

**Preliminary**

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO-IC

# TLP106

Intelligent Power Module Signal Isolation

Industrial Inverters

Motor Drive

The Toshiba TLP106 consists of a GaAlAs light emitting diode and a integrated high gain, high speed photo detector.

TLP106 is suitable for input control signals isolation of IPM.

This unit is MFSOP 6pin.

The detector has a totem pole output stage that provides source drive and sink drive, and built-in Schmitt trigger.

The detector IC has an internal shield that provides a guaranteed common mode transient immunity of 10kV/μs.

TLP106 is a buffer logic type.

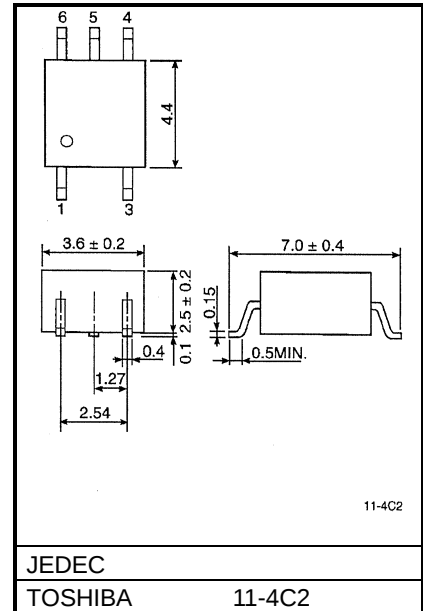
For inverter logic type, TLP102 is in line-up.

- Buffer logic type (totem pole output)
- Guaranteed Performance Over temperature : -40~85°C
- Power Supply Voltage : -0.5~20V
- Input Current : IFLH=3mA(Max.)
- Switching Time (tpLH/tpHL) : 400ns(Max.)
- Common mode transient immunity : 10kV/us
- Isolation Voltage: 3750Vrms

## Truth Table

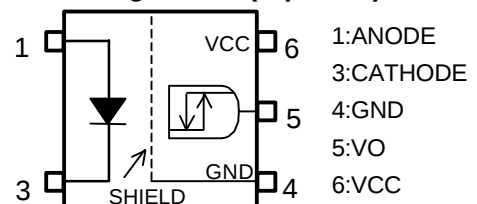
| Input | LED | Tr1 | Tr2 | Output |
|-------|-----|-----|-----|--------|
| H     | ON  | ON  | OFF | H      |
| L     | OFF | OFF | ON  | L      |

Unit in mm

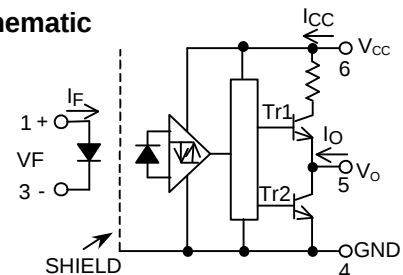


Weight: 0.09 g

## Pin Configuration (top View)



## Schematic



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

## Recommended Operating Conditions

| CHARACTERISTIC        | SYMBOL  | MIN. | TYP. | MAX. | UNIT |
|-----------------------|---------|------|------|------|------|
| Input Current , ON    | IF(ON)  | 5    | -    | 10   | mA   |
| Input Voltage , OFF   | VF(OFF) | 0    | -    | 0.8  | V    |
| Supply Voltage        | VCC     | 4.5  | -    | 20   | V    |
| Operating Temperature | Topr    | -40  | -    | 85   | °C   |

## Maximum Ratings (Ta=25°C)

| CHARACTERISTIC                                           |                                        | SYMBOL | RATING   | UNIT |
|----------------------------------------------------------|----------------------------------------|--------|----------|------|
| LED                                                      | Forward Current                        | IF     | 20       | mA   |
|                                                          | Peak Transient Forward Current (Note1) | IFPT   | 1        | A    |
|                                                          | Reverse Voltage                        | VR     | 5        | V    |
| DETECTOR                                                 | Output Current 1 (Ta=25°C)             | IO1    | 15/-15   | mA   |
|                                                          | Output Current 2 (Ta=85°C)             | IO2    | 4.5/-4.5 | mA   |
|                                                          | Peak Output Current                    | IOP    | 20/-20   | mA   |
|                                                          | Output Voltage                         | VO     | -0.5~20  | V    |
|                                                          | Supply Voltage                         | VCC    | -0.5~20  | V    |
| Operating Temperature Range                              |                                        | Topr   | -40~85   | °C   |
| Storage Temperature Range                                |                                        | Tstg   | -55~125  | °C   |
| Lead Solder Temperature(10s)                             |                                        | Tsol   | 260      | °C   |
| Isolation Voltage<br>(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 85°C,VCC=4.5~20V)

| CHARACTERISTIC                             | SYMBOL  | CONDITION                  |                       | MIN. | TYP. | MAX. | UNIT  |
|--------------------------------------------|---------|----------------------------|-----------------------|------|------|------|-------|
| Input Forward Voltage                      | VF      | IF=5mA , T a=25°C          |                       | -    | 1.5  | 1.7  | V     |
| Temperature Coefficient of Forward Voltage | ?VF/?Ta | IF=5mA                     |                       | -    | -2.0 | -    | mV/°C |
| Input Reverse Current                      | IR      | VR=5V,Ta=25°C              |                       | -    | -    | 10   | μA    |
| Input Capacitance                          | CT      | V=0,f=1MHz,Ta=25°C         |                       | -    | 30   | -    | pF    |
| Logic Low Output Voltage                   | VOL     | IOL=3.5mA,VF=0.8V          |                       | -    | 0.1  | 0.35 | V     |
| Logic High Output Voltage                  | VOH     | IOH=-3.5mA,IF=5mA          | VCC=5V                | 2.4  | 2.58 | -    | V     |
|                                            |         |                            | VCC=20V               | 17.4 | 18.1 | -    |       |
| Logic Low Supply Current                   | ICCL    | VF=0V                      | VCC=20V , Ta=-40~85°C | -    | -    | 6.0  | mA    |
|                                            |         |                            | VCC=5V , Ta= 25°C     | -    | 3.8  | 4.5  |       |
| Logic High Supply Current                  | ICCH    | IF=5mA                     | VCC=20V , Ta=-40~85°C | -    | -    | 6.0  | mA    |
|                                            |         |                            | VCC=5V , Ta= 25°C     | -    | 3.8  | 4.5  |       |
| Logic Low Short Circuit Output Current     | IOSL    | VF=0V<br>VCC=VO=20V        |                       | 7    | 37   | -    | mA    |
| Logic High Short Circuit Output Current    | IOSH    | IF=5mA , VO=GND<br>VCC=20V |                       | -7   | 40   | -    | mA    |
| Input Current Logic High Output            | IFLH    | IO=-3.5mA,VO>2.4V          |                       | -    | 0.3  | 3    | mA    |
| Input Voltage Logic Low Output             | VFHL    | IO=3.5mA,VO<0.4V           |                       | 0.8  | -    | -    | V     |
| Input Current Hysteresis                   | IHYS    | VCC=5V                     |                       | -    | 0.05 | -    | mA    |

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

## Isolation Characteristics (Ta = 25°C)

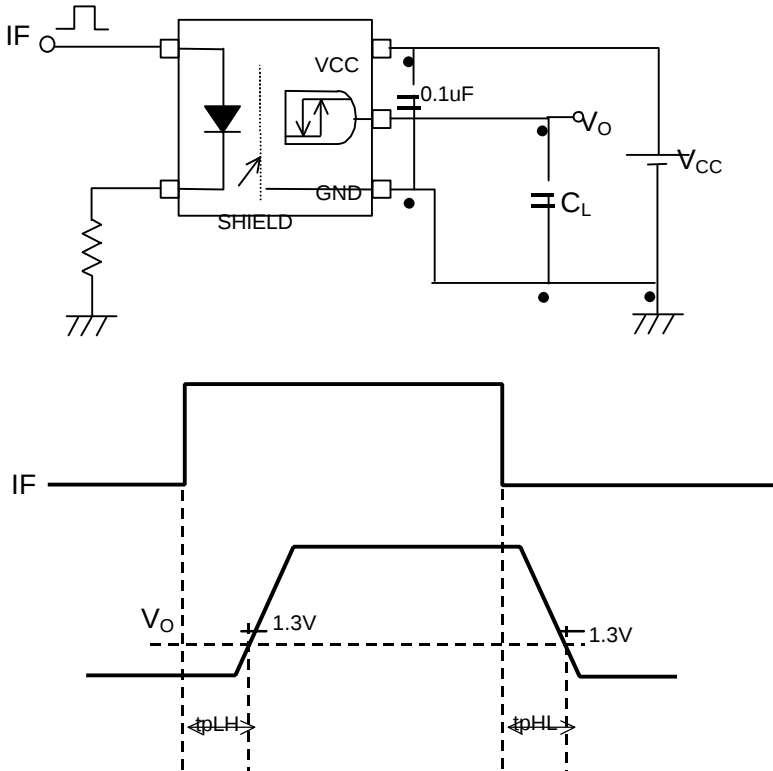
| Characteristic              | Symbol | Test Condition                 | Min.               | Typ.             | Max. | Unit |
|-----------------------------|--------|--------------------------------|--------------------|------------------|------|------|
| Capacitance input to output | CS     | V = 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, Ta=-40 to 85°C,VCC=4.5~20V )

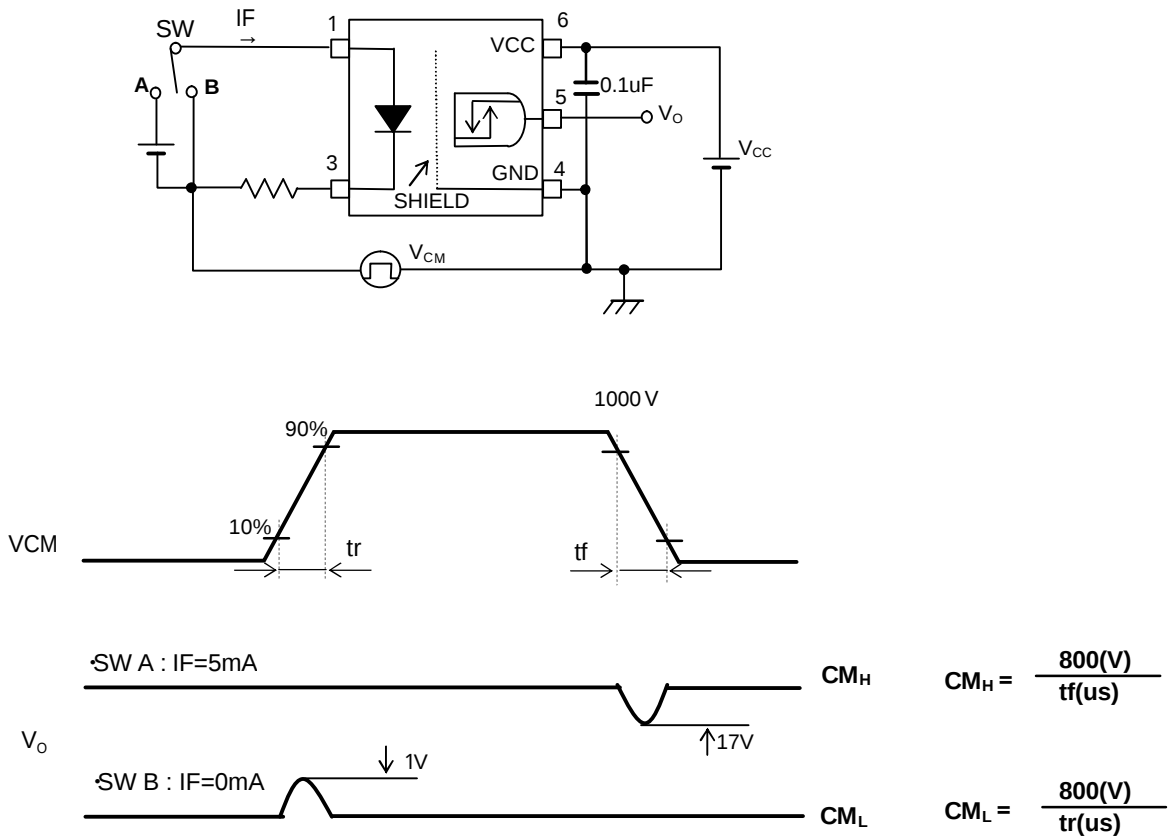
| CHARACTERISTIC                                      | SYMBOL    | TEST CIR-CUIT | CONDITION                            | MIN.   | TYP. | MAX. | UNIT |
|-----------------------------------------------------|-----------|---------------|--------------------------------------|--------|------|------|------|
| Propagation Delay Time to Logic High output         | tpLH      | 1             | IF=0? 5mA<br>CL=100pF                | 50     | 250  | 400  | ns   |
| Propagation Delay Time to Logic Low output          | tpHL      |               | IF=5? 0mA<br>CL=100pF                | 50     | 270  | 400  | ns   |
| Switching Time Dispersion between ON and OFF        | tpHL-tpLH |               | CL=100PF                             | -      | -    | 350  | ns   |
| Output Rise Time                                    | tr        |               | IF=0? 5mA,VCC=5V                     | -      | 35   | -    | ns   |
| Output Fall Time                                    | tf        |               | IF=5? 0mA,VCC=5V                     | -      | 20   | -    | ns   |
| Common Mode transient Immunity at High Level Output | CMH       | 2             | VCM=1000Vp-p,IF=5mA, VCC=20V,Ta=25°C | -10000 | -    | -    | V/us |
| Common Mode transient Immunity at Low Level Output  | CML       |               | VCM=1000Vp-p,IF=0mA, VCC=20V,Ta=25°C | 10000  | -    | -    | V/us |

\*All typical values are at Ta=25°C

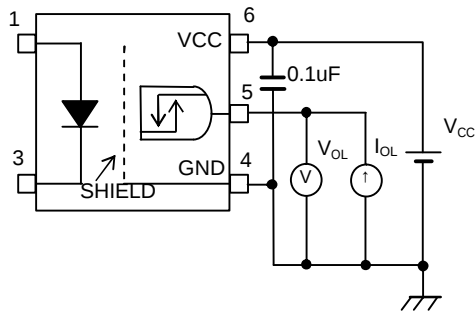
TEST CIRCUIT 1:Switching Time Test Circuit



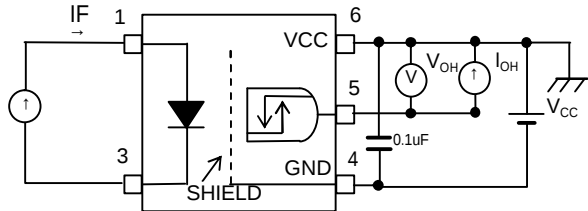
TEST CIRCUIT 2:Common Mode Transient Immunity Test circuit



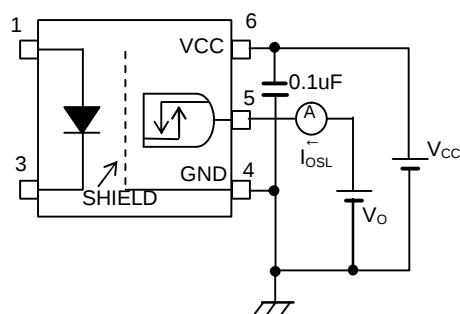
VOL Test Circuit



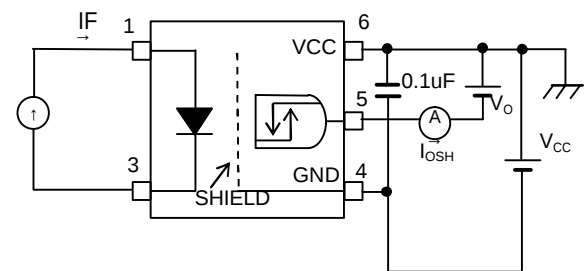
VOH Test Circuit

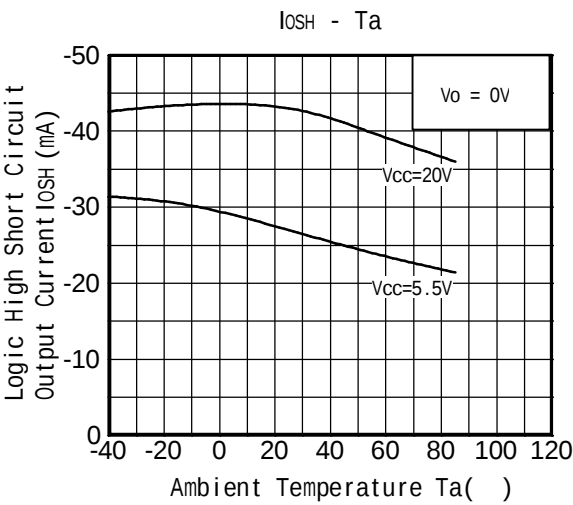
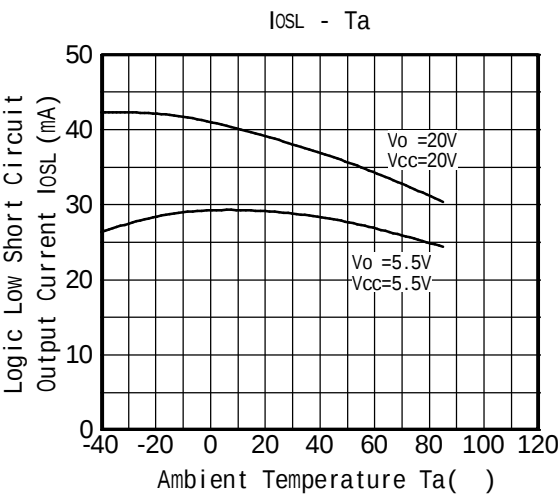
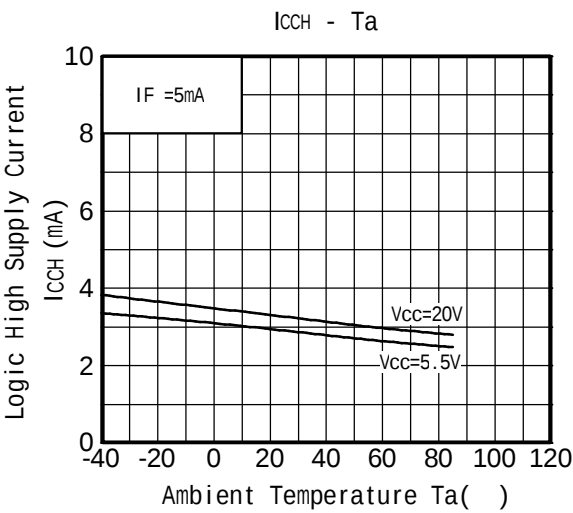
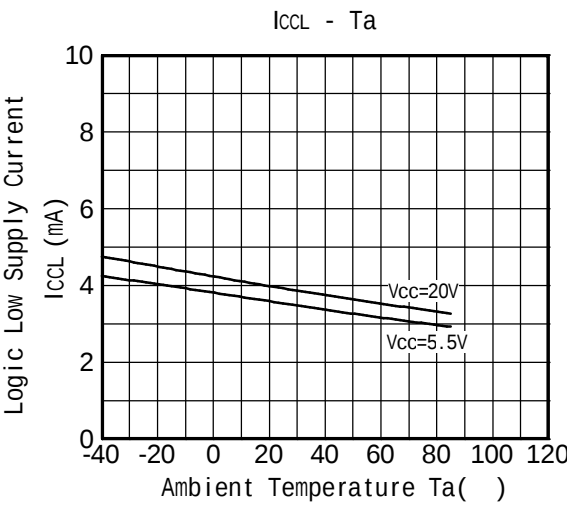
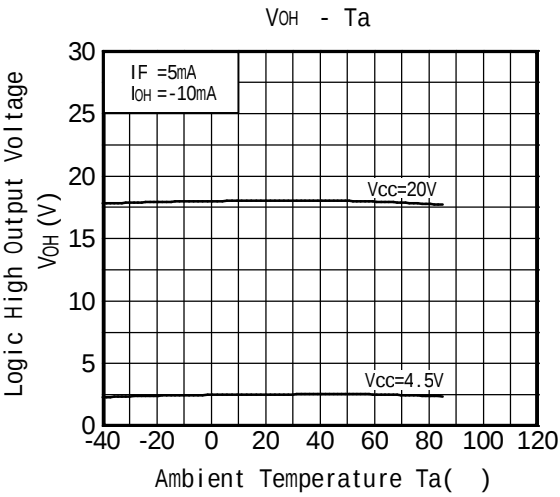
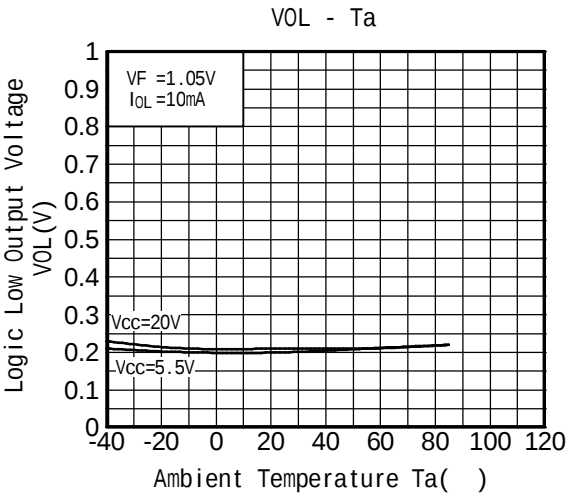


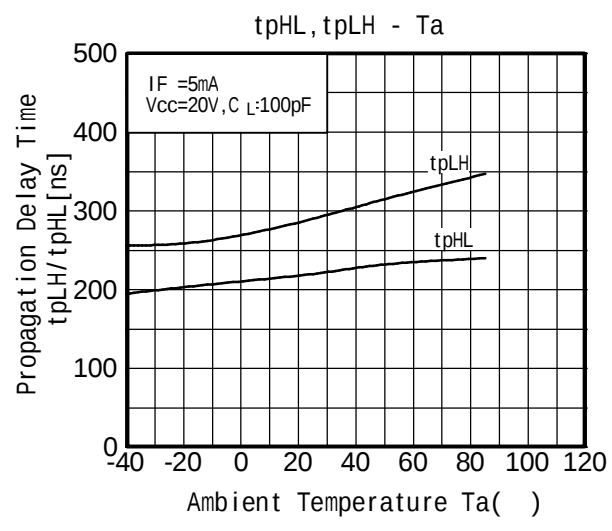
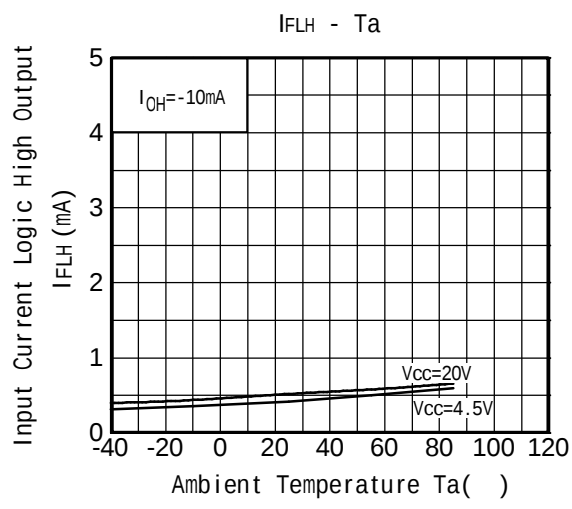
IOSL Test Circuit



IOSH Test Circuit







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