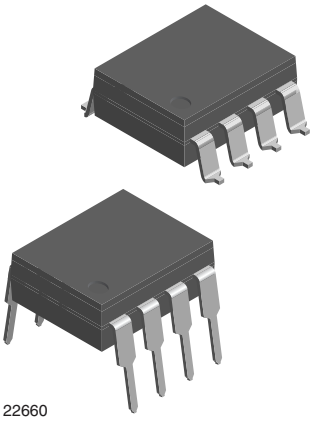
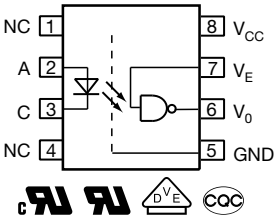
Widebody, High Isolation, High Speed Optocoupler, 10 MBd



22660



FEATURES

- External creepage > 10 mm
- Reinforced isolation
- Internal shield for very high input to output noise isolation
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

APPLICATIONS

- Solar inverters
- Industrial motor drives
- Welding equipment
- Isolated industrial communication
- Ground loop elimination
- Noise isolation of sensitive circuits

DESCRIPTION

Both 10 MBd widebody optocouplers consist of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector. The detector incorporating an integral Faraday shield provides a high level of noise isolation, required by high power switching applications.

Vishay's 10 MBd widebody couplers feature a high level of isolation distance, exhibiting an external creepage distance of > 10 mm. This makes these parts ideal for applications with working voltages exceeding 1000 V.

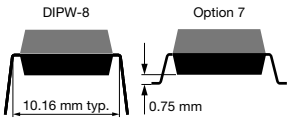
AGENCY APPROVALS

The safety application model number covering all products in this datasheet is VOW137. This model number should be used when consulting safety agency documents.

- UL1577
- cUL
- DIN EN 60747-5-5 (VDE 0884)
- CQC

ORDERING INFORMATION

V	O	W	#	#	#	#	-	X	0	#	#	T
PART NUMBER								PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CMR (kV/µs)	
VDE, UL, cUL	10	25
DIP-8, 400 mil, widebody	VOW137-X001	VOW2611-X001
SMD-8, 400 mil, option 7, widebody	VOW137-X017T	VOW2611-X017T

TRUTH TABLE

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

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Average forward current		I_F	20	mA
Reverse input voltage		V_R	5	V
Enable input voltage		V_E	V_{CC} + 0.5 V	V
Enable input current		I_E	5	mA
Surge current	t = 100 µs	I_{FSM}	200	mA
Input junction temperature		$T_{J\ max.}$	125	°C
Output power dissipation		P_{diss}	35	mW
OUTPUT				
Supply voltage	1 min maximum	V_{CC}	7	V
Output current		I_O	50	mA
Output voltage		V_O	7	V
Output junction temperature		$T_{J\ max.}$	125	°C
Output power dissipation		P_{diss}	85	mW
COUPLER				
Isolation voltage	t = 1 min	V_{ISO}	5300	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 (1)			260	°C

Notes

- 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.

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMDW). Refer to wave profile for soldering conditions for through hole devices (DIPW).

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
Logic high enable voltage		V_{EH}	2	V_{CC}	V
Logic low enable voltage		V_{EL}	0	0.8	V
Output pull up resistor		R_L	330	4K	Ω
Fanout	R_L = 1 kΩ	N		5	-

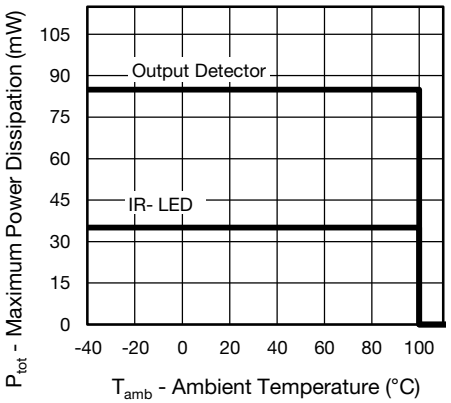


Fig. 1 - Dissipated Power vs. Ambient Temperature

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		38		pF
OUTPUT						
High level supply current	V_E = 0.5 V, I_F = 0 mA	I_{CCH}		4.3	10	mA
	V_E = V_{CC}, I_F = 0 mA	I_{CCH}		3.3		mA
Low level supply current	V_E = 0.5 V, I_F = 10 mA	I_{CCL}		4.3	13	mA
	V_E = V_{CC}, I_F = 10 mA	I_{CCL}		3.3	6	mA
High level output current	V_E = 2 V, V_O = 5.5 V, I_F = 250 µA	I_{OH}		0.02	10	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 = 0.6 V, I_{OL} (sinking) = 13 mA	I_{TH}		2.4	5	mA
Input-output capacitance	f = 1 MHz, T_{amb} = 25 °C	C_{IO}		0.9		pF
High level enable current	V_E = 2 V	I_{EH}		-0.6	-1.6	mA
Low level enable current	V_E = 0.5 V	I_{EL}		-0.8	-1.6	mA
High level enable voltage		V_{EH}	2			V
Low level enable voltage		V_{EL}			0.8	V

Notes

- Over recommended temperature (T_{amb} = -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.
- 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	49	100	ns
Propagation delay time to low output level	R_L = 350 Ω, C_L = 15 pF	t_{PHL}	25	46	100	ns
Pulse width distortion	R_L = 350 Ω, C_L = 15 pF	$\lvert t_{PHL} - t_{PLH} \rvert$		3.1	40	ns
Propagation delay skew	R_L = 350 Ω, C_L = 15 pF	t_{PSK}		16	40	ns
Output rise time (10 % to 90 %)	R_L = 350 Ω, C_L = 15 pF	t_r		14		ns
Output fall time (90 % to 10 %)	R_L = 350 Ω, C_L = 15 pF	t_f		7		ns
Propagation delay time of enable from V_{EH} to V_{EL}	R_L = 350 Ω, C_L = 15 pF, V_{EL} = 0 V, V_{EH} = 3 V	t_{ELH}		11		ns
Propagation delay time of enable from V_{EL} to V_{EH}	R_L = 350 Ω, C_L = 15 pF, V_{EL} = 0 V, V_{EH} = 3 V	t_{EHL}		9		ns

Notes

- Over recommended temperature (T_{amb} = -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.
- 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.

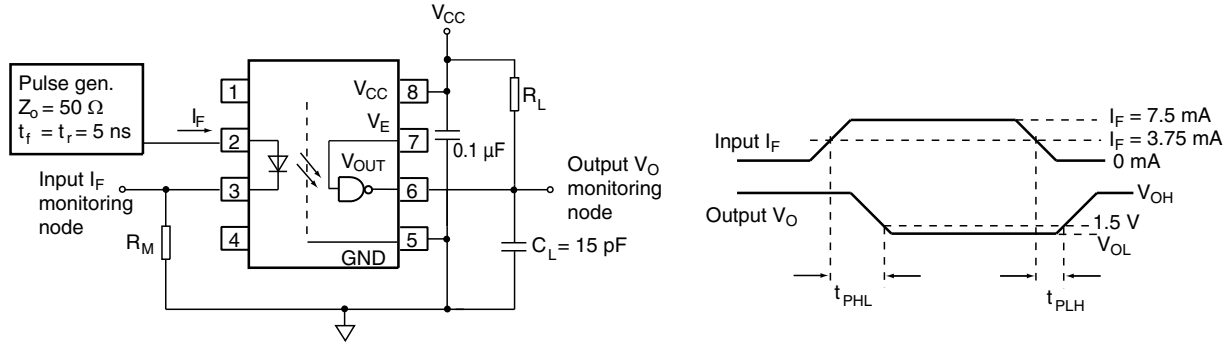


Fig. 2 - Test Circuit for t_{PLH}, t_{PHL}, t_r and t_f

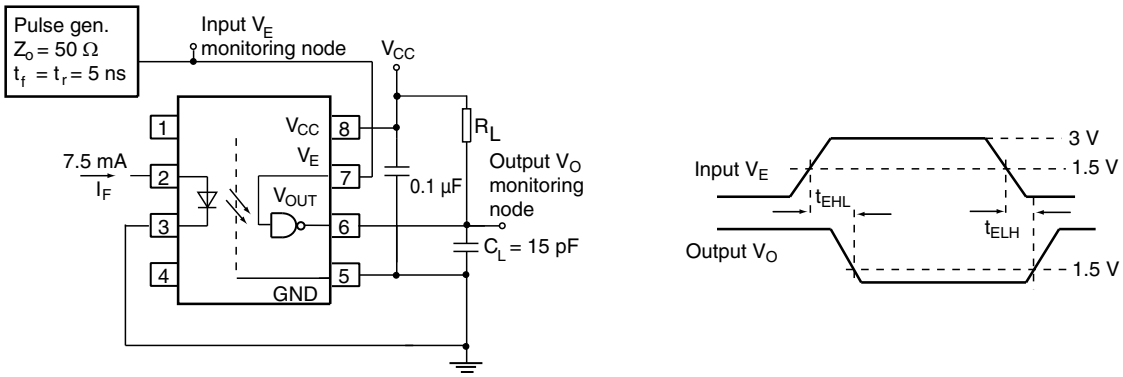


Fig. 3 - Test Circuit for t_{EHL}, and t_{ELH}

COMMON MODE TRANSIENT IMMUNITY							
PARAMETER	**TEST CONDITION**	**DEVICE**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity	$\|V_{CM}\|$ = 1 kV, V_{CC} = 5 V, I_F = 0 mA (1)(2)(3)(4)	VOW137	$\|CM_H\|$	10 000			V/µs
	$\|V_{CM}\|$ = 1 kV, V_{CC} = 5 V, I_F = 0 mA (1)(2)(5)	VOW2611	$\|CM_H\|$	25 000	40 000		V/µs
	$\|V_{CM}\|$ = 1 kV, V_{CC} = 5 V, I_F = 7.5 mA (1)(2)(3)(4)	VOW137	$\|CM_L\|$	10 000			V/µs
	$\|V_{CM}\|$ = 1 kV, V_{CC} = 5 V, I_F = 7.5 mA (1)(2)(5)	VOW2611	$\|CM_L\|$	25 000	40 000		V/µs

Notes

(1) Over recommended temperature (T_{amb} = -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.

(2) 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.

(3) With pulling V_E to logic high state will improve the CMR performance.

(4) VOW137 CMTI test circuit refer to figure 4.

(5) VOW2611 CMTI test circuit refer to figure 5.

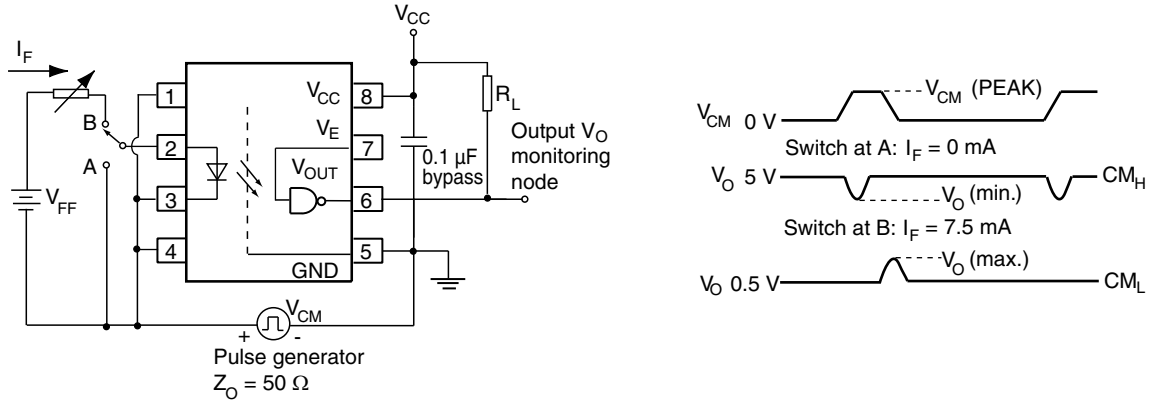


Fig. 4 - VOW137 Test Circuit for Common Mode Transient Immunity

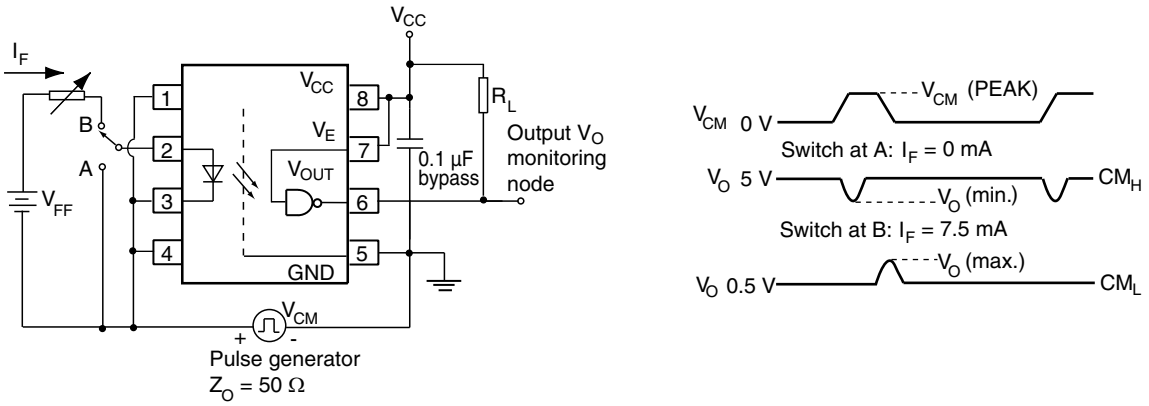


Fig. 5 - VOW2611 Test Circuit for Common Mode Transient Immunity

SAFETY AND INSULATION RATINGS				
PARAMETER		**SYMBOL**	**VALUE**	**UNIT**
MAXIMUM SAFETY RATINGS				
Output safety power		P_{SO}	700	mW
Input safety current		I_{si}	350	mA
Safety temperature		T_S	150	°C
Comparative tracking index		CTI	250	
INSULATION RATED PARAMETERS				
Maximum withstanding isolation voltage	t = 1 min	V_{ISO}	5300	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	1414	V_{peak}
Insulation resistance	T_{amb} = 25 °C, V_{DC} = 500 V	R_{IO}	≥ 10^{12}	Ω
Isolation resistance	T_{amb} = 100 °C, V_{DC} = 500 V	R_{IO}	≥ 10^{11}	Ω
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}	2651	V_{peak}
Input to output test voltage, method a	V_{IORM} x 1.6 = V_{PR}, 100 % production test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	2262	V_{peak}
Climatic classification (according to IEC 68 part 1)			55/100/21	
Environment (pollution degree in accordance to DIN VDE 0109)			2	
Clearance distance (DIP-8, widebody)			≥ 10	mm
Creepage distance (DIP-8, widebody)			≥ 10	mm
Insulation thickness		DTI	≥ 0.4	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)

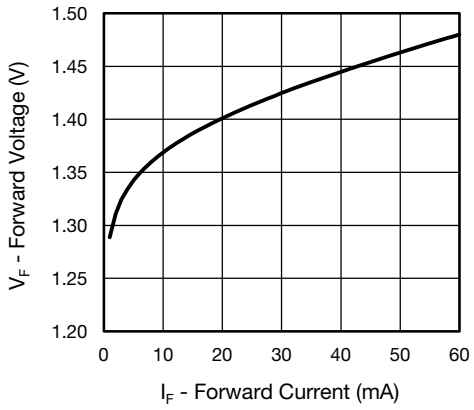


Fig. 6 - Forward Voltage vs. Forward Current

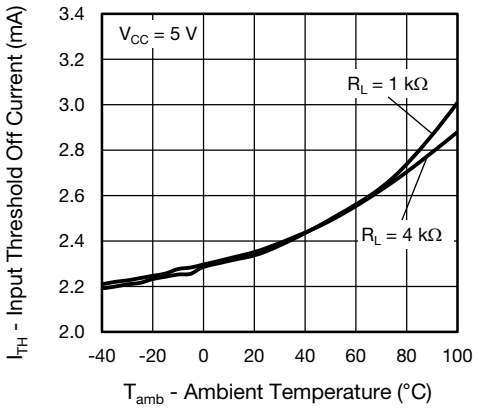


Fig. 9 - Input Threshold Off Current vs. Ambient Temperature

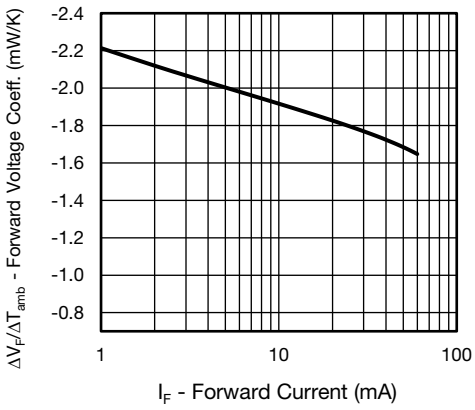


Fig. 7 - Forward Voltage Coefficient vs. Forward Current

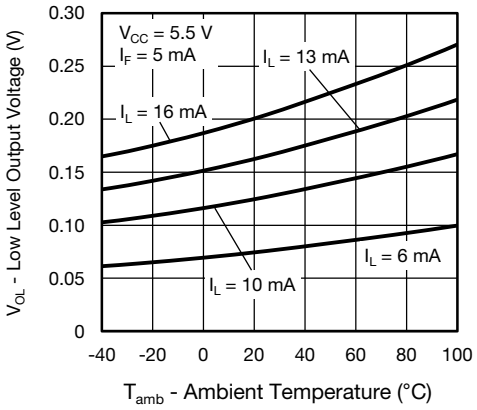


Fig. 10 - Low Level Output Voltage vs. Ambient Temperature

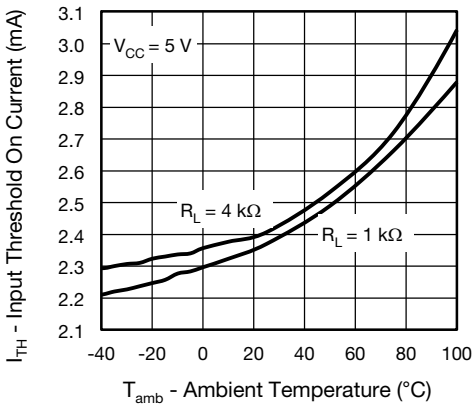


Fig. 8 - Input Threshold On Current vs. Ambient Temperature

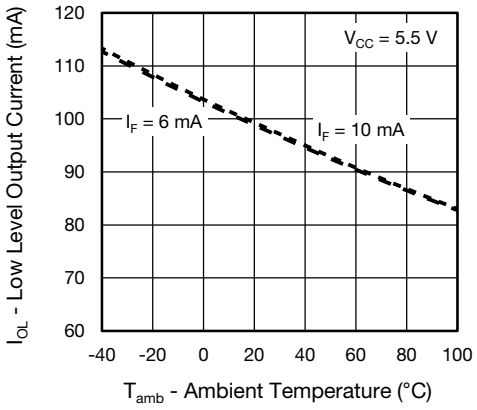


Fig. 11 - Low Level Output Current vs. Ambient Temperature

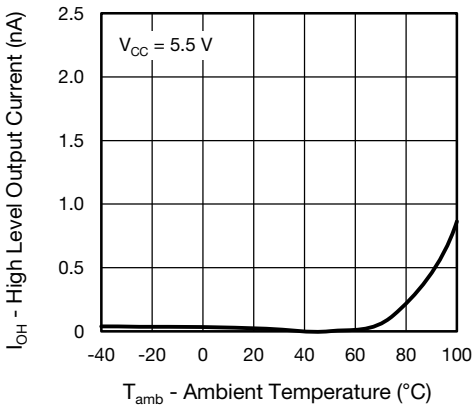


Fig. 12 - High Level Output Current vs. Ambient Temperature

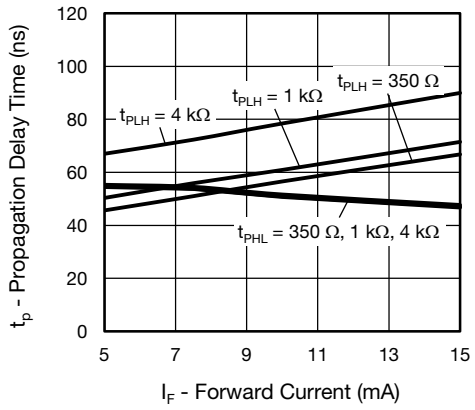


Fig. 15 - Propagation Delay vs. Forward Current

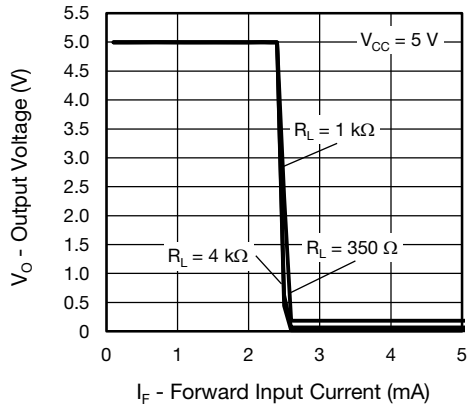


Fig. 13 - Output Voltage vs. Forward Current

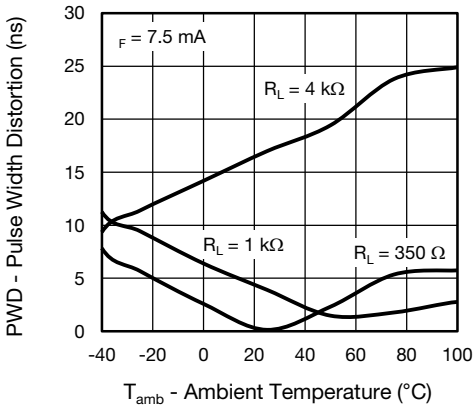


Fig. 16 - Pulse Width Distortion vs. Ambient Temperature

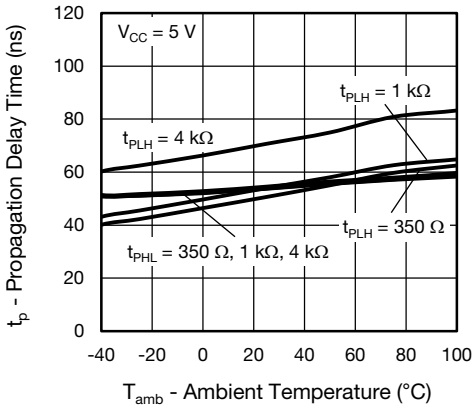


Fig. 14 - Propagation Delay vs. Ambient Temperature

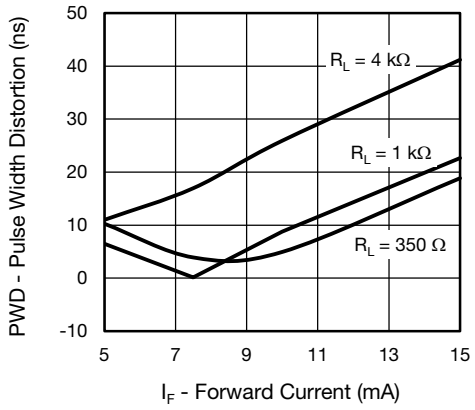


Fig. 17 - Pulse Width Distortion vs. Forward Current

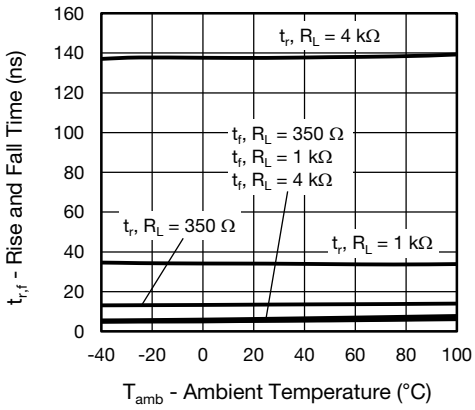


Fig. 18 - Rise and Fall Time vs. Ambient Temperature

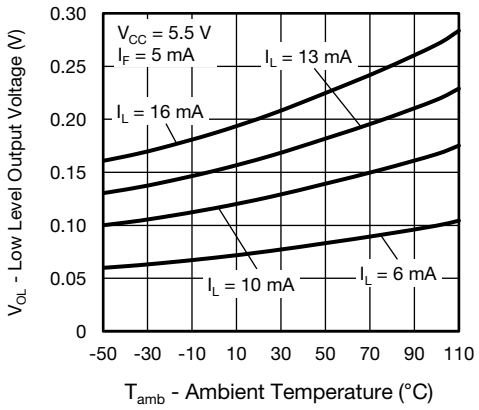


Fig. 21 - Low Level Output Voltage vs. Ambient Temperature

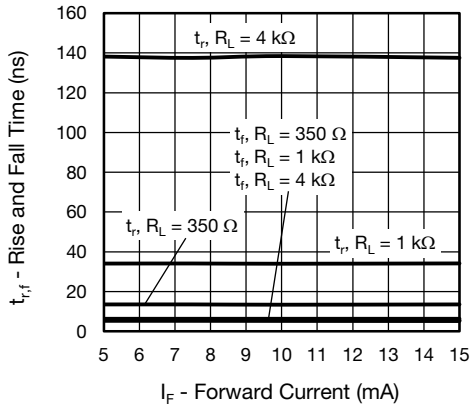


Fig. 19 - Rise and Fall Time vs. Forward Current

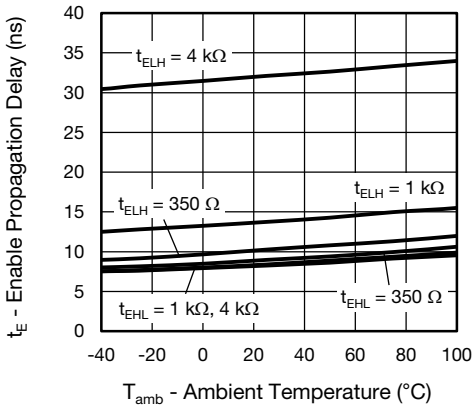
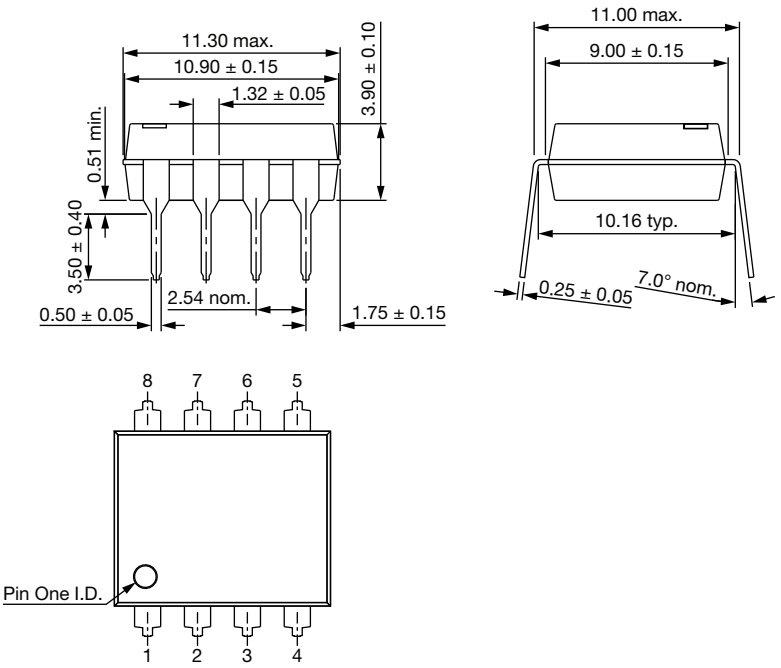


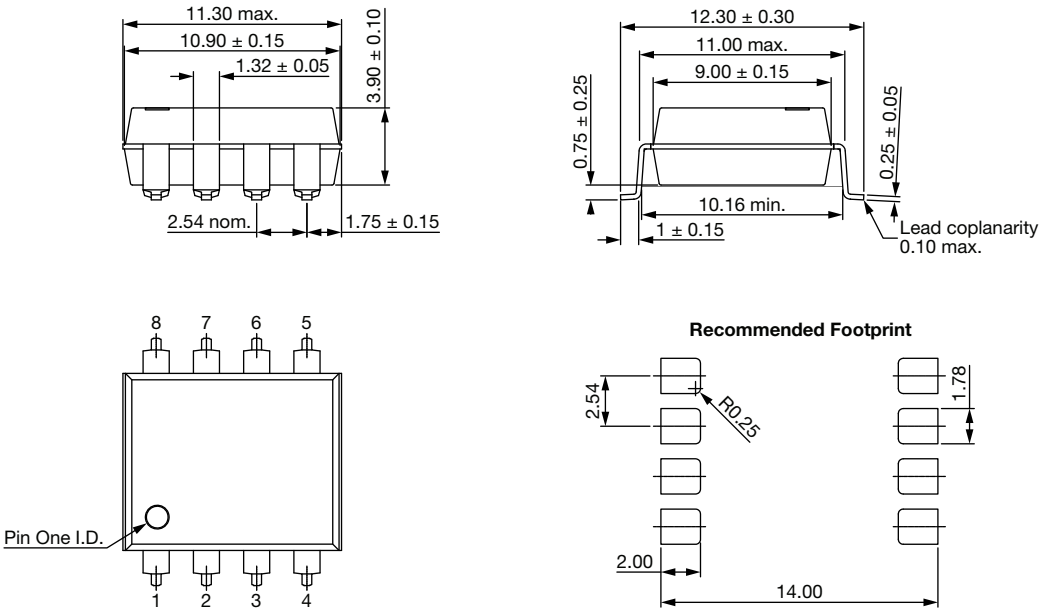
Fig. 20 - Enable Propagation Delay vs. Ambient Temperature

PACKAGE DIMENSIONS in millimeters

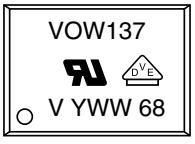
DIP-8, widebody



SMD-8, widebody, (Option 7)



PACKAGE MARKING (Example of VOW137-X017T)



Note

- Tape and reel suffix (T) is not part of the package marking.

PACKING INFORMATION (Tape and Reel)

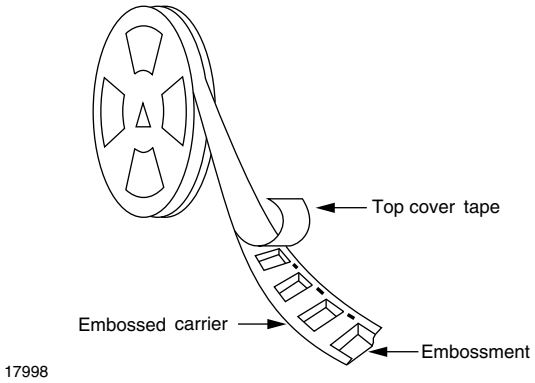


Fig. 22 - Tape and Reel Shipping Medium

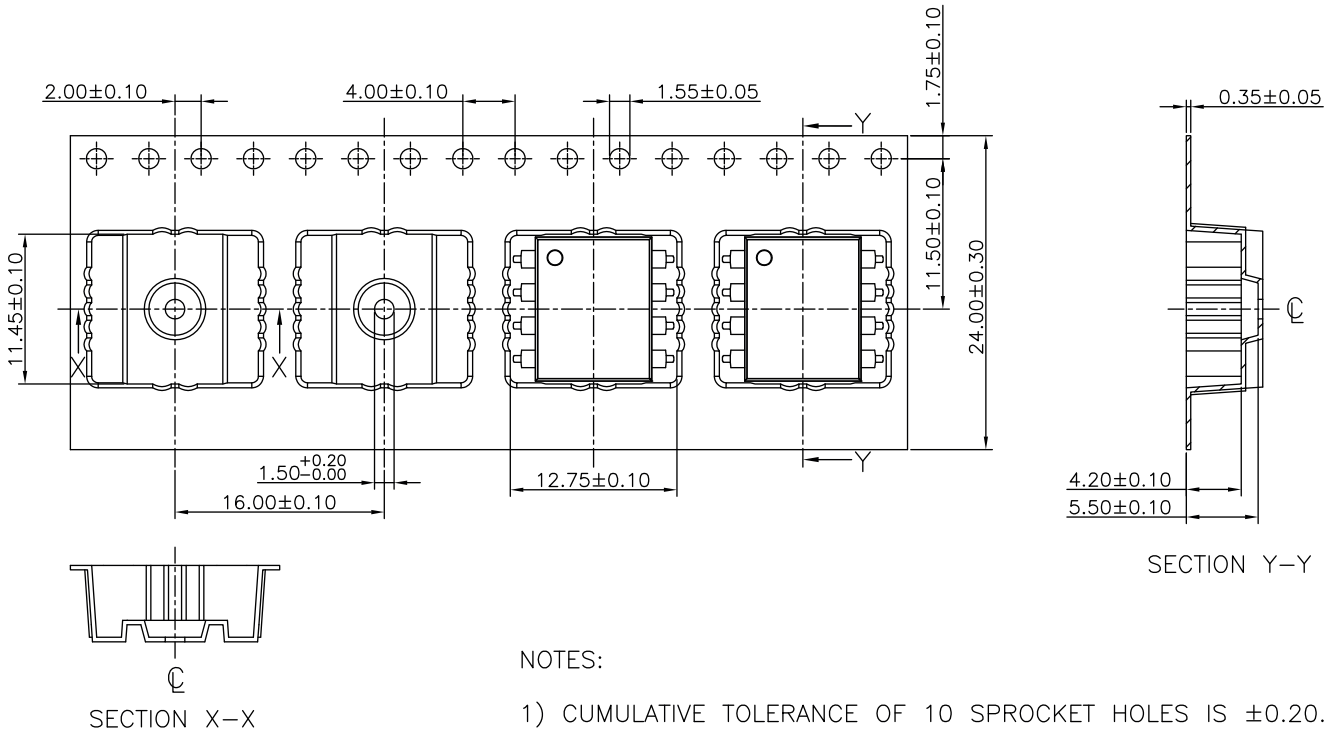
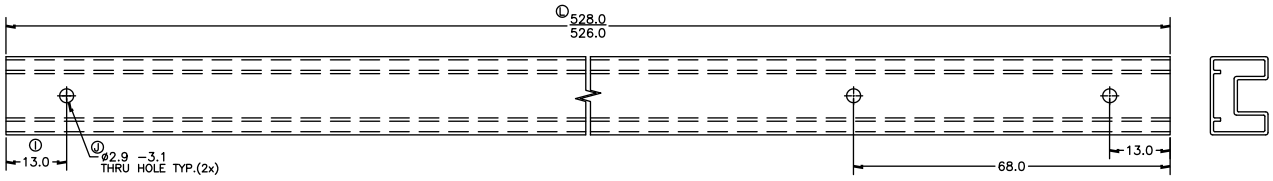
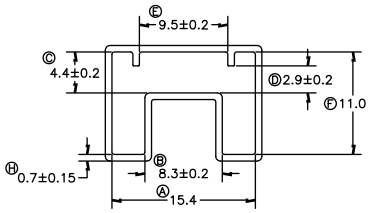


Fig. 23 - Tape and Reel Packing Option 7 (750 parts per reel)

PACKING INFORMATION (Tubes)

DEVICE PER TUBE			
TYPE	**UNITS/TUBE**	**TUBE/BOX**	**UNITS/BOX**
DIP-8, widebody	40	30	1200





TUBE COLOUR:	CLEAR
PRINT COLOUR:	–

1. ALL DIMENSIONS ARE IN MILLIMETERS, U.O.S.

1. ALL TUBE TOLERANCES TO BE ±0.25 UNLESS OTHERWISE SPECIFIED.
2. ALL RADII AND ANGLES REFERENCE ONLY, UNLESS OTHERWISE SPECIFIED.

Footprint and Schematic Information for VOW137, VOW2611

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

PART NUMBER	FOOTPRINT / SCHEMATIC
VOW137-X001	www.snapeda.com/parts/VOW137-X001/Vishay/view-part
VOW2611-X001	www.snapeda.com/parts/VOW2611-X001/Vishay/view-part

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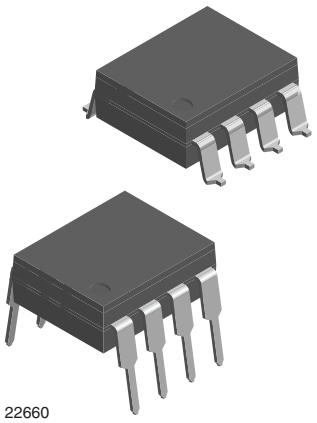

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