

## Optocoupler, Phototransistor Output, AC Input (Dual, 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  $5300\text{ V}_{RMS}$
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

### Agency Approvals

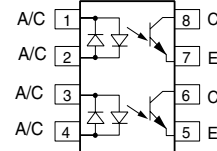
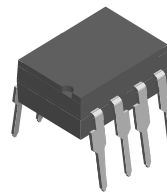
- UL1577, File No. E52744 System Code H or J, Double Protection
- CSA 93751
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending  
Available with Option 1
- BSI IEC60950 IEC60065

### Description

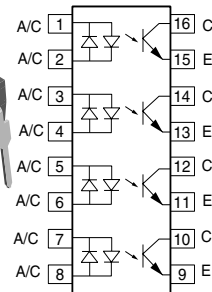
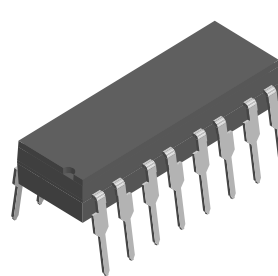
The ILD620/ ILQ620 and ILD620GB/ ILQ620GB are multi-channel input phototransistor optocouplers that use inverse parallel GaAs IRLED emitter and high gain NPN silicon phototransistors per channel. These devices are constructed using over/under leadframe optical coupling and double molded insulation resulting 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 ILD/Q620GB with its low  $I_F$  guaranteed  $CTR_{CESat}$  minimizes power dissipation of the AC 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.

Dual Channel



Quad Channel



1179053



### Order Information

Part	Remarks
ILD620	CTR > 50 %, DIP-8
ILD620GB	CTR > 100 %, DIP-8
ILQ620	CTR > 50 %, DIP-16
ILQ620GB	CTR > 100 %, DIP-16
ILD620-X007	CTR > 50 %, SMD-8 (option 7)
ILD620-X009	CTR > 50 %, SMD-8 (option 9)
ILD620GB-X009	CTR > 100 %, SMD-8 (option 9)
ILQ620-X009	CTR > 50 %, SMD-16 (option 9)
ILQ620GB-X009	CTR > 100 %, SMD-16 (option 9)

For additional information on the available options refer to Option Information.

### Absolute Maximum Ratings

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

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 Rating for extended periods of the time can adversely affect reliability.

### Input

Parameter	Test condition	Symbol	Value	Unit
Forward current		$I_F$	$\pm 60$	mA
Surge current		$I_{FSM}$	$\pm 1.5$	A
Power dissipation		$P_{diss}$	100	mW
Derate linearly from 25 °C			1.3	mW/°C

### Output

Parameter	Test condition	Symbol	Value	Unit
Collector-emitter breakdown voltage		$BV_{CEO}$	70	V
Collector current		$I_C$	50	mA
	$t < 1.0\text{ sec.}$	$I_C$	100	mA
Power dissipation		$P_{diss}$	150	mW
Derate from 25 °C			2.0	mW/°C

### Coupler

Parameter	Test condition	Part	Symbol	Value	Unit
Isolation test voltage	$t = 1.0\text{ sec.}$		$V_{ISO}$	5300	$V_{RMS}$
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				$\geq 7.0$	mm
Clearance				$\geq 7.0$	mm
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$		$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$		$R_{IO}$	$\geq 10^{11}$	$\Omega$
Storage temperature			$T_{stg}$	- 55 to + 150	°C
Operating temperature			$T_{amb}$	- 55 to + 100	°C
Junction temperature			$T_j$	100	°C
Soldering temperature	2.0 mm from case bottom		$T_{sld}$	260	°C



### Electrical Characteristics

T<sub>amb</sub> = 25 °C, unless otherwise specified

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.

### Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I <sub>F</sub> = ± 10 mA	V <sub>F</sub>	1.0	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 = 1.0 MHz	C <sub>O</sub>		25		pF
Thermal resistance, junction to lead		R <sub>THJL</sub>		750		K/W

### Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
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
	T <sub>A</sub> = 85 °C, V <sub>CE</sub> = 24 V	I <sub>CEO</sub>		2.0	50	μA
Thermal resistance, junction to lead		R <sub>THJL</sub>		500		K/W

### Coupler

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Off-state collector current	V <sub>F</sub> = ± 0.7 V, V <sub>CE</sub> = 24 V		I <sub>CE(OFF)</sub>		1.0	10	μA
Collector-emitter saturation voltage	I <sub>F</sub> = ± 8.0 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> = ± 1.0 mA, I <sub>CE</sub> = 0.2 mA	ILD620GB	V <sub>CEsat</sub>			0.4	V
		ILQ620GB	V <sub>CEsat</sub>			0.4	V

### Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Channel/Channel CTR match	I <sub>F</sub> = ± 5.0 mA, V <sub>CE</sub> = 5.0 V		CTR <sub>X</sub> /CTR <sub>Y</sub>	1 to 1		3 to 1	
CTR symmetry	I <sub>CE</sub> (I <sub>F</sub> = - 5.0 mA)/ I <sub>CE</sub> (I <sub>F</sub> = + 5.0 mA)		I <sub>CE</sub> (RATIO)	0.5		2.0	
Current Transfer Ratio (collector-emitter saturated)	I <sub>F</sub> = ± 1.0 mA, V <sub>CE</sub> = 0.4 V	ILD620	CTR <sub>CEsat</sub>		60		%
		ILQ620	CTR <sub>CEsat</sub>		60		%
Current Transfer Ratio (collector-emitter)	I <sub>F</sub> = ± 5.0 mA, V <sub>CE</sub> = 5.0 V	ILD620	CTR <sub>CE</sub>	50	80	600	%
		ILQ620	CTR <sub>CE</sub>	50	80	600	%
Current Transfer Ratio (collector-emitter saturated)	I <sub>F</sub> = ± 1.0 mA, V <sub>CE</sub> = 0.4 V	ILD620GB	CTR <sub>CEsat</sub>	30			%
		ILQ620GB	CTR <sub>CEsat</sub>	30			%
Current Transfer Ratio (collector-emitter)	I <sub>F</sub> = ± 5.0 mA, V <sub>CE</sub> = 5.0 V	ILD620GB	CTR <sub>CE</sub>	100	200	600	%
		ILQ620GB	CTR <sub>CE</sub>	100	200	600	%

### Switching Characteristics

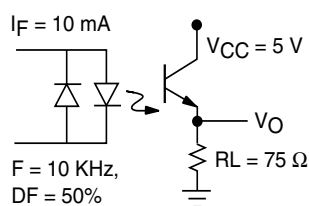
Non-saturated

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
On time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{on}$		3.0		$\mu\text{s}$
Rise time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_r$		20		$\mu\text{s}$
Off time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{off}$		2.3		$\mu\text{s}$
Fall time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_f$		2.0		$\mu\text{s}$
Propagation H-L	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{PHL}$		1.1		$\mu\text{s}$
Propagation L-H	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 75 \Omega$ , 50 % of $V_{PP}$	$t_{PLH}$		2.5		$\mu\text{s}$

Saturated

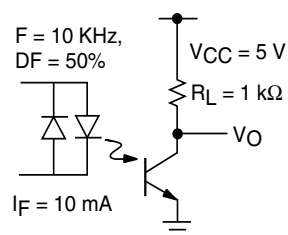
Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
On time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1.0 \text{ K}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{on}$		4.3		$\mu\text{s}$
Rise time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1.0 \text{ K}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_r$		2.8		$\mu\text{s}$
Off time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1.0 \text{ K}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{off}$		2.5		$\mu\text{s}$
Fall time	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1.0 \text{ K}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_f$		11		$\mu\text{s}$
Propagation H-L	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1.0 \text{ K}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{PHL}$		2.6		$\mu\text{s}$
Propagation L-H	$I_F = \pm 10 \text{ mA}$ , $V_{CC} = 5.0 \text{ V}$ , $R_L = 1.0 \text{ K}\Omega$ , $V_{TH} = 1.5 \text{ V}$	$t_{PLH}$		7.2		$\mu\text{s}$

### Typical Characteristics ( $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified)



ild620\_01

Figure 1. Non-saturated Switching Timing



ild620\_02

Figure 2. Saturated Switching Timing

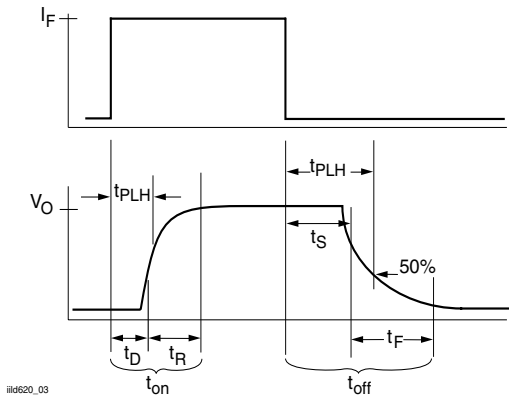


Figure 3. Non-saturated Switching Timing

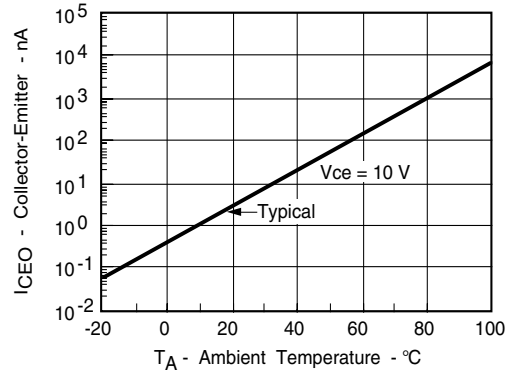


Figure 6. Collector-Emitter Leakage vs. Temperature

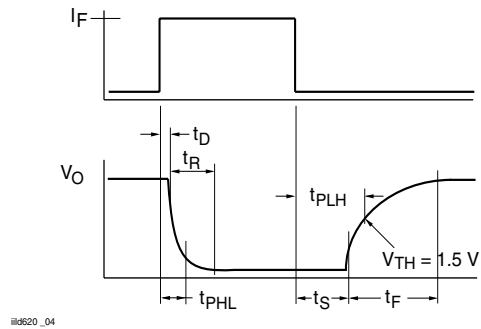


Figure 4. Saturated Switching Timing

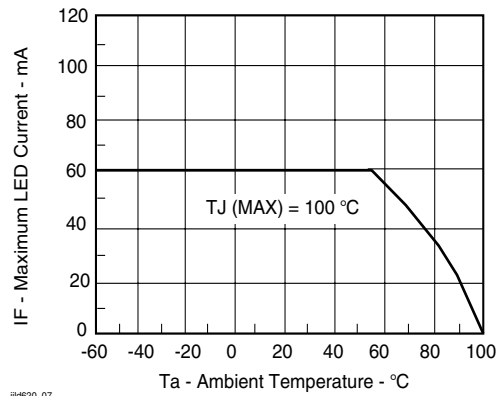


Figure 7. Maximum LED Current vs. Ambient Temperature

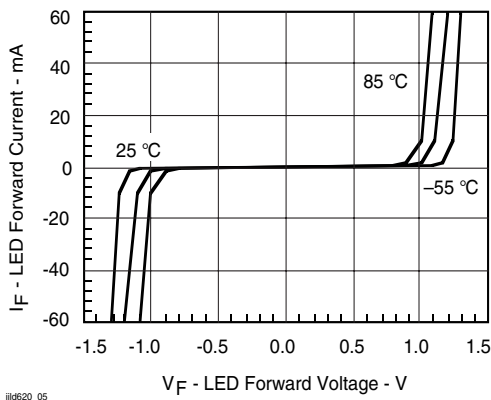


Figure 5. LED Forward Current vs. Forward Voltage

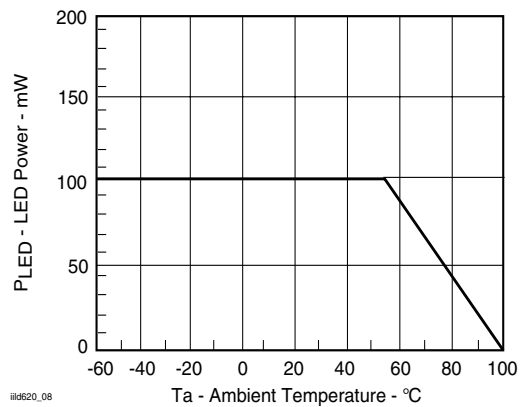
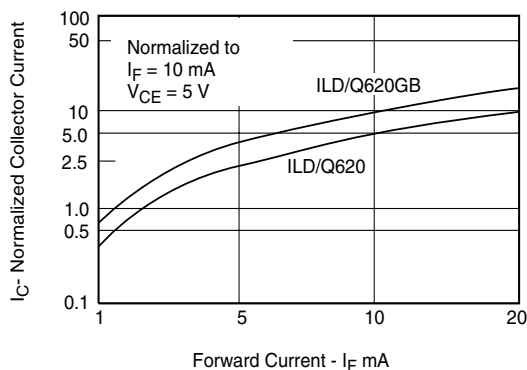
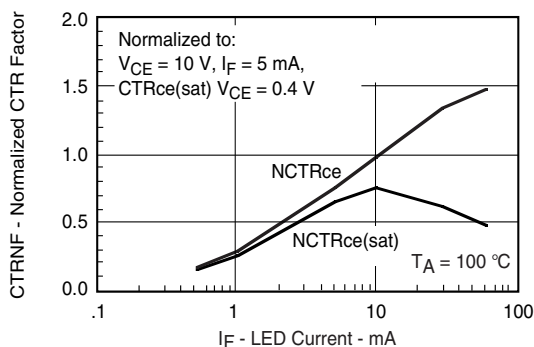


Figure 8. Maximum LED Power Dissipation



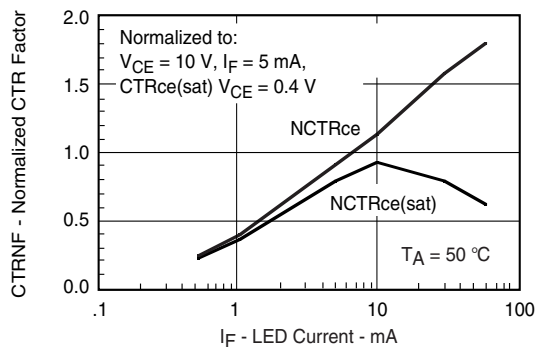
ild620\_09

Figure 9. Collector Current vs. Diode Forward Current



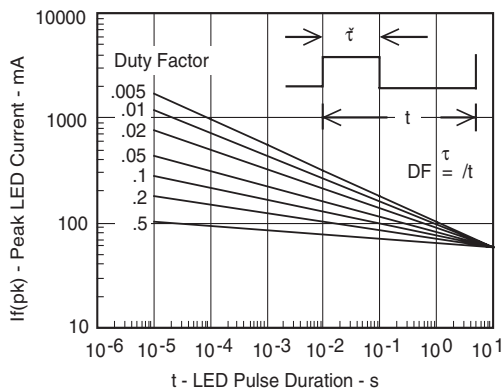
ild620\_12

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



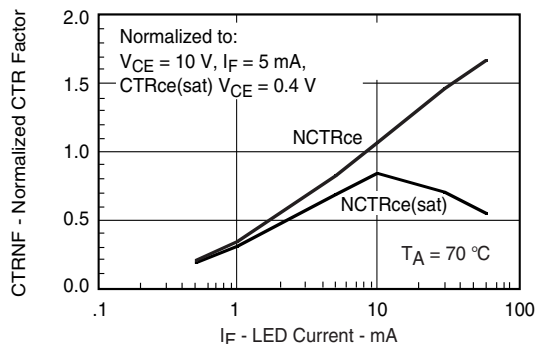
ild620\_10

Figure 10. Normalization Factor for Non-saturated and Saturated CTR vs.  $I_F$



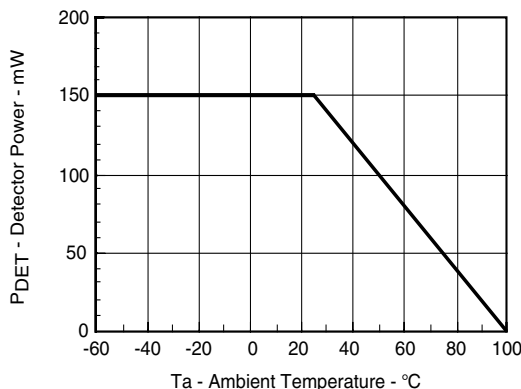
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Figure 13. Peak LED Current vs. Pulse Duration, Tau



ild620\_11

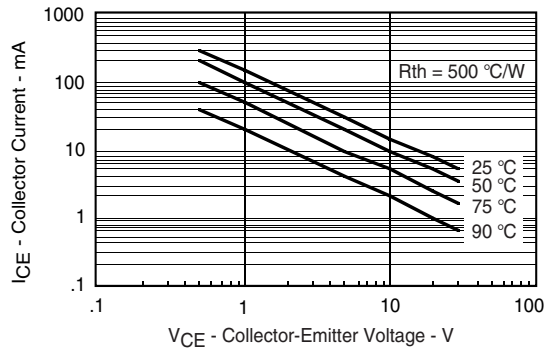
Figure 11. Normalization Factor for Non-saturated and Saturated CTR vs.  $I_F$



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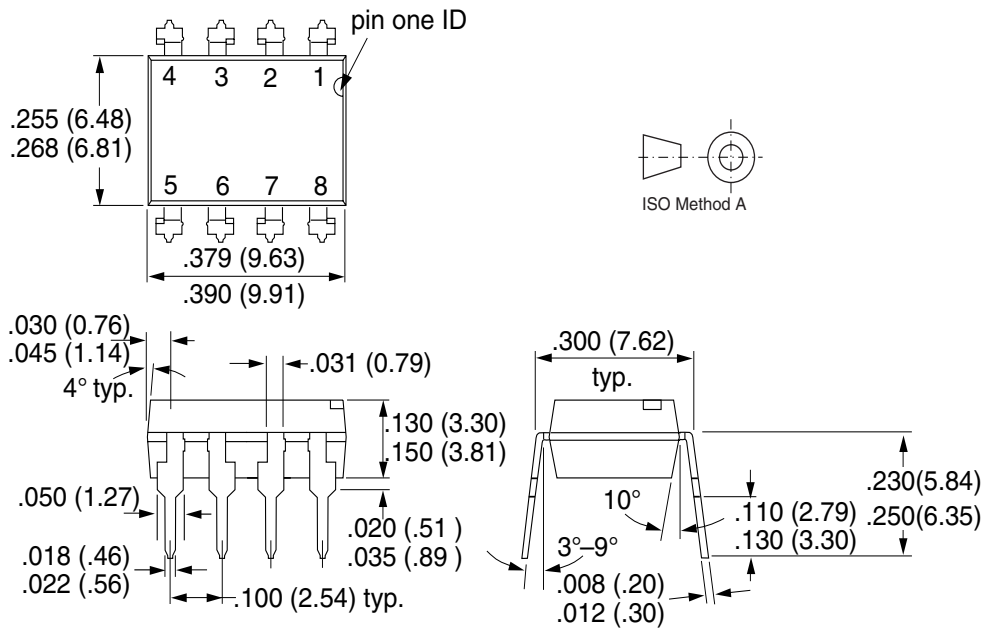
Figure 14. Maximum Detector Power Dissipation

Figure 15. Maximum Collector Current vs. Collector Voltage



ild620\_15

## Package Dimensions in Inches (mm)



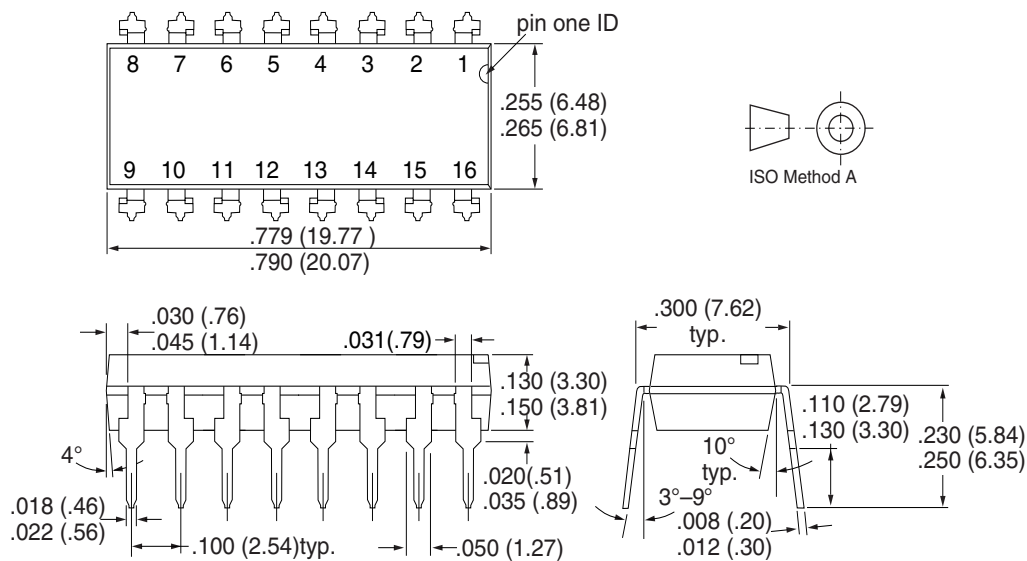
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# ILD620/ 620GB / ILQ620/ 620GB

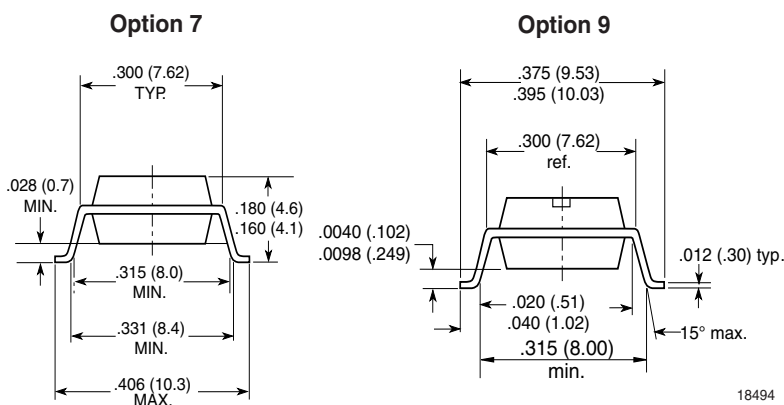


Vishay Semiconductors

## Package Dimensions in Inches (mm)



i178007







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1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

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Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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