TOSHIBA Photocoupler GaAlAs Ired & Photo-IC

TLP115A

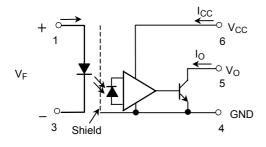
High Speed, Long Distance Isolated Line Receiver Microprocessor System Interfaces
Digital Isolation For A / D, D / A Conversion
Computer-Peripheral Interfaces
Ground Loop Elimination

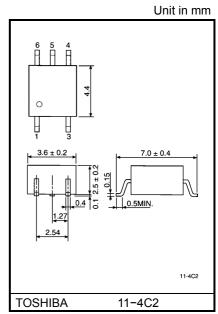
The TOSHIBA mini flat coupler TLP115A is a small outline coupler, suitable for surface mount assembly.

TLP115A consists of a high output power 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 capacirively coupled common noise to ground, provides a guaranteed transient immunity specification of $1000V\,/\,\mu s$.

- Input current thresholds: IF = 5mA (max.)
- Switching speed: 10MBd (typ.)
- Common mode transient immunity: ± 1000V / μs (min.)
- Guaranteed performance over temp.: 0~70°C
- Isolation voltage: 2500Vrms (min.)
- UL recognized: UL1577, file no. E67349

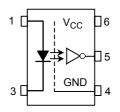
Schematic





Weight: 0.09g

Pin Configuration (top view)



- 1 : Anode
- 3: Cathode
- 4 : GND
- 5 : V_O(Output)
- 6 : V_{CC}

Truth Table (positive logic)

Input	Output
Н	L
L	Н

Note. A $0.1\mu F$ bypass capacitor must be connected between pins 4 and 6.

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit	
	Forward current	(Note 1)	l _F	20	mA
Pulse forward current		(Note 2)	I _{FP}	40	mA
LED	Peak transient forward current	(Note 3)	I _{FPT}	1	Α
	Reverse voltage		V _R	5	V
	Output current		IO	25	mA
Detector	Output voltage		Vo	7	V
Dete	Supply voltage(1 minute maximum)		V _{CC}	7	V
	Output power dissipation		Ро	40	mW
Оре	perating temperature range		T _{opr}	-40~85	°C
Sto	Storage temperature range		T _{stg}	−55~125	°C
Lea	Lead solder temperature(10 sec.)		T _{sol}	260	°C
Isol	Isolation voltage(AC, 1 min., RH≤ 60%, Note 4)		BVS	2500	Vrms

⁽Note 1) Derate 0.36mA / °C above 70°C.

Recommended Operating Conditions

Characteristic	Symbol	Min.	Тур.	Max.	Unit
Input voltage, low level	V_{FL}	-3	0	1.0	V
Input current, high level	I _{FH}	6.3	8	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

⁽Note 2) 50% duty cycle, 1ms pulse width. Derate 0.72mA / °C above 70°C.

⁽Note 3) Pulse width $\leq 1\mu s$, 300pps.

Electrical Characteristics (unless otherwise specified, Ta = 0~70°C, V_{CC} = 4.5 ~ 5.5V, $V_{FL} \le 1.0V$)

Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Forward voltage	V_{F}	I _F = 10mA, Ta =25°C	1.2	1.4	1.7	V
Forward voltage temperature coefficient	V _F / Ta	I _F = 10mA	_	-2	_	mV / °C
Reverse current	I _R	V _R = 3V, Ta = 25°C	-	_	10	μΑ
Capacitance between terminals	C _T	V _F = 0, f = 1MHz, Ta = 25°C	_	30	_	РF
High level output voltage		V _F = 1.0, V _O = 5.5V	25		250	
	ІОН	V _F = 1.0, V _O = 5.5V, Ta = 25°C	_	0.5	10	μΑ
Low level output current	V _{OL}	I _F = 5mA 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	_	_	5	mA
High level supply current	Іссн	V _{CC} = 5.5V, I _F = 0	-	7	15	mA
Low level supply current	I _{CCL}	V _{CC} = 5.5V, I _F = 10mA	_	12	19	mA
Input-output insulation leakage current	IS	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	CS	V _S = 0, f = 1MHz Ta = 25°C (Note 4)	_	0.8	_	РF

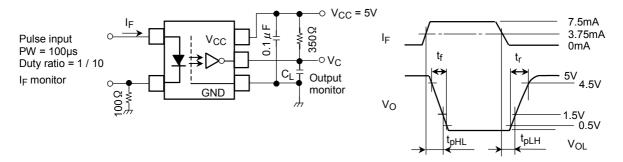
^{*} All typical values are V_{CC} = 5V, Ta = 25°C.

Switching Characteristics (V_{CC} = 5V, Ta = 25°C)

Characteristic	Symbol	Test Cir- cuit	Test Condition	Min.	Тур.	Max.	Unit
Propagation delay time (H→L)	t _{pHL}	1	$I_F = 0 \rightarrow 7.5 \text{mA}$ C _L = 15pF, R _L = 350Ω	_	60	120	ns
Propagation delay time (L→H)	t _{pLH}	1	$I_F = 7.5 \rightarrow 0$ mA C _L = 15pF, R _L = 350Ω	-	60	120	ns
Output rise fall time(10–90%)	t _r , t _f	2	$R_L = 350, C_L = 15pF$ $I_F = 0 \leftrightarrow 7.5mA$	-	30	_	ns
Common mode transient immunity at high output level	CM _H	2	$I_F = 0 \text{ mA},$ $V_{CM} = 400V_{p-p}, V_{O(MIN)}=2V$ $R_L = 350\Omega$	1000	ı	_	V / µs
Common mode transient immunity at low output level	CM_L	2	$I_F = 7.5 \text{ mA}, V_{CM} = 400V_{p-p}$ $V_{O(MAX)} = 0.8V,$ $R_L = 350\Omega$	-1000	ı	_	V / µs

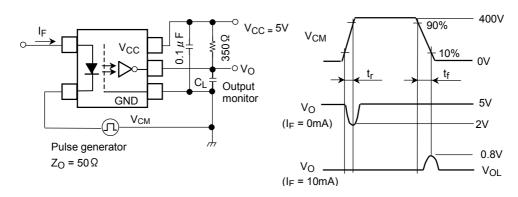
- (Note 4) Device considered a two–terminal device: Pins 1 and 3 shorted together, and pins 4, 5 and 6 shorted together.
- (Note 5) The V_{CC} supply voltage to each TLP115A isolator must be bypassed by $0.1\mu F$ capacitor. This can be either a ceramic or solid tantalum capacitor with good high frequency 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



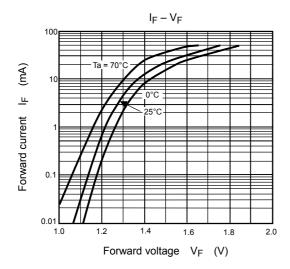
C_L is approximately 15pF which includes probe and stray wiring capacitance.

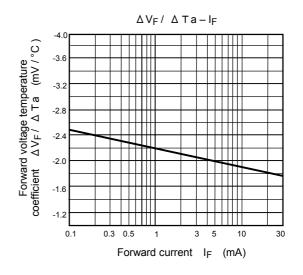
Test Circuit 2: Common Mode Transient Immunity Test Circuit

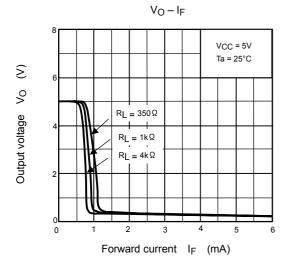


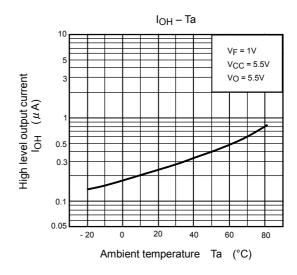
$$CM_{H} = \frac{320 \ (V)}{t_{f}(\mu s)}, CM_{L} = \frac{320 \ (V)}{t_{f}(\mu s)}$$

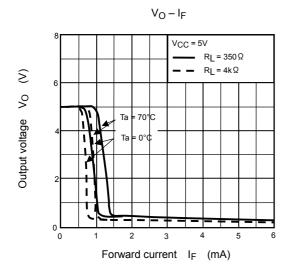
 $\ensuremath{C_L}$ is approximately 15pF which includes probe and stray wiring capacitance.

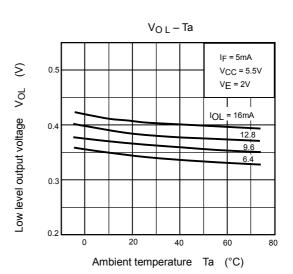


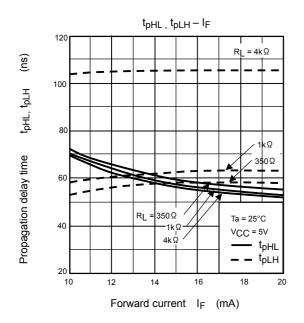


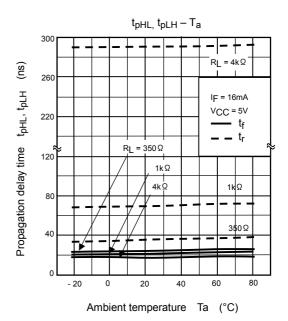


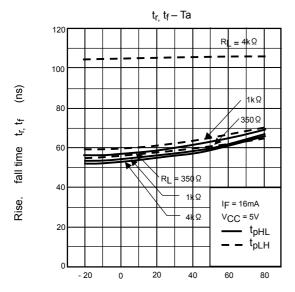












Ambient temperature Ta (°C)

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