

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-IC

TLP113

ISOLATED LINE RECEIVER

SIMPLEX/MULTIPLEX DATA TRANSMISSION

COMPUTER-PERIPHERAL INTERFACE

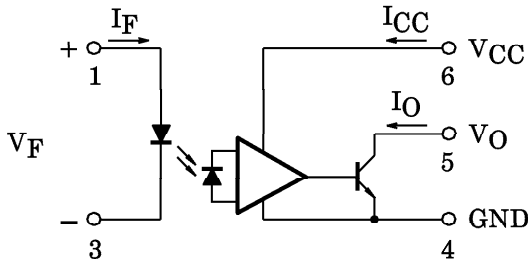
MICROPROCESSOR SYSTEM INTERFACE

DIGITAL ISOLATION FOR A/D, D/A CONVERSION

The TOSHIBA MINI FLAT COUPLER TLP113 is a small outline coupler, suitable for surface mount assembly. TLP113 consists of a GaAs light emitting diode, optically coupled to an integrated high gain, high speed photodetector whose output is an open collector, schottky clamped transistor.

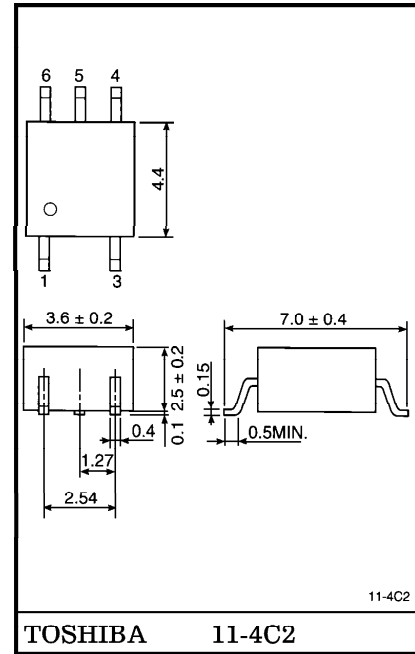
- Input Current Thresholds : $I_F = 10\text{mA (Max.)}$
- Switching Speed : 10MBd (Typ.)
- TTL/LSTTL Compatible : $V_{CC} = 5\text{V}$
- Guaranteed Performance Over Temp. : $0\sim 70^\circ\text{C}$
- Isolation Voltage : $2500V_{\text{rms (Min.)}}$
- UL Recognized : UL1577 File No. E67349

SCHMATIC



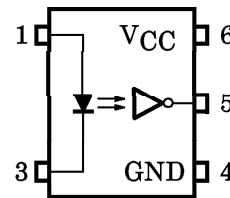
(Note) A $0.1\mu\text{F}$ bypass capacitor must be connected between pins 4 and 6.

Unit in mm



Weight : 0.09g

PIN CONFIGURATION (TOP VIEW)



- 1 : ANODE
- 3 : CATHODE
- 4 : GND
- 5 : OUTPUT (OPEN COLLECTOR)
- 6 : VCC

TRUTH TABLE (Positive Logic)

INPUT	OUTPUT
H	L
L	H

961001EBC2

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● Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.

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● The information contained herein is subject to change without notice.

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, 1 min., RH ≤ 60%, Note 4)		BVS	2500	V _{rms}

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

(Note 2) Pulse width ≤ 1μs, 300pps.

RECOMMENDE 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

* 13mA is a guard banded value which allows for at least 20% CTR degradation. Initial input current threshold value is 10mA or less.

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $T_a = 0 \sim 70^\circ\text{C}$, $V_{CC} = 4.5 \sim 5.5\text{V}$, $V_{FL} \leq 1.0\text{V}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Voltage	V_F	$I_F = 10\text{mA}$, $T_a = 25^\circ\text{C}$	—	1.65	1.80	V
Forward Voltage Temperature Coefficient	V_F / T_a	$I_F = 10\text{mA}$	—	-2	—	mV / °C
Reverse Current	I_R	$V_R = 5\text{V}$, $T_a = 25^\circ\text{C}$	—	—	10	μA
Capacitance Between Terminals	C_T	$V_F = 0$, $f = 1\text{MHz}$, $T_a = 25^\circ\text{C}$	—	45	—	pF
High Level Output Current	I_{OH}	$V_F = 1.0$, $V_O = 5.5\text{V}$	—	—	250	μA
		$V_F = 1.0$, $V_O = 5.5\text{V}$, $T_a = 25^\circ\text{C}$	—	0.5	10	
Low Level Output Voltage	V_{OL}	$I_F = 10\text{mA}$ $I_{OL} = 13\text{mA}$ (Sinking)	—	0.4	0.6	V
“H Level Output → L Level Output” Input Current	I_{FH}	$I_{OL} = 13\text{mA}$ (Sinking) $V_{OL} = 0.6\text{V}$	—	—	10	mA
High Level Supply Current	I_{CCH}	$V_{CC} = 5.5\text{V}$, $I_F = 0$	—	7	15	mA
Low Level Supply Current	I_{CCL}	$V_{CC} = 5.5\text{V}$, $I_F = 16\text{mA}$	—	12	18	mA
Input-Output Insulation Leakage Current	I_S	$V_S = 3540\text{V}$, $t = 5\text{s}$ $T_a = 25^\circ\text{C}$ (Note 4)	—	—	100	μA
Isolation Resistance	R_S	R.H. $\leq 60\%$, $V_S = 500\text{V DC}$ $T_a = 25^\circ\text{C}$ (Note 4)	5×10^{10}	10^{14}	—	Ω
Stray Capacitance Between Input to Output	C_S	$V_S = 0$, $f = 1\text{MHz}$ $T_a = 25^\circ\text{C}$ (Note 4)	—	0.8	—	pF

* All typical values are $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$

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

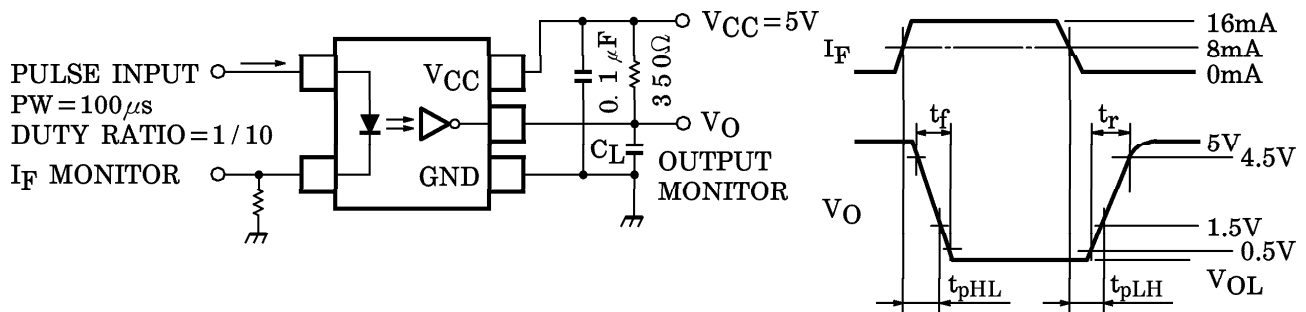
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (H→L)	t_{pHL}	1	$I_F = 0 \rightarrow 16mA$ $C_L = 15pF$, $R_L = 350\Omega$	—	60	120	ns
Propagation Delay Time (L→H)	t_{pLH}	1	$I_F = 16 \rightarrow 0mA$ $C_L = 15pF$, $R_L = 350\Omega$	—	60	120	ns
Output Rise-Fall 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	$I_F = 0mA$, $V_{CM} = 200V_{p-p}$ $V_{O(MIN)} = 2V$, $R_L = 350\Omega$	—	200	—	V / μs
Common Mode Transient Immunity at Low Output Level	CM_L	2	$I_F = 16mA$, $V_{CM} = 200V_{p-p}$ $V_{O(MAX)} = 0.8V$, $R_L = 350\Omega$	—	-500	—	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 TLP113 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.

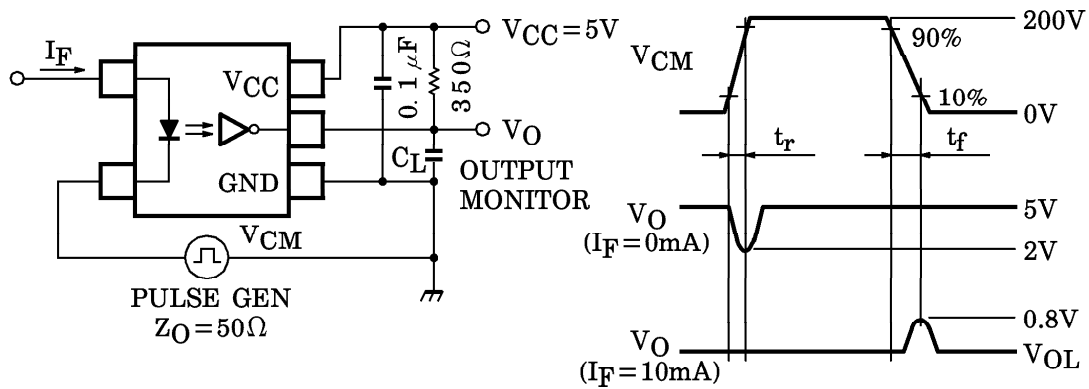
(Note 6) Maximum electrostatic discharge voltage for any pins : 180V ($C = 200pF$, $R = 0$)

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



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

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

