SGMOP07C
3MHz, Low Noise, High Voltage Precision Operational Amplifier

GENERAL DESCRIPTION

The SGMOP07C is low noise, low offset voltage and high voltage operational amplifier, which can be designed into a wide range of applications. The SGMOP07C has a high gain- bandwidth product of 3MHz, a slew rate of 4V/μs, and a quiescent current of 0.9mA at wide power supply range.

The SGMOP07C is designed to provide optimal performance in low noise systems. It provides rail-to-rail output swing into heavy loads.

The single SGMOP07C is available in Green SOIC-8 package. It is specified over the extended -40℃ to +125℃ temperature range.

FEATURES

- **Rail-to-Rail Output**
- **Low Bias Current: 1nA (TYP)**
- **High Open-Loop Gain: 120dB**
- **High PSRR: 130dB**
- **High Gain-Bandwidth Product: 3MHz**
- **Settling Time to 0.1% with 1V Step: 0.5μs**
- **Overload Recovery Time: 10μs**
- **Low Noise: 8.5nV/$\sqrt{Hz}$ at 1kHz**
- **Supply Voltage Range:**
  3.6V to 36V or ±1.8V to ±18V
- **Input Common Mode Voltage Range:**
  ($-V_S$) + 1.5V to ($+V_S$) - 2V
- **Low Quiescent Current: 0.9mA (TYP)**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green SOIC-8 Package**

APPLICATIONS

Sensors
Audio
Active Filters
A/D Converters
Communications
Test Equipment
Cellular and Cordless Phones
Laptops and PDAs
Photodiode Amplification

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGMOP07C	SOIC-8	-40℃ to +125℃	SGMOP07CXS8G/TR	SGM OP07CXS8 XXXXX	Tape and Reel, 2500

NOTE: XXXXX = Date Code and Vendor Code.

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 $-V_S$ 40V
Input Common Mode Voltage Range
..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Storage Temperature Range ..... -65℃ to +150℃
Junction Temperature ..... 150℃
Lead Temperature (Soldering 10sec) ..... 260℃
ESD Susceptibility
HBM 4000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 3.6V to 36V
Operating Temperature Range ..... -40℃ to +125℃

OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

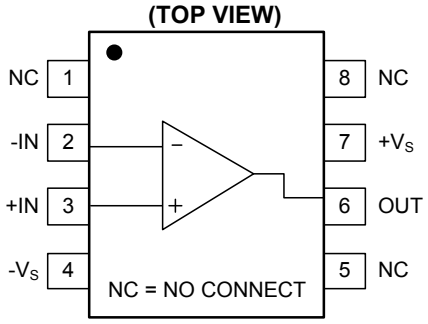
ESD SENSITIVITY CAUTION

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.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

PIN CONFIGURATION



SOIC-8

ELECTRICAL CHARACTERISTICS

(V_S = ±5V to V_S = ±15V, V_{CM} = 0, T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{OS}			50		μV
Input Bias Current	I_B			1		nA
Input Offset Current	I_{OS}			1		nA
Input Common Mode Voltage Range	V_{CM}		$(-V_S)$ + 1.5		$(+V_S)$ - 2	V
Common Mode Rejection Ratio	CMRR	$(-V_S)$ + 1.5V ≤ V_{CM} ≤ $(+V_S)$ - 2V		140		dB
Open-Loop Voltage Gain	A_{OL}	R_L = 2kΩ		120		dB
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			0.8		μV/℃
OUTPUT CHARACTERISTICS						
Output Voltage Swing from Rail	V_{OUT}	V_S = ±15V, R_L = 2kΩ		450		mV
		V_S = ±15V, R_L = 10kΩ		90		
		V_S = ±5V, R_L = 2kΩ		140		
		V_S = ±5V, R_L = 10kΩ		30		
Output Current	I_{OUT}			35		mA
POWER SUPPLY						
Operating Voltage Range	V_S		3.6		36	V
Quiescent Current	I_Q	I_{OUT} = 0mA		0.9		mA
Power Supply Rejection Ratio	PSRR	V_S = +3.6V to +36V		130		dB
DYNAMIC PERFORMANCE						
Gain-Bandwidth Product	GBP	V_O = 100mV_{P-P}, R_L = 2kΩ		3		MHz
Slew Rate	SR	R_L = 2kΩ		4		V/μs
Settling Time to 0.1%	t_S	V_{IN} = 1V Step, R_L = 2kΩ, A_V = +1		0.5		μs
Overload Recovery Time		R_L = 2kΩ, V_{IN} × GAIN = V_S		10		μs
Phase Margin	φ_O	V_O = 100mV_{P-P}, R_L = 2kΩ, C_L = 10pF		55		°
Total Harmonic Distortion + Noise	THD+N	V_{IN} = 1V_{RMS}, A_V = +1, R_L = 2kΩ, f = 1kHz		0.0008		%
NOISE						
Input Voltage Noise		f = 0.1Hz to 10Hz		300		nV_{P-P}
Voltage Noise Density	e_n	f = 1kHz		8.5		$nV/\sqrt{Hz}$
Current Noise Density	i_n	f = 1kHz		1.5		$pA/\sqrt{Hz}$

APPLICATION NOTES

Power-Supply Bypassing and Layout

The SGMOP07C operates from either a single +3.6V to +36V supply or dual ±1.8V to ±18V supplies. For single-supply operation, bypass the power supply $+V_S$ with a 0.1μF ceramic capacitor which should be placed close to the $+V_S$ pin. For dual-supply operation, both the $+V_S$ and the $-V_S$ supplies should be bypassed to ground with separate 0.1μF ceramic capacitors. 10μF tantalum capacitor can be added for better performance.

Good PCB layout techniques optimize performance by decreasing the amount of stray capacitance at the op amp's inputs and output. To decrease stray capacitance, minimize trace lengths and widths by placing external components as close to the device as possible. Use surface-mount components whenever possible.

For the operational amplifier, soldering the part to the board directly is strongly recommended. Try to keep the high frequency current loop area small to minimize the EMI (electromagnetic interfacing).

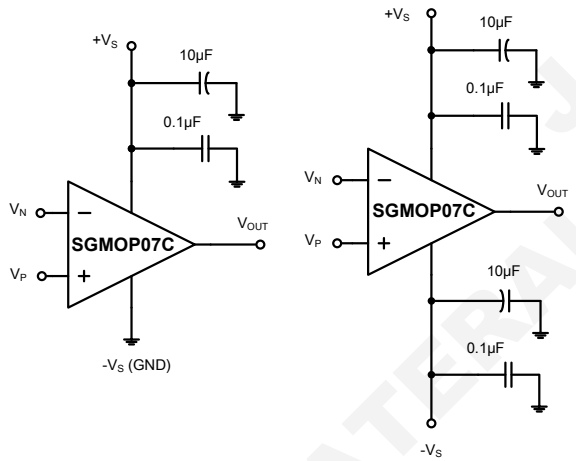


Figure 1. Amplifier with Bypass Capacitors

Grounding

A ground plane layer is important for SGMOP07C circuit design. The length of the current path in an inductive ground return will create an unwanted voltage noise. Broad ground plane areas will reduce the parasitic inductance.

Input-to-Output Coupling

To minimize capacitive coupling, the input and output signal traces should not be in parallel. This helps reduce unwanted positive feedback.

Differential Amplifier

The circuit shown in Figure 2 performs the difference function. If the resistor ratios are equal ($R_4/R_3 = R_2/R_1$), then $V_{OUT} = (V_P - V_N) \times R_2/R_1 + V_{REF}$.

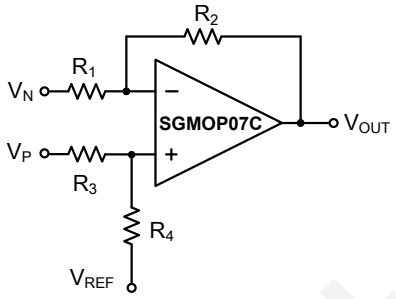


Figure 2. Differential Amplifier

Instrumentation Amplifier

The circuit in Figure 3 performs the same function as that in Figure 2 but with a high input impedance.

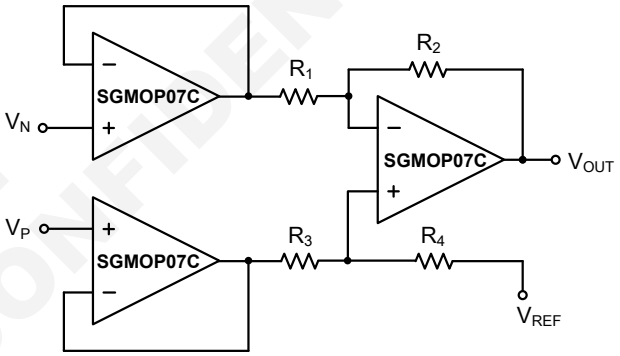


Figure 3. Instrumentation Amplifier

Low-Pass Active Filter

The low-pass filter shown in Figure 4 has a DC gain of $(-R_2/R_1)$ and the -3dB corner frequency is $1/2\pi R_2C$. Make sure the filter bandwidth is within the bandwidth of the amplifier. The large values of feedback resistors can couple with parasitic capacitance and cause undesired effects such as ringing or oscillation in high-speed amplifiers. Keep resistor values as low as possible and consistent with output loading consideration.

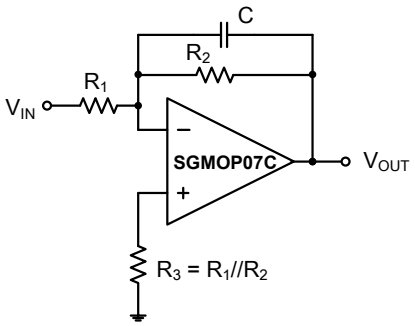
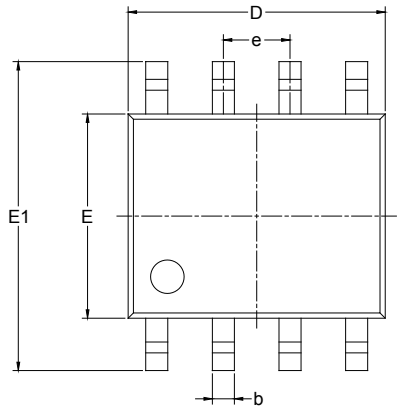
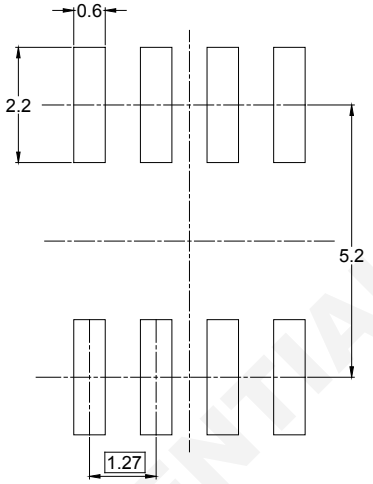


Figure 4. Low-Pass Active Filter

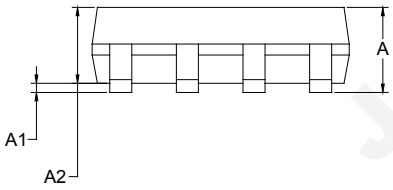
PACKAGE OUTLINE DIMENSIONS

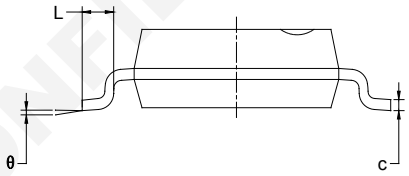
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

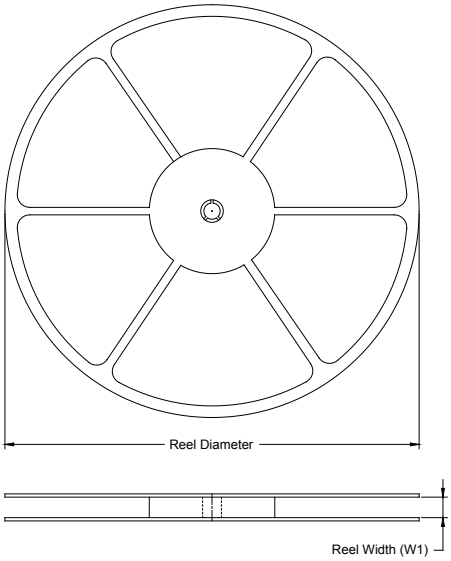




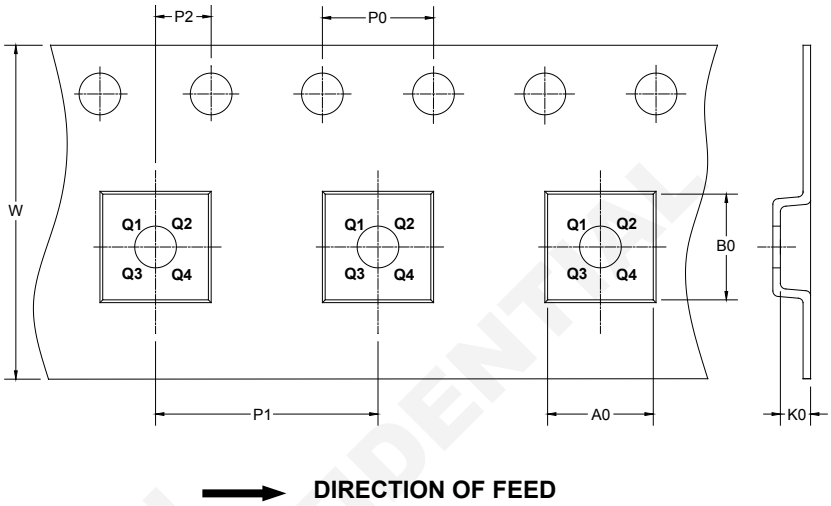
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



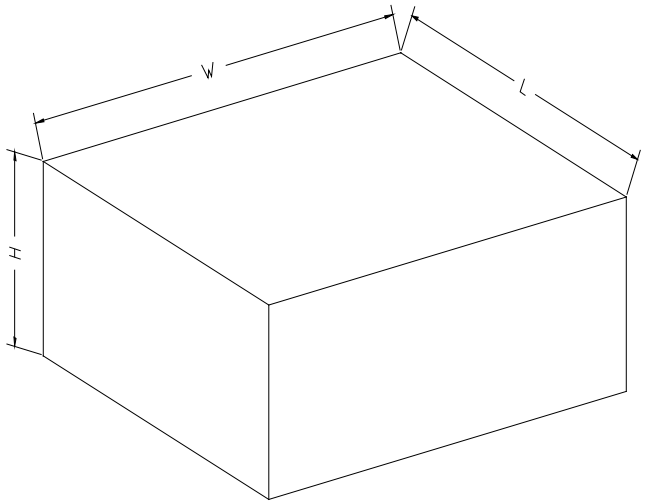
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOIC-8	13″	12.4	6.4	5.4	2.1	4.0	8.0	2.0	12.0	Q1

DD0001

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

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