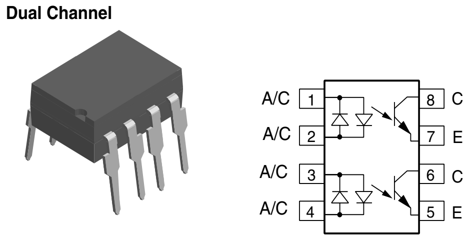
Optocoupler, Phototransistor Output, AC Input (Dual, Quad Channel)

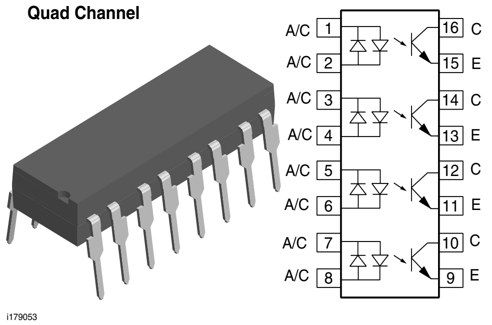
Features

- Identical Channel to Channel Footprint
- ILD620 Crosses to TLP620-2
- ILQ620 Crosses to TLP620-4
- High Collector-Emitter Voltage, BV_{CEO} = 70 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}



Agency Approvals

- UL File #E52744 System Code H or J
- CSA 93751
- DIN EN 60747-5-2(VDE0884)
  DIN EN 60747-5-5 pending
  Available with Option 1
- BSI IEC60950 IEC60965



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 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 quaranteed 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.

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 °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	± 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

Parameter	Test condition	Symbol	Value	Unit
Collector-emitter breakdown voltage		BV_{CEO}	70	V
Collector current		I_C	50	mA
	t < 1.0 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 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				≥ 7.0	mm
Clearance				≥ 7.0	mm
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C		R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °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	2.0 mm from case bottom		T_{sld}	260	°C

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Electrical Characteristics

T_{amb} = 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_F = ± 10 mA	V_F	1.0	1.15	1.3	V
Forward current	V_R = ± 0.7 V	I_F		2.5	20	µA
Capacitance	V_F = 0 V, f = 1.0 MHz	C_O		25		pF
Thermal resistance, junction to lead		R_{THJL}		750		K/W

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter capacitance	V_{CE} = 5.0 V, f = 1.0 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}		2.0	50	µA
Thermal resistance, junction to lead		R_{THJL}		500		K/W

Coupler

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Off-state collector current	V_F = ± 0.7 V, V_{CE} = 24 V		$I_{CE(OFF)}$		1.0	10	µA
Collector-emitter saturation voltage	I_F = ± 8.0 mA, I_{CE} = 2.4 mA	ILD620	V_{CEsat}			0.4	V
		ILQ620	V_{CEsat}			0.4	V
	I_F = ± 1.0 mA, I_{CE} = 0.2 mA	ILD620GB	V_{CEsat}			0.4	V
		ILQ620GB	V_{CEsat}			0.4	V

Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Channel/Channel CTR match	I_F = ± 5.0 mA, V_{CE} = 5.0 V		CTRX/CTRY	1 to 1		3 to 1	
CTR symmetry	$I_{CE}(I_F$ = - 5.0 mA)/ $I_{CE}(I_F$ = + 5.0 mA)		$I_{CE(RATIO)}$	0.5		2.0	
Current Transfer Ratio (collector-emitter saturated)	I_F = ± 1.0 mA, V_{CE} = 0.4 V	ILD620	CTR_{CEsat}		60		%
		ILQ620	CTR_{CEsat}		60		%
Current Transfer Ratio (collector-emitter)	I_F = ± 5.0 mA, V_{CE} = 5.0 V	ILD620	CTR_{CE}	50	80	600	%
		ILQ620	CTR_{CE}	50	80	600	%
Current Transfer Ratio (collector-emitter saturated)	I_F = ± 1.0 mA, V_{CE} = 0.4 V	ILD620GB	CTR_{CEsat}	30			%
		ILQ620GB	CTR_{CEsat}	30			%
Current Transfer Ratio (collector-emitter)	I_F = ± 5.0 mA, V_{CE} = 5.0 V	ILD620GB	CTR_{CE}	100	200	600	%
		ILQ620GB	CTR_{CE}	100	200	600	%

Switching Characteristics

Non-saturated

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

Saturated

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

Typical Characteristics (T_{amb} = 25 °C unless otherwise specified)

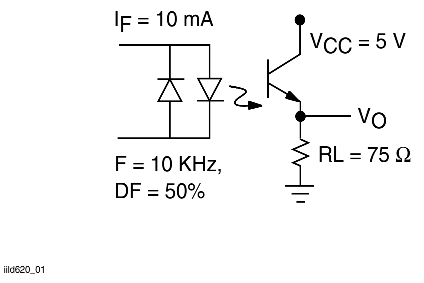

Fig. 1 Non-saturated Switching Timing

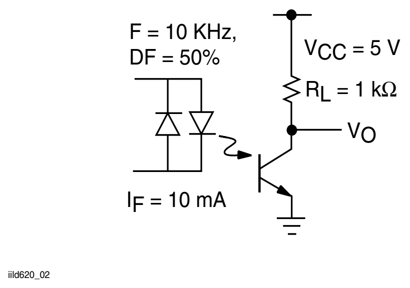

Fig. 2 Saturated Switching Timing

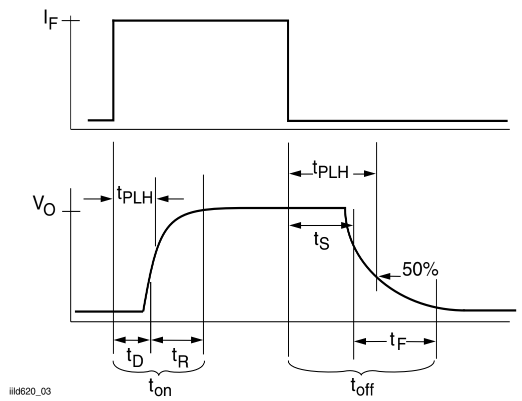

Fig. 3 Non-saturated Switching Timing

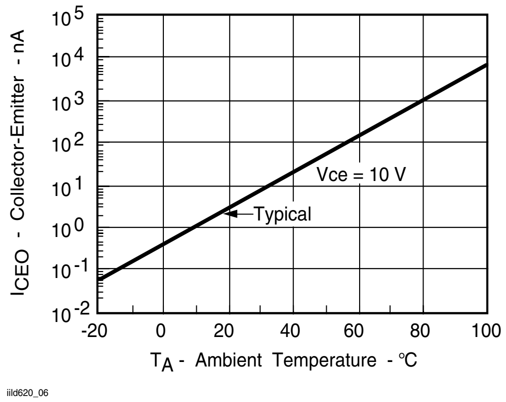

Fig. 6 Collector-Emitter Leakage vs. Temperature

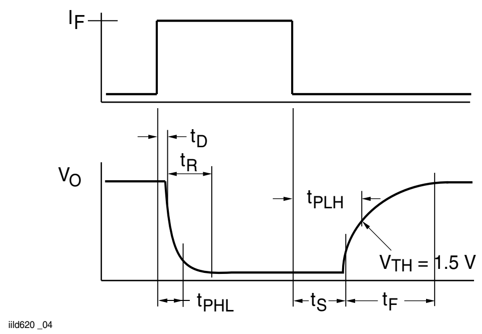

Fig. 4 Saturated Switching Timing

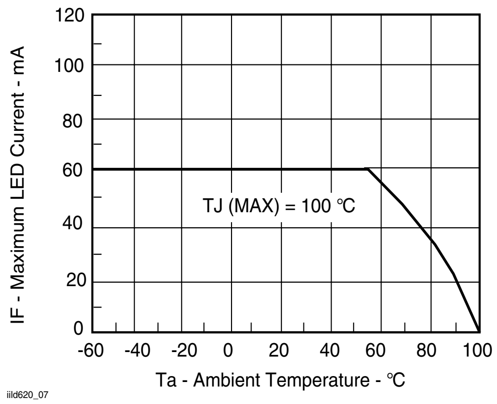

Fig. 7 Maximum LED Current vs. Ambient Temperature

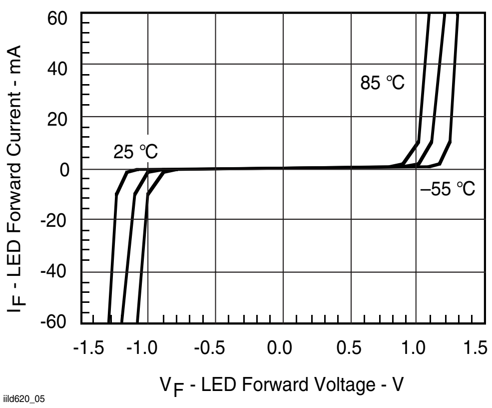

Fig. 5 LED Forward Current vs.Forward Voltage

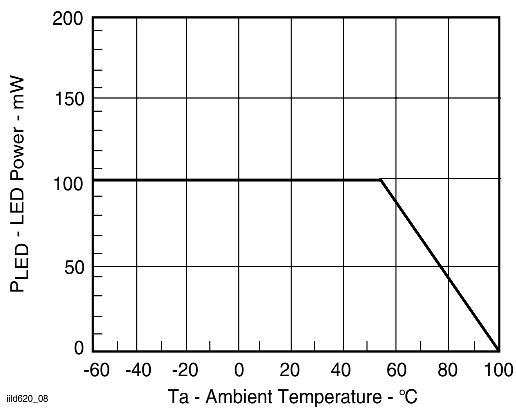

Fig. 8 Maximum LED Power Dissipation

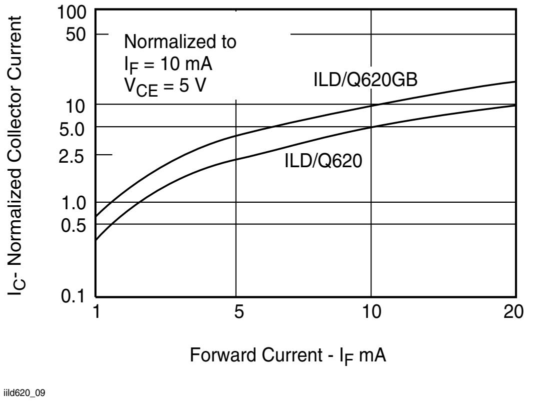

Fig. 9 Collector Current vs. Diode Forward Current

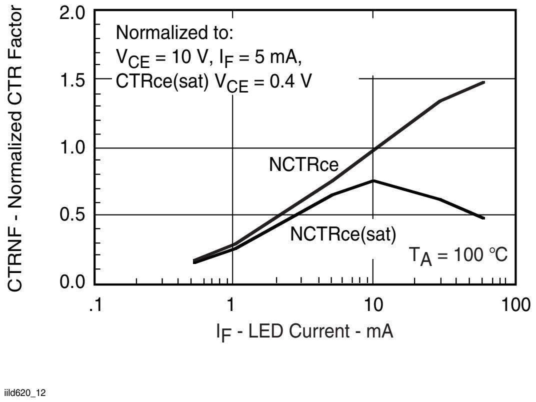

Fig. 12 Normalization Factor for Non-saturated and Saturated CTR vs. I_F

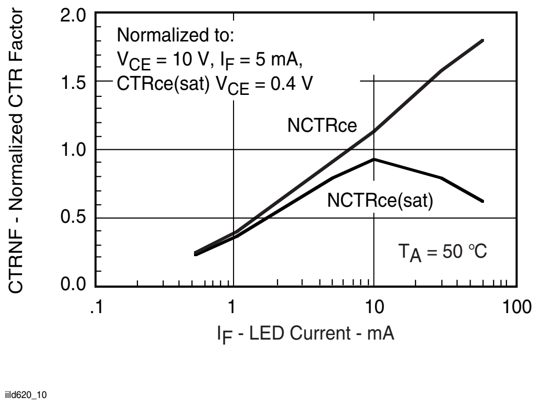

Fig. 10 Normalization Factor for Non-saturated and Saturated CTR vs. I_F

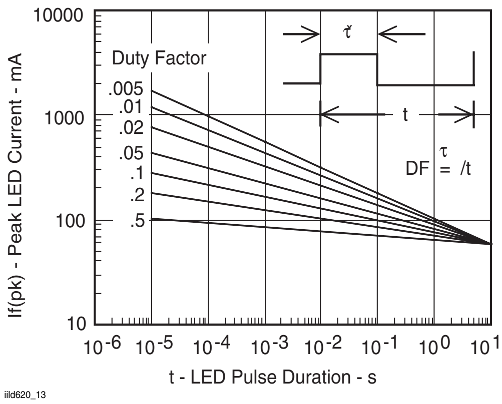

Fig. 13 Peak LED Current vs. Pulse Duration, Tau

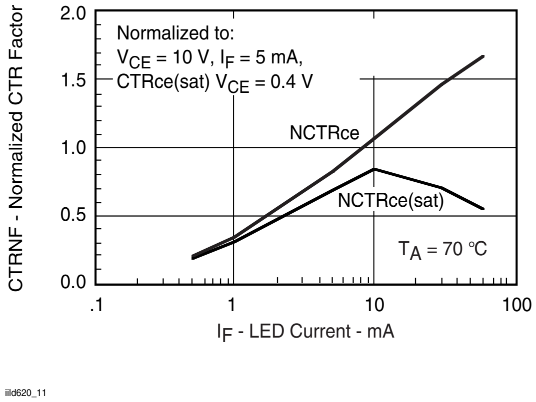

Fig. 11 Normalization Factor for Non-saturated and Saturated CTR vs. I_F

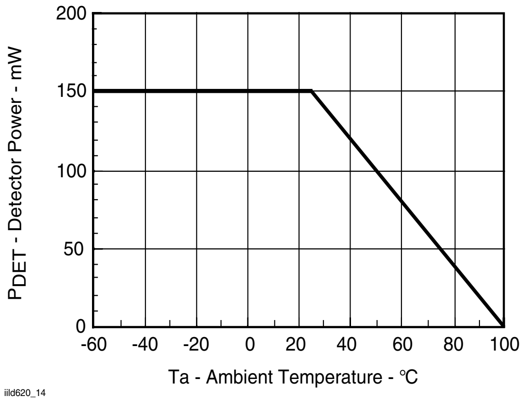

Fig. 14 Maximum Detector Power Dissipation

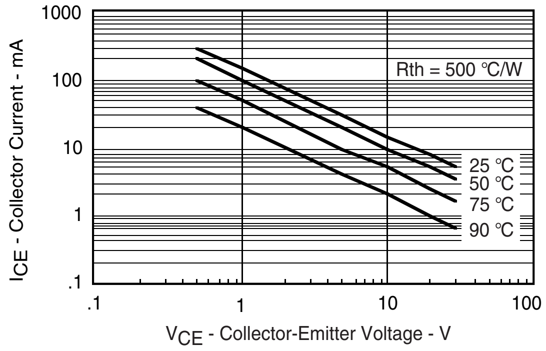

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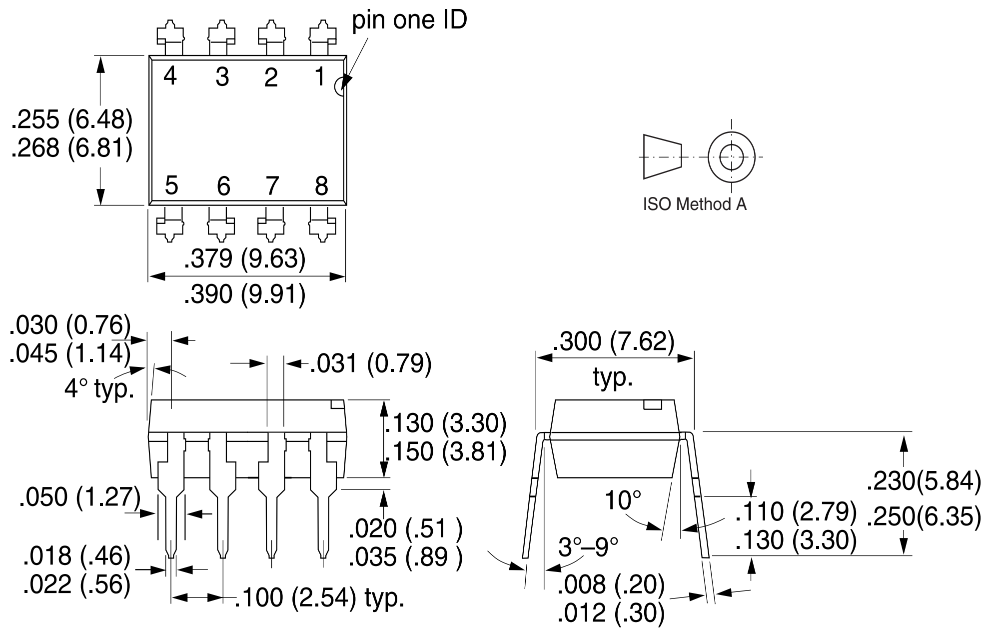
Fig. 15 Maximum Collector Current vs. Collector Voltage

Package Dimensions in Inches (mm)



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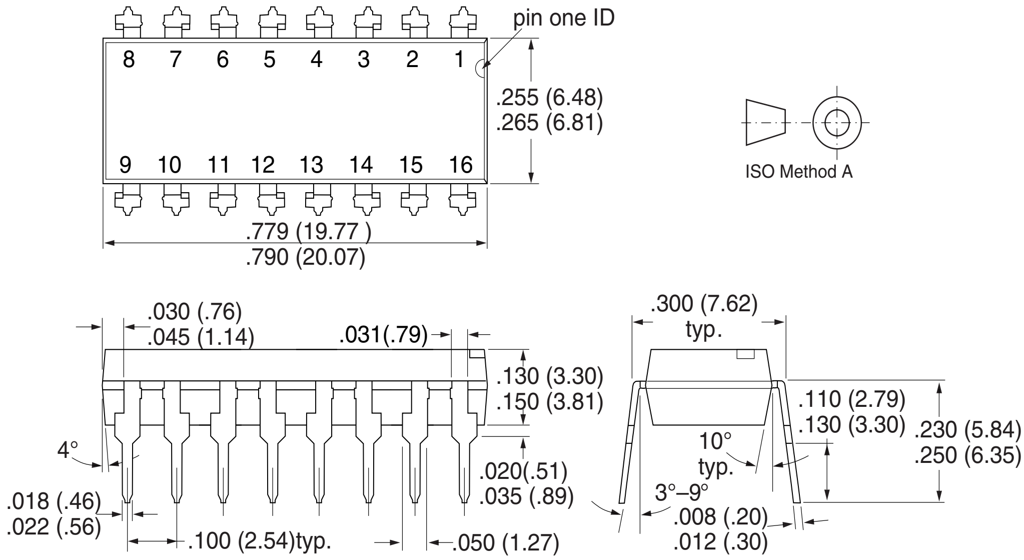
Package Dimensions in Inches (mm)



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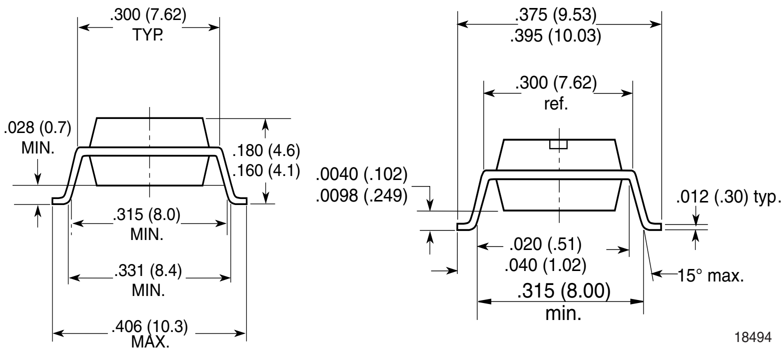
Option 7 **Option 9**



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Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operatingsystems 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).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

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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