SIEMENS

DUAL CHANNEL ILD615
QUAD CHANNEL ILQ615
PHOTOTRANSISTOR OPTOCOUPLER

FEATURES
- **Identical Channel to Channel Footprint**
- **Current Transfer Ratio (CTR) Range at I_F=10 mA**
  ILD/Q615-1: 40 – 80% Min.
  ILD/Q615-2: 63 – 125% Min.
  ILD/Q615-3: 100 – 200% Min.
  ILD/Q615-4: 160 – 320% Min.
- **Guaranteed CTR at I_F=1 mA**
  ILD/Q615-1: 13% Min.
  ILD/Q615-2: 22% Min.
  ILD/Q615-3: 34% Min.
  ILD/Q615-4: 56% 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 (TR**ansparent **IO**n **S**hield**)**
- **Isolation Test Voltage from Double Molded Package, 5300 VAC_{RMS}**
- **UL Approval #E52744**
- **VDE #0884 Available with Option 1**

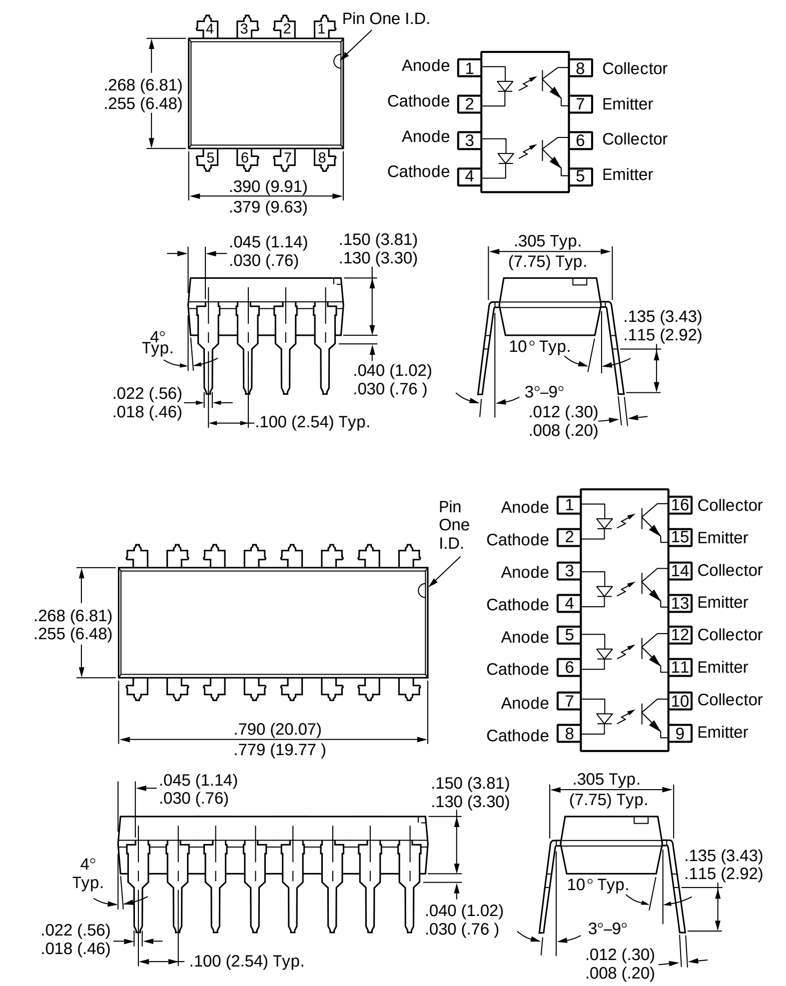
Maximum Ratings (Each Channel)

Emitter
Reverse Voltage .... 6 V
Forward Current .... 60 mA
Surge Current ....1.5 A
Power Dissipation .... 100 mW
Derate Linearly from 25°C .... 1.33 mW/°C

Detector
Collector-Emitter Reverse Voltage .... 70 V
Emitter-Collector Reverse Voltage .... 7 V
Collector Current.. 50 mA
Collector Current (t <1 ms) .... 100 mA
Power Dissipation .... 150 mW
Derate Linearly from 25°C........................ 2 mW/°C

Package
Storage Temperature.................. –55°C to +150°C
Operating Temperature............... –55°C to +100°C
Junction Temperature................................... 100°C
Soldering Temperature
(2 mm distance from case bottom) .... 260°C
Package Power Dissipation, ILD615.......... 400 mW
Derate Linearly from 25°C.................. 5.33 mW/°C
Package Power Dissipation, ILQ615 .... 500 mW
Derate Linearly from 25°C................. 6.67 mW/°C
Isolation Test Voltage (t=1 sec.)........ 5300 VAC_{RMS}
Creepage .... 7 mm min.
Clearance... 7 mm min.
Isolation Resistance
V_{IO}=500 V, T_A=25°C .... $\geq 10^{12}\ \Omega$
V_{IO}=500 V, T_A=100°C .... $\geq 10^{11}\ \Omega$

Dimensions in inches (mm)



DESCRIPTION
The ILD/Q615 are multi-channel phototransistor optocouplers that use GaAs IRLED emitters and high gain NPN phototransistors. These devices are constructed using over/under leadframe optical coupling and double molded insulation technology resulting a Withstand Test Voltage of 7500 VAC_{PEAK} and a Working Voltage of 1700 VAC_{RMS}.

The binned min./max. and linear CTR characteristics combined with the TRIOS (TRansparent IOn Shield) field-effect process make these devices well suited for DC or AC voltage detection. Eliminating the phototransistor base connection provides added electrical noise immunity from the transients found in many industrial control environments.

Because of guaranteed maximum non-saturated and saturated switching characteristics, the ILD/Q615 can be used in medium speed data I/O and control systems. The binned min./max. CTR specification allow easy worst case interface calculations for both level detection and switching applications. Interfacing with a CMOS logic is enhanced by the guaranteed CTR at an I_F=1 mA.

See Appnote 45, “How to Use Optocoupler Normalized Curves.”

Characteristics, T_A=25°C

	Symbol	Min.	Typ.	Max.	Unit	Condition
Emitter						
Forward Voltage	V_F	1	1.15	1.3	V	I_F=10 mA
Breakdown Voltage	V_{BR}	6	30		V	I_R=10 μA
Reverse Current	I_F		0.01	10	μA	V_R=6 V
Capacitance	C_O		25		pF	V_R=0 V, f=1 MHz
Thermal Resistance, Junction to Lead	R_{THJL}		750		°C/W	
Detector						
Capacitance	C_{CE}		6.8		pF	V_{CE}=5 V, f=1 MHz
Collector-Emitter Leakage Current, -1, -2	I_{CEO}		2	50	nA	V_{CE}=10 V
Collector-Emitter Leakage Current, -3, -4	I_{CEO}		5	100	nA	V_{CE}=10 V
Collector-Emitter Breakdown Voltage	BV_{CEO}	70			V	I_{CE}=0.5 mA
Emitter-Collector Breakdown Voltage	BV_{ECO}	7			V	I_E=0.1 mA
Thermal Resistance, Junction to Lead	R_{THJL}		500		°C/W	
Package Transfer Characteristics						
Channel/Channel CTR Match	CTRX/CTRY	1 to 1		2 to 1		I_F=10 mA, V_{CE}=5 V
ILD/Q615-1						
Saturated Current Transfer Ratio	CTR_{CEsat}		25		%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio	CTR_{CE}	40	60	80	%	I_F=10 mA, V_{CE}=5 V
Current Transfer Ratio	CTR_{CE}	13	30		%	I_F=1 mA, V_{CE}=5 V
ILD/Q615-2						
Saturated Current Transfer Ratio	CTR_{CEsat}		40		%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio	CTR_{CE}	63	80	125	%	I_F=10 mA, V_{CE}=5 V
Current Transfer Ratio	CTR_{CE}	22	45		%	I_F=1 mA, V_{CE}=5 V
ILD/Q615-3						
Saturated Current Transfer Ratio	CTR_{CEsat}		60		%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio	CTR_{CE}	100	150	200	%	I_F=10 mA, V_{CE}=5 V
Current Transfer Ratio	CTR_{CE}	34	70		%	I_F=1 mA, V_{CE}=5 V
ILD/Q615-4						
Saturated Current Transfer Ratio	CTR_{CEsat}		100		%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio	CTR_{CE}	160	200	320	%	I_F=10 mA, V_{CE}=5 V
Current Transfer Ratio	CTR_{CE}	56	90		%	I_F=1 mA, V_{CE}=5 V
Isolation and Insulation						
Common Mode Rejection, Output High	CMH		5000		V/μs	V_{CM}=50 V_{P-P}, R_L=1 kΩ, I_F=0 mA
Common Mode Rejection, Output Low	CML		5000		V/μs	V_{CM}=50 V_{P-P}, R_L=1 kΩ, I_F=10 mA
Common Mode Coupling Capacitance	C_{CM}		0.01		pF	
Package Capacitance	CI-O	0.8			pF	V_{IO}=0 V, f=1 MHz
Insulation Resistance	R_S		10^{14}		Ω	V_{IO}=500 V, T_A=25°C
Channel to Channel Isolation		500			VAC	

Switching Times

Figure 1. Non-saturated switching timing

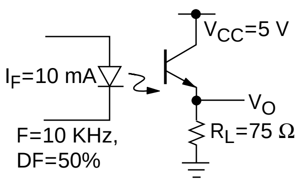


Figure 2. Saturated switching timing

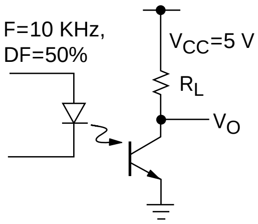


Figure 3. Non-saturated switching timing

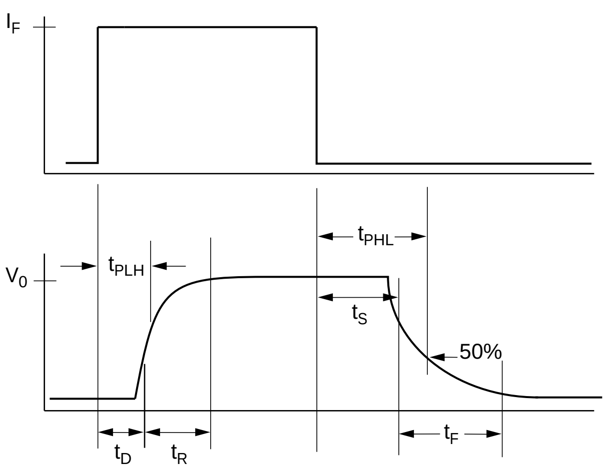
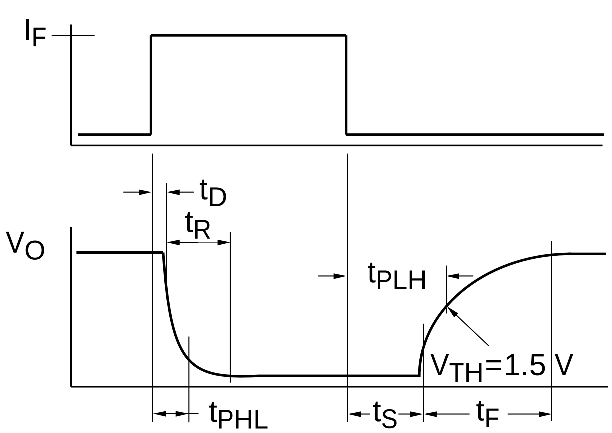


Figure 4. Saturated switching timing



Parameter	Typ.	Unit	Test Condition
t_{ON}	3.0	µs	R_L=75 Ω I_F=10 mA V_{CC}=5 V
t_R	2.0	µs	
t_{OFF}	2.3	µs	
t_F	2.0	µs	
t_{PHL} Propagation H-L (50% of V_{PP})	1.1	µs	
t_{PHL} Propagation L-H	2.5	µs	

Parameter	-1 I_F=20 mA	-1,-3 I_F=10 mA	-4 I_F=5mA		Test Condition
	Typ.	Typ.	Typ.	Unit	
t_{ON}	3.0	4.3	6.0	µs	R_L=1 Ω V_{CC}=5 V V_{TH}=1.5 V
t_R	2.0	2.8	4.6	µs	
t_{OFF}	18	25	25	µs	
t_F	11	14	15	µs	
t_{PHL} Propagation H-L	1.6	2.6	5.4	µs	
t_{PLH} Propagation L-H	8.6	7.2	7.4	µs	

Figure 5. Maximum LED current versus ambient temperature

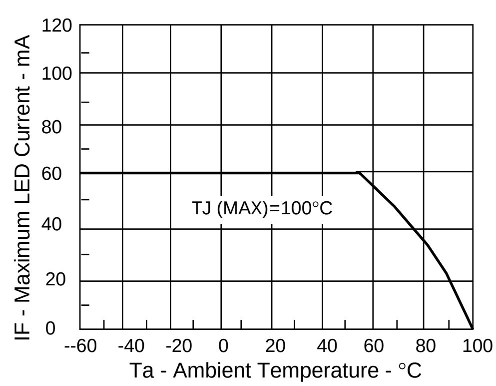


Figure 6. Maximum LED power dissipation

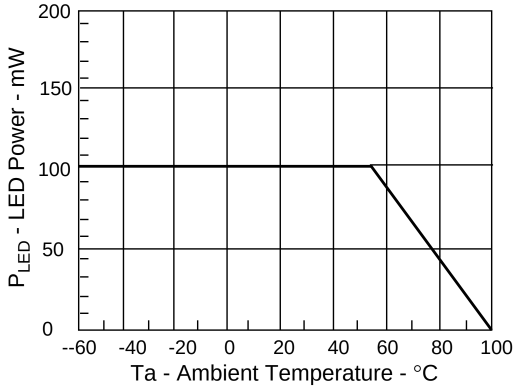


Figure 7. Forward voltage versus forward current

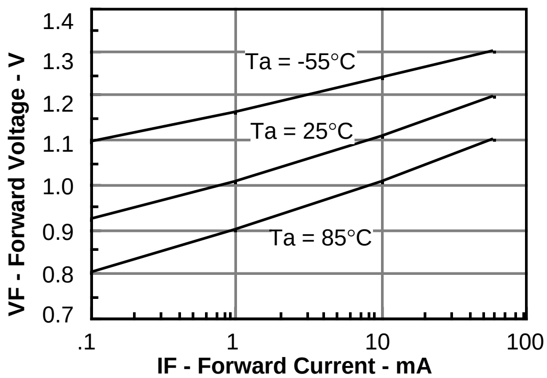


Figure 8. Peak LED current versus pulse detection, Tau

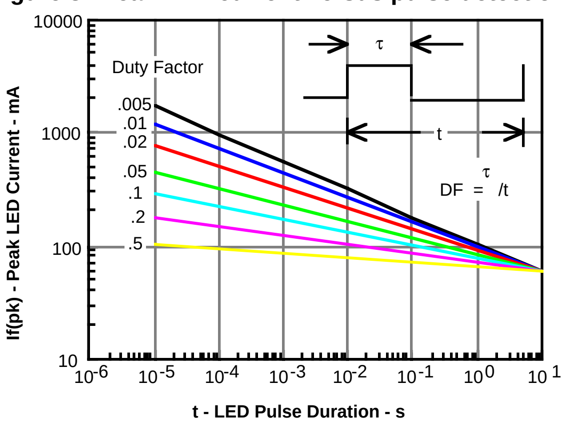


Figure 9. Maximum detector power dissipation

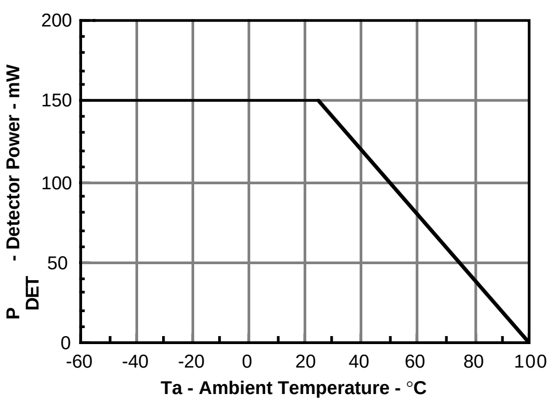


Figure 10. Maximum collector current versus collector voltage

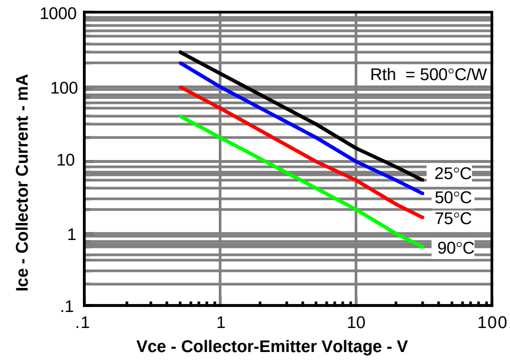


Figure 11. Normalization factor for non-saturated and saturated CTR T_A=25°C versus if

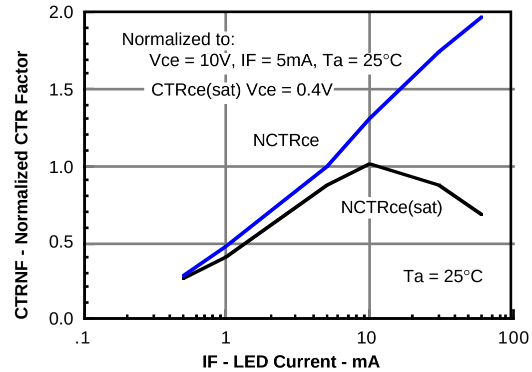


Figure 12. Normalization factor for non-saturated and saturated CTR T_A=50°C versus if

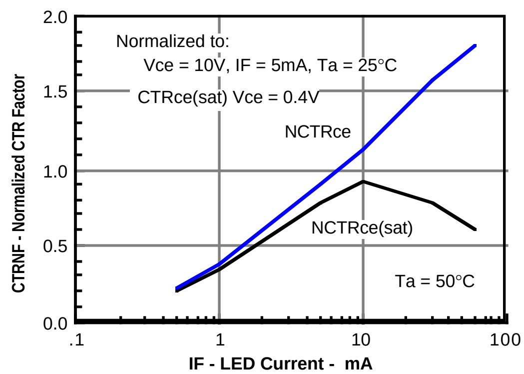


Figure 13. Normalization factor for non-saturated and saturated CTR T_A=70°C versus if

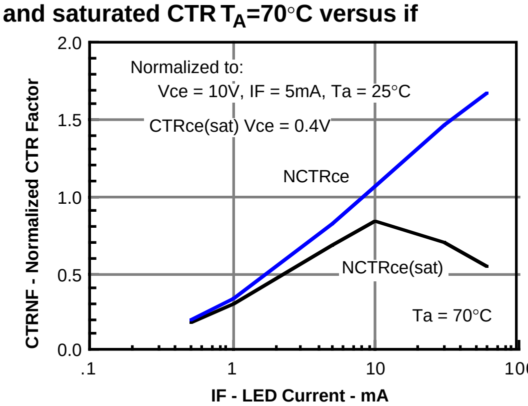


Figure 14. Normalization factor for non-saturated and saturated CTR T_A=85°C versus if

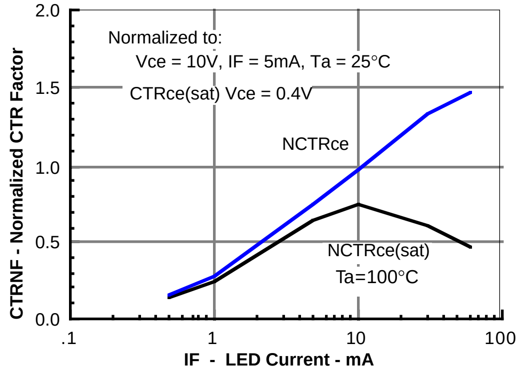


Figure 15. Collector-emitter current versus temperature and LED current

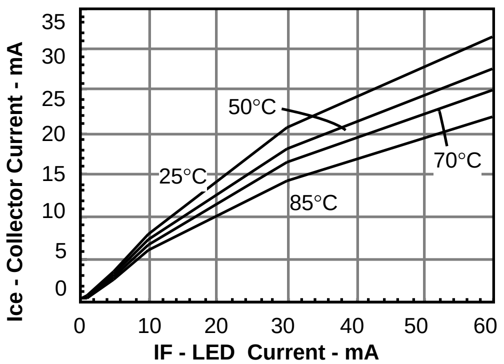


Figure 16. Collector-emitter leakage versus temperature

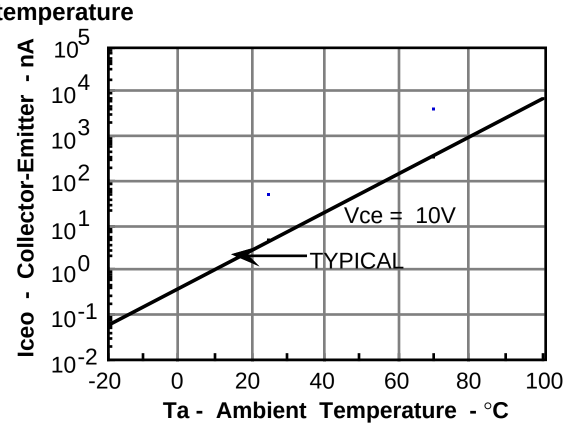


Figure 17. -1 Propagation delay versus collector load resistor

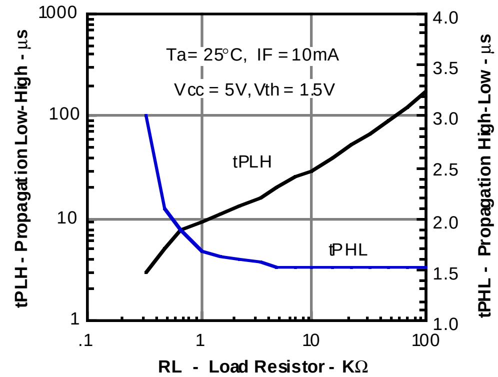


Figure 18. -2, -3 Propagation delay versus collector load resistor

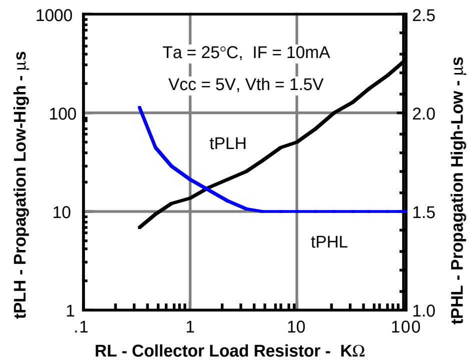


Figure 19. -4 Propagation delay versus collector load resistor