

TLP115

High Speed, Long Distance Isolated Line Receiver

Microprocessor System Interfaces

Digital Isolation For A / D, D / A Conversion

Computer-Peripheral Interfaces

Ground Loop Elimination

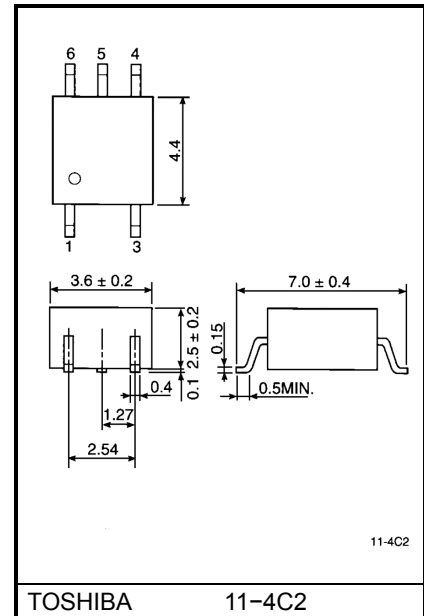
The TOSHIBA mini flat coupler TLP115 is small outline coupler, suitable for surface mount assembly.

TLP115 consists of a GaAlAs light emitting diode, optically coupled to an integrated high gain, high speed shielded photo detector whose output is an open collector schottky clamped transistor.

The shield, which shunts capacitively coupled common noise to ground, provides a guaranteed transient immunity specification of 1000V / μ s.

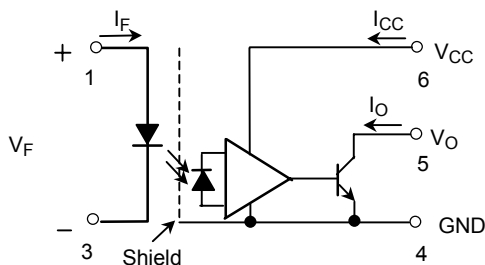
- Input current thresholds: $I_F=10\text{mA}$ (max.)
- Switching speed: 10MBd (typ.)
- Common mode transient immunity: $\pm 1000\text{V} / \mu\text{s}$ (min.)
- Guaranteed performance over temp.: $0\sim 70^\circ\text{C}$
- Isolation voltage: 2500Vrms (min.)
- UL recognized: UL1577, file no. E67349

Unit in mm



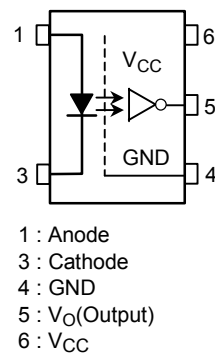
Weight: 0.09 g

Schematic



Note. A 0.1 μ F bypass capacitor must be connected between pins 4 and 6.

Pin Configuration(top view)



Truth Table(positive logic)

| Input | Output |
|-------|--------|
| H | L |
| L | H |

Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|--|---|------------------|---------|------------------|
| LED | Forward current | I _F | 20 | mA |
| | Pulse forward current (Note 1) | I _{FP} | 40 | mA |
| | Peak transient forward current (Note 2) | I _{FPT} | 1 | A |
| | Reverse voltage | V _R | 5 | V |
| Detector | Output current | I _O | 25 | mA |
| | Output voltage | V _O | 7 | V |
| | Supply voltage (1 minute maximum) | V _{CC} | 7 | V |
| | Output power dissipation | P _O | 40 | mW |
| Operating temperature range | | T _{opr} | −40~85 | °C |
| Storage temperature range | | T _{stg} | −55~125 | °C |
| Lead solder temperature(10s) | | T _{sol} | 260 | °C |
| Isolation voltage (AC, 1min., RH ≤ 60%, Note 4) | | BV _S | 2500 | V _{rms} |

(Note 1) 50% duty cycle, 1ms pulse width.

(Note 2) Pulse width ≤ 1μs, 300pps.

Recommended Operating Conditions

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------------------|------------------|------|------|------|------|
| Input voltage, low level | V _{FL} | −3 | 0 | 1.0 | V |
| Input current, high level | I _{FH} | 13 | 16 | 20 | mA |
| Supply voltage | V _{CC} | 4.5 | 5 | 5.5 | V |
| Fan out (TTL load, each channel) | N | — | — | 8 | — |
| Operating temperature | T _{opr} | 0 | — | 70 | °C |

Electrical Characteristics

(unless otherwise specified, Ta = 0~70°C, V_{CC} = 4.5~5.5V, V_{FL} ≤ 1.0V)

| Characteristic | Symbol | Test Condition | Min. | Typ.* | Max. | Unit |
|--|---------------------|---|--------------------|------------------|------|---------|
| Forward voltage | V _F | I _F =10mA, Ta=25°C | — | 1.65 | 1.80 | V |
| Forward voltage temperature coefficient | V _F / Ta | I _F =10mA | — | -2 | — | mV / °C |
| Reverse current | I _R | V _R =5V, Ta=25°C | — | — | 10 | μA |
| Capacitance between terminals | C _T | V _F =0, f=1MHz, Ta=25°C | — | 45 | — | pF |
| High level output current | I _{OH} | V _F =1.0, V _O =5.5V | — | — | 250 | μA |
| | | V _F =1.0, V _O =5.5V, Ta=25°C | — | 0.5 | 10 | |
| Low level output voltage | V _{OL} | I _F =10mA I _{OL} =13mA(sinking) | — | 0.4 | 0.6 | V |
| "H level output→ L level output" input current | I _{FH} | I _{OL} =13mA(sinking) V _{OL} =0.6V | — | — | 10 | mA |
| High level supply current | I _{CCH} | V _{CC} =5.5V, I _F =0 | — | 7 | 15 | mA |
| Low level supply current | I _{CCL} | V _{CC} =5.5V, I _F =16mA | — | 12 | 18 | mA |
| Input-output insulation leakage current | I _S | V _S =3540V, t=5s Ta=25°C (Note 4) | — | — | 100 | μA |
| Isolation resistance | R _S | R.H.≤ 60%, V _S =500V DC Ta=25°C (Note 4) | 5×10 ¹⁰ | 10 ¹⁴ | — | Ω |
| Stray capacitance between input to output | C _S | V _S =0, f=1MHz Ta=25°C (Note 4) | — | 0.8 | — | pF |

* All typical values are V_{CC}=5V, Ta=25°C

Switching Characteristics($V_{CC} = 5V$, $T_a = 25^\circ C$)

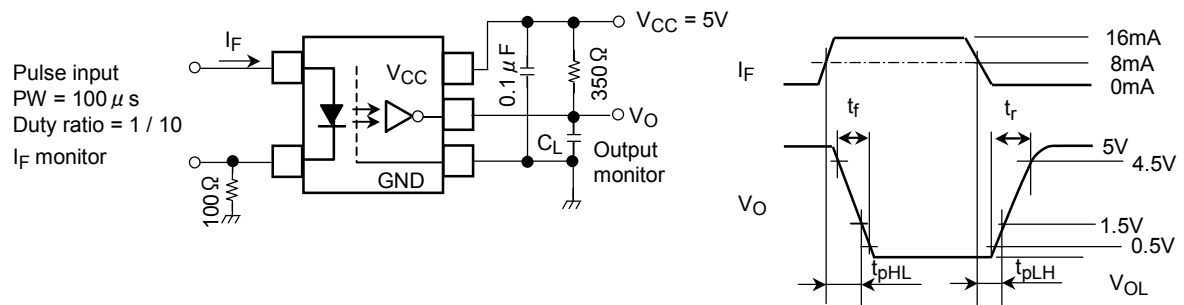
| Characteristic | Symbol | Test Cir-cuit | Test Condition | Min. | Typ. | Max. | Unit |
|---|---------------|---------------|--|-------|------|------|-------------|
| Propagation delay time (H→L) | t_{pHL} | 1 | $I_F=0 \rightarrow 16mA$ $C_L=15pF$, $R_L=350\Omega$ | — | 60 | 120 | ns |
| Propagation delay time (L→H) | t_{pLH} | 1 | $I_F=16 \rightarrow 0mA$ $C_L=15pF$, $R_L=350\Omega$ | — | 60 | 120 | ns |
| Output rise fall time (10–90%) | t_r , t_f | 2 | $R_L=350\Omega$, $C_L=15pF$ $I_F=0 \rightleftharpoons 16mA$ | — | 30 | — | ns |
| Common mode transient immunity at high output level | CM_H | 2 | $I_F=0mA$, $V_{CM}=400V_{p-p}$ $V_{O(min)}=2V$, $R_L=350\Omega$ | 1000 | — | — | V / μs |
| Common mode transient immunity at low output level | CM_L | 2 | $I_F=16mA$, $V_{CM}=400V_{p-p}$ $V_{O(max)}=0.8V$, $R_L=350\Omega$ | –1000 | — | — | V / μs |

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

(Note 5) The V_{CC} supply voltage to each TLP115 isolator must be bypassed by 0.1 μF capacitor. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to package V_{CC} and GND pins of each device.

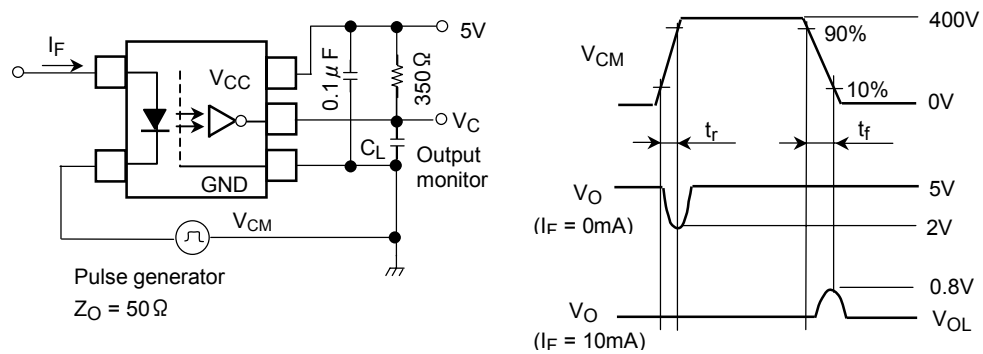
(Note 6) Maximum electrostatic discharge voltage for any pins: 180V($C=200pF$, $R=0$)

Test Circuit 1: Switching Time Test Circuit



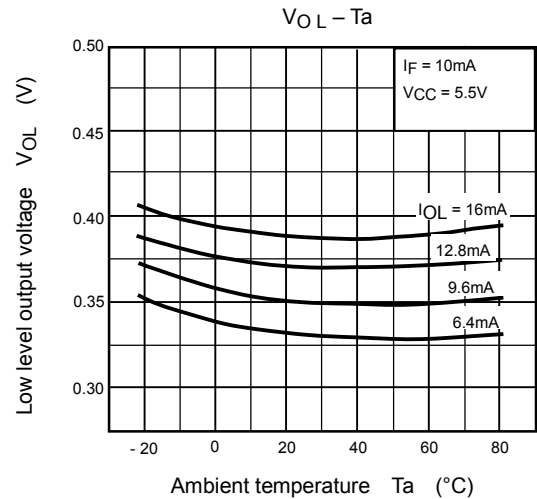
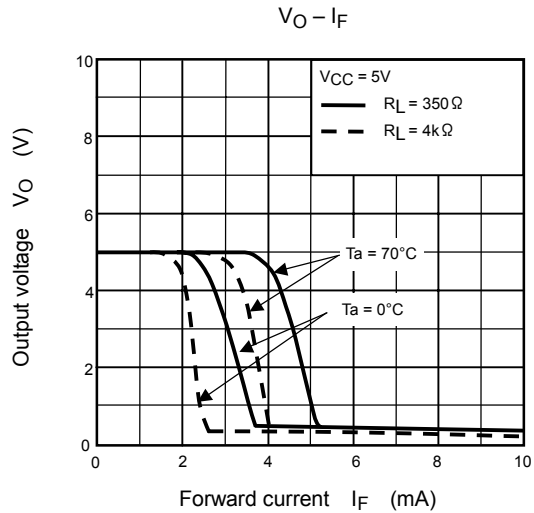
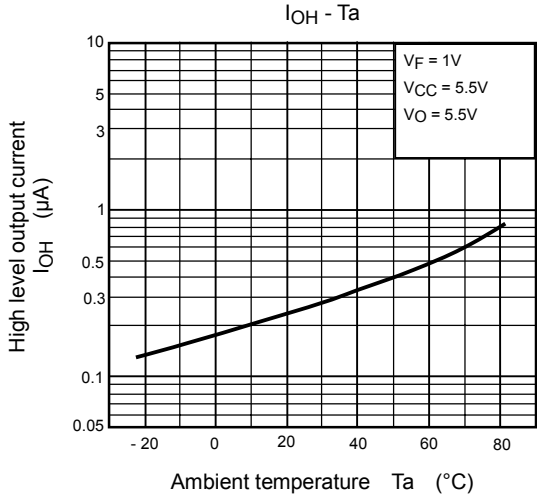
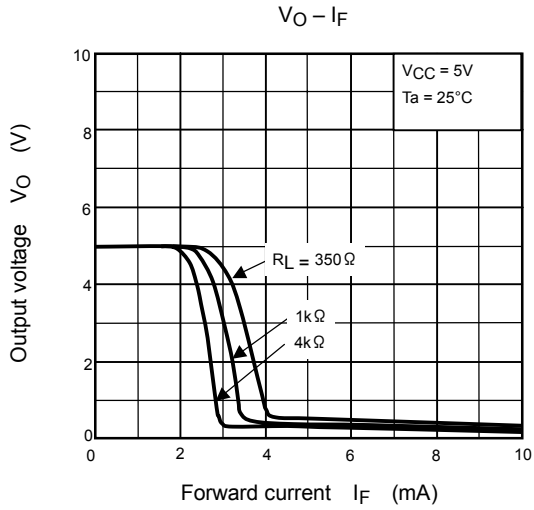
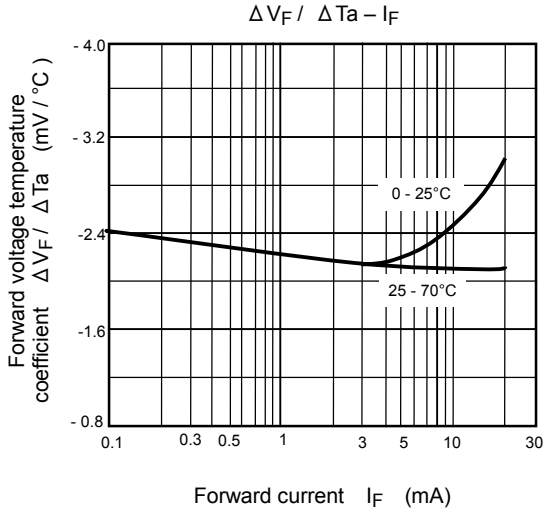
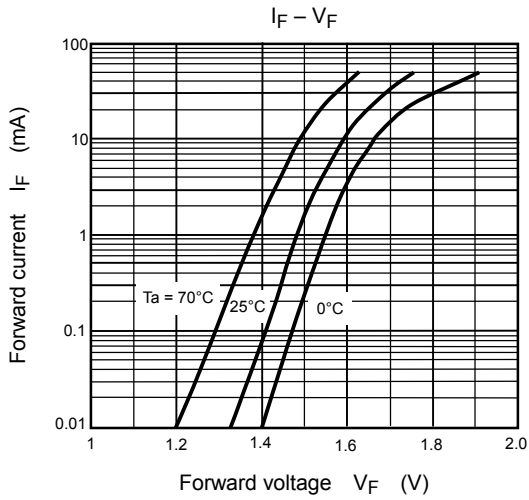
C_L is approximately 15pF which includes probe and stray wiring capacitance.

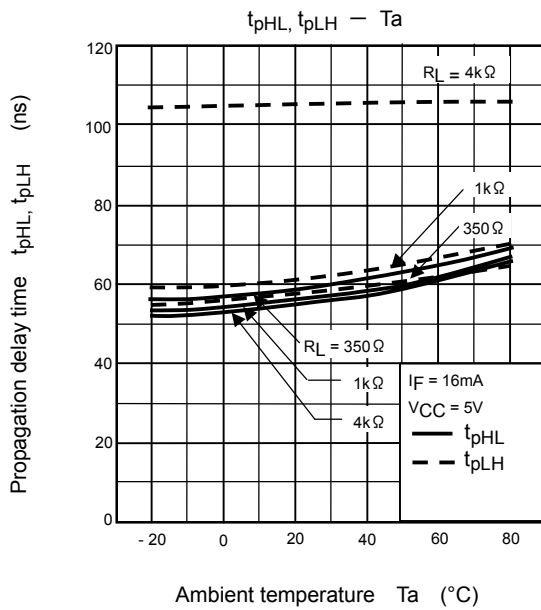
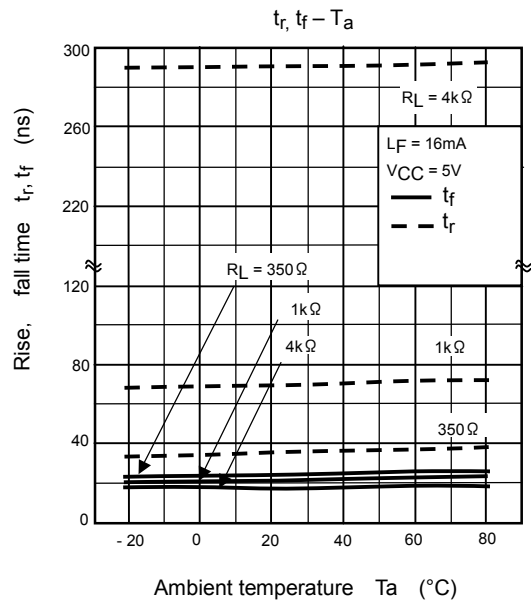
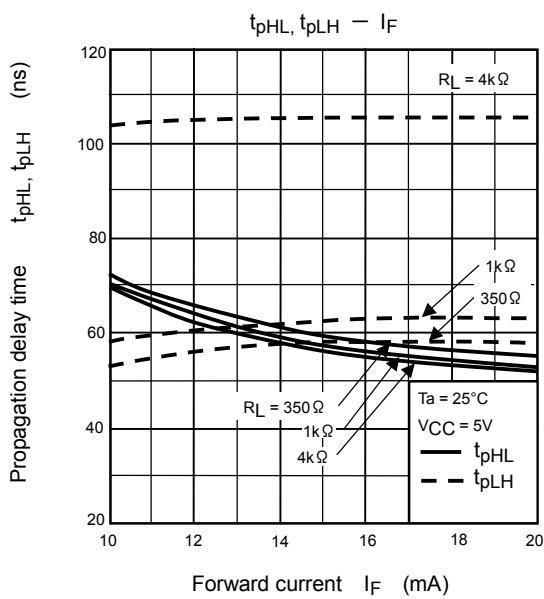
Test Circuit 2: Common Mode Transient Immunity Test Circuit



$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$

C_L is approximately 15pF which includes probe and stray wiring capacitance.





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