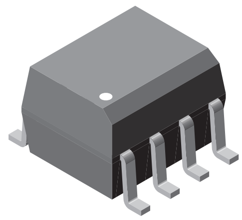
High Speed Optocoupler, Dual, 5 MBd, in SOIC-8 Package



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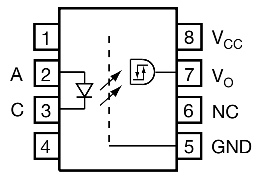

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FEATURES

- Data rate 5 MBits/s (2.5 MBit/s over temperature)
- Buffer
- Isolation test voltage, 4000 V_{RMS}
- TTL, LSTTL and CMOS compatible
- Internal shield for very high common mode transient immunity
- Wide supply voltage range (4.5 V to 15 V)
- Low input current (1.6 mA to 5 mA)
- Parameters specified from 0 °C to 85 °C
- T_{amb} from - 40 °C to 100 °C
- Compliant to RoHS Directive to 2002/95/EC and in accordance WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

DESCRIPTION

The single channel 5 Mb/s SFH6720T and SFH6721T 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 SFH6720T and 2500 V/µs at V_{CM} = 400 V for SFH6721T.
The SFH6720T and SFH6721T uses an industry standard SOIC-8A package.

AGENCY APPROVALS

- UL1577, file no. E52744 system code Y
- DIN EN 60747-5-5 (VDE 0884) available with option 1

APPLICATIONS

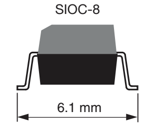
- Industrial control
- Replace pulse transformers
- Routine logic interfacing
- Motion/power control
- High speed line receiver
- Microprocessor system interfaces
- Computer peripheral interfaces

ORDERING INFORMATION

S F H 6 7 2 # T

PART NUMBER: S F H 6 7 2 #

TAPE AND REEL: T



AGENCY CERTIFIED/PACKAGE	CMR (kV/µs)	CMR (kV/µs)
UL	**1**	**2.5**
SOIC-8	SFH6720T	SFH6721T
VDE, UL	**1**	**2.5**
SOIC-8	SFH6720-X001T	-

TRUTH TABLE (positive logic)

PART	IR DIODE	OUTPUT
SFH6720T	On	H
	Off	L
SFH6721T	On	H
	Off	L

ABSOLUTE MAXIMUM RATINGS (1) (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	3	V
DC forward current		I_F	10	mA
Surge forward	$t_p \leq 1$ µs, 300 pulses/s	I_{FSM}	1	mA
Power dissipation		P_{diss}	20	mW
OUTPUT				
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				
Storage temperature range		T_{stg}	- 55 to + 125	°C
Ambient temperature range		T_{amb}	+ 85	°C
Isolation test voltage	t = 1 s	V_{ISO}	4000	V_{RMS}
Pollution degree			2	
Creepage distance			4	mm
Clearance distance			4	mm
Comparative tracking index per DIN IEC112/VDE 0303, part 1		CTI	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
Lead soldering temperature (2)	t = 10 s	T_{sld}	260	°C

Notes

(1) 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.

(2) Refer to reflow profile soldering conditions for surface mounted devices.

RECOMMENDED OPERATING CONDITIONS (1)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply voltage		V_{CC}	4.5		15	V
Forward input current		I_{Fon}	1.6 (2)		5	mA
		I_{Foff}			0.1	mA
Operating temperature		T_A	- 40		85	°C

Notes

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

(2) We recommended using a 2.2 mA if to permit at least 20 % CTR degradation guard band.

ELECTRICAL CHARACTERISTICS (1)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 5 mA, 25 °C	V_F		1.6	1.75	V
		V_F			1.9	V
Input current hysteresis	V_{CC} = 5 V, $I_{HYS} = I_{Fon} - I_{Foff}$	I_{HYS}	0.1			V
Reverse current	V_R = 3 V	I_R		0.5	10	µA
Capacitance	V_R = 0 V, f = 1 MHz	C_O		60		pF
Thermal resistance		R_{thja}		700		K/W

ELECTRICAL CHARACTERISTICS (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
OUTPUT						
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 mA	I_{OHH}		0.5	100	µA
	V_O = 15 V, V_{CC} = 4.5 V, I_F = 5 mA	I_{OHH}		1	500	µA
Logic low supply current	V_{CC} = 5.5 V, I_F = 0	I_{CCL}		3.7	6	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 mA	I_{CCH}		3.4	4	mA
	V_{CC} = 15 V, I_F = 5 mA	I_{CCH}		3.7	5	mA
Logic low short circuit output current (output short circuit time ≤ 10 ms)	$V_O = V_{CC}$ = 5.5 V, I_F = 0	I_{OSL}	25			mA
	$V_O = V_{CC}$ = 15 V, I_F = 0	I_{OSL}	40			mA
Logic high short circuit output current (output short circuit time ≤ 10 ms)	V_{CC} = 5.5 V, V_O = 0 V, I_F = 5 mA	I_{OSH}			- 10	mA
	V_{CC} = 15 V, V_O = 0 V, I_F = 5 mA	I_{OSH}			-25	mA
Thermal resistance		R_{thja}		300		K/W
COUPLER						
Capacitance (input to output)	f = 1 MHz, pins 1 to 4 and 5 to 8 shorted together	C_{IO}		0.6		pF
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C		10^{12}			Ω
	V_{IO} = 500 V, T_{amb} = 100 °C		10^{11}			Ω

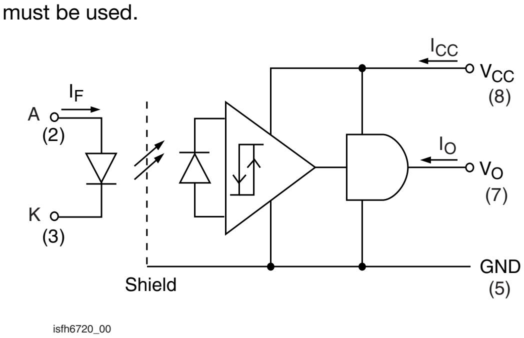
Note

(1) - 40 ° C ≤ T_{amb} ≤ 85 °C; 4.5 V ≤ V_{CC} ≤ 15 V; 1.6 mA ≤ I_{Fon} ≤ 5 mA; 2 ≤ 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 V; I_{Fon} = 3 mA 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.

SWITCHING CHARACTERISTICS (1)						
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
Propagation delay time to logic high output level	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

Note

(1) 0 °C ≤ T_{amb} ≤ 85 °C; 4.5 V ≤ V_{CC} ≤ 15 V; 1.6 mA ≤ I_{Fon} ≤ 5 mA; 0 mA ≤ I_{Foff} ≤ 0.1 mA
Typical values: T_{amb} = 25 ° C; V_{CC} = 5 V; I_{Fon} = 3 mA unless otherwise specified. A 0.1 µF bypass capacitor connected between pins 5 and 8 must be used.



COMMON MODE TRANSIENT IMMUNITY (1)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Logic high common mode transient immunity (2)	$\lvert V_{CM} \rvert$ = 50 V, I_F = 1.6 mA	SFH6731	$\lvert CM_H \rvert$	1000			V/μs
	$\lvert V_{CM} \rvert$ = 300 V, I_F = 1.6 mA	SFH6732	$\lvert CM_H \rvert$	5000			V/μs
Logic low common mode transient immunity (2)	$\lvert V_{CM} \rvert$ = 50 V, I_F = 0 mA	SFH6731	$\lvert CM_L \rvert$	1000			V/μs
	$\lvert V_{CM} \rvert$ = 1000 V, I_F = 0 mA	SFH6732	$\lvert CM_L \rvert$	10 000			V/μs

Note

(1) T_{amb} = 25 °C, V_{CC} = 5 V. (2)

(2) CM_H is the maximum slew rate of a common mode voltage V_{CM} at which the output voltage remains at logic high level (V_O > 2 V). CM_L is the maximum slew rate of a common mode voltage V_{CM} at which the output voltage remains at logic low level (V_O < 0.8 V).

SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic Classification (according to IEC 68 part 1)				55/100/21		
Comparative Tracking Index		CTI	175		399	
V_{IOTM}			6000			V
V_{IORM}			560			V
P_{SO}					350	mW
I_{SI}					150	mA
T_{SI}					165	°C
Creepage distance			4			mm
Clearance distance			4			mm
Insulation thickness			0.2			mm

Note

- As per IEC 60747-5-5, § 7.4.3.8.1, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

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

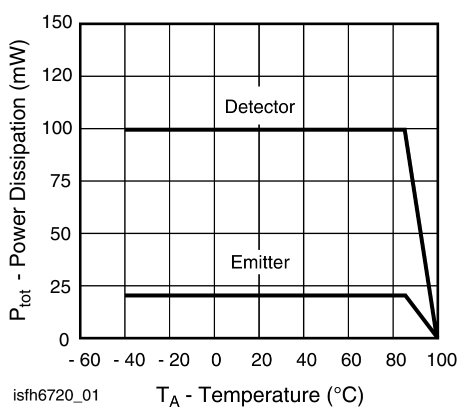


Fig. 1 - Permissible Total Power Dissipation vs. Temperature

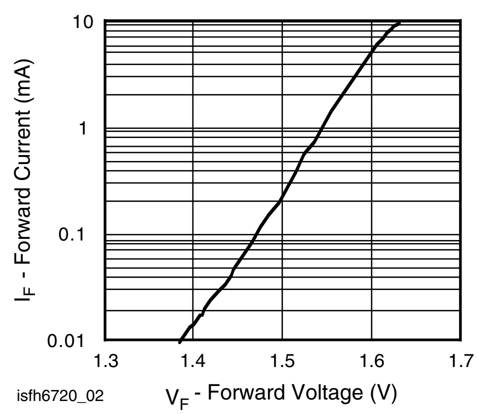


Fig. 2 - Typical Input Diode Forward Current vs. Forward Voltage

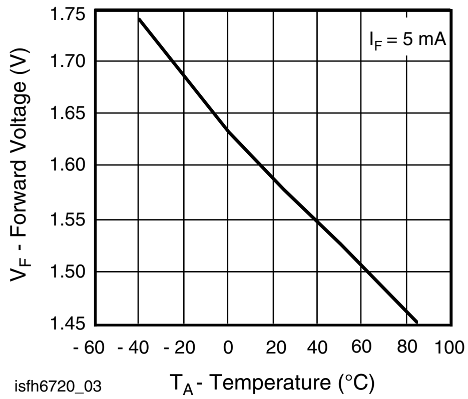


Fig. 3 - Typical Forward Input Voltage vs. Temperature

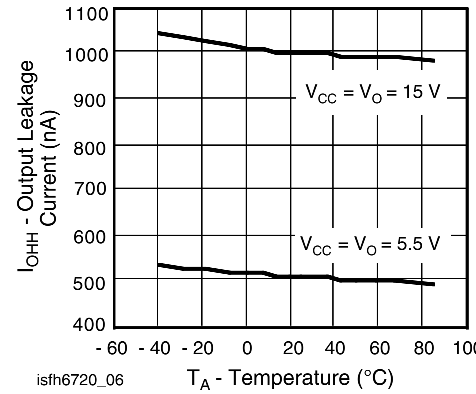


Fig. 6 - Typical Output Leakage Current vs. Temperature

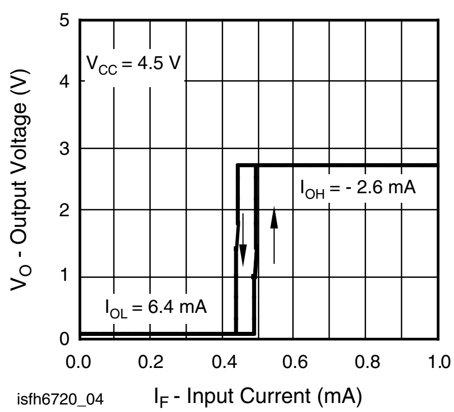


Fig. 4 - Typical Output Voltage vs. Forward Input Current

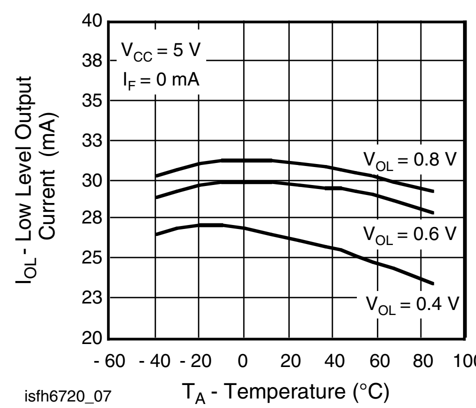


Fig. 7 - Typical Low Level Output Current vs. Temperature

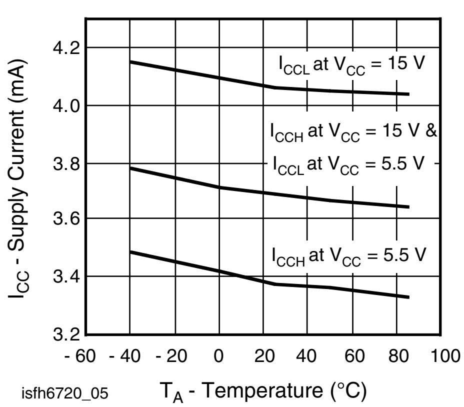


Fig. 5 - Typical Supply Current vs. Temperature

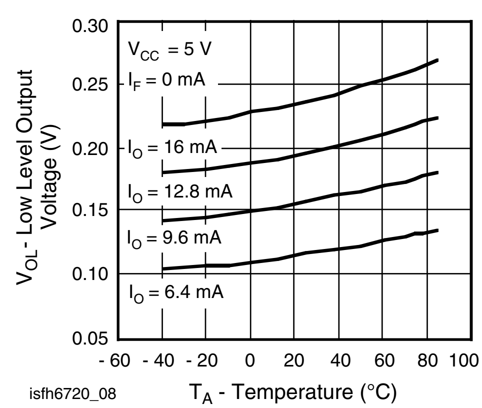


Fig. 8 - Typical Low Level Output Voltage vs. Temperature

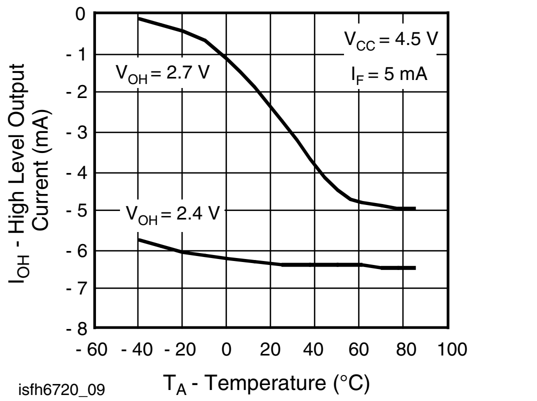


Fig. 9 - Typical High Level Output Current vs. Temperature

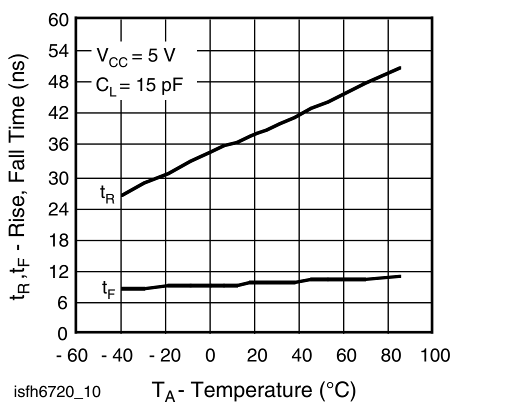


Fig. 10 - Rise and Fall Time vs. Ambient Temperature

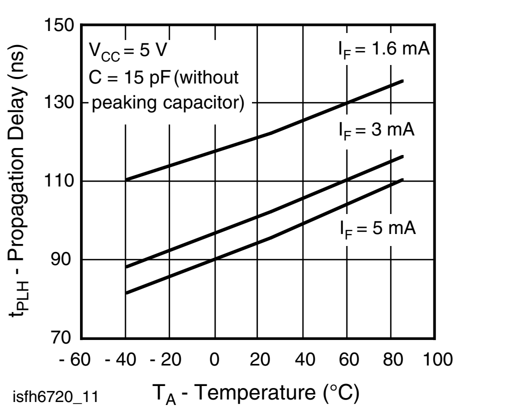


Fig. 11 - Typical Propagation Delays to Logic High vs. Temperature

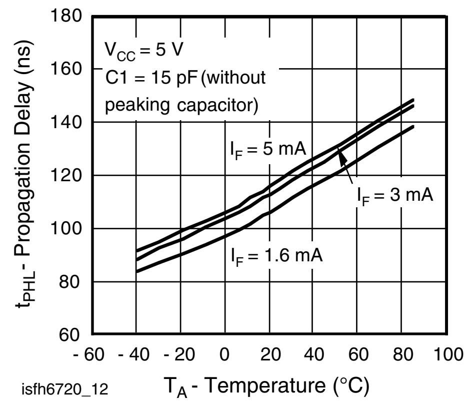


Fig. 12 - Typical Propagation Delays to Logic Low vs. Temperature

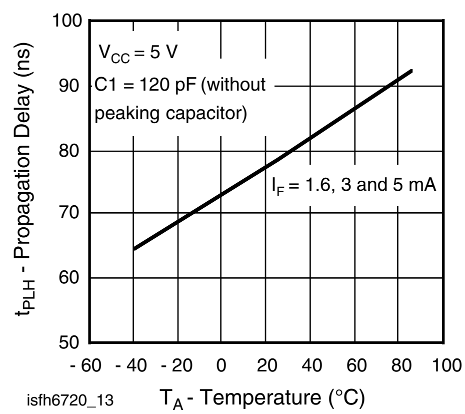


Fig. 13 - Typical Propagation Delays to Logic High vs. Temperature

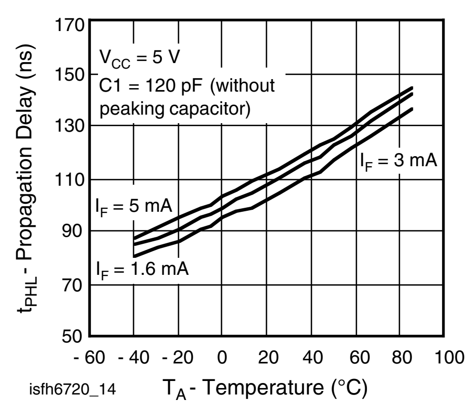


Fig. 14 - Typical Propagation Delays to Logic Low vs. Temperature

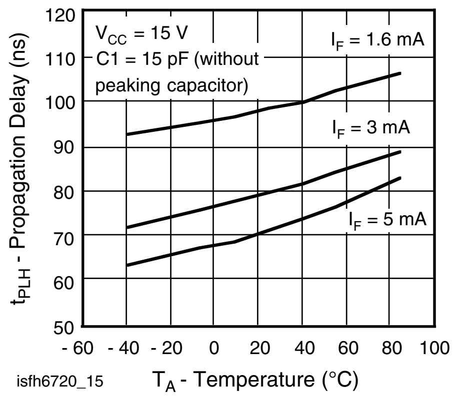


Fig. 15 - Typical Propagation Delays to Logic High vs. Temperature

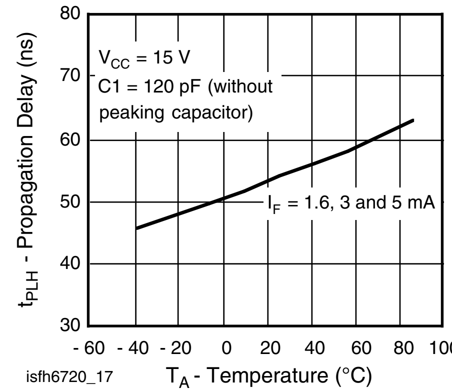


Fig. 17 - Typical Propagation Delays to Logic High vs. Temperature

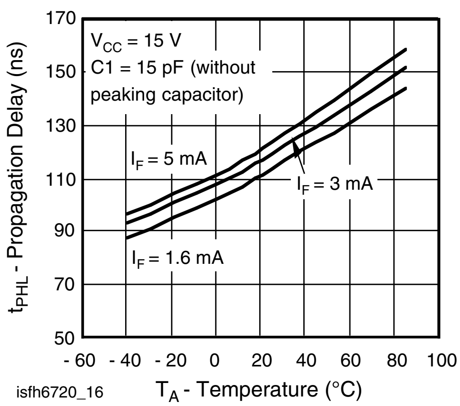


Fig. 16 - Typical Propagation Delays to Logic Low vs. Temperature

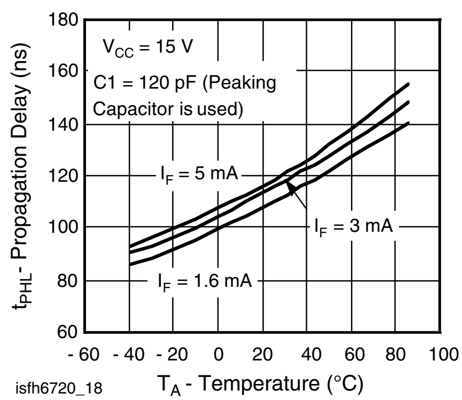
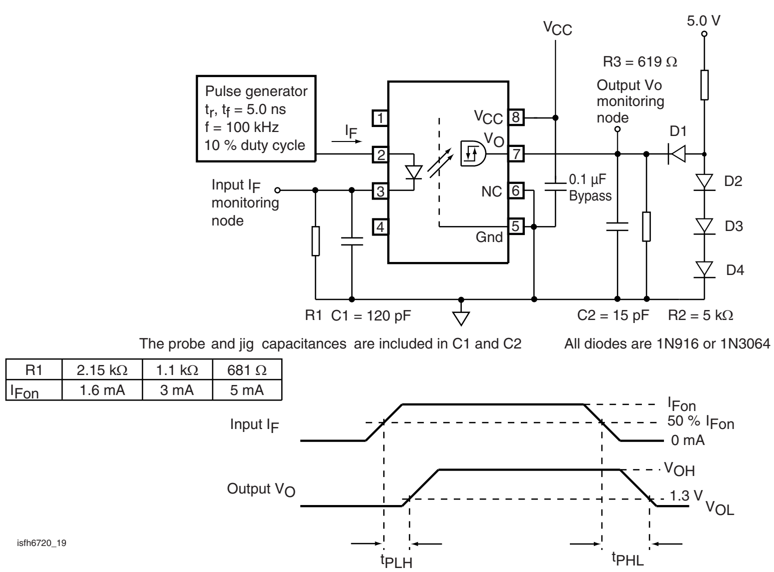


Fig. 18 - Typical Propagation Delays to Logic Low vs. Temperature



R1	2.15 kΩ	1.1 kΩ	681 Ω
I_{Fon}	1.6 mA	3 mA	5 mA

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

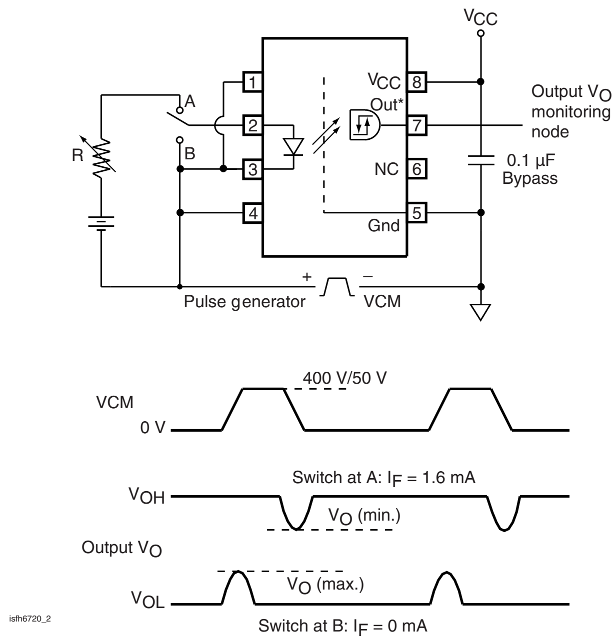
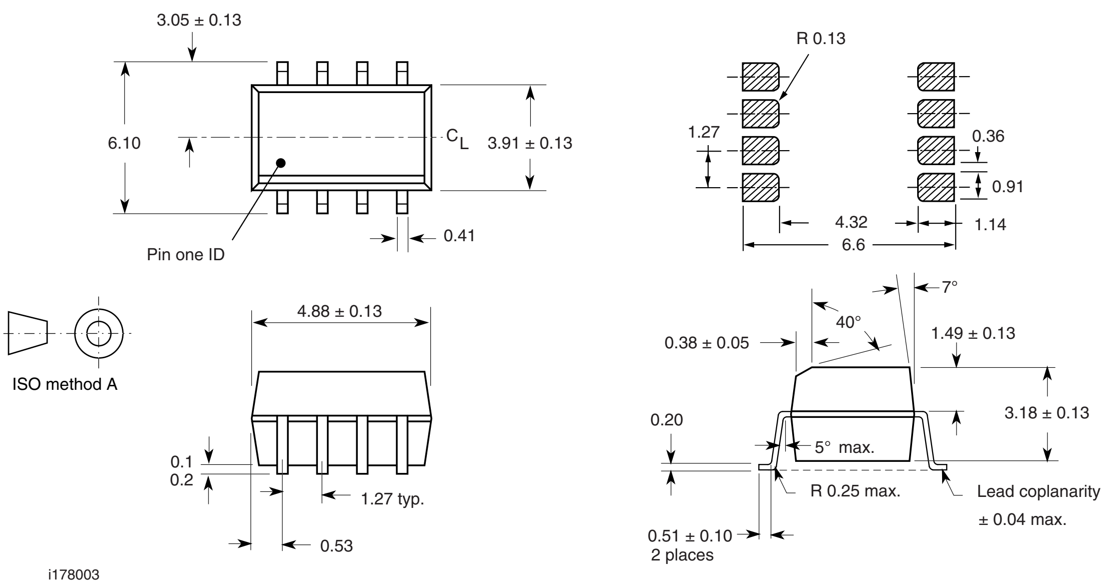


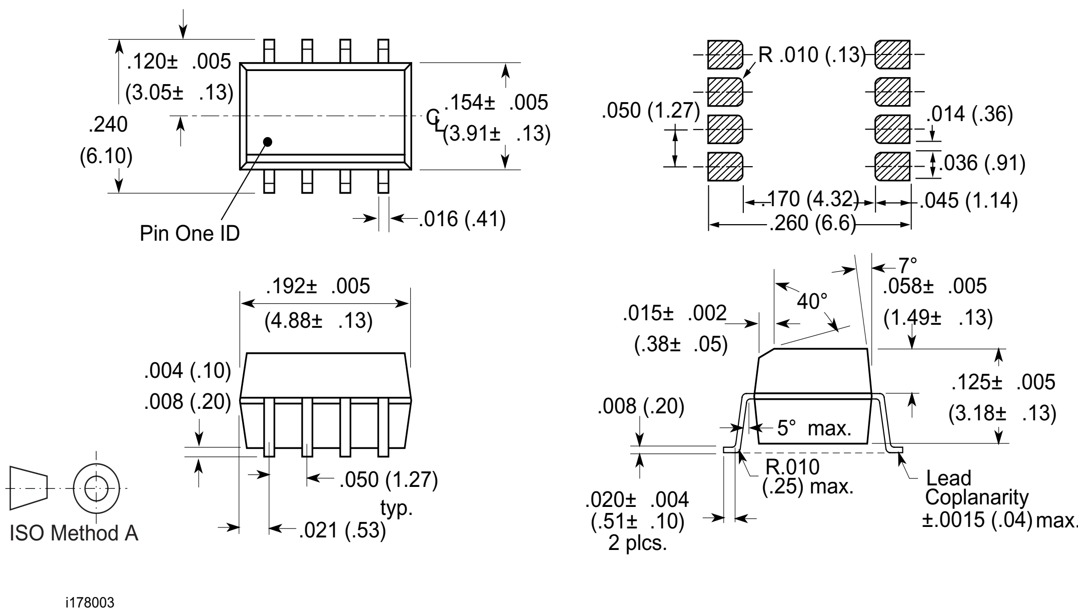
Fig. 20 - Test Circuit for Common Mode Transient Immunity and Typical Waveforms

PACKAGE DIMENSIONS millimeters



SOIC-8

Package Dimensions in Inches (mm)



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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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