



# SGM8651/SGM8652/SGM8653 SGM8654/SGM8655 50MHz, Rail-to-Rail Output CMOS Operational Amplifiers

## GENERAL DESCRIPTION

The SGM8651/3 (single), SGM8652/5 (dual) and SGM8654 (quad) are high precision, low distortion and noise operational amplifiers with voltage feedback function. These devices can operate from 2.5V to 5.5V single supply. The SGM8651/2/3/4/5 feature a 2mV (TYP) input offset voltage and offer a low supply current of 2.3mA/amplifier.

The SGM8651/2/3/4/5 have excellent performance. They exhibit a gain-bandwidth product of 50MHz and a slew rate of 66V/ $\mu$ s.

The fast settling time and low distortion make the operational amplifiers appropriate for high speed ADC/DAC. The supply current of SGM8653/5 is 75 $\mu$ A in shutdown mode. The devices are suitable for use in portable instrumentation and battery-powered systems.

The SGM8651 is available in Green SOT-23-5 and SOIC-8 packages. The SGM8652 is available in Green SOIC-8 and MSOP-8 packages. The SGM8653 is available in Green SOT-23-6 and SOIC-8 packages. The SGM8654 is available in Green SOIC-14 and TSSOP-14 packages. The SGM8655 is available in a Green MSOP-10 package. They are specified over the extended -40°C to +125°C temperature range.

## FEATURES

- **Input Offset Voltage:** 2mV (TYP)
- **Low Input Voltage Noise:** 8.7nV/ $\sqrt{\text{Hz}}$
- **High Speed:**
  - Gain-Bandwidth Product: 50MHz
  - High Slew Rate: 66V/ $\mu$ s
  - Settling Time to 0.1% with 2V Step: 60ns
- **Overload Recovery Time:** 25ns
- **Rail-to-Rail Output**
- **Supply Voltage Range:** 2.5V to 5.5V
- **Input Common Mode Voltage Range:**
  - 0.2V to 3.8V with  $V_S = 5V$
- **Low Supply Current:**
  - 2.3mA/Amplifier (TYP)
  - 75 $\mu$ A/Amplifier Shutdown Current for SGM8653/5
- **-40°C to +125°C Operating Temperature Range**
- **Small Packaging:**
  - SGM8651 Available in Green SOT-23-5 and SOIC-8 Packages
  - SGM8652 Available in Green MSOP-8 and SOIC-8 Packages
  - SGM8653 Available in Green SOT-23-6 and SOIC-8 Packages
  - SGM8654 Available in Green TSSOP-14 and SOIC-14 Packages
  - SGM8655 Available in a Green MSOP-10 Package

## APPLICATIONS

ADC/DAC  
Filter  
Data Acquisition  
Process Control  
Audio & Video Processing  
Test Equipment  
Cell Phone PA Control  
Broadband Communication

**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8651	SOT-23-5	-40°C to +125°C	SGM8651XN5/TR	8651	Tape and Reel, 3000
	SOIC-8	-40°C to +125°C	SGM8651XS/TR	SGM8651XS	Tape and Reel, 2500
SGM8652	MSOP-8	-40°C to +125°C	SGM8652XMS/TR	SGM8652XMS	Tape and Reel, 3000
	SOIC-8	-40°C to +125°C	SGM8652XS/TR	SGM8652XS	Tape and Reel, 2500
SGM8653	SOT-23-6	-40°C to +125°C	SGM8653XN6/TR	8653	Tape and Reel, 3000
	SOIC-8	-40°C to +125°C	SGM8653XS/TR	SGM8653XS	Tape and Reel, 2500
SGM8654	SOIC-14	-40°C to +125°C	SGM8654XS14/TR	SGM8654XS14	Tape and Reel, 2500
	TSSOP-14	-40°C to +125°C	SGM8654XTS14/TR	SGM8654XTS14	Tape and Reel, 3000
SGM8655	MSOP-10	-40°C to +125°C	SGM8655XMS/TR	SGM8655XMS	Tape and Reel, 3000

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 ..... 7.5V  
 Input Common Mode Voltage ..... (-Vs) - 0.5V to (+Vs) + 0.5V  
 Package Thermal Resistance @ TA = +25°C  
 SOT-23-5, θJA ..... 190°C/W  
 SOT-23-6, θJA ..... 190°C/W  
 SOIC-8, θJA ..... 125°C/W  
 MSOP-8, θJA ..... 216°C/W  
 MSOP-10, θJA ..... 216°C/W  
 Junction Temperature ..... +160°C  
 Storage Temperature Range ..... -65°C to +150°C  
 Lead Temperature (Soldering, 10s) ..... +260°C  
 ESD Susceptibility  
 HBM ..... 1000V  
 MM ..... 400V

**RECOMMENDED OPERATING CONDITIONS**

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**

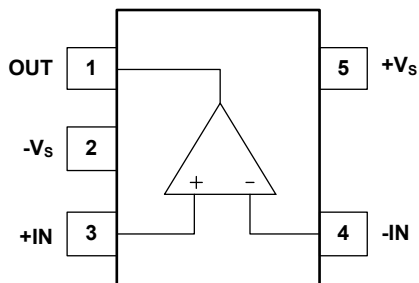
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

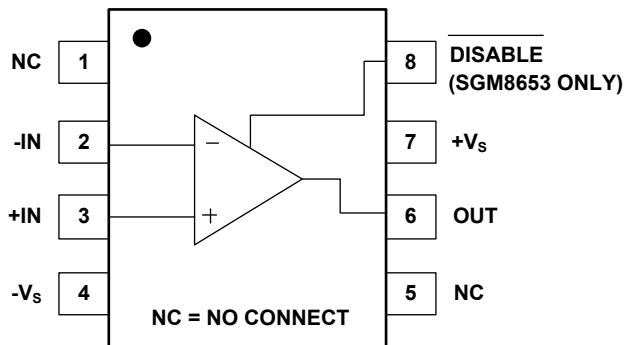
**PIN CONFIGURATIONS**

**SGM8651 (TOP VIEW)**



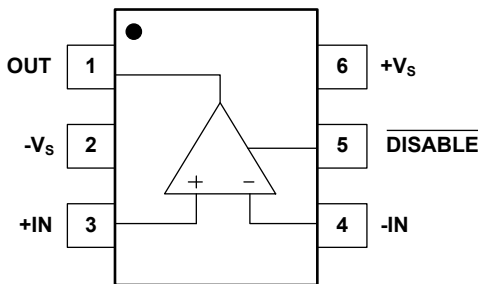
**SOT-23-5**

**SGM8651/8653 (TOP VIEW)**



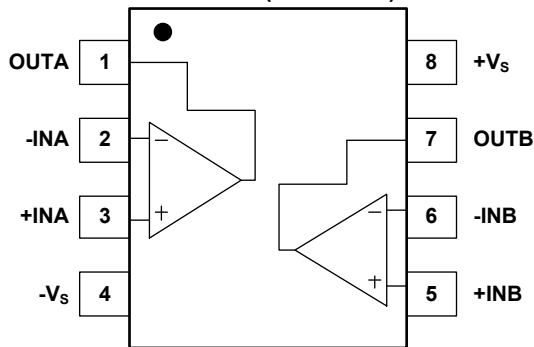
**SOIC-8**

**SGM8653 (TOP VIEW)**



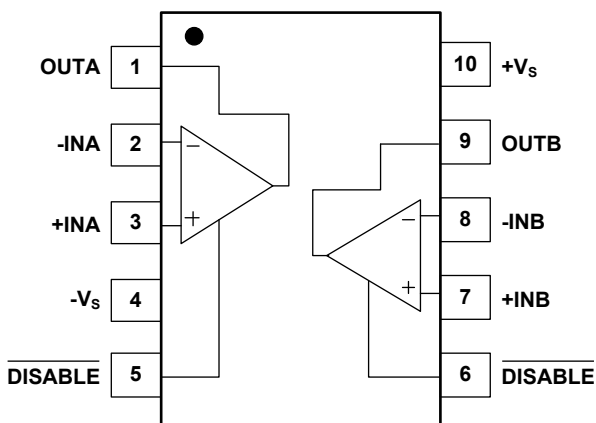
**SOT-23-6**

**SGM8652 (TOP VIEW)**



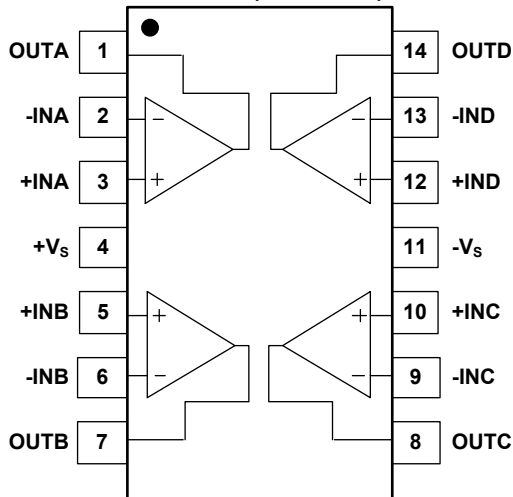
**SOIC-8/MSOP-8**

**SGM8655 (TOP VIEW)**



**MSOP-10**

**SGM8654 (TOP VIEW)**



**TSSOP-14/SOIC-14**

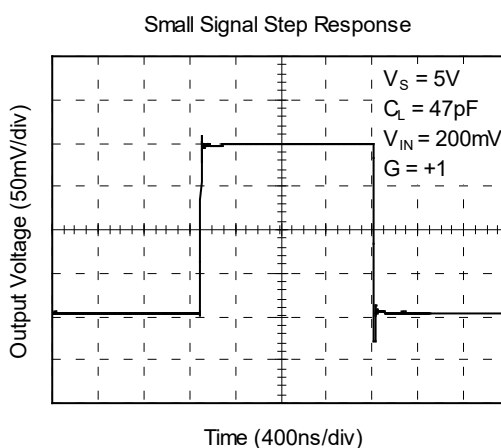
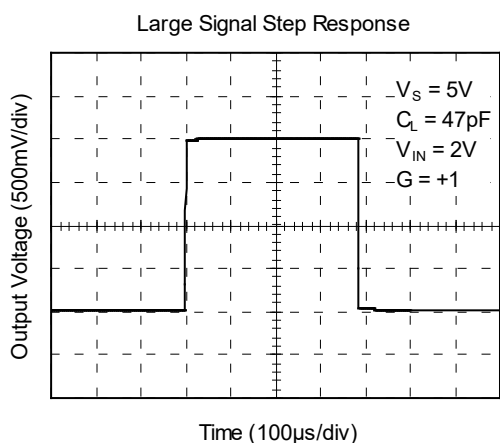
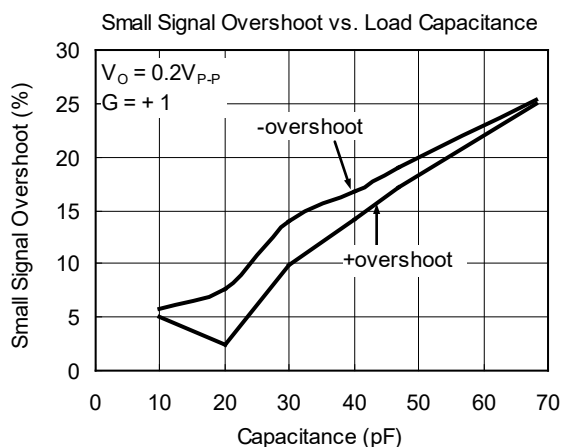
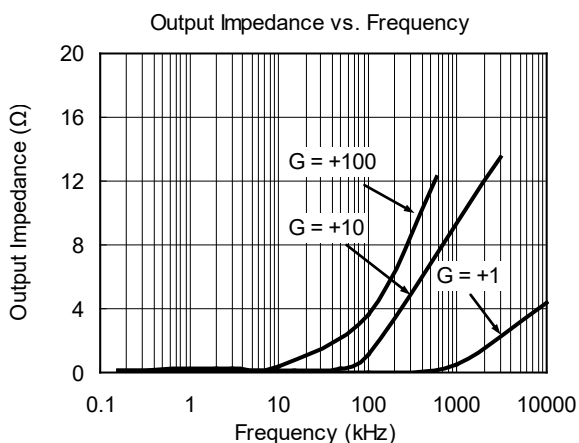
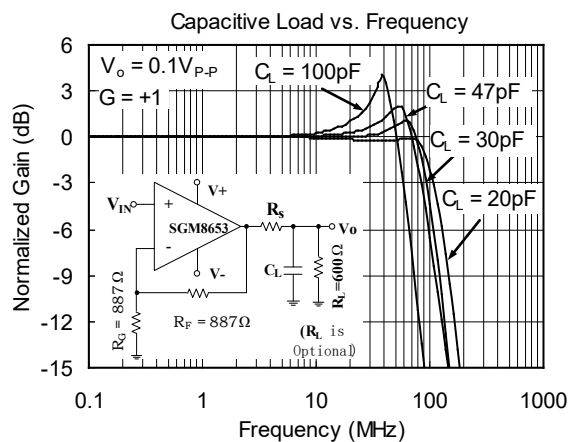
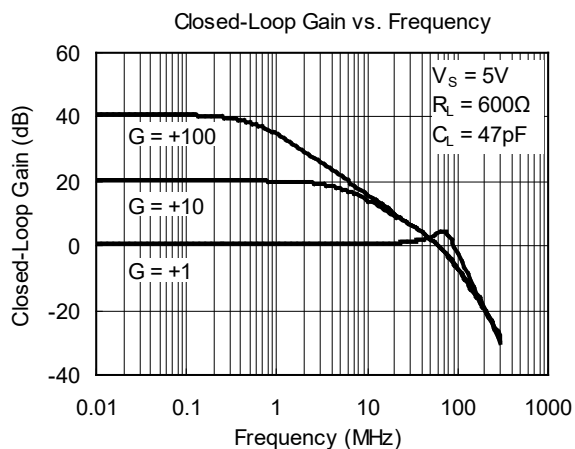
**ELECTRICAL CHARACTERISTICS**

(At T<sub>A</sub> = +25°C, V<sub>S</sub> = 5V, R<sub>L</sub> = 600Ω connected to V<sub>S</sub>/2, unless otherwise noted.)

PARAMETER	CONDITIONS	SGM8651/2/3/4/5							
		TYP	MIN/MAX OVER TEMPERATURE					UNITS	MIN/ MAX
		+25°C	+25°C	0°C to +70°C	-40°C to +85°C	-40°C to +125°C			
<b>Dynamic Performance</b>									
Gain-Bandwidth Product (GBP)	G = +10	50						MHz	TYP
Slew Rate	G = +1, 2V Output step	66						V/μs	TYP
Settling Time to 0.1%	G = +1, 2V Output step	60						ns	TYP
Overload Recovery Time	V <sub>IN</sub> , G = +V <sub>S</sub>	25						ns	TYP
<b>Noise Performance</b>									
Input Voltage Noise Density (e <sub>n</sub> )	f = 100kHz	16						nV/√Hz	TYP
	f = 1MHz	8.7						nV/√Hz	TYP
<b>DC Performance</b>									
Input Offset Voltage (V <sub>OS</sub> )		±2	±8	±8.9	±9.5	±9.8		mV	MAX
Input Offset Voltage Drift		4.5						μV/°C	TYP
Input Bias Current (I <sub>B</sub> )		6						pA	TYP
Input offset Current (I <sub>OS</sub> )		2						pA	TYP
Open-Loop Gain (A <sub>OL</sub> )	V <sub>OUT</sub> = 0.3V to 4.7V, R <sub>L</sub> = 150Ω	80	75	74	74	73		dB	MIN
	V <sub>OUT</sub> = 0.2V to 4.8V, R <sub>L</sub> = 1kΩ	104	92	91	91	80		dB	MIN
<b>Input Characteristics</b>									
Input Common Mode Voltage Range (V <sub>CM</sub> )		-0.2 to +3.8						V	TYP
Common Mode Rejection Ratio(CMRR)	V <sub>CM</sub> = -0.1V to 3.5V	80	66	65	65	62		dB	MIN
<b>Output Characteristics</b>									
Output Voltage Swing from Rail	R <sub>L</sub> = 150Ω	0.12						V	TYP
	R <sub>L</sub> = 1kΩ	0.03						V	TYP
Output Current		127	100	96	89	82		mA	MIN
Closed-Loop Output Impedance	f < 100kHz, G = +1	0.08						Ω	TYP
<b>Power-Down Disable</b> (SGM8653/5 Only)									
Turn-On Time		220						ns	TYP
Turn-Off Time		150						ns	TYP
$\overline{\text{DISABLE}}$ Voltage-Off			0.8					V	MAX
$\overline{\text{DISABLE}}$ Voltage-On			2					V	MIN
<b>Power Supply</b>									
Operating Voltage Range			2.5	2.7	2.7	2.7		V	MIN
			5.5	5.5	5.5	5.5		V	MAX
Quiescent Current (per Amplifier)		2.3	2.9	3.4	3.8	4		mA	MAX
Supply Current when Disabled per Amplifier (SGM8653/5 Only)		75	120	127	130	137		μA	MAX
Power Supply Rejection Ratio (PSRR)	ΔV <sub>S</sub> = 2.7V to 5.5V, V <sub>CM</sub> = (-V <sub>S</sub> ) + 0.5	80	67	67	65	62		dB	MIN

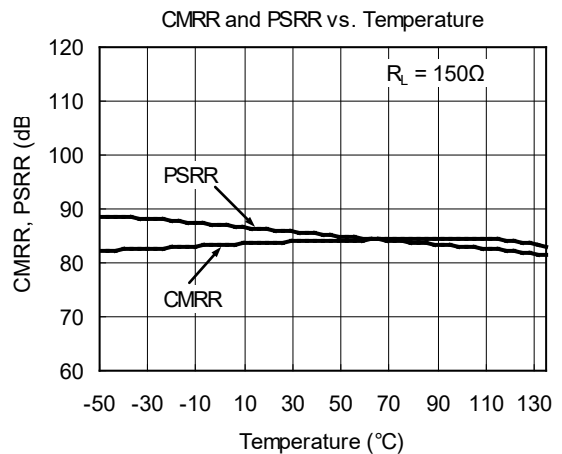
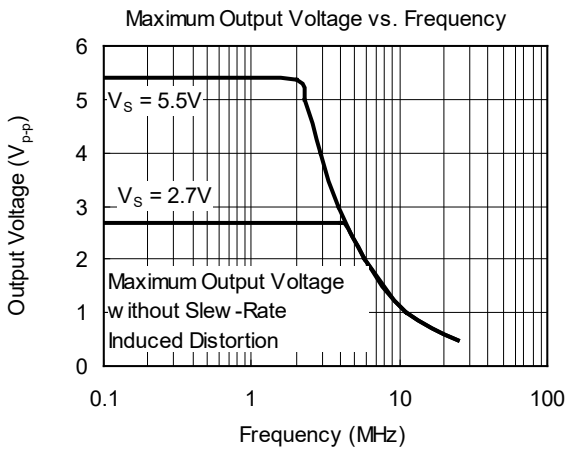
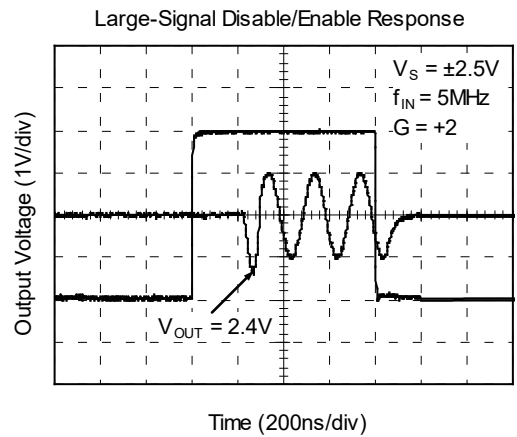
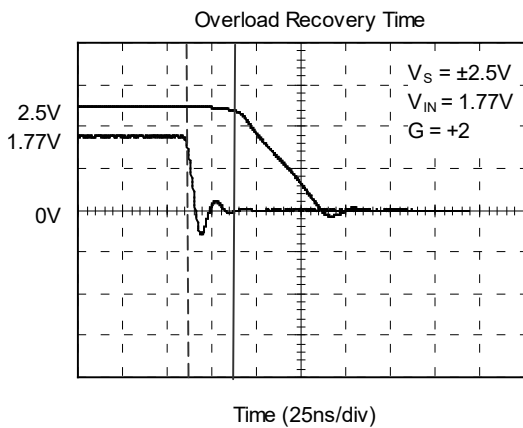
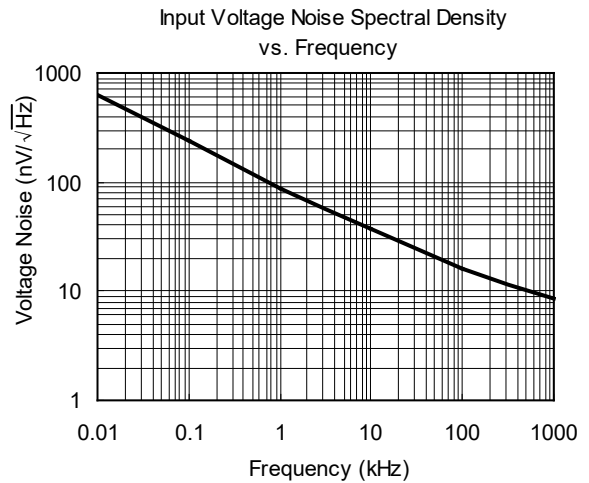
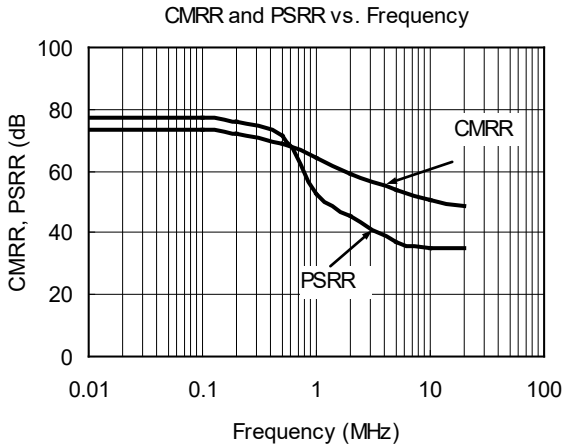
**TYPICAL PERFORMANCE CHARACTERISTICS**

At  $T_A = +25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $G = +2$ ,  $R_F = 887\Omega$ ,  $R_G = 887\Omega$ ,  $C_L = 47\text{pF}$ , and  $R_L = 600\Omega$ , unless otherwise noted.



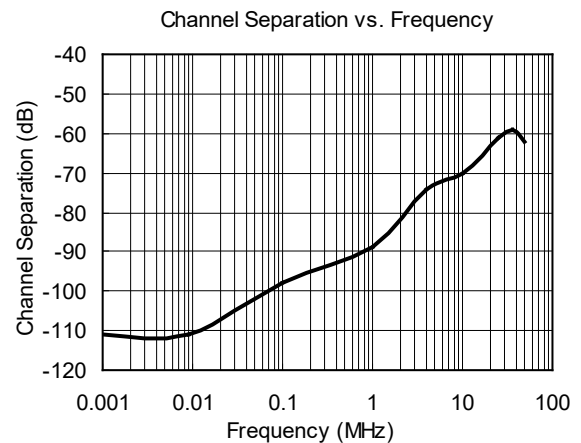
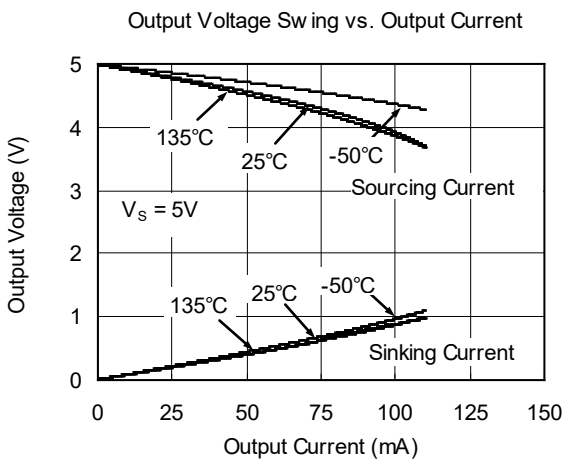
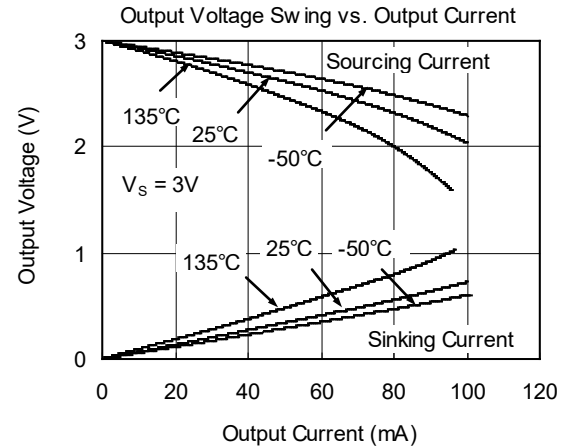
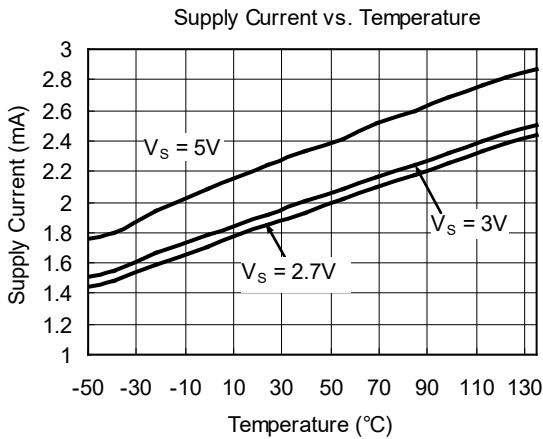
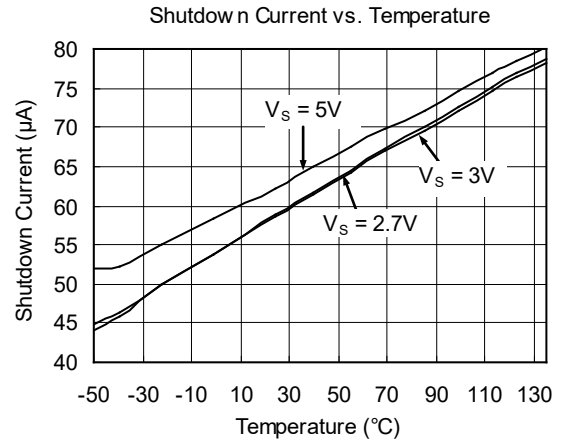
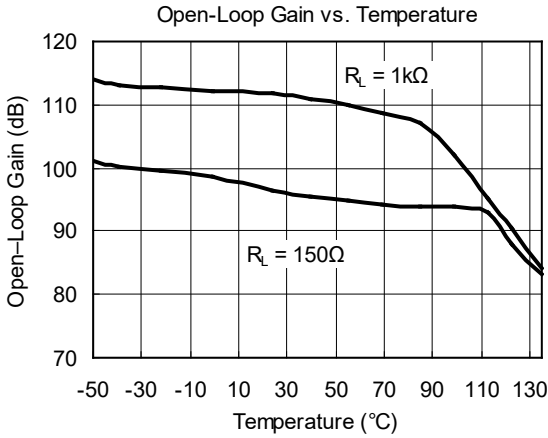
**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

At  $T_A = +25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $G = +2$ ,  $R_F = 887\Omega$ ,  $R_G = 887\Omega$ ,  $C_L = 47\text{pF}$ , and  $R_L = 600\Omega$ , unless otherwise noted.



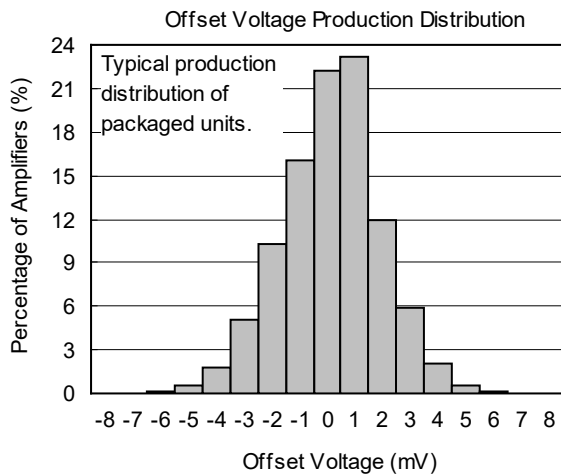
**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

At  $T_A = +25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $G = +2$ ,  $R_F = 887\Omega$ ,  $R_G = 887\Omega$ ,  $R_L = 150\Omega$  connected to  $V_S/2$ , unless otherwise noted.



**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

At  $T_A = +25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $G = +2$ ,  $R_F = 887\Omega$ ,  $R_G = 887\Omega$ ,  $R_L = 150\Omega$  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.

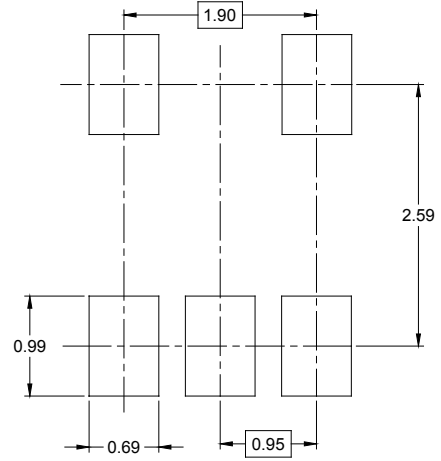
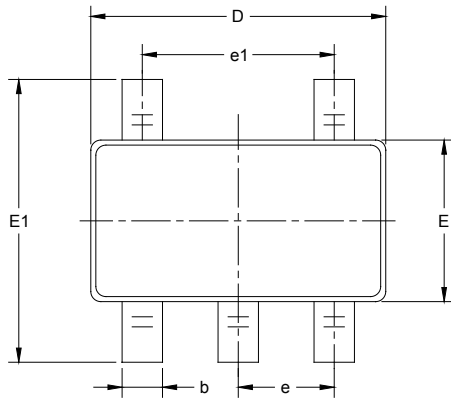
JANUARY 2013 – REV.C.1 to REV.C.2	Page
Changed Pin Configurations section.....	4
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APRIL 2009 – REV.C to REV.C.1	Page
Changed from 16 pin to 14 pin.....	All



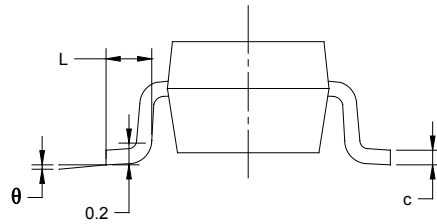
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOT-23-5



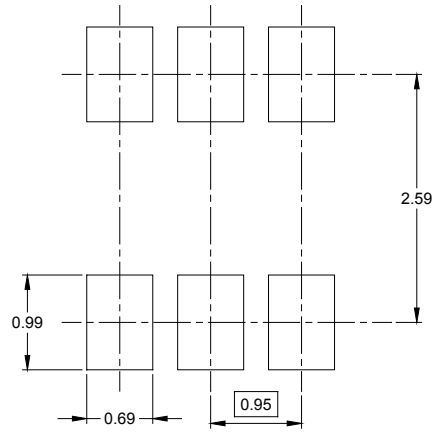
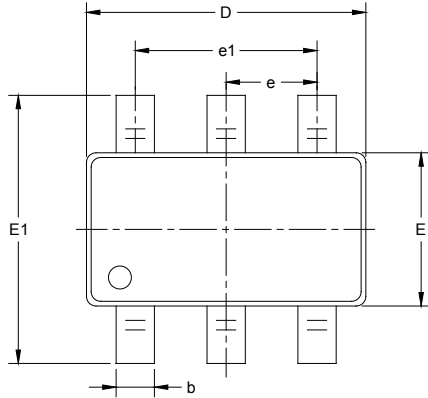
RECOMMENDED LAND PATTERN (Unit: mm)



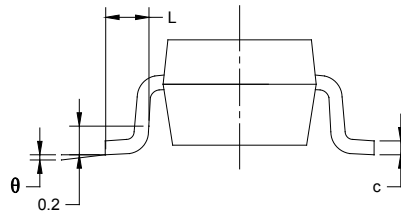
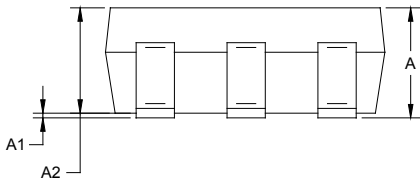
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

PACKAGE OUTLINE DIMENSIONS

SOT-23-6



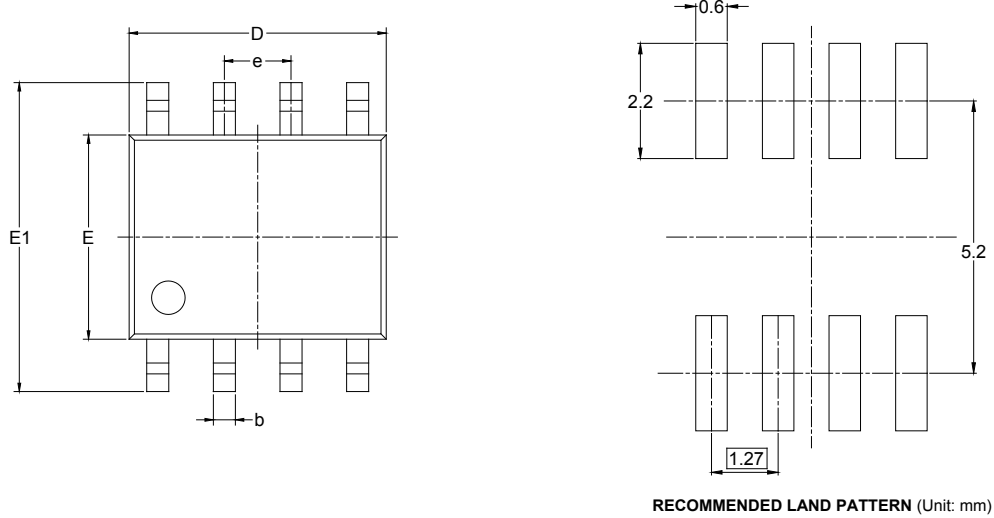
RECOMMENDED LAND PATTERN (Unit: mm)



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
$\theta$	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

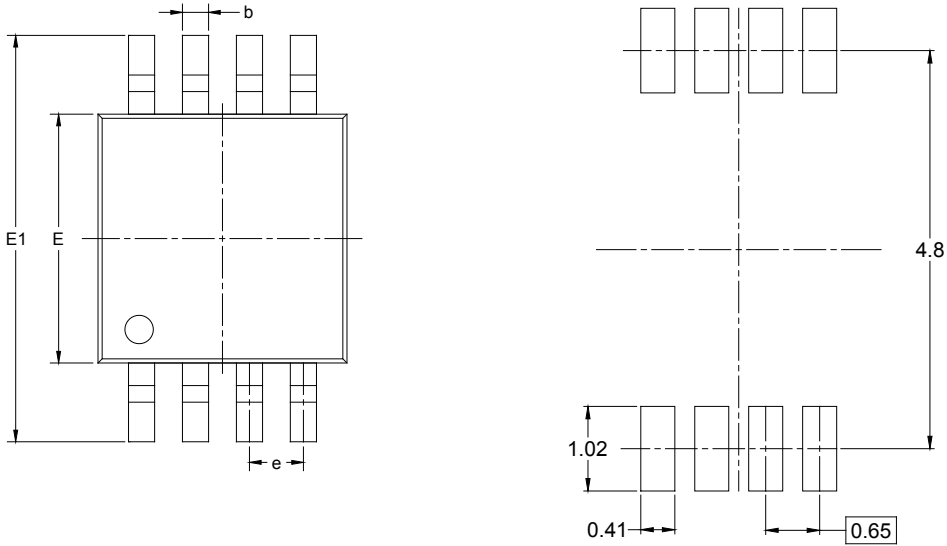
SOIC-8



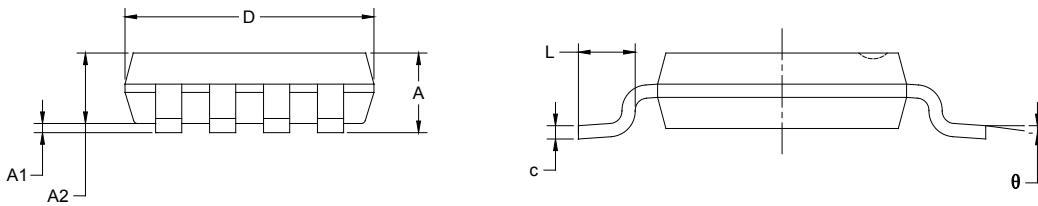
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

PACKAGE OUTLINE DIMENSIONS

MSOP-8



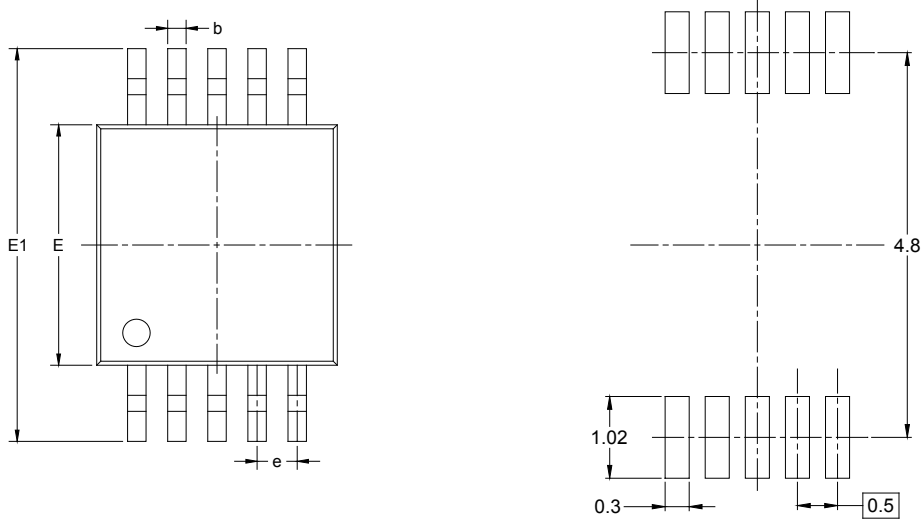
RECOMMENDED LAND PATTERN (Unit: mm)



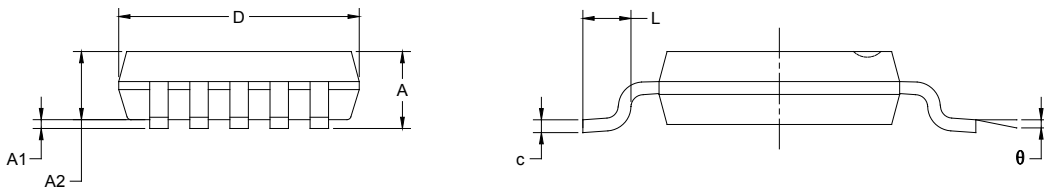
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

PACKAGE OUTLINE DIMENSIONS

MSOP-10



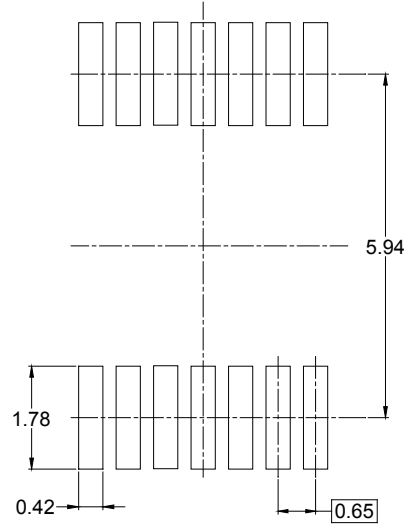
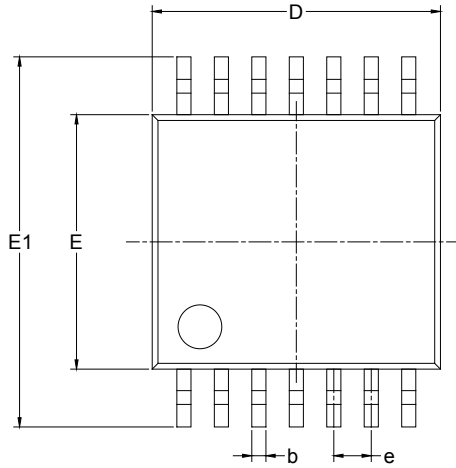
RECOMMENDED LAND PATTERN (Unit: mm)



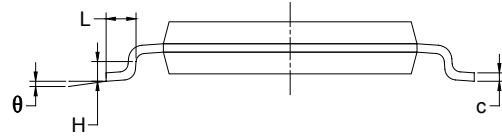
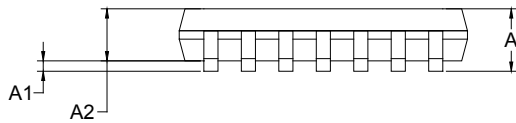
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

PACKAGE OUTLINE DIMENSIONS

TSSOP-14



RECOMMENDED LAND PATTERN (Unit: mm)

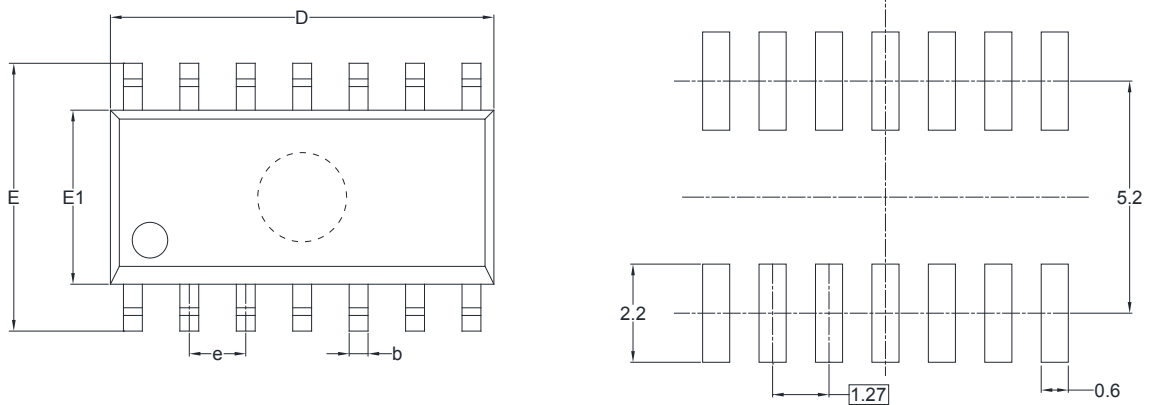


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

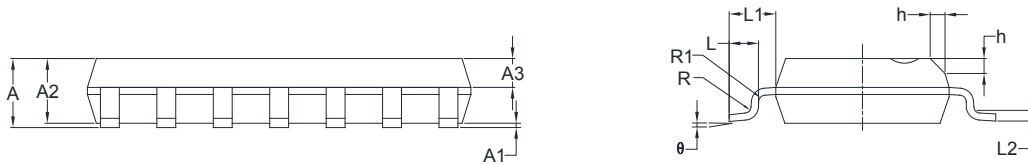
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOIC-14



RECOMMENDED LAND PATTERN (Unit: mm)

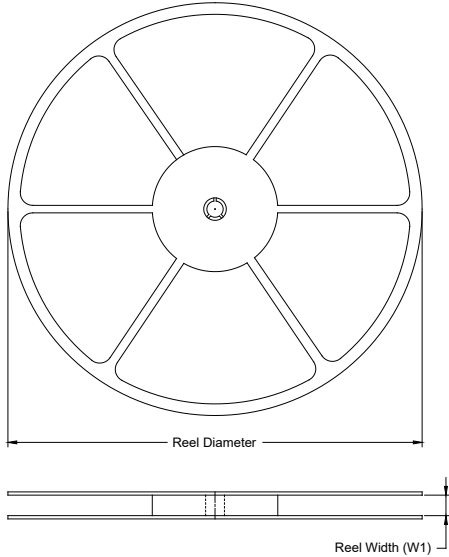


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	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
SOT-23-6	7"	9.5	3.17	3.23	1.37	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
MSOP-10	13"	12.4	5.20	3.30	1.20	4.0	8.0	2.0	12.0	Q1
TSSOP-14	13"	12.4	6.95	5.60	1.20	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

D00001



# 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

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)