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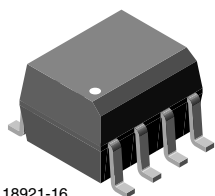
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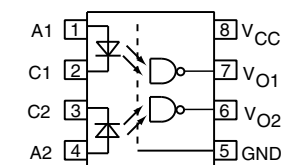
SFH6755T, SFH6756T, SFH6757T

Vishay Semiconductors

High Speed Optocoupler, 10 MBd, Dual, SOIC-8 Package



18921-16



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20050

DESCRIPTION

The SFH675xT-series, is a dual channel 10 MBd optocoupler utilizing a high efficient input LED coupled with an integrated optical photodiode IC detector. The detector has an open drain NMOS-transistor output, providing less leakage compared to an open collector Schottky clamped transistor output. The internal shield provides a guaranteed common mode transient immunity of 5 kV/μs for the SFH6756T and 15 kV/μs for the SFH6757T. The use of a 0.1 μF bypass capacitor connected between pin 5 and 8 is recommended.

AGENCY APPROVALS

- UL1577, file no. E52744 system code Y
- cUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-5 (VDE 0884) available with option 1

FEATURES

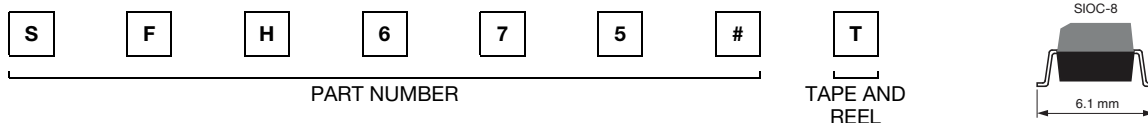
- Choice of CMR performance of 15 kV/μs, 5 kV/μs, and 100 V/μs
- External creepage distance > 5 mm
- High speed: 10 Mbd typical
- + 5 V CMOS compatibility
- Guaranteed AC and DC performance over temperature: - 40 °C to + 100 °C temperature range
- Pure tin leads
- Meets IEC 60068-2-42 (SO₂) and IEC 60068-2-43 (H₂S) requirements
- Low input current capability: 5 mA
- Compliant to RoHS Directive to 2002/95/EC and in accordance WEEE 2002/96/EC



APPLICATIONS

- Microprocessor system interface
- PLC, ATE input/output isolation
- Computer peripheral interface
- Digital fieldbus isolation: CC-link, DeviceNet, profibus, SDS
- High speed A/D and D/A conversion
- AC plasma display panel level shifting
- Multiplexed data transmission
- Digital control power supply
- Ground loop elimination

ORDERING INFORMATION



AGENCY CERTIFIED/PACKAGE	CMR (kV/μs)	CMR (kV/μs)	CMR (kV/μs)
UL, cUL	0.1	5	15
SOIC-8	SFH6755T	SFH6756T	SFH6757T

TRUTH TABLE (positive logic)

LED	ENABLE	OUTPUT
On	H	L
Off	H	H
On	L	H
Off	L	H
On	NC	L
Off	NC	H

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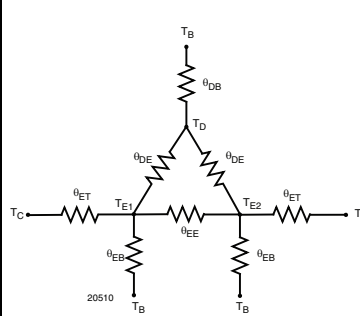
Vishay Semiconductors High Speed Optocoupler, 10 MBd,
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ABSOLUTE MAXIMUM RATINGS ⁽¹⁾ (T _{amb} = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Average forward current (single channel)		I _F	20	mA
Average forward current (per channel for dual channel)		I _F	15	mA
Reverse input voltage		V _R	5	V
Surge current	t = 100 μs	I _{FSM}	200	mA
Output power dissipation (single channel)		P _{diss}	35	mW
Output power dissipation (per channel for dual)		P _{diss}	25	mW
OUTPUT				
Supply voltage	1 min maximum	V _{CC}	7	V
Output current		I _O	50	mA
Output voltage		V _O	7	V
Output power dissipation (single channel)		P _{diss}	85	mW
Output power dissipation (for dual channel)		P _{diss}	60	mW
COUPLER				
Isolation test voltage	t = 1 s	V _{ISO}	4000	V _{RMS}
Storage temperature		T _{stg}	- 55 to + 150	°C
Operating temperature		T _{amb}	- 40 to + 100	°C
Lead solder temperature	for 10 s		260	°C
Solder reflow temperature ⁽²⁾	for 1 min	T _{slid}	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 for soldering conditions for surface mounted devices.

RECOMMENDED OPERATING CONDITIONS					
PARAMETER	TEST CONDITION	SYMBOL	MIN.	MAX.	UNIT
Operating temperature		T _{amb}	- 40	100	°C
Supply voltage		V _{CC}	4.5	5.5	V
Input current low level		I _{FL}	0	250	μA
Input current high level		I _{FH}	5	15	mA
Output pull up resistor		R _L	330	4K	Ω
Fanout	R _L = 1 kΩ	N		5	-

THERMAL CHARACTERISTICS					
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT	
LED power dissipation	at 25 °C	P _{diss}	100	mW	
Output power dissipation	at 25 °C	P _{diss}	500	mW	
Maximum LED junction temperature		T _{jmax}	125	°C	
Maximum output die junction temperature		T _{jmax}	125	°C	
Thermal resistance, junction emitter to emitter		θ _{EE}	412	°C/W	
Thermal resistance, junction detector to emitter		θ _{DE}	133	°C/W	
Thermal resistance, junction emitter to board		θ _{EB}	120	°C/W	
Thermal resistance, junction detector to board		θ _{DB}	77	°C/W	
Thermal resistance, junction emitter to case		θ _{EC}	110	°C/W	

Note

- The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's Thermal Characteristics of Optocouplers application note.



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 Dual, SOIC-8 Package

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, and $V_{CC} = 5.5\text{ V}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Input forward voltage	$I_F = 10\text{ mA}$	V_F	1.1	1.4	1.7	V
Reverse current	$V_R = 5\text{ V}$	I_R		0.01	10	μA
Input capacitance	$f = 1\text{ MHz}$, $V_F = 0\text{ V}$	C_I		55		pF
OUTPUT						
High level supply current (single channel)	$V_E = 0.5\text{ V}$, $I_F = 0\text{ mA}$	I_{CCH}		4.1	7	mA
	$V_E = V_{CC}$, $I_F = 0\text{ mA}$	I_{CCH}		3.3	6	mA
High level supply current (dual channel)	$I_F = 0\text{ mA}$	I_{CCH}		6.5	12	mA
Low level supply current (single channel)	$V_E = 0.5\text{ V}$, $I_F = 10\text{ mA}$	I_{CCL}		4	7	mA
	$V_E = V_{CC}$, $I_F = 10\text{ mA}$	I_{CCL}		3.3	6	mA
Low level supply current (dual channel)	$I_F = 10\text{ mA}$	I_{CCL}		6.5	12	mA
High level output current	$V_E = 2\text{ V}$, $V_O = 5.5\text{ V}$, $I_F = 250\text{ }\mu\text{A}$	I_{OH}		0.002	1	μA
Low level output voltage	$V_E = 2\text{ V}$, $I_F = 5\text{ mA}$, $I_{OL}(\text{sinking}) = 13\text{ mA}$	V_{OL}		0.2	0.6	V
Input threshold current	$V_E = 2\text{ V}$, $V_O = 5.5\text{ V}$, $I_{OL}(\text{sinking}) = 13\text{ mA}$	I_{TH}		2.4	5	mA

Note

- 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 high output level	$R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$	t_{PLH}	20	48	100	ns
Propagation delay time to low output level	$R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$	t_{PHL}	25	50	100	ns
Pulse width distortion	$R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$	$ t_{PHL} - t_{PLH} $		2.9	35	ns
Propagation delay skew	$R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$	t_{PSK}		8	40	ns
Output rise time (10 to 90 %)	$R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$	t_r		23		ns
Output fall time (90 to 10 %)	$R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$	t_f		7		ns

Note

- ⁽¹⁾ Over recommended temperature ($T_A = -40\text{ }^{\circ}\text{C}$ to $+100\text{ }^{\circ}\text{C}$), $V_{CC} = 5\text{ V}$, $I_F = 7.5\text{ mA}$ unless otherwise specified.
 All typicals at $T_{amb} = 25\text{ }^{\circ}\text{C}$, $V_{CC} = 5\text{ V}$.

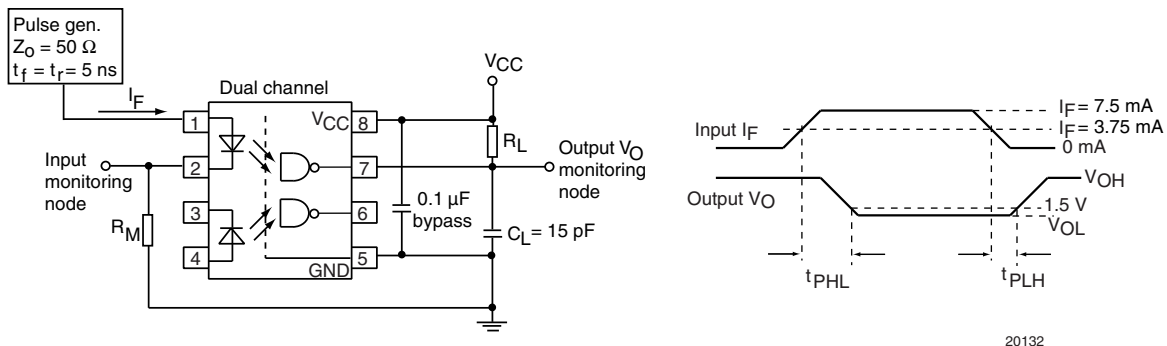


Fig. 1 - Dual Channel Test Circuit for t_{PLH} , t_{PHL} , t_r and t_f

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COMMON MODE TRANSIENT IMMUNITY						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode transient immunity (high)	$ V_{CM} = 10\text{ V}, V_{CC} = 5\text{ V}, I_F = 0\text{ mA}, V_{O(\text{min.})} = 2\text{ V}, R_L = 350\ \Omega, T_{\text{amb}} = 25\text{ }^\circ\text{C}^{(1)}$	$ CM_H $	100			V/ μs
	$ V_{CM} = 50\text{ V}, V_{CC} = 5\text{ V}, I_F = 0\text{ mA}, V_{O(\text{min.})} = 2\text{ V}, R_L = 350\ \Omega, T_{\text{amb}} = 25\text{ }^\circ\text{C}^{(2)}$	$ CM_H $	5000	10 000		V/ μs
	$ V_{CM} = 1\text{ kV}, V_{CC} = 5\text{ V}, I_F = 0\text{ mA}, V_{O(\text{min.})} = 2\text{ V}, R_L = 350\ \Omega, T_{\text{amb}} = 25\text{ }^\circ\text{C}^{(3)}$	$ CM_H $	15 000	25 000		V/ μs
Common mode transient immunity (low)	$ V_{CM} = 10\text{ V}, V_{CC} = 5\text{ V}, I_F = 7.5\text{ mA}, V_{O(\text{max.})} = 0.8\text{ V}, R_L = 350\ \Omega, T_{\text{amb}} = 25\text{ }^\circ\text{C}^{(1)}$	$ CM_L $	100			V/ μs
	$ V_{CM} = 50\text{ V}, V_{CC} = 5\text{ V}, I_F = 7.5\text{ mA}, V_{O(\text{max.})} = 0.8\text{ V}, R_L = 350\ \Omega, T_{\text{amb}} = 25\text{ }^\circ\text{C}^{(2)}$	$ CM_L $	5000	10 000		V/ μs
	$ V_{CM} = 1\text{ kV}, V_{CC} = 5\text{ V}, I_F = 7.5\text{ mA}, V_{O(\text{max.})} = 0.8\text{ V}, R_L = 350\ \Omega, T_{\text{amb}} = 25\text{ }^\circ\text{C}^{(3)}$	$ CM_L $	15 000	25 000		V/ μs

Notes

- (1) For SFH6755T
- (2) For SFH6756T
- (3) For SFH6757T

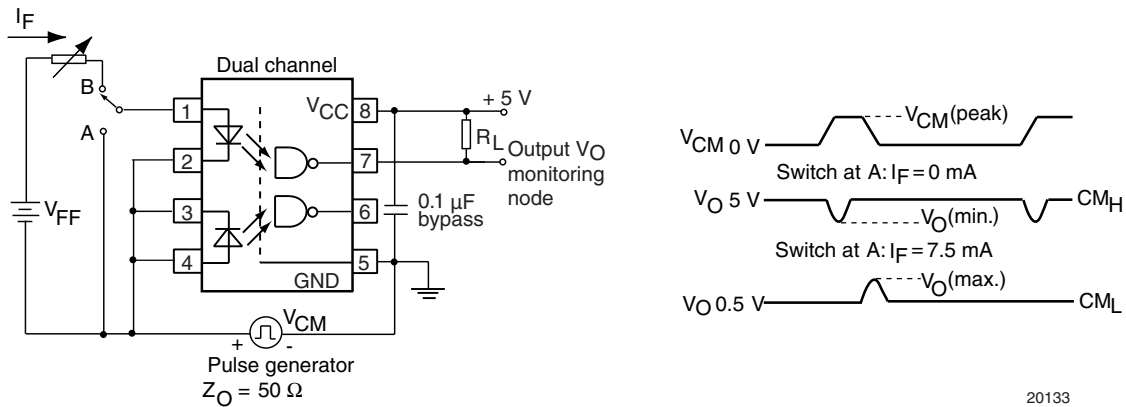


Fig. 2 - Dual Channel Test Circuit for Common Mode Transient Immunity

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	
Peak transient overvoltage		V_{IOTM}	6000			V
Peak insulation voltage		V_{IORM}	560			V
Safety rating - power output		P_{SO}			350	mW
Safety rating - input current		I_{SI}			150	mA
Safety rating - temperature		T_{SI}			165	$^\circ\text{C}$
Creepage distance			5			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.



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

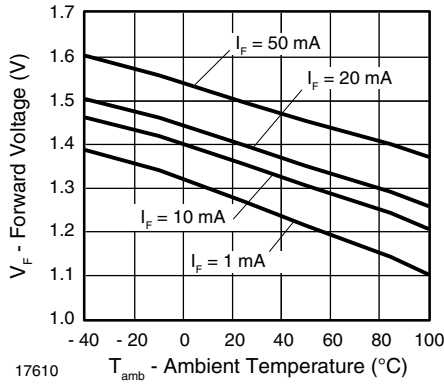


Fig. 3 - Forward Voltage vs. Ambient Temperature

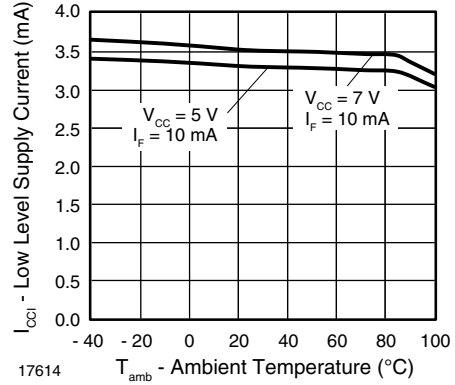


Fig. 6 - Low Level Supply Current vs. Ambient Temperature

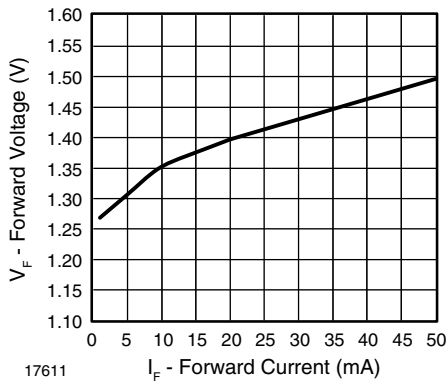


Fig. 4 - Forward Voltage vs. Forward Current

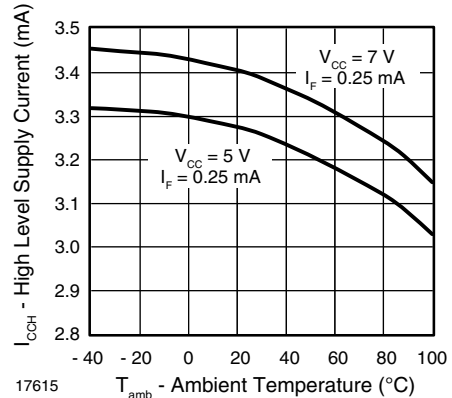


Fig. 7 - High Level Supply Current vs. Ambient Temperature

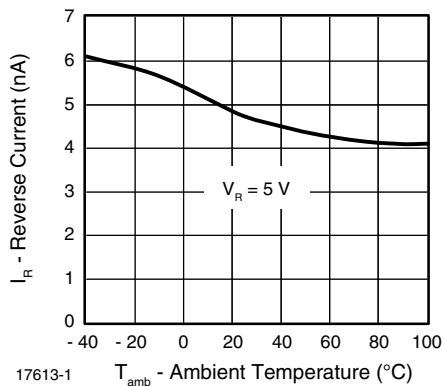


Fig. 5 - Reverse Current vs. Ambient Temperature

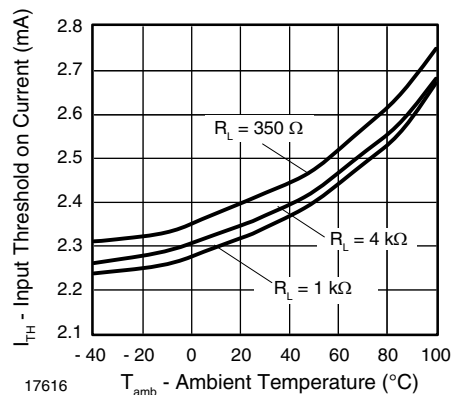


Fig. 8 - Input Threshold on Current vs. Ambient Temperature

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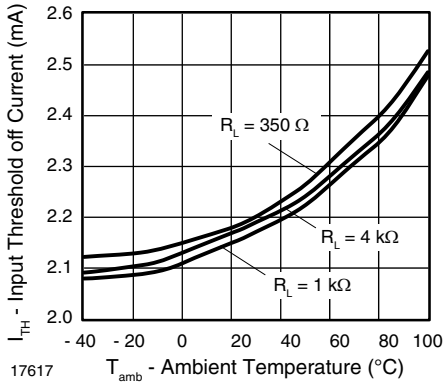


Fig. 9 - Input Threshold off Current vs. Ambient Temperature

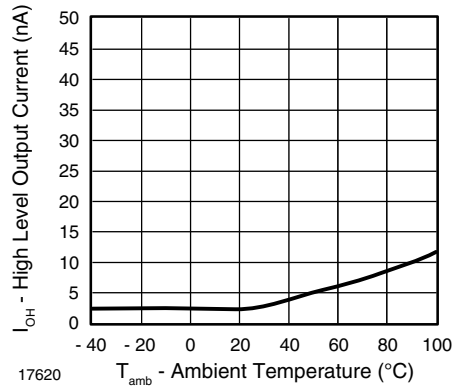


Fig. 12 - High Level Output Current vs. Ambient Temperature

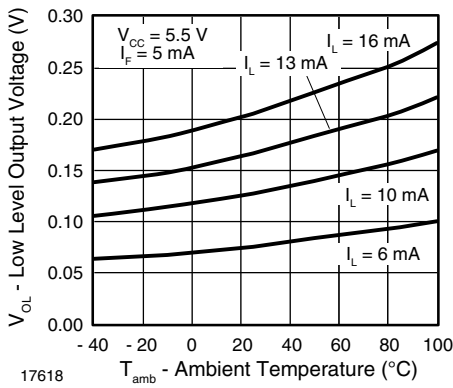


Fig. 10 - Low Level Output Voltage vs. Ambient Temperature

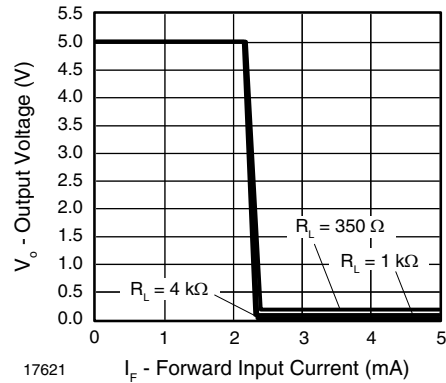


Fig. 13 - Output Voltage vs. Forward Input Current

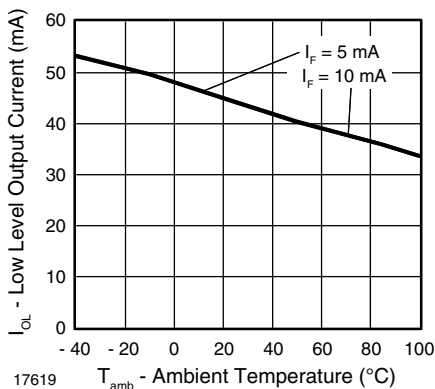


Fig. 11 - Low Level Output Current vs. Ambient Temperature

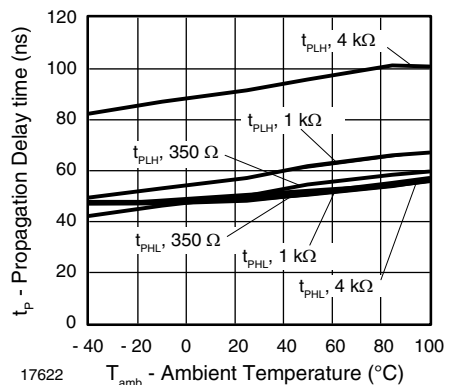


Fig. 14 - Propagation Delay vs. Ambient Temperature



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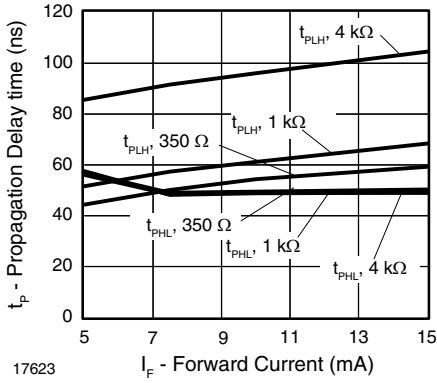


Fig. 15 - Propagation Delay vs. Forward Current

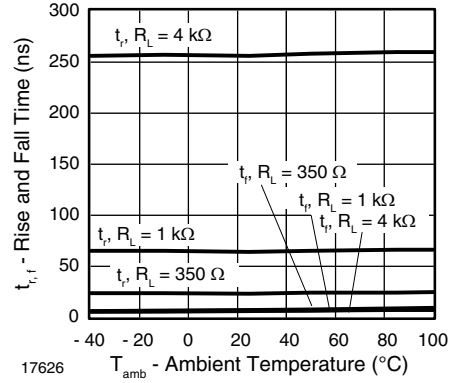


Fig. 18 - Rise and Fall Time vs. Ambient Temperature

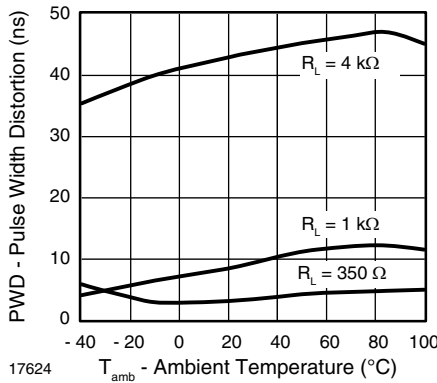


Fig. 16 - Pulse Width Distortion vs. Ambient Temperature

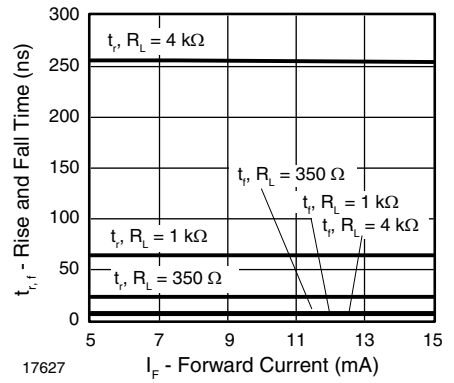


Fig. 19 - Rise and Fall Time vs. Forward Current

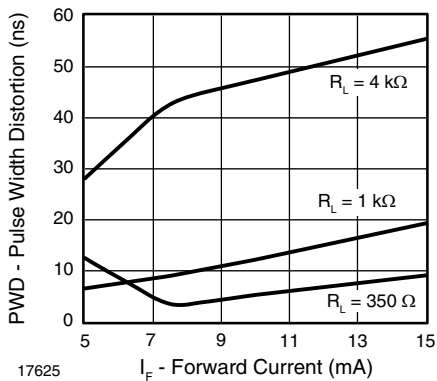


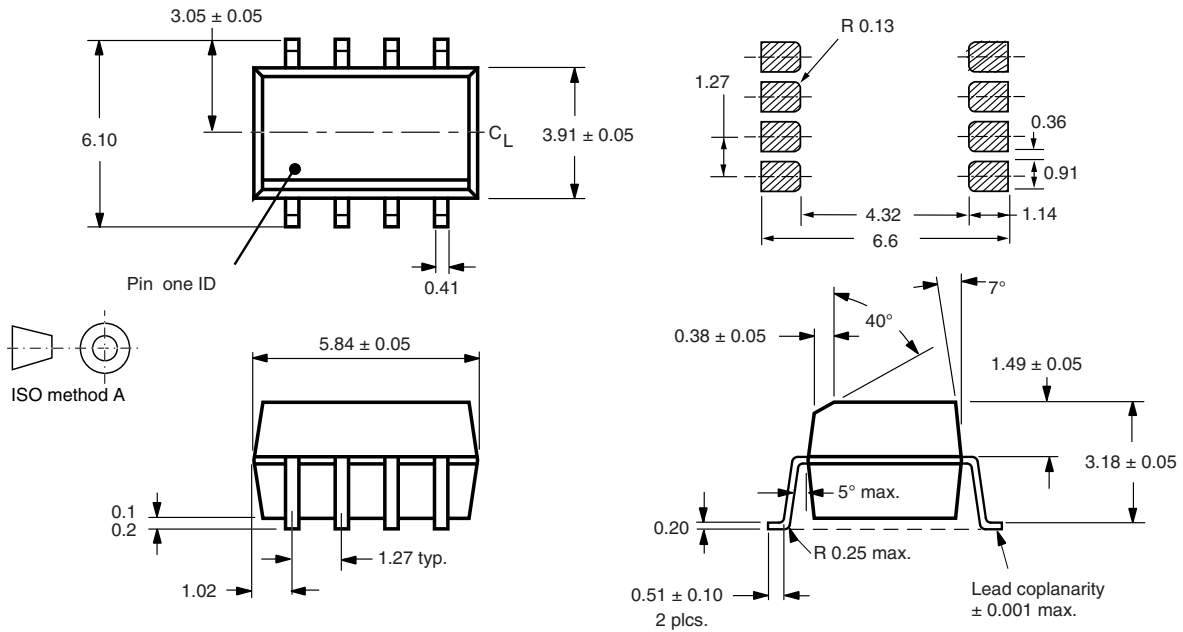
Fig. 17 - Pulse Width Distortion vs. Forward Current

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PACKAGE DIMENSIONS millimeters
DUAL CHANNEL SOIC-8



i178020

ESD CAUTION

This is an ESD (electro static discharge) sensitive device. Electrostatic charges accumulate on the human body and test equipment and can discharge without detection. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality. ESD withstand voltage of this device is up to 1500 V acc. to JESD22-A114-B.



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