



SGM80581/SGM80582/SGM80584 220MHz, Rail-to-Rail I/O, CMOS Operational Amplifiers

GENERAL DESCRIPTION

The SGM80581 (single), SGM80582 (dual) and SGM80584 (quad) are voltage feedback CMOS operational amplifiers, which are optimized for high speed operation. These devices are designed for applications requiring wide bandwidth or high continuous output current, such as video, etc. They can offer a high output current of 150mA. They are unity-gain stable and offer a wide bandwidth of 220MHz. They exhibit a differential gain of 0.01% and a differential phase of 0.1°.

The SGM80581/2/4 can operate from 2.5V to 5.5V single supply or $\pm 1.25V$ to $\pm 2.75V$ dual power supplies, and consume 4.5mA quiescent current per amplifier. These devices support rail-to-rail input and output operation. The input common mode voltage range is from $(-V_S) - 0.1V$ to $(+V_S) + 0.1V$, and the output range is from $(-V_S) + 0.015V$ to $(+V_S) - 0.015V$. The circuitry of multichannel versions is fully independent, which minimizes crosstalk and avoids interaction.

The SGM80581 is available in Green SOT-23-5 and SOIC-8 packages. The SGM80582 is available in Green MSOP-8 and SOIC-8 packages. The SGM80584 is available in a Green SOIC-14 package. They are rated over the extended $-40^\circ C$ to $+125^\circ C$ temperature range.

FEATURES

- **High Speed:**
 - **Unity-Gain Bandwidth: 220MHz**
 - **Gain-Bandwidth Product: 100MHz**
 - **Slew Rate: 160V/ μ s**
- **Excellent Video Performance:**
 - **0.1dB Gain Flatness: 30MHz**
 - **Diff Gain Error: 0.01%**
 - **Diff Phase Error: 0.1°**
- **High Output Current: 150mA (TYP)**
- **Low Noise: $7nV/\sqrt{Hz}$ at 1MHz**
- **Low Input Bias Current: 2pA (TYP)**
- **Rail-to-Rail Input and Output**
- **Support Single or Dual Power Supplies: 2.5V to 5.5V or $\pm 1.25V$ to $\pm 2.75V$**
- **Quiescent Current: 4.5mA/Amplifier (TYP)**
- **Thermal Shutdown**
- **-40°C to +125°C Operating Temperature Range**
- **Small Packaging:**
 - SGM80581 Available in Green SOT-23-5 and SOIC-8 Packages**
 - SGM80582 Available in Green MSOP-8 and SOIC-8 Packages**
 - SGM80584 Available in a Green SOIC-14 Package**

APPLICATIONS

- Video Processing
- Active Filter
- Photodiode Amplifier
- High Speed Integrator
- ADC Input
- DAC Output
- Ultrasound
- Barcode Scanner
- Optical Network
- Tunable Laser

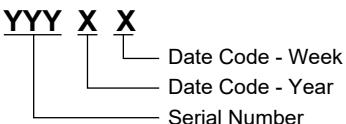
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM80581	SOT-23-5	-40°C to +125°C	SGM80581XN5G/TR	SU1XX	Tape and Reel, 3000
	SOIC-8	-40°C to +125°C	SGM80581XS8G/TR	SGM 80581XS8 XXXXX	Tape and Reel, 2500
SGM80582	MSOP-8	-40°C to +125°C	SGM80582XMS8G/TR	SGM80582 XMS8 XXXXX	Tape and Reel, 4000
	SOIC-8	-40°C to +125°C	SGM80582XS8G/TR	SGM 80582XS8 XXXXX	Tape and Reel, 2500
SGM80584	SOIC-14	-40°C to +125°C	SGM80584XS14G/TR	SGM80584XS14 XXXXX	Tape and Reel, 2500

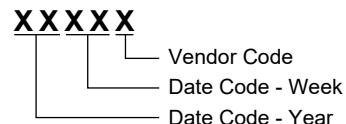
MARKING INFORMATION

NOTE: XX = Date Code. XXXXX = Date Code and Vendor Code.

SOT-23-5



SOIC-8/MSOP-8/SOIC-14



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, +Vs to -Vs	6V
Input Common Mode Voltage Range	(-Vs) - 0.1V to (+Vs) + 0.1V
Signal Input Terminals Voltage Range	(-Vs) - 0.3V to (+Vs) + 0.3V
Output Short-Circuit	Continuous
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM.....	6000V
MM.....	400V
CDM	1000V

RECOMMENDED OPERATING CONDITIONS

Specified Voltage Range	2.7V to 5.5V
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.

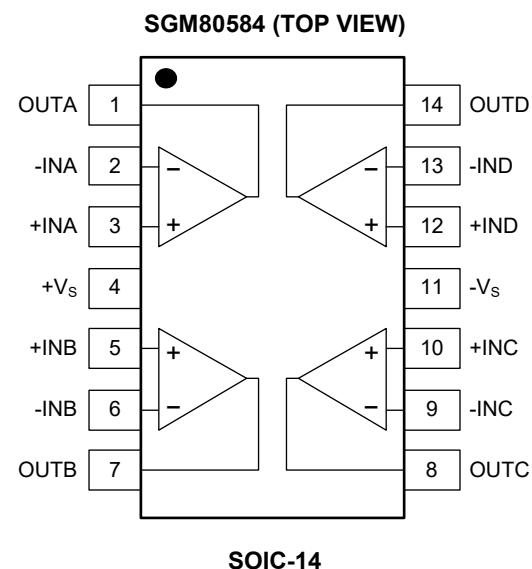
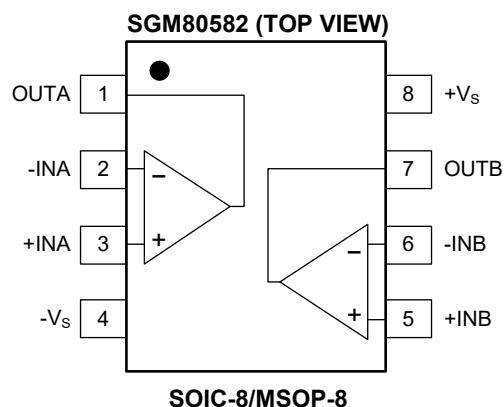
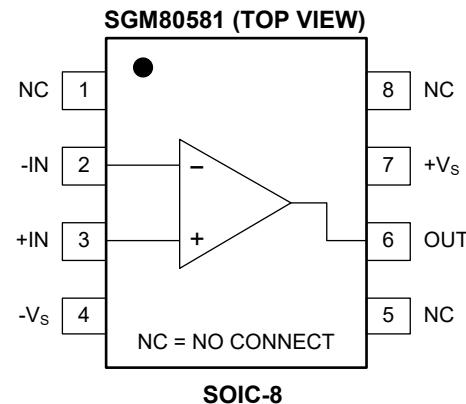
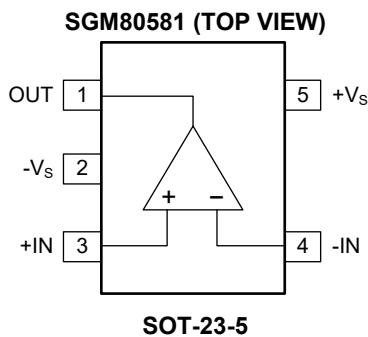
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



ELECTRICAL CHARACTERISTICS

(At $T_A = +25^\circ\text{C}$, $V_S = 2.7\text{V}$ to 5.5V , $V_{CM} = V_S/2$, $V_{OUT} = V_S/2$, $R_L = 1\text{k}\Omega$ connected to $V_S/2$, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Characteristics					
Input Offset Voltage (V_{OS})	$V_S = 5\text{V}$		1.0	3.0	mV
	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			6.5	
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$)	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		6.5		$\mu\text{V}/^\circ\text{C}$
Input Bias Current (I_B)			2		pA
Input Offset Current (I_{OS})			0.1		pA
Input Common Mode Voltage Range (V_{CM})		$(-V_S) - 0.1$		$(+V_S) + 0.1$	V
Common Mode Rejection Ratio (CMRR)	$V_S = 5.5\text{V}$, $-0.1\text{V} < V_{CM} < 5.6\text{V}$	56	71		dB
	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	53			
	$V_S = 5.5\text{V}$, $-0.1\text{V} < V_{CM} < 3.5\text{V}$	60	71		
	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	58			
Open-Loop Voltage Gain (A_{OL})	$(-V_S) + 0.3\text{V} < V_{OUT} < (+V_S) - 0.3\text{V}$, $R_L = 1\text{k}\Omega$	89	109		dB
	$(-V_S) + 0.4\text{V} < V_{OUT} < (+V_S) - 0.4\text{V}$, $R_L = 1\text{k}\Omega$	89	109		
	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	84			
Input Impedance					
Differential			$10^{12} \parallel 4$		$\Omega \parallel \text{pF}$
Common Mode			$10^{12} \parallel 6$		$\Omega \parallel \text{pF}$
Output Characteristics					
Output Voltage Swing from Rail	$V_S = 5\text{V}$, $R_L = 1\text{k}\Omega$		15	62	mV
Output Short-Circuit Current (I_{SC})	$V_S = 5\text{V}$	110	150		mA
	$V_S = 3\text{V}$		90		
Closed-Loop Output Impedance	$f < 100\text{kHz}$		0.1		Ω
Dynamic Performance					
-3dB Small-Signal Bandwidth ($f_{-3\text{dB}}$)	$G = +1$, $V_{OUT} = 100\text{mV}_{\text{P-P}}$, $R_F = 25\Omega$		220		MHz
	$G = +2$, $V_{OUT} = 100\text{mV}_{\text{P-P}}$		106		
Gain-Bandwidth Product (GBP)	$G = +10$, $V_{OUT} = 100\text{mV}_{\text{P-P}}$		100		MHz
Bandwidth for 0.1dB Gain Flatness	$G = +2$, $V_{OUT} = 100\text{mV}_{\text{P-P}}$		30		MHz
Slew Rate (SR)	$V_S = 5\text{V}$, $V_{OUT} = 2\text{V}_{\text{P-P}}$		160		$\text{V}/\mu\text{s}$
	$V_S = 5\text{V}$, $V_{OUT} = 4\text{V}_{\text{P-P}}$		170		
Rise-and-Fall Time	$G = +1$, $V_{OUT} = 200\text{mV}_{\text{P-P}}$, 10% to 90%		3.5		ns
	$G = +1$, $V_{OUT} = 2\text{V}_{\text{P-P}}$, 10% to 90%		12		
Settling Time to 0.1%	$V_{OUT} = 2\text{V}_{\text{P-P}}$		75		ns
	$V_{OUT} = 4\text{V}_{\text{P-P}}$		35		
Overload Recovery Time	$V_{IN} \times G = V_S$		18		ns
Crosstalk (SGM80582/4)	$f = 5\text{MHz}$		-110		dB

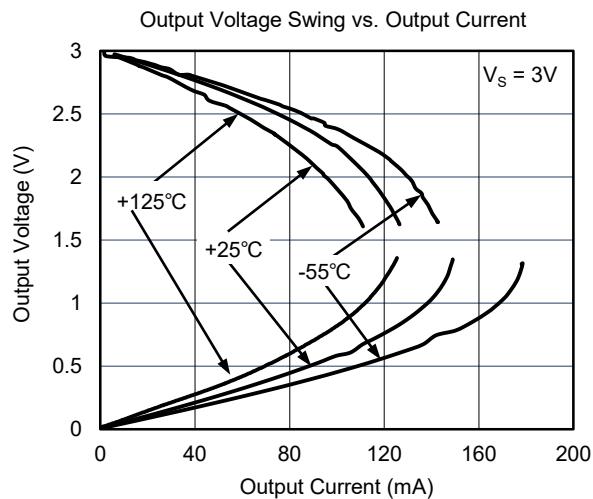
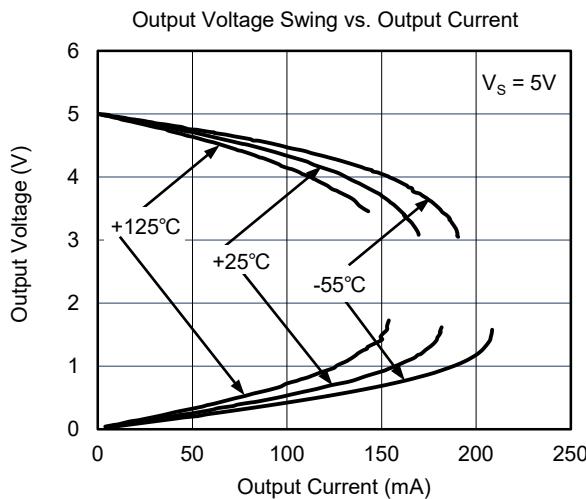
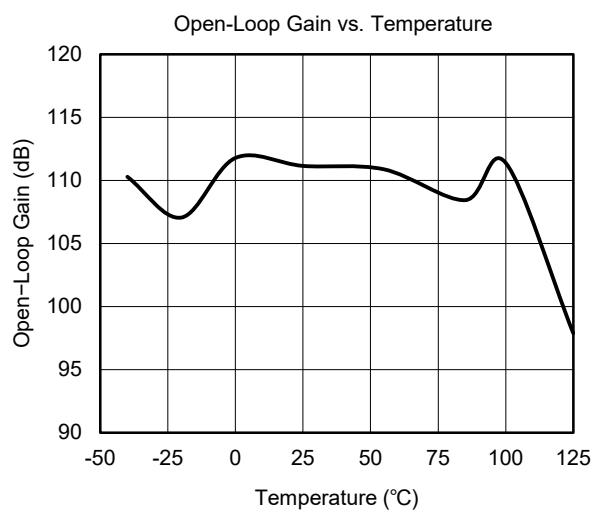
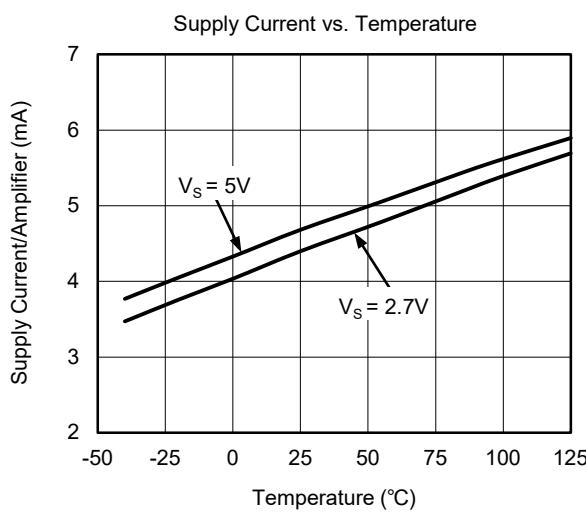
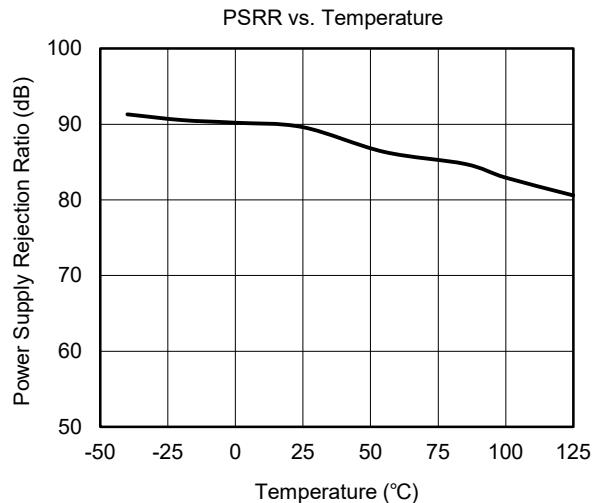
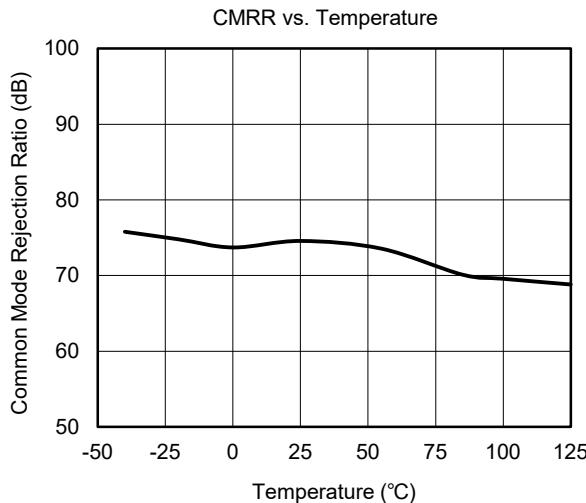
ELECTRICAL CHARACTERISTICS (continued)

(At $T_A = +25^\circ\text{C}$, $V_S = 2.7\text{V}$ to 5V , $V_{CM} = V_S/2$, $V_{OUT} = V_S/2$, $R_L = 1\text{k}\Omega$ connected to $V_S/2$, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Power Supply					
Specified Voltage Range (V_S)		2.7		5.5	V
Operating Voltage Range		2.5		5.5	V
Power Supply Rejection Ratio (PSRR)	$V_S = 2.7\text{V}$ to 5.5V , $V_{CM} = (V_S/2) - 0.55\text{V}$		100	540	$\mu\text{V/V}$
	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			620	
Quiescent Current/Amplifier (I_Q)	$V_S = 5\text{V}$, $I_{OUT} = 0\text{A}$		4.5	7	mA
	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			9	
Noise/Distortion Performance					
Input Voltage Noise Density (e_n)	$f = 1\text{MHz}$		7		$\text{nV}/\sqrt{\text{Hz}}$
Input Current Noise Density (i_n)	$f = 1\text{MHz}$		10		$\text{fA}/\sqrt{\text{Hz}}$
Differential Gain Error	PAL , $R_L = 150\Omega$		0.01		%
Differential Phase Error	PAL , $R_L = 150\Omega$		0.1		°
Harmonic Distortion (2nd-Harmonic)	$G = +1$, $f = 1\text{MHz}$, $V_{OUT} = 2V_{P-P}$, $V_{CM} = 1.5\text{V}$, $R_L = 200\Omega$		-66		dBc
Harmonic Distortion (3rd-Harmonic)	$G = +1$, $f = 1\text{MHz}$, $V_{OUT} = 2V_{P-P}$, $V_{CM} = 1.5\text{V}$, $R_L = 200\Omega$		-76		dBc
Thermal Shutdown					
Thermal Shutdown			150		°C
Reset from Shutdown			130		°C

TYPICAL PERFORMANCE CHARACTERISTICS

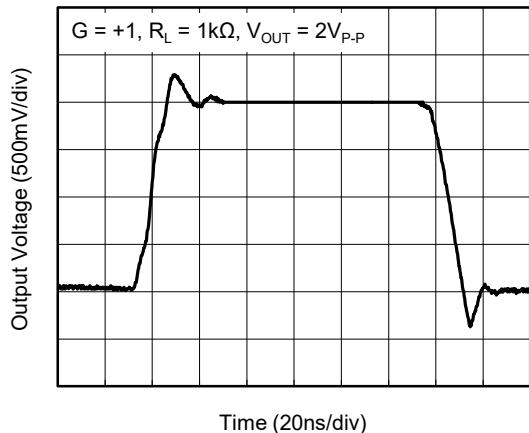
At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $G = +1$, $R_L = 1\text{k}\Omega$ and connected to $V_S/2$, unless otherwise noted.



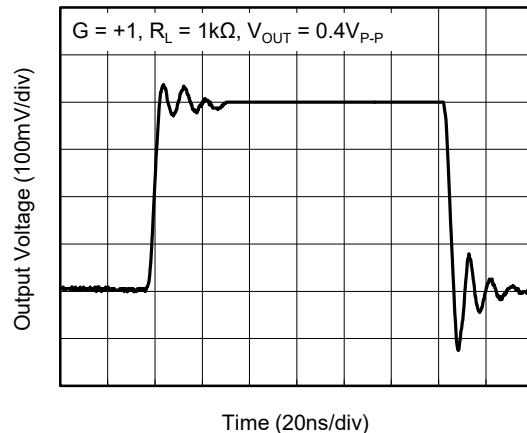
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $G = +1$, $R_L = 1\text{k}\Omega$ and connected to $V_S/2$, unless otherwise noted.

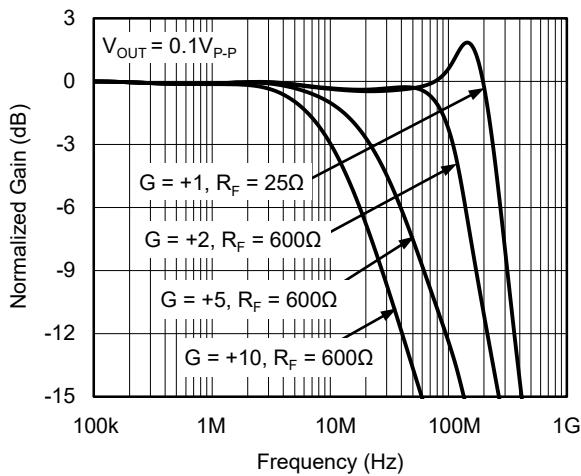
Non-Inverting Large-Signal Step Response



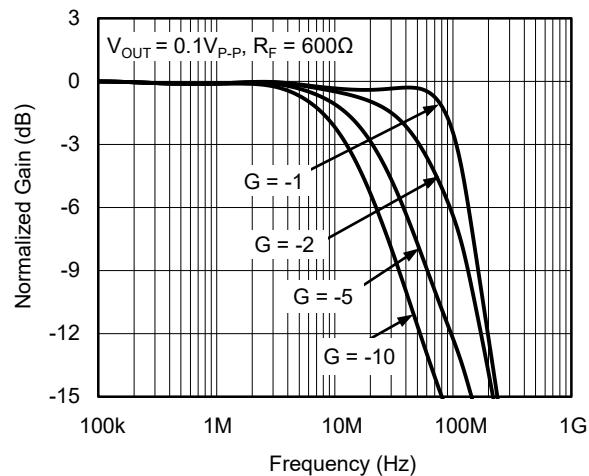
Non-Inverting Small-Signal Step Response



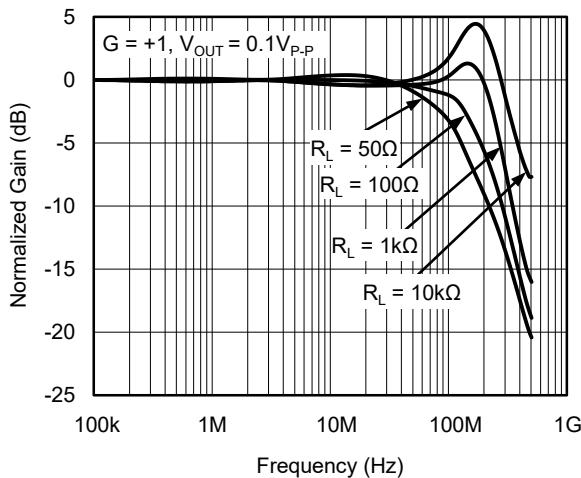
Non-Inverting Small-Signal Frequency Response



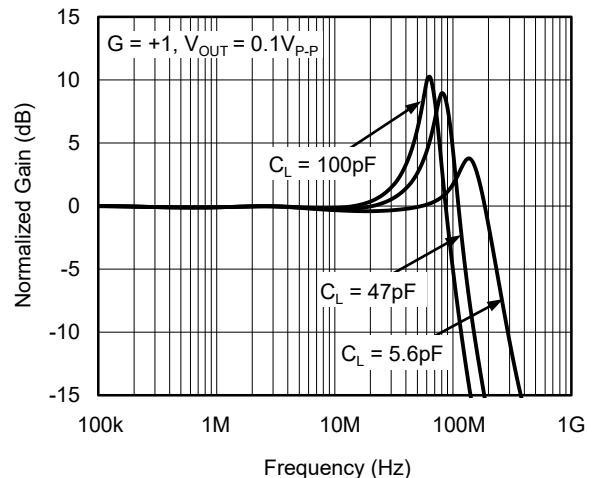
Inverting Small-Signal Frequency Response



Frequency Response for Various R_L

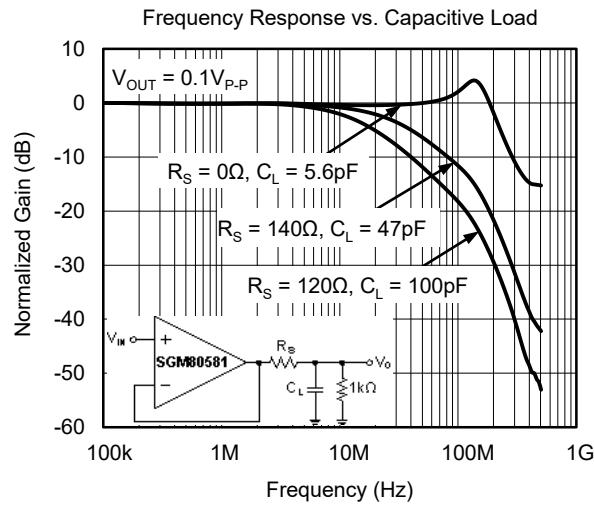
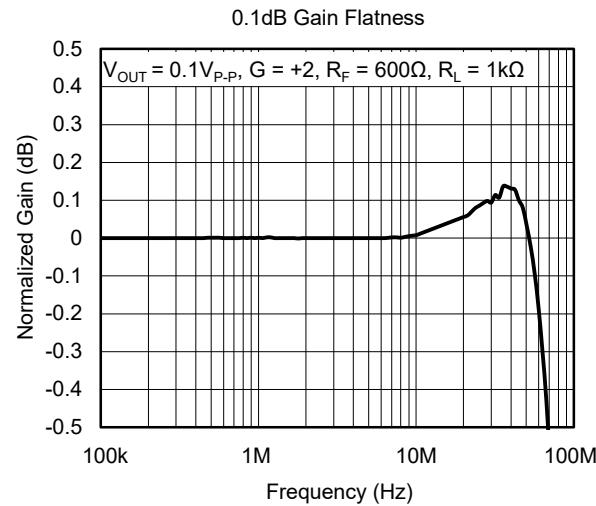
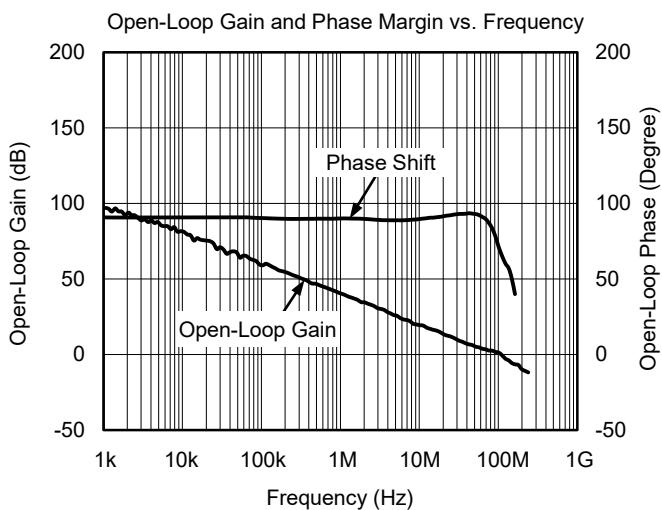
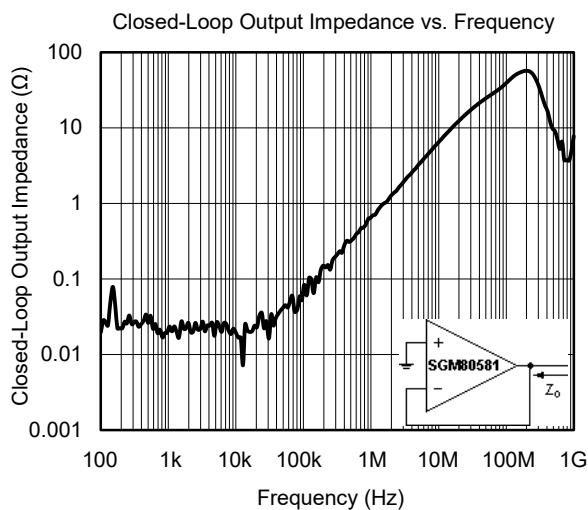
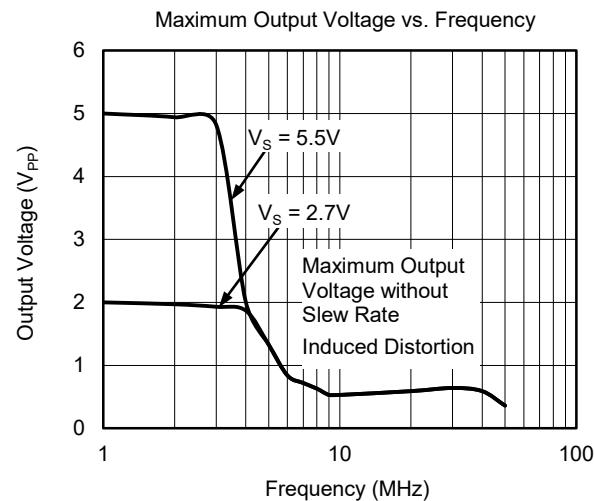
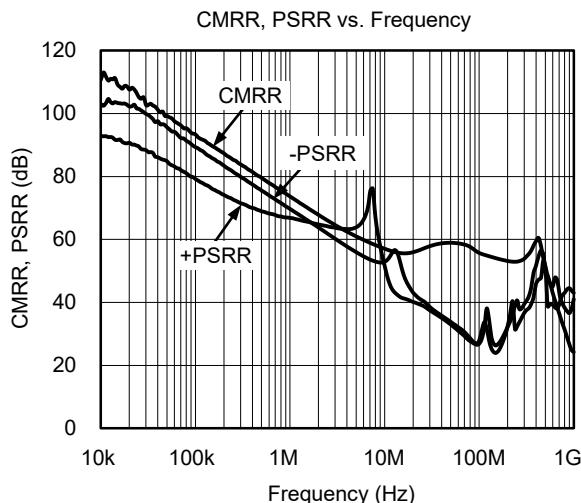


Frequency Response for Various C_L



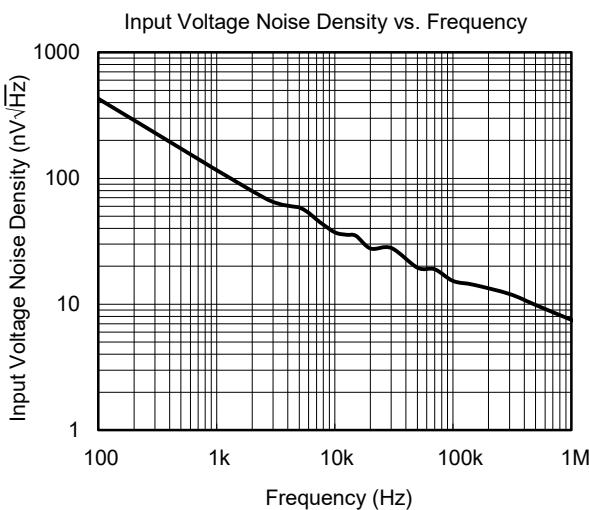
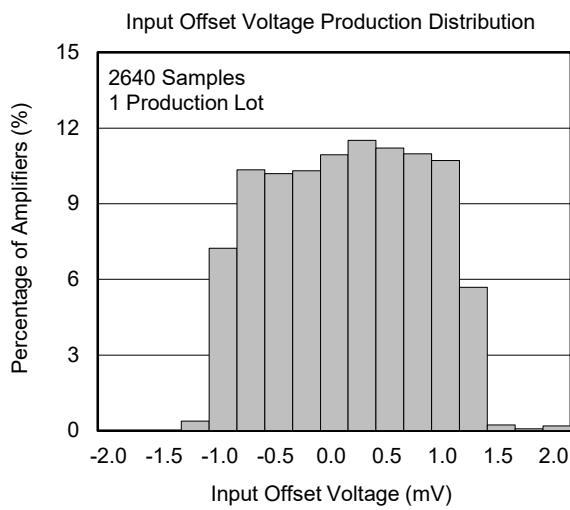
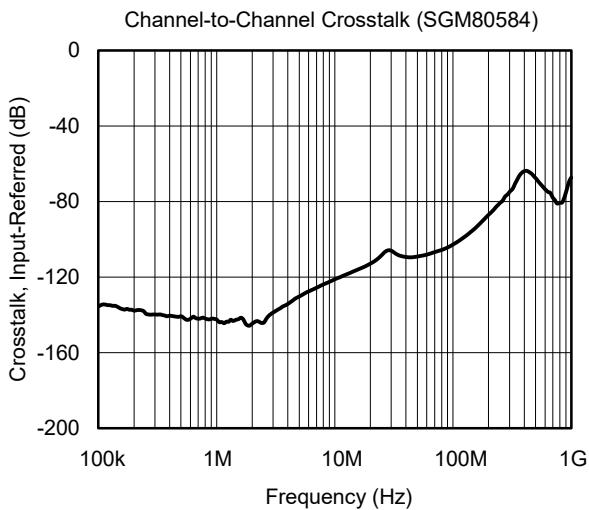
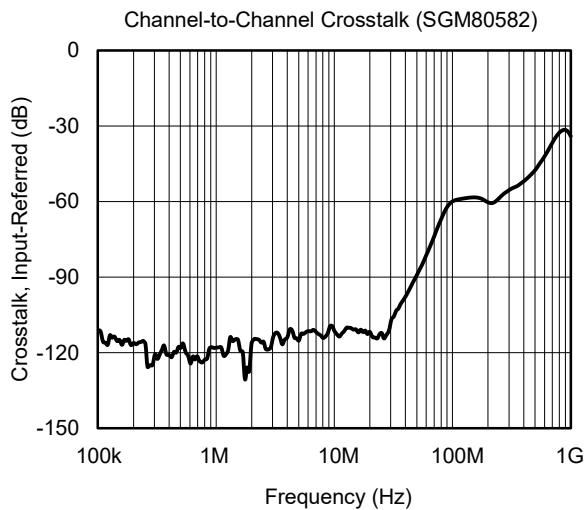
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $G = +1$, $R_L = 1\text{k}\Omega$ and connected to $V_S/2$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $G = +1$, $R_L = 1\text{k}\Omega$ and connected to $V_S/2$, unless otherwise noted.



REVISION HISTORY

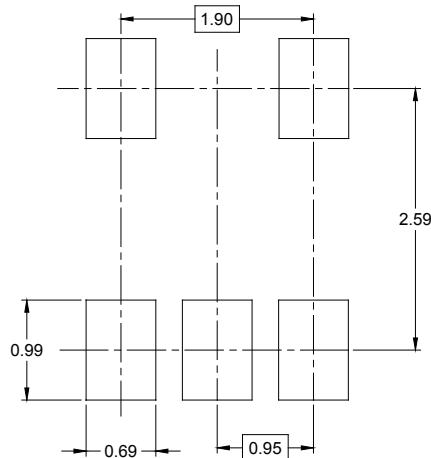
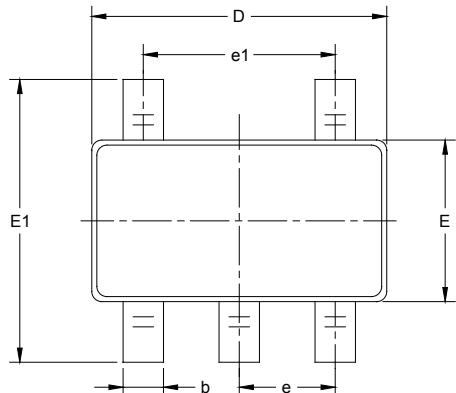
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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Updated Marking Information section.....	2
JUNE 2019 – REV.A to REV.A.1	
Updated Electrical Characteristics section	4
Changes from Original (DECEMBER 2016) to REV.A	
Changed from product preview to production data.....	All

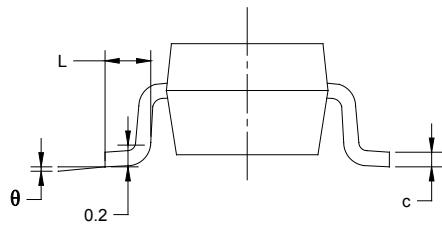
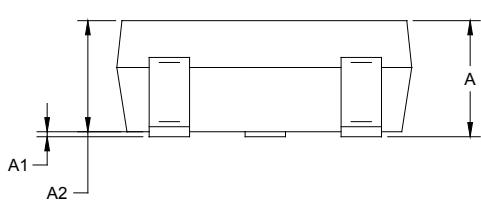
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)

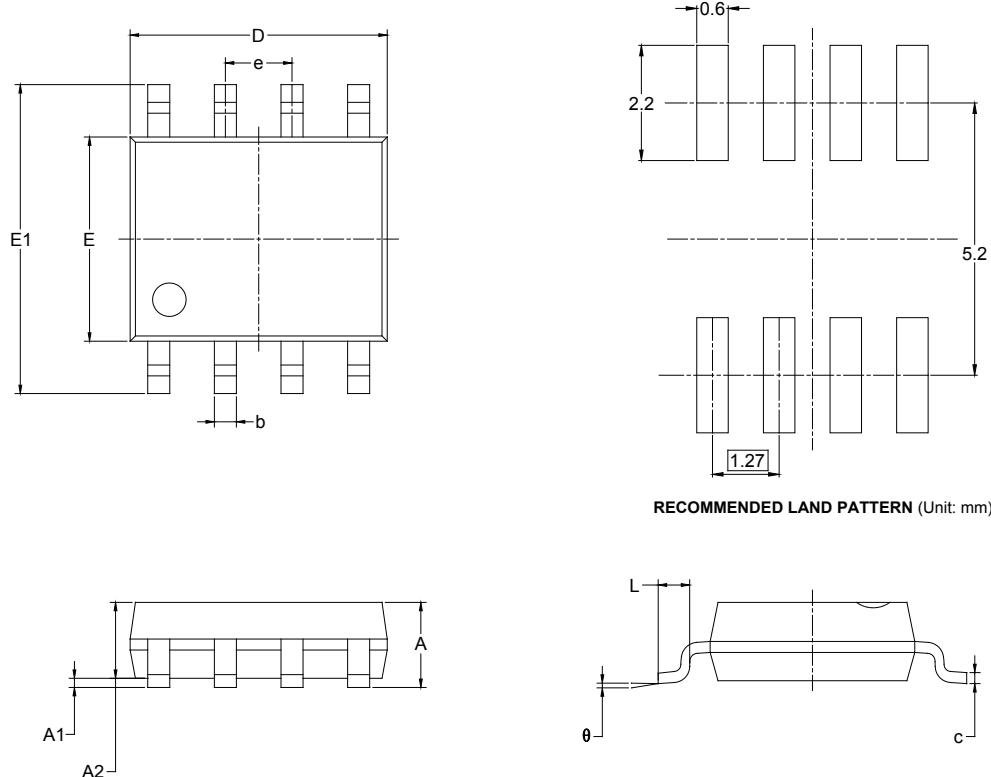


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOIC-8

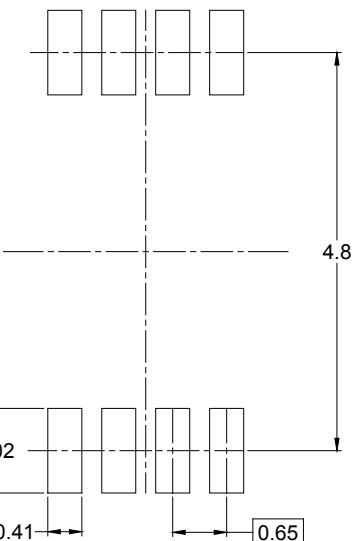
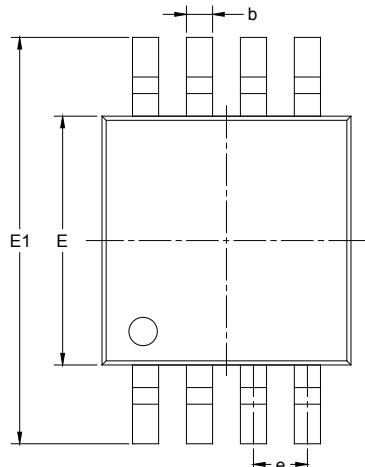


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

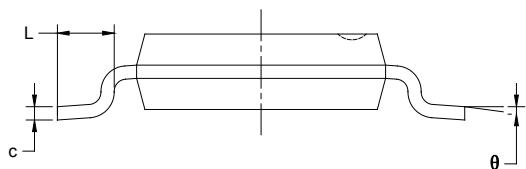
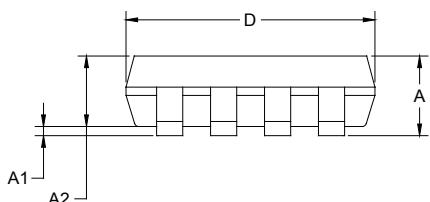
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

MSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)

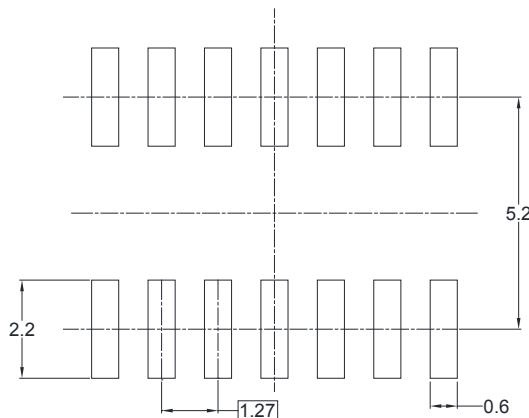
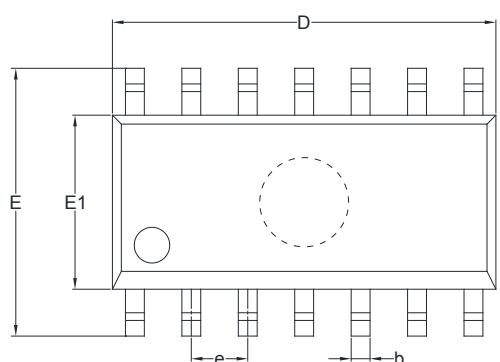


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

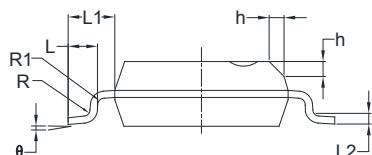
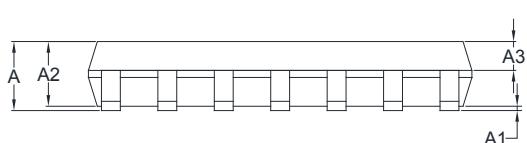
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOIC-14



RECOMMENDED LAND PATTERN (Unit: mm)

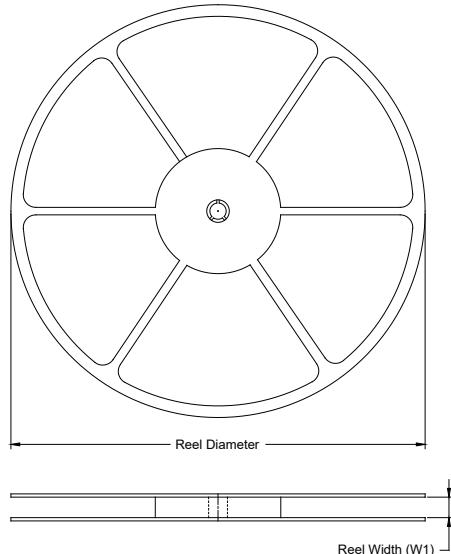


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	0.018	0.032
L1	1.04 REF		0.040 REF	
L2	0.25 BSC		0.01 BSC	
R	0.07		0.003	
R1	0.07		0.003	
h	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°

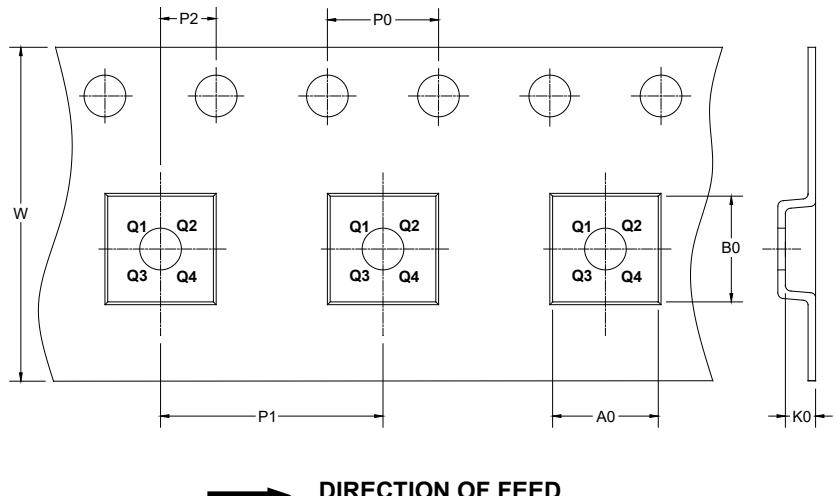
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

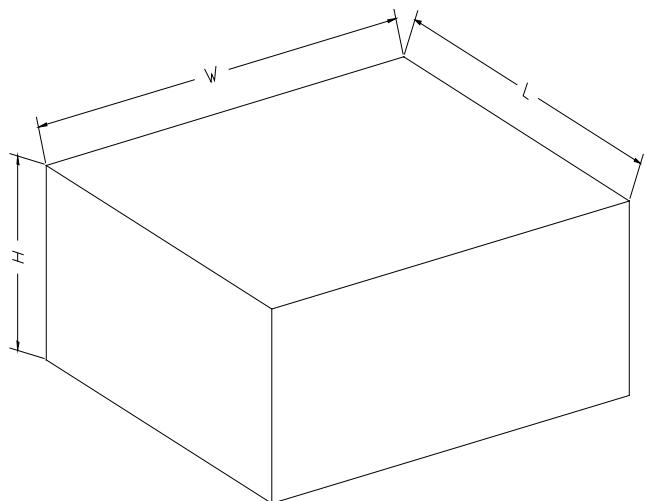
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SOIC-8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1
SOIC-14	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	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