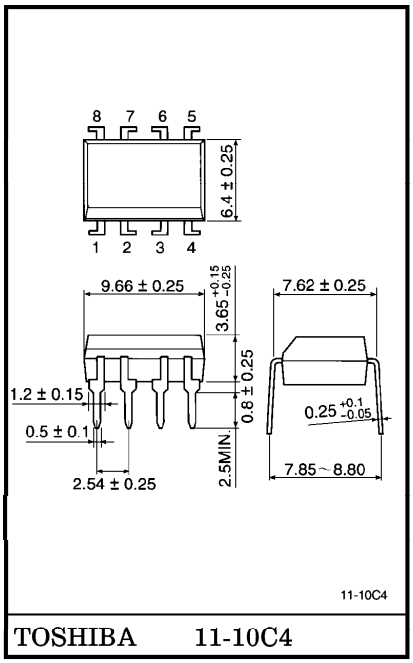
TOSHIBA PHOTOCOUPLER GaAℓAs IRED & PHOTO IC

TLP2530, TLP2531

DEGITAL LOGIC ISOLATION
LINE RECEIVER
POWER SUPPLY CONTROL
SWITCHING POWER SUPPLY
TRANSISTOR INVERTER

Unit in mm



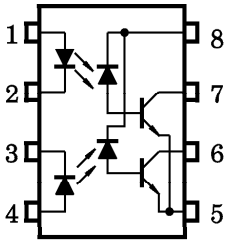
TOSHIBA 11-10C4

Weight : 0.54g

The TOSHIBA TLP2530 and TLP2531 dual photocouplers consist of a pair of GaAℓAs light emitting diode and integrated photodetector. This unit is 8-lead DIP.
Separate connection for the photodiode bias and output transistor collectors improve the speed up to a hundred times that of a conventional phototransistor coupler by reducing the base-collector capacitance.

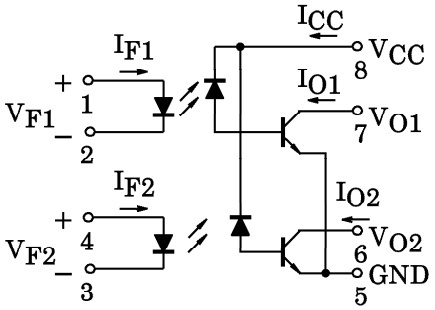
- TTL Compatibel
- Switching Speed : $t_{pHL}=0.3\mu s$, $t_{pLH}=0.3\mu s$ (Typ.) ($@R_L=1.9k\Omega$)
- Guaranteed Performance Over Temp : 0~70°C
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATION (TOP VIEW)



1. : ANODE.1
2. : CATHODE.1
3. : CATHODE.2
4. : ANODE.2
5. : GND
6. : V_{O2} (OUTPUT 2)
7. : V_{O1} (OUTPUT 1)
8. : V_{CC}

SCHEMATIC



980508EBC2

MAXIMUM RATINGS

	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current (Each channel) (Note 1)	I_F	25	mA
	Pulse Forward Current (Each channel) (Note 2)	I_{FP}	50	mA
	Total Pulse Forward Current (Each channel) (Note 3)	I_{FPT}	1	A
	Reverse Voltage (Each channel)	V_R	5	V
	Diode Power Dissipation (Each channel) (Note 4)	P_D	45	mW
DETECTOR	Otuput Current (Each channel)	I_O	8	mA
	Peak Output Current (Each channel)	I_{OP}	16	mA
	Supply Voltage	V_{CC}	−0.5~15	V
	Output Voltage (Each channel)	V_O	−0.5~15	V
	Output Power Dissipation (Each channel) (Note 5)	P_O	35	mW
Operating Temperature Range		T_{opr}	−55~100	°C
Storage Temperature Range		T_{stg}	−55~125	°C
Lead Solder Temperature (10s)**		T_{sol}	260	°C
Isolation Voltage (AC, 1min., R.H.≦60%) (Note 7)		BV_S	2500	Vrms

(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 1mW / °C above 70°C.

** 2mm below seating plane.

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	0	—	12	V
Forward Current, Each Channel	I_F	—	16	25	mA
Operating Temperature	T_{opr}	−25	—	85	°C

ELECTRICAL CHARACTERISTICS
OVER RECOMMENDED TEMPERATURE (Ta = 0°C~70°C, Unless otherwise noted)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.**	MAX.	UNIT
Current Transfer Ratio (Each Channel)	TLP2530	CTR	I_F=16mA, V_O=0.4V, V_{CC}=4.5V, Ta=25°C (Note 6)	7	30	—	%
	TLP2531			19	30	—	
	TLP2530	CTR	I_F=16mA, V_O=0.5V, V_{CC}=4.5V (Note 6)	5	—	—	%
	TLP2531			15	—	—	
Logic Low Output Voltage (Each Channel)	TLP2530	V_{OL}	I_F=16mA, I_O=1.1mA, V_{CC}=4.5V	—	0.1	0.4	V
	TLP2531		I_F=16mA, I_O=2.4mA, V_{CC}=4.5V	—	0.1	0.4	V
Logic High Output Current (Each Channel)		I_{OH}	I_F=0mA, V_O=V_{CC}=5.5V, Ta=25°C	—	3	500	nA
			I_F=0mA, V_O=V_{CC}=15V	—	—	50	μA
Logic Low Supply Current		I_{CCL}	I_{F1}=I_{F2}=16mA, V_{O1}=V_{O2}=Open, V_{CC}=15V	—	160	—	μA
Logic High Supply Current		I_{CCH}	I_{F1}=I_{F2}=0mA, V_{O1}=V_{O2}=Open, V_{CC}=15V	—	0.05	4	μA
Input Forward Voltage (Each Channel)		V_F	I_F=16mA, Ta=25°C	—	1.65	1.7	V
Temperature Coefficent of Forward Voltage (Each Channel)		$\Delta V_F / \Delta Ta$	I_F=16mA	—	−2	—	mV / °C
Input Reverse Breakdown Voltage (Each Channel)		BV_R	I_R=10μA, Ta=25°C	5	—	—	V
Input Capacitance (Each Channel)		C_{IN}	f=1MHz, V_F=0	—	60	—	pF
Input-Output Insulation Leakage Current		I_{I-O}	Relative Humidity=45%, t=5s, V_{I-O}=3000V_{dc}, Ta=25°C (Note 7)	—	—	1.0	μA
Resistance (Input-Output)		R_{I-O}	V_{I-O}=500V_{dc} (Note 7)	—	10^{12}	—	Ω
Capacitance (Input-Output)		C_{I-O}	f=1MHz (Note 7)	—	0.6	—	pF
Input-Input Leakage Current		I_{I-I}	Relative Humidity=45%, t=5s, V_{I-I}=500V (Note 8)	—	0.005	—	μA
Resistance (Input-Input)		R_{I-I}	V_{I-I}=500V_{dc} (Note 8)	—	10^{11}	—	Ω
Capacitance (Input-Input)		C_{I-I}	f=1MHz (Note 8)	—	0.25	—	pF

** All typicals at Ta=25°C.

SWITCHING CHARACTERISTICS (Unless otherwise specified, Ta = 25°C, V_{CC} = 5V, I_F = 16mA)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to Logic Low at Output (Each Channel)	TLP2530	t_{pHL}	1	R_L = 4.1kΩ	—	0.3	1.5	μs
	TLP2531			R_L = 1.9kΩ	—	0.2	0.8	
Propagation Delay Time to Logic High at Output (Each Channel)	TLP2530	t_{pLH}	1	R_L = 4.1kΩ	—	0.5	1.5	μs
	TLP2531			R_L = 1.9kΩ	—	0.3	0.8	
Common Mode Transient Immunity at Logic High Level Output (Each Channel, Note 9)	TLP2530	CM_H	2	I_F = 0mA, V_{CM} = 400V_{p-p}, R_L = 4.1kΩ	—	1500	—	V / μs
	TLP2531			I_F = 0mA, V_{CM} = 400V_{p-p}, R_L = 1.9kΩ	—	1500	—	
Common Mode Transient Immunity at Logic Low Level Output (Each Channel, Note 9)	TLP2530	CM_L	2	V_{CM} = 400V_{p-p}, R_L = 4.1kΩ, I_F = 16mA	—	−1500	—	V / μs
	TLP2531			V_{CM} = 400 $_{p-p}$, R_L = 1.9kΩ, I_F = 16mA	—	−1500	—	
Bandwidth (Each Channel, Note 10)		BW	3	R_L = 100Ω	—	2	—	MHz

(Note 6) DC CURRENT TRANSFER RATIO is defined as the ratio of output collector current, I_O, to the forward LED input current, I_F, times 100%.

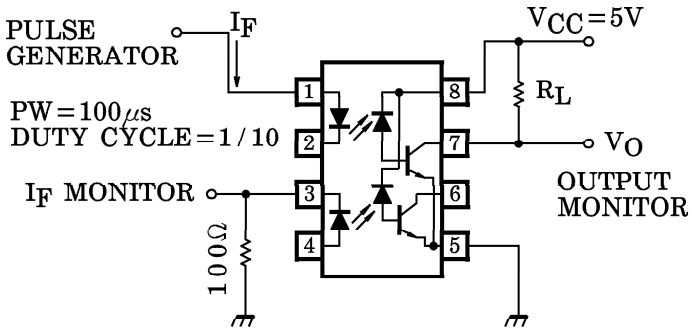
(Note 7) Device considered a two-terminal device : Pins 1, 2, 3 and 4 shorted together and Pins 5, 6, 7, and 8 shorted together.

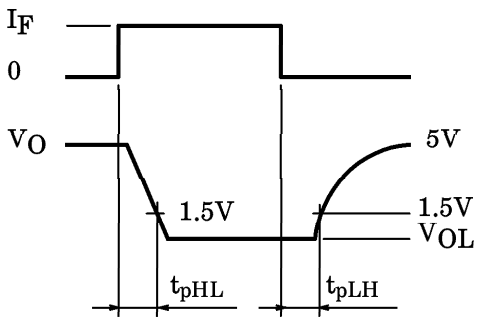
(Note 8) Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

(Note 9) Common mode transient immunity in Logic High level is the maximum tolerable (Positive) dVcm / dt on the leading edge of the common mode pulse, Vcm, to assure that the output will remain in a Logic High state (i.e., V_O > 2.0V).
Common mode transient immunity in Logic Low level is the maximum tolerable (negative) dVcm / dt on the trailing edge of the common mode pulse signal, Vcm, to assure that the output will remain in a Logic Low state (i.e., V_O > 0.8V).

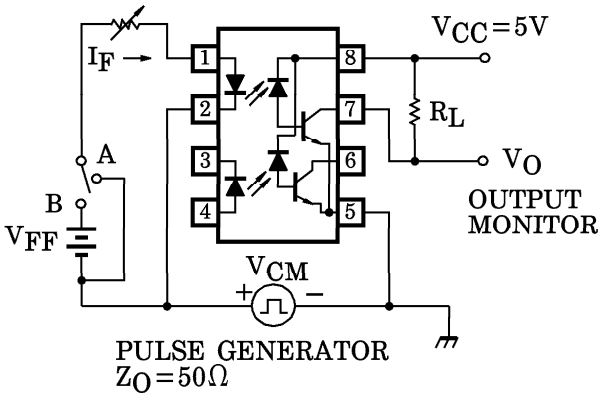
(Note 10) The frequency at which the ac output voltage is 3dB below the low frequency asymptote.

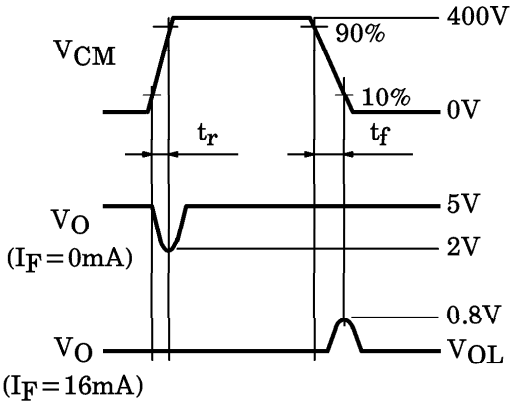
TEST CIRCUIT 1 : SWITCHING TIME, t_pHL, t_pLH





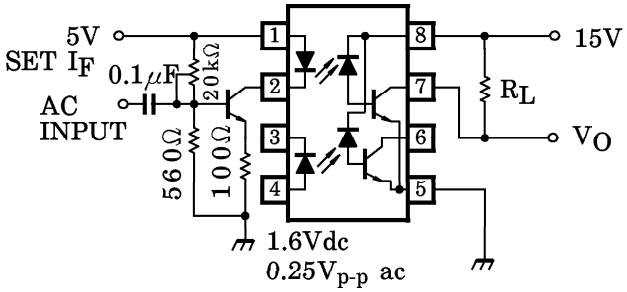
TEST CIRCUIT 2 : TRANSIENT IMMUNITY AND TYPICAL WAVEFORM



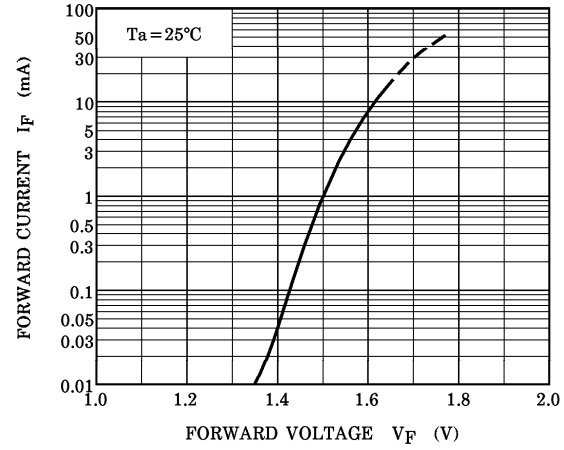


$$CM_H=\frac{320\,(V)}{t_r\,(\mu s)},\ CM_L=\frac{320\,(V)}{t_f\,(\mu s)}$$

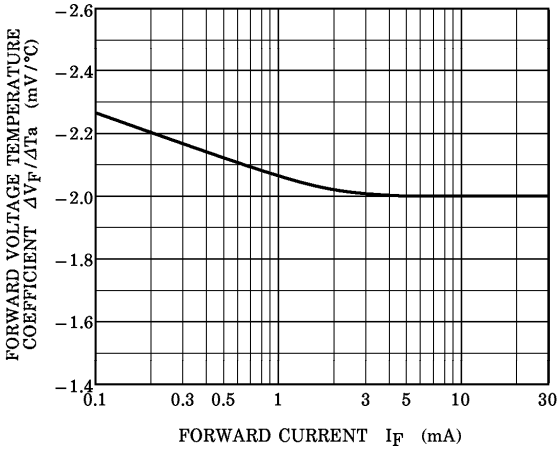
TEST CIRCUIT 3 : FREQUENCY RESPONCE



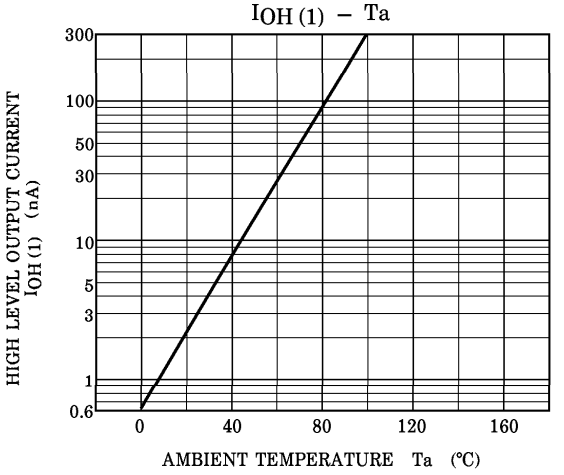
$I_F - V_F$



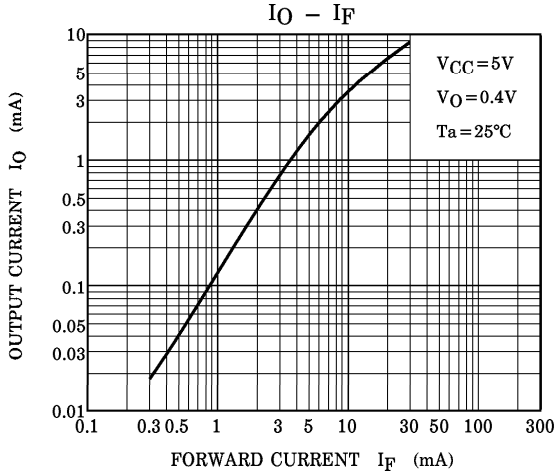
$\Delta V_F / \Delta Ta - I_F$



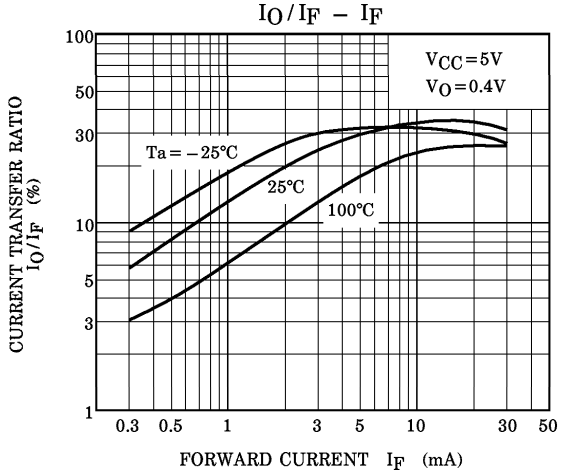
$I_{OH\,(1)} - Ta$



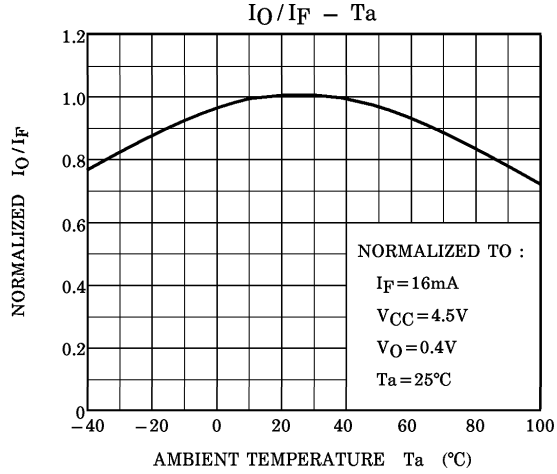
$I_O - I_F$



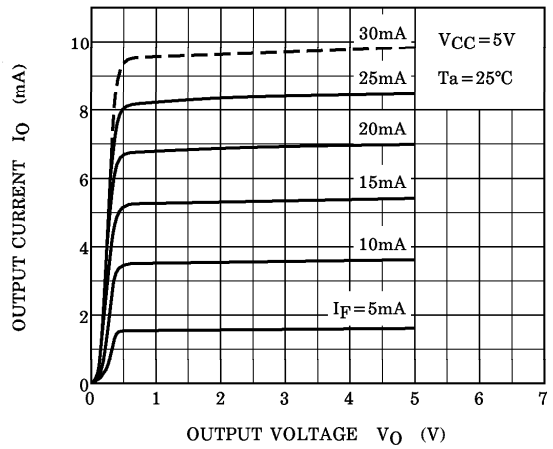
$I_O / I_F - I_F$



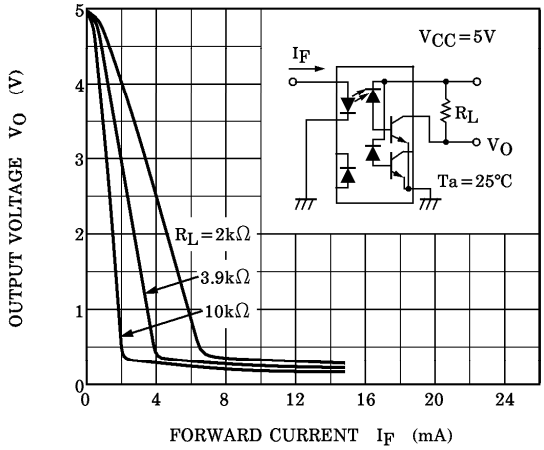
$I_O / I_F - Ta$



$I_O - V_O$



$V_O - I_F$



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