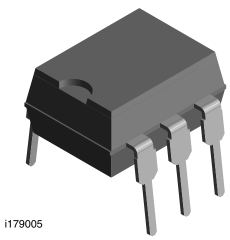
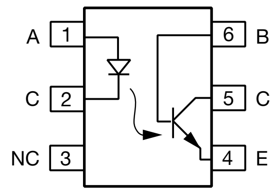
Optocoupler, Phototransistor Output, With Base Connection





FEATURES

- Current transfer ratio (see order information)
- Isolation test voltage 4420 V_{RMS}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AGENCY APPROVALS

- UL 1577
- cUL
- CQC GB4943.1
- CQC GB8898
- FIMKO

LINKS TO ADDITIONAL RESOURCES

Related Documents

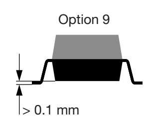
DESCRIPTION

The IL2 is an 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 IL2 is especially designed for driving medium-speed logic and can be used to eliminate troublesome ground loop and noise problems. This coupler can be used also to replace relays and transformers in many digital interface applications such as CRT modulation.

ORDERING INFORMATION

I	L	2	-	X	0	0	9	T

PART NUMBER (I L 2) — PACKAGE OPTION (X 0 0 9) — PACKAGE OPTION (T)



AGENCY CERTIFIED / PACKAGE	CTR (%)
UL, cUL, CQC, FIMKO	**> 100**
SMD-6, option 9	IL2-X009T

Note

- Additional options may be possible, please contact sales office

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	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			1.33	mW/°C

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	70	V
Emitter base breakdown voltage		BV_{EBO}	7	V
Collector base breakdown voltage		BV_{CBO}	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				
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	125	°C
Soldering temperature (1)	2.0 mm from case bottom	T_{sld}	260	°C

Notes

- 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 ratings for extended periods of the time can adversely affect reliability

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP)

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 60 mA	V_F	-	1.25	1.65	V
Breakdown voltage	I_R = 10 μA	V_{BR}	6	30	-	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	-	40	-	pF
Thermal resistance junction to lead		R_{thjl}	-	750	-	K/W
OUTPUT						
Collector emitter capacitance	V_{CE} = 5.0 V, f = 1.0 MHz	C_{CE}	-	6.8	-	pF
Collector base capacitance	V_{CB} = 5.0 V, f = 1.0 MHz	C_{CB}	-	8.5	-	pF
Emitter base capacitance	V_{EB} = 5.0 V, f = 1.0 MHz	C_{EB}	-	11	-	pF
Collector emitter leakage voltage	V_{CE} = 10 V	I_{CEO}	-	5	50	nA
Collector emitter saturation voltage	I_{CE} = 1.0 mA, I_B = 20 μA	V_{CEsat}	-	0.25	-	V
Base emitter voltage	V_{CE} = 10 V, I_B = 20 μA	VBE	-	0.65	-	V
DC forward current gain	V_{CE} = 10 V, I_B = 20 μA	h_{FE}	200	650	1800	
DC forward current gain saturated	V_{CE} = 0.4 V, I_B = 20 μA	h_{FEsat}	120	400	600	
Thermal resistance junction to lead		R_{thjl}	-	500	-	K/W
COUPLER						
Capacitance (input to output)	V_{I-O} = 0 V, f = 1.0 MHz	C_{IO}	-	0.6	-	pF
Insulation resistance	V_{I-O} = 500 V	R_S	-	10^{14}	-	Ω

Note

- 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

CURRENT TRANSFER RATIO						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio (collector emitter saturated)	I_F = 10 mA, V_{CE} = 0.4 V	CTR_{CEsat}	-	170	-	%
Current transfer ratio (collector emitter)	I_F = 10 mA, V_{CE} = 10 V	CTR_{CE}	100	200	500	%
Current transfer ratio (collector base)	I_F = 10 mA, V_{CB} = 9.3 V	CTR_{CB}	-	0.25	-	%

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED						
Current time	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	I_F	-	4	-	mA
Delay time	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	t_D	-	1.7	-	μs
Rise time	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	t_r	-	2.6	-	μs
Storage time	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	t_s	-	0.4	-	μs
Fall time	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	t_f	-	2.2	-	μs
Propagation H to L	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	t_{PHL}	-	1.2	-	μs
Propagation L to H	V_{CE} = 5 V, R_L = 75 Ω, t_P measured at 50 % of output	t_{PLH}	-	2.3	-	μs
SATURATED						
Current time	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	I_F	-	5	-	mA
Delay time	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	t_D	-	1	-	μs
Rise time	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	t_r	-	2	-	μs
Storage time	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	t_S	-	5.4	-	μs
SATURATED						
Fall time	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	t_f	-	13.5	-	μs
Propagation H to L	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	t_{PHL}	-	5.4	-	μs
Propagation L to H	V_{CE} = 0.4 V, R_L = 1.0 kΩ, V_{CL} = 5 V, V_{TH} = 1.5 V	t_{PLH}	-	7.4	-	μs

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 kΩ, I_F = 10 mA	$\|CM_H\|$	-	5000	-	V/μs
Common mode rejection output low	V_{CM} = 50 V_{P-P}, R_L = 1 kΩ, I_F = 10 mA	$\|CM_L\|$	-	5000	-	V/μs
Common mode coupling capacitance		C_{CM}	-	0.01	-	pF

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 100 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	t = 1 min	V_{ISO}	4420	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	10 000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	890	V_{peak}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	275	mA
Safety temperature		T_S	175	°C
Creepage distance			≥ 7	mm
Clearance distance			≥ 7	mm
Insulation thickness		DTI	≥ 0.4	mm

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

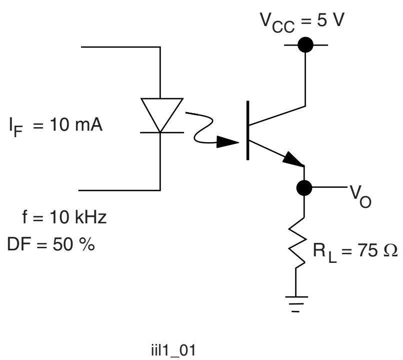


Fig. 1 - Non-Saturated Switching Schematic

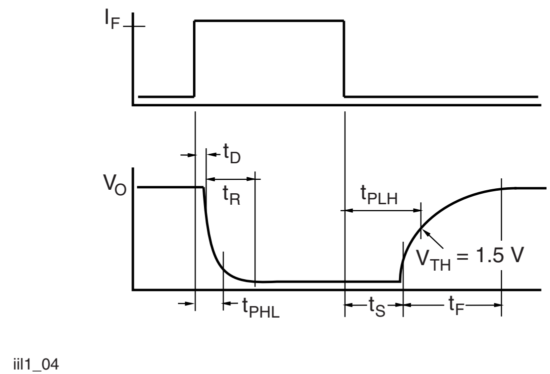


Fig. 4 - Saturated Switching Timing

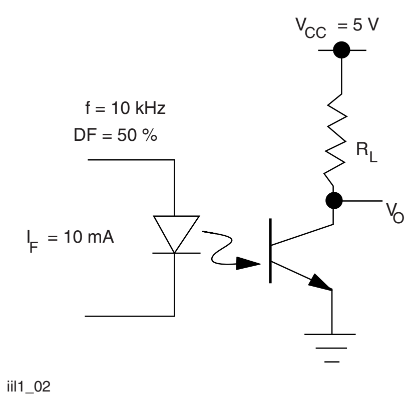


Fig. 2 - Saturated Switching Schematic

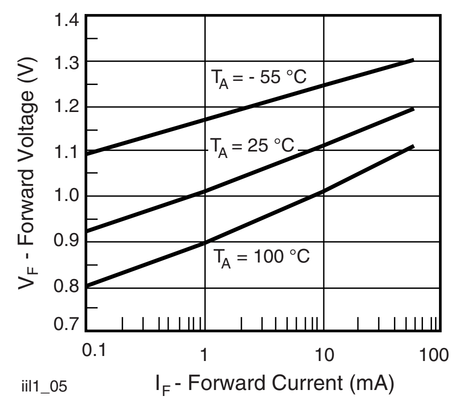


Fig. 5 - Forward Voltage vs. Forward Current

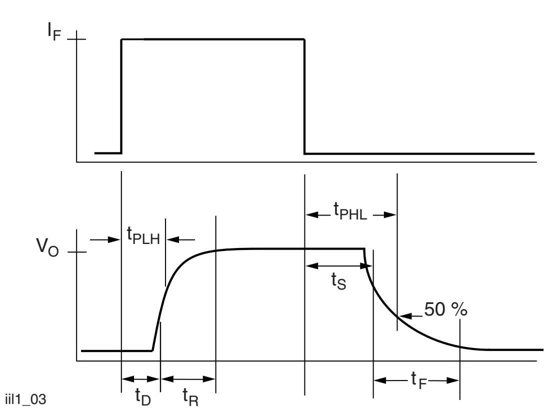


Fig. 3 - Non-Saturated Switching Timing

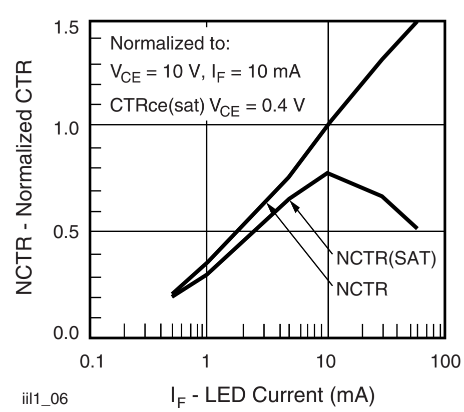


Fig. 6 - Normalized Non-Saturated and Saturated CTR vs. LED Current

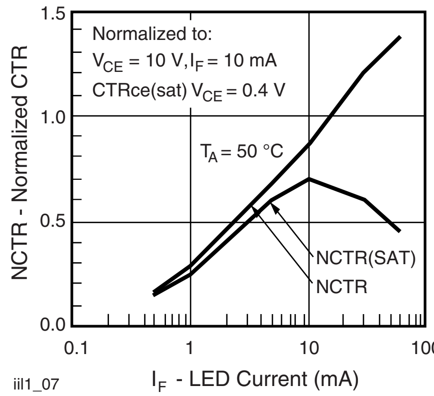


Fig. 7 - Normalized Non-Saturated and Saturated CTR vs. LED Current

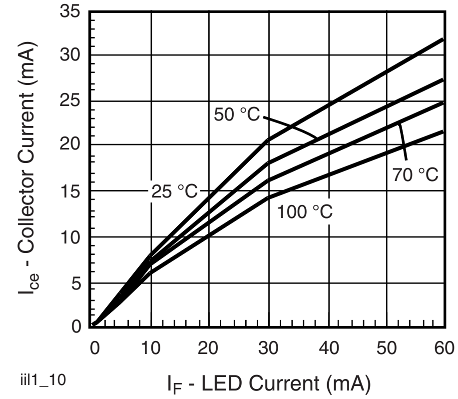


Fig. 10 - Collector Emitter Current vs. Temperature and LED Current

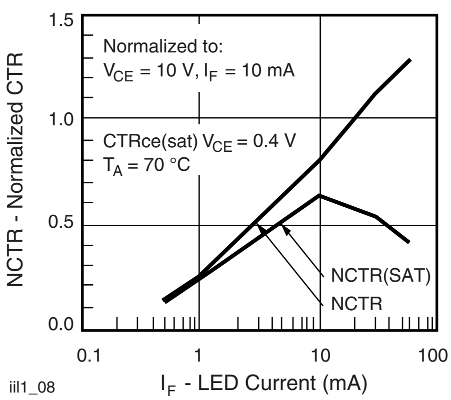


Fig. 8 - Normalized Non-Saturated and Saturated CTR vs. LED Current

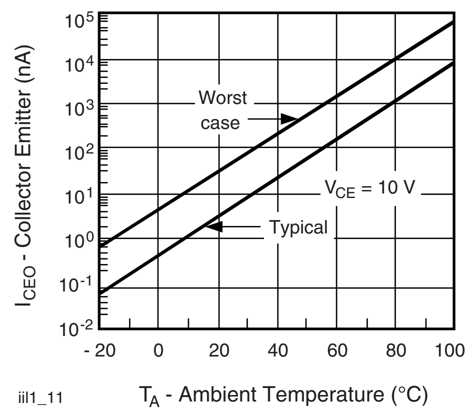


Fig. 11 - Collector Emitter Leakage Current vs.Temperature

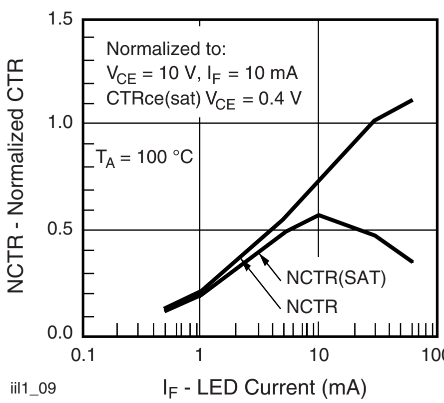


Fig. 9 - Normalized Non-Saturated and Saturated CTR, T_{amb} = 100 °C vs. LED Current

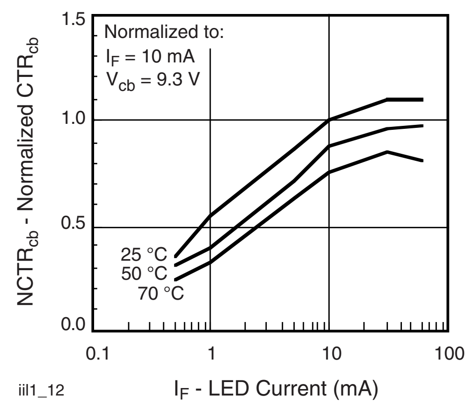


Fig. 12 - Normalized CTR_{cb} vs. LED Current and Temperature

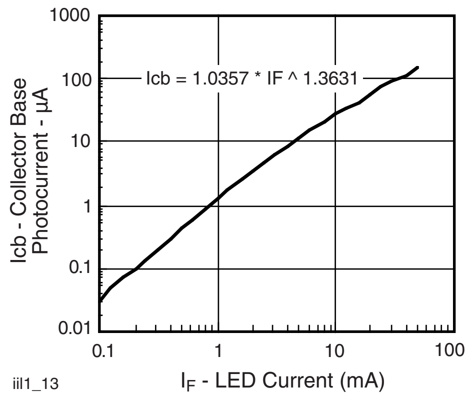


Fig. 13 - Collector Base Photocurrent vs. LED Current

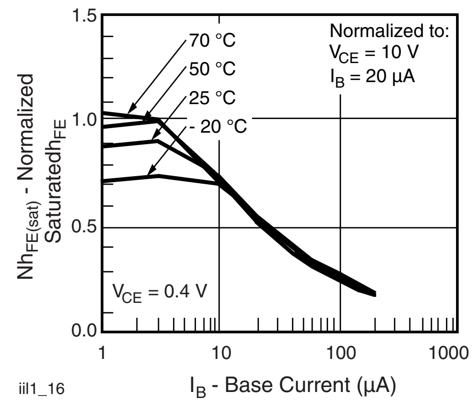


Fig. 16 - Normalized Saturated h_{FE} vs. Base Current and Temperature

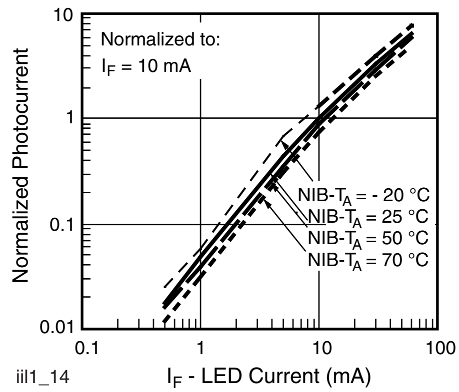


Fig. 14 - Normalized Photocurrent vs. I_F and Temperature

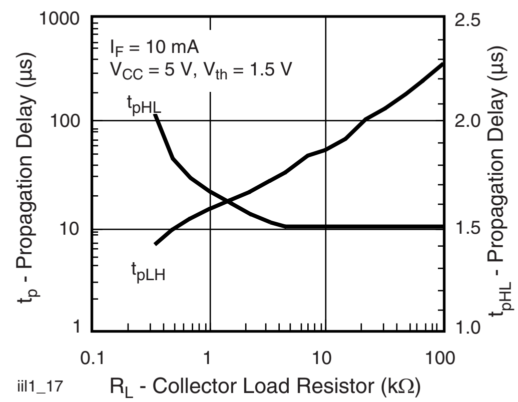


Fig. 17 - Propagation Delay vs. Collector Load Resistor

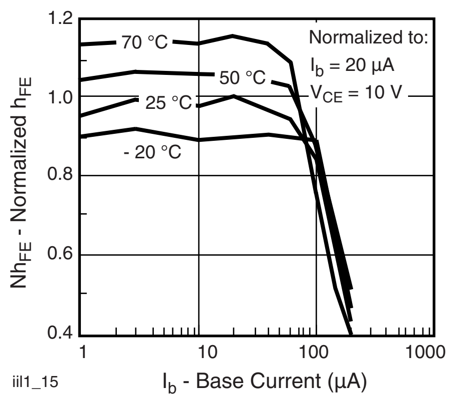
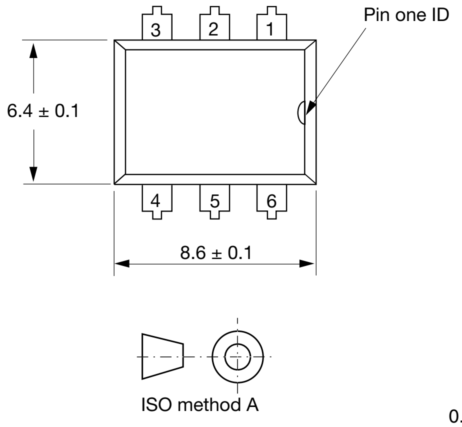
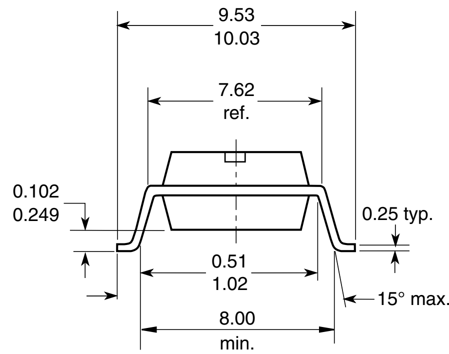


Fig. 15 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

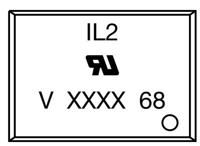
PACKAGE DIMENSIONS in millimeters



Option 9



PACKAGE MARKING



Note

- XXXX = LMC (lot marking code)

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