

## Low Input Current, Phototransistor Output, SOP-4, Mini-Flat Package



I179089



### FEATURES

- Operating temperature from - 55 °C to + 110 °C
- SOP-4 mini-flat package
- CTR range 40 % to 600 %,  $I_F = 1$  mA
- Isolation test voltage, 3750  $V_{RMS}$
- Low saturation voltage
- Fast switching times
- Low coupling capacitance
- End-stackable, 0.100" (2.54 mm) spacing
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

The 110 °C rated VOM618A has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4 pin 100 mil lead pitch miniflat package. It features a high current transfer ratio with low input current, low coupling capacitance, and high isolation voltage.

These coupling devices are designed for signal transmission between two electrically separated circuits.

### APPLICATIONS

- PLCs
- Telecommunication
- Lighting control system
- Solar inverters
- AC drives

### AGENCY APPROVALS

- UL1577, file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884), available with option 1
- FIMKO EN60065 and EN60950-1
- CQC GB8898-2001

| ORDERING INFORMATION   |               |                |                |                |                |                |                |                |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|--|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse;"> <tr> <td>V</td><td>O</td><td>M</td><td>6</td><td>1</td><td>8</td><td>A</td><td>-</td><td>#</td><td>X</td><td>0</td><td>0</td><td>1</td><td>T</td> </tr> </table> <p>PART NUMBER</p> </div> <div style="text-align: center;"> <p>CTR BIN</p> </div> <div style="text-align: center;"> <p>VDE OPTION</p> </div> <div style="text-align: center;"> <p>TAPE AND REEL</p> </div> <div style="text-align: center;"> </div> </div> |               |                |                |                |                |                |                |                | V | O | M | 6 | 1 | 8 | A | - | # | X | 0 | 0 | 1 | T |
| V  | O             | M              | 6              | 1              | 8              | A              | -              | #              | X | 0 | 0 | 1 | T |   |   |   |   |   |   |   |   |   |
| AGENCY CERTIFIED/<br>PACKAGE   | CTR (%)       |                |                |                |                |                |                |                |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|  | 1 mA          |                |                |                |                |                |                |                |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| UL, cUL, FIMKO, CQC  | 50 to 600     | 40 to 80       | 63 to 125      | 100 to 200     | 160 to 320     | 50 to 100      | 80 to 160      | 130 to 260     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| SOP-4, mini-flat   | VOM618AT      | VOM618A-1T     | VOM618A-2T     | VOM618A-3T     | VOM618A-4T     | VOM618A-5T     | VOM618A-7T     | VOM618A-8T     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| VDE, UL, cUL, FIMKO, CQC   | 50 to 600     | 40 to 80       | 63 to 125      | 100 to 200     | 160 to 320     | 50 to 100      | 80 to 160      | 130 to 260     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| SOP-4, mini-flat   | VOM618A-X001T | VOM618A-1X001T | VOM618A-2X001T | VOM618A-3X001T | VOM618A-4X001T | VOM618A-5X001T | VOM618A-7X001T | VOM618A-8X001T |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                  |            |               |                    |
|--|----------------------------------|------------|---------------|--------------------|
| PARAMETER  | TEST CONDITION                   | SYMBOL     | VALUE         | UNIT               |
| <b>INPUT</b>   |                                  |            |               |                    |
| DC forward current   |                                  | $I_F$      | 60            | mA                 |
| Reverse voltage  |                                  | $V_R$      | 6             | V                  |
| Power dissipation  |                                  | $P_{diss}$ | 70            | mW                 |
| Surge forward current  | $t_p \leq 10\text{ }\mu\text{s}$ | $I_{FSM}$  | 2.5           | A                  |
| <b>OUTPUT</b>  |                                  |            |               |                    |
| Collector emitter voltage  |                                  | $V_{CEO}$  | 80            | V                  |
| Emitter collector voltage  |                                  | $V_{ECO}$  | 7             | V                  |
| Collector current  |                                  | $I_C$      | 50            | mA                 |
|  | $t_p \leq 1\text{ ms}$           | $I_C$      | 100           | mA                 |
| Power dissipation  |                                  | $P_{diss}$ | 150           | mW                 |
| <b>COUPLER</b>   |                                  |            |               |                    |
| Isolation test voltage between emitter and detector  | $t = 1\text{ min}$               | $V_{ISO}$  | 3750          | $V_{RMS}$          |
| Total power dissipation  |                                  | $P_{tot}$  | 170           | mW                 |
| Operating temperature range  |                                  | $T_{amb}$  | - 55 to + 110 | $^{\circ}\text{C}$ |
| Storage temperature range  |                                  | $T_{stg}$  | - 55 to + 150 | $^{\circ}\text{C}$ |
| Junction temperature   |                                  | $T_j$      | 125           | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup>   |                                  | $T_{sld}$  | 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> See "Assembly Instructions" for surface mounted devices ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054)).



Fig. 1 - Total Power Dissipation vs. Ambient Temperature



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |             |      |      |      |               |
|--|--|-------------|------|------|------|---------------|
| PARAMETER  | TEST CONDITION   | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>   |  |             |      |      |      |               |
| Forward voltage  | $I_F = 5\text{ mA}$  | $V_F$       |      | 1.1  | 1.6  | V             |
| Reverse current  | $V_R = 6\text{ V}$   | $I_R$       |      | 0.01 | 10   | $\mu\text{A}$ |
| Capacitance  | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                                  | $C_j$       |      | 9    |      | pF            |
| <b>OUTPUT</b>  |  |             |      |      |      |               |
| Collector emitter leakage current  | $V_{CE} = 20\text{ V}$   | $I_{CEO}$   |      | 0.4  | 100  | nA            |
| Collector emitter breakdown voltage  | $I_C = 100\text{ }\mu\text{A}$   | $BV_{CEO}$  | 80   |      |      | V             |
| Emitter collector breakdown voltage  | $I_E = 10\text{ }\mu\text{A}$  | $BV_{ECO}$  | 7    |      |      | V             |
| Collector emitter capacitance  | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$                               | $C_{CE}$    |      | 2.8  |      | pF            |
| <b>COUPLER</b>   |  |             |      |      |      |               |
| Coupling capacitance   | $f = 1\text{ MHz}$   | $C_C$       |      | 0.3  |      | pF            |
| Collector emitter saturation voltage   | $I_F = 1\text{ mA}$ , $I_C = 0.25\text{ mA}$                             | $V_{CEsat}$ |      | 0.12 | 0.4  | V             |
| Cut-off frequency  | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 100\text{ }\Omega$ | $f_{ctr}$   |      | 110  |      | kHz           |

**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.

| <b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |           |        |      |      |      |      |
|--|---|-----------|--------|------|------|------|------|
| PARAMETER  | TEST CONDITION                              | PART      | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$  | $I_F = 1\text{ mA}$ , $V_{CE} = 5\text{ V}$ | VOM618A   | CTR    | 50   |      | 600  | %    |
|  |   | VOM618A-1 | CTR    | 40   |      | 80   | %    |
|  |   | VOM618A-2 | CTR    | 63   |      | 125  | %    |
|  |   | VOM618A-3 | CTR    | 100  |      | 200  | %    |
|  |   | VOM618A-4 | CTR    | 160  |      | 320  | %    |
|  |   | VOM618A-5 | CTR    | 50   |      | 100  | %    |
|  |   | VOM618A-7 | CTR    | 80   |      | 160  | %    |
|  |   | VOM618A-8 | CTR    | 130  |      | 260  | %    |

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |           |      |      |      |               |
|---|---|-----------|------|------|------|---------------|
| PARAMETER   | TEST CONDITION  | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| <b>NON-SATURATED</b>  |   |           |      |      |      |               |
| Rise and fall time  | $I_C = 2\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 100\text{ }\Omega$    | $t_r$     |      | 5    |      | $\mu\text{s}$ |
| Fall time   |   | $t_f$     |      | 4    |      | $\mu\text{s}$ |
| Turn-on time  |   | $t_{on}$  |      | 7    |      | $\mu\text{s}$ |
| Turn-off time   |   | $t_{off}$ |      | 6    |      | $\mu\text{s}$ |
| <b>SATURATED</b>  |   |           |      |      |      |               |
| Rise and fall time  | $I_F = 1.6\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 4.7\text{ k}\Omega$ | $t_r$     |      | 6    |      | $\mu\text{s}$ |
| Fall time   |   | $t_f$     |      | 29   |      | $\mu\text{s}$ |
| Turn-on time  |   | $t_{on}$  |      | 8    |      | $\mu\text{s}$ |
| Turn-off time   |   | $t_{off}$ |      | 35   |      | $\mu\text{s}$ |



Fig. 2 - Test Circuit

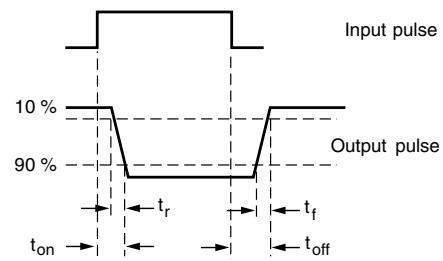


Fig. 3 - Test Circuit and Waveforms

| SAFETY AND INSULATION RATINGS                                |  |            |                   |
|--|--|------------|-------------------|
| PARAMETER  | SYMBOL   | VALUE      | UNIT              |
| <b>MAXIMUM SAFETY RATINGS</b>                                |  |            |                   |
| Output safety power  | $P_{SO}$   | 300        | mW                |
| Input safety current   | $I_{si}$   | 200        | mW                |
| Safety temperature   | $T_S$  | 150        | °C                |
| Comparative tracking index                                   | CTI  | 175        |                   |
| <b>INSULATION RATED PARAMETERS</b>                           |  |            |                   |
| Maximum withstanding isolation voltage                       | $V_{ISO}$  | 3750       | $V_{RMS}$         |
| Maximum transient isolation voltage                          | $V_{IOTM}$                                       | 6000       | $V_{peak}$        |
| Maximum repetitive peak isolation voltage                    | $V_{IORM}$                                       | 565        | $V_{peak}$        |
| Insulation resistance  | $T_{amb} = 25\text{ °C}, V_{DC} = 500\text{ V}$  | $R_{IO}$   | $10^{12}\ \Omega$ |
| Insulation resistance  | $T_{amb} = 100\text{ °C}, V_{DC} = 500\text{ V}$ | $R_{IO}$   | $10^{11}\ \Omega$ |
| Climatic classification (according to IEC 68 part 1)         |  | 55/110/21  |                   |
| Environment (pollution degree in accordance to DIN VDE 0109) |  | 2          |                   |
| Internal creepage  |  | $\geq 5$   | mm                |
| External creepage  |  | $\geq 5$   | mm                |
| Clearance  |  | $\geq 5$   | mm                |
| Insulation thickness   |  | $\geq 0.4$ | mm                |

**Note**

- As per DIN EN 60747-5-5 (VDE 0884), § 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.

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


Fig. 4 - Forward Voltage vs. Forward Current

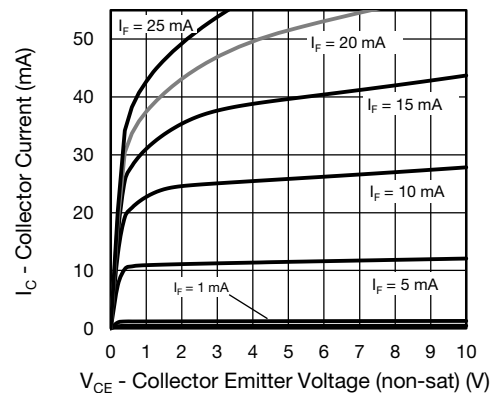


Fig. 5 - Collector Current vs. Collector Emitter Voltage (non-saturated)



Fig. 6 - Collector Emitter Current vs. Ambient Temperature



Fig. 9 - Normalized Current Transfer Ratio vs. Ambient Temperature (saturated)



Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)



Fig. 10 - Normalized Current Transfer Ratio vs. Ambient Temperature (non-saturated)

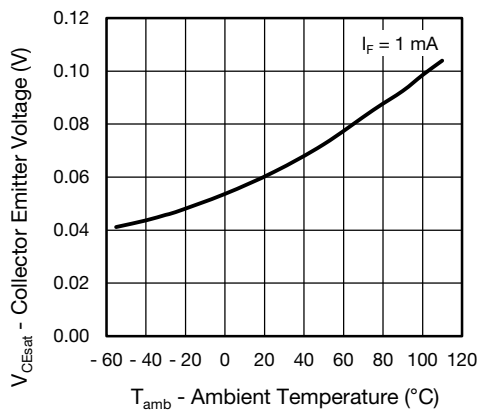


Fig. 8 - Collector Emitter Voltage vs. Ambient Temperature (saturated)



Fig. 11 - Current Transfer Ratio vs. Forward Current (saturated) normalized to 1 mA at 25 °C



Fig. 12 - Current Transfer Ratio vs. Forward Current (non-saturated) normalized to 1 mA at 25 °C



Fig. 15 - Switching Time vs. Load Resistance



Fig. 13 - Cut-off Frequency (-3 dB) vs. Collector Current



Fig. 16 - Voltage Gain vs. Cut-off Frequency



Fig. 14 - F<sub>CTR</sub> vs. Phase Angle

**PACKAGE DIMENSIONS** in millimeters



**PACKAGE MARKING** (example of VOM618A-3X001T)



**Notes**

- Only option 1 is reflected in the package marking with the character "X".
- Tape and reel suffix (T) is not part of the package marking.

**TAPE AND REEL DIMENSIONS** in millimeters



Fig. 17 - Reel Dimensions (3000 units per reel)



Fig. 18 - Tape Dimensions



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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.