

Preliminary

TOSHIBA Photocoupler GaAlAs IRED & Photo-IC

TLP716

Digital Isolation for A/D,D/A Conversion.

High Speed Line Receiver.

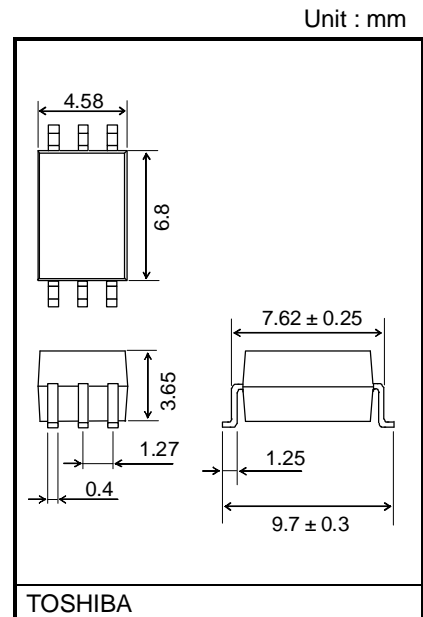
Microprocessor System Interfaces.

Plasma display panel.

The TOSHIBA TLP716 consists of a GaAlAs light emitting diode and a high speed photodetector. This unit is 6-lead SDIP. TLP716 is 50% smaller than 8PIN DIP and has suited the safety standard reinforced insulation class. So mounting area in safety standard required equipment can be reduced.

- Inverter Logic (totempole output)
- Package Type : SDIP6
- Guaranteed Performance Over Temperature : -40~100°C
- Power Supply Voltage : 4.5~5.5V
- Input Thresholds Current : IFHL=6.5mA(max.)
- Propagation delay Time (tpHL/ tpLH) : 75ns(max.)
- Switching speed : 20MBd(typ.) (NRZ)
- Common mode transient immunity : 10kV/us
- Isolation Voltage : 5000Vrms
- Construction Mechanical Rating

	7.62 mm pich standard type	10.16 mm pich TLPXXXF type
Creepage Distance	7.0 mm (min)	8.0 mm (min)
Clearance	7.0 mm (min)	8.0 mm (min)
Insulation Thickness	0.4 mm (min)	0.4 mm (min)

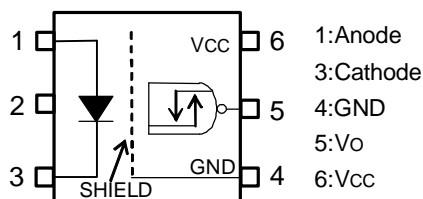


Weight: 0.26g

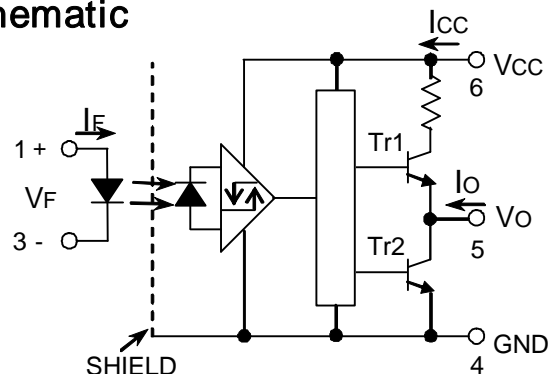
Truth Table

Input	LED	Tr1	Tr2	Output
H	ON	OFF	ON	L
L	OFF	ON	OFF	H

Pin Configuration (top view)



Schematic



A 0.1uF bypass capacitor must be connected between pin6 and 4. (See Note3)

Maximum Ratings (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	IF	20	mA
	Peak Transient Forward Current (Note1)	IFPT		A
	Reverse Voltage	VR	5	V
DETECTOR	Output Current	IO	10	mA
	Output Voltage	VO	6	V
	Supply Voltage	VCC	6	V
	Output power dissipation	PO	40	mW
Operating Temperature Range		Topr	-40~100	°C
Storage Temperature Range		Tstg	-55~125	°C
Lead Solder Temperature(10s)		Tsol	260	°C
Isolation Voltage (AC,1min.,R.H.≤60%,Ta=25°C) (Note2)		BVs	5000	Vrms

Note1 : Pulse width PW≤10us,300pps.

Note2 : Device Considered a two terminal device : pins 1,2 and 3 shorted together and pins 4,5 and 6 shorted together.

Note3 : A ceramic capacitor(0.1 μF) should be connected from pin 6 to pin 4 to stabilize the operation of the high gain linear amplifier. Failure to provide the bypassing may impair the switching property.

The total lead length between capacitor and coupler should not exceed 1 cm.

Recommended Operating Conditions

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current , ON	IF(ON)	8	12	18	mA
Input Voltage , OFF	VF(OFF)	0	—	0.8	V
Supply Voltage	VCC	4.5	5	5.5	V
Operating Temperature	Topr	-40	—	100	°C

The correlation between input current and switching speed and drive circuit (reference information).

Input Current (IF)	TEST CIRCUIT	Typical Switching Speed
12mA	1 (Page 4)	18 – 20 MBd
8mA	1 (Page 4)	16 – 18 MBd
8mA	2 (Page 4,With Speed up capacitor)	20 – 22 MBd

Electrical Characteristics

(Unless otherwise specified, Ta=-40 to 100°C, Vcc=4.5~5.5V)

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input Forward Voltage	VF	IF=10mA, Ta=25°C	—	1.65	1.8	V
Temperature Coefficient of Forward Voltage	$\Delta VF/\Delta Ta$	IF=10mA	—	-2.0	—	mV/°C
Input Reverse Current	IR	VR=5V, Ta=25°C	—	—	10	μA
Input Capacitance	CT	V=0V, f=1MHz, Ta=25°C	—	—	—	pF
Logic Low Output Voltage	VOL	IOL=1.6mA, IF=12mA, VCC=5V	—	—	0.4	V
Logic High Output Voltage	VOH	IOH=-0.02mA, VF=1.05V, VCC=5V	4.0	—	—	V
Logic Low Supply Current	ICCL	IF=12mA	—	—	5.0	mA
Logic High Supply Current	ICCH	VF=0V (Note4)	—	—	5.0	mA
Input Current Logic Low Output	IFHL	IO=1.6mA, VO<0.4V	—	—	6.5	mA
Input Voltage Logic High Output	VFLH	IO=-0.02mA, VO>4.0V	0.8	—	—	V

*All typical values are at Ta=25°C, VCC=5V, IF(ON)=12mA unless otherwise specified

Note4 : The Photodetector needs VCC of 4.5V or more for the stability operation.

In the VCC domain not more than this, since ICCH may increase in part, please use it after checking operation at the time of power supply current, power supply ON, and OFF.

Isolation Characteristics (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance input to output	Cs	Vs = 0V, f = 1MHz (Note 2)	—	0.8	—	pF
Isolation resistance	Rs	R.H. ≤ 60%, Vs = 500V (Note 2)	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV _S	AC, 1 minute	5000	—	—	V _{rms}
		AC, 1 second, in oil	—	10000	—	Vdc
		DC, 1 minute, in oil	—	10000	—	

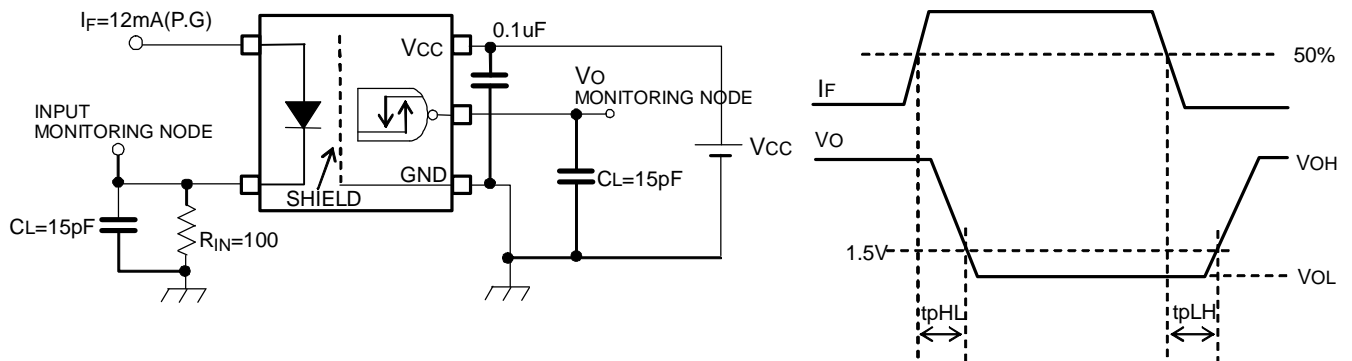
Switching Characteristics
 (Unless otherwise specified, $T_a = -40$ to 100 , $V_{CC} = 4.5 \sim 5.5V$)

CHARACTERISTIC	SYMBOL	TEST -CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
propagation Delay Time to Logic High output	tpLH	1	IF=0→12mA	RIN=100Ω CL=15pF (Note 5)	—	—	75	ns
propagation Delay Time to Logic Low output	tpHL		IF=12→0mA		—	—	75	ns
propagation Delay Time to Logic High output	tpLH	2	VIN=5→0V (IF=8→0mA)	RIN=430Ω CIN=33pF CL=15pF (Note 5)	—	—	65	ns
propagation Delay Time to Logic Low output	tpHL		VIN=0→5V (IF=0→8mA)		—	—	65	ns
Switching Time Dispersion between ON and OFF	tpHL-tpLH	1	RIN=100Ω, CL=15pF (Note 5)		—	—	45	ns
Output Rise Time	tr		IF=12→0mA	RIN=100Ω CL=15pF (Note 5)	—	15	—	ns
Output Fall Time	tf		IF=0→12mA		—	15	—	ns
Common Mode transient Immunity at High Level Output	CMH	3	VCM=1000Vp-p, IF=0mA, VO(Min)=4V, Ta=25°C		-10000	—	—	V/us
Common Mode transient Immunity at Low Level Output	CML		VCM=1000Vp-p, IF=12mA, VO(Max)=0.4V, Ta=25°C		10000	—	—	V/us

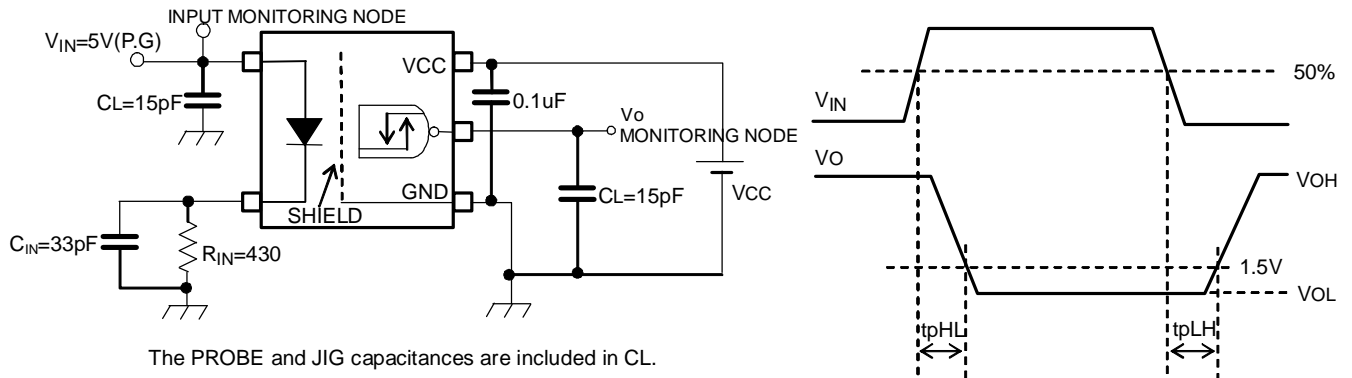
*All typical values are at $T_a = 25^\circ C$

Note 5 : Capacity of a probe and a wire.

TEST CIRCUIT 1 : tpLH , tpHL

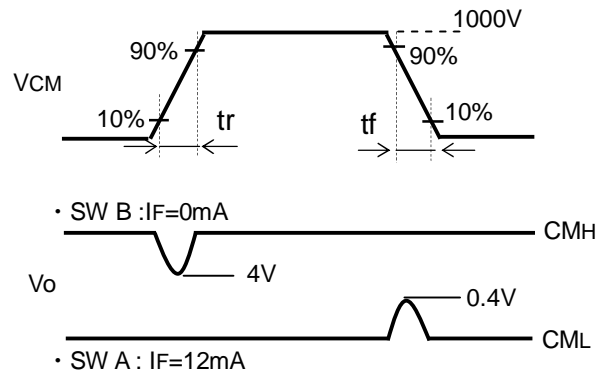
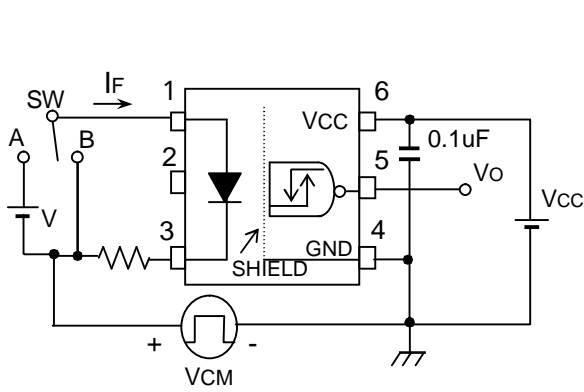


TEST CIRCUIT 2 : tpLH , tpHL



The PROBE and JIG capacitances are included in CL.
 (P.G) : Pulse Generator

TEST CIRCUIT 3 : CMH , CML



$$CMH = \frac{800(V)}{tr(\mu s)} \quad CML = - \frac{800(V)}{tf(\mu s)}$$

CM_L (CM_H) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

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