

## DUAL CHANNEL ILD620/620GB QUAD CHANNEL ILQ620/620GB AC INPUT PHOTOTRANSISTOR OPTOCOUPLER

### FEATURES

- **Identical Channel to Channel Footprint**  
ILD620 Crosses to TLP620-2  
ILQ620 Crosses to TLP620-4
- **Current Transfer Ratio (CTR) at  $I_F = \pm 5$  mA**  
ILD/Q620: 50% Min.  
ILD/Q620GB: 100% Min.
- **Saturated Current Transfer Ratio ( $CTR_{SAT}$ ) at  $I_F = \pm 1$  mA**  
ILD/Q620: 60% Typ.  
ILD/Q620GB: 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 IOShield)**
- **Isolation Test Voltage from Double Molded Package**
- **Underwriters Lab File #E52744**
- **VDE 0884 Available with Option 1**

### Maximum Ratings (Each Channel)

#### Emitter

Forward Current .....	$\pm 60$ mA
Surge Current.....	$\pm 1.5$ A
Power Dissipation .....	100 mW
Derate from 25°C .....	1.3 mW/°C

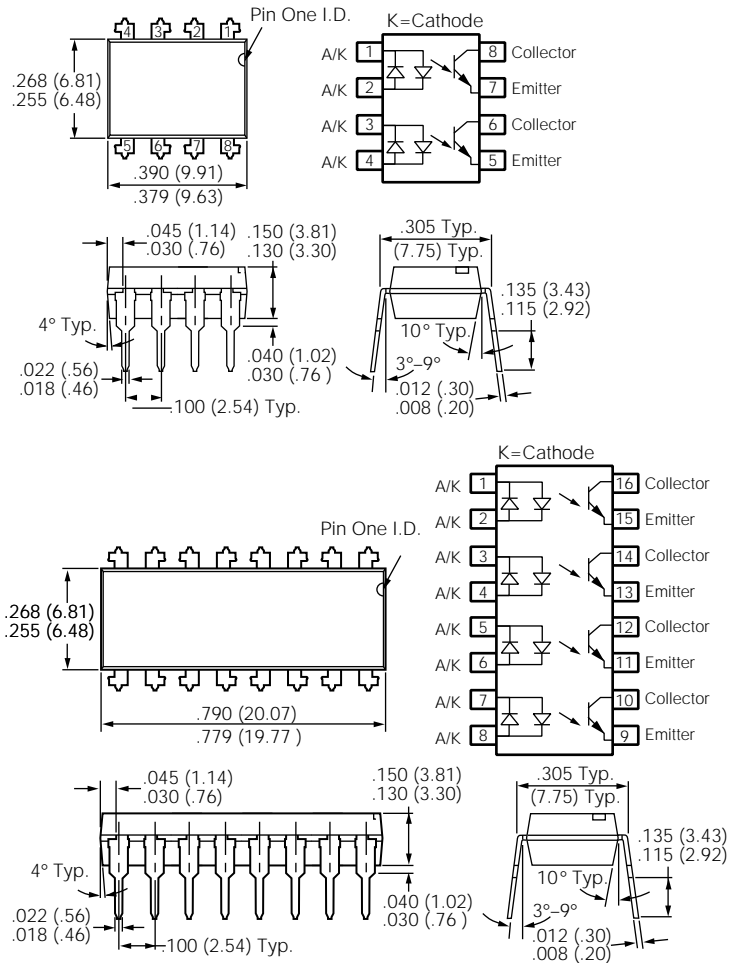
#### Detector

Collector-Emitter Breakdown Voltage .....	70 V
Collector Current.....	50 mA
Collector Current ( $t < 1$ ms) .....	100 mA
Power Dissipation .....	150 mW
Derate from 25°C .....	2 mW/°C

#### Package

Isolation Test Voltage( $t=1$ sec.).....	5300 VAC <sub>RMS</sub>
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 mm min.
Clearance .....	7 mm min.
Isolation Resistance	
$V_{IO} = 500$ V, $T_A = 25^\circ\text{C}$ .....	$\geq 10^{12}$ $\Omega$
$V_{IO} = 500$ V, $T_A = 100^\circ\text{C}$ .....	$\geq 10^{11}$ $\Omega$
Storage Temperature .....	-55°C to +150°C
Operating Temperature.....	-55°C to +100°C
Junction Temperature .....	100°C
Soldering Temperature	
(2 mm from case bottom).....	260°C

Dimensions in inches (mm)



### DESCRIPTION

The ILD/Q620 and ILD/Q620GB are multi-channel input phototransistor optocouplers that use inverse parallel GaAs IRLED emitters and high gain NPN silicon phototransistors per channel. These devices are constructed using over/under leadframe optical coupling and double molded insulation resulting in a Withstand Test Voltage of 7500 VAC<sub>PEAK</sub>.

The LED parameters and the linear CTR characteristics combined with the TRIOS field-effect process make these devices well suited for AC voltage detection. The ILD/Q620GB with its low  $I_F$  guaranteed  $CTR_{CESat}$  minimizes power dissipation of the AC voltage detection network that is placed in series with the LEDs. Eliminating the phototransistor base connection provides added electrical noise immunity from the transients found in many industrial control environments.

## Characteristics

	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Emitter</b>						
Forward Voltage	$V_F$	1	1.15	1.3	V	$I_F = \pm 10 \text{ mA}$
Forward Current	$I_F$		2.5	20	$\mu\text{A}$	$V_R = \pm 0.7 \text{ V}$
Capacitance	$C_O$		25		pF	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$
Thermal Resistance, Junction to Lead	$R_{THJL}$		750		$^{\circ}\text{C/W}$	
<b>Detector</b>						
Capacitance	$C_{CE}$		6.8		pF	$V_{CE} = 5 \text{ V}, f = 1 \text{ MHz}$
Collector-Emitter Leakage Current	$I_{CEO}$		10	100	nA	$V_{CE} = 24 \text{ V}$
Collector-Emitter Leakage Current	$I_{CEO}$		2	50	$\mu\text{A}$	$T_A = 85^{\circ}\text{C}, V_{CE} = 24 \text{ V}$
Thermal Resistance, Junction to Lead	$R_{THJL}$		500		$^{\circ}\text{C/W}$	
<b>Package Transfer Characteristics</b>						
Channel/Channel CTR Match	CTR <sub>X</sub> /CTR <sub>Y</sub>	1 to 1		3 to 1		$I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V}$
CTR Symmetry	$I_{CE(\text{RATIO})}$	0.5		2		$I_{CE}(I_F = -5 \text{ mA})/I_{CE}(I_F = +5 \text{ mA})$
Off-State Collector Current	$I_{CE(\text{OFF})}$		1	10	$\mu\text{A}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 24 \text{ V}$
<b>ILD/Q620</b>						
Saturated Current Transfer Ratio	CTR <sub>CEsat</sub>		60		%	$I_F = \pm 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$
Current Transfer Ratio	CTR <sub>CE</sub>	50	80	600	%	$I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V}$
Collector-Emitter Saturation Voltage	$V_{CEsat}$			0.4	V	$I_F = \pm 8 \text{ mA}, I_{CE} = 2.4 \text{ mA}$
<b>ILD/Q620GB</b>						
Saturated Current Transfer Ratio	CTR <sub>CEsat</sub>	30			%	$I_F = \pm 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$
Current Transfer Ratio (Collector-Emitter)	CTR <sub>CE</sub>	100	200	600	%	$I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V}$
Collector-Emitter Saturation Voltage	$V_{CEsat}$			0.4	V	$I_F = \pm 1 \text{ mA}, I_{CE} = 0.2 \text{ mA}$
<b>Isolation and Insulation</b>						
Common Mode Rejection, Output High	CMH		5000		V/ $\mu\text{s}$	$V_{CM} = 50 \text{ V}_{P-P}, R_L = 1 \text{ k}\Omega, I_F = 0 \text{ mA}$
Common Mode Rejection, Output Low	CML		5000		V/ $\mu\text{s}$	$V_{CM} = 50 \text{ V}_{P-P}, R_L = 1 \text{ k}\Omega, I_F = 10 \text{ mA}$
Common Mode Coupling Capacitance	$C_{CM}$		0.01		pF	
Package Capacitance	CI-O	0.8			pF	$V_{I-O} = 0 \text{ V}, f = 1 \text{ MHz}$
Insulation Resistance	$R_S$		$10^{12}$		$\Omega$	$V_{I-O} = 500 \text{ V}$
Channel to Channel Insulation		500			VAC	

## Switching Times

Figure 1. Non-saturated switching timing

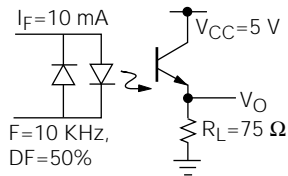


Figure 2. Saturated switching timing

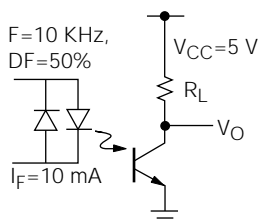


Figure 3. Non-saturated switching timing

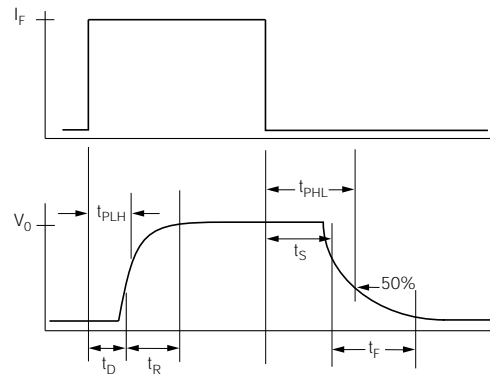
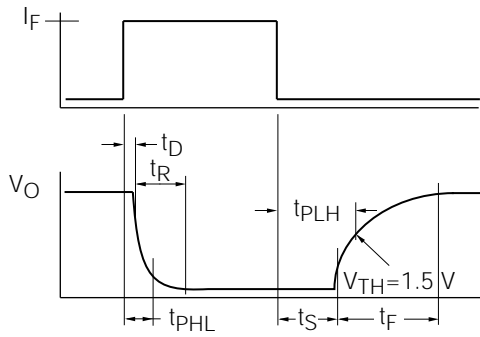


Figure 4. Saturated switching timing



Characteristic	Symbol	Typ.	Unit	Test Condition
On Time	$T_{ON}$	3.0	$\mu s$	$I_F = \pm 10 \text{ mA}$ $V_{CC} = 5 \text{ V}$ $R_L = 75 \Omega$ 50% of $V_{PP}$
Rise Time	$t_R$	20	$\mu s$	
Off Time	$t_{OFF}$	2.3	$\mu s$	
Fall Time	$t_F$	2.0	$\mu s$	
Propagation H-L	$t_{PHL}$	1.1	$\mu s$	
Propagation L-H	$t_{PLH}$	2.5	$\mu s$	

Characteristic	Symbol	Typ.	Unit	Test Condition
On Time	$T_{ON}$	4.3	$\mu s$	$I_F = \pm 10 \text{ mA}$ $V_{CC} = 5 \text{ V}$ $R_L = 1 \Omega$ $V_{TH} = 1.5 \text{ V}$
Rise Time	$t_R$	2.8	$\mu s$	
Off Time	$t_{OFF}$	2.5	$\mu s$	
Fall Time	$t_F$	11	$\mu s$	
Propagation H-L	$t_{PHL}$	2.6	$\mu s$	
Propagation L-H	$t_{PLH}$	7.2	$\mu s$	

Figure 5. LED forward current versus forward voltage

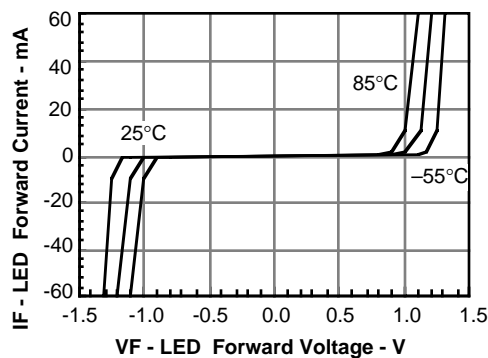


Figure 6. Collector-emitter leakage versus temperature

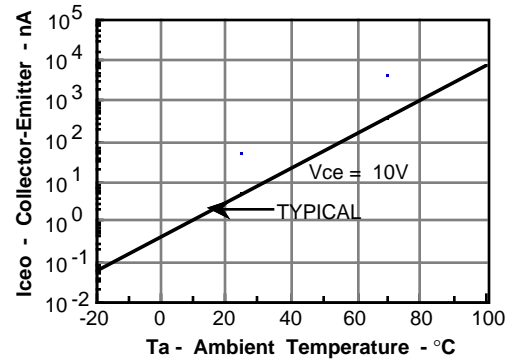


Figure 7. Maximum LED current versus ambient temperature

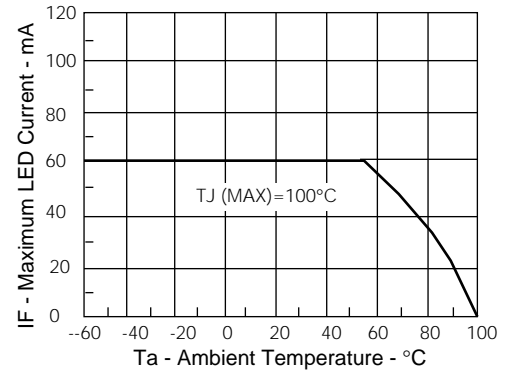


Figure 8. Maximum LED power dissipation

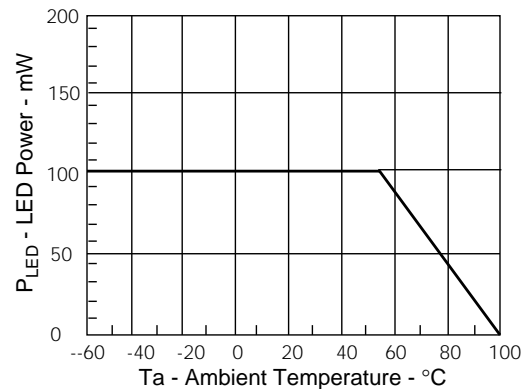
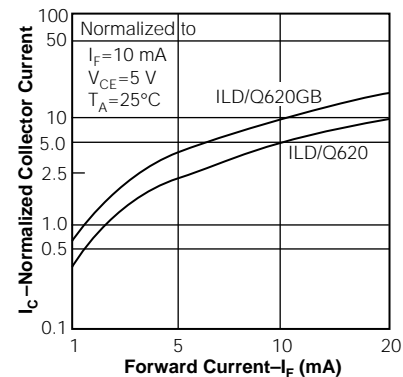
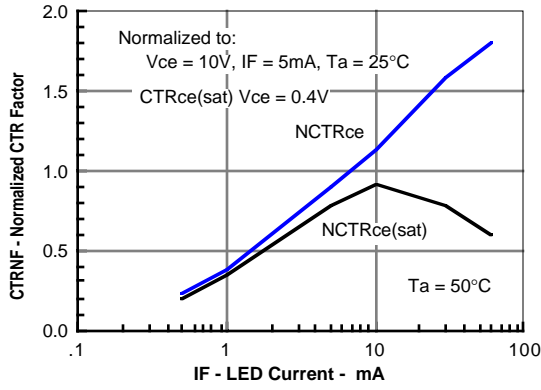


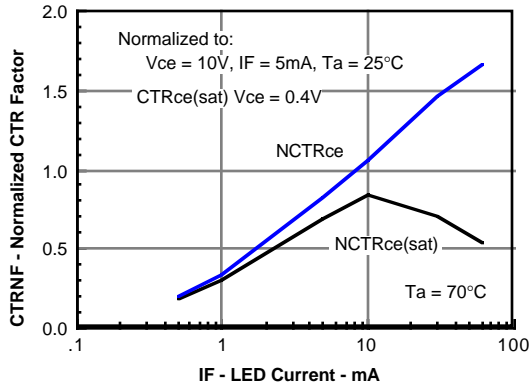
Figure 9. Collector current versus diode forward current



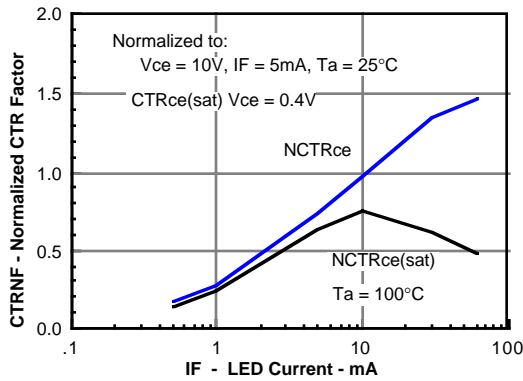
**Figure 10. Normalization factor for non-saturated and saturated CTR  $T_A=50^\circ\text{C}$  versus  $I_F$**



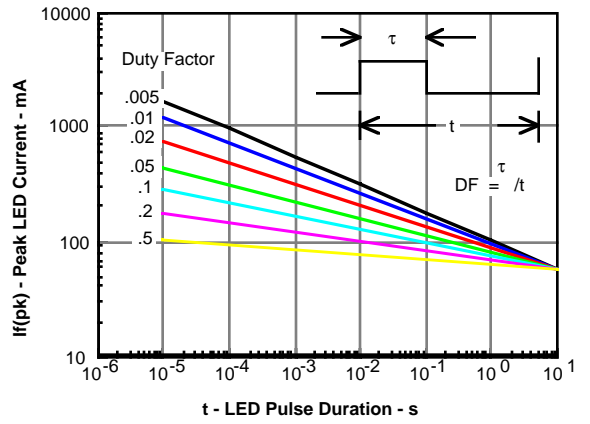
**Figure 11. Normalization factor for non-saturated and saturated CTR  $T_A=70^\circ\text{C}$  versus  $I_F$**



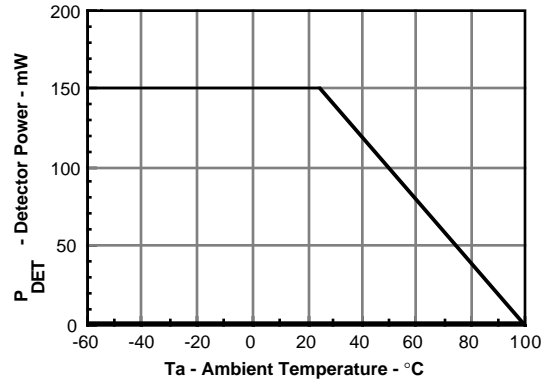
**Figure 12. Normalization factor for non-saturated and saturated CTR  $T_A=100^\circ\text{C}$  versus  $I_F$**



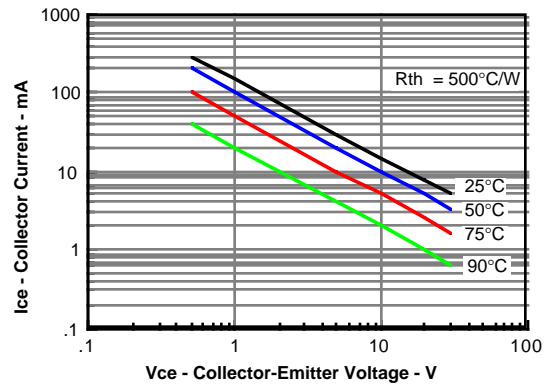
**Figure 13. Peak LED current versus peak duration,  $\tau$**



**Figure 14. Maximum detector power dissipation**



**Figure 15. Maximum collector current versus collector voltage**





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