

TOSHIBA PHOTOCOUPLER GaAIAs IRED & PHOTO-IC

TLP250(INV)

TRANSISTOR INVERTER
 INVERTERS FOR AIR CONDITIONER
 IGBT GATE DRIVE
 POWER MOS FET GATE DRIVE

The TOSHIBA TLP250(INV) consists of a GaAIAs light emitting diode and a integrated photodetector.

This unit is 8-lead DIP.

TLP250(INV) is suitable for gate driving circuit of IGBT or power MOS FET.

- Input Threshold Current : $I_F=5\text{mA(MAX)}$
- Supply Current(I_{CC}) : 11mA(MAX)
- Supply Voltage(V_{CC}) : $10\sim 35\text{V}$
- Output Current(I_O) : $\pm 2.0\text{A(MAX)}$
- Switching Time(t_{pLH}/t_{pHL}) : $0.5\mu\text{s(MAX)}$
- Isolation Voltage : 2500Vrms
- UL Recognized : UL1577,File No.E67349
- Option(D4)

VDE Approved : DIN VDE0884/06.92 Certificate No.76823

Maximum Operating Insulation Voltage : 630V_{PK}

Highest Permissible Over Voltage : 4000V_{PK}

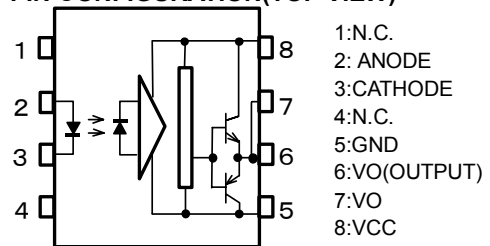
**(Note):When a VDE0884 approved type is needed,
 Please designate the "Option(D4)"**

- Creepage Distance : 6.4mm(MIN)
- Clearance : 6.4mm(MIN)

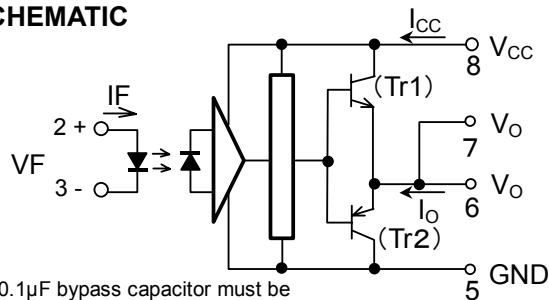
TRUTH TABLE

| | | Tr 1 | Tr 2 |
|-----------|-----|------|------|
| INPUT LED | ON | ON | OFF |
| | OFF | OFF | ON |

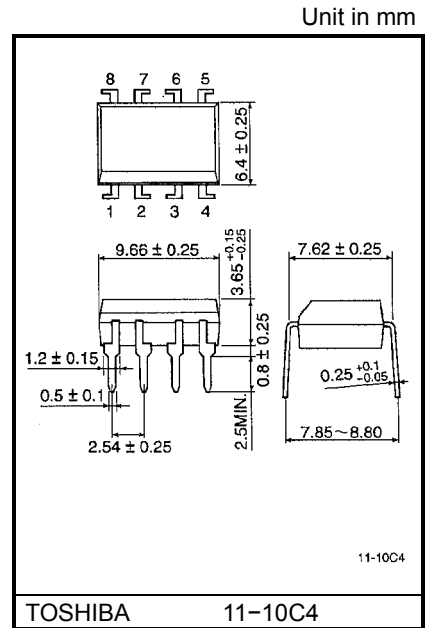
PIN CONFIGURATION(TOP VIEW)



SCHEMATIC



A 0.1 μF bypass capacitor must be connected between pin 8 and 5(See Note 5).



Weight: 0.54 g

MAXIMUM RATINGS (Ta=25°C)

| CHARACTERISTIC | | | SYMBOL | RATING | UNIT | |
|--|---|----------------------|---------------------------|------------------------------|---------|--------|
| LED | Forward Current | | I_F | 20 | mA | |
| | Forward Current Derating (Ta≥70°C) | | $\Delta I_F / \Delta T_a$ | -0.36 | mA / °C | |
| | Peak Transient Forward Current (Note 1) | | I_{FPT} | 1 | A | |
| | Reverse Voltage | | V_R | 5 | V | |
| | Junction Temperature | | T_J | 125 | °C | |
| DETECTOR | "H" Peak Output Current | PW ≤2.5μs , f≤15 kHz | (Note 2) | I_{OPH} | -1.5 | A |
| | | PW≤1.0μs , f≤15 kHz | | | -2.0 | |
| | "L" Peak Output Current | PW≤2.5μs , f≤15 kHz | | I_{OPL} | +1.5 | A |
| | | PW ≤1.0μs , f≤15 kHz | | | +2.0 | |
| | Output Voltage | | (Ta≤70°C) | V_O | 35 | V |
| | | | (Ta=85°C) | | 24 | |
| | Supply Voltage | | (Ta≤70°C) | V_{CC} | 35 | V |
| | | | (Ta=85°C) | | 24 | |
| | Output Voltage Derating (Ta≥70°C) | | | $\Delta V_O / \Delta T_a$ | -0.73 | V / °C |
| | Supply Voltage Derating (Ta≥70°C) | | | $\Delta V_{CC} / \Delta T_a$ | -0.73 | V / °C |
| Junction Temperature | | | T_j | 125 | °C | |
| Operating Frequency (Note 3) | | | f | 25 | kHz | |
| Operating Temperature Range | | | T_{opr} | -20~85 | °C | |
| Storage Temperature Range | | | T_{stg} | -55~125 | °C | |
| Lead Soldering Temperature(10s) | | | T_{sol} | 260 | °C | |
| Isolation Voltage (AC,1min., R.H. ≤60%,Ta=25°C) (Note 4) | | | BV_S | 2500 | Vrms | |

(Note 1) : Pulse width PW≤1μs,300pps

(Note 2) : Exponential Waveform

(Note 3) : Exponential Waveform $I_{OPH} \leq -1.0A (\leq 2.5\mu s)$, $I_{OPL} \leq +1.0A (\leq 2.5\mu s)$

(Note 4) : Device considered a two terminal device : pins 1,2,3 and 4 shorted together and pins 5,6,7 and 8 shorted together.

(Note 5) : A ceramic capacitor(0.1μF) should be connected from pin 8 to pin 5 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 1cm.

RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC | SYMBOL | MIN | TYP. | MAX | UNIT |
|-----------------------|---------------------|-----|------|---------|------|
| Input Current, ON | $I_{F(ON)}$ | 7 | 8 | 10 | mA |
| Input Voltage, OFF | $V_{F(OFF)}$ | 0 | — | 0.8 | V |
| Supply Voltage | V_{CC} | 15 | — | 30 20 | V |
| Peak Output Current | I_{OPH} / I_{OPL} | — | — | ±0.5 | A |
| Operating Temperature | T_{opr} | -20 | 25 | 70 85 | °C |

ELECTRICAL CHARACTERISTICS (Ta = -20~70°C, Unless otherwise specified)

| CHARACTERISTIC | | SYMBOL | TEST CIRCUIT | TEST CONDITION | MIN | TYP. | MAX | UNIT | |
|--|-----------|---------------------------|--------------|---|---|--|-------|---------|----|
| Input Forward Voltage | | V_F | — | $I_F = 10 \text{ mA}$, $T_a = 25^\circ\text{C}$ | — | 1.6 | 1.8 | V | |
| Temperature Coefficient of Forward Voltage | | $\Delta V_F / \Delta T_a$ | — | $I_F = 10 \text{ mA}$ | — | -2.0 | — | mV / °C | |
| Input Reverse Current | | I_R | — | $V_R = 5 \text{ V}$, $T_a = 25^\circ\text{C}$ | — | — | 10 | μA | |
| Input Capacitance | | C_T | — | $V = 0$, $f = 1 \text{ MHz}$, $T_a = 25^\circ\text{C}$ | — | 45 | 250 | pF | |
| Output Current | “H” Level | I_{OPH} | 2 | $V_{CC} = 30 \text{ V}$ (*1) | $I_F = 10 \text{ mA}$ $V_{8-6} = 4 \text{ V}$ | -1.0 | -1.5 | — | A |
| | “L” Level | I_{OPL} | 1 | | | $I_F = 0$ $V_{6-5} = 2.5 \text{ V}$ | 1.0 | 2 | |
| Output Voltage | “H” Level | V_{OH} | 3 | $V_{CC1} = +15 \text{ V}$ $V_{EE1} = -15 \text{ V}$ $R_L = 200\Omega$, $I_F = 5 \text{ mA}$ | 11 | 12.8 | — | V | |
| | “L” Level | V_{OL} | 4 | $V_{CC1} = +15 \text{ V}$ $V_{EE1} = -15 \text{ V}$ $R_L = 200\Omega$, $V_F = 0.8 \text{ V}$ | — | -14.2 | -12.5 | | |
| Supply Current | “H” Level | I_{CCH} | — | $V_{CC} = 30 \text{ V}$ | $I_F = 10 \text{ mA}$ $T_a = 25^\circ\text{C}$ | — | 7 | — | mA |
| | | | | | $I_F = 10 \text{ mA}$ | — | — | 11 | |
| | “L” Level | I_{CCL} | — | | $I_F = 0 \text{ mA}$ $T_a = 25^\circ\text{C}$ | — | 7.5 | — | mA |
| | | | | | $I_F = 0 \text{ mA}$ | — | — | 11 | |
| Threshold Input Current | L→H | I_{FLH} | — | $V_{CC1} = +15 \text{ V}$ $V_{EE1} = -15 \text{ V}$ $R_L = 200\Omega$, $V_O > 0\text{V}$ | — | 1.2 | 5 | mA | |
| Threshold Input Voltage | H→L | V_{FHL} | — | $V_{CC1} = +15 \text{ V}$ $V_{EE1} = -15 \text{ V}$ $R_L = 200\Omega$, $V_O < 0\text{V}$ | 0.8 | — | — | V | |
| Supply Voltage | | V_{CC} | — | — | 10 | — | 35 | V | |
| Capacitance (Input-Output) | | C_S | — | $V_S = 0$, $f = 1 \text{ MHz}$, $T_a = 25^\circ\text{C}$ | — | 1.0 | 2.0 | pF | |
| Resistance (Input-Output) | | R_S | — | $V_S = 500 \text{ V}$, $T_a = 25^\circ\text{C}$ R.H. ≤ 60% | 1×10^{12} | 10^{14} | — | Ω | |

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

(*1) : Duration of IO time ≤ 50μs

SWITCHING CHARACTERISTICS (Ta = -20~70°C, Unless otherwise specified)

| CHARACTERISTIC | | SYMBOL | TEST CIRCUIT | TEST CONDITION | MIN | TYP. | MAX | UNIT | |
|---|-----|-----------------------|--------------|---|--------|------|------|------------------------|--|
| Propagation Delay Time | L→H | t_{pLH} | 5 | $I_F = 8\text{ mA}$, $V_{CC} = 15\text{ V}$ $R_L = 20\Omega$, $C_L = 10\text{ nF}$ | 0.05 | 0.15 | 0.5 | μs | |
| | H→L | t_{pHL} | | | 0.05 | 0.15 | 0.5 | | |
| Switching Time Dispersion between ON and OFF | | $ t_{pHL} - t_{pLH} $ | | | — | — | 0.45 | | |
| Output Rise Time | | t_r | | | — | — | — | | |
| Output Fall Time | | t_f | | | — | — | — | | |
| Common Mode Transient Immunity at High Level Output | | CM_H | 6 | $V_{CM} = 1000\text{ V}$, $I_F = 8\text{ mA}$ $V_{CC} = 30\text{ V}$, $T_a = 25^\circ\text{C}$ | -15000 | — | — | $\text{V}/\mu\text{s}$ | |
| Common Mode Transient Immunity at Low Level Output | | CM_L | | | 15000 | — | — | $\text{V}/\mu\text{s}$ | |

Fig.1 I_{OPL} TEST CIRCUIT

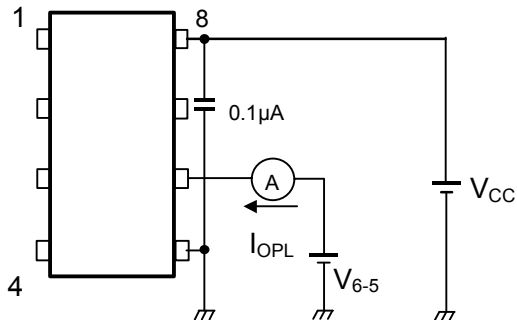


Fig.2 I_{OPH} TEST CIRCUIT

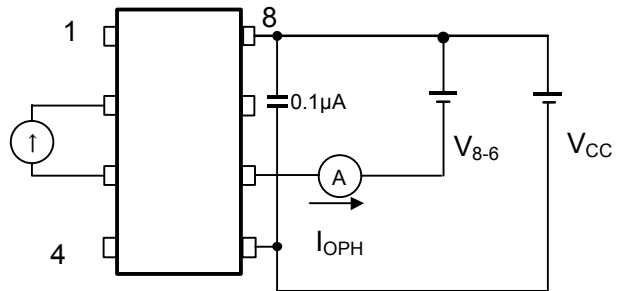


Fig.3 V_{OH} TEST CIRCUIT

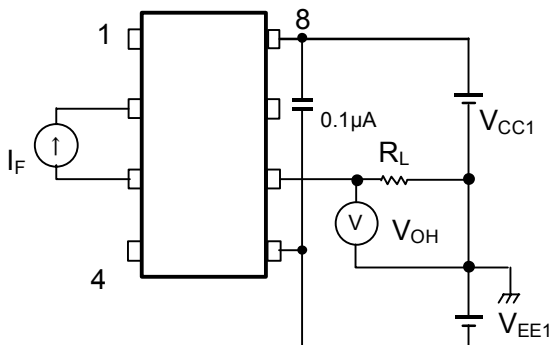


Fig.4 V_{OL} TEST CIRCUIT

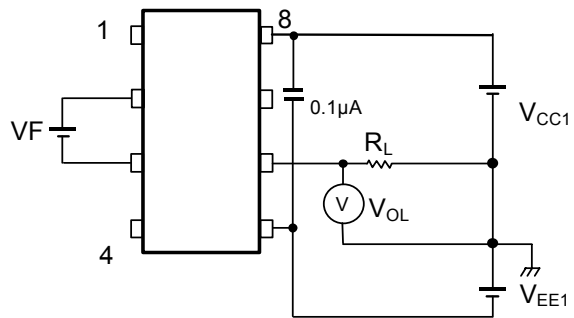


Fig.5 tpLH, tpHL, tr, tf TEST CIRCUIT

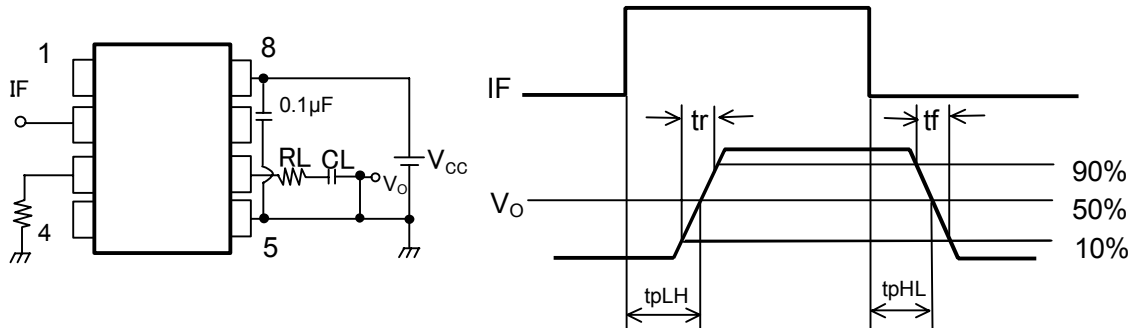
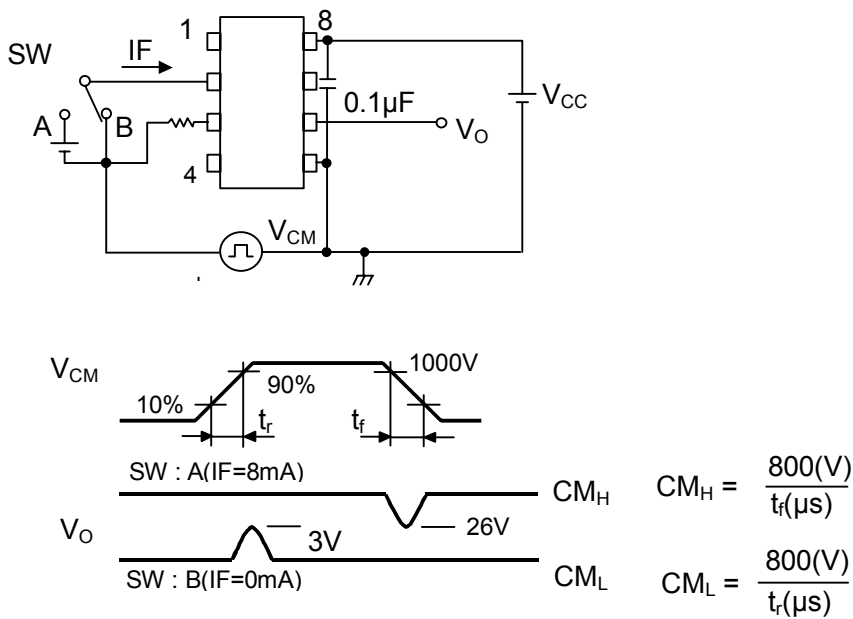


Fig.6 CMH, CML TEST CIRCUIT



CML(CMH) 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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