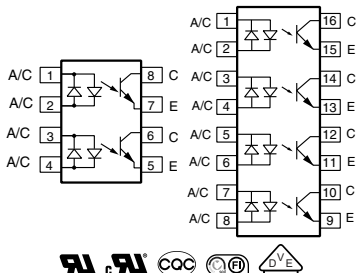


Optocoupler, Phototransistor Output, AC Input (Dual, Quad Channel)

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 test voltage 5300 V_{RMS}
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

DESCRIPTION

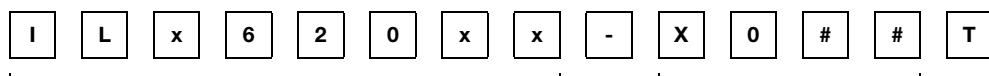
The ILD620, ILQ620, ILD620GB, and ILQ620GB are multi-channel input phototransistor optocouplers that use inverse parallel GaAs IRLED emitter and high gain NPN silicon phototransistors per channel. These devices are constructed using over/under leadframe optical coupling and double molded insulation resulting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

- UL1577, file no. E52744 system code H, double protection
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884)
- FIMKO
- CQC GB4943.1-2011 and GB8898:2011 (suitable for installation altitude below 2000 m)

ORDERING INFORMATION

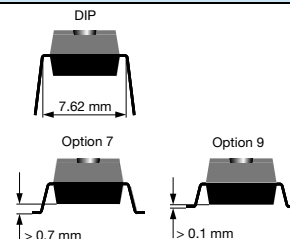


PART NUMBER

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 ⁽¹⁾	-	-	-
SMD-8, option 9	ILD620-X009T ⁽¹⁾	ILD620GB-X009T ⁽¹⁾	-	-
DIP-16	-	-	ILQ620	ILQ620GB
SMD-16, option 7	-	-	ILQ620-X007	-
SMD-16, option 9	-	-	ILQ620-X009T ⁽¹⁾	ILQ620GB-X009T ⁽¹⁾
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 ⁽¹⁾	-

Notes

- Additional options may be possible, please contact sales office.

⁽¹⁾ Also available in tubes, do not put T on the end.



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
INPUT					
Forward current			I_F	± 60	mA
Surge current			I_{FSM}	± 1.5	A
Power dissipation			P_{diss}	100	mW
Derate linearly from 25 °C				1.3	mW/°C
OUTPUT					
Collector emitter breakdown voltage			BV_{CEO}	70	V
Collector current			I_C	50	mA
	$t < 1\text{ s}$		I_C	100	mA
Power dissipation			P_{diss}	150	mW
Derate from 25 °C				2	mW/°C
COUPLER					
Isolation test voltage	$t = 1\text{ s}$		V_{ISO}	5300	V_{RMS}
Isolation voltage			V_{IORM}	890	V_P
Total power dissipation			P_{tot}	250	mW
Package dissipation		ILD620		400	mW
		ILD620GB		400	mW
Derate from 25 °C				5.33	mW/°C
Package dissipation		ILQ620		500	mW
		ILQ620GB		500	mW
Derate from 25 °C				6.67	mW/°C
Creepage distance				≥ 7	mm
Clearance distance				≥ 7	mm
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$		R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$		R_{IO}	$\geq 10^{11}$	Ω
Storage temperature			T_{stg}	- 55 to + 150	°C
Operating temperature			T_{amb}	- 55 to + 100	°C
Junction temperature			T_j	100	°C
Soldering temperature ⁽¹⁾	2 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	$I_F = \pm 10\text{ mA}$		V_F	1	1.15	1.3	V
Forward current	$V_R = \pm 0.7\text{ V}$		I_F		2.5	20	μA
Capacitance	$V_F = 0\text{ V}, f = 1\text{ MHz}$		C_O		25		pF
Thermal resistance, junction to lead			R_{thJL}		750		K/W
OUTPUT							
Collector emitter capacitance	$V_{CE} = 5\text{ V}, f = 1\text{ MHz}$		C_{CE}		6.8		pF
Collector emitter leakage current	$V_{CE} = 24\text{ V}$		I_{CEO}		10	100	nA
	$T_A = 85\text{ }^{\circ}\text{C}, V_{CE} = 24\text{ V}$		I_{CEO}		2	50	μA
Thermal resistance, junction to lead			R_{thJL}		500		K/W



ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
COUPLER							
Off-state collector current	$V_F = \pm 0.7\text{ V}$, $V_{CE} = 24\text{ V}$		I_{CEoff}		1	10	μA
Collector emitter saturation voltage	$I_F = \pm 8\text{ mA}$, $I_{CE} = 2.4\text{ mA}$	ILD620	V_{CEsat}			0.4	V
		ILQ620	V_{CEsat}			0.4	V
	$I_F = \pm 1\text{ mA}$, $I_{CE} = 0.2\text{ mA}$	ILD620GB	V_{CEsat}			0.4	V
		ILQ620GB	V_{CEsat}			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/CTRY	1 to 1		3 to 1	
CTR symmetry	$I_{CE} (I_F = -5\text{ mA}) / I_{CE} (I_F = +5\text{ mA})$		$I_{CE(RATIO)}$	0.5		2	
Current transfer ratio (collector emitter saturated)	$I_F = \pm 1\text{ mA}$, $V_{CE} = 0.4\text{ V}$	ILD620	CTR_{CEsat}		60		%
		ILQ620	CTR_{CEsat}		60		%
Current transfer ratio (collector emitter)	$I_F = \pm 5\text{ mA}$, $V_{CE} = 5\text{ V}$	ILD620	CTR_{CE}	50	80	600	%
		ILQ620	CTR_{CE}	50	80	600	%
Current transfer ratio (collector emitter saturated)	$I_F = \pm 1\text{ mA}$, $V_{CE} = 0.4\text{ V}$	ILD620GB	CTR_{CEsat}	30			%
		ILQ620GB	CTR_{CEsat}	30			%
Current transfer ratio (collector emitter)	$I_F = \pm 5\text{ mA}$, $V_{CE} = 5\text{ V}$	ILD620GB	CTR_{CEsat}	100	200	600	%
		ILQ620GB	CTR_{CEsat}	100	200	600	%

SAFETY AND INSULATION RATED PARAMETERS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Partial discharge test voltage - routine test	100 %, $t_{test} = 1\text{ s}$	V_{pd}	1.669			kV
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60\text{ s}$, $t_{test} = 10\text{ s}$, (see figure 2)	V_{IOTM}	10			kV
		V_{pd}	1.424			kV
Insulation resistance	$V_{IO} = 500\text{ V}$	R_{IO}	10^{12}			Ω
	$V_{IO} = 500\text{ V}$, $T_{amb} = 100\text{ }^{\circ}\text{C}$	R_{IO}	10^{11}			Ω
	$V_{IO} = 500\text{ V}$, $T_{amb} = 150\text{ }^{\circ}\text{C}$ (construction test only)	R_{IO}	10^9			Ω
Forward current		I_{si}			275	mA
Power dissipation		P_{SO}			400	mW
Rated impulse voltage		V_{IOTM}			10	kV
Safety temperature		T_{si}			175	$^{\circ}\text{C}$

Note

- According to DIN EN 60747-5-5 (VDE 0884) (see figure 2). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

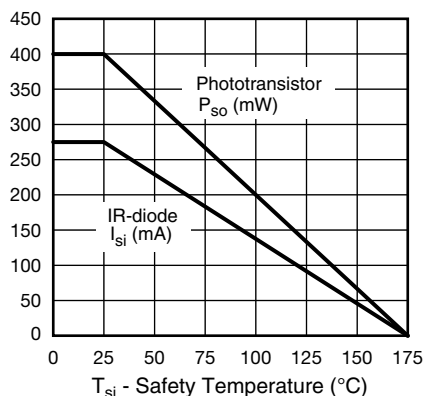


Fig. 1 - Derating Diagram

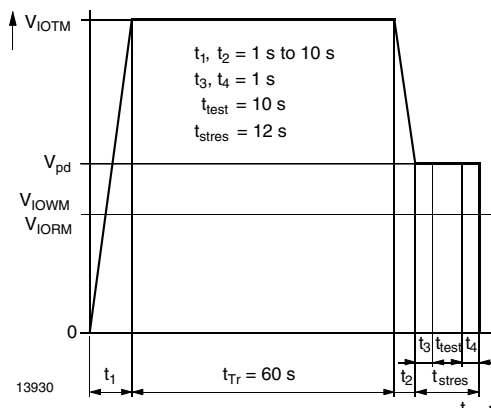


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SWITCHING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED						
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		μs
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		μs
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		μs
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		μs
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		μs
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		μs
SATURATED						
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		μs
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		μs
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		μs
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		μs
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		μs
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		μs

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

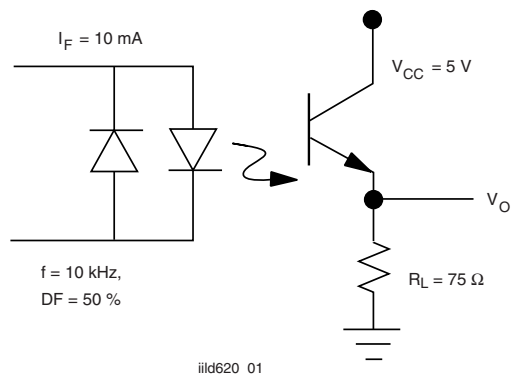


Fig. 3 - Non-Saturated Switching Timing

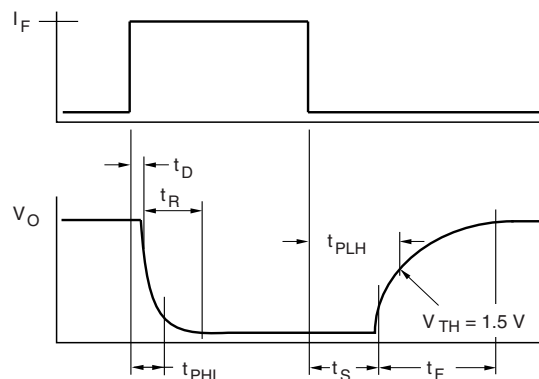


Fig. 6 - Saturated Switching Timing

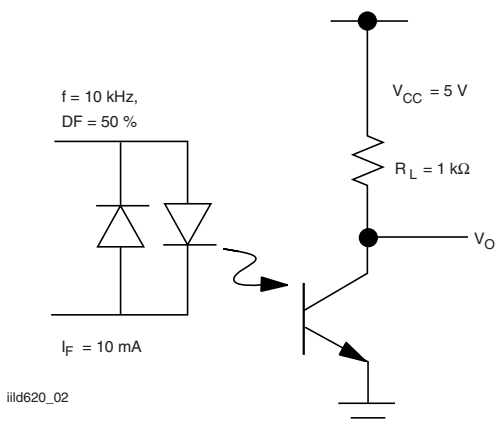


Fig. 4 - Saturated Switching Timing

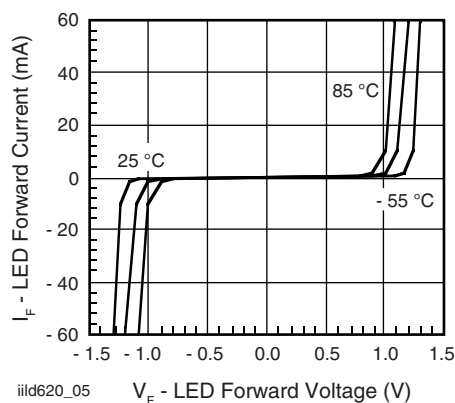


Fig. 7 - LED Forward Current vs. Forward Voltage

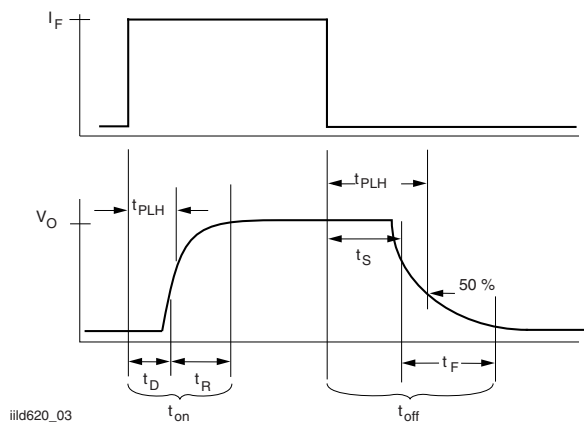


Fig. 5 - Non-Saturated Switching Timing

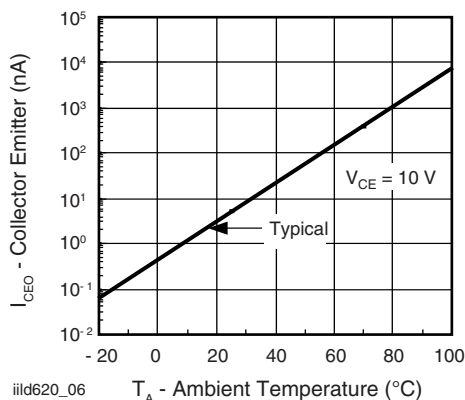


Fig. 8 - Collector Emitter Leakage vs. Temperature

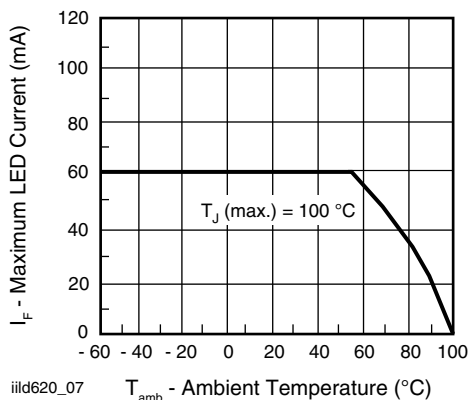


Fig. 9 - Maximum LED Current vs. Ambient Temperature

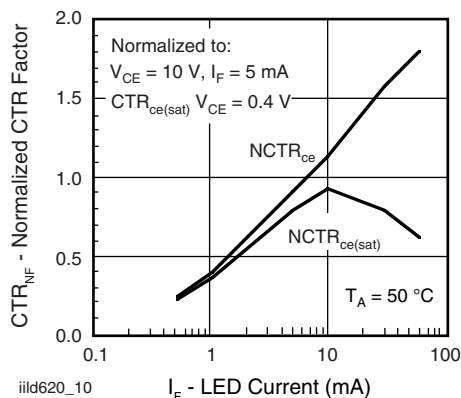
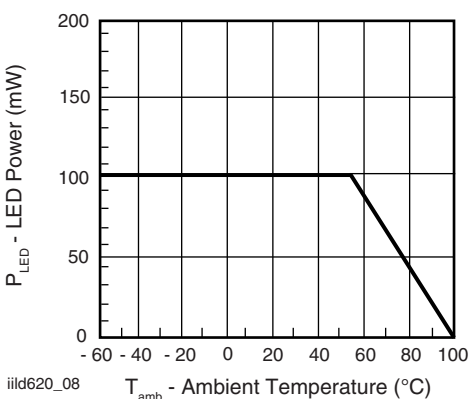

Fig. 12 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F


Fig. 10 - Maximum LED Power Dissipation

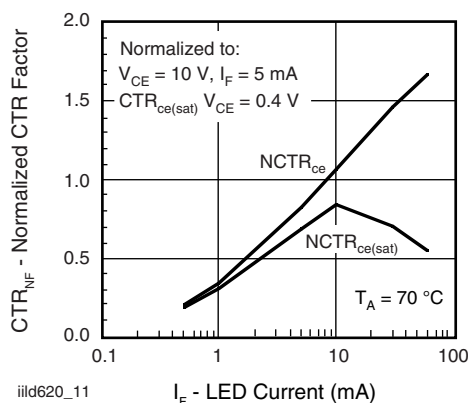
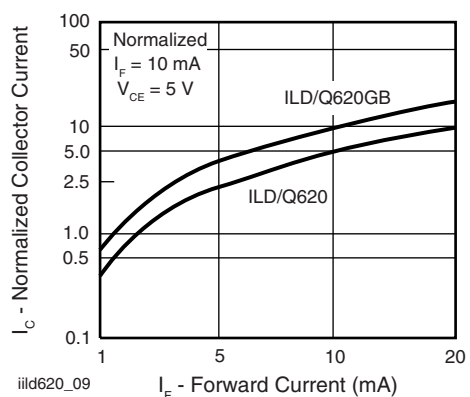
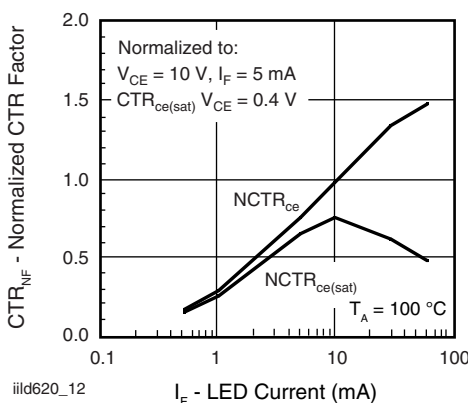

Fig. 13 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F


Fig. 11 - Collector Current vs. Diode Forward Current


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

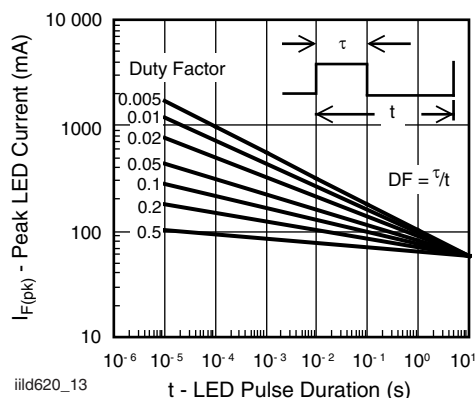
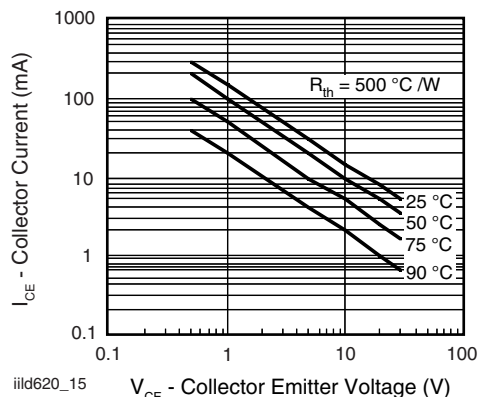

Fig. 15 - Peak LED Current vs. Pulse Duration, τ


Fig. 17 - Maximum Collector Current vs. Collector Voltage

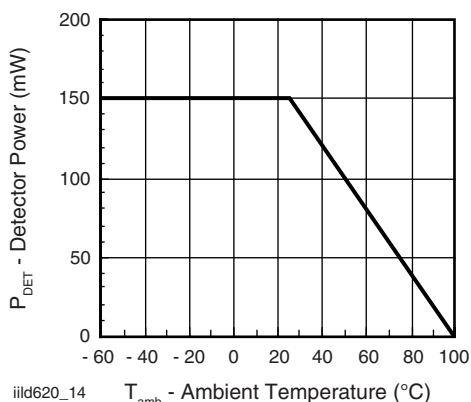
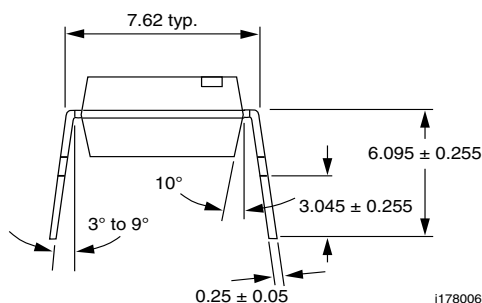
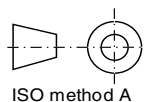
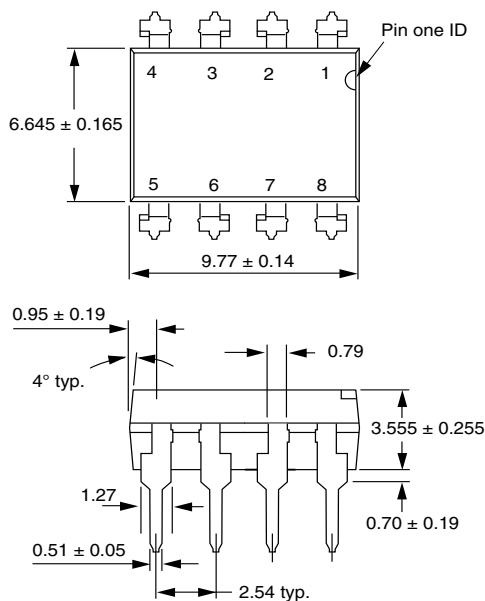
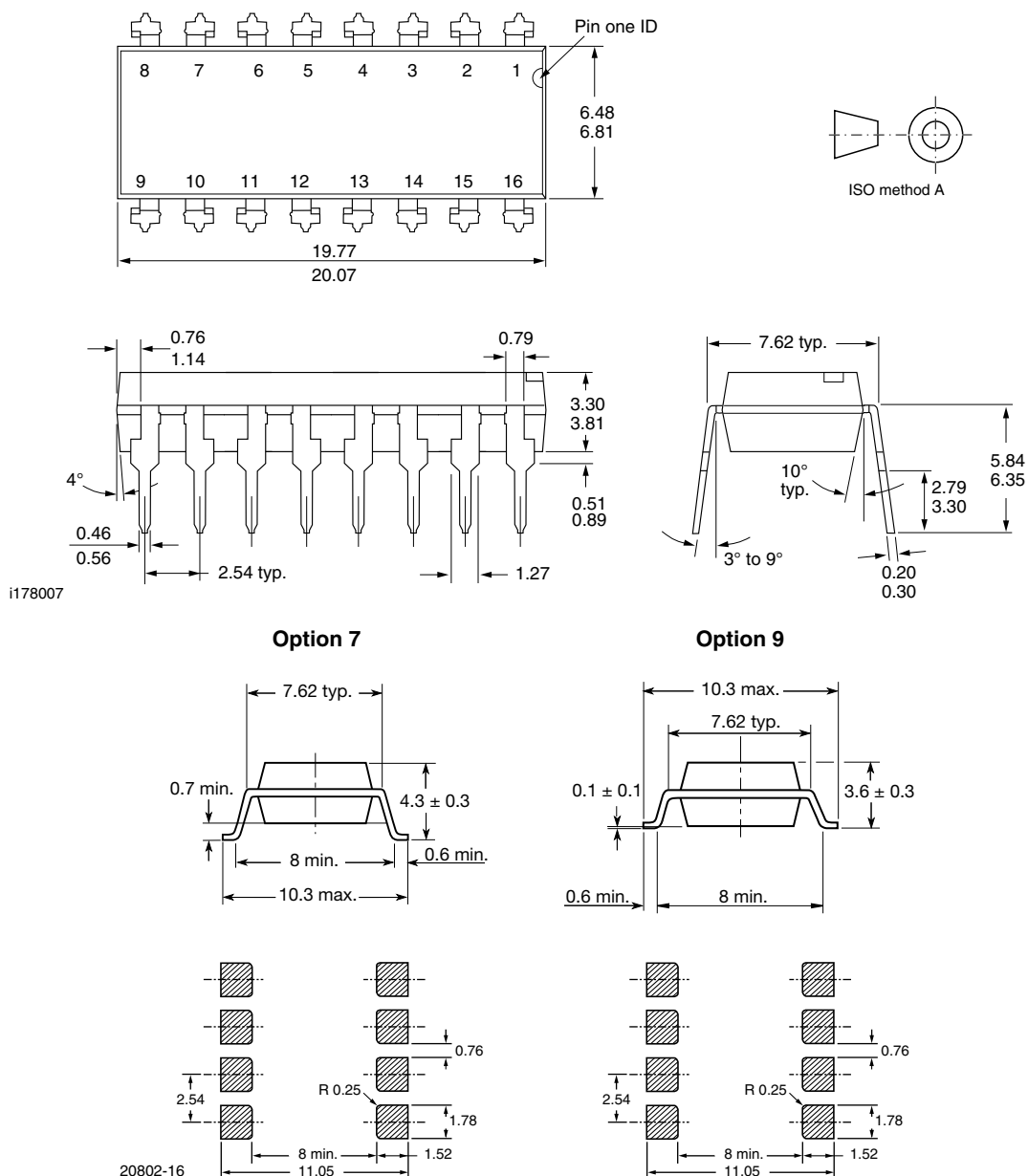


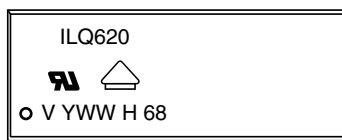
Fig. 16 - Maximum Detector Power Dissipation

PACKAGE DIMENSIONS in millimeters





PACKAGE MARKING (example)



Notes

- 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.



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