SGM9135
4-Channel, 6th-Order Video Filter Driver for SD/HD (1080p)

GENERAL DESCRIPTION

The SGM9135 is a 4-channel, 6th-order output reconstruction filter which can operate from 3.1V to 5.5V single power supply. It is designed to replace passive LC filters and drivers with an integrated device. One channel is Standard Definition (SD) filter while the rest three channels are Definition (HDp) filters.

The device allows DC- or AC-coupled output. SGM9135 can be DC-coupled or AC-coupled with input video signal to eliminate out-of-band noise, such as the output stage of DAC. Internal clamp circuitry may be used if AC-coupled inputs are required.

The SGM9135 is available in a Green MSOP-10 (Exposed Pad) package. It operates over an ambient temperature range of -40℃ to +85℃.

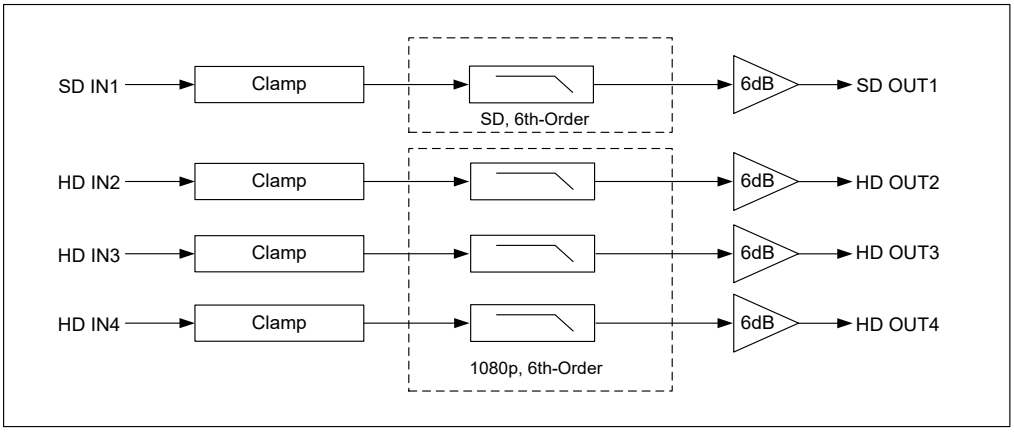
FEATURES

- **Supply Voltage Range: 3.1V to 5.5V**
- **Three 6th-Order 1080p High Definition Filters**
- **One 6th-Order Standard Definition Filter**
- **Clamp Mode Active with AC-Coupled Inputs**
- **Clamp Mode Inactive with DC-Coupled Inputs**
- **AC- or DC-Coupled Outputs**
- **DC-Coupled Outputs Eliminate AC-Coupled Capacitors**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green MSOP-10 (Exposed Pad) Package**

APPLICATIONS

Video Recorders
Video on Demand (VOD)
Cable and Satellite Set-Top Boxes
Portable and Handheld Products
Communication Devices
TVs

BLOCK DIAGRAM

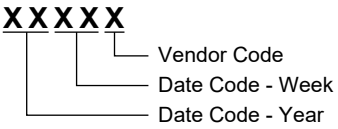


PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM9135	MSOP-10 (Exposed Pad)	-40℃ to +85℃	SGM9135YPMS10G/TR	SGM9135 YPMS10 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.

Input Voltage ..... GND - 0.3V to V_{CC} + 0.3V
Supply Voltage, V_{CC} 6.0V
Junction Temperature ..... 150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... 260℃
ESD Susceptibility
HBM 8000V
MM 400V

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range ..... 3.1V to 5.5V
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.

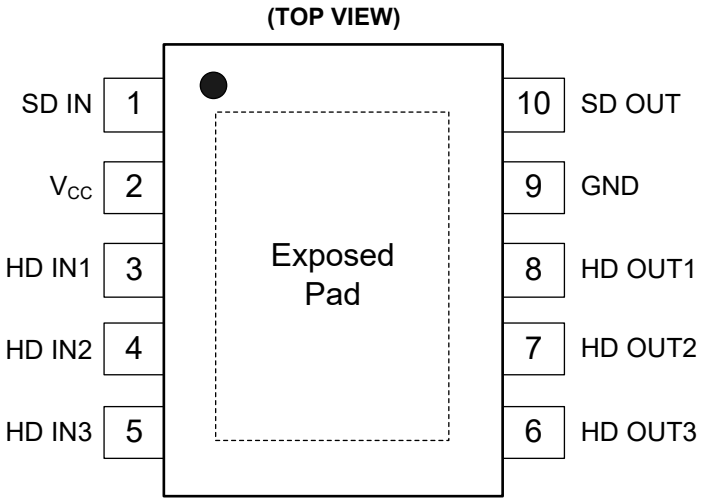
ESD SENSITIVITY CAUTION

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 CONFIGURATION



MSOP-10 (Exposed Pad)

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	SD IN	SD Video Input.
2	V_{CC}	Power Supply.
3	HD IN1	HD Video Input for Channel 1.
4	HD IN2	HD Video Input for Channel 2.
5	HD IN3	HD Video Input for Channel 3.
6	HD OUT3	Filtered HD Video Output for Channel 3.
7	HD OUT2	Filtered HD Video Output for Channel 2.
8	HD OUT1	Filtered HD Video Output for Channel 1.
9	GND	Ground.
10	SD OUT	Filtered SD Video Output.
Exposed Pad	—	Exposed Pad. Can only be connected to GND or left floating.

ELECTRICAL CHARACTERISTICS

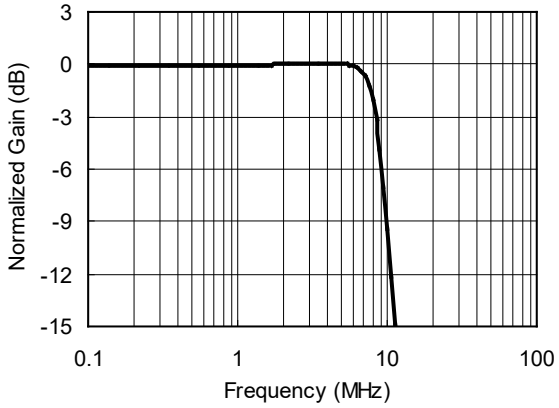
(T_A = +25℃, V_{IN} = 1V_{PP}, V_{CC} = 5V, R_{SOURCE} = 37.5Ω; all inputs are AC-coupled with 0.1μF; all outputs are AC-coupled with 220μF into 150Ω, referenced to 400kHz, unless otherwise noted.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
DC Electrical Characteristics						
Operating Voltage Range (V_{CC})			3.1	5	5.5	V
Quiescent Current (I_Q)	V_{CC} = 5.0V, No load			75	96	mA
Output Level Shift Voltage (V_{OLS})	V_{IN} = 0V, No load	SD channel		420	550	mV
		1080p channel		550	700	
Voltage Gain (A_V)	R_L = 150Ω		5.8	6.1	6.35	dB
Output Voltage High Swing	V_{IN} = 3V, R_L = 150Ω to GND			4.8		V
Video Input Voltage Range	Referenced to GND if DC-coupled			1.4		V_{PP}
Power Supply Rejection Ratio (PSRR)	DC (All channels)			50		dB
Standard Definition Mode Electrical Characteristics						
-0.1dB Bandwidth	SD channel			6.4		MHz
-1dB Bandwidth	SD channel			7.6		MHz
-3dB Bandwidth	SD channel			8.5		MHz
Filter Response (Normalized Gain)	SD channel, f_{IN} = 400kHz to 27MHz			50		dB
Slew Rate	2V Output step, 80% to 20%			34		V/μs
Differential Gain (DG)	AC-AC coupled, PAL			0.5		%
	AC-DC coupled, PAL			0.4		
Differential Phase (DP)	AC-AC coupled, PAL			1.0		deg
	AC-DC coupled, PAL			1.0		
Group Delay Variation (D/DT)	Difference between 400kHz and 6.5MHz			35		ns
Crosstalk (channel-to-channel)	V_{OUT} = 1.4V_{PP}, f = 1MHz			-63		dB
Signal-to-Noise Ratio (SNR)	100kHz to 5MHz			-66		dB
Fall Time	2V Output step, 80% to 20%			34		ns
Rise Time	2V Output step, 80% to 20%			36		ns
Chroma Luma Gain (CLG_{SD})	f = 3.58MHz (Referenced to SD_{IN} at 400kHz)			102		%
Chroma Luma Delay (CLD_{SD})	f = 3.58MHz (Referenced to SD_{IN} at 400kHz)			8		ns
1080p High Definition Mode Electrical Characteristics						
-0.1dB Bandwidth	R_L = 150Ω			78		MHz
-1dB Bandwidth	R_L = 150Ω			86		MHz
-3dB Bandwidth	R_L = 150Ω			98		MHz
Filter Response (Normalized Gain)	f_{IN} = 400kHz to 148MHz			21		dB
Slew Rate	2V Output step, 80% to 20%			340		V/μs
Group Delay Variation (D/DT)	Difference between 400kHz and 70MHz			5.3		ns
Crosstalk (channel-to-channel)	V_{OUT} = 1.4V_{PP}, f = 1MHz			-64		dB
Fall Time	2V Output step, 80% to 20%			3.3		ns
Rise Time	2V Output step, 80% to 20%			3.6		ns

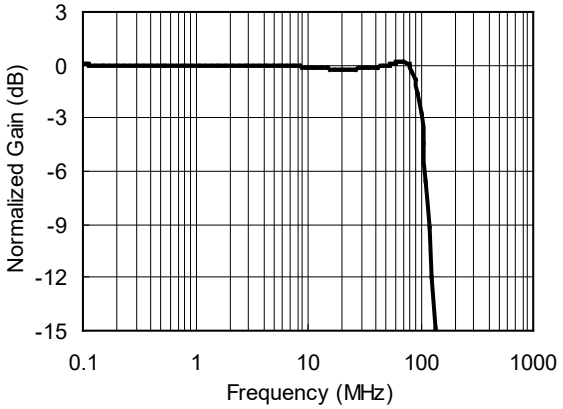
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, V_{IN} = 1V_{PP}, V_{CC} = 5V, R_{SOURCE} = 37.5Ω; all inputs are AC-coupled with 0.1μF; all outputs are AC-coupled with 220μF into 150Ω, referenced to 400kHz, unless otherwise noted.

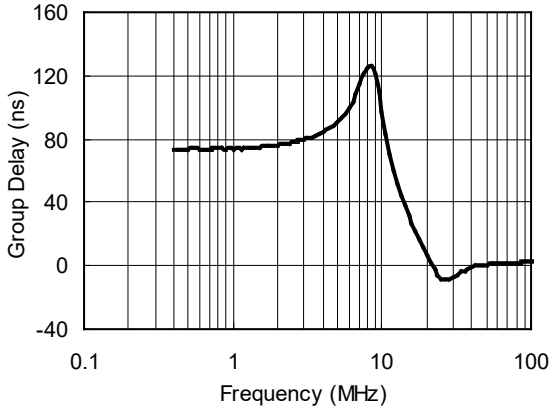
SD Gain vs. Frequency



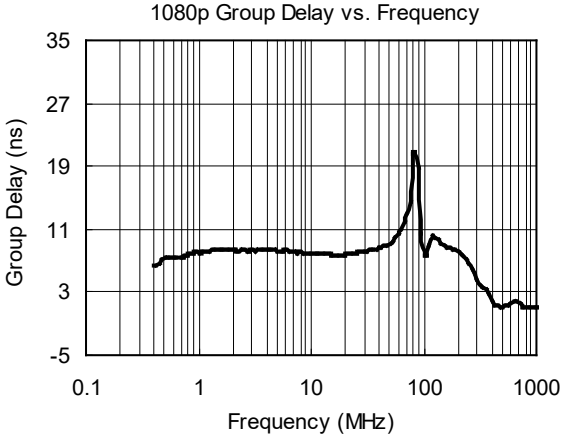
1080p Gain vs. Frequency



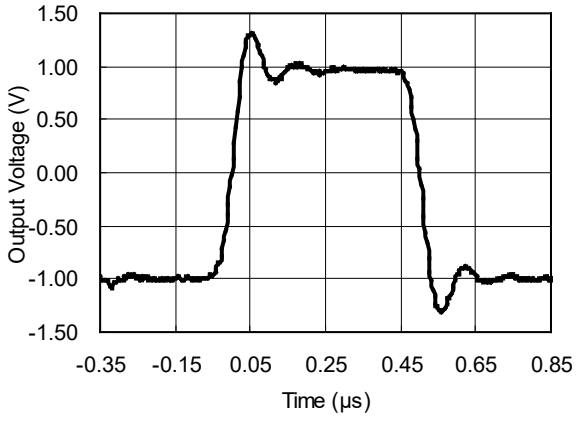
SD Group Delay vs. Frequency



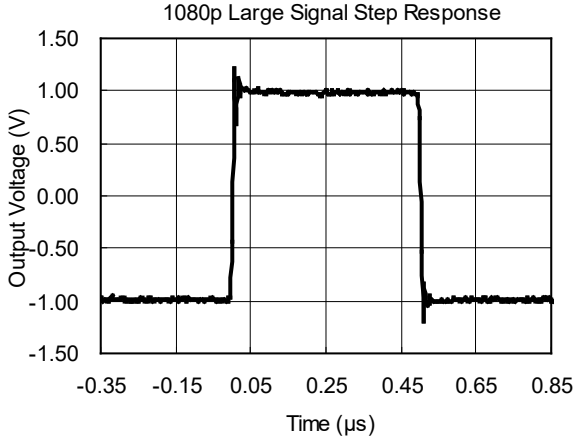
1080p Group Delay vs. Frequency



SD Large Signal Step Response



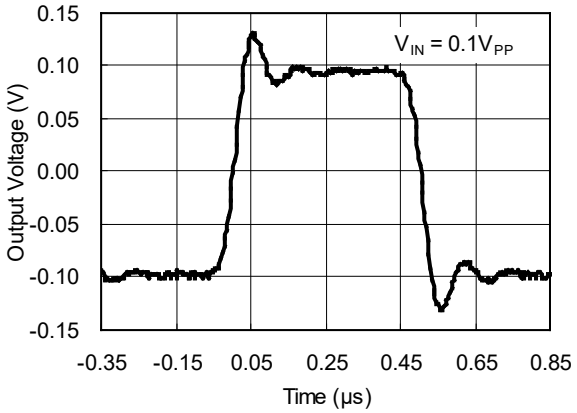
1080p Large Signal Step Response



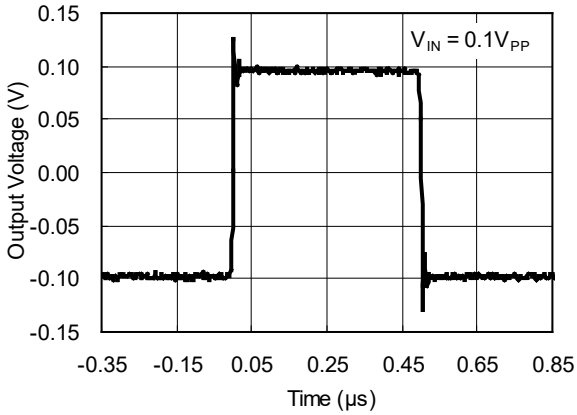
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, V_{IN} = 1V_{PP}, V_{CC} = 5V, R_{SOURCE} = 37.5Ω; all inputs are AC-coupled with 0.1μF; all outputs are AC-coupled with 220μF into 150Ω, referenced to 400kHz, unless otherwise noted.

SD Small Signal Step Response

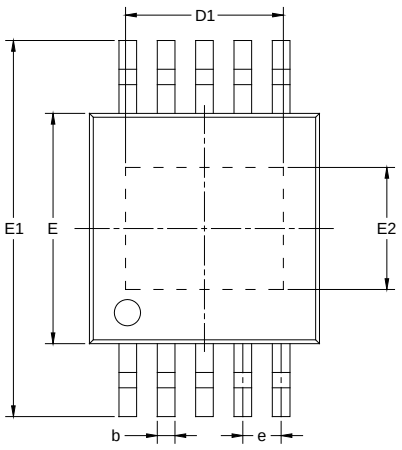


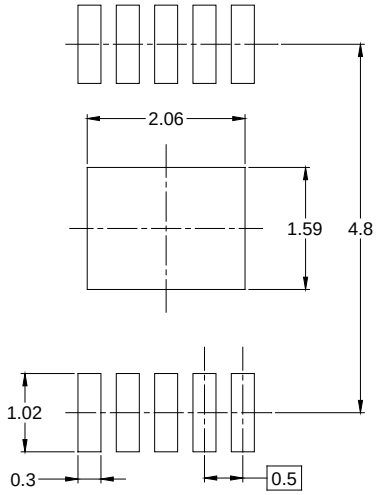
1080p Small Signal Step Response



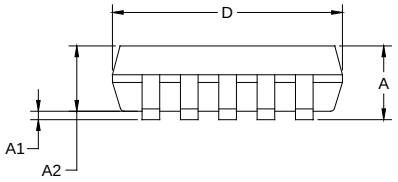
PACKAGE OUTLINE DIMENSIONS

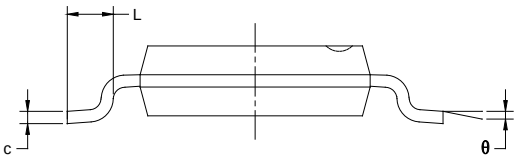
MSOP-10 (Exposed Pad)





RECOMMENDED LAND PATTERN (Unit: mm)



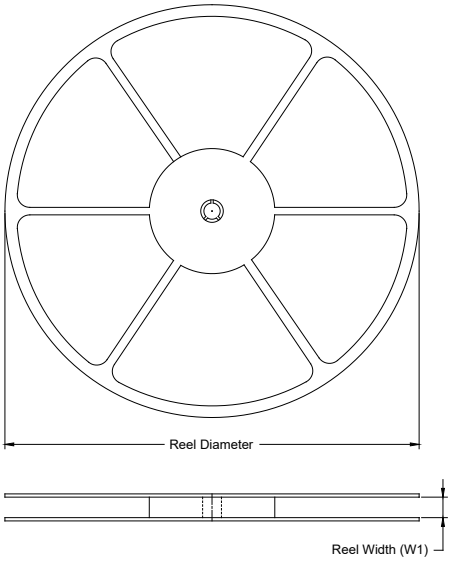


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.820	-	1.100
A1	0.020	-	0.150
A2	0.750	-	0.950
b	0.170	-	0.280
c	0.080	-	0.230
D	2.900	-	3.100
D1	1.700	-	2.416
E	2.900	-	3.100
E1	4.750	-	5.050
E2	1.450	-	1.730
e	0.500 BSC		
L	0.400	-	0.800
θ	0°	-	8°

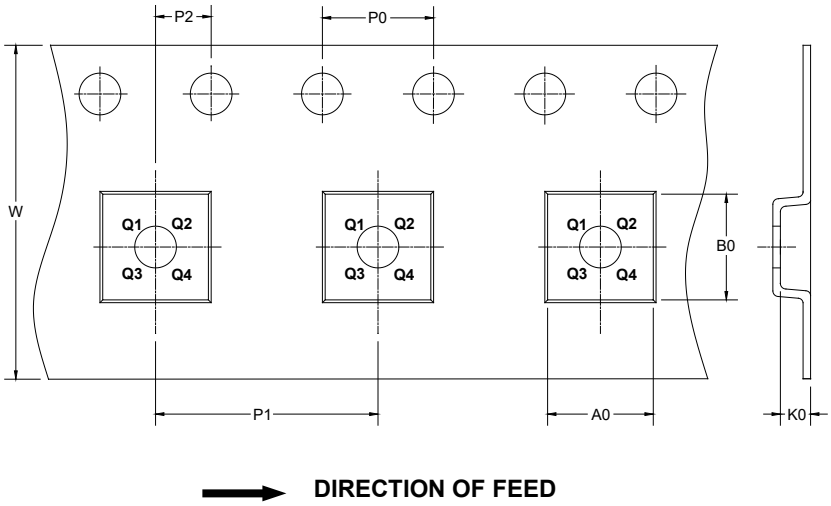
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

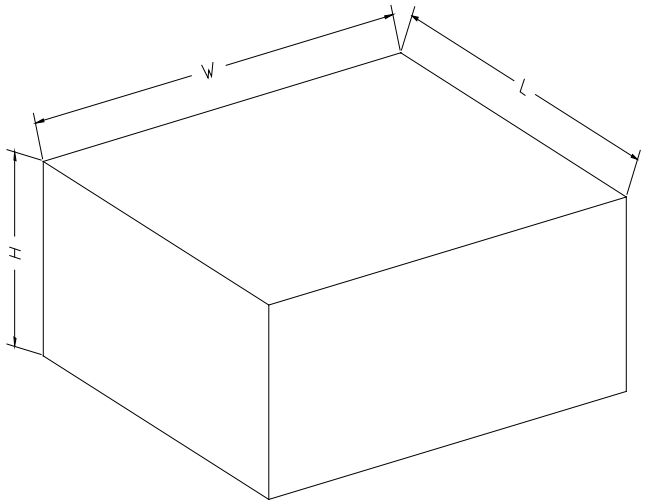
NOTE: The picture is only for reference. Please make the object as the standard.

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
MSOP-10 (Exposed Pad)	13″	12.4	5.20	3.30	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