

ICPL2730  
ICPL2731



**HIGH SPEED DUAL CHANNEL  
OPTICALLY COUPLED ISOLATOR  
PHOTODARLINGTON OUTPUT**

**APPROVALS**

- UL recognised, File No. E91231

**DESCRIPTION**

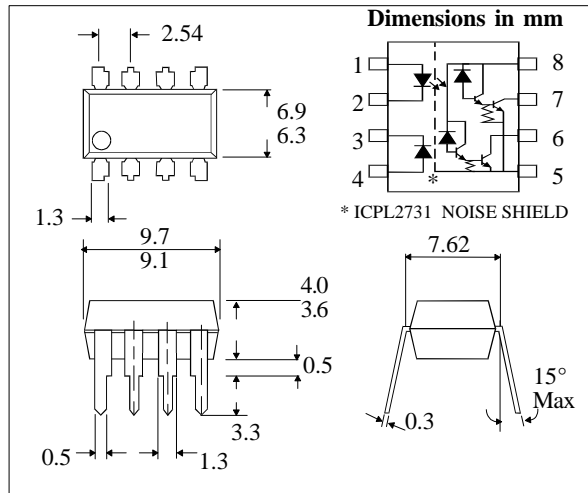
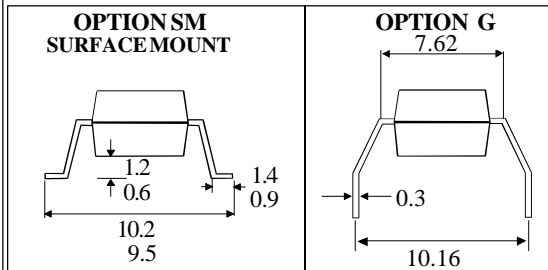
These dual channel diode-darlington optocouplers use a pair of light emitting diodes and an integrated high gain photon detectors to provide 2500Volts<sub>RMS</sub> electrical isolation between input and output. Seperate connection for the photodiode bias and output darlington collector improve the speed up to a hundred times that of a conventional photo-darlington coupler by reducing the base-collector capacitance.

**FEATURES**

- High speed - DC to 200kBits/s operation
- High Common Mode Transient Immunity 10kV/μs typical
- TTL Compatible - 0.1V V<sub>OL</sub> typical
- Low Input Current Requirement - 0.5mA
- High Current Transfer Ratio - 2000% typ.
- Open Collector Output
- 2500V<sub>RMS</sub> Withstand Test Voltage, 1 min
- ICPL2731 has improved noise shield which gives 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.
- All electrical parameters 100% tested
- Custom electrical selections available

**APPLICATIONS**

- Line receivers
- Digital logic ground isolation
- Telephone ring detector
- Current loop receiver



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

Storage Temperature	-55°C to + 125°C
Operating Temperature	-40°C to + 85°C
Lead Soldering Temperature (1/16 inch (1.6mm) from case for 10 secs)	260°C

**INPUT DIODE**

Average Forward Current	20mA ( 1 )
Peak Forward Current ( 50% duty cycle, 1ms pulse width )	40mA
Reverse Voltage	5V
Power Dissipation	35mW( 2 )

**DETECTOR**

Output Current	60mA ( 3 )
Supply and Output Voltage	
ICPL2730	-0.5 to +7V
ICPL2731	-0.5 to +18V
Power Dissipation	100mW ( 4 )

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**ELECTRICAL CHARACTERISTICS (  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$ ,  $V_{CC} = 4.5\text{V}$  Unless otherwise noted )**

PARAMETER	SYM	DEVICE	MIN	TYP*	MAX	UNITS	TEST CONDITION
Current Transfer Ratio (note 5, 6)	CTR	ICPL2731	400	2000		%	$I_F = 0.5\text{mA}, V_O = 0.4\text{V}$
		ICPL2731	500	2000		%	$I_F = 1.6\text{mA}, V_O = 0.4\text{V}$
		ICPL2730	300	2000		%	$I_F = 1.6\text{mA}, V_O = 0.4\text{V}$
Logic Low Output Voltage (note 5)	$V_{OL}$	ICPL2731		0.1	0.4	V	$I_F = 0.5\text{mA}, I_O = 2\text{mA}$
		ICPL2731		0.1	0.4	V	$I_F = 1.6\text{mA}, I_O = 8\text{mA}$
		ICPL2731		0.1	0.4	V	$I_F = 5\text{mA}, I_O = 15\text{mA}$
		ICPL2731		0.1	0.4	V	$I_F = 12\text{mA}, I_O = 24\text{mA}$
		ICPL2730		0.1	0.4	V	$I_F = 1.6\text{mA}, I_O = 4.8\text{mA}$
Logic High Output Current (note 5)	$I_{OH}$	ICPL2731		0.01	100	$\mu\text{A}$	$I_F = 0\text{mA}$ $V_O = V_{CC} = 18\text{V}$
		ICPL2730		0.01	100	$\mu\text{A}$	$I_F = 0\text{mA}$ $V_O = V_{CC} = 7\text{V}$
Logic Low Supply Current	$I_{CCL}$	ICPL2731		0.5		$\text{mA}$	$I_{F1} = I_{F2} = 1.6\text{mA}, V_{CC} = 18\text{V}$ $V_{O1} = V_{O2} = \text{open}$
		ICPL2730		0.4		$\text{mA}$	$I_{F1} = I_{F2} = 1.6\text{mA}, V_{CC} = 7\text{V}$ $V_{O1} = V_{O2} = \text{open}$
Logic High Supply Current	$I_{CCH}$	ICPL2731		5		$\text{nA}$	$I_{F1} = I_{F2} = 0\text{mA}, V_{CC} = 18\text{V}$ $V_{O1} = V_{O2} = \text{open}$
		ICPL2730		4		$\text{nA}$	$I_{F1} = I_{F2} = 0\text{mA}, V_{CC} = 18\text{V}$ $V_{O1} = V_{O2} = \text{open}$
Input Forward Voltage (note 5)	$V_F$			1.45	1.7	V	$I_F = 1.6\text{mA}, T_A = 25^\circ\text{C}$
Temperature Coefficient of Forward Voltage (note 5)	$\frac{\Delta V_F}{\Delta T_A}$			-1.8		$\text{mV}/^\circ\text{C}$	$I_F = 1.6\text{mA}$
Input Reverse Voltage (note 5)	$V_R$		5			V	$I_R = 10\mu\text{A}, T_A = 25^\circ\text{C}$
Input Capacitance (note 5)	$C_{IN}$			60		$\text{pF}$	$f = 1\text{MHz}, V_F = 0$
Input-output Isolation Voltage (note 10)	$V_{ISO}$		2500	5000		$V_{RMS}$	R.H.equal to or less than 50%, $t = 1\text{min. } T_A = 25^\circ\text{C}$
Resistance (Input to Output) (note 10)	$R_{I-O}$			$10^{12}$		$\Omega$	$V_{I-O} = 500\text{V dc}$
Capacitance (Input to Output) (note 10)	$C_{I-O}$			0.6		$\text{pF}$	$f = 1\text{MHz}$
Input-Input Insulation (note 7)	$I_{I-I}$			0.005		$\mu\text{A}$	R.H.equal to or less than 50%, $t = 5\text{sec. } V_{I-I} = 500\text{DC}$
Resistance (Input to Input) (note7)	$R_{I-I}$			$10^{11}$		$\Omega$	$V_{I-I} = 500\text{V dc}$
Capacitance (Input to Input) (note7)	$C_{I-I}$			0.25		$\text{pF}$	$f = 1\text{MHz}$

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

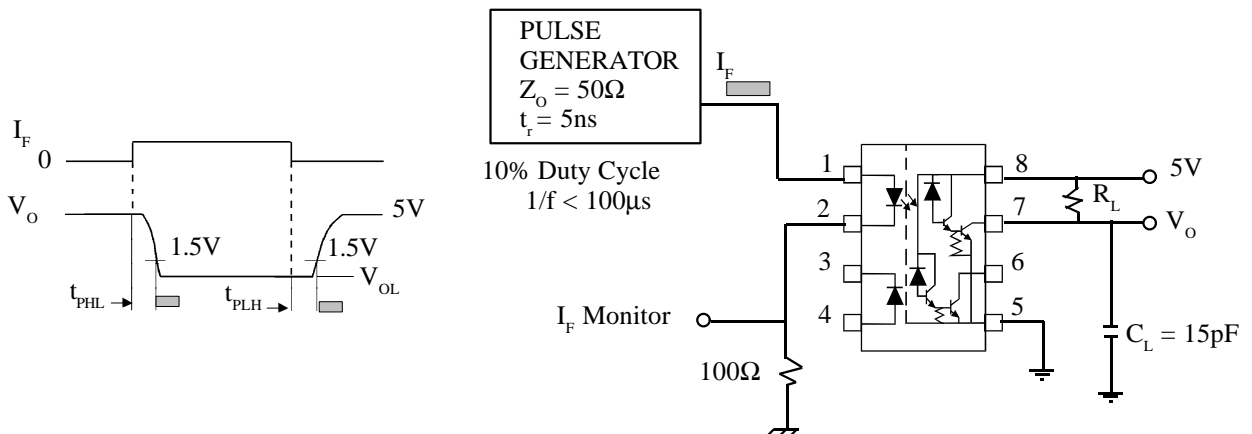
**SWITCHING SPECIFICATIONS AT  $T_A = 25^\circ\text{C}$  ( $V_{CC} = 5\text{V}$  Unless otherwise noted )**

PARAMETER	SYM	DEVICE	MIN	TYP	MAX	UNITS	TEST CONDITION
Propagation Delay Time to Logic Low at Output ( fig 1 )( note 5 )	$t_{PHL}$	ICPL2731		25	100	$\mu\text{s}$	$I_F = 0.5\text{mA}, R_L = 4.7\text{k}\Omega$
		ICPL2730/1		0.5	2	$\mu\text{s}$	$I_F = 12\text{mA}, R_L = 270\Omega$
		ICPL2730/1		4.0	20	$\mu\text{s}$	$I_F = 1.6\text{mA}, R_L = 2.2\text{k}\Omega$
Propagation Delay Time to Logic High at Output ( fig 1 )( note 5 )	$t_{PLH}$	ICPL2731		20	60	$\mu\text{s}$	$I_F = 0.5\text{mA}, R_L = 4.7\text{k}\Omega$
		ICPL2730/1		4	10	$\mu\text{s}$	$I_F = 12\text{mA}, R_L = 270\Omega$
		ICPL2730/1		12	35	$\mu\text{s}$	$I_F = 1.6\text{mA}, R_L = 2.2\text{k}\Omega$
Common Mode Transient Immunity at Logic High Level Output ( fig 2 )( note 9 )	$CM_H$		1000	10000		$\text{V}/\mu\text{s}$	$I_F = 0\text{mA}, V_{CM} = 10V_{PP}$ $R_L = 2.2\text{k}\Omega$
Common Mode Transient Immunity at Logic Low Level Output ( fig 2 )( note 8 )	$CM_L$		-1000	-10000		$\text{V}/\mu\text{s}$	$I_F = 1.6\text{mA}, V_{CM} = 10V_{PP}$ $R_L = 2.2\text{k}\Omega$

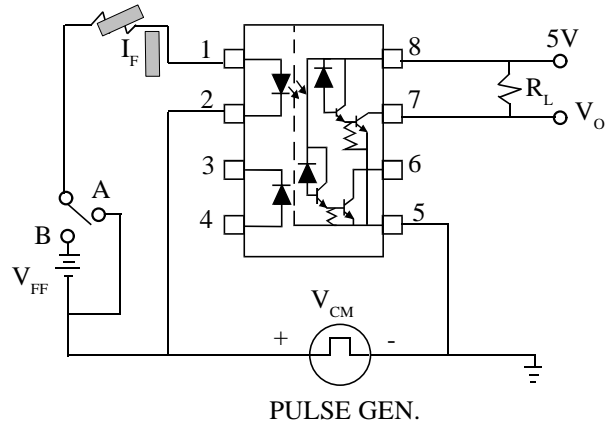
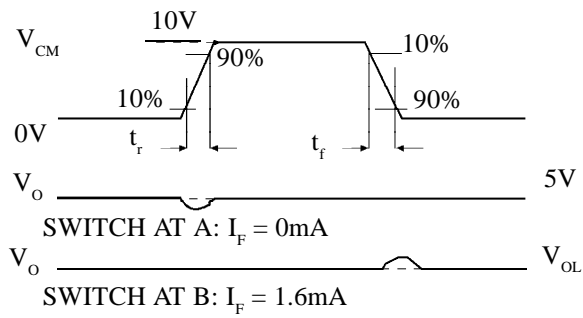
**NOTES:-**

- Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $0.5 \text{ mA}/^\circ\text{C}$ .
- Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $0.9 \text{ mW}/^\circ\text{C}$ .
- Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $0.6 \text{ mA}/^\circ\text{C}$ .
- Derate linearly above  $35^\circ\text{C}$  free air temperature at a rate of  $1.7 \text{ mW}/^\circ\text{C}$ .  
Output power = (Collector output) + (Supply output).
- Each channel.
- CURRENT TRANSFER RATIO is defined as the ratio of output collector current,  $I_O$ , to the forward LED input current,  $I_F$  times 100%.
- Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.
- Common mode transient immunity in Logic Low level is the maximum tolerable (negative)  $dV_{CM}/dt$  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.  $V_O < 0.8\text{V}$ ). Measured in volts per microsecond ( $\text{V}/\mu\text{s}$ ).
- Common mode transient immunity in Logic High level is the maximum tolerable (positive)  $dV_{CM}/dt$  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.  $V_O > 2.0\text{V}$ ). Measured in volts per microsecond ( $\text{V}/\mu\text{s}$ ).
- Device considered a two-terminal device: pins 1,2,3, and 4 shorted together and pins 5,6,7 and 8 shorted together.

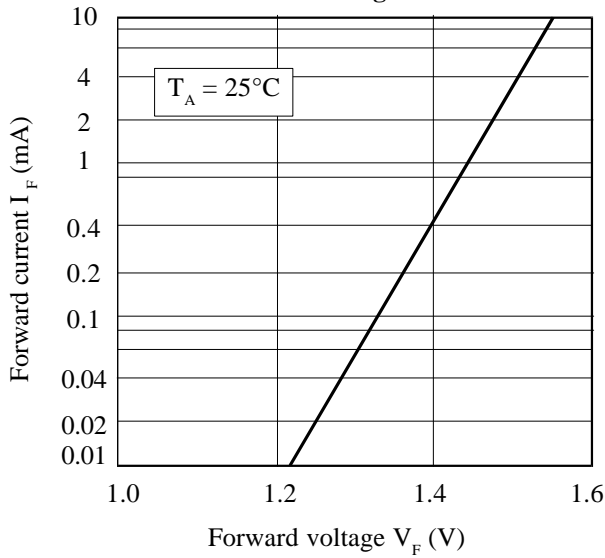
**FIG.1 SWITCHING TEST CIRCUIT**



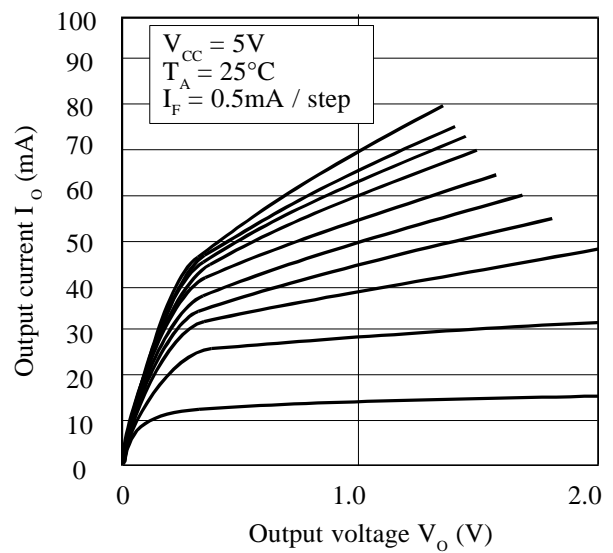
**FIG. 2 TEST CIRCUIT FOR TRANSIENT IMMUNITY AND TYPICAL WAVEFORMS**



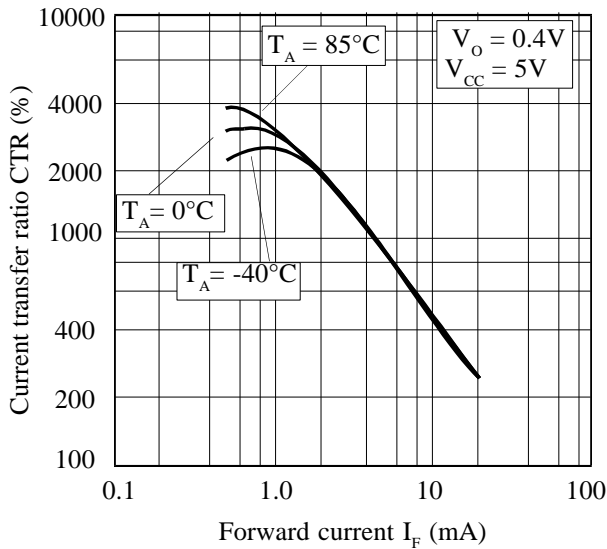
**Forward Current vs. Forward Voltage**



**Output Current vs. Output Voltage**



**Current Transfer Ratio vs. Forward Current**



**Supply Current vs. Forward Current**

