Three-Channel, 6th-Order, Standard-Definition Video Filter Driver

PRODUCT DESCRIPTION

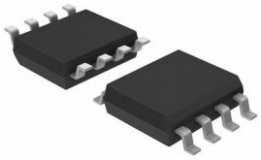
The MS6364 is a three-channel video buffer, which integrates 6dB gain rail-to-rail output driver and 6th-order output reconstruction filter. -3dB bandwidth is 10MHz and slew rate is 46V/μs. The MS6364 can provide better image quality compared with the solutions of passive LC filter and external driver. The single power supply ranges from +2.5V to +5.5V and the MS6364 has ultra-low 43.5mA operating current. It is ideally suited for battery-powered application.

The input signal of the MS6364 is DAC output. It can be DC-coupled or AC-coupled. Internal diode clamps and bias circuit can be used as AC-coupled input. The MS6364 also integrates an internal level shift circuit to avoid sync-pulse being clipped and allow DC-coupled output. The output of the MS6364 can drive DC or AC-coupled single (150Ω) or dual (75Ω) loads.

The MS6364 is available in SOP8 package and ESD(HBM) can reach 8kV.

FEATURES

- Three-Channel, 10MHz, 6th-Order Filter
- Transparent Input Clamp
- 6dB Gain Output Driver and Drive Dual Video Load
- Rail-to-Rail Output
- Input Voltage Range Includes Ground
- AC or DC-Coupled Input
- AC or DC-Coupled Output
- Single Power Supply: 2.5V to 5.5V
- Low Power Dissipation, Total Operating Current 43.5mA, Single-Channel 12.2mA
- SOP8 Package



SOP8

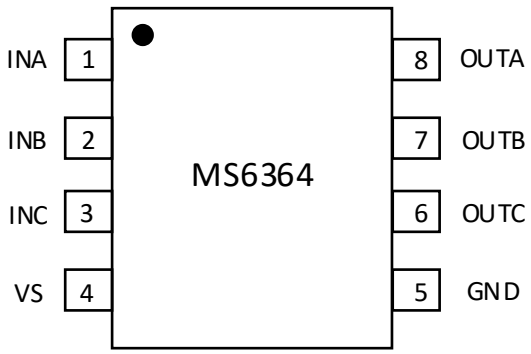
APPLICATIONS

- Video Amplifier
- Cable and Satellite Set-top Box
- Communication Device
- Consumer Video
- Portable and Handheld Products
- Personal Video Recorder
- DVD Player
- SDTV
- Projector

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS6364	SOP8	MS6364

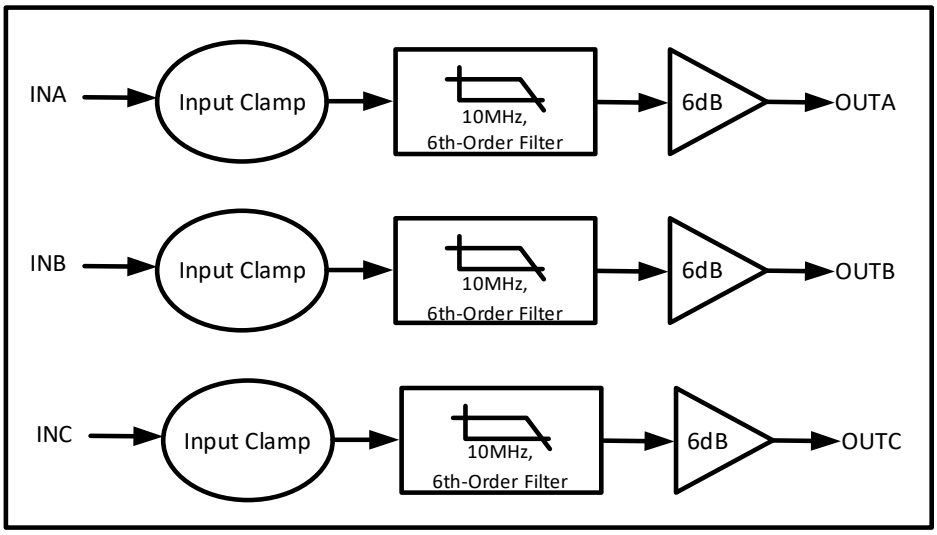
PIN CONFIGURATION



PIN DESCRIPTION

Pin	Name	Type	Description
1	INA	I	Channel A Input
2	INB	I	Channel B Input
3	INC	I	Channel C Input
4	VS	-	Power Supply
5	GND	-	Ground
6	OUTC	O	Channel C Output
7	OUTB	O	Channel B Output
8	OUTA	O	Channel A Output

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions.

Parameter	Symbol	Ratings	Unit
Power Supply	Vs	7.5	V
Input Voltage	Vin	GND-0.3V ~ (+VS)+0.3V	V
Storage Temperature	T_{stg}	-65 ~ +150	°C
Junction Temperature	T_j	160	°C
Operating Temperature	T_A	-40 ~ +125	°C
Power Dissipation@ T_A= 25°C	PD	0.8W	W
Package Thermal Resistance		128	°C/W
Lead Temperature (Soldering 10s)		260	°C
ESD(HBM)		8000	V

ELECTRICAL CHARACTERISTICS

Unless otherwise noted, RL=150Ω connected to ground, Vin=1Vpp, Cin=0.1μF,
all outputs AC-coupled with 220μF.

Parameter	Condition	Typ	Min/Max Over Temperature					
		+25°C	+25°C	0°C~ 70°C	-40°C ~85°C	-40°C ~ 125°C	Unit	Max/ Min
Input Characteristics								
Output Level Shift Voltage	Vin=0V, no load	235	327	330	340	370	mv	Max
Input Clamp Voltage(Vclp)	Iin= -1mA	-4.5	-15	-16	-19	-22	mV	Min
Clamp Charge Current	Vin=Vclp-100mV	-5	-6.0	-6.1	-6.6	-7.2	mA	Min
Voltage Gain (Av)	RL=150	2	1.92	1.90	1.88	1.85	V/V	Min
			2.04	2.06	2.08	2.1	V/V	Max
Output Characteristics								
Output Voltage Swing	Vin=3V, RL=150Ω	4.5	4.3	4.28	4.25	4.2	V	Min
Output Short-circuit Current	Vin=3V connected to GND with 10Ω	-105	-102				mA	Max
	Vin=0.1V, output connected to power with 10Ω	115	103				mA	Min
Power Supply								
Power Supply			2.5	2.7	2.7	2.7	V	Min
			5.5	5.5	5.5	5.5	V	Max
Power Supply Rejection Ratio	Vs=+2.7V to +5.5V	60	58	58	57	56	dB	Min
Operating Current	Vin=500mV	43.5	42.5	43	44	45	mA	Max
Quiescent Current	No input, no load	15					mA	Max
Dynamic Characteristics								
±0.1dB Bandwidth	RL=150Ω	5.4					MHz	Typ
-3dB Bandwidth	RL=150Ω	10					MHz	Typ
Slew Rate	Vin=1V step, 20%to 80%	46					V/μs	Typ
Differential Gain (DG)	NTSC & PAL DC	0.02					%	Typ
	NTSC & PAL AC	0.3					%	Typ
Differential Phase (DP)	NTSC & PAL DC	0.02						Typ
	NTSC & PAL AC	0.36						Typ
Group Delay Variation	f = 400kHz, 26.5MHz	1.2					ns	Typ

Parameter	Condition	Typ	Min/Max Over Temperature					
		+25°C	+25°C	0°C~ 70°C	-40°C ~85°C	-40°C ~ 125°C	Unit	Max/ Min
Crosstalk (Channel-to-Channel)	at 1MHz	-64					dB	Typ
Rise Time	2V step, 80%-20%	28					ns	Typ
Fall Time	2V step, 80%-20%	27					ns	Typ

TYPICAL CHARACTERISTICS CURVE

VS=+5.0V, T_A=+25°C, RL=150Ω, all outputs AC-coupled with 220μF, unless otherwise noted.

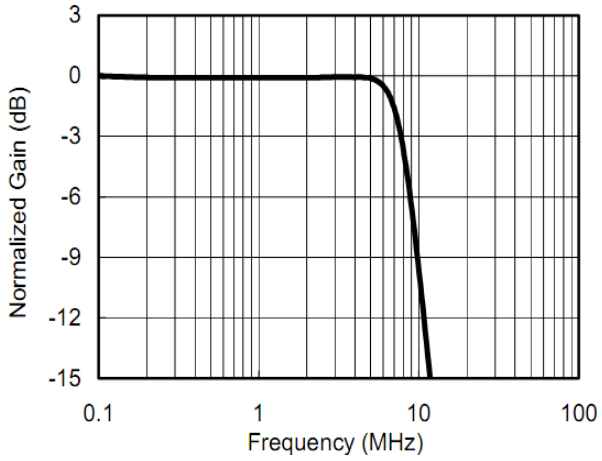


Figure 1. Frequency Response

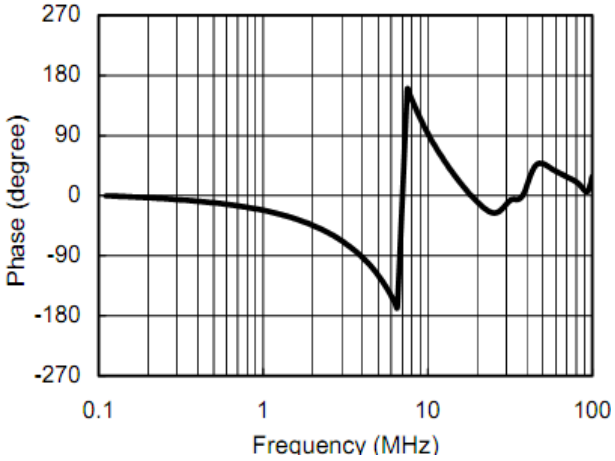


Figure 2. Phase VS. Frequency

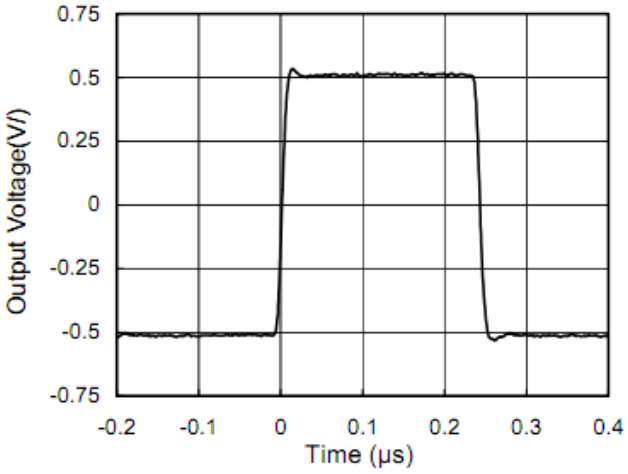


Figure 3. Large-signal Step Response

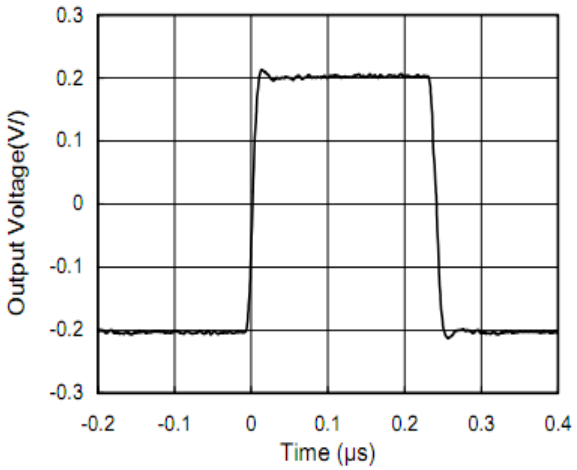


Figure 4. Small-signal Step Response

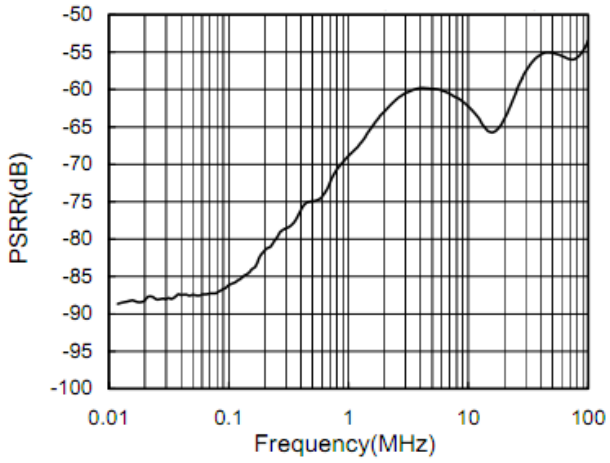


Figure 5. PSRR VS. Frequency (with Bypass Capacitor)

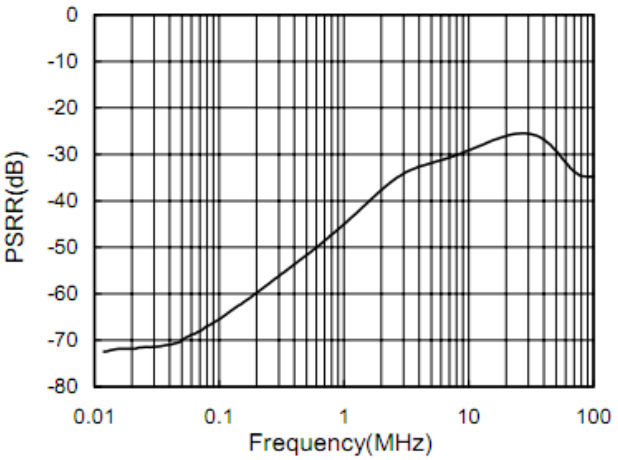


Figure 6. PSRR VS. Frequency (without Bypass Capacitor)

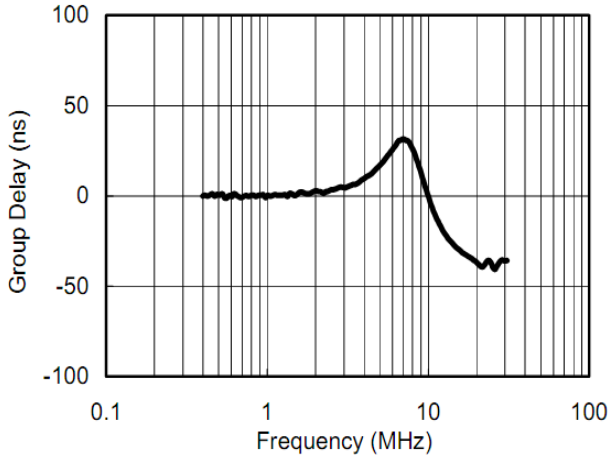


Figure 7. Group Delay VS. Frequency

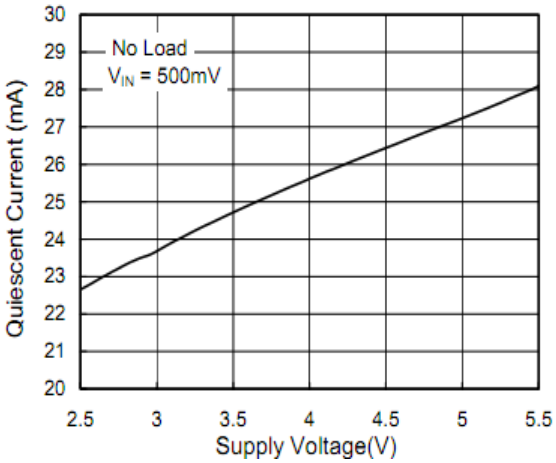


Figure 8. Quiescent Current VS. Supply Voltage

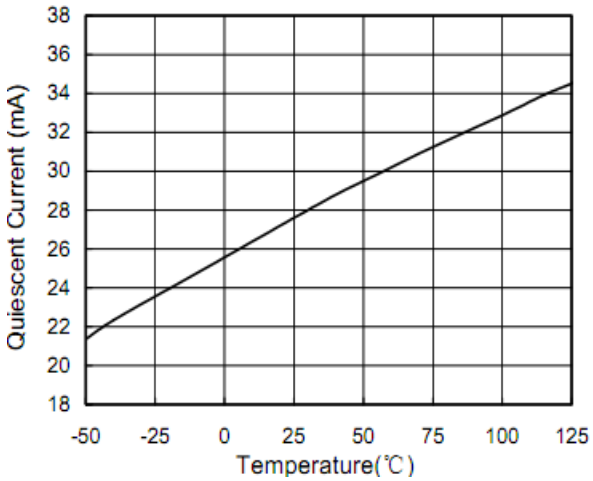


Figure 9. Quiescent Current VS. Temperature

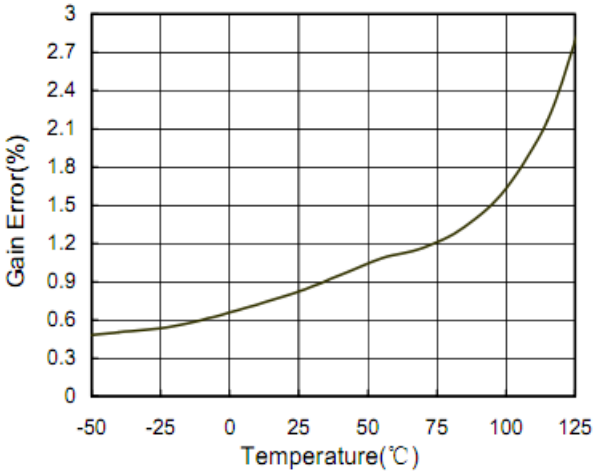


Figure 10. Gain Error VS. Temperature

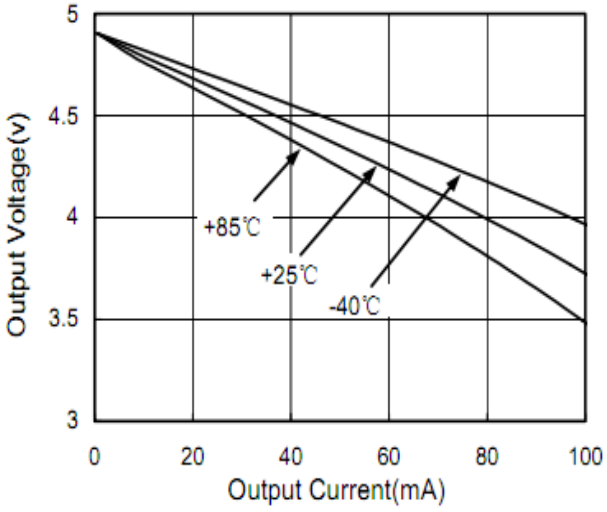


Figure 11. Output Voltage Swing to Positive Rail VS. Output Current

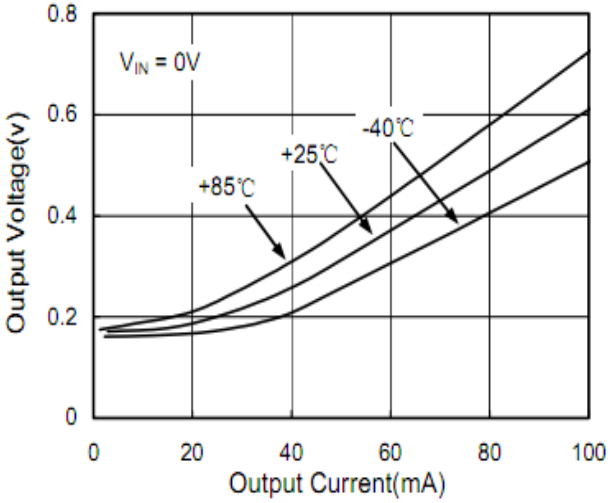


Figure 12. Output Voltage Swing to Negative Rail VS. Output Current

APPLICATION INFORMATION

Function Description

The MS6364 operates from a single +2.5V to +5.5V power supply. In application, the MS6364 is a fully integrated solution for filtering and buffering SD video signals by decoding and encoding. For example, the MS6364 can replace three passive LC filters and three amplifier drivers on the R\G\B and Y\Pb\Pr outputs in set-top box and DVD player. The solution of the MS6364 can save PCB size and cost, and it can also improve video signal performance compared with traditional design using discrete components.

The MS6364 integrates a DC-coupled input buffer, a video encoder to eliminate out-of-band noise, a gain of +6dB OPA driver to drive 75Ω load. AC or DC-coupled input buffer can eliminate sync crush, droop and field tilt. The output of the MS6364 can also be DC-coupled or AC-coupled.

Input Compensation

The MS6364 input can be DC-coupled and AC-coupled. In DC-coupled application, input couple capacitor is needed. Because input video signal comes from DAC and it includes ground and extends up to 1.4V. The MS6364 can be directly connected to the output of a single power supply DAC without any external bias. In the following applications, AC-coupled input should be used. For example, DAC output exceeds the range of 0V to 1.4V, the MS6364 is driven by an unknown external source and the MS6364 is driven by a SCART switch with own clamp circuit.

Output Compensation

The MS6364 output can be DC-coupled or AC-coupled. When input is 0V, the output voltage of the MS6364 is 260mV typically. In DC-coupled design, 75Ω resistor is used to connect the output pin of the MS6364 with external load. This back-termination resistor is used to match the impedance of the transmission line between MS6364 and external load in order to eliminate the signal reflection. The MS6364 can be directly AC-coupled with external load. And 220μF capacitor is used to eliminate field tilt.

Power Supply Bypass and Layout

Appropriate power supply bypassing is very important for optimizing video performance in design. Both a 0.1μF and a 10μF capacitors are always used to bypass power supply pin. These two capacitors should be placed as close to the output pin of the MS6364 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 the MS6364 as possible in order to avoid performance degradation.

The PCB traces on the output terminal has 75Ω resistance in order to match 75Ω characteristic impedance cable. In design, please keep the board traces at the input and output of the MS6364 as short as possible to minimize the parasitic stray capacitance and noise.

Typical Application Diagram

In Figure 14, the circuit is always used for AC-coupled output and DC-coupled input of DAC whose output voltage range is from 0V to 1.4V. AC -coupled output can provide lower power dissipation and high ESD protection capacity. The schematic diagram in Figure 13 is are also popular in design. Figure 15 is a special application in set-top box. During the process of using the optical transceiver and other solutions, all input and output terminals all need to add TVS tube.

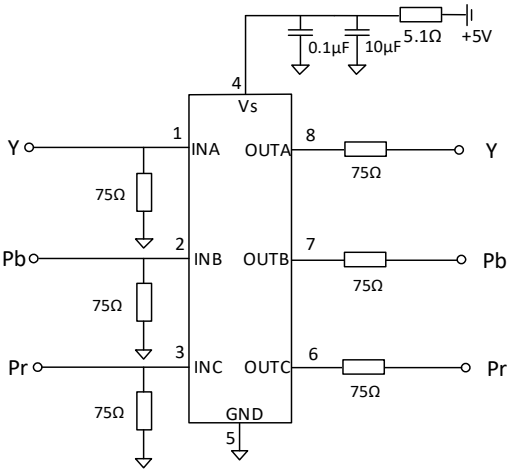


Figure 13. DC-coupled Application Schematic Diagram

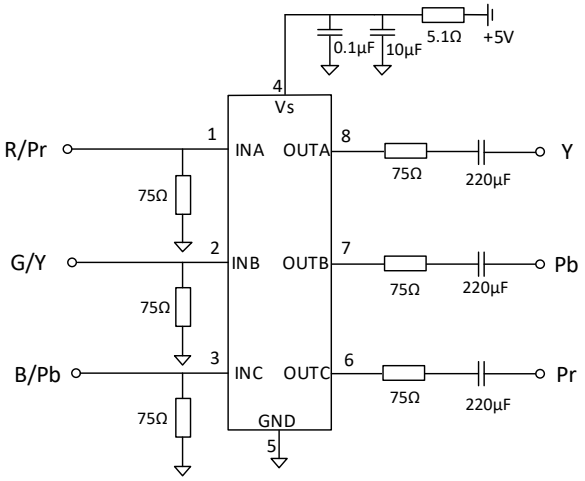


Figure 14. DC-coupled Input and AC-coupled Output Application Schematic Diagram

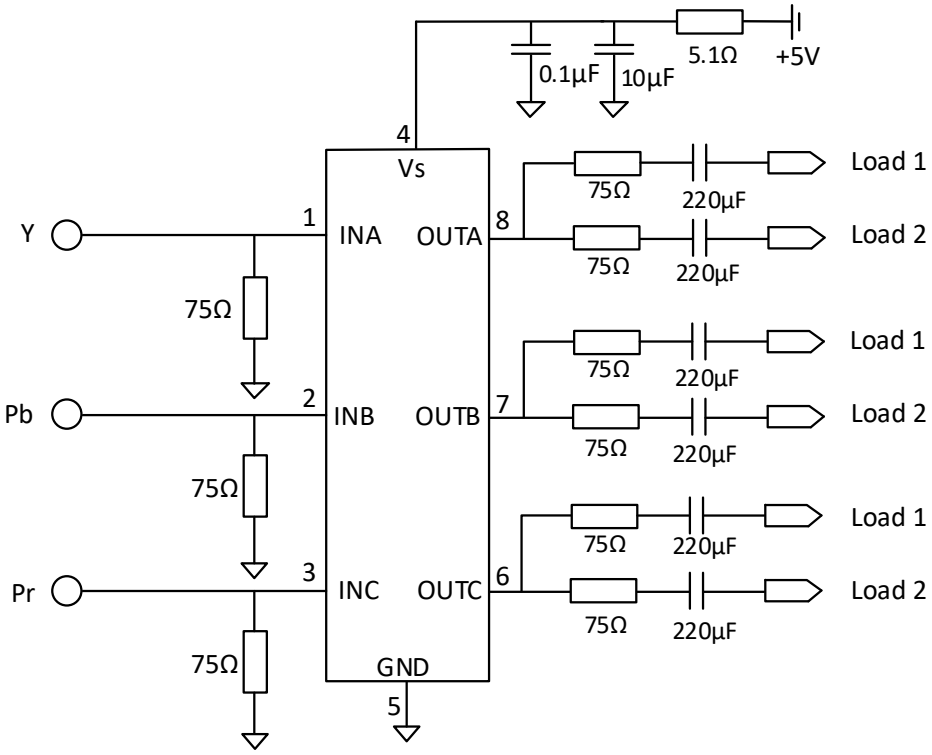
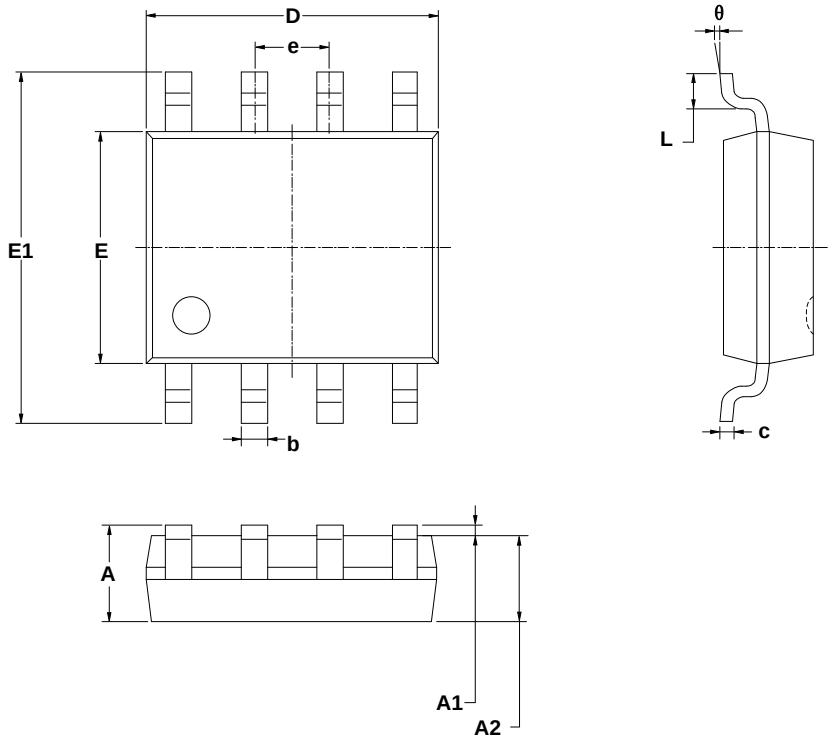


Figure 15. DC-coupled Circuit Schematic Diagram in STB

PACKAGE OUTLINE DIMENSIONS

SOP8



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	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

MARKING and PACKAGING SPECIFICATION

1. Marking Drawing Description

Product Name : MS6364

Product Code: XXXXXX

2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

3. Packaging Specification

Device	Package	Piece/Reel	Reel/Box	Piece/Box	Box/Carton	Piece/Carton
MS6364	SOP8	2500	1	2500	8	20000

STATEMENT

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- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

MOS CIRCUIT OPERATION PRECAUTIONS

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.

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