

# Optocoupler, Phototransistor Output, no Base Connection



i179004-14



## FEATURES

- Isolation test voltage, 5000 V<sub>RMS</sub>
- No base terminal connection for improved common mode interface immunity
- Long term stability
- Industry standard dual-in-line package
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS COMPLIANT

## AGENCY APPROVALS

- UL file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- BSI: EN 60065, EN 60950-1
- FIMKO
- CQC

## DESCRIPTION

The CNY17F is an optocoupler consisting of a gallium arsenide infrared emitting diode optically coupled to a silicon planar phototransistor detector in a plastic plug-in DIP-6 package.

The coupling device is suitable for signal transmission between two electrically separated circuits. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible reference voltages.

In contrast to the CNY17 series, the base terminal of the F type is not connected, resulting in a substantially improved common-mode interference immunity.

| ORDERING INFORMATION  |   |                              |                              |                              |
|---|---|------------------------------|------------------------------|------------------------------|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">C</div> <div style="border: 1px solid black; padding: 2px 5px;">N</div> <div style="border: 1px solid black; padding: 2px 5px;">Y</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">7</div> <div style="border: 1px solid black; padding: 2px 5px;">F</div> <div style="border: 1px solid black; padding: 2px 5px;">-</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">X</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">T</div> </div> <p style="text-align: center; margin-top: 5px;"> <span style="margin-right: 100px;">PART NUMBER</span> <span style="margin-right: 100px;">CTR BIN</span> <span style="margin-right: 100px;">PACKAGE OPTION</span> <span>TAPE AND REEL</span> </p> | <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>DIP-6</p> <p>7.62 mm</p> </div> <div style="text-align: center;"> <p>Option 6</p> <p>10.16 mm</p> </div> <div style="text-align: center;"> <p>Option 7</p> <p>&gt; 8 mm</p> </div> <div style="text-align: center;"> <p>Option 9</p> <p>8 mm typ.</p> </div> </div> |                              |                              |                              |
| AGENCY CERTIFIED/PACKAGE  | CTR (%)   |                              |                              |                              |
| UL, cUL, BSI, FIMKO   | 40 to 80  | 63 to 125                    | 100 to 200                   | 160 to 320                   |
| DIP-6   | CNY17F-1  | CNY17F-2                     | CNY17F-3                     | CNY17F-4                     |
| DIP-6, 400 mil, option 6  | CNY17F-1X006  | CNY17F-2X006                 | CNY17F-3X006                 | CNY17F-4X006                 |
| SMD-6, option 7   | CNY17F-1X007 <sup>(1)</sup>   | CNY17F-2X007T <sup>(1)</sup> | CNY17F-3X007T <sup>(1)</sup> | CNY17F-4X007T <sup>(1)</sup> |
| SMD-6, option 9   | CNY17F-1X009T <sup>(1)</sup>  | CNY17F-2X009T <sup>(1)</sup> | CNY17F-3X009T <sup>(1)</sup> | CNY17F-4X009T <sup>(1)</sup> |
| VDE, UL, cUL, BSI, FIMKO  | 40 to 80  | 63 to 125                    | 100 to 200                   | 160 to 320                   |
| DIP-6   | CNY17F-1X001  | CNY17F-2X001                 | CNY17F-3X001                 | CNY17F-4X001                 |
| DIP-6, 400 mil, option 6  | CNY17F-1X016  | CNY17F-2X016                 | CNY17F-3X016                 | CNY17F-4X016                 |
| SMD-6, option 7   | CNY17F-1X017 <sup>(1)</sup>   | CNY17F-2X017 <sup>(1)</sup>  | CNY17F-3X017 <sup>(1)</sup>  | CNY17F-4X017 <sup>(1)</sup>  |
| SMD-6, option 9   | CNY17F-1X019  | CNY17F-2X019 <sup>(1)</sup>  | CNY17F-3X019 <sup>(1)</sup>  | -                            |

## Notes

- Additional options may be possible, please contact sales office.
- <sup>(1)</sup> Also available in tubes; do not put T on end.



| <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  |                                      | $V_R$      | 6              | V                  |
| DC forward current   |                                      | $I_F$      | 60             | mA                 |
| Surge forward current  | $t \leq 10\text{ }\mu\text{s}$       | $I_{FSM}$  | 2.5            | A                  |
| Power dissipation  |                                      | $P_{diss}$ | 70             | mW                 |
| <b>OUTPUT</b>  |                                      |            |                |                    |
| Collector emitter breakdown voltage  |                                      | $BV_{CEO}$ | 70             | 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                 |
| Output power dissipation   |                                      | $P_{diss}$ | 150            | mW                 |
| <b>COUPLER</b>   |                                      |            |                |                    |
| Isolation test voltage between emitter and detector  | $t = 1\text{ min}$                   | $V_{ISO}$  | 5000           | $V_{RMS}$          |
| Creepage distance  |                                      |            | $\geq 7$       | mm                 |
| Clearance distance   |                                      |            | $\geq 7$       | mm                 |
| Isolation thickness between emitter and detector   |                                      |            | $\geq 0.4$     | mm                 |
| Comparative tracking index per DIN IEC 112/VDE 0303, part 1  |                                      |            | $\geq 175$     |                    |
| Isolation resistance   | $V_{IO} = 500\text{ V}$              | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
| Storage temperature range  |                                      | $T_{stg}$  | - 55 to + 150  | $^{\circ}\text{C}$ |
| Ambient temperature range  |                                      | $T_{amb}$  | - 55 to + 110  | $^{\circ}\text{C}$ |
| Junction temperature   |                                      | $T_j$      | 100            | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup>   | 2 mm from case, $\leq 10\text{ s}$   | $T_{sld}$  | 260            | $^{\circ}\text{C}$ |
| Total power dissipation  |                                      | $P_{diss}$ | 220            | mW                 |

**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.
- Refer to reflow profile for soldering conditions for surface mounted parts (SMD). Refer to wave profile for soldering conditions for through hole parts (DIP).

| <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>   |   |          |             |      |      |      |               |
| Forward voltage  | $I_F = 60\text{ mA}$                      |          | $V_F$       |      | 1.39 | 1.65 | V             |
| Breakdown voltage  | $I_R = 10\text{ }\mu\text{A}$             |          | $V_{BR}$    | 6    |      |      | V             |
| Reverse current  | $V_R = 6\text{ V}$                        |          | $I_R$       |      | 0.01 | 10   | $\mu\text{A}$ |
| Capacitance  | $V_R = 0\text{ V}, f = 1\text{ MHz}$      |          | $C_O$       |      | 25   |      | pF            |
| <b>OUTPUT</b>  |   |          |             |      |      |      |               |
| Collector emitter capacitance  | $V_{CE} = 5\text{ V}, f = 1\text{ MHz}$   |          | $C_{CE}$    |      | 5.2  |      | pF            |
| Base collector capacitance   | $V_{CE} = 5\text{ V}, f = 1\text{ MHz}$   |          | $C_{BC}$    |      | 6.5  |      | pF            |
| Emitter base capacitance   | $V_{CE} = 5\text{ V}, f = 1\text{ MHz}$   |          | $C_{EB}$    |      | 7.5  |      | pF            |
| <b>COUPLER</b>   |   |          |             |      |      |      |               |
| Collector emitter, saturation voltage  | $I_F = 10\text{ mA}, I_C = 2.5\text{ mA}$ |          | $V_{CEsat}$ |      | 0.25 | 0.4  | V             |
| Coupling capacitance   |   |          | $C_C$       |      | 0.6  |      | pF            |
| Collector emitter, leakage current   | $V_{CE} = 10\text{ V}$                    | CNY17F-1 | $I_{CEO}$   |      | 2    | 50   | nA            |
|  |   | CNY17F-2 | $I_{CEO}$   |      | 2    | 50   | nA            |
|  |   | CNY17F-3 | $I_{CEO}$   |      | 5    | 100  | nA            |
|  |   | CNY17F-4 | $I_{CEO}$   |      | 5    | 100  | nA            |

**Note**

- Minimum and maximum values were tested 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.



| CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                      |          |        |      |      |      |      |
|---|----------------------|----------|--------|------|------|------|------|
| PARAMETER   | TEST CONDITION       | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$   | $I_F = 10\text{ mA}$ | CNY17F-1 | CTR    | 40   |      | 80   | %    |
|   |                      | CNY17F-2 | CTR    | 63   |      | 125  | %    |
|   |                      | CNY17F-3 | CTR    | 100  |      | 200  | %    |
|   |                      | CNY17F-4 | CTR    | 160  |      | 320  | %    |
|   | $I_F = 1\text{ mA}$  | CNY17F-1 | CTR    | 13   | 30   |      | %    |
|   |                      | CNY17F-2 | CTR    | 22   | 45   |      | %    |
|   |                      | CNY17F-3 | CTR    | 34   | 70   |      | %    |
|   |                      | CNY17F-4 | CTR    | 56   | 90   |      | %    |

**Note**

- Current transfer ratio  $I_C/I_F$  at  $V_{CE} = 5\text{ V}$ ,  $25\text{ }^{\circ}\text{C}$  and collector emitter leakage current by dash number.

| SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |          |           |      |      |      |               |
|--|--|----------|-----------|------|------|------|---------------|
| PARAMETER  | TEST CONDITION   | PART     | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| <b>LINEAR OPERATION (without saturation)</b>   |  |          |           |      |      |      |               |
| Turn-on time   | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 75\text{ }\Omega$ |          | $t_{on}$  |      | 3    |      | $\mu\text{s}$ |
| Rise time  | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 75\text{ }\Omega$ |          | $t_r$     |      | 2    |      | $\mu\text{s}$ |
| Turn-off time  | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 75\text{ }\Omega$ |          | $t_{off}$ |      | 2.3  |      | $\mu\text{s}$ |
| Fall time  | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 75\text{ }\Omega$ |          | $t_f$     |      | 2    |      | $\mu\text{s}$ |
| Cut-off frequency  | $I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 75\text{ }\Omega$ |          | $f_{CO}$  |      | 110  |      | kHz           |
| <b>SWITCHING OPERATION (with saturation)</b>   |  |          |           |      |      |      |               |
| Turn-on time   | $I_F = 20\text{ mA}$   | CNY17F-1 | $t_{on}$  |      | 3    |      | $\mu\text{s}$ |
|  | $I_F = 10\text{ mA}$   | CNY17F-2 | $t_{on}$  |      | 4.2  |      | $\mu\text{s}$ |
|  |  | CNY17F-3 | $t_{on}$  |      | 4.2  |      | $\mu\text{s}$ |
|  |  | CNY17F-4 | $t_{on}$  |      | 6    |      | $\mu\text{s}$ |
| Rise time  | $I_F = 20\text{ mA}$   | CNY17F-1 | $t_r$     |      | 2    |      | $\mu\text{s}$ |
|  | $I_F = 10\text{ mA}$   | CNY17F-2 | $t_r$     |      | 3    |      | $\mu\text{s}$ |
|  |  | CNY17F-3 | $t_r$     |      | 3    |      | $\mu\text{s}$ |
|  |  | CNY17F-4 | $t_r$     |      | 4.6  |      | $\mu\text{s}$ |
| Turn-off time  | $I_F = 20\text{ mA}$   | CNY17F-1 | $t_{off}$ |      | 18   |      | $\mu\text{s}$ |
|  | $I_F = 10\text{ mA}$   | CNY17F-2 | $t_{off}$ |      | 23   |      | $\mu\text{s}$ |
|  |  | CNY17F-3 | $t_{off}$ |      | 23   |      | $\mu\text{s}$ |
|  |  | CNY17F-4 | $t_{off}$ |      | 25   |      | $\mu\text{s}$ |
| Fall time  | $I_F = 20\text{ mA}$   | CNY17F-1 | $t_f$     |      | 11   |      | $\mu\text{s}$ |
|  | $I_F = 10\text{ mA}$   | CNY17F-2 | $t_f$     |      | 14   |      | $\mu\text{s}$ |
|  |  | CNY17F-3 | $t_f$     |      | 14   |      | $\mu\text{s}$ |
|  |  | CNY17F-4 | $t_f$     |      | 15   |      | $\mu\text{s}$ |



95 10804-3

Fig. 1 - Test Circuit, Non-Saturated Operation



|                        |                |                         |               |
|------------------------|----------------|-------------------------|---------------|
| $t_p$                  | Pulse duration | $t_s$                   | Storage time  |
| $t_d$                  | Delay time     | $t_f$                   | Fall time     |
| $t_r$                  | Rise time      | $t_{off} (= t_s + t_f)$ | Turn-off time |
| $t_{on} (= t_d + t_r)$ | Turn-on time   |                         |               |

96 11698

Fig. 3 - Switching Times



95 10843

Fig. 2 - Test Circuit, Saturated Operation

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

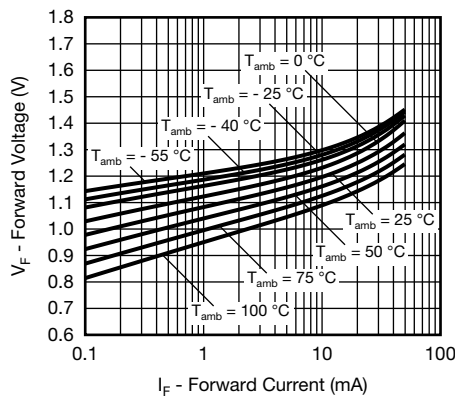


Fig. 4 - Forward Voltage vs. Forward Current



Fig. 5 - Collector Current vs. Collector Emitter Voltage (NS)

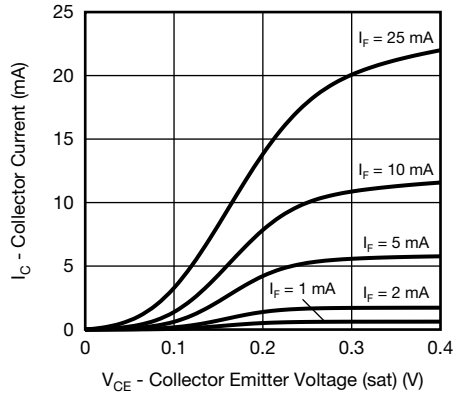


Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

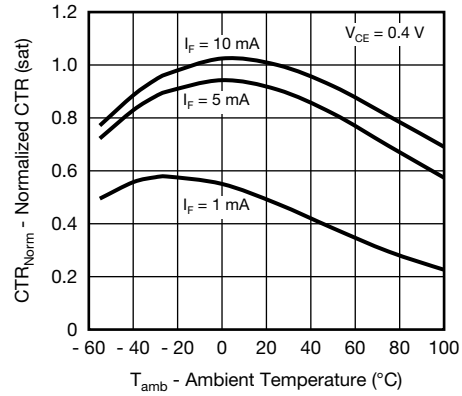


Fig. 9 - Normalized CTR (sat) vs. Ambient Temperature

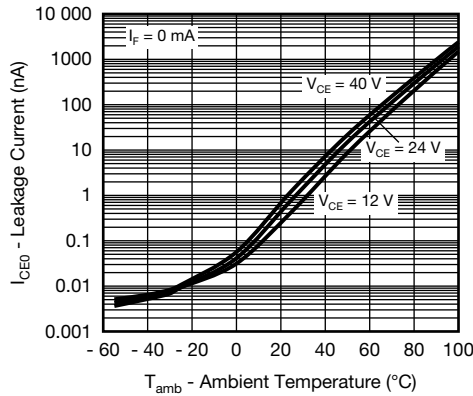


Fig. 7 - Leakage Current vs. Ambient Temperature

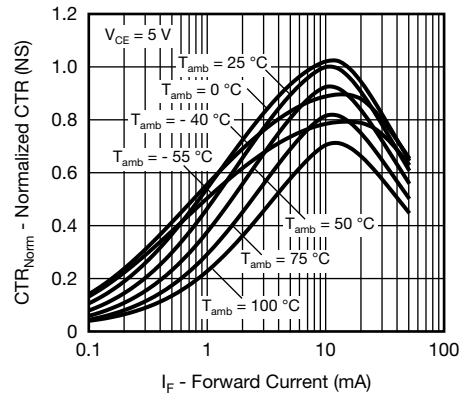


Fig. 10 - Normalized CTR (NS) vs. Forward Current

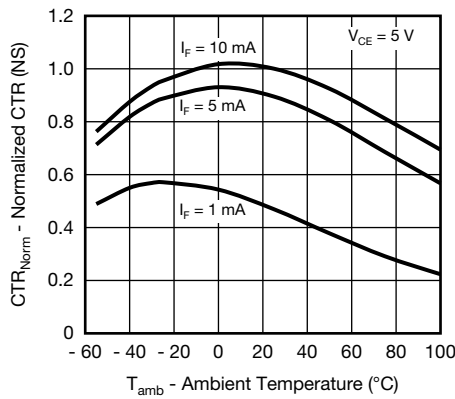


Fig. 8 - Normalized CTR (NS) vs. Ambient Temperature

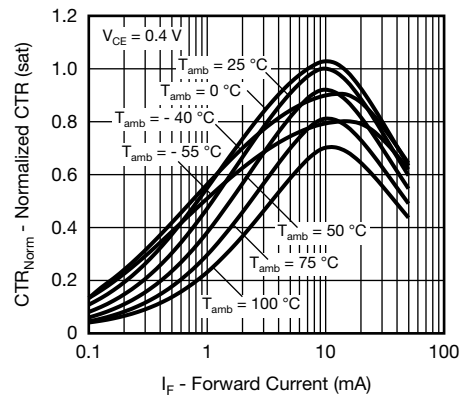


Fig. 11 - Normalized CTR (sat) vs. Forward Current



Fig. 12 - CTR Frequency vs. Phase Angle



Fig. 13 - CTR Frequency vs. Collector Current



Fig. 14 - Switching Time vs. Load Resistance

**PACKAGE DIMENSIONS** in millimeters

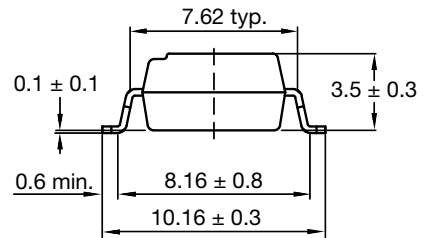
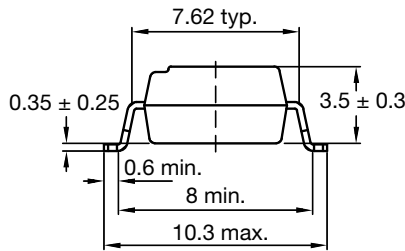
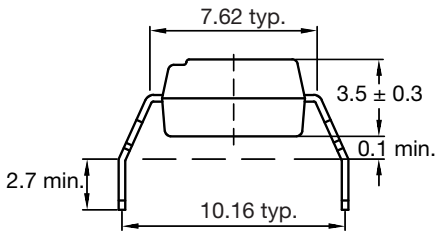


22530

**Option 6**

**Option 7**

**Option 9**



20802-34

**PACKAGE MARKING**



**Notes**

- VDE logo is only marked on option 1 parts. Option information is not marked on the part.
- Tape and reel suffix (T) is not part of the package marking.



TUBE AND TAPE INFORMATION

| DEVICES PER TUBE |            |           |           |
|------------------|------------|-----------|-----------|
| TYPE             | UNITS/TUBE | TUBES/BOX | UNITS/BOX |
| DIP-6            | 50         | 40        | 2000      |



Fig. 15 - Tape and Reel Drawing, 1000 Units per Reel





## Disclaimer

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