

**ICPL2631**  
**ICPL2630**



**DUAL CHANNEL, HIGH CMR, VERY HIGH SPEED OPTICALLY COUPLED ISOLATOR LOGIC GATE OUTPUT**

**APPROVALS**

- UL recognised, File No. E91231

**DESCRIPTION**

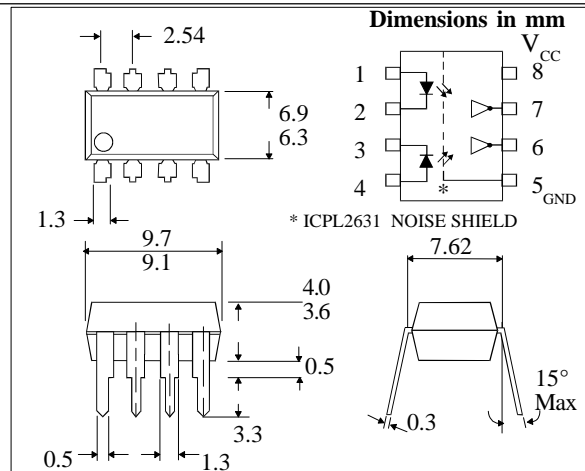
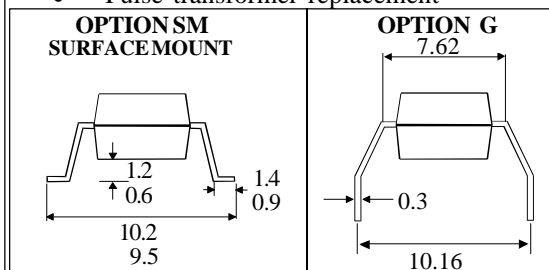
The ICPL2630 / ICPL2631 are dual channel optocouplers consisting of GaAsP light emitting diodes and high gain integrated photo detectors to provide 3500Volts<sub>RMS</sub> electrical isolation between input and output. The output of the detector I.C.'s are open collector Schottky clamped transistors. The ICPL2631 has an internal shield which provides a guaranteed common mode transient immunity specification of 1000V/ $\mu$ s minimum. This unique design provides maximum ac and dc circuit isolation while achieving TTL compatibility. The coupled parameters are guaranteed over the temperature range of 0°C to 70°C, such that a maximum input signal of 5mA will provide a minimum output sink current of 13mA (equivalent to fan-out of eight gates)

**FEATURES**

- High speed - 10MBit/s
- High Common Mode Transient Immunity 10kV/ $\mu$ s typical
- Logic gate output
- ICPL2631 has improved noise shield for superior common mode rejection
- Options :-  
10mm lead spread - add G after part no.  
Surface mount - add SM after part no.  
Tape&reel - add SMT&R after part no.

**APPLICATIONS**

- Line receiver, data transmission
- Computer-peripheral interface
- Data multiplexing
- Pulse transformer replacement



**ABSOLUTE MAXIMUM RATINGS**  
(25°C unless otherwise specified)

Storage Temperature \_\_\_\_\_ -55°C to + 125°C  
Operating Temperature \_\_\_\_\_ 0°C to + 70°C  
Lead Soldering Temperature  
(1/16 inch (1.6mm) from case for 10 secs) 260°C

**INPUT DIODE**

Average Forward Current \_\_\_\_\_ 15mA  
(note 5)  
Peak Forward Current \_\_\_\_\_ 30mA  
(less than 1msec duration)(note 5)  
Reverse Voltage \_\_\_\_\_ 5V  
(note 5)

**DETECTOR**

Supply Voltage( $V_{CC}$ ) \_\_\_\_\_ 7V  
(1 minute maximum)  
Output Current ( $I_O$ ) \_\_\_\_\_ 16mA  
(note 5)  
Output Voltage ( $V_O$ ) \_\_\_\_\_ 7V  
(note 5)  
Collector Output Power Dissipation \_\_\_\_\_ 60mW

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**ELECTRICAL CHARACTERISTICS (  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$  Unless otherwise noted )**

PARAMETER	SYM	DEVICE	MIN	TYP*	MAX	UNITS	TEST CONDITION
High Level Output Current (note 5)	$I_{OH}$			2	250	$\mu\text{A}$	$V_{CC} = 5.5\text{V}$ , $V_O = 5.5\text{V}$ $I_F = 250\mu\text{A}$
Low Level Output Voltage (note 5)	$V_{OL}$			0.4	0.6	V	$V_{CC} = 5.5\text{V}$ , $I_F = 5\text{mA}$ $I_{OL}$ (sinking) = 13mA
High Level Supply Current (both channels)	$I_{CCH}$			14	30	mA	$V_{CC} = 5.5\text{V}$ , $I_F = 0\text{mA}$
Low Level Supply Current (both channels)	$I_{CCL}$			26	36	mA	$V_{CC} = 5.5\text{V}$ , $I_F = 10\text{mA}$
Input Forward Voltage	$V_F$			1.55	1.75	V	$I_F = 10\text{mA}$ , $T_A = 25^\circ\text{C}$
Input Reverse Breakdown Voltage	$V_{BR}$		5			V	$I_R = 10\mu\text{A}$ , $T_A = 25^\circ\text{C}$
Input Capacitance	$C_{IN}$			60		pF	$V_F = 0$ , $f = 1\text{MHz}$
Temperature Coefficient of Forward Voltage	$\frac{\Delta V_F}{\Delta T_A}$			-1.4		mV/ $^\circ\text{C}$	$I_F = 10\text{mA}$
Input-output Isolation Voltage (note 4)	$V_{ISO}$		2500	5000		$V_{RMS}$	R.H.equal to or less than 50%, $t = 1\text{min}$ . $T_A = 25^\circ\text{C}$
Input-output Insulation Leakage Current (note 4)	$I_{I-O}$				1	$\mu\text{A}$	R.H = 45% $t = 5\text{s}$ , $T_A = 25^\circ\text{C}$ $V_{I-O} = 3000\text{V dc}$
Resistance (Input to Output) (note 4)	$R_{I-O}$			$10^{12}$		$\Omega$	$V_{I-O} = 500\text{V dc}$
Capacitance (Input to Output) (note 4)	$C_{I-O}$			0.6		pF	$f = 1\text{MHz}$
Input-input Insulation Leakage Current (note 6)	$I_{I-I}$			0.005		$\mu\text{A}$	R.H = 45% $t = 5\text{s}$ , $T_A = 25^\circ\text{C}$ $V_{I-O} = 500\text{V dc}$
Resistance (Input to input) (note 6)	$R_{I-I}$			$10^{11}$		$\Omega$	$V_{I-O} = 500\text{V dc}$
Capacitance (Input to input) (note 6)	$C_{I-I}$			0.6		pF	$f = 1\text{MHz}$

\* All typicals at  $T_A = 25^\circ\text{C}$ **RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	MIN	MAX	UNITS
Input Current, Low Level	$I_{FL}$	0	250	$\mu\text{A}$
Input Current, High Level	$I_{FH}$	6.3*	15	mA
Supply Voltage, Output	$V_{CC}$	4.5	5.5	V
Fan Out ( TTL Load )	N		8	
Operating Temperature	$T_A$	0	70	$^\circ\text{C}$

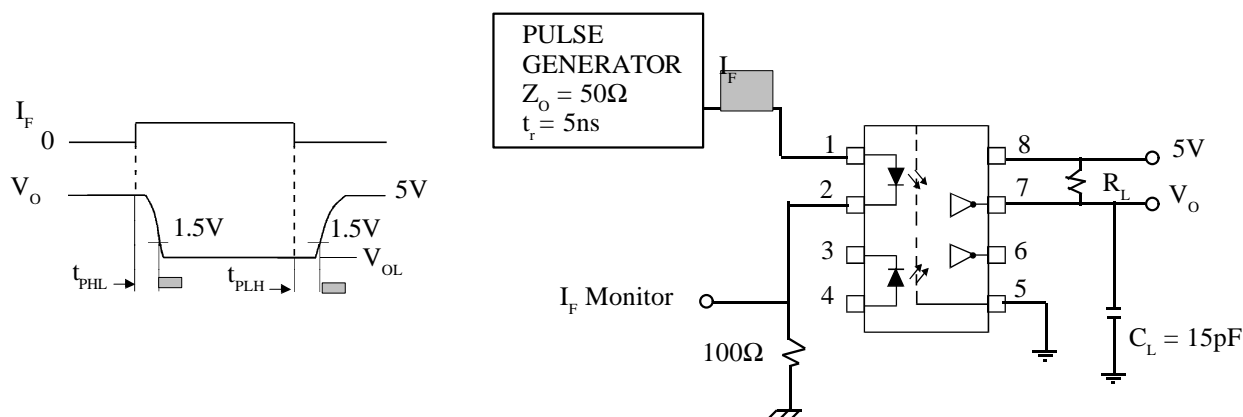
\*6.3mA is a guard banded value which allows for at least 20% CTR degradation.  
Initial input current threshold value is 5.0mA or less

**SWITCHING SPECIFICATIONS AT  $T_A = 25^\circ\text{C}$  ( $V_{CC} = 5\text{V}$ ,  $I_F = 7.5\text{mA}$  Unless otherwise noted )**

PARAMETER	SYM	DEVICE	MIN	TYP	MAX	UNITS	TEST CONDITION
Propagation Delay Time to Logic Low at Output ( fig 1 )( note2 )	$t_{PHL}$			55	75	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$
Propagation Delay Time to Logic High at Output ( fig 1 )( note3 )	$t_{PLH}$			45	75	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$
Common Mode Transient Immunity at Logic High Level Output ( fig 2 )( note7 )	$CM_H$	ICPL2630 ICPL2631	1000	10000 10000		V/ $\mu\text{s}$ V/ $\mu\text{s}$	$I_F = 0\text{mA}$ , $V_{CM} = 50V_{PP}$ $R_L = 350\Omega$ , $V_{OH} = 2V_{min.}$
Common Mode Transient Immunity at Logic Low Level Output ( fig 2 )( note8 )	$CM_L$	ICPL2630 ICPL2631	-1000	-10000 -10000		V/ $\mu\text{s}$ V/ $\mu\text{s}$	$V_{CM} = 50V_{PP}$ $R_L = 350\Omega$ , $V_{OL} = 0.8V_{max.}$

## NOTES:-

- 1 Bypassing of the power supply line is required, with a  $0.01\mu\text{F}$  ceramic disc capacitor adjacent to each isolator. The power supply bus for the isolator(s) should be separate from the bus for any active loads. Otherwise a larger value of bypass capacitor (up to  $0.1\mu\text{F}$ ) may be needed to suppress regenerative feedback via the power supply.
- 2 The  $t_{PHL}$  propagation delay is measured from the  $3.75\text{mA}$  level Low to High transition of the input current pulse to the  $1.5\text{V}$  level on the High to Low transition of the output voltage pulse.
- 3 The  $t_{PLH}$  propagation delay is measured from the  $3.75\text{mA}$  level High to Low transition of the input current pulse to the  $1.5\text{V}$  level on the Low to High transition of the output voltage pulse.
- 4 Device considered a two terminal device; pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.
- 5 Each channel.
- 6 Measured between pins 1 and 2 shorted together and pins 3 and 4 shorted together.
- 7  $CM_H$  is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (ie  $V_{out} > 2.0\text{V}$ ).
- 8  $CM_L$  is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (ie  $V_{out} < 0.8\text{V}$ )

**FIG.1 SWITCHING TEST CIRCUIT**


**FIG. 2 TEST CIRCUIT FOR TRANSIENT IMMUNITY AND TYPICAL WAVEFORMS**

