SGM8422/SGM8424
2.4MHz, High Voltage, Rail-to-Rail I/O Operational Amplifiers

GENERAL DESCRIPTION

The dual SGM8422 and quad SGM8424 are low power operational amplifiers optimized for high voltage systems. These devices can operate from 4.5V to 30V single supply or from ±2.25V to ±15V dual power supplies, and each amplifier consumes only 0.72mA quiescent current. They support rail-to-rail input and output operation, which results in wide dynamic range. The SGM8422/4 are suitable for low power systems, such as portable and battery-powered applications.

The SGM8422/4 have a gain-bandwidth product of 2.4MHz. They offer fast settling and slewing times. These devices are well suited for TFT-LCDs.

The SGM8422 is available in Green SOIC-8 and MSOP-8 packages. The SGM8424 is available in Green TSSOP-14 and SOIC-14 packages. They are specified over the extended -40℃ to +85℃ temperature range.

FEATURES

- **Rail-to-Rail Input and Output**
- **Support Single or Dual Power Supplies: 4.5V to 30V or ±2.25V to ±15V**
- **Gain-Bandwidth Product: 2.4MHz (TYP)**
- **High Slew Rate: 2V/μs**
- **Supply Current: 0.72mA/Amplifier**
- **-40℃ to +85℃ Operating Temperature Range**
- **Small Packaging:**
  SGM8422 Available in SOIC-8 and MSOP-8 Packages
  SGM8424 Available in TSSOP-14 and SOIC-14 Packages

APPLICATIONS

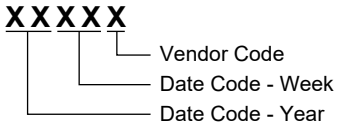
TFT-LCD Drive Circuits
Laptops
Touch-Screen Monitors
Electronics Games
WLANs
Office Automation
Personal Communication Equipment
PDAs
Portable Equipment
A/D Converter Buffers
Active Filters

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8422	SOIC-8	-40℃ to +85℃	SGM8422YS8G/TR	SGM 8422YS8 XXXXX	Tape and Reel, 2500
	MSOP-8	-40℃ to +85℃	SGM8422YMS8G/TR	SGM8422 YMS8 XXXXX	Tape and Reel, 3000
SGM8424	SOIC-14	-40℃ to +85℃	SGM8424YS14G/TR	SGM8424YS14 XXXXX	Tape and Reel, 2500
	TSSOP-14	-40℃ to +85℃	SGM8424YTS14G/TR	SGM8424 YTS14 XXXXX	Tape and Reel, 3000

MARKING INFORMATION

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 $-V_S$ 32V
Input Common Mode Voltage Range
..... ($-V_S$) - 0.1V to ($+V_S$) + 0.1V
Input/Output Voltage Range ..... ($-V_S$) - 0.3V to ($+V_S$) + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM (SGM8422) 3000V
HBM (SGM8424) 4000V
MM (SGM8422) 150V
MM (SGM8424) 250V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃

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

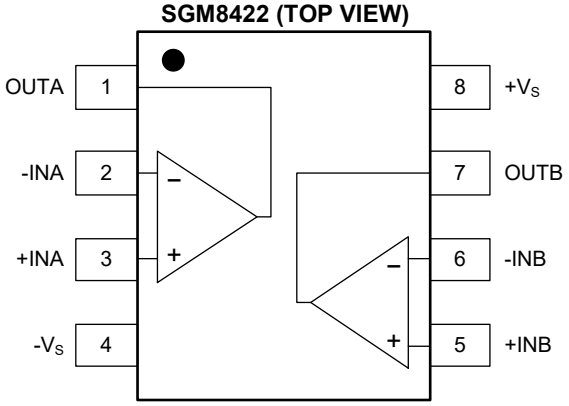
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

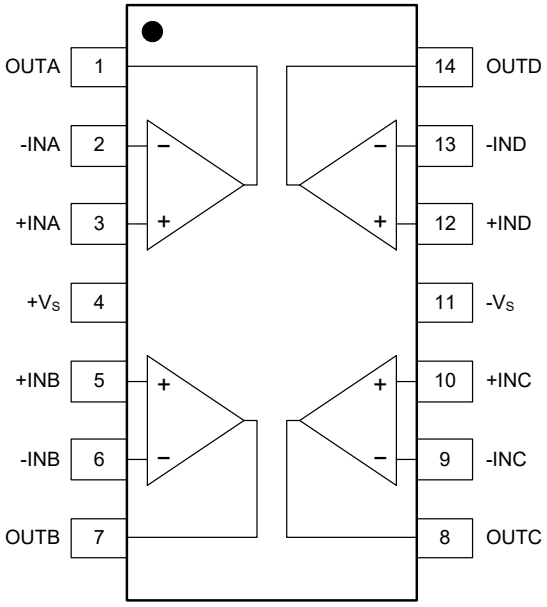
PIN CONFIGURATIONS

SGM8422 (TOP VIEW)



SOIC-8/MSOP-8

SGM8424 (TOP VIEW)



SOIC-14/TSSOP-14

ELECTRICAL CHARACTERISTICS

(At T_A = +25℃, V_S = 5V, R_L = 2kΩ connected to V_S/2, Full = -40℃ to +85℃, unless otherwise noted.)

PARAMETER		CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Characteristics							
Input Offset Voltage (V_{OS})		V_{CM} = V_S/2	+25℃		1.5	5.8	mV
			Full			6.1	
Input Offset Current (I_{OS})			+25℃		10		pA
Input Bias Current (I_B)			+25℃		10		pA
Common Mode Rejection Ratio (CMRR)		V_{CM} = -0.1V to 5.1V	+25℃	54	65		dB
			Full	51			
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = 0.5V to 4.5V	+25℃	80	105		dB
			Full	77			
Output Characteristics							
Output Voltage Swing from Rail	V_{OH}	I_{OUT} = 70mA	+25℃		1.12	1.46	V
			Full			1.79	
		R_L = 2kΩ	+25℃		21	38	mV
			Full			43	
	V_{OL}	I_{OUT} = -70mA	+25℃		1.09	1.43	V
			Full			1.87	
		R_L = 2kΩ	+25℃		21	36	mV
			Full			43	
Output Short-Circuit Current (I_{SC})	Sink	R_L = 10Ω to V_S/2	+25℃		73.4		mA
	Source	R_L = 10Ω to V_S/2	+25℃		67.8		
Power Supply							
Power Supply Rejection Ratio (PSRR)		V_S = 4.5V to 30V, V_{CM} = V_S/2	+25℃	85	102		dB
			Full	82			
Quiescent Current/Amplifier (I_Q)		I_{OUT} = 0A	+25℃		0.66	0.90	mA
			Full			1.07	
Dynamic Performance							
Gain-Bandwidth Product (GBP)		R_L = 2kΩ, C_L = 100pF, V_{CM} = V_S/2	+25℃		2.3		MHz
Slew Rate (SR)		V_{OUT} = $2V_{PP}$ step, A_V = 1	+25℃		2		V/μs
Gain Margin		R_L = 2kΩ, C_L = 100pF, V_{CM} = V_S/2	+25℃		-8.9		dB
Phase Margin		R_L = 2kΩ, C_L = 100pF, V_{CM} = V_S/2	+25℃		49		°
Crosstalk		f = 1MHz	+25℃		-74		dB
Noise Performance							
Input Voltage Noise Density (e_n)		f = 1kHz, V_{CM} = V_S/2	+25℃		80		nV/$\sqrt{Hz}$
		f = 10kHz, V_{CM} = V_S/2	+25℃		40		

ELECTRICAL CHARACTERISTICS (continued)

(At T_A = +25℃, V_S = 15V, R_L = 2kΩ connected to V_S/2, Full = -40℃ to +85℃, unless otherwise noted.)

PARAMETER		CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Characteristics							
Input Offset Voltage (V_{OS})		V_{CM} = V_S/2	+25℃		1.5	6.3	mV
			Full			6.6	
Input Offset Current (I_{OS})			+25℃		10		pA
Input Bias Current (I_B)			+25℃		10		pA
Common Mode Rejection Ratio (CMRR)		V_{CM} = -0.1V to 15.1V	+25℃	61	73		dB
			Full	58			
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = 0.5V to 14.5V	+25℃	91	113		dB
			Full	88			
Output Characteristics							
Output Voltage Swing from Rail	V_{OH}	R_L = 2kΩ	+25℃		56	101	mV
			Full			114	
	V_{OL}	R_L = 2kΩ	+25℃		59	90	
			Full			104	
Output Current (I_{OUT})			+25℃		80		mA
Power Supply							
Quiescent Current/Amplifier (I_Q)		I_{OUT} = 0A	+25℃		0.68	0.93	mA
			Full			1.10	
Dynamic Performance							
Gain-Bandwidth Product (GBP)		R_L = 2kΩ, C_L = 100pF, V_{CM} = V_S/2	+25℃		2.4		MHz
Slew Rate (SR)		V_{OUT} = $2V_{PP}$ step, A_V = 1	+25℃		2		V/μs
Gain Margin		R_L = 2kΩ, C_L = 100pF, V_{CM} = V_S/2	+25℃		-6.7		dB
Phase Margin		R_L = 2kΩ, C_L = 100pF, V_{CM} = V_S/2	+25℃		46		°
Crosstalk		f = 1MHz	+25℃		-73		dB
Noise Performance							
Input Voltage Noise Density (e_n)		f = 1kHz, V_{CM} = V_S/2	+25℃		73		$nV/\sqrt{Hz}$
		f = 10kHz, V_{CM} = V_S/2	+25℃		40		

ELECTRICAL CHARACTERISTICS (continued)

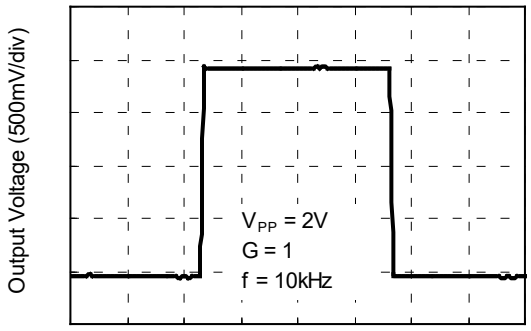
(At T_A = +25℃, V_S = ±15V, R_L = 2kΩ connected to 0V, Full = -40℃ to +85℃, unless otherwise noted.)

PARAMETER		CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Characteristics							
Input Offset Voltage (V_{OS})		V_{CM} = 0V	+25℃		1.5	6	mV
			Full			6.3	
Input Offset Current (I_{OS})			+25℃		10		pA
Input Bias Current (I_B)			+25℃		10		pA
Common Mode Rejection Ratio (CMRR)		V_{CM} = -15.1V to 15.1V	+25℃	69	81		dB
			Full	66			
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = -14.5V to 14.5V	+25℃	94	115		dB
			Full	91			
Output Characteristics							
Output Voltage Swing from Rail	V_{OH}	R_L = 2kΩ	+25℃		129	195	mV
			Full			225	
	V_{OL}	R_L = 2kΩ	+25℃		125	180	
			Full			215	
Output Current (I_{OUT})			+25℃		80		mA
Power Supply							
Quiescent Current/Amplifier (I_Q)		I_{OUT} = 0A	+25℃		0.72	0.96	mA
			Full			1.14	
Dynamic Performance							
Gain-Bandwidth Product (GBP)		R_L = 2kΩ, C_L = 100pF, V_{CM} = 0V	+25℃		2.4		MHz
Slew Rate (SR)		V_{OUT} = $2V_{PP}$ step, A_V = 1	+25℃		2		V/μs
Gain Margin		R_L = 2kΩ, C_L = 100pF, V_{CM} = 0V	+25℃		-8.6		dB
Phase Margin		R_L = 2kΩ, C_L = 100pF, V_{CM} = 0V	+25℃		48		°
Crosstalk		f = 1MHz	+25℃		-73		dB
Noise Performance							
Input Voltage Noise Density (e_n)		f = 1kHz, V_{CM} = 0V	+25℃		74		$nV/\sqrt{Hz}$
		f = 10kHz, V_{CM} = 0V	+25℃		46		

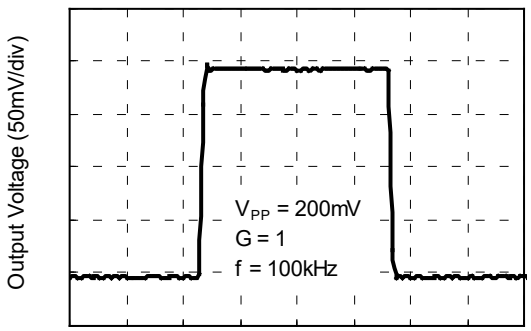
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = ±15V, R_L = 2kΩ connected to 0V, unless otherwise noted.

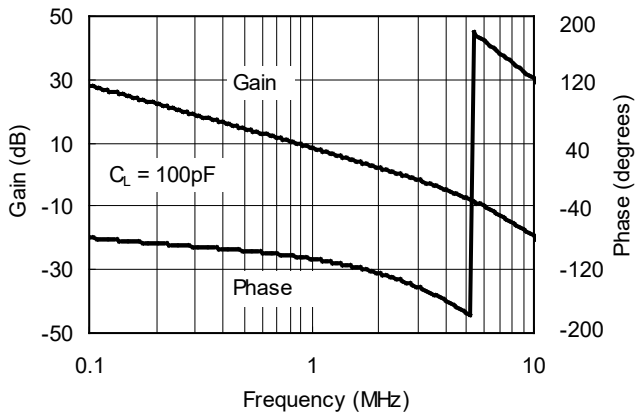
Large Signal Step Response



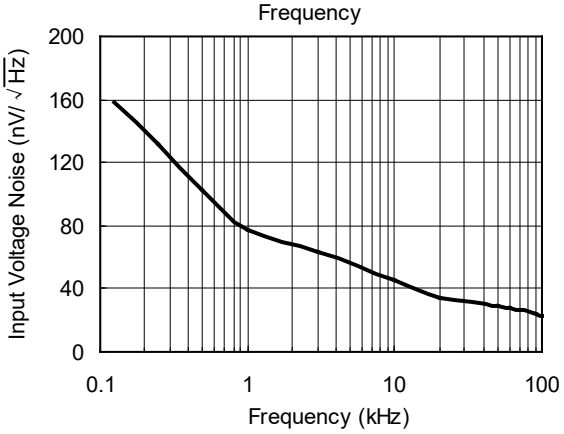
Small Signal Step Response



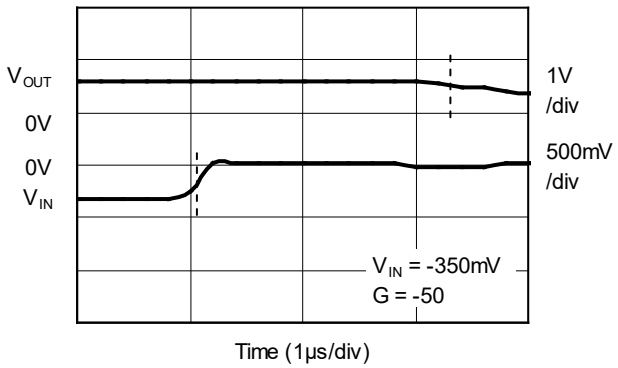
Gain and Phase vs. Frequency



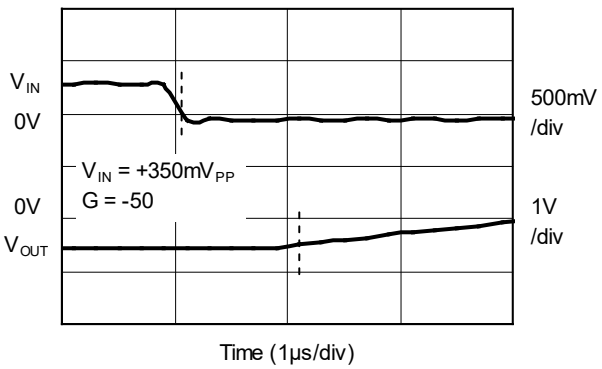
Input Voltage Noise Spectral Density vs. Frequency



Positive Overload Recovery Time



Negative Overload Recovery Time



REVISION HISTORY

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

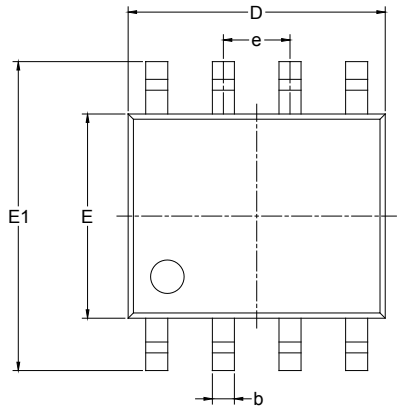
OCTOBER 2013 – REV.A.1 to REV.A.2	**Page**
Changed Electrical Characteristics section	5, 6

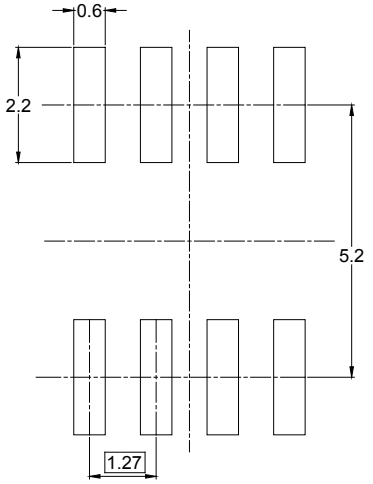
APRIL 2013 – REV.A to REV.A.1	**Page**
Updated Electrical Characteristics section	4 ~ 6

Changes from Original (SEPTEMBER 2012) to REV.A	**Page**
Changed from product preview to production data	All

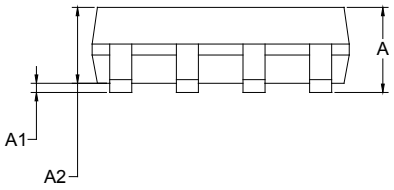
PACKAGE OUTLINE DIMENSIONS

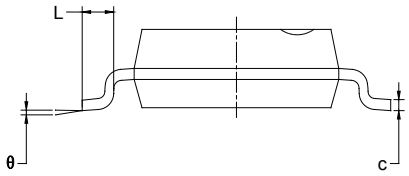
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

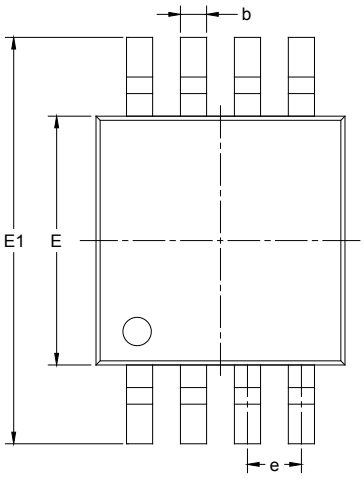


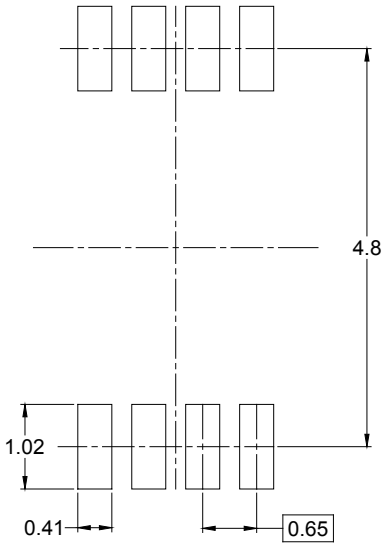


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

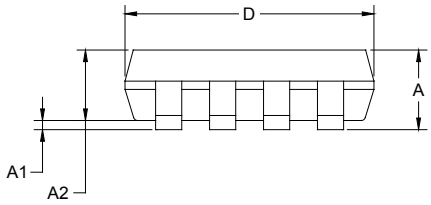
PACKAGE OUTLINE DIMENSIONS

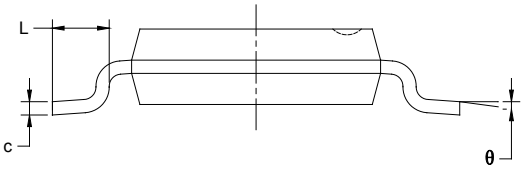
MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)

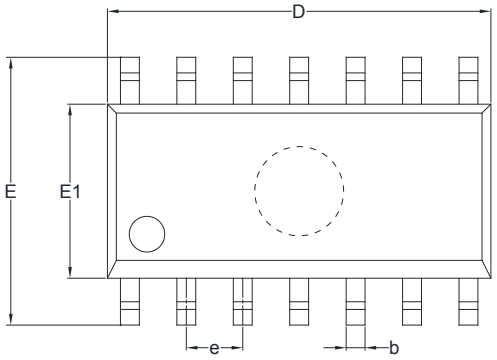


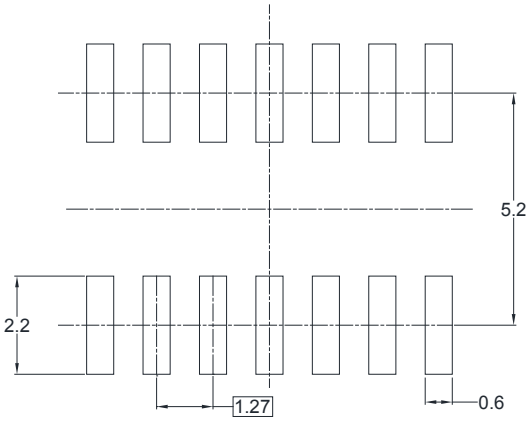


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

PACKAGE OUTLINE DIMENSIONS

SOIC-14





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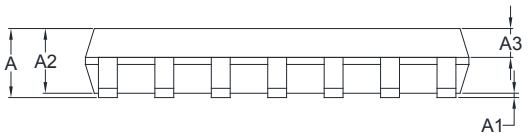
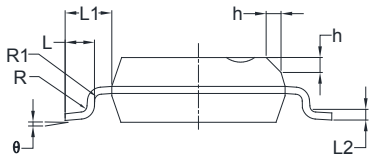
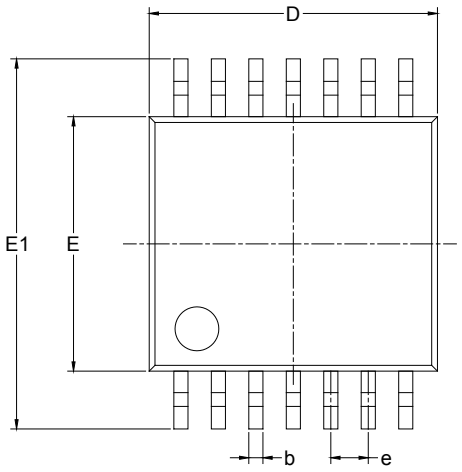


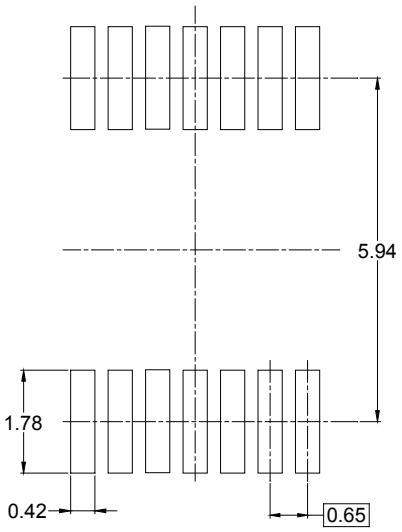


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	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°

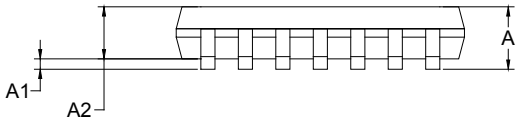
PACKAGE OUTLINE DIMENSIONS

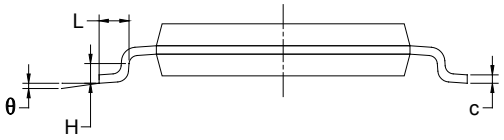
TSSOP-14





RECOMMENDED LAND PATTERN (Unit: mm)

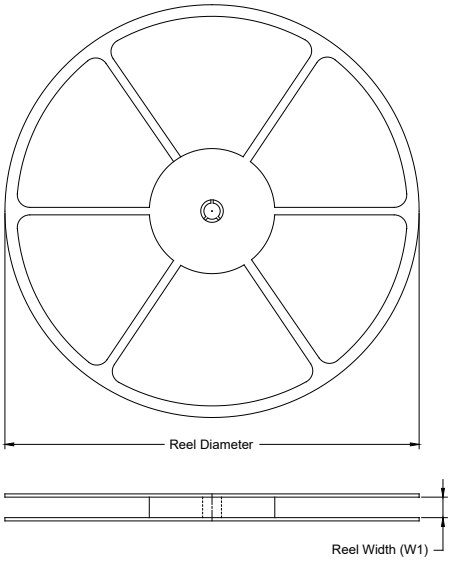




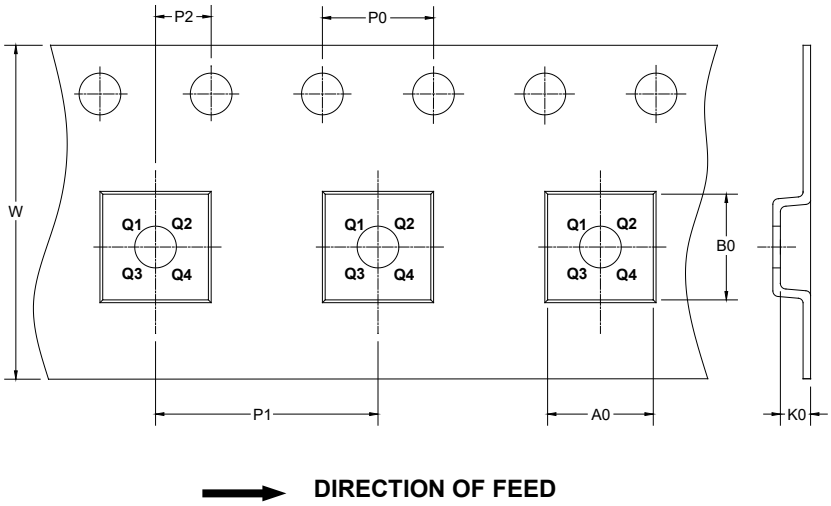
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



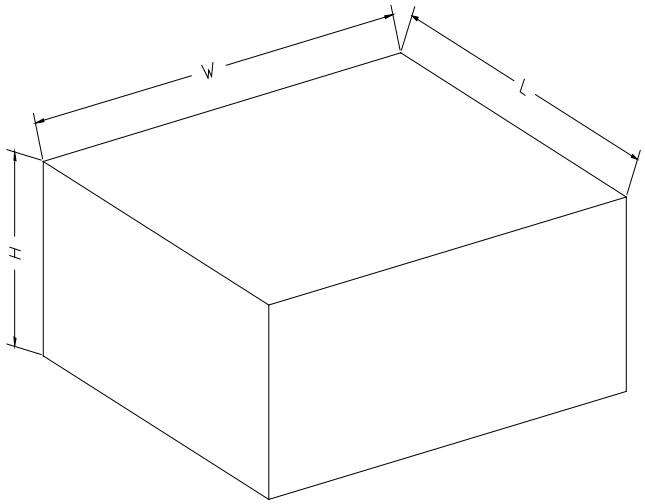
NOTE: The picture is only for reference. Please make the object as the standard.

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	6.40	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
TSSOP-14	13″	12.4	6.95	5.60	1.20	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