SGM9203
Triple, 6th-Order, Video Filter Driver for SD/PS/HD (1080i)/HD (1080p)

PRODUCT DESCRIPTION

The SGM9203 is a comprehensive filtering solution designed to give designers the flexibility to easily filter and drive various video signals, including high definition video, DVD and set-top box applications.

The SGM9203 offers 6th-order output reconstruction filter on all three channels. Filter channels are specialized for either component (YPbPr) or RGB video signals. These channels offer selectable frequency response of 8MHz, 18MHz, 38MHz or 75MHz. Additional functionality of these channels includes input biasing mode and output disable.

The SGM9203 may be driven directly by a DC-coupled DAC output or an AC-coupled signal. All inputs accept standard $1V_{PP}$ video signals.

Each channel includes an output amplifier capable of driving a single (150Ω), AC- or DC-coupled video load. All outputs can be disabled.

The device is available in two factory-set options, a 6dB gain option and a 0dB gain option.

SGM9203 is available in Green TSSOP-14 package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Triple 6th-Order Video Reconstruction Filters**
- **Operates from 3.3V to 5.5V Single Power Supply**
- **Output Disable**
- **Supports Component YPbPr or RGB Video**
- **Three Channels, Selectable to 8MHz, 18MHz, 38MHz, 75MHz for SD/PS/HD (1080i)/HD (1080p) Applications**
- **6dB Gain Option Available for 150Ω Double Terminated Video Load**
- **0dB Gain Option Available for High Impedance Loading**
- **Selectable Clamp or Bias Mode on Pb/B, Pr/R Inputs**
- **Available in Green TSSOP-14 Package**
- **-40°C to +85°C Operating Temperature Range**

APPLICATIONS

Cable and Satellite Set-Top Boxes
Projectors
Communication Devices
Portable and Handheld Products
Personal Video Recorders
Video on Demand
DVD Players
HDTVs

PACKAGE/ORDERING INFORMATION

ORDER NUMBER	GAIN SETTING	PACKAGE DESCRIPTION	TEMPERATURE RANGE	MARKING INFORMATION	PACKAGE OPTION
SGM9203AYTS14G/TR	6dB	TSSOP-14	-40℃ to +85℃	SGM9203AYTS14	Tape and Reel, 3000
SGM9203BYTS14G/TR	0dB	TSSOP-14	-40℃ to +85℃	SGM9203BYTS14	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} to GND.....6V
Input Voltage..... GND - 0.3V to V_{CC} + 0.3V
Storage Temperature Range.....-65℃ to +150℃
Junction Temperature ..... 150℃
Operating Temperature Range ..... -40℃ to +85℃
Lead Temperature Range (Soldering 10 sec)
.....260℃
ESD Susceptibility
HBM 5000V
MM.....400V

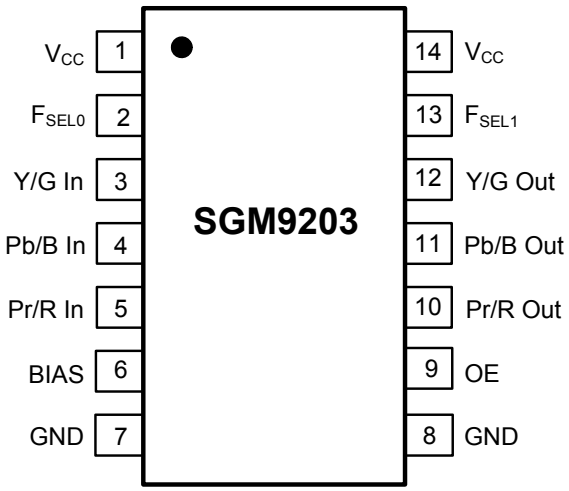
NOTE:
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN CONFIGURATION (TOP VIEW)

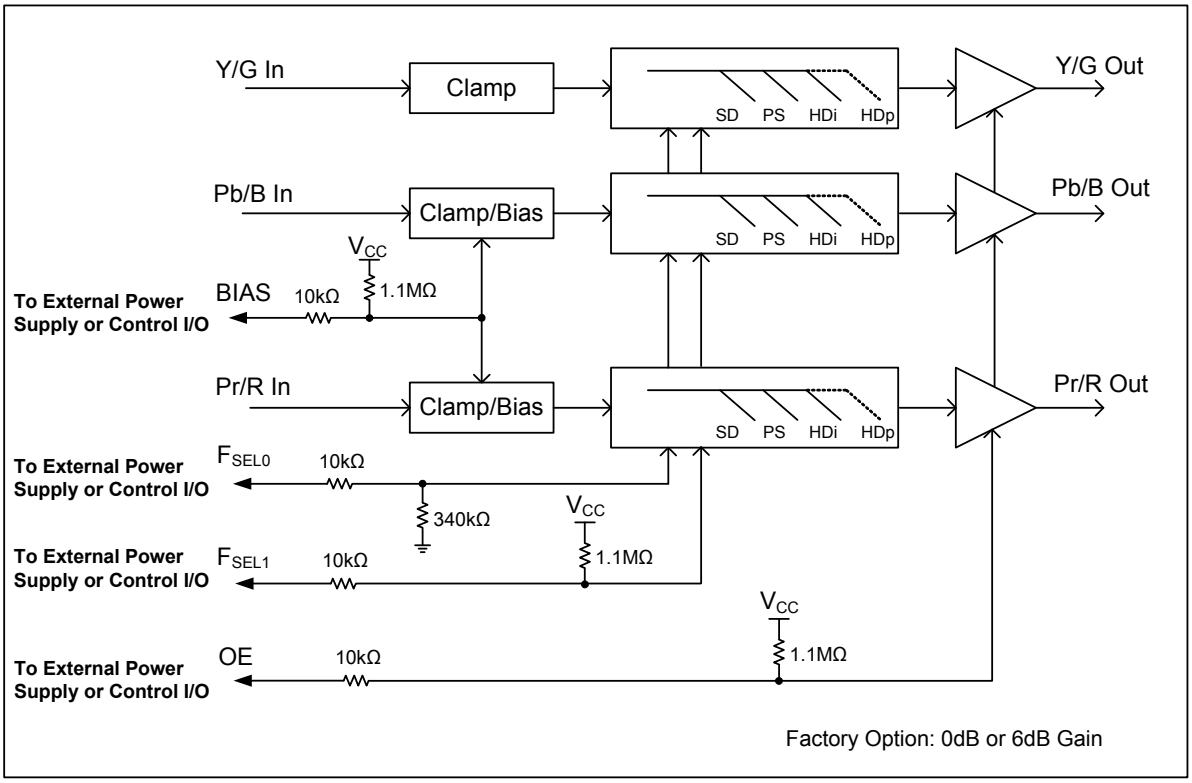


TSSOP-14

PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 14	V_{CC}	Power Supply.
2	F_{SEL0}	Selects Filter Corner Frequency.
3	Y/G In	Selectable Video Input.
4	Pb/B In	Selectable Video Input.
5	Pr/R In	Selectable Video Input.
6	BIAS	Input Bias on Pb/B Pr/R: 0 = Bias, 1 = Clamp.
7, 8	GND	Must be tied to ground. Do not float.
9	OE	Output Disable Control: 0 = Disable, 1 = Enable.
10	Pr/R Out	Filtered SD, PS, HD (1080i), HD (1080p) Video Output.
11	Pb/B Out	Filtered SD, PS, HD (1080i), HD (1080p) Video Output.
12	Y/G Out	Filtered SD, PS, HD (1080i), HD (1080p) Video Output.
13	F_{SEL1}	Selects Filter Corner Frequency.

BLOCK DIAGRAM



NOTES:
1. A 10kΩ resistor must be serially connected to BIAS, OE, F_{SEL0} or F_{SEL1} pin.
2. Power supply V_{CC} must be sequenced on first before input video signals.

FREQUENCY SELECT TRUTH TABLE

FSEL1	FSEL0	Filter Frequency	Video Format	Sync Format
0	0	8MHz	SD, 480i	Bi-level, 4.7μs pulse width
0	1	18MHz	PS, 480p	Bi-level, 2.35μs pulse width
1	0	38MHz	HD, 1080i, 720p	Tri-level, 589ns pulse width
1	1	75MHz	HD, 1080p	Tri-level, 295ns pulse width

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5V, Full = -40°C to +85°C, at R_L = 150Ω connected to GND, V_{IN} = 1V_{PP}, all outputs AC-coupled with 220μF, unless otherwise noted.)

PARAMETER		CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Operating Voltage Range (V_{CC})			+25°C	3.3		5.5	V
Power Supply Rejection Ratio (PSRR)		V_{CC} = 3.5V to 5.0V	+25°C	50	61		dB
			Full	46			
Quiescent Current (I_Q)		No load	+25°C		40	51	mA
			Full			57	
Voltage Gain (A_V)	6dB	R_L = 150Ω	+25°C	5.93	6.15	6.36	dB
			Full	5.9		6.4	
Output Voltage High Swing	6dB	V_{IN} = 3V, R_L = 150Ω to GND	+25°C	4.73	4.79		V
			Full	4.7			
Supply Current when Disabled		OE = 0V, No load	+25°C		19	23	mA
			Full			26.4	
Digital Input Low (V_{IL})		F_{SEL0}, F_{SEL1}, OE	+25°C			0.4	V
Digital Input High (V_{IH})		F_{SEL0}, F_{SEL1}, OE	+25°C	1.2			

ELECTRICAL CHARACTERISTICS

(T_A = +25℃, V_{CC} = 5V, at R_L = 150Ω connected to GND, R_{source} = 37.5Ω, V_{IN} = 1V_{PP}, all inputs AC-coupled with 0.1μF, all outputs AC-coupled with 220μF into 150Ω, referenced to 400kHz, 6dB; unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
AC PERFORMANCE (STANDARD DEFINITION MODE)						
-0.1dB Bandwidth		R_L = 150Ω		5.4		MHz
-1dB Bandwidth		R_L = 150Ω		7		MHz
-3dB Bandwidth		R_L = 150Ω		8.5		MHz
Filter Response (Normalized Gain)		f_{IN} = 27MHz		-43		dB
Slew Rate		2V Output step, 80% to 20%		40		V/μs
Differential Gain (DG)		PAL DC-coupled		0.32		%
		PAL AC-coupled		0.83		
Differential Phase (DP)		PAL DC-coupled		1.60		°
		PAL AC-coupled		1.78		
Group Delay Variation (D/DT)		Clamp and Bias, Difference between 400kHz and 6.5MHz		22		ns
Crosstalk (channel-to-channel)		f = 1MHz		-72		dB
Output Distortion (THD)	6dB	V_{OUT} = 1.4V_{PP}, 3.58MHz		0.8		%
	0dB			1.16		

ELECTRICAL CHARACTERISTICS

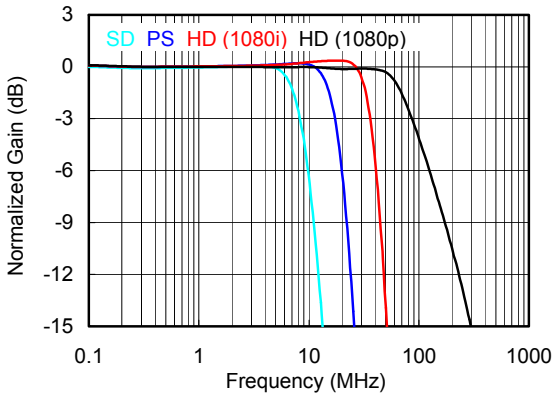
(T_A = +25℃, V_{CC} = 5V, at R_L = 150Ω connected to GND, R_{source} = 37.5Ω, V_{IN} = 1V_{PP}, all inputs AC-coupled with 0.1μF, all outputs AC-coupled with 220μF into 150Ω, referenced to 400kHz, 6dB; unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
AC PERFORMANCE (PROGRESSIVE SCAN MODE)						
-0.1dB Bandwidth		R_L = 150Ω		12		MHz
-1dB Bandwidth		R_L = 150Ω		15		MHz
-3dB Bandwidth		R_L = 150Ω		18		MHz
Filter Response (Normalized Gain)		f_{IN} = 54MHz		-53		dB
Slew Rate		2V Output step, 80% to 20%		78		V/μs
Group Delay Variation (D/DT)		Clamp and Bias, Difference between 400kHz and 13MHz		13.5		ns
Crosstalk (channel-to-channel)		f = 1MHz		-72		dB
Output Distortion (THD)	6dB	V_{OUT} = 1.4V_{PP}, 7MHz		1.2		%
	0dB			1.54		
AC PERFORMANCE (HIGH DEFINITION 1080i MODE)						
-0.1dB Bandwidth		R_L = 150Ω		30		MHz
-1dB Bandwidth		R_L = 150Ω		33		MHz
-3dB Bandwidth		R_L = 150Ω		38		MHz
Filter Response (Normalized Gain)		f_{IN} = 74.25MHz		-36		dB
Slew Rate		2V Output step, 80% to 20%		155		V/μs
Group Delay Variation (D/DT)		Clamp and Bias, Difference between 400kHz and 26.5MHz		9.5		ns
Crosstalk (channel-to-channel)		f = 1MHz		-74		dB
		f = 30MHz		-54		
Output Distortion (THD)	6dB	V_{OUT} = 1.4V_{PP}, 22MHz, R_L = 150Ω		1.82		%
	0dB	V_{OUT} = 0.7V_{PP}, 12MHz, R_L = 10kΩ		0.86		
AC PERFORMANCE (HIGH DEFINITION 1080p MODE)						
-0.1dB Bandwidth		R_L = 150Ω		40		MHz
-1dB Bandwidth		R_L = 150Ω		67		MHz
-3dB Bandwidth		R_L = 150Ω		89		MHz
Slew Rate		2V Output step, 80% to 20%		311		V/μs
Crosstalk (channel-to-channel)		f = 1MHz		-75		dB
		f = 30MHz		-53		
Output Distortion (THD)	6dB	V_{OUT} = 1.4V_{PP}, 22MHz		1.2		%
	0dB	V_{OUT} = 0.7V_{PP}, 22MHz, R_L = 10kΩ		1		

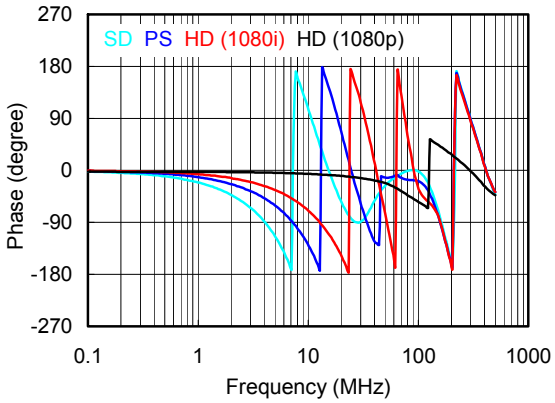
TYPICAL PERFORMANCE CHARACTERISTICS

At V_{CC} = 5V, T_A = +25℃, R_L = 150Ω, all outputs AC-coupled with 220μF, unless otherwise noted.

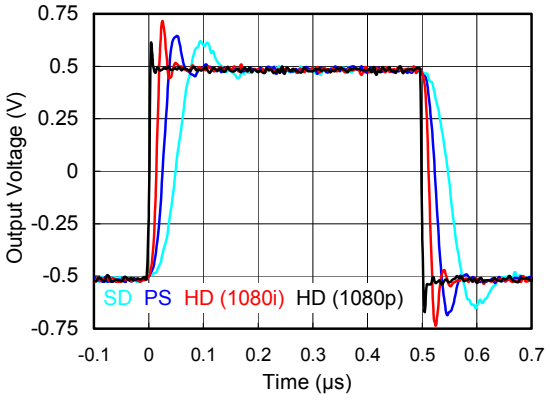
Frequency Response (6dB)



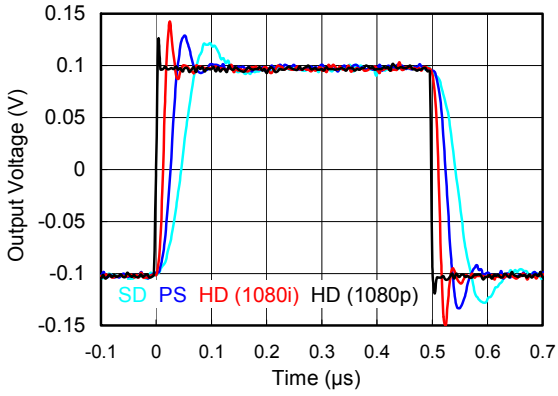
Phase vs. Frequency (6dB)



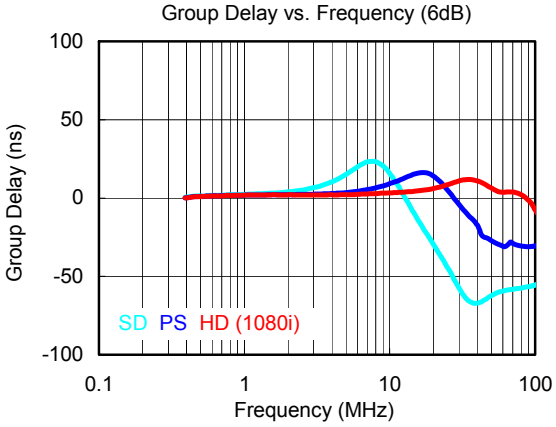
Large Signal Step Response (6dB)



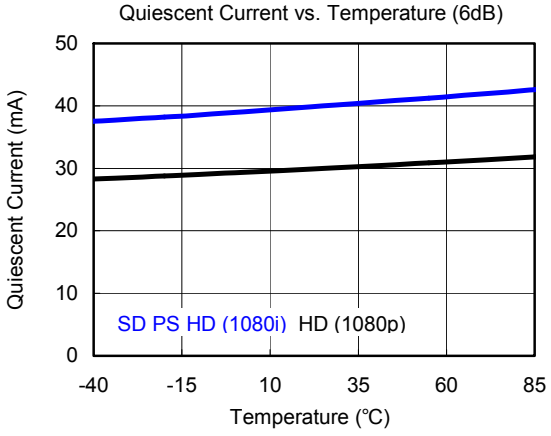
Small Signal Step Response (6dB)



Group Delay vs. Frequency (6dB)



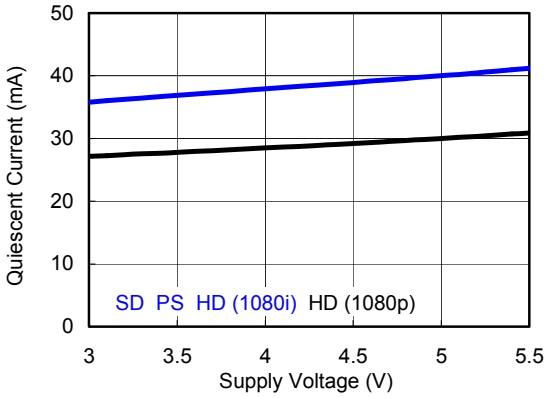
Quiescent Current vs. Temperature (6dB)



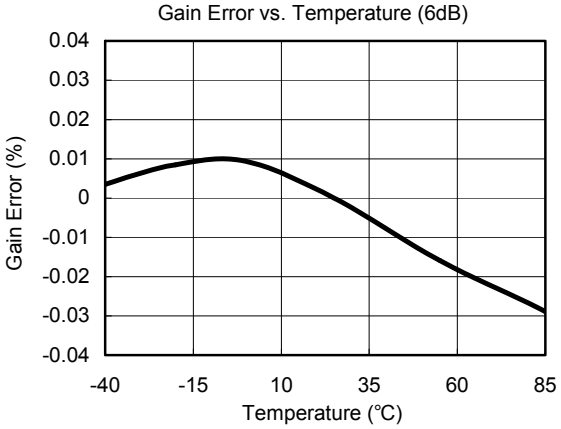
TYPICAL PERFORMANCE CHARACTERISTICS

At V_{CC} = 5V, T_A = +25℃, R_L = 150Ω, all outputs AC-coupled with 220μF, unless otherwise noted.

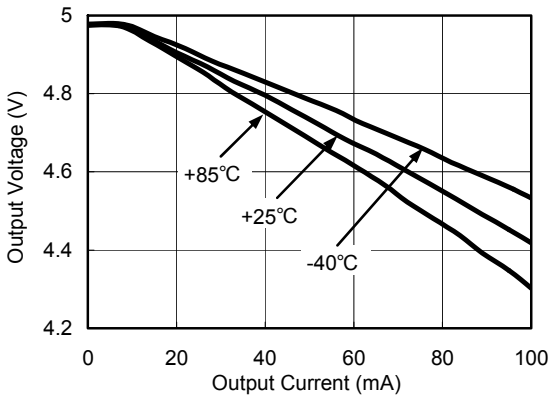
Quiescent Current vs. Supply Voltage (6dB)



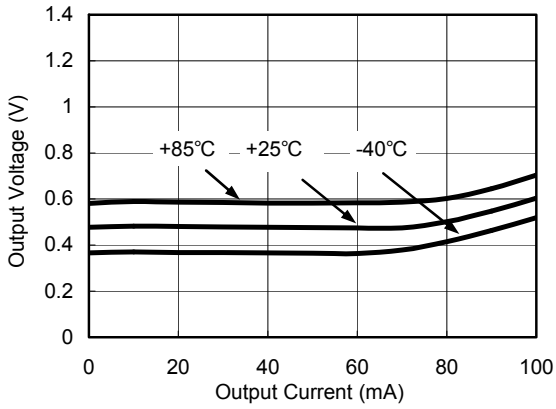
Gain Error vs. Temperature (6dB)



Output Voltage Swing to the Positive Rail vs. Output Current (6dB)

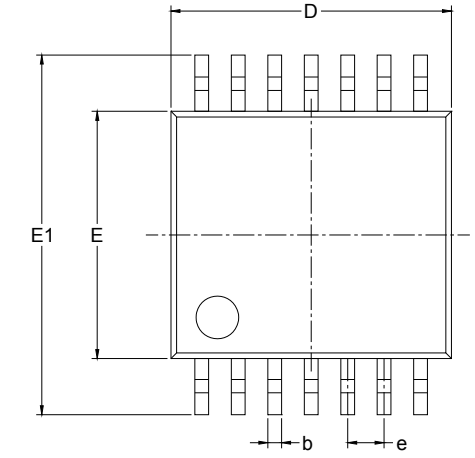


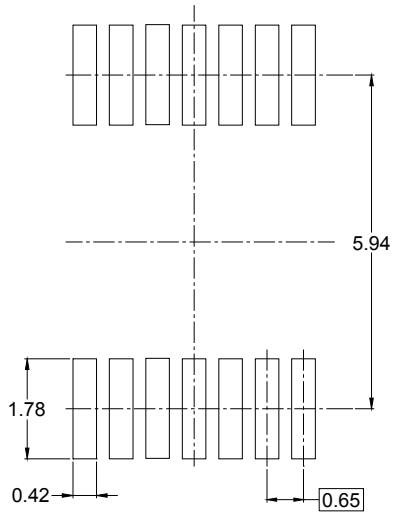
Output Voltage Swing to the Negative Rail vs. Output Current (6dB)



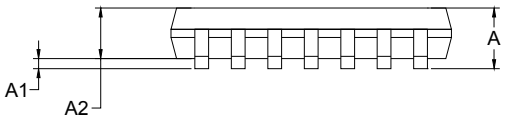
PACKAGE OUTLINE DIMENSIONS

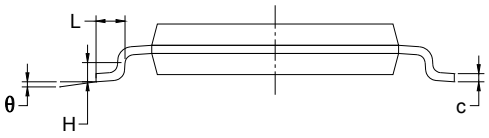
TSSOP-14





RECOMMENDED LAND PATTERN (Unit: mm)

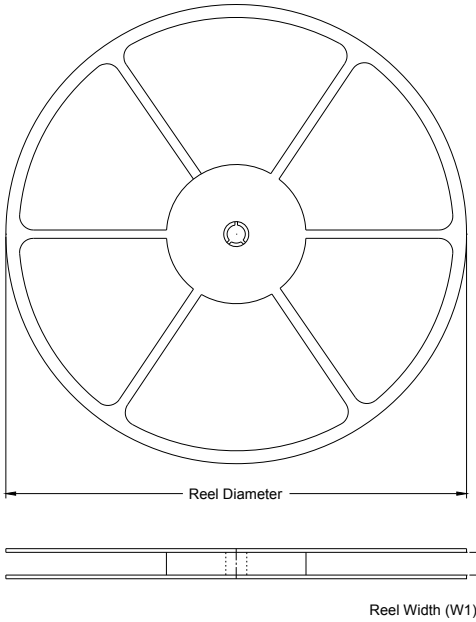




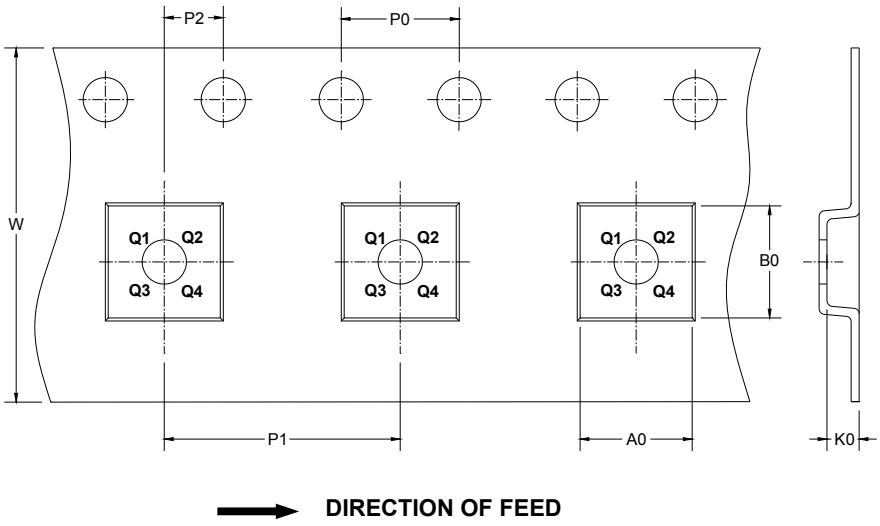
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.100		0.043
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	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

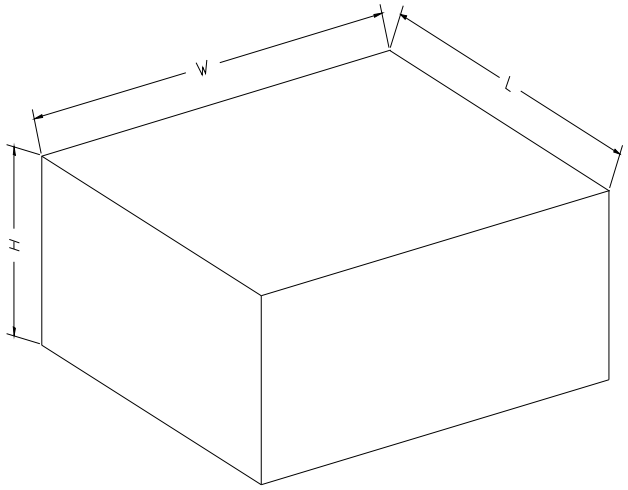


NOTE: The picture is only for reference. Please make the object as the standard.

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
TSSOP-14	13″	12.4	6.95	5.6	1.2	4.0	8.0	2.0	12.0	Q1

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