



SGM9346

6-Channel, 6th-Order

Video Filter Driver for SD/HD

PRODUCT DESCRIPTION

The SGM9346 video filter is intended to replace passive LC filters and drivers with an integrated device. Six 6th-order Butterworth filters provide improved image quality compared to typical passive solutions. Three channels offer fixed SD filters while the other three are configurable between SD and HD filters.

The SGM9346 offers a fixed gain of 6dB. It may be directly driven by a DC-coupled DAC output or an AC-coupled signal. Internal clamp circuitry may be used if AC-coupled inputs are required.

The outputs can be AC- or DC-coupled. DC coupling the output removes the need for output coupling capacitors.

SGM9346 is available in Green TSSOP-20 package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **Three Configurable 6th-Order SD/HD Filters**
- **Three Fixed 6th-Order Standard Definition Filters**
- **Clamp Mode Active with AC-Coupled Inputs**
- **Clamp Mode Inactive with DC-Coupled Inputs**
- **AC- or DC-Coupled Inputs**
- **Single Supply Range: 3.3V to 5.5V**
- **Available in Green TSSOP-20 Package**
- **-40°C to +85°C Operating Temperature Range**

APPLICATIONS

Set-Top Boxes
DVD Players
HDTV
Personal Video Recorders (PVR)
Video on Demand (VOD)



PACKAGE/ORDERING INFORMATION

ORDER NUMBER	PACKAGE DESCRIPTION	TEMPERATURE RANGE	PACKAGE OPTION	MARKING INFORMATION
SGM9346YTS20G/TR	TSSOP-20	-40°C to +85°C	Tape and Reel, 3000	SGM9346YTS20

ABSOLUTE MAXIMUM RATINGS

DC Supply Voltage 6V
 Analog and Digital Input/Output Voltage
 GND - 0.3V to $V_{CC} + 0.3V$
 Storage Temperature Range.....-65°C to +150°C
 Junction Temperature 150°C
 Operating Temperature Range-40°C to +85°C
 Lead Temperature Range (Soldering 10 sec)..... 260°C
 ESD Susceptibility
 HBM.....8000V
 MM.....400V

NOTE:

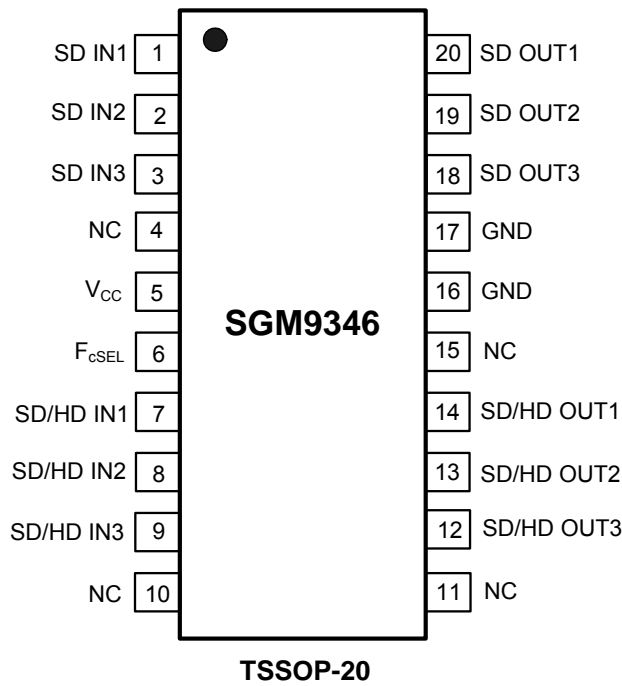
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

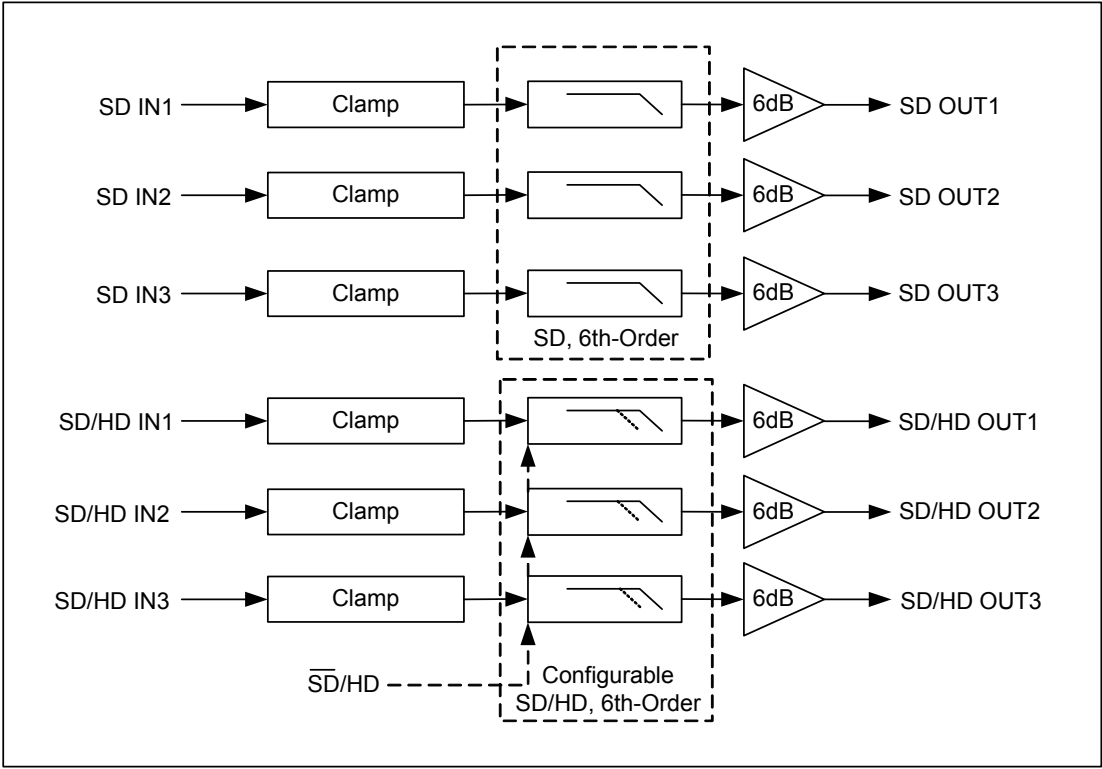
PIN CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	SD IN1	SD Video Input. Channel 1.
2	SD IN2	SD Video Input. Channel 2.
3	SD IN3	SD Video Input. Channel 3.
4, 10, 11, 15	NC	No Connection.
5	V _{CC}	Power Supply.
6	F _{cSEL}	Selects Filter Corner Frequency for Pins 7, 8 and 9. "0" = SD, "1" = HD.
7	SD/HD IN1	SD or HD Video Input. Channel 1.
8	SD/HD IN2	SD or HD Video Input. Channel 2.
9	SD/HD IN3	SD or HD Video Input. Channel 3.
12	SD/HD OUT3	Filtered SD or HD Video Output. Channel 3.
13	SD/HD OUT2	Filtered SD or HD Video Output. Channel 2.
14	SD/HD OUT1	Filtered SD or HD Video Output. Channel 1.
16, 17	GND	Ground.
18	SD OUT3	Filtered SD Video Output. Channel 3.
19	SD OUT2	Filtered SD Video Output. Channel 2.
20	SD OUT1	Filtered SD Video Output. Channel 1.

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

($T_A = +25^\circ\text{C}$, $V_{CC} = 5\text{V}$, at $R_L = 150\Omega$ connected to GND, $V_{IN} = 1V_{PP}$, all outputs AC-coupled with $220\mu\text{F}$, Full = -40°C to $+85^\circ\text{C}$, unless otherwise noted.)

PARAMETER	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS						
Output Level Shift Voltage (V _{OLS})	V _{IN} = 0V, No load	+25°C		503	630	mV
		Full			739	
Input Voltage Clamp (V _{CLAMP})	I _{IN} = -3.5mA	+25°C	-163	-131		mV
		Full	-243			
Clamp Charge Current	V _{IN} = V _{CLAMP} - 100mV	+25°C	-5.43	-5		mA
		Full	-6.5			
Voltage Gain (A _V)	R _L = 150Ω	+25°C	5.89	6.13	6.32	dB
		Full	5.85		6.4	
OUTPUT CHARACTERISTICS						
Output Voltage High Swing	V _{IN} = 3V, R _L = 150Ω to GND	+25°C	4.71	4.77		V
		Full	4.65			
POWER SUPPLY						
Operating Voltage Range		+25°C	3.3		5.5	V
Power Supply Rejection Ratio (PSRR)	V _{CC} = 3.5V to 5.0V	+25°C	47	59		dB
		Full	40.5			
Quiescent Current (I _Q)	V _{IN} = 0V, No load	+25°C		64.5	83	mA
		Full			95	
AC PERFORMANCE (STANDARD DEFINITION MODE)						
-0.1dB Bandwidth	R _L = 150Ω	+25°C		5.36		MHz
-3dB Bandwidth	R _L = 150Ω	+25°C		8.18		MHz
Filter Response (Normalized Gain)	f _{IN} = 27MHz	+25°C		-45.5		dB
Slew Rate	2V Output step, 80% to 20%	+25°C		39.5		V/μs
Differential Gain (DG)	PAL DC-coupled	+25°C		0.15		%
	PAL AC-coupled	+25°C		0.66		
Differential Phase (DP)	PAL DC-coupled	+25°C		1.10		°
	PAL AC-coupled	+25°C		1.75		
Group Delay Variation (D/DT)	Difference between 400kHz and 4.5MHz	+25°C		10.5		ns
Crosstalk (channel-to-channel)	f = 1MHz	+25°C		-68		dB
Fall Time	2V Output step, 80% to 20%	+25°C		30.5		ns
Rise Time	2V Output step, 80% to 20%	+25°C		30.4		ns
Output Distortion (THD)	V _{OUT} = 1.4V _{PP} , 3.58MHz	+25°C		1.00		%

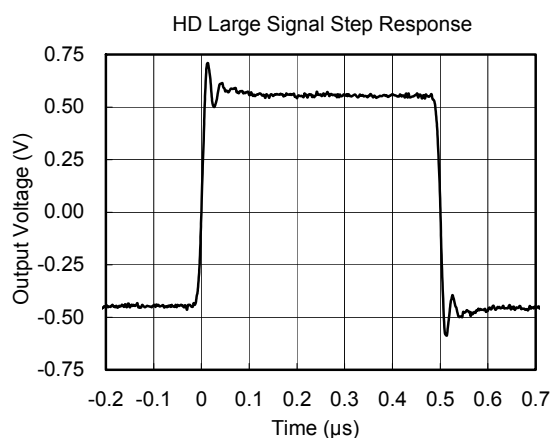
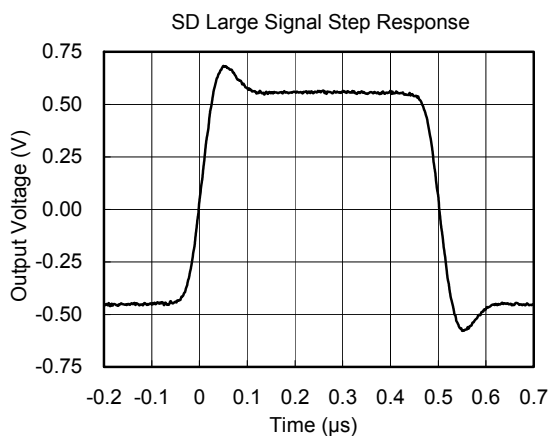
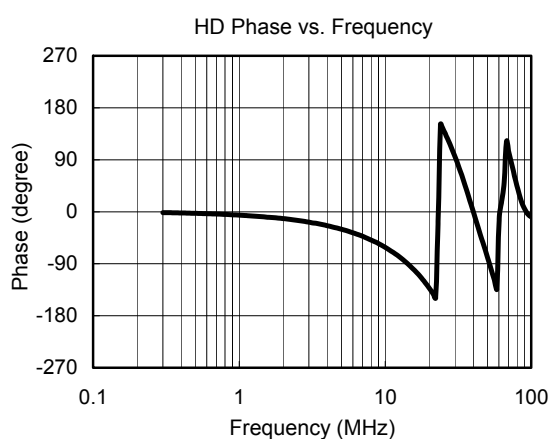
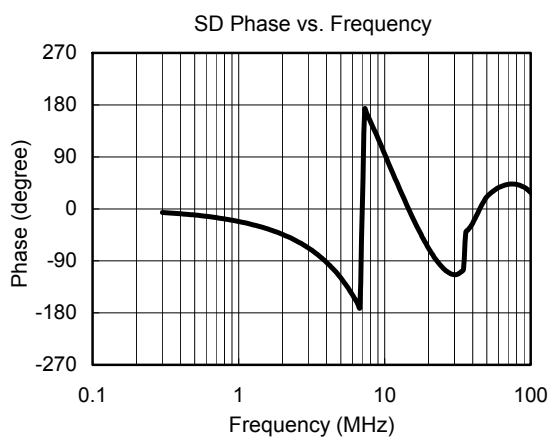
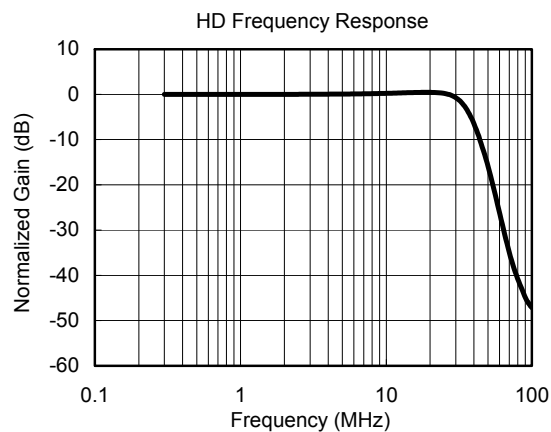
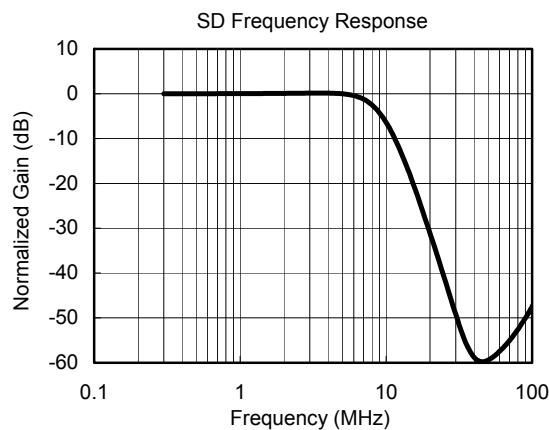
ELECTRICAL CHARACTERISTICS

($T_A = +25^\circ\text{C}$, $V_{CC} = 5\text{V}$, at $R_L = 150\Omega$ connected to GND, $V_{IN} = 1V_{PP}$, all outputs AC-coupled with $220\mu\text{F}$, Full = -40°C to $+85^\circ\text{C}$, unless otherwise noted.)

PARAMETER	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
AC PERFORMANCE (HIGH DEFINITION MODE)						
-0.1dB Bandwidth	$R_L = 150\Omega$	$+25^\circ\text{C}$		28.2		MHz
-3dB Bandwidth	$R_L = 150\Omega$	$+25^\circ\text{C}$		35.5		MHz
Filter Response (Normalized Gain)	$f_{IN} = 74.25\text{MHz}$	$+25^\circ\text{C}$		-37.5		dB
Slew Rate	2V Output step, 80% to 20%	$+25^\circ\text{C}$		140		V/ μs
Differential Gain (DG)	PAL DC-coupled	$+25^\circ\text{C}$		0.06		%
	PAL AC-coupled	$+25^\circ\text{C}$		0.37		
Differential Phase (DP)	PAL DC-coupled	$+25^\circ\text{C}$		0.40		°
	PAL AC-coupled	$+25^\circ\text{C}$		0.53		
Group Delay Variation (D/DT)	Difference between 400kHz and 20MHz	$+25^\circ\text{C}$		4.90		ns
Crosstalk (channel-to-channel)	$f = 1\text{MHz}$	$+25^\circ\text{C}$		-71		dB
Fall Time	2V Output step, 80% to 20%	$+25^\circ\text{C}$		8.50		ns
Rise Time	2V Output step, 80% to 20%	$+25^\circ\text{C}$		8.40		ns
Output Distortion (THD)	$V_{OUT} = 1.4V_{PP}$, 22MHz	$+25^\circ\text{C}$		2.30		%

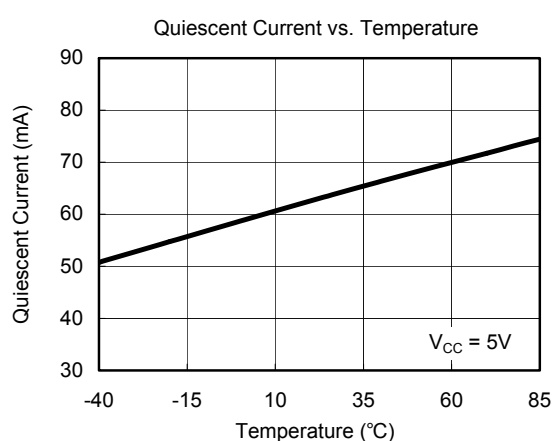
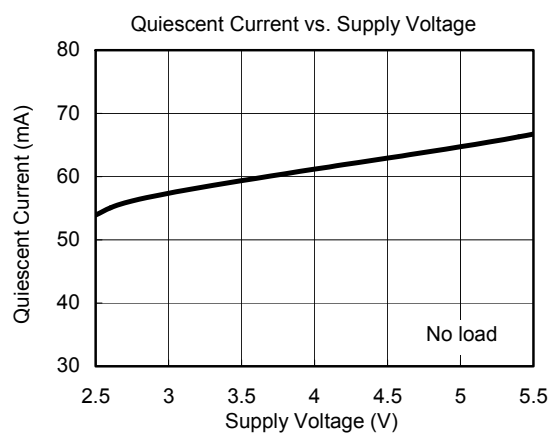
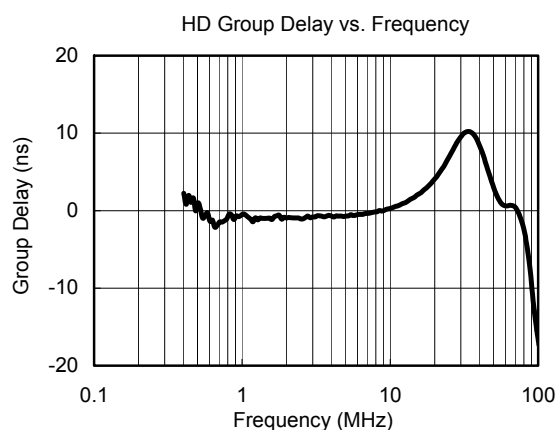
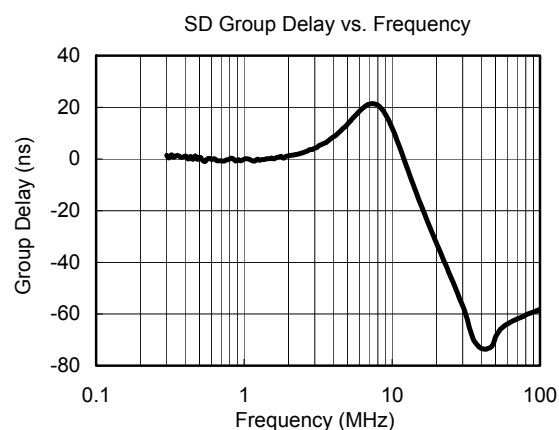
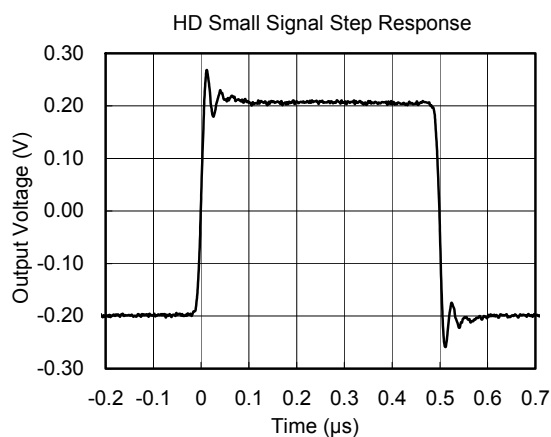
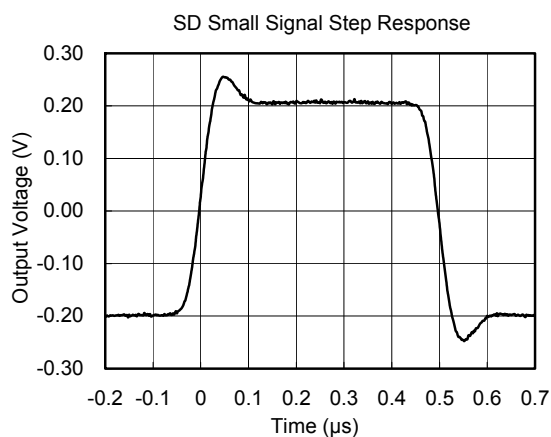
TYPICAL PERFORMANCE CHARACTERISTICS

At $V_{CC} = 5V$, $T_A = +25^\circ C$, $R_L = 150\Omega$, all outputs AC-coupled with $220\mu F$, unless otherwise noted.



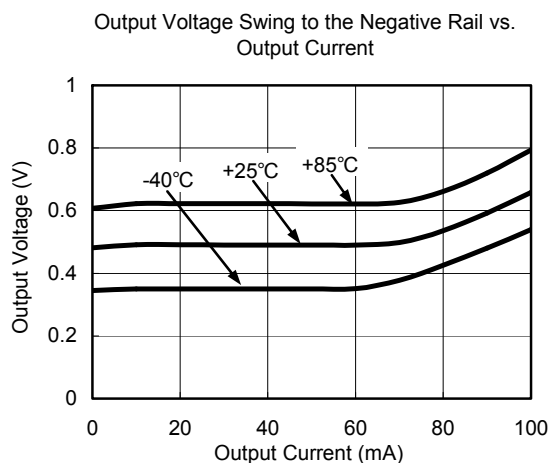
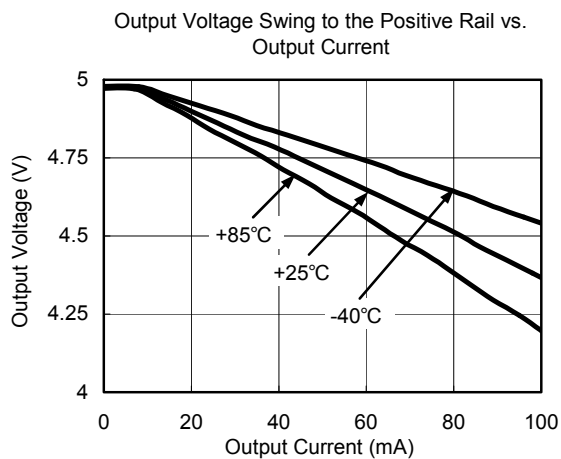
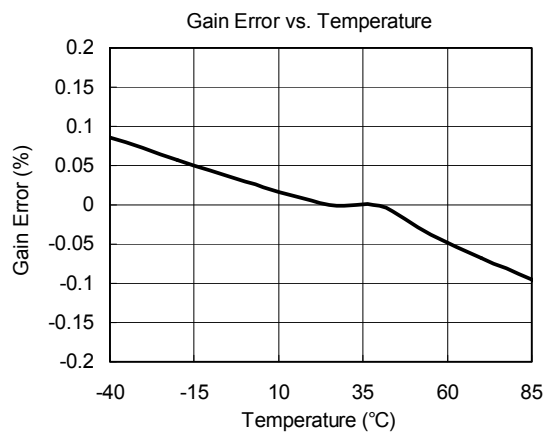
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APPLICATION INFORMATION

Functional Description

The SGM9346 video filter provides 6dB gain from input to output, and the input will be slightly offset to optimize the output driver performance. The offset is held to the minimum required value to decrease the standing DC current into the load.

The SGM9346 provides an internal clamp to support AC-coupled input signals. If the input signal does not go below ground, the input clamp will not operate. This allows DAC outputs to directly drive the SGM9346 without an AC coupling capacitor. The worst-case sync tip compression due to the clamp will not exceed 7mV. The input level set by the clamp combined with the internal DC offset will keep the output within its acceptable range. When the input is AC-coupled, the clamp will set the sync tip (or lowest voltage) just below ground.

I/O Configuration

The Figure1 and Figure 2 can be used with AC-coupled outputs if desired.

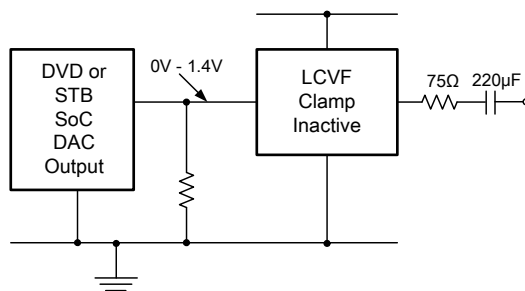


Figure 1. DC-coupled Inputs, AC-coupled Outputs

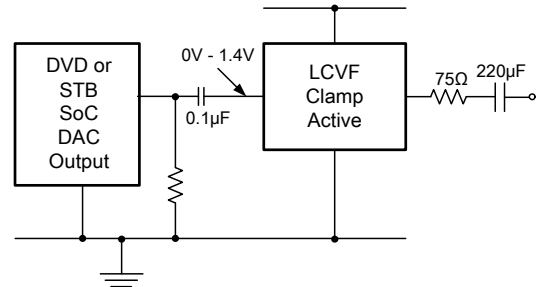


Figure 2. AC-coupled Inputs, AC-coupled Outputs

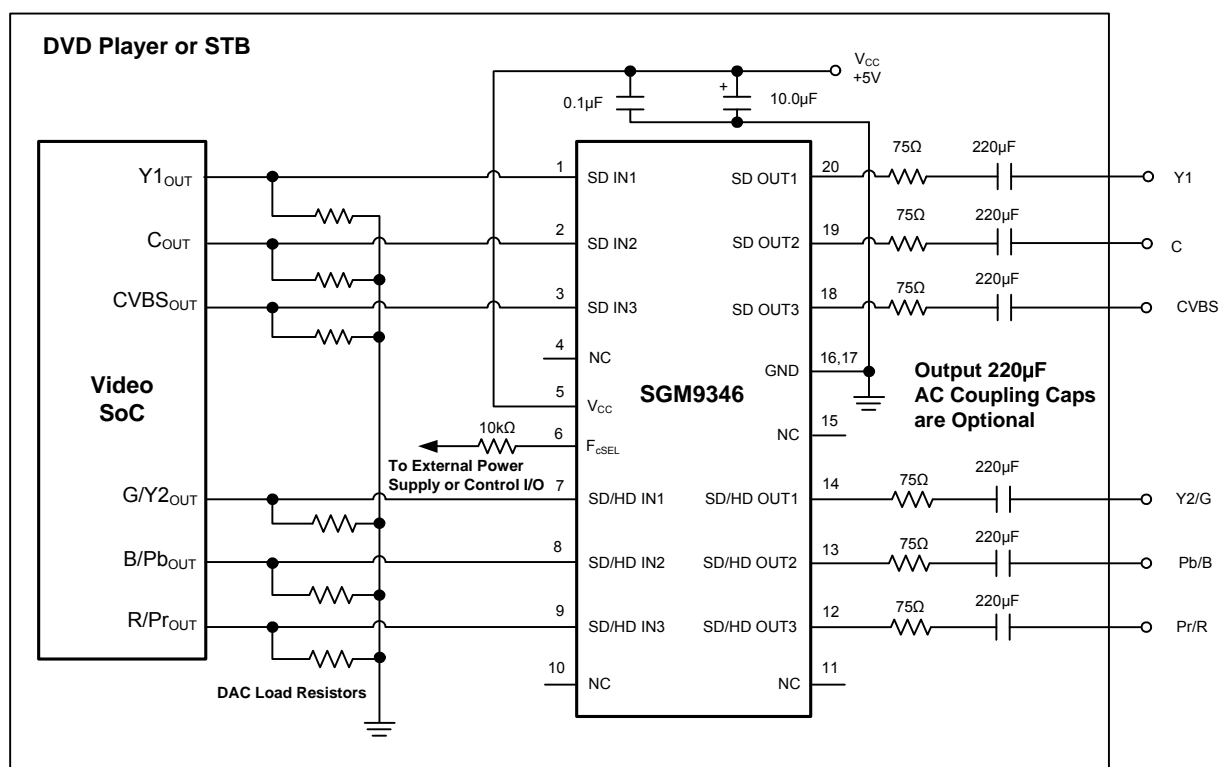
NOTE: The video tilt or line time distortion will be dominated by the AC coupling capacitor. The value may need to be increased beyond 220μF in order to obtain satisfactory operation in some applications.

Power-Supply Bypassing and Layout

Correct power supply bypassing is very important for optimizing video performance in design. One 0.1μF and one 10μF capacitors are always used to bypass V_{CC} pin of SGM9346. Place these two capacitors as close to the SGM9346 supply pin as possible. A large ground plane is also needed to ensure optimum performance. The input and output termination resistors should be placed as close to the related pins of SGM9346 as possible to avoid performance degradation. The PCB traces at the output side should have 75Ω characteristic impedance in order to match the 75Ω characteristic impedance of the cable connecting external load. In design, keep the board trace at the inputs and outputs of the SGM9346 as short as possible to minimize the parasitic stray capacitance and noise pickup.

TYPICAL APPLICATION DIAGRAM

The following circuit may be used for direct DC-coupled drive by DACs with an output voltage range from 0V to 1.4V. AC-coupled or DC-coupled outputs may be used with AC-coupled outputs offering slightly lower power dissipation.



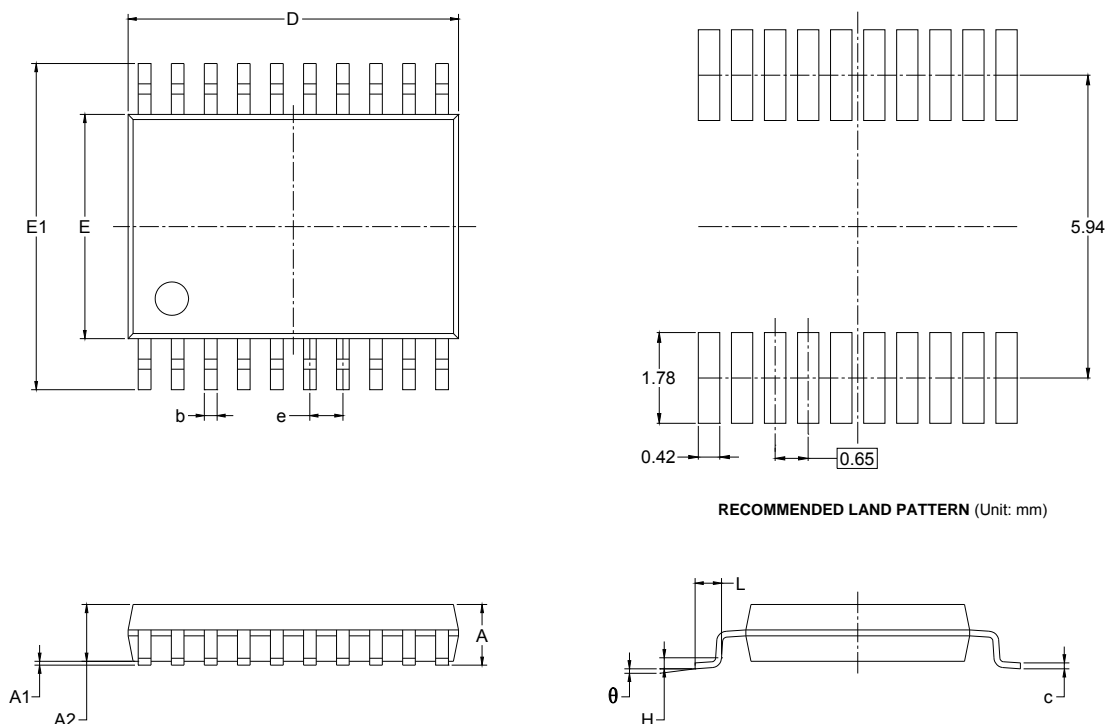
NOTES:

1. A $10k\Omega$ resistor must be serially connected to F_{CSEL} pin.
2. Power supply V_{CC} must be sequenced on first before input video signals.

Figure 3. Typical Application Diagram

PACKAGE OUTLINE DIMENSIONS

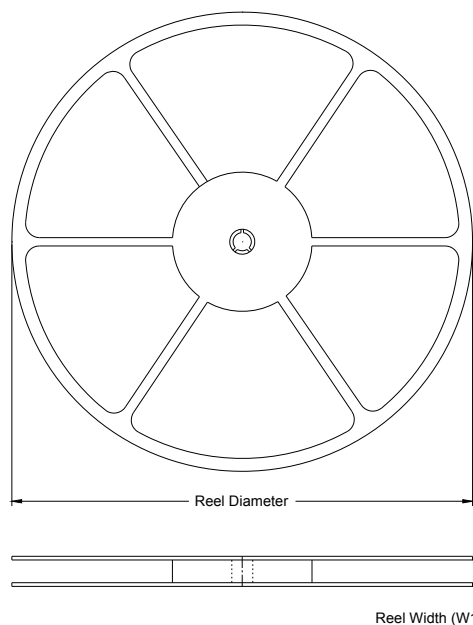
TSSOP-20



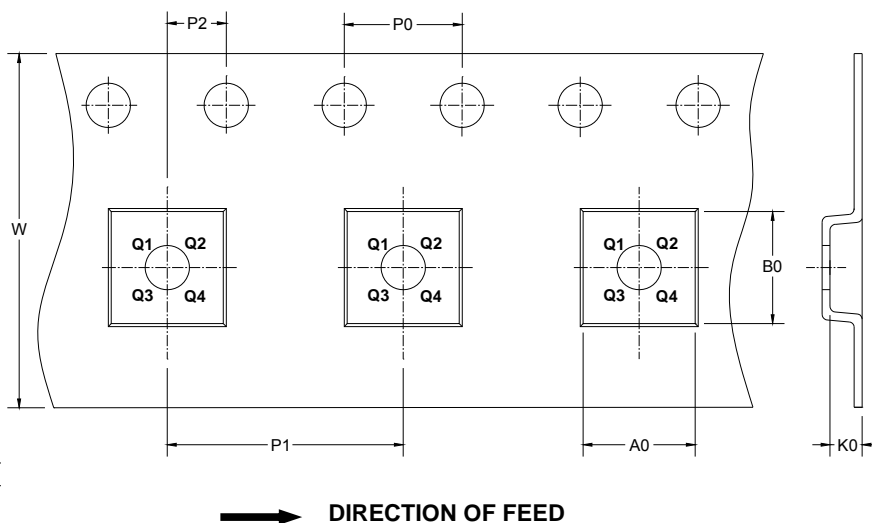
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.100		0.043
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	6.400	6.600	0.252	0.259
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	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

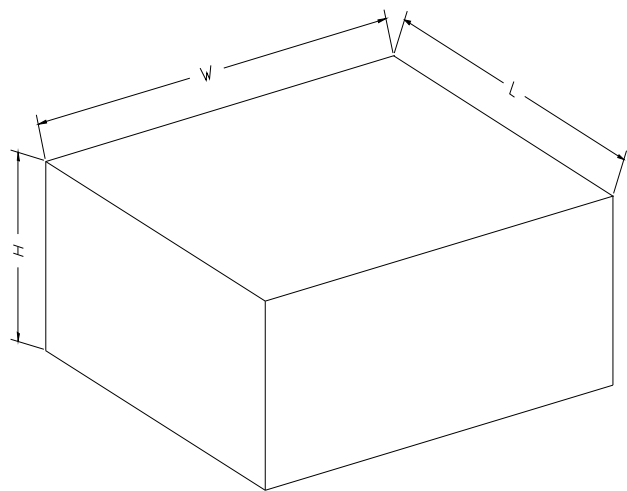


NOTE: The picture is only for reference. Please make the object as the standard.

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-20	13"	12.4	6.8	6.85	1.7	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