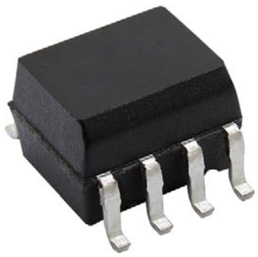
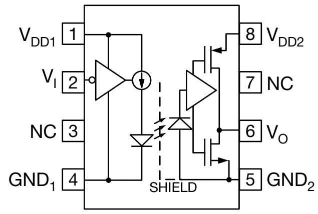
High Speed Optocoupler, 25 MBd, SOIC-8 Package





DESCRIPTION

The VOIH72A is a single channel 25 MBd high speed optocoupler in CMOS technology. Utilizing an input LED driver with a high speed IRED coupled with an integrated optical detector IC. A true digital input and output interface, in combination with the very low pulse width distortion of max. 6 ns and a high noise immunity of minimum 20 kV/μs enable an easy integration into digital logic systems.

FEATURES

- CMOS logic digital input and output
- High speed data rate of 25 MBd
- Wide supply voltage range 2.7 V to 5.5 V
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Galvanic isolation in digital systems
- Ground loop elimination
- Digital bus system isolation
- PLC and ATE interface isolation
- Feedback control in digital power supplies

AGENCY APPROVALS

- UL 1577 (pending)
- cUL 1577 (pending)

ORDERING INFORMATION

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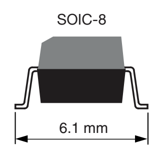
PART NUMBER								PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED / PACKAGE	
UL, cUL	
SOIC-8	VOIH72AT

Note

- Additional options may be possible, please contact sales office

TRUTH TABLE (positive logic)	
INPUT	**OUTPUT**
H	H
L	L

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Supply voltage		V_{DD1}	-0.5 to 6.0	V
Input voltage		V_I	-0.5 to V_{DD1} + 0.5	V
Input current		I_I	15	mA
Input power dissipation		P_{diss}	100	mW
OUTPUT				
Supply voltage		V_{DD2}	-0.5 to 6.0	V
Output voltage		V_O	-0.5 to V_{DD2} + 0.5	V
Output current		I_O	10	mA
Output power dissipation		P_{diss}	50	mW
COUPLER				
Isolation test voltage	t = 1 min	V_{ISO}	3750	V_{RMS}
Storage temperature		T_{stg}	-55 to +150	°C
Operating temperature		T_{amb}	-40 to +110	°C
Lead solder temperature	for 10 s		260	°C
Solder reflow temperature	for 1 min		260	°C

Note

- 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.

RECOMMENDED OPERATING CONDITION					
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**MAX.**	**UNIT**
Operating temperature		T_{amb}	-40	+110	°C
Input supply voltage		V_{DD1}	2.7	5.5	V
Output supply voltage		V_{DD2}	2.7	5.5	V
Logic low input voltage		V_{IL}	0	0.8	V
Logic high input level		V_{IH}	2.0	V_{DD1}	V

ELECTRICAL CHARACTERISTICS (T_{amb} = -40 °C to +110 °C, 2.7 V ≤ V_{DD1} ≤ 5.5 V, 2.7 V ≤ V_{DD2} ≤ 5.5 V, unless otherwise specified; typical values are at V_{DD1} = V_{DD2} = 3.3 V, T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Input current		I_I	-10	-	10	μA
High level supply current		I_{DD1H}	-	0.65	5	mA
Low level supply current		I_{DD1L}	-	9	15	mA
OUTPUT						
High level supply current		I_{DD2H}	-	1.3	2	mA
Low level supply current		I_{DD2L}	-	1.2	2	mA
High level output voltage	$V_I = V_{IH}$, I_O = -20 μA	V_{OH}	V_{DD2} - 0.4	V_{DD2}	-	V
	$V_I = V_{IH}$, I_O = -4 mA	V_{OH}	V_{DD2} - 1.4	V_{DD2} - 0.4	-	V
Low level output voltage	$V_I = V_{IL}$, I_O = 20 μA	V_{OL}	-	0	0.1	V
	$V_I = V_{IL}$, I_O = 4 mA	V_{OL}	-	0.16	0.6	V

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 (T_{amb} = -40 °C to +110 °C, 2.7 V ≤ V_{DD1} ≤ 5.5 V, 2.7 V ≤ V_{DD2} ≤ 5.5 V, unless otherwise specified; typical values are at V_{DD1} = V_{DD2} = 3.3 V, T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Propagation delay time to high output level	C_L = 15 pF, V_{IL} = 0 V, V_{IH} = V_{DD1}	t_{PLH}	-	29	40	ns
Propagation delay time to low output level	C_L = 15 pF, V_{IL} = 0 V, V_{IH} = V_{DD1}	t_{PHL}	-	24	40	ns
Pulse width distortion	C_L = 15 pF, V_{IL} = 0 V, V_{IH} = V_{DD1}	$\|t_{PLH} - t_{PHL}\|$	-	2	6	ns
Propagation delay skew	C_L = 15 pF, V_{IL} = 0 V, V_{IH} = V_{DD1}	t_{PSK}	-	5.8	20	ns
Output rise time (10 to 90 %)	C_L = 15 pF, V_{IL} = 0 V, V_{IH} = V_{DD1}	t_r	-	3.3	-	ns
Output fall time (90 to 10 %)	C_L = 15 pF, V_{IL} = 0 V, V_{IH} = V_{DD1}	t_f	-	3.1	-	ns

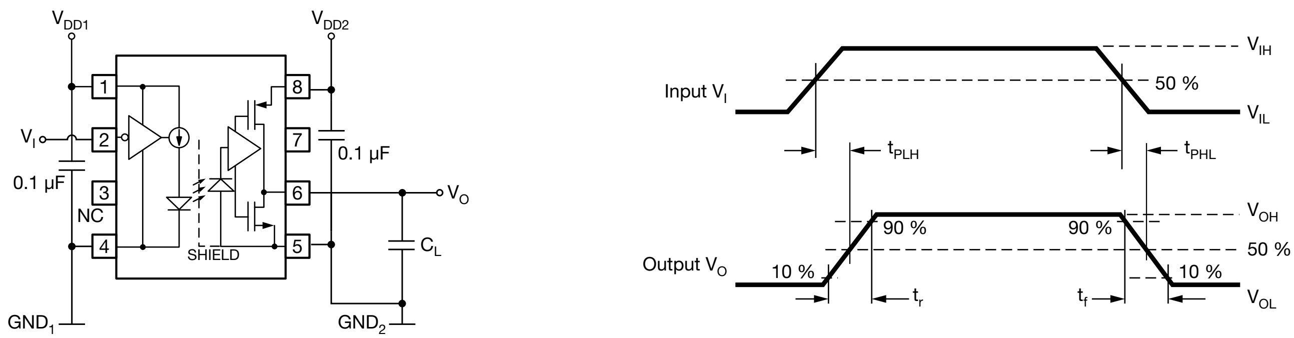


Fig. 1 - Test Circuit for t_{PLH}, t_{PHL}, t_r and t_f

COMMON MODE TRANSIENT IMMUNITY (T_{amb} = -40 °C to +110 °C, 2.7 V ≤ V_{DD1} ≤ 5.5 V, 2.7 V ≤ V_{DD2} ≤ 5.5 V, unless otherwise specified; typical values are at V_{DD1} = V_{DD2} = 3.3 V, T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity (high)	V_{CM} = 1000 V, V_I = V_{DD1}, V_O > 0.8 x V_{DD2}	$\|CM_H\|$	20 000	50 000	-	V/µs
Common mode transient immunity (low)	V_{CM} = 1000 V, V_I = 0 V, V_O < 0.8 V	$\|CM_L\|$	20 000	30 000	-	V/µs

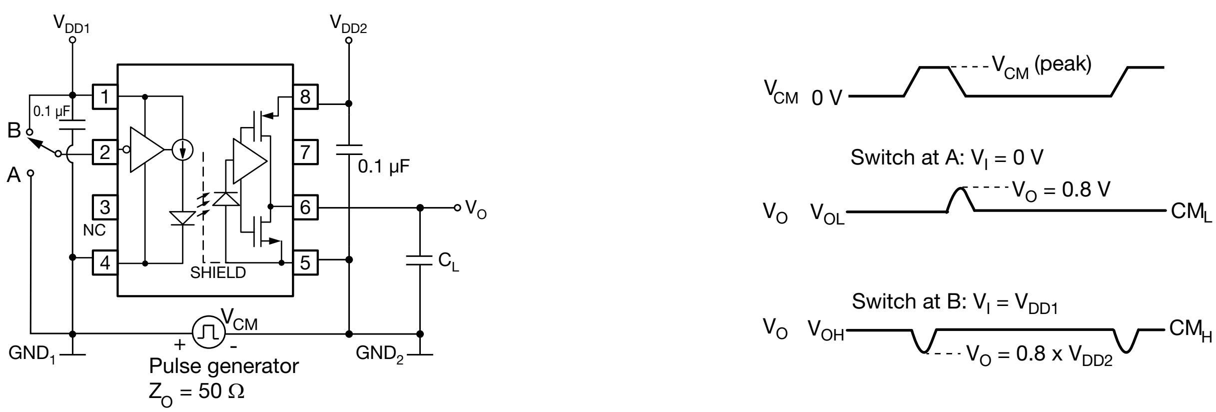


Fig. 2 - Test Circuit for Common Mode Transient Immunity

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 110 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL 1577, t = 1 min	V_{ISO}	3750	VRMS
Maximum transient isolation voltage	according to DIN EN 60747-5-5	V_{IOTM}	6000	V_{peak}
Maximum repetitive peak isolation voltage	according to DIN EN 60747-5-5	V_{IORM}	560	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{12}$	Ω
	T_{amb} = 110 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{11}$	Ω
	T_{amb} = 165 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{9}$	Ω
Output safety power		P_{SO}	350	mW
Input safety current		I_{SI}	150	mA
Input safety temperature		T_S	165	°C
Creepage distance			≥ 4	mm
Clearance distance			≥ 4	mm
Insulation thickness		DTI	≥ 0.2	mm
Input to output test voltage, method B	V_{IORM} x 1.875 = V_{PR}, 100 % production test with t_M = 1 s, partial discharge < 5 pC	V_{PR}	1050	V_{peak}
Input to output test voltage, method A	V_{IORM} x 1.6 = V_{PR}, 100 % sample test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	896	V_{peak}

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 productive circuits.

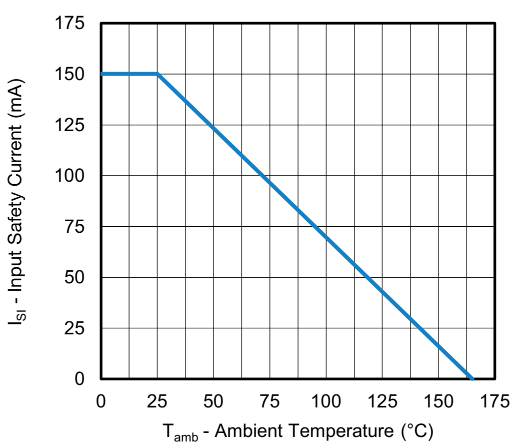


Fig. 3 - Input Safety Current vs. Ambient Temperature

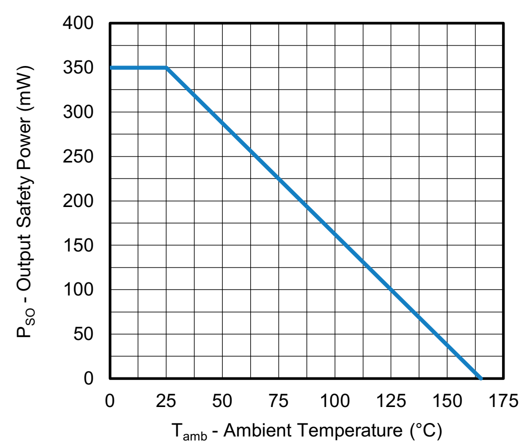


Fig. 4 - Output Safety Power vs. Ambient Temperature

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

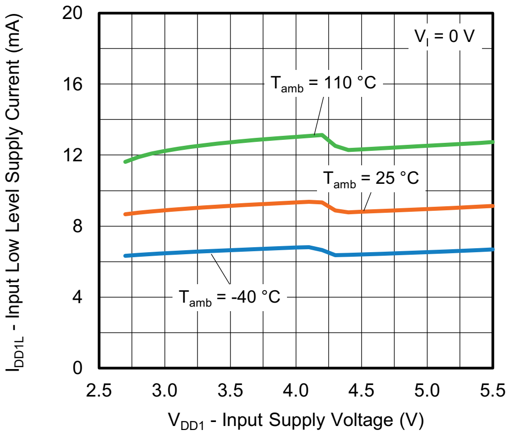


Fig. 5 - Input Low Level Supply Current vs. Input Supply Voltage

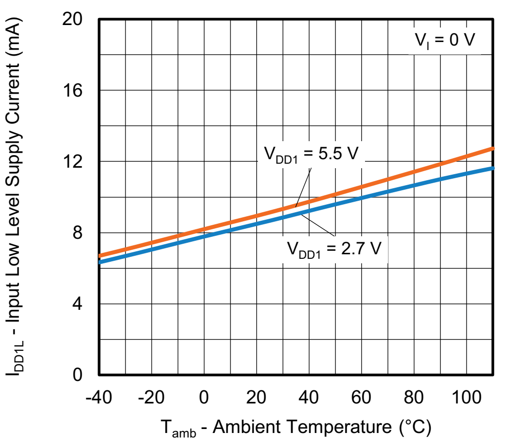


Fig. 6 - Input Low Level Supply Current vs. Ambient Temperature

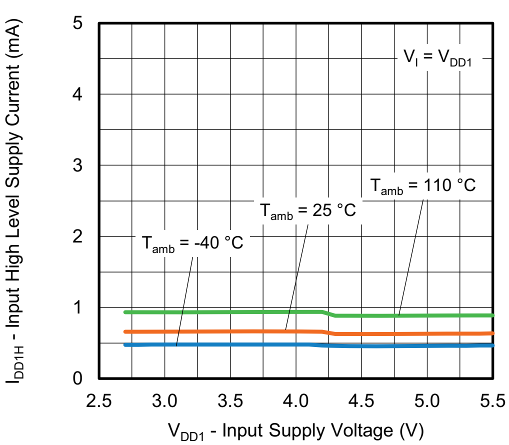


Fig. 7 - Input High Level Supply Current vs. Input Supply Voltage

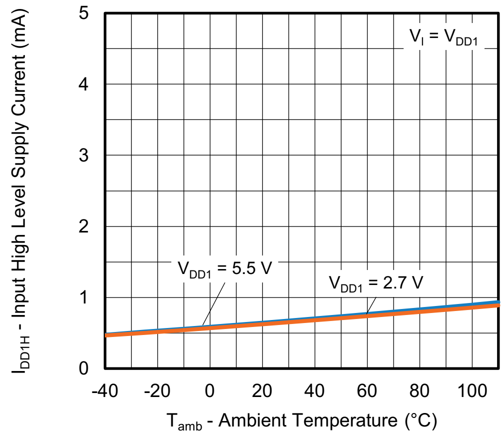


Fig. 8 - Input High Level Supply Current vs. Ambient Temperature

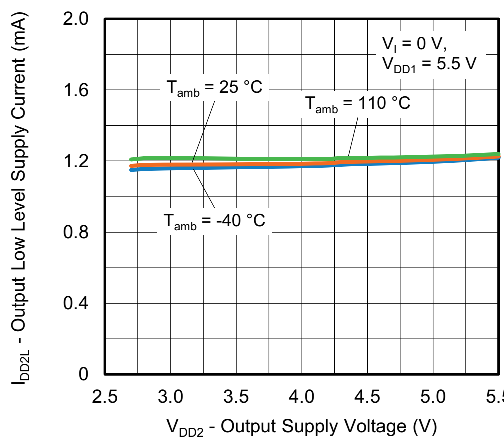


Fig. 9 - Output Low Level Supply Current vs. Output Supply Voltage

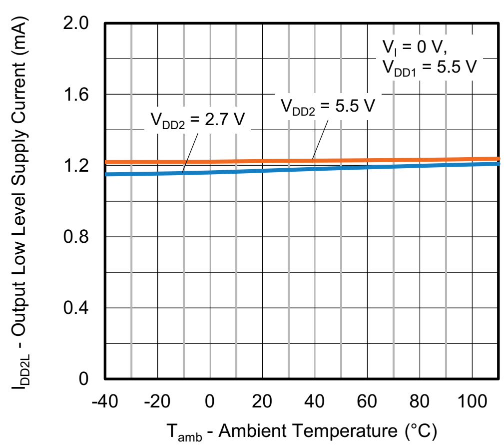


Fig. 10 - Output Low Level Supply Current vs. Ambient Temperature

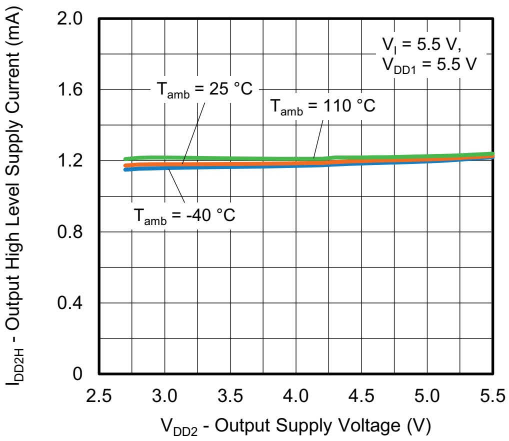


Fig. 11 - Output High Level Supply Current vs. Output Supply Voltage

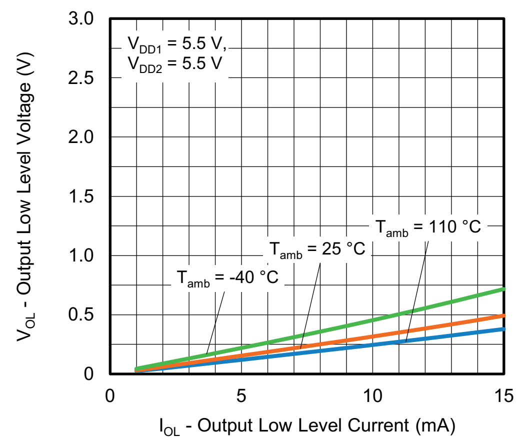


Fig. 14 - Output Low Level Voltage vs. Output Low Level Current

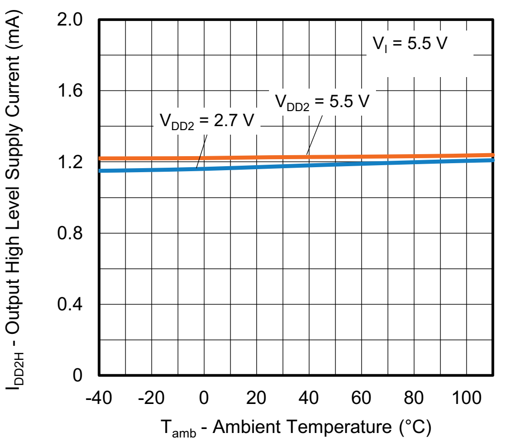


Fig. 12 - Output High Level Supply Current vs. Ambient Temperature

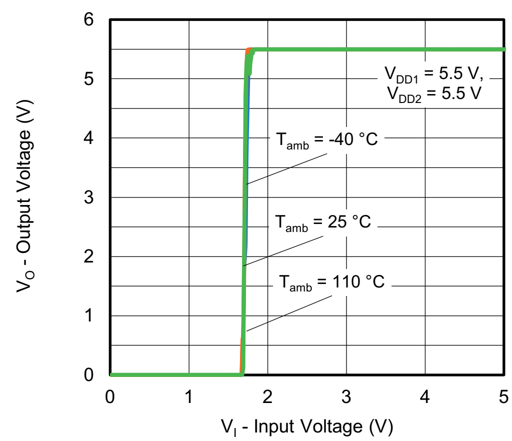


Fig. 15 - Output Voltage vs. Input Voltage

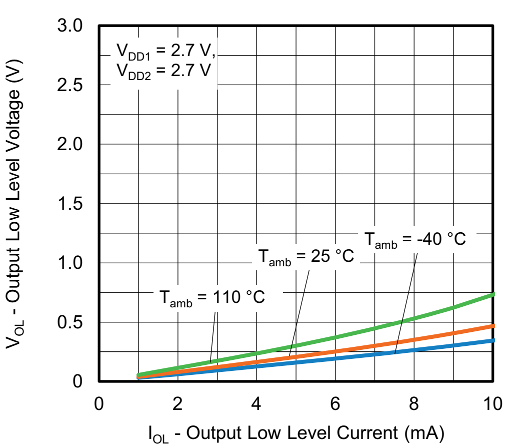


Fig. 13 - Output Low Level Voltage vs. Output Low Level Current

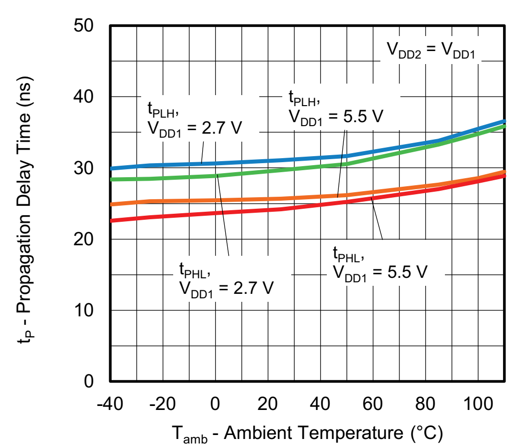


Fig. 16 - Propagation Delay Time vs. Ambient Temperature

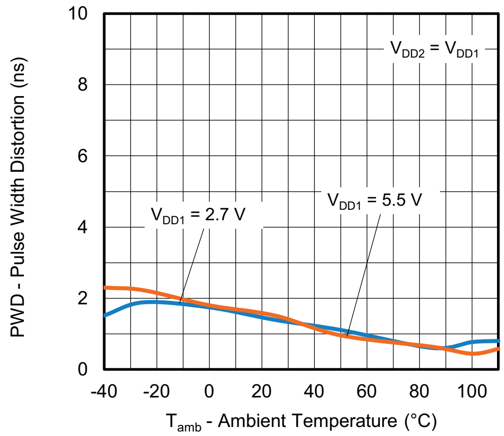


Fig. 17 - Pulse Width Distortion vs. Ambient Temperature

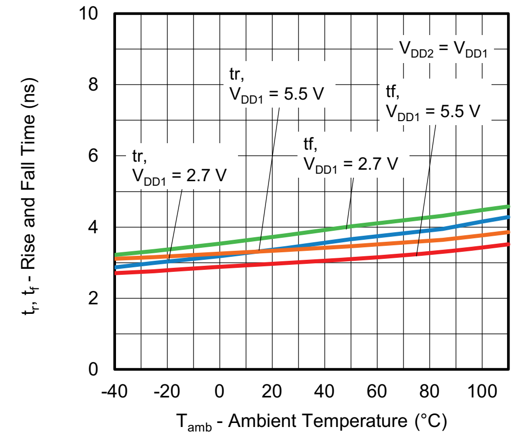
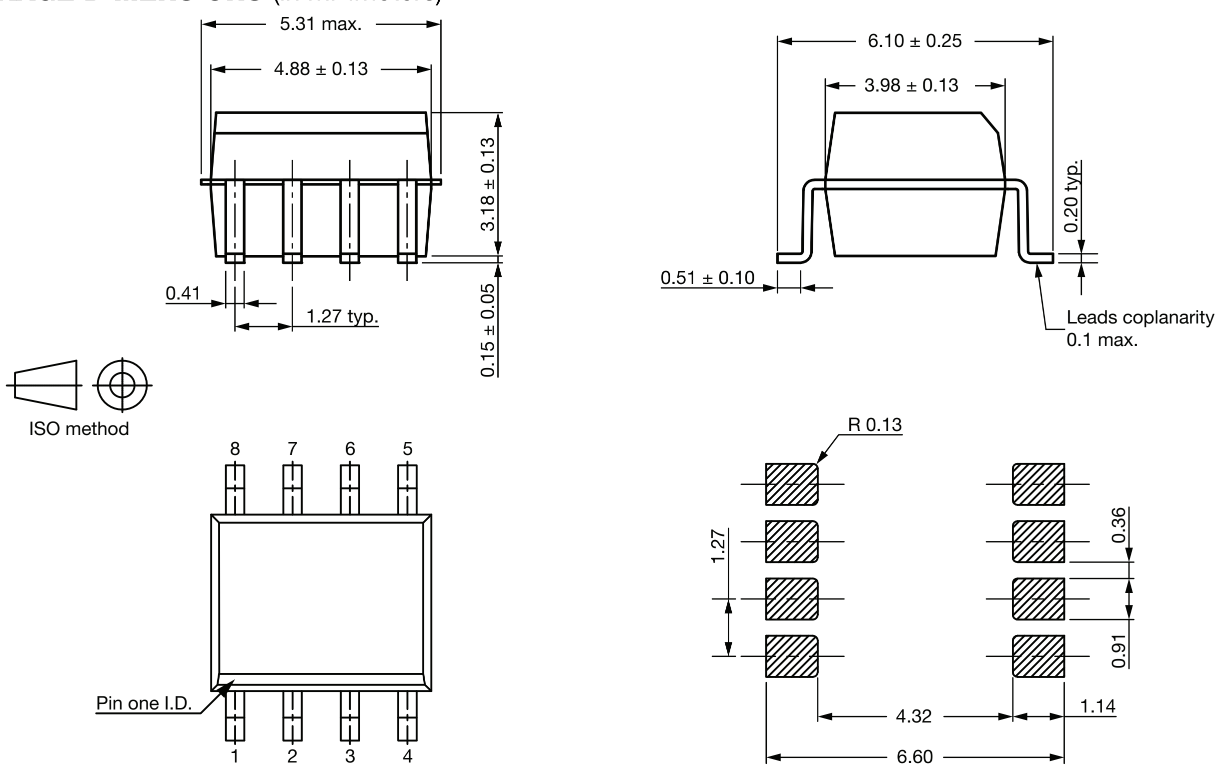


Fig. 18 - Rise and Fall Time vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)



PACKAGE MARKING

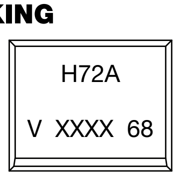


Fig. 19 - Example of VOIH72AT

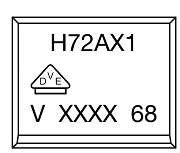


Fig. 20 - Example of VOIH72A-X001T

Notes

- XXXX = LMC (lot marking code)
- The VDE logo is only marked on option1 (-X001) parts
- Tape and reel suffix (T) is not part of the package marking

PACKING INFORMATION (in millimeters)

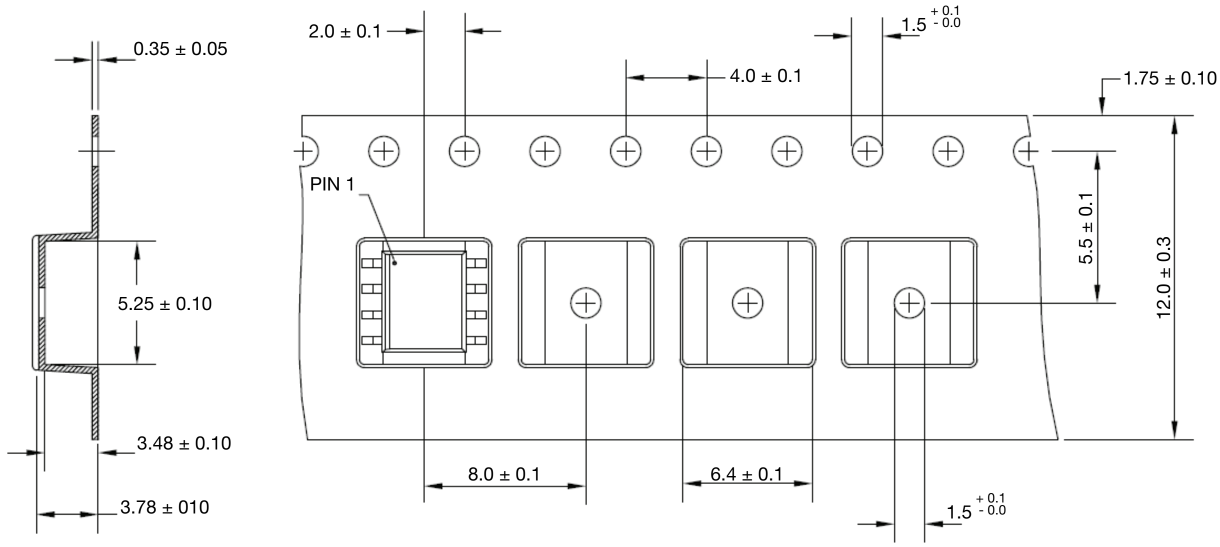


Fig. 21 - Tape and Reel Packing (2000 pieces on reel)

SOLDER PROFILES

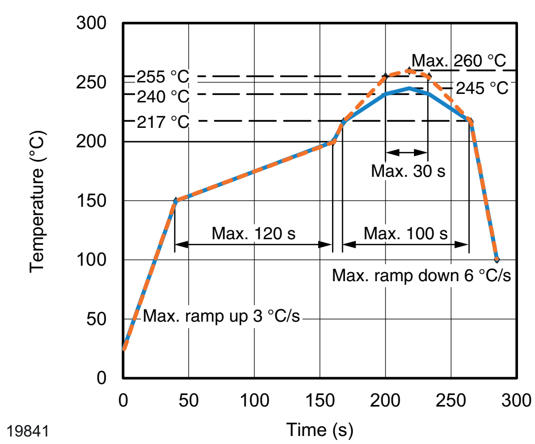


Fig. 22 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020

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 according to JESD22-A114-B.

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