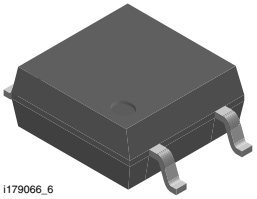
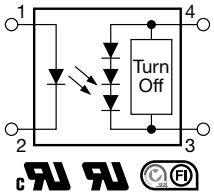
Photovoltaic MOSFET Driver with Integrated Fast Turn-Off, Solid-State Relay





FEATURES

- Open circuit voltage at I_F = 10 mA, 8.4 V typical
- Short circuit current at I_F = 10 mA, 15 µA typical
- Isolation test voltage 4500 V_{RMS}
- Logic compatible input
- High reliability
- Integrated rapid turn-off circuitry
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE GREEN (5-2008)

DESCRIPTION

The VOM1271 is a stand-alone optically isolated MOSFET driver. Unlike conventional MOSFET drivers, which require an external power supply to provide V_{CC} and or V_{DD} rails to the driver itself, the VOM1271 obtains all the required current to drive its internal circuitry from the LED current on the low voltage primary side of the isolation barrier. This saves the designer the space and cost associated with providing one or more external power supplies. The VOM1271 also integrates a turn-off circuit internal to the component itself, thus doing away with the need for additional components in order to increase the overall switching speed by decreasing the turn-off time. These features, combined with a small SOP4 package, provide designers with a small footprint, highly integrated isolated gate driver solution for a large variety of MOSFET drive applications.

APPLICATIONS

- High-side driver
- Solid-state relays
- Floating power supply
- Power control
- Data acquisition
- ATE
- Isolated solenoid drivers
- Isolated high current relay drivers
- Isolated high voltage relay drivers

AGENCY APPROVALS

The safety application model number covering all products in this datasheet is VOM1271. This model number should be used when consulting safety agency documents.

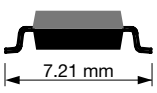
- UL1577
- cUL, equivalent to CSA bulletin 5A
- FIMKO EN 60950-1

SAFETY AGENCY COMPLIANCE

Please see document: www.vishay.com/doc?83743

ORDERING INFORMATION

V	O	M	1	2	7	1	T
PART NUMBER							TAPE AND REEL



PACKAGE	UL, cUL, FIMKO
SOP-4	VOM1271T

Note

- For additional information on the available options refer to option information. The product is available only on tape and reel.

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
SSR				
LED input ratings continous forward current		I_F	50	mA
LED input ratings reverse voltage	$I_R \leq 10$ µA	V_R	5	V
Ambient operating temperature range		T_{amb}	- 40 to + 100	°C
Storage temperature range		T_{stg}	- 40 to + 125	°C
Pin soldering temperature (1)	t ≤ 10 s max.	T_{sld}	260	°C
Isolation test voltage between emitter and detector	t = 1 s	V_{ISO}	4500	V_{RMS}

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 (SOP).

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	1.2	1.4	1.6	V
Open circuit voltage	I_F = 5 mA	V_{OC}		8.1		V
	I_F = 10 mA	V_{OC}	7.8	8.4		V
	I_F = 20 mA	V_{OC}		8.7		V
	I_F = 30 mA	V_{OC}		8.9		V
Short circuit current	I_F = 5 mA	I_{SC}		7.0		µA
	I_F = 10 mA	I_{SC}	6.0	15.0		µA
	I_F = 20 mA	I_{SC}		30.0		µA
	I_F = 30 mA	I_{SC}		47.0		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, I_F = 20 mA, P_W = 2 ms, duty cycle = 50 %	t_{on}		53		µs
Turn-off time		t_{off}		24		µs

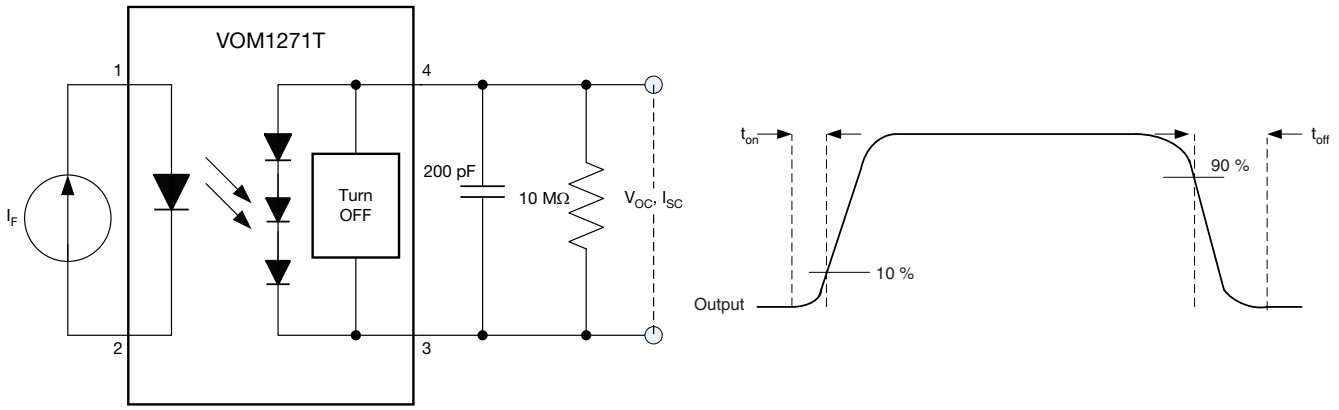


Fig. 1 - t_{on}, t_{off} Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification (according to IEC 68 part 1)	IEC 68 part 1			40/100/21		
Comparative tracking index	Insulation group IIIa	CTI	175		399	
Transient overvoltage		V_{IOTM}			6000	V
Recurring peak voltage		V_{IORM}			630	V
Package safety power		P_{SO}			350	mW
Package safety current		I_{SI}			150	mA
Package safety temperature		T_{SI}			175	°C
Creepage distance			5			mm
Clearance distance			5			mm

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

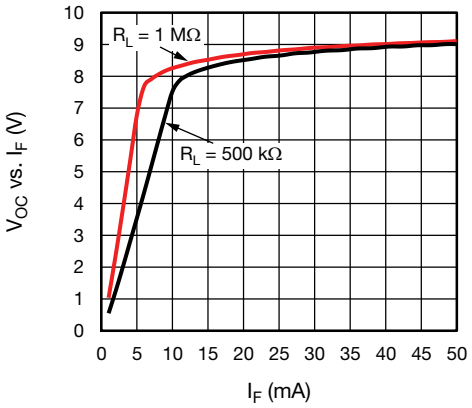


Fig. 2 - Output Open Circuit Voltage vs. LED Current

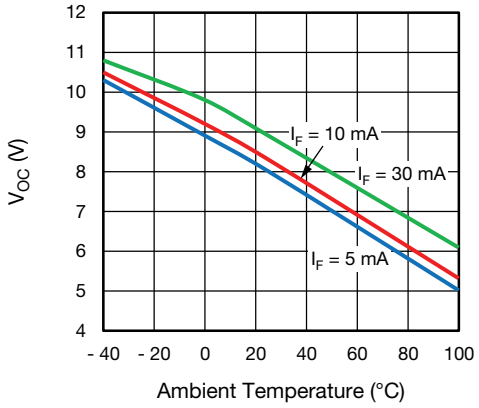


Fig. 4 - Output Open Circuit Voltage vs. Ambient Temperature

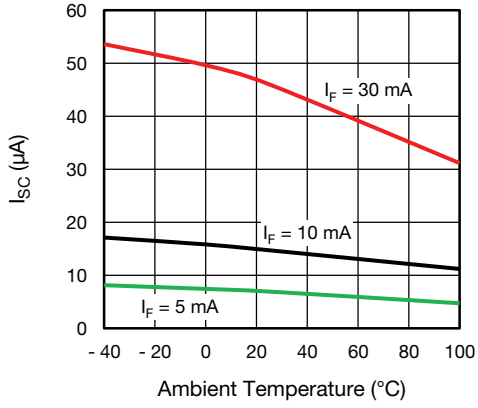


Fig. 3 - Output Short-Circuit Current vs. Ambient Temperature

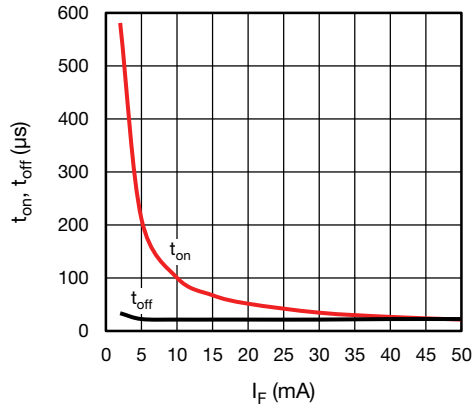


Fig. 5 - t_{on}, t_{off} vs. LED Current

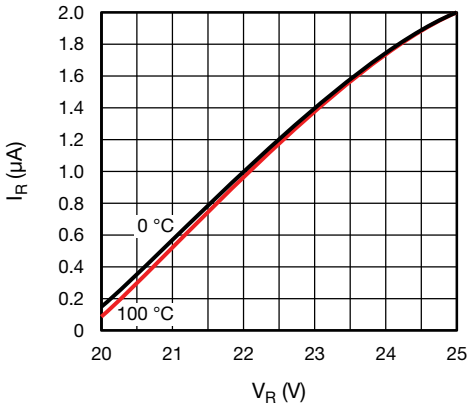


Fig. 6 - LED Reverse Current vs. Reverse Voltage

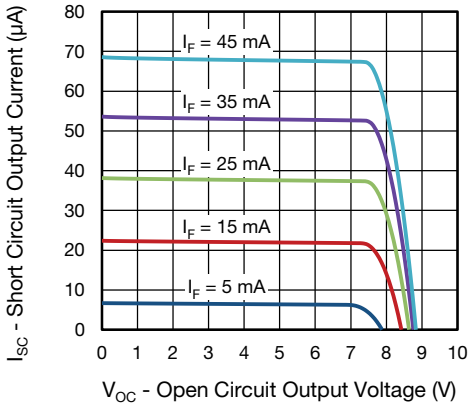


Fig. 8 - Short Circuit Output Current vs. Open Circuit Output Voltage

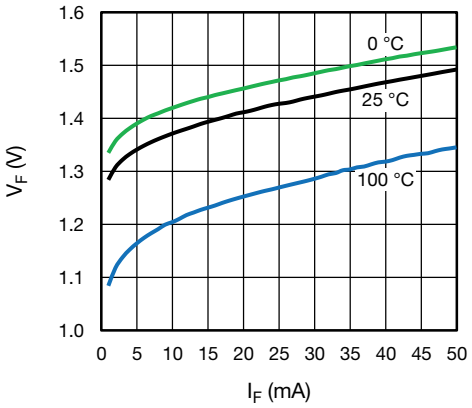


Fig. 7 - LED Forward Voltage vs. LED Forward Current

APPLICATION DESCRIPTION

Figure 8 illustrates a standard isolated MOSFET driver such as Vishay's VO1263. Though these parts are generally capable of supplying higher output current, they lack integrated fast turn-off circuitry. Thus, if high turn-off speed is required. external circuitry needs to be provided, as illustrated in figure one.

Figure 9 illustrates the ability to do away with external turn-off circuitry with the VOM1271, by taking advantage of the VOM1271's integrated turn-off circuitry.

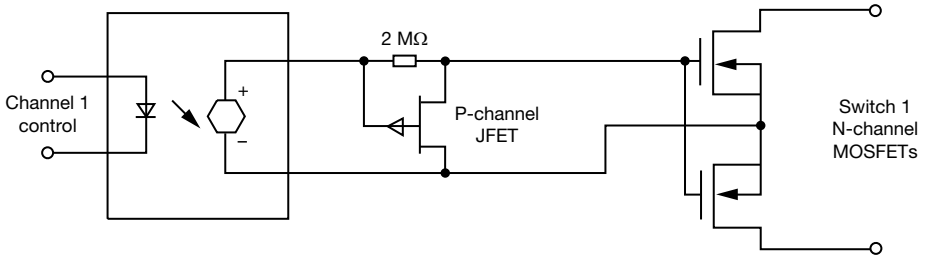
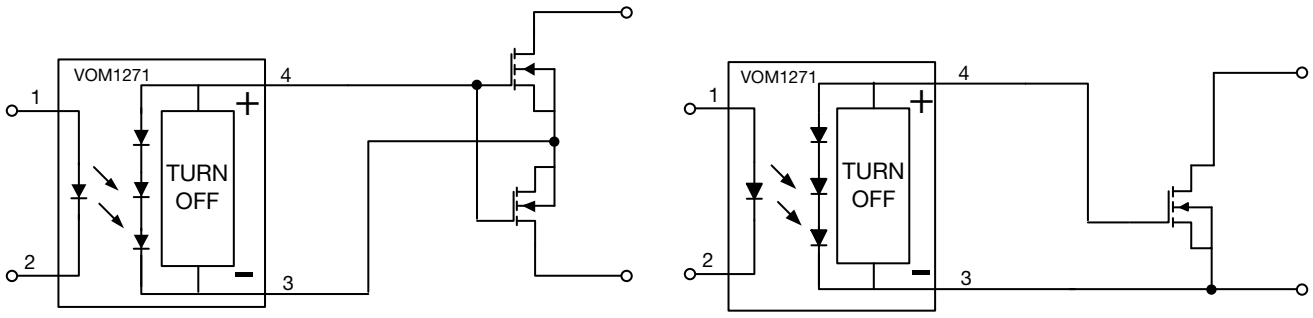


Fig. 9 - Typical MOSFET Driver Application without Integrated Fast Turn-Off

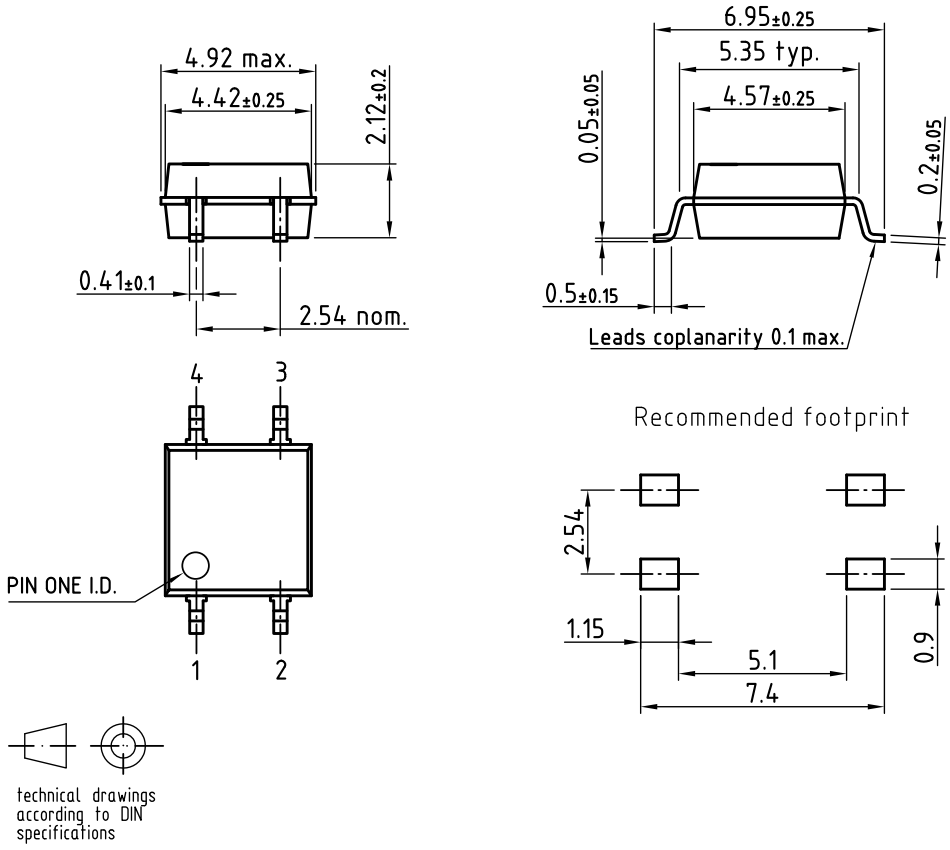


Bidirectional MOSFET Driver Application

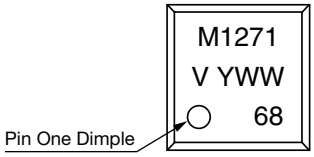
Single MOSFET Driver Application

Fig. 10 - Typical MOSFET Driver Applications with Integrated Fast Turn-Off

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



TAPE AND REEL PACKAGING

Dimensions in millimeters

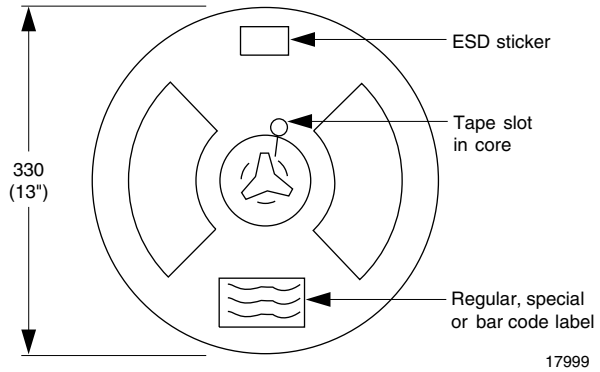


Fig. 11 - Tape and Reel Shipping Medium
(EIA-481, revision A, and IEC 60286), 2000 units per reel

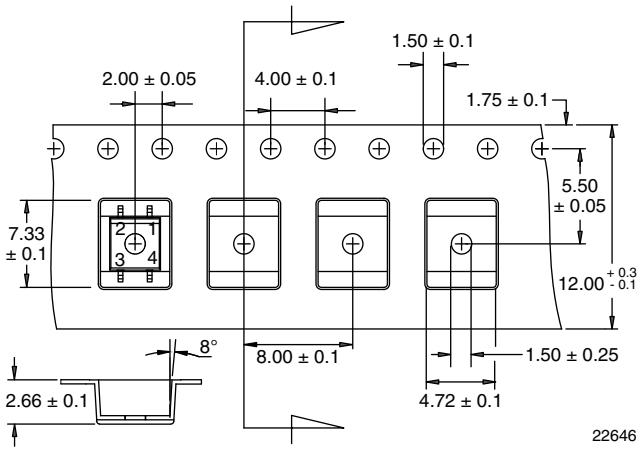


Fig. 12 - Tape Dimensions

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