

**Preliminary**

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO-IC

# TLP106

Intelligent Power Module Signal Isolation  
 Industrial Inverters  
 Moter Drive

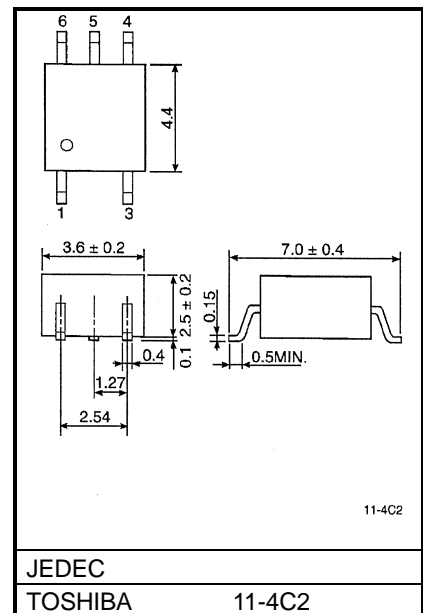
The Toshiba TLP106 consists of a GaAlAs light emitting diode and a integrated high gain, high speed photo detector.  
 TLP106 is suitable for input control signals isolation of IPM.  
 This unit is MFSOP 6pin.  
 The detector has a totem pole output stage that provides source drive and sink drive, and built-in Schmitt trigger.  
 The detector IC has an internal shield that provides a guaranteed common mode transient immunity of 10kV/  $\mu$  s.  
 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**

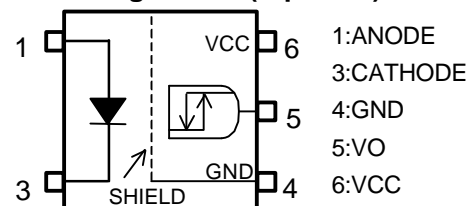
Input	LED	Tr1	Tr2	Output
H	ON	ON	OFF	H
L	OFF	OFF	ON	L

Unit in mm

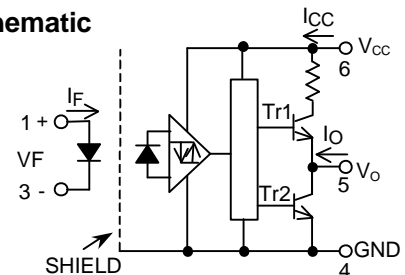


Weight: 0.09 g

**Pin Configuration (top View)**



**Schematic**



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

## Recommended Operating Conditions

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current , ON	IF(ON)	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 (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, Ta=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 VCC=VO=20V		7	37	-	mA
Logic High Short Circuit Output Current	IOSH	IF=5mA, VO=GND 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)

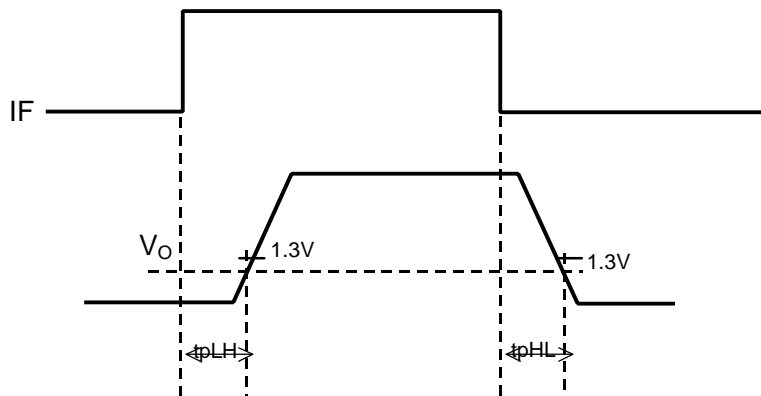
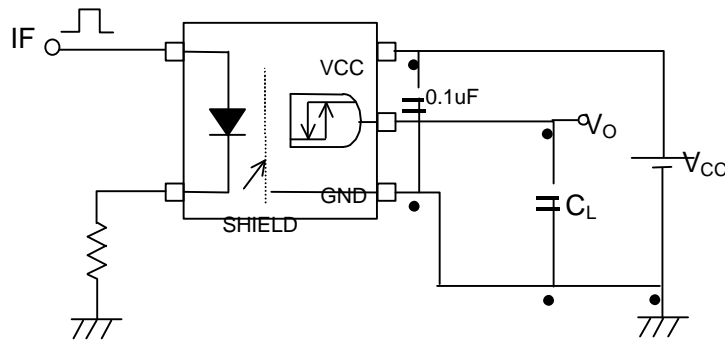
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	CS	V = 0, f = 1MHz (Note 2)	?	0.8	?	pF
Isolation resistance	RS	R.H. = 60%, VS = 500V (Note 2)	1×10 <sup>12</sup>	10 <sup>14</sup>	?	Ω
Isolation voltage	BVS	AC, 1 minute	3750	?	?	Vrms
		AC, 1 second, in oil	?	10000	?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

**Switching Characteristics**  
 (Unless otherwise specified,  $T_a = -40$  to  $85^\circ\text{C}$ ,  $V_{CC} = 4.5 \sim 20\text{V}$ )

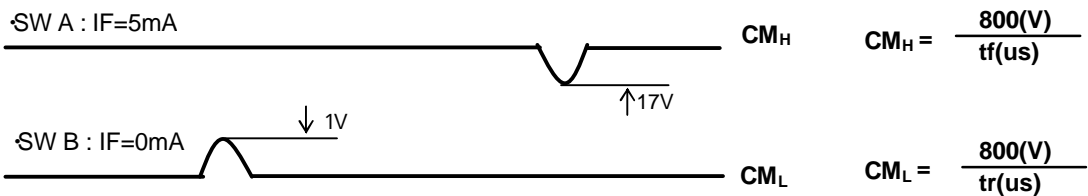
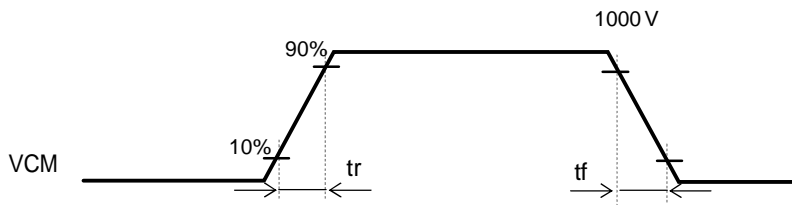
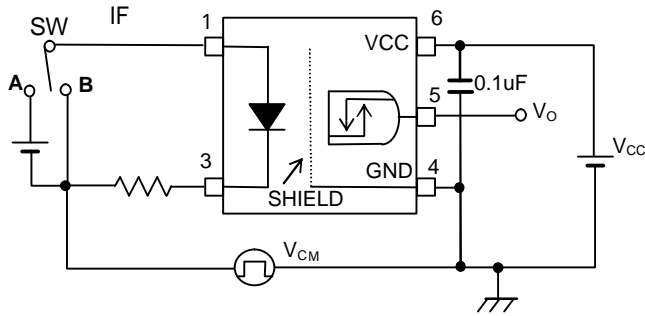
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to Logic High output	tpLH	1	IF=0? 5mA CL=100pF	50	250	400	ns
Propagation Delay Time to Logic Low output	tpHL		IF=5? 0mA CL=100pF	50	270	400	ns
Switching Time Dispersion between ON and OFF	tpHL-tpLH		CL=100PF	-	-	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  $T_a = 25^\circ\text{C}$

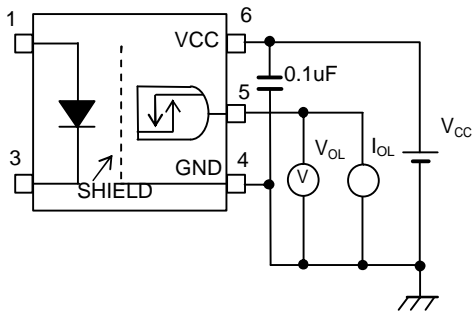
**TEST CIRCUIT 1: Switching Time Test Circuit**



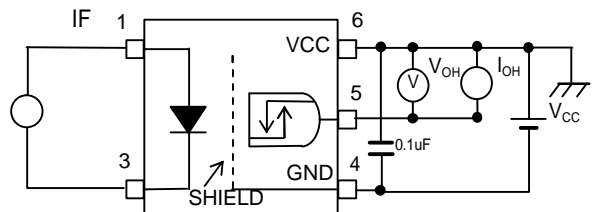
**TEST CIRCUIT 2: Common Mode Transient Immunity Test circuit**



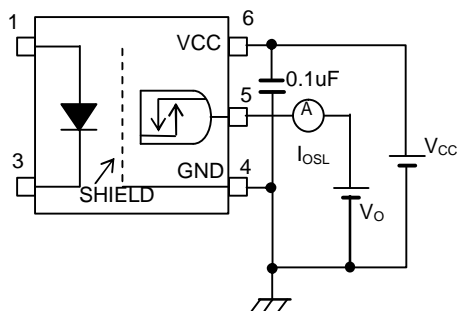
**VOL Test Circuit**



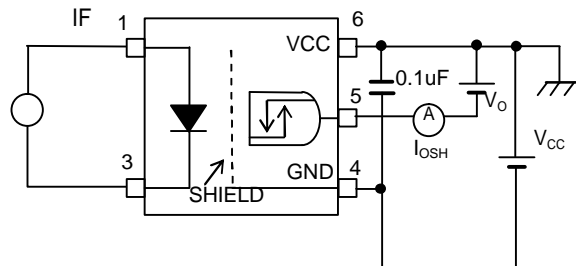
**VOH Test Circuit**

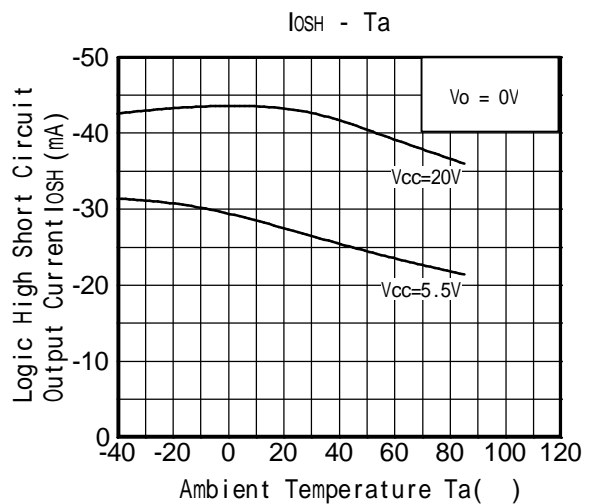
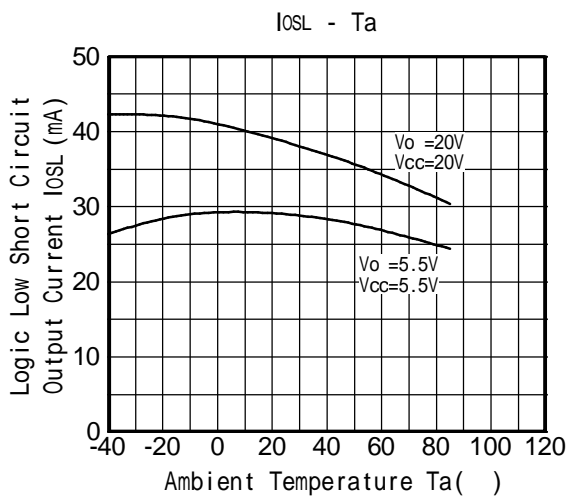
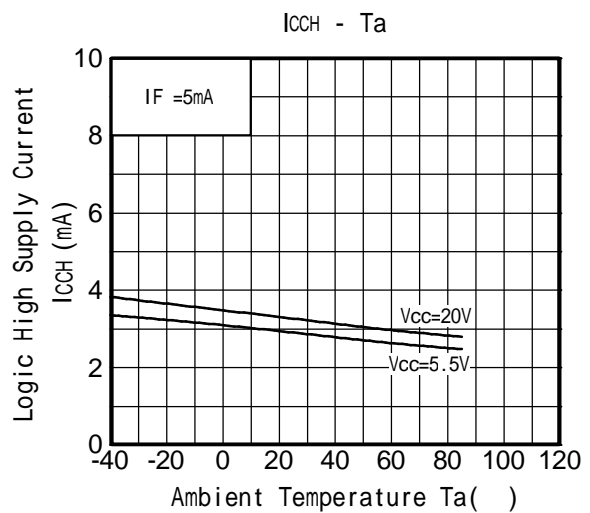
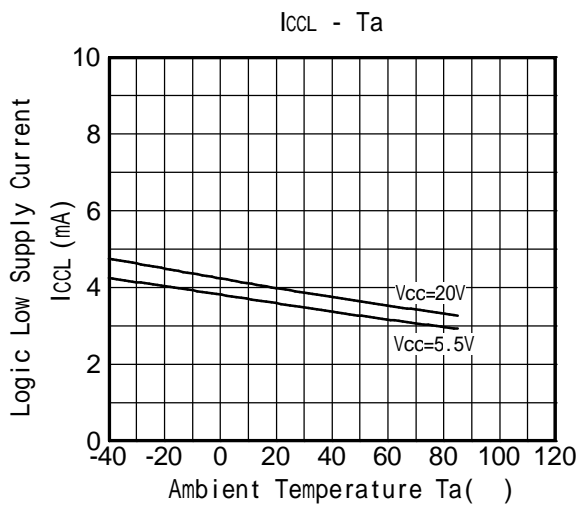
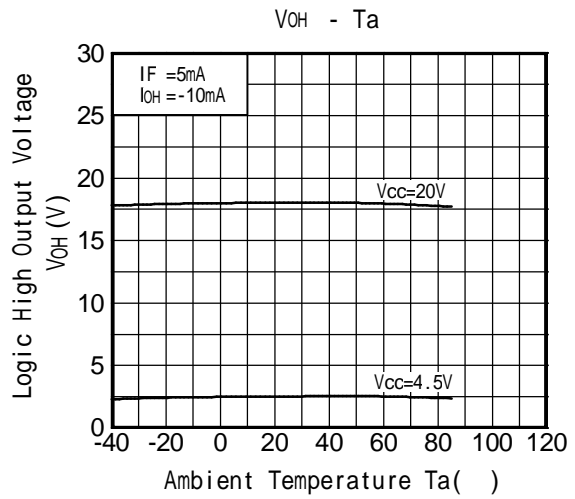
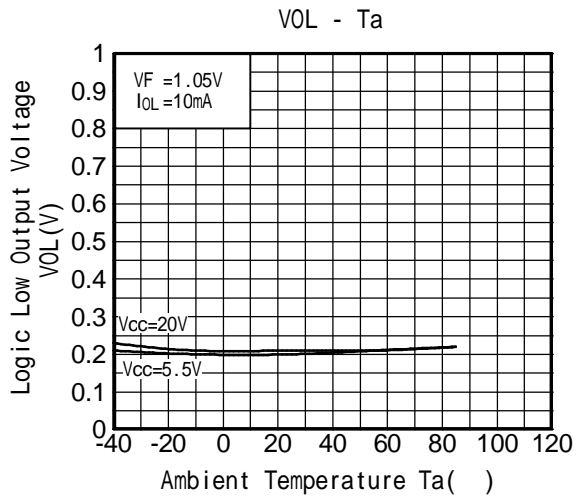


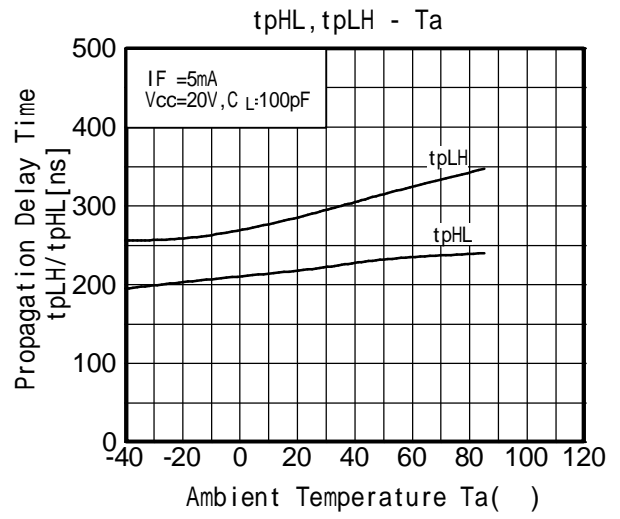
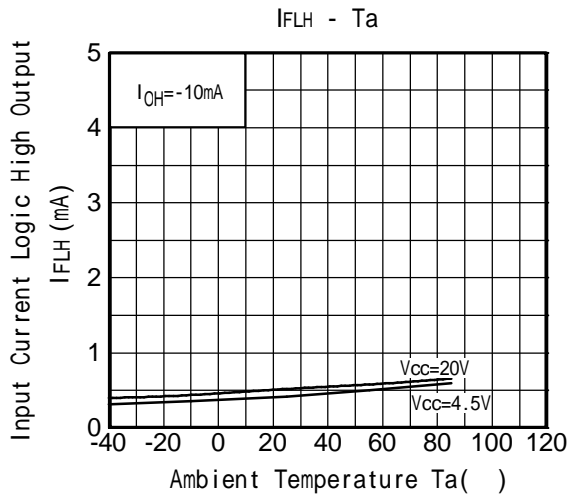
**IOSL Test Circuit**



**IOSH Test Circuit**







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