

SGM9117

Triple, 200MHz 6dB, Video Driver

PRODUCT DESCRIPTION

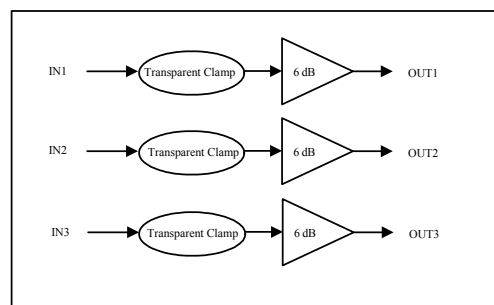
The SGM9117 includes triple high-speed video buffers with $G = +2$ in one package. Every video buffer has -3 dB full signal bandwidth in excess of 200 MHz, along with slew rates in excess of 300 V/ μ s. With -65 dB of crosstalk at 1MHz, the SGM9117 is useful in many high-speed applications. The differential gain and differential phase error are 0.01% and 0.02° . The SGM9117 is ideal for RGB and YPbPr signal buffering or driving. Operating from single supplies ranging from +2.5V to +5.5V and sinking an ultra-low 27.5mA quiescent current, the SGM9117 is also ideally suited for battery powered applications.

The SGM9117 is specified over the extended -40°C to $+125^\circ\text{C}$ temperature range. It has lead (Pb) free SOIC-8 package.

APPLICATIONS

Video amplifier
Cable and Satellite set- top box
Communications device
Video on demand
Portable and handheld product
Personal video recorder
DVD player
HDTV
Projector

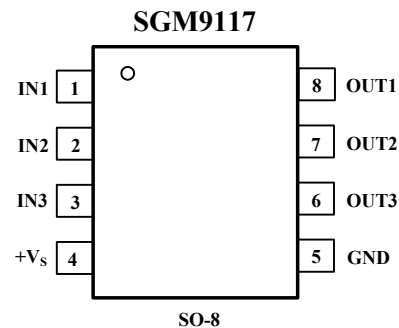
BLOCK DIAGRAM



FEATURES

- Triple 200MHz Video Drivers
- Transparent input clamping
- 6dB output driver Gain and drive dual video load
- Rail-to-Rail Output
- Input Voltage Range Includes Ground
- AC or DC Coupled Inputs
- AC or DC Coupled Outputs
- Operates from 2.5 V to 5.5 V Single power supply
- Low Power (9.2mA/channel)
27.5 mA total Supply Current
- Lead (Pb) Free SOIC-8 package

PIN CONFIGURATIONS (Top View)



ELECTRICAL CHARACTERISTICS: $V_S = +5.0V$

(At $R_L = 150\Omega$ connected to GND, $V_{in} = 100mV_{p-p}$, and $C_{in} = 0.1\mu F$, all outputs AC coupled with $220\mu F$, unless otherwise noted)

| PARAMETER | CONDITION | SGM9117 | | | | | | | |
|---|---|---------|--------------------------|----------------|------------------|-------------------|------------|-------|-------------|
| | | TYP | MIN/MAX OVER TEMPERATURE | | | | | UNITS | MIN/ MAX |
| | | +25°C | +25°C | 0°C to 70°C | -40°C to 85°C | -40°C to 125°C | | | |
| INPUT CHARACTERISTICS | | | | | | | | | |
| Output Level Shift Voltage (V_{OLS}) | $V_{IN} = 0V$, no load | 261 | 348 | 355 | 365 | 395 | mV | MAX | |
| Input Bias Current (I_B) | | | | | | | pA | TYP | |
| Input Voltage Clamp (V_{CLAMP}) | $I_{IN} = -1mA$ | -4.3 | -14 | -16 | -20 | -23 | mV | MIN | |
| Clamp Charge Current | $V_{IN} = V_{CLAMP} - 100mV$ | -5.3 | -6.2 | -6.3 | -6.9 | -7.5 | mA | MIN | |
| Input Resistance (R_{IN}) | $0.5V < V_{IN} < 1.0V$ | | | | | | MΩ | MIN | |
| Voltage Gain (A_V) | $R_L = 150\Omega$ | 1.97 | 1.90 | 1.88 | 1.85 | 1.80 | V/V | MIN | |
| | | | 2.04 | 2.06 | 2.08 | 2.1 | V/V | MAX | |
| OUTPUT CHARACTERISTICS | | | | | | | | | |
| Output Voltage High Swing | $V_{IN} = 3V$, $R_L = 150\Omega$ to GND | 4.5 | 4.3 | 4.28 | 4.25 | 4.2 | V | MIN | |
| Output Short-Circuit Current (I_{SC}) | $V_{IN} = 3V$, to GND through 10Ω | -105 | -102 | | | | mA | MAX | |
| | $V_{IN} = 100mV$, out short to V_{DD} through 10Ω | 115 | 103 | | | | mA | MIN | |
| POWER SUPPLY | | | | | | | | | |
| Operating Voltage Range | | | 2.5 | 2.7 | 2.7 | 2.7 | V | MIN | |
| | | | 5.5 | 5.5 | 5.5 | 5.5 | V | MAX | |
| Power Supply Rejection Ratio (PSRR) | $V_S = +2.7V$ to $+5.5V$ | 62 | 60 | 59 | 56 | 55 | dB | MIN | |
| Quiescent Current (I_Q) | $V_{IN} = 500mV$ | 27.5 | 31.5 | 32 | 33 | 34 | mA | MAX | |
| DYNAMIC PERFORMANCE | | | | | | | | | |
| $\pm 0.1dB$ Bandwidth | $R_L = 150\Omega$ | 92 | | | | | MHz | TYP | |
| -3dB Bandwidth | $R_L = 150\Omega$ | 200 | | | | | MHz | TYP | |
| Slew Rate | 20% to 80%, $V_{IN} = 1V$ Step, | 300 | | | | | V/ μs | TYP | |
| Differential Gain (DG) | NTSC & PAL DC coupled | 0.01 | | | | | % | TYP | |
| | NTSC & PAL AC coupled | 0.46 | | | | | % | TYP | |
| Differential Phase (DP) | NTSC & PAL DC coupled | 0.02 | | | | | ° | TYP | |
| | NTSC & PAL AC coupled | 0.8 | | | | | ° | TYP | |
| Group Delay Variation (D/DT) | $f = 400KHz, 26.5MHz$ | 3.0 | | | | | ns | TYP | |
| Crosstalk (channel - to - channel) | at 1MHz | -65 | | | | | dB | TYP | |
| Fall Time | $2.0V_{STEP}$, 80% to 20% | 5.0 | | | | | ns | TYP | |
| Rise Time | $2.0V_{STEP}$, 80% to 20% | 5.1 | | | | | ns | TYP | |

Specifications subject to change without notice.

PACKAGE/ORDERING INFORMATION

| ORDER NUMBER | PACKAGE DESCRIPTION | TEMPERATURE RANGE | PACKAGE OPTION | MARKING INFORMATION |
|--------------|---------------------|-------------------|---------------------|---------------------|
| SGM9117ZS/TR | SO-8 | 0°C to +70°C | Tape and Reel, 2500 | SGM9117ZS |
| SGM9117XS/TR | SO-8 | -40°C to +125°C | Tape and Reel, 2500 | SGM9117XS |

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 –40°C to +125°C
 Power Dissipation, P_D @ T_A = 25°C
 SO-8 0.8W
 Package Thermal Resistance
 SO-8, θ_{JA} 128°C/W
 Lead Temperature Range (Soldering 10 sec)
 260°C

ESD Susceptibility
 HBM 4000V
 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.

PIN DESCRIPTION

| PIN | NAME | FUNCTION |
|-----|------|----------------------------|
| 1 | IN1 | Video input, channel 1 |
| 2 | IN2 | Video input, channel 2 |
| 3 | IN3 | Video input, channel 3 |
| 4 | +Vs | Power supply |
| 5 | GND | Ground |
| 6 | OUT3 | Filtered output, channel 3 |
| 7 | OUT2 | Filtered output, channel 2 |
| 8 | OUT1 | Filtered output, channel 1 |

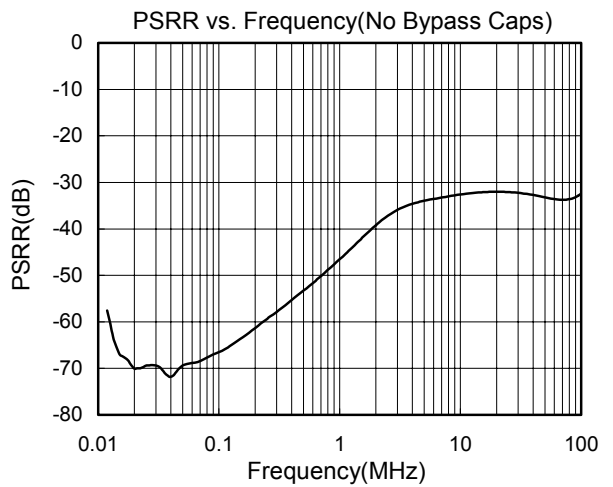
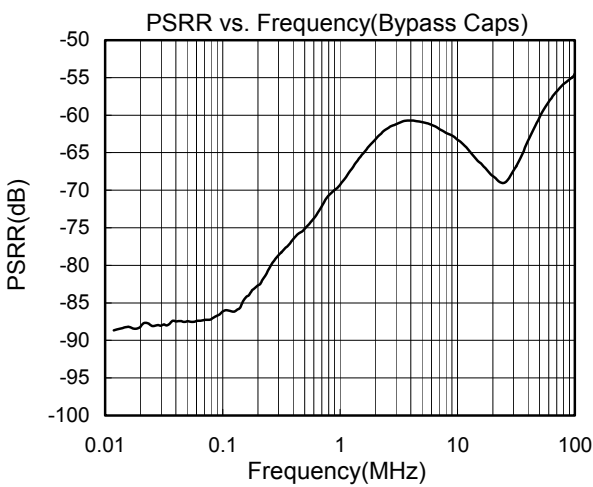
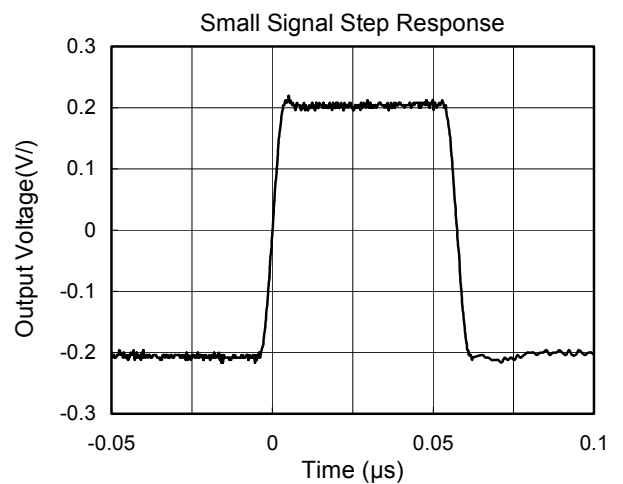
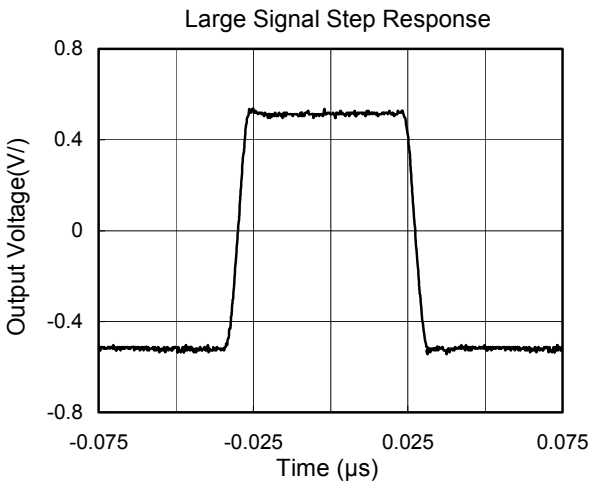
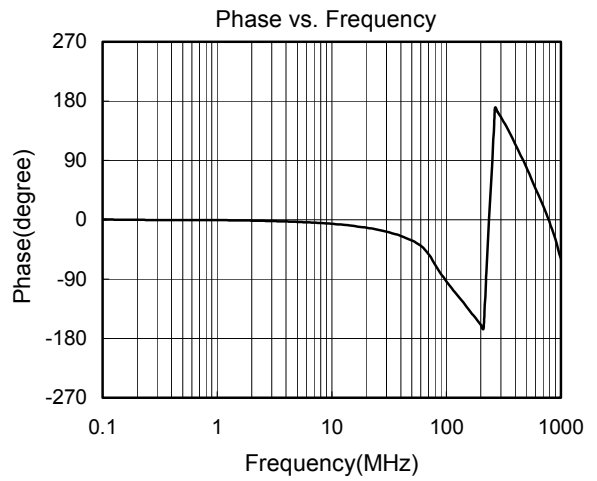
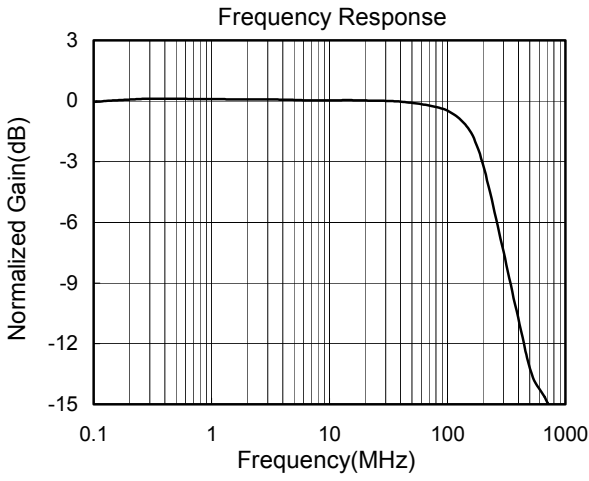
CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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.

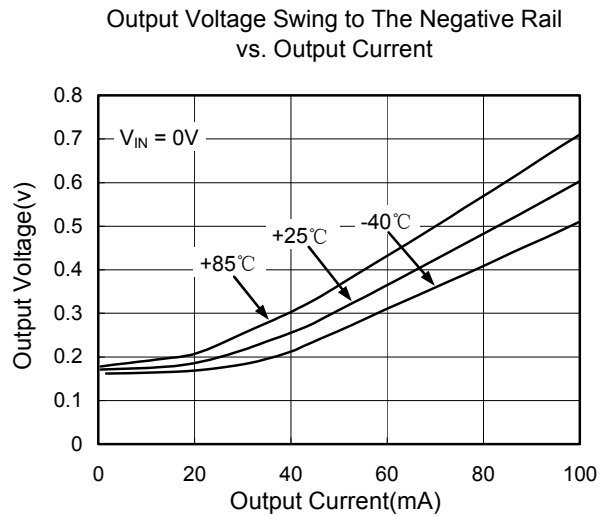
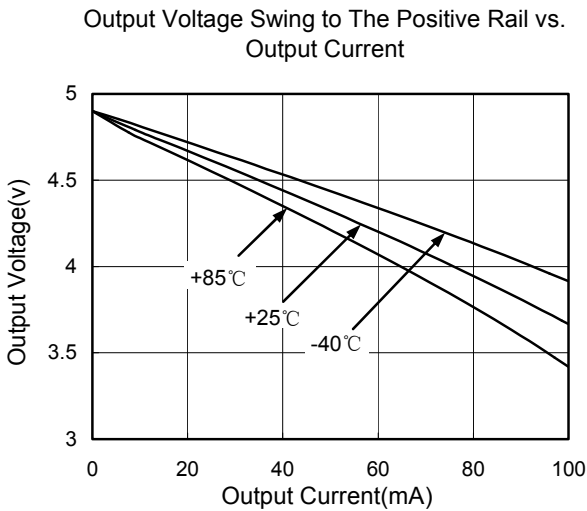
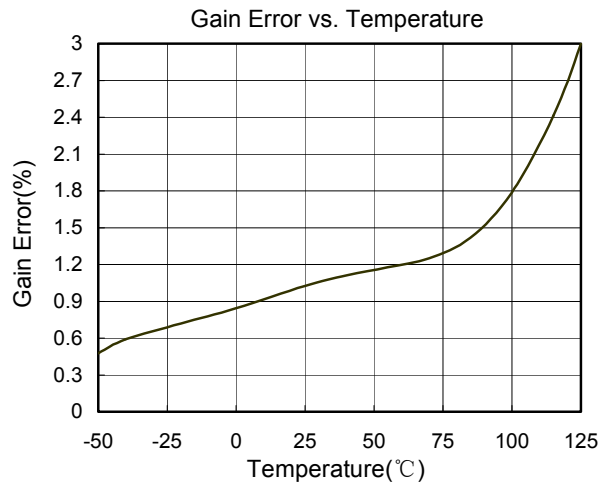
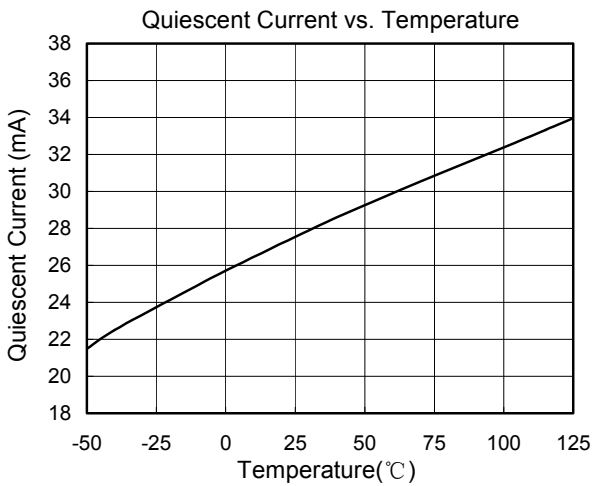
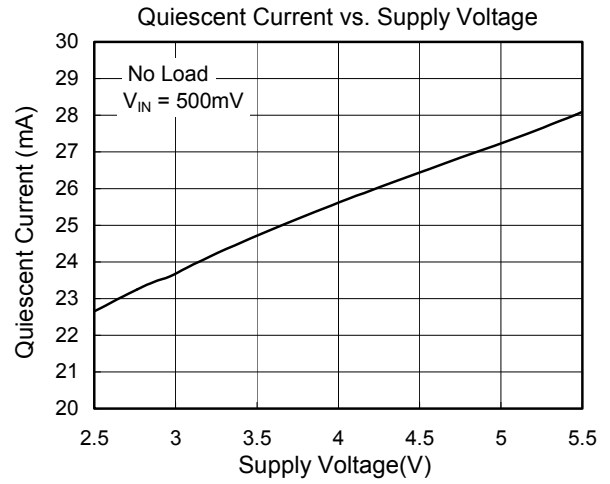
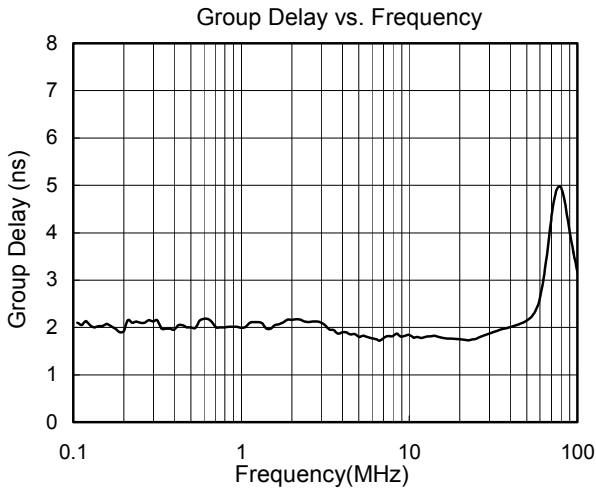
TYPICAL PERFORMANCE CHARACTERISTICS

At $V_S = +5.0V$, $T_A = +25^\circ C$, $R_L = 150\Omega$, all outputs AC coupled with $220\mu F$, unless otherwise noted.



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Applications Information

Functional Description

SGM9117 operates from a single +2.5V to +5V supply. In application, SGM9117 is a fully integrated solution for buffering RGB or HDTV component signals in front of video decoder or behind video encoder. For example, SGM9117 can replace three amplifier drivers at R\G\B and Y\Pb\Pr output side in set-top box, Monitor and LCD TV, this solution can help you save PCB size and production cost, it also improves video signal performance comparing with traditional design using discrete components. SGM9117 features a DC-coupled input buffer, 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 SGM9117 also can be DC-coupled or AC-coupled.

Input Considerations

Besides AC coupling, the SGM9117 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, then SGM9117 can be directly connected to the output of a single-supply, current-output DAC without any external bias network. Some time, if DAC's output level exceeds the range of 0V to 1.4V, or SGM9117 is driven by an unknown external source or a SCART switch which has its own clamping circuit, AC coupling is needed in such application.

Output Considerations

The SGM9117 outputs can be DC-coupled or AC-coupled. While input is 0V, the SGM9117 output voltage is 260mV typically. In DC coupling design, one 75Ω resistor is used to Connect SGM9117's output pin with external load directly, this serial back-termination resistor is used to match the impedance of the transmission line between SGM9117 and external load to cancel the signal reflection. The SGM9117 outputs can sink and source current allowing the device to be AC-coupled with external load, in AC coupling, 220μF at least capacitor will be used in order to cancel 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 SGM9117, please place these two capacitors as close to the SGM9117 output 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 pin of SGM9117 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 cable connecting external load. In design, please keep the board trace at the inputs and outputs of the SGM9117 as short as possible to minimize the parasitic stray capacitance and noise pickup, designer needs to cavern out the ground layer under input and output trace in order to reduce stray capacitance and avoid signal peaking.

Typical Application Diagram

The circuit in Figure 3 is normally used for AC coupled output and DC-coupled input with DAC which has an output voltage range of 0V to 1.4V. AC coupled output offers slightly lower power dissipation and high ESD protection ability. The schematics in Figure 1 and Figure 2 are also popular in design.

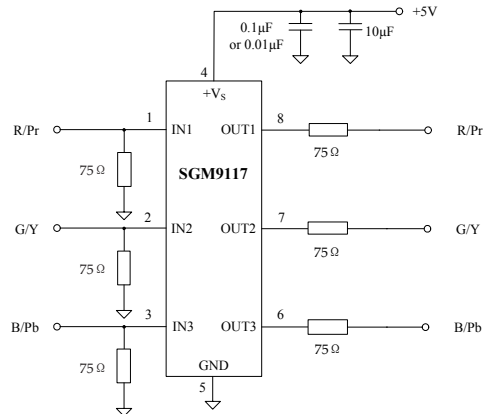


Figure 1. DC Coupling circuit

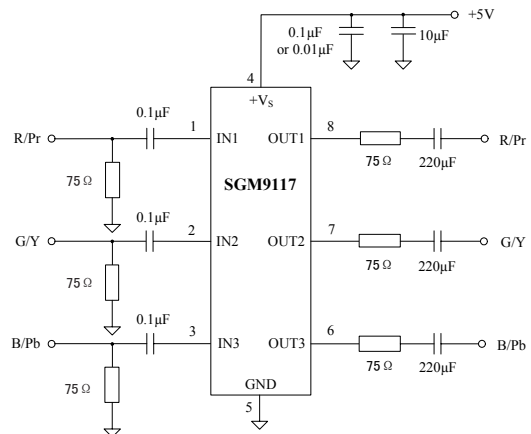


Figure 2. AC Coupling Application Schematic

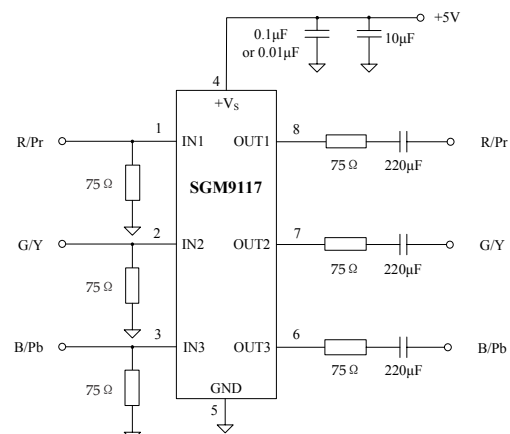
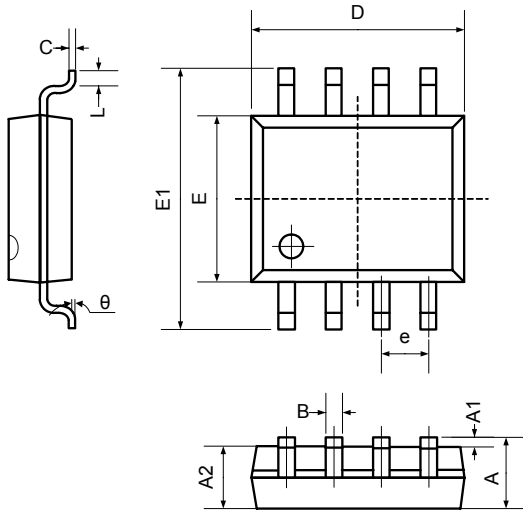


Figure 3. Input DC and output AC Coupling circuit

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° |