

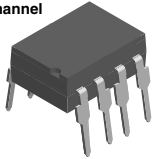


**THE DATASHEET OF  
ILD621-X009T**

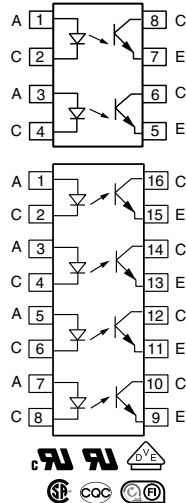
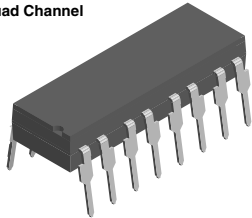


## Optocoupler, Phototransistor Output (Dual, Quad Channel)

Dual Channel



Quad Channel



### FEATURES

- Alternate source to TLP621-2, TLP621-4 and TLP621GB-2, TLP621GB-4
- High collector emitter voltage,  $BV_{CEO} = 70\text{ V}$
- Dual and quad packages feature:
  - Lower pin and parts count
  - Better channel to channel CTR match
  - Improved common mode rejection
- Isolation rated voltage  $4420\text{ V}_{RMS}$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#), available with option 1
- [CQC GB4943.1](#)
- [CQC GB8898](#)
- [FIMKO](#)

### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The ILD621, ILQ621, ILD621GB, ILQ621GB are multi-channel phototransistor optocouplers that use GaAs IRED emitters and high gain NPN silicon phototransistors. These devices are constructed using double molded insulation technology.

The ILD621, ILQ621GB is well suited for CMOS interfacing given the  $CTR_{CEsat}$  of 30 % minimum at  $I_F$  of 1.0 mA. High gain linear operation is guaranteed by a minimum  $CTR_{CE}$  of 100 % at 5.0 mA. The ILD621, ILQ621 has a guaranteed  $CTR_{CE}$  50 % minimum at 5.0 mA. The transparent ion shield insures stable DC gain in applications such as power supply feedback circuits, where constant DC  $V_{IO}$  voltages are present.

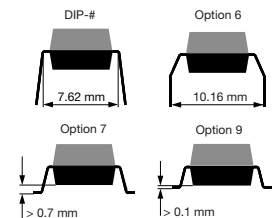
### ORDERING INFORMATION



PART NUMBER

PACKAGE OPTION

x = D (Dual) or Q (Quad)



AGENCY CERTIFIED / PACKAGE	DUAL CHANNEL		QUAD CHANNEL	
	CTR (%)			
<b>UL, cUL, CSA, CQC, FIMKO</b>	<b>&gt; 50</b>	<b>&gt; 100</b>	<b>&gt; 50</b>	<b>&gt; 100</b>
DIP-8	-	ILD621GB	-	-
SMD-8, option 7	ILD621-X007T	ILD621GB-X007T	-	-
DIP-16	-	-	ILQ621	ILQ621GB
DIP-16, option 6	-	-	ILQ621-X006	-
SMD-16, option 7	-	-	ILQ621-X007T	-
SMD-16, option 9	-	-	-	ILQ621GB-X009
<b>VDE, UL, cUL, CSA, CQC, FIMKO</b>	<b>&gt; 50</b>	<b>&gt; 100</b>	<b>&gt; 50</b>	<b>&gt; 100</b>
DIP-16	-	-	-	ILQ621GB-X001
SMD-16, option 7	-	-	-	ILQ621GB-X017T

### Note

- For additional information on the available options refer to option information



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			V <sub>R</sub>	6.0	V
Forward current			I <sub>F</sub>	60	mA
Surge current			I <sub>FSM</sub>	1.5	A
Power dissipation			P <sub>diss</sub>	100	mW
Derate from 25 °C				1.33	mW/°C
<b>OUTPUT</b>					
Collector emitter reverse voltage			V <sub>CEO</sub>	70	V
Collector current			I <sub>C</sub>	50	mA
	t < 1.0 ms		I <sub>C</sub>	100	mA
Power dissipation			P <sub>diss</sub>	150	mW
Derate from 25 °C				-2.0	mW/°C
<b>COUPLER</b>					
Package dissipation		ILD621		400	mW
		ILD621GB		400	mW
Derate from 25 °C				5.33	mW/°C
Package dissipation		ILQ621		500	mW
		ILQ621GB		500	mW
Derate from 25 °C				6.67	mW/°C
Storage temperature			T <sub>stg</sub>	-55 to +150	°C
Operating temperature			T <sub>amb</sub>	-55 to +100	°C
Junction temperature			T <sub>j</sub>	100	°C
Soldering temperature <sup>(1)</sup>	2.0 mm from case bottom		T <sub>slid</sub>	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.
- <sup>(1)</sup> 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 <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Forward voltage	I <sub>F</sub> = 10 mA		V <sub>F</sub>	1.0	1.15	1.3	V
Reverse current	V <sub>R</sub> = 6.0 V		I <sub>R</sub>	-	0.01	10	μA
Capacitance	V <sub>R</sub> = 0 V, f = 1.0 MHz		C <sub>O</sub>	-	40	-	pF
Thermal resistance, junction to lead			R <sub>THJL</sub>	-	750	-	K/W
<b>OUTPUT</b>							
Collector emitter capacitance	V <sub>CE</sub> = 5.0 V, f = 1.0 MHz		C <sub>CE</sub>	-	6.8	-	pF
Collector emitter leakage current	V <sub>CE</sub> = 24 V		I <sub>CEO</sub>	-	10	100	nA
			I <sub>CEO</sub>	-	20	50	μA
Thermal resistance, junction to lead			R <sub>THJL</sub>	-	500	-	K/W
<b>COUPLER</b>							
Capacitance (input to output)	V <sub>IO</sub> = 0 V, f = 1.0 MHz		C <sub>IO</sub>	0.8	-	-	pF
Insulation resistance	V <sub>IO</sub> = 500 V			10 <sup>12</sup>	-	-	Ω
Channel to channel insulation				500	-	-	VAC
Collector emitter saturation voltage	I <sub>F</sub> = 8.0 mA, I <sub>CE</sub> = 2.4 mA	ILD621	V <sub>CEsat</sub>	-	-	0.4	V
		ILQ621					
	I <sub>F</sub> = 1.0 mA, I <sub>CE</sub> = 0.2 mA	ILD621GB	V <sub>CEsat</sub>	-	-	0.4	V
		ILQ621GB					

**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	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Channel/channel CTR match	$I_F = 5.0 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$		CTR <sub>X</sub> /CTR <sub>Y</sub>	1 to 1	-	3 to 1	%
Current transfer ratio (collector emitter saturated)	$I_F = 1.0 \text{ mA}$ , $V_{CE} = 0.4 \text{ V}$	ILD621	CTR <sub>CEsat</sub>	-	60	-	%
		ILQ621	CTR <sub>CEsat</sub>	-	60	-	%
		ILD621GB	CTR <sub>CEsat</sub>	30	-	-	%
		ILQ621GB	CTR <sub>CEsat</sub>	30	-	-	%
Current transfer ratio (collector emitter)	$I_F = 5.0 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$	ILD621	CTR <sub>CE</sub>	50	80	600	%
		ILQ621	CTR <sub>CE</sub>	50	80	600	%
		ILD621GB	CTR <sub>CE</sub>	100	200	600	%
		ILQ621GB	CTR <sub>CE</sub>	100	200	600	%

SWITCHING CHARACTERISTICS							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
<b>NON-SATURATED</b>							
On time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{on}$	-	3.0	-	$\mu\text{s}$	
Rise time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_r$	-	2.0	-	$\mu\text{s}$	
Off time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{off}$	-	2.3	-	$\mu\text{s}$	
Fall time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_f$	-	2.0	-	$\mu\text{s}$	
Propagation H to L	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{PHL}$	-	1.1	-	$\mu\text{s}$	
Propagation L to H	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{PLH}$	-	2.5	-	$\mu\text{s}$	
<b>SATURATED</b>							
On time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{on}$	-	4.3	-	$\mu\text{s}$	
Rise time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_r$	-	2.8	-	$\mu\text{s}$	
Off time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{off}$	-	2.5	-	$\mu\text{s}$	
Fall time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_f$	-	11	-	$\mu\text{s}$	
Propagation H to L	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{PHL}$	-	2.6	-	$\mu\text{s}$	
Propagation L to H	$I_F = 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1 \text{ k}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{PLH}$	-	7.2	-	$\mu\text{s}$	

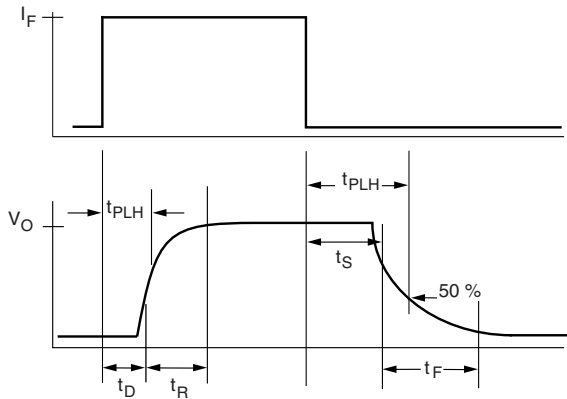
COMMON MODE TRANSIENT IMMUNITY							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Common mode rejection, output high	$V_{CM} = 50 V_{P-P}$ , $R_L = 1.0 \text{ k}\Omega$ , $I_F = 0 \text{ mA}$	CM <sub>H</sub>	-	5000	-	V/ $\mu\text{s}$	
Common mode rejection, output low	$V_{CM} = 50 V_{P-P}$ , $R_L = 1.0 \text{ k}\Omega$ , $I_F = 10 \text{ mA}$	CM <sub>L</sub>	-	5000	-	V/ $\mu\text{s}$	

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	$t = 1 \text{ min}$	$V_{ISO}$	4420	$V_{RMS}$
Isolation test voltage	$t = 1.0 \text{ s}$	$V_{ISO}$	5300	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	10 000	$V_{peak}$
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	$V_{peak}$
Isolation resistance	$V_{IO} = 500 \text{ V}$ , $T_{amb} = 25 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500 \text{ V}$ , $T_{amb} = 100 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	400	mW
Input safety current		$I_{SI}$	275	mA
Safety temperature		$T_s$	175	$^\circ\text{C}$
Creepage distance			$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	mm

**Note**

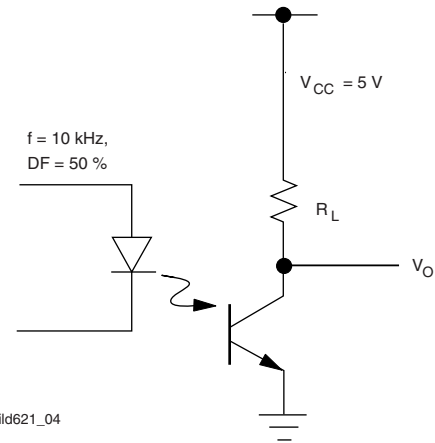
- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)



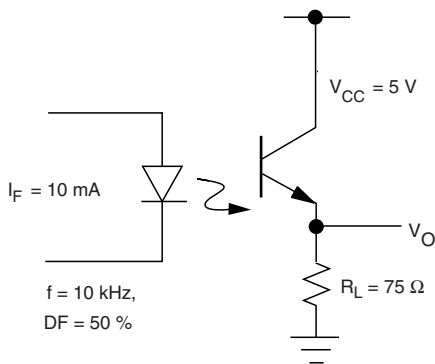
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Fig. 1 - Non-Saturated Switching Timing



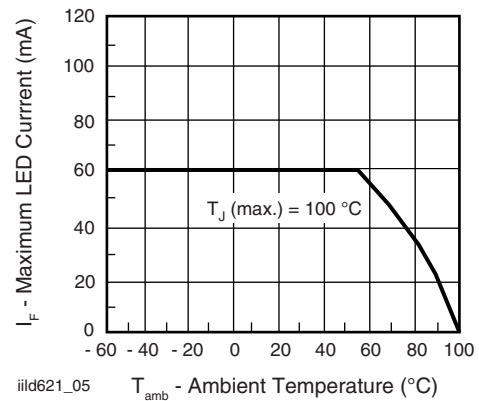
iiild621\_04

Fig. 4 - Saturated Switching Timing



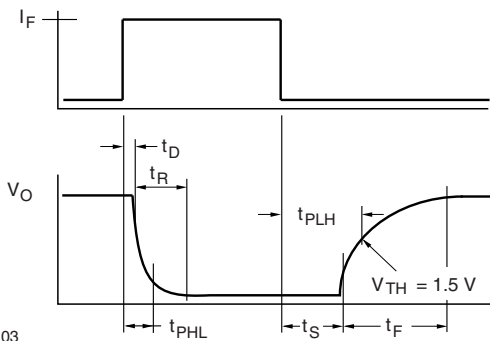
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Fig. 2 - Non-Saturated Switching Timing



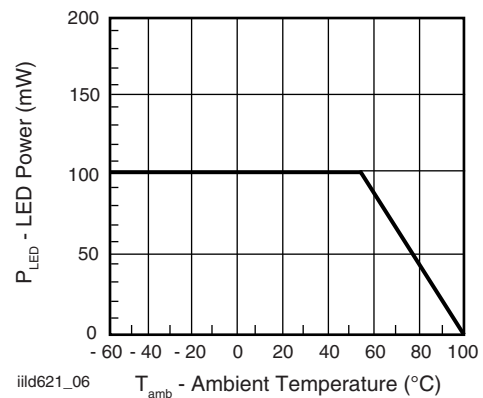
iiild621\_05

Fig. 5 - Maximum LED Current vs. Ambient Temperature



iiild621\_03

Fig. 3 - Saturated Switching Timing



iiild621\_06

Fig. 6 - Maximum LED Power Dissipation

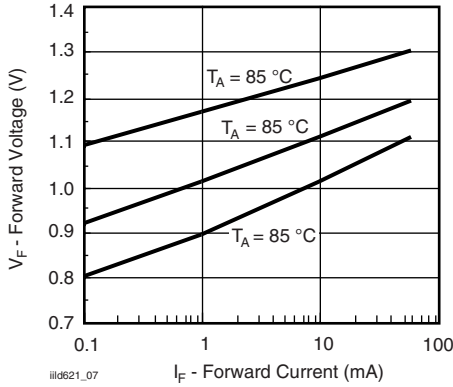


Fig. 7 - Forward Voltage vs. Forward Current

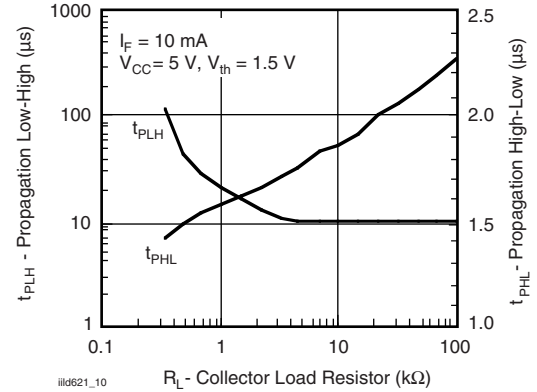


Fig. 10 - Propagation Delay vs. Collector Load Resistor

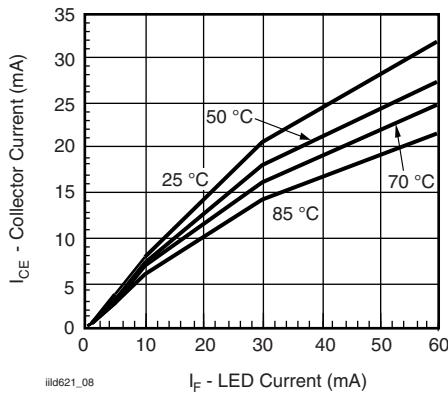


Fig. 8 - Collector Emitter Current vs. Temperature and LED Current

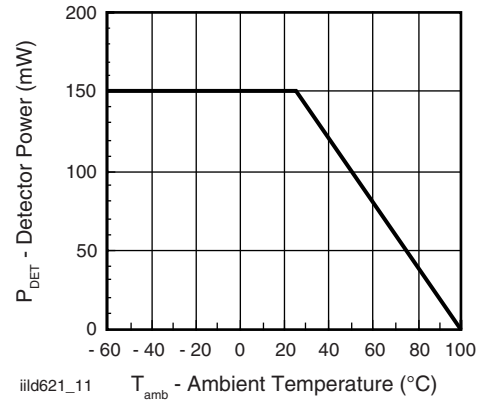


Fig. 11 - Maximum Detector Power Dissipation

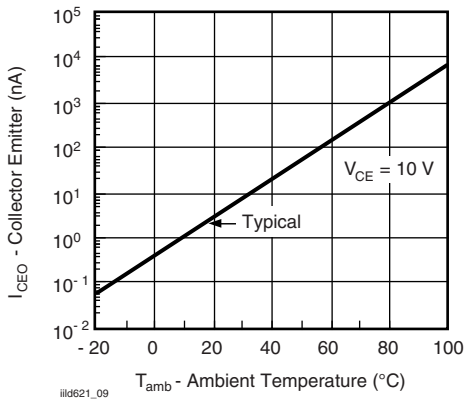


Fig. 9 - Collector Emitter Leakage vs. Temperature

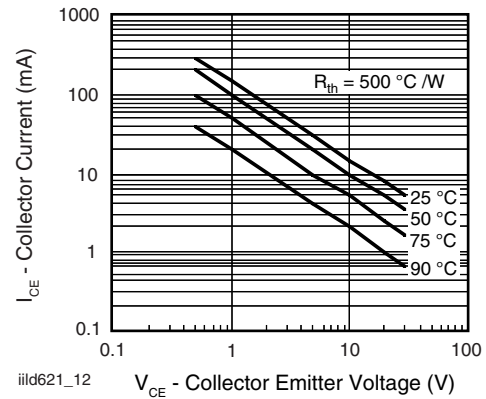


Fig. 12 - Maximum Collector Current vs. Collector Voltage

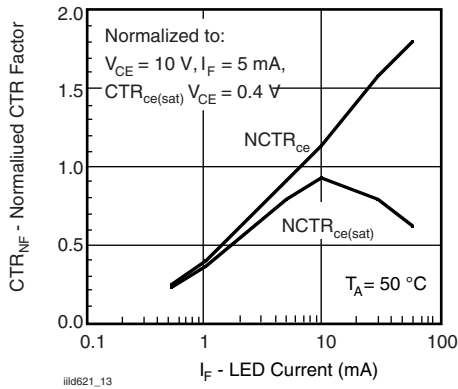


Fig. 13 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

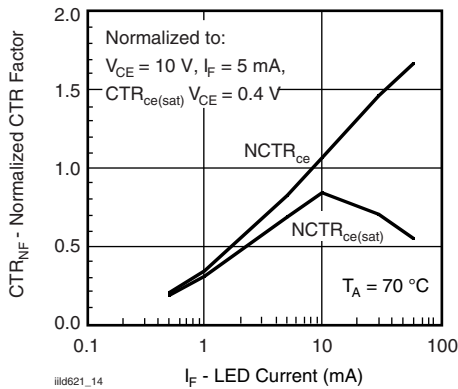


Fig. 14 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

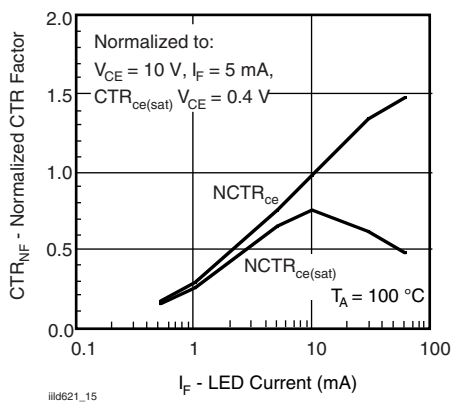
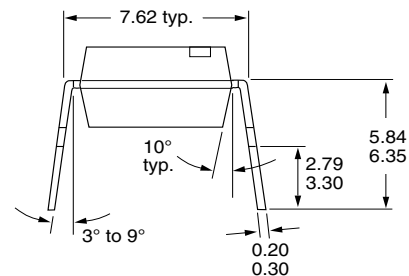
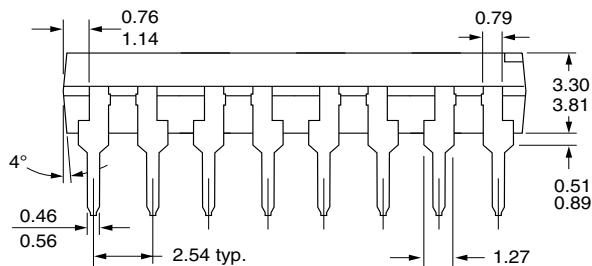
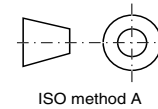
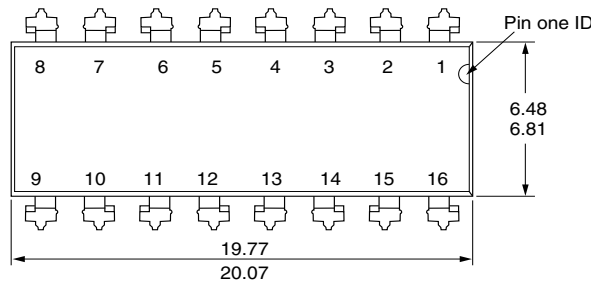
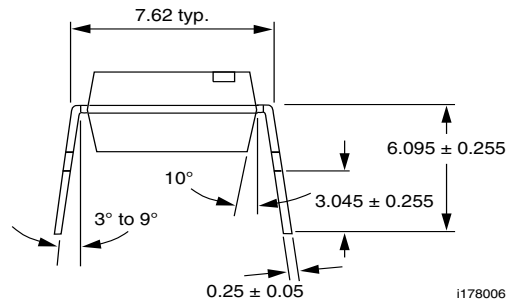
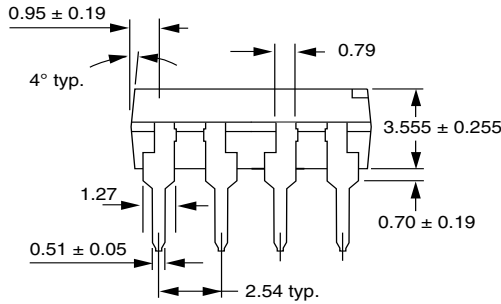
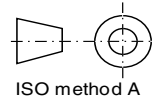
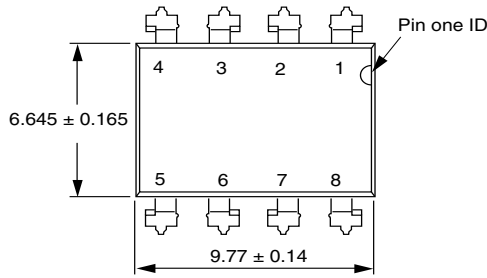


Fig. 15 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

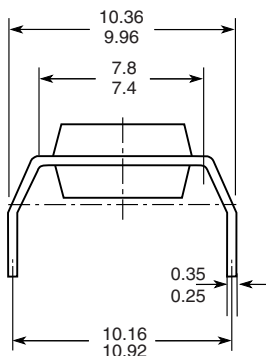


## PACKAGE DIMENSIONS in millimeters

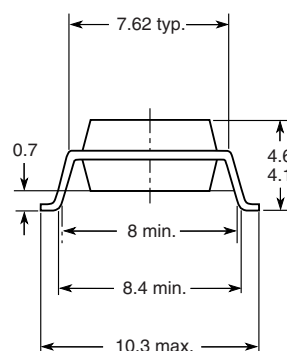


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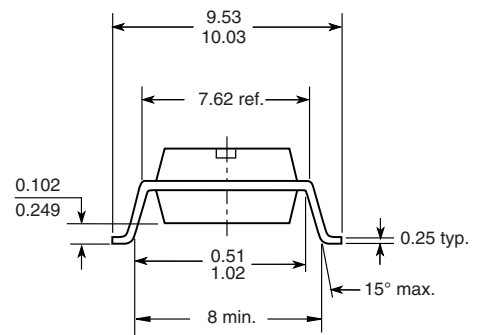
### Option 6



### Option 7



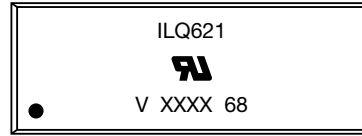
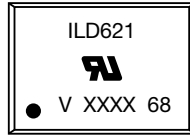
### Option 9



18450



## PACKAGE MARKING



### Note

- XXXX = LMC (lot marking code)



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