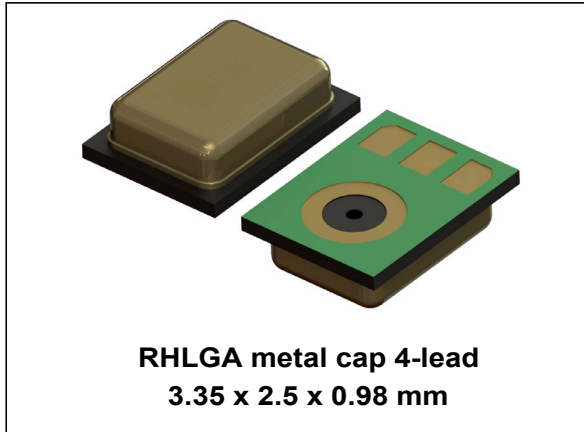


High-performance MEMS audio sensor: fully differential analog bottom-port microphone

Datasheet - production data



Description

The MP23AB01DM is a compact, low-power microphone built with a capacitive sensing element and an IC interface.

The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process to produce audio sensors.

The MP23AB01DM has an acoustic overload point of 130 dB SPL with a typical 64 dB signal-to-noise ratio.

The MP23AB01DM has fully differential output in order to minimize common-mode noise.

The sensitivity of MP23AB01DM is -38 dBV \pm 3 dB @ (0 dB = 1 V/Pa), 1 kHz.

The MP23AB01DM is available in a package compliant with reflow soldering and is guaranteed to operate over an extended temperature range from -40 °C to +85 °C.

Features

- Single supply voltage operation
- Fully differential output
- Omnidirectional sensitivity
- High signal-to-noise ratio
- High bandwidth
- High acoustic overload point
- Package compliant with reflow soldering
- High RF immunity

Table 1. Device summary

| Order code | Temperature range (°C) | Package | Packing |
|--------------|------------------------|------------------------|---------------|
| MP23AB01DM | -40 to +85 | (3.35 x 2.5 x 0.98) mm | Tray |
| MP23AB01DMTR | -40 to +85 | (3.35 x 2.5 x 0.98) mm | Tape and reel |

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1 Pin description

Figure 1. Pin connections

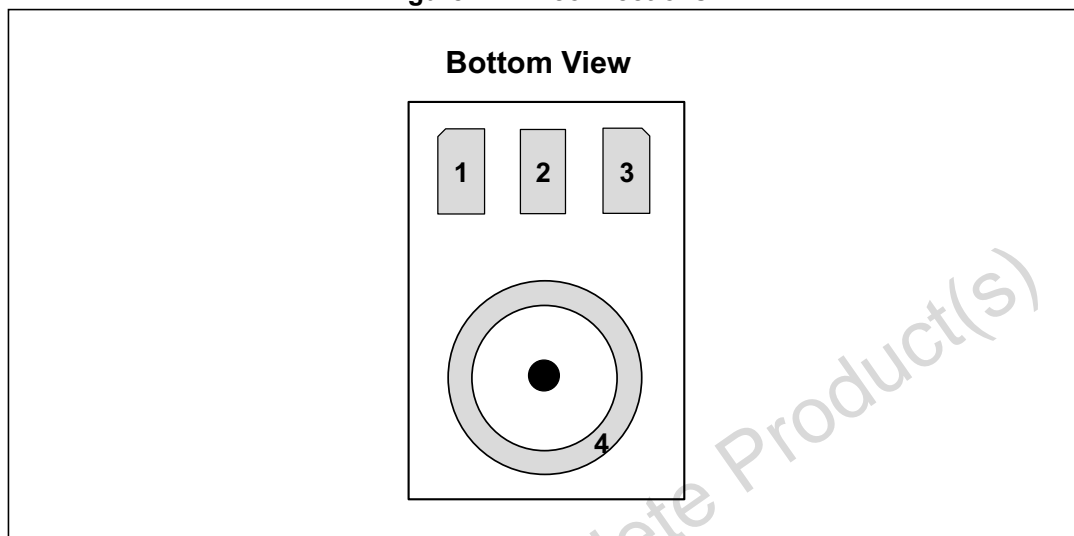


Table 2. Pin description

| Pin n° | Pin name | Function |
|--------|----------|------------------------|
| 1 | Vdd | Supply voltage |
| 2 | OUT- | Negative output signal |
| 3 | OUT+ | Positive output signal |
| 4 | Ground | Ground |

2 Acoustic and electrical specifications

2.1 Acoustic and electrical characteristics

The values listed in the tables below are specified for Vdd = 2.7 V, no load, Tamb = 25 °C unless otherwise specified.

Table 3. Acoustic and electrical characteristics

| Symbol | Parameter | Test condition | Min. | Typ. ⁽¹⁾ | Max. | Unit |
|--------|-------------------------------|---------------------------------------|------|---------------------|------|--------|
| Vdd | Supply voltage ⁽²⁾ | | 2.1 | | 3.6 | V |
| Idd | Current consumption | | | | 250 | μA |
| So | Sensitivity | @ 1 kHz (0dB = 1V/Pa) | -41 | -38 | -35 | dBV |
| SNR | Signal-to-noise ratio | A-weighted | | 64 | | dB(A) |
| PSR | Power Supply Rejection | 20 Hz - 20 kHz, 100 mVpp sine wave | | -85 | | dB |
| AOP | Acoustic Overload Point | | 125 | | 130 | dB SPL |
| Zout | Output Impedance | | | | 400 | Ω |
| Cload | Load capacitance | | | | 300 | pF |
| Rload | Load resistance | | 10 | | | kΩ |
| Top | Operating temperature range | | -40 | | +85 | °C |

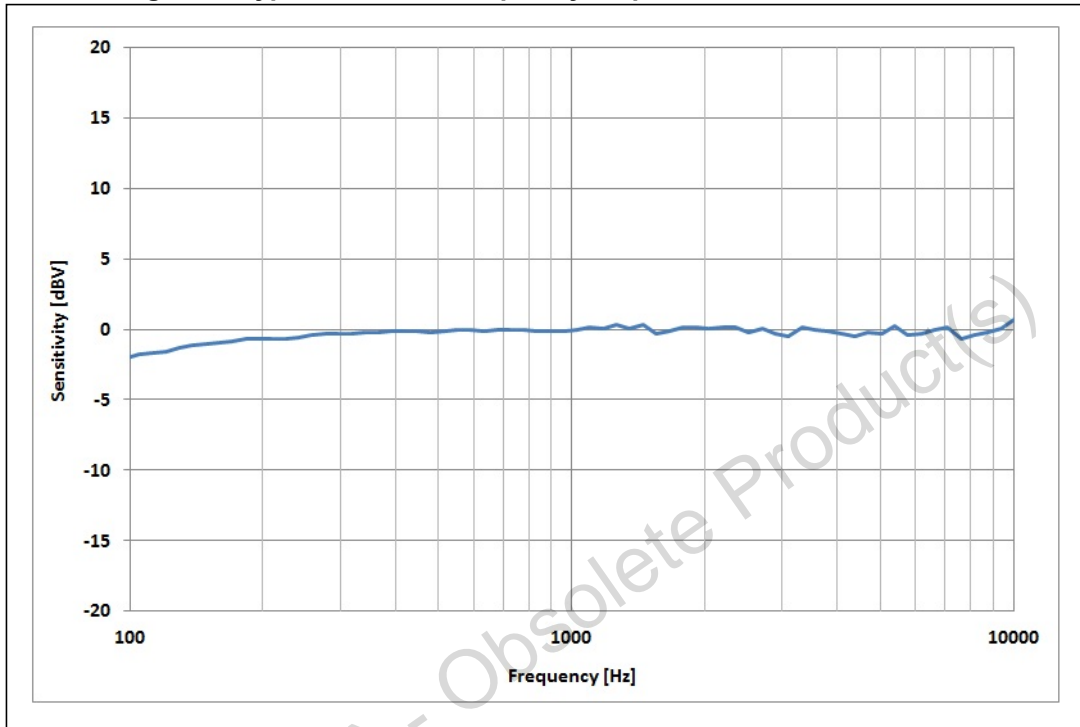
1. Typical specifications are not guaranteed
2. Minimum supply 2.1 V

Table 4. Typical distortion specifications at 1 kHz sine wave input

| Parameter | Test condition | Typ. value |
|-----------|----------------|------------|
| THD+N | 94 dB SPL | < 0.5% |
| | 120 dB SPL | < 4% |
| | 130 dB SPL | < 10% |

2.2 Frequency response

Figure 2. Typical free field frequency response normalized at 1 kHz



3 Absolute maximum ratings

Stresses above those listed as “Absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Table 5. Absolute maximum ratings

| Symbol | Ratings | Maximum value | Unit |
|------------------|---------------------------|---------------|------|
| V _{dd} | Supply voltage | -0.5 to 4.8 | V |
| T _{STG} | Storage temperature range | -40 to +105 | °C |



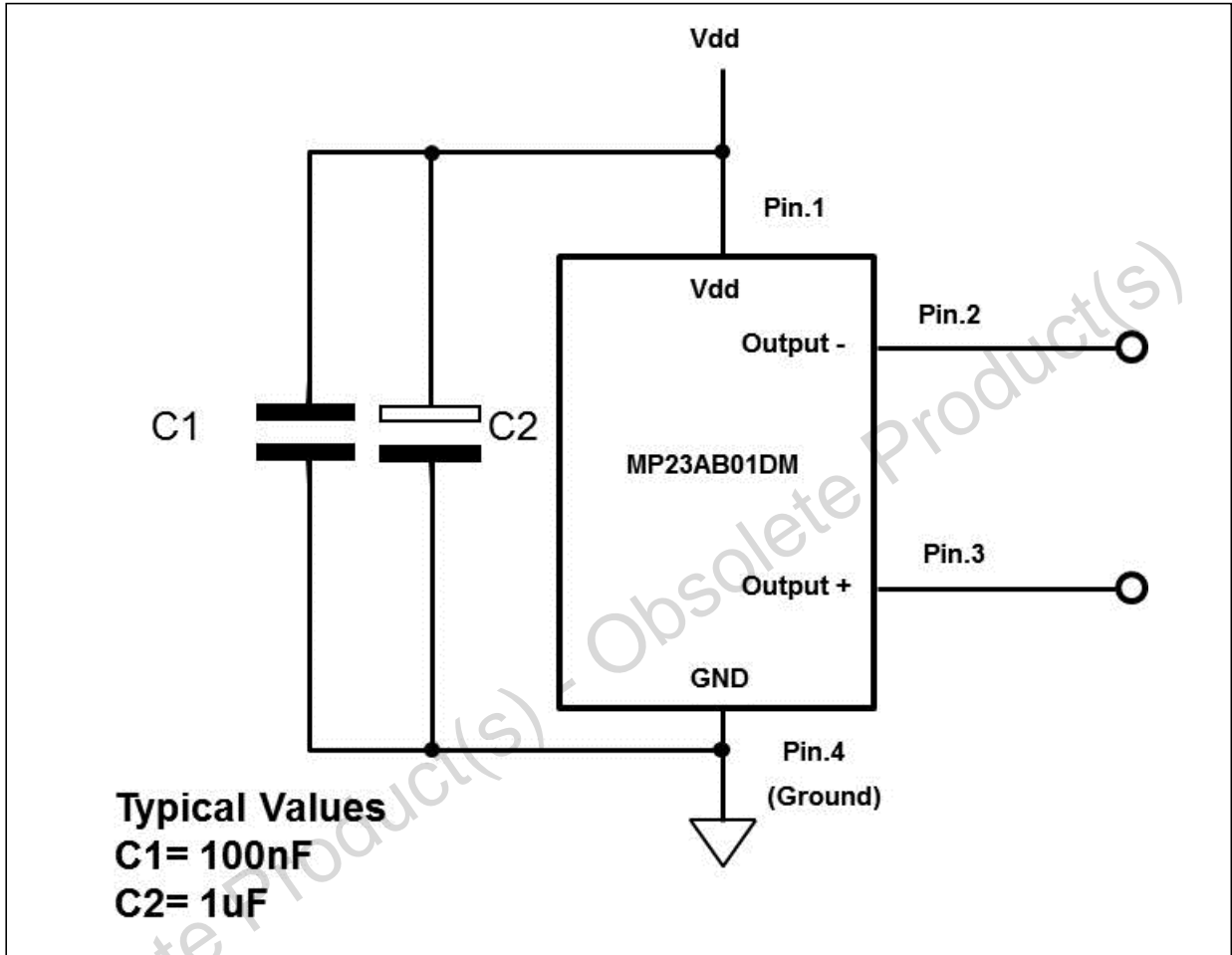
This device is sensitive to mechanical shock, improper handling can cause permanent damage to the part.



This device is sensitive to electrostatic discharge (ESD), improper handling can cause permanent damage to the part.

4 Application recommendations

Figure 3. MP23AB01DM electrical connections and external component values



5 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

5.1 Soldering information

Figure 4. Recommended soldering profile limits

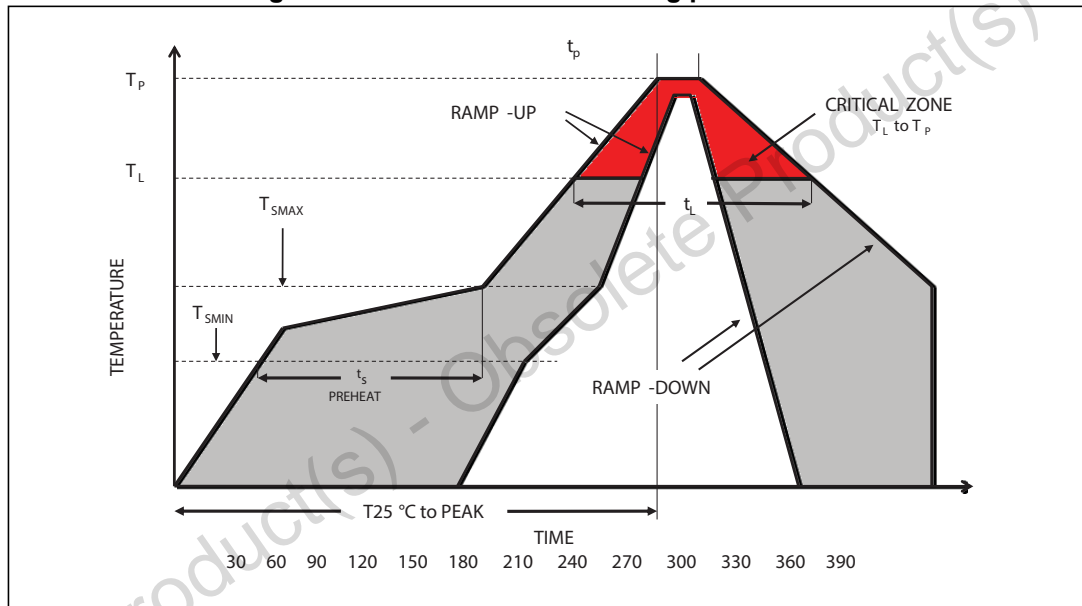


Table 6. Recommended soldering profile limits

| Description | Parameter | Pb free |
|---|---------------------|-------------------|
| Average ramp rate | T_L to T_P | 3 °C/sec max |
| Preheat | | |
| Minimum temperature | T_{SMIN} | 150 °C |
| Maximum temperature | T_{SMAX} | 200 °C |
| Time (T_{SMIN} to T_{SMAX}) | t_s | 60 sec to 120 sec |
| Ramp-up rate | T_{SMAX} to T_L | |
| Time maintained above liquidus temperature | t_L | 60 sec to 150 sec |
| Liquidus temperature | T_L | 217 °C |
| Peak temperature | T_P | 260 °C max |
| Time within 5 °C of actual peak temperature | | 20 sec to 40 sec |
| Ramp-down rate | | 6 °C/sec max |
| Time 25 °C ($t = 25$ °C) to peak temperature | | 8 minutes max |

5.2 RHLGA metal cap 4-lead package information

Figure 5. RHLGA metal cap 4-lead (3.35 x 2.5 x 0.98 mm) package outline

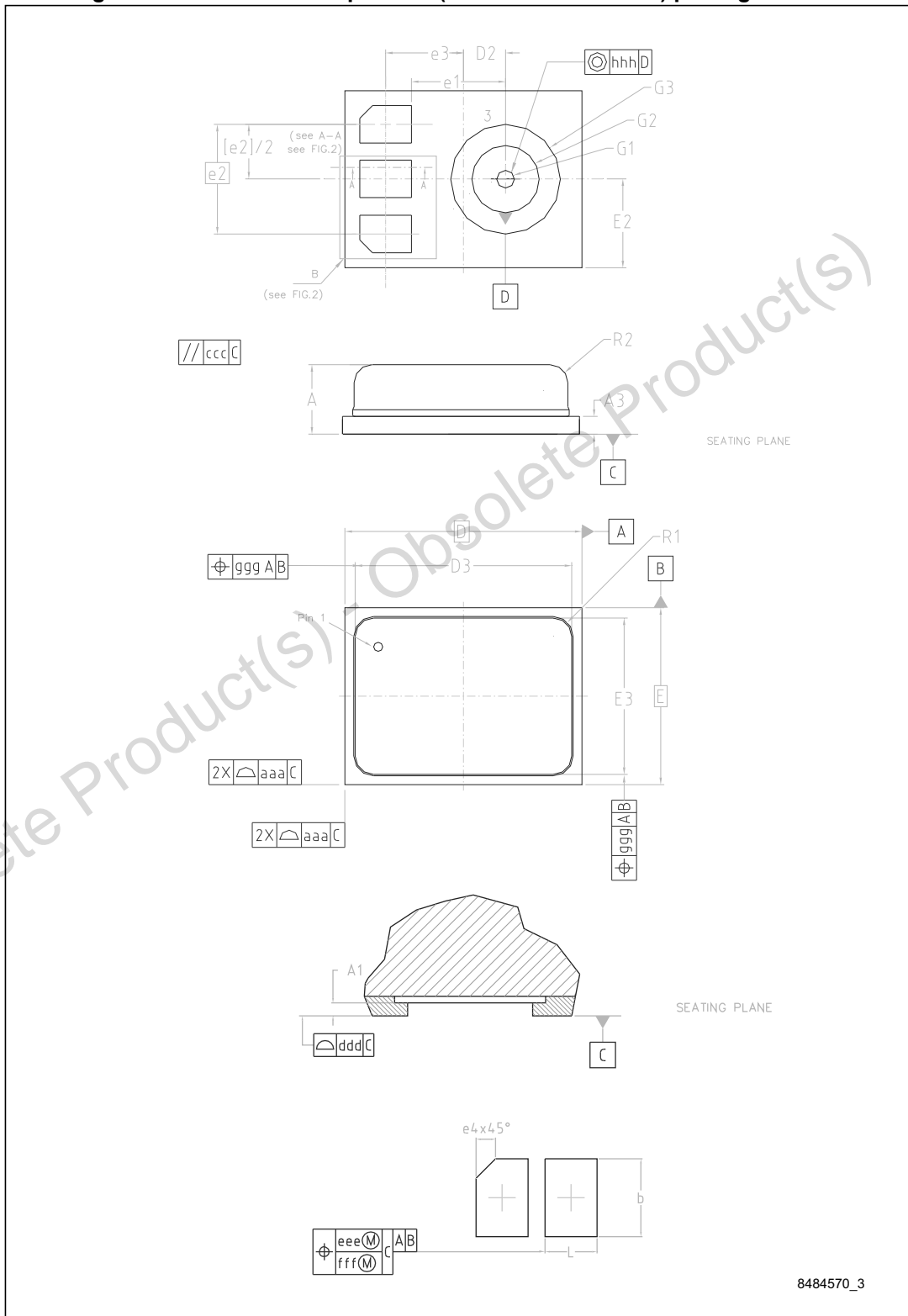
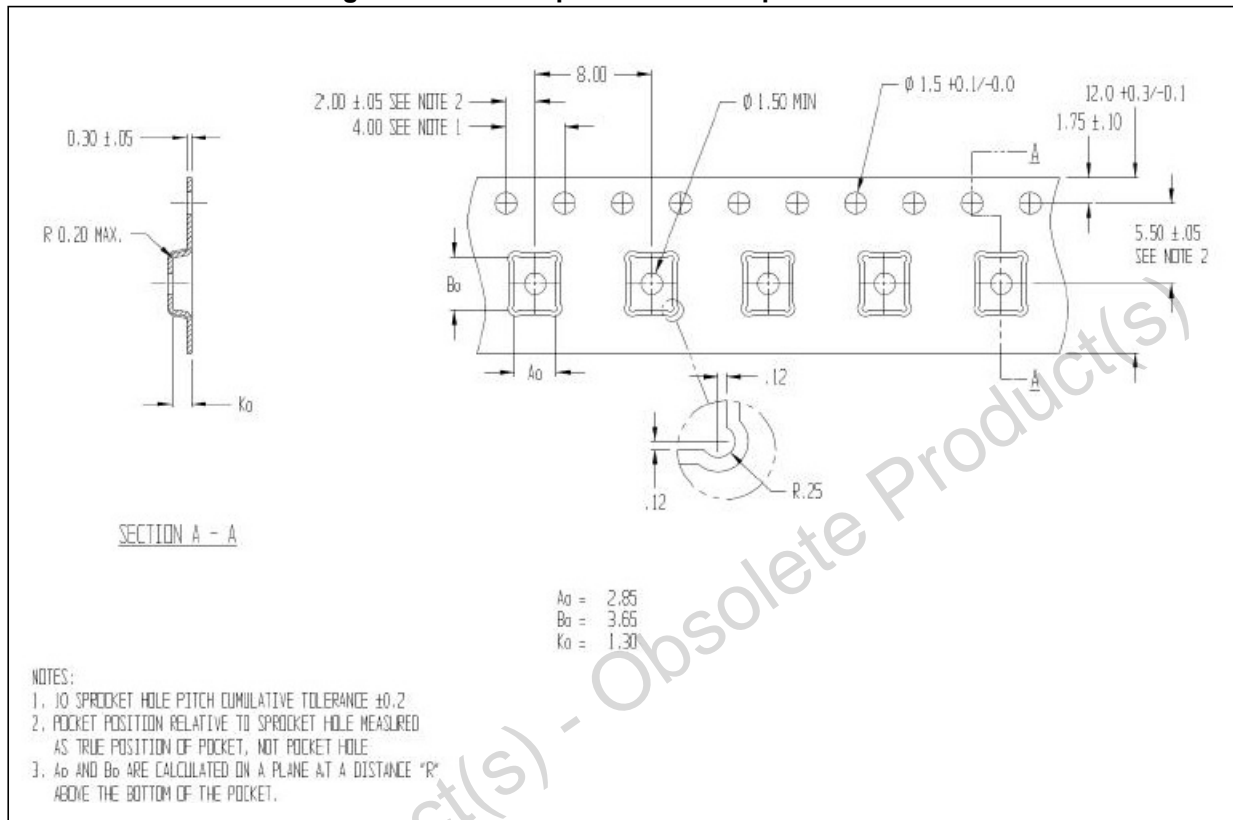


Table 7. RHLGA metal cap 4-lead (3.35 x 2.5 x 0.98 mm) package mechanical data

| Reference | Dimensions (mm) | | |
|-----------|-----------------|-------|-------|
| | Min. | Typ. | Max. |
| A | 0.88 | 0.98 | 1.08 |
| A1 | 0.00 | - | 0.025 |
| A3 | 0.21 | 0.25 | 0.29 |
| b | 0.63 | 0.73 | 0.83 |
| D | 3.25 | 3.35 | 3.45 |
| D2 | 0.495 | 0.595 | 0.695 |
| D3 | 2.94 | 3.04 | 3.14 |
| E | 2.4 | 2.5 | 2.6 |
| E3 | 2.09 | 2.19 | 2.29 |
| e1 | 1.18 | 1.33 | 1.48 |
| e2 | 1.41 | 1.56 | 1.71 |
| e3 | 0.95 | 1.1 | 1.25 |
| e4 | - | 0.18 | - |
| G1 | 0.20 | 0.25 | 0.30 |
| G2 | 0.8 | 0.95 | 1.1 |
| G3 | 1.4 | 1.55 | 1.7 |
| L | 0.43 | 0.53 | 0.63 |
| R1 | - | 0.28 | - |
| R2 | - | 0.25 | - |

5.3 RHLGA metal cap 4-lead packing information

Figure 6. Carrier tape mechanical specifications



6 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|-----------------|
| 19-Apr-2016 | 1 | Initial release |

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