

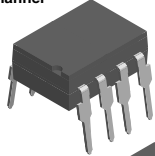


**THE DATASHEET OF  
ILQ620GB-X009T**

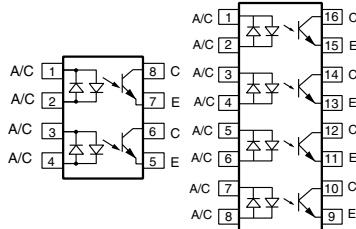
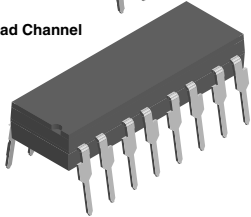


## Optocoupler, Phototransistor Output, AC Input (Dual, Quad Channel)

Dual Channel



Quad Channel



### FEATURES

- Identical channel to channel footprint
- ILD620 crosses to TLP620-2
- ILQ620 crosses to TLP620-4
- High collector emitter voltage,  $BV_{CEO} = 70\text{ V}$
- Dual and quad packages feature:
  - Reduced board space
  - 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

### LINKS TO ADDITIONAL RESOURCES



Related Documents



Design Tools



3D Models



Footprints



Schematics

**SPICE**  
Models

### DESCRIPTION

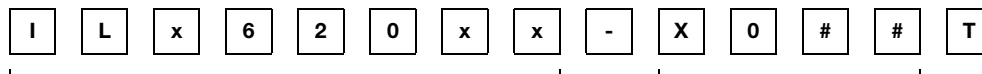
The ILD620, ILQ620, ILD620GB, and ILQ620GB are multi-channel input phototransistor optocouplers that use inverse parallel GaAs IRLED emitter and high gain NPN silicon phototransistors per channel. These devices are constructed using over/under leadframe optical coupling and double molded insulation resulting in a withstand test voltage of  $5300\text{ V}_{RMS}$ .

The LED parameters and the linear CTR characteristics make these devices well suited for AC voltage detection. The ILD620GB and ILQ620GB with its low  $I_F$  guaranteed  $CTR_{CEsat}$  minimizes power dissipation of the  $A_C$  voltage detection network that is placed in series with the LEDs. Eliminating the phototransistor base connection provides added electrical noise immunity from the transients found in many industrial control environments.

### AGENCY APPROVALS

- [UL 1577](#)
- [cUL 1577](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#)
- CQC
  - ILD620x:
    - [GB8898-2011](#)
    - [GB4943.1-2011](#)
  - ILQ620x:
    - [GB4943.1-2011](#)
    - [GB8898-2011](#)
- [FIMKO](#)

### ORDERING INFORMATION

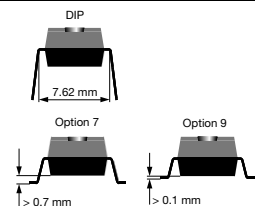


PART NUMBER

PACKAGE OPTION

 TAPE  
AND  
REEL

x = D (Dual) or Q (Quad)



AGENCY CERTIFIED / PACKAGE	DUAL CHANNEL		QUAD CHANNEL	
	CTR (%)			
UL, cUL, FIMKO	50 to 600	100 to 600	50 to 600	100 to 600
DIP-8	ILD620	ILD620GB	-	-
SMD-8, option 7	ILD620-X007T	-	-	-
SMD-8, option 9	ILD620-X009T	ILD620GB-X009T	-	-
DIP-16	-	-	ILQ620	ILQ620GB
SMD-16, option 9	-	-	ILQ620-X009T <sup>(1)</sup>	ILQ620GB-X009T <sup>(1)</sup>



AGENCY CERTIFIED / PACKAGE	DUAL CHANNEL		QUAD CHANNEL	
	CTR (%)			
VDE, UL, cUL, FIMKO	50 to 600	100 to 600	50 to 600	100 to 600
DIP-16	-	-	ILQ620-X001	-
SMD-16, option 9	-	-	ILQ620-X019T <sup>(1)</sup>	-

**Notes**

- Additional options may be possible, please contact sales office
- <sup>(1)</sup> Also available in tubes, do not put T on the end

ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	6	V
Forward current		I <sub>F</sub>	60	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1.5	A
LED power dissipation	at 25 °C	P <sub>diss</sub>	100	mW
<b>OUTPUT</b>				
Collector emitter voltage		V <sub>CEO</sub>	70	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector current		I <sub>C</sub>	50	mA
Collector peak current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> ≤ 10 ms	I <sub>CM</sub>	100	mA
Output power dissipation	at 25 °C	P <sub>diss</sub>	150	mW
<b>COUPLER</b>				
Operating ambient temperature range		T <sub>amb</sub>	-55 to +110	°C
Storage temperature range		T <sub>stg</sub>	-55 to +125	°C
Soldering temperature <sup>(1)</sup>	2 mm from case, ≤ 10 s	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>(2)</sup> Refer to reflow profile for soldering conditions for surface mounted parts (SMD), and wave profile for soldering conditions for through hole parts (DIP), please go to "Assembly Instructions" ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054))

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	1.15	1.3	V
Forward current	V <sub>R</sub> = ± 0.7 V		I <sub>F</sub>	-	2.5	20	μA
Capacitance	V <sub>F</sub> = 0 V, f = 1 MHz		C <sub>O</sub>	-	25	-	pF
Thermal resistance, junction to lead			R <sub>thJL</sub>	-	750	-	K/W
<b>OUTPUT</b>							
Collector emitter capacitance	V <sub>CE</sub> = 5 V, f = 1 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
	T <sub>A</sub> = 85 °C, V <sub>CE</sub> = 24 V		I <sub>CEO</sub>	-	2	50	μA
Thermal resistance, junction to lead			R <sub>thJL</sub>	-	500	-	K/W
<b>COUPLER</b>							
Off-state collector current	V <sub>F</sub> = ± 0.7 V, V <sub>CE</sub> = 24 V		I <sub>CEoff</sub>	-	1	10	μA
Collector emitter saturation voltage	I <sub>F</sub> = ± 8 mA, I <sub>CE</sub> = 2.4 mA	ILD620	V <sub>CEsat</sub>	-	-	0.4	V
		ILQ620	V <sub>CEsat</sub>	-	-	0.4	V
	I <sub>F</sub> = ± 1 mA, I <sub>CE</sub> = 0.2 mA	ILD620GB	V <sub>CEsat</sub>	-	-	0.4	V
		ILQ620GB	V <sub>CEsat</sub>	-	-	0.4	V

**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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Channel/channel CTR match	$I_F = \pm 5\text{ mA}$ , $V_{CE} = 5\text{ V}$		CTR <sub>X</sub> /CTR <sub>Y</sub>	1 to 1	-	3 to 1	
CTR symmetry	$I_{CE} (I_F = -5\text{ mA})/I_{CE} (I_F = +5\text{ mA})$		$I_{CE}(\text{RATIO})$	0.5	-	2	
Current transfer ratio (collector emitter saturated)	$I_F = \pm 1\text{ mA}$ , $V_{CE} = 0.4\text{ V}$	ILD620	CTR <sub>CEsat</sub>	-	60	-	%
		ILQ620	CTR <sub>CEsat</sub>	-	60	-	%
Current transfer ratio (collector emitter)	$I_F = \pm 5\text{ mA}$ , $V_{CE} = 5\text{ V}$	ILD620	CTR <sub>CE</sub>	50	80	600	%
		ILQ620	CTR <sub>CE</sub>	50	80	600	%
Current transfer ratio (collector emitter saturated)	$I_F = \pm 1\text{ mA}$ , $V_{CE} = 0.4\text{ V}$	ILD620GB	CTR <sub>CEsat</sub>	30	-	-	%
		ILQ620GB	CTR <sub>CEsat</sub>	30	-	-	%
Current transfer ratio (collector emitter)	$I_F = \pm 5\text{ mA}$ , $V_{CE} = 5\text{ V}$	ILD620GB	CTR <sub>CEsat</sub>	100	200	600	%
		ILQ620GB	CTR <sub>CEsat</sub>	100	200	600	%

SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
<b>NON-SATURATED</b>							
On time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ , 50 % of $V_{PP}$	$t_{on}$	-	3	-	$\mu\text{s}$	
Rise time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ , 50 % of $V_{PP}$	$t_r$	-	20	-	$\mu\text{s}$	
Off time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ , 50 % of $V_{PP}$	$t_{off}$	-	2.3	-	$\mu\text{s}$	
Fall time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ , 50 % of $V_{PP}$	$t_f$	-	2	-	$\mu\text{s}$	
Propagation H to L	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ , 50 % of $V_{PP}$	$t_{PHL}$	-	1.1	-	$\mu\text{s}$	
Propagation L to H	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ , 50 % of $V_{PP}$	$t_{PLH}$	-	2.5	-	$\mu\text{s}$	
<b>SATURATED</b>							
On time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $V_{TH} = 1.5\text{ V}$	$t_{on}$	-	4.3	-	$\mu\text{s}$	
Rise time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $V_{TH} = 1.5\text{ V}$	$t_r$	-	2.8	-	$\mu\text{s}$	
Off time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $V_{TH} = 1.5\text{ V}$	$t_{off}$	-	2.5	-	$\mu\text{s}$	
Fall time	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $V_{TH} = 1.5\text{ V}$	$t_f$	-	11	-	$\mu\text{s}$	
Propagation H to L	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $V_{TH} = 1.5\text{ V}$	$t_{PHL}$	-	2.6	-	$\mu\text{s}$	
Propagation L to H	$I_F = \pm 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $V_{TH} = 1.5\text{ V}$	$t_{PLH}$	-	7.2	-	$\mu\text{s}$	

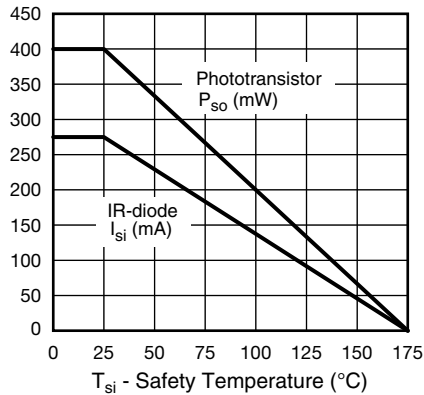


Fig. 1 - Derating Diagram

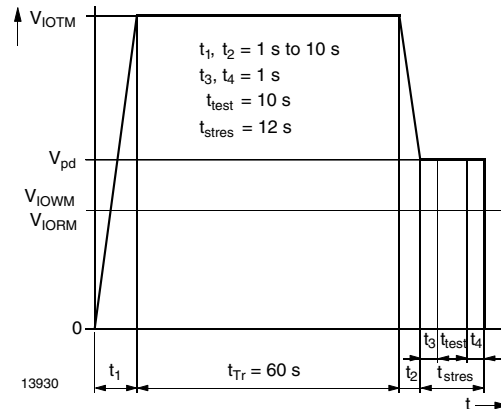


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 110 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	$t = 1 \text{ min}$	$V_{ISO}$	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	$V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 150 \text{ }^\circ\text{C}$ (construction test only)	$R_{IO}$	$\geq 10^9$	$\Omega$
Output safety power		$P_{SO}$	400	mW
Input safety current		$I_{SI}$	275	mA
Safety temperature		$T_{SI}$	175	$^\circ\text{C}$
Creepage distance			$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	mm
Partial discharge test voltage - routine test	100 %, $t_{test} = 1 \text{ s}$	$V_{pd}$	1.669	$\text{kV}_{peak}$
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60 \text{ s}, t_{test} = 10 \text{ s}$ , (see Fig. 2)	$V_{pd}$	1.424	$\text{kV}_{peak}$

**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)

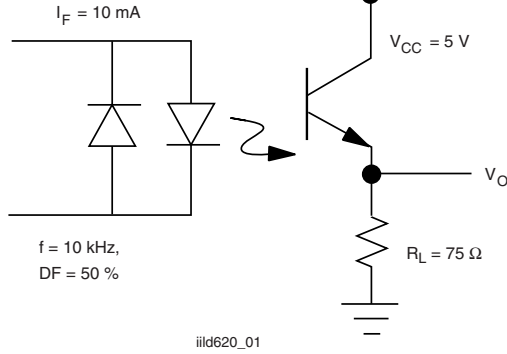


Fig. 3 - Non-Saturated Switching Timing

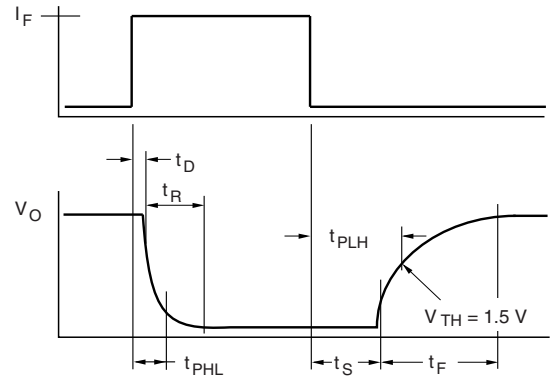


Fig. 6 - Saturated Switching Timing

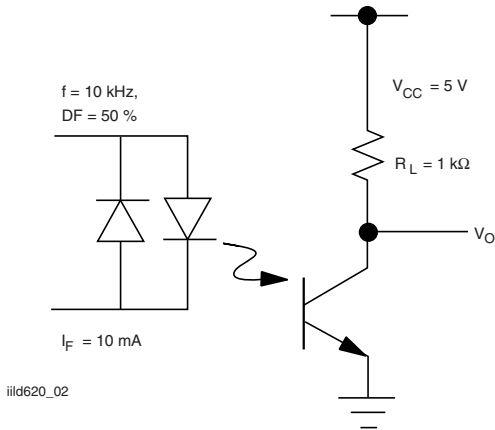


Fig. 4 - Saturated Switching Timing

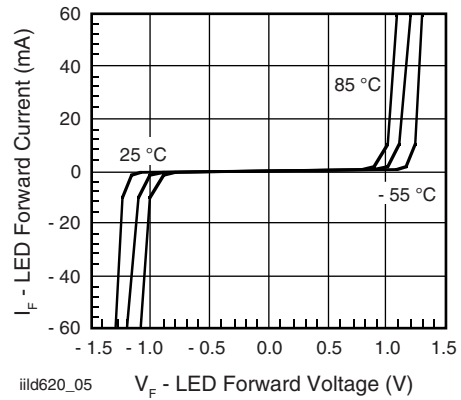


Fig. 7 - LED Forward Current vs. Forward Voltage

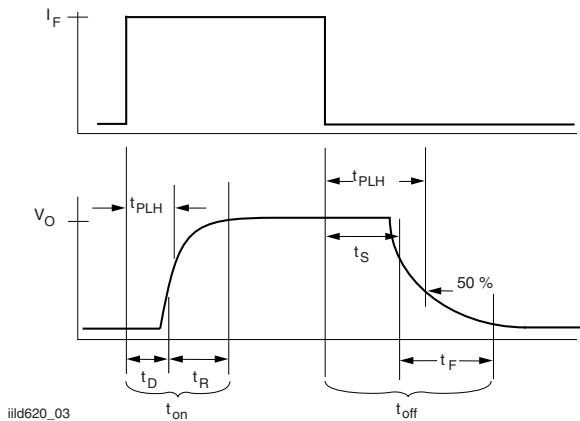


Fig. 5 - Non-Saturated Switching Timing

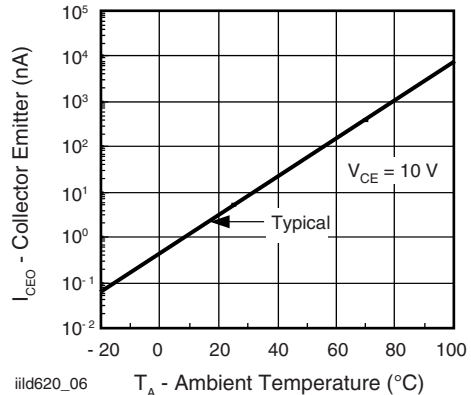


Fig. 8 - Collector Emitter Leakage vs. Temperature

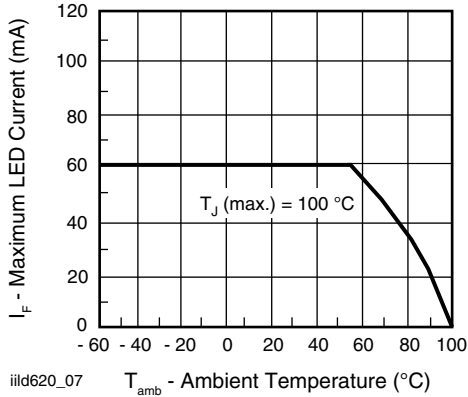


Fig. 9 - Maximum LED Current vs. Ambient Temperature

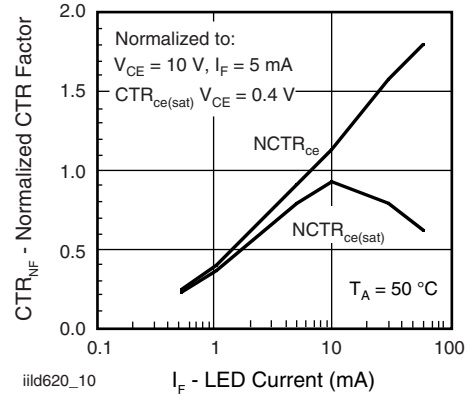


Fig. 12 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

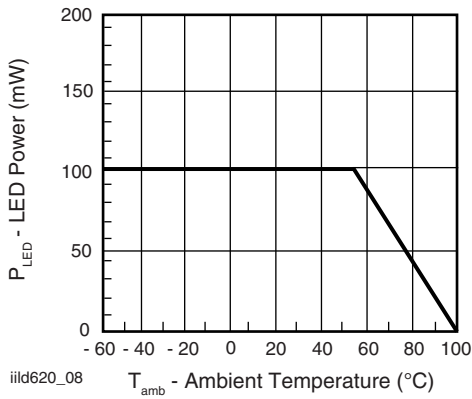


Fig. 10 - Maximum LED Power Dissipation

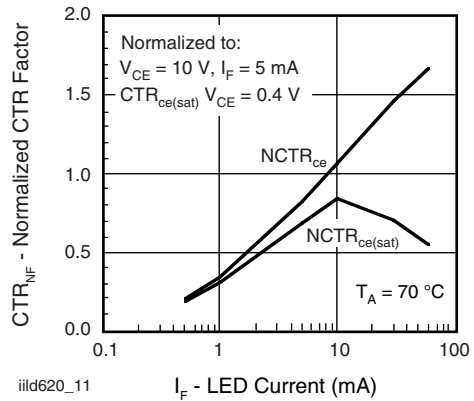


Fig. 13 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

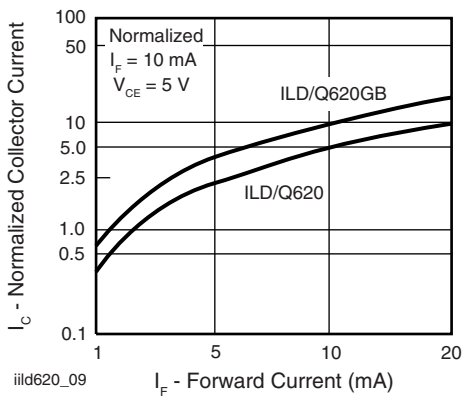


Fig. 11 - Collector Current vs. Diode Forward Current

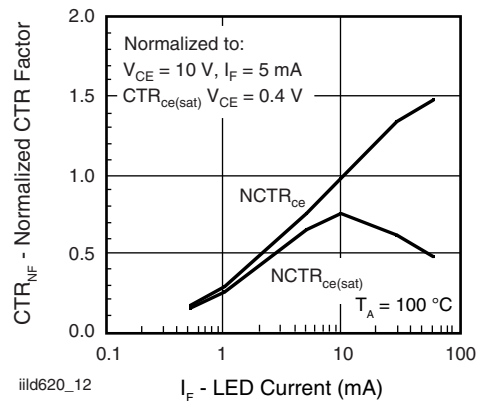


Fig. 14 - Normalization Factor for Non-Saturated and Saturated CTR vs.  $I_F$

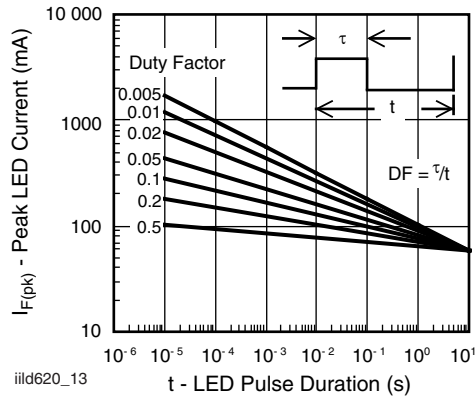


Fig. 15 - Peak LED Current vs. Pulse Duration,  $\tau$

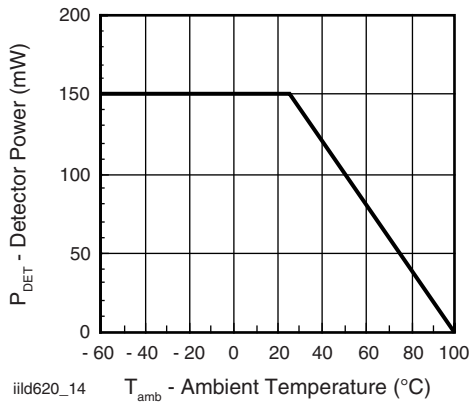


Fig. 16 - Maximum Detector Power Dissipation

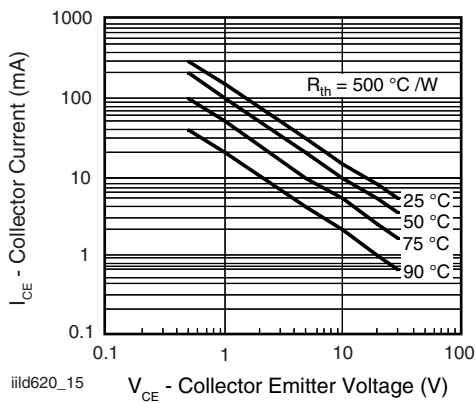
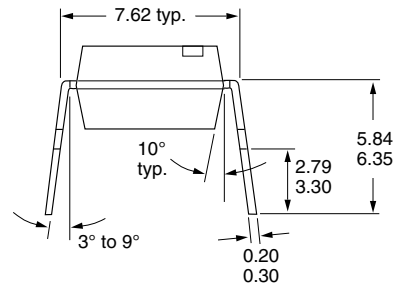
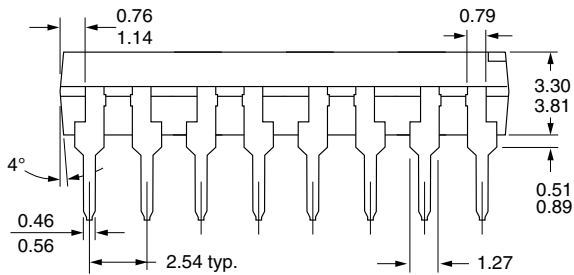
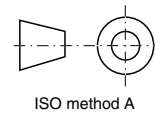
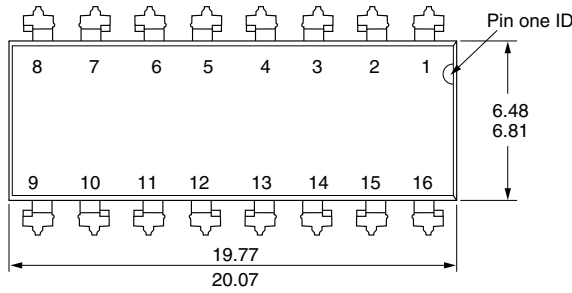
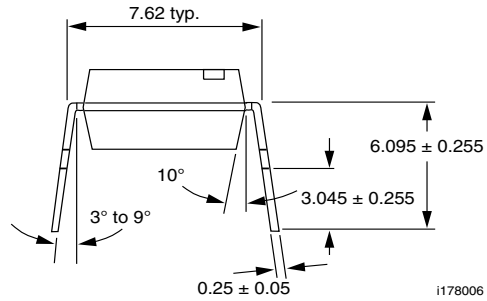
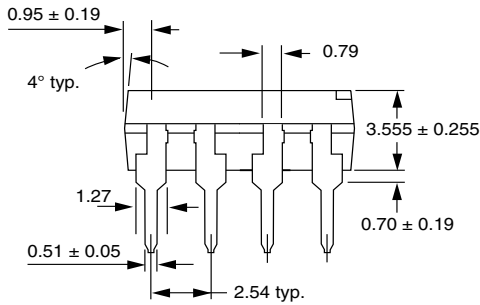
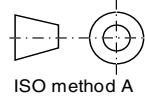
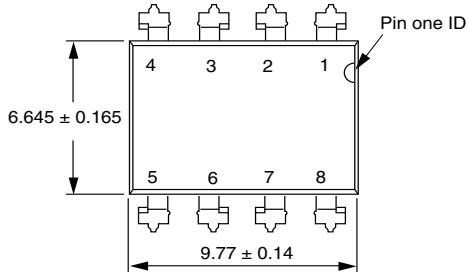


Fig. 17 - Maximum Collector Current vs. Collector Voltage

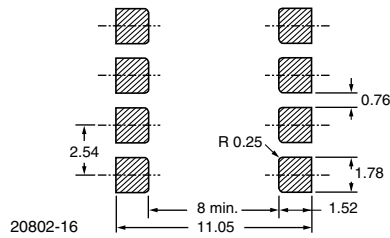
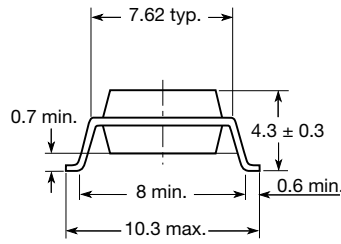


## PACKAGE DIMENSIONS in millimeters

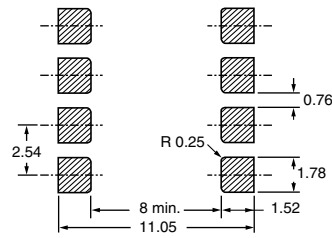
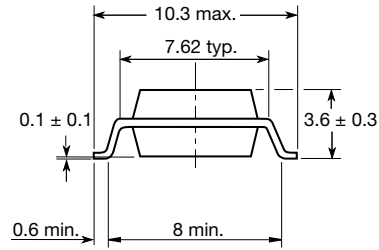




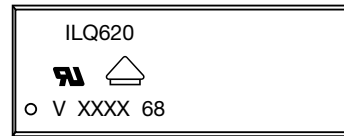
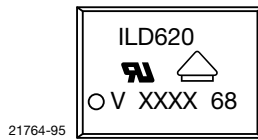
### Option 7



### Option 9



## PACKAGE MARKING (example)



### Notes

- XXXX = LMC (lot marking code)
- Only option 1 and 7 reflected in the package marking
- The VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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