

**Preliminary** TOSHIBA PHOTOCOUPLER GaAlAs LED & PHOTO-IC

# TLP116

Unit in mm

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

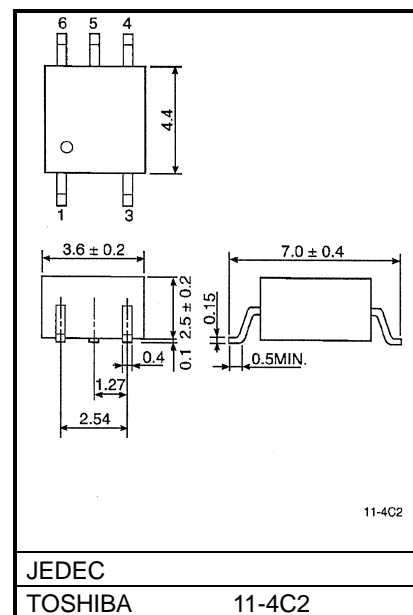
High Speed Line Receiver.

Microprocessor System Interfaces.

Plasma Display Panel.

The Toshiba TLP116 consists of a GaAlAs light emitting diode and a integrated high gain, high speed photo detector.

- Inverter Logic (totempole output)
- Package Type : MFSOP6
- Guaranteed Performance Over Temperature : -40~100°C
- Power Supply Voltage : 4.5~5.5V
- Input Thresholds Current : IFHL=5mA(Max.)
- Propagation delay Time (tpHL/tpLH) : 60ns(Max.)
- Switching speed : 20MBd(TYP.) (NRZ)
- Common mode transient immunity : 10kV/us
- Isolation Voltage : 3750Vrms

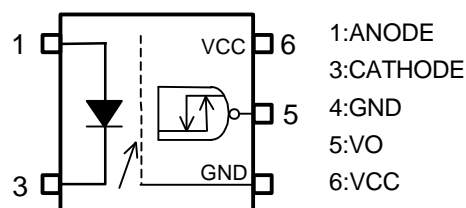


Weight: 0.09 g

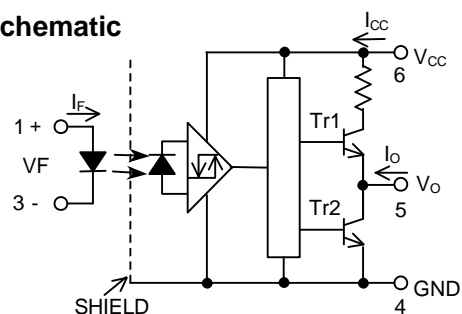
## Truth Table

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

## Pin Configuration (Top View)



## Schematic



0.1uF bypass capacitor must be connected between pin 6 and 4

## Recommended Operating Conditions

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current , ON	IF(ON)	8	—	18	mA
Input Voltage , OFF	VF(OFF)	0	—	0.8	V
Supply Voltage	VCC	4.5	5.0	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)	21 – 23 MBd
8mA	1 (Page 4)	18 – 20 MBd
8mA	2 (Page 4, With Speed up capacitor)	23 – 27 MBd

## Maximum Ratings (Ta=25°C )

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	IF	20	mA
	Forward Current Derating (Ta=85°C)	? IF/? Ta	-0.5	mA/°C
	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	3750	Vrms

Note1 : Pulse width PW=10us, 500pps.

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

## 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	—	1.3	1.5	V
Temperature Coefficient of Forward Voltage	?VF/?Ta	IF=10mA	—		—	mV/°C
Input Reverse Current	IR	VR=5V, Ta=25°C	—	—	10	μA
Input Capacitance	CT	V=0, 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 (Note 3)	—	—	5.0	mA
Input Current Logic Low Output	IFHL	IO=1.6mA, VO<0.4V	—	—	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

Note3 : The Photodetector needs VCC of 4.5V or more for the stability operation.

In the VCC range less than 4.5V, ICCH may increase in some part of VCC range. It is recommended to check operation of power supply stability in timing at power supply ON, and OFF before product is used.

## Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	CS	V = 0, f = 1MHz (Note 2)	?	0.8	?	pF
Isolation resistance	RS	R.H. = 60%, VS = 500V (Note 2)	1×10 <sup>12</sup>	10 <sup>14</sup>	?	Ω
Isolation voltage	BVS	AC, 1 minute	3750	?	?	Vrms
		AC, 1 second, in oil	?	10000	?	Vdc
		DC, 1 minute, in oil	?	10000	?	

## Switching Characteristics

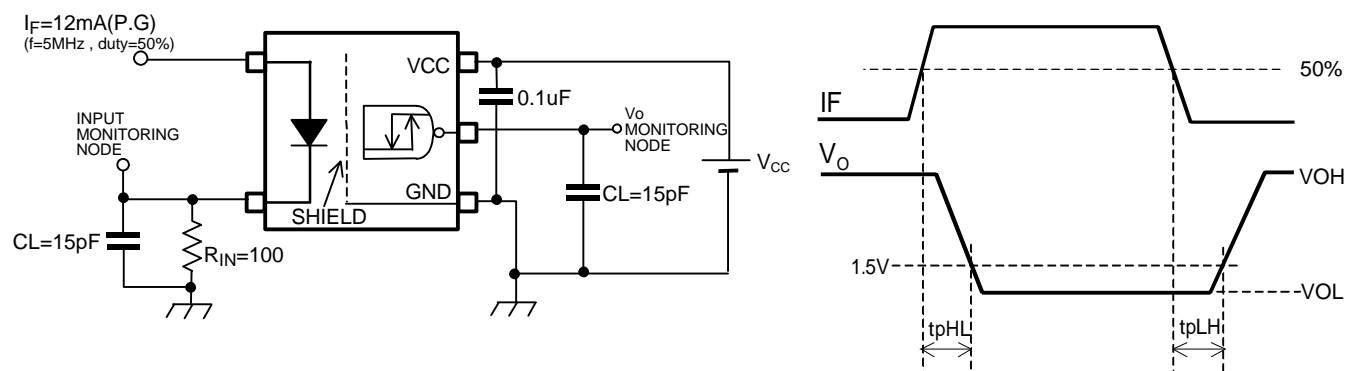
(Unless otherwise specified,  $T_a = -40$  to  $100^\circ\text{C}$ ,  $V_{CC} = 4.5 \sim 5.5\text{V}$ )

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
propagation Delay Time to Logic High output	$t_{pHL}$	1	$I_F = 0 \quad 12\text{mA}$	—	—	60	ns
propagation Delay Time to Logic Low output	$t_{pLH}$		$I_F = 12 \quad 0\text{mA}$				
propagation Delay Time to Logic High output	$t_{pHL}$	2	$V_{IN} = 0 \quad 5\text{V}$ ( $I_F = 0 \quad 8\text{mA}$ )	—	—	60	ns
propagation Delay Time to Logic Low output	$t_{pLH}$		$V_{IN} = 5 \quad 0\text{V}$ ( $I_F = 8 \quad 0\text{mA}$ )				
Switching Time Dispersion between ON and OFF	$ t_{pHL} - t_{pLH} $	1	$I_F = 12\text{mA}$ , $R_{IN} = 100$ , $CL = 15\text{pF}$ (Note 4)	—	—	30	ns
Output Fall Time(90-10%)	$t_f$		$I_F = 0 \quad 12\text{mA}$	—	—	—	ns
Output Rise Time(10-90%)	$t_r$		$I_F = 12 \quad 0\text{mA}$	—	—	—	ns
Common Mode transient Immunity at High Level Output	CMH		$V_{CM} = 1000\text{Vp-p}$ , $I_F = 0\text{mA}$ , $V_o(\text{Min}) = 4\text{V}$ , $T_a = 25^\circ\text{C}$	10000	—	—	V/us
Common Mode transient Immunity at Low Level Output	CML		$V_{CM} = 1000\text{Vp-p}$ , $I_F = 12\text{mA}$ , $V_o(\text{Max}) = 0.4\text{V}$ , $T_a = 25^\circ\text{C}$	-10000	—	—	V/us

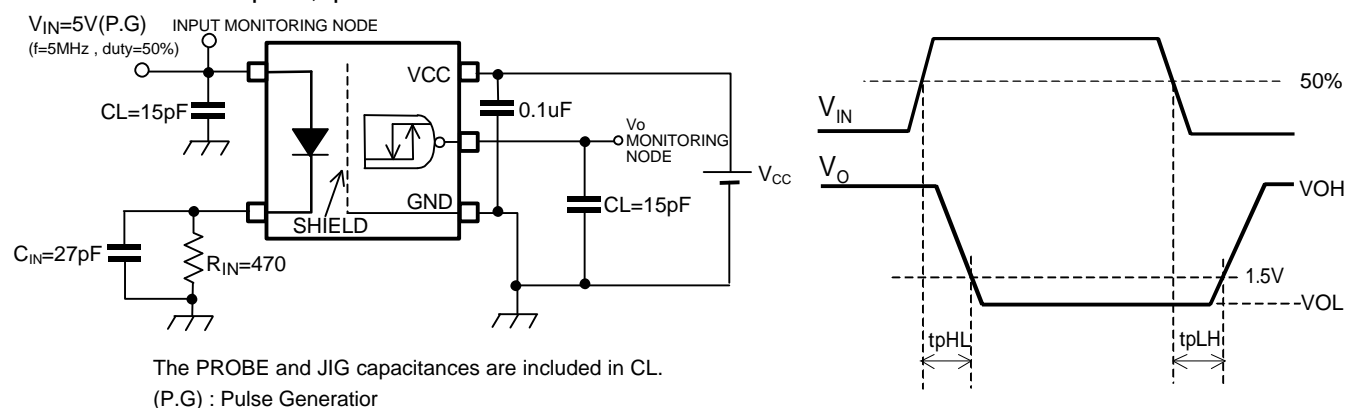
\*All typical values are at  $T_a = 25^\circ\text{C}$

Note 4 : CL is approximately 15pF which includes probe and Jig/stray wiring capacitance.

### TEST CIRCUIT 1 : $t_{pHL}$ , $t_{pLH}$



### TEST CIRCUIT 2 : $t_{pHL}$ , $t_{pLH}$



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