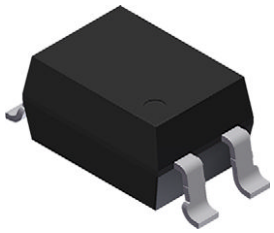
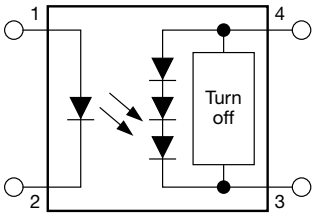
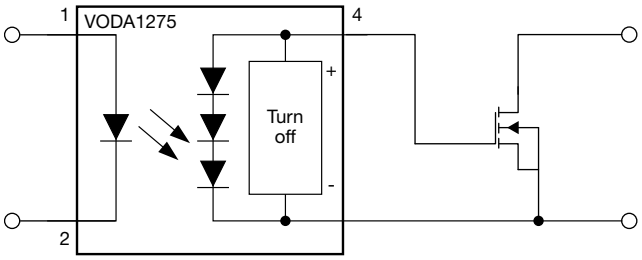
Automotive High Voltage Photovoltaic MOSFET Driver







Single MOSFET Driver Application

LINKS TO ADDITIONAL RESOURCES

Product Page | Application Notes | SPICE Models | Ultra Librarian EDA / CAD

DESCRIPTION

The VODA1275 is an automotive qualified optically isolated MOSFET driver. The VODA1275 obtains all the required current to drive its internal circuitry from the infrared emitter on the low voltage, primary side of the isolation barrier. VODA1275 comes in a small DIP-4 package offering open circuit output voltage of 20 V.

FEATURES

- AEC-Q102 qualified
- Open circuit voltage of 20 V typical at I_F = 10 mA
- Short circuit current at 20 µA typical at I_F = 10 mA
- Isolation test voltage 5300 V_{RMS}
- Operating temperature from -40 °C to +125 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

APPLICATIONS

- Automotive pre-charge relay
- Powerwall chargers
- Gate driver for High Voltage MOSFETs
- BMS
- Custom solid-state relays

AGENCY APPROVALS

- UL (pending)
- cUL (pending)
- VDE (pending)
- CQC (pending)

ORDERING INFORMATION

V	O	D	A	1	2	7	5	B	4	T
PART NUMBER								PACKAGE CONFIGURATION		

PACKAGE	UL, VDE
SMD-4, tape and reel	VODA1275B4T

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
LED continous forward current		I_F	50	mA
LED reverse voltage		V_R	5	V
Power dissipation		P_{diss}	150	mW
Power derating	T_{amb} > 70 °C	$\Delta P_D/\Delta T_{amb}$	-2.0	mW/°C
Junction temperature		T_j	145	°C
MOSFET DRIVER				
Power dissipation		P_{diss}	2	mW
Ambient operating temperature range		T_{amb}	-40 to +125	°C
Storage temperature range		T_{stg}	-40 to +150	°C
Pin soldering temperature	t = 10 s	T_{sld}	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.

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

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
LED forward voltage	I_F = 10 mA	V_F	2.4	2.7	3.0	V
Open circuit voltage	I_F = 5 mA	V_{OC}	-	19	-	V
	I_F = 10 mA	V_{OC}	14	20	24	V
	I_F = 20 mA	V_{OC}	-	21	-	V
Short circuit current	I_F = 5 mA	I_{SC}	-	10	-	µA
	I_F = 10 mA	I_{SC}	12	20	30	µA
	I_F = 20 mA	I_{SC}	-	45	-	µA

Note

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

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

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	C_L = 200 pF, R_L = 10 MΩ , I_F = 10 mA, P_W = 2 ms, duty cycle = 50 %	t_{on}	-	80	-	µs
Turn-off time		t_{off}	-	40	-	µs

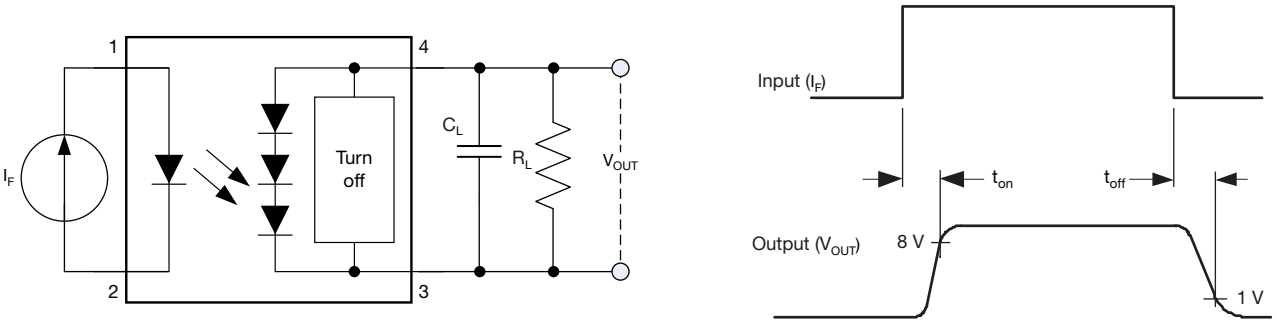


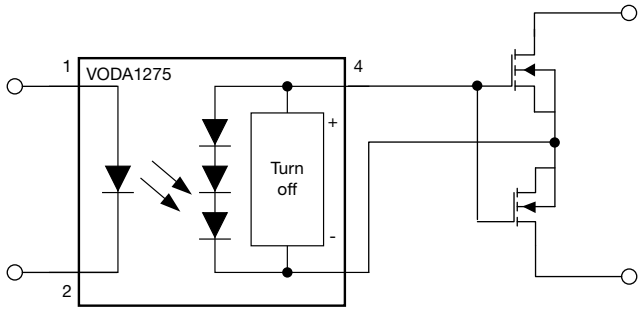
Fig. 1 - t_{on}, t_{off} Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 125 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	600	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	5300	V_{RMS}
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}	1260	V_{peak}
Isolation resistance	T_{amb} = 125 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = T_S, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	720	mW
Input safety current		I_{SI}	240	mA
Input safety temperature		T_S	175	°C
Creepage distance	SMD-4		≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm

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.

APPLICATION EXAMPLES



Bidirectional MOSFET Driver Application

Fig. 2 - Typical MOSFET Driver Applications With Integrated Turn-Off Functionality

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

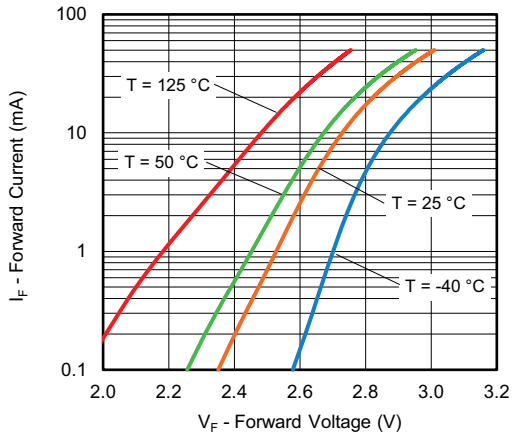


Fig. 3 - Forward Current vs. Forward Voltage

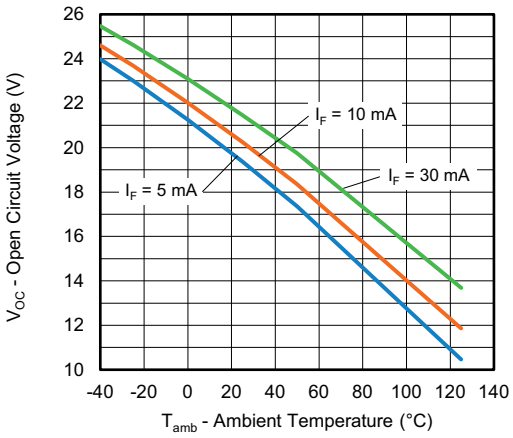


Fig. 5 - Open Circuit Voltage vs. Ambient Temperature

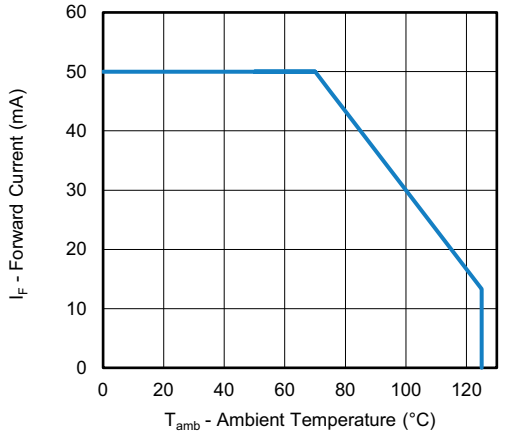


Fig. 4 - Forward Current vs. Ambient Temperature

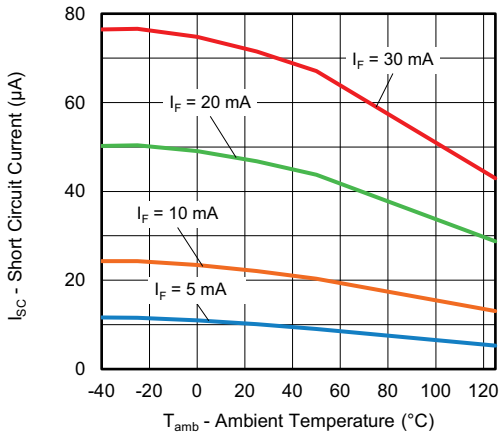


Fig. 6 - Short Circuit Current vs. Ambient Temperature

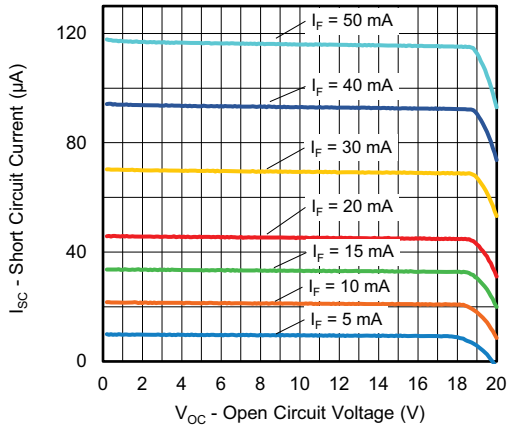
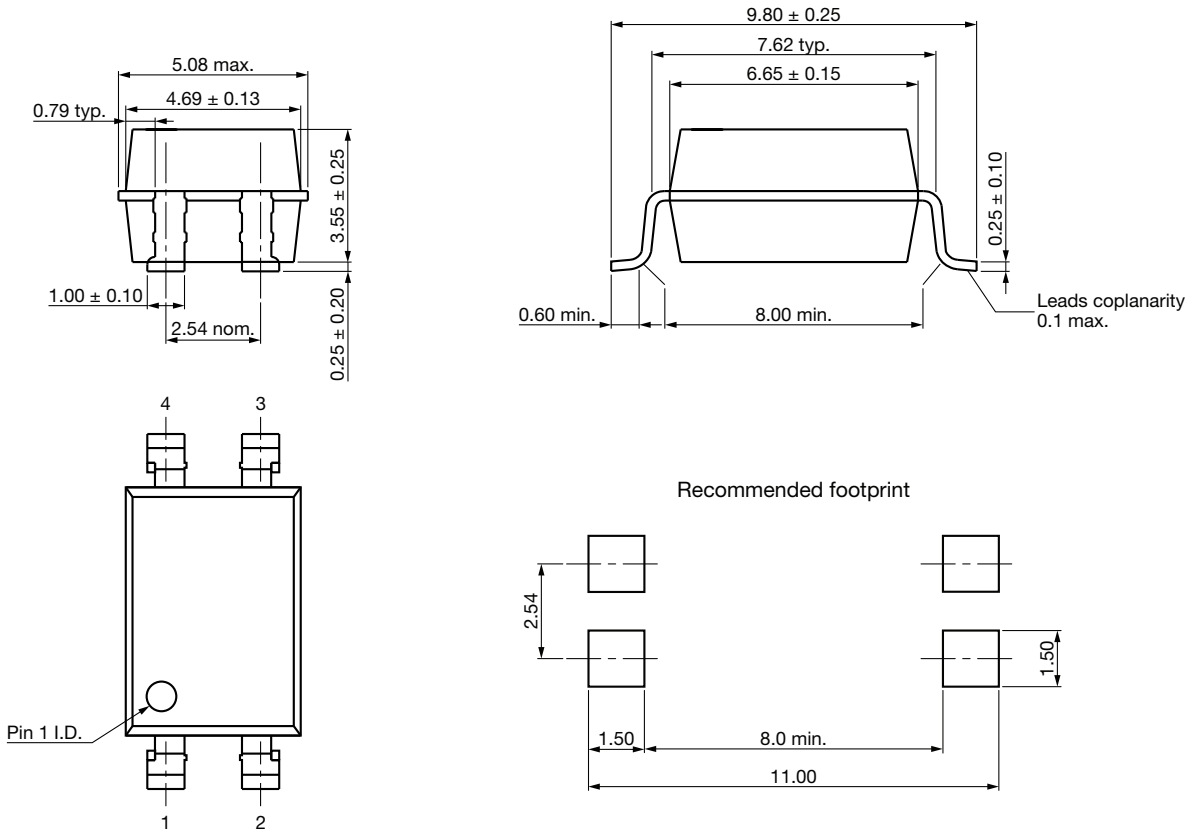


Fig. 7 - Short Circuit Current vs. Open Circuit Voltage

PACKAGE DIMENSIONS in millimeters

SMD-4



PACKAGE MARKING

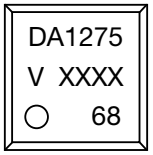


Fig. 8 - VODA1275

Notes

- XXXX = LMC (lot marking code)
- Package configuration (T, M) are not part of the package marking

TAPE AND REEL PACKAGING

Dimensions in millimeters

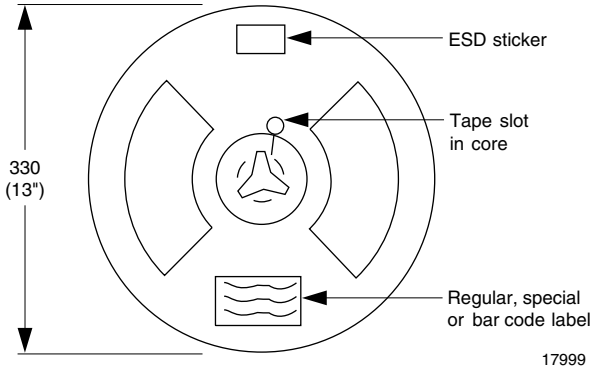


Fig. 9 - Tape and Reel Shipping Medium
(EIA-481, revision A, and IEC 60286), 1000 units per reel

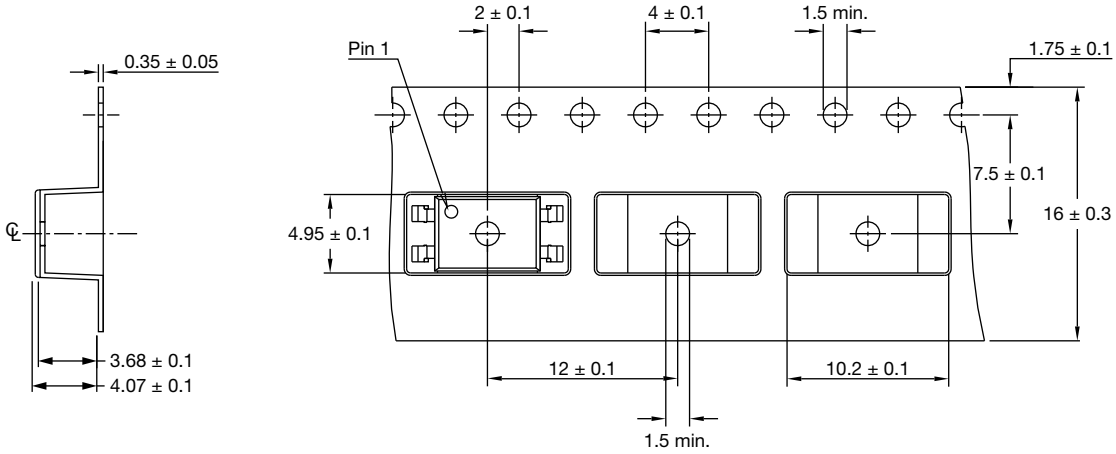


Fig. 10 - Tape and Reel Packing (1000 pieces on reel)

SOLDER PROFILES

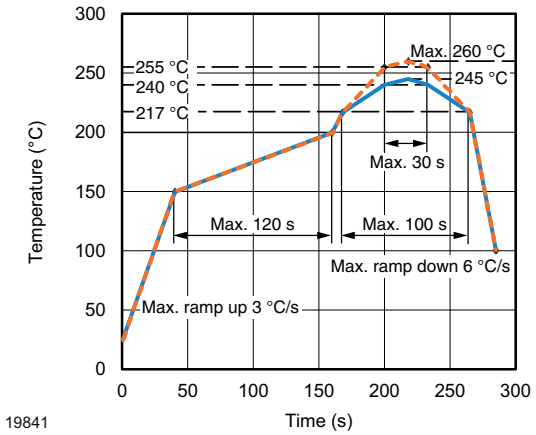


Fig. 11 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: 168 h

Conditions: $T_{amb} < 30$ °C, RH ≤ 60 %

Moisture sensitivity level 3, according to J-STD-020

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