SGM9147
13MHz Rail-to-Rail Composite Video Driver with 6dB Gain

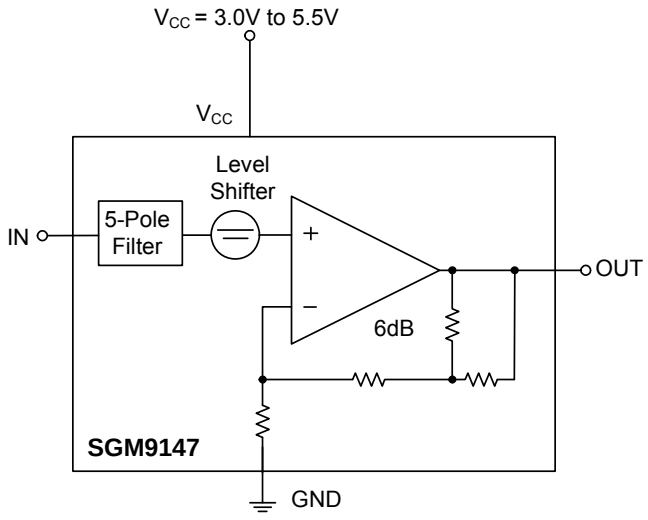
GENERAL DESCRIPTION

The SGM9147 is a single rail-to-rail 5-pole output reconstruction filter with a -3dB bandwidth of 13MHz and 60V/μs slew rate. Operating from single power supply ranging from 3.0V to 5.5V and sinking 5mA quiescent current, the SGM9147 is ideally suited for low power, battery-operated applications.

The SGM9147 employs an internal level shift circuit that avoids sync-pulse clipping and allows DC-coupled output.

The SGM9147 is available in Green SC70-5 package. It is specified over the -40℃ to +85℃ temperature range.

BLOCK DIAGRAM



NOTE: Power supply V_{CC} must be sequenced on first before input video signals.

FEATURES

- **Excellent Video Performance**
- **5-Pole Reconstruction Filter**
- **Internal Gain: 6dB**
- **Rail-to-Rail Output**
- **Input Voltage Range Includes Ground**
- **AC- and DC-Coupled Input**
- **Operates from 3.0V to 5.5V Single Power Supply**
- **Low Power**
  5mA Typical Supply Current
- **Available in Green SC70-5 Package**
- **-40℃ to +85℃ Operating Temperature Range**

APPLICATIONS

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

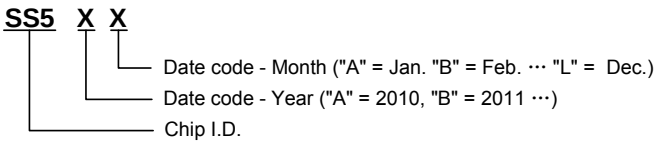
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM9147A	SC70-5	-40℃ to +85℃	SGM9147AYC5G/TR	SS5XX	Tape and Reel, 3000

NOTE: XX = Date 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.

MARKING INFORMATION



For example: SS5AA (2010, January)

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} 6V
Input Voltage Range ..... GND - 0.3V to V_{CC} + 0.3V
Storage Temperature Range ..... -65℃ to +150℃
Junction Temperature ..... 150℃
Lead Temperature (Soldering, 10s) ..... 260℃
ESD Susceptibility
HBM 8000V
MM 400V
CDM 2000V

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range ..... 3.0V to 5.5V
Operating Temperature Range ..... -40℃ to +85℃

OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

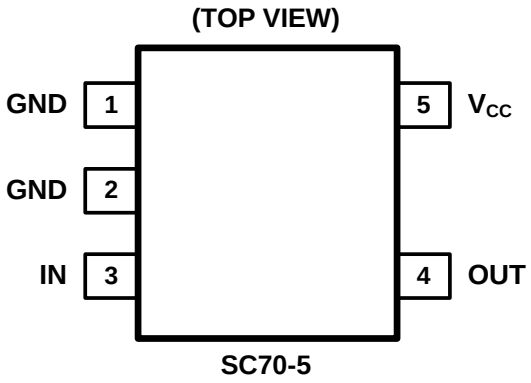
ESD SENSITIVITY CAUTION

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, specification or other related things if necessary without notice at any time.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 2	GND	Ground.
3	IN	Video Input.
4	OUT	Filtered Video Output.
5	V_{CC}	Power Supply.

ELECTRICAL CHARACTERISTICS

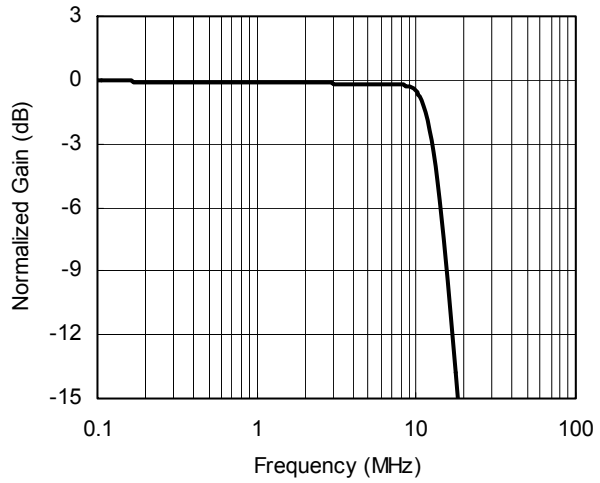
(At V_{CC} = 5V, T_A = +25℃, at R_L = 150Ω connected to GND, V_{IN} = 1V_{PP} and C_{IN} = 0.1μF, output AC-coupled, referenced to 400kHz, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS					
Output Level Shift Voltage (V_{OLS})	V_{IN} = 0V, No load		290	550	mV
Input Voltage Clamp (V_{CLAMP})	I_{IN} = -3.5mA		-210		mV
Clamp Charge Current	V_{IN} = V_{CLAMP} - 100mV		-4.8		mA
Clamp Discharge Current	V_{IN} = 500mV		1.8		μA
Voltage Gain (A_V)	R_L = 150Ω	5.6	6	6.4	dB
OUTPUT CHARACTERISTICS					
Output Voltage High Swing	V_{IN} = 3.0V, R_L = 150Ω to GND		4.74		V
Output Short-Circuit Current (I_{SC})	V_{IN} = 0.5V, Out shorted to V_{CC} through 36Ω		-102		mA
	V_{IN} = 1.5V, Out shorted to GND through 36Ω		91		
POWER SUPPLY					
Operating Voltage Range		3.0		5.5	V
Power Supply Rejection Ratio (PSRR)	V_{CC} = 3.5V to 5.0V		50		dB
Quiescent Current (I_Q)	V_{IN} = 0.5V		5	8.8	mA
DYNAMIC PERFORMANCE					
-0.1dB Bandwidth			10		MHz
-1dB Bandwidth			11.5		MHz
-3dB Bandwidth			13		MHz
Filter Response (Normalized Gain)	f_{IN} = 27MHz		30		dB
Slew Rate	2V Output step, 80% to 20%		60		V/μs
Differential Gain Error (DG)	DC-DC coupled		0.65		%
	AC-AC coupled		1.15		
Differential Phase Error (DP)	DC-DC coupled		1		°
	AC-AC coupled		1.5		
Group Delay Variation (D/DT)	Difference between 400kHz and 6.5MHz		6		ns
Fall Time	2V Output step, 80% to 20%		20		ns
Rise Time	2V Output step, 80% to 20%		20		ns

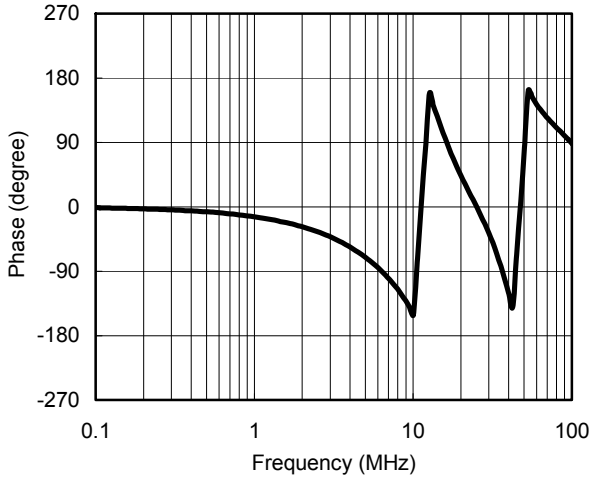
TYPICAL PERFORMANCE CHARACTERISTICS

At V_{CC} = 5V, T_A = +25℃, at R_L = 150Ω connected to GND, V_{IN} = 1V_{PP} and C_{IN} = 0.1μF, output AC-coupled, referenced to 400kHz, unless otherwise noted.

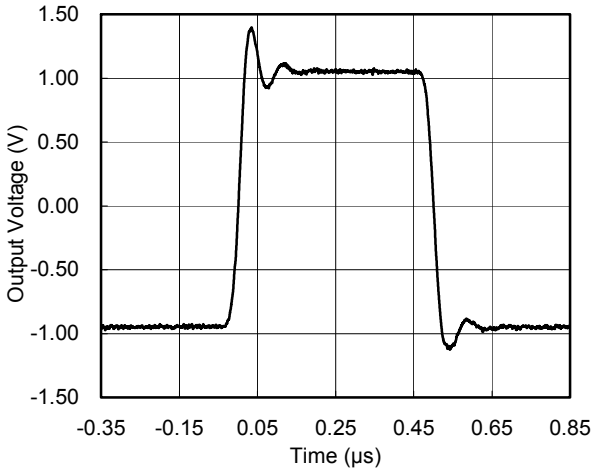
Gain vs. Frequency



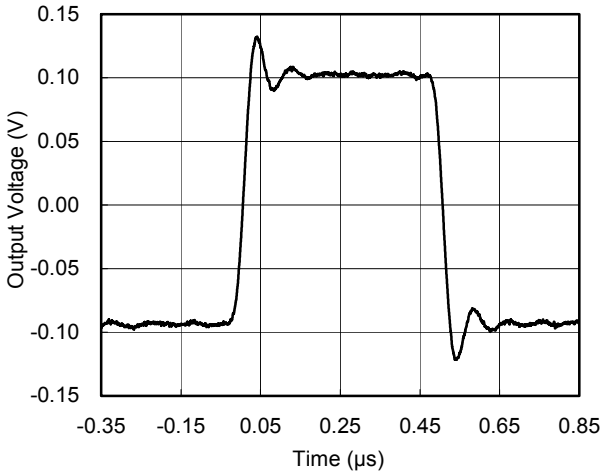
Phase vs. Frequency



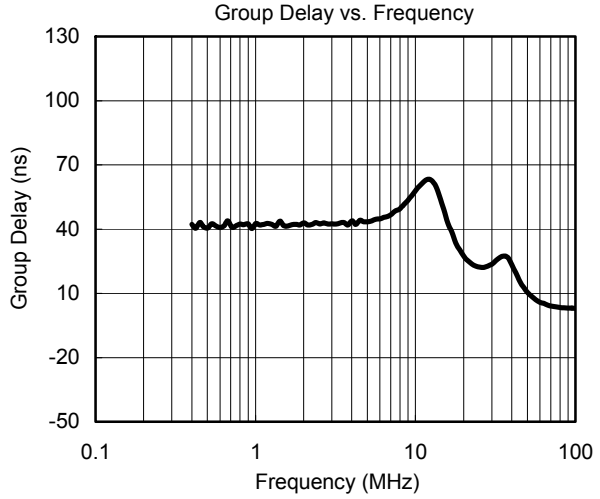
Large Signal Step Response



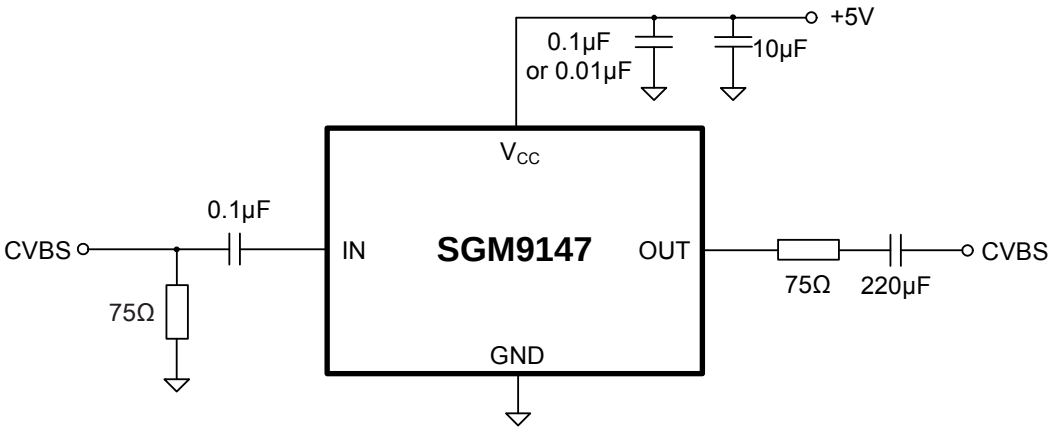
Small Signal Step Response



Group Delay vs. Frequency



TYPICAL APPLICATION CIRCUIT



NOTE:
1. Power supply V_{CC} must be sequenced on first before input video signals.

Figure 1. AC Coupling Application Schematic

APPLICATION INFORMATION

Functional Description

SGM9147 operates from a single 3.0V to 5.5V supply. In application, SGM9147 is a fully integrated solution for filtering and buffering SDTV signals in front of video decoder or behind video encoder. For example, SGM9147 can replace a passive LC filter and an amplifier driver at CVBS side in set-top box and DVD player. This solution can help reduce PCB size and production cost, and it also improves video signal performance comparing with traditional design using discrete components. SGM9147 features a DC-coupled input buffer, a 5-pole low-pass filter to eliminate out-of-band noise of video encoder, and a gain of 6dB in the output amplifier to drive 75Ω load. The AC- or DC-coupled input buffer eliminates sync crush, droop, and field tilt. The output of SGM9147 also can be DC-coupled or AC-coupled.

Input Considerations

Besides AC coupling, the SGM9147 inputs also can be DC-coupled. In DC coupling application, no input coupling capacitors are needed because the amplitude of input video signal from DAC includes ground and extends up to 1.4V, and SGM9147 can be directly connected to the output of a single-supply, current-output DAC without any external bias network. In applications where DAC's output level exceeds the range from 0V to 1.4V, or SGM9147 is driven by an unknown external source or a SCART switch which has its own clamping circuit, AC coupling is needed.

Output Considerations

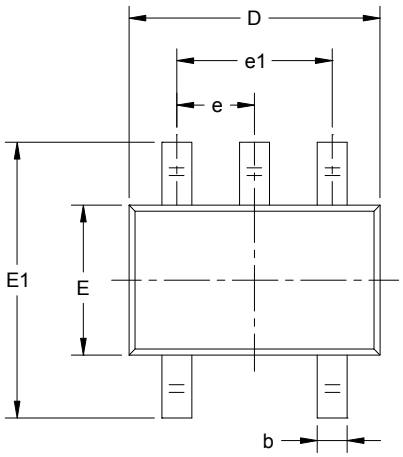
The SGM9147 outputs can be DC-coupled or AC-coupled. When input is 0V, the SGM9147 output voltage is 290mV typically. In DC coupling design, one 75Ω resistor is used to connect SGM9147's output pin with external load directly, and this serial back-termination resistor is used to match the impedance of the transmission line between SGM9147 and external load to cancel the signal reflection. The SGM9147 outputs can sink and source current allowing the device to be AC-coupled with external load. In AC coupling, at least 220μF capacitor will be used in order to eliminate field tilt.

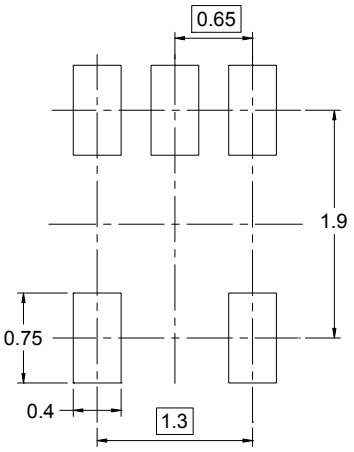
Power-Supply Bypassing and Layout

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 SGM9147. Place these two capacitors as close to the SGM9147 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 SGM9147 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 SGM9147 as short as possible to minimize the parasitic stray capacitance and noise pickup.

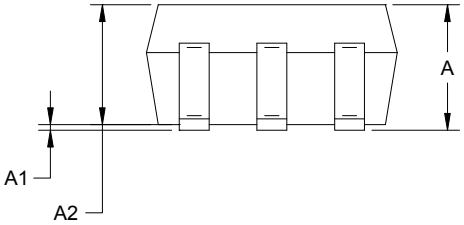
PACKAGE OUTLINE DIMENSIONS

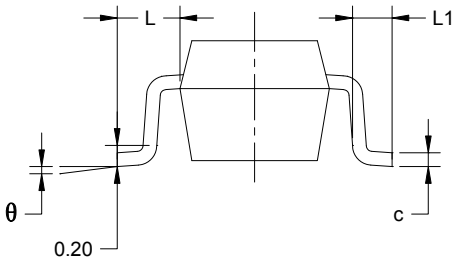
SC70-5





RECOMMENDED LAND PATTERN (Unit: mm)

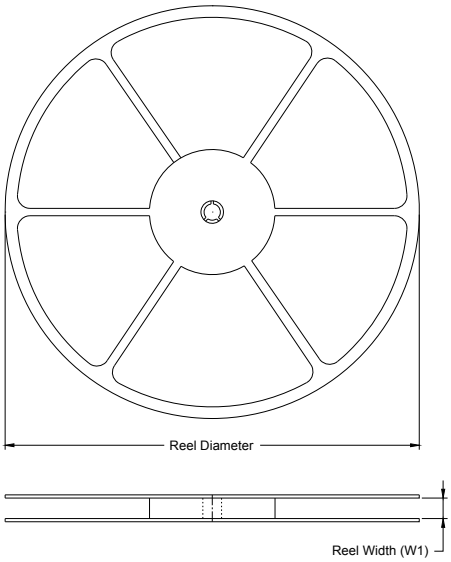




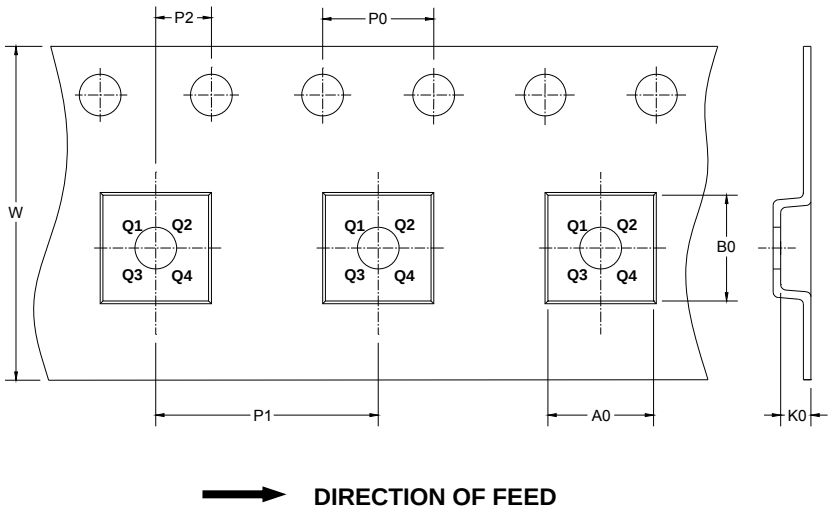
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 TYP	
e1	1.300 BSC		0.051 BSC	
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



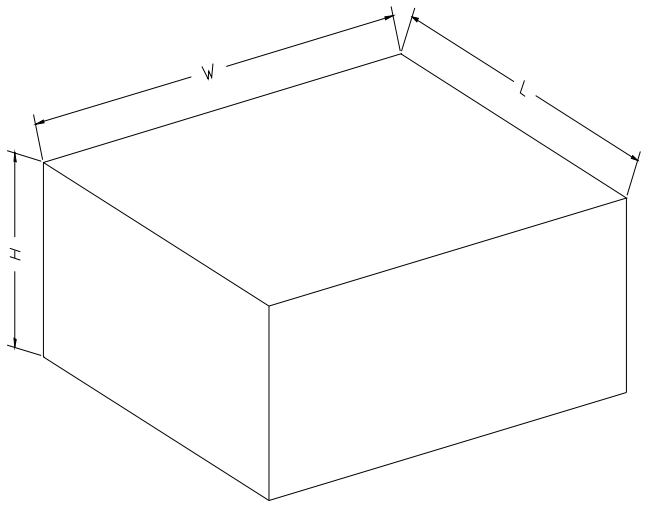
NOTE: The picture is only for reference. Please make the object as the standard.

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
SC70-5	7″	9.5	2.25	2.55	1.20	4.0	4.0	2.0	8.0	Q3

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
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002