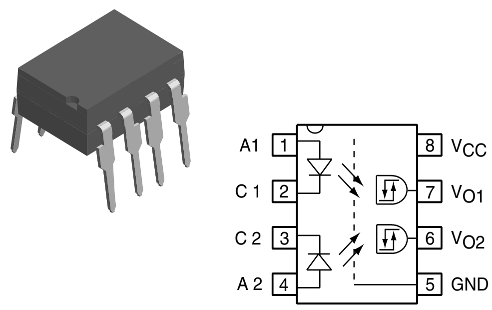
High Speed Optocoupler, Dual, 5 MBd

Features
- Data Rate 5 MBits/s (2.5 MBit/s over Temperature)
- Buffer
- Isolation Test Voltage, 5300 V_{RMS}
- TTL, LSTTL and CMOS Compatible
- Internal Shield for Very High Common Mode Transient Immunity
- Wide Supply Voltage Range (4.5 to 15 V)
- Low Input Current (1.6 mA to 5.0 mA)
- Specified from 0 °C to 85 °C



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Agency Approvals
- UL - File No. E52744 System Code H or J

Applications
Industrial Control
Replace Pulse Transformers
Routine Logic Interfacing
Motion/Power Control
High Speed Line Receiver
Microprocessor System Interfaces
Computer Peripheral Interfaces

Description
The dual channel 5 Mb/s SFH6731 and SFH6732 high speed optocoupler consists of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector. The detector incorporates a Schmitt-Trigger stage for improved noise immunity. A Faraday shield provides a common mode transient immunity of 1000 V/µs at V_{CM} = 50 V for SFH6731 and 500 V/µs at V_{CM} = 300 V for SFH6732.

The SFH6731 and SFH6732 uses an industry standard DIP-8 package. With standard lead bending, creepage distance and clearance of ≥ 7.0 mm with lead bending options 6, 7 and 9 ≥ 8.0 mm are achieved.

Order Information

Part	Remarks
SFH6731	$\vert CM_H \vert \geq 1000$ @ $\vert V_{CM} \vert = 50$ V, DIP-8
SFH6732	$\vert CM_H \vert \geq 5000$ @ $\vert V_{CM} \vert = 300$ V, DIP-8
SFH6732-X007	$\vert CM_H \vert \geq 5000$ @ $\vert V_{CM} \vert = 300$ V, SMD-8 (option 7)

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

Truth Table (Positive Logic)

Parts	IR Diode	Output
SFH6731	on	H
	off	L
SFH6732	on	H
	off	L

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	3.0	V
DC Forward current		I_F	10	mA
Surge forward current	$t_p \leq$ 1.0 µs, 300 pulses/s	I_{FSM}	1.0	A
Power dissipation		P_{diss}	20	mW

Output

Parameter	Test condition	Symbol	Value	Unit
Supply voltage		V_{CC}	- 0.5 to + 15	V
Output voltage		V_O	- 0.5 to + 15	V
Average output current		I_O	25	mA
Power dissipation		P_{diss}	100	mW

Coupler

Parameter	Test condition	Symbol	Value	Unit
Storage temperature range		T_{stg}	- 55 to + 125	°C
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Lead soldering temperature	t = 10 sec	T_s	260	°C
Isolation test voltage	t = 1 s	V_{ISO}	5300	V_{RMS}
Pollution degree			2.0	
Creepage distance and clearance	Standard lead bending		7.0	mm
	Option 6, 7, 9		8.0	mm
Comparative tracking index per DIN IEC112/VDE 0303, part 1			175	
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

Recommended Operating Conditions

A 0.1 µF bypass capacitor connected between pins 5 and 8 must be used.

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Supply voltage		V_{CC}	4.5		15	V
Forward input current		I_{Fon}	1.6[1)]		5.0	mA
		I_{Foff}			0.1	mA
Operating temperature		T_A	0		85	°C

[1)] We recommend using a 2.2 mA to permit at least 20 % CTR degradation guard band.

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

0 ° C ≤ T_{amb} ≤ 85 °C; 4.5 V ≤ V_{CC} ≤ 15 V; 1.6 mA ≤ I_{Fon} ≤ 5.0 mA; 2.0 ≤ V_{EH} ≤ 15 V; 0 ≤ V_{EL} ≤ 0.8 V; 0 mA ≤ I_{Foff} ≤ 0.1 mA
Typical values: T_{amb} = 25 °C; V_{CC} = 5.0 V; I_{Fon}=3.0 mA unless otherwise specified.

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 5.0 mA,	V_F		1.6	1.75	V
		V_F			1.8	V
Input current hysteresis	V_{CC} = 5 V, I_{HYS} = I_{Fon} - I_{Foff}			01		mA
Reverse current	V_R = 3.0 V	I_R		0.5	10	µA
Capacitance	V_R = 0 V, f = 1MHz	C_O		60		pF
Thermal resistance		R_{thja}		700		K/W

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Logic low output voltage	I_{OL} = 6.4 mA	V_{OL}			0.5	V
Logic high output voltage	I_{OH} = - 2.6 mA, *V_{OH} = V_{CC} - 1.8 V	V_{OH}	2.4	*		V
Output leakage current (V_{OUT}> V_{CC})	V_O = 5.5 V, V_{CC} = 4.5 V, I_F = 5.0 mA	I_{OHH}		0.5	100	µA
	V_O = 15 V, V_{CC} = 4.5 V, I_F = 5.0 mA	I_{OHH}		1.0	500	µA
Logic low supply current	V_{CC} = 5.5 V, I_F = 0	I_{CCL}		3.7	6.0	mA
	V_{CC} = 15 V, I_F = 0	I_{CCL}		4.1	6.5	mA
Logic high supply current	V_{CC} = 5.5 V, I_F = 5.0 mA	I_{CCH}		3.4	4.0	mA
	V_{CC} = 15 V, I_F = 5.0 mA	I_{CCH}		3.7	5.0	mA
Logic low short circuit output current	V_O = V_{CC} = 5.5 V, I_F = 0	I_{OSL} (2)	25			mA
	V_O = V_{CC} = 15 V, I_F = 0	I_{OSL} (2)	40			mA
Logic high short circuit output current	V_{CC} = 5.5 V, V_O = 0 V, I_F = 5.0 mA	I_{OSH} (2)			- 10	mA
	V_{CC} = 15 V, V_O = 0 V, I_F = 5.0 mA	I_{OSH} (2)			-25	mA
Thermal resistance				300		K/W

* Output short circuit time ≤ 10 ms.

Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	f = 1.0 MHz, pins 1-4 and 5-8 shorted together	C_{IO}		0.6		pF

Switching Characteristics

0 °C ≤ T_{amb} ≤ 85 °C; 4.5 V ≤ V_{CC} ≤ 15 V; 1.6 mA ≤ I_{Fon} ≤ 5.0 mA; 0 mA ≤ I_{Foff} ≤ 0.1 mA
Typical values: T_{amb} = 25 ° C; V_{CC} = 5.0 V; I_{Fon} = 3.0 mA unless otherwise specified.

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Propagation delay time to logic low output level	Without peaking capacitor	t_{PHL}		120		ns
	With peaking capacitor	t_{PHL}		115	300	ns
	Without peaking capacitor	t_{PLH}		125		ns
	With peaking capacitor	t_{PLH}		90	300	ns
Output rise time	10 % to 90 %	t_r		40		ns
Output fall time	90 % to 10 %	t_f		10		ns

Common Mode Transient Immunity

T_{amb} = 25 °C, V_{CC} = 5 V(4)

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Logic high common mode transient immunity4)	I V_{CM} I = 50 V, I_F = 1.6 mA	SFH6731	I CM_H I	1000			V/µs
	I V_{CM} I = 300 V, I_F = 1.6 mA	SFH6732	I CM_H I	5000			V/µs
Logic low common mode transient immunity4)	I V_{CM} I = 50 V, I_F = 0 mA	SFH6731	I CM_L I	1000			V/µs
	I V_{CM} I = 1000 V, I_F = 0 mA	SFH6732	I CM_L I	10000			V/µs

(4) CMH is the maximum slew rate of a common mode voltage VCM at which the output voltage remains at logic high level (VO > 2.0 V). CML is the maximum slew rate of a common mode voltage VCM at which the output voltage remains at logic low level (V_O < 0.8 V).

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

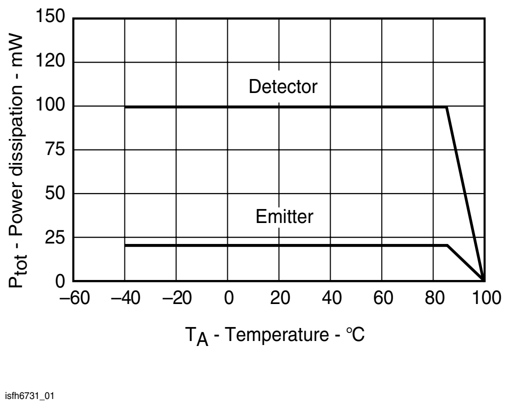

Fig. 1 Permissible Total Power Dissipation vs. Temperature

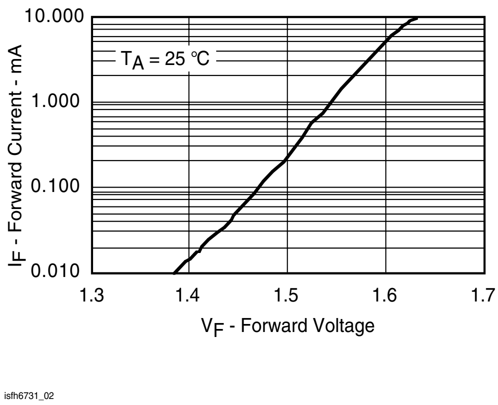

Fig. 2 Typical Input Diode Forward Current vs. Forward Voltage

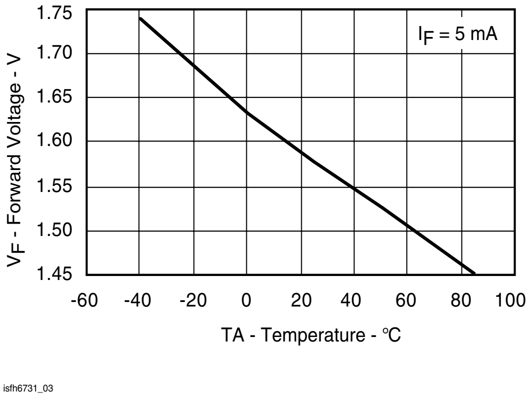

Fig. 3 Typical Forward Input Voltage vs. Temperature

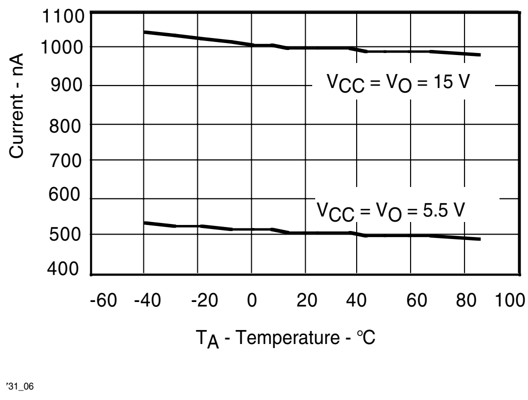

Fig. 6 Typical Output Leakage Current vs. Temperature

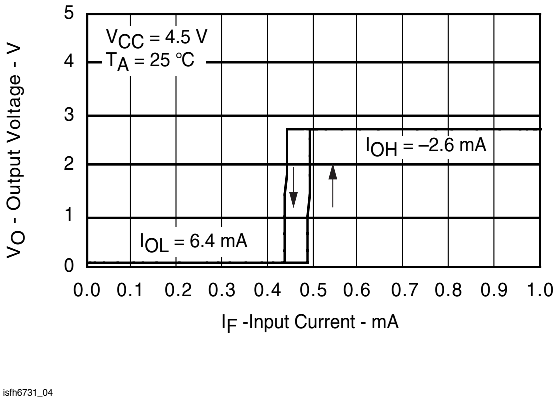

Fig. 4 Typical Output Voltage vs. Forward Input Current

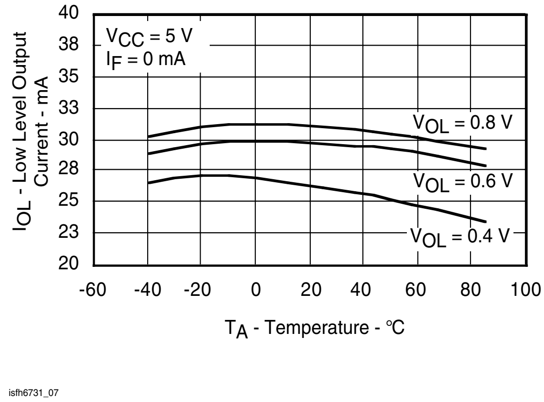

Fig. 7 Typical Low Level Output Current vs. Temperature

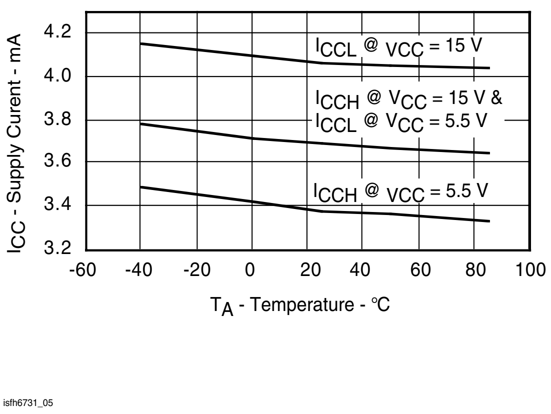

Fig. 5 Typical Supply Current vs. Temperature

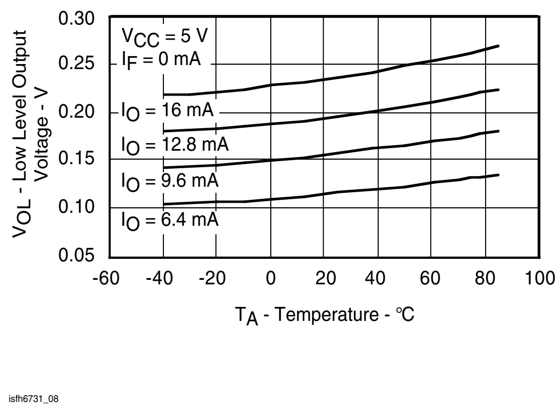

Fig. 8 Typical Low Level Output Voltage vs. Temperature

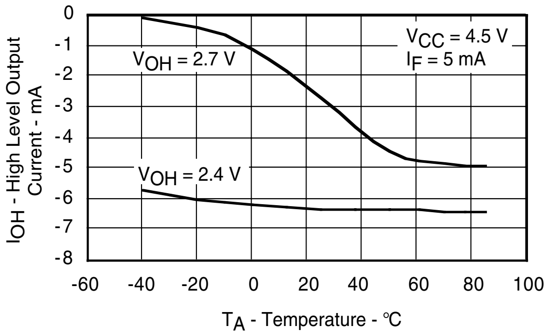

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Fig. 9 Typical High Level Output Current vs. Temperature

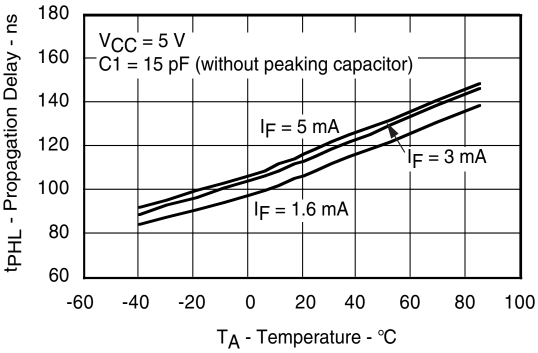

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Fig. 12 Typical Propagation Delays to Logic Low vs.Temperature

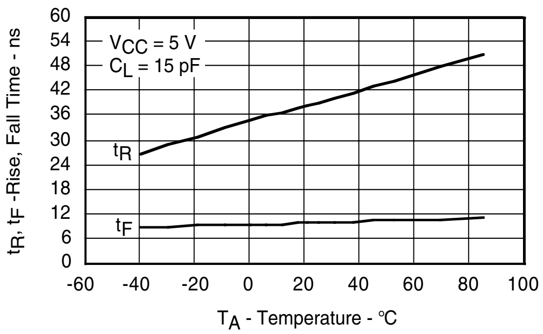

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Fig. 10 Typical Rise, Fall Time vs. Temperature

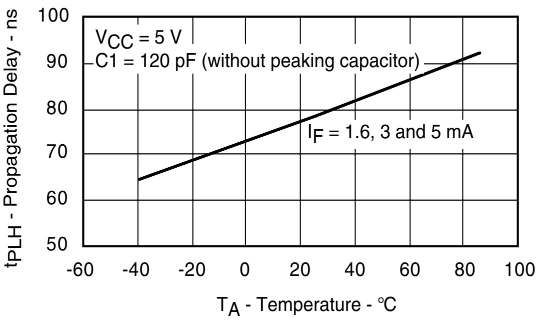

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Fig. 13 Typical Propagation Delays to Logic High vs. Temperature

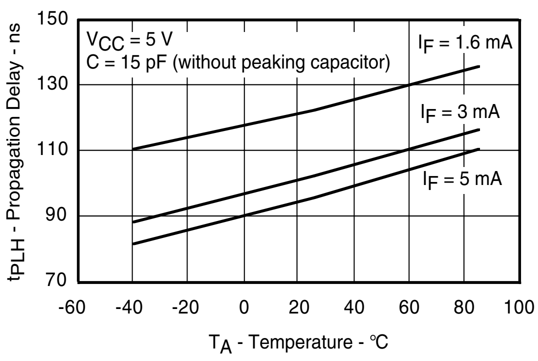

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Fig. 11 Typical Propagation Delays to Logic High vs. Temperature

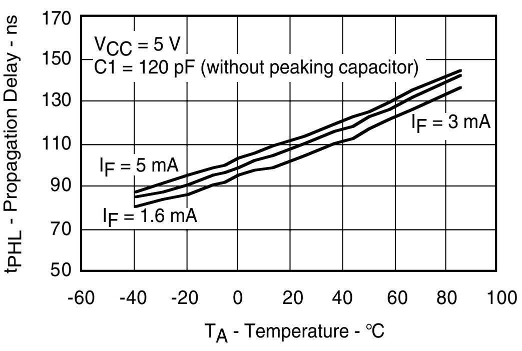

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Fig. 14 Typical Propagation Delays to Logic Low vs.Temperature

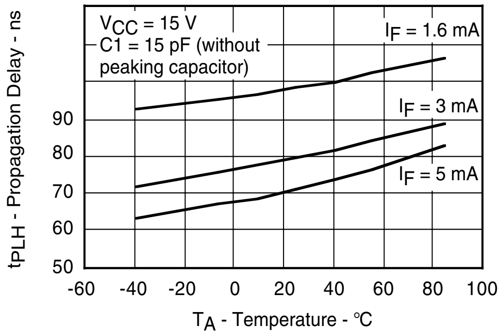

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Fig. 15 Typical Propagation Delays to Logic High vs. Temperature

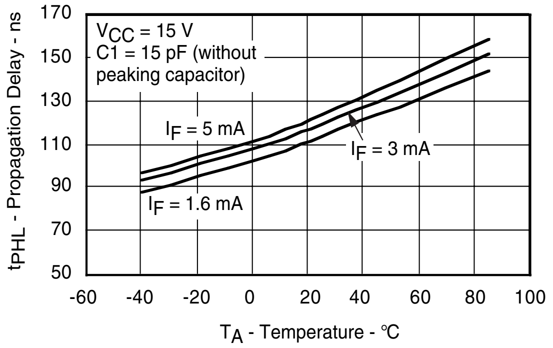

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Fig. 16 Typical Propagation Delays to Logic Low vs.Temperature

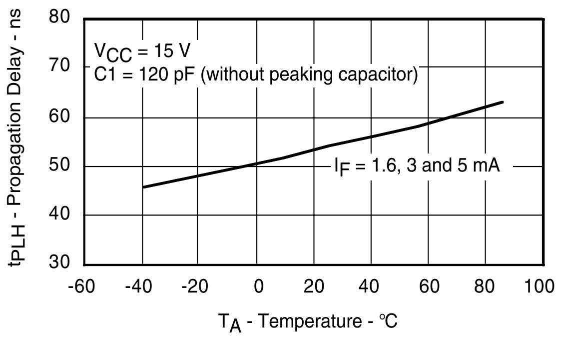

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Fig. 17 Typical Propagation Delays to Logic High vs. Temperature

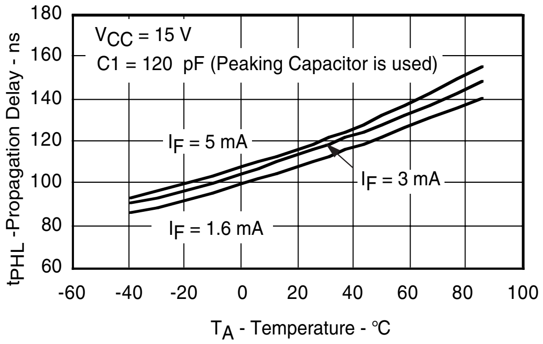

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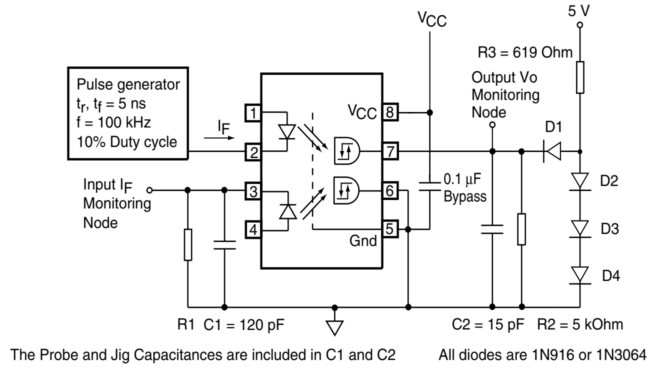
Fig. 18 Typical Propagation Delays to Logic Low vs.Temperature



R1	2.15 kOhm	1.1 kOhm	681 Ohm
I_F (ON)	1.6 mA	3 mA	5 mA

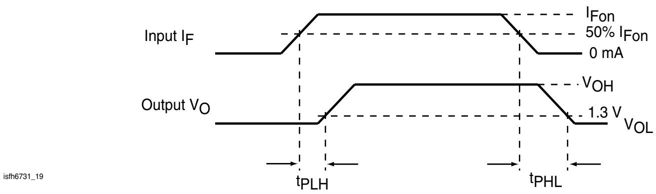


Fig. 19 Test Circuit for t_{PLH}, t_{PHL}, t_r and t_f

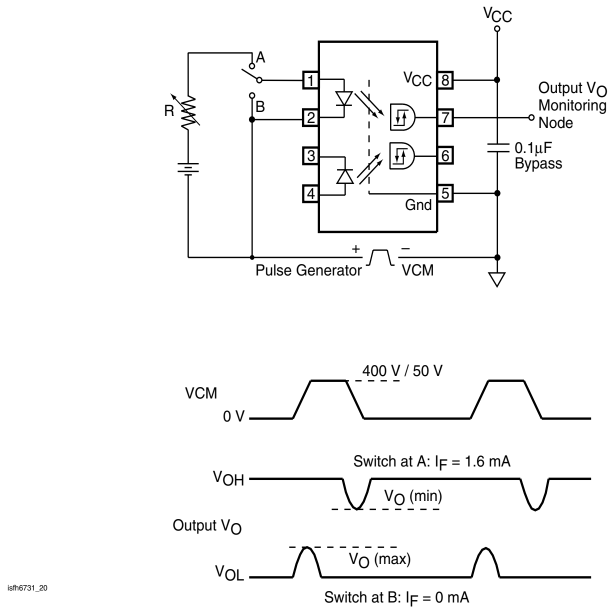
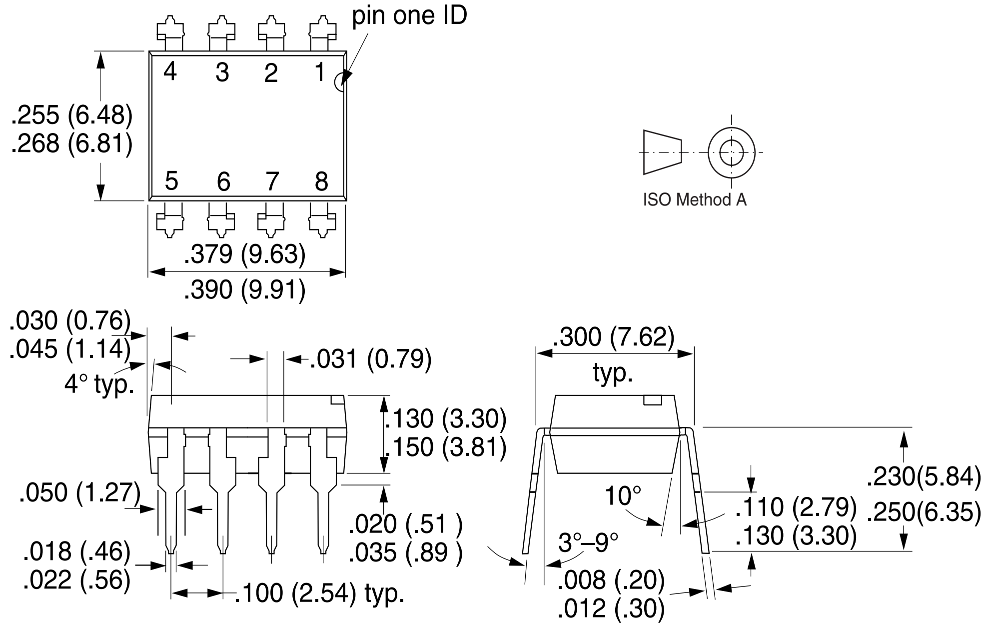


Fig. 20 Test Circuit for Common Mode Transient Immunity and Typical Waveforms

Package Dimensions in Inches (mm)



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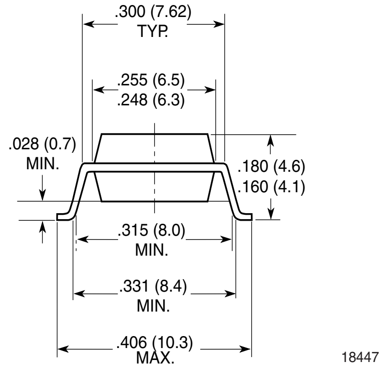
Option 7



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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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