

BCR430U

Low Drop Voltage LED Driver IC

Feature list

- Supply voltage from 6 V to 42 V
- Controls up to 100 mA LED current
- Typ. 135 mV saturation voltage at 50 mA
- LED current precision $\pm 5\%$ at 95 mA
- Smart over temperature protection function

Advantages with respect to discrete solutions

- Low BOM count
- Lower assembly cost
- Smaller form factor
- Higher reliability due to less parts and soldering joints

Potential Applications

- LED strips
- LED displays and channel letters
- Architectural and landscape lighting
- Retail lighting

Product Validation

- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

| Product Name | Package | Marking |
|--------------|--------------|---------|
| BCR430U | PG-SOT23-6-1 | 43 |

Description

BCR430U is a linear LED controller IC in a small PG-SOT23-6-1 package regulating the LED current in standalone operation without any external power transistor. The IC supply voltage range is from 6 V up to 42 V. The LED current level can be adjusted up to 100 mA connecting a high ohmic resistor R_{set} to pin RS. The minimal voltage drop at the integrated LED driver stage is 200 mV at 50 mA improving the overall system efficiency and providing extra voltage headroom to compensate for tolerances of LED forward voltage or supply voltage. The smart over temperature protection function reduces the LED current when junction temperature of BCR430U is very high.

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Application circuit

1 Application circuit

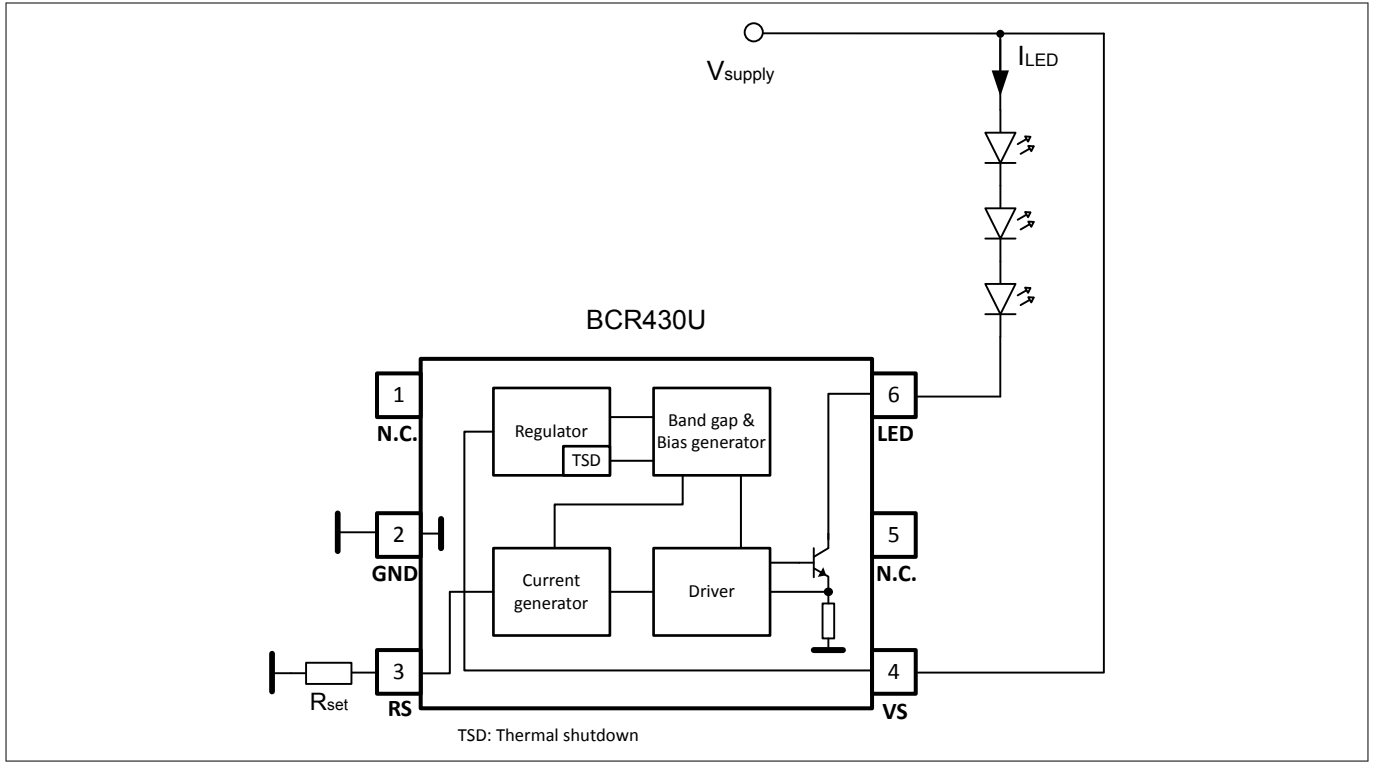


Figure 1 Typical Application Circuit of BCR430U

2 Pin configuration

| Pin No. | Pin Name | Pin Type | Function |
|---------|----------|----------|--|
| 1 | N.C. | - | Not connected |
| 2 | GND | GND | IC ground & thermal connection to heat spreader on PCB |
| 3 | RS | Output | Connection of Rset resistor |
| 4 | VS | Input | Supply voltage |
| 5 | N.C. | - | Not connected |
| 6 | LED | Input | Driver pin to control the LED current |

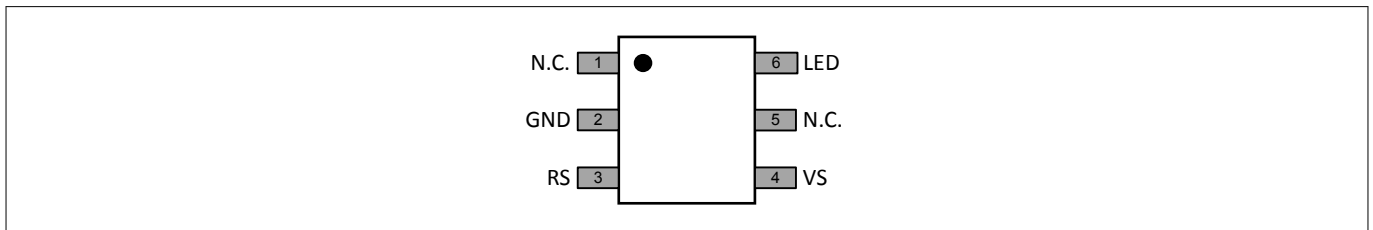


Figure 2 Pinout BCR430U

Functional description

3 Functional description

LED current configuration

The LED current is configured by the external resistor R_{set} at pin RS. The current flowing into pin LED is proportional to the current flowing out of pin RS by a ratio of about 520:1. Therefore, the LED current depends on the value of R_{set} .

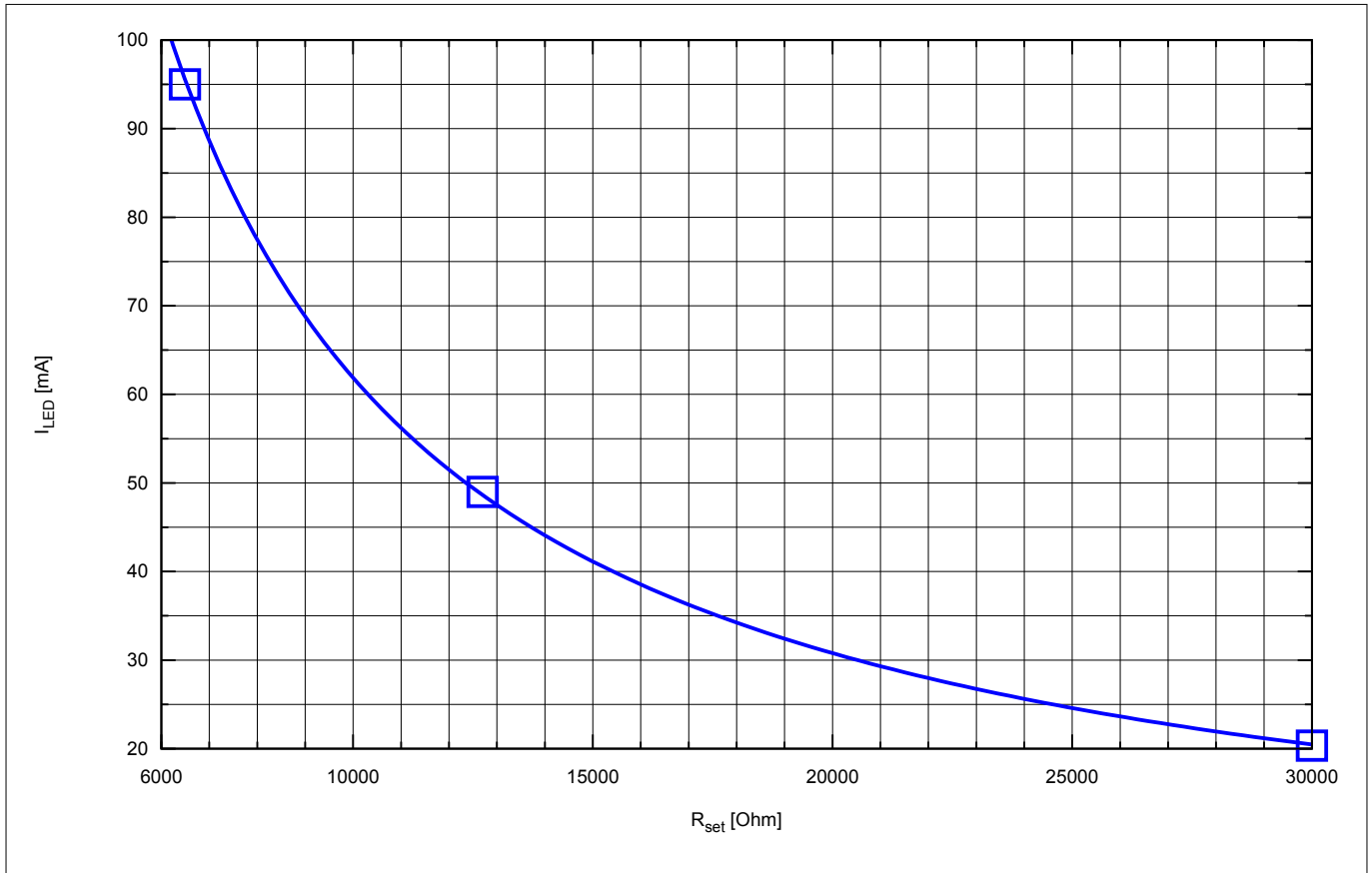


Figure 3 Relation between I_{LED} and R_{set}

Functional description

Smart over temperature protection function

BCR430U reduces the LED current with increasing junction temperature by reducing the voltage at pin RS. The reduced voltage of pin RS drives less current through the external resistor Rset, causing the current into pin LED to reduce. The LED current is never turned off fully.

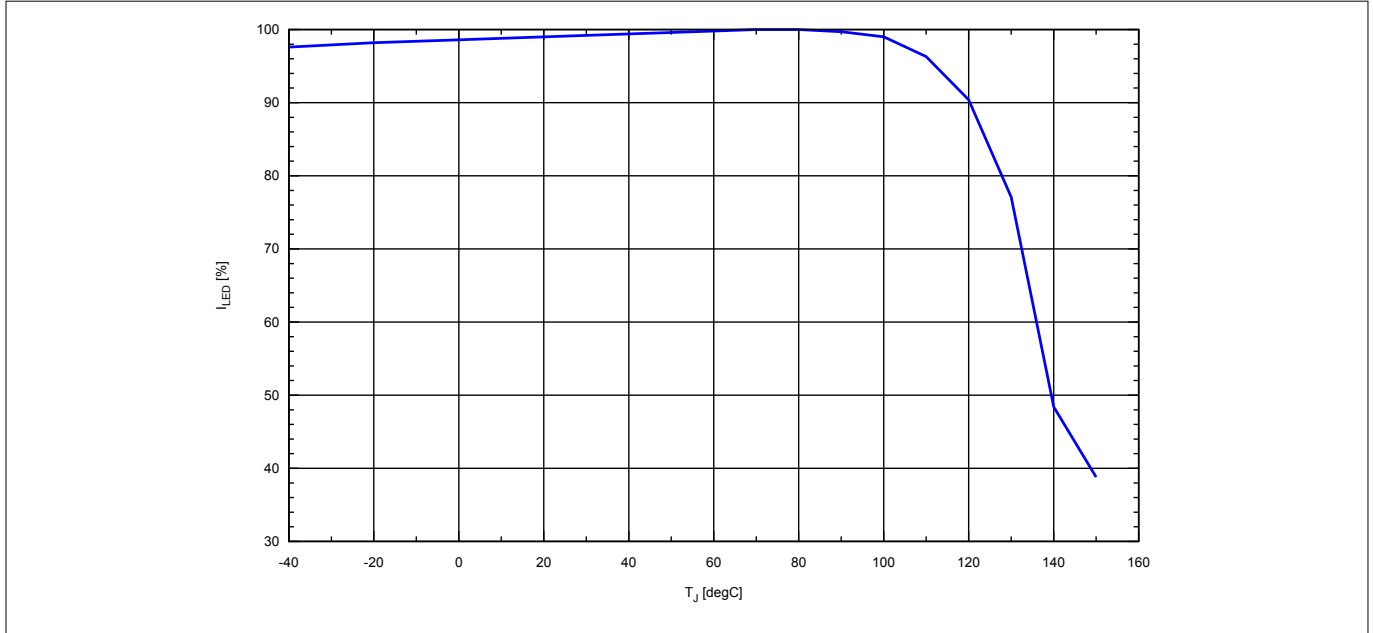


Figure 4 Relative reduction of LED current versus junction temperature of BCR430U

Maximum Permitted Power Dissipation

To avoid damage of the IC the power dissipation of BCR430U must be reduced with increasing ambient temperature according to [Figure 5](#).

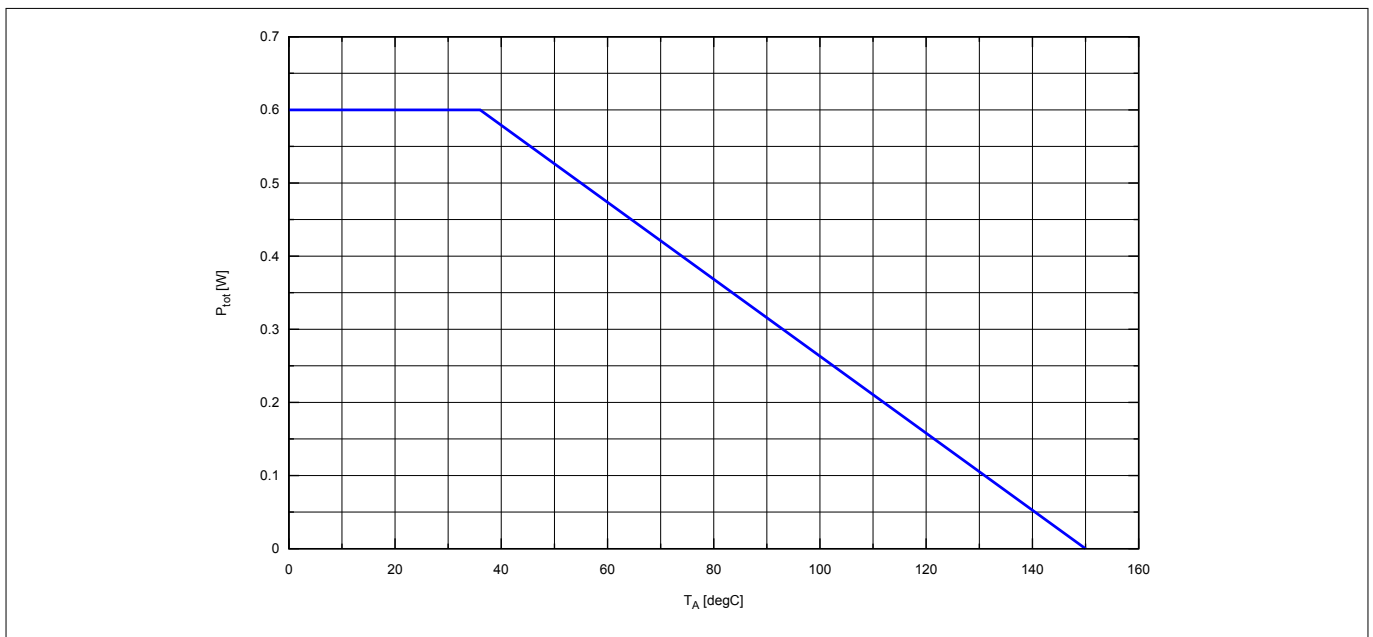


Figure 5 Maximum permitted total power dissipation of BCR430U on a JESD 51-7 board

Electrical characteristics and parameters

4 Electrical characteristics and parameters

Table 1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note or test condition |
|----------------------|----------------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Junction temperature | T _J | -40 | - | 150 | °C | |
| Supply voltage | V _S | 0 | - | 45 | V | |
| Voltage at LED pin | V _{LED} | 0 | - | 20 | V | |
| Driver LED current | I _{LED} | 0 | - | 100 | mA | |
| RS output current | I _{RS} | 0 | - | 0.3 | mA | |
| Power dissipation | P _{tot} | - | - | 600 | mW | JESD 51-7 test board, T _A ≤ 36 °C |
| ESD robustness | V _{ESD,HBM} | - | - | 1 | kV | HBM according to JEDEC JS-001 |

Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

1. For the supply pin VS, ESD protection vs. GND is performed with a snapback device, that will pull the VS voltage back to voltages around 20V if triggered. Usually this will happen if VS exceeds a trigger voltage (a typical value is 59V at room temperature in an ESD time range), e.g. by hot-plugging the LED driver with a power supply without proper system protection to limit the VS voltage. Then, the protection device would remain active until the voltage at this pin is reduced to a level sufficiently below the snapback voltage. So, if such a scenario cannot be excluded, an application would have to deactivate any snapback in due time to avoid damage by thermal overload.
2. For all other pins ESD protections is triggered without snapback, once the connected voltage signal exceeds a threshold higher than the maximum voltage rating specified.

Table 2 Thermal Resistance at T_A = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|---|----------------------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance junction to ambient | R _{thJA,1s0p,0} | - | - | 288 | K/W | JEDEC 1s0p (JESD 51-3) footprint w/o extra cooling area |
| | R _{thJA,1s0p,300} | - | - | 182 | K/W | JEDEC 1s0p (JESD 51-3) with 300 mm ² cooling area connected to GND pin |
| | R _{thJA,2s2p} | - | - | 190 | K/W | JEDEC 2s2p (JESD 51-7) |
| Thermal resistance junction to soldering pint | R _{thJS} | - | 70 | - | K/W | |

Electrical characteristics and parameters

Table 3 Electrical Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|---------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Supply voltage | V_S | 6 | - | 42 | V | Operational voltage range |
| Supply current | I_S | 1.2 | 1.7 | 2.2 | mA | $I_{LED} = 50\text{ mA}$, $V_S = 6\text{ V}$ |
| | | 1.3 | 1.8 | 2.3 | | $I_{LED} = 50\text{ mA}$, $V_S = 42\text{ V}$ |
| Driver LED capability | I_{LED} | 20 | - | 100 | mA | |
| Driver LED current by R_{set} | I_{LED} | 18.0 | 20.4 | 22.7 | mA | $R_{set} = 30\text{ k}\Omega$, $V_{LED} = 1\text{ V}$ |
| | | 45.7 | 49 | 52.3 | | $R_{set} = 12.7\text{ k}\Omega$, $V_{LED} = 1\text{ V}$ |
| | | 90 | 95 | 100 | | $R_{set} = 6.49\text{ k}\Omega$, $V_{LED} = 1\text{ V}$ |
| Driver saturation voltage | $V_{LED,sat}$ | - | - | 200 | mV | $I_{LED} = 50\text{ mA}$ |
| RS pin voltage | V_{RS} | 1.16 | 1.20 | 1.24 | V | $I_{RS} = 0\text{ }\mu\text{A}$ |
| | | 1.15 | 1.19 | 1.23 | | $I_{RS} = 200\text{ }\mu\text{A}$ |

Package dimensions

5 Package dimensions

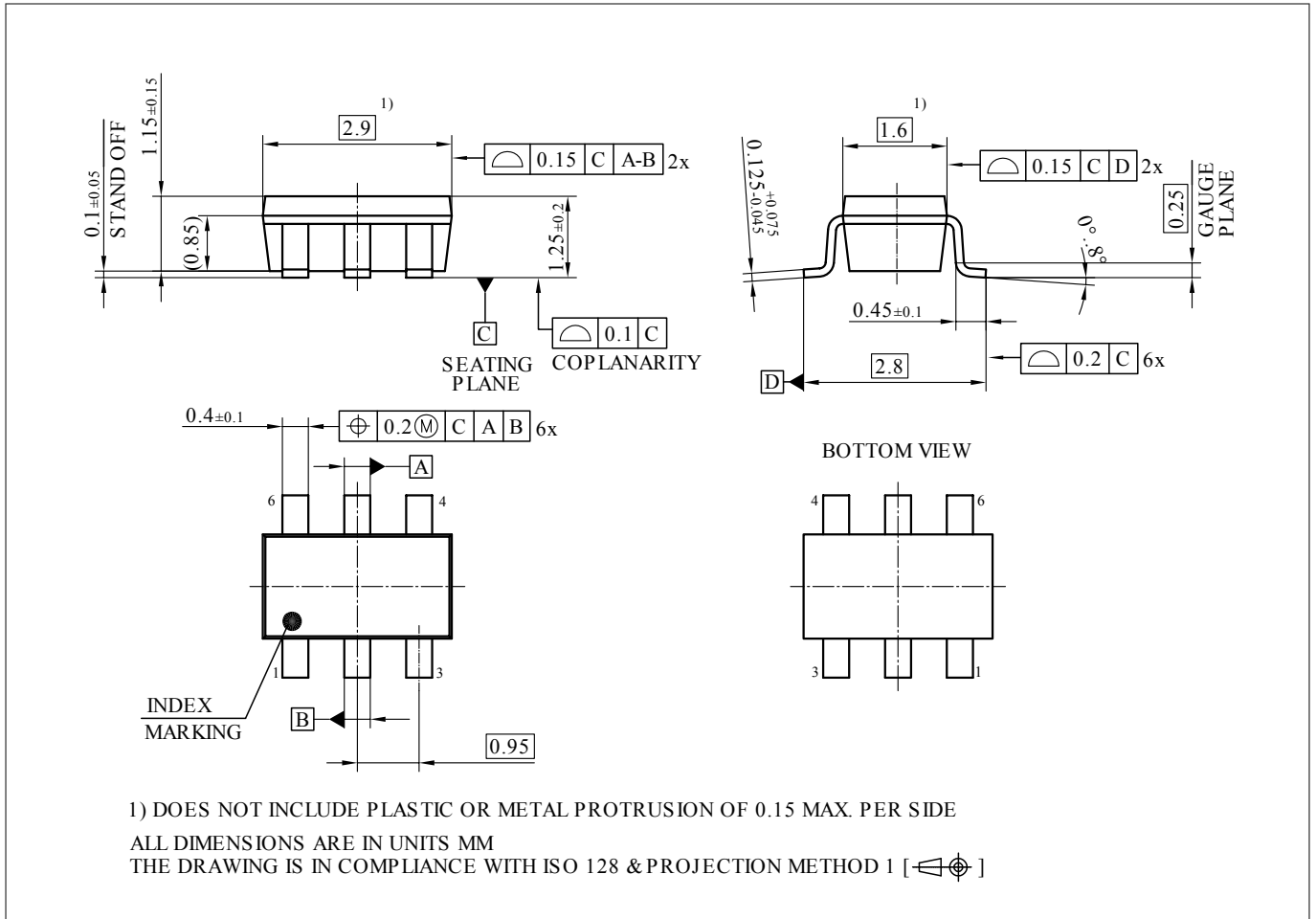


Figure 6 Package outline PG-SOT23-6-1

Package dimensions

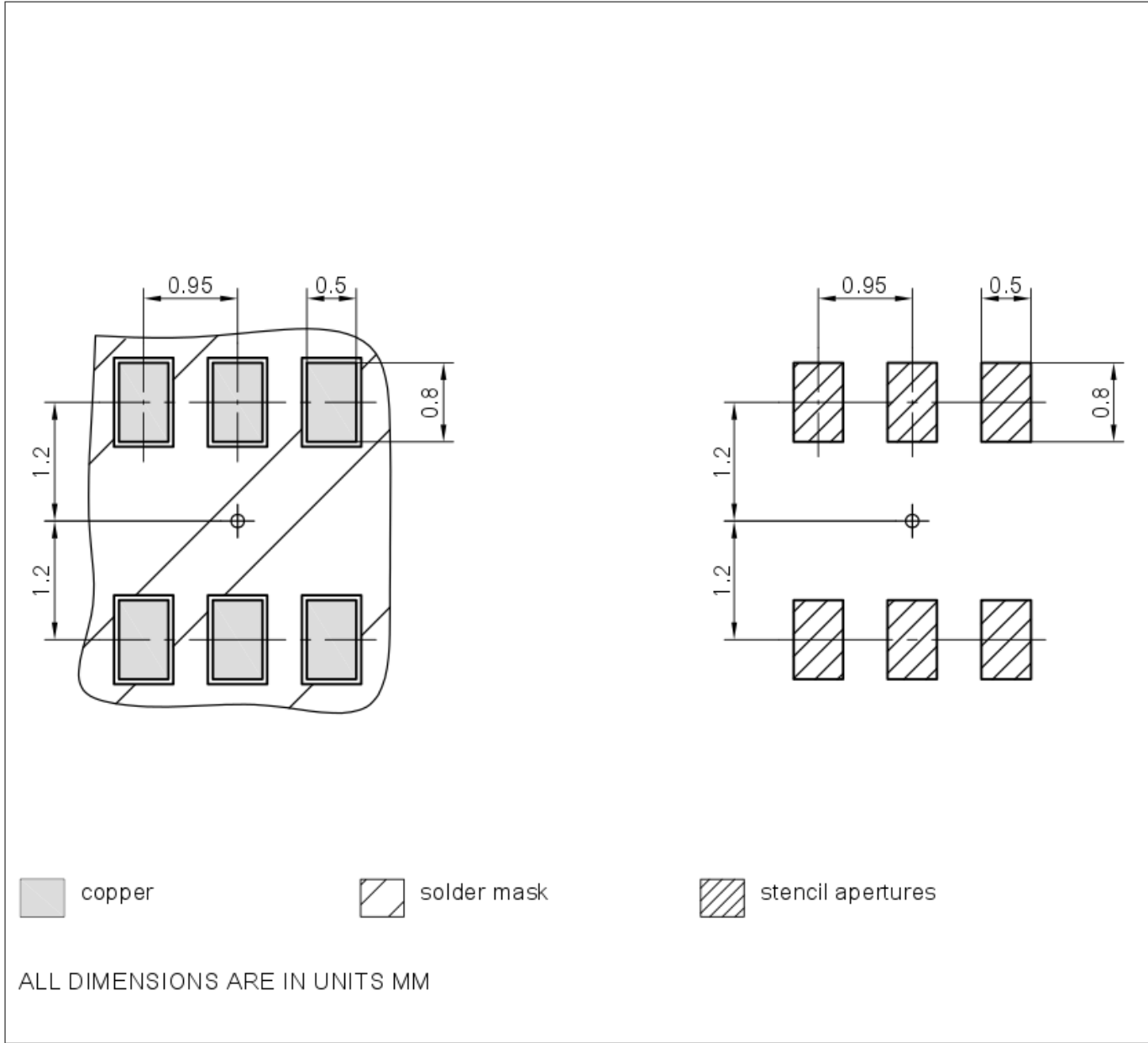


Figure 7 **Footprint PG-SOT23-6-1**

References

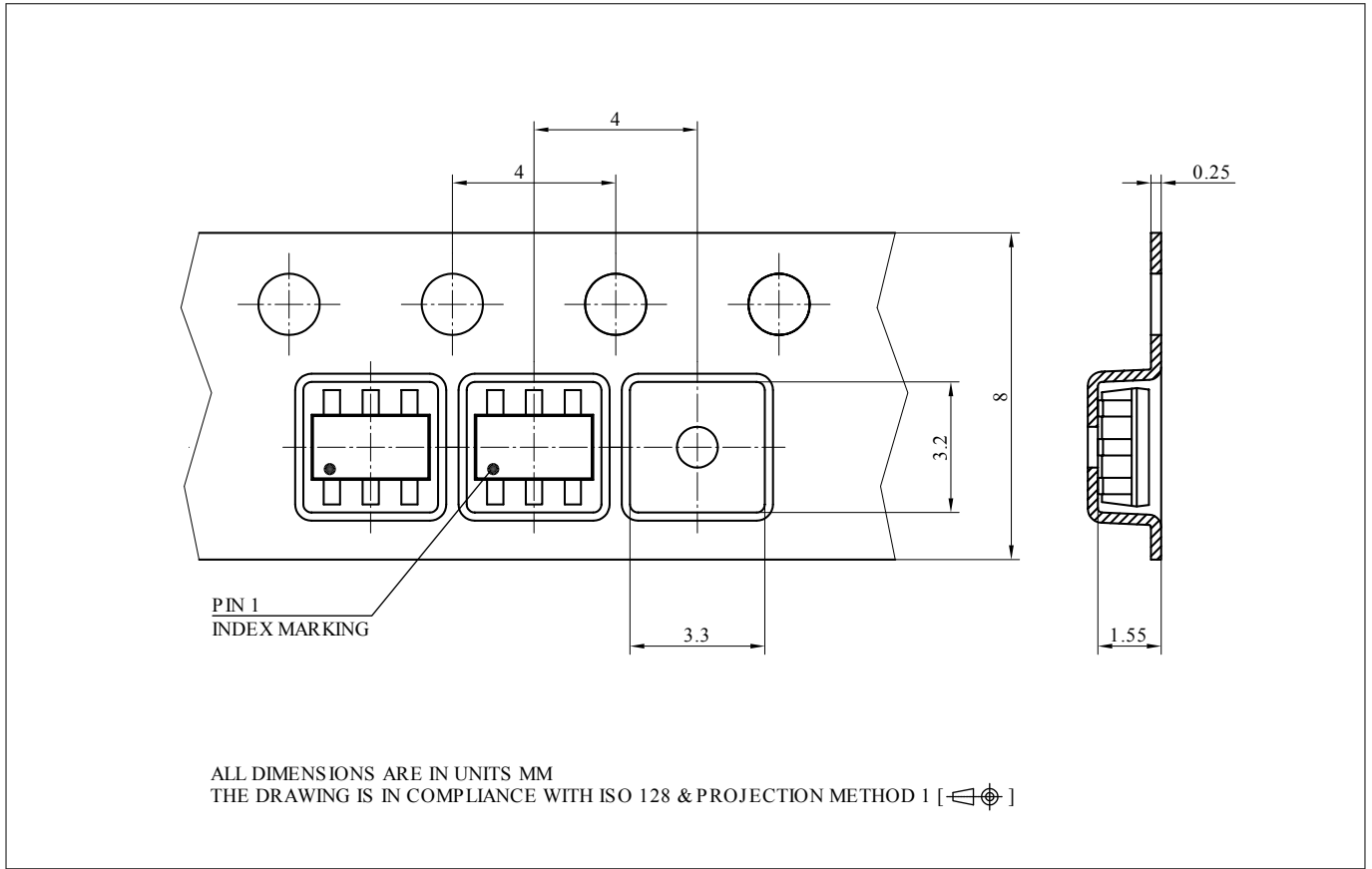


Figure 8 **Tape & Reel PG-SOT23-6-1**

6 **References**

Revision history

| Document version | Date of release | Description of changes |
|------------------|-----------------|--|
| 1.0 | 2017-10-09 | First version of data sheet |
| 1.1 | 2019-01-21 | ESD note added, electrical characteristics updated |

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