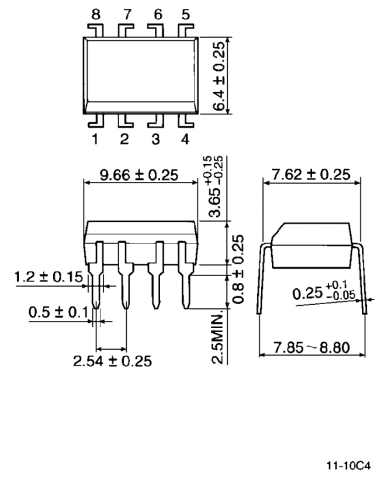
TOSHIBA Photocoupler Infrared LED + Photo IC

# TLP550

Digital Logic Isolation
Line Receiver Feedback Control
Power Supply Control
Switching Power Supply
Transistor Inverter

Unit: mm



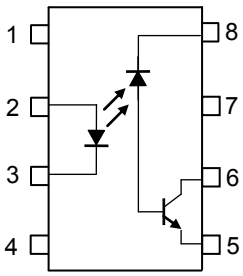

| TOSHIBA | 11−10C4 |
|---|---|

Weight: 0.54 g (typ.)

TLP550 consists of a high emitting diode and a one chip photo diode−transistor.
TLP550 has no base connection, and is suitable for application at noisy environmental condition.
This unit is 8−lead DIP package.

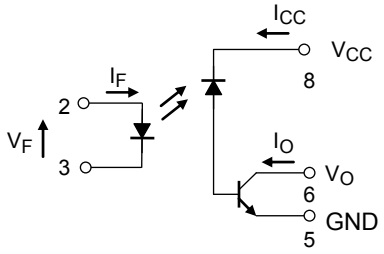
- Isolation voltage : 2500 Vrms (min)
- Propagation delay time ($t_{pHL}$ / $t_{pLH}$):
  $t_{pHL}$ = 0.5μs (typ.), $t_{pLH}$ = 0.6μs (typ.)
  ($R_L$=1.9 kΩ)
- TTL compatible
- UL recognized: UL1577, file No. E67349

## Pin Configuration (top view)




1 : N.C.
2 : Anode
3 : Cathode
4 : N.C.
5 : Emitter
6 : Collector
7 : N.C.
8 : Cathode

## Schematic




Start of commercial production
1981/09

## Current Transfer Ratio

| Classification | Current Transfer Ratio (%) ($I_C/I_F$) | | Marking of Classification |
|---|---|---|---|
| | Min | Max | |
| (None) | 10 | — | Blank, O, Y |
| Rank O | 19 | — | O |
| Rank Y | 35 | — | Y |

## Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | | | Symbol | Rating | Unit |
|---|---|---|---|---|---|
| LED | Forward current | (Note 1) | $I_F$ | 25 | mA |
| | Pulse forward current | (Note 2) | $I_{FP}$ | 50 | mA |
| | Peak transient forward current | (Note 3) | $I_{FPT}$ | 1 | A |
| | Reverse voltage | | $V_R$ | 5 | V |
| | Diode power dissipation | (Note 4) | $P_D$ | 45 | mW |
| Detector | Output current | | $I_O$ | 8 | mA |
| | Peak output current | | $I_{OP}$ | 16 | mA |
| | Supply voltage | | $V_{CC}$ | −0.5~15 | V |
| | Output voltage | | $V_O$ | −0.5~15 | V |
| | Output power dissipation | (Note 5) | $P_O$ | 100 | mW |
| Operating temperature range | | | $T_{opr}$ | −55~100 | °C |
| Storage temperature range | | | $T_{stg}$ | −55~125 | °C |
| Lead solder temperature (10s) | | | $T_{sol}$ | 260 | °C |
| Isolation voltage (AC, 1minute, R.H. = 40 to 60%) | | (Note 6) | $BV_S$ | 2500 | Vrms |

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) Derate 0.8mA above 70°C.

(Note 2) 50% duty cycle, 1ms pulse width.
Derate 1.6mA / °C above 70°C.

(Note 3) Pulse width 1μs, 300pps.

(Note 4) Derate 0.9mW / °C above 70°C.

(Note 5) Derate 2mW / °C above 70°C.

## Electrical Characteristics (Ta = 25°C)

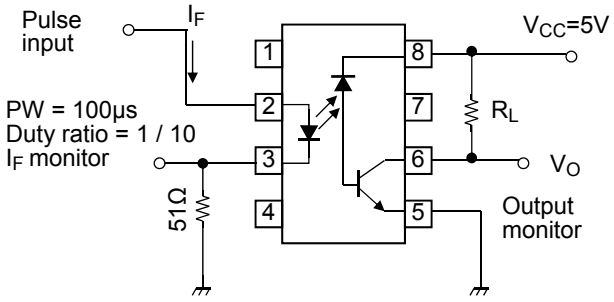
| | Characteristic | Symbol | Test condition | | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| LED | Forward voltage | $V_F$ | $I_F$ = 16 mA | | 1.45 | 1.65 | 1.85 | V |
| | Forward voltage temperature coefficient | $\Delta V_F / \Delta Ta$ | $I_F$ = 16 mA | | — | −2 | — | mV / °C |
| | Reverse current | $I_R$ | $V_R$ = 5 V | | — | — | 10 | μA |
| | Capacitance between terminal | $C_T$ | $V_F$ = 0, f = 1MHz | | — | 60 | — | pF |
| Detector | High level output current | $I_{OH\ (1)}$ | $I_F$ = 0 mA, $V_{CC}$ = $V_O$ = 5.5 V | | — | 3 | 500 | nA |
| | | $I_{OH\ (2)}$ | $I_F$ = 0 mA, $V_{CC}$ = $V_O$ = 15 V | | — | — | 5 | μA |
| | | $I_{OH}$ | $I_F$ = 0 mA, $V_{CC}$ = $V_O$ = 15 V Ta = 70°C | | — | — | 50 | μA |
| | High level supply voltage | $I_{CCH}$ | $I_F$ = 0 mA, $V_{CC}$ = 15 V | | — | 0.01 | 1 | μA |
| Coupled | Current transfer ratio | $I_O / I_F$ | $I_F$ = 16 mA $V_{CC}$ = 4.5 V $V_O$ = 0.4 V | Ta = 25°C | 10 | 40 | — | % |
| | | | | Rank: O | 19 | 40 | — | |
| | | | | Rank: Y | 35 | 50 | | |
| | | | | Ta = 0~70°C | 5 | — | — | |
| | | | | Rank: O, Y | 15 | — | — | |
| | Low level output voltage | $V_{OL}$ | $I_F$ = 16 mA, $V_{CC}$ = 4.5 V $I_O$ = 1.1 mA (rank O: $I_O$ = 2.4mA) | | — | — | 0.4 | V |
| | Isolation resistance | $R_S$ | R.H. = 40~60%, V = 1kV DC (Note 6) | | — | $10^{12}$ | — | Ω |
| | Capacitance between input to output | $C_S$ | V = 0, f = 1MHz | | — | 0.8 | — | pF |

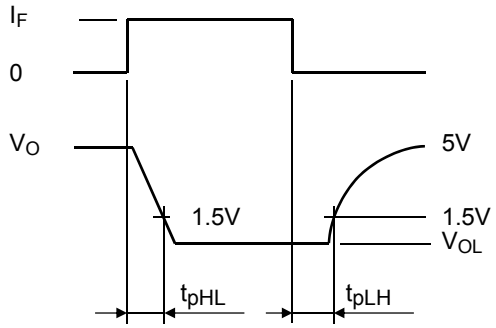
## Switching Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Propagation delay time (H→ L) | $t_{pHL}$ | $I_F$ = 0→ 16 mA, $V_{CC}$ = 5V, $R_L$ = 4.1 kΩ | | — | 0.3 | 0.8 | μs |
| | | (Note 7) | Rank O: $R_L$ = 1.9 kΩ | — | 0.5 | 0.8 | |
| Propagation delay time (L→ H) | $t_{pLH}$ | $I_F$ = 16→ 0 mA, $V_{CC}$ = 5V, $R_L$ = 4.1 kΩ | | — | 1.0 | 2.0 | μs |
| | | (Note 7) | Rank O: $R_L$ = 1.9 kΩ | — | 0.6 | 1.2 | |
| Common mode transient immunity at high output level | $C_{MH}$ | $I_F$ = 0 mA, $V_{CM}$ = 200 $V_{p-p}$ $R_L$ = 4.1 kΩ (rank O: $R_L$ = 1.9 kΩ) (Note 8) | | — | 1500 | — | V /μs |
| Common mode transient immunity at low output level | $C_{ML}$ | $I_F$ = 16 mA, $V_{CM}$ = 200 $V_{p-p}$ $R_L$ = 4.1 kΩ (rank O: $R_L$ = 1.9 kΩ) (Note 8) | | — | −1500 | — | V /μs |

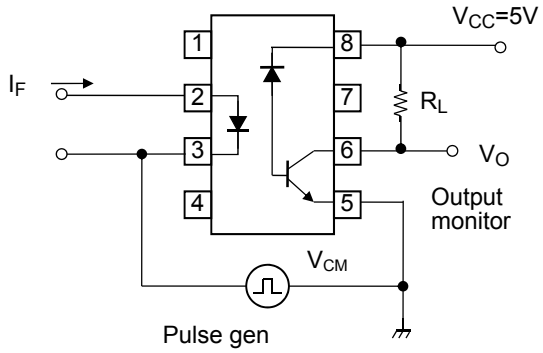
(Note 6) Device considered two−terminal device: Pins 1, 2, 3 and 4 shorted together and pin 5, 6, 7 and 8 shorted together.

(Note 7) Switching time test circuit.



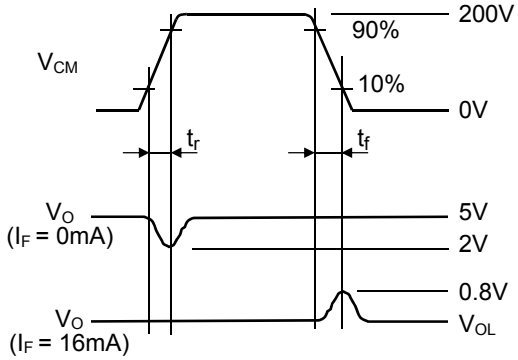




(Note 8) Common mode transient immunity test circuit.



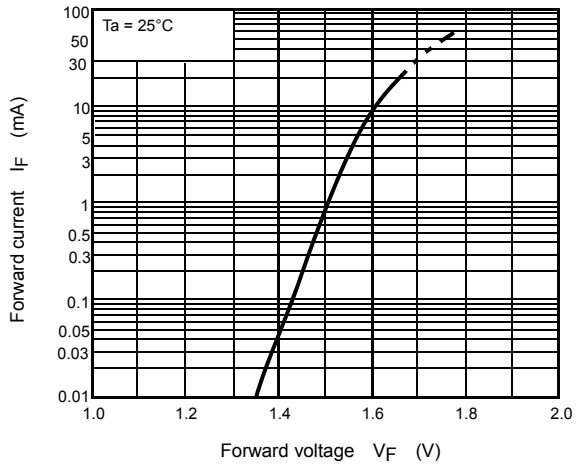

$Z_O$=50Ω

$$CM_H = \frac{160\ (V)}{t_f\ (\mu s)}\ ,\ CM_L = \frac{160\ (V)}{t_f\ (\mu s)}$$

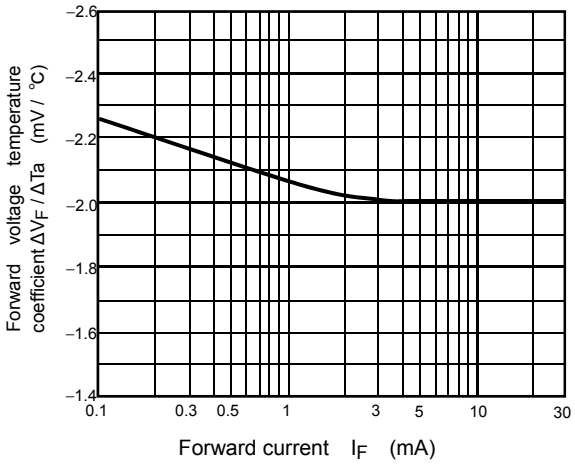



(Note 9) Maximum electrostatic discharge voltage for any pins: 100V (C = 200pF, R = 0)

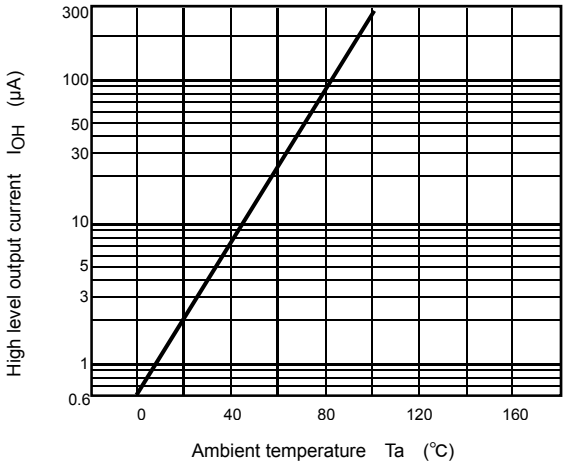
$I_F - V_F$



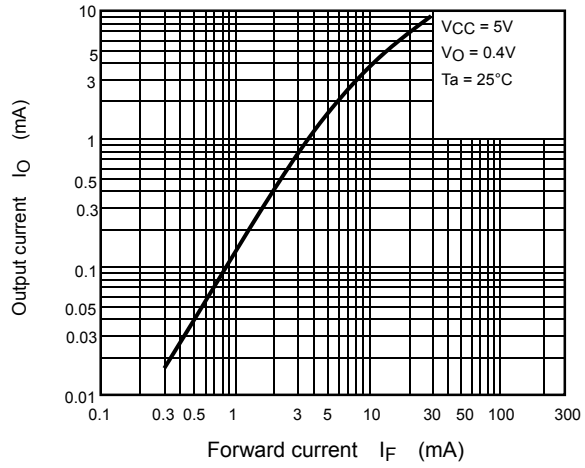

$\Delta V_F / \Delta Ta - I_F$



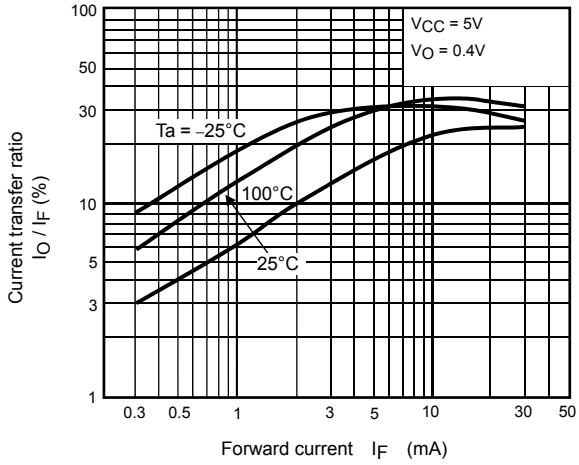

$I_{OH}$ (1) – Ta



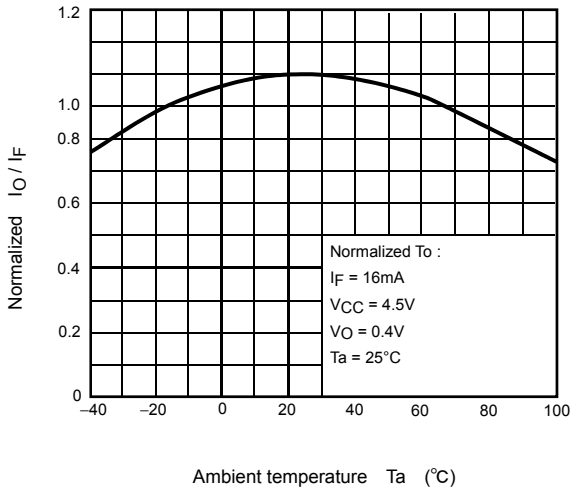

$I_O - I_F$



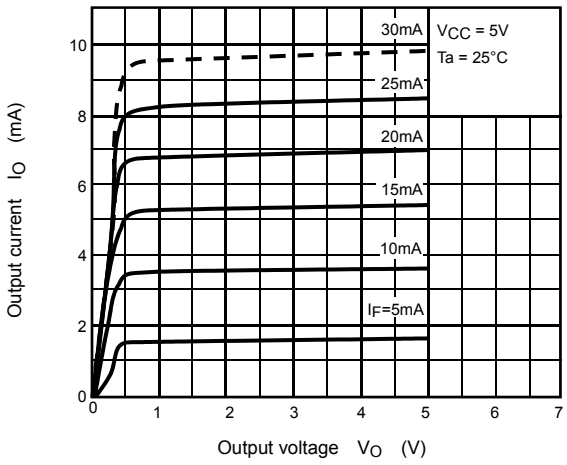

$I_O / I_F - I_F$



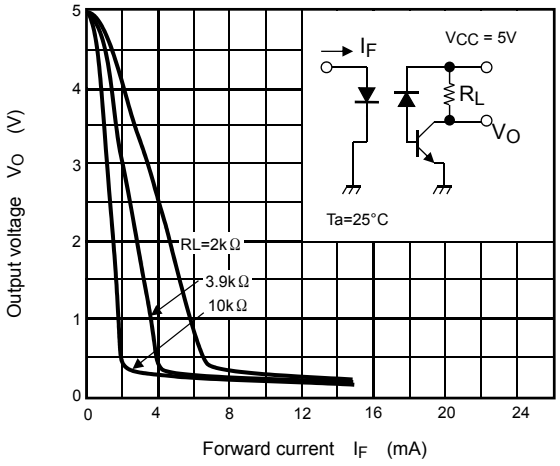

$I_O / I_F - Ta$



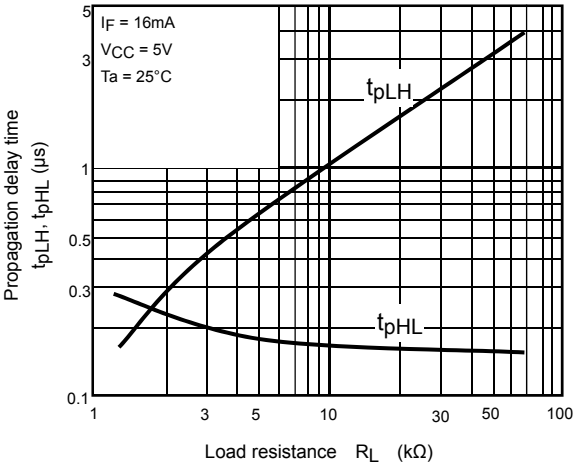
$I_O - V_O$




$V_O - I_F$




$t_{pHL}, t_{pLH} - R_L$



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