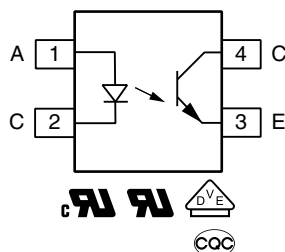
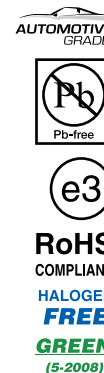


# Optocoupler, Phototransistor Output, Low Input Current, SOP-4, Mini-Flat Package



## FEATURES

- AEC-Q102 qualified
- High CTR with low input current
- SOP-4 low profile package
- High collector emitter voltage,  $V_{CEO} = 80\text{ V}$
- Isolation test voltage =  $3750\text{ V}_{RMS}$
- Low coupling capacitance
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



## LINKS TO ADDITIONAL RESOURCES



## DESCRIPTION

The VOMA617A series has a GaAlAs infrared emitting diode, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4-pin mini-flat package.

It features a high current transfer ratio at low input current, low coupling capacitance, and high isolation voltage.

The coupling devices are designed for signal transmission between two electrically separated circuits, specifically for use in automotive, as well as high reliable industrial applications.

## APPLICATIONS

- Galvanic and noise isolation
- Signal transmission
- Hybrid / electric vehicle applications
- Battery management
- 48 V board net
- System control

## AGENCY APPROVALS

- [UL1577](#)
- [cUL 1577](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#)
- [CQC GB4943.1-2011](#)

## ORDERING INFORMATION

|                                                                                                                                                    |  |                |                 |                 |                 |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------|-----------------|-----------------|-----------------|--|--|--|--|--|--|--|
| <div> <div>V O M A 6 1 7 A - # X 0 0 1 T</div> <div>PART NUMBER</div> <div>CTR BIN</div> <div>PACKAGE OPTION</div> <div>TAPE AND REEL</div> </div> |  |                |                 |                 |                 |  |  |  |  |  |  |  |
| AGENCY CERTIFIED / PACKAGE                                                                                                                         |  | CTR (%)        |                 |                 |                 |  |  |  |  |  |  |  |
|                                                                                                                                                    |  | 5 mA           |                 |                 |                 |  |  |  |  |  |  |  |
| UL, cUL, VDE, CQC                                                                                                                                  |  | 50 to 600      | 100 to 200      | 160 to 320      | 130 to 260      |  |  |  |  |  |  |  |
| SOP-4                                                                                                                                              |  | VOMA617A-X001T | VOMA617A-3X001T | VOMA617A-4X001T | VOMA617A-8X001T |  |  |  |  |  |  |  |

### Note

- Additional options may be possible, please contact sales office

| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                  |            |             |                    |
|--------------------------------------------------------------------------------------------------------|----------------------------------|------------|-------------|--------------------|
| PARAMETER                                                                                              | TEST CONDITION                   | SYMBOL     | VALUE       | UNIT               |
| <b>INPUT</b>                                                                                           |                                  |            |             |                    |
| Reverse voltage                                                                                        |                                  | $V_R$      | 5           | V                  |
| Power dissipation                                                                                      |                                  | $P_{diss}$ | 30          | mW                 |
| Forward current                                                                                        |                                  | $I_F$      | 20          | mA                 |
| Surge forward current                                                                                  | $t_p \leq 10\text{ }\mu\text{s}$ | $I_{FSM}$  | 0.5         | A                  |
| Junction temperature                                                                                   |                                  | $T_j$      | 125         | $^{\circ}\text{C}$ |
| <b>OUTPUT</b>                                                                                          |                                  |            |             |                    |
| Collector emitter voltage                                                                              |                                  | $V_{CEO}$  | 80          | V                  |
| Emitter collector voltage                                                                              |                                  | $V_{ECO}$  | 7           | V                  |
| Collector current                                                                                      |                                  | $I_C$      | 50          | mA                 |
| Power dissipation                                                                                      |                                  | $P_{diss}$ | 150         | mW                 |
| Junction temperature                                                                                   |                                  | $T_j$      | 125         | $^{\circ}\text{C}$ |
| <b>COUPLER</b>                                                                                         |                                  |            |             |                    |
| Total power dissipation                                                                                |                                  | $P_{tot}$  | 180         | mW                 |
| Storage temperature range                                                                              |                                  | $T_{stg}$  | -40 to +150 | $^{\circ}\text{C}$ |
| Ambient temperature range                                                                              |                                  | $T_{amb}$  | -40 to +110 | $^{\circ}\text{C}$ |
| Soldering temperature                                                                                  | $t = 10\text{ s}$                | $T_{sld}$  | 260         | $^{\circ}\text{C}$ |

**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

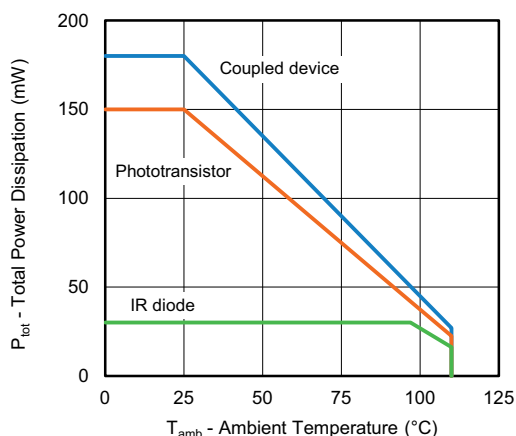


Fig. 1 - Power Dissipation vs. Ambient Temperature

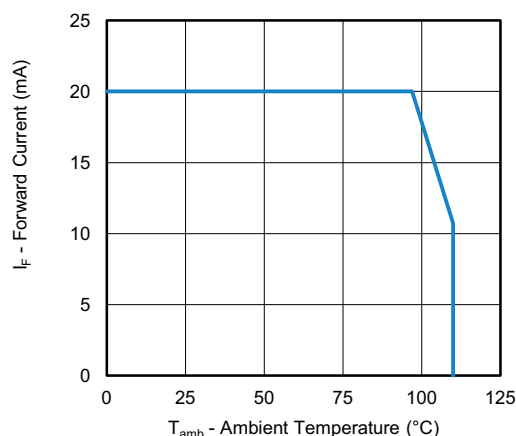


Fig. 2 - Maximum Forward Current vs. Ambient Temperature

**ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                            | TEST CONDITION                                                           | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
|--------------------------------------|--------------------------------------------------------------------------|-------------|------|------|------|---------------|
| <b>INPUT</b>                         |                                                                          |             |      |      |      |               |
| Forward voltage                      | $I_F = 5\text{ mA}$                                                      | $V_F$       | -    | 1.33 | 1.5  | V             |
| Reverse current                      | $V_R = 5\text{ V}$                                                       | $I_R$       | -    | -    | 10   | $\mu\text{A}$ |
| Capacitance                          | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                                  | $C_I$       | -    | 40   | -    | pF            |
| Thermal resistance                   |                                                                          | $R_{thJA}$  | -    | 1000 | -    | K/W           |
| <b>OUTPUT</b>                        |                                                                          |             |      |      |      |               |
| Collector emitter leakage current    | $V_{CE} = 50\text{ V}$                                                   | $I_{CEO}$   | -    | 1    | 100  | nA            |
| Collector emitter breakdown voltage  | $I_C = 100\text{ }\mu\text{A}$                                           | $BV_{CEO}$  | 80   | -    | -    | V             |
| Collector emitter capacitance        | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$                               | $C_{CE}$    | -    | 7    | -    | pF            |
| Thermal resistance                   |                                                                          | $R_{thJA}$  | -    | 667  | -    | K/W           |
| <b>COUPLER</b>                       |                                                                          |             |      |      |      |               |
| Collector emitter saturation voltage | $I_F = 5\text{ mA}$ , $I_C = 1.25\text{ mA}$                             | $V_{CEsat}$ | -    | 0.25 | 0.4  | V             |
| Cut-off frequency                    | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 100\text{ }\Omega$ | $f_{CTR}$   | -    | 165  | -    | kHz           |
| Coupling capacitance                 | $f = 1\text{ MHz}$                                                       | $C_{IO}$    | -    | 1.2  | -    | pF            |
| Thermal resistance                   |                                                                          | $R_{thJA}$  | -    | 556  | -    | K/W           |

**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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER | TEST CONDITION                              | PART       | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------|---------------------------------------------|------------|--------|------|------|------|------|
| $I_C/I_F$ | $I_F = 5\text{ mA}$ , $V_{CE} = 5\text{ V}$ | VOMA617A   | CTR    | 50   | -    | 600  | %    |
|           |                                             | VOMA617A-3 | CTR    | 100  | -    | 200  | %    |
|           |                                             | VOMA617A-4 | CTR    | 160  | -    | 320  | %    |
|           |                                             | VOMA617A-8 | CTR    | 130  | -    | 260  | %    |

**SWITCHING CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER     | TEST CONDITION                                                          | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
|---------------|-------------------------------------------------------------------------|-----------|------|------|------|---------------|
| NON-SATURATED |                                                                         |           |      |      |      |               |
| Rise time     | $I_C = 2\text{ mA}, V_{CC} = 5\text{ V},$<br>$R_L = 100\ \Omega$        | $t_r$     | -    | 1.8  | -    | $\mu\text{s}$ |
| Fall time     |                                                                         | $t_f$     | -    | 2.2  | -    | $\mu\text{s}$ |
| Turn-on time  |                                                                         | $t_{on}$  | -    | 2.5  | -    | $\mu\text{s}$ |
| Turn-off time |                                                                         | $t_{off}$ | -    | 3.0  | -    | $\mu\text{s}$ |
| SATURATED     |                                                                         |           |      |      |      |               |
| Rise time     | $I_F = 5\text{ mA}, V_{CC} = 5\text{ V},$<br>$R_L = 1.9\text{ k}\Omega$ | $t_r$     | -    | 1.2  | -    | $\mu\text{s}$ |
| Fall time     |                                                                         | $t_f$     | -    | 5.7  | -    | $\mu\text{s}$ |
| Turn-on time  |                                                                         | $t_{on}$  | -    | 1.7  | -    | $\mu\text{s}$ |
| Turn-off time |                                                                         | $t_{off}$ | -    | 11.2 | -    | $\mu\text{s}$ |

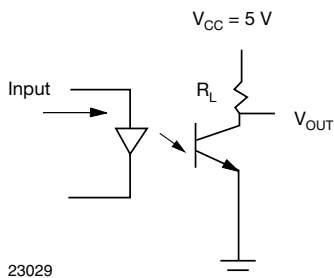


Fig. 3 - Test Circuit for Switching Characteristics

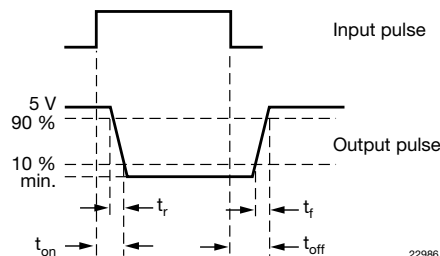


Fig. 4 - Parameter and Limit Definition

| SAFETY AND INSULATION RATINGS                |                                         |            |                |            |
|----------------------------------------------|-----------------------------------------|------------|----------------|------------|
| PARAMETER                                    | TEST CONDITION                          | SYMBOL     | VALUE          | UNIT       |
| Climatic classification                      | According to IEC 68 part 1              |            | 40 / 110 / 21  |            |
| Pollution degree                             | According to DIN VDE 0109               |            | 2              |            |
| Comparative tracking index                   | Insulation group IIIa                   | CTI        | 175            |            |
| Maximum rated withstanding isolation voltage | According to UL1577, $t = 1$ min        | $V_{ISO}$  | 3750           | $V_{RMS}$  |
| 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           | $V_{IORM}$ | 707            | $V_{peak}$ |
| Isolation resistance                         | $T_{amb} = 25^\circ C, V_{IO} = 500$ V  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$   |
|                                              | $T_{amb} = 100^\circ C, V_{IO} = 500$ V | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$   |
|                                              | $T_{amb} = T_S, V_{IO} = 500$ V         | $R_{IO}$   | $\geq 10^9$    | $\Omega$   |
| Output safety power                          |                                         | $P_{SO}$   | 550            | mW         |
| Input safety current                         |                                         | $I_{SI}$   | 180            | mA         |
| Input safety temperature                     |                                         | $T_S$      | 175            | $^\circ C$ |
| Creepage distance                            |                                         |            | $\geq 5$       | mm         |
| Clearance distance                           |                                         |            | $\geq 5$       | mm         |

**Note**

- As per IEC 60747-5-5, § 5.5.4.9.3, 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.

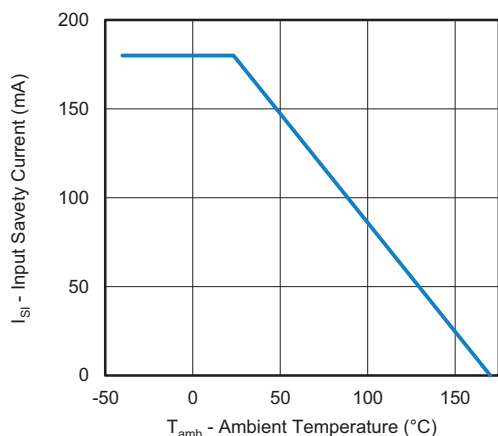


Fig. 5 - Input Safety Current vs. Ambient Temperature

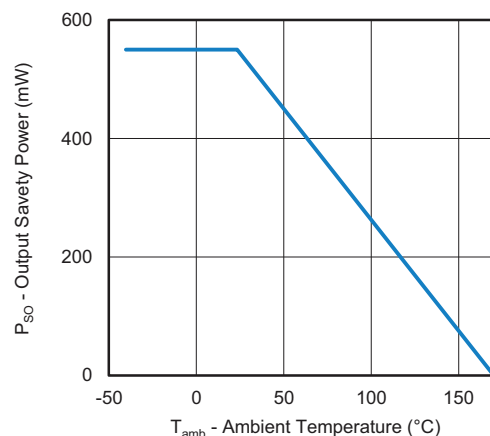


Fig. 6 - Output Safety Power vs. Ambient Temperature

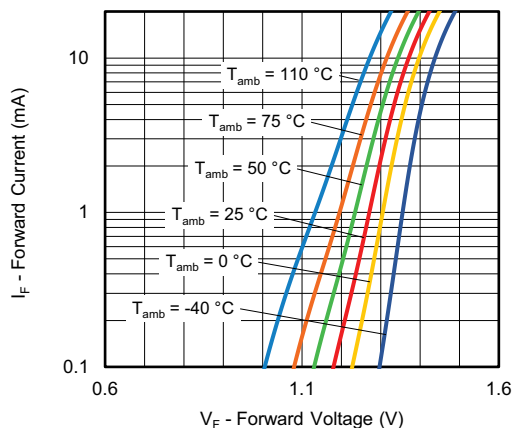
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 7 - Forward Current vs. Forward Voltage

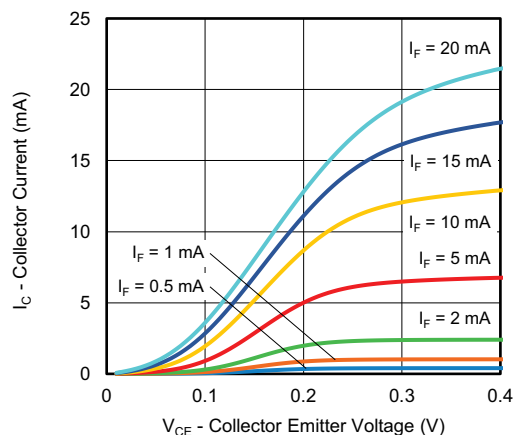


Fig. 10 - Collector Current vs. Collector Emitter Voltage (sat.)

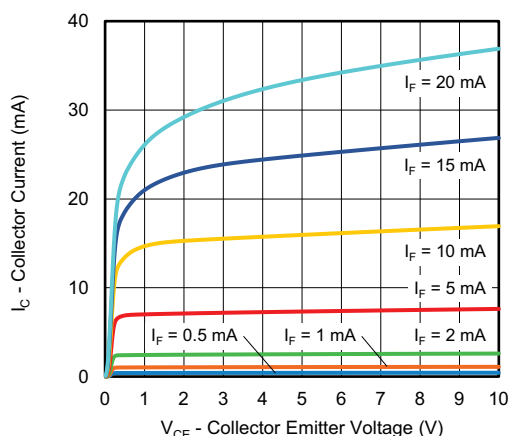


Fig. 8 - Collector Current vs. Collector Emitter Voltage (non-sat.)

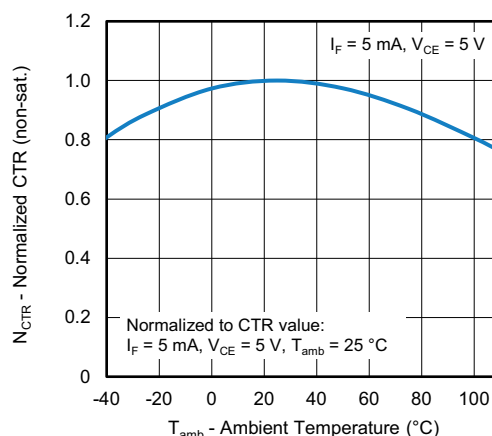


Fig. 11 - Normalized CTR (non-sat.) vs. Ambient Temperature

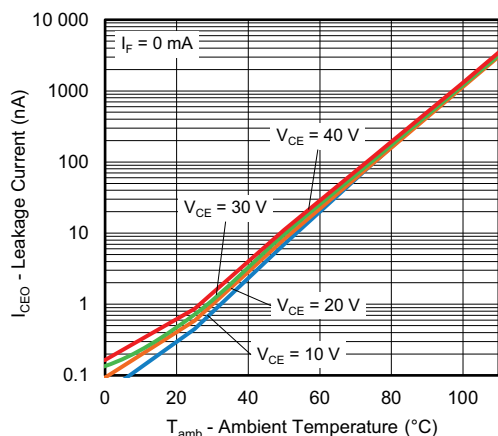


Fig. 9 - Leakage Current vs. Ambient Temperature

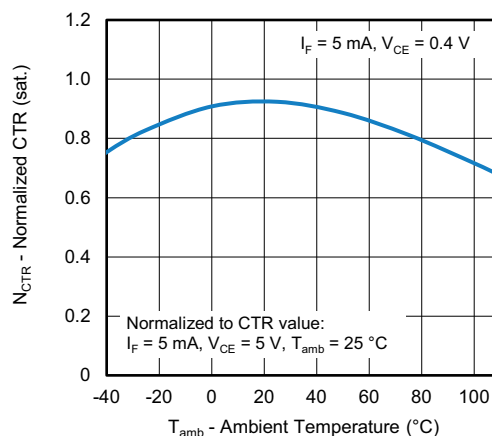


Fig. 12 - Normalized CTR (sat.) vs. Ambient Temperature

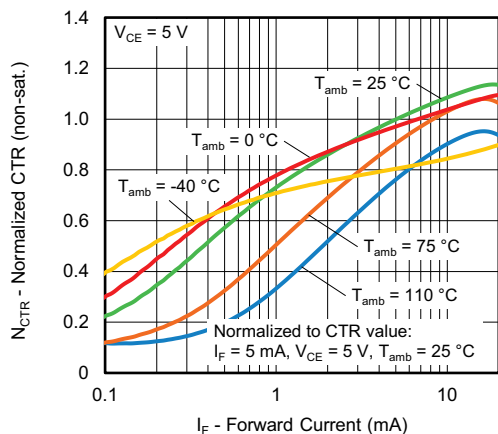


Fig. 13 - Normalized CTR (non-sat.) vs. Forward Current

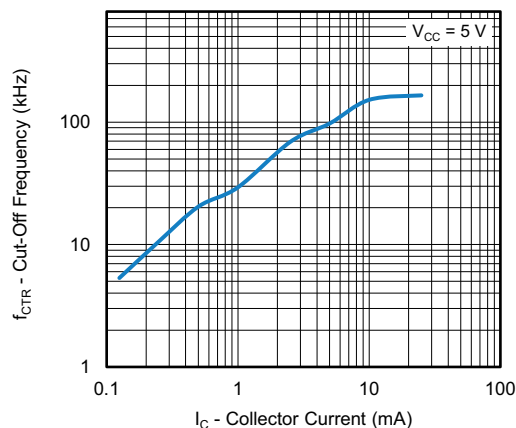


Fig. 16 - Cut-Off Frequency vs. Collector Current

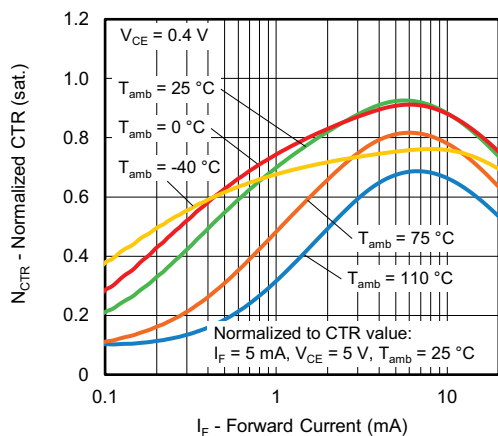


Fig. 14 - Normalized CTR (sat.) vs. Forward Current

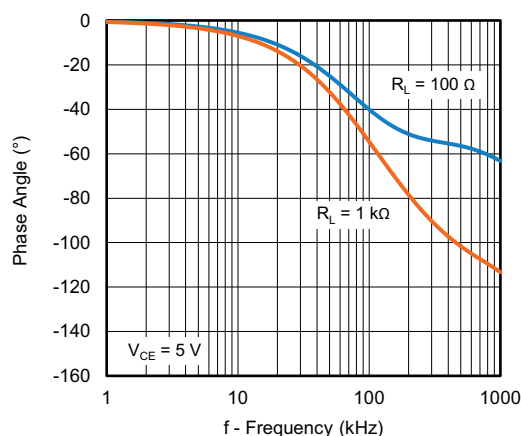


Fig. 17 - Phase Angle vs. Frequency

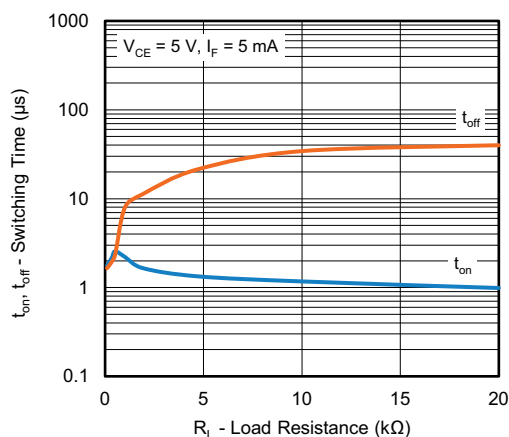


Fig. 15 - Switching Time vs. Load Resistance

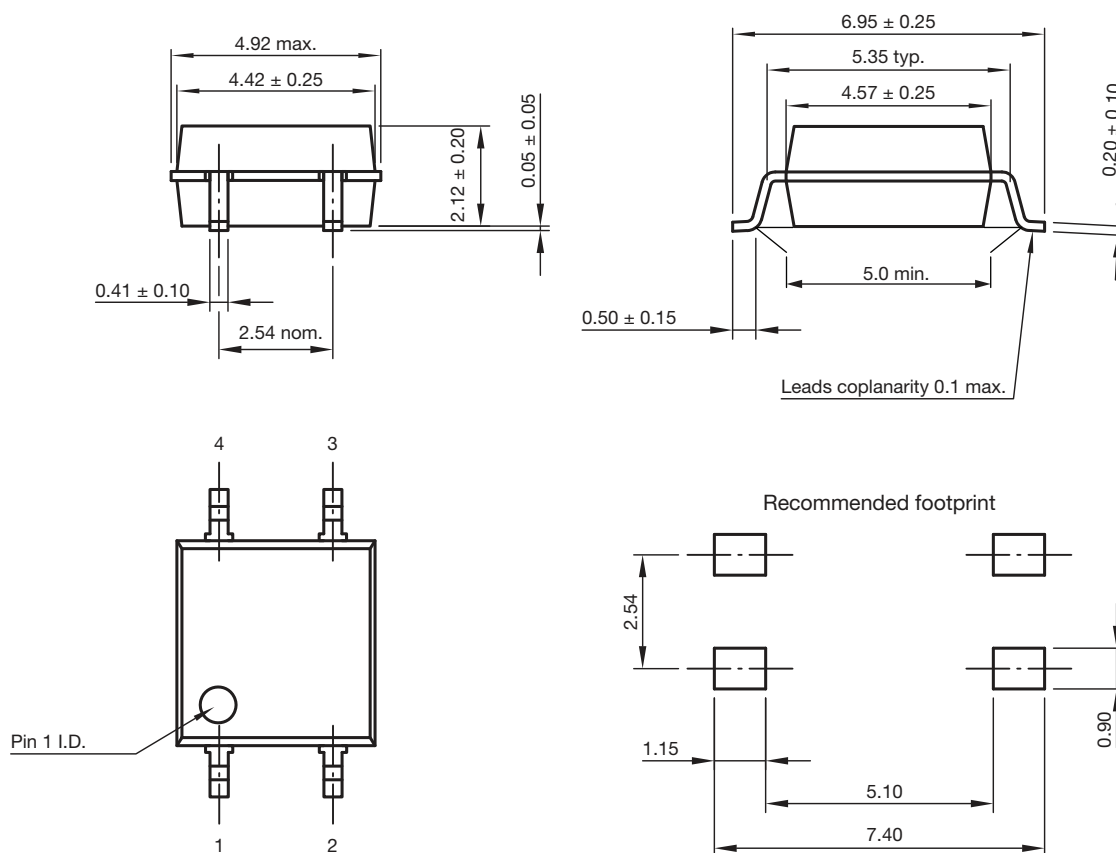
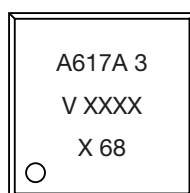
**PACKAGE DIMENSIONS** (in millimeters)


Fig. 18 - Package Drawing

**PACKAGE MARKING** (example of VOMA617A-3X001T)

**Notes**

- XXXX = LMC (lot marking code)
- Option 1 is reflected with letter "X"
- Tape and reel suffix (T) is not part of the package marking

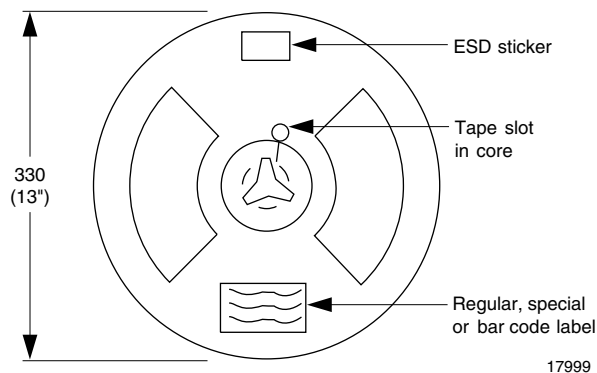
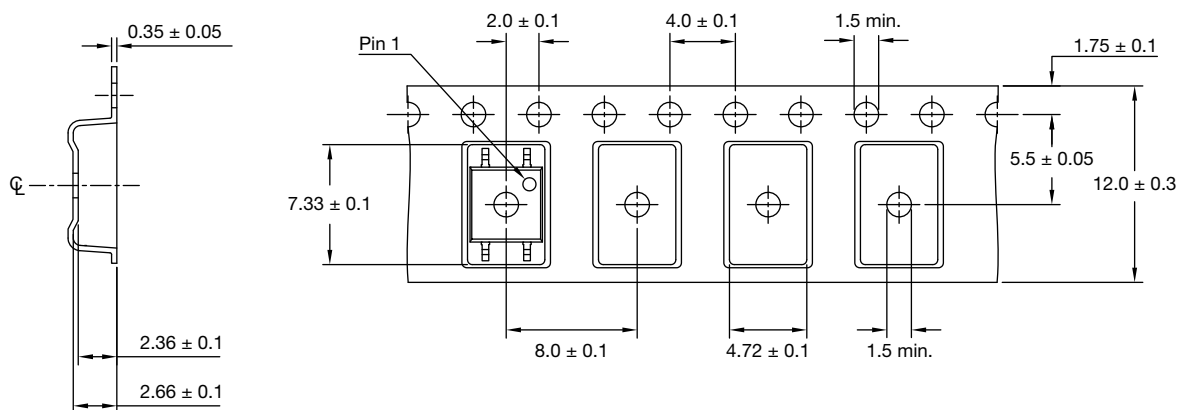
**PACKAGING INFORMATION** (in millimeters)


Fig. 19 - Tape and Reel Shipping Medium  
(EIA-481, revision A, and IEC 60286)


**Note**

- Cumulative tolerance of 10 spocket holes is 0.20 mm

Fig. 20 - Tape and Reel Packing

| TAPE AND REEL PACKING |            |
|-----------------------|------------|
| TYPE                  | UNITS/REEL |
| SOP-4                 | 2000       |

## SOLDER PROFILES

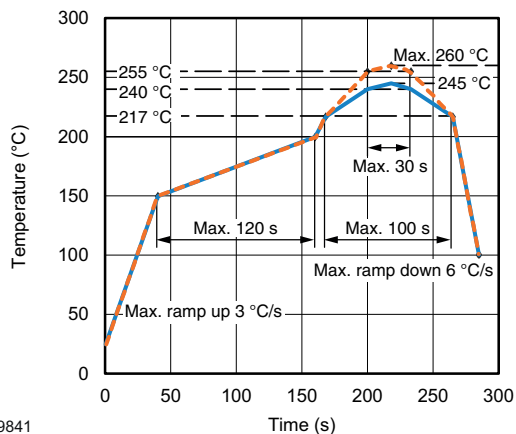


Fig. 21 - Lead (Pb)-free Reflow Solder Profile  
According to J-STD-020 for SMD Devices

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

### DRYPACK

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

### FLOOR LIFE

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

Floor life: 168 h

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

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

### DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-033D.



## Disclaimer

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