19-3674; Rev 1; 6/06

可提供评估板

MAXIM

带有重建滤波器的2.5V视频放大器

MAX9502

概述

MAX9502小尺寸、低功耗视频放大器，内置重建滤波器，可工作在低至2.5V的电源电压。较小的尺寸和较低的电源电压使MAX9502非常适合便携产品或小尺寸、低功耗应用。

MAX9502的输入和输出采用直流耦合，支持超小尺寸的解决方案。MAX9502输入可直接连接到视频数/模转换器(DAC)的输出。重建滤波器可提供4阶切比雪夫滤波特性，最小通带为5.5MHz，8MHz频点衰减为3dB，27MHz频点衰减为55dB。

输出放大器提供+6dB (MAX9502G)或+12dB (MAX9502M)闭环增益，并能以2V_{P-P}视频信号驱动150Ω对地负载。可对输出信号进行电平偏移，使同步头高出地电位110mV(典型值)。

MAX9502采用2.5V至3.6V单电源供电，静态电源电流仅为5.3mA。低电平有效关断模式可将电源电流降至0.01µA。

MAX9502采用微型6引脚µDFN (1mm x 1.5mm x 0.8mm)封装和5引脚SC70封装。工作在-40°C至+85°C扩展级温度范围和-40°C至+125°C汽车级温度范围。

应用

移动电话

数码相机

便携式视频产品

汽车

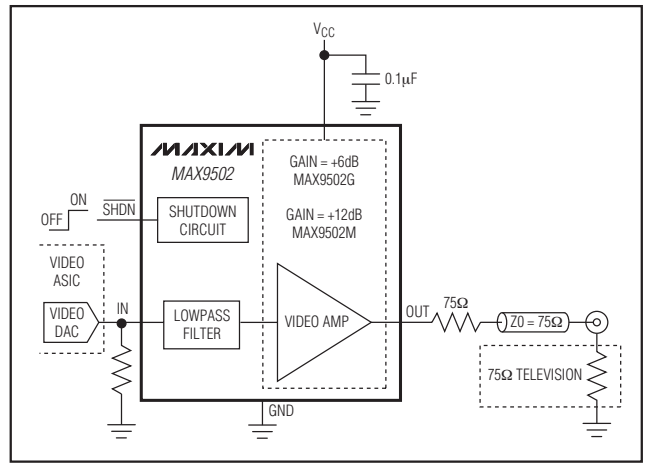
安全/CCTV

引脚配置在数据资料的最后给出。

特性

- 微型6引脚µDFN (1mm x 1.5mm x 0.8mm)封装和5引脚SC70封装
- 直流耦合输入和输出，节省电路板面积
- 4阶切比雪夫滤波器
- 通带为5.5MHz
- 在27MHz频点衰减55dB
- 0.01µA低电流关断模式
- 2.5V至3.6V单电源供电
- +6dB (MAX9502G)或+12dB (MAX9502M)固定增益视频放大器

典型工作电路



其它便携产品视频放大器

PRODUCT	FEATURES
MAX9503	DirectDrive™, LPF, TQFN
MAX9505	DirectDrive, LPF, analog switch, TQFN
MAX4090	Input clamp, µDFN, SOT23, SC70
MAX9504	Optional DC offset bias, µDFN, SOT23

定购信息

PART	PIN-PACKAGE	TEMP RANGE	GAIN	TOP MARK	PKG CODE
MAX9502GAALT+T	6 µDFN-6	-40°C to +125°C	+6	LI	L611-1
MAX9502GAAXK+T	5 SC70-5	-40°C to +125°C	+6	ASO	X5-1
MAX9502GELT+T	6 µDFN-6	-40°C to +85°C	+6	AU	L611-1
MAX9502GEXK+T	5 SC70-5	-40°C to +85°C	+6	ARV	X5-1

定购信息(续)在数据资料的最后给出。

+表示无铅封装。

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND .....-0.3V to +4V
$\overline{SHDN}$, IN, OUT to GND.....-0.3V to (V_{CC} + 0.3V)
OUT Short-Circuit Duration to V_{CC}, GND…….....Continuous
Continuous Power Dissipation (T_A = +70°C)
5-Pin SC70 (derate 3.1mW/°C above +70°C)……..247mW
6-Pin µDFN (derate 2.1mW/°C above +70°C)……168mW

Operating Temperature Ranges:
MAX9502GE/ME .....-40°C to +85°C
MAX9502GA/MA.....-40°C to +125°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.

DC ELECTRICAL CHARACTERISTICS

(V_{CC} = $\overline{SHDN}$ = 3.0V, GND = 0V, no load, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Voltage Range	V_{CC}	Guaranteed by PSRR		2.5		3.6	V
Quiescent Supply Current	I_{CC}	V_{IN} = 0V, 2.5V ≤ V_{CC} ≤ 3.6V, $\overline{SHDN}$ = V_{CC}, T_A = -40°C to +85°C			5.3	9	mA
		V_{IN} = 0V, 2.5V ≤ V_{CC} ≤ 3.6V, $\overline{SHDN}$ = V_{CC}, T_A = -40°C to +125°C				11	
Shutdown Supply Current	I_{SHDN}	$V_{\overline{SHDN}}$ = 0V			0.01	1	µA
Input Voltage Range	V_{IN}	Guaranteed by DC voltage gain (MAX9502G)	V_{CC} = 2.5V	0		1.05	V
			V_{CC} = 3.0V	0		1.2	
		Guaranteed by DC voltage gain (MAX9502M)	V_{CC} = 2.5V	0		0.525	
			V_{CC} = 3.0V	0		0.6	
Input Current	I_{IN}	V_{IN} = 0V			3.5	10	µA
Input Resistance	R_{IN}	$\Delta V_{IN}/\Delta I_{IN}$			17		MΩ
DC Voltage Gain (Note 2)	A_V	R_L = 150Ω to GND, V_{CC} = 2.5V to 3V	MAX9502G	5.5	6	6.5	dB
			MAX9502M	11.5	12	12.5	
Output Sync-Tip Level	V_{STIP}	Measured at OUT, V_{IN} = 0V, R_L = 150Ω to GND			110	230	mV
Output Voltage Swing	V_{OUT}	MAX9502G, R_L = 150Ω to GND	V_{CC} = 2.5V, 0 ≤ V_{IN} ≤ 1.05V	1.97	2.1	2.23	V_{P-P}
			V_{CC} = 3.0V, 0 ≤ V_{IN} ≤ 1.2V	2.26	2.4	2.54	
		MAX9502M, R_L = 150Ω to GND	V_{CC} = 2.5V, 0 ≤ V_{IN} ≤ 0.525V	1.97	2.1	2.23	
			V_{CC} = 3.0V, 0 ≤ V_{IN} ≤ 0.6V	2.26	2.4	2.54	
Output Short-Circuit Current Threshold	I_{SC}	Sourcing (Note 3)			95		mA
Output Resistance	R_{OUT}				0.15		Ω
Shutdown Output Impedance	$R_{OUT(OFF)}$	$V_{\overline{SHDN}}$ = 0V			4		kΩ
DC Power-Supply Rejection Ratio	$PSRR_{DC}$	V_{IN} = 0V, 2.5V ≤ V_{CC} ≤ 3.6V		50	90		dB
LOGIC INPUTS ($\overline{SHDN}$)							
Logic-Low Level	V_{IL}	T_A = -40°C to +85°C				0.8	V
		T_A = -40°C to +125°C				0.65	
Logic-High Level	V_{IH}			2.0			V
Logic Input Current	I_{IL}	$\overline{SHDN}$ = GND and V_{CC}				1	µA

AC ELECTRICAL CHARACTERISTICS

(V_{CC} = $\overline{SHDN}$ = 3.0V, GND = 0V, R_L = 150Ω to GND, T_A = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Passband Flatness		V_{OUT} = 2V_{P-P}, f = 100kHz to 5.5MHz, flatness is referred to 100kHz		-1		+1	dB
Attenuation	f_{dt}	V_{OUT} = 2V_{P-P}, attenuation is referred to 100kHz	f = 8MHz		3		dB
			f = 27MHz	35	55		
Power-Supply Rejection Ratio	PSRR	f = 100kHz			56		dB
Output Impedance	Z_{OUT}	V_{OUT} = 1.5V DC; f = 5MHz			2.5		Ω
Differential Gain Error	DG	NTSC, V_{OUT} = 2V_{P-P}	MAX9502G		0.4		%
			MAX9502M		0.4		
Differential Phase Error	DP	NTSC, V_{OUT} = 2V_{P-P}	MAX9502G		0.4		degrees
			MAX9502M		0.4		
2T Pulse-to-Bar K Rating		2T = 250ns; bar time is 18µs; the beginning 2.5% and the ending 2.5% of the bar time are ignored			0.2		K%
2T Pulse Response		2T = 250ns			0.3		K%
2T Bar Response		2T = 250ns; bar time is 18µs; the beginning 2.5% and the ending 2.5% of the bar time are ignored			0.4		K%
Nonlinearity		5-step staircase			0.4		%
Line Time Distortion					0		%
Field Time Distortion					0		%
Group-Delay Variation	Δ(dφ/dω)	f = 100kHz to 5.5MHz	MAX9502G		30		ns
			MAX9502M		30		
Peak Signal to RMS Noise	SNR	V_{OUT} = 2V_{P-P}, 100kHz to 5MHz	MAX9502G		68		dB
			MAX9502M		65		
Enable Time	t_{ON}	$V_{\overline{SHDN}}$ = 3V, V_{OUT} settled to within 1% of the final voltage	MAX9502G (V_{IN} = 1V)		800		ns
			MAX9502M (V_{IN} = 0.5V)		800		
Disable Time	t_{OFF}	$V_{\overline{SHDN}}$ = 0V, V_{OUT} settled to below 1% of the output voltage	MAX9502G (V_{IN} = 1V)		220		ns
			MAX9502M (V_{IN} = 0.5V)		175		

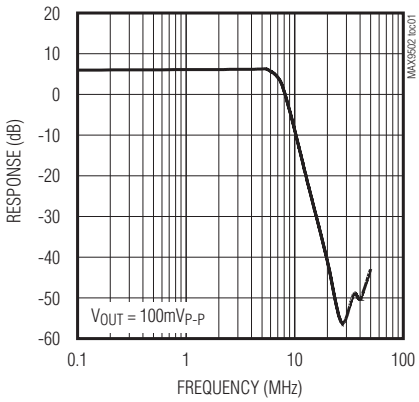
Note 1: All devices are 100% production tested at T_A = +25°C. Specifications over temperature limits are guaranteed by design.
Note 2: DC voltage gain (A_V) is a two-point measurement in which the output voltage swing is divided by the input voltage swing.
Note 3: Short-circuit current is the trip current for the protection. During the protection, OUT is switched alternatively on and off.

带有重建滤波器的2.5V视频放大器

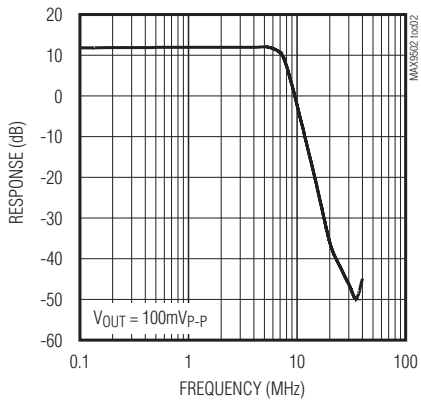
典型工作特性

(V_{CC} = $\overline{SHDN}$ = 3.0V, GND = 0V, R_L = 150Ω to GND.)

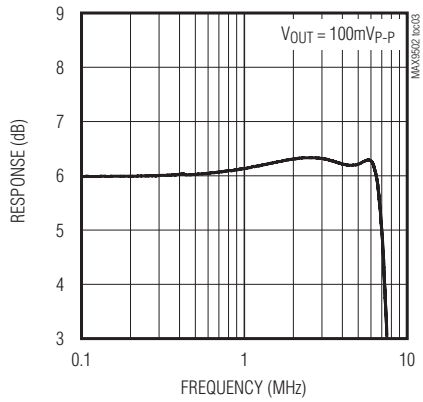
MAX9502G SMALL-SIGNAL BANDWIDTH



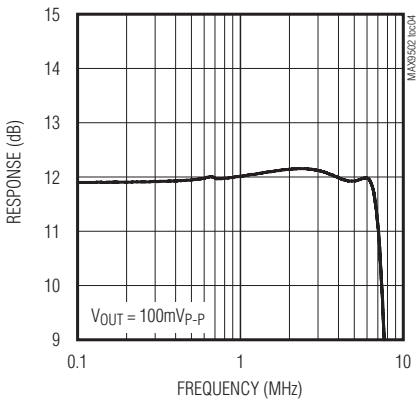
MAX9502M SMALL-SIGNAL BANDWIDTH



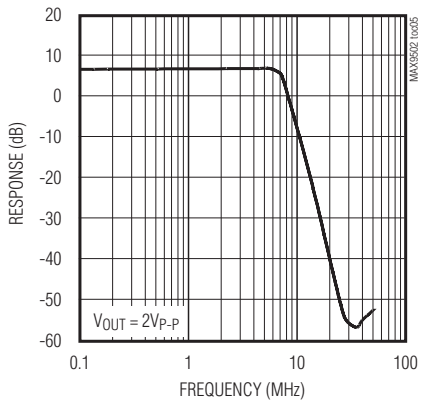
MAX9502G SMALL-SIGNAL GAIN FLATNESS



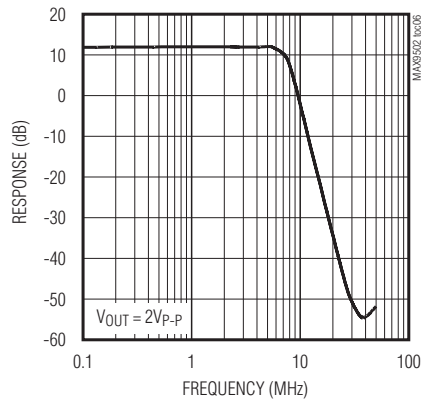
MAX9502M SMALL-SIGNAL GAIN FLATNESS



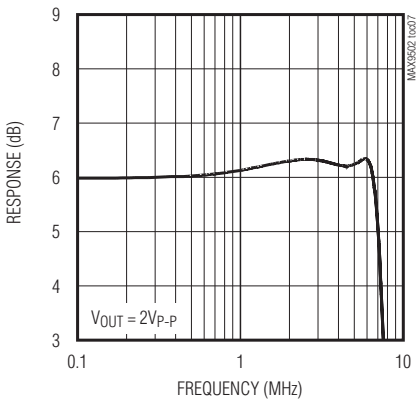
MAX9502G LARGE-SIGNAL BANDWIDTH



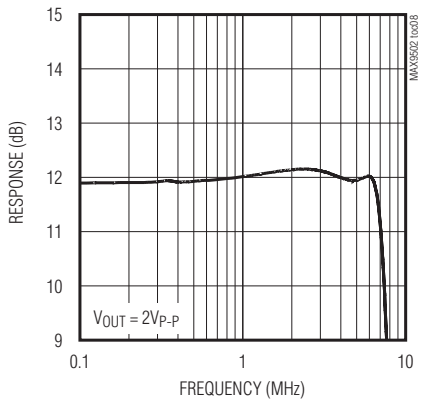
MAX9502M LARGE-SIGNAL BANDWIDTH



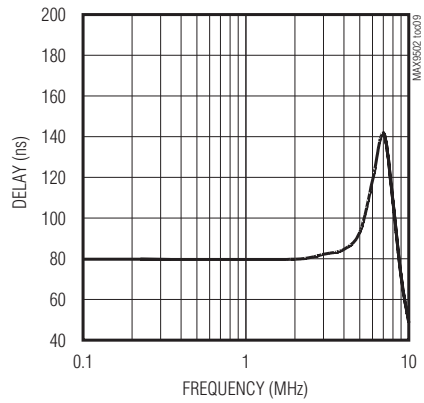
MAX9502G LARGE-SIGNAL GAIN FLATNESS



MAX9502M LARGE-SIGNAL GAIN FLATNESS



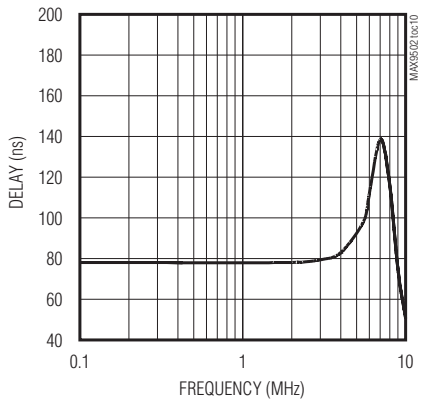
MAX9502G GROUP DELAY



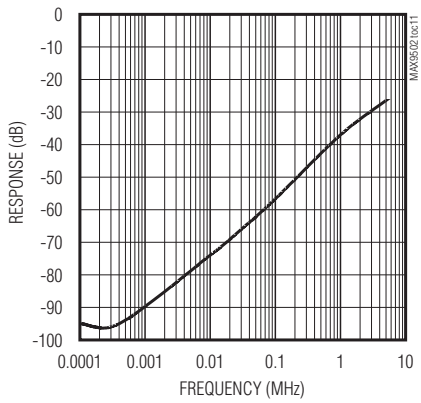
典型工作特性(续)

(V_{CC} = $\overline{SHDN}$ = 3.0V, GND = 0V, R_L = 150Ω to GND.)

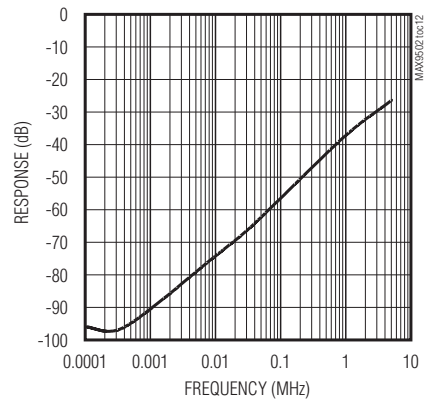
MAX9502M GROUP DELAY



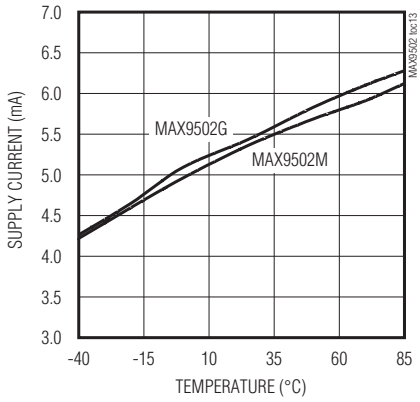
MAX9502G POWER-SUPPLY REJECTION RATIO



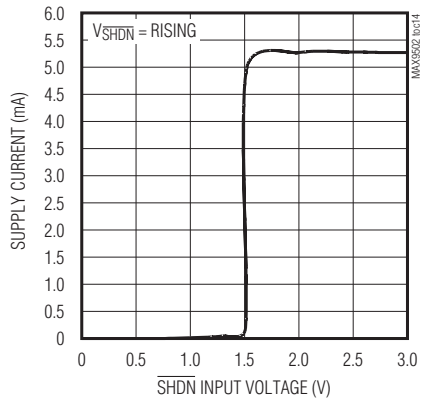
MAX9502M POWER-SUPPLY REJECTION RATIO



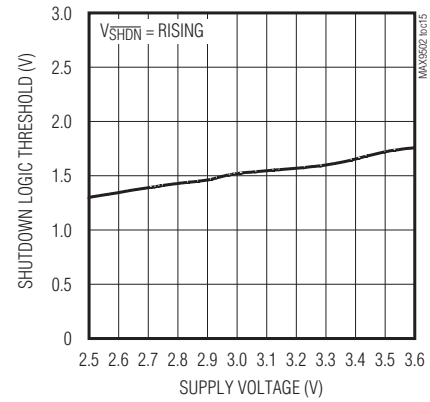
SUPPLY CURRENT vs. TEMPERATURE



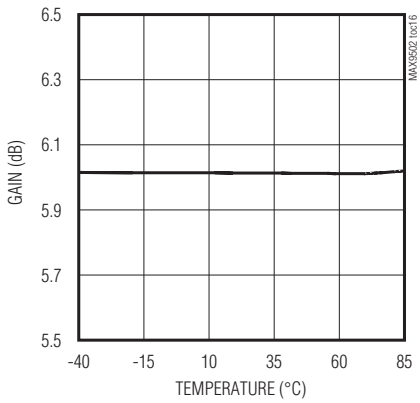
SUPPLY CURRENT vs. $\overline{SHDN}$ INPUT VOLTAGE



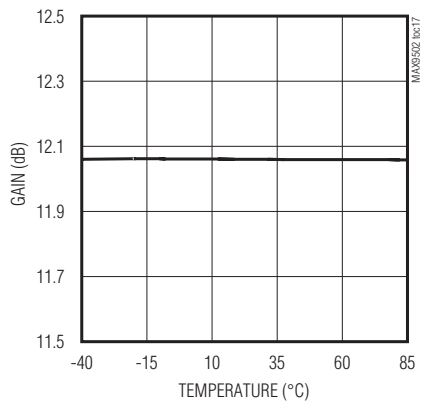
SHUTDOWN LOGIC THRESHOLD vs. SUPPLY VOLTAGE



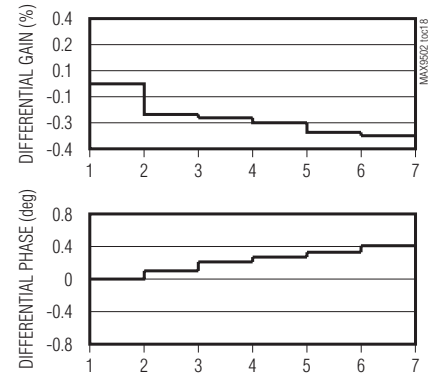
MAX9502G VOLTAGE GAIN vs. TEMPERATURE



MAX9502M VOLTAGE GAIN vs. TEMPERATURE



MAX9502G DIFFERENTIAL GAIN AND PHASE

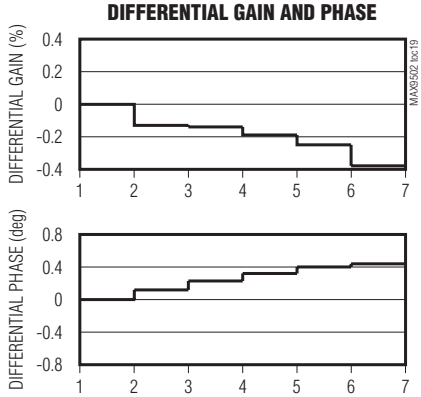


带有重建滤波器的2.5V视频放大器

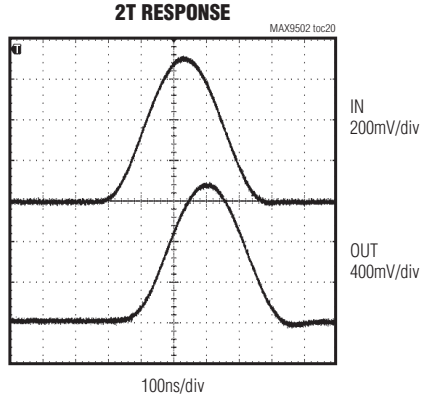
典型工作特性(续)

(V_{CC} = $\overline{SHDN}$ = 3.0V, GND = 0V, R_L = 150Ω to GND.)

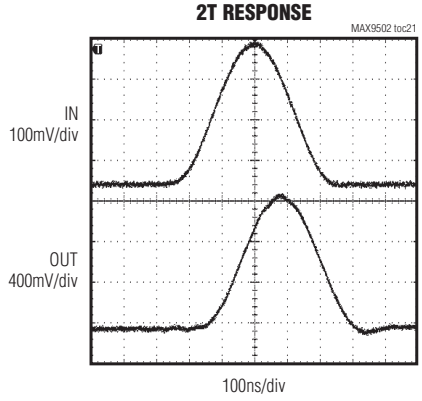
MAX9502M
DIFFERENTIAL GAIN AND PHASE



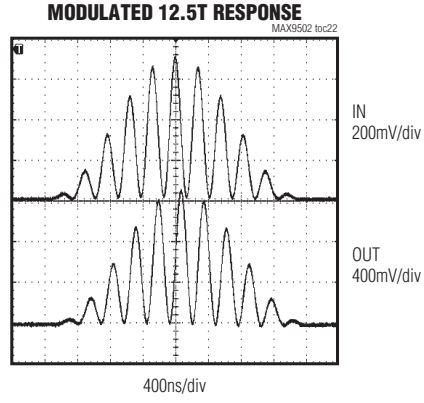
MAX9502G
2T RESPONSE



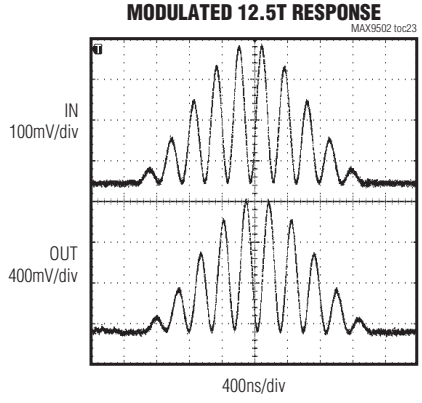
MAX9502M
2T RESPONSE



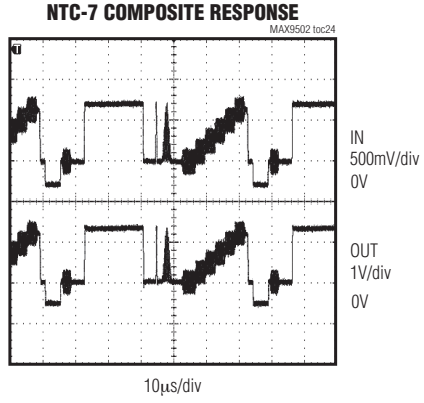
MAX9502G
MODULATED 12.5T RESPONSE



MAX9502M
MODULATED 12.5T RESPONSE



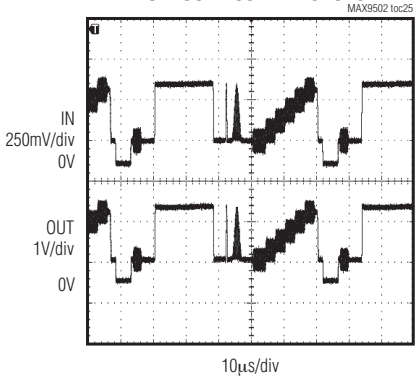
MAX9502G
NTC-7 COMPOSITE RESPONSE



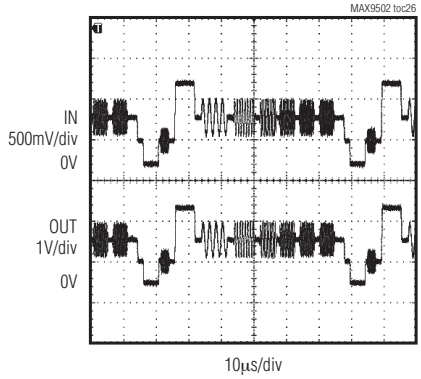
典型工作特性(续)

(V_{CC} = $\overline{SHDN}$ = 3.0V, GND = 0V, R_L = 150Ω to GND.)

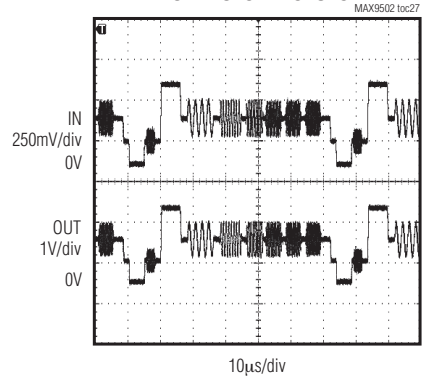
MAX9502M NTC-7 COMPOSITE RESPONSE



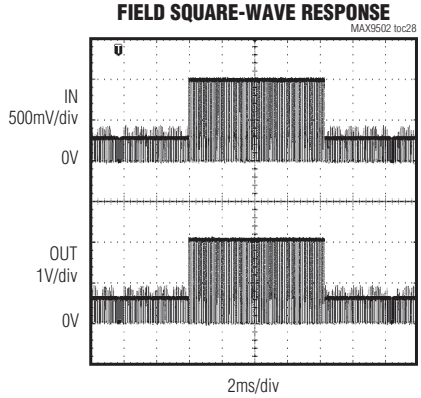
MAX9502G MULTIBURST RESPONSE



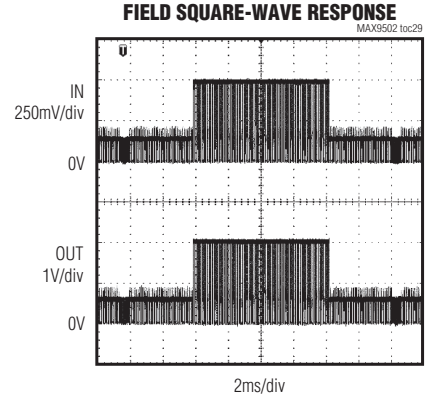
MAX9502M MULTIBURST RESPONSE



MAX9502G FIELD SQUARE-WAVE RESPONSE



MAX9502M FIELD SQUARE-WAVE RESPONSE



引脚说明

引脚		名称	功能
µDFN	SC70		
1	1	IN	视频输入。
2	2	GND	地。
3	3	$\overline{SHDN}$	低电平有效关断输入，接GND时关断。
4	4	V_{CC}	供电电源正极。
5	—	N.C.	无连接，没有内部连接。
6	5	OUT	视频输出。

带有重建滤波器的2.5V视频放大器

详细说明

MAX9502对数码相机或移动电话等应用中的视频DAC输出进行滤波、放大。MAX9502由一个低通滤波器和一个输出视频缓冲器构成，能够驱动标准的对地150Ω视频负载。MAX9502G输出缓冲器提供+6dB固定增益，MAX9502M输出缓冲器提供+12dB固定增益。

滤波器

MAX9502含有一个4阶切比雪夫重建滤波器。对于NTSC和PAL信号，切比雪夫滤波器频率响应具有0.4dB通带平坦度。在27MHz及更高频点，阻带具有55dB (典型值)衰减(参见*典型工作特性*)。

输出放大器

MAX9502G提供+6dB增益，MAX9502M提供+12dB增益。输出放大器在2.5V至3.0V电源供电时，能够以2V信号驱动150Ω视频对地负载。输出放大器在3.0V至3.6V电源供电时，能够以2.4V_{P-P}信号驱动150Ω视频对地负载。输出通常相对于地电位偏移110mV，以确保放大器线性工作。MAX9502输出仅吸收电流；所有负载应连接至地。

短路保护

MAX9502典型应用电路含有一个75Ω背向端接电阻，可限制视频输出外部短路电流。MAX9502具有内部输出短路保护，原型开发和应用中可避免由于放大器输出直接短路所造成的器件损坏。

如果输出短路，输出电流超过95mA，则短路保护启动。在短路保护期间，MAX9502输出关断12µs，然后打开0.8µs。如果仍旧存在短路，MAX9502输出再次关断。长时间的短路将产生脉冲输出。短路消除后，器件恢复正常工作。

应用信息

输入考虑

MAX9502输入为直流耦合。当供电电压在2.5V至3V之间时，MAX9502G输入电压范围从地电位至1.05V，MAX9502M输入电压范围从地电位至0.525V。当供电电压在3V至3.6V之间时，MAX9502G输入电压范围从地电位至1.2V，MAX9502M输入电压范围从地电位至0.6V。MAX9502G可接受同步头在0至50mV的复合视频信号，MAX9502M可接受同步头在0至25mV的复合视频信号。典型的单电源供电、电流输出DAC所产生的复合信号的同步头非常接近地电位。因此，DAC输出可直接连接至MAX9502输入。电路板布线应尽量短，以减小寄生杂散电容，防止出现高频衰减。

输出考虑

MAX9502输出必须采用直流耦合，不允许使用交流耦合电容。MAX9502通过一个75Ω串联背向端接电阻直接连接至视频电缆。电缆另一端应采用75Ω电阻端接。由于采用这种配置，信号的峰值和直流电平减半。MAX9502输出信号电平向上偏移，因此，同步头在110mV附近。

电源旁路和布板考虑

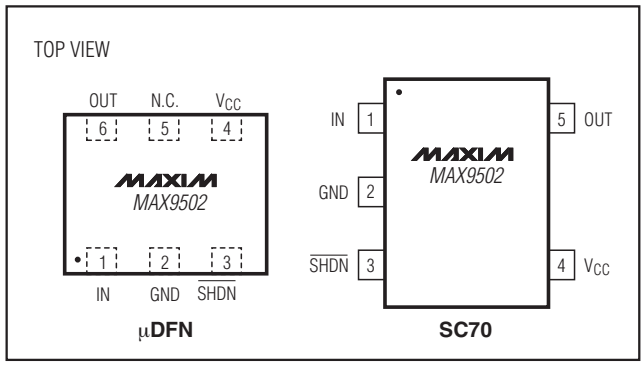
MAX9502的供电电压可低至2.5V，支持低功耗应用。采用一个0.1µF电容将V_{CC}旁路至GND。所有外部元件应尽可能靠近器件放置。

定购信息(续)

PART	PIN-PACKAGE	TEMP RANGE	GAIN	TOP MARK	PKG CODE
MAX9502MAALT+T	6 µDFN-6	-40°C to +125°C	+12	LJ	L611-1
MAX9502MAAXK+T	5 SC70-5	-40°C to +125°C	+12	ASP	X5-1
MAX9502MELT+T	6 µDFN-6	-40°C to +85°C	+12	AV	L611-1
MAX9502MEXK+T	5 SC70-5	-40°C to +85°C	+12	ARW	X5-1

+表示无铅封装。

引脚配置



芯片信息

PROCESS: BICMOS

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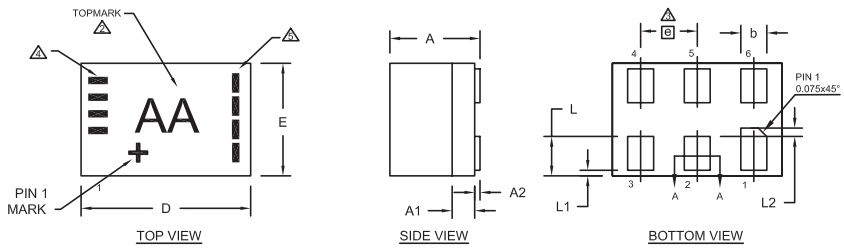
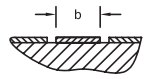
封装信息

(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**。)

6L UDFN.EPS





SECTION A-A

SYMBOL	COMMON DIMENSIONS		
	MIN.	NOM.	MAX.
A	0.65	0.72	0.80
A1	--	0.20	--
A2	0.00	--	0.05
D	1.45	1.50	1.55
E	0.95	1.00	1.05
L	0.30	0.35	0.40
L1	0.00	--	0.08
L2	0.05	--	0.10
b	0.17	0.20	0.23
e	0.50 BSC.		
Pkg. Code	L611-1		

NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY. PACKAGE USES 2 CHARACTER PRODUCT CODE.
3. LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.
4. CALENDAR YEAR BINARY DATE CODE (REFER TO PG. 2 TABLE 1 FOR TRANSLATION).
5. 6 WEEKLY DATE BINARY CODE (REFER TO PG. 2 TABLE 2 FOR TRANSLATION).
6. MATERIAL MUST COMPLY WITH BANNED AND RESTRICTED SUBSTANCES SPEC#10-0.0131.
7. MEETS JEDEC MO-252 VARIATION WAAD.

-DRAWING NOT TO SCALE-

DALLAS SEMICONDUCTOR MAXIM

TITLE: PACKAGE OUTLINE, 6L uDFN, 1.5x1.0x0.8mm

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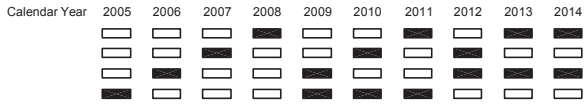
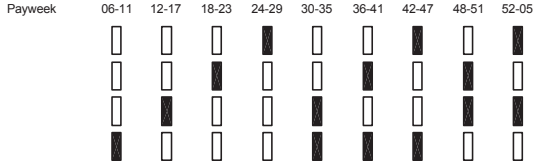
TABLE 1 Translation Table for Calendar Year Code



Legend: Marked with bar | Blank space - no bar required

TABLE 2 Translation Table for Payweek Binary Coding



Legend: Marked with bar | Blank space - no bar required

DALLAS SEMICONDUCTOR MAXIM

TITLE: PACKAGE OUTLINE, 6L uDFN, 1.5x1.0x0.8mm

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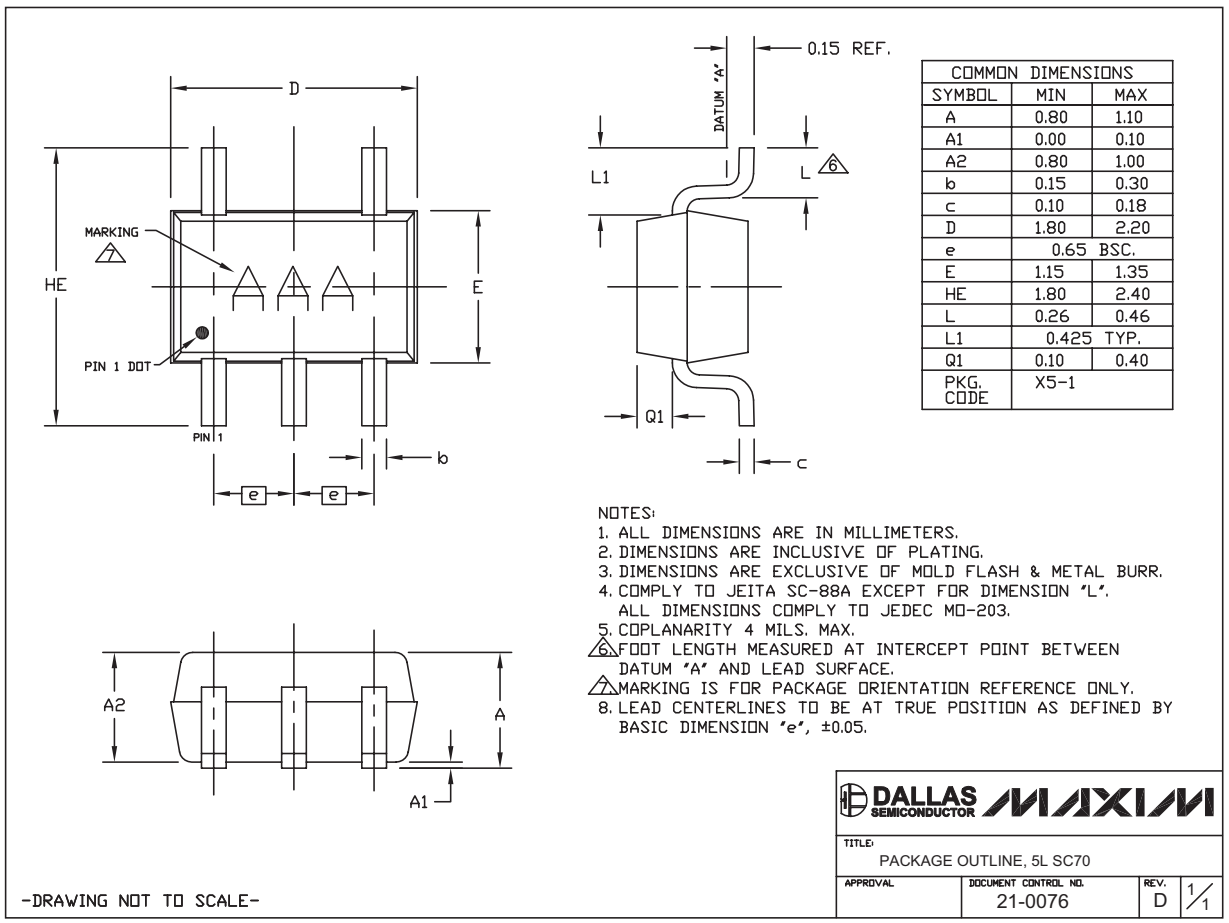
封装信息(续)

(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**。)



COMMON DIMENSIONS		
SYMBOL	MIN	MAX
A	0.80	1.10
A1	0.00	0.10
A2	0.80	1.00
b	0.15	0.30
c	0.10	0.18
D	1.80	2.20
e	0.65 BSC.	
E	1.15	1.35
HE	1.80	2.40
L	0.26	0.46
L1	0.425 TYP.	
Q1	0.10	0.40
PKG. CODE	X5-1	

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH & METAL BURR.
4. COMPLY TO JEITA SC-88A EXCEPT FOR DIMENSION "L". ALL DIMENSIONS COMPLY TO JEDEC MO-203.
5. COPLANARITY 4 MILS. MAX.
6. FOOT LENGTH MEASURED AT INTERCEPT POINT BETWEEN DATUM "A" AND LEAD SURFACE.
7. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
8. LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.

DALLAS SEMICONDUCTOR MAXIM

TITLE: PACKAGE OUTLINE, 5L SC70

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