ICPL4502

HIGH SPEED, NON BASE LEAD OPTICALLY COUPLED ISOLATOR PHOTOTRANSISTOR OUTPUT

APPROVALS

- UL recognised, File No. E91231

DESCRIPTION

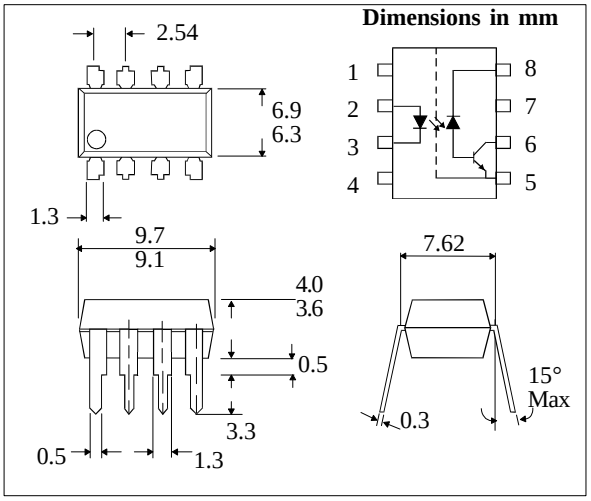
These diode-transistor optocouplers use a light emitting diode and an integrated photon detector to provide 2500Volts $_{RMS}$ electrical isolation between input and output. Seperate connection for the photodiode bias and output transistor collector improve the speed up to a hundred times that of a conventional photo-transistor coupler by reducing the base-collector capacitance.

FEATURES

- High speed - 1 MBits/s
- High Common Mode Transient Immunity 10000V/µs typical
- Pin 7 not connected to give enhanced Noise Immunity
- TTL Compatible
- 2 MHz Bandwidth
- Open Collector Output
- 2500V $_{RMS}$ Withstand Test Voltage,1 Min
- Options :-
  10mm lead spread - add G after part no.
  Surface mount - add SM after part no.
  Tape&reel - add SMT&R after part no.
- All electrical parameters 100% tested
- Custom electrical selections available

APPLICATIONS

- Line receivers
- Pulse transformer replacement
- Wide bandwidth analog coupling
- Output interface to CMOS-LSTTL-TTL



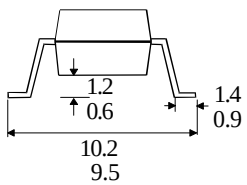
ABSOLUTE MAXIMUM RATINGS
(25°C unless otherwise specified)

Storage Temperature	-55°C to + 125°C
Operating Temperature	-55°C to + 100°C
Lead Soldering Temperature (1/16 inch (1.6mm) from case for 10 secs)	260°C

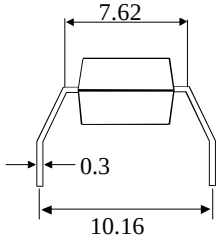
INPUT DIODE

Average Forward Current	25mA (1)
Peak Forward Current	50mA (2)
(50% duty cycle, 1ms pulse width)	
Peak Transient Current	1.0A
(equal to or less than 1µs P.W., 300 pps)	
Reverse Voltage	5V
Power Dissipation	45mW(3)

OPTION SM
SURFACE MOUNT



OPTION G



DETECTOR

Average Output Current	8mA
Peak Output Current	16mA
Supply and Output Voltage	-0.5 to +15V
Power Dissipation	100mW(4)

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ELECTRICAL CHARACTERISTICS (T_A= 0°C to 70°C Unless otherwise noted)

PARAMETER	SYM		MIN	TYP*	MAX	UNITS	TEST CONDITION
Current Transfer Ratio (note 5)	CTR		19	24		%	I_F = 16mA, V_O = 0.4V V_{CC} = 4.5V, T_A= 25°C
			15	25		%	I_F = 16mA, V_O = 0.5V V_{CC} = 4.5V
Logic Low Output Voltage	V_{OL}			0.1	0.4	V	I_F = 16mA, I_O = 2.4mA V_{CC} = 4.5V, T_A= 25°C
Logic High Output Current	I_{OH}			0.02	500	nA	I_F = 0mA, T_A= 25°C V_O = V_{CC} = 5.5V
				0.01	1	µA	I_F = 0mA, T_A= 25°C V_O = V_{CC} = 15V
					50	µA	I_F = 0mA V_O = V_{CC} = 15V
Logic Low Supply Current	I_{CCL}				40	µA	I_F = 16mA,V_O= open V_{CC} = 15V
Logic High Supply Current	I_{CCH}			0.02	1	µA	I_F = 0mA, V_O= open V_{CC} = 15V, T_A= 25°C
					2	µA	I_F = 0mA,V_O= open V_{CC} = 15V
Input Forward Voltage	V_F			1.5	1.7	V	I_F = 16mA, T_A= 25°C
Temperature Coefficient of Forward Voltage	$\frac{\Delta V_F}{\Delta T_A}$			-1.6		mV/°C	I_F = 16mA
Input Reverse Voltage	V_R		5			V	I_R = 10µA,T_A= 25°C
Input Capacitance	C_{IN}			60		pF	f = 1MHz, V_F = 0
Input-output Isolation Voltage	V_{ISO}		2500	5000		V_{RMS}	R.H.equal to or less than 50%, t = 1min. T_A= 25°C
Resistance (Input to Output)	R_{IO}			10^{12}		Ω	V_{IO} = 500V dc (note 6)
Capacitance (Input to Output)	C_{IO}			0.6		pF	f = 1MHz (note 6)
Transistor DC Current Gain	H_{FE}			150			V_O = 5V, I_O = 3mA

* All typicals at T_A= 25°C

SWITCHING SPECIFICATIONS AT T_A = 25°C (V_{CC} = 5V, I_F = 16mA Unless otherwise noted)

PARAMETER	SYM	DEVICE	MIN	TYP	MAX	UNITS	TEST CONDITION
Propagation Delay Time To Logic Low at Output (fig 1)	t_{PHL}			0.2	0.8	µs	R_L = 1.9kΩ,(note 8)
Propagation Delay Time To Logic High at Output (fig 1)	t_{PLH}			0.2	0.8	µs	R_L = 1.9kΩ,(note 8)
Common Mode Transient Immunity at Logic High Level Output (fig 2)	CM_H			10000		V/µs	I_F = 0mA, V_{CM} = $10V_{PP}$ R_L = 1.9kΩ,(note 7,8)
Common Mode Transient Immunity at Logic Low Level Output (fig 2)	CM_L			-10000		V/µs	V_{CM} = $10V_{PP}$ R_L = 1.9kΩ,(note 7,8)
Bandwidth	BW			2		MHz	R_L = 100Ω, (note 9)

NOTES:-

1. Derate linearly above 70°C free air temperature at a rate of 0.8 mA/°C.
2. Derate linearly above 70°C free air temperature at a rate of 1.6 mA/°C.
3. Derate linearly above 70°C free air temperature at a rate of 0.9 mW/°C.
4. Derate linearly above 70°C free air temperature at a rate of 1.0 mW/°C.
5. CURRENT TRANSFER RATIO is defined as the ratio of output collector current,I_O , to the forward LED input current, I_F times 100%.
6. Device considered a two-terminal device: pins 1,2,3, and 4 shorted together and pins 5,6,7 and 8 shorted together.
7. Common mode transient immunity in Logic High level is the maximum tolerable (positive) dVcm/dt on the leading edge of the common mode pulse V_{CM} to assure that the output will remain in a Logic High state (i.e. V_O > 2.0V). Common mode transient immunity in Logic Low level is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common mode pulse signal, V_{CM} to assure that the output will remain in Logic Low state (i.e. V_O< 0.8V).
8. The 1.9kΩ load represents 1 TTL unit load of 1.6mA and the 5.6kΩ pull-up resistor.
9. The frequency at which the a.c. output voltage is 3dB below the low frequency asymptote.

FIG.1 SWITCHING TEST CIRCUIT

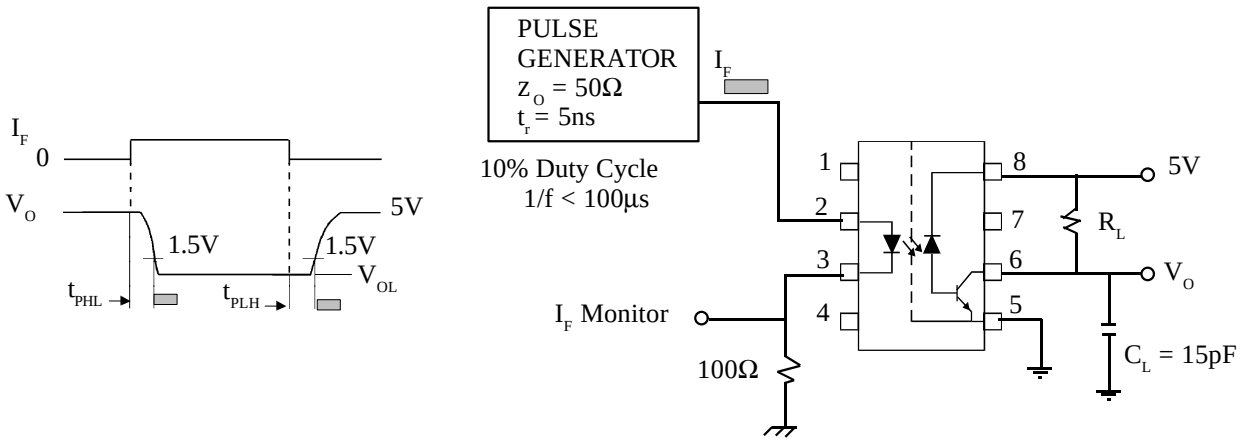
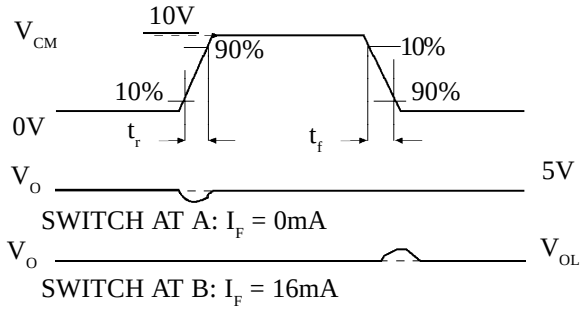
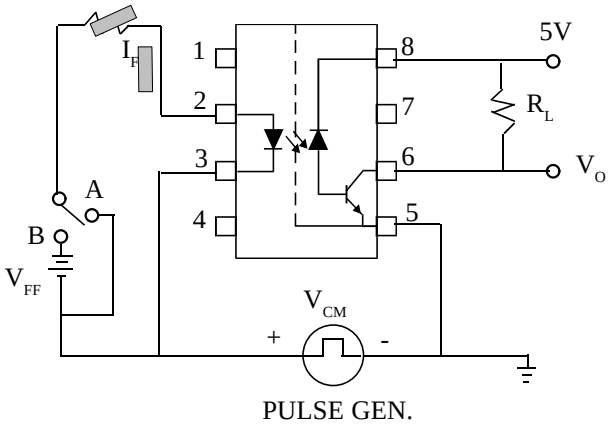
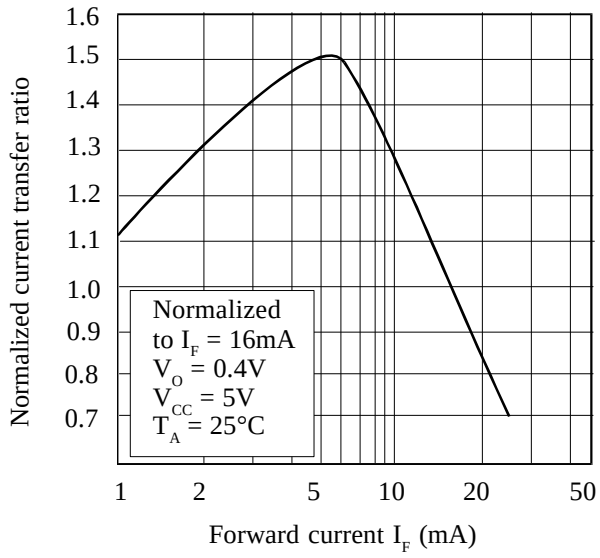


FIG. 2 TEST CIRCUIT FOR TRANSIENT IMMUNITY AND TYPICAL WAVEFORMS

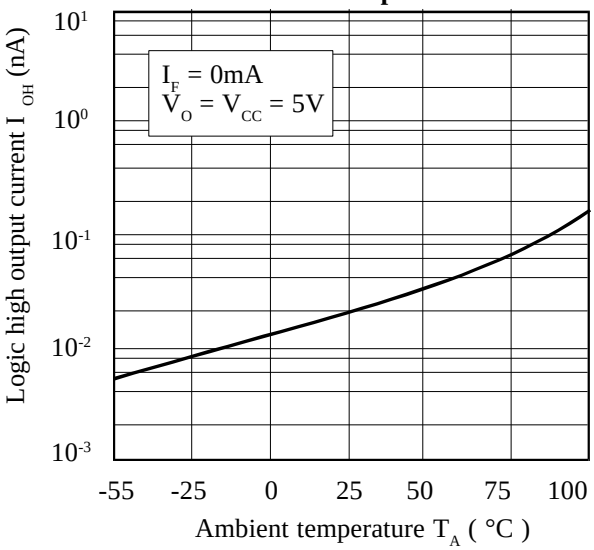




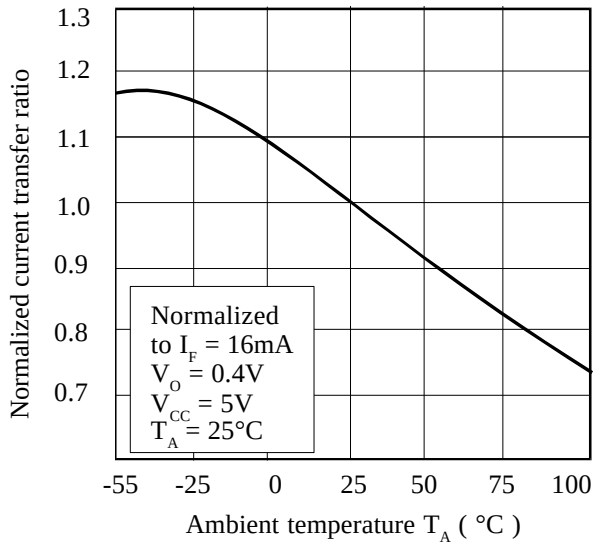
Normalized Current Transfer Ratio vs. Forward Current



Logic High Output Current vs. Ambient Temperature



Normalized Current Transfer Ratio vs. Ambient Temperature



Normalized Propagation Delay vs. Ambient Temperature