



# DUAL CHANNEL ILD621/621GB QUAD CHANNEL ILQ621/621GB

## Multi-Channel Phototransistor Optocoupler

### FEATURES

- Alternate Source to TLP621-2/-4 and TLP621GB-2/-4
- Current Transfer Ratio (CTR) at  $I_F = 5.0$  mA  
ILD/Q621: 50% Min.  
ILD/Q621GB: 100% Min.
- Saturated Current Transfer Ratio ( $CTR_{SAT}$ ) at  $I_F = 1.0$  mA  
ILD/Q621: 60% Typ.  
ILD/Q621GB: 30% Min.
- High Collector-Emitter Voltage,  $BV_{CEO} = 70$  V
- Dual and Quad Packages Feature:
  - Reduced Board Space
  - Lower Pin and Parts Count
  - Better Channel to Channel CTR Match
  - Improved Common Mode Rejection
- Field-Effect Stable by TRIOS (TRANSPARENT IOn Shield)
- Isolation Test Voltage from Double Molded Package, 5300  $V_{RMS}$
- Underwriters Lab File #E52744
- VDE 0884 Available with Option 1

### Maximum Ratings (Each Channel)

#### Emitter

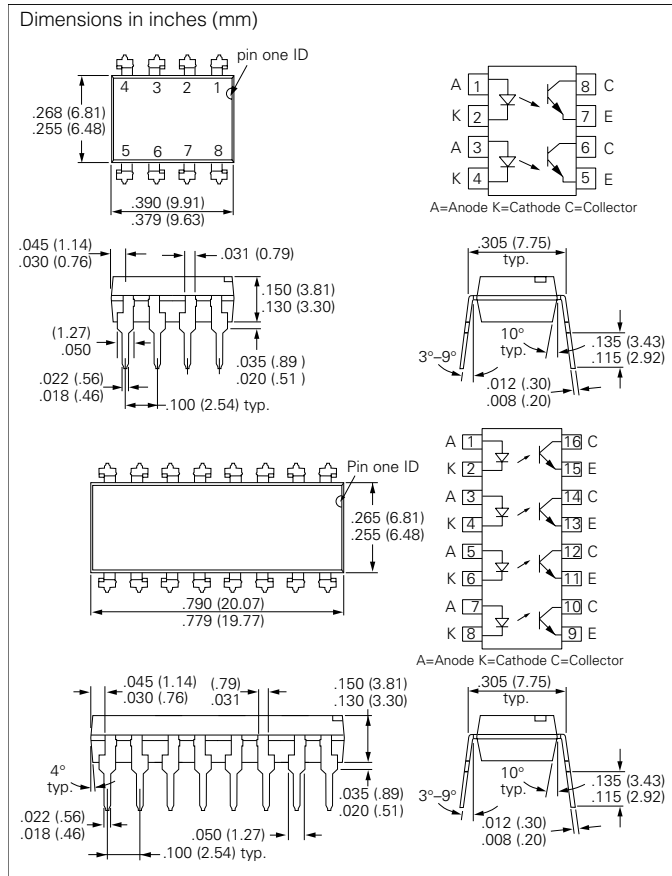
Reverse Voltage	6.0 V
Forward Current	60 mA
Surge Current	1.5 A
Power Dissipation	100 mW
Derate from 25°C	1.33 mW/°C

#### Detector

Collector-Emitter Reverse Voltage	70 V
Collector Current	50 mA
Collector Current (t < 1.0 ms)	100 mA
Power Dissipation	150 mW
Derate from 25°C	-2.0 mW/°C

#### Package

Isolation Test Voltage (t=1.0 sec.)	5300 $V_{RMS}$
Package Dissipation ILD620/GB	400 mW
Derate from 25°C	5.33 mW/°C
Package Dissipation ILQ620/GB	500 mW
Derate from 25°C	6.67 mW/°C
Creepage	≥7.0 mm
Clearance	≥7.0 min
Isolation Resistance	
$V_{IO} = 500$ V, $T_A = 25^\circ\text{C}$	≥10 <sup>12</sup> Ω
$V_{IO} = 500$ V, $T_A = 100^\circ\text{C}$	≥10 <sup>11</sup> Ω
Storage Temperature	-55°C to +150°C
Operating Temperature	-55°C to +100°C
Junction Temperature	100°C
Soldering Temperature (2.0 mm from case bottom)	260°C



### DESCRIPTION

The ILD/Q621 and ILD/Q621GB are multi-channel phototransistor optocouplers that use GaAs IRLED emitters and high gain NPN silicon phototransistors. These devices are constructed using over/under leadframe optical coupling and double molded insulation technology. This assembly process offers a withstand test voltage of 7500 VDC.

The ILD/Q621GB 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  $CTR_{CE}$  of 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.

## Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Emitter</b>						
Forward Voltage	$V_F$	1.0	1.15	1.3	V	$I_F=10\text{ mA}$
Reverse Current	$I_R$	—	0.01	10	$\mu\text{A}$	$V_R=6.0\text{ V}$
Capacitance	$C_O$	—	40	—	pF	$V_F=0\text{ V}$ , $f=1.0\text{ MHz}$
Thermal Resistance, Junction to Lead	$R_{THJL}$	—	750	—	K/W	—
<b>Detector</b>						
Capacitance	$C_{CE}$	—	6.8	—	pF	$V_{CE}=5.0\text{ V}$ , $f=1.0\text{ MHz}$
Collector-Emitter Leakage Current	$I_{CEO}$	—	10	100	nA	$V_{CE}=24\text{ V}$
Collector-Emitter Leakage Current	$I_{CEO}$	—	2.0	50	$\mu\text{A}$	$T_A=85^\circ\text{C}$ , $V_{CE}=24\text{ V}$
Thermal Resistance, Junction to Lead	$R_{THJL}$	—	500	—	K/W	—
<b>Package Transfer Characteristics</b>						
Channel/Channel CTR Match	CTR <sub>X</sub> /CTR <sub>Y</sub>	1 to 1	—	3 to 1	—	$I_F=5.0\text{ mA}$ , $V_{CE}=5.0\text{ V}$
<b>ILD/Q621</b>						
Saturated Current Transfer Ratio	CTR <sub>CEsat</sub>	—	60	—	%	$I_F=1.0\text{ mA}$ , $V_{CE}=0.4\text{ V}$
Current Transfer Ratio	CTR <sub>CE</sub>	50	80	600	%	$I_F=5.0\text{ mA}$ , $V_{CE}=5.0\text{ V}$
Collector-Emitter Saturation Voltage	$V_{CEsat}$	—	—	0.4	V	$I_F=8.0\text{ mA}$ , $I_{CE}=2.4\text{ mA}$
<b>ILD/Q621GB</b>						
Saturated Current Transfer Ratio	CTR <sub>CEsat</sub>	30	—	—	%	$I_F=1.0\text{ mA}$ , $V_{CE}=0.4\text{ V}$
Current Transfer Ratio (Collector-Emitter)	CTR <sub>CE</sub>	100	200	600	%	$I_F=5.0\text{ mA}$ , $V_{CE}=5.0\text{ V}$
Collector-Emitter Saturation Voltage	$V_{CEsat}$	—	—	0.4	V	$I_F=1.0\text{ mA}$ , $I_{CE}=0.2\text{ mA}$
<b>Isolation and Insulation</b>						
Common Mode Rejection, Output High	CMH	—	5000	—	V/ $\mu\text{s}$	$V_{CM}=50\text{ V}_{P,P}$ , $R_L=1.0\text{ k}\Omega$ , $I_F=0\text{ mA}$
Common Mode Rejection, Output Low	CML	—	5000	—	V/ $\mu\text{s}$	$V_{CM}=50\text{ V}_{P,P}$ , $R_L=1.0\text{ k}\Omega$ , $I_F=10\text{ mA}$
Common Mode Coupling Capacitance	$C_{CM}$	—	0.01	—	pF	—
Package Capacitance	$C_{I-O}$	0.8	—	—	pF	$V_{IO}=0\text{ V}$ , $f=1.0\text{ MHz}$
Insulation Resistance	$R_S$	$10^{12}$	—	—	$\Omega$	$V_{IO}=500\text{ V}$ , $T_A=25^\circ\text{C}$
Channel to Channel Insulation	—	500	—	—	VAC	—

## Switching Times

Figure 1. Non-saturated switching timing

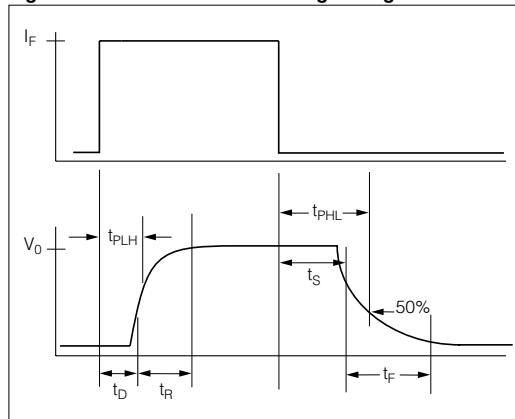
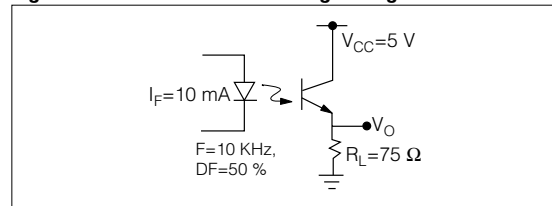
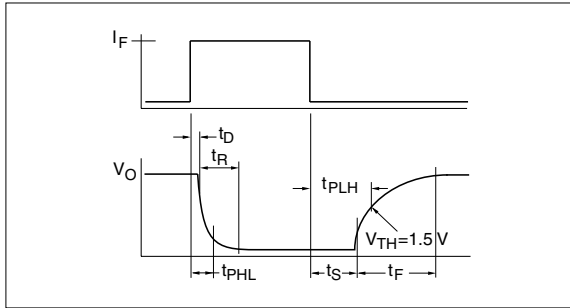


Figure 2. Non-saturated switching timing

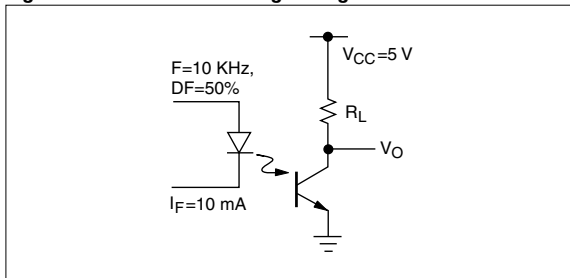


Characteristic	Symbol	Typ.	Unit	Test Condition
On Time	$t_{ON}$	3.0	$\mu\text{s}$	$I_F=\pm 10\text{ mA}$ $V_{CC}=5.0\text{ V}$ $R_L=75\ \Omega$ 50% of $V_{PP}$
Rise Time	$t_r$	2.0		
Off Time	$t_{OFF}$	2.3		
Fall Time	$t_f$	2.0		
Propagation H-L	$t_{PHL}$	1.1		
Propagation L-H	$t_{PLH}$	2.5		

**Figure 3. Saturated switching timing**

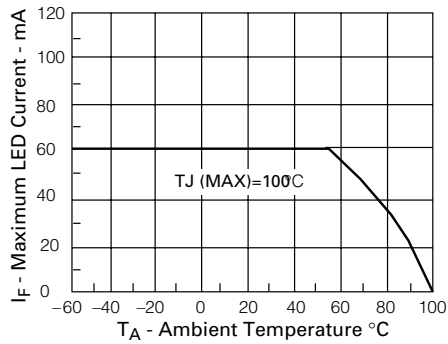


**Figure 4. Saturated switching timing**

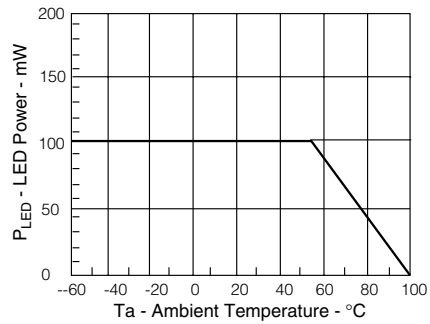


Characteristic	Symbol	Typ.	Unit	Test Condition
On Time	$t_{ON}$	4.3	$\mu s$	$I_F = \pm 10 \text{ mA}$ $V_{CC} = 5.0 \text{ V}$ $R_L = 1.0 \text{ K}\Omega$ $V_{TH} = 1.5 \text{ V}$
Rise Time	$t_r$	2.8		
Off Time	$t_{OFF}$	2.5		
Fall Time	$t_f$	11		
Propagation H-L	$t_{PHL}$	2.6		
Propagation L-H	$t_{PLH}$	7.2		

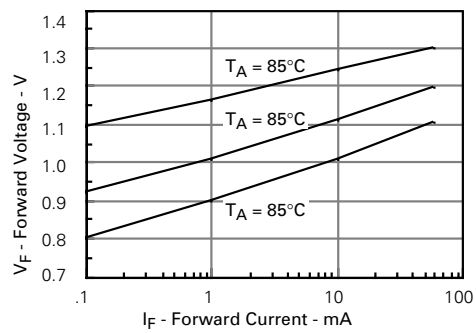
**Figure 5. Maximum LED current versus ambient temperature**



**Figure 6. Maximum LED power dissipation**



**Figure 7. Forward voltage versus forward current**



**Figure 8. Collector-emitter current versus temperature and LED current**

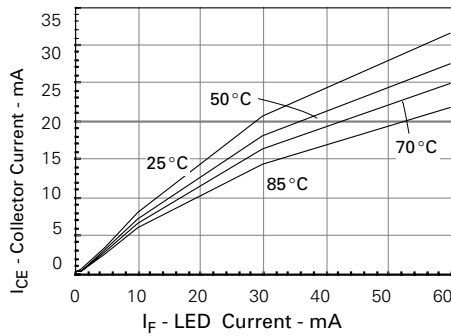


Figure 9. Collector-emitter leakage versus temperature

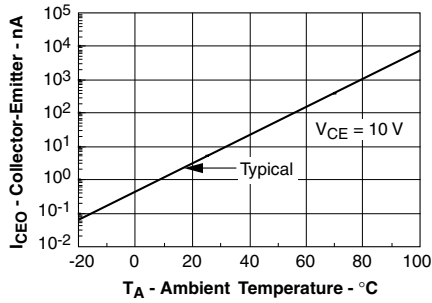


Figure 10. Propagation delay versus collector load resistor

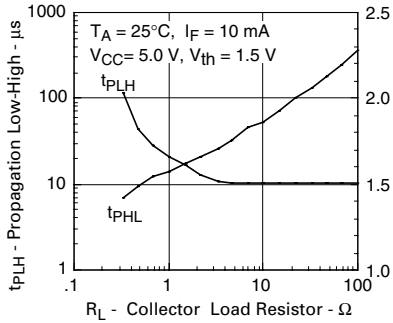


Figure 11. Maximum detector power dissipation

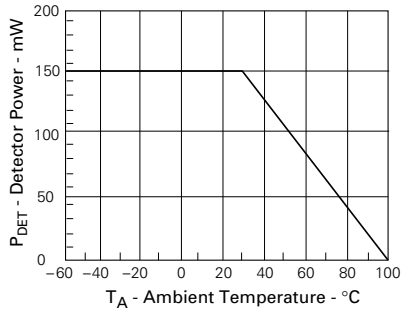


Figure 12. Maximum collector current versus collector voltage

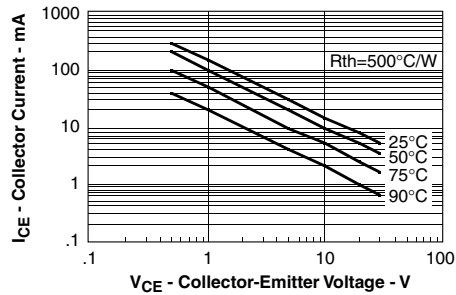


Figure 13. Normalization factor for non-saturated and saturated CTR  $T_A=50^{\circ}C$  versus  $I_F$

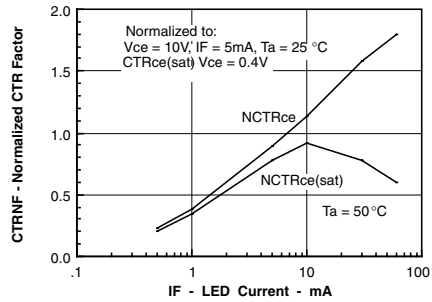


Figure 14. Normalization factor for non-saturated and saturated CTR  $T_A=70^{\circ}C$  versus  $I_F$

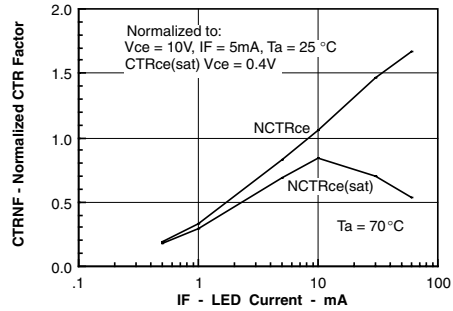


Figure 15. Normalization factor for non-saturated and saturated CTR  $T_A=100^{\circ}C$  versus  $I_F$

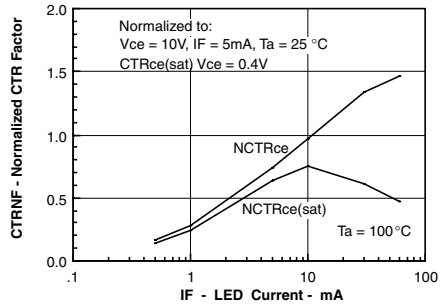


Figure 16. Peak LED current versus pulse duration,  $\tau$

