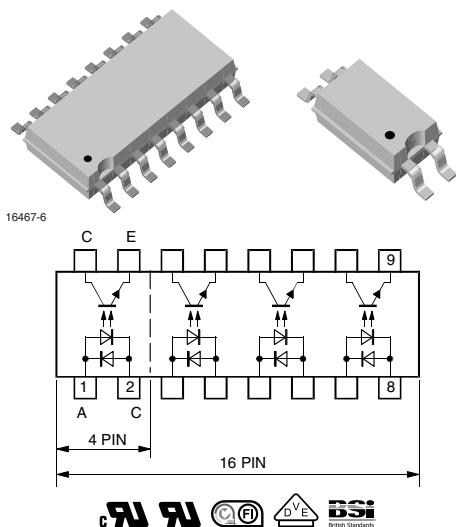


## Optocoupler, Phototransistor Output, AC Input, Single/Quad Channel, Half Pitch Mini-Flat Package



### FEATURES

- Low profile package (half pitch)
- AC isolation test voltage 3750 V<sub>RMS</sub>
- Low coupling capacitance of typical 0.3 pF
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- Programmable logic controllers

### AGENCY APPROVALS

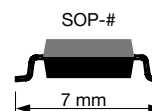
- UL1577, file no. E76222 system code M, double protection
- cUL CSA 22.2 bulletin 5A
- DIN EN 60747-5-2 (VDA 0884)  
DIN EN 60747-5-5 (pending)
- FIMKO: FI EN 60950-1:2006
- BSI: BS EN60065:2002  
BS EN60950-1:2006

### DESCRIPTION

The low profile miniflat package includes an optocoupler with AC Input and transistor output. It is available in single channel (4 pin) TCMT1600 or quad channel (16 pin) TCMT4600.

### ORDERING INFORMATION

|             |   |   |   |   |   |   |   |
|-------------|---|---|---|---|---|---|---|
| T           | C | M | T | # | 6 | 0 | # |
| PART NUMBER |   |   |   |   |   |   |   |



| AGENCY CERTIFIED/PACKAGE | CTR (%)                   |                           |            |
|--------------------------|---------------------------|---------------------------|------------|
|                          | SINGLE CHANNEL            | QUAD CHANNEL              |            |
| UL, cUL, FIMKO, BSI, VDE | 80 to 300                 | 80 to 300                 | 100 to 300 |
| SOP-4                    | TCMT1600                  | -                         | -          |
| SOP-4                    | TCMT1600T3 <sup>(1)</sup> | -                         | -          |
| SOP-16                   | -                         | TCMT4600                  | TCMT4606   |
| SOP-16                   | -                         | TCMT4600T0 <sup>(1)</sup> | -          |

#### Notes

- Available only on tape and reel.
- <sup>(1)</sup> Product is rotated 180° in tape and reel cavity.

### ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

| PARAMETER             | TEST CONDITION         | SYMBOL            | VALUE | UNIT |
|-----------------------|------------------------|-------------------|-------|------|
| <b>INPUT</b>          |                        |                   |       |      |
| Forward current       |                        | I <sub>F</sub>    | ± 60  | mA   |
| Forward surge current | t <sub>p</sub> ≤ 10 μs | I <sub>FSM</sub>  | ± 1.5 | A    |
| Power dissipation     |                        | P <sub>diss</sub> | 100   | mW   |
| Junction temperature  |                        | T <sub>j</sub>    | 125   | °C   |



| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                      |            |               |                    |
|-------------------------------------------------------------------------------------------------|--------------------------------------|------------|---------------|--------------------|
| PARAMETER                                                                                       | TEST CONDITION                       | SYMBOL     | VALUE         | UNIT               |
| <b>OUTPUT</b>                                                                                   |                                      |            |               |                    |
| Collector emitter voltage                                                                       |                                      | $V_{CEO}$  | 70            | V                  |
| Emitter collector voltage                                                                       |                                      | $V_{ECO}$  | 7             | V                  |
| Collector current                                                                               |                                      | $I_C$      | 50            | mA                 |
| Collector peak current                                                                          | $t_p/T = 0.5, t_p \leq 10\text{ ms}$ | $I_{CM}$   | 100           | mA                 |
| Power dissipation                                                                               |                                      | $P_{diss}$ | 150           | mW                 |
| Junction temperature                                                                            |                                      | $T_j$      | 125           | $^{\circ}\text{C}$ |
| <b>COUPLER</b>                                                                                  |                                      |            |               |                    |
| AC isolation test voltage (RMS)                                                                 |                                      | $V_{ISO}$  | 3750          | $V_{RMS}$          |
| Total power dissipation                                                                         |                                      | $P_{tot}$  | 250           | mW                 |
| Operating ambient temperature range                                                             |                                      | $T_{amb}$  | - 40 to + 100 | $^{\circ}\text{C}$ |
| Storage temperature range                                                                       |                                      | $T_{stg}$  | - 40 to + 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>(2)</sup> Wave soldering three cycles are allowed. Also refer to "Assembly Instructions" ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054)).

| 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                                                                                   | $I_F = \pm 50\text{ mA}$                                               | $V_F$       |      | 1.25 | 1.6  | V    |
| Junction capacitance                                                                              | $V_R = 0\text{ V}, f = 1\text{ MHz}$                                   | $C_j$       |      | 50   |      | pF   |
| <b>OUTPUT</b>                                                                                     |                                                                        |             |      |      |      |      |
| Collector emitter voltage                                                                         | $I_C = 100\text{ }\mu\text{A}$                                         | $V_{CEO}$   | 70   |      |      | V    |
| Emitter collector voltage                                                                         | $I_E = 100\text{ }\mu\text{A}$                                         | $V_{ECO}$   | 7    |      |      | V    |
| Collector dark current                                                                            | $V_{CE} = 20\text{ V}, I_F = 0$                                        | $I_{CEO}$   |      |      | 100  | nA   |
| <b>COUPLER</b>                                                                                    |                                                                        |             |      |      |      |      |
| Collector emitter saturation voltage                                                              | $I_F = \pm 10\text{ mA}, I_C = 1\text{ mA}$                            | $V_{CEsat}$ |      |      | 0.3  | V    |
| Cut-off frequency                                                                                 | $V_{CE} = 5\text{ V}, I_F = \pm 10\text{ mA}, R_L = 100\text{ }\Omega$ | $f_c$       |      | 100  |      | kHz  |
| Capacitance (input to output)                                                                     | $f = 1\text{ MHz}$                                                     | $C_{IO}$    |      | 0.3  |      | pF   |

**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 |
| $I_C/I_F$                                                                                     | $V_{CE} = 5\text{ V}, I_F = \pm 5\text{ mA}$ | TCMT1600 | CTR    | 80   |      | 300  | %    |
|                                                                                               |                                              | TCMT4600 | CTR    | 80   |      | 300  | %    |
|                                                                                               |                                              | TCMT4606 | CTR    | 100  |      | 300  | %    |

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                                            |           |      |      |      |               |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------|------|------|------|---------------|
| PARAMETER                                                                                               | TEST CONDITION                                                                             | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Delay time                                                                                              | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see figure 1)     | $t_d$     |      | 3    |      | $\mu\text{s}$ |
| Rise time                                                                                               | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see figure 1)     | $t_r$     |      | 3    |      | $\mu\text{s}$ |
| Fall time                                                                                               | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see figure 1)     | $t_f$     |      | 4.7  |      | $\mu\text{s}$ |
| Storage time                                                                                            | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see figure 1)     | $t_s$     |      | 0.3  |      | $\mu\text{s}$ |
| Turn-on time                                                                                            | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see figure 1)     | $t_{on}$  |      | 6    |      | $\mu\text{s}$ |
| Turn-off time                                                                                           | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see figure 1)     | $t_{off}$ |      | 5    |      | $\mu\text{s}$ |
| Turn-on time                                                                                            | $V_S = 5\text{ V}$ , $I_F = \pm 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$<br>(see figure 2) | $t_{on}$  |      | 9    |      | $\mu\text{s}$ |
| Turn-off time                                                                                           | $V_S = 5\text{ V}$ , $I_F = \pm 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$<br>(see figure 2) | $t_{off}$ |      | 18   |      | $\mu\text{s}$ |

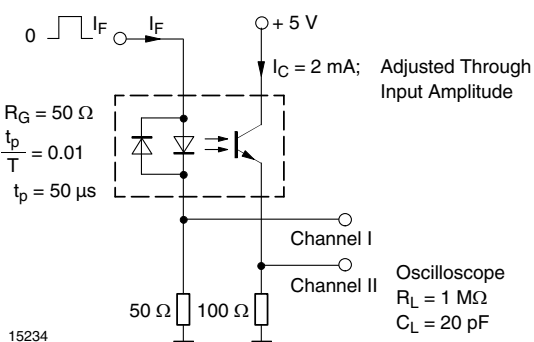


Fig. 1 - Test Circuit, Non-Saturated Operation

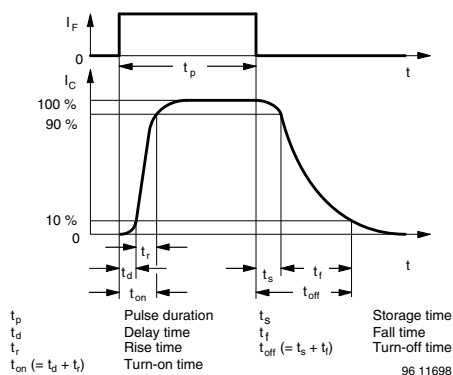


Fig. 3 - Switching Times

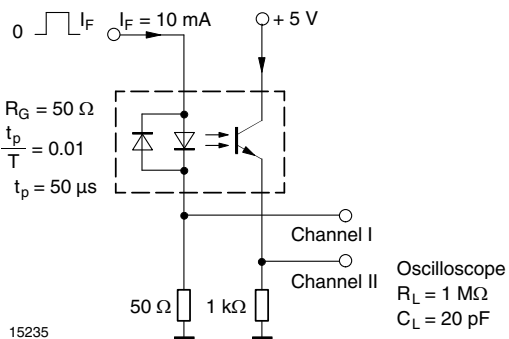


Fig. 2 - Test Circuit, Saturated Operation

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

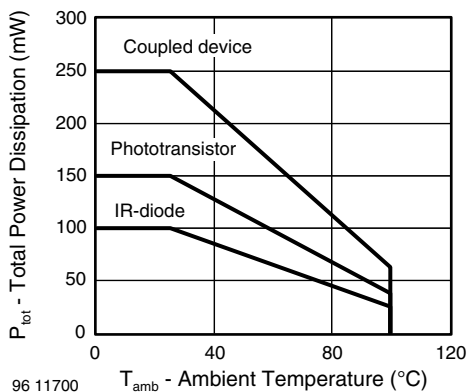


Fig. 4 - Total Power Dissipation vs. Ambient Temperature

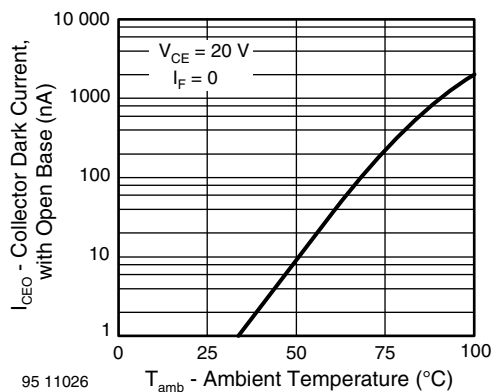


Fig. 7 - Collector Dark Current vs. Ambient Temperature

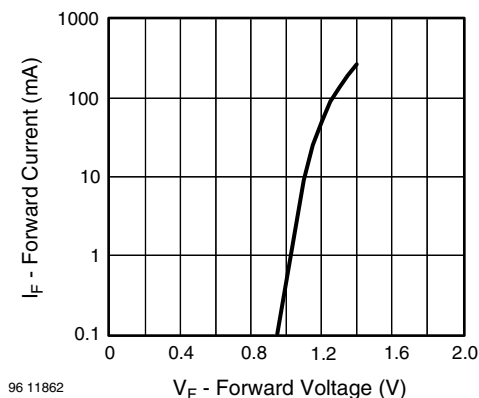


Fig. 5 - Forward Current vs. Forward Voltage

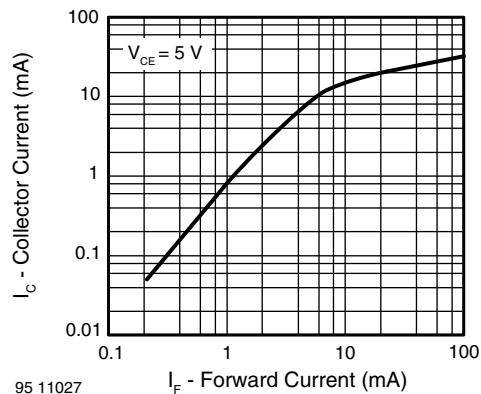


Fig. 8 - Collector Current vs. Forward Current

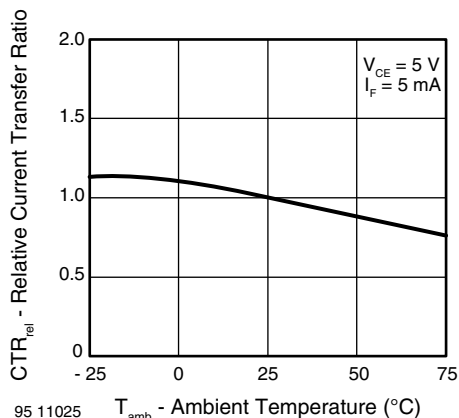


Fig. 6 - Relative Current Transfer Ratio vs. Ambient Temperature

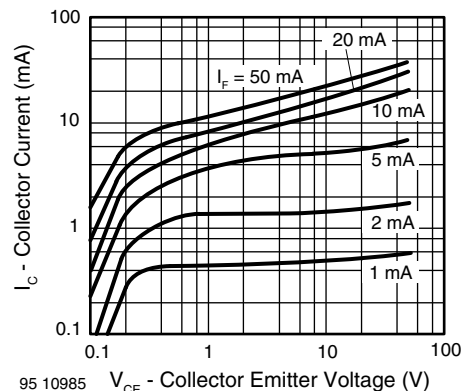


Fig. 9 - Collector Current vs. Collector Emitter Voltage

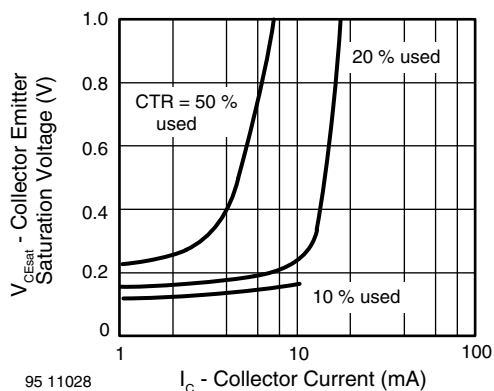


Fig. 10 - Collector Emitter Saturation Voltage vs. Collector Current

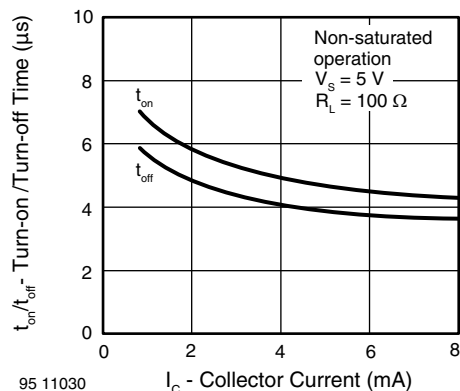


Fig. 13 - Turn-on/Turn-off Time vs. Collector Current

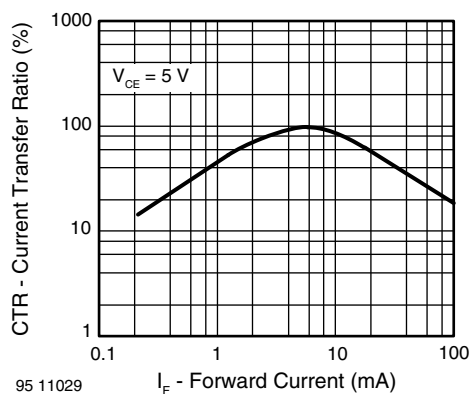


Fig. 11 - Current Transfer Ratio vs. Forward Current

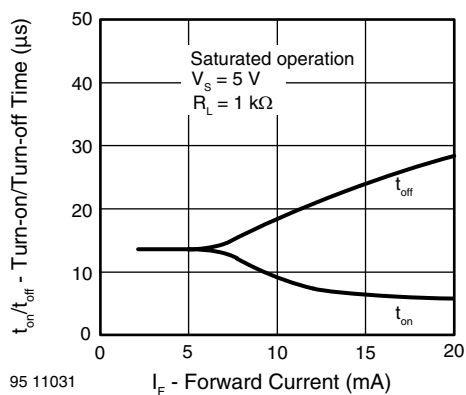
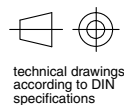
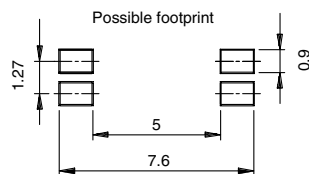
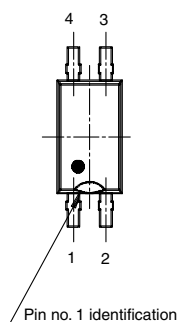
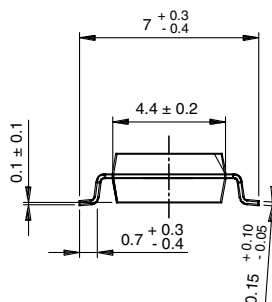
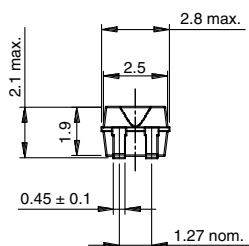


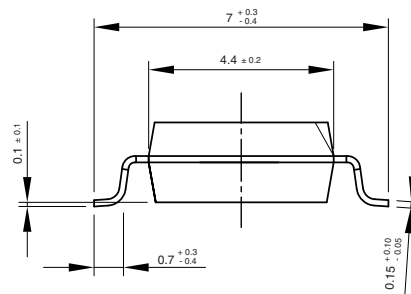
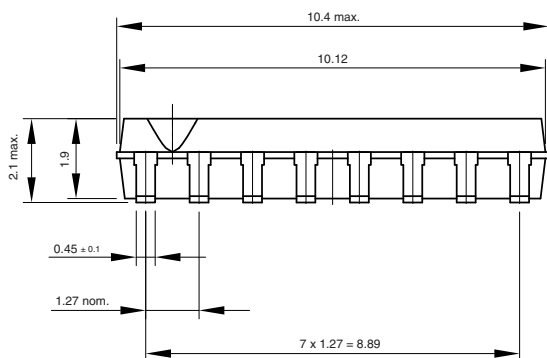
Fig. 12 - Turn-on/Turn-off Time vs. Forward Current



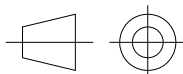
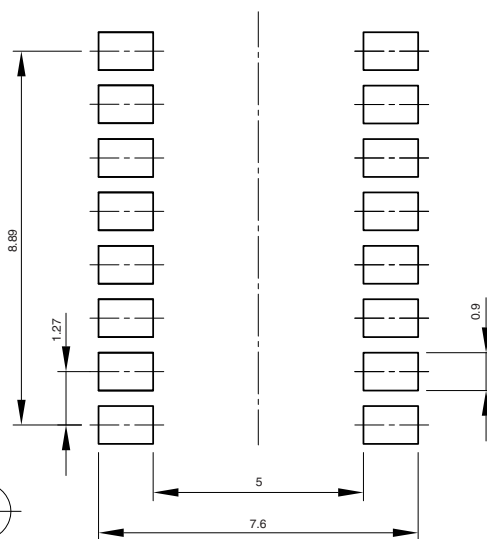
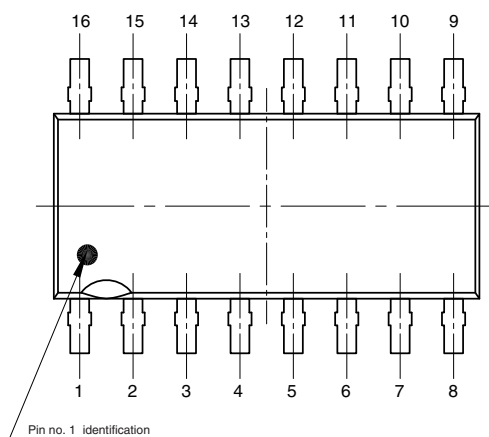
## PACKAGE DIMENSIONS in millimeters



16283



Possible footprint



Drawing-No.: 6.544-5330.03-4

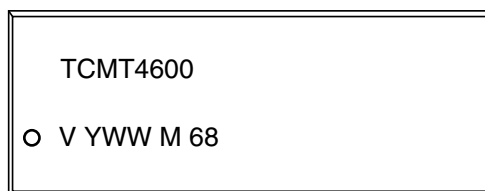
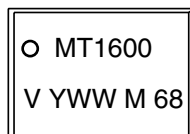
Issue: 1; 04.04.00

15226

technical drawings  
according to DIN  
specifications



## PACKAGE MARKING





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