# SGM8422
# 2.2MHz, Dual, High Voltage, Rail-to-Rail I/O Amplifier

## GENERAL DESCRIPTION

The SGM8422 (dual) is a low power, high voltage, rail to rail input and output operational amplifier. This device can operate from ±2.5V to ±15V dual power supplies or from a +5V to +30V single supply.

The SGM8422 has a gain bandwidth product of 2.2MHz (TYP), while consuming only 0.8mA per amplifier. It also provides common mode input ability beyond the supply rails, as well as rail-to-rail output capability. This enables the SGM8422 to offer maximum dynamic range at any supply voltage.

The SGM8422 also features fast slewing and settling times. These features make this amplifier ideal for use as voltage reference buffers in Thin Film Transistor Liquid Crystal Displays (TFT-LCD). Other applications include battery power, portable devices, and anywhere low power consumption is important.

The SGM8422 comes in Green SOIC-8 and MSOP-8 packages. It is specified over the extended -40℃ to +85℃ temperature range.

## FEATURES

- **±2.5V to ±15V Dual Power Supplies or a +5V to +30V Single Supply**
- **Gain Bandwidth Product: 2.2MHz (TYP)**
- **Supply Current/Amplifier: 0.8mA**
- **High Slew Rate: 1.9V/μs**
- **High Output Voltage Swing: 3.96V (with 70mA Output Current at $V_S$ = +5V)**
- **Low Output Voltage Swing: 0.96V (with 70mA Output Current at $V_S$ = +5V)**
- **Beyond the Rails Input Capability**
- **Rail-to-Rail Output Swing**
- **Green SOIC-8 and MSOP-8 Packages**
- **-40℃ to +85℃ Operating Temperature Range**

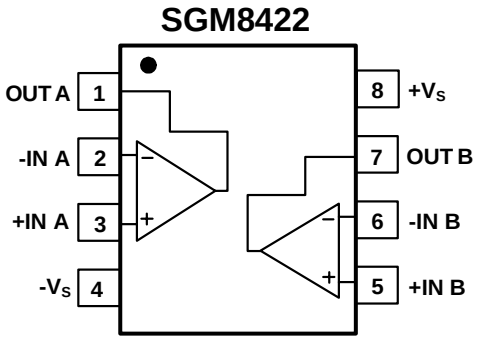
## APPLICATIONS

TFT-LCD Drive Circuits
Electronics Notebooks
Electronics Games
Touch-Screen Displays
Wireless LANs
Office Automation
Personal Communication Devices
Personal Digital Assistants (PDA)
Portable Instrumentation
A/D Converter Buffer
Active Filters

## PACKAGE/ORDERING INFORMATION

| MODEL | ORDER NUMBER | PACKAGE DESCRIPTION | PACKAGE OPTION | MARKING INFORMATION |
|---|---|---|---|---|
| SGM8422 | SGM8422YS8G/TR | SOIC-8 | Tape and Reel, 2500 | SGM8422YS8 |
| | SGM8422YMS8G/TR | MSOP-8 | Tape and Reel, 3000 | SGM8422YMS8 |

## PIN CONFIGURATIONS (Top View)




SOIC-8/MSOP-8

## 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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $+V_S$ to $-V_S$.....32V
Input Voltage.....$(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Storage Temperature Range.....-65℃ to +150℃
Junction Temperature.....150℃
Operating Temperature Range.....-40℃ to +85℃
Lead Temperature Range (Soldering 10 sec)
.....260℃
ESD Susceptibility
HBM.....2000V
MM.....150V

NOTE:
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

# ELECTRICAL CHARACTERISTICS: $V_S$ = +5V

(At $T_A$ = +25℃, $R_L$ = 2kΩ connected to $V_S$/2, and $V_{OUT}$ = $V_S$/2, unless otherwise noted.)

| PARAMETER | | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **INPUT CHARACTERISTICS** | | | | | | |
| Input Offset Voltage ($V_{OS}$) | | $V_{CM}$ = $V_S$/2 | | 0.9 | | mV |
| Common-Mode Rejection Ratio (CMRR) | | $V_{CM}$ = -0.1V to +5.1V | | 75 | | dB |
| Large Signal Voltage Gain ($A_{VO}$) | | $V_{OUT}$ = +0.5V to +4.5V | | 105 | | dB |
| **OUTPUT CHARACTERISTICS** | | | | | | |
| Output Voltage Swing from Rail | $V_{OH}$ | $I_{OUT}$ = 70mA | | 3.96 | | V |
| | | $R_L$ = 2kΩ | | 4.98 | | |
| | $V_{OL}$ | $I_{OUT}$ = -70mA | | 960 | | mV |
| | | $R_L$ = 2kΩ | | 18 | | |
| Short Circuit Current ($I_{SC}$) | | $R_L$ = 10Ω to $V_S$/2 | | 100 | | mA |
| **POWER SUPPLY** | | | | | | |
| Power Supply Rejection Ratio (PSRR) | | $V_S$ = +4V to +30V | | 90 | | dB |
| Quiescent Current / Amplifier ($I_Q$) | | $I_{OUT}$ = 0A | | 0.7 | | mA |
| **DYNAMIC PERFORMANCE** | | | | | | |
| Gain-Bandwidth Product (GBP) | | $R_L$ = 2kΩ, $C_L$ = 100pF, $V_{CM}$ = $V_S$/2 | | 2.2 | | MHz |
| Slew Rate (SR) Up | | $V_{OUT}$ = 2$V_{PP}$ Step, $A_V$ = 1 | | 1.7 | | V/μs |
| Phase Margin | | $R_L$ = 2kΩ, $C_L$ = 100pF, $V_{CM}$ = $V_S$/2 | | 53 | | ° |
| Crosstalk | | f = 1MHz | | 90 | | dB |
| **NOISE PERFORMANCE** | | | | | | |
| Voltage Noise Density ($e_n$) | | f = 1kHz, $V_{CM}$ = $V_S$/2 | | 81 | | $nV/\sqrt{Hz}$ |
| | | f = 10kHz, $V_{CM}$ = $V_S$/2 | | 30 | | |

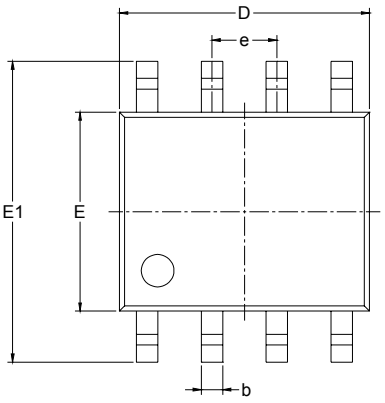
# ELECTRICAL CHARACTERISTICS: $V_S$ = ±15V

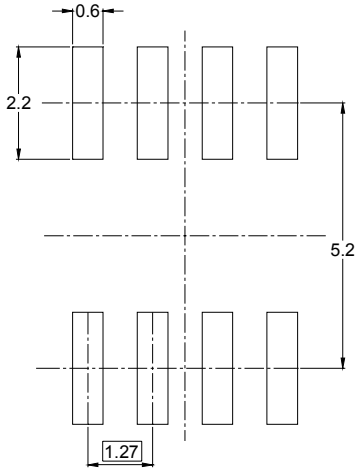
(At $T_A$ = +25℃, $R_L$ = 2kΩ connected to 0V, and $V_{OUT}$ = 0V, unless otherwise noted.)

| PARAMETER | | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **INPUT CHARACTERISTICS** | | | | | | |
| Input Offset Voltage ($V_{OS}$) | | $V_{CM}$ = 0V | | 0.9 | | mV |
| Common-Mode Rejection Ratio (CMRR) | | $V_{CM}$ = -15.1V to +15.1V | | 90 | | dB |
| Large Signal Voltage Gain ($A_{VO}$) | | $V_{OUT}$ = -14.5V to +14.5V | | 115 | | dB |
| **OUTPUT CHARACTERISTICS** | | | | | | |
| Output Voltage Swing from Rail | $V_{OH}$ | $R_L$ = 2kΩ | | 29.88 | | V |
| | $V_{OL}$ | | | 111 | | mV |
| Short Circuit Current ($I_{SC}$) | | $R_L$ = 10Ω to GND | | 300 | | mA |
| **POWER SUPPLY** | | | | | | |
| Power Supply Rejection Ratio (PSRR) | | $V_S$ = +4V to +30V | | 90 | | dB |
| Quiescent Current / Amplifier ($I_Q$) | | $I_{OUT}$ = 0A | | 0.8 | | mA |
| **DYNAMIC PERFORMANCE** | | | | | | |
| Gain-Bandwidth Product (GBP) | | $R_L$ = 2kΩ, $C_L$ = 100pF, $V_{CM}$ = 0V | | 2.2 | | MHz |
| Slew Rate (SR) Up | | $V_{OUT}$ = $2V_{PP}$ Step, $A_V$ = 1 | | 1.9 | | V/μs |
| Phase Margin | | $R_L$ = 2kΩ, $C_L$ = 100pF, $V_{CM}$ = 0V | | 53 | | ° |
| Crosstalk | | f = 1MHz | | 95 | | dB |
| **NOISE PERFORMANCE** | | | | | | |
| Voltage Noise Density ($e_n$) | | f = 1kHz, $V_{CM}$ = 0V | | 90 | | $nV/\sqrt{Hz}$ |
| | | f = 10kHz, $V_{CM}$ = 0V | | 30 | | |

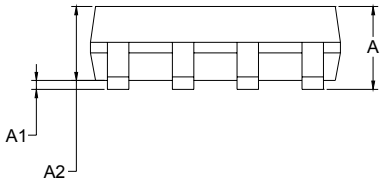
# PACKAGE OUTLINE DIMENSIONS

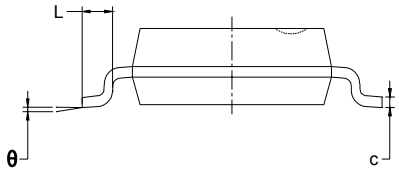
## SOIC-8




**RECOMMENDED LAND PATTERN** (Unit: mm)

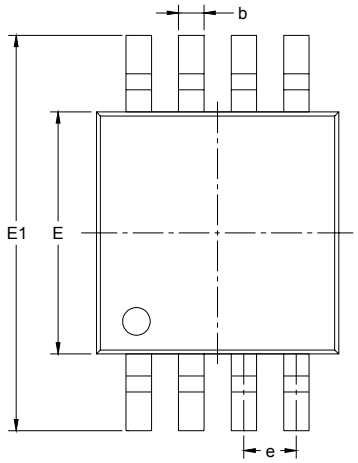


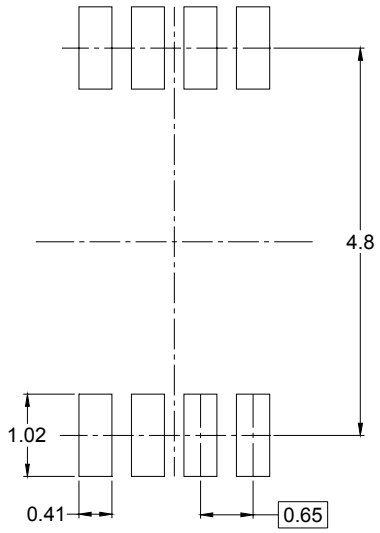




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

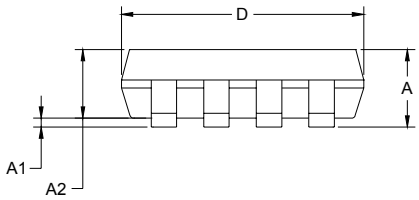
# PACKAGE OUTLINE DIMENSIONS

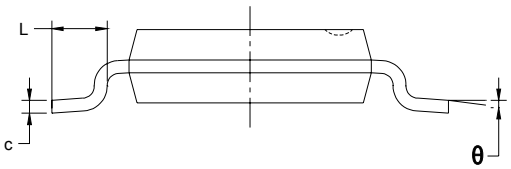
## MSOP-8




**RECOMMENDED LAND PATTERN** (Unit: mm)




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250 | 0.380 | 0.010 | 0.015 |
| c | 0.090 | 0.230 | 0.004 | 0.009 |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 4.750 | 5.050 | 0.187 | 0.199 |
| e | 0.650 BSC | | 0.026 BSC | |
| L | 0.400 | 0.800 | 0.016 | 0.031 |
| θ | 0° | 6° | 0° | 6° |