

SGM9111

8MHz Rail-to-Rail Composite Video Driver with 6dB Gain

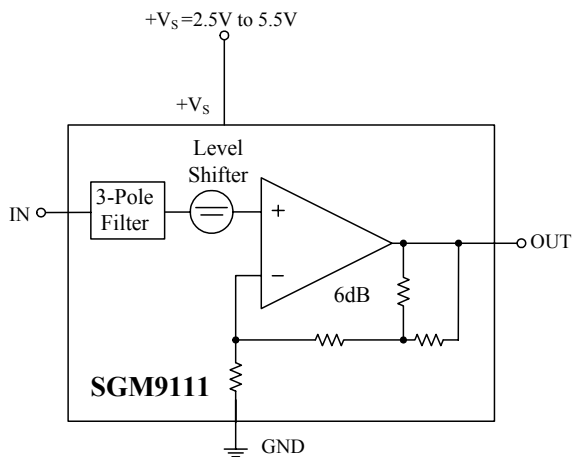
PRODUCT DESCRIPTION

The SGM9111 is single rail-to-rail 3-pole output reconstruction filter with a -3dB bandwidth of 8MHz and a slew rate of 40V/ μ s. Operating from single supplies ranging from +2.5V to +5.5V and sinking an ultra-low 2.65mA quiescent current, the SGM9111 is ideally suited for low power, battery-operated applications.

The output swings within 100mV of GND and 170mV to V+ with a standard back-terminated video load (150 Ω). SGM9111 employs an internal level shift circuit that avoids sync-pulse clipping and allows DC-coupled output.

It has lead (Pb) free SO-8 package.

BLOCK DIAGRAM



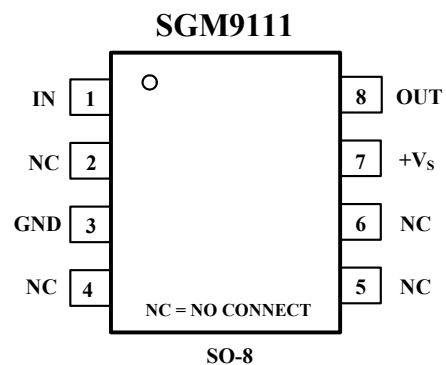
FEATURES

- Low Cost
- Excellent Video Performance
- 3-Pole Reconstruction Filter
- Internal Gain: 6dB
- Rail-to-Rail Output
- Input Voltage Range Includes Ground
AC-Coupled Input
- Operates on 2.5 V to 5.5 V Single-Supplies
- Low Power
2.65 mA Typical Supply Current
- Small Packaging
SGM9111 Available in SO-8

APPLICATIONS

Video amplifiers
Cable and Satellite set top boxes
Communications devices
Video on demand
Portable and handheld products
Personal video recorders
DVD players
HDTV

PIN CONFIGURATION (Top View)



ELECTRICAL CHARACTERISTICS: $V_S = +3.3V$

(At $R_L = 150\Omega$ connected to GND, and $C_{IN} = 0.1\mu F$, $C_{out} = 220\mu F$, unless otherwise noted)

PARAMETER	CONDITIONS	SGM9111						
		TYP	MIN/MAX OVER TEMPERATURE				UNITS	MIN/MAX
		+25°C	+25°C	0°C to 70°C	-40°C to +85°C			
INPUT CHARACTERISTICS								
Output Level Shift Voltage (V_{OLS})	$V_{IN} = 0V$, no load	106	130	135	145	mV	MAX	
Input Bias Current (I_B)						pA	TYP	
Input Voltage Clamp (V_{CLAMP})	$I_{IN} = -1mA$	-61	-65	-70	-73	mV	MIN	
Clamp Charge Current	$V_{IN} = V_{CLAMP} - 100mV$	-2.7	-2.8	-2.82	-2.84	mA	MIN	
Clamp Discharge Current	$V_{IN} = 500mV$	4	5	6	6.5	μA	MAX	
Input Resistance (R_{IN})	$0.5V < V_{IN} < 1.0V$					M Ω	MIN	
Voltage Gain (A_V)	$R_L = 150\Omega$	2.0	1.97	1.968	1.966	V/V	MIN	
			2.03	2.032	2.034	V/V	MAX	
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$)						$\mu V/^\circ C$	TYP	
OUTPUT CHARACTERISTICS								
Output Voltage High Swing	$V_{IN} = 2V$, $R_L = 150\Omega$ to GND	3.13	3.1	3.05	3.03	V	MIN	
Output Short-Circuit Current (I_{SC})	$V_{IN} = 2V$, to GND through 10Ω	-105	-100	-100	-95	mA	MAX	
	$V_{IN} = 100mV$, out short to V_{DD} through 10Ω	120	110	108	107	mA	MIN	
POWER SUPPLY								
Operating Voltage Range			2.5	2.7	2.7	V	MIN	
			5.5	5.5	5.5	V	MAX	
Power Supply Rejection Ratio (PSRR)	$V_S = +2.7V$ to $+5.5V$	70	62	61	60	dB	MIN	
Quiescent Current (I_Q)	$V_{IN} = 500mV$, no load	2.65	2.94	3.03	3.12	mA	MAX	
DYNAMIC PERFORMANCE								
$\pm 0.1dB$ Bandwidth	$R_L = 150\Omega$, $C_L = 5pF$	4.4				MHz	TYP	
-3dB Bandwidth	$R_L = 150\Omega$, $C_L = 5pF$	8.0				MHz	TYP	
Filter Response								
Normalized Gain: $f_{IN} = 4.5MHz$		+0.15				dB	TYP	
$f_{IN} = 27MHz$		-22				dB	TYP	
Slew Rate	10% to 90%, $V_{IN} = 1V$ Step,	40				V/ μs	TYP	
Differential Gain Error (DG)	NTSC & PAL DC coupled	0.46				%	TYP	
	NTSC & PAL AC coupled	1.2				%	TYP	
Differential Phase Error (DP)	NTSC & PAL DC coupled	0.8				°	TYP	
	NTSC & PAL AC coupled	1.0				°	TYP	
Group Delay Variation (D/DT)	$f = 100kHz$, $5MHz$	8				ns	TYP	
Fall Time	$2.5V_{STEP}$, 80% to 20%	30				ns	TYP	
Rise Time	$2.5V_{STEP}$, 80% to 20%	40				ns	TYP	

Specifications subject to changes without notice.

PACKAGE/ORDERING INFORMATION

ORDER NUMBER	PACKAGE DESCRIPTION	TEMPERATURE RANGE	PACKAGE OPTION	MARKING INFORMATION
SGM9111YS/TR	SO-8	-40°C to +85°C	Tape and Reel, 2500	SGM9111YS
SGM9111ZS/TR	SO-8	0°C to +70°C	Tape and Reel, 2500	SGM9111ZS

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V+ to V-	7.5 V
Input Voltage	GND – 0.3 V to (+Vs) +0.3V
Storage Temperature Range	-65°C to +150°C
Junction Temperature.....	160°C
Operating Temperature Range	
SGM9111YS	-40°C to +85°C
SGM9111ZS	0°C to +70°C
Package Thermal Resistance	
SO-8, θ_{JA}	125°C/W
Lead Temperature Range (Soldering 10 sec)	
.....	260°C
ESD Susceptibility	
HBM.....	1000V
MM.....	400V

NOTES

1. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

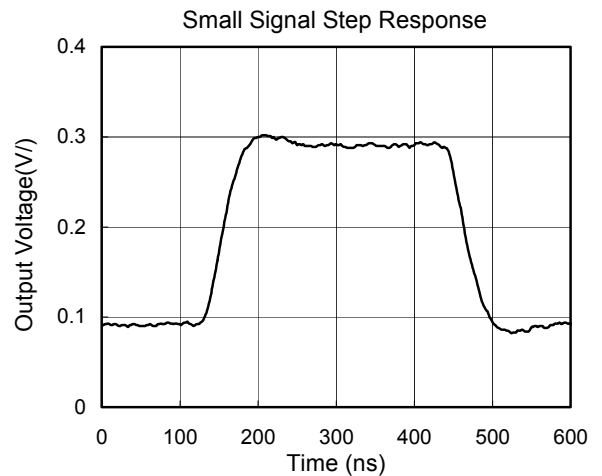
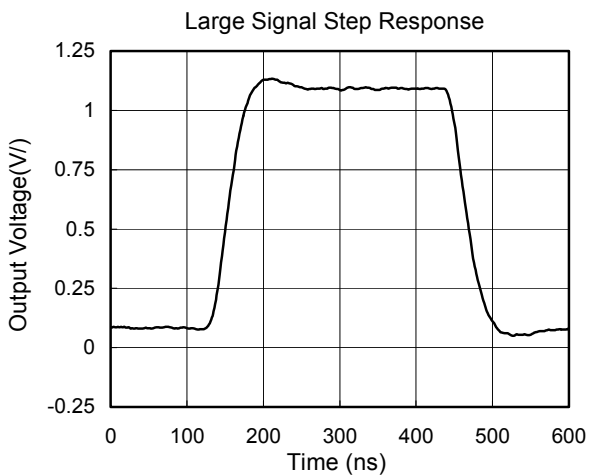
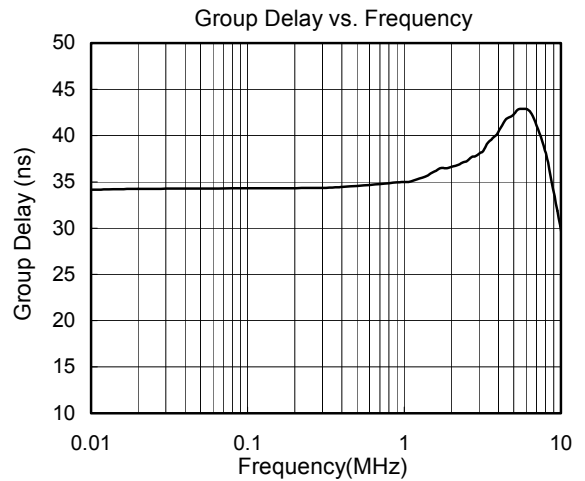
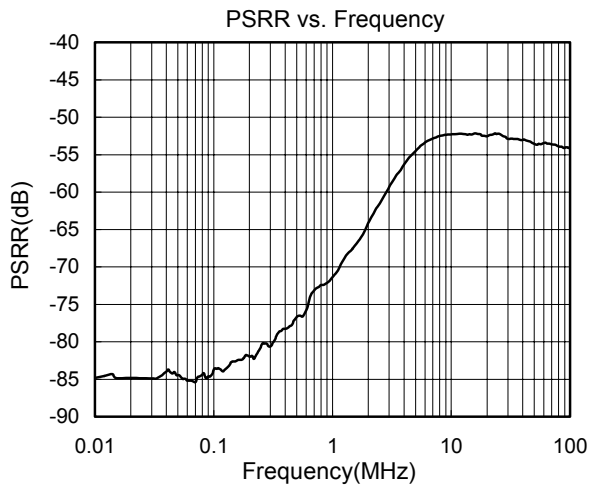
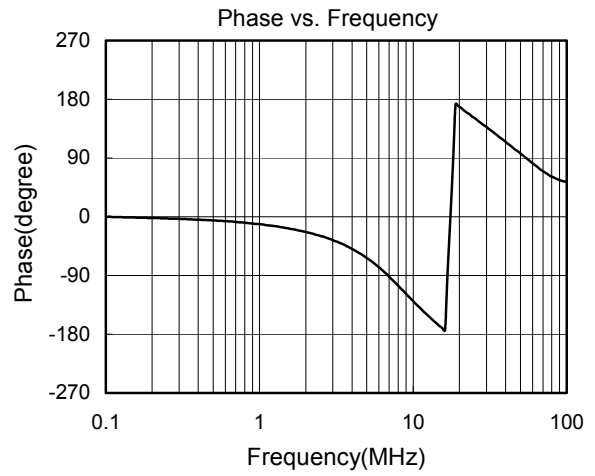
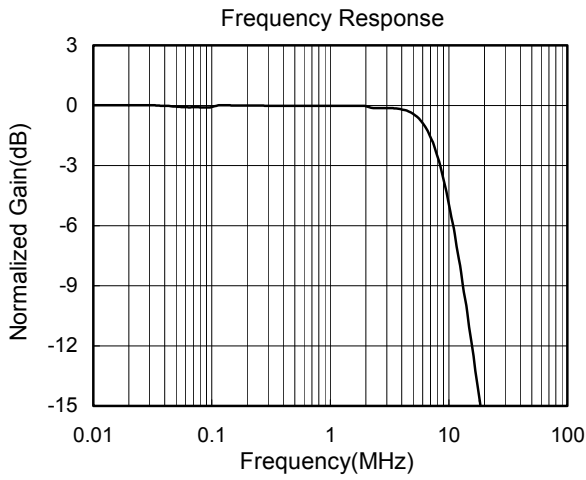
CAUTION

This integrated circuit can be damaged by ESD. Shengbang Micro-electronics 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.

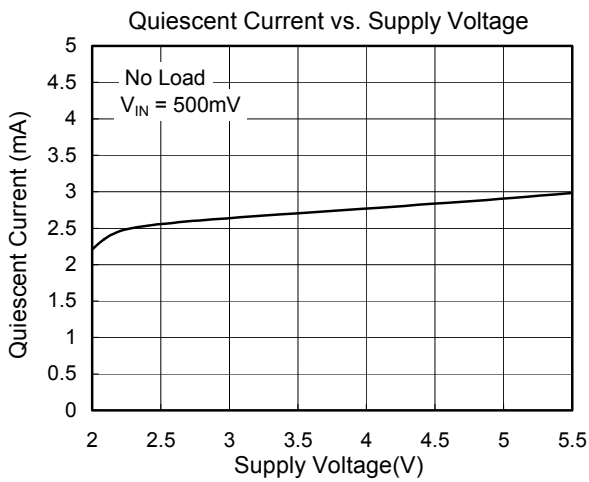
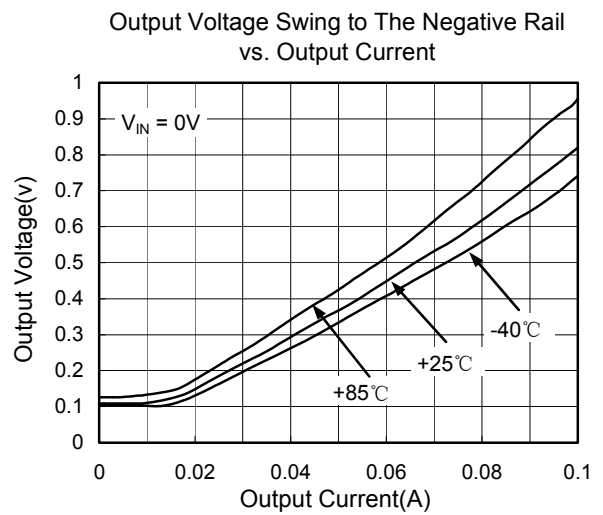
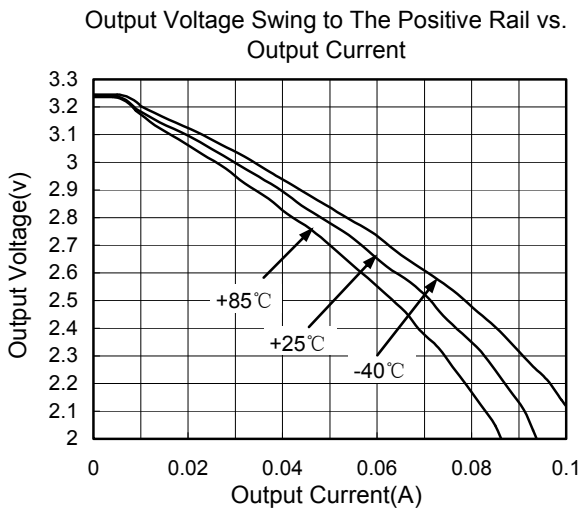
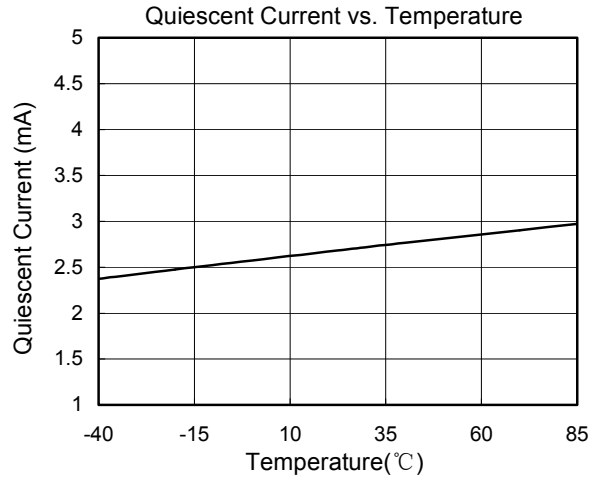
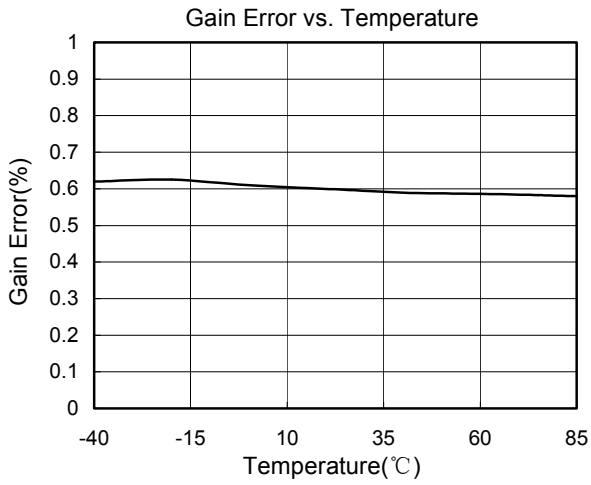
TYPICAL PERFORMANCE CHARACTERISTICS

At $V_S = +3.3V$, $T_A = +25^\circ C$, $R_L = 150\Omega$, $C_L = 5pF$ unless otherwise noted.



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Application Information

The SGM9111 low cost, integrated, 3-pole, video filter is intended to replace passive LC filters and drivers in low voltage portable video applications. The 3-pole filter provides better image quality compared to typical 2-pole solutions.

The SGM9111 input must be AC-coupled because the input capacitor stores the clamp voltage. It needs a typical value of $0.1\mu\text{F}$ for the input clamp to meet the Line Droop specification. The SGM9111 output can drive an AC or DC-coupled doubly terminated coax (150Ω) load (see Figure 1). DC-coupling the output removes the need for an expensive and large output coupling capacitor (see Figure 2).

output stage of the amplifier resulting in a clipped sync tip and degrading the video image. A larger positive reference may offset the input above its positive range.

The SGM9111 features an internal sync clamp and offset function to level shift the entire video signal to the best level before it reaches the input of the amplifier stage. These features are also helpful to avoid saturation of the output stage of the amplifier by setting the signal closer to the best voltage range.

The typical Application diagram of the SGM9111 in Figure 1 is divided into four sections. The first, Section A is the Sync Clamp. The AC coupled video sync signal is pulled negative by a current source at the input of the comparator amplifier. When the sync tip goes below the comparator threshold the output comparator is driven negative, The PMOS device turns on clamping sync tip to near ground level. The network triggers on the sync tip of video signal.

Internal Sync Clamp

The typical embedded video DAC operates from a ground referenced single supply. This becomes an issue because the lower level of the sync pulse output may be at a 0V reference level to some positive level. The problem is presenting a 0V input to most single supply driven amplifiers will saturate the

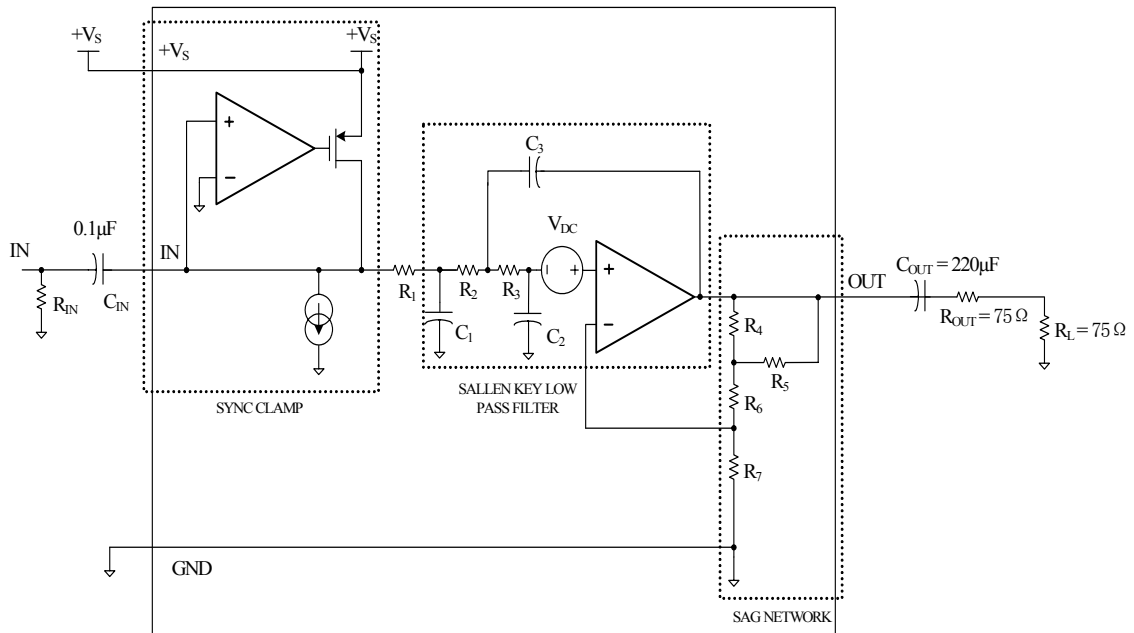


Figure 1. Typical Application Diagram

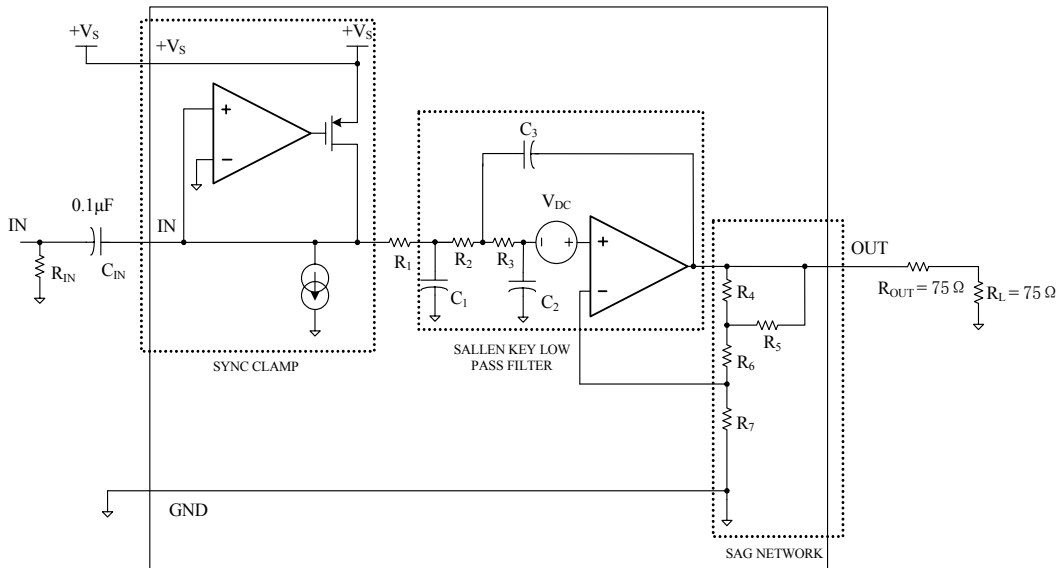


Figure 2. AC-Coupled Input/DC-Coupled Output

The Sallen Key Low Pass Filter

The Sallen Key in a classic low pass configuration illustrated in Figure 1. The filter provides a very stable low pass function, and in the case of the SGM9111, a 3-pole roll-off at around 8MHz. The 3-pole function is accomplished with an RC low pass network placed in series with and before the Sallen Key. One pole provided by the RC network and poles two and three provided by the Sallen Key for a nice 3-pole roll-off at around 8MHz.

Layout and Power-Supply Bypassing

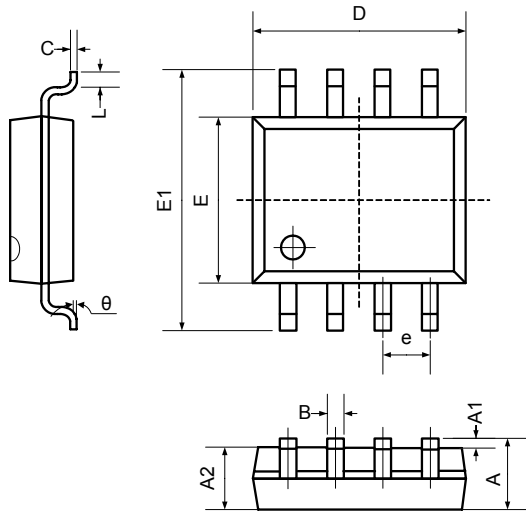
The SGM9111 operates from single 2.5V to 5.5V supply. Bypass the supply with a 0.1μF capacitor as close to the pin as possible. SGMC recommends using microstrip and stripline techniques to obtain full bandwidth. To ensure that the PC board does not degrade the device's performance, design it for

a frequency greater than 1GHz. Pay careful attention to inputs and outputs to avoid large parasitic capacitance. Whether or not you use a constant-impedance board, observe the following design guidelines:

- Do not use IC sockets; they increase parasitic capacitance and inductance.
- Do not use wire-wrap boards; they are too inductive.
- Use surface-mount instead of through-hole components for better, high-frequency performance.
- Use a PC board with at least two layers; it should be as free from voids as possible.
- Keep signal lines as short and as straight as possible. Do not make 90° turns; round all corners.

PACKAGE OUTLINE DIMENSIONS

SO-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	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

REVISION HISTORY

Location	Page
<hr/>	
03/07 – Data Sheet changed from REV. A to REV. B	
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02/08 – Data Sheet changed from REV. B to REV. C	
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Changes to TYPICAL PERFORMANCE CHARACTERISTICS	5

SG Microelectronics Co., Ltd

A2608, NO.72 North Road
Xisanhuan, Haidian District,
Beijing, China 100037
Tel: 86-10-51798160/80
Fax: 86-10-51798180-803
www.sg-micro.com