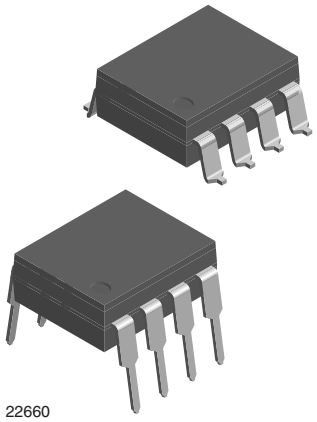
Widebody, High Isolation, High Speed Optocoupler, 1 MBd



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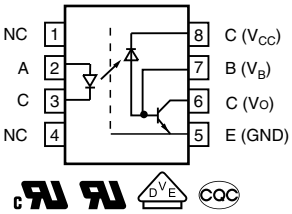


FEATURES

- External creepage > 10 mm
- Reinforced isolation
- Internal shield for very high input to output noise isolation
- High common mode interference immunity
- 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 communications
- Noise isolation of sensitive circuits

LINKS TO ADDITIONAL RESOURCES

Product Page | Design Tools | Footprints | Schematics | Videos

DESCRIPTION

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

Vishay's 1 MBd wide body 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.

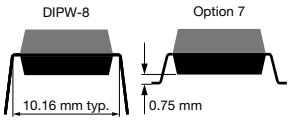
AGENCY APPROVALS

The safety application model number covering all products in this datasheet is VOW135 or VOW136 respectively. This model number should be used when consulting safety agency documents.

- UL
- cUL
- DIN EN 60747-5-5 (VDE 0884-5)
- CQC GB4943.1
- CQC GB8898

ORDERING INFORMATION

V	O	W	1	3	#	-	X	0	#	#	T
PART NUMBER							PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED / PACKAGE	CTR (%)	
VDE, UL, cUL, CQC	**≥ 7**	**≥ 19**
DIP-8, 400 mil, widebody	VOW135-X001	VOW136-X001
SMD-8, 400 mil, option 7, widebody	VOW135-X017T	VOW136-X017T

For technical questions, contact: optocoupleranswers@vishay.com

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ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	3	V
Forward current		I_F	25	mA
Peak forward current	t = 1 ms, duty cycle 50 %	I_{FM}	50	mA
Maximum surge forward current	t ≤ 1 µs, 300 pulses/s	I_{FSM}	1	A
Power dissipation		P_{diss}	45	mW
Input junction temperature		$T_{j\ max.}$	125	°C
OUTPUT				
Supply voltage		V_S	-0.5 to 30	V
Output voltage		V_O	-0.5 to 25	V
Emitter base voltage		V_{EBO}	5	V
Average output current		I_O	8	mA
Peak output current		I_O	16	mA
Base current		I_B	5	mA
Power dissipation		P_{diss}	100	mW
Output junction temperature		$T_{j\ max.}$	125	°C
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-40 to +100	°C
Soldering temperature	max. ≤ 10 s, dip soldering ≥ 0.5 mm distance from case bottom	T_{sld}	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.

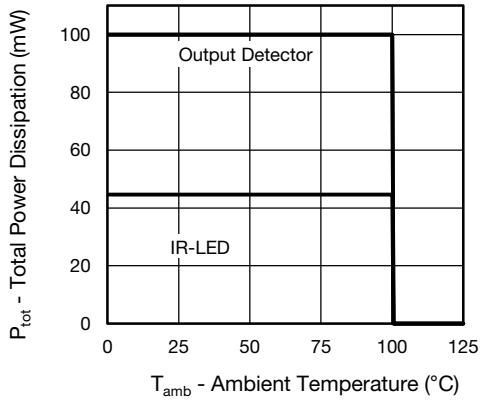

Fig. 1 - Maximum Power vs. Operating Temperature

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ELECTRICAL CHARACTERISTICS (T_{amb} = 0 °C to 70 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 16 mA		V_F	-	1.38	1.9	V
Breakdown voltage	I_R = 10 µA		V_{BR}	3	-	-	V
Reverse current	V_R = 3 V		I_R	-	0.5	10	µA
Input capacitance	V_R = 0 V, f = 1 MHz		C_I	-	36	-	pF
Temperature coefficient of forward voltage	I_F = 16 mA		$\Delta V_F/\Delta T_{amb}$	-	-1.9	-	mV/°C
OUTPUT							
Logic low supply current	I_F = 16 mA, V_O = open, V_{CC} = 15 V		I_{CCL}	-	50	200	µA
Logic high supply current	I_F = 0 A, V_O = open, V_{CC} = 15 V		I_{CCH}	-	0.02	2	µA
Output voltage, output logic low	I_F = 16 mA, V_{CC} = 4.5 V, I_O = 0.8 mA	VOW135	V_{OL}	-	0.1	0.5	V
	I_F = 16 mA, V_{CC} = 4.5 V, I_O = 2.4 mA	VOW136	V_{OL}	-	0.1	0.5	V
Output current, output logic high	I_F = 0 mA, V_O = V_{CC} = 5.5 V		I_{OH}	-	3	500	nA
	I_F = 0 mA, V_O = V_{CC} =15 V		I_{OH}	-	0.01	1	µA
Output capacitance	V_R = 0 V, f = 1 MHz		C_O	-	3.70	-	pF
COUPLER							
Capacitance (input to output)	f = 1 MHz		C_{IO}	-	0.9	-	pF

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.

CURRENT TRANSFER RATIO (T_{amb} = 0 °C to 70 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	I_F = 16 mA, V_O = 0.4 V, V_{CC} = 4.5 V, T_{amb} = 25 °C	VOW135	CTR	7	18	50	%
		VOW136	CTR	19	24	50	%
	I_F = 16 mA, V_O = 0.5 V, V_{CC} = 4.5 V	VOW135	CTR	5	19	-	%
		VOW136	CTR	15	25	-	%

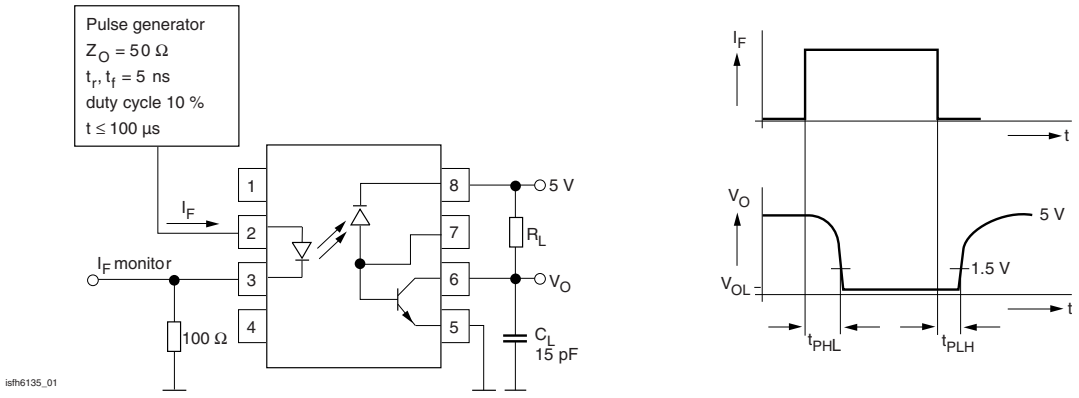

Fig. 2 - Schematics

SWITCHING CHARACTERISTICS (T_{amb} = 0 °C to 70 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
High to low	I_F = 16 mA, V_{CC} = 5 V, R_L = 4.1 kΩ	VOW135	t_{PHL}	-	0.2	2.0	µs
	I_F = 16 mA, V_{CC} = 5 V, R_L = 1.9 kΩ	VOW136	t_{PHL}	-	0.2	1.0	µs
Low to high	I_F = 16 mA, V_{CC} = 5 V, R_L = 4.1 kΩ	VOW135	t_{PLH}	-	1.3	2.0	µs
	I_F = 16 mA, V_{CC} = 5 V, R_L = 1.9 kΩ	VOW136	t_{PLH}	-	0.6	1.0	µs

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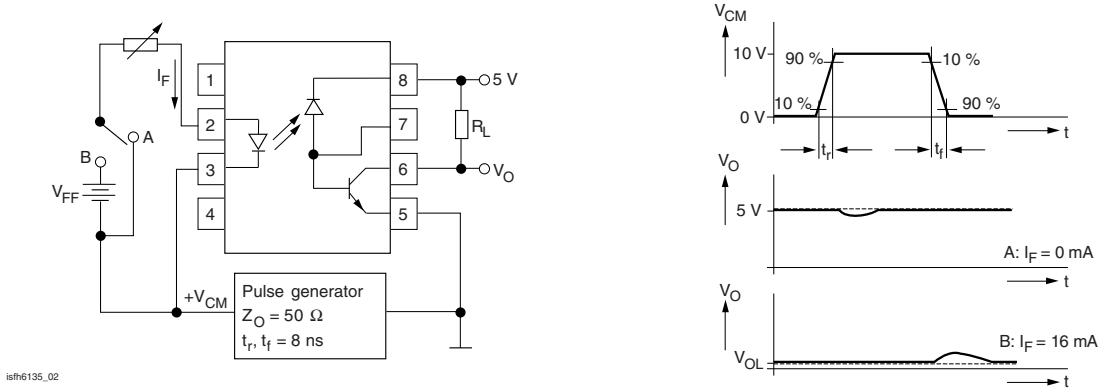

Fig. 3 - Common Mode Interference Immunity

COMMON MODE TRANSIENT IMMUNITY (T_{amb} = 0 °C to 70 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
High	V_{CM} = 10 V_{PP}, V_{CC} = 5 V, I_F = 0 mA, R_L = 4.1 kΩ	VOW135	CM_H	1000	-	-	V/µs
	V_{CM} = 10 V_{PP}, V_{CC} = 5 V, I_F = 0 mA, R_L = 1.9 kΩ	VOW136	CM_H	1000	-	-	V/µs
Low	V_{CM} = 10 V_{PP}, V_{CC} = 5 V, I_F = 16 mA, R_L = 4.1 kΩ	VOW135	CM_L	1000	-	-	V/µs
	V_{CM} = 10 V_{PP}, V_{CC} = 5 V, I_F = 16 mA, R_L = 1.9 kΩ	VOW136	CM_L	1000	-	-	V/µs

SAFETY AND INSULATION RATINGS				
PARAMETER		**SYMBOL**	**VALUE**	**UNIT**
Climatic classification (according to IEC 68 part 1)			55 / 100 / 21	
Comparative tracking index		CTI	250	
Maximum rated 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
	T_{amb} = 100 °C, V_{DC} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Safety temperature		T_S	150	°C
Clearance distance (DIP-8, widebody)			≥ 10	mm
Creepage distance (DIP-8, widebody)			≥ 10	mm
Insulation thickness		DTI	≥ 0.4	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}	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}
Environment (pollution degree in accordance to DIN VDE 0109)			2	

Note

- As per DIN EN 60747-5-5, § 7.4.3.8.2, 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 °C, unless otherwise specified)

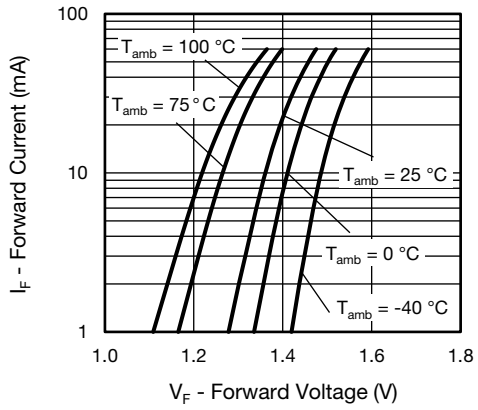

Fig. 4 - Output Current vs. Forward Voltage

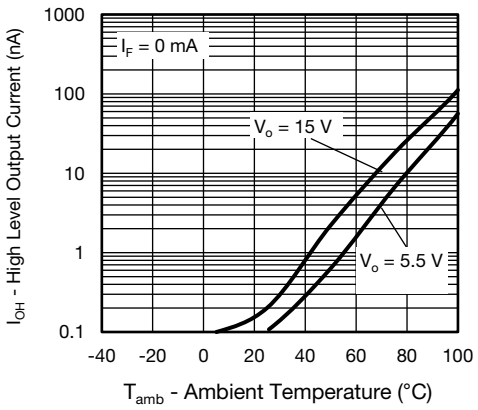

Fig. 7 - Logic High Level Output Current vs. Temperature

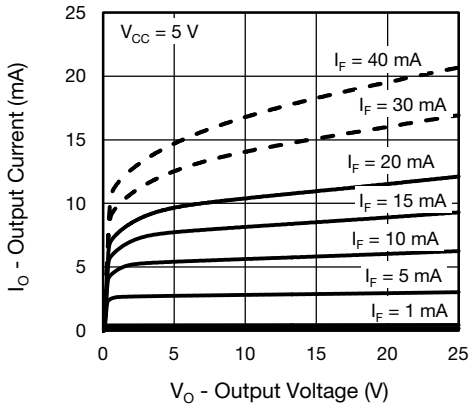

Fig. 5 - Output Current vs. Output Voltage

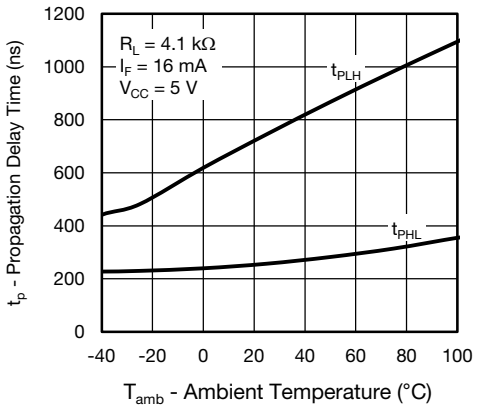

Fig. 8 - Propagation Delay vs. Ambient Temperature - VOW135

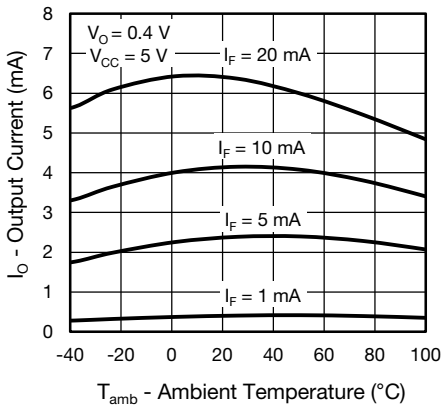

Fig. 6 - Output Current vs. Temperature

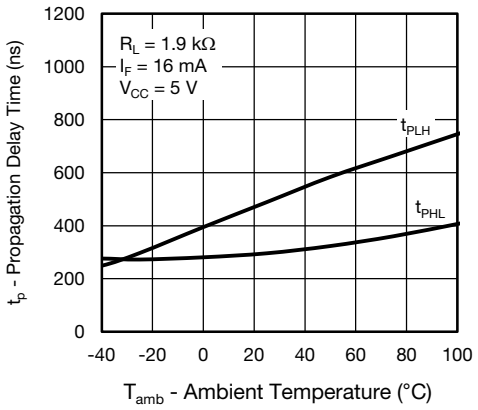

Fig. 9 - Propagation Delay vs. Ambient Temperature - VOW136

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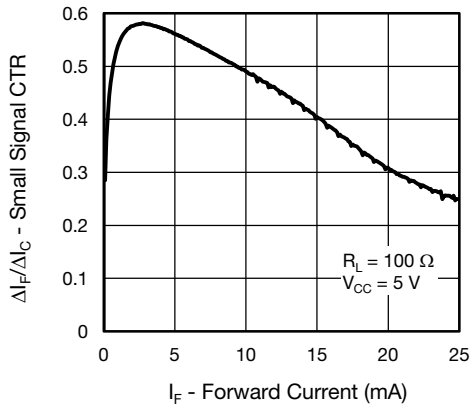

Fig. 10 - Small Signal Current Transfer Ratio vs. Forward Current

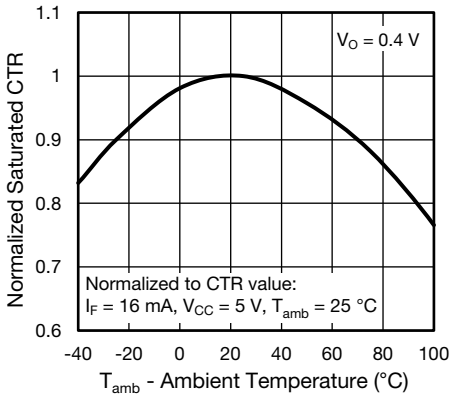

Fig. 13 - Normalized Saturated CTR vs. Ambient Temperature

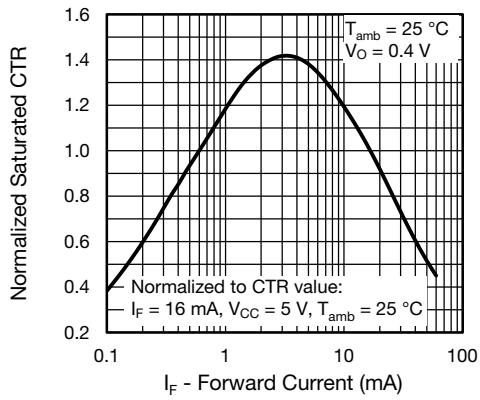

Fig. 11 - Normalized Saturated CTR vs. Forward Current

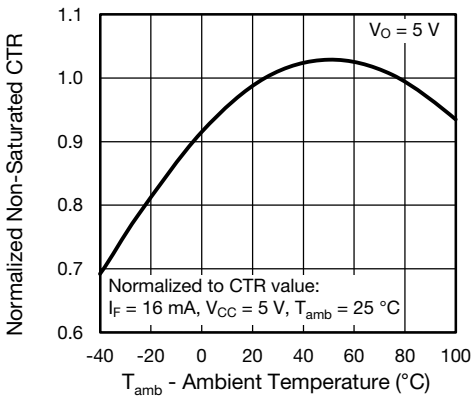

Fig. 14 - Normalized Non-Saturated CTR vs. Ambient Temperature

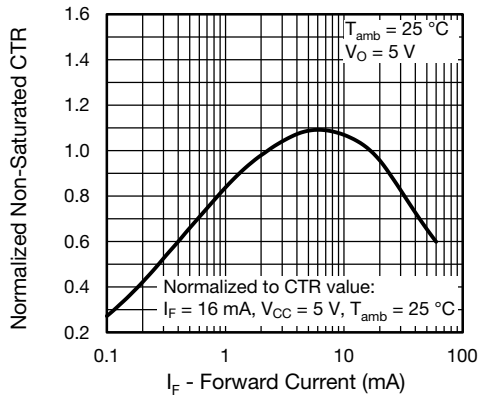

Fig. 12 - Normalized Non-Saturated CTR vs. Forward Current

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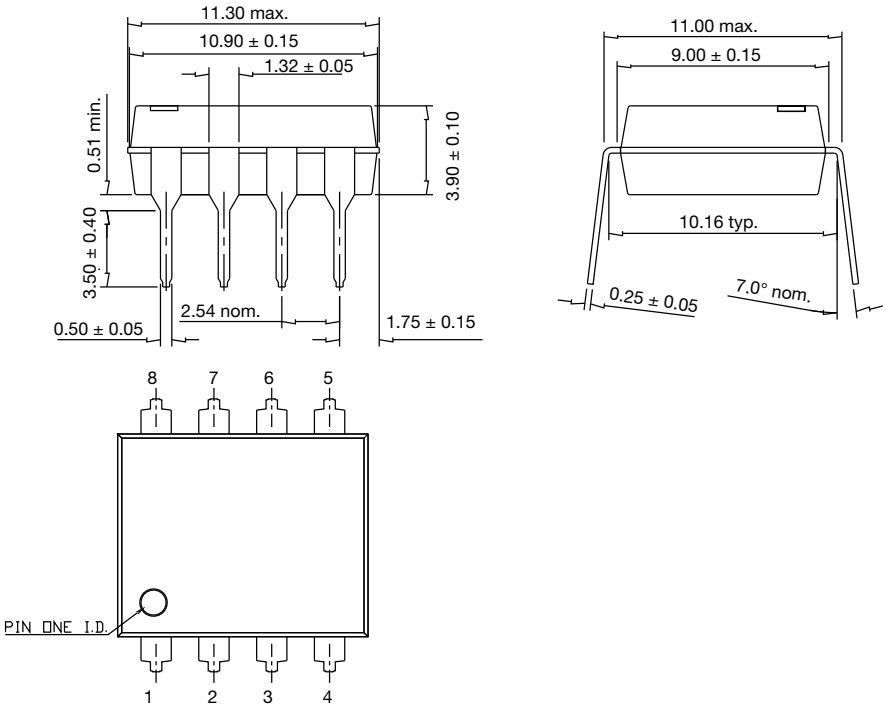
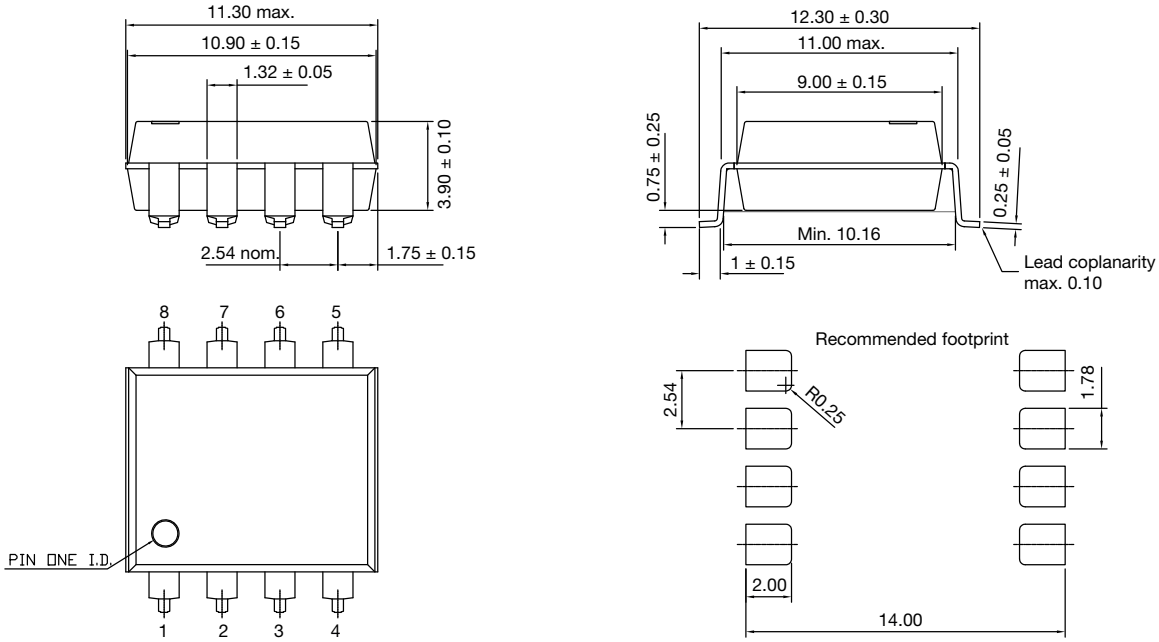
PACKAGE DIMENSIONS in millimeters

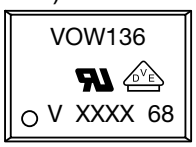
DIP-8, widebody



SMD-8, widebody (option 7)



PACKAGE MARKING (example of VOW136-X017T)



Notes

- XXXX = LMC (lot marking code)
- Tape and reel suffix (T) is not part of the package marking

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PACKING INFORMATION (tape and reel)

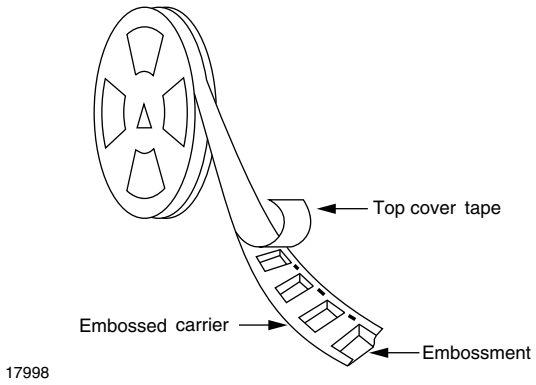

Fig. 15 - Tape and Reel Shipping Medium

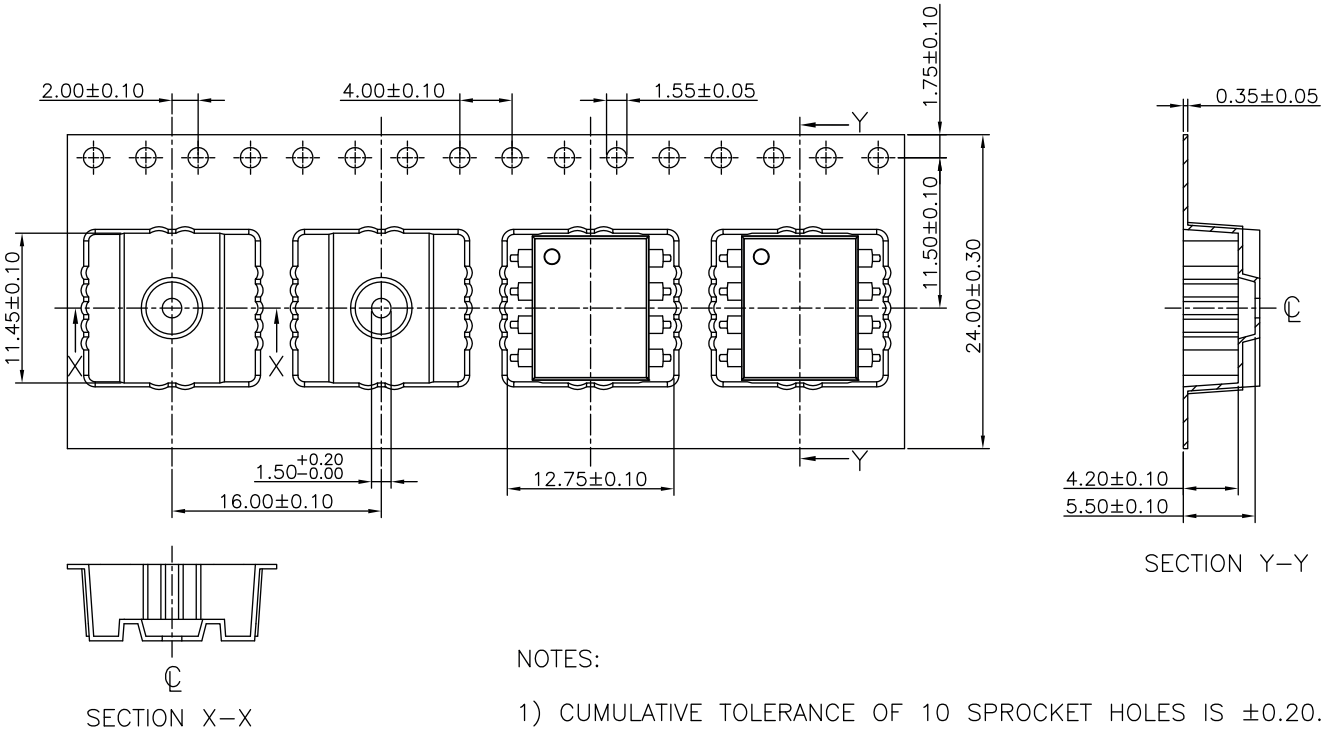

Fig. 16 - Tape and Reel Packing Option 7 (750 parts per reel)

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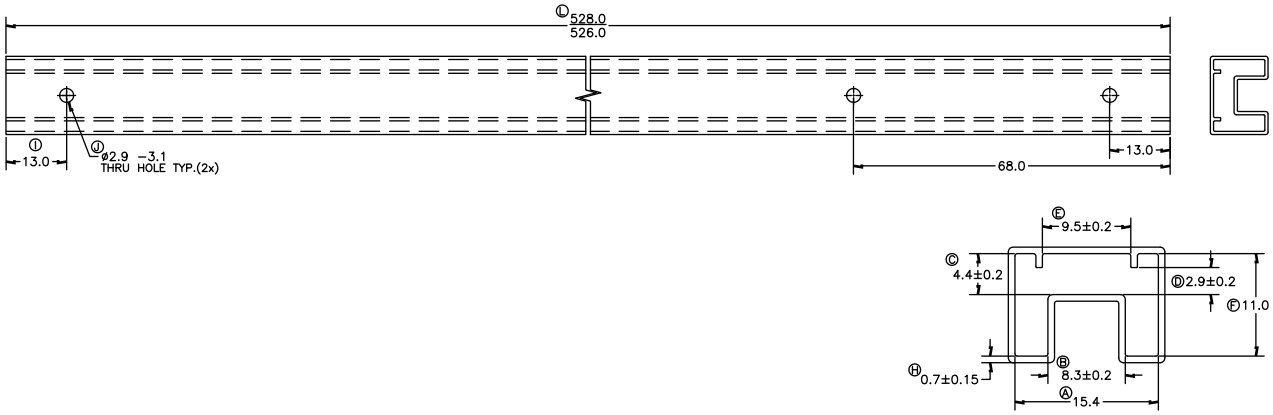
PACKING INFORMATION (tubes)

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.

SOLDER PROFILES

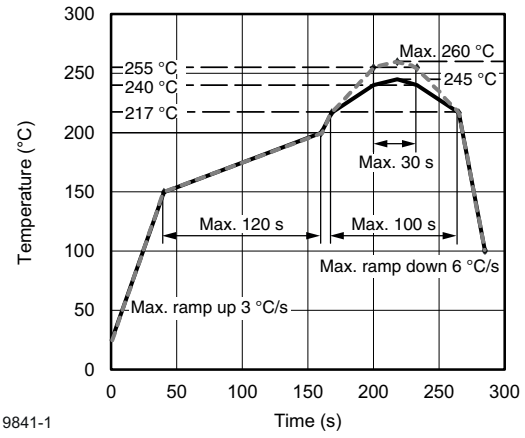


Fig. 17 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

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

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