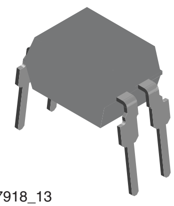
# Optocoupler, Phototransistor Output



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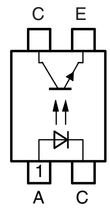



17203-5

## FEATURES

- Endstackable to 2.54 mm (0.1") spacing
- DC isolation test voltage 5000 $V_{RMS}$
- Current transfer ratio (CTR) selected into groups
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Available in single, dual and quad channel packages
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

## DESCRIPTION

In the K817P part each channel consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4 pin (single) plastic dual inline package.

## AGENCY APPROVALS

- BSI: EN 60065:2002, EN 60950-1:2006
- DIN EN 60747-5-2 (VDE 0884)
- FIMKO
- UL file no. E52744
- cUL tested to CSA 22.2 bulletin 5A

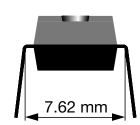
## APPLICATIONS

- Programmable logic controllers
- Modems
- Answering machines
- General applications

## ORDERING INFORMATION

| K | 8 | 1 | 7 | P | # | x |
|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | PACKAGE OPTION |

DIP




| AGENCY CERTIFIED/ PACKAGE | CTR (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mA | 10 mA | | | | 5 mA | | | | |
| VDE, BSI, FIMKO, UL, cUL | 50 to 600 | 40 to 80 | 63 to 125 | 100 to 200 | 160 to 320 | 50 to 150 | 100 to 300 | 80 to 160 | 130 to 260 | 200 to 400 |
| DIP-4 | K817P | K817P1 | K817P2 | K817P3 | K817P4 | K817P5 | K817P6 | K817P7 | K817P8 | K817P9 |

## ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25 °C, unless otherwise specified)

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| **INPUT** | | | | |
| Reverse voltage | | $V_R$ | 6 | V |
| Forward current | | $I_F$ | 60 | mA |
| Forward surge current | $t_p \leq 10$ μs | $I_{FSM}$ | 1.5 | A |
| Power dissipation | | $P_{diss}$ | 70 | mW |
| Junction temperature | | $T_j$ | 125 | °C |
| **OUTPUT** | | | | |
| Collector emitter voltage | | $V_{CEO}$ | 70 | V |
| Emitter collector voltage | | $V_{ECO}$ | 7 | V |
| Collector current | | $I_C$ | 50 | mA |
| Collector peak current | $t_p/T = 0.5$, $t_p \leq 10$ ms | $I_{CM}$ | 100 | mA |
| Power dissipation | | $P_{diss}$ | 70 | mW |
| Junction temperature | | $T_j$ | 125 | °C |

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **COUPLER** | | | | |
| AC isolation test voltage (RMS) | t = 1 s | $V_{ISO}$ | 5000 | $V_{RMS}$ |
| Total power dissipation | | $P_{tot}$ | 200 | mW |
| Operating ambient temperature range | | $T_{amb}$ | - 40 to + 100 | °C |
| Storage temperature range | | $T_{stg}$ | - 55 to + 125 | °C |
| Soldering temperature [1] | 2 mm from case, t ≤ 10 s | $T_{sld}$ | 260 | °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.

[1] Refer to wave profile for soldering conditions for through hole devices.

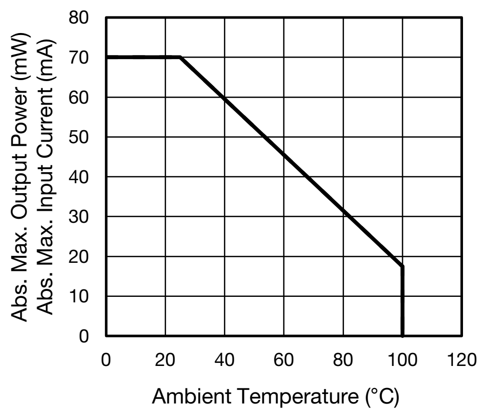



Fig. 1 - Absolute Maximum Output Power and Input Current vs. Ambient Temperature

| **ELECTRICAL CHARACTERISTICS** | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | |
| Forward voltage | $I_F$ = 50 mA | $V_F$ | | 1.25 | 1.6 | V |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz | $C_j$ | | 50 | | pF |
| **OUTPUT** | | | | | | |
| Collector emitter voltage | $I_C$ = 100 μA | $V_{CEO}$ | 70 | | | V |
| Emitter collector voltage | $I_E$ = 100 μA | $V_{ECO}$ | 7 | | | V |
| Collector dark current | $V_{CE}$ = 20 V, $I_F$ = 0, E = 0 | $I_{CEO}$ | | 10 | 100 | nA |
| **COUPLER** | | | | | | |
| Collector emitter saturation voltage | $I_F$ = 10 mA, $I_C$ = 1 mA | $V_{CEsat}$ | | | 0.3 | V |
| Cut-off frequency | $I_F$ = 10 mA, $V_{CE}$ = 5 V, $R_L$ = 100 Ω | $f_c$ | | 110 | | kHz |
| Coupling capacitance | f = 1 MHz | $C_k$ | | 0.6 | | pF |

**Note**

$T_{amb}$ = 25 °C, unless otherwise specified.
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 | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$ | $V_{CE}$ = 5 V, $I_F$ = 5 mA | K817P | CTR | 50 | | 600 | % |
| | $V_{CE}$ = 5 V, $I_F$ = 10 mA | K817P1 | CTR | 40 | | 80 | % |
| | | K817P2 | CTR | 63 | | 125 | % |
| | | K817P3 | CTR | 100 | | 200 | % |
| | | K817P4 | CTR | 160 | | 320 | % |
| | $V_{CE}$ = 5 V, $I_F$ = 5 mA | K817P5 | CTR | 50 | | 150 | % |
| | | K817P6 | CTR | 100 | | 300 | % |
| | | K817P7 | CTR | 80 | | 160 | % |
| | | K817P8 | CTR | 130 | | 260 | % |
| | | K817P9 | CTR | 200 | | 400 | % |

| SAFETY AND INSULATION RATED PARAMETERS | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Partial discharge test voltage - routine test | 100 %, $t_{test}$ = 1 s | $V_{pd}$ | 1.6 | | | kV |
| Partial discharge test voltage - lot test (sample test) | $t_{Tr}$ = 60 s, $t_{test}$ = 10 s, (see figure 2) | $V_{pd}$ | 1.36 | | | kV |
| Insulation resistance | $V_{IO}$ = 500 V | $R_{IO}$ | $10^{12}$ | | | Ω |
| | $V_{IO}$ = 500 V, $T_{amb}$ = 100 °C | $R_{IO}$ | $10^{11}$ | | | Ω |
| | $V_{IO}$ = 500 V, $T_{amb}$ = 150 °C (construction test only) | $R_{IO}$ | $10^9$ | | | Ω |
| Rated impulse voltage | | $V_{IOTM}$ | | | 6000 | $V_{peak}$ |
| Max. working voltages | Recurring peak voltage | $V_{IORM}$ | | | 850 | $V_{peak}$ |
| Forward current | | $I_{SI}$ | | | 130 | mA |
| Power dissipation | | $P_{SO}$ | | | 265 | mW |
| Safety temperature | | $T_{si}$ | | | 150 | °C |
| Creepage distance | | | | | 7.6 | mm |

**Note**

- According to DIN EN 60747-5-5 (VDE 0884) (see figure 2). 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.

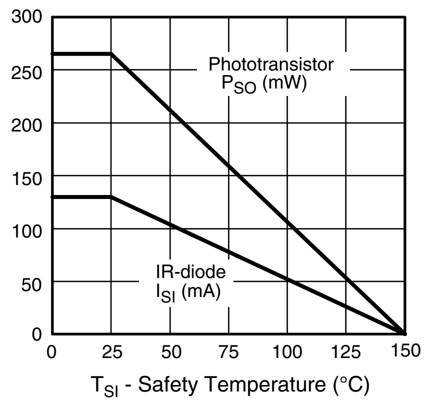



Fig. 2 - Derating Diagram

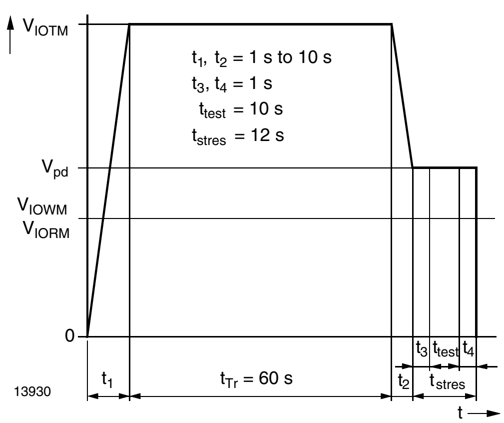



Fig. 3 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

| SWITCHING CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Delay time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_d$ | | 3 | | µs |
| Rise time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_r$ | | 3 | | µs |
| Fall time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_f$ | | 4.7 | | µs |
| Storage time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_s$ | | 0.3 | | µs |
| Turn-on time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_{on}$ | | 6 | | µs |
| Turn-off time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_{off}$ | | 5 | | µs |
| Turn-on time | $V_S$ = 5 V, $I_F$ = 10 mA, $R_L$ = 1 kΩ (see figure 2) | $t_{on}$ | | 3 | | µs |
| Turn-off time | $V_S$ = 5 V, $I_F$ = 10 mA, $R_L$ = 1 kΩ (see figure 2) | $t_{off}$ | | 10 | | µs |

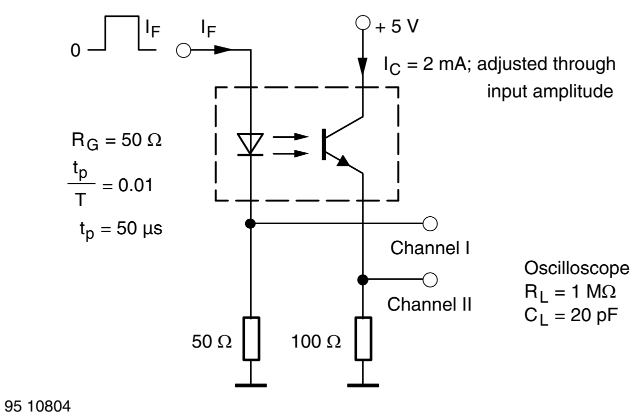



Fig. 1 - Test Circuit, Non-Saturated Operation

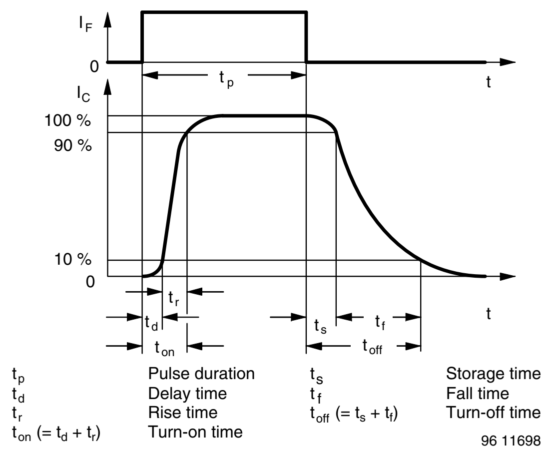



Fig. 3 - Switching Times

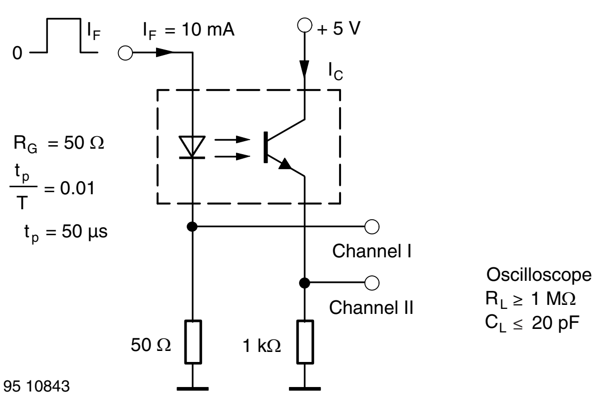



Fig. 2 - Test Circuit, Saturated Operation

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

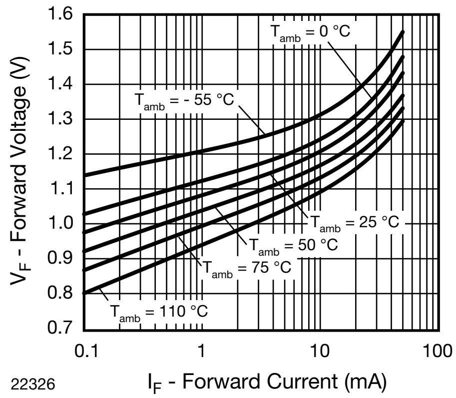



Fig. 4 - Forward Voltage vs. Forward Current

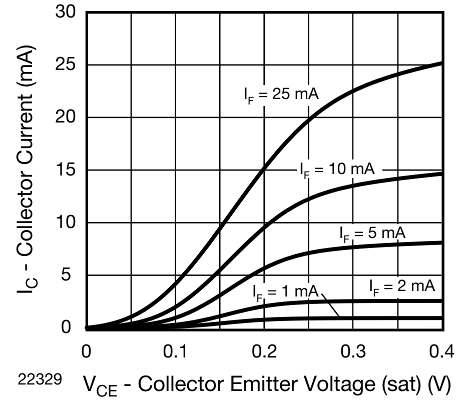



Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

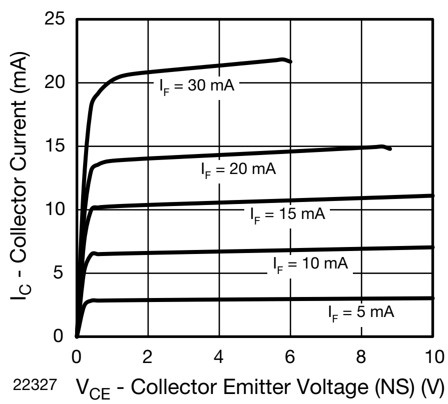



Fig. 5 - Collector Current vs. Collector Emitter Voltage (non-saturated)

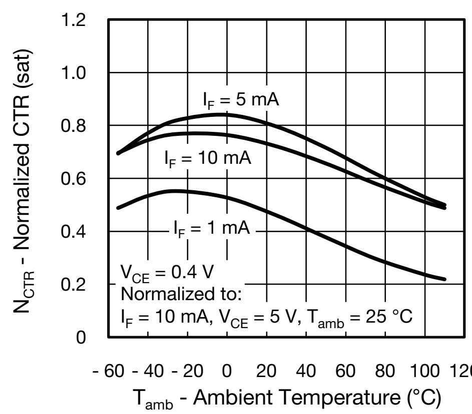



Fig. 8 - Normalized CTR (saturated) vs. Ambient Temperature

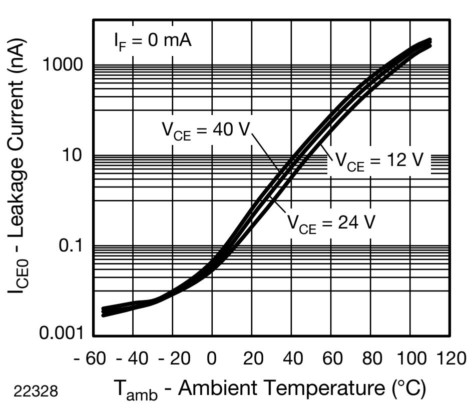



Fig. 6 - Leakage Current vs. Ambient Temperature

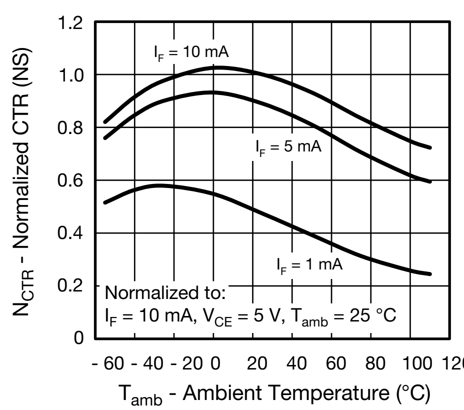



Fig. 9 - Normalized CTR (non-saturated) vs. Ambient Temperature

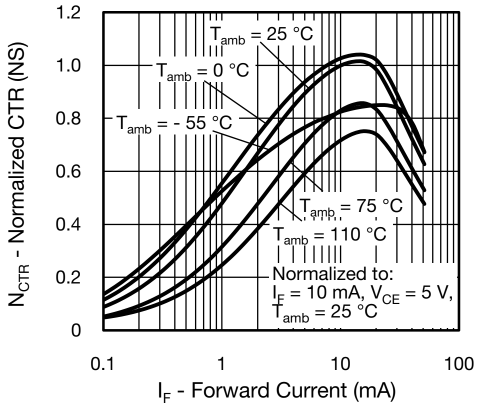



Fig. 10 - Normalized CTR (non-saturated) vs. Forward Current

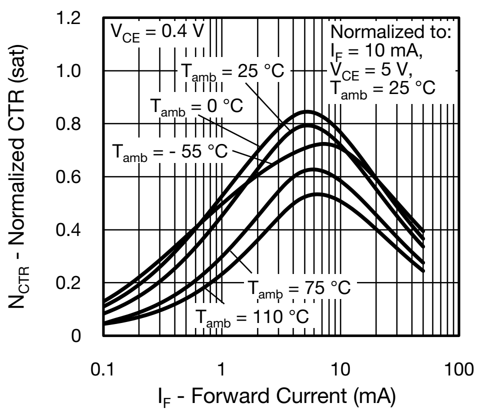



Fig. 11 - Normalized CTR (saturated) vs. Forward Current

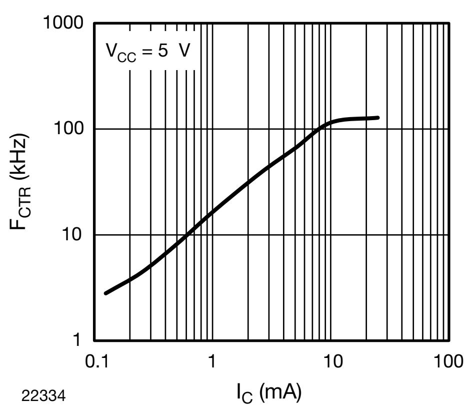



Fig. 12 - $F_{CTR}$ vs. $I_C$ (saturated) (mA)

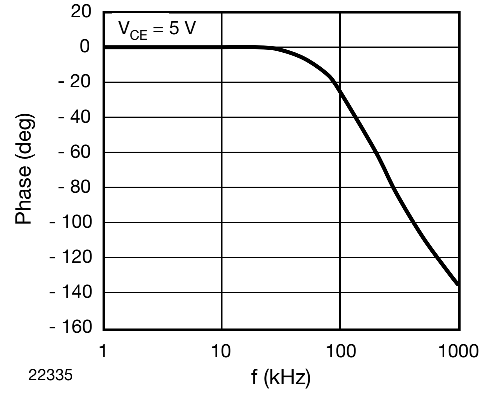



Fig. 13 - $F_{CTR}$ vs. Phase Angle (kHz)

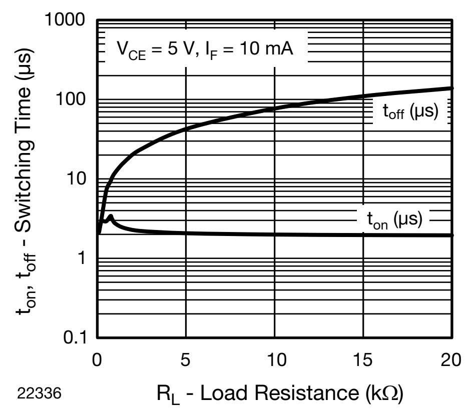
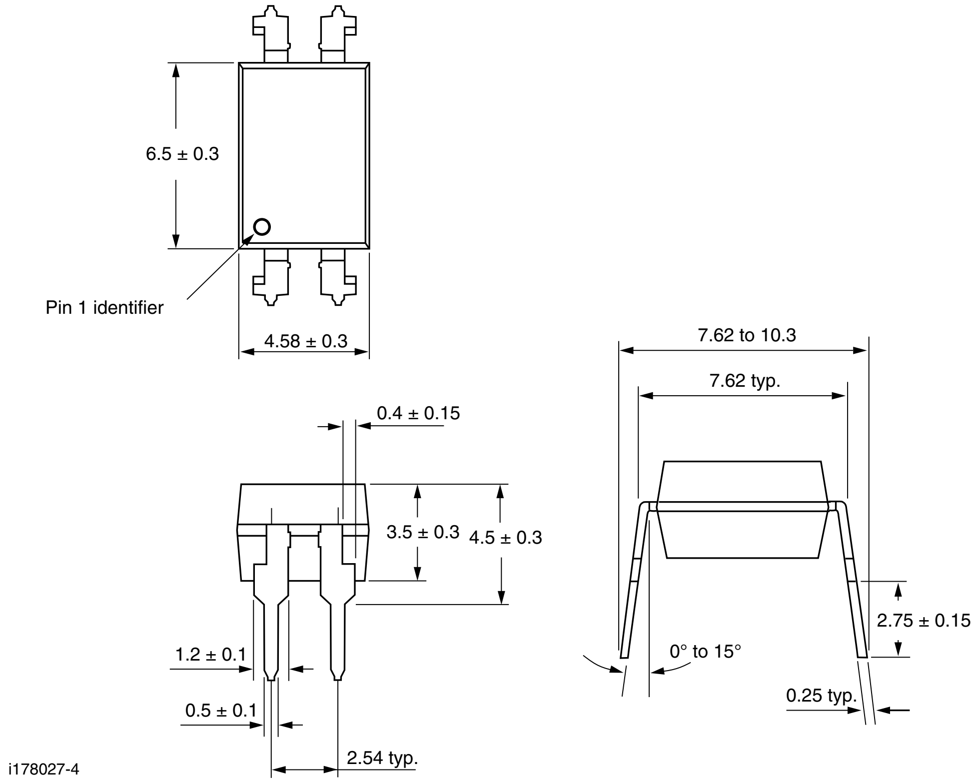
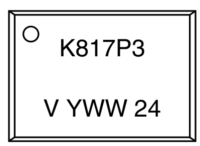



Fig. 14 - Switching Time vs. Load Resistance

**PACKAGE DIMENSIONS** in millimeters




**PACKAGE MARKING**



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