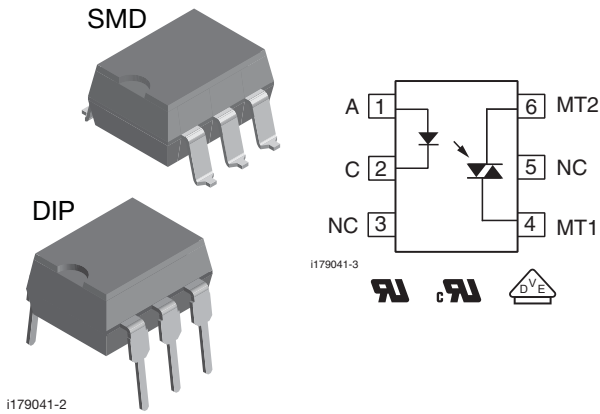


# Optocoupler, Phototriac Output, 1.5 kV/μs dV/dt, 600 V



## DESCRIPTION

The VO3052 and VO3053 triac driver family consists of a GaAs infrared LED optically coupled to a monolithic photosensitive non zero crossing triac detector chip.

The 600 V blocking voltage permits control of off-line voltages up to 240 V<sub>AC</sub>, with a safety factor or more than two, and is sufficient for as much as 380 V.

## FEATURES

- 1500 V/μs dV/dt minimum 2000 V/μs typical
- 600 V blocking voltage
- 100 mA on-state current
- Low input trigger current
- 6 pin DIP package
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

## APPLICATIONS

- Household appliances
- Triac drive/AC motor drives
- Solenoid/valve controls
- Office automation equipment/machine
- Temperature (HVAC)/lighting controls
- Switching power supply

## AGENCY APPROVALS

- UL-file E52744 system code H or J
- cUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-2 (VDE 0884) available with option 1

ORDERING INFORMATION		
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">V</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">O</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">3</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">5</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">-</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">X</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">T</div> </div> <p style="text-align: center; margin-top: 5px;"> <span style="margin-right: 100px;">PART NUMBER</span> <span style="margin-right: 100px;">PACKAGE OPTION</span> <span>TAPE AND REEL</span> </p>		
AGENCY CERTIFIED/PACKAGE	TRIGGER, CURRENT I <sub>FT</sub> (mA)	
UL, cUL	5	10
DIP-6	VO3053	VO3052
DIP-6, 400 mil, option 6	VO3053-X006	VO3052-X006
SMD-6, option 7	VO3053-X007T	VO3052-X007T
SMD-6, option 9	VO3053-X009T	-
VDE, UL, cUL	5	10
DIP-6, 400 mil, option 6	-	VO3052-X016

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			$V_R$	6	V
Forward current - continuous			$I_F$	60	mA
Power dissipation			$P_{diss}$	100	mW
<b>OUTPUT</b>					
Off state output terminal voltage		VO3052, VO3053	$V_{DRM}$	600	V
Peak repetitive surge current	PW = 100 ms, 120 pps		$I_{TSM}$	1	A
Power dissipation			$P_{diss}$	200	mW
On-state RMS current			$I_{T(RMS)}$	100	mA
<b>COUPLER</b>					
Isolation test voltage	$t = 1\text{ s}$		$V_{ISO}$	5300	$V_{RMS}$
Total power dissipation			$P_{tot}$	300	mW
Operating temperature			$T_{amb}$	- 40 to + 100	$^{\circ}\text{C}$
Storage temperature			$T_{stg}$	- 55 to + 150	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>	10 s		$T_{sld}$	260	$^{\circ}\text{C}$

**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.

<sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

<b>THERMAL CHARACTERISTICS</b>				
PARAMETER	SYMBOL	VALUE	UNIT	
Maximum LED junction temperature	$T_{jmax.}$	125	$^{\circ}\text{C}$	
Maximum output die junction temperature	$T_{jmax.}$	125	$^{\circ}\text{C}$	
Thermal resistance, junction emitter to board	$\theta_{JEB}$	150	$^{\circ}\text{C}/\text{W}$	
Thermal resistance, junction emitter to case	$\theta_{JEC}$	139	$^{\circ}\text{C}/\text{W}$	
Thermal resistance, junction detector to board	$\theta_{JDB}$	78	$^{\circ}\text{C}/\text{W}$	
Thermal resistance, junction detector to case	$\theta_{JDC}$	103	$^{\circ}\text{C}/\text{W}$	
Thermal resistance, junction emitter to junction detector	$\theta_{JED}$	496	$^{\circ}\text{C}/\text{W}$	
Thermal resistance, case to ambient	$\theta_{CA}$	3563	$^{\circ}\text{C}/\text{W}$	

**Note**

- The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's Thermal Characteristics of Optocouplers application note.



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Reverse current	$V_R = 6\text{ V}$		$I_R$			10	$\mu\text{A}$
Forward voltage	$I_F = 30\text{ mA}$		$V_F$		1.2	1.5	V
<b>OUTPUT</b>							
Leakage with LED off, either direction	$V_{DRM} = 600\text{ V}$		$I_{DRM}$		10	500	nA
Critical rate of rise off-state voltage	$V_D = 400\text{ V}$		$dV/dt_{cr}$	1500	2000		V/ $\mu\text{s}$
<b>COUPLER</b>							
LED trigger current, current required to latch output		VO3053	$I_{FT}$			5	mA
		VO3052	$I_{FT}$			10	mA
Peak on-state voltage, either direction	$I_{TM} = 100\text{ mA peak}$ , $I_F = \text{rated } I_{FT}$		$V_{TM}$		1.7	3	V
Holding current, either direction			$I_H$		200		$\mu\text{A}$
Coupling capacitance	10 KHz		$C_{IO}$		0.4		pF

**Note**

- 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.

<b>SAFETY AND INSULATION RATINGS</b>							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Climatic classification	IEC68 part 1			40/100/21			
Pollution degree	DIN VDE 0109			2			
Tracking resistance (comparative tracking index)	Insulation group IIIa	CTI	175				
Highest allowable overvoltage	Transient overvoltage	$V_{IOTM}$	8000			$V_{peak}$	
Maximum working insulation voltage	Recurring peak voltage	$V_{IORM}$	890			$V_{peak}$	
Insulation resistance at 25 °C	$V_{IO} = 500\text{ V}$	$R_{IS}$			$\geq 10^{12}$	$\Omega$	
Insulation resistance at $T_S$	$V_{IO} = 500\text{ V}$	$R_{IS}$			$\geq 10^{12}$	$\Omega$	
Insulation resistance at 100 °C	$V_{IO} = 500\text{ V}$	$R_{IS}$			$\geq 10^{12}$	$\Omega$	
Partial discharge test voltage	Method a, $V_{pd} = V_{IORM} \times 1.875$	$V_{pd}$			1669	$V_{peak}$	
Safety limiting values - maximum values allowed in the event of a failure	Output power	$P_{SO}$			500	mW	
	Input current	$I_{SI}$			250	mA	
	Case temperature	$T_{SI}$			175	$^{\circ}\text{C}$	
Minimum external air gap (clearance)	Measured from input terminals to output terminals, shortest distance through air		$\geq 7$			mm	
Minimum external tracking (creepage)	Measured from input terminals to output terminals, shortest distance path along body		$\geq 7$			mm	
Minimum external air gap (clearance)	Measured from input terminals to output terminals, shortest distance through air		$\geq 8$			mm	
Minimum external tracking (creepage)	Measured from input terminals to output terminals, shortest distance path along body		$\geq 8$			mm	

**Note**

- As per IEC60747-5-5, 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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

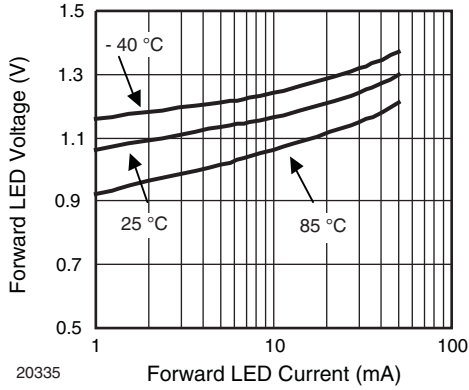


Fig. 1 - Forward Voltage vs. Forward Current

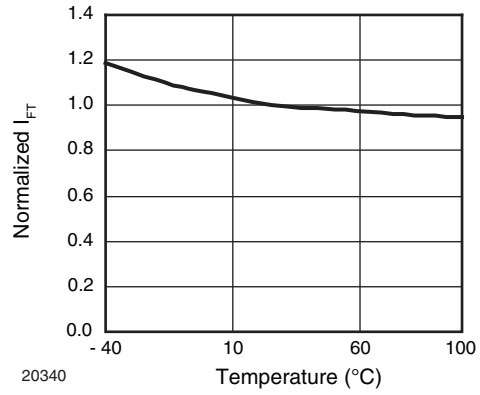


Fig. 4 - Normalized Trigger Current vs. Temperature

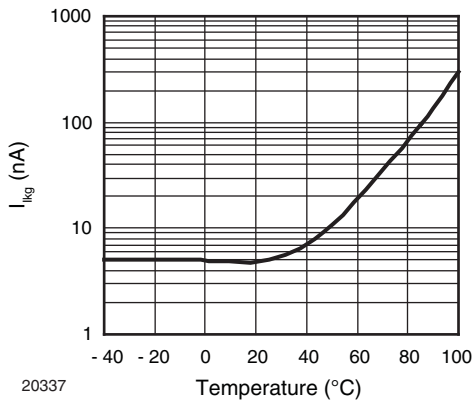


Fig. 2 - Off-State Leakage Current vs. Temperature

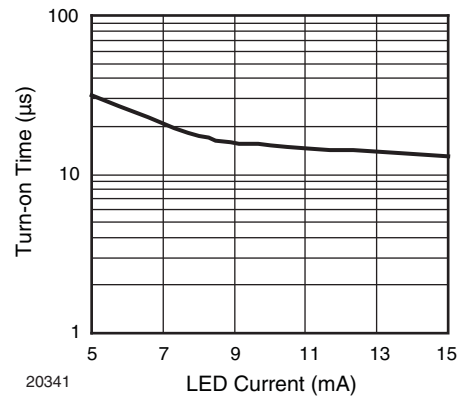


Fig. 5 - Turn-on Time vs. LED Current

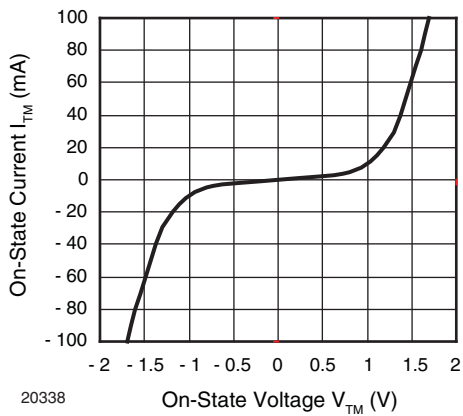


Fig. 3 - On-State Current vs.  $V_{TM}$

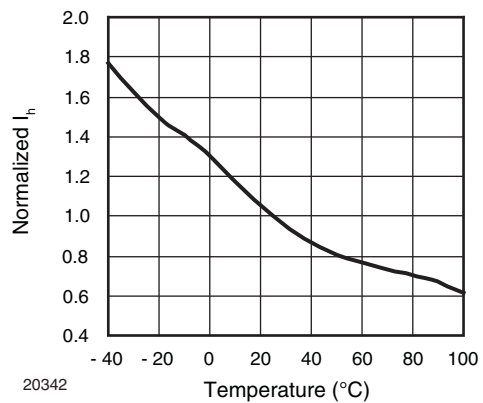


Fig. 6 - Normalized Holding Current vs. Temperature

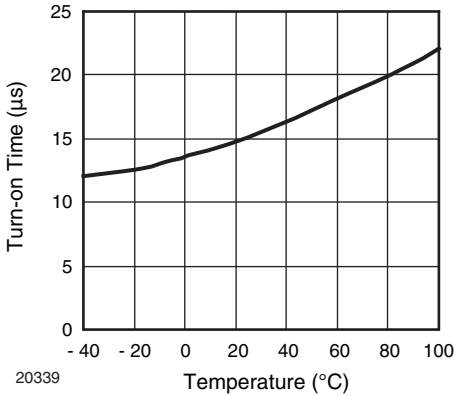


Fig. 7 - Turn-on Time vs. Temperature

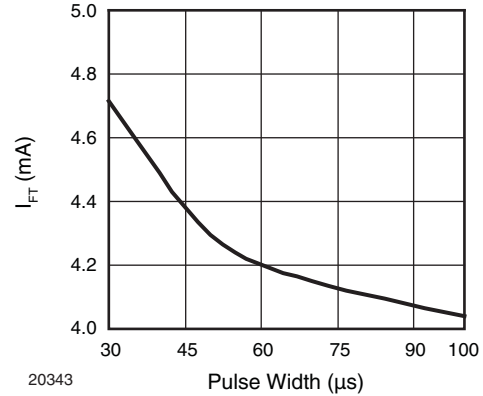
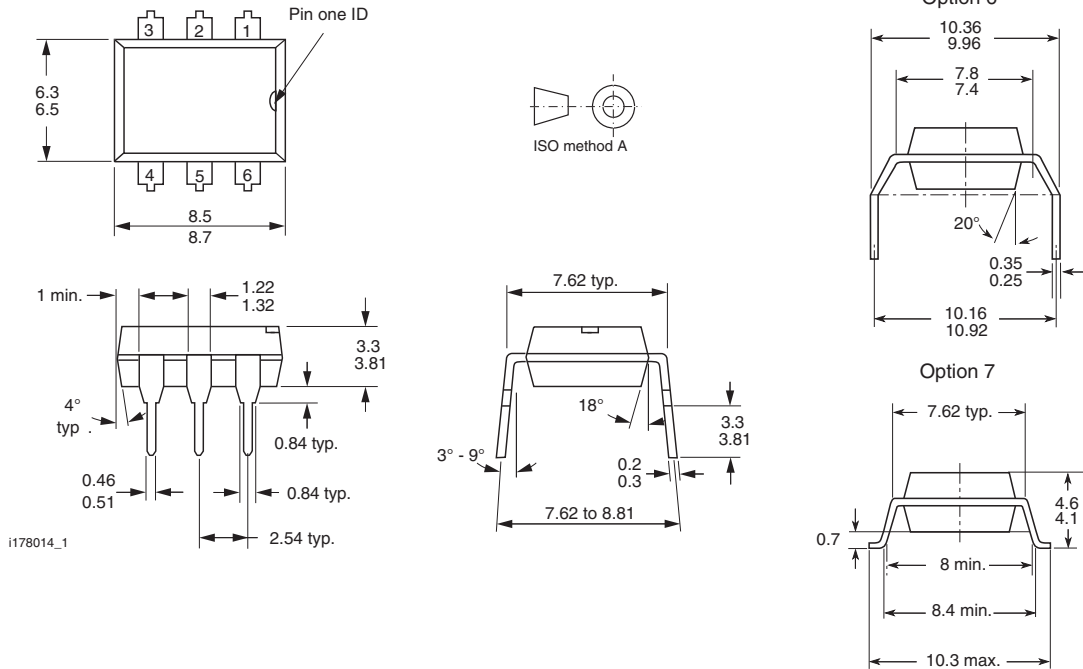


Fig. 8 - Trigger Current vs. Pulse Width

**PACKAGE DIMENSIONS** in millimeters



**PACKAGE MARKING**



**Notes**

- The VDE logo is only marked on option1 parts.
- Tape and reel suffix (T) is not part of the package marking.



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