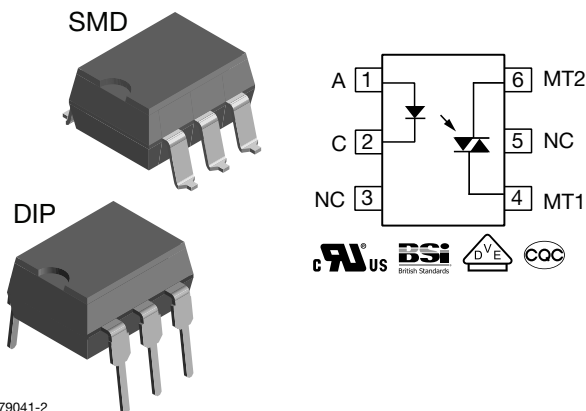


## Optocoupler, Phototriac Output, Non-Zero Crossing, 250 V<sub>DRM</sub>



**RoHS**  
COMPLIANT

### FEATURES

- Isolation materials according to UL 94 V-0
- Special construction: therefore, extra low coupling capacity of typical 0.2 pF, high common mode rejection
- I<sub>FT</sub> of 5 mA, 10 mA, and 15 mA
- Rated impulse voltage (transient overvoltage) V<sub>IOTM</sub> = 8 kV<sub>peak</sub>
- Isolation test voltage, 5300 V<sub>RMS</sub>, t = 1 s
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):

- for appl. class I to IV at mains voltage ≤ 300 V
- for appl. class I to IV at mains voltage ≤ 600 V according to DIN EN60747-5-5 (VDE0884), suitable for:
  - Monitors
  - Air conditioners
  - Line switches
  - Solid state relay
  - Microwave

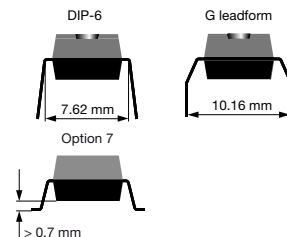
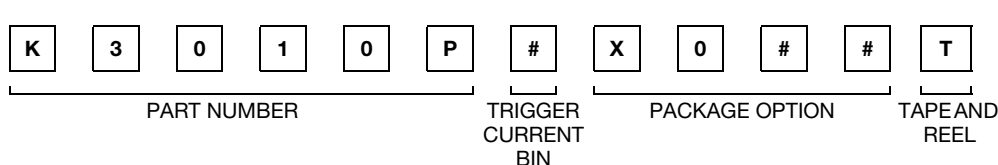
### DESCRIPTION

The K3010P, K3010PG series consists of a photo-transistor optically coupled to a gallium arsenide infrared-emitting diode in a 6-pin plastic dual inline package

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H, double protection
- BSI: BS EN60065:2002 and IEC 60065:2001, certificate number 7955. An BS EN60950-1:2006 certificate number 7956
- DIN EN 60747-5-5
- CQC: GB8898-2001

### ORDERING INFORMATION



| AGENCY CERTIFIED/PACKAGE | TRIGGER CURRENT, I <sub>FT</sub> |         |              |
|--------------------------|----------------------------------|---------|--------------|
| VDE, cUL, BSI            | 5 mA                             | 10 mA   | 15 mA        |
| DIP-6                    | K3012P                           | K3011P  | K3010P       |
| DIP-6, 400 mil           | K3012PG                          | K3011PG | K3010PG      |
| SMD-6, option 7          | K3012P-X007T                     | -       | K3010P-X007T |

### Note

- G = leadform 10.16 mm; G is not marked on the body.

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

| PARAMETER                            | TEST CONDITION                       | SYMBOL     | VALUE         | UNIT               |
|--------------------------------------|--------------------------------------|------------|---------------|--------------------|
| <b>INPUT</b>                         |                                      |            |               |                    |
| Reverse voltage                      |                                      | $V_R$      | 5             | V                  |
| Forward current                      |                                      | $I_F$      | 80            | mA                 |
| Forward surge current                | $t_p \leq 10\text{ }\mu\text{s}$     | $I_{FSM}$  | 3             | A                  |
| Power dissipation                    |                                      | $P_{diss}$ | 100           | mW                 |
| Junction temperature                 |                                      | $T_j$      | 100           | $^{\circ}\text{C}$ |
| <b>OUTPUT</b>                        |                                      |            |               |                    |
| Off state output terminal voltage    |                                      | $V_{DRM}$  | 250           | V                  |
| On state RMS current                 |                                      | $I_{TRM}$  | 100           | mA                 |
| Peak surge current, non-repetitive   | $t_p \leq 10\text{ ms}$              | $I_{TMS}$  | 1.5           | A                  |
| Power dissipation                    |                                      | $P_{diss}$ | 300           | mW                 |
| Junction temperature                 |                                      | $T_j$      | 100           | $^{\circ}\text{C}$ |
| <b>COUPLER</b>                       |                                      |            |               |                    |
| Isolation test voltage (RMS)         | $t = 1\text{ s}$                     | $V_{ISO}$  | 5300          | $V_{RMS}$          |
| Total power dissipation              |                                      | $P_{tot}$  | 350           | mW                 |
| Storage temperature range            |                                      | $T_{stg}$  | - 55 to + 150 | $^{\circ}\text{C}$ |
| Ambient temperature range            |                                      | $T_{amb}$  | - 55 to + 100 | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup> | 2 mm from case, $t \leq 10\text{ s}$ | $T_{sld}$  | 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 wave profile for soldering conditions for through hole devices (DIP) "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)

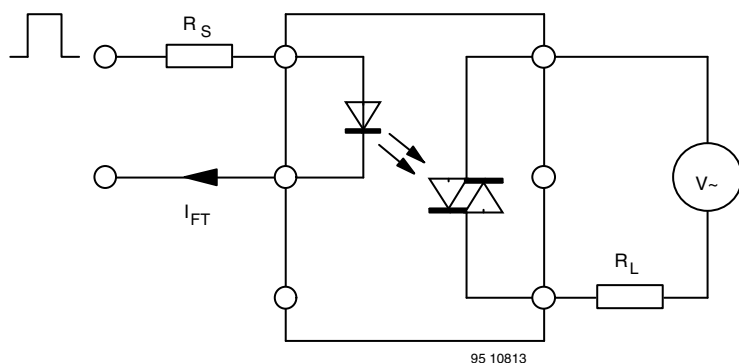
| PARAMETER                                   | TEST CONDITION                              | PART    | SYMBOL          | MIN. | TYP. | MAX. | UNIT             |
|---------------------------------------------|---------------------------------------------|---------|-----------------|------|------|------|------------------|
| INPUT                                       |                                             |         |                 |      |      |      |                  |
| Forward voltage                             | $I_F = 50\text{ mA}$                        |         | $V_F$           |      | 1.25 | 1.6  | V                |
| Junction capacitance                        | $V_R = 0, f = 1\text{ MHz}$                 |         | $C_j$           |      | 50   |      | pF               |
| OUTPUT                                      |                                             |         |                 |      |      |      |                  |
| Forward peak off-state voltage (repetitive) | $I_{RDM} = 100\text{ nA}$                   |         | $V_{DRM}^{(1)}$ | 250  |      |      | V                |
| Peak on-state voltage                       | $I_{TM} = 100\text{ mA}$                    |         | $V_{TM}$        |      | 1.5  | 3    | V                |
| Critical rate of rise of off-state voltage  | $I_{FT} = 0, I_{FT} = 30\text{ mA}$         |         | $dV/dt_{cr}$    |      | 10   |      | V/ $\mu\text{s}$ |
|                                             |                                             |         | $dV/dt_{crq}$   | 0.1  | 0.2  |      | V/ $\mu\text{s}$ |
| COUPLER <sup>(2)</sup>                      |                                             |         |                 |      |      |      |                  |
| Collector emitter trigger current           | $V_S = 3\text{ V}, R_L = 150\text{ }\Omega$ | K3010P  | $I_{FT}$        |      | 8    | 15   | mA               |
|                                             |                                             | K3010PG | $I_{FT}$        |      | 8    | 15   | mA               |
|                                             |                                             | K3011P  | $I_{FT}$        |      | 5    | 10   | mA               |
|                                             |                                             | K3011PG | $I_{FT}$        |      | 5    | 10   | mA               |
|                                             |                                             | K3012P  | $I_{FT}$        |      | 2    | 5    | mA               |
|                                             |                                             | K3012PG | $I_{FT}$        |      | 2    | 5    | mA               |
| Holding current                             | $I_F = 10\text{ mA}, V_S \geq 3\text{ V}$   |         | $I_H$           |      | 100  |      | $\mu\text{A}$    |

**Notes**

- 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.

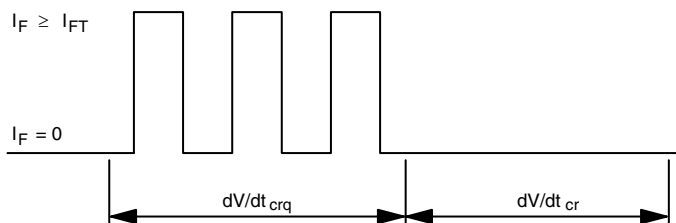
<sup>(1)</sup> Test voltage must be applied within  $dV/dt$  ratings.

<sup>(2)</sup>  $I_{FT}$  is defined as a minimum trigger current.



Test condition:  
 $dV/dt_{cr}$   
 $V_S = 2/3 V_{DRM}$   
 (sine wave)  
 $R_L = 33 \text{ k}\Omega$   
 $dV/dt_{crq}$   
 $V_{eff.} = 30 \text{ V}$   
 (sine wave)  
 $R_L = 2 \text{ k}\Omega$

Fig. 1 - Test Circuit for  $dV/dt_{cr}$  and  $dV/dt_{crq}$



$dV/dt_{cr}$  Highest value of the "rate of rise of off-state voltage" which does not cause any switching from the off state to the on state  
 $dV/dt_{crq}$  Highest value of the "rate of rise of communicating voltage" which does not switch on the device again, after the voltage has decreased to zero and the trigger current is switched from  $I_{FT}$  to zero

95 10814

Fig. 2

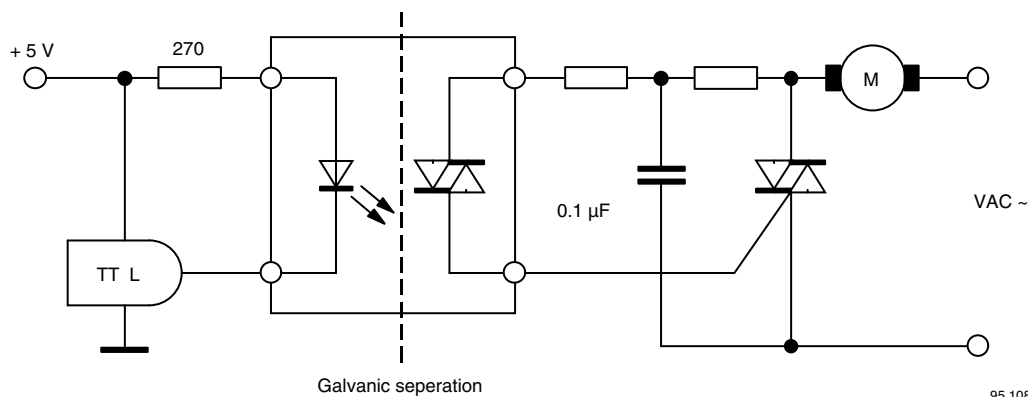


Fig. 3 - Motor Control Circuit

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**SAFETY AND INSULATION RATINGS**

| PARAMETER                                                                                 | SYMBOL     | MIN.      | TYP.      | MAX. | UNIT               |
|-------------------------------------------------------------------------------------------|------------|-----------|-----------|------|--------------------|
| Climatic classification (according to IEC 68 part 1)                                      |            |           | 55/100/21 |      |                    |
| Pollution degree (DIN VDE 0109)                                                           |            |           | 2         |      |                    |
| Comparative tracking index                                                                | CTI        | 175       |           |      |                    |
| Peak transient overvoltage                                                                | $V_{IOTM}$ |           |           | 8000 | $V_{peak}$         |
| Peak working insulation voltage                                                           | $V_{IORM}$ |           |           | 890  | $V_{peak}$         |
| Partial discharge test voltage (method a, $V_{pd} = V_{IORM} \times 1.875$ )              | $V_{pd}$   |           |           | 1669 | $V_{peak}$         |
| Isolation resistance at $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$ | $R_{IO}$   | $10^{11}$ |           |      | $\Omega$           |
| Isolation resistance at $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$  | $R_{IO}$   | $10^{12}$ |           |      | $\Omega$           |
| Safety rating - power                                                                     | $P_{SO}$   |           |           | 265  | mW                 |
| Safety rating - input current                                                             | $I_{SI}$   |           |           | 130  | mA                 |
| Safety rating - temperature                                                               | $T_{SI}$   |           |           | 150  | $^{\circ}\text{C}$ |
| Clearance distance (Standard DIP-6)                                                       |            | 7         |           |      | mm                 |
| Creepage distance (Standard DIP-6)                                                        |            | 7         |           |      | mm                 |
| Clearance distance (400 mil DIP-6)                                                        |            | 8         |           |      | mm                 |
| Creepage distance (400 mil DIP-6)                                                         |            | 8         |           |      | mm                 |

**Note**

- According to DIN EN60747-5-5 (see figure 4). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

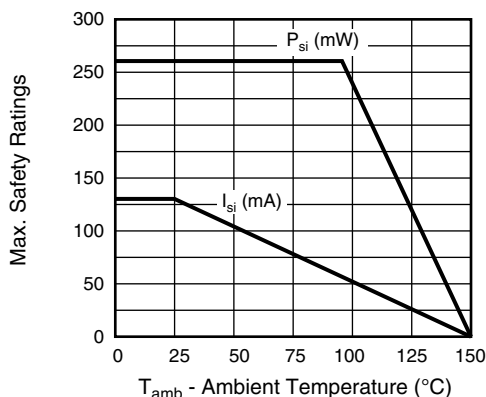


Fig. 4 - Safety Parameter Derating Diagram

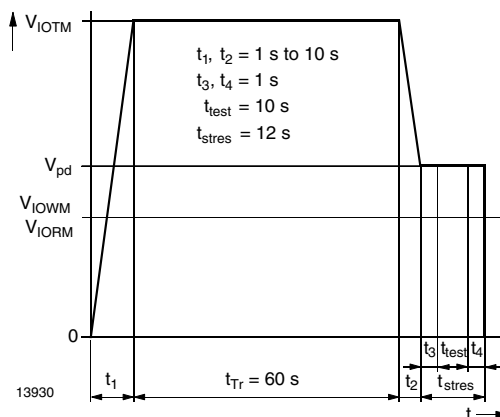


Fig. 5 - Test Pulse Diagram for Sample Test according to DIN EN60747-5-5/DIN EN60747-; IEC 60747



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

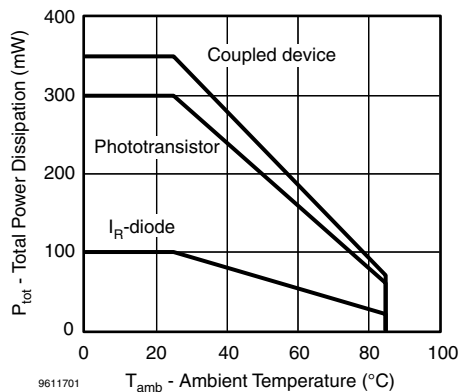


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

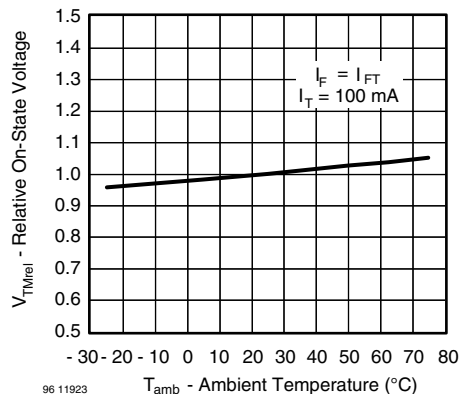


Fig. 9 - Relative On-State vs. Ambient Temperature

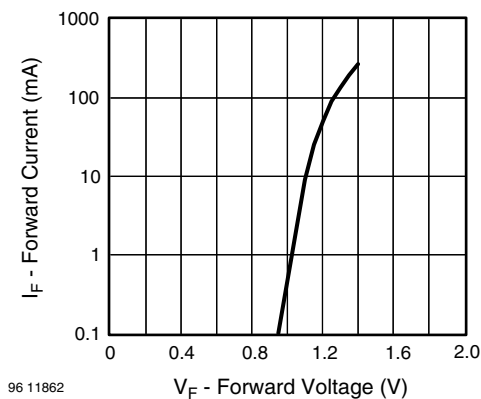


Fig. 7 - Forward Current vs. Forward Voltage

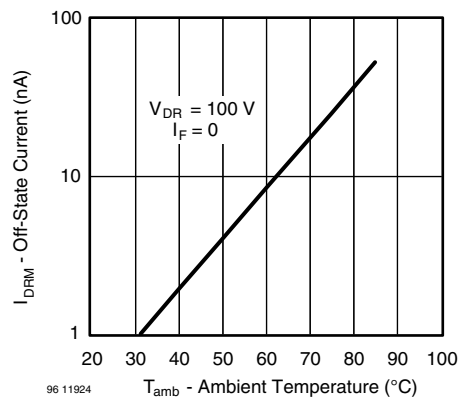


Fig. 10 - Off-State Current vs. Ambient Temperature

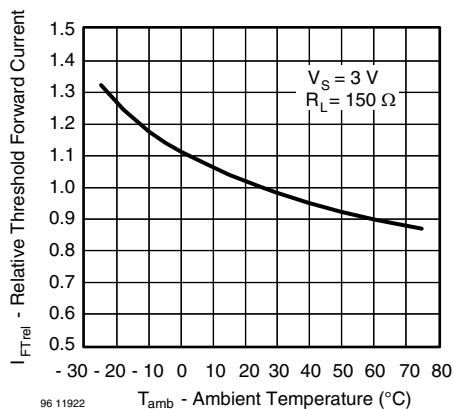


Fig. 8 - Relative Threshold Forward Current vs. Ambient Temperature

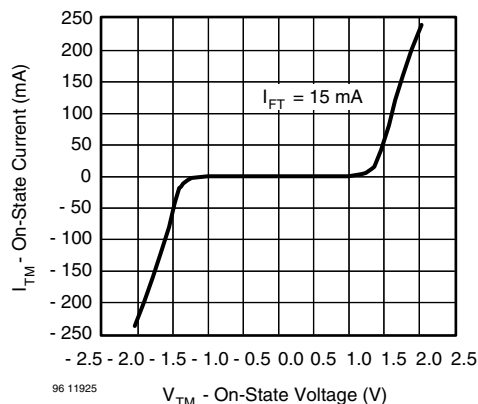
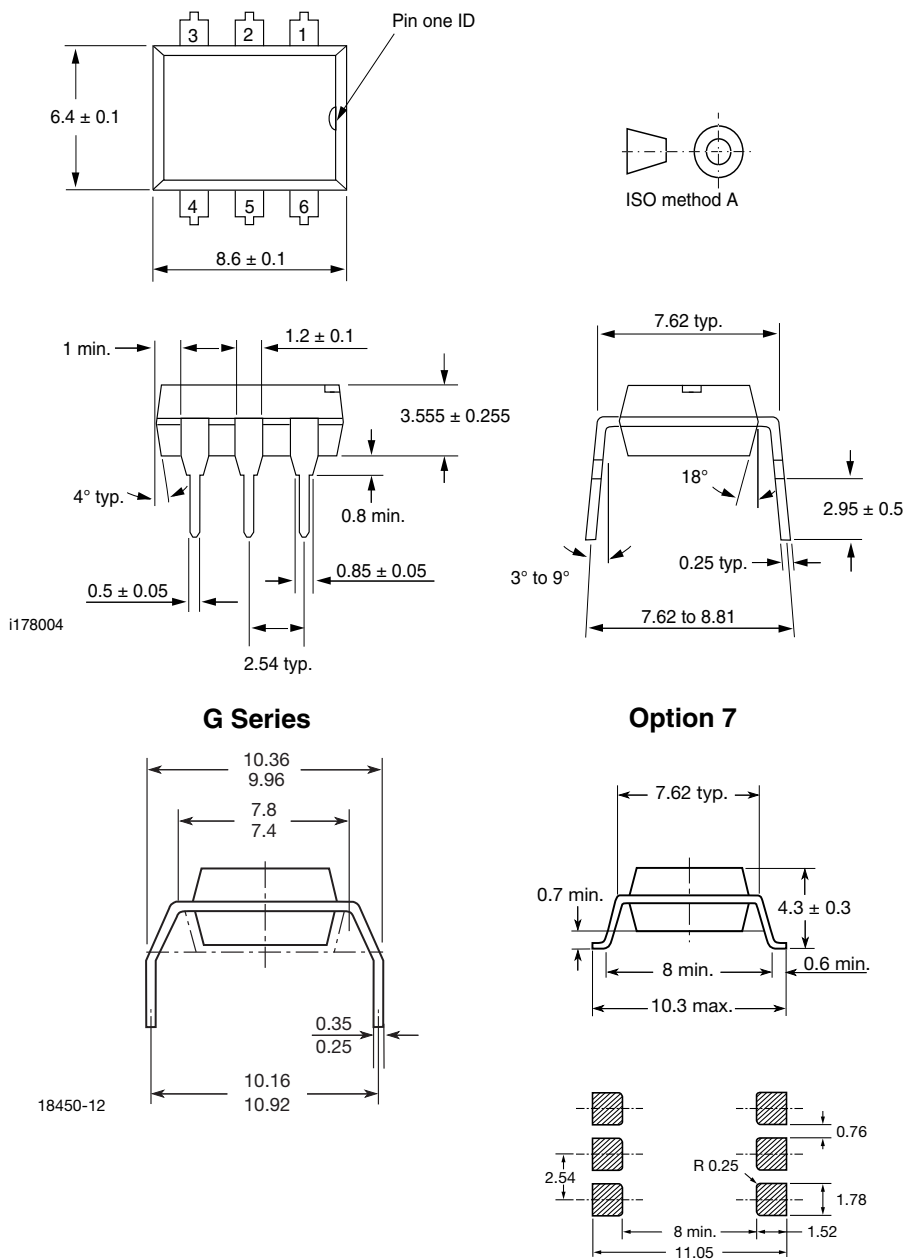


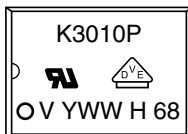
Fig. 11 - Collector Current vs. Forward Current



## PACKAGE DIMENSIONS millimeters



## PACKAGE MARKING (example)



### Notes

- The "G" of the 400 mil G leadform type is not marked on the body.
- The VDE logo is only marked on option1 parts.



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