

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP120

PROGRAMMABLE CONTROLLERS

AC/DC-INPUT MODULE

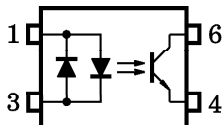
TELECOMMUNICATION

The TOSHIBA MINI FLAT COUPLER TLP120 is a small outline coupler, suitable for surface mount assembly.

TLP120 consists of a photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current.

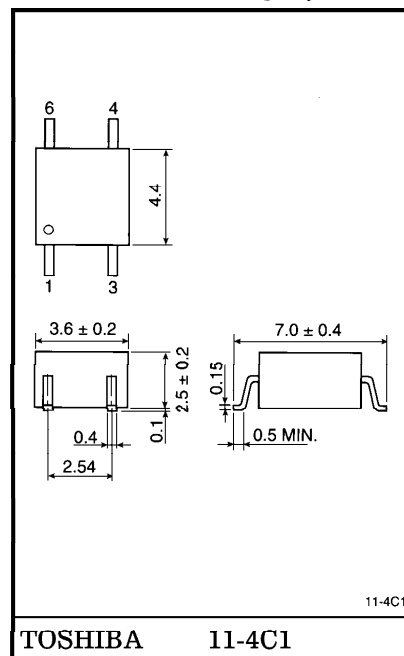
- Collector-Emitter Voltage : 80V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- Isolation Voltage : 3750Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATIONS (TOP VIEW)



- 1 : ANODE
- CATHODE
- 3 : CATHODE
- ANODE
- 4 : EMITTER
- 6 : COLLECTOR

Unit in mm



Weight : 0.09g

961001EBC2

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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	$I_{F(RMS)}$	50	mA
	Forward Current Derating	$\Delta I_F / ^\circ C$	-0.7 (Ta $\geq$ 53°C)	mA / °C
	Pulse Forward Current	$I_{FP}$	1 (100 $\mu$ s pulse, 100pps)	A
	Reverse Voltage	$V_R$	5	V
	Junction Temperature	$T_j$	125	°C
DETECTOR	Collector-Emitter Voltage	$V_{CEO}$	80	V
	Emitter-Collector Voltage	$V_{ECO}$	7	V
	Collector Current	$I_C$	50	mA
	Collector Power Dissipation	$P_C$	150	mW
	Collector Power Dissipation Derating (Ta $\geq$ 25°C)	$\Delta P_C / ^\circ C$	-1.5	mW / °C
	Junction Temperature	$T_j$	125	°C
Storage Temperature Range		$T_{stg}$	-55~125	°C
Operating Temperature Range		$T_{opr}$	-55~100	°C
Lead Soldering Temperature		$T_{sol}$	260 (10s)	°C
Total Package Power Dissipation		$P_T$	200	mW
Total Package Power Dissipation Derating (Ta $\geq$ 25°C)		$\Delta P_T / ^\circ C$	-2.0	mW / °C
Isolation Voltage (Note 1)		$BV_S$	3750 (AC, 1min., R.H. $\leq$ 60%)	Vrms

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

## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	$V_{CC}$	—	5	48	V
Forward Current	$I_F (RMS)$	—	16	20	mA
Collector Current	$I_C$	—	1	10	mA
Operating Temperature	$T_{opr}$	-25	—	85	°C

INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	$V_F$	$I_F = \pm 10\text{mA}$	1.0	1.15	1.3	V
	Capacitance	$C_T$	$V = 0, f = 1\text{MHz}$	—	60	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 0.5\text{mA}$	80	—	—	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector Dark Current	$I_{CEO}$	$V_{CE} = 48\text{V}$	—	10	100	nA
			$V_{CE} = 48\text{V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
Capacitance (Collector to Emitter)	$C_{CE}$	$V = 0, f = 1\text{MHz}$	—	10	—	pF	

COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio	$I_C / I_F$	$I_F = \pm 5\text{mA}, V_{CE} = 5\text{V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_{F(\text{sat})}$	$I_F = \pm 1\text{mA}, V_{CE} = 0.4\text{V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-Emitter Saturation Voltage	$V_{CE(\text{sat})}$	$I_C = 2.4\text{mA}, I_F = \pm 8\text{mA}$ $I_C = 0.2\text{mA}, I_F = \pm 1\text{mA}$ Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	
Off-State Collector Current	$I_{C(\text{off})}$	$V_F = \pm 0.7\text{V}, V_{CE} = 48\text{V}$	—	1	10	$\mu\text{A}$
CTR Symmetry	$I_{C(\text{ratio})}$	$I_C (I_F = -5\text{mA}) / I_C (I_F = 5\text{mA})$	0.33	1	3	—

ISOLATION CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance (Input to Output)	$C_S$	$V_S = 0, f = 1\text{MHz}$	—	0.8	—	pF
Isolation Resistance	$R_S$	$V_S = 500\text{V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation Voltage	$BV_S$	AC, 1 minute	3750	—	—	$V_{\text{rms}}$
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	$V_{\text{dc}}$

SWITCHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	$t_r$	$V_{CC} = 10V, I_C = 2mA$ $R_L = 100\Omega$	—	2	—	$\mu s$
Fall Time	$t_f$		—	3	—	
Turn-on Time	$t_{on}$		—	3	—	
Turn-off Time	$t_{off}$		—	3	—	
Turn-on Time	$t_{ON}$	$R_L = 1.9k\Omega$ (Fig.1) $V_{CC} = 5V, I_F = \pm 16mA$	—	2	—	$\mu s$
Storage Time	$t_s$		—	25	—	
Turn-off Time	$t_{OFF}$		—	40	—	

Fig.1 SWITCHING TIME TEST CIRCUIT

