

三通道HDTV滤波器

概述

MAX9500/MAX9501为HDTV信号滤波、缓冲提供完全集成的解决方案。MAX9500采用+5V单电源供电，而MAX9501采用 $\pm 5V$ 双电源供电。MAX9500/MAX9501三通道视频重建滤波器具有一致的增益和延时，可理想用于机顶盒、DVD播放器和其它产生模拟HDTV输出的设备。

MAX9500/MAX9501用于ATSC、MPEG解码器的电流输出数/模转换器(DAC)与电视、机顶盒或DVD播放器外部接口之间的连接。

MAX9500/MAX9501的直流耦合输入具有非常低的输入电容和较高的输入阻抗。具有高选择性的低通滤波器消除了DAC输出的频谱重叠。输出放大器具有+6dB增益，能够以单位增益驱动75 Ω 背向端接负载。直流耦合输入避免了同步失真、信号损耗和场倾斜等问题。根据实际应用，输出负载可以采用直流或交流耦合。

MAX9500/MAX9501的3个通道保持相同的频率响应特性和完全一致的群延时与增益。MAX9500/MAX9501滤波器响应符合EIA-770.3/SMPTE 274M滤波模板的要求，在44.25MHz频点提供40dB以上的衰减。MAX9500/MAX9501还可以用作HDTV复合视频输入的抗混叠滤波器。

MAX9500/MAX9501提供紧凑的16引脚QSOP封装，工作在-40°C至+85°C扩展级温度范围。

应用

电缆和卫星机顶盒接收机
A/V接收机
家庭影院系统
HDTV
DVD播放器
投影仪
数字显示器

引脚配置在数据资料的最后给出。

特性

- ◆ 30MHz带宽， $\pm 1.5\text{dB}$ 通带平坦度
- ◆ 陡峭的滚降沿，低通滤波器在44.25MHz频点具有-50dB衰减
- ◆ 直流耦合输入；交流或直流耦合输出
- ◆ $\pm 5V$ 双电源供电(MAX9501)
- ◆ 5V单电源供电(MAX9500)
- ◆ 完全一致的群延时和增益
- ◆ 驱动单/双背向端接负载(150 Ω /75 Ω)
- ◆ 可吸收、源出电流
- ◆ 利用高阻输入与低输出电流DAC连接
- ◆ 16引脚QSOP封装

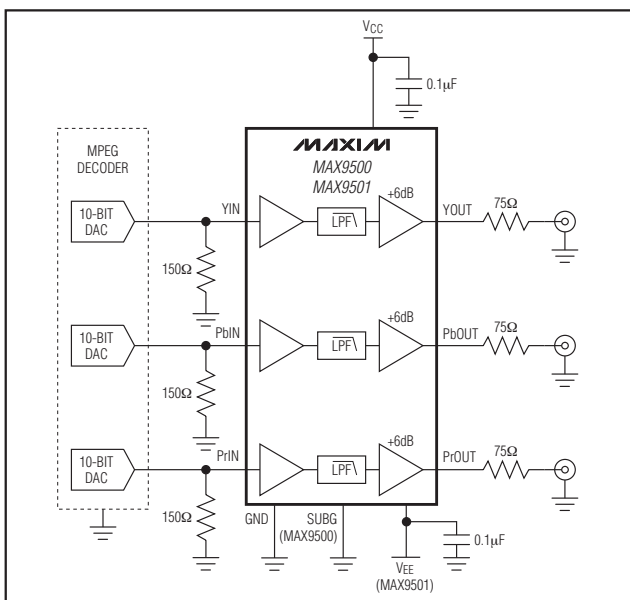
订购信息

PART	PIN-PACKAGE	SUPPLY VOLTAGE (V)	PKG CODE
MAX9500EEE+	16 QSOP	+5	E16-8F
MAX9501EEE+	16 QSOP	± 5	E16-8F

+表示无铅封装。

注：所有器件规定工作在-40°C至+85°C温度范围。

典型应用电路



三通道HDTV滤波器

ABSOLUTE MAXIMUM RATINGS

Positive Supply Voltage (V_{CC} to GND)-0.3V to +6V
 Negative Supply Voltage (MAX9501)
 (V_{EE} to GND)+0.3V to -6V
 All Input Pins.....-0.3V to (V_{CC} + 0.3V)
 All Output Pins (MAX9500).....-0.3V to (V_{CC} + 0.3V)
 All Output Pins (MAX9501)(V_{EE} - 0.3V) to +3V
 Output Short-Circuit Duration
 (OUT to V_{CC} or GND) (MAX9500) 10s
 Output Short-Circuit Duration
 (OUT to GND or V_{EE}) (MAX9501) 10s

Continuous Input Current (I_{IN} , P_{bIN} , P_{rIN})±20mA
 Continuous Power Dissipation (T_A = +70°C)
 16-Pin QSOP (derate 12.8mW/°C above +70°C).....1025mW
 Operating Temperature Range-40°C to +85°C
 Junction Temperature+150°C
 Storage Temperature Range.....-65°C to +150°C
 Lead Temperature (soldering, 10s)+300°C

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.

ELECTRICAL CHARACTERISTICS—MAX9500 (Single Supply)

(V_{CC} = 5V, R_L = ∞ , T_A = T_{MIN} to T_{MAX} , unless otherwise noted. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
DC CHARACTERISTICS							
Supply Voltage Range	V _{CC}	Guaranteed by PSRR		4.5	5.0	5.5	V
Quiescent Supply Current (Per Channel)	I _{CC}				34	46	mA
Input Voltage Range	V _{IN}	Guaranteed by voltage gain		0		1.4	V
Voltage Gain	A _V	V _{IN} = 0 to 1.4V	R _L = 150Ω to GND	+5.5	+6	+6.4	dB
			R _L = 150Ω to 2V	+5.5	+6	+6.4	
			R _L = 75Ω to GND	+5.5	+6	+6.4	
			R _L = 75Ω to 2V	+5.5	+6	+6.4	
Gain Matching	ΔA _V	Any two channels		-0.5	0	+0.5	dB
Input Bias Current	I _B	V _{IN} = 0V			4	10	μA
Input Resistance	R _{IN}	V _{IN} = 0 to 1.4V		250	800		kΩ
Output Offset Voltage	V _{OS}	V _{IN} = 0V		0.55	0.8	1.15	V
Power-Supply Rejection Ratio	PSRR	V _{CC} = 4.5V to 5.5V, V _{IN} = 1.4V		30	60		dB
AC CHARACTERISTICS (R _L = 150Ω to GND, unless otherwise noted)							
Passband Flatness	A _{PB}	f = 0.1MHz to 30MHz, V _{IN} = 1V _{P-P} , T _A = +25°C		±3.0	±1.5		dB
Attenuation	A _{SB}	f = 44.25MHz, V _{IN} = 1V _{P-P} , T _A = +25°C		40	51		dB
		f = 74.25MHz, V _{IN} = 1V _{P-P}			38		dB
Settling Time	t _S	V _{IN} = 1V _{P-P} , V _{OUT} < 1%			150		ns
Slew Rate	SR	V _{IN} = 1V _{P-P}			100		V/μs
Bar Response	BR	Bar time is one-half the active line of a 1080i format signal; the beginning 2.5% and the ending 2.5% of the bar time is ignored			0.4		K%

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MAX9500/MAX9501

ELECTRICAL CHARACTERISTICS—MAX9500 (Single Supply) (continued)

($V_{CC} = 5V$, $R_L = \infty$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^{\circ}C$.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Nonlinearity	NL	5-step staircase		0.4		%
Channel Delay	t_D	Difference in time between the 50% point of the output signals, Y to Pb and Y to Pr		< 1		ns
Group Delay	GD	$100kHz \leq f \leq 20MHz$, $V_{YOUT} = V_{PbOUT} = V_{PrOUT} = 2V_{P-P}$		26		ns
Group-Delay Variation	ΔGD	$100kHz \leq f \leq 20MHz$, $V_{YOUT} = V_{PbOUT} = V_{PrOUT} = 2V_{P-P}$		< 10		ns
Channel-to-Channel Group-Delay Matching	ΔGD_{CH-CH}	$V_{YOUT} = V_{PbOUT} = V_{PrOUT} = 2V_{P-P}$, Y to Pb and Y to Pr, $1MHz \leq f \leq 20MHz$		0.2		ns
Peak Signal-to-RMS Noise	SNR	$100kHz \leq f \leq 20MHz$, $V_{IN} = 1V_{P-P}$		60		dB
Power-Supply Rejection Ratio	PSRR _{AC}	$f = 100kHz$, $V_{RIPPLE} = 200mV_{P-P}$		60		dB
Output Impedance	Z_O	$f = 30MHz$		8		Ω
Input Capacitance	C_{IN}			1		pF
Capacitive-Load Drive	C_L	No sustained oscillations		25		pF

ELECTRICAL CHARACTERISTICS—MAX9501 (Dual Supply)

($V_{CC} = 5V$, $V_{EE} = -5V$, $R_L = \infty$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^{\circ}C$.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC CHARACTERISTICS						
Positive Supply Voltage Range	V_{CC}	Guaranteed by PSRR	4.5	5.0	5.5	V
Negative Supply Voltage Range	V_{EE}	Guaranteed by PSRR	-5.5	-5.0	-4.5	V
V_{CC} Quiescent Supply Current (Per Channel)	I_{CC}			35	48	mA
V_{EE} Supply Current (Per Channel)	I_{EE}			6	9	mA
Input Voltage Range	V_{IN}	Guaranteed by voltage gain	0		1.4	V
Voltage Gain	A_V	$V_{IN} = 0$ to 1.4V				dB
		$R_L = 150\Omega$ to GND	+5.5	+6	+6.4	
		$R_L = 75\Omega$ to GND	+5.5	+6	+6.4	
Gain Matching	ΔA_V	Any two channels	-0.5	0	+0.5	dB
Input Bias Current	I_B	$V_{IN} = 0V$		4	10	μA
Input Resistance	R_{IN}	$V_{IN} = 0$ to 1.4V	250	800		k Ω
Output Offset Voltage	V_{OS}	$V_{IN} = 0V$	-0.3	0	+0.35	V
Power-Supply Rejection Ratio	PSRR	$V_{CC} = 4.5V$ to 5.5V, $V_{IN} = 1.4V$, $V_{EE} = -4.5V$ to -5.5V	40	60		dB

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ELECTRICAL CHARACTERISTICS—MAX9501 (Dual Supply) (continued)

($V_{CC} = 5V$, $V_{EE} = -5V$, $R_L = \infty$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^\circ C$.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
AC CHARACTERISTICS ($R_L = 150\Omega$ to GND, unless otherwise noted)						
Passband Flatness	A_{PB}	$f = 0.1MHz$ to $30MHz$, $V_{IN} = 1V_{P-P}$, $T_A = +25^\circ C$	± 4.0	± 1.5		dB
Attenuation	A_{SB}	$f = 44.25MHz$, $V_{IN} = 1V_{P-P}$, $T_A = +25^\circ C$	38	45		dB
		$f = 74.25MHz$, $V_{IN} = 1V_{P-P}$		38		dB
Settling Time	t_S	$V_{IN} = 1V_{P-P}$, $V_{OUT} < 1\%$		150		ns
Slew Rate	SR	$V_{IN} = 1V_{P-P}$		100		V/ μs
Bar Response	BR	Bar time is one-half the active line of a 1080i format signal; the beginning 2.5% and the ending 2.5% of the bar time is ignored		0.4		K%
Nonlinearity	NL	5-step staircase		0.4		%
Channel Delay	t_D	Difference in time between the 50% point of the output signals, Y to Pb and Y to Pr		< 1		ns
Group Delay	GD	$100kHz \leq f \leq 20MHz$, $V_{YOUT} = V_{PbOUT} = V_{PrOUT} = 2V_{P-P}$		25		ns
Group-Delay Variation	ΔGD	$100kHz \leq f \leq 20MHz$, $V_{YOUT} = V_{PbOUT} = V_{PrOUT} = 2V_{P-P}$		< 10		ns
Channel-to-Channel Group-Delay Matching	ΔGD_{CH-CH}	$V_{YOUT} = V_{PbOUT} = V_{PrOUT} = 2V_{P-P}$, Y to Pb and Y to Pr, $1MHz \leq f \leq 20MHz$		0.6		ns
Peak Signal-to-RMS Noise	SNR	$100kHz \leq f \leq 20MHz$, $V_{IN} = 1V_{P-P}$		60		dB
Power-Supply Rejection Ratio	PSRR _{AC}	$f = 100kHz$, $V_{RIPPLE} = 200mV_{P-P}$		60		dB
Output Impedance	Z_O	$f = 30MHz$		8		Ω
Input Capacitance	C_{IN}			1		pF
Capacitive-Load Drive	C_L	No sustained oscillations		25		pF

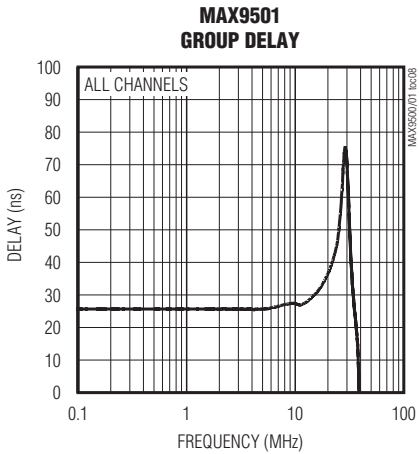
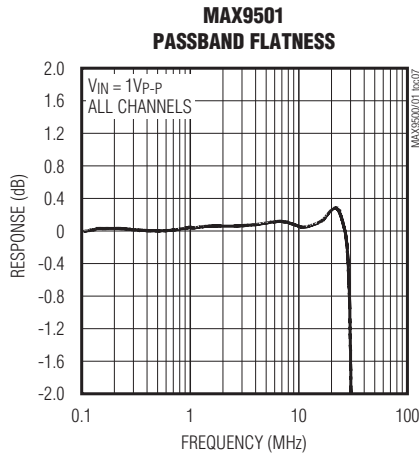
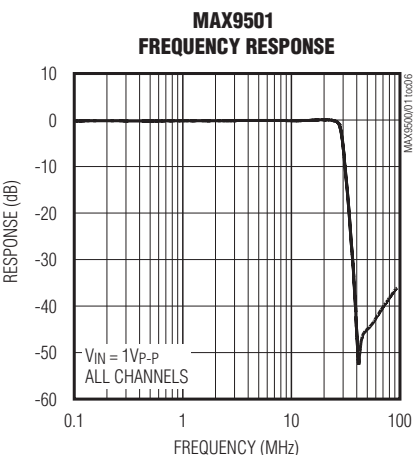
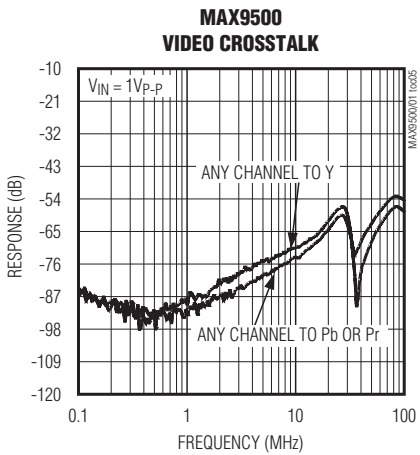
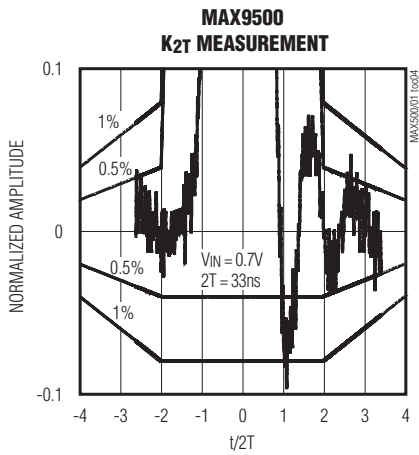
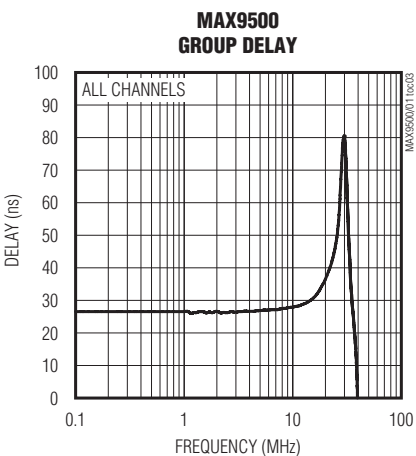
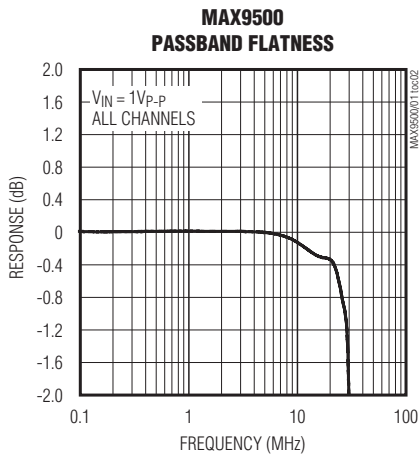
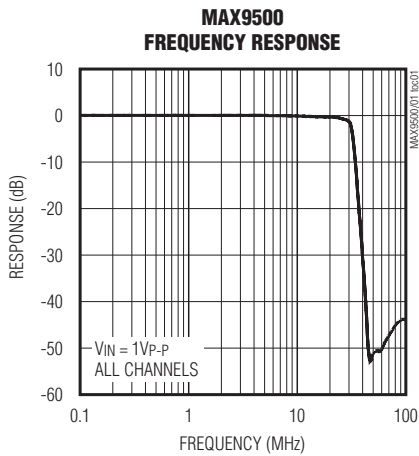
Note 1: All specifications are 100% tested at $T_A = +25^\circ C$; temperature limits are guaranteed by design.

三通道HDTV滤波器

典型工作特性

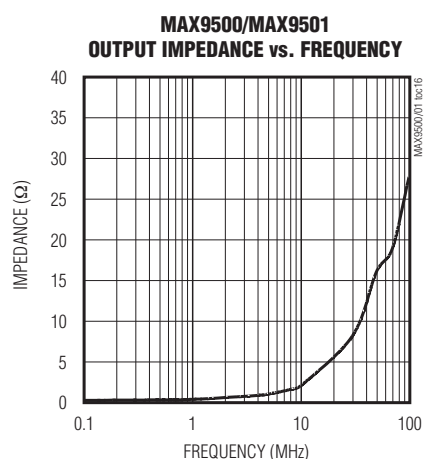
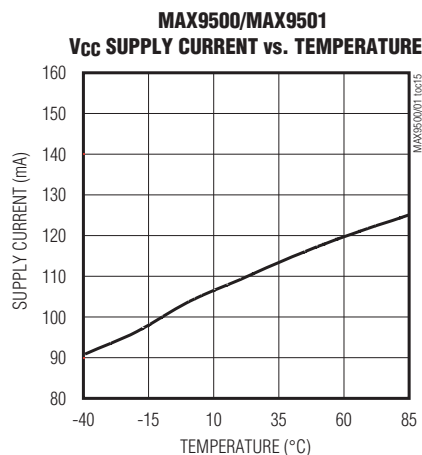
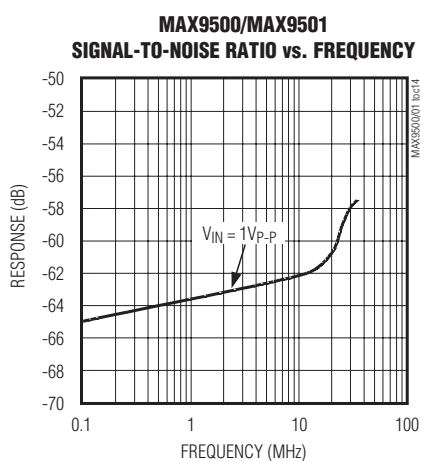
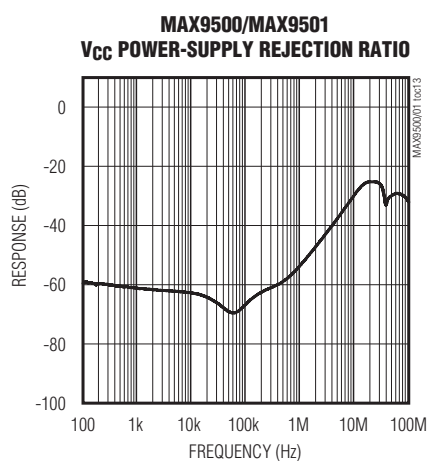
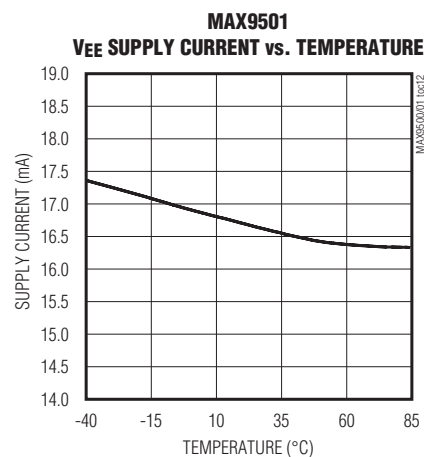
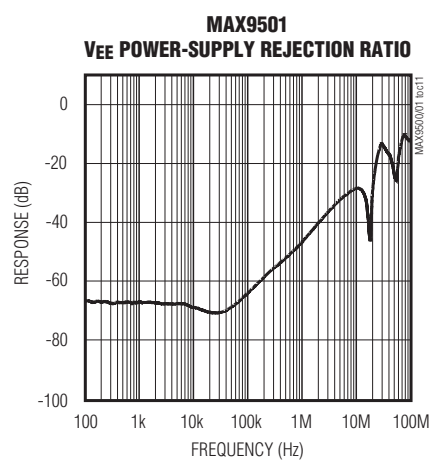
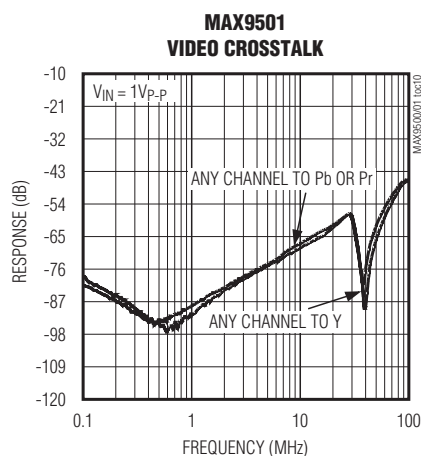
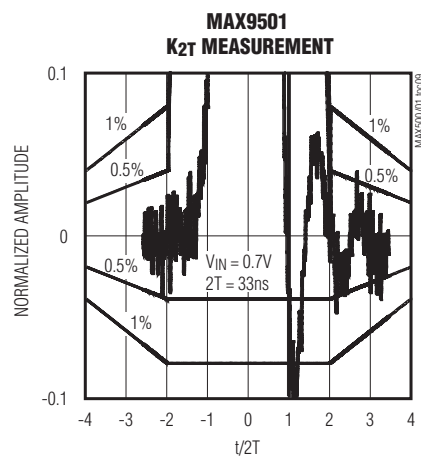
($V_{CC} = 5V$, $R_L = 150\Omega$ to GND, $T_A = +25^\circ C$, unless otherwise noted.)

MAX9500/MAX9501



三通道HDTV滤波器

典型工作特性(续)

(V_{CC} = 5V, R_L = 150Ω to GND, T_A = +25°C, unless otherwise noted.)

三通道HDTV滤波器

引脚说明

引脚		名称	功能
MAX9500	MAX9501		
1, 7, 8, 9, 16	—	SUBG	衬底地, 接地。
2	2	YIN	Y通道输入。
3, 5	3, 5	GND	地。
4	4	PbIN	Pb通道输入。
6	6	PrIN	Pr通道输入。
10	10	PrOUT	Pr通道输出。
11, 13, 15	11, 13, 15	VCC	正电源。
12	12	PbOUT	Pb通道输出。
14	14	YOUT	Y通道输出。
—	1, 7, 8, 9, 16	VEE	负电源。

详细说明

MAX9500/MAX9501是完全集成的HDTV信号滤波、缓冲方案, MAX9500采用+5V单电源供电; MAX9501采用 $\pm 5V$ 双电源供电。MAX9500/MAX9501用于连接ATSC、MPEG解码器的DAC输出和电视、机顶盒或DVD播放器的外部接口。MAX9500/MAX9501提供直流耦合输入缓冲器, 具有非常低的输入电容, 高选择性低通滤波器可消除带外噪声, 增益为+6dB的输出放大器能够以单位增益驱动75 Ω 背向端接负载, 直流耦合输入避免了同步失真、信号损耗和场倾斜等问题。根据实际应用, 输出负载可以采用直流或交流耦合。

滤波器

MAX9500/MAX9501重建滤波器提供6阶椭圆滤波器频响特性, 在30MHz频带内具有1.5dB的通带平坦度。滤波器满足EIA-770.3/SMPTE 274M滤波模板的要求, 在44.25MHz频点提供40dB以上的衰减。MAX9500/MAX9501还可用于HDTV复合视频输入的抗混叠滤波。

输出缓冲器

MAX9500/MAX9501输出缓冲器提供+6dB的增益, 能够为单个或两个背向端接负载(分别为150 Ω 或75 Ω)提供2V_{P-P}驱动。输出可以采用交流耦合或直流耦合。

应用信息

输入考虑

MAX9500/MAX9501通常采用直流耦合输入。因为MAX9500/MAX9501的输入范围为地电位至1.4V, 可直接与单电源供电、电流输出DAC的输出端连接, 不需要外部偏置电路, 省去了交流耦合电容。

MAX9500/MAX9501输入也可采用交流耦合, 利用固定偏置或视频钳位建立直流偏置, 确保视频信号的负峰尽可能接近0V。最好采用视频钳位, 因为它可以限制信号摆幅, 保持固定的消隐电平。

输出考虑

MAX9500/MAX9501输出通常采用直流耦合, 不需要交流耦合电容。对于0V输入, MAX9500的输出电压为0.8V, MAX9501的输出电压为0V。MAX9500/MAX9501直接与具有75 Ω 串联背向端接电阻(匹配电缆阻抗)的视频电缆连接。电缆另一端采用75 Ω 电阻进行适当匹配。MAX9500/MAX9501可以吸收、源出电流, 允许器件交流耦合。但交流耦合会降低视频质量。

电源旁路与布线

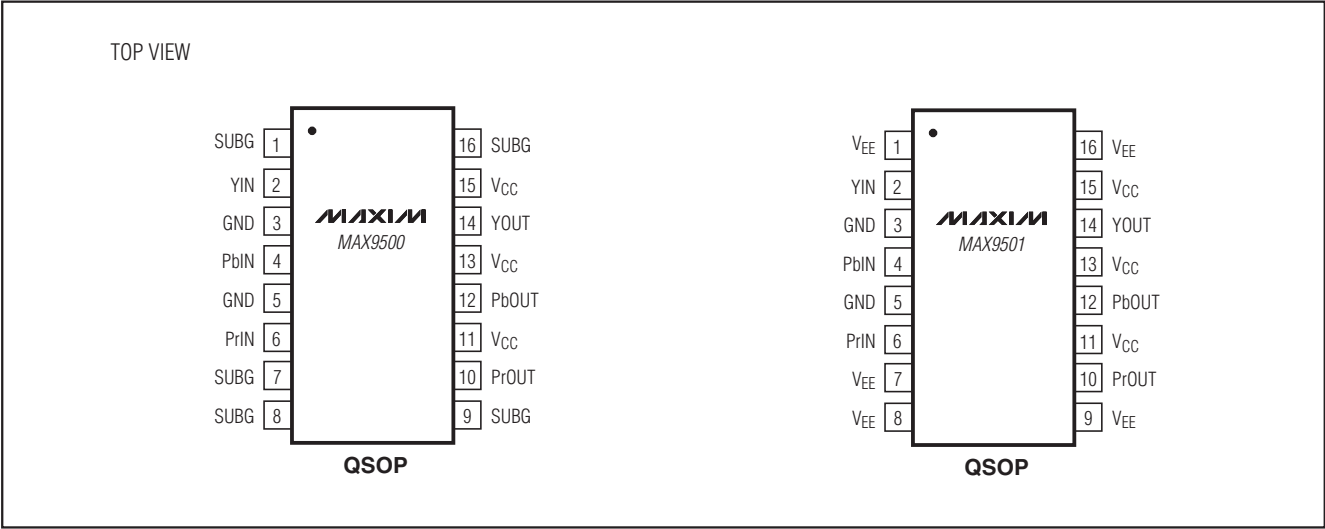
MAX9500采用+5V单电源供电, MAX9501采用 $\pm 5V$ 双电源供电。利用0.1 μF 电容将V_{CC}和V_{EE} (MAX9501)旁路至地, 电容须尽可能靠近芯片安装。存在明显的低频失真时, 可以靠近MAX9500/MAX9501并联一个0.1 μF 的电容。使用大面积的地层有助于改善性能。

输入、输出端接电阻应该尽可能靠近器件安装, 以避免劣化频响特性。

需要匹配75 Ω 电缆时, 输出端的PCB引线应具有75 Ω 特征阻抗。MAX9500/MAX9501输入、输出端的电路板引线应尽可能短, 以减小寄生电容和拾取噪声。

三通道HDTV滤波器

引脚配置



芯片信息

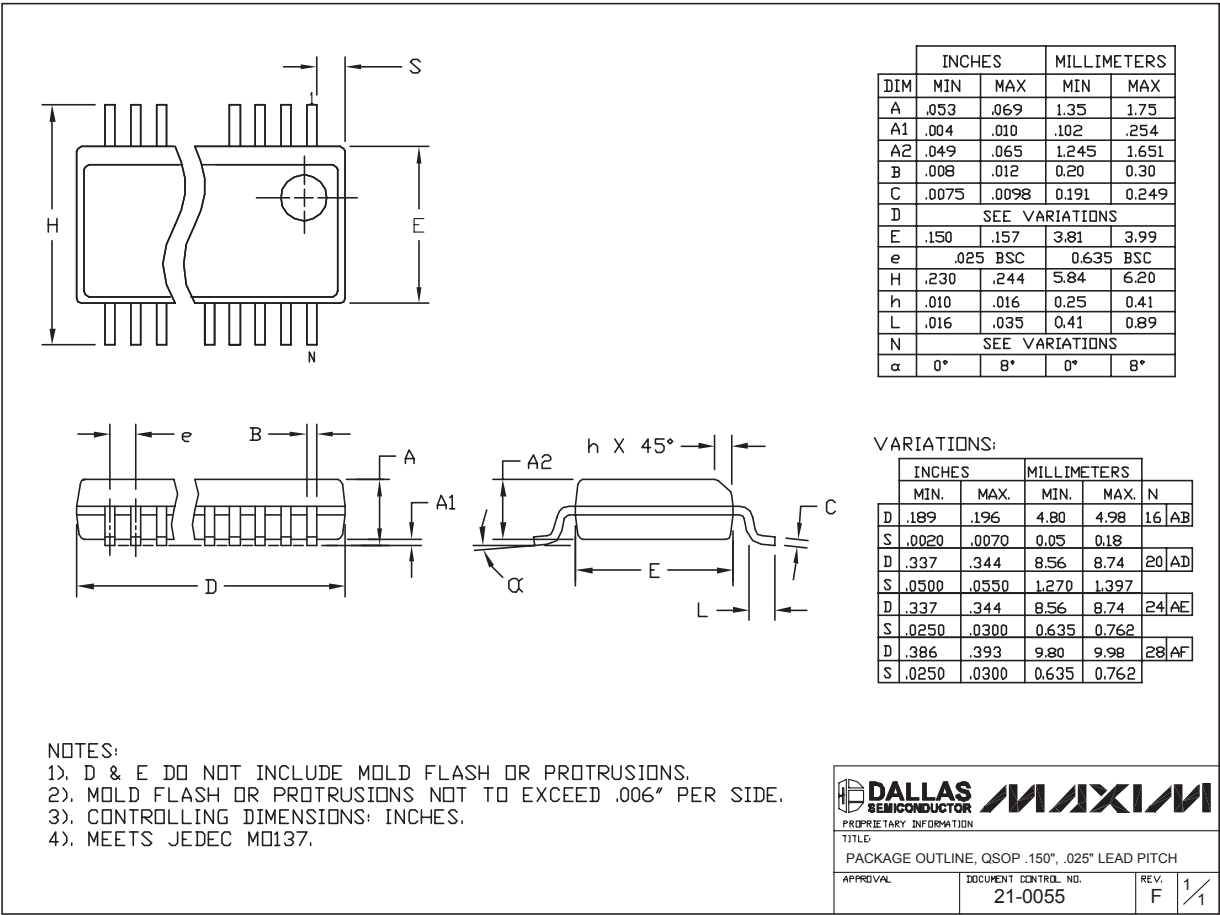
PROCESS: Bipolar

三通道HDTV滤波器

封装信息

(本数据资料提供的封装图可能不是最近的规格，如需最近的封装外形信息，请查询 www.maxim-ic.com.cn/packages.)

MAX9500/MAX9501



修订历史

Rev 4中的修改页：1、2、3、9。

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