

SGM8422/SGM8424

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

GENERAL DESCRIPTION

The SGM8422 (dual) and SGM8424 (quad) are low power, high voltage, rail-to-rail input and output operational amplifiers. These devices can operate from $\pm 2.25\text{V}$ to $\pm 15\text{V}$ dual power supplies or from 4.5V to 30V single supply.

The SGM8422/4 have a gain-bandwidth product of 2.4MHz (TYP), while consuming only 0.72mA per amplifier. They also provide common mode input ability beyond the supply rails, as well as rail-to-rail output capability. This enables the SGM8422/4 to offer maximum dynamic range at any supply voltage.

The SGM8422/4 also feature fast slewing and settling times. These features make these amplifiers ideal for use as voltage reference buffers in Thin Film Transistor Liquid Crystal Displays (TFT-LCD). Other applications include battery power, portable devices, and anywhere low power consumption is important.

The SGM8422 comes in Green SOIC-8 and MSOP-8 packages. The SGM8424 is offered in Green TSSOP-14 and SOIC-14 packages. They are specified over the extended -40°C to $+85^{\circ}\text{C}$ temperature range.

FEATURES

- $\pm 2.25\text{V}$ to $\pm 15\text{V}$ Dual Power Supplies or 4.5V to 30V Single Supply
- Gain-Bandwidth Product: 2.4MHz (TYP)
- Supply Current: 0.72mA/Amplifier
- High Slew Rate: 2V/ μs
- Beyond the Rails Input Capability
- Rail-to-Rail Output Swing
- -40°C to $+85^{\circ}\text{C}$ 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
Electronics Notebooks
Electronics Games
Touch-Screen Displays
Wireless LANs
Office Automation
Personal Communication Devices
Personal Digital Assistants (PDAs)
Portable Instrumentation
A/D Converter Buffers
Active Filters

PACKAGE/ORDERING INFORMATION

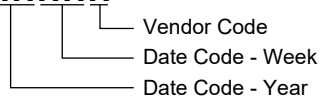
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8422	SOIC-8	-40°C to +85°C	SGM8422YS8G/TR	SGM 8422YS8 XXXXX	Tape and Reel, 2500
	MSOP-8	-40°C to +85°C	SGM8422YMS8G/TR	SGM8422 YMS8 XXXXX	Tape and Reel, 3000
SGM8424	SOIC-14	-40°C to +85°C	SGM8424YS14G/TR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

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

SOIC-8/MSOP-8/SOIC-14/TSSOP-14

XXXXX



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°C
- Storage Temperature Range -65°C to +150°C
- Lead Temperature (Soldering, 10s) +260°C
- ESD Susceptibility
- HBM (SGM8422) 3000V
- HBM (SGM8424) 4000V
- MM (SGM8422) 150V
- MM (SGM8424) 250V

RECOMMENDED OPERATING CONDITIONS

- Operating Temperature Range -40°C to +85°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.

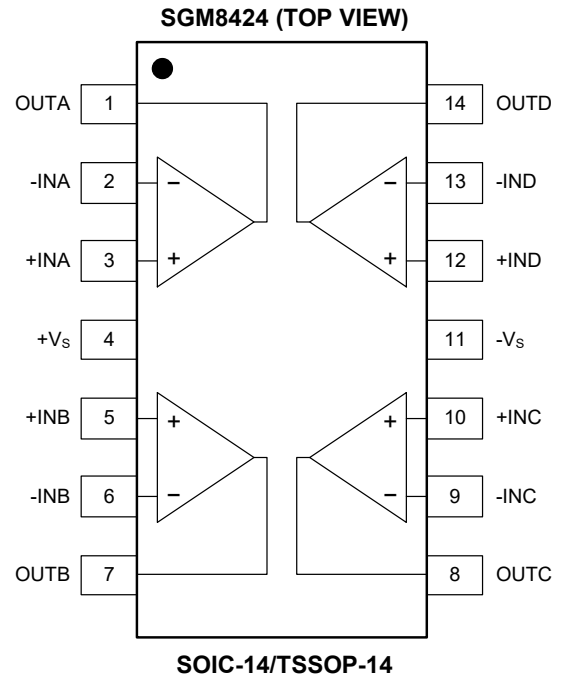
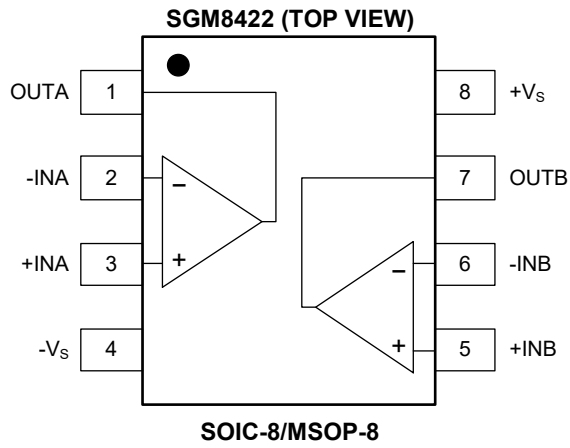
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged 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, or specifications without prior notice.

PIN CONFIGURATIONS



ELECTRICAL CHARACTERISTICS

(At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $R_L = 2\text{k}\Omega$ connected to $V_S/2$, Full = -40°C to $+85^\circ\text{C}$, unless otherwise noted.)

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

ELECTRICAL CHARACTERISTICS (continued)

(At $T_A = +25^\circ\text{C}$, $V_S = 15\text{V}$, $R_L = 2\text{k}\Omega$ connected to $V_S/2$, Full = -40°C to $+85^\circ\text{C}$, unless otherwise noted.)

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

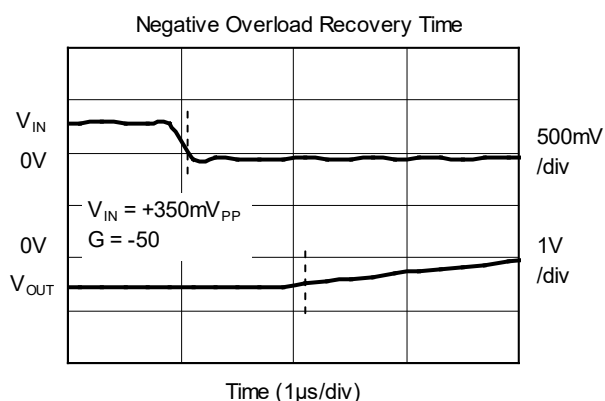
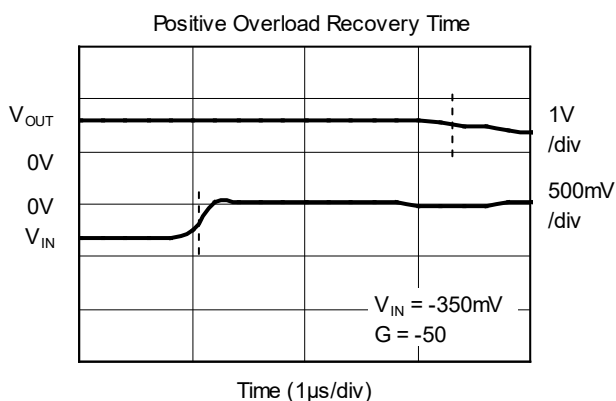
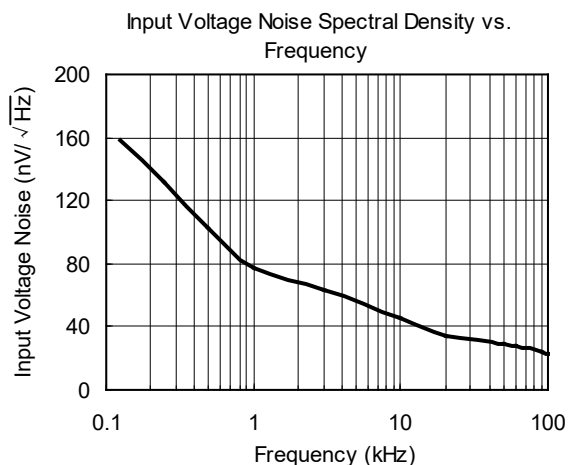
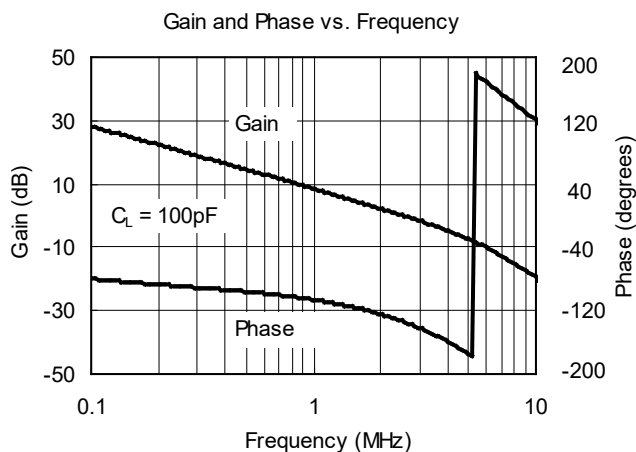
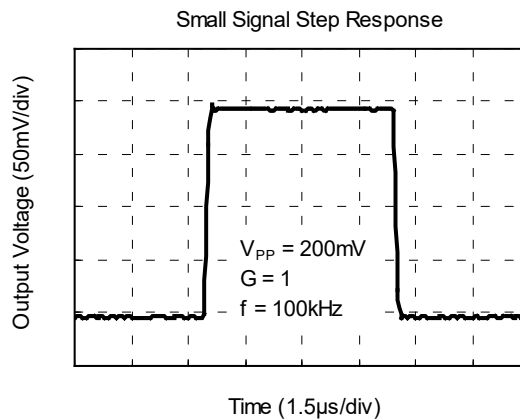
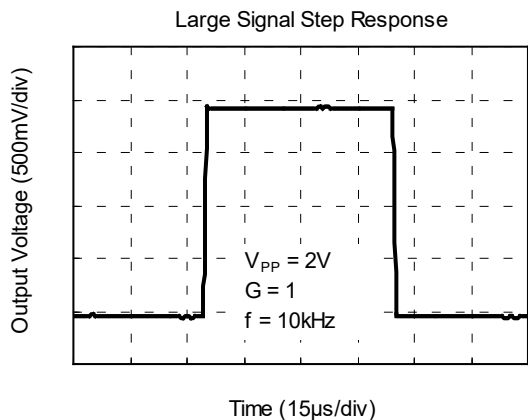
ELECTRICAL CHARACTERISTICS (continued)

(At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$, $R_L = 2\text{k}\Omega$ connected to 0V , Full = -40°C to $+85^\circ\text{C}$, unless otherwise noted.)

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

TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$, $R_L = 2\text{k}\Omega$ connected to 0V , unless otherwise noted.



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

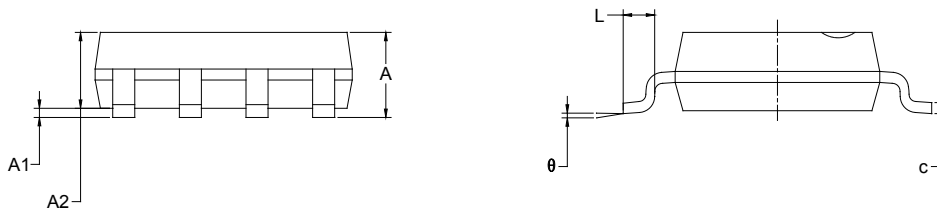
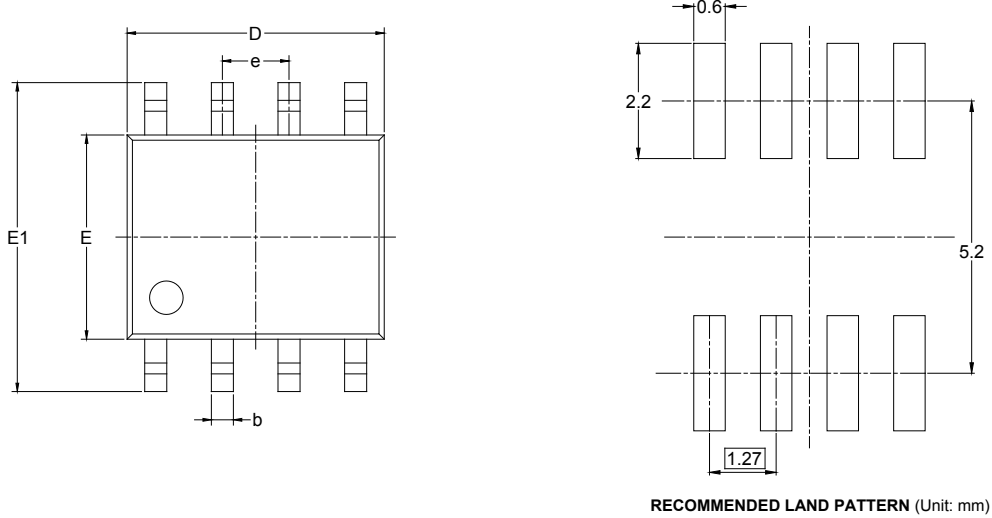
APRIL 2013 – REV.A to REV.A.1	Page
Updated Electrical Characteristics section	4 ~ 6

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

PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

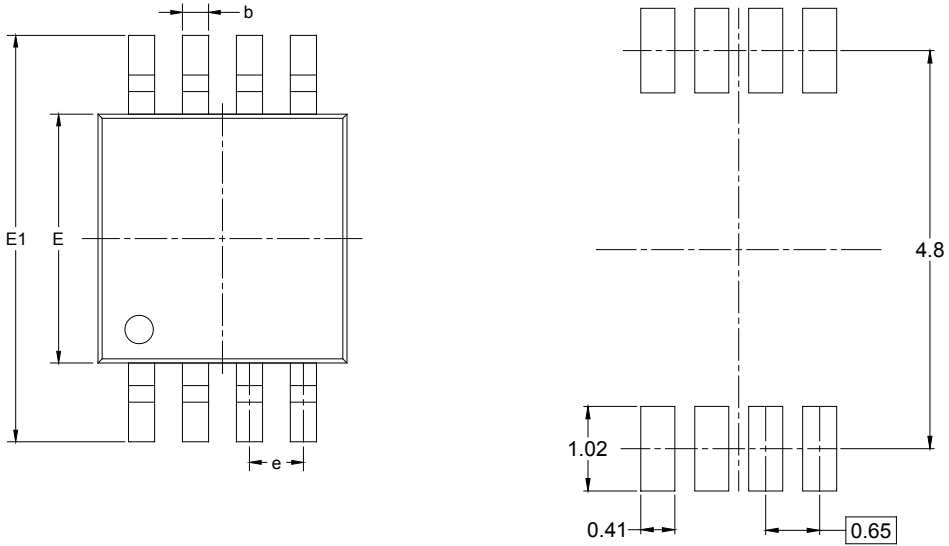
SOIC-8



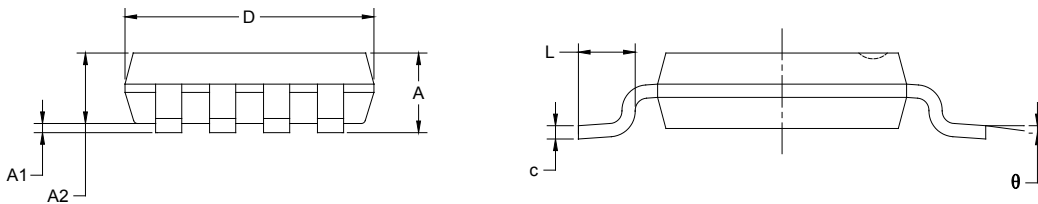
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

PACKAGE OUTLINE DIMENSIONS

MSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)

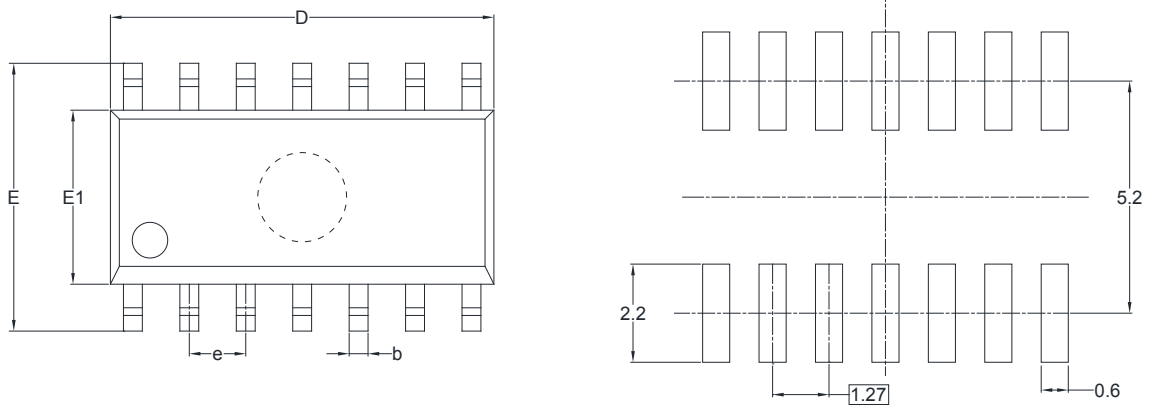


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

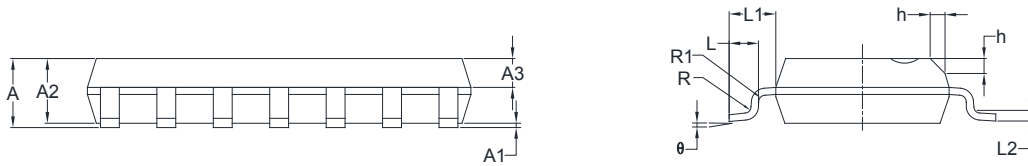
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOIC-14



RECOMMENDED LAND PATTERN (Unit: mm)

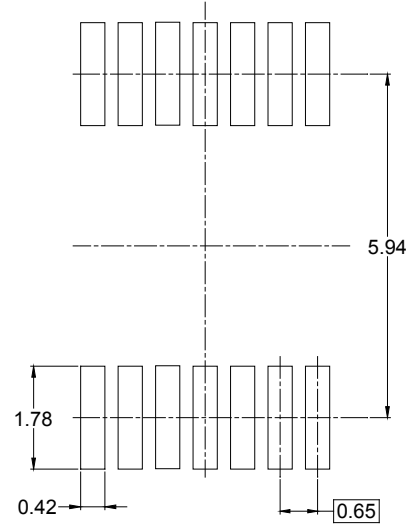
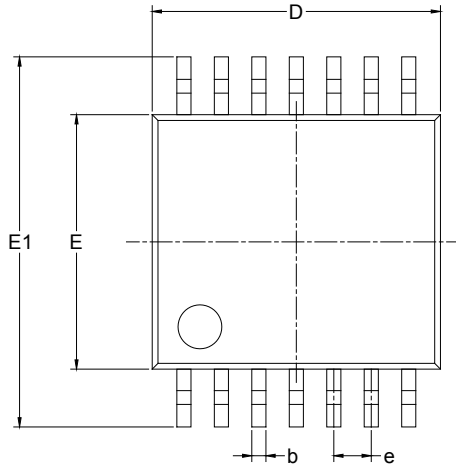


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80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

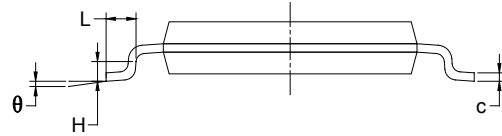
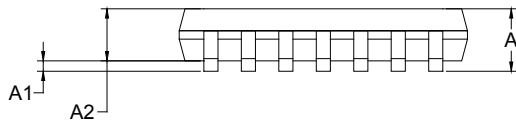
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

TSSOP-14



RECOMMENDED LAND PATTERN (Unit: mm)

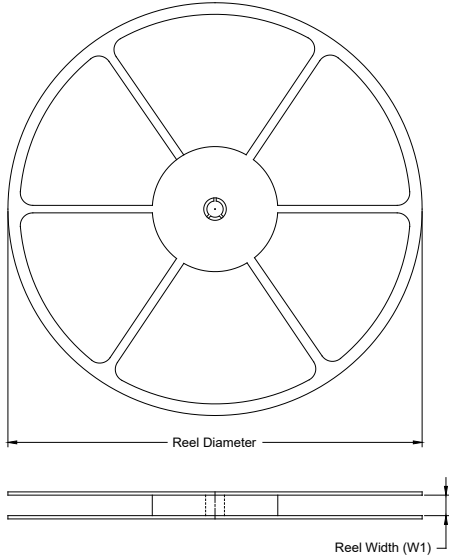


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500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

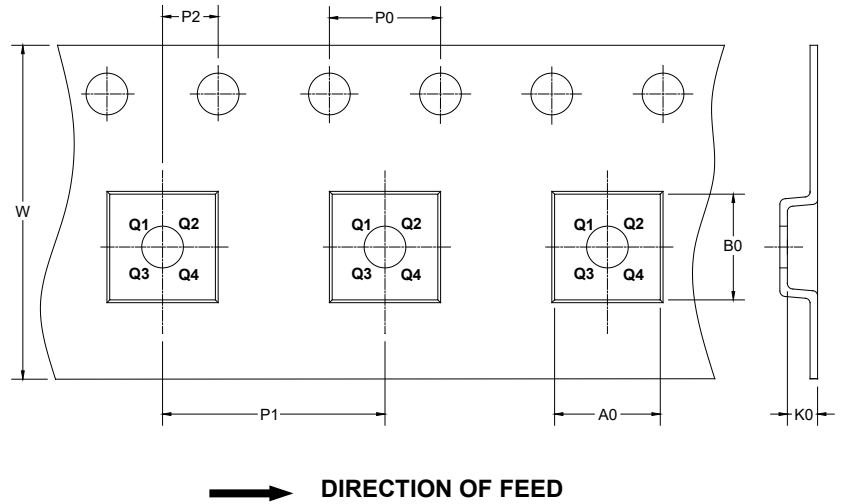
PACKAGE INFORMATION

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

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
13"	386	280	370	5

DD0002