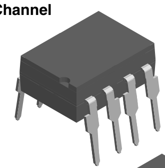
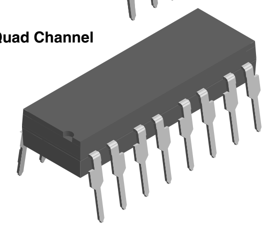
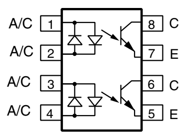
Optocoupler, Phototransistor Output, AC Input (Dual, Quad Channel)

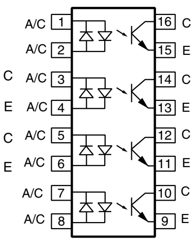
Dual Channel



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 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

Pb-free
e3
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)

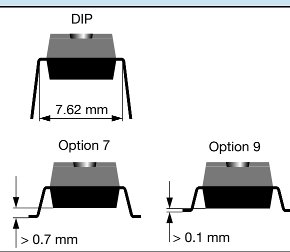
ORDERING INFORMATION

I	L	x	6	2	0	x	x	-	X	0	#	#	T

PART NUMBER — x = D (Dual) or Q (Quad)

PACKAGE OPTION

TAPE AND REEL



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 °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 s		I_C	100	mA
Power dissipation			P_{diss}	150	mW
Derate from 25 °C				2	mW/°C
COUPLER					
Isolation test voltage	t = 1 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 V, T_{amb} = 25 °C		R_{IO}	≥ 10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C		R_{IO}	≥ 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 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = ± 10 mA		V_F	1	1.15	1.3	V
Forward current	V_R = ± 0.7 V		I_F		2.5	20	µA
Capacitance	V_F = 0 V, f = 1 MHz		C_O		25		pF
Thermal resistance, junction to lead			R_{thJL}		750		K/W
OUTPUT							
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}		6.8		pF
Collector emitter leakage current	V_{CE} = 24 V		I_{CEO}		10	100	nA
	T_A = 85 °C, V_{CE} = 24 V		I_{CEO}		2	50	µA
Thermal resistance, junction to lead			R_{thJL}		500		K/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
COUPLER							
Off-state collector current	V_F = ± 0.7 V, V_{CE} = 24 V		I_{CEoff}		1	10	µA
Collector emitter saturation voltage	I_F = ± 8 mA, I_{CE} = 2.4 mA	ILD620	V_{CEsat}			0.4	V
		ILQ620	V_{CEsat}			0.4	V
	I_F = ± 1 mA, I_{CE} = 0.2 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 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Channel/channel CTR match	I_F = ± 5 mA, V_{CE} = 5 V		CTRX/CTRY	1 to 1		3 to 1	
CTR symmetry	I_{CE} (I_F = - 5 mA)/I_{CE} (I_F = + 5 mA)		$I_{CE(RATIO)}$	0.5		2	
Current transfer ratio (collector emitter saturated)	I_F = ± 1 mA, V_{CE} = 0.4 V	ILD620	CTR_{CEsat}		60		%
		ILQ620	CTR_{CEsat}		60		%
Current transfer ratio (collector emitter)	I_F = ± 5 mA, V_{CE} = 5 V	ILD620	CTR_{CE}	50	80	600	%
		ILQ620	CTR_{CE}	50	80	600	%
Current transfer ratio (collector emitter saturated)	I_F = ± 1 mA, V_{CE} = 0.4 V	ILD620GB	CTR_{CEsat}	30			%
		ILQ620GB	CTR_{CEsat}	30			%
Current transfer ratio (collector emitter)	I_F = ± 5 mA, V_{CE} = 5 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 s	V_{pd}	1.669			kV
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see figure 2)	V_{IOTM}	10			kV
		V_{pd}	1.424			kV
Insulation resistance	V_{IO} = 500 V	R_{IO}	10^{12}			Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}			Ω
	V_{IO} = 500 V, T_{amb} = 150 °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	°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.

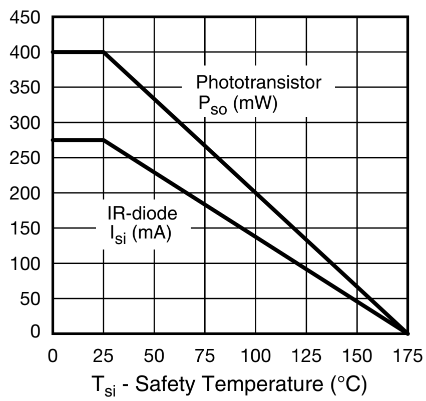


Fig. 1 - Derating Diagram

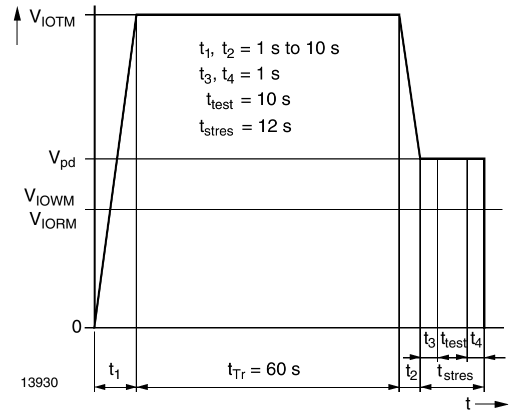


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
NON-SATURATED						
On time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_{on}		3		µs
Rise time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_r		20		µs
Off time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_off		2.3		µs
Fall time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_f		2		µs
Propagation H to L	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_{PHL}		1.1		µs
Propagation L to H	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_{PLH}		2.5		µs
SATURATED						
On time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_{on}		4.3		µs
Rise time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_r		2.8		µs
Off time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_off		2.5		µs
Fall time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_f		11		µs
Propagation H to L	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_{PHL}		2.6		µs
Propagation L to H	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_{PLH}		7.2		µs

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

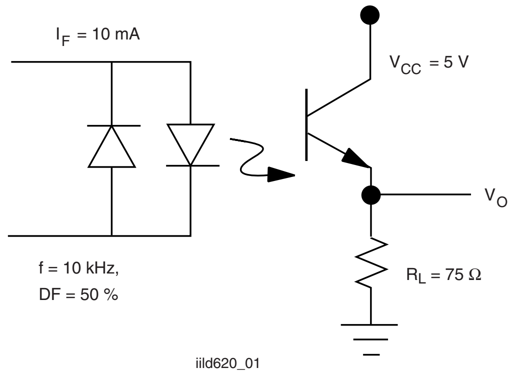


Fig. 3 - Non-Saturated Switching Timing

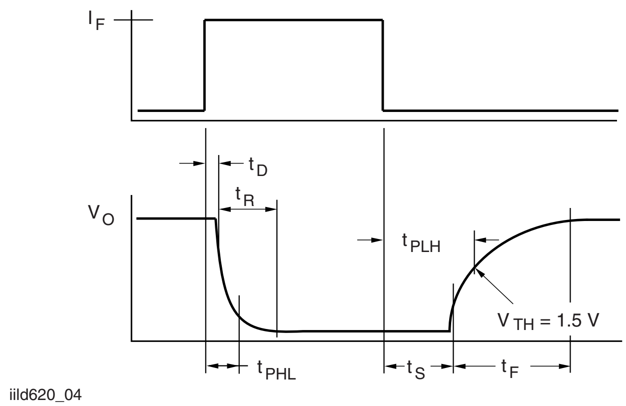


Fig. 6 - Saturated Switching Timing

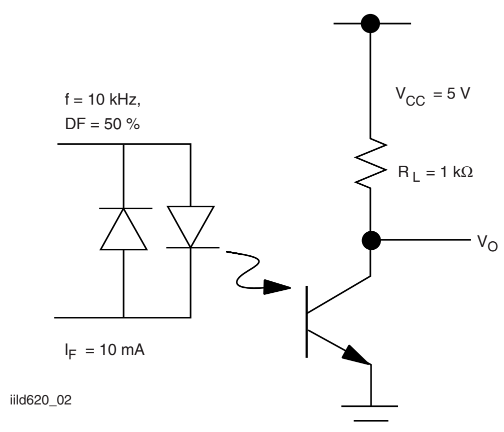


Fig. 4 - Saturated Switching Timing

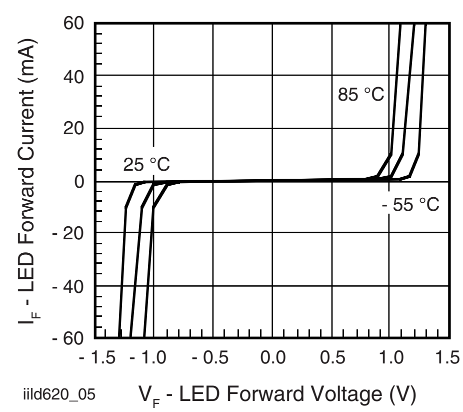


Fig. 7 - LED Forward Current vs.Forward Voltage

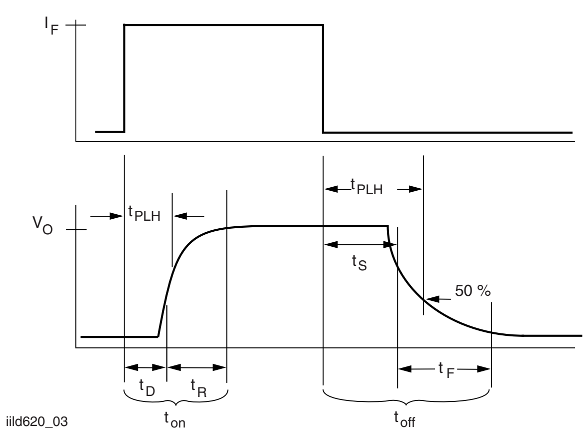


Fig. 5 - Non-Saturated Switching Timing

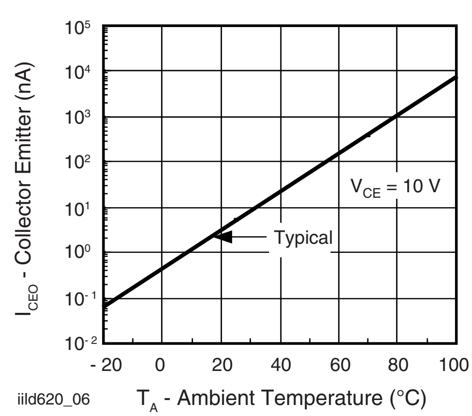


Fig. 8 - Collector Emitter Leakage vs. Temperature

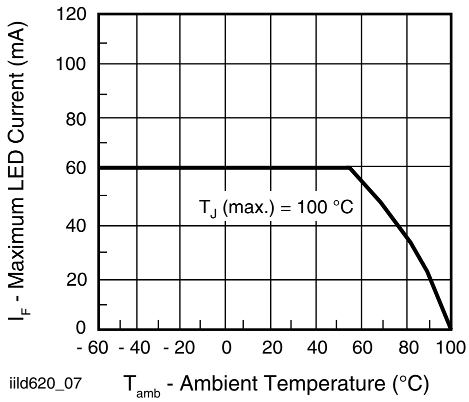


Fig. 9 - Maximum LED Current vs. Ambient Temperature

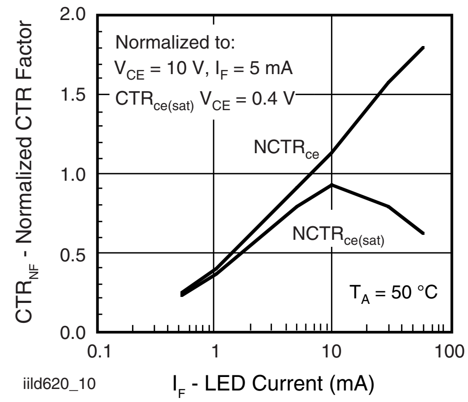


Fig. 12 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F

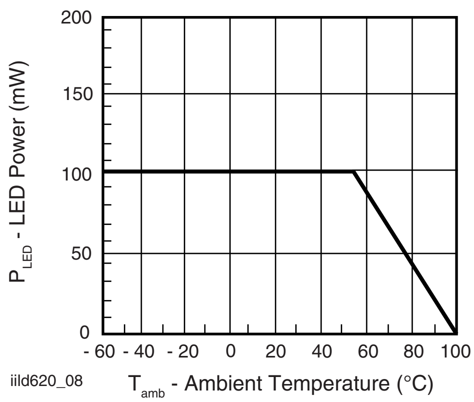


Fig. 10 - Maximum LED Power Dissipation

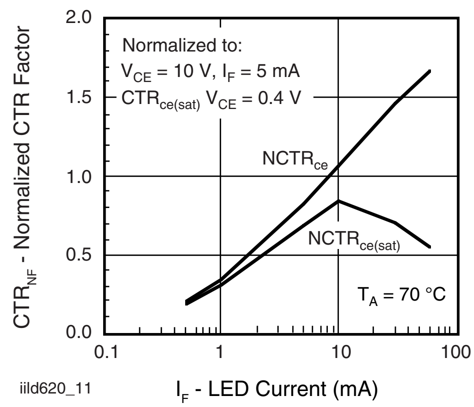


Fig. 13 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F

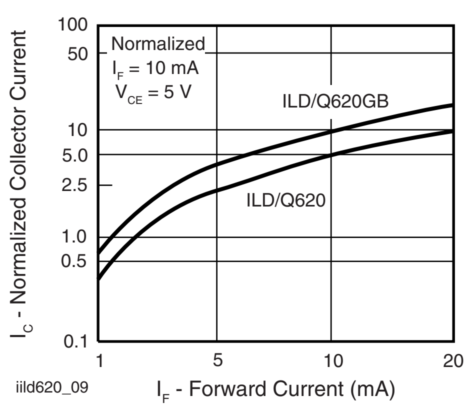


Fig. 11 - Collector Current vs. Diode Forward Current

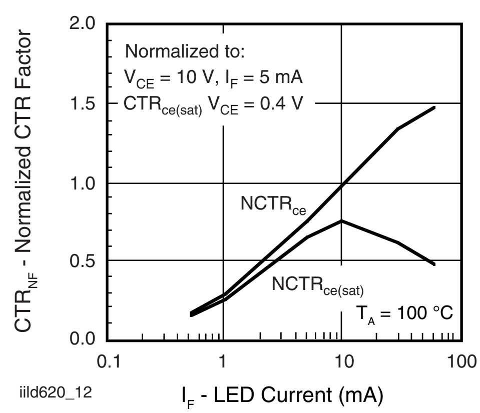


Fig. 14 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F

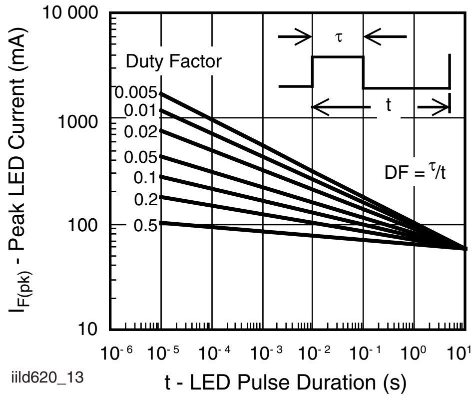


Fig. 15 - Peak LED Current vs. Pulse Duration, τ

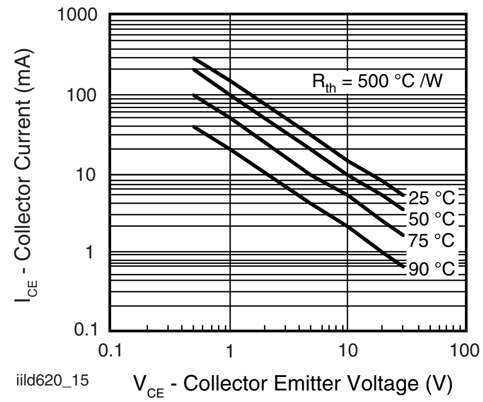


Fig. 17 - Maximum Collector Current vs. Collector Voltage

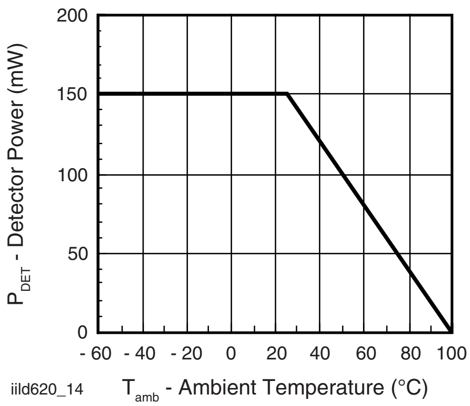
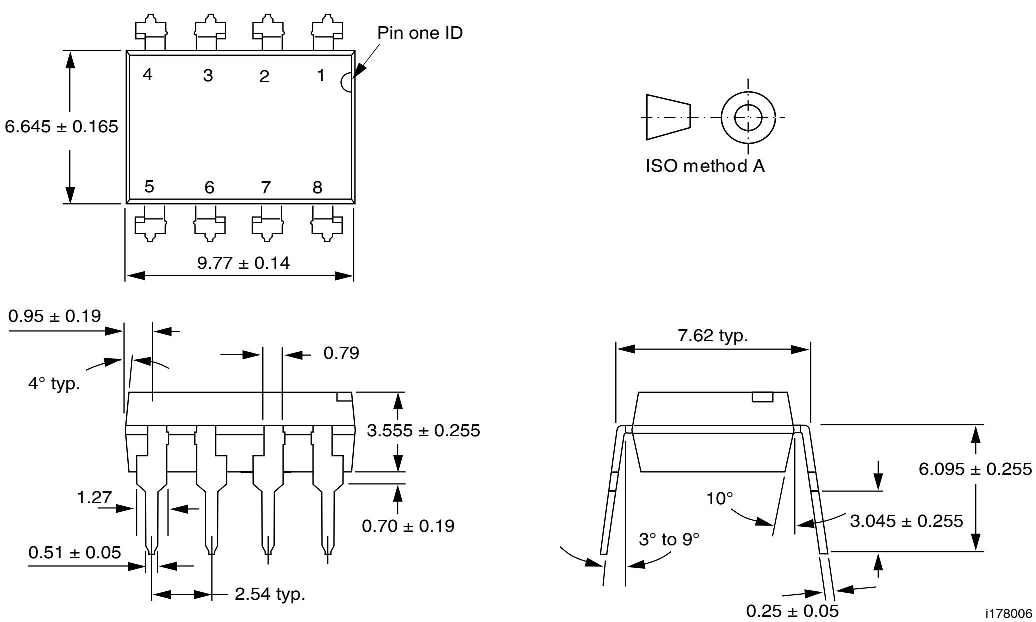
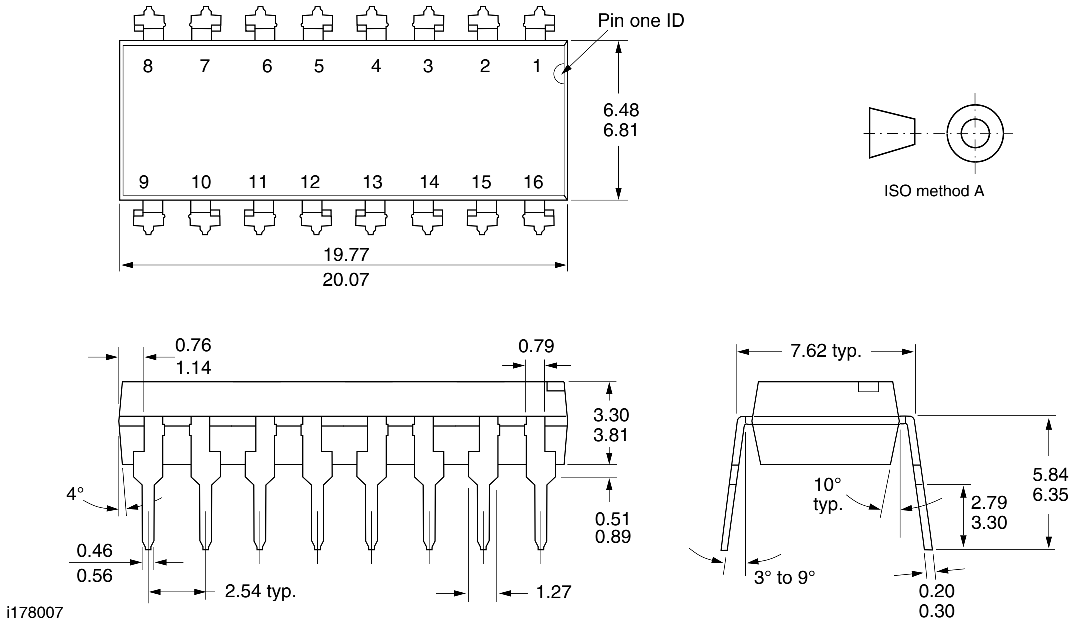
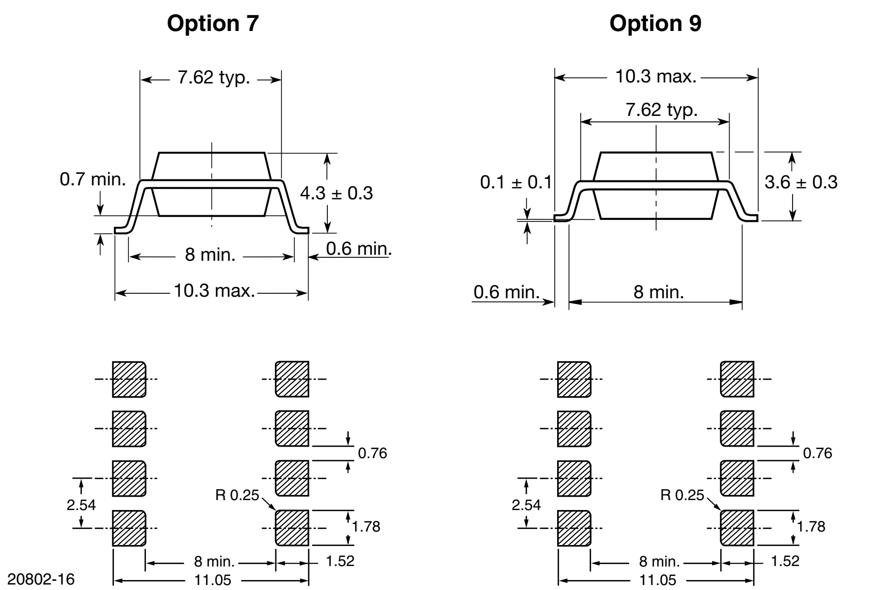


Fig. 16 - Maximum Detector Power Dissipation

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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