Optocoupler, Phototransistor Output (Dual, Quad Channel)

Features

- Alternate Source to TLP621-2/-4 and TLP621GB-2/-4
- High Collector-Emitter Voltage, BV_{CEO}=70 V
- Dual and Quad Packages Feature:
  - Lower Pin and Parts Count
  - Better Channel to Channel CTR Match
  - Improved Common Mode Rejection
- Isolation Test Voltage 5300 V_{RMS}

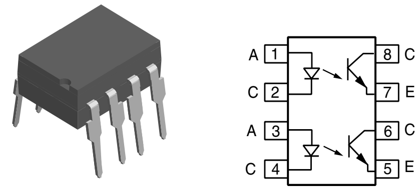
Agency Approvals

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

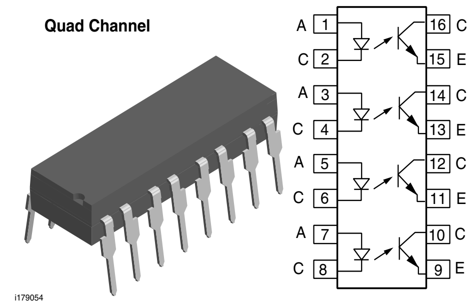
Description

The ILD621/ ILQ621 and ILD621GB/ ILQ621GB are multi-channel phototransistor optocouplers that use GaAs IRLED emitters and high gain NPN silicon phototransistors. These devices are constructed using double molded insulation technology. This assembly process offers a withstand test voltage of 7500 VDC. The ILD621/ ILQ621GB is well suited for CMOS interfacing given the $CTR_{CE\ sat}$ of 30 % minimum at I_F of 1.0 mA. High gain linear operation is guaranteed by a minimum CTR_{CE} of 100 % at 5.0 mA. The ILD/Q621 has a guaranteed CTR_{CE} 50 % minimum at 5.0 mA. The TRansparent IOn Shield insures stable DC gain in applications such as power supply feedback circuits, where constant DC V_{IO} voltages are present.

Dual Channel



Quad Channel



Order Information

Part	Remarks
ILD621	CTR > 50 %, DIP-8
ILD621GB	CTR > 100 %, DIP-8
ILQ621	CTR > 50 %, DIP-16
ILQ621GB	CTR > 100 %, DIP-16
ILD621-X006	CTR > 50 %, DIP-8 400 mil (option 6)
ILD621-X007	CTR > 50 %, SMD-8 (option 7)
ILD621-X009	CTR > 50 %, SMD-8 (option 9)
ILD621GB-X007	CTR > 100 %, SMD-8 (option 7)
ILQ621-X006	CTR > 50 %, DIP-8 400 mil (option 6)
ILQ621-X007	CTR > 50 %, SMD-16 (option 7)
ILQ621-X009	CTR > 50 %, SMD-16 (option 9)
ILQ621GB-X006	CTR > 100 %, DIP-16 400 mil (option 6)
ILQ621GB-X007	CTR > 100 %, SMD-16 (option 7)
ILQ621GB-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
Reverse voltage		V_R	6.0	V
Forward current		I_F	60 mA	mA
Surge current		I_{FSM}	1.5	A
Power dissipation		P_{diss}	100	mW
Derate from 25 °C			1.33	mW/°C

Output

Parameter	Test condition	Symbol	Value	Unit
Collector -emitter reverse voltage		V_{ECO}	70	V
Collector current		I_C	50	mA
	t < 1.0 ms	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		ILD621		400	mW
		ILD621GB		400	mW
Derate from 25 °C				5.33	mW/°C
Package dissipation		ILQ621		500	mW
		ILQ621GB		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

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
Reverse current	V_R = 6.0 V	I_R		0.01	10	µA
Capacitance	V_F = 0, f = 1.0 MHz	C_O		40		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
		I_{CEO}		20	50	µA
Thermal resistance, Junction to lead		R_{THJL}		500		K/W

Coupler

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	V_{IO} = 0 V, f = 1.0 MHz		C_{IO}	0.8			pF
Insulation resistance	V_{IO} = 500 V			10^{12}			Ω
Channel to channel insulation				500			VAC
Collector-emitter saturation voltage	I_F = 8.0 mA, I_{CE} = 2.4 mA	ILD621 ILQ621	V_{CEsat}			0.4	V
	I_F = 1.0 mA, I_{CE} = 0.2 mA	ILD621GB ILQ621GB	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	
Current Transfer Ratio (collector-emitter saturated)	I_F = 1.0 mA, V_{CE} = 0.4 V	ILD621 ILQ621	CTR_{CEs} at		60		%
		ILD621GB ILQ621GB	CTR_{CEs} at	30			%
Current Transfer Ratio (collector-emitter)	I_F = 5.0 mA, V_{CE} = 5.0 V	ILD621 ILQ621	CTR_{CE}	50	80	600	%
		ILD621GB ILQ621GB	CTR_{CE}	100	200	600	%

Switching Characteristics

Non-saturated switching timing

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		2.0		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 switching timing

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

Common Mode Transient Immunity

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Common mode rejection output high	V_{CM} = 50 V_{P-P} R_L = 1.0 KΩ, I_F = 0 mA	CM_H		5000		V/µs
Common mode rejection output low	V_{CM} = 50 V_{P-P} R_L = 1.0 KΩ, I_F = 10 mA	CM_L		5000		V/µs

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

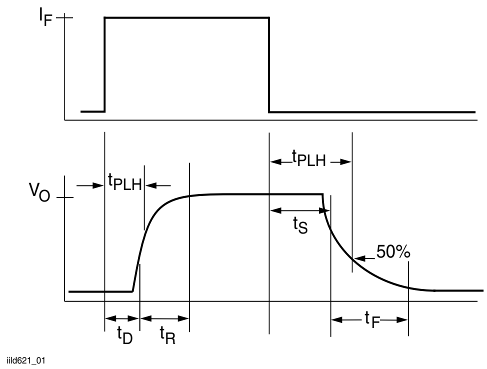


Fig. 1 Non-saturated Switching Timing

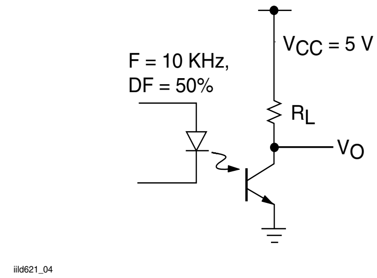


Fig. 4 Saturated Switching Timing

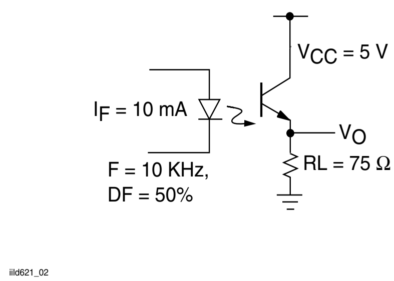


Fig. 2 Non-saturated Switching Timing

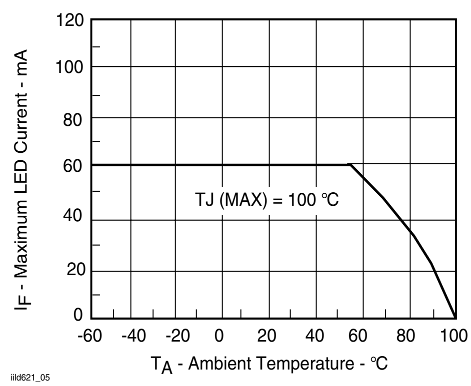


Fig. 5 Maximum LED Current vs. Ambient Temperature

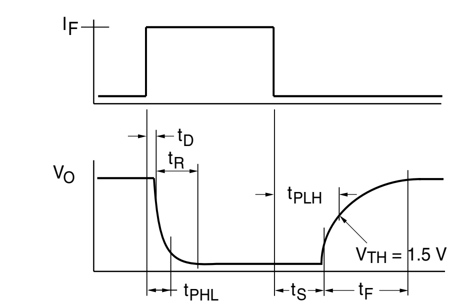


Fig. 3 Saturated Switching Timing

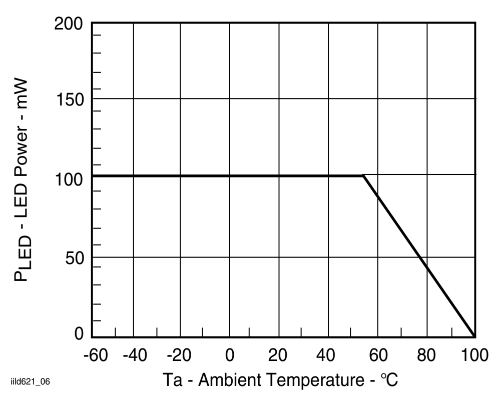


Fig. 6 Maximum LED Power Dissipation

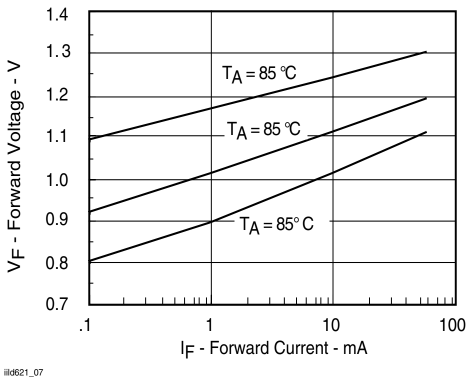


Fig. 7 Forward Voltage vs. Forward Current

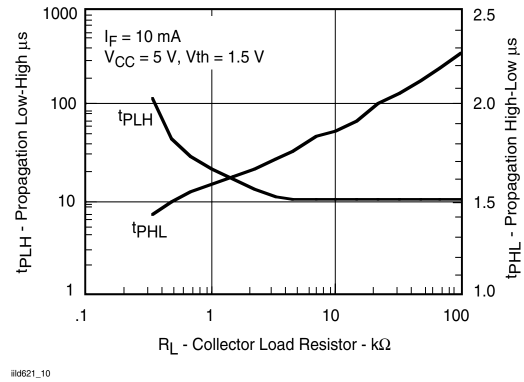


Fig. 10 Propagation Delay vs. Collector Load Resistor

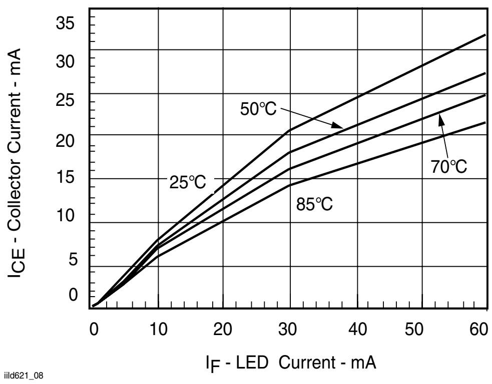


Fig. 8 Collector-Emitter Current vs. Temperature and LED Current

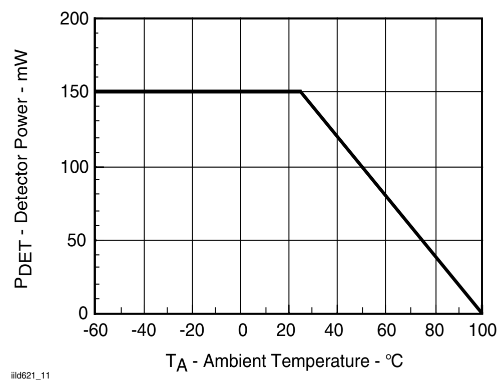


Fig. 11 Maximum Detector Power Dissipation

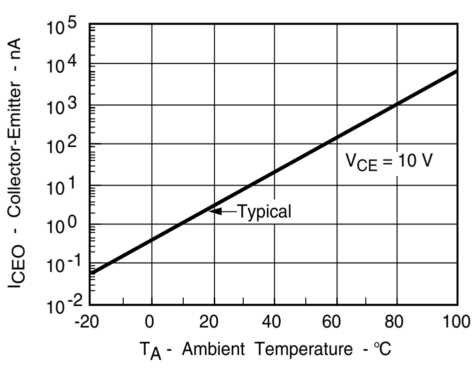


Fig. 9 Collector-Emitter Leakage vs. Temperature

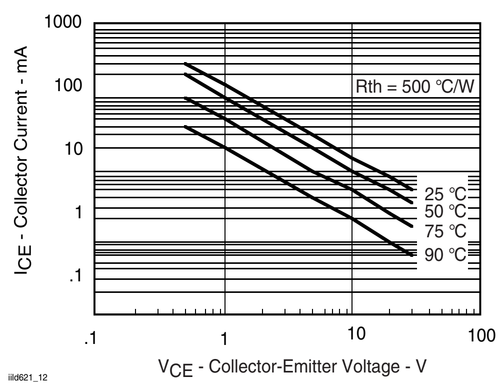


Fig. 12 Maximum Collector Current vs. Collector Voltage

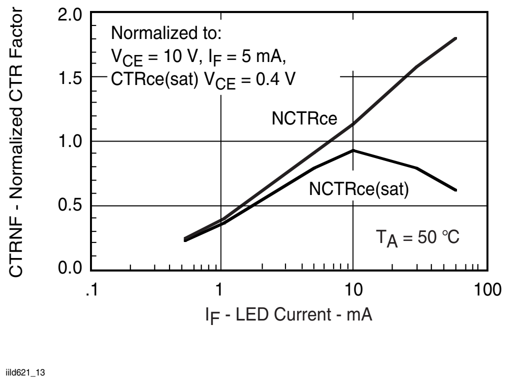


Fig. 13 Normalization Factor for Non-saturated and Saturated CTR vs. I_F

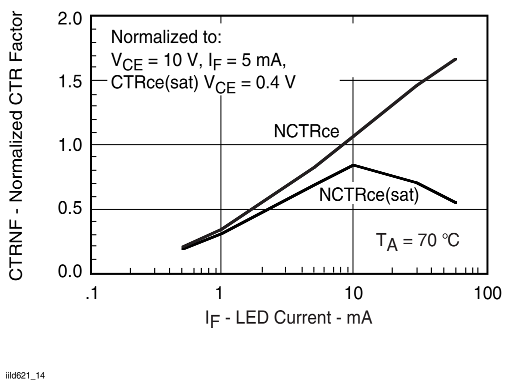


Fig. 14 Normalization Factor for Non-saturated and Saturated CTR vs. I_F

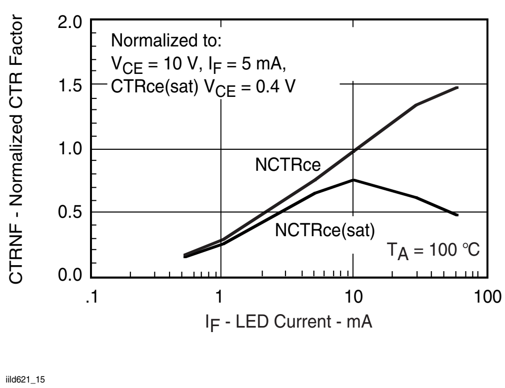
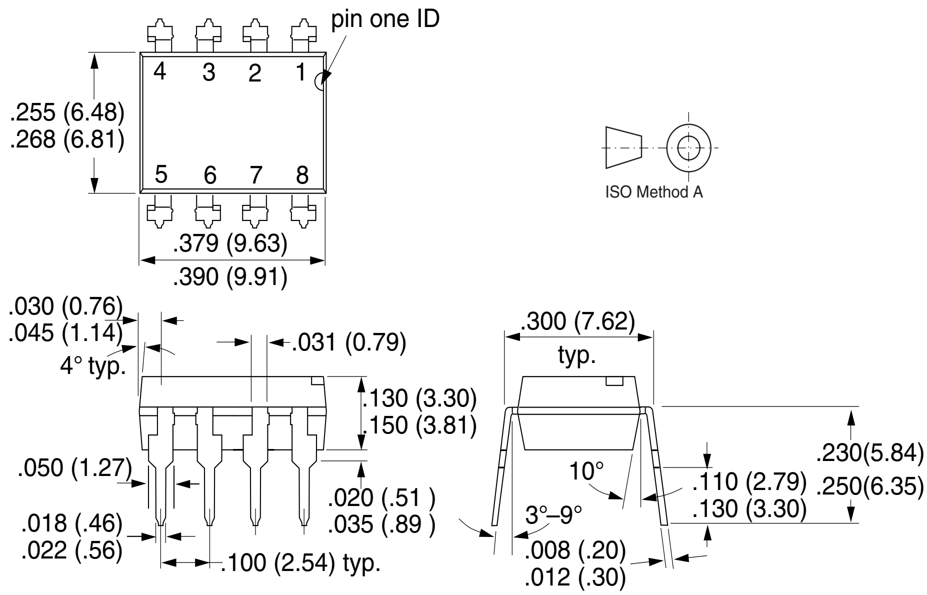


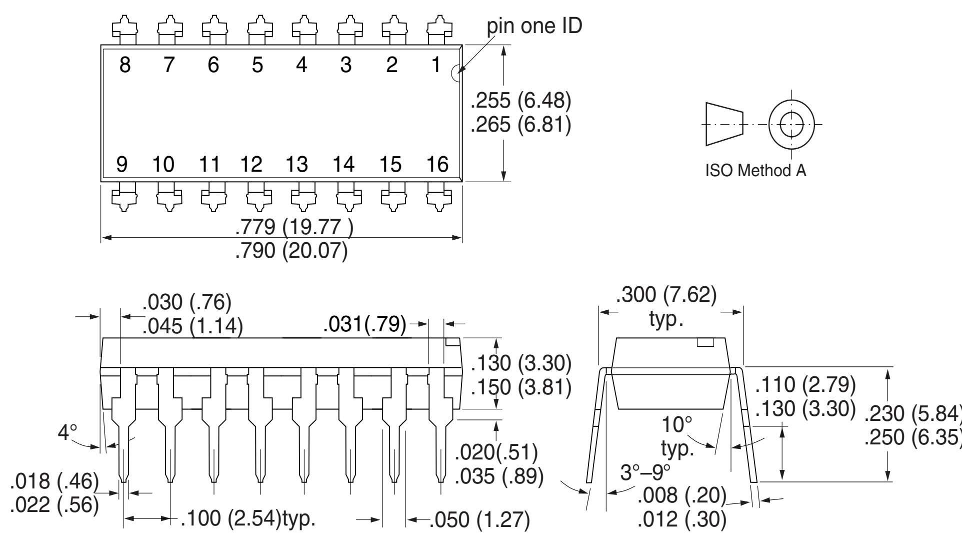
Fig. 15 Normalization Factor for Non-saturated and Saturated CTR vs. I_F

Package Dimensions in Inches (mm)



i178006

Package Dimensions in Inches (mm)



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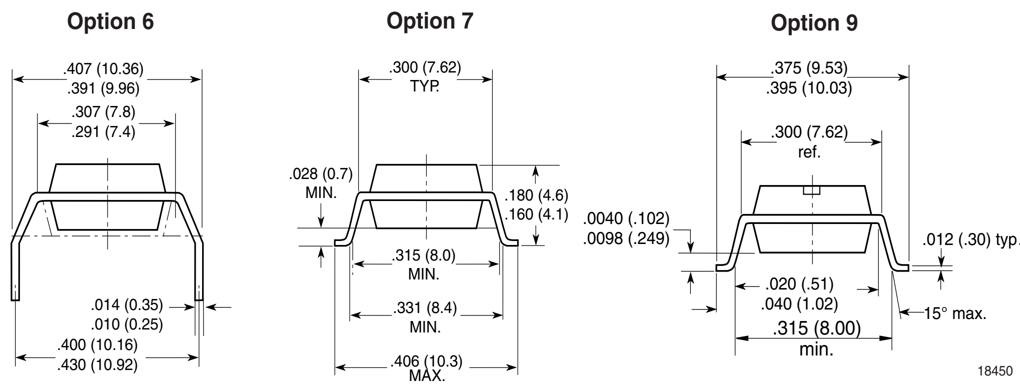
Option 6
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.391 (9.96)
.307 (7.8)
.291 (7.4)
.014 (0.35)
.010 (0.25)
.400 (10.16)
.430 (10.92)
Option 7
.300 (7.62)
TYP.
.028 (0.7)
MIN.
.180 (4.6)
.160 (4.1)
.315 (8.0)
MIN.
.331 (8.4)
MIN.
.406 (10.3)
MAX.
Option 9
.375 (9.53)
.395 (10.03)
.300 (7.62)
ref.
.0040 (.102)
.0098 (.249)
.012 (.30) typ.
.020 (.51)
.040 (1.02)
15° max.
.315 (8.00)
min.
18450

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.

We reserve the right to make changes to improve technical design and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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