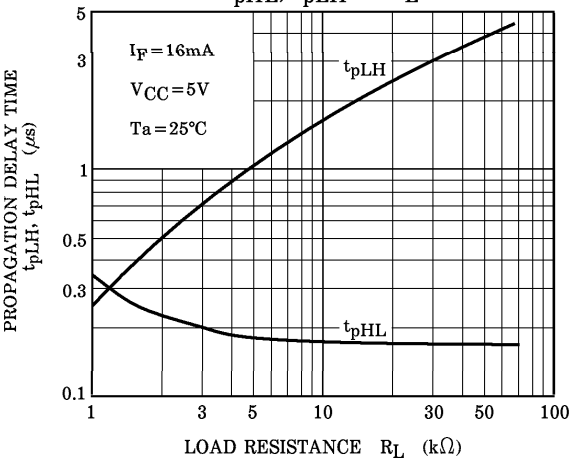
$I_O - V_O$



$V_O - I_F$



$t_{pHL}, t_{pLH} - R_L$



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