



SGM8556

Single-Supply, Rail-to-Rail I/O Precision Operational Amplifier

PRODUCT DESCRIPTION

The SGM8556 is a dual precision operational amplifier which has low input offset voltage, low bias current, very low input voltage noise and very high open loop gain. It is guaranteed to operate from 2.7V to 5.5V single supply.

The SGM8556 provides benefits previously found only in expensive auto-zeroing or chopper-stabilized amplifiers. This amplifier combines low cost with high accuracy and low noise. No external capacitor is required. In addition, the SGM8556 reduces the digital switching noise found in most chopper-stabilized amplifiers.

The SGM8556 is suited for applications where error sources cannot be tolerated. With precision DC specifications and very low noise, it is ideal for position and pressure sensors, bridge sensors, medical equipment and other high accuracy applications with very low error budgets.

The SGM8556 is specified for the extended industrial/automotive (-40°C to +125°C) temperature range. The SGM8556 is offered in Green SOP8 and MSOP8 packages.

FEATURES

- **Low 0Hz-10Hz Voltage Noise**
- **Wide Bandwidth: 4MHz (TYP)**
- **Low Offset Voltage: 3 μ V (TYP)**
- **Rail-to-Rail Input and Output Swing**
- **2.7V to 5.5V Single Supply Operation**
- **Voltage Gain: 150dB (TYP)**
- **PSRR: 115dB (TYP)**
- **CMRR: 110dB (TYP)**
- **Low Supply Current: 900 μ A/per Channel**
- **Overload Recovery Time: 45 μ s**
- **No External Capacitors Required**
- **-40°C to +125°C Operating Temperature Range**
- **Green SOP8 and MSOP8 Packages**

APPLICATIONS

Temperature Measurements
Pressure Sensors
Precision Current Sensing
Electronic Scales
Strain Gage Amplifiers
Medical Instrumentation
Thermocouple Amplifiers
Handheld Test Equipment

Single-Supply, Rail-to-Rail I/O Precision Operational Amplifier

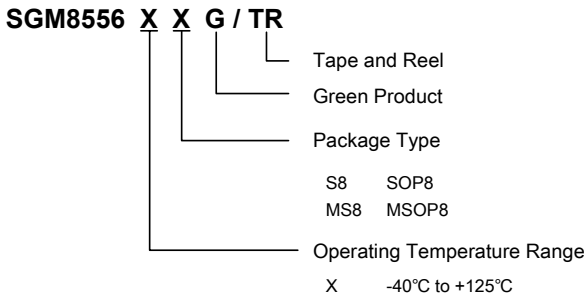
SGM8556

PACKAGE/ORDERING INFORMATION

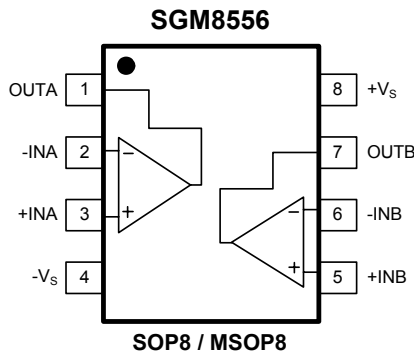
| MODEL | ORDER NUMBER | PACKAGE DESCRIPTION | PACKAGE OPTION | MARKING INFORMATION |
|---------|-----------------|---------------------|---------------------|---------------------|
| SGM8556 | SGM8556XS8G/TR | SOP8 | Tape and Reel, 2500 | SGM8556XS8 |
| | SGM8556XMS8G/TR | MSOP8 | Tape and Reel, 3000 | SGM8556XMS8 |

Note 1: Order number is defined as the follow:

ORDER NUMBER



PIN CONFIGURATIONS (Top View)



CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ABSOLUTE MAXIMUM RATINGS

| | |
|---|---------------------------|
| Supply Voltage | 6V |
| Input Voltage | $-V_S$ to $(+V_S) + 0.1V$ |
| Differential Input Voltage | -5V to 5V |
| Storage Temperature Range | -65°C to +150°C |
| Junction Temperature | 150°C |
| Operating Temperature Range | -40°C to +125°C |
| Package Thermal Resistance @ $T_A = 25^\circ C$ | |
| SOP8, θ_{JA} | °C/W |
| MSOP8, θ_{JA} | °C/W |
| Lead Temperature Range (Soldering 10 sec) | |
| | 260°C |
| ESD Susceptibility | |
| HBM | V |
| MM | V |

NOTES

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

ELECTRICAL CHARACTERISTICS(V_S = +5V, V_{CM} = +2.5V, V_O = +2.5V, T_A = +25°C, unless otherwise noted.)

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|--|-----|-------|-----|-------------------|
| INPUT CHARACTERISTICS | | | | | |
| Input Offset Voltage (V _{OS}) | | | 3 | 10 | μV |
| Input Bias Current (I _B) | | | 650 | | pA |
| Input Offset Current (I _{OS}) | | | 25 | | pA |
| Input Voltage Range | | 0 | | 5 | V |
| Common-Mode Rejection Ratio (CMRR) | V _{CM} = 0V to 5V | | 110 | | dB |
| Large Signal Voltage Gain (A _{VO}) | R _L = 10kΩ, V _O = 0.3V to 4.7V | | 150 | | dB |
| Input Offset Voltage Drift (ΔV _{OS} /ΔT) | | | 20 | | nV/°C |
| OUTPUT CHARACTERISTICS | | | | | |
| Output Voltage High (V _{OH}) | R _L = 100kΩ to -V _S | | 4.996 | | V |
| | R _L = 10kΩ to -V _S | | 4.992 | | V |
| Output Voltage Low (V _{OL}) | R _L = 100kΩ to +V _S | | 3 | | mV |
| | R _L = 10kΩ to +V _S | | 6 | | mV |
| Short Circuit Limit (I _{SC}) | V _O = 5V, R _L = 10Ω to -V _S | | 45 | | mA |
| Output Current (I _O) | | | 30 | | mA |
| POWER SUPPLY | | | | | |
| Power Supply Rejection Ratio (PSRR) | V _S = 2.7V to 5.5V | | 115 | | dB |
| Quiescent Current /per Channel (I _Q) | V _O = 0V, R _L = 0Ω | | 900 | | μA |
| DYNAMIC PERFORMANCE | | | | | |
| Gain-Bandwidth Product (GBP) | G = +100 | | 4 | | MHz |
| Slew Rate (SR) | G = +1, R _L = 10kΩ, 2V Output Step | | 2.2 | | V/μs |
| Overload Recovery Time | | | 45 | | μs |
| NOISE PERFORMANCE | | | | | |
| Voltage Noise (e _n p-p) | 0Hz to 10Hz | | 0.5 | | μV _{P-P} |
| Voltage Noise Density (e _n) | f = 1kHz | | 32 | | nV/√Hz |

Specifications subject to changes without notice.

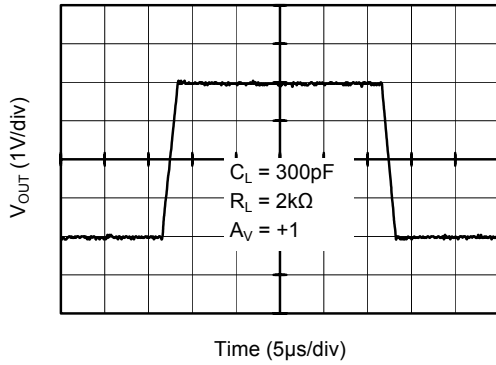
ELECTRICAL CHARACTERISTICS(V_S = +2.7V, V_{CM} = +1.35V, V_O = +1.35V, T_A = +25°C, unless otherwise noted.)

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|--|-----|-------|-----|-------------------|
| INPUT CHARACTERISTICS | | | | | |
| Input Offset Voltage (V _{OS}) | | | 3 | 10 | μV |
| Input Bias Current (I _B) | | | 350 | | pA |
| Input Offset Current (I _{OS}) | | | 25 | | pA |
| Input Voltage Range | | 0 | | 2.7 | V |
| Common-Mode Rejection Ratio (CMRR) | V _{CM} = 0V to 2.7V | | 110 | | dB |
| Large Signal Voltage Gain (A _{VO}) | R _L = 10kΩ, V _O = 0.3V to 2.4V | | 145 | | dB |
| Input Offset Voltage Drift (ΔV _{OS} /ΔT) | | | 20 | | nV/°C |
| OUTPUT CHARACTERISTICS | | | | | |
| Output Voltage High (V _{OH}) | R _L = 100kΩ to -V _S | | 2.699 | | V |
| | R _L = 10kΩ to -V _S | | 2.697 | | V |
| Output Voltage Low (V _{OL}) | R _L = 100kΩ to +V _S | | 1 | | mV |
| | R _L = 10kΩ to +V _S | | 3 | | mV |
| Short Circuit Limit (I _{SC}) | V _O = 2.7V, R _L = 10Ω to -V _S | | 30 | | mA |
| Output Current (I _O) | | | 30 | | mA |
| POWER SUPPLY | | | | | |
| Power Supply Rejection Ratio (PSRR) | V _S = 2.7V to 5.5V | | 115 | | dB |
| Quiescent Current/per Channel (I _Q) | V _O = 0V, R _L = 0Ω | | 900 | | μA |
| DYNAMIC PERFORMANCE | | | | | |
| Gain-Bandwidth Product (GBP) | A _V = +100 | | 4 | | MHz |
| Slew Rate (SR) | A _V = +1, R _L = 10kΩ, 2V Output Step | | 2.22 | | V/μs |
| Overload Recovery Time | | | 15 | | μs |
| NOISE PERFORMANCE | | | | | |
| Voltage Noise (e _n p-p) | 0Hz to 10Hz | | 0.6 | | μV _{P-P} |
| Voltage Noise Density (e _n) | f = 1kHz | | 37 | | nV/√Hz |

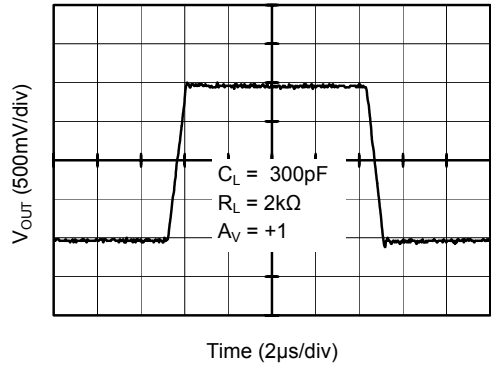
Specifications subject to changes without notice.

TYPICAL PERFORMANCE CHARACTERISTICS

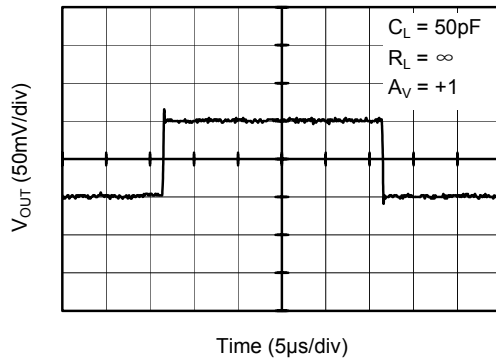
Large Signal Transient Response at +5V



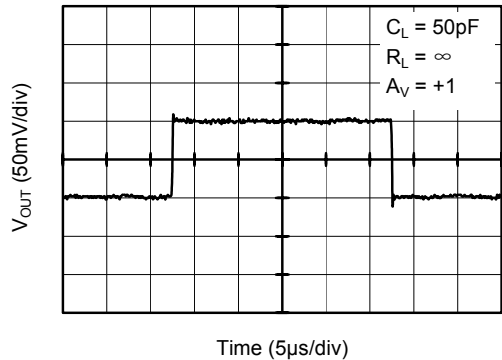
Large Signal Transient Response at +2.7V



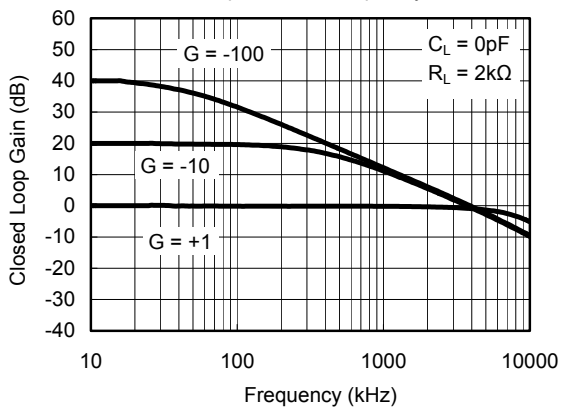
Small Signal Transient Response at +5V



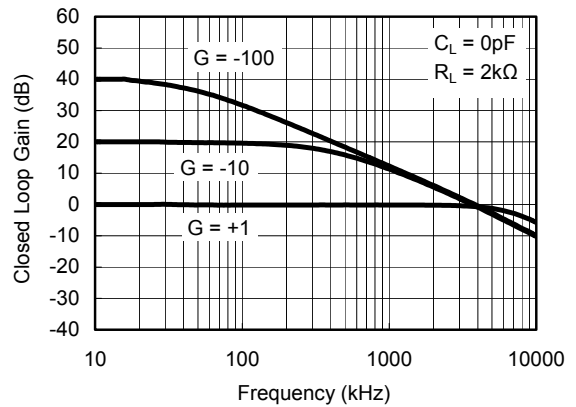
Small Signal Transient Response at +2.7V



Closed Loop Gain vs. Frequency at +5V

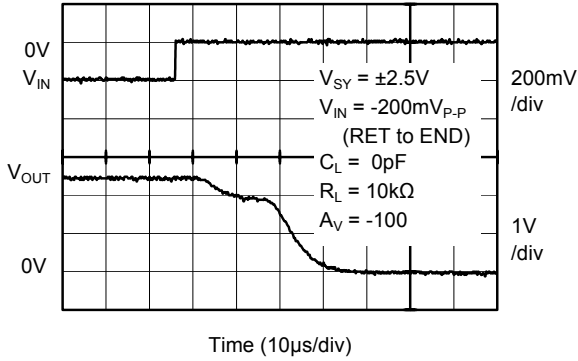


Closed Loop Gain vs. Frequency at +2.7V

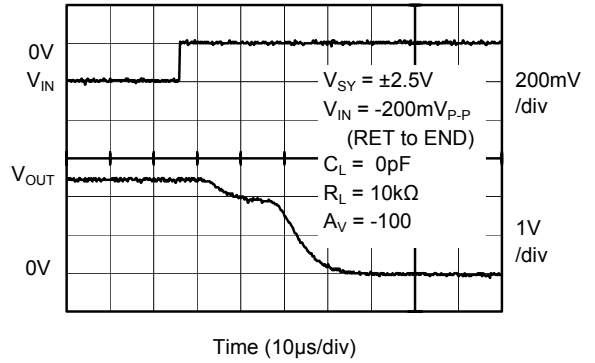


TYPICAL PERFORMANCE CHARACTERISTICS

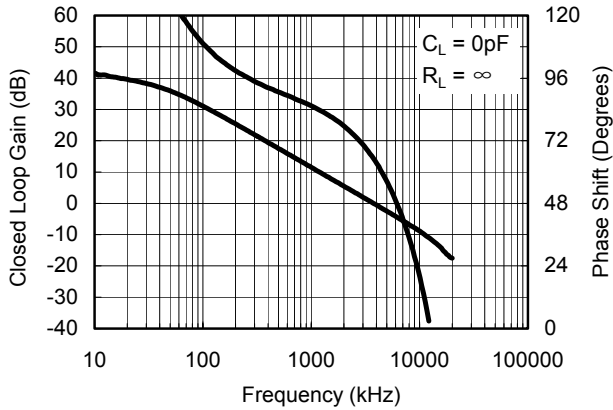
Positive Overvoltage Recovery



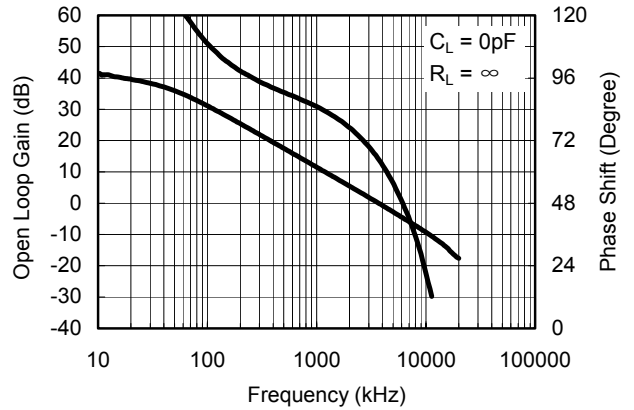
Positive Overvoltage Recovery



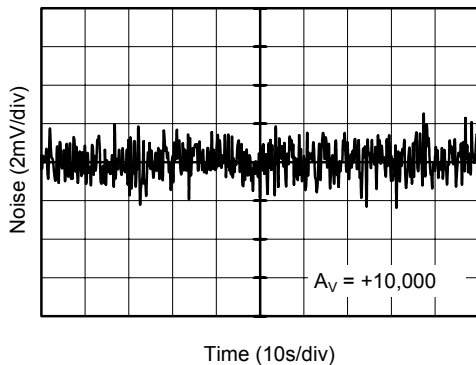
Open Loop Gain vs. Frequency at +5V



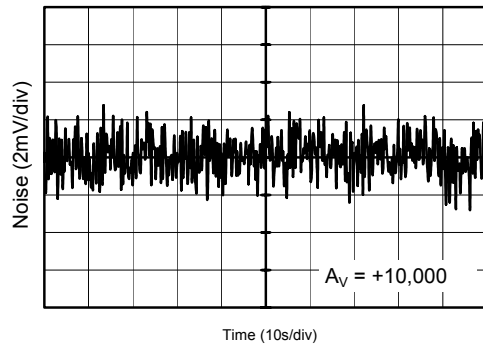
Open Loop Gain vs. Frequency at +2.7V



0.1Hz to 10Hz Noise at +5V

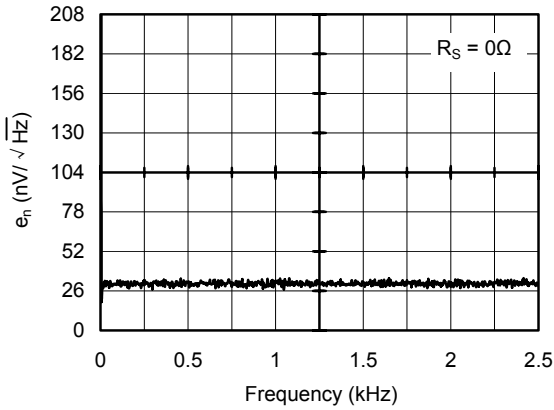


0.1Hz to 10Hz Noise at +2.7V

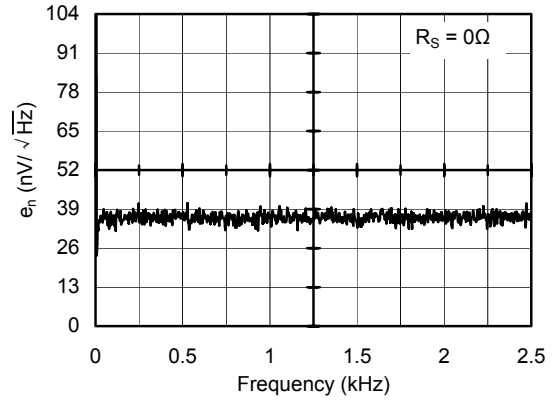


TYPICAL PERFORMANCE CHARACTERISTICS

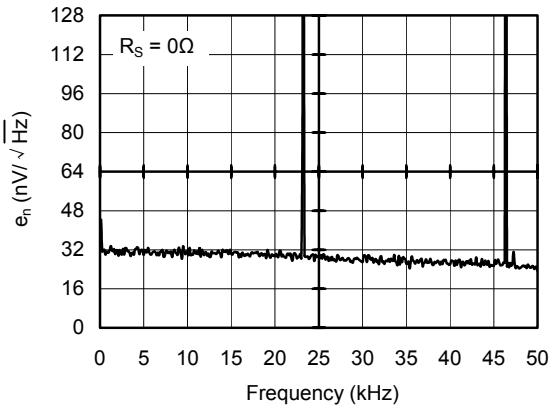
Voltage Noise Density at +5V
from 0Hz to 2.5kHz



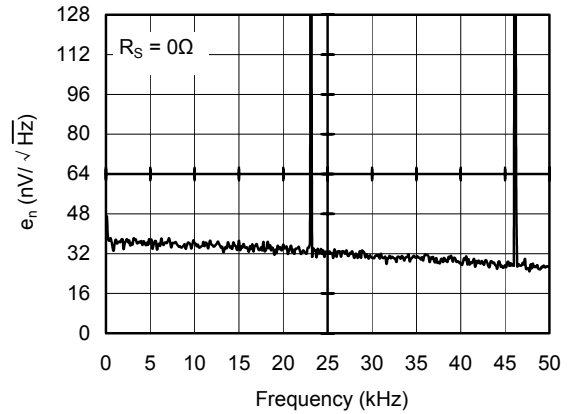
Voltage Noise Density at +2.7V
from 0Hz to 2.5kHz



Voltage Noise Density at +5V
from 0Hz to 25kHz

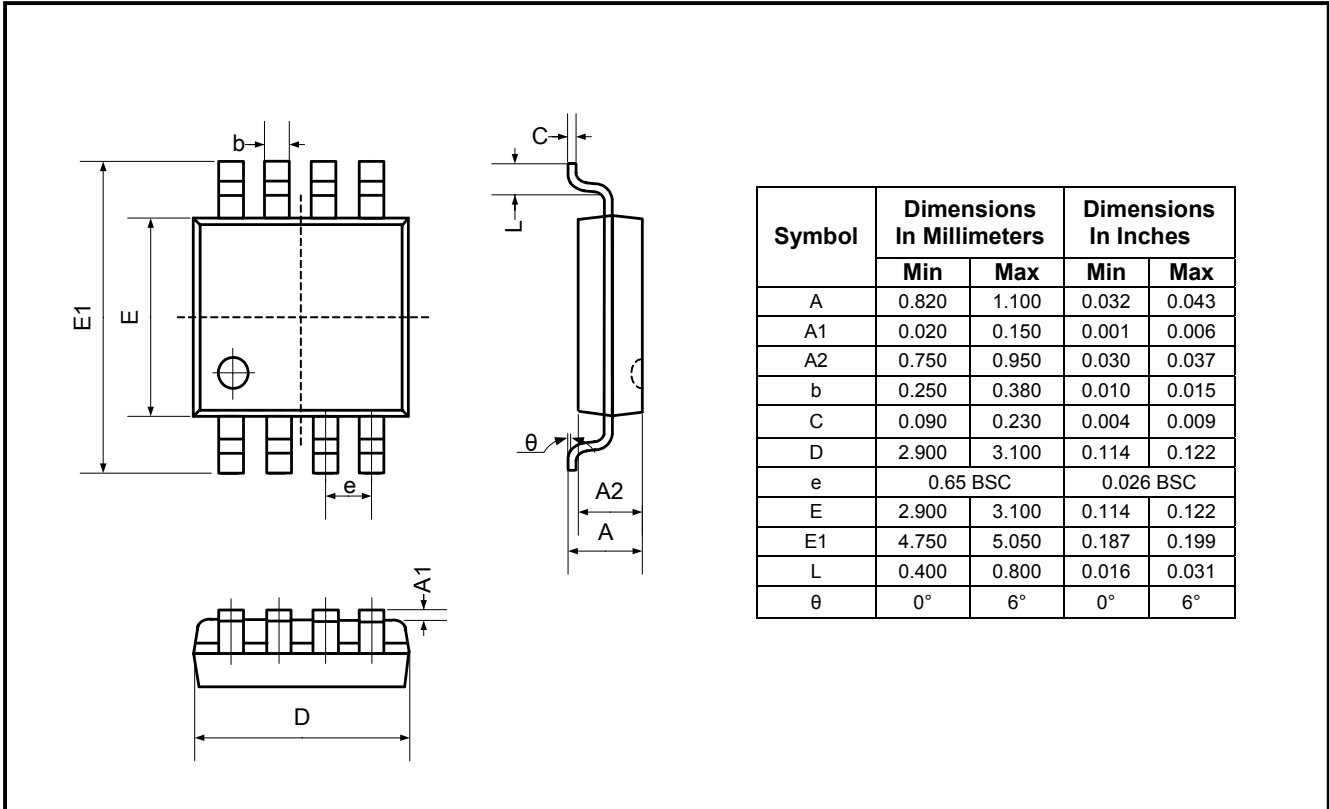


Voltage Noise Density at +2.7V
from 0Hz to 25kHz



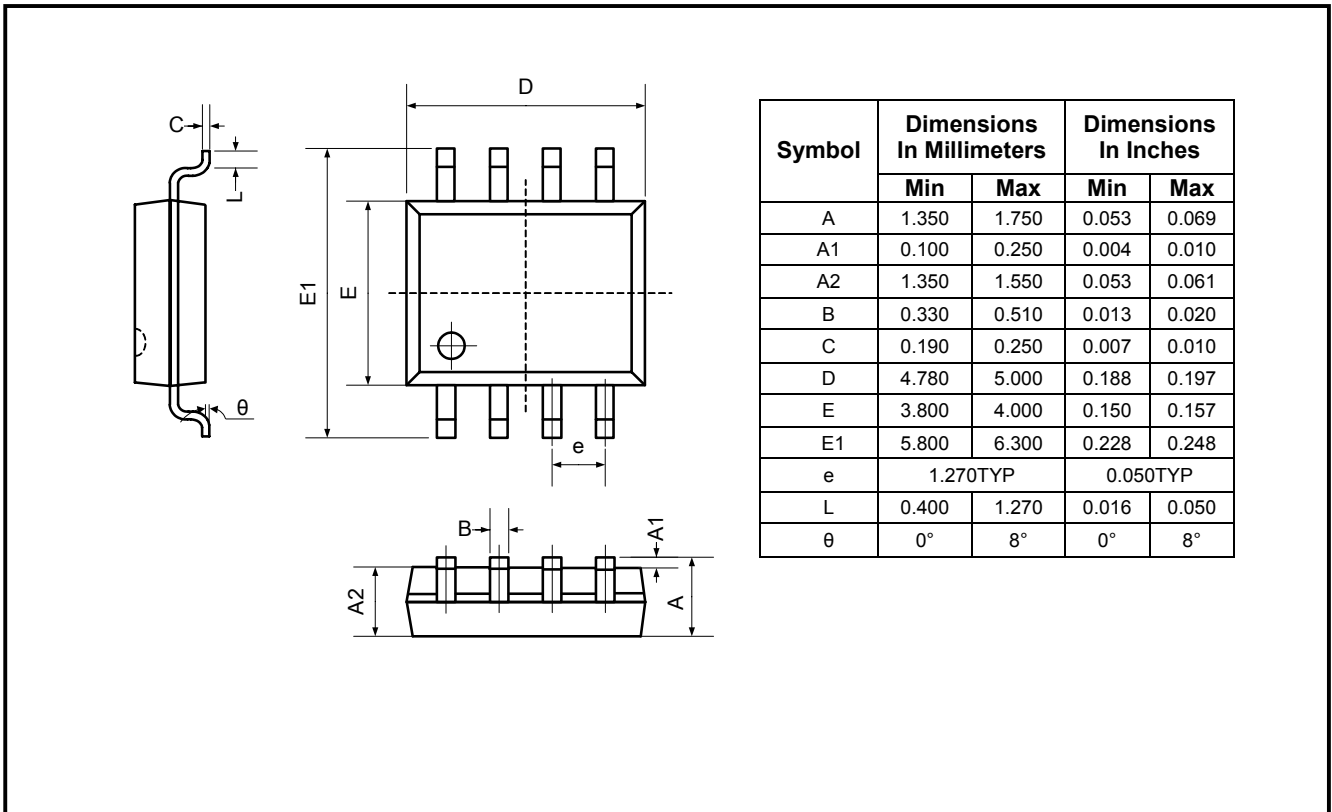
PACKAGE OUTLINE DIMENSIONS

MSOP8



PACKAGE OUTLINE DIMENSIONS

SOP8



Important Note:

This preliminary data sheet is provided to assist you in the evaluation of engineering samples of the product. It is not intended to be complete or correct in any detail. There might be major changes for the final version.