Optocoupler, Phototransistor Output (Dual, Quad Channel)

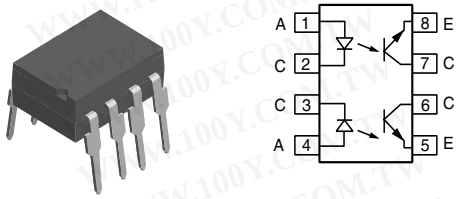
Features

- Current Transfer Ratio at I_F = 10 mA
- Isolation Test Voltage, 5300 V_{RMS}
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

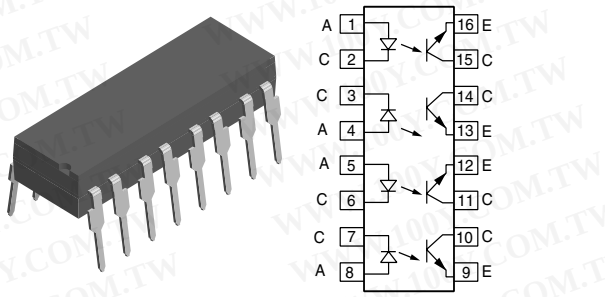
Agency Approvals

- UL1577, File No. E52744 System Code H or J, Double Protection
- CSA 93751
- BSI IEC60950 IEC60065
- DIN EN 60747-5-2 (VDE0884)
  DIN EN 60747-5-5 pending
  Available with Option 1
- FIMKO

Dual Channel



Quad Channel



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Description

The ILD1/ 2/ 5/ ILQ1/ 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 ILD1/ 2/ 5/ ILQ1/ 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 CTR 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.

Order Information

Part	Remarks
ILD1	CTR > 20 %, DIP-8
ILQ1	CTR > 20 %, DIP-16
ILD2	CTR > 100 %, DIP-8
ILQ2	CTR > 100 %, DIP-16
ILD5	CTR > 50 %, DIP-8
ILQ5	CTR > 50 %, DIP-16
ILD1-X007	CTR > 20 %, SMD-8 (option 7)
ILD1-X009	CTR > 20 %, SMD-8 (option 9)
ILD2-X006	CTR > 100 %, DIP-8 400 mil (option 6)
ILD2-X007	CTR > 100 %, SMD-8 (option 7)
ILD2-X009	CTR > 100 %, SMD-8 (option 9)
ILD5-X009	CTR > 50 %, SMD-8 (option 9)
ILQ1-X009	CTR > 20 %, SMD-16 (option 9)
ILQ2-X009	CTR > 100 %, SMD-16 (option 9)

For additional information on the available options refer to Option Information.

Absolute Maximum Ratings

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 Rating for extended periods of the time can adversely affect reliability.

Input

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		V_R	6.0	V
Forward current		I_F	60	mA
Surge current		I_{FSM}	2.5	A
Power dissipation		P_{diss}	100	mW
Derate linearly from 25 °C			1.3	mW/°C

Output

Parameter	Test condition	Part	Symbol	Value	Unit
Collector-emitter reverse voltage		ILD1	V_{CER}	50	V
		ILQ1	V_{CER}	50	V
		ILD2	V_{CER}	70	V
		ILQ2	V_{CER}	70	V
		ILD5	V_{CER}	70	V
		ILQ5	V_{CER}	70	V
Collector current			I_C	50	mA
	t < 1.0 ms		I_C	400	mA
Power dissipation			P_{diss}	200	mW
Derate linearly from 25 °C				2.6	mW/°C

Coupler

Parameter	Test condition	Symbol	Value	Unit
Isolation test voltage (between emitter and detector referred to standard climate 25 °C/ 50 % RH, DIN 50014)		V_{ISO}	5300	V_{RMS}
Creepage			≥ 7.0	mm
Clearance			≥ 7.0	mm
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}	Ω
Package power dissipation		P_{tot}	250	mW
Derate linearly from 25 °C			3.3	mW/°C
Storage temperature		T_{stg}	- 40 to + 150	°C
Operating temperature		T_{amb}	- 40 to + 100	°C
Junction temperature		T_j	100	°C
Soldering temperature	2.0 mm from case bottom	T_{sld}	260	°C

Electrical Characteristics

T_{amb} = 25 °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.

Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 60 mA	V_F		1.25	1.65	V
Reverse current	V_R = 6.0 V	I_R		0.01	10	µA
Capacitance	V_R = 0 V, f = 1.0 MHz	C_O		25		pF
Thermal resistance, junction to lead		T_{thJL}		750		K/W

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter capacitance	V_{CE} = 5.0 V, f = 1.0 MHz	C_{CE}		6.8		pF
Collector-emitter leakage current	V_{VCE} = 10 V	I_{CEO}		5.0	50	nA
Saturation voltage, collector-emitter	I_{CE} = 1.0 mA, I_B = 20 µA	V_{CESAT}		0.25	0.4	V
DC forward current gain	V_{CE} = 10 V, I_B = 20 µA	HFE	200	650	1800	
DC forward current gain saturated	V_{CE} = 0.4 V, I_B = 20 µA	HFE_{sat}	120	400	600	
Thermal resistance, junction to lead		R_{thjl}		500		K/W

Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	V_{IO} = 0 V, f = 1.0 MHz	C_{IO}		0.8		pF

Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Current Transfer Ratio (collector-emitter saturated)	I_F = 10 mA, V_{CE} = 0.4 V	ILD1 ILQ1	CTR_{CEsat}		75		%
		ILD2 ILQ2	CTR_{CEsat}		170		%
		ILD5 ILQ5	CTR_{CEsat}		100		%
Current Transfer Ratio (collector-emitter)	I_F = 10 mA, V_{CE} = 10 V	ILD1 ILQ1	CTR_{CE}	20	80	300	%
		ILD2 ILQ2	CTR_{CE}	100	200	500	%
		ILD5 ILQ5	CTR_{CE}	50	130	400	%

Typical Switching Times

Non-saturated Switching Timing

Parameter	Current	Delay	Rise time	Storage	Fall time	Propagation H-L	Propagation L-H
Test condition	V_{CE} = 5.0 V, R_L = 75 Ω, 50 % of V_{PP}						
Symbol	I_F	t_D	t_r	t_S	t_f	t_{PHL}	t_{PLH}
Unit	mA	µs	µs	µs	µs	µs	µs
ILD1 ILQ1	20	0.8	1.9	0.2	1.4	0.7	1.4
ILD2 ILQ2	5.0	1.7	2.6	0.4	2.2	1.2	2.3
ILD5 ILQ5	10	1.7	2.6	0.4	2.2	1.1	2.5

Saturated Switching Timing

Parameter	Current	Delay	Rise time	Storage	Fall time	Propagation H-L	Propagation L-H
Test condition	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CC} = 5.0 V, V_{TH} = 1.5 V						
Symbol	I_F	t_D	t_r	t_S	t_f	t_{PHL}	t_{PLH}
Unit	mA	µs	µs	µs	µs	µs	µs
ILD1 ILQ1	20	0.8	1.2	7.4	7.6	1.6	8.6
ILD2 ILQ2	5.0	1.0	2.0	5.4	13.5	5.4	7.4
ILD5 ILQ5	10	1.7	7.0	4.6	20	2.6	7.2

Common Mode Transient Immunity

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Common mode rejection, output high	V_{CM} = 50 V_{P-P}, R_L = 1.0 kΩ, I_F = 0 mA	CM_H		5000		V/µs
Common mode rejection, output low	V_{CM} = 50 V_{P-P}, R_L = 1.0 kΩ, I_F = 10 mA	CM_L		5000		V/µs
Common mode coupling capacitance		C_{CM}		0.01		pF

Typical Characteristics (Tamb = 25 °C unless otherwise specified)

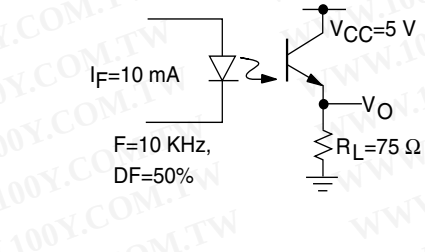


Figure 1. Non-saturated Switching Schematic

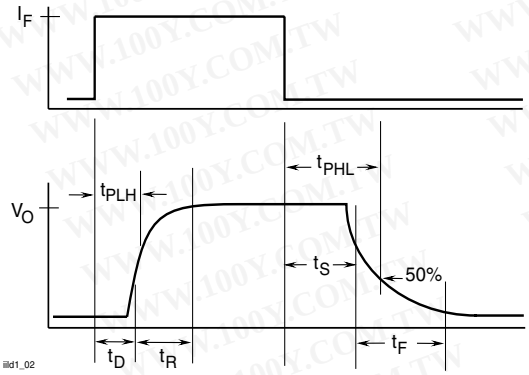


Figure 2. Non-saturated Switching Timing

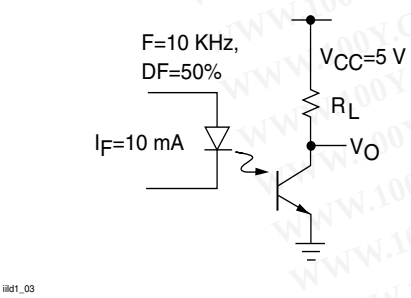


Figure 3. Saturated Switching Schematic

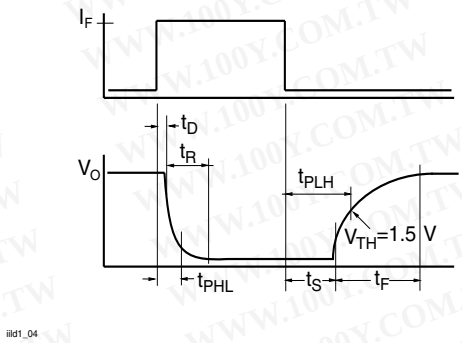


Figure 4. Saturated Switching Timing

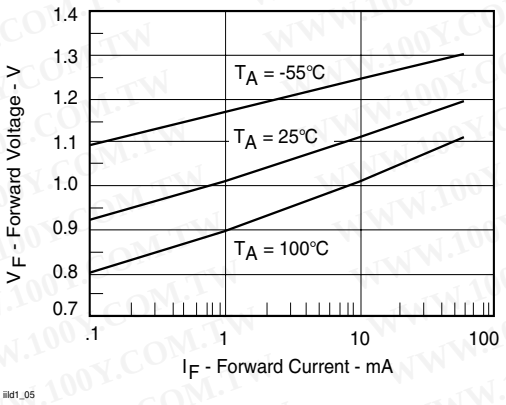


Figure 5. Normalized Non-Saturated and Saturated CTR vs. LED Current

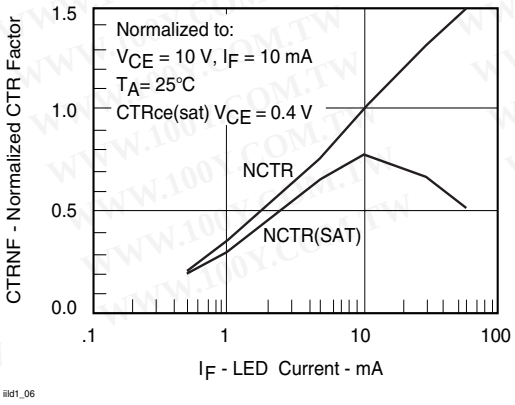


Figure 6. Normalized Non-Saturated and Saturated CTR vs. LED Current

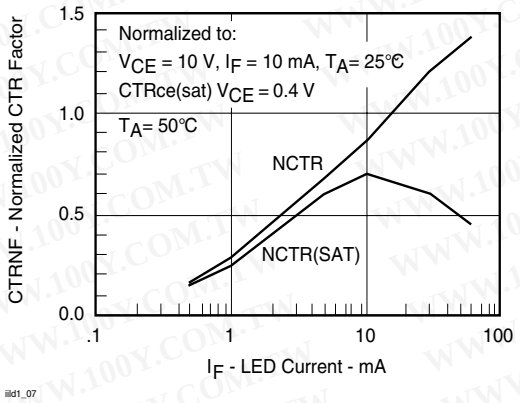


Figure 7. Normalized Non-Saturated and Saturated CTR vs. LED Current

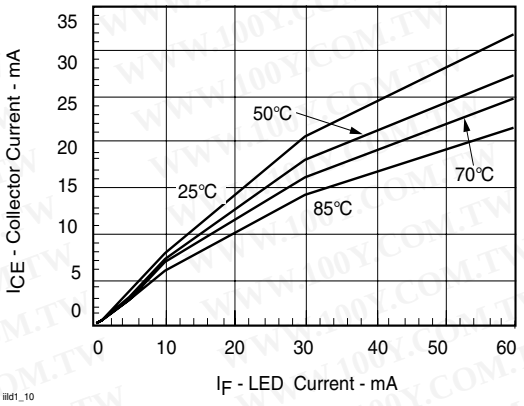


Figure 10. Collector-Emitter Current vs. Temperature and LED Current

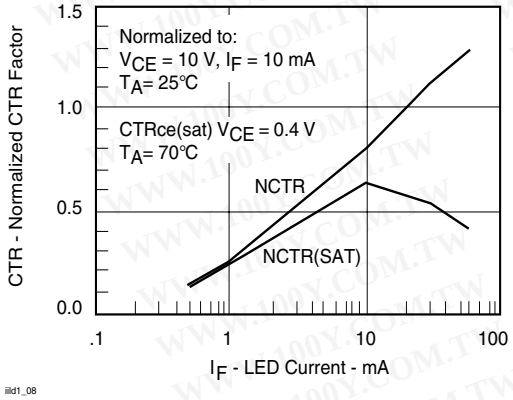


Figure 8. Normalized Non-Saturated and Saturated CTR vs. LED Current

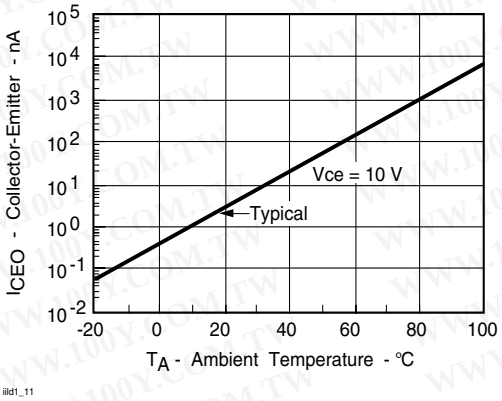


Figure 11. Collector-Emitter Leakage Current vs.Temp.

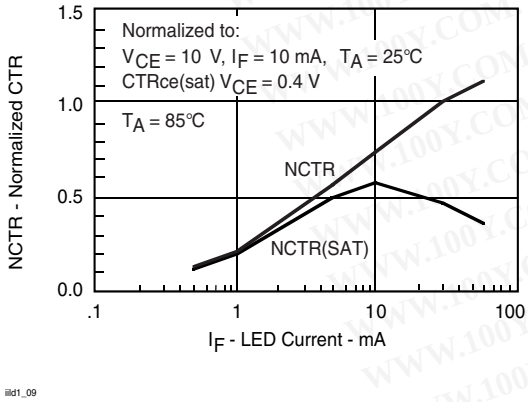


Figure 9. Normalized Non-Saturated and Saturated CTR vs. LED Current

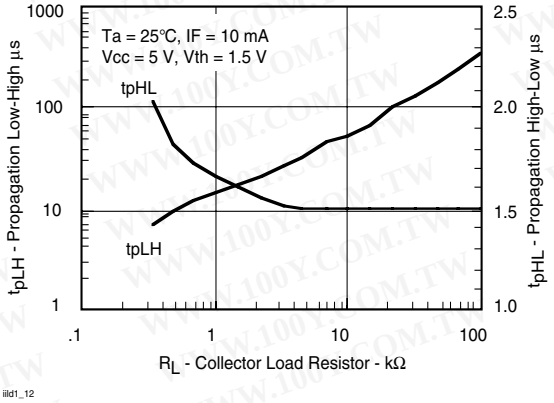
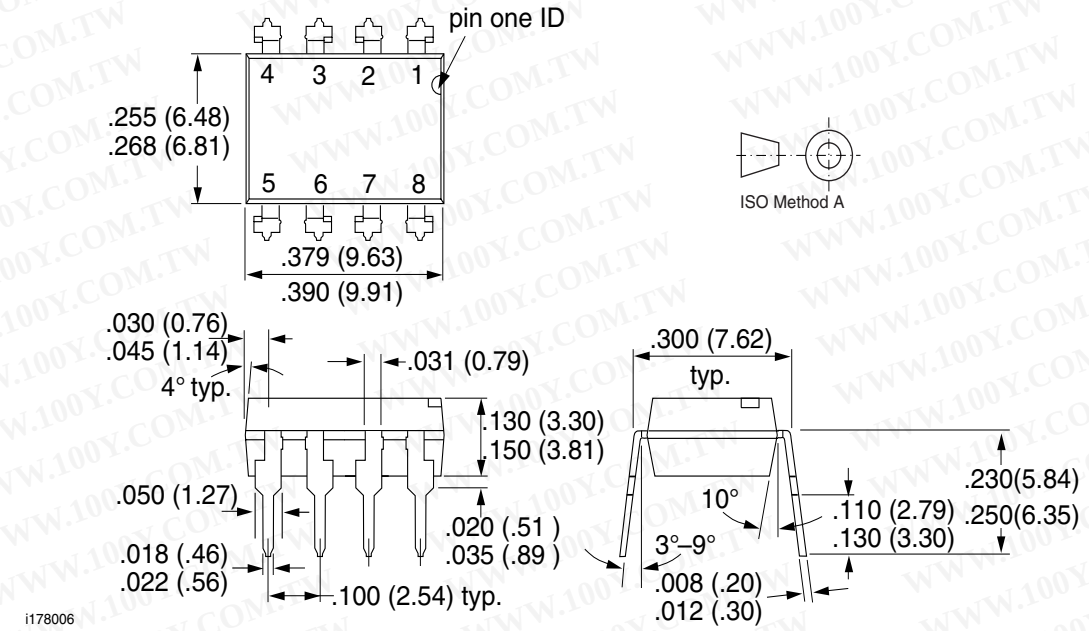
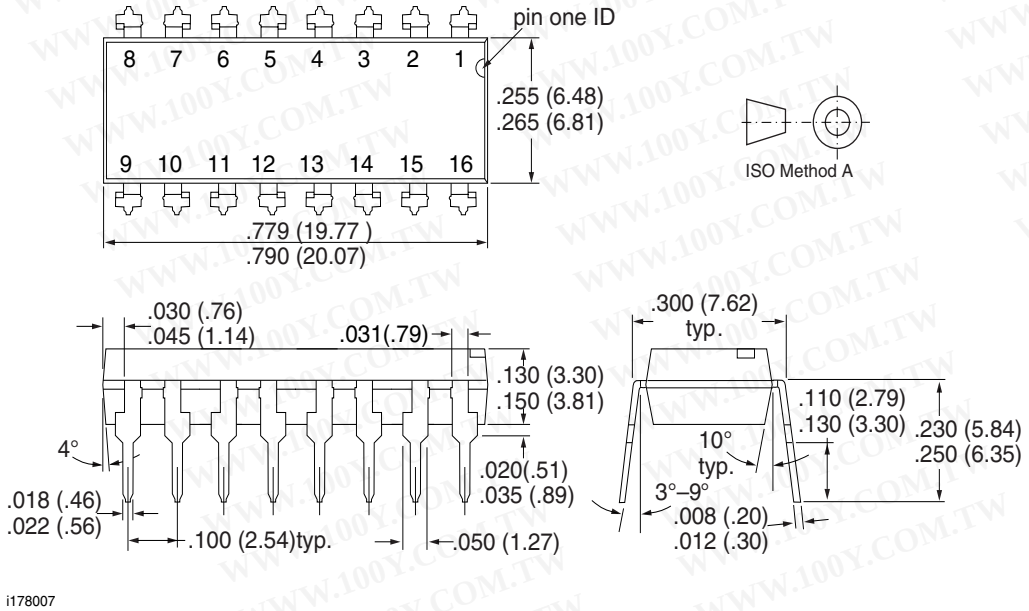


Figure 12. Propagation Delay vs. Collector Load Resistor

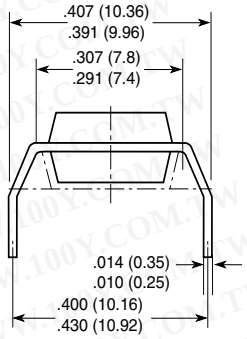
Package Dimensions in Inches (mm)



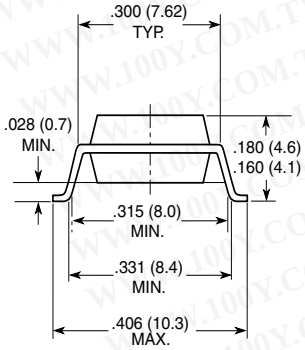
Package Dimensions in Inches (mm)



Option 6



Option 7



Option 9