



IR Receiver Modules for Remote Control Systems



23196

DESCRIPTION

This IR receiver series is optimized for long burst remote control systems in different environments. The customer can choose between different IC settings (AGC variants), to find the optimum solution for his application. The higher the AGC, the better noise is suppressed, but the lower the code compatibility.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. These components have not been qualified to automotive specifications.

FEATURES

- Individual IC settings to reach maximum performance
- Immunity against noise (lamps, LCD TV, Wi-Fi)
- Low supply current
- Photo detector and preamplifier in one package
- Supply voltage: 2.0 V to 5.5 V
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

LINKS TO ADDITIONAL RESOURCES



[Product Page](#)



[Marking](#)



[Packages](#)



[Holders](#)



[Bends and Cuts](#)

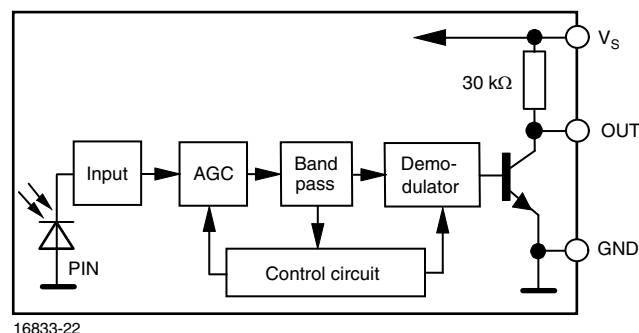
APPLICATIONS

- Infrared remote control systems

DESIGN SUPPORT TOOLS

- [3D models](#)
- [Window size calculator](#)

BLOCK DIAGRAM



16833-22



TSOP122..., TSOP124..., TSOP126..., TSOP142..., TSOP144..., TSOP146..

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Vishay Semiconductors

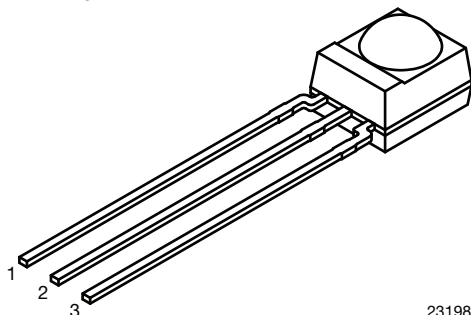
MECHANICAL DATA

Pinning for TSOP14...:

1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP12...:

1 = OUT, 2 = V_S , 3 = GND

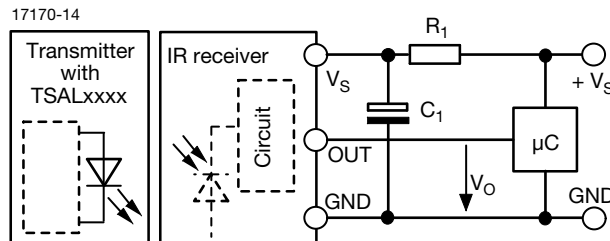


23198

ORDERING CODE

TSOP12..., TSOP14... - 2160 pieces in tubes

APPLICATION CIRCUIT



R_1 and C_1 recommended in case there are strong ripple or spikes on the supply line.

PARTS TABLE

| AGC | | BASIC NOISE SUPPRESSION (AGC2) | | ENHANCED NOISE SUPPRESSION (AGC4) | | MAXIMIZED NOISE SUPPRESSION (AGC6) | |
|-------------------|--------|--|------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------|
| Carrier frequency | 30 kHz | TSOP14230 | TSOP12230 | TSOP14430 | TSOP12430 | TSOP14630 | TSOP12630 |
| | 33 kHz | TSOP14233 | TSOP12233 | TSOP14433 | TSOP12433 | TSOP14633 | TSOP12633 |
| | 36 kHz | TSOP14236 | TSOP12236 | TSOP14436 ⁽⁴⁾⁽⁶⁾ | TSOP12436 ⁽⁴⁾⁽⁶⁾ | TSOP14636 ⁽⁵⁾ | TSOP12636 ⁽⁵⁾ |
| | 38 kHz | TSOP14238 | TSOP12238 | TSOP14438 ⁽²⁾⁽³⁾⁽⁹⁾⁽¹⁰⁾ | TSOP12438 ⁽²⁾⁽³⁾⁽⁹⁾⁽¹⁰⁾ | TSOP14638 | TSOP12638 |
| | 40 kHz | TSOP14240 ⁽¹¹⁾ | TSOP12240 ⁽¹¹⁾ | TSOP14440 | TSOP12440 | TSOP14640 | TSOP12640 |
| | 56 kHz | TSOP14256 ⁽¹⁾ | TSOP12256 ⁽¹⁾ | TSOP14456 ⁽⁸⁾ | TSOP12456 ⁽⁸⁾ | TSOP14656 ⁽⁷⁾ | TSOP12656 ⁽⁷⁾ |
| Package | | Mold | | | | | |
| Pinning | | 1 = OUT, 2 = GND, 3 = V_S | 1 = OUT, 2 = V_S , 3 = GND | 1 = OUT, 2 = GND, 3 = V_S | 1 = OUT, 2 = V_S , 3 = GND | 1 = OUT, 2 = GND, 3 = V_S | 1 = OUT, 2 = V_S , 3 = GND |
| Dimensions (mm) | | 6.0 W x 6.95 H x 5.6 D | | | | | |
| Mounting | | Leaded | | | | | |
| Application | | Remote control | | | | | |
| Best choice for | | ⁽¹⁾ Cisco ⁽²⁾ Mitsubishi ⁽³⁾ NEC ⁽⁴⁾ Panasonic ⁽⁵⁾ RC-5 ⁽⁶⁾ RC-6 ⁽⁷⁾ RCA ⁽⁸⁾ r-step ⁽⁹⁾ Sejin 4PPM ⁽¹⁰⁾ Sharp ⁽¹¹⁾ Sony | | | | | |
| Special options | | <ul style="list-style-type: none"> Narrow optical filter: www.vishay.com/doc?81590 Wide optical filter: www.vishay.com/doc?82726 | | | | | |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|-----------------------------|---------------------------------|-----------|-------------------------|------|
| Supply voltage | | V_S | -0.3 to +6 | V |
| Supply current | | I_S | 3 | mA |
| Output voltage | | V_O | -0.3 to ($V_S + 0.3$) | V |
| Output current | | I_O | 5 | mA |
| Junction temperature | | T_j | 100 | °C |
| Storage temperature range | | T_{stg} | -25 to +85 | °C |
| Operating temperature range | | T_{amb} | -25 to +85 | °C |
| Power consumption | $T_{amb} \leq 85^\circ\text{C}$ | P_{tot} | 10 | mW |
| Soldering temperature | $t \leq 10$ s, 1 mm from case | T_{sd} | 260 | °C |

Note

- Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability



| ELECTRICAL AND OPTICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, unless otherwise specified) | | | | | | |
|---|--|-------------------|------|----------|------|-----------------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Supply current | $E_v = 0$, $V_S = 3.3\text{ V}$ | I_{SD} | 0.25 | 0.35 | 0.45 | mA |
| | $E_v = 40\text{ klx}$, sunlight | I_{SH} | - | 0.45 | - | mA |
| Supply voltage | | V_S | 2.0 | - | 5.5 | V |
| Transmission distance | $E_v = 0$, test signal see Fig. 1, IR diode TSAL6200, $I_F = 50\text{ mA}$ | d | - | 39 | - | m |
| Output voltage low | $I_{OSL} = 0.5\text{ mA}$, $E_e = 0.7\text{ mW/m}^2$, test signal see Fig. 1 | V_{OSL} | - | - | 100 | mV |
| Minimum irradiance | Test signal: RC5 code | $E_e\text{ min.}$ | - | 0.05 | 0.1 | mW/m^2 |
| | Test signal: NEC code | $E_e\text{ min.}$ | - | 0.1 | 0.2 | mW/m^2 |
| Maximum irradiance | $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 5/f_0$, test signal see Fig. 1 | $E_e\text{ max.}$ | 30 | - | - | W/m^2 |
| Directivity | Angle of half transmission distance | $\Phi_{1/2}$ | - | ± 45 | - | $^{\circ}$ |

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

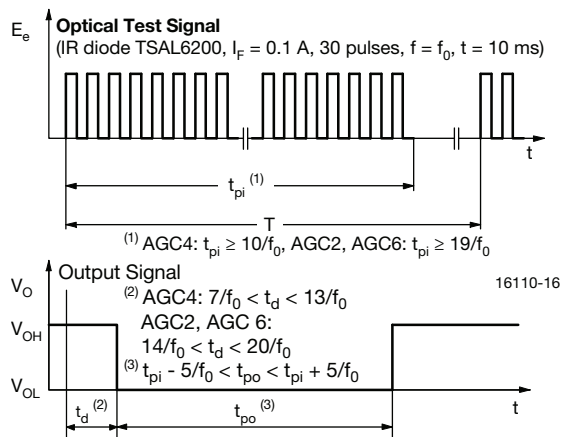


Fig. 1 - Output Delay and Pulse-Width

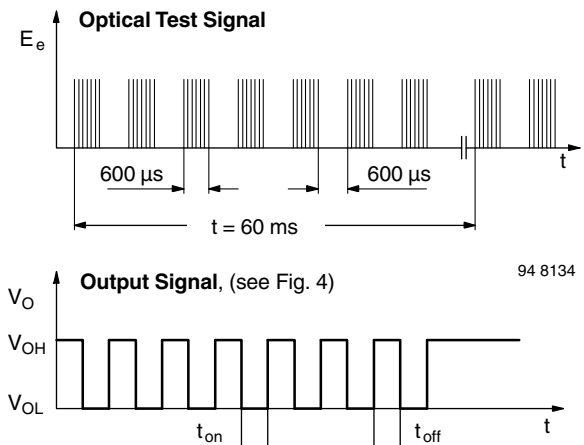


Fig. 3 - Test Signal

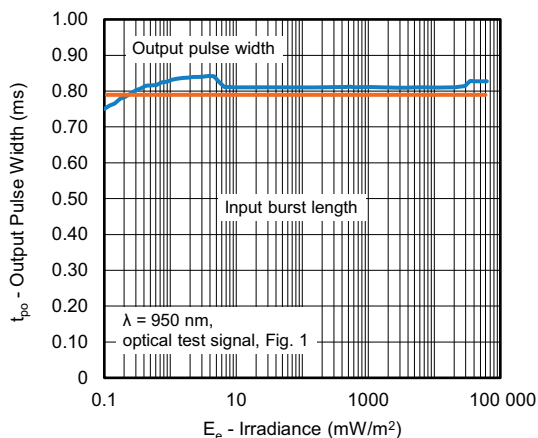


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

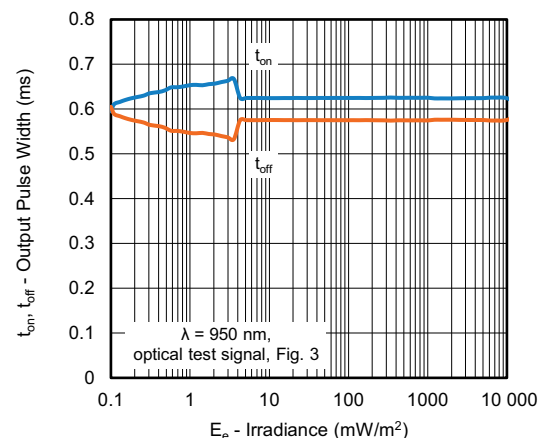


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

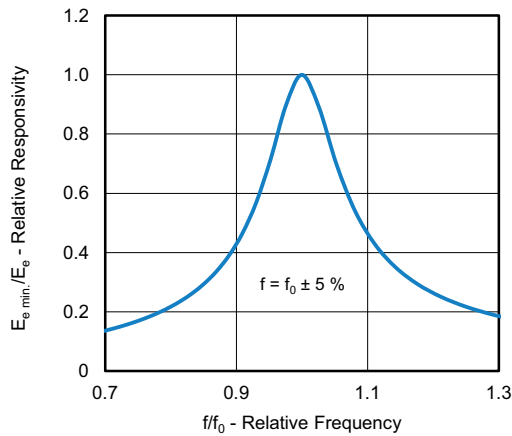


Fig. 5 - Frequency Dependence of Responsivity

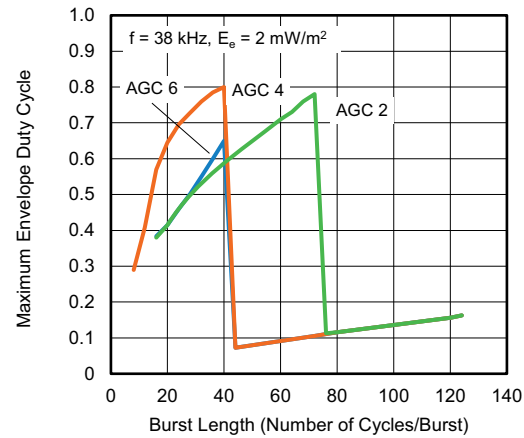


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

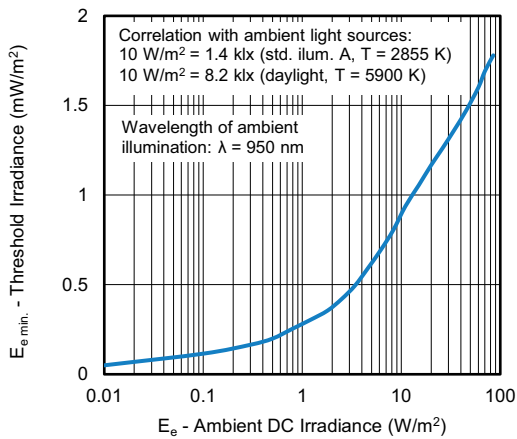


Fig. 6 - Sensitivity in Bright Ambient

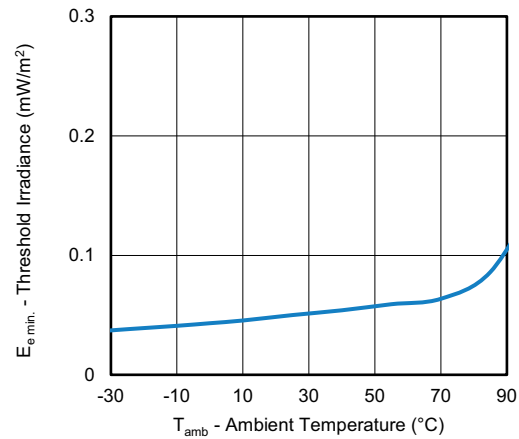


Fig. 9 - Sensitivity vs. Ambient Temperature

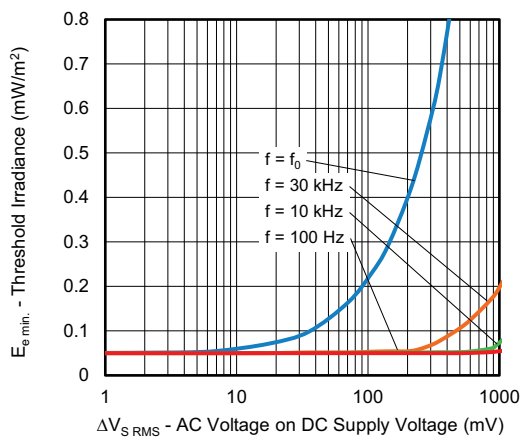


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

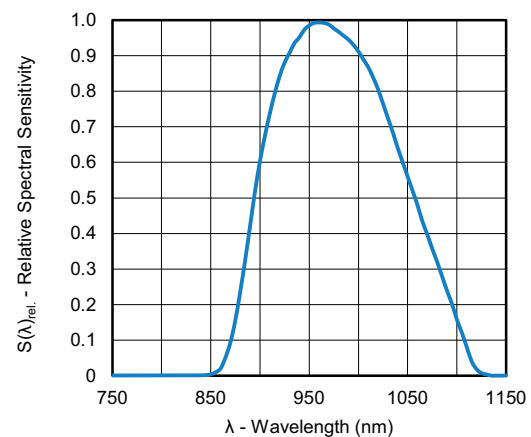
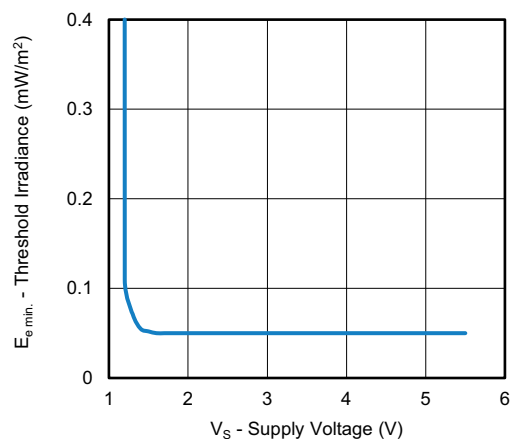
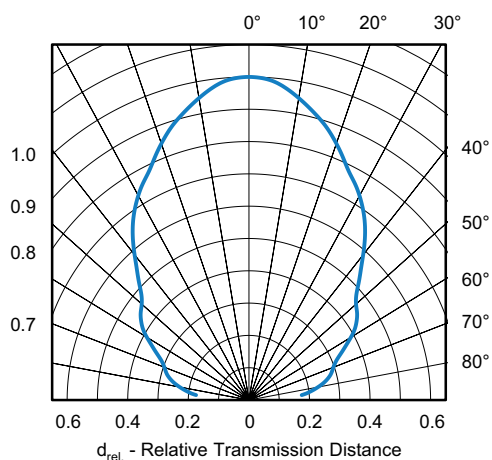


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength





SUITABLE DATA FORMAT

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output. Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14)
- 2.4 GHz and 5 GHz Wi-Fi

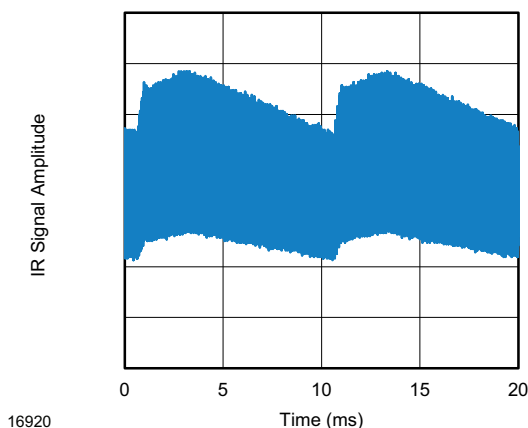


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

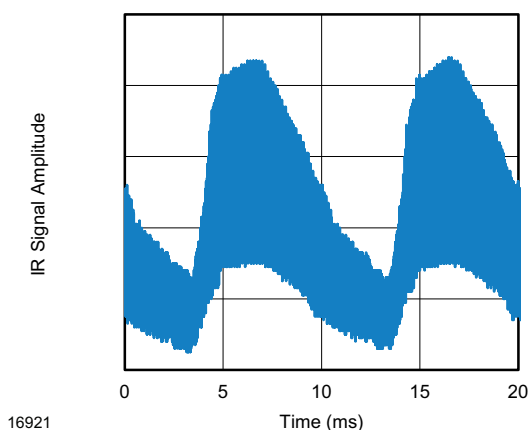


Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

| | TSOP122.., TSOP142.. | TSOP124.., TSOP144.. | TSOP126.., TSOP146.. |
|--|---------------------------------|----------------------------------|----------------------------------|
| Minimum burst length | 19 cycles/burst | 10 cycles/burst | 19 cycles/burst |
| After each burst of length a minimum gap time is required of | 19 to 72 cycles ≥ 20 cycles | 10 to 40 cycles ≥ 11 cycles | 19 to 40 cycles ≥ 20 cycles |
| For bursts greater than a minimum gap time in the data stream is needed of | 72 cycles > 6 x burst length | 40 cycles > 10 x burst length | 40 cycles > 10 x burst length |
| Maximum number of continuous short bursts/second | 750 | 1300 | 750 |
| RC-5 code | Yes | Yes | Preferred |
| RC-6 code | No | Preferred | No |
| NEC code | Yes | Preferred | Yes |
| r-step code | No | Preferred | No |
| Sony code | Preferred | No | No |
| RCA 56 kHz code | Yes | Yes | Preferred |
| Suppression of interference from fluorescent lamps | Fig. 13 | Fig. 13 and Fig. 14 | Fig. 13 and Fig. 14 |

Note

- For data formats with short bursts please see the datasheet for TSOP121.., TSOP123.., TSOP125.., TSOP141.., TSOP143.., TSOP145..

Technical drawing of a 125mm x 125mm x 30mm LED module. The drawing includes three views: a top view, a side view, and a bottom view.

Top View Dimensions:

- Overall width: 125mm
- Overall height: 125mm
- Mounting hole diameter: 6mm
- Distance from top edge to mounting hole center: 30.5 ± 0.5mm
- Distance from left edge to mounting hole center: 62.5mm
- Distance from top edge to LED chip center: 6.95mm
- Distance from left edge to LED chip center: 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm

Side View Dimensions:

- Overall height: 30.5 ± 0.5mm
- Distance from top edge to LED chip center: 6.95mm
- Distance from left edge to LED chip center: 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm

Bottom View Dimensions:

- Overall width: 125mm
- Overall height: 125mm
- Mounting hole diameter: 6mm
- Distance from top edge to mounting hole center: 30.5 ± 0.5mm
- Distance from left edge to mounting hole center: 62.5mm
- Distance from top edge to LED chip center: 6.95mm
- Distance from left edge to LED chip center: 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm
- Distance from top edge to LED chip center (alternative): 5.3mm
- Distance from left edge to LED chip center (alternative): 62.5mm

Other Dimensions:

- 0.85 max.
- 0.89
- 2.54 nom.
- 0.7 max.
- 2.54 nom.
- 0.5 max.
- 1.3
- 4.1
- 5.6
- 3.9
- 0.7 max.
- 2.54 nom.
- 0.5 max.
- 1.3
- 4.1
- 5.6
- 3.9

Notes:


- Not indicated tolerances ± 0.2
- marking area
- R 2.5

Technical Drawing Symbols:

- Technical drawing symbols according to DIN specifications.

13655

Not indicated tolerances ± 0.2



technical drawings
according to DIN
specifications



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