

6MHz, Rail-to-Rail I/O CMOS Op Amps

Feature

- **Stable 6MHz GBWP with Low I_Q of Only 380 μ A Typical per Amplifier**
- **Offset Voltage: +/-2mV Maximum**
- **High Slew Rate: 3.7V/ μ s**
- **Input Bias Current: 1pA Typical**
- **CMRR/PSRR:100dB/100dB**
- **Settling time to 0.1% with 2V Step: 0.46 μ s**
- **Beyond the Rails Input Common-Mode Range**
- **Output Swing to within 10mV Typical of each Rail**
- **No Phase Reversal for Overdriven Inputs**
- **Supply Voltage Range: 2.5V to 5.5V**
- **-40 $^{\circ}$ C to 125 $^{\circ}$ C Operation Range**
- **Green, Popular Type Package**

Applications

- **Active Filters, ASIC Input or Output Amplifier**
- **Sensor Interface**
- **Smoke/Gas/Environment Sensors**
- **Portable Instruments and Mobile Device**
- **Audio Output**
- **PCMCIA Cards**
- **Battery or Solar Power Systems**
- **Medical Equipment**
- **Piezo Electrical Transducer Amplifier**

General Description

The HT2374B are CMOS op-amps with low offset, stable high frequency response, low power, low supply voltage, and rail-to-rail inputs and outputs.

HT2374B have a high gain-bandwidth product of 6MHz, 3.7V/ μ s slew rate while consuming only 380 μ A of supply current per amplifier. The maximum input offset voltage is 1mV for HT2374B. Beyond the rail input and rail-to-rail output characteristics allow the full power-supply voltage to be used for signal range. The operating range is from 2.5V to 5.5V.

This combination of features makes the HT2374B superior among rail-to-rail input/output CMOS op amps in its power class. It is specified over the extended industrial temperature rang -40 $^{\circ}$ C to +125 $^{\circ}$ C.

The HT2374B can be used as cost-effective plug-in replacements for many commercially available op amps to reduce power and improve input/output range and performance.

Absolute Maximum Ratings

(If out of these ratings, the filter may be fail or damaged)

Table 1

| Symbol | parameter | rating | units |
|------------------|-------------------------------------|----------|-------|
| VDD | Power supply | 6 | V |
| T _A | Operating ambient Temperature Range | -40~+125 | °C |
| T _{STG} | Storage Temperature | -65~+150 | °C |

Recommended Operating Conditions

Table 2

| Symbol | parameter | rating | units |
|----------------|-------------------------------------|----------|-------|
| VDD | Power supply | 2.5~5.5 | V |
| T _A | Operating ambient Temperature Range | -40~+125 | °C |

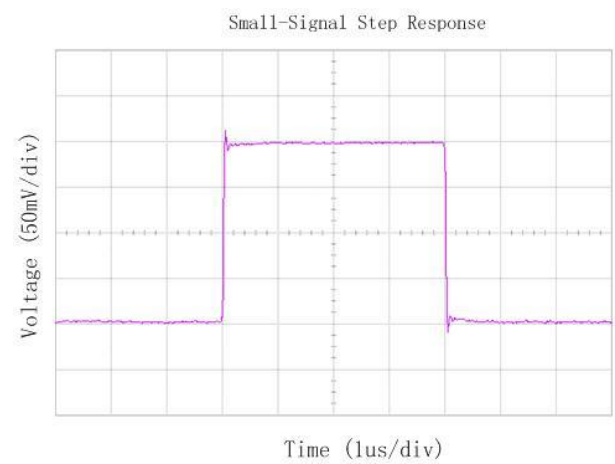
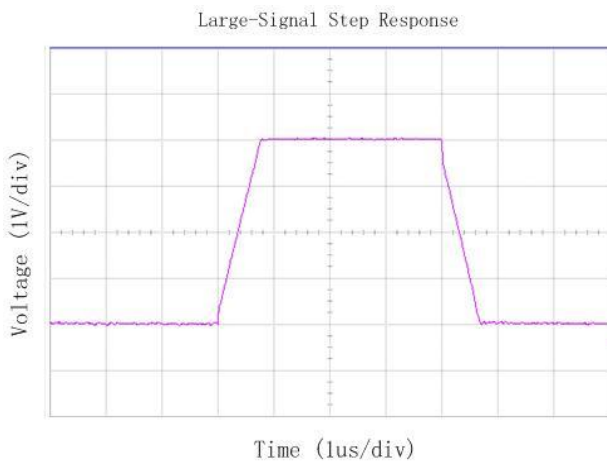
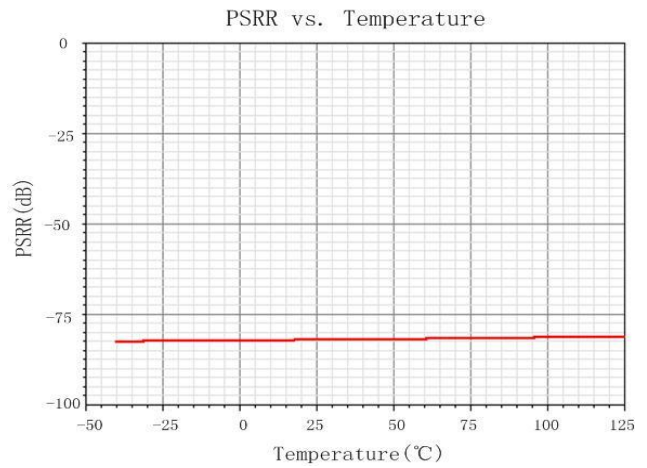
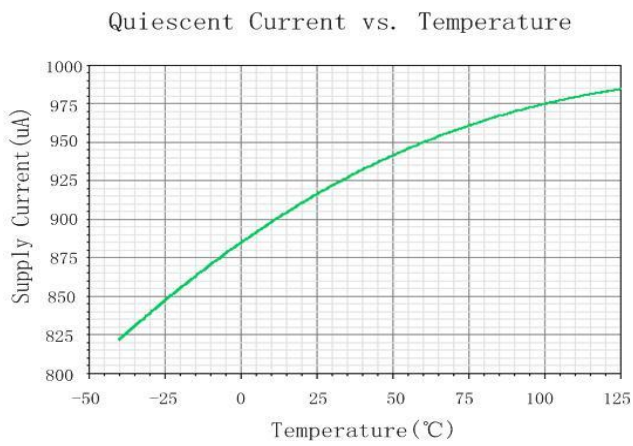
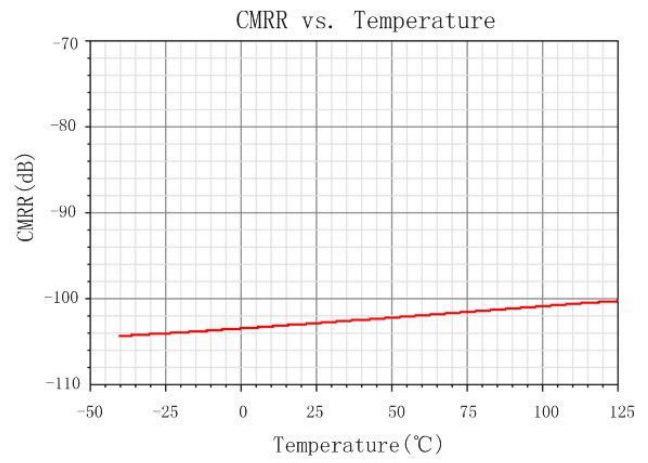
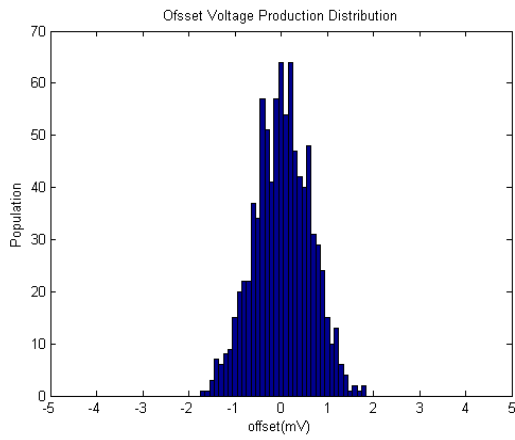
Electrical Characteristics

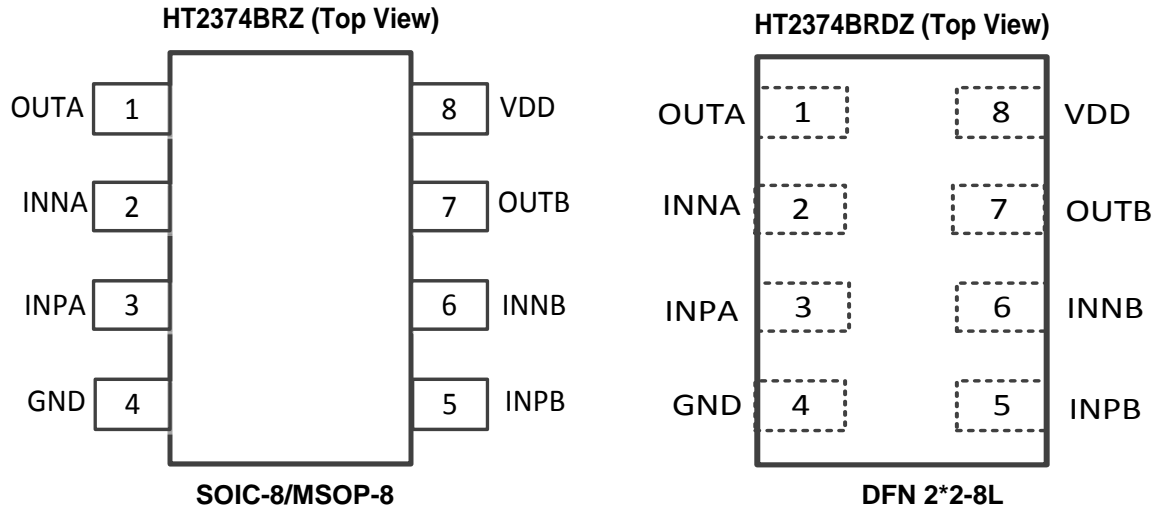
 Specifications are at $T_A=+27^{\circ}\text{C}$, $V_{DD}=5\text{V}$, $V_{CM}=V_{OUT}=V_{DD}/2$, $R_L=10\text{Kohm}$, $C_L=100\text{pF}$

| Symbol | Parameter | Spec | | | Units |
|--------------------|--|--------------|--------|---------|--------------------------------|
| | | Min | Typ | Max | |
| VCC | Operating Supply Voltage | 2.5 | 5 | 5.5 | V |
| V _{OS} | Input Offset Voltage | -1 | +/-2 | +4 | mV |
| V _{OS_TC} | Input Offset voltage Temp Drift | | 4 | | $\mu\text{V}/^{\circ}\text{C}$ |
| e _n | Input Voltage Noise Density: f=1KHz | | 25 | | nV/ $\sqrt{\text{Hz}}$ |
| C _{IN} | Input Capacitance | Differential | 1.5 | | pF |
| | | Common Mode | 3.0 | | |
| R _{IN} | Input Resistance | >100 | | | G Ω |
| I _Q | Quiescent Current per Amplifier | | 330 | 590 | μA |
| I _{out} | Output Current | | 50 | | mA |
| V _{in_cm} | Common mode Input voltage | 0 | | VDD-0.1 | V |
| V _{OL} | Output Voltage from supply Swing | | 10 | | mV |
| CMRR | Common Mode Rejection Ratio | | 100 | | dB |
| I _{sc} | Output short-circuit current | | 80 | | mA |
| PM | Phase Margin | | 65 | | $^{\circ}$ |
| GM | Gain Margin | | -10 | | dB |
| GBWP | Gain-Bandwidth Product | | 6 | | MHz |
| PSRR | Power supply rejection ratio: 1Hz 1KHz | | 100 | | dB |
| | | | 72 | | |
| t _s | Settling time, 1.5V to 3.5V, Unity Gain: 0.1% | | 0.46 | | μs |
| SR | Slew Rate | | 3.7 | | μs |
| THD+Noise | Total Harmonic Distortion and Noise: f=1KHz | | 0.0007 | | % |

Typical performance characteristics

At $T_A=+27^\circ\text{C}$, $V_{DD}=5\text{V}$, $V_{CM}=V_{OUT}=V_{DD}/2$, $R_L=10\text{Kohm}$, $C_L=100\text{pF}$

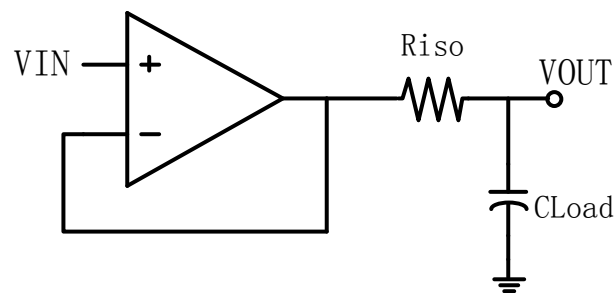


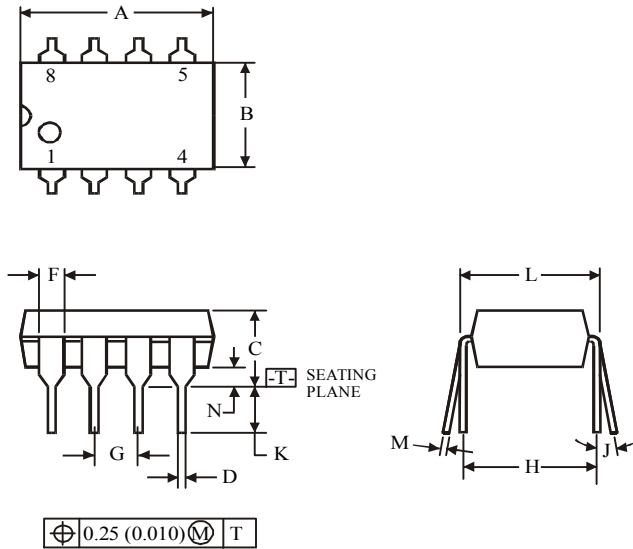
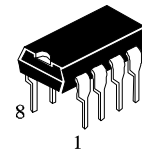
PIN Definition


| Name | I/O | Analog/Digital | Description |
|------|--------|----------------|---|
| INP | I | A | Non-Inverting Input of Amplifier. Voltage range of this pin can go from 0 to VDD. |
| GND | GROUND | GROUND | Ground pin. Connect to the most negative supply, ALL GND pads are connected on die. |
| INN | I | A | Inverting Input of Amplifier. This pin has same voltage range as INP. |
| OUT | O | A | Amplifier Output. The voltage range extends to within millivolts of each supply rail. |
| VDD | POWER | POWER | Power supply (5V) ,connect to positive voltage supply |

Application Circuits

The HT2374B of operational amplifier can operate with power supply voltages from 2.5V to 5.5V. Each amplifier draws only 380uA quiescent current. The HT2374B can driver larger capacitive loads in unity-gain without oscillation. The unity-gain follower (buffer) is the most sensitive configuration to capacitive loading. When driving large capacitive loads with the HT2374B OPA, a small series resistor at the output improves the feedback loop's phase margin and stability by making the output load resistive at higher frequencies.

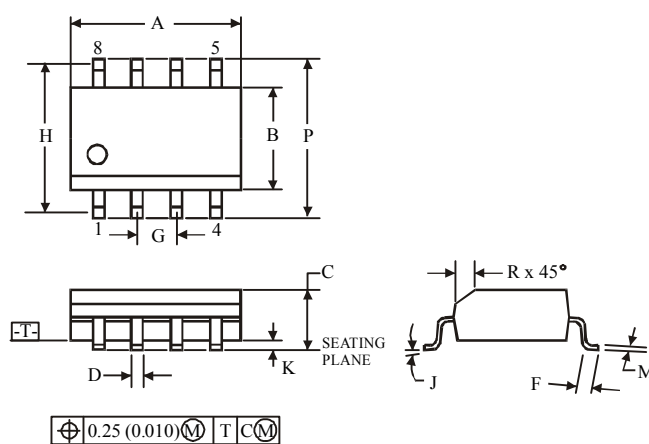
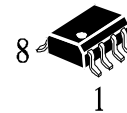


(DIP8)


| Symbol | Dimension, mm | |
|--------|---------------|-------|
| | MIN | MAX |
| A | 8.51 | 10.16 |
| B | 6.1 | 7.11 |
| C | | 5.33 |
| D | 0.36 | 0.56 |
| F | 1.14 | 1.78 |
| G | 2.54 | |
| H | 7.62 | |
| J | 0° | 10° |
| K | 2.92 | 3.81 |
| L | 7.62 | 8.26 |
| M | 0.2 | 0.36 |
| N | 0.38 | |

NOTES:

- Dimensions "A", "B" do not include mold flash or protrusions.
Maximum mold flash or protrusions 0.25 mm (0.010) per side.

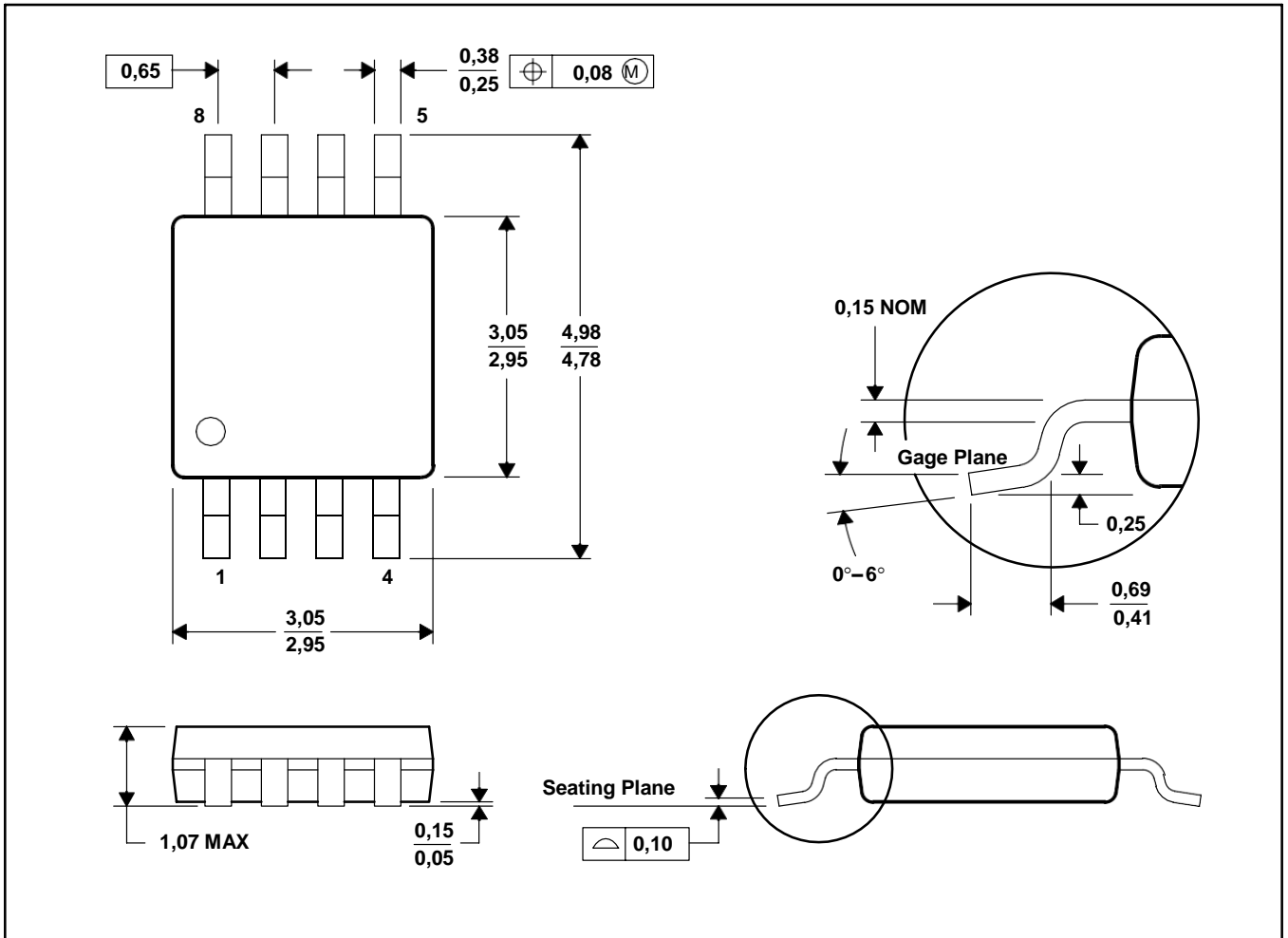
(SOP8)


| Symbol | Dimension, mm | |
|--------|---------------|------|
| | MIN | MAX |
| A | 4.8 | 5 |
| B | 3.8 | 4 |
| C | 1.35 | 1.75 |
| D | 0.33 | 0.51 |
| F | 0.4 | 1.27 |
| G | 1.27 | |
| H | 5.72 | |
| J | 0° | 8° |
| K | 0.1 | 0.25 |
| M | 0.19 | 0.25 |
| P | 5.8 | 6.2 |
| R | 0.25 | 0.5 |

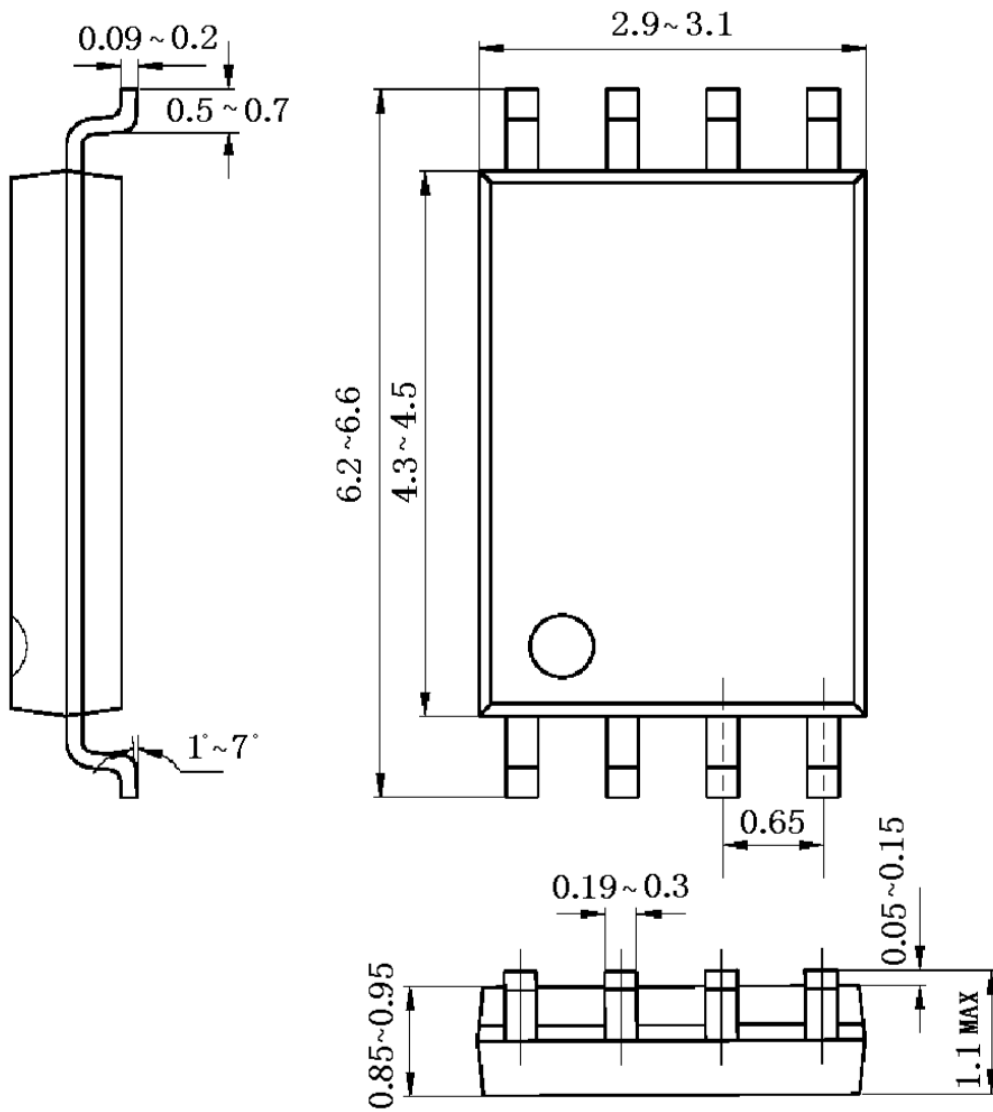
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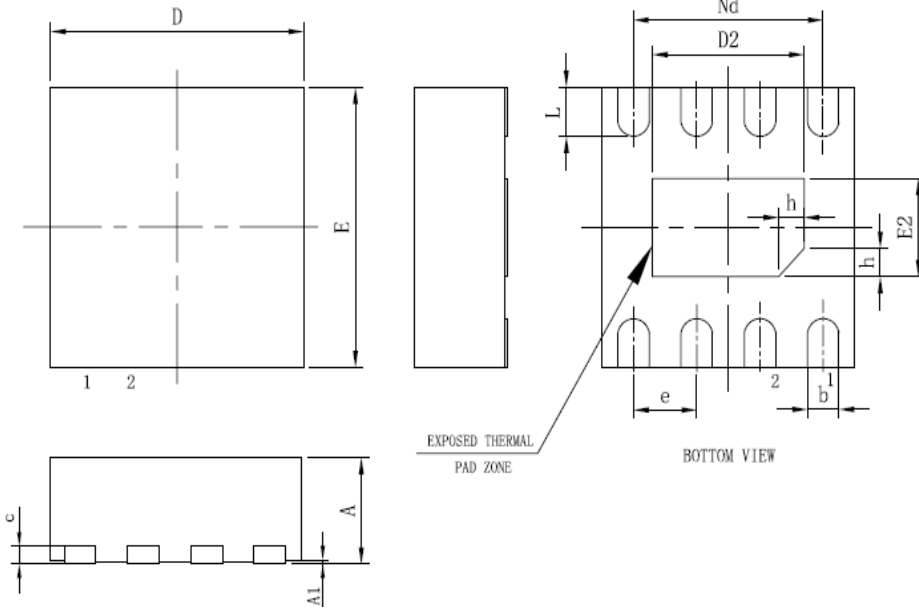
- Dimensions A and B do not include mold flash or protrusion.
- Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B - 0.25 mm (0.010) per side.

MSOP8



TSSOP8



DFN-8L


| SYMBOL | MILLIMETER | | |
|------------|------------|------|------|
| | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| A1 | — | 0.02 | 0.05 |
| b | 0.18 | 0.25 | 0.30 |
| c | 0.18 | 0.20 | 0.25 |
| D | 1.90 | 2.00 | 2.10 |
| D2 | 1.10 | 1.20 | 1.30 |
| e | 0.50BSC | | |
| Nd | 1.50BSC | | |
| E | 1.90 | 2.00 | 2.10 |
| E2 | 0.60 | 0.70 | 0.80 |
| L | 0.30 | 0.35 | 0.40 |
| h | 0.15 | 0.20 | 0.25 |
| 载体尺寸 (mil) | 63X39 | | |