



SGM8421-1

High Voltage, High Current, Rail-to-Rail I/O Operational Amplifier

GENERAL DESCRIPTION

The SGM8421-1 is a high slew rate, low power operational amplifier optimized for high voltage systems. The device can operate on single or dual power supply. It supports rail-to-rail input and output operation.

The SGM8421-1 features 10mV maximum offset voltage, 3A peak output current (source/sink), and 65V/ μ s high slew rate. The combination of characteristics makes the device suitable for high current drivers.

The SGM8421-1 is available in a Green TO-263-5A package. It is specified over -40°C to +125°C temperature range.

FEATURES

- **Source/Sink Peak Output Current: 3A**
- **High Slew Rate: 65V/ μ s**
- **Unity-Gain Stable**
- **Rail-to-Rail Input and Output**
- **Supply Voltage Range: 4.5V to 26.5V**
- **-40°C to +125°C Operating Temperature Range**
- **Available in a Green TO-263-5A Package**

APPLICATIONS

Motor Drivers
Servo Amplifiers
Audio Power Amplifiers
Coil Drivers
Valves Drivers
Actuator Drivers

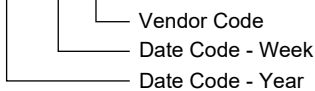
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-----------|---------------------|-----------------------------|------------------|--------------------------|--------------------|
| SGM8421-1 | TO-263-5A | -40°C to +125°C | SGM8421-1XO5G/TR | SGM84211 XO5 XXXXX | Tape and Reel, 800 |

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

XXXXX



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

| | |
|--|------------------------------------|
| Supply Voltage, +V _S to -V _S | -0.3V to 28V |
| Input/Output Voltage to -V _S | -0.3V to (+V _S) + 0.3V |
| +IN to -IN | ±5V |
| Package Thermal Resistance | |
| TO-263-5A, θ _{JA} | 30°C/W |
| Junction Temperature..... | +150°C |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (soldering, 10s)..... | +260°C |
| ESD Susceptibility | |
| HBM..... | 8000V |
| MM..... | 400V |
| CDM | 1000V |

RECOMMENDED OPERATING CONDITIONS

| | |
|-----------------------------------|-----------------|
| Supply Voltage Range | 4.5V to 26.5V |
| Operating Temperature Range | -40°C to +125°C |

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. 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 even small parametric changes could cause the device not to meet the published specifications.

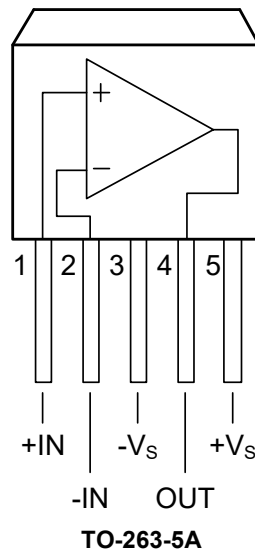
DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION

SGM8421-1 (TOP VIEW)

Tab is connected to -V_S supply.



ELECTRICAL CHARACTERISTICS(+V_S = 16V, -V_S = 0V, +V_{IN} = V_{OUT} = +V_S/2, T_A = +25°C, unless otherwise specified.)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------------------------|----------------------|--|---------------------------|---------------------------|--------------------------|-------|
| Input Characteristics | | | | | | |
| Supply Voltage Range | | | 4.5 | | 26.5 | V |
| Input Offset Voltage | V _{OS} | V _{CM} = +V _S /2 | | 2 | 10 | mV |
| Input Offset Voltage Drift | ΔV _{OS} /ΔT | V _{CM} = +V _S /2 | | 3.5 | | μV/°C |
| Input Bias Current | I _B | V _{CM} = +V _S /2 | | 1 | | nA |
| Load Regulation | ΔV _{LOAD} | I _{OUT} = 0mA to -80mA | | 0.01 | | mV/mA |
| | | I _{OUT} = 0mA to 80mA | | -0.01 | | |
| Input Common Mode Voltage Range | V _{CM} | | -0.1 | | (+V _S) + 0.1 | V |
| Common Mode Rejection Ratio | CMRR | -0.1V ≤ V _{CM} ≤ +V _S + 0.1V | | 72 | | dB |
| Open-Loop Voltage Gain | A _{OL} | 0.5V ≤ V _{OUT} ≤ +V _S - 0.5V | | 120 | | dB |
| Output Characteristics | | | | | | |
| Output Swing Low | V _{OL} | I _L = -50mA | | 0.07 | 0.14 | V |
| Output Swing High | V _{OH} | I _L = 50mA | (+V _S) - 0.17 | (+V _S) - 0.11 | | V |
| Transient Peak Output Current | I _{PK} | | | ±3 | | A |
| Continuous Output Current | I _O | | | ±400 | | mA |
| Power Supply | | | | | | |
| Power Supply Rejection Ratio | PSRR | +V _S = 4.5V to 26.5V, V _{CM} = 3V | | 94 | | dB |
| Quiescent Current | I _Q | No Load | | 4.8 | | mA |
| Dynamic Performance | | | | | | |
| Slew Rate | SR | 4V Step, C _L = 50pF, R _L = 10kΩ, 20% to 80%, A _v = 1 | | 65 | | V/μs |
| Setting to ±0.1% (A _v = 1) | t _s | A _v = 1, V _{OUT} = 2V Step, R _L = 10kΩ, C _L = 10pF | | 140 | | ns |
| -3dB Bandwidth | BW | R _L = 10kΩ, C _L = 10pF | | 75 | | MHz |
| Gain-Bandwidth Product | GBP | R _L = 10kΩ, C _L = 10pF | | 28 | | MHz |
| Phase Margin | | R _L = 10kΩ, C _L = 10pF | | 33 | | ° |
| Thermal Protection | | | | | | |
| Thermal Shutdown Temperature | T _{SHDN} | | | 150 | | °C |
| Thermal Shutdown Hysteresis | ΔT _{SHDN} | | | 25 | | °C |

APPLICATION INFORMATION

The SGM8421-1 is specifically designed to drive high current load. The device supports rail-to-rail input and output operation, and consumes low quiescent current. It also features high voltage, high current and high slew rate. The combination of characteristics makes SGM8421-1 suitable for drivers.

Operating Voltage

The SGM8421-1 is guaranteed to operate from 4.5V to 26.5V, and the operation is extremely stable over the whole specified range of the temperature. The output voltage swing can be closer to the supply rail by reducing the load current.

Thermal Considerations

When operating the device, the users need to make sure that the junction temperature is below the absolute maximum one. The junction temperature is increasing because the power dissipation is higher than before. And a lot of possibilities can cause the thermal considerations, such as the width of trace in PCB, the package of the device, the gap between ambient and junction temperature and rate of environmental airflow.

The following equation indicates the calculation of power dissipation:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA} \quad (1)$$

where:

$T_{J(MAX)}$ = Maximum junction temperature.

T_A = Ambient temperature.

θ_{JA} = Junction to ambient thermal resistance.

It is recommended that the junction temperature should not exceed +125°C for normal operation. The parameter of ambient thermal resistance is determined by the width of trace in PCB layout.

In addition, the ambient temperature and thermal resistance will affect the power dissipation of SGM8421-1.

Layout

For the circuits with high power path, a good PCB design is essential. It is recommended to use the following layout method to improve the performance of SGM8421-1 at most.

- ◆ The power component should be close enough to SGM8421-1 for better performance. Also, if the high current is necessary, the corresponding trace in PCB should be short and wide.
- ◆ For some applications such as filtering, a series resistor is necessary to be added at the output of the device.
- ◆ Choosing a suitable bypass capacitor can enhance the stability when driving the loads with high transient. For single-supply operation, the bypass capacitor should be placed as close to +V_S pin as possible. For dual-supply operation, both +V_S and -V_S supplies should be bypassed to ground with separate 0.1μF ceramic capacitors. Using a 10μF tantalum capacitor is a good choice to improve the operating stability of the device when driving high transient load.
- ◆ A 0.1μF capacitor should be connected with +IN pin to GND for better operation of SGM8421-1 and the distance between this capacitor and +IN pin should be minimized.
- ◆ It is recommended to connect mounting tab to -V_S directly in the PCB.

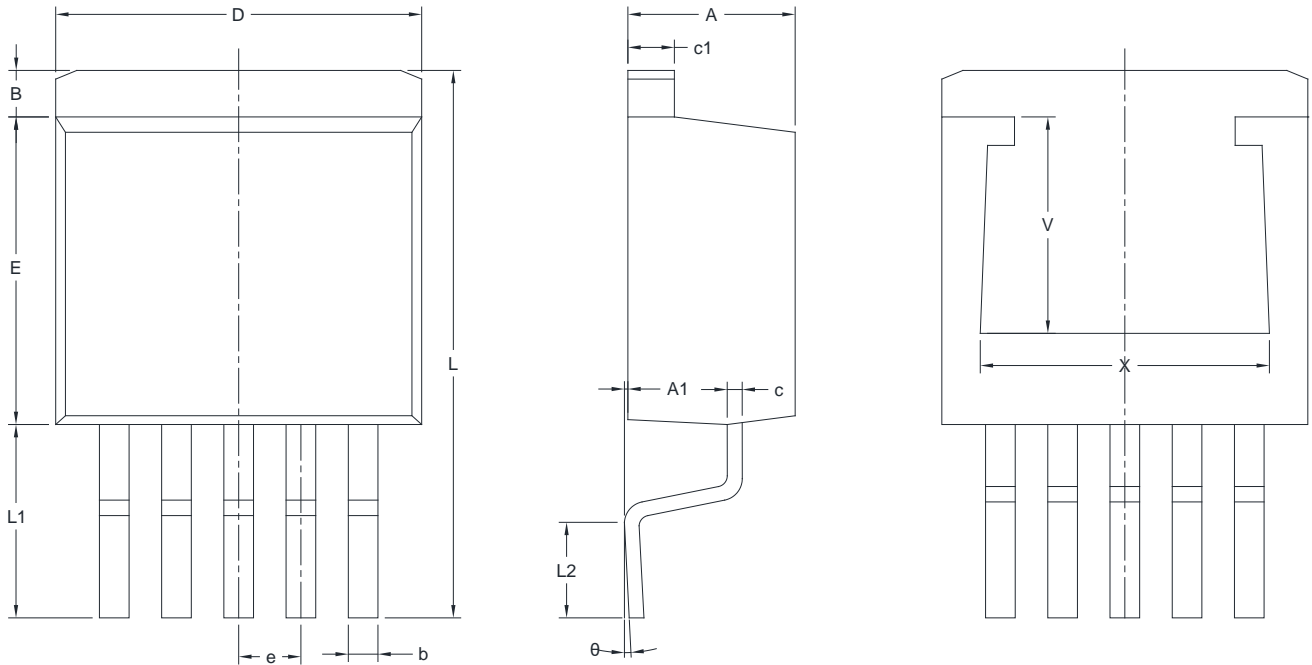
REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Original (SEPTEMBER 2017) to REV.A | Page |
|--|-------------|
| Changed from product preview to production data..... | All |

PACKAGE OUTLINE DIMENSIONS

TO-263-5A

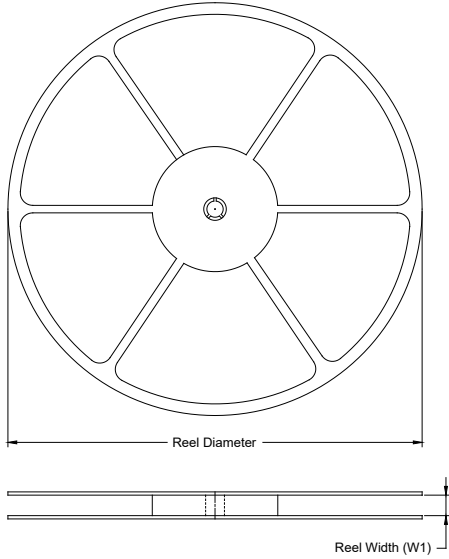


| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|----------|------------------------------|--------|--------|-------------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 4.470 | 4.570 | 4.670 | 0.176 | 0.180 | 0.184 |
| A1 | 0.000 | 0.060 | 0.150 | 0.000 | 0.002 | 0.006 |
| B | 1.120 | 1.270 | 1.420 | 0.044 | 0.050 | 0.056 |
| b | 0.710 | 0.810 | 0.910 | 0.028 | 0.032 | 0.036 |
| c | 0.310 | 0.380 | 0.530 | 0.012 | 0.015 | 0.021 |
| c1 | 1.170 | 1.270 | 1.370 | 0.046 | 0.050 | 0.054 |
| D | 9.880 | 10.000 | 10.180 | 0.389 | 0.395 | 0.401 |
| E | 8.200 | 8.400 | 8.600 | 0.323 | 0.331 | 0.339 |
| e | 1.700 TYP | | | 0.067 TYP | | |
| L | 15.140 | 15.340 | 15.540 | 0.596 | 0.604 | 0.612 |
| L1 | 5.080 | 5.280 | 5.480 | 0.200 | 0.208 | 0.216 |
| L2 | 2.340 | 2.540 | 2.740 | 0.092 | 0.100 | 0.108 |
| θ | 0° | 2° | 8° | 0° | 2° | 8° |
| V | 5.600 REF | | | 0.220 REF | | |
| X | 7.800 REF | | | 0.307 REF | | |

PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS

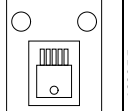


TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---|
| TO-263-5A | 13" | 24.4 | 10.80 | 16.13 | 5.21 | 4.0 | 16.0 | 2.0 | 24.0 |  |

D20001

PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

| Reel Type | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-----------|-------------|------------|-------------|--------------|
| 13" | 386 | 280 | 370 | 5 |

DD0002