



SGMOP17C

1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

GENERAL DESCRIPTION

The single SGMOP17C is a rail-to-rail output, low noise and high precision operational amplifier which has low input offset voltage, and bias current. It is guaranteed to operate from 4.5V to 36V single supply.

The rail-to-rail output swing provided by the SGMOP17C makes both high-side and low-side sensing easy. The combination of characteristics makes the SGMOP17C good choice for temperature, position and pressure sensors, medical equipment and strain gauge amplifiers, or any other 4.5V to 36V application requiring precision and long term stability.

The single SGMOP17C is available in Green SOT-23-5 and SOIC-8 packages. It is specified over the extended -40°C to +125°C temperature range.

FEATURES

- **Low Offset Voltage: 120 μ V (MAX)**
- **Rail-to-Rail Output Swing**
- **4.5V to 36V Single Supply Operation**
- **Voltage Gain: 135dB (TYP)**
- **PSRR: 145dB (TYP)**
- **CMRR: 125dB (TYP)**
- **0.1Hz to 10Hz Noise: 1 μ V_{p.p}**
- **56nV/ $\sqrt{\text{Hz}}$ Voltage Noise Density at 1kHz**
- **Gain-Bandwidth Product: 1.5MHz**
- **Low Supply Current: 480 μ A (TYP)**
- **Overload Recovery Time: 3 μ s (TYP)**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green SOT-23-5 and SOIC-8 packages**

APPLICATIONS

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

SGMOP17C

1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGMOP17C	SOT-23-5	-40°C to +125°C	SGMOP17CXN5G/TR	ST3XX	Tape and Reel, 3000
	SOIC-8	-40°C to +125°C	SGMOP17CXS8G/TR	SGM OP17CXS8 XXXXX	Tape and Reel, 2500

NOTE: XX = Date Code. 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.

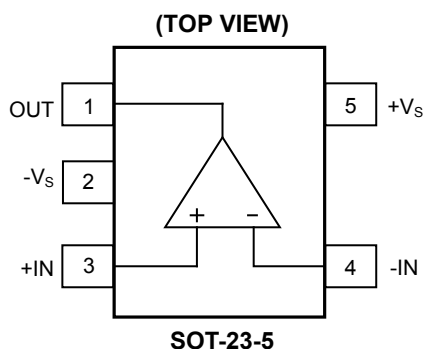
ABSOLUTE MAXIMUM RATINGS

Supply Voltage.....	40V
Input Voltage.....	(-V _S) - 0.3V to (+V _S) + 0.3V
Differential Input Voltage.....	-15V to +15V
Storage Temperature Range	-65°C to +150°C
Junction Temperature	150°C
Lead Temperature (Soldering 10 sec)	260°C
ESD Susceptibility	
HBM.....	3000V
MM.....	300V
CDM	1000V

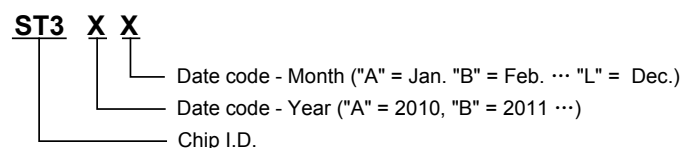
RECOMMENDED OPERATING CONDITIONS

Input Voltage Range	4.5V to 36V
Operating Temperature Range	-40°C to +125°C

PIN CONFIGURATIONS



MARKING INFORMATION



For example: ST3GA (2016, January)

OVERSTRESS CAUTION

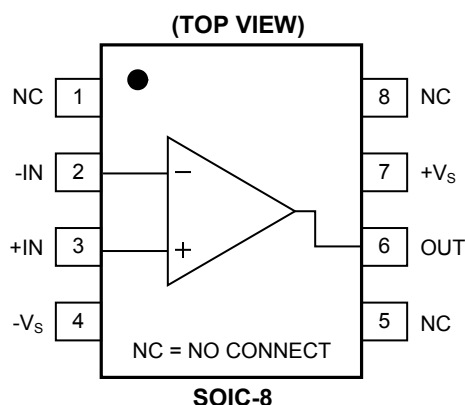
Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect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



SGMOP17C

1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

ELECTRICAL CHARACTERISTICS

($V_S = +5V$, $V_{CM} = +2.5V$, $V_O = +2.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER		CONDITIONS		MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS							
Input Offset Voltage (V _{OS})					5	120	μV
Input Bias Current (I _B)					100		pA
Input Offset Current (I _{OS})					100		pA
Input Voltage Range				0		3.5	V
Common Mode Rejection Ratio ⁽¹⁾ (CMRR)		V _{CM} = 0.1V to 3.5V		99	125		dB
		-40°C ≤ T _A ≤ +125°C		97			
Large Signal Voltage Gain (A _{VO})		R _L = 10kΩ, V _O = 0.3V to 4.7V		110	135		dB
		-40°C ≤ T _A ≤ +125°C		108			
Input Offset Voltage Drift (ΔV _{OS} /ΔT)					0.3		μV/°C
OUTPUT CHARACTERISTICS							
Output Voltage High (V _{OH})		R _L = 10kΩ to 0V			75	95	mV
		-40°C ≤ T _A ≤ +125°C				100	
Output Voltage Low (V _{OL})		R _L = 10kΩ to 5V			60	75	mV
		-40°C ≤ T _A ≤ +125°C				80	
Short Circuit Limit	I _{SOURCE}	V _O = 2.5V, R _L =10Ω to 0V		4.6	8.5		mA
		-40°C ≤ T _A ≤ +125°C		3.5			
	I _{SINK}	V _O = 2.5V, R _L =10Ω to 5V		3.9	10		mA
		-40°C ≤ T _A ≤ +125°C		2.9			
POWER SUPPLY							
Power Supply Rejection Ratio ⁽¹⁾ (PSRR)		V _S = 4.5V to 36V		117	145		dB
		-40°C ≤ T _A ≤ +125°C		115			
Quiescent Current (I _Q)		V _O = 2.5V			450	600	μA
		-40°C ≤ T _A ≤ +125°C				790	
DYNAMIC PERFORMANCE							
Gain-Bandwidth Product (GBP)		A _V = +100			1.5		MHz
Slew Rate (SR)		A _V = +1, R _L = 10kΩ, 2V Output Step			1.7		V/μs
Overload Recovery Time		A _V = -100, R _L = 10kΩ, V _{IN} = 200mV (RET to 0V)			3		μs
Total Harmonic Distortion + Noise (THD + N)		f = 1kHz, A _V = +1, V _{OUT} = 2V _{P-P}			0.0006		%
NOISE PERFORMANCE							
Voltage Noise (e _{np-p})		0.1Hz to 10Hz			1		μV _{P-P}
Voltage Noise Density (e _n)		f = 0.1kHz			56		nV/√Hz
		f = 1kHz			56		
		f = 12kHz			22		

NOTE 1: PSRR and CMRR are affected by the matching between external gain-setting resistor ratios.

SGMOP17C

1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

ELECTRICAL CHARACTERISTICS

($V_S = +30V$, $V_{CM} = +15V$, $V_O = +15V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER		CONDITIONS		MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS							
Input Offset Voltage (V _{OS})					4	120	μV
Input Bias Current (I _B)					100		pA
Input Offset Current (I _{OS})					100		pA
Input Voltage Range				0		28.5	V
Common Mode Rejection Ratio ⁽¹⁾ (CMRR)		V _{CM} = 0.1V to 28.5V		112	140		dB
		-40°C ≤ T _A ≤ +125°C		106			
Large Signal Voltage Gain (A _{VO})		R _L = 10kΩ, V _O = 0.3V to 29.7V		119	145		dB
		-40°C ≤ T _A ≤ +125°C		117			
Input Offset Voltage Drift (ΔV _{OS} /ΔT)					0.3		μV/°C
OUTPUT CHARACTERISTICS							
Output Voltage High (V _{OH})		R _L = 10kΩ to 0V			425	505	mV
		-40°C ≤ T _A ≤ +125°C				555	
Output Voltage Low (V _{OL})		R _L = 10kΩ to 30V			360	430	mV
		-40°C ≤ T _A ≤ +125°C				455	
Short Circuit Limit	I _{SOURCE}	V _O = 15V, R _L =10Ω to 0V		23	43		mA
	I _{SINK}	V _O = 15V, R _L =10Ω to 30V		25	48		mA
POWER SUPPLY							
Power Supply Rejection Ratio ⁽¹⁾ (PSRR)		V _S = 4.5V to 36V		117	145		dB
		-40°C ≤ T _A ≤ +125°C		115			
Quiescent Current (I _Q)		V _O = 15V			465	620	μA
		-40°C ≤ T _A ≤ +125°C				800	
DYNAMIC PERFORMANCE							
Gain-Bandwidth Product (GBP)		A _V = +100			1.5		MHz
Slew Rate (SR)		A _V = +1, R _L = 10kΩ, 2V Output Step			1.8		V/μs
Overload Recovery Time		A _V = -100, R _L = 10kΩ, V _{IN} = 200mV (RET to 0V)			2		μs
Total Harmonic Distortion + Noise (THD + N)		f = 1kHz, A _V = +1, V _{OUT} = 2V _{p-p}			0.0006		%
NOISE PERFORMANCE							
Voltage Noise (e _{np-p})		0.1Hz to 10Hz			1		μV _{P-P}
Voltage Noise Density (e _n)		f = 0.1kHz			60		nV/√Hz
		f = 1kHz			60		
		f = 12kHz			22		

NOTE 1: PSRR and CMRR are affected by the matching between external gain-setting resistor ratios.

SGMOP17C

1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

ELECTRICAL CHARACTERISTICS

($V_S = +36V$, $V_{CM} = +18V$, $V_O = +18V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS						
Input Offset Voltage (V _{OS})				4	120	μV
Input Bias Current (I _B)				100		pA
Input Offset Current (I _{OS})				100		pA
Input Voltage Range			0		28.5	V
Common Mode Rejection Ratio ⁽¹⁾ (CMRR)		V _{CM} = 0.1V to 34.5V	105	130		dB
		-40°C ≤ T _A ≤ +125°C	96			
Large Signal Voltage Gain (A _{VO})		R _L = 10kΩ, V _O = 0.3V to 35.7V	116	150		dB
		-40°C ≤ T _A ≤ +125°C	114			
Input Offset Voltage Drift (ΔV _{OS} /ΔT)				0.3		μV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High (V _{OH})		R _L = 10kΩ to 0V		515	610	mV
		-40°C ≤ T _A ≤ +125°C			675	
Output Voltage Low (V _{OL})		R _L = 10kΩ to 36V		435	515	mV
		-40°C ≤ T _A ≤ +125°C			545	
Short Circuit Limit	I _{SOURCE}	V _O = 15V, R _L =10Ω to 0V	25	47		mA
	I _{SINK}	V _O = 15V, R _L =10Ω to 36V	26	51		mA
POWER SUPPLY						
Power Supply Rejection Ratio ⁽¹⁾ (PSRR)		V _S = 4.5V to 36V	117	145		dB
		-40°C ≤ T _A ≤ +125°C	115			
Quiescent Current (I _Q)		V _O = 18V		480	640	μA
		-40°C ≤ T _A ≤ +125°C			820	
DYNAMIC PERFORMANCE						
Gain-Bandwidth Product (GBP)		A _V = +100		1.5		MHz
Slew Rate (SR)		A _V = +1, R _L = 10kΩ, 2V Output Step		1.7		V/μs
Overload Recovery Time		A _V = -100, R _L = 10kΩ, V _{IN} = 200mV (RET to 0V)		2		μs
Total Harmonic Distortion + Noise (THD + N)		f = 1kHz, A _V = +1, V _{OUT} = 2V _{p-p}		0.0006		%
NOISE PERFORMANCE						
Voltage Noise (e _{np-p})		0.1Hz to 10Hz		1		μV _{P-P}
Voltage Noise Density (e _n)		f = 0.1kHz		60		nV/√Hz
		f = 1kHz		60		
		f = 12kHz		22		

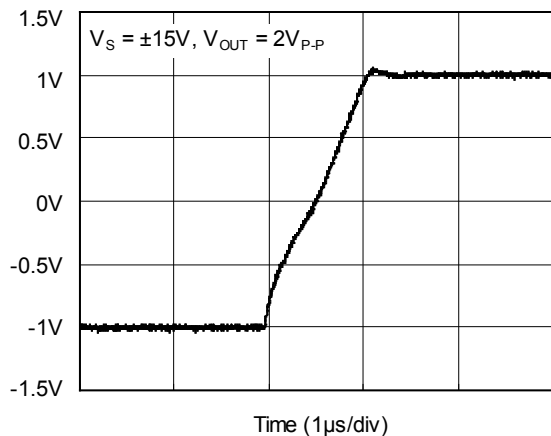
NOTE 1: PSRR and CMRR are affected by the matching between external gain-setting resistor ratios.

SGMOP17C

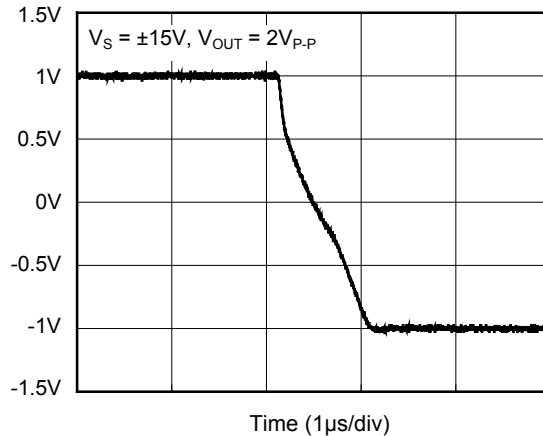
1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

TYPICAL PERFORMANCE CHARACTERISTICS

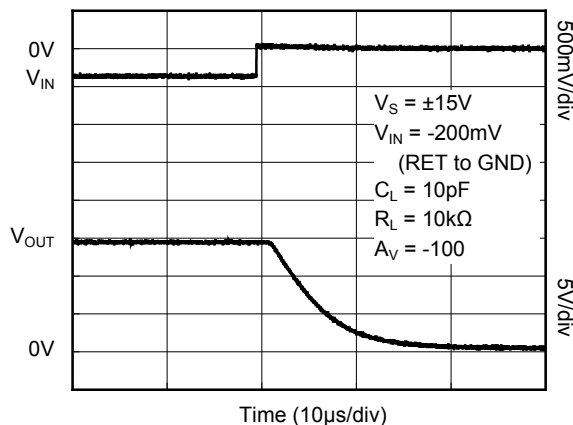
Slew Rate (UP)



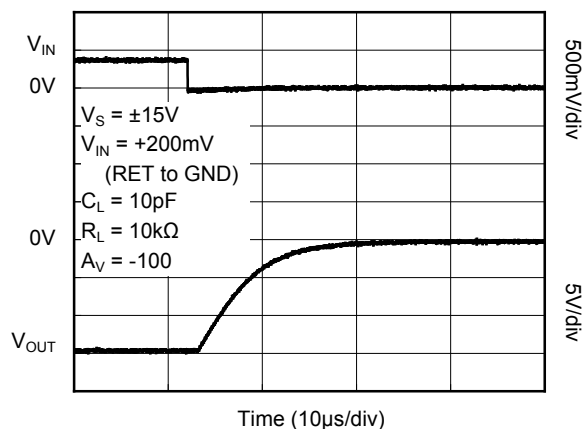
Slew Rate (DOWN)



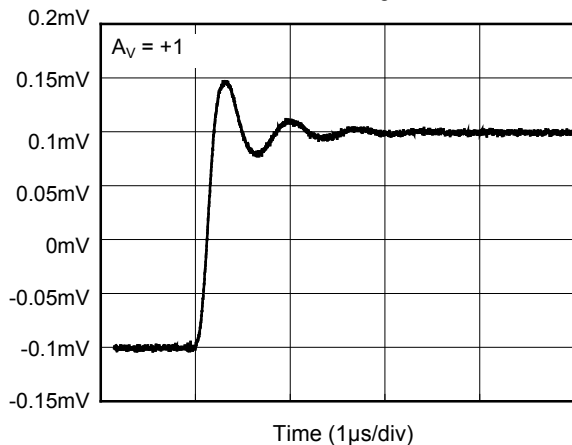
Positive Overload Recovery Time



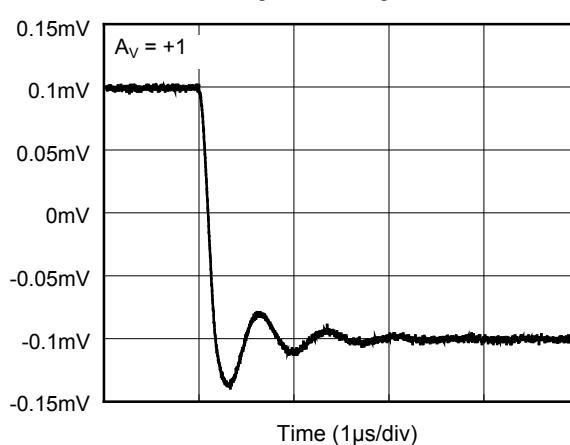
Negative Overload Recovery Time



Positive Settling Time



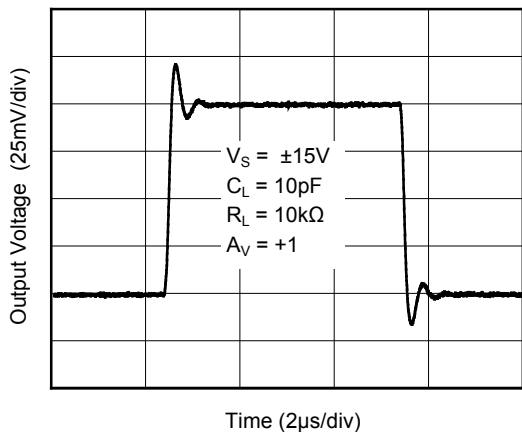
Negative Settling Time



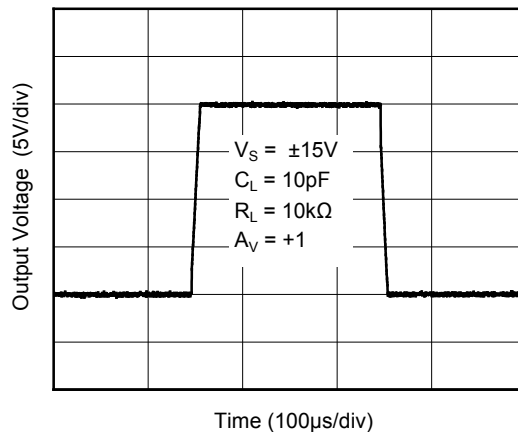
SGMOP17C 1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

TYPICAL PERFORMANCE CHARACTERISTICS

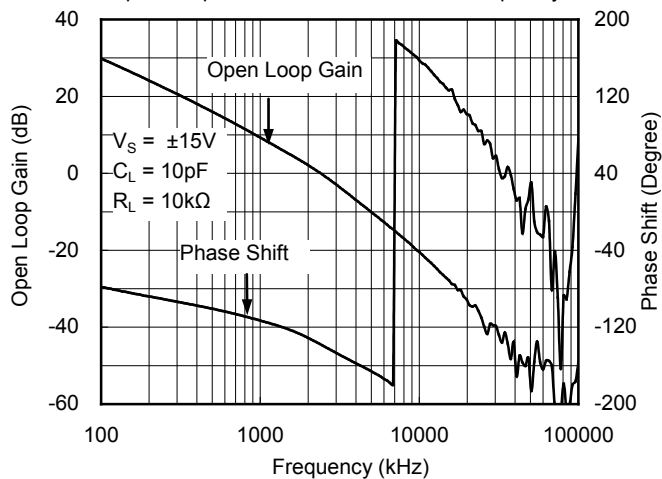
Small Signal Step Response



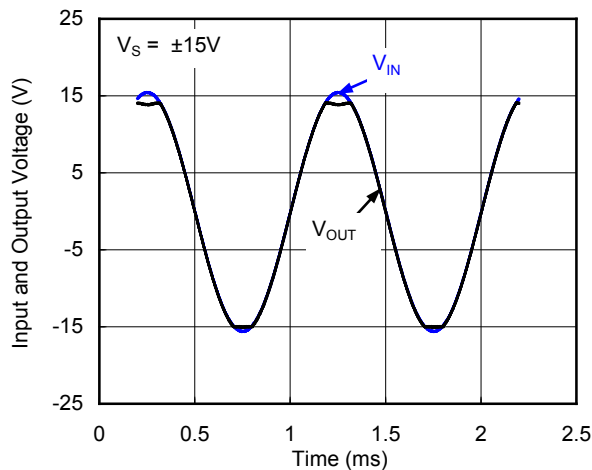
Large Signal Step Response



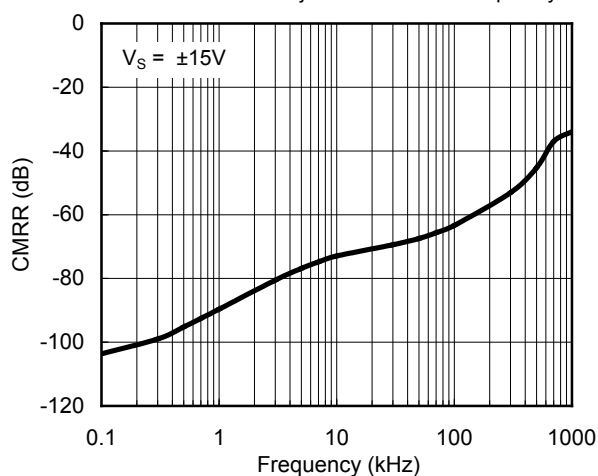
Open Loop Gain and Phase Shift vs. Frequency



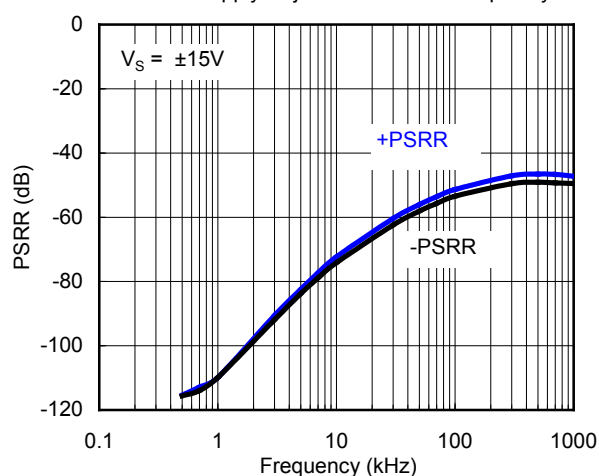
No Phase Reversal



Common Mode Rejection Ratio vs. Frequency

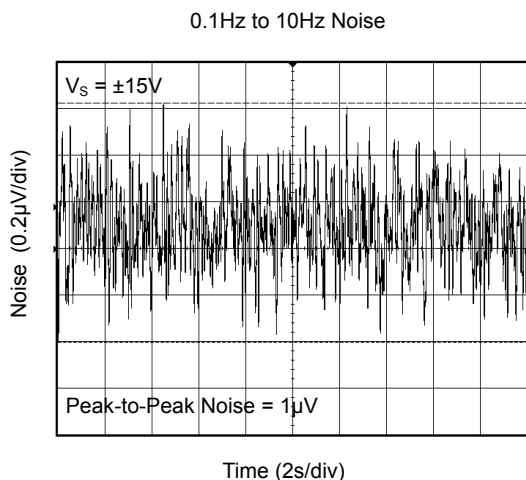
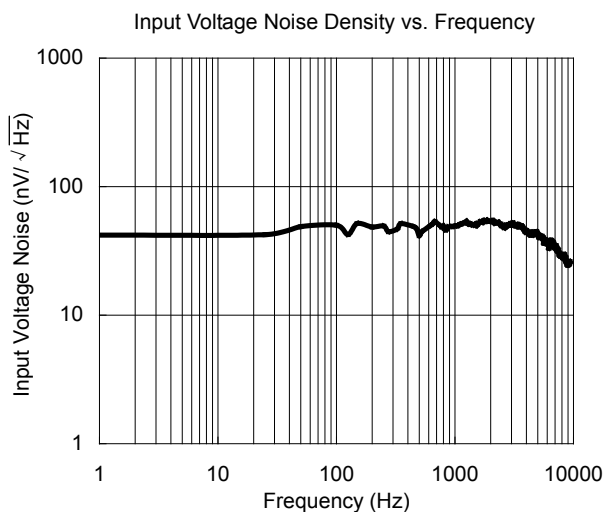
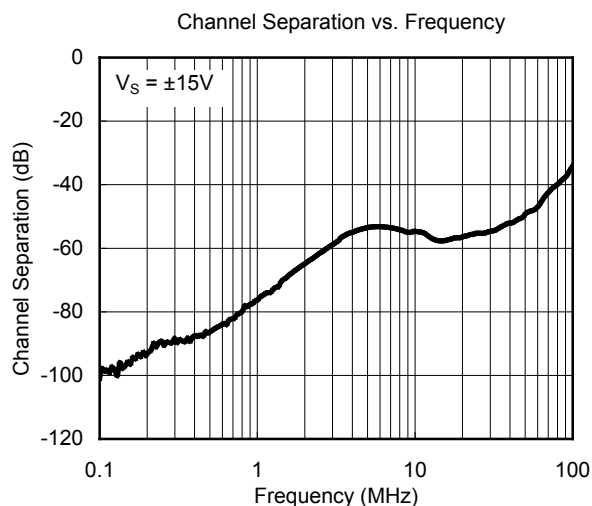
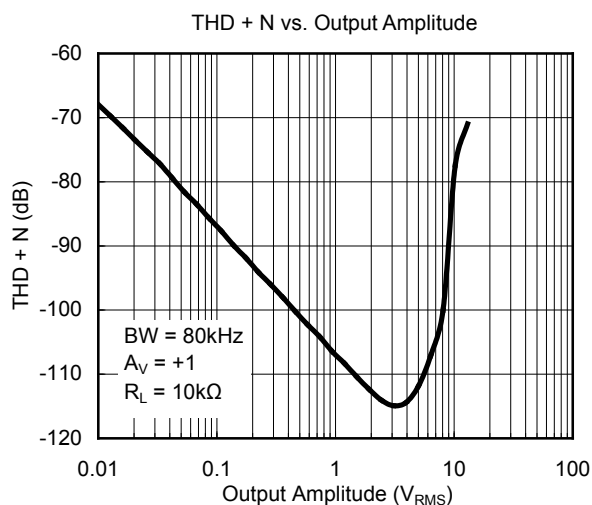
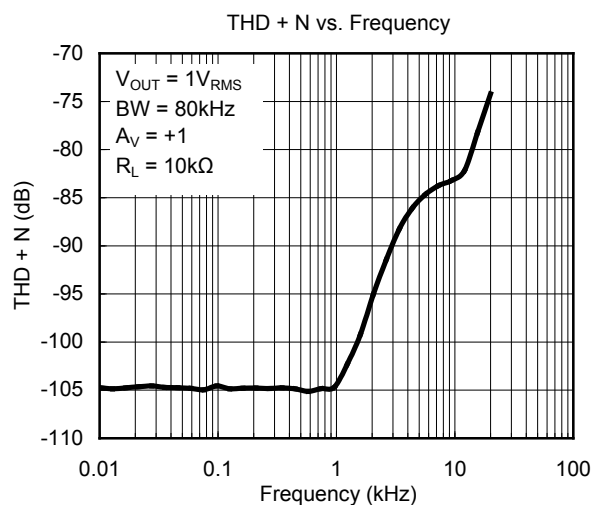


Power Supply Rejection Ratio vs. Frequency



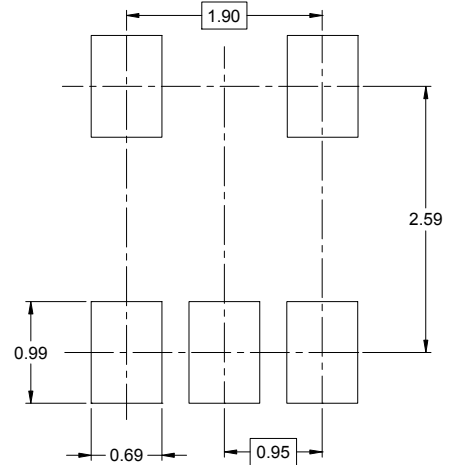
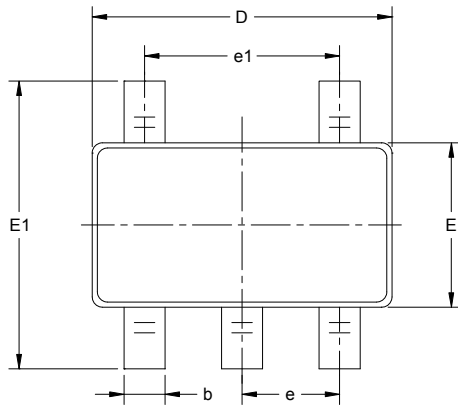
SGMOP17C 1.5MHz, High Voltage, High Precision, Low Noise Rail-to-Rail Output Operational Amplifier

TYPICAL PERFORMANCE CHARACTERISTICS

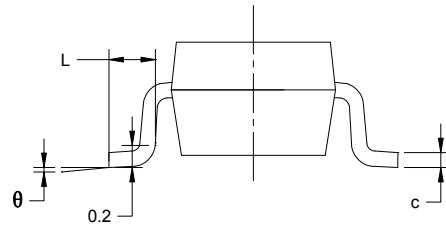
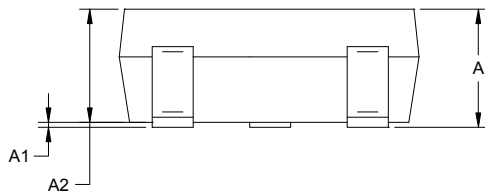


PACKAGE OUTLINE DIMENSIONS

SOT-23-5



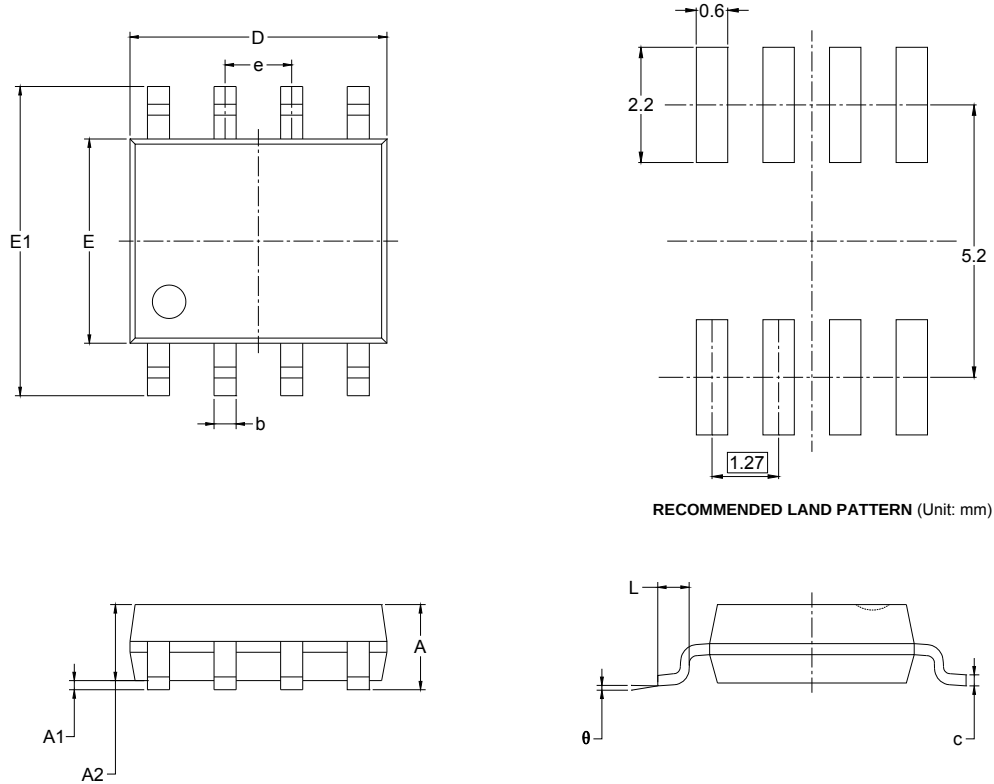
RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

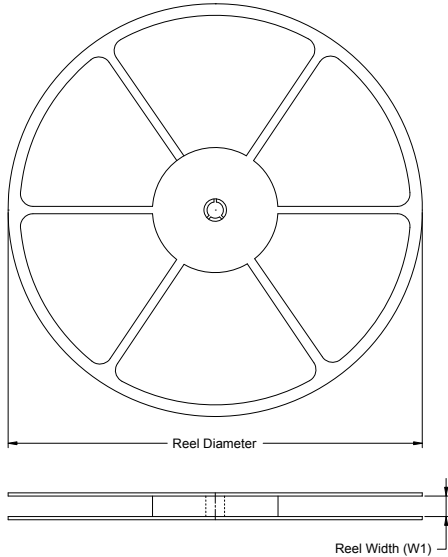
SOIC-8



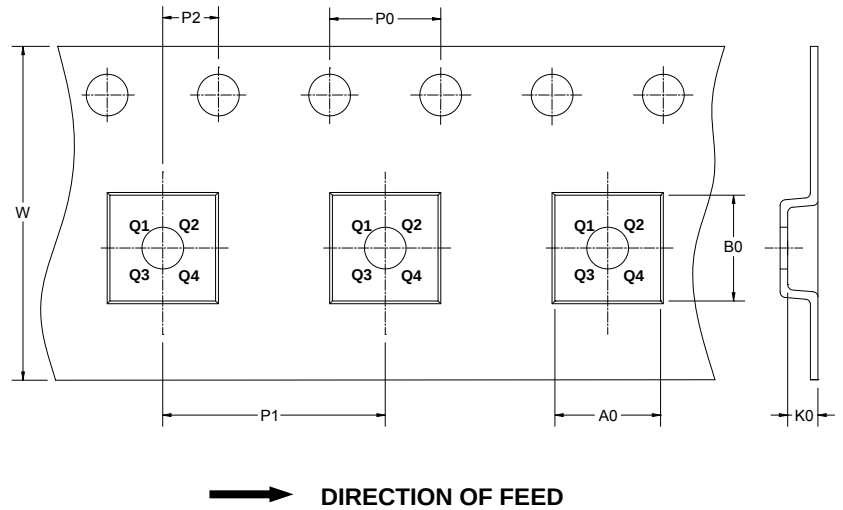
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

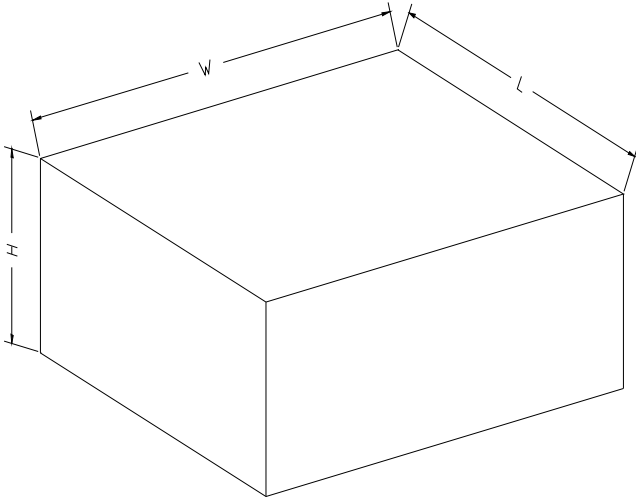
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7"	9.5	3.2	3.2	1.4	4.0	4.0	2.0	8.0	Q3
SOIC-8	13"	12.4	6.4	5.4	2.1	4.0	8.0	2.0	12.0	Q1

DD0001

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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002