DUAL CHANNEL ILD1/2/5
QUAD CHANNEL ILQ1/2/5
Phototransistor Optocoupler

FEATURES
- **Current Transfer Ratio at I_F=10 mA**
  ILD/Q1, 20% Min.
  ILD/Q2, 100% Min.
  ILD/Q5, 50% Min.
- **High Collector-Emitter Voltage**
  ILD/Q1: BV_{CEO}=50 V
  ILD/Q2, ILD/Q5: BV_{CEO}=70 V
- **Field-Effect Stable by TRansparent IOn Shield (TRIOS) Isolation Test Voltage, 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	2.5 A
Power Dissipation	100 mW
Derate Linearly from 25°C	1.3 mW/°C

Detector

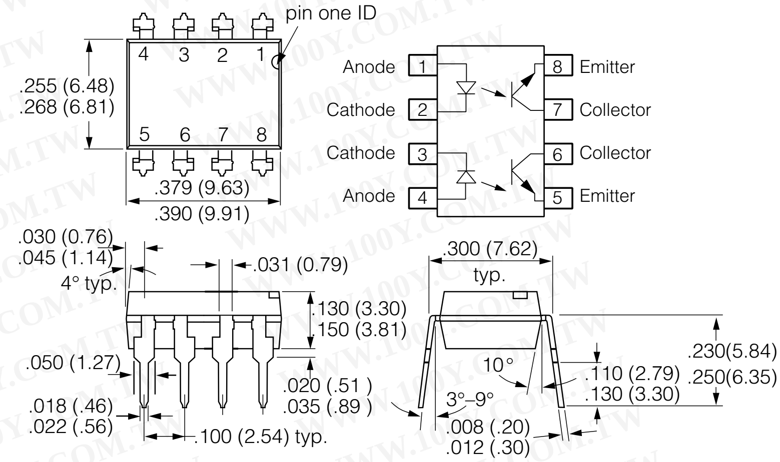
Collector-Emitter Reverse Voltage	
ILD/Q1	50 V
ILD/Q2, ILD/Q5	70 V
Collector Current	50 mA
Collector Current (t<1.0 ms)	400 mA
Power Dissipation	200 mW
Derate Linearly from 25°C	2.6 mW/°C

Package

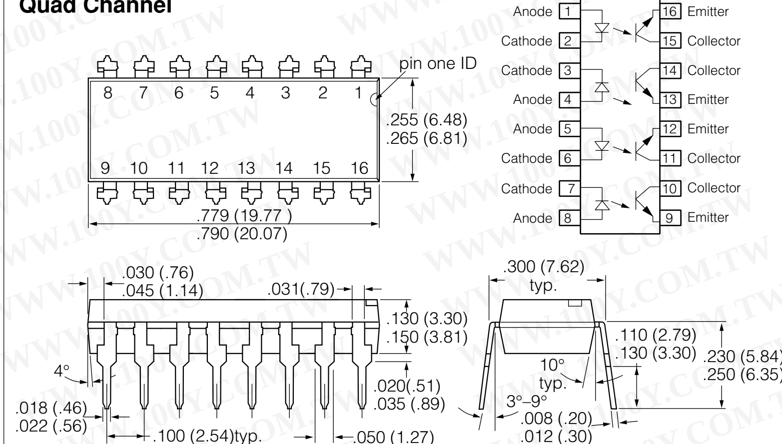
Isolation Test Voltage (between emitter and detector referred to standard climate 23°C/50%RH, DIN 50014)	5300 V_{RMS}
Creepage	≥7.0 mm
Clearance	≥7.0 mm
Isolation Resistance	
V_{IO}=500 V, T_A=25°C	$R_{IO}=10^{12}\ \Omega$
V_{IO}=500 V, T_A=100°C	$R_{IO}=10^{11}\ \Omega$
Package Power Dissipation	250 mW
Derate Linearly from 25°C	3.3 mW/°C
Storage Temperature	–40°C to +150°C
Operating Temperature	–40°C to +100°C
Junction Temperature	100°C
Soldering Temperature (2.0 mm from case bottom)	260°C

Dimensions in inches (mm)

Dual Channel



Quad Channel



DESCRIPTION

The ILD/Q1/2/5 are optically coupled isolated pairs employing GaAs infrared LEDs and silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the drive while maintaining a high degree of electrical isolation between input and output. The ILD/Q1/2/5 are especially designed for driving medium-speed logic and can be used to eliminate troublesome ground loop and noise problems. Also these couplers can be used to replace relays and transformers in many digital interface applications such as CRT modulation. The ILD1/2/5 has two isolated channels in a single DIP package and the ILQ1/2/5 has four isolated channels per package.

See Appnote 45, *"How to Use Optocoupler Normalized Curves"*.

Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Emitter						
Forward Voltage	V_F	—	1.25	1.65	V	I_F=60 mA
Reverse Current	I_R	—	0.01	10	µA	V_R=6.0 V
Capacitance	C_0	—	25	—	pF	V_R=0 V, f=1.0 MHz
Thermal Resistance, Junction to Lead	R_{THJL}	—	750	—	K/W	—
Detector						
Capacitance	C_{CE}	—	6.8	—	pF	V_{CE}=5.0 V, f=1.0 MHz
Leakage Current, Collector-Emitter	I_{CEO}	—	5.0	50	nA	V_{CE}=10 V
Saturation Voltage, Collector-Emitter	V_{CESAT}	—	0.25	0.4	—	I_{CE}=1.0 mA, I_B=20 µA
DC Forward Current Gain	HFE	200	650	1800	—	V_{CE}= 10 V, I_B=20 µA
Saturated DC Forward Current Gain	HFE_{SAT}	120	400	600	—	V_{CE}= 0.4 V, I_B=20 µA
Thermal Resistance, Junction to Lead	R_{THJL}	—	500	—	K/W	—

Package Transfer Characteristics (Each Channel)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
ILD/Q1						
Saturated Current Transfer Ratio (Collector-Emitter)	CTR_{CESAT}	—	75	—	%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio (Collector-Emitter)	CTR_{CE}	20	80	300	%	I_F=10 mA, V_{CE}=10 V
ILD/Q2						
Saturated Current Transfer Ratio (Collector-Emitter)	CTR_{CESAT}	—	170	—	%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio (Collector-Emitter)	CTR_{CE}	100	200	500	%	I_F=10 mA, V_{CE}=10 V
ILD/Q5						
Saturated Current Transfer Ratio (Collector-Emitter)	CTR_{CESAT}	—	100	—	%	I_F=10 mA, V_{CE}=0.4 V
Current Transfer Ratio (Collector-Emitter)	CTR_{CE}	50	130	400	%	I_F=10 mA, V_{CE} =10 V
Isolation and Insulation						
Common Mode Rejection, Output High	C_{MH}	—	5000	—	V/µs	V_{CM}=50 V_{P-P}, R_L=1.0 kΩ, I_F=0 mA
Common Mode Rejection, Output Low	C_{ML}	—	5000	—	V/µs	V_{CM}=50 V_{P-P}, R_L=1.0 kΩ, I_F=10 mA
Common Mode Coupling Capacitance	C_{CM}	—	0.01	—	pF	—
Package Capacitance	C_{IO}	—	0.8	—	pF	V_{IO}=0 V, f=1.0 MHz

Typical Switching Times

Figure 1. Non-saturated switching timing

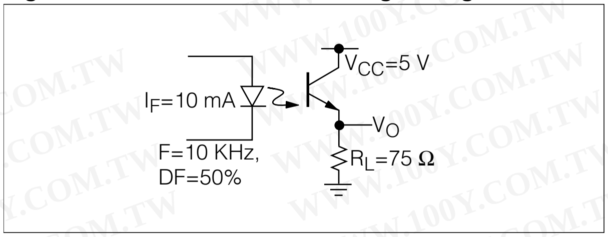


Figure 2. Non-saturated switching timing

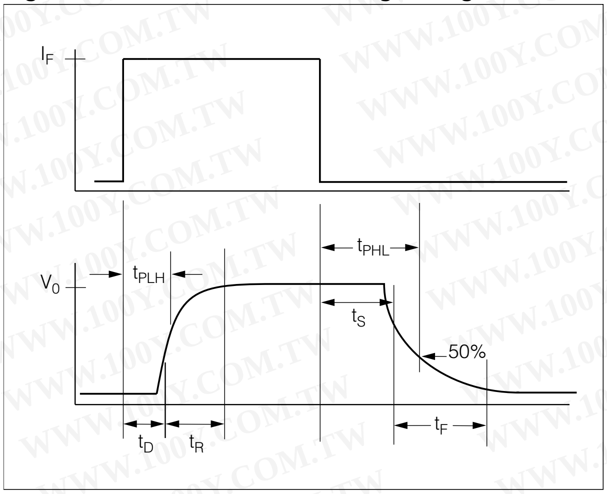


Figure 3. Saturated switching timing

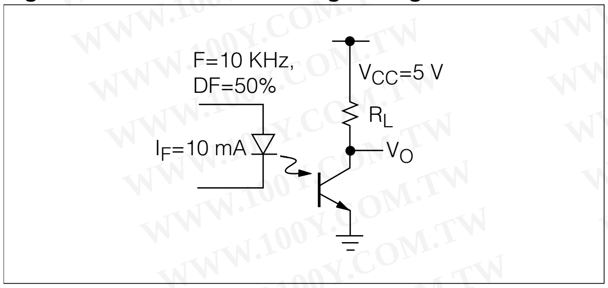
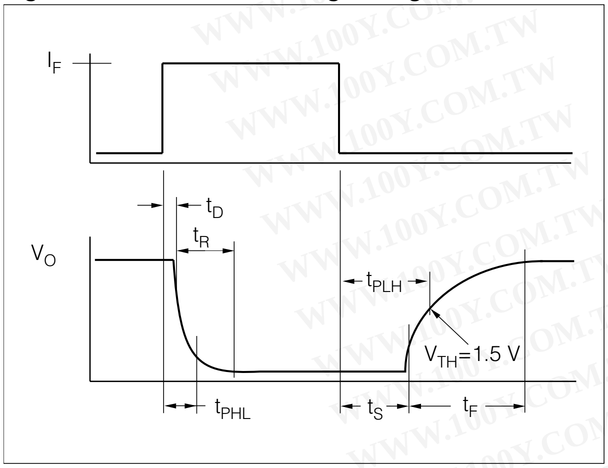


Figure 4. Saturated switching timing



Non-saturated

Characteristic	ILD/Q1 I_F=20 mA	ILD/Q2 I_F=5.0 mA	ILD/Q5 I_F=10 mA	Unit	Condition
Delay, t_D	0.8	1.7	1.7	µs	V_{CE}=5.0 V R_L=75 Ω 50% of V_{PP}
Rise time, t_r	1.9	2.6	2.6	µs	
Storage, t_S	0.2	0.4	0.4	µs	
Fall Time, t_f	1.4	2.2	2.2	µs	
Propagation H-L, t_{PHL}	0.7	1.2	1.1	µs	
Propagation L-H, t_{PLH}	1.4	2.3	2.5	µs	

Saturated

Characteristic	ILD/Q1 I_F=20 mA	ILD/Q2 I_F=5.0 mA	ILD/Q5 I_F=10 mA	Unit	Condition
Delay, t_D	0.8	1.0	1.7	µs	V_{CE}=0.4 V R_L=1.0 kΩ V_{CC}=5.0 V V_{TH}=1.5 V
Rise time, t_r	1.2	2.0	7.0	µs	
Storage, t_S	7.4	5.4	4.6	µs	
Fall Time, t_f	7.6	13.5	20	µs	
Propagation H-L, t_{PHL}	1.6	5.4	2.6	µs	
Propagation L-H, t_{PLH}	8.6	7.4	7.2	µs	

Figure 5. Normalized non-saturated and saturated CTR at T_A=25°C versus LED current

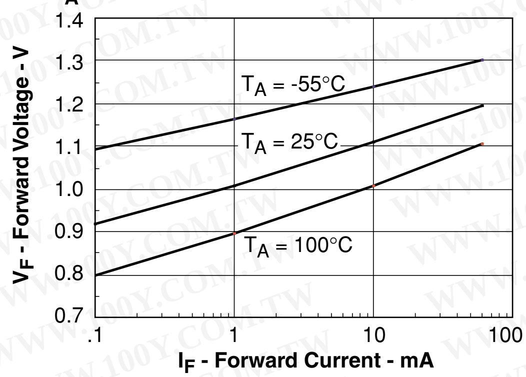


Figure 6. Normalized non-saturated and saturated CTR at T_A=25°C versus LED current

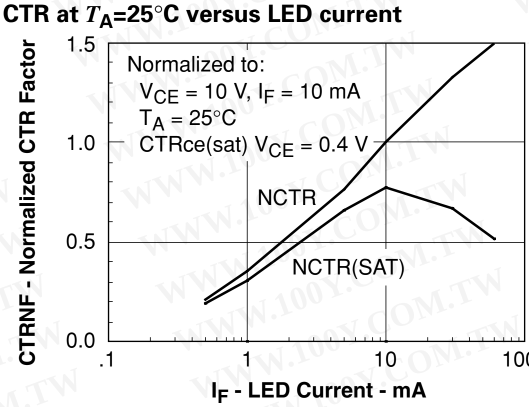


Figure 7. Normalized non-saturated and saturated CTR at T_A=50°C versus LED current

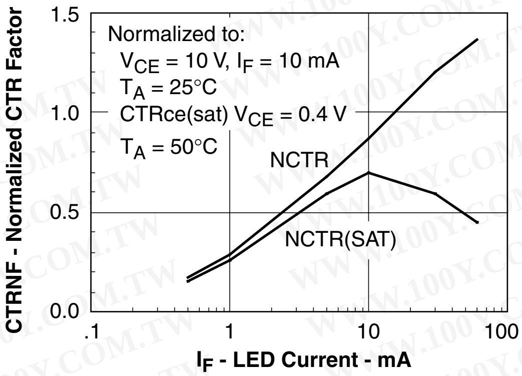


Figure 10. Collector-emitter current versus temperature and LED current

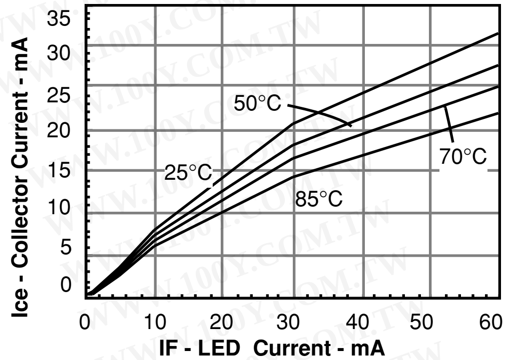


Figure 8. Normalized non-saturated and saturated CTR at T_A=70°C versus LED current

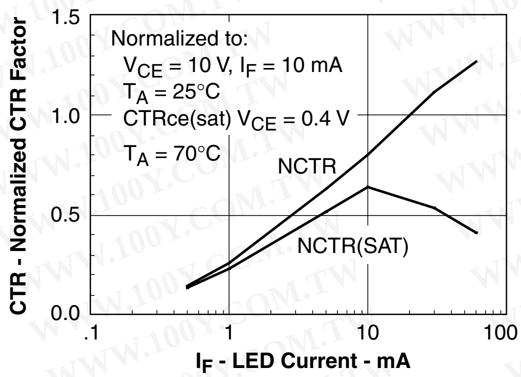


Figure 11. Collector-emitter leakage current versus temperature

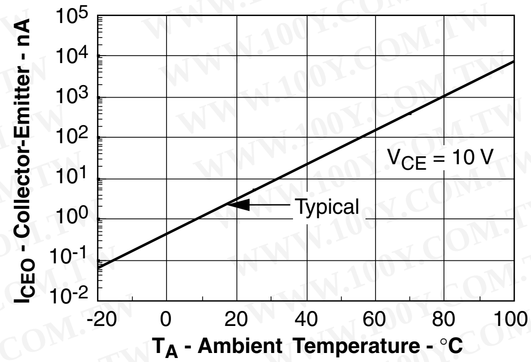


Figure 9. Normalized non-saturated and saturated CTR at T_A=85°C versus LED current

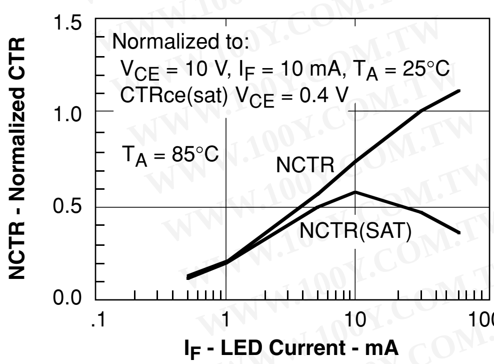


Figure 12. Propagation delay versus collector load resistor