

TLP705

Plasma Display Panel.
Industrial Inverter
IGBT/Power MOS FET Gate Drive

TLP705 consists of a GaAlAs light emitting diode and a integrated photodetector.
This unit is 6-lead SDIP package. TLP705 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.
TLP705 is suitable for gate driving circuit of IGBT or power MOS FET.
Especially TLP705 is capable of "direct" gate drive of lower Power IGBTs.

- Peak output current : ± 0.45 A (max)
- Operating frequency : 250kHz (max)
- Guaranteed performance over temperature : -40 to 100°C
- Supply current : 3mA (max)
- Power supply voltage : 10 to 20 V
- Threshold input current : $I_{FLH} = 8$ mA (max)
- Switching time (t_{pLH} / t_{pHL}) : 200 ns (max)
- Common mode transient immunity : ± 10 kV/ μs (min)
- Isolation voltage : 5000 Vrms(min)
- UL Recognized : UL1577, File No.E67349
- Construction Mechanical Rating

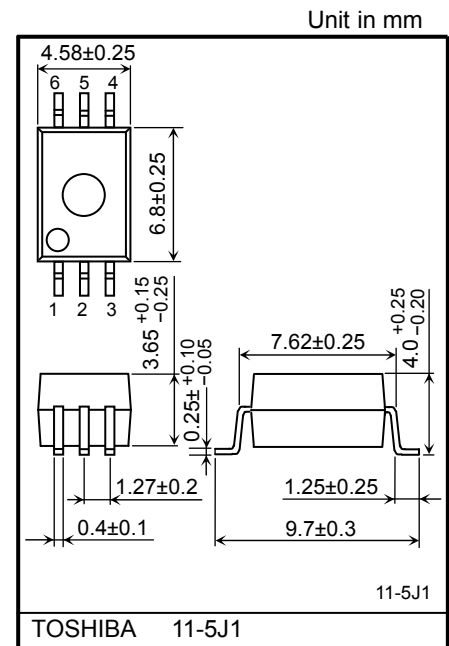
	7.62-mm pitch standard type	10.16-mm pitch TLPXXXF type
Creepage Distance	7.0 mm (min)	8.0 mm (min)
Clearance	7.0 mm (min)	8.0 mm (min)
Insulation Thickness	0.4 mm (min)	0.4 mm (min)

- Option (D4)
TÜV approved : EN60747-5-2
Certificate No. R50033433
Maximum operating insulation voltage : 890 Vpk
Highest permissible over voltage : 8000 Vpk

(Note) When a EN60747-5-2 approved type is needed, please designate the "Option(D4)"

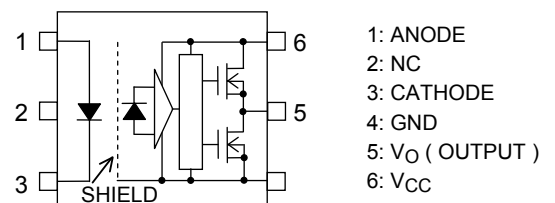
Truth Table

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

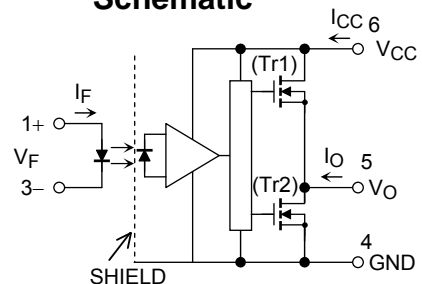


Weight: 0.26 g (typ.)

Pin Configuration (Top View)



Schematic



A 0.1 μF bypass capacitor must be connected between pins 6 and 4. (See Note 6.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
LED	Forward current	I_F	20	mA
	Forward current derating (Ta ≥ 85°C)	$\Delta I_F / \Delta T_a$	-0.54	mA/°C
	Peak transient forward current (Note 1)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Junction temperature	T_j	125	°C
Detector	"H" peak output current (Note 2)	I_{OPH}	-0.45	A
	"L" peak output current (Note 2)	I_{OPL}	0.45	A
	Output voltage	V_O	25	V
	Supply voltage	V_{CC}	25	V
	Junction temperature	T_j	125	°C
Operating frequency (Note 3)	f	250	kHz	
Storage temperature range	T_{stg}	-55 to 125	°C	
Operating temperature range	T_{opr}	-40 to 100	°C	
Lead soldering temperature (10 s) (Note 4)	T_{sol}	260	°C	
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 5)	BV_S	5000	V _{rms}	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Pulse width $P_W \leq 1\mu s$, 300 pps

Note 2: Exponential waveform pulse width $P_W \leq 10\mu s$, $f \leq 15\text{ kHz}$

Note 3: Exponential waveform $I_{OPH} \leq -0.25\text{ A}$ ($\leq 80\text{ ns}$), $I_{OPL} \leq +0.25\text{ A}$ ($\leq 80\text{ ns}$), $T_a = 100\text{ °C}$

Note 4: It is effective soldering area of Lead .

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

Note 6: 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

Characteristics	Symbol	Min	Typ.	Max	Unit
Input current, ON (Note 7)	I_F (ON)	10	—	15	mA
Input voltage, OFF	V_F (OFF)	0	—	0.8	V
Supply voltage	V_{CC}	10	—	20	V
Peak output current	I_{OPH} / I_{OPL}	—	—	± 0.15	A
Operating temperature	T_{opr}	-40	—	100	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

Note 7: Input signal rise time (fall time) < 0.5 μs .

Note 8: If the rising slope of the supply voltage (VCC) for the detector is steep, stable operation of the internal circuits cannot be guaranteed.

Be sure to set 3.0V/ μs or less for a rising slope of the VCC.

Electrical Characteristics (Ta = -40 to 100°C, unless otherwise specified)

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.*	Max	Unit		
Forward voltage		V _F	—	I _F = 10 mA, Ta = 25°C	—	1.6	1.8	V		
Temperature coefficient of forward voltage		ΔV _F /ΔTa	—	I _F = 10 mA	—	-2.0	—	mV/°C		
Input reverse current		I _R	—	V _R = 5 V, Ta = 25°C	—	—	10	μA		
Input capacitance		C _T	—	V = 0 V, f = 1 MHz, Ta = 25°C	—	45	—	pF		
Output current (Note 9)	“H” Level	I _{OPH1}	1	V _{CC} = 15 V I _F = 10 mA	V ₆₋₅ = 4 V	-0.15	-0.35	—	A	
		I _{OPH2}			V ₆₋₅ = 10 V	-0.3	-0.6			
	“L” Level	I _{OPL1}	2	V _{CC} = 15 V I _F = 0 mA	V ₅₋₄ = 2 V	0.15	0.36	—		
		I _{OPL2}			V ₅₋₄ = 10 V	0.3	0.62	—		
Output voltage	“H” Level	V _{OH}	3	V _{CC} = 10 V	I _O = -100 mA, I _F = 10 mA	6.0	8.5	—	V	
	“L” Level	V _{OL}			4	I _O = 100 mA, V _F = 0.8 V	—	0.4		1.0
Supply current	“H” Level	I _{CCH}	5	V _{CC} = 10 to 20 V V _O open	I _F = 10 mA	—	2.0	3.0	mA	
	“L” Level	I _{CCL}			6	I _F = 0 mA	—	2.0		3.0
Threshold input current		L → H	I _{FLH}	—	V _{CC} = 15 V, V _O > 1 V		—	2.5	8	mA
Threshold input voltage		H → L	V _{FHL}	—	V _{CC} = 15 V, V _O < 1 V		0.8	—	—	V
Supply voltage		V _{CC}	—	—	10	—	20	V		

*: All typical values are at Ta = 25°C

Note 9: Duration of I_O time ≤ 50 μs

Note 10: This product is more sensitive than the conventional product to static electricity (ESD) because of a lowest power consumption design.

General precaution to static electricity (ESD) is necessary for handling this component.

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	C _S	V = 0 V, f = 1MHz (Note 5)	—	1.0	—	pF
Isolation resistance	R _S	R.H. ≤ 60%, V _S = 500V (Note 5)	1×10 ¹²	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1 minute	5000	—	—	V _{rms}
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V _{dc}

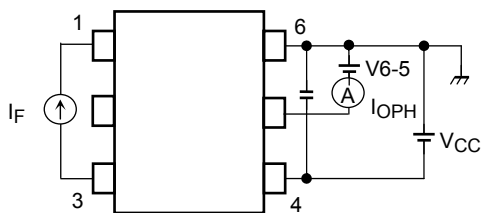
Switching Characteristics (Ta = -40 to 100°C, unless otherwise specified)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.*	Max	Unit	
Propagation delay time	L → H	7	$V_{CC} = 20\text{ V}$ $R_g = 30\ \Omega$ $C_g = 1\text{ nF}$ $f = 250\text{ kHz}$ Duty Cycle = 50%	$T_a = 25^\circ\text{C}$ $I_F = 0 \rightarrow 10\text{ mA}$	70	95	170	ns
	H → L			$T_a = 25^\circ\text{C}$ $I_F = 10 \rightarrow 0\text{ mA}$	70	105	170	
Propagation delay time	L → H			$T_a = -40\text{ to }100^\circ\text{C}$ $I_F = 0 \rightarrow 10\text{ mA}$	50	—	200	
	H → L			$T_a = -40\text{ to }100^\circ\text{C}$ $I_F = 10 \rightarrow 0\text{ mA}$	50	—	200	
Propagation delay skew (Note11)	tpsk			$T_a = -40\text{ to }100^\circ\text{C}$ $I_F = 10\text{ mA}$	-90	—	90	
Switching time dispersion between ON and OFF	$ t_{pHL} - t_{pLH} $			$T_a = -40\text{ to }100^\circ\text{C}$ $I_F = 10\text{ mA}$	-65	—	65	
Output rise time (10-90%)	t_r			$I_F = 0 \rightarrow 10\text{ mA}$	—	—	—	
Output fall time (90-10%)	t_f			$I_F = 10 \rightarrow 0\text{ mA}$	—	—	—	
Common mode transient immunity at high level output	CMH	8	$V_{CM} = 1000\text{ Vp-p}$ $V_{CC} = 20\text{ V}$ $T_a = 25^\circ\text{C}$	$I_F = 10\text{ mA}$ $V_O(\text{min}) = 16\text{ V}$	-10000	—	—	V/ μs
Common mode transient immunity at low level output	CM _L			$I_F = 0\text{ mA}$ $V_O(\text{max}) = 1\text{ V}$	10000	—	—	

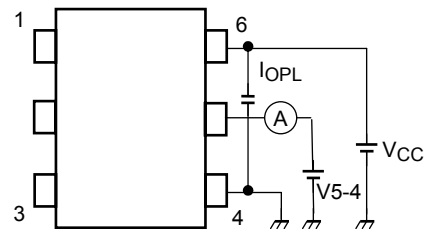
*: All typical values are at Ta = 25°C

Note 11: Propagation delay difference between any two parts.

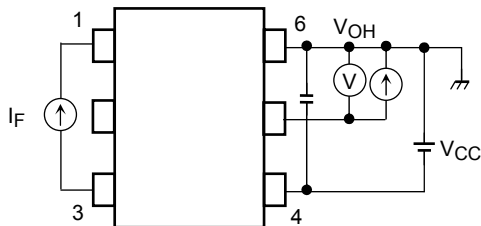
Test Circuit 1: I_{OPH}



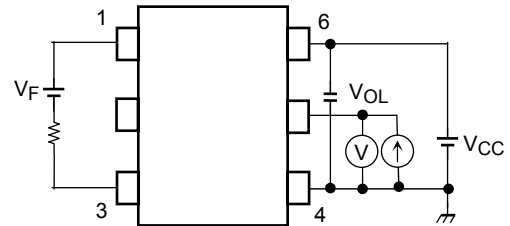
Test Circuit 2: I_{OPL}



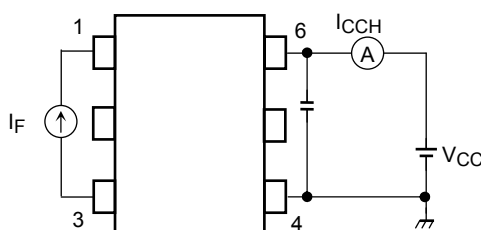
Test Circuit 3: V_{OH}



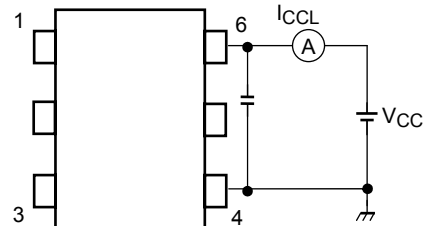
Test Circuit 4: V_{OL}



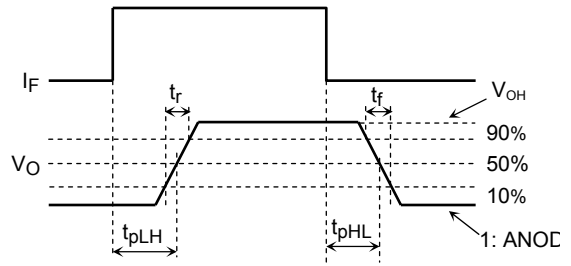
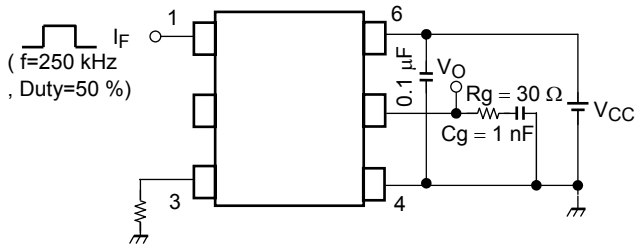
Test Circuit 5: I_{CCH}



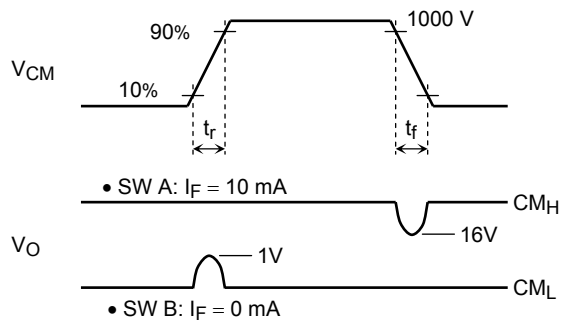
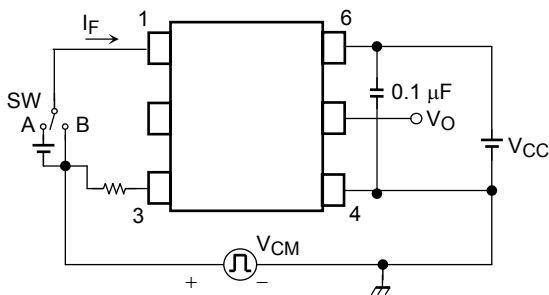
Test Circuit 6: I_{CCL}



Test Circuit 7 : t_{pLH}, t_{pHL}, t_r, t_f, PWD



Test Circuit 8: C_{MH}, C_{ML}



$$C_{ML} = \frac{800 \text{ V}}{t_r (\mu\text{s})}$$

$$C_{MH} = -\frac{800 \text{ V}}{t_f (\mu\text{s})}$$

C_{ML} (C_{MH}) 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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