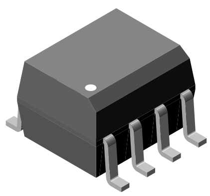
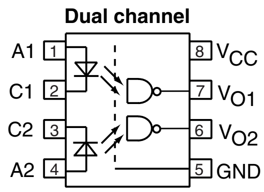
High Speed Optocoupler, 10 MBd, SOIC-8 Package

20050





SFH6755T/56T/57T

18921-16

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-transister output, providing less leakage compared to an open collector Schottky clamped transister 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 (SO_2) and IEC 60068-2-43 (H_2S) requirements
- Low input current capability: 5 mA
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

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

ORDER INFORMATION	
PART	**REMARKS**
SFH6755T	100 V/µs, dual channel, SOIC-8
SFH6756T	5 kV/µs, dual channel, SOIC-8
SFH6757T	15 kV/µs, dual channel, SOIC-8

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

ABSOLUTE MAXIMUM RATINGS [1]

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 channel)		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 = 1.0 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_{sld}	260	°C

Notes

(1) 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 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	-

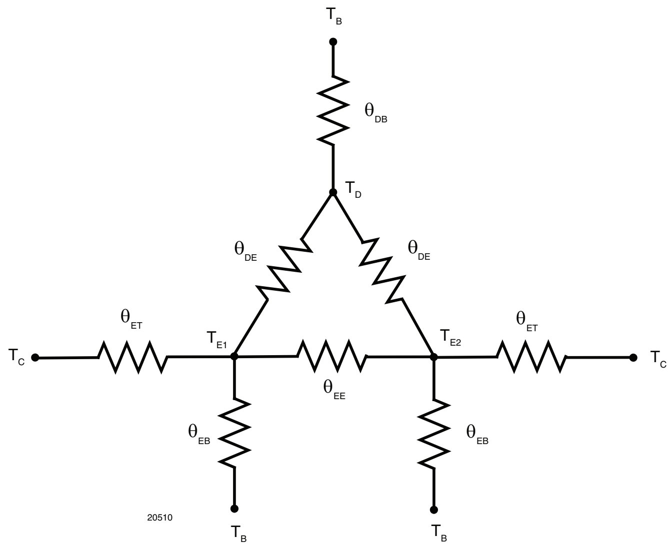
THERMAL CHARACTERISTICS

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 CHARACTERISTICS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
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.



ELECTRICAL CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Input forward voltage	I_F = 10 mA	V_F	1.1	1.4	1.7	V
Reverse current	V_R = 5 V	I_R		0.01	10	µA
Input capacitance	f = 1 MHz, V_F = 0 V	C_I		55		pF
OUTPUT						
High level supply current (single channel)	V_E = 0.5 V, I_F = 0 mA	I_{CCH}		4.1	7.0	mA
	V_E = V_{CC}, I_F = 0 mA	I_{CCH}		3.3	6.0	mA
High level supply current (dual channel)	I_F = 0 mA	I_{CCH}		6.5	12.0	mA
Low level supply current (single channel)	V_E = 0.5 V, I_F = 10 mA	I_{CCL}		4.0	7.0	mA
	V_E = V_{CC}, I_F = 10 mA	I_{CCL}		3.3	6.0	mA
Low level supply current (dual channel)	I_F = 10 mA	I_{CCL}		6.5	12.0	mA
High level output current	V_E = 2 V, V_O = 5.5 V, I_F = 250 µA	I_{OH}		0.002	1	µA
Low level output voltage	V_E = 2 V, I_F = 5 mA, I_{OL} (sinking) = 13 mA	V_{OL}		0.2	0.6	V
Input threshold current	V_E = 2 V, V_O = 5.5 V, I_{OL} (sinking) = 13 mA	I_{TH}		2.4	5.0	mA

Note

T_{amb} = 25 °C, and V_{CC} = 5.5 V, 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						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Propagation delay time to high output level	R_L = 350 Ω, C_L = 15 pF	t_{PLH}	20	48	100	ns
Propagation delay time to low output level	R_L = 350 Ω, C_L = 15 pF	t_{PHL}	25	50	100	ns
Pulse width disortion	R_L = 350 Ω, C_L = 15 pF	$\|t_{PHL} - t_{PLH}\|$		2.9	35	ns
Propagation delay skew	R_L = 350 Ω, C_L = 15 pF	t_{PSK}		8	40	ns
Output rise time (10 to 90 %)	R_L = 350 Ω, C_L = 15 pF	t_r		23		ns
Output fall time (90 to 10 %)	R_L = 350 Ω, C_L = 15 pF	t_f		7		ns

Note

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

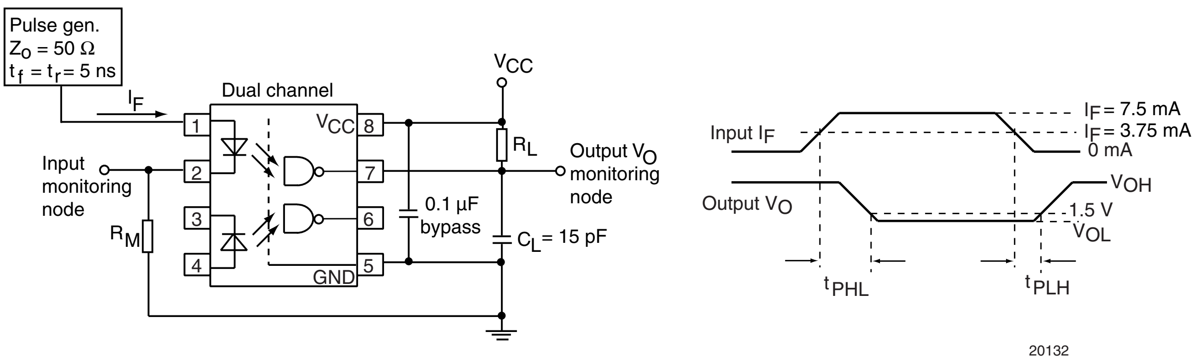


Fig. 1 - Dual Channel Test Circuit for t_{PLH}, t_{PHL}, t_r and t_f

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

Notes

[1] For SFH6755T
[2] For SFH6756T
[3] For SFH6757T

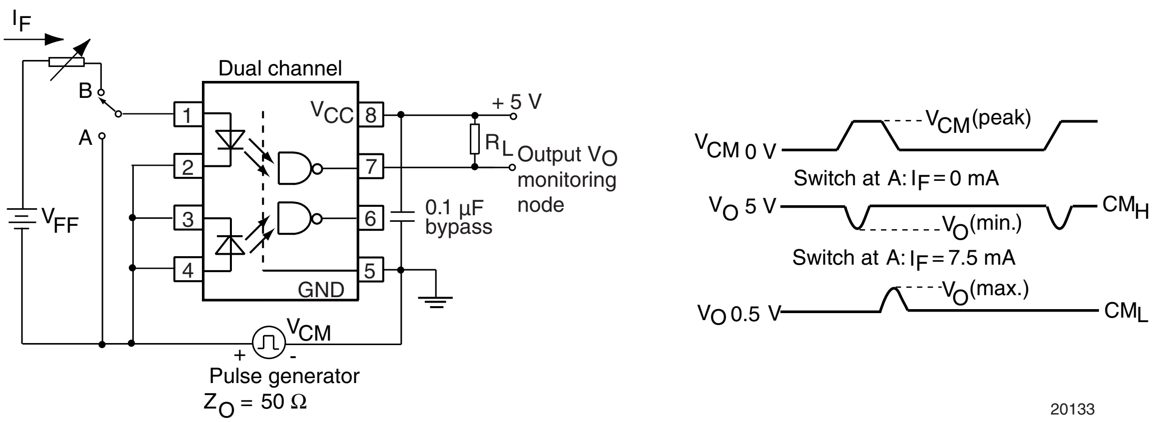


Fig. 2 - Dual Channel Test Circuit for Common Mode Transient Immunity

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	°C
Creepage distance			5			mm
Clearance distance			4			mm
Insulation thickness			0.2			mm

Note

As per IEC 60747-5-2, §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 prodective circuits.

TYPICAL CHARACTERISTICS

T_{amb} = 25 °C, unless otherwise specified

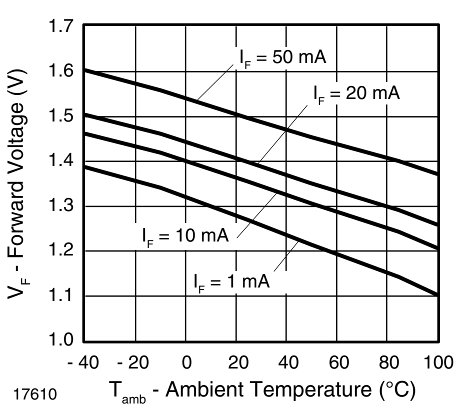


Fig. 3 - Forward Voltage vs. Ambient Temperature

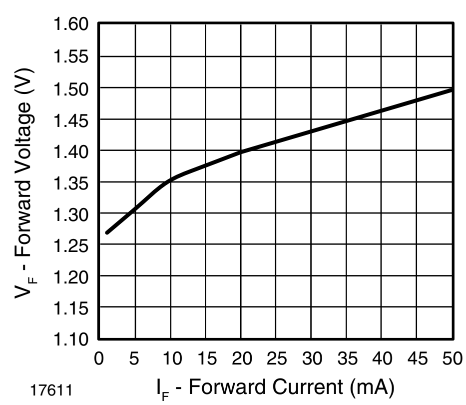


Fig. 4 - Forward Voltage vs. Forward Current

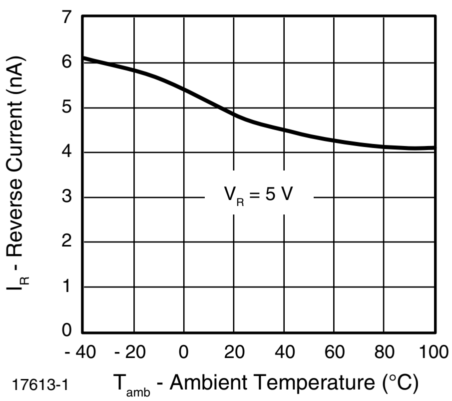


Fig. 5 - Reverse Current vs. Ambient Temperature

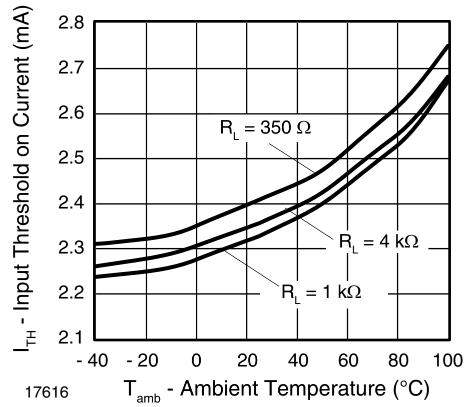


Fig. 8 - Input Threshold on Current vs. Ambient Temperature

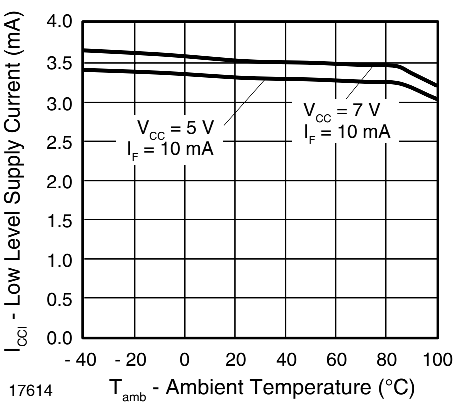


Fig. 6 - Low Level Supply Current vs. Ambient Temperature

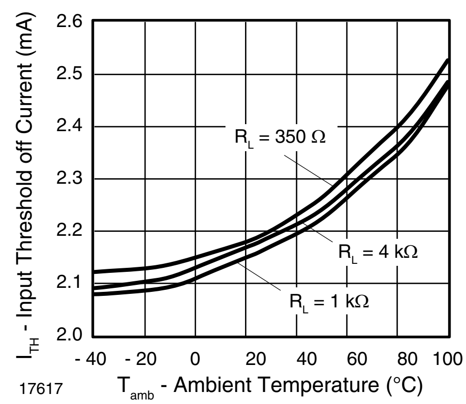


Fig. 9 - Input Threshold off Current vs. Ambient Temperature

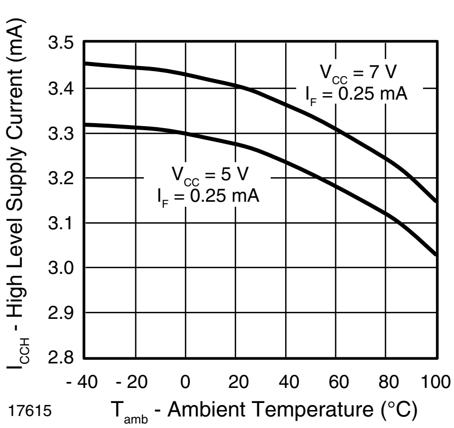


Fig. 7 - High Level Supply Current vs. Ambient Temperature

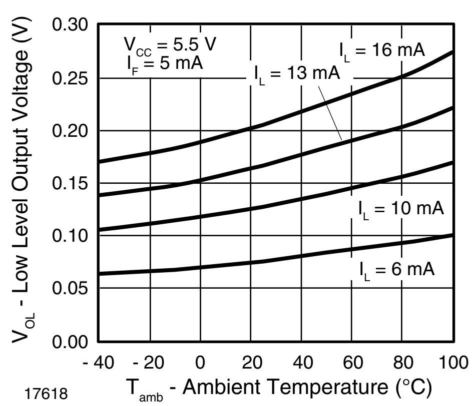


Fig. 10 - Low Level Output Voltage vs. Ambient Temperature

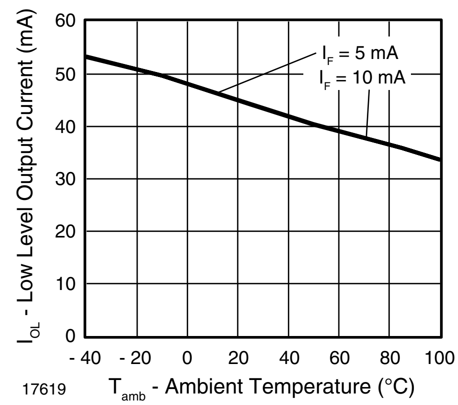


Fig. 11 - Low Level Output Current vs. Ambient Temperature

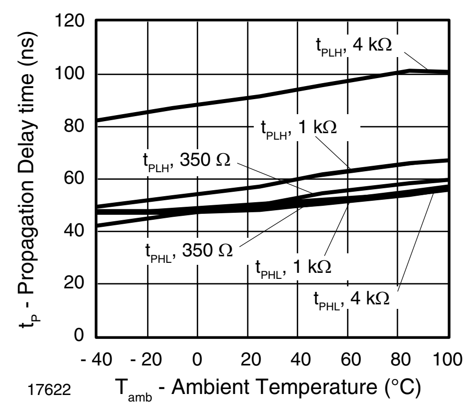


Fig. 14 - Propagation Delay vs. Ambient Temperature

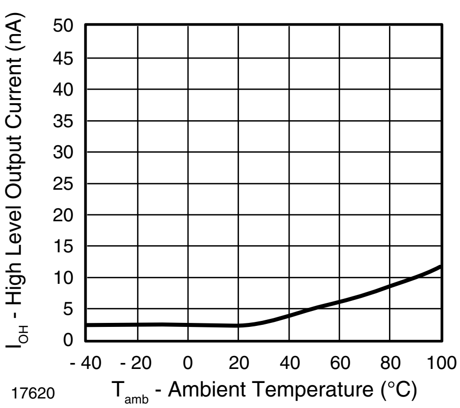


Fig. 12 - High Level Output Current vs. Ambient Temperature

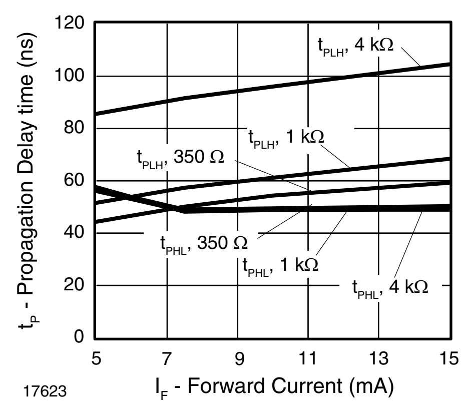


Fig. 15 - Propagation Delay vs. Forward Current

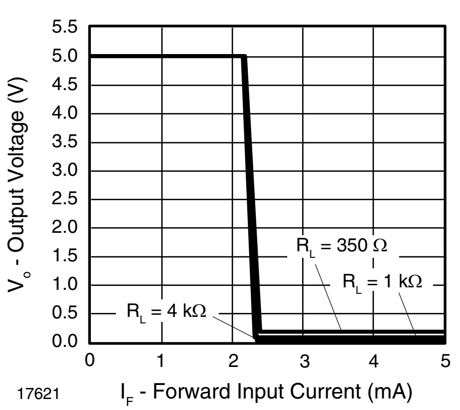


Fig. 13 - Output Voltage vs. Forward Input Current

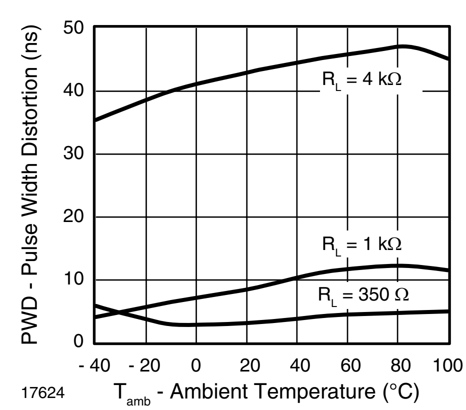


Fig. 16 - Pulse Width Distortion vs. Ambient Temperature

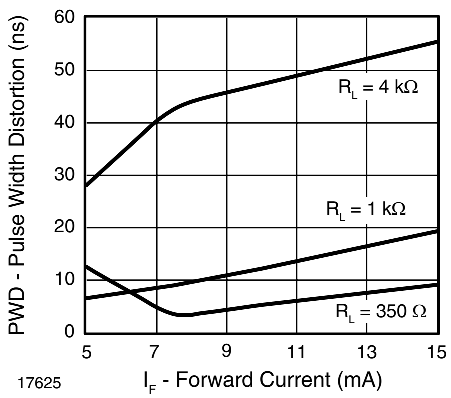


Fig. 17 - Pulse Width Distortion vs. Forward Current

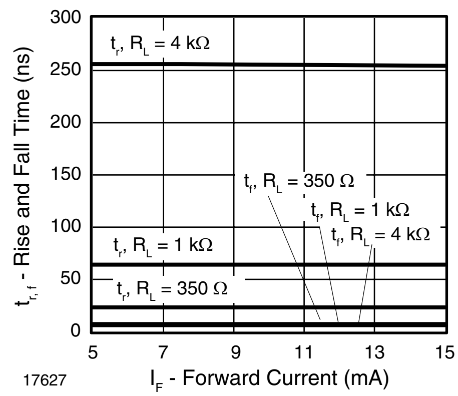


Fig. 19 - Rise and Fall Time vs. Forward Current

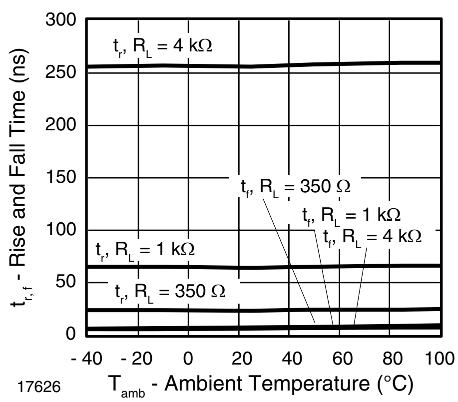
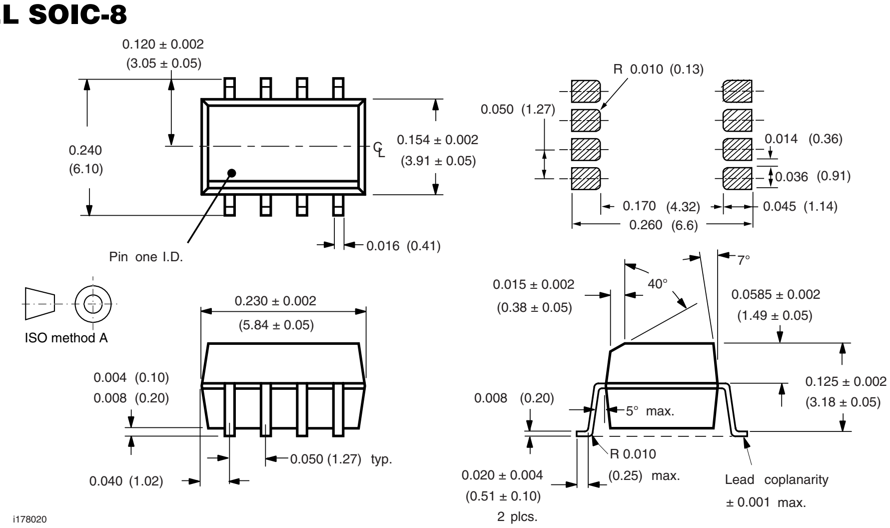


Fig. 18 - Rise and Fall Time vs. Ambient Temperature

PACKAGE DIMENSIONS in inches (millimeters)

DUAL CHANNEL SOIC-8



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.

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 operating systems 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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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