

## Optocoupler, Phototransistor Output (Dual, Quad Channel)

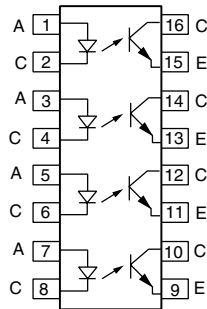
Dual Channel



Quad Channel



H79054



### FEATURES

- Alternate source to TLP621-2/-4 and TLP621GB-2/-4
- High collector emitter voltage,  $BV_{CEO} = 70\text{ V}$
- Dual and quad packages feature:
  - Lower pin and parts count
  - Better channel to channel CTR match
  - Improved common mode rejection
- Isolation test voltage,  $5300\text{ V}_{RMS}$
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

### DESCRIPTION

The ILD621/ILQ621 and ILD621GB/ILQ621GB are multi-channel phototransistor optocouplers that use GaAs IRLED emitters and high gain NPN silicon phototransistors. These devices are constructed using double molded insulation technology. This assembly process offers a withstand test voltage of 7500 VDC.

The ILD621/ILQ621GB is well suited for CMOS interfacing given the  $CTR_{CEsat}$  of 30 % minimum at  $I_F$  of 1.0 mA. High gain linear operation is guaranteed by a minimum  $CTR_{CE}$  of 100 % at 5.0 mA. The ILD/Q621 has a guaranteed  $CTR_{CE}$  50 % minimum at 5.0 mA. The transparent ion shield insures stable DC gain in applications such as power supply feedback circuits, where constant DC  $V_{IO}$  voltages are present.

### ORDER INFORMATION

PART	REMARKS
ILD621	CTR > 50 %, dual, DIP-8
ILD621GB	CTR > 100 %, dual, DIP-8
ILQ621	CTR > 50 %, quad, DIP-16
ILQ621GB	CTR > 100 %, quad, DIP-16
ILD621-X006	CTR > 50 %, dual, DIP-8 400 mil

# ILD621/ILD621GB/ILQ621/ILQ621GB



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ORDER INFORMATION	
PART	REMARKS
ILD621-X007	CTR > 50 %, dual, SMD-8 (option 7)
ILD621-X009	CTR > 50 %, dual, SMD-8 (option 9)
ILD621GB-X007	CTR > 100 %, dual, SMD-8 (option 7)
ILQ621-X006	CTR > 50 %, quad, DIP-16 400 mil
ILQ621-X007	CTR > 50 %, quad, SMD-16 (option 7)
ILQ621-X009	CTR > 50 %, quad, SMD-16 (option 9)
ILQ621GB-X006	CTR > 100 %, quad, DIP-16 400 mil
ILQ621GB-X007	CTR > 100 %, quad, SMD-16 (option 7)
ILQ621GB-X009	CTR > 100 %, quad, SMD-16 (option 9)

**Note**

For additional information on the available options refer to option information.

ABSOLUTE MAXIMUM RATINGS (1)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			$V_R$	6.0	V
Forward current			$I_F$	60	mA
Surge current			$I_{FSM}$	1.5	A
Power dissipation			$P_{diss}$	100	mW
Derate from 25 °C				1.33	mW/°C
<b>OUTPUT</b>					
Collector emitter reverse voltage			$V_{ECO}$	70	V
Collector current			$I_C$	50	mA
	$t < 1.0$ ms		$I_C$	100	mA
Power dissipation			$P_{diss}$	150	mW
Derate from 25 °C				- 2.0	mW/°C
<b>COUPLER</b>					
Isolation test voltage	$t = 1.0$ s		$V_{ISO}$	5300	$V_{RMS}$
Package dissipation		ILD621		400	mW
		ILD621GB		400	mW
Derate from 25 °C				5.33	mW/°C
Package dissipation		ILQ621		500	mW
		ILQ621GB		500	mW
Derate from 25 °C				6.67	mW/°C
Creepage distance				≥ 7.0	mm
Clearance distance				≥ 7.0	mm
Isolation resistance	$V_{IO} = 500$ V, $T_{amb} = 25$ °C		$R_{IO}$	≥ $10^{12}$	$\Omega$
	$V_{IO} = 500$ V, $T_{amb} = 100$ °C		$R_{IO}$	≥ $10^{11}$	$\Omega$
Storage temperature			$T_{stg}$	- 55 to + 150	°C
Operating temperature			$T_{amb}$	- 55 to + 100	°C
Junction temperature			$T_j$	100	°C
Soldering temperature (2)	2.0 mm from case bottom		$T_{sld}$	260	°C

**Notes**

(1)  $T_{amb} = 25$  °C, unless otherwise specified.

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(2) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).



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ELECTRICAL CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Forward voltage	$I_F = 10 \text{ mA}$		$V_F$	1.0	1.15	1.3	V
Reverse current	$V_R = 6.0 \text{ V}$		$I_R$		0.01	10	$\mu\text{A}$
Capacitance	$V_R = 0 \text{ V}, f = 1.0 \text{ MHz}$		$C_O$		40		pF
Thermal resistance, junction to lead			$R_{THJL}$		750		K/W
<b>OUTPUT</b>							
Collector emitter capacitance	$V_{CE} = 5.0 \text{ V}, f = 1.0 \text{ MHz}$		$C_{CE}$		6.8		pF
Collector emitter leakage current	$V_{CE} = 24 \text{ V}$		$I_{CEO}$		10	100	nA
			$I_{CEO}$		20	50	$\mu\text{A}$
Thermal resistance, junction to lead			$R_{THJL}$		500		K/W
<b>COUPLER</b>							
Capacitance (input to output)	$V_{IO} = 0 \text{ V}, f = 1.0 \text{ MHz}$		$C_{IO}$	0.8			pF
Insulation resistance	$V_{IO} = 500 \text{ V}$			$10^{12}$			$\Omega$
Channel to channel insulation				500			VAC
Collector emitter saturation voltage	$I_F = 8.0 \text{ mA}, I_{CE} = 2.4 \text{ mA}$	ILD621	$V_{CEsat}$			0.4	V
		ILQ621					
Collector emitter saturation voltage	$I_F = 1.0 \text{ mA}, I_{CE} = 0.2 \text{ mA}$	ILD621GB	$V_{CEsat}$			0.4	V
		ILQ621GB					

**Note**

$T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified.

Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

CURRENT TRANSFER RATIO							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Channel/channel CTR match	$I_F = 5.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$		CTR <sub>X</sub> / CTR <sub>Y</sub>	1 to 1		3 to 1	%
Current transfer ratio (collector emitter saturated)	$I_F = 1.0 \text{ mA}, V_{CE} = 0.4 \text{ V}$	ILD621	CTR <sub>CEsat</sub>		60		%
		ILQ621	CTR <sub>CEsat</sub>		60		%
		ILD621GB	CTR <sub>CEsat</sub>	30			%
		ILQ621GB	CTR <sub>CEsat</sub>	30			%
Current transfer ratio (collector emitter)	$I_F = 5.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$	ILD621	CTR <sub>CE</sub>	50	80	600	%
		ILQ621	CTR <sub>CE</sub>	50	80	600	%
		ILD621GB	CTR <sub>CE</sub>	100	200	600	%
		ILQ621GB	CTR <sub>CE</sub>	100	200	600	%

SWITCHING CHARACTERISTICS							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
<b>NON-SATURATED</b>							
On time	$I_F = \pm 10 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 75 \Omega, 50 \% \text{ of } V_{PP}$	$t_{on}$		3.0		$\mu\text{s}$	
Rise time	$I_F = \pm 10 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 75 \Omega, 50 \% \text{ of } V_{PP}$	$t_r$		2.0		$\mu\text{s}$	
Off time	$I_F = \pm 10 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 75 \Omega, 50 \% \text{ of } V_{PP}$	$t_{off}$		2.3		$\mu\text{s}$	
Fall time	$I_F = \pm 10 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 75 \Omega, 50 \% \text{ of } V_{PP}$	$t_f$		2.0		$\mu\text{s}$	
Propagation H to L	$I_F = \pm 10 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 75 \Omega, 50 \% \text{ of } V_{PP}$	$t_{PHL}$		1.1		$\mu\text{s}$	
Propagation L to H	$I_F = \pm 10 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 75 \Omega, 50 \% \text{ of } V_{PP}$	$t_{PLH}$		2.5		$\mu\text{s}$	

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>SATURATED</b>						
On time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{on}$		4.3		$\mu\text{s}$
Rise time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_r$		2.8		$\mu\text{s}$
Off time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{off}$		2.5		$\mu\text{s}$
Fall time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_f$		11		$\mu\text{s}$
Propagation H to L	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{PHL}$		2.6		$\mu\text{s}$
Propagation L to H	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{PLH}$		7.2		$\mu\text{s}$

COMMON MODE TRANSIENT IMMUNITY						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode rejection, output high	$V_{CM} = 50 \text{ V}_{P-P}$ , $R_L = 1.0 \text{ k}\Omega$ , $I_F = 0 \text{ mA}$	$CM_H$		5000		$\text{V}/\mu\text{s}$
Common mode rejection, output low	$V_{CM} = 50 \text{ V}_{P-P}$ , $R_L = 1.0 \text{ k}\Omega$ , $I_F = 10 \text{ mA}$	$CM_L$		5000		$\text{V}/\mu\text{s}$

### TYPICAL CHARACTERISTICS

$T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified



Fig. 1 - Non-Saturated Switching Timing

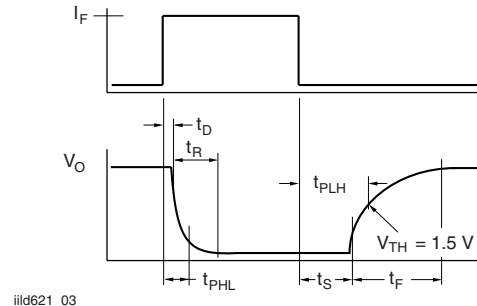


Fig. 3 - Saturated Switching Timing



Fig. 2 - Non-Saturated Switching Timing



Fig. 4 - Saturated Switching Timing



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Fig. 5 - Maximum LED Current vs. Ambient Temperature



Fig. 8 - Collector Emitter Current vs. Temperature and LED Current



Fig. 6 - Maximum LED Power Dissipation



Fig. 9 - Collector Emitter Leakage vs. Temperature



Fig. 7 - Forward Voltage vs. Forward Current



Fig. 10 - Propagation Delay vs. Collector Load Resistor



Fig. 11 - Maximum Detector Power Dissipation

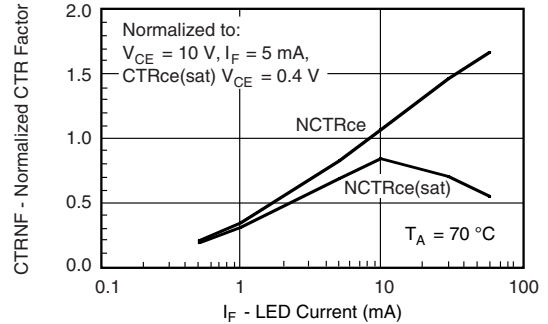


Fig. 14 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$



Fig. 12 - Maximum Collector Current vs. Collector Voltage



Fig. 15 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$



Fig. 13 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

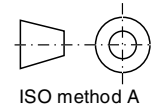
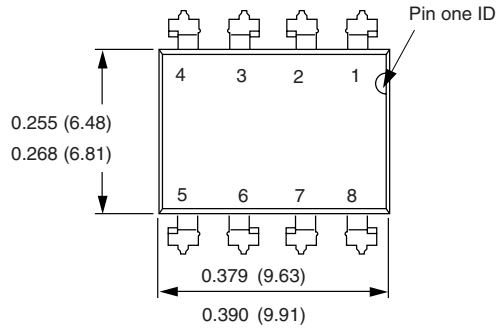


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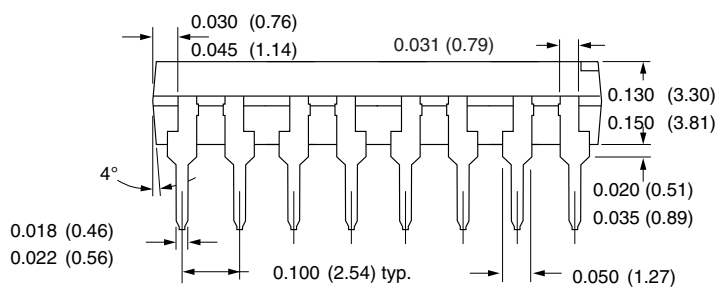
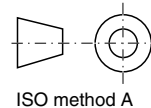
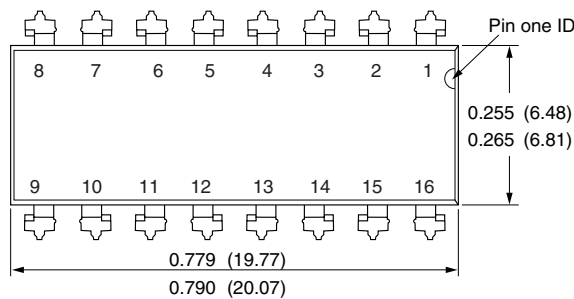
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## PACKAGE DIMENSIONS in inches (millimeters)



i178006



i178007

# ILD621/ILD621GB/ILQ621/ILQ621GB



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Optocoupler, Phototransistor Output  
(Dual, Quad Channel)



18450



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1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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