

EVALUATION KIT  
AVAILABLE

## Complete Audio/Video Backend Solution

MAX4079

### General Description

The MAX4079 filters and buffers video (NTSC/PAL/DVB) and stereo audio signals from the MPEG decoder of a cable/satellite receiver, VCR/DVD player, or a TV to an external load. The MAX4079 has luma-chroma (Y-C) and composite (CVBS) video inputs with one Y-C and two CVBS outputs. All video inputs are AC-coupled with internal DC biasing on the chroma input and active clamps for the luma and composite.

The MAX4079 video reconstruction filters have a 6MHz cutoff frequency and 50dB attenuation at 27MHz. The filters are matched with flat group delay for standard-definition video. The video gain is fixed at +6dB to drive a 75Ω back-terminated load (150Ω) to unity gain. The video outputs can be either DC- or AC-coupled and are powered by a single +5V supply.

The MAX4079 audio amplifiers have differential inputs for optimum performance, but can be used with single-ended sources with external biasing. The audio channels have a fixed gain of +6dB and deliver 2.6V<sub>RMS</sub> output with a differential input of ±1.85V. The audio amplifiers operate from a +9V to +12V single supply and feature an internal bias generator. An on-chip mixer also provides a mono output, with +3dB gain, derived from the left and right audio channels.

The MAX4079 is available in 24-pin TSSOP package, and is fully specified over the 0°C to +70°C commercial temperature range. The MAX4079 Evaluation Kit is available to help speed designs.

### Applications

Satellite Receivers  
Cable Receivers  
Home Theater Systems  
DVD Players  
AV Receivers  
Televisions

Pin Configuration appears at end of data sheet.

### Features

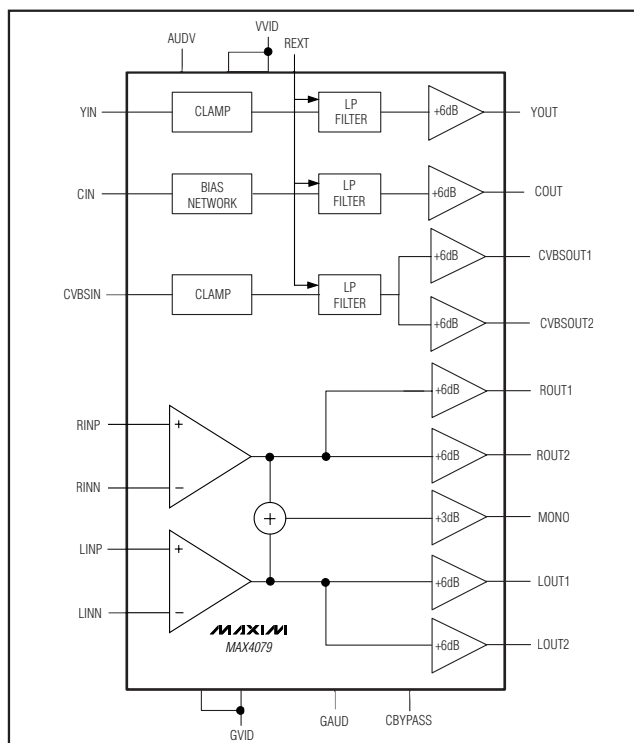
- ♦ Integrated Video Reconstruction Filters—6MHz Lowpass Filter Supports NTSC, PAL, or DVB per ITU-601
- ♦ Integrated Video and Audio Amplifiers
- ♦ Integrated Video Input Clamps and Biasing
- ♦ Mono Audio and CVBS Output to Drive External Modulator
- ♦ +5V (Video) and +9V to +12V (Audio) Single-Supply Operation
- ♦ Differential/Single-Ended Audio Inputs
- ♦ 24-Pin TSSOP Package

### Ordering Information

| PART        | TEMP RANGE   | PIN-PACKAGE |
|-------------|--------------|-------------|
| MAX4079CUG+ | 0°C to +70°C | 24 TSSOP    |

+ Denotes lead (Pb)-free package.

### Functional Diagram



Maxim Integrated Products 1

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).

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## ABSOLUTE MAXIMUM RATINGS

GVID to GAUD.....-0.1V to +0.1V  
 VVID to GVID.....-0.3V to +6V  
 AUDV to GAUD.....-0.3V to +14V  
 LINP, LINN, RINP, RINN, CBYPASS to GAUD.....-0.3V to +6V  
 LOUT1, LOUT2, ROUT1, ROUT2,  
 MONO to GAUD.....-0.3V to lower of (+9V and AUDV + 0.3V)  
 YIN, CIN, CVBSIN, REXT to GVID.....-0.3V to (VVID + 0.3V)  
 YOUT, COUT, CVBSOUT1, CVBSOUT2 to  
 GVID.....-0.3V to (VVID + 0.3V)  
 Video Output Short-Circuit Duration to GVID or  
 VVID.....Continuous

Audio Output Short-Circuit Duration to GAUD or  
 AUDV.....Continuous  
 Continuous Power Dissipation ( $T_A = +70^\circ\text{C}$ )  
 24-Pin TSSOP (derate 12.2mW/ $^\circ\text{C}$  above  $+70^\circ\text{C}$ ).....975.6mW  
 Operating Temperature Range..... $0^\circ\text{C}$  to  $+70^\circ\text{C}$   
 Storage Temperature Range..... $-65^\circ\text{C}$  to  $+150^\circ\text{C}$   
 Junction Temperature..... $+150^\circ\text{C}$   
 Lead Temperature (soldering, 10s)..... $+300^\circ\text{C}$

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

( $V_{VVID} = +5\text{V}$ ,  $V_{AUDV} = +12\text{V}$ ,  $V_{GVID} = V_{GAUD} = 0\text{V}$ ,  $R_{LOAD\_VID} = 150\Omega$  to GVID,  $R_{REXT} = 10\text{k}\Omega \pm 1\%$ ,  $C_{CBYPASS} = 1\mu\text{F}$ ,  $T_A = 0^\circ\text{C}$  to  $+70^\circ\text{C}$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ\text{C}$ .) (Note 1)

| PARAMETER                      | SYMBOL              | CONDITIONS                                                                 | MIN  | TYP  | MAX  | UNITS            |
|--------------------------------|---------------------|----------------------------------------------------------------------------|------|------|------|------------------|
| <b>SUPPLIES</b>                |                     |                                                                            |      |      |      |                  |
| Audio Supply Voltage Range     | AUDV                |                                                                            | 8.5  |      | 12.6 | V                |
| Video Supply Voltage Range     | VVID                |                                                                            | 4.75 | 5.0  | 5.25 | V                |
| Video Quiescent Supply Current | $I_{CCV}$           | $V_{VVID} = 5.25\text{V}$ , no load, all video inputs AC-coupled to ground |      | 60   | 100  | mA               |
| Audio Quiescent Supply Current | $I_{CCA}$           | $V_{AUDV} = 12.6\text{V}$ , no load, audio inputs biased at 2.5V           |      | 8    | 15   | mA               |
| Thermal Shutdown               | $T_{SD}$            | Rising die temperature                                                     |      | +150 |      | $^\circ\text{C}$ |
| Thermal-Shutdown Hysteresis    | $T_{SD,HYS}$        |                                                                            |      | 25   |      | $^\circ\text{C}$ |
| <b>VIDEO</b>                   |                     |                                                                            |      |      |      |                  |
| Voltage Gain                   | $A_{V,VID}$         | $V_{IN} = 1\text{V}_{P-P}$ , all video inputs, no load                     | 5.8  | 6    | 6.2  | dB               |
| Gain Matching                  | $\Delta A_{V,VID}$  | $V_{IN} = 1\text{V}_{P-P}$ , all video inputs, no load                     | -0.4 |      | +0.4 | dB               |
| Input Voltage Swing            | $V_{IN,VID}$        | YIN, CVBSIN                                                                | 0    |      | 1.2  | $\text{V}_{P-P}$ |
|                                |                     | CIN                                                                        | 0    |      | 0.9  |                  |
| Clamp Voltage                  | $V_{CLMP}$          | CVBSOUT_ and YOUT, no signal, no load                                      |      | 1.0  |      | V                |
| Chroma Bias                    | $V_{BIAS}$          | COUT, no signal, no load                                                   |      | 2.1  |      | V                |
| Droop                          | D                   | (Note 2)                                                                   |      |      | 2    | %                |
| REXT Reference Voltage         | $V_{REXT}$          |                                                                            | 0.85 | 1.00 | 1.15 | V                |
| Input Resistance               | $R_{IN,VID}$        | CVBSIN or YIN                                                              |      | 2.3  |      | $\text{M}\Omega$ |
|                                |                     | CIN                                                                        |      | 10   |      | $\text{k}\Omega$ |
| Input Clamping Current         | $I_{CLMP}$          | CVBSIN or YIN input, $V_{IN} = 3.5\text{V}$                                | 1    | 2.5  | 4    | $\mu\text{A}$    |
| Output Voltage Swing           | $V_{OUT,VID}$       | CVBSOUT_, YOUT                                                             | 2.4  |      |      | $\text{V}_{P-P}$ |
|                                |                     | COUT                                                                       | 1.8  |      |      |                  |
| Short-Circuit Current          | $I_{SC,VID}$        | Video output shorted to VVID or GVID                                       |      | 50   |      | mA               |
| Power-Supply Rejection Ratio   | $\text{PSRR}_{VID}$ | $4.75\text{V} \leq V_{VVID} \leq 5.25\text{V}$ YOUT/COUT                   |      | 48   |      | dB               |
|                                |                     | CVBSOUT_                                                                   |      | 48   |      |                  |

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## DC ELECTRICAL CHARACTERISTICS (continued)

( $V_{VVID} = +5V$ ,  $V_{AUDV} = +12V$ ,  $V_{GVID} = V_{GAUD} = 0V$ ,  $R_{LOAD\_VID} = 150\Omega$  to  $GVID$ ,  $R_{REXT} = 10k\Omega \pm 1\%$ ,  $C_{CBYPASS} = 1\mu F$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .) (Note 1)

| PARAMETER                        | SYMBOL             | CONDITIONS                                                  | MIN   | TYP | MAX   | UNITS            |
|----------------------------------|--------------------|-------------------------------------------------------------|-------|-----|-------|------------------|
| <b>AUDIO</b>                     |                    |                                                             |       |     |       |                  |
| Voltage Gain                     | $A_{V,AUD}$        | 1.414V <sub>P-P</sub> differential input                    | 5.8   | 6   | 6.2   | dB               |
| Mono Voltage Gain                | $A_{V,MONO}$       | 1.414V <sub>P-P</sub> differential input, $L_{IN} = R_{IN}$ | 2.8   | 3   | 3.2   | dB               |
| Gain Matching Between Channels   | $\Delta A_{V,AUD}$ | 1.414V <sub>P-P</sub> differential input                    | -0.4  |     | +0.4  | dB               |
| Input Voltage Range              | $V_{IN,AUD}$       | Inferred from CMRR test                                     | 0.3   |     | 5.2   | V                |
| Differential Input Voltage Range | $V_{IN,AUD\ DIF}$  | Inferred from output voltage swing                          | -1.85 |     | +1.85 | V                |
| Input Current                    | $I_{IN,AUD}$       |                                                             |       |     | 2     | $\mu A$          |
| Output Voltage Swing             | $V_{OUT,AUD}$      | Input overdriven, 10k $\Omega$ load to 4.15V                | 7.4   |     |       | V <sub>P-P</sub> |
| Short-Circuit Current            | $I_{SC,AUD}$       |                                                             |       | 15  |       | mA               |
| Power-Supply Rejection Ratio     | $PSRR_{AUD}$       | $8.5V \leq V_{AUDV} \leq 12.6V$                             | 70    |     |       | dB               |
| Common-Mode Rejection Ratio      | $CMRR_{AUD}$       | $0.3V \leq V_{CM} \leq 5.2V$                                | 50    | 60  |       | dB               |

## AC ELECTRICAL CHARACTERISTICS

( $V_{VVID} = +5V$ ,  $V_{AUDV} = +12V$ ,  $V_{GVID} = V_{GAUD} = 0V$ ,  $R_{IN\_VIDEO} = 75\Omega$  to  $GVID$ ,  $C_{IN\_VIDEO} = 0.1\mu F$ ,  $R_{LOAD\_VID} = 150\Omega$  to  $GVID$ ,  $C_{OUT\_AUDIO} = 10\mu F$ ,  $R_{LOAD\_AUD} = 10k\Omega \pm 1\%$  to  $GAUD$ ,  $R_{REXT} = 10k\Omega$ ,  $C_{CBYPASS} = 1\mu F$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .) (Note 1)

| PARAMETER                    | SYMBOL           | CONDITIONS                                                                                                                | MIN                  | TYP  | MAX  | UNITS      |
|------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|------|------|------------|
| <b>VIDEO</b>                 |                  |                                                                                                                           |                      |      |      |            |
| Filter Attenuation           | $A_{VIDEO}$      | CVBSOUT1 = CVBSOUT2 = YOUT = COUT = 2V <sub>P-P</sub> ;<br>$R_L = 150\Omega$ to ground, attenuation is referred to 100kHz | $f = 4MHz$           | -0.5 | +0.5 | dB         |
|                              |                  |                                                                                                                           | $f = 7MHz$           | 3    |      |            |
|                              |                  |                                                                                                                           | $f = 27MHz$          | 40   | 50   |            |
| Slew Rate                    | SR               | $V_{OUT} = 2V_{P-P}$                                                                                                      |                      | 30   |      | V/ $\mu s$ |
| Differential Gain            | DG               | CVBSOUT <sub>-</sub> , YOUT, COUT, 5-step modulated staircase                                                             |                      | 0.5  |      | %          |
| Differential Phase           | DP               | CVBSOUT <sub>-</sub> , YOUT, COUT, 5-step modulated staircase                                                             |                      | 0.9  |      | degrees    |
| Power-Supply Rejection Ratio | $PSRR_{VID}$     | $f = 100kHz$ , 0.5V <sub>P-P</sub>                                                                                        | YOUT/COUT            | 48   |      | dB         |
|                              |                  |                                                                                                                           | CVBSOUT <sub>-</sub> | 44   |      |            |
| Peak Signal to RMS Noise     | $SNR_{VID}$      | CVBSOUT <sub>-</sub> , YOUT, COUT, $V_{IN} = 1V_{P-P}$                                                                    |                      | 65   |      | dB         |
| Group Delay Deviation        | GD               | CVBSOUT <sub>-</sub> , YOUT, COUT, $f_{IN} = 0.1MHz$ to 4.5MHz                                                            |                      | 25   |      | ns         |
| Output Impedance             | $Z_{OUT,VID}$    | $f = 3.58MHz$                                                                                                             |                      | 0.5  |      | $\Omega$   |
| Capacitive Load              | $C_{L,VID}$      | No sustained oscillations                                                                                                 |                      | 35   |      | pF         |
| Video Crosstalk              | $X_{TALK,VID}$   | $f = 3.58MHz$ , 1V <sub>P-P</sub> input, between any two active inputs                                                    |                      | -63  |      | dB         |
| Audio/Video Crosstalk        | $X_{TALK,VD/AD}$ | $f = 15kHz$ , 1V <sub>P-P</sub> input, between any two active audio or video inputs                                       |                      | -76  |      |            |

# Complete Audio/Video Backend Solution

## AC ELECTRICAL CHARACTERISTICS (continued)

( $V_{VVID} = +5V$ ,  $V_{AUDV} = +12V$ ,  $V_{GVID} = V_{GAUD} = 0V$ ,  $R_{IN\_VIDEO} = 75\Omega$  to  $G_{VID}$ ,  $C_{IN\_VIDEO} = 0.1\mu F$ ,  $R_{LOAD\_VID} = 150\Omega$  to  $G_{VID}$ ,  $C_{OUT\_AUDIO} = 10\mu F$ ,  $R_{LOAD\_AUD} = 10k\Omega \pm 1\%$  to  $G_{AUD}$ ,  $R_{REXT} = 10k\Omega$ ,  $C_{CBYPASS} = 1\mu F$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .) (Note 1)

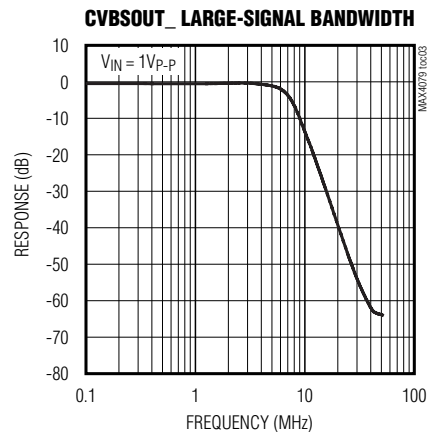
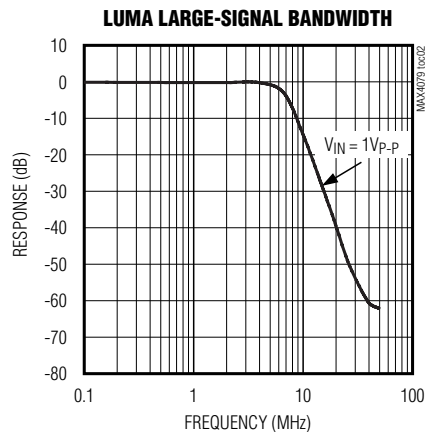
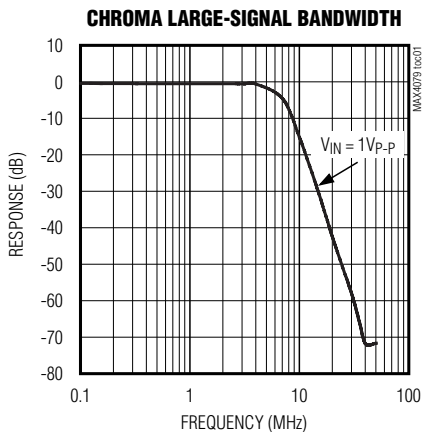
| PARAMETER                            | SYMBOL           | CONDITIONS                                                                                             | MIN | TYP   | MAX | UNITS    |
|--------------------------------------|------------------|--------------------------------------------------------------------------------------------------------|-----|-------|-----|----------|
| <b>AUDIO</b>                         |                  |                                                                                                        |     |       |     |          |
| Gain Flatness                        | $\Delta A_{AUD}$ | $L_{OUT\_}$ , $R_{OUT\_}$ , $f_{IN} = 20Hz$ to $20kHz$ , $0.5V_{RMS}$ input                            |     | 0.01  |     | dB       |
|                                      |                  | MONO, $f_{IN} = 20Hz$ to $20kHz$ , $0.5V_{RMS}$ input                                                  |     | 0.01  |     |          |
| Signal-to-Noise Ratio                | $SNR_{AUD}$      | $f_{IN} = 1.0kHz$ , $0.5V_{RMS}$ , CCIR weighing highpass filter at $20Hz$ , lowpass filter at $20kHz$ |     | 85    |     | dB       |
| Total Harmonic Distortion Plus Noise | THD+N            | $f_{IN} = 1.0kHz$ , $0.5V_{RMS}$                                                                       |     | 0.005 |     | %        |
|                                      |                  | $f_{IN} = 1.0kHz$ , $1V_{RMS}$                                                                         |     | 0.003 |     |          |
| Output Impedance                     | $Z_{O\_AUD}$     | $f = 1kHz$                                                                                             |     | 0.2   |     | $\Omega$ |
| Power-Supply Rejection Ratio         | $PSRR_{AUD,AC}$  | $f = 1kHz$ , $V_{RIPPLE} = 200mV_{p-p}$                                                                |     | 60    |     | dB       |
| Crosstalk                            | $X_{TLK\_AUD}$   | $f = 1kHz$ , $0.5V_{RMS}$ input                                                                        |     | 70    |     | dB       |
| Capacitive Load                      | $C_{L\_AUD}$     | No sustained oscillations                                                                              |     | 200   |     | pF       |

**Note 1:** All devices are 100% production tested at  $T_A = +25^\circ C$ . Specifications over temperature limits are guaranteed by design.

**Note 2:** Droop is defined as the percentage change in the DC level from the start to the end of a video line. Inferred from input clamping current with a  $0.1\mu F$  coupling capacitor.

## Typical Operating Characteristics

( $V_{VVID} = +5V$ ,  $V_{AUDV} = +12V$ ,  $V_{GVID} = V_{GAUD} = 0V$ ,  $R_{IN\_VIDEO} = 75\Omega$  to  $G_{VID}$ ,  $C_{IN\_VIDEO} = 0.1\mu F$ ,  $R_{LOAD\_VID} = 150\Omega$  to  $G_{VID}$ ,  $C_{OUT\_AUDIO} = 10\mu F$ ,  $R_{LOAD\_AUD} = 10k\Omega$  to  $G_{AUD}$ ,  $R_{REXT} = 10k\Omega$ ,  $C_{BYPASS} = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

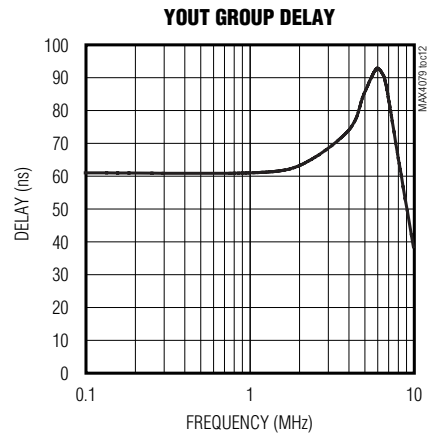
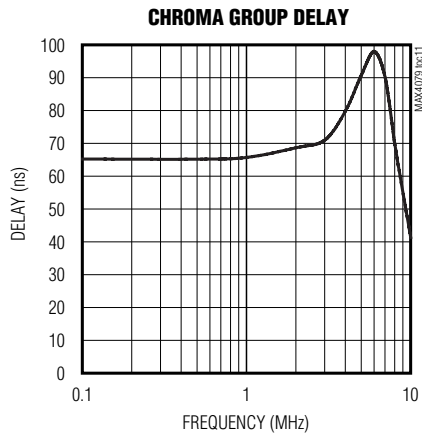
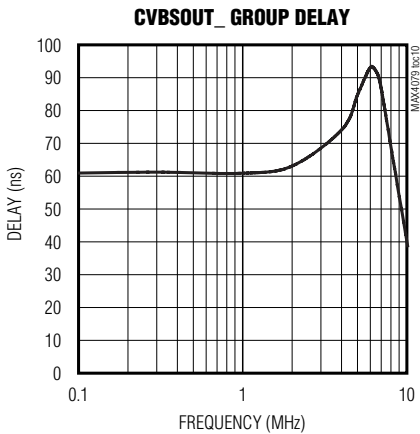
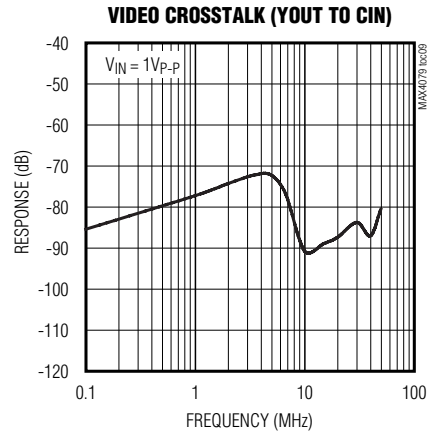
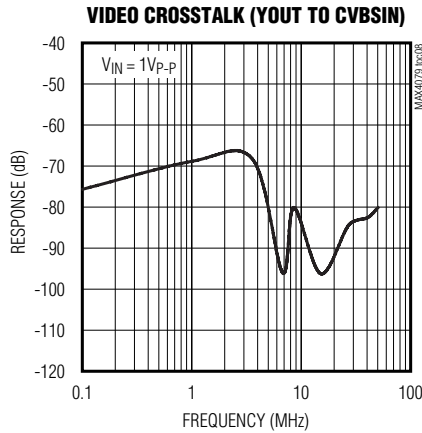
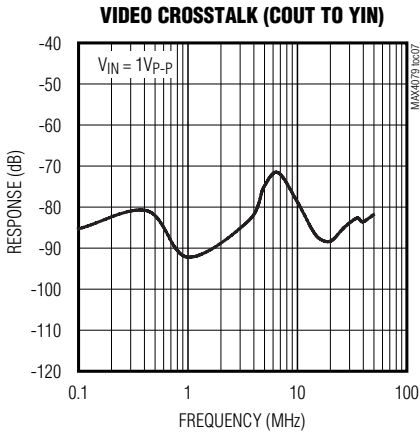
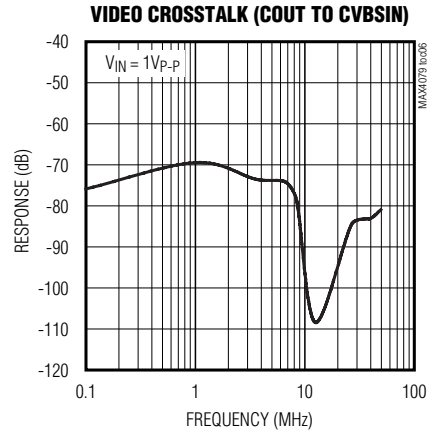
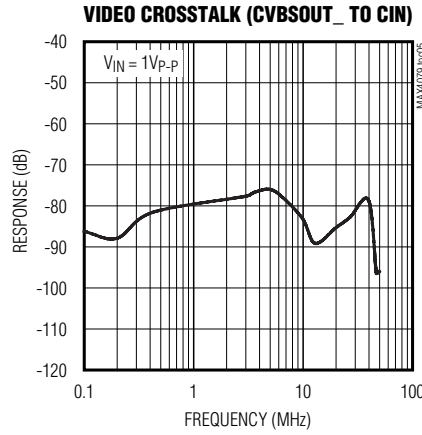
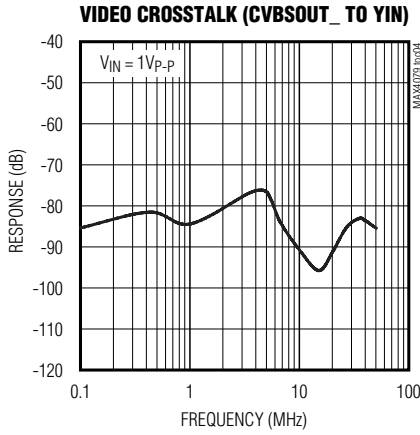


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## Typical Operating Characteristics (continued)

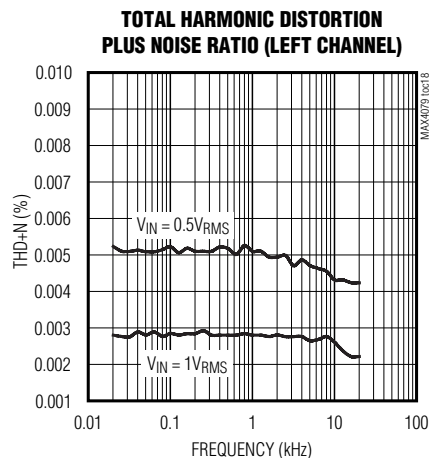
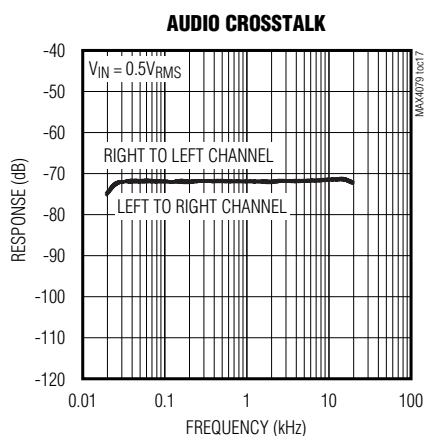
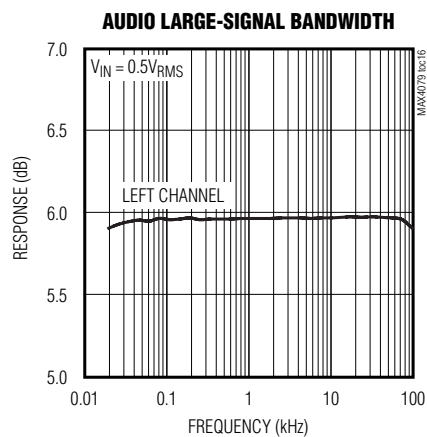
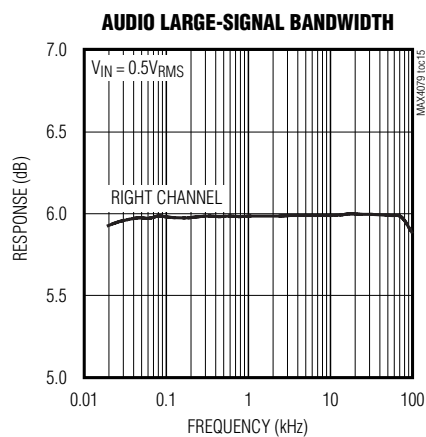
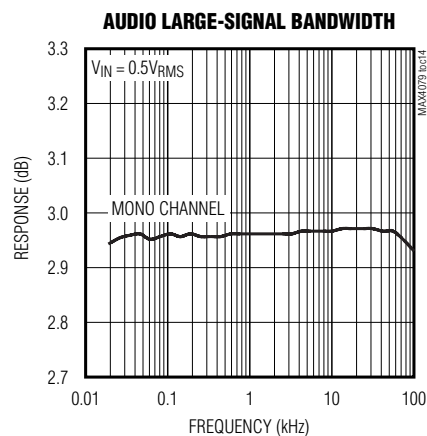
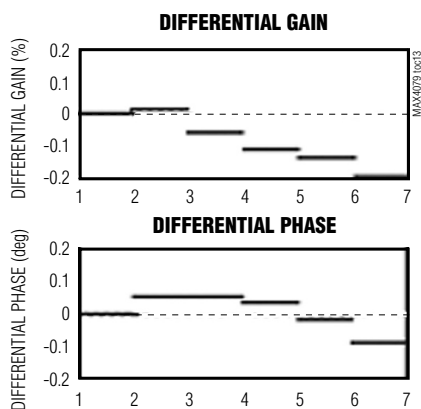
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# Complete Audio/Video Backend Solution

## Typical Operating Characteristics (continued)

( $V_{VDD} = +5V$ ,  $V_{AUDV} = +12V$ ,  $V_{GVID} = V_{GAUD} = 0V$ ,  $R_{IN\_VIDEO} = 75\Omega$  to  $G_{VID}$ ,  $C_{IN\_VIDEO} = 0.1\mu F$ ,  $R_{LOAD\_VID} = 150\Omega$  to  $G_{VID}$ ,  $C_{OUT\_AUDIO} = 10\mu F$ ,  $R_{LOAD\_AUD} = 10k\Omega$  to  $G_{AUD}$ ,  $R_{REXT} = 10k\Omega$ ,  $C_{BYPASS} = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)



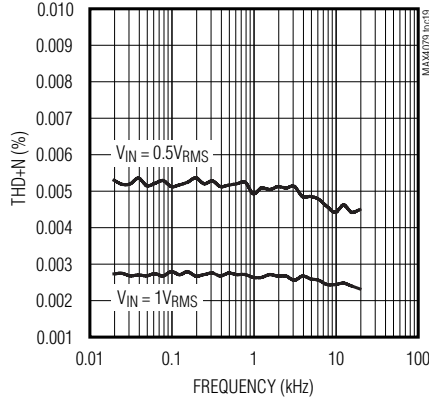
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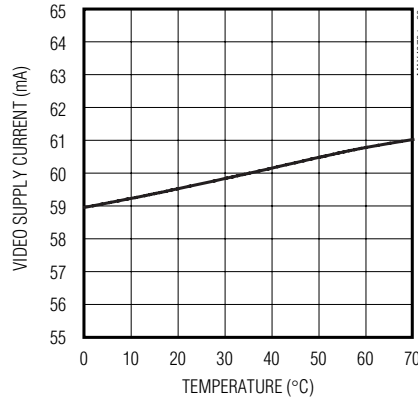
## Typical Operating Characteristics (continued)

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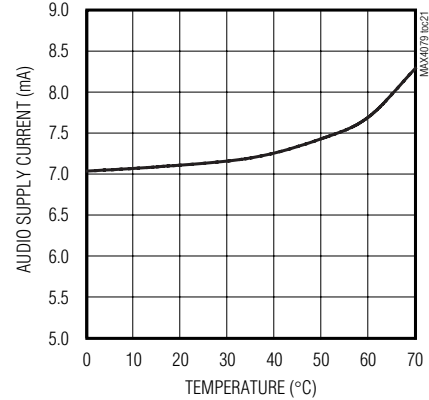
**TOTAL HARMONIC DISTORTION PLUS NOISE RATIO (RIGHT CHANNEL)**



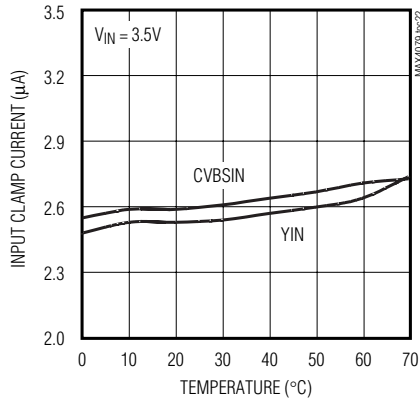
**VIDEO SUPPLY CURRENT vs. TEMPERATURE**



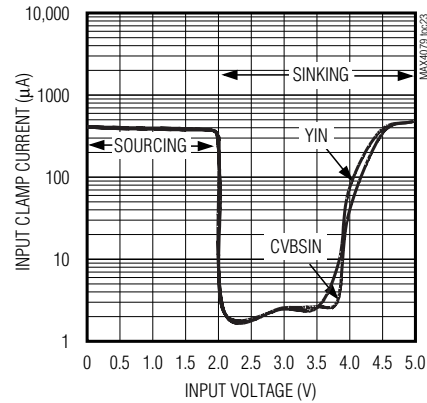
**AUDIO SUPPLY CURRENT vs. TEMPERATURE**



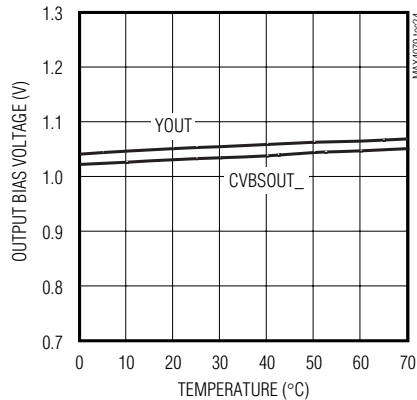
**INPUT CLAMP CURRENT vs. TEMPERATURE**



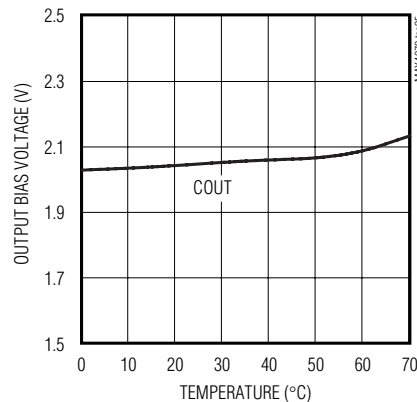
**INPUT CLAMP CURRENT vs. INPUT VOLTAGE**



**OUTPUT BIAS VOLTAGE vs. TEMPERATURE**



**OUTPUT BIAS VOLTAGE vs. TEMPERATURE**



# Complete Audio/Video Backend Solution

## Pin Description

| PIN   | NAME     | FUNCTION                                                                                                    |
|-------|----------|-------------------------------------------------------------------------------------------------------------|
| 1     | REXT     | External Filter Resistor. Bypass with a 10k $\Omega$ $\pm$ 1% resistor and a 0.1 $\mu$ F capacitor to GVID. |
| 2, 24 | VVID     | Video Power-Supply Input                                                                                    |
| 3     | CVBSIN   | Composite Video Input                                                                                       |
| 4, 21 | GVID     | Video Ground                                                                                                |
| 5     | YIN      | Luma Input                                                                                                  |
| 6     | CBYPASS  | Audio LDO Regulator Bypass Capacitor. Bypass with a 1 $\mu$ F capacitor to GAUD.                            |
| 7     | CIN      | Chroma Input                                                                                                |
| 8     | AUDV     | Audio Power-Supply Input                                                                                    |
| 9     | LINP     | Left-Channel Audio Positive Input                                                                           |
| 10    | LINN     | Left-Channel Audio Negative Input                                                                           |
| 11    | RINN     | Right-Channel Audio Negative Input                                                                          |
| 12    | RINP     | Right-Channel Audio Positive Input                                                                          |
| 13    | ROUT2    | Right-Channel Audio Output 2                                                                                |
| 14    | ROUT1    | Right-Channel Audio Output 1                                                                                |
| 15    | GAUD     | Audio Ground                                                                                                |
| 16    | MONO     | Mono Audio Output                                                                                           |
| 17    | LOUT2    | Left-Channel Audio Output 2                                                                                 |
| 18    | LOUT1    | Left-Channel Audio Output 1                                                                                 |
| 19    | COUT     | Chroma Video Output                                                                                         |
| 20    | YOUT     | Luma Video Output                                                                                           |
| 22    | CVBSOUT1 | Composite Video Output 1                                                                                    |
| 23    | CVBSOUT2 | Composite Video Output 2                                                                                    |

## Detailed Description

The MAX4079 filters and buffers video (NTSC/PAL/DVB) and stereo audio signals from the MPEG decoder of a cable/satellite receiver, VCR/DVD player, or a TV to an external load. The MAX4079 has luma-chroma (Y-C) and composite (CVBS) video inputs with one Y-C and two CVBS outputs. All video inputs are AC-coupled with internal DC biasing on the chroma input and active clamps for the luma and composite.

The MAX4079 video reconstruction filters have a 6MHz cutoff frequency and 50dB attenuation at 27MHz. The filters are matched, with flat group delay for standard-definition video. The video gain is fixed at +6dB to drive a 75 $\Omega$  back-terminated load (150 $\Omega$ ) to unity gain. The video outputs can be either DC- or AC-coupled and are powered by a single +5V supply.

The MAX4079 audio amplifiers have differential inputs for optimum performance, but can be used with single-ended sources with external biasing. The audio channels have a fixed gain of +6dB and deliver 2.6V<sub>RMS</sub> output with a differential input of  $\pm$ 1.85V. The audio

amplifiers operate from a +9V to +12V single supply and feature an internal bias generator. An on-chip mixer also provides a mono output, with +3dB gain, derived from the left and right audio channels.

### Video

The video section of the MAX4079 implements DC restore/biasing, amplification, and reconstruction filtering for the Y-C and CVBS input signals. All of the video inputs are AC-coupled. DC restore is performed using a sync tip clamp for both luma and composite video channels. The chroma DC level input is biased at the midlevel of the signal.

All video channels have a fixed gain of +6dB. The DC level at the video outputs is controlled so that coupling capacitors are not required.

All composite and luma video outputs are capable of driving 2.4V<sub>P-P</sub>, and the chroma output is capable of driving 1.8V<sub>P-P</sub> into 150 $\Omega$  resistive load to ground. Up to 35pF of load capacitance can be tolerated at each video output without stability or slew-rate issues.

# Complete Audio/Video Backend Solution

MAX4079

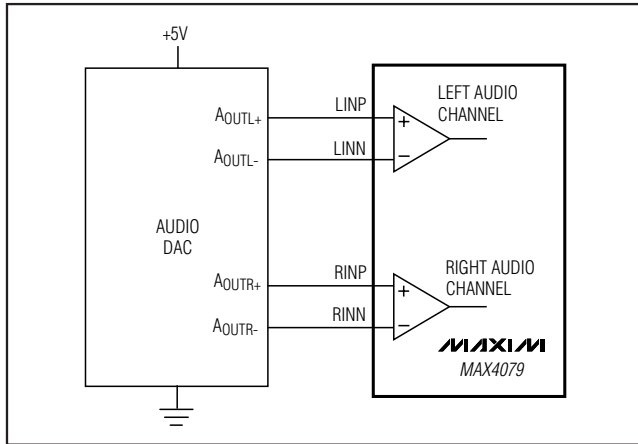


Figure 1. Differential Audio Inputs

All video inputs are stable with up to 150Ω source resistance. For higher values, consult Maxim applications.

## Video Reconstruction Filter

The MAX4079 reconstruction filters are 4th-order Butterworth filters that provide a cutoff frequency of 6MHz and flat group delay response up to 4.5MHz. The stopband offers 26dB of attenuation at 13.5MHz and 50dB at 27MHz.

## Audio

The audio section of the MAX4079 is a stereo amplifier with one differential input and two single-ended outputs for each channel (left and right). A mono output is provided by summing the two channels of the stereo signal together. The stereo channels have a +6dB typical gain, while the mono has a +3dB gain.

The audio inputs can be DC-coupled, eliminating space-consuming coupling capacitors. Each of the five outputs can deliver 2.6V<sub>RMS</sub> into an AC-coupled 10kΩ load.

## Applications Information

### Audio DAC Interfacing

#### Differential Audio DAC

The MAX4079 accepts differential audio signals. Figure 1 shows a typical configuration for connecting the device to an audio DAC with differential outputs. Figure 2 shows the reconstruction filters that can be used for the differential audio inputs. Carefully select resistors and capacitors to attenuate out-of-band noise and mini-

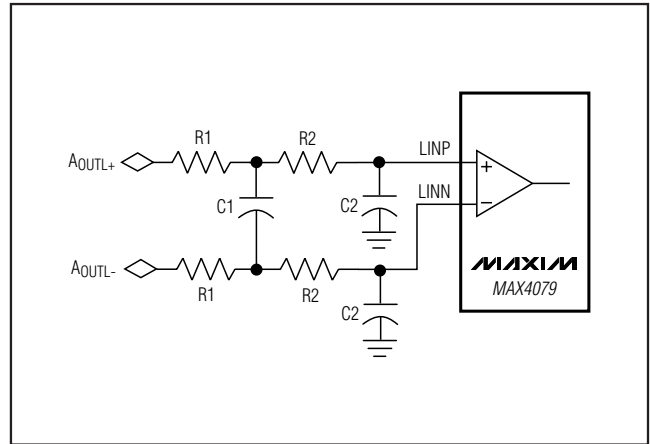


Figure 2. Filtering Differential Audio Inputs

mize the effect on the gain. The common-mode voltage for these signals is typically 2.5V.

### Single-Ended Audio DAC

The MAX4079 can also be configured for single-ended inputs. Figure 3 shows how to connect an audio DAC with single-ended outputs to the MAX4079. Figure 4 shows how reconstruction filters can be used for single-ended audio inputs. Choose these values to minimize the effect on gain.

If the single-ended audio DAC does not include a common-mode voltage output, create a bias point with well-matched resistors and couple the audio signal to the positive differential input (see Figure 5). The bias point can also be created using a resistor-divider network from the video supply voltage. Note that the tolerance of the resistors will affect the common-mode and power-supply rejection ratios. Tighter tolerances improve the performance of CMRR and PSRR, e.g., 1% resistors will not give any better than 40dB of CMRR and PSRR, whereas 0.1% resistors could improve the number to 60dB.

### Power Supplies and Bypassing

The MAX4079 features single +5V (video) and +12V (audio) supply operation, and requires no negative supply. Connect the VVID pins together and bypass to GVID with 0.01μF, 0.1μF, and 4.7μF capacitors in parallel. Bypass the AUDV to GAUD with 0.1μF, 1μF, and 47μF capacitors in parallel. Bypass CBYPASS to GAUD with a 1μF capacitor (see the *Typical Operating Circuit*).

# Complete Audio/Video Backend Solution

## Layout and Grounding

For optimal performance, stitch ground vias between the narrow adjacent signal traces to minimize crosstalk. Avoid running video traces parallel to high-speed data lines. The MAX4079 provides separate ground connections

for video and audio supplies. For best performance use separate ground planes for each of the ground returns, and connect all ground planes together at a single point. Refer to the MAX4079 Evaluation Kit for a proven circuit board layout example.

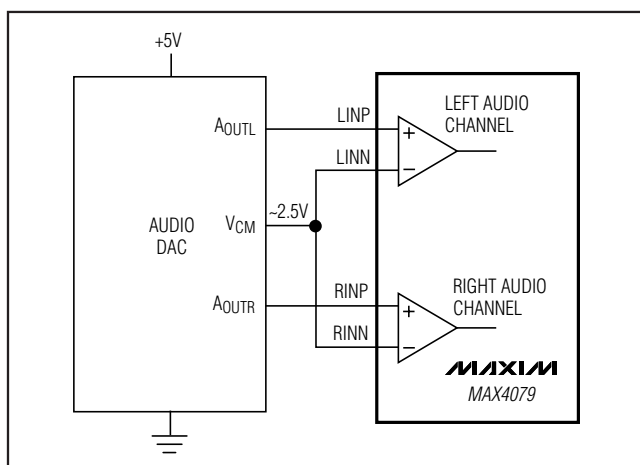


Figure 3. Single-Ended Audio Inputs

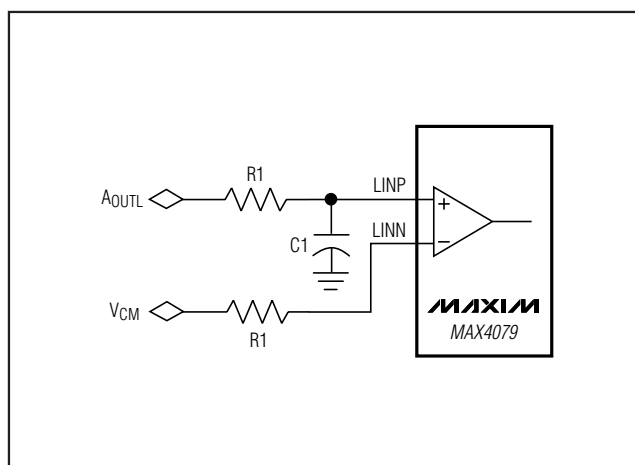


Figure 4. Filtering Single-Ended Audio Inputs

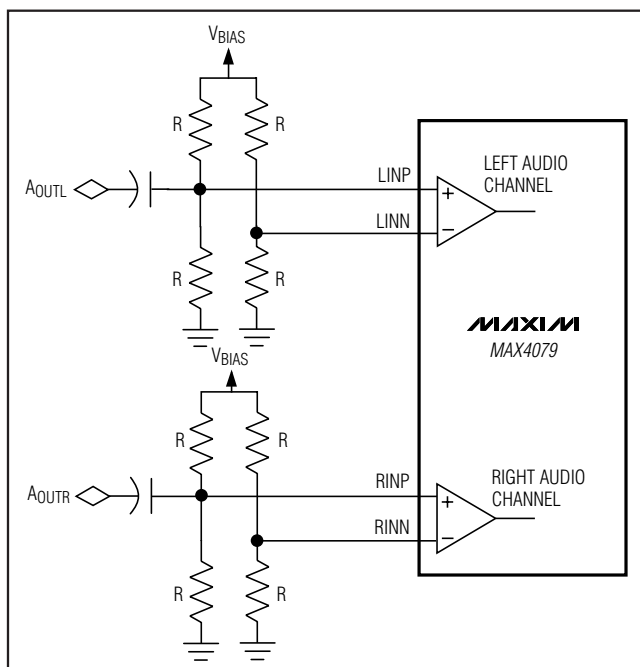


Figure 5. Biasing Single-Ended Audio Inputs

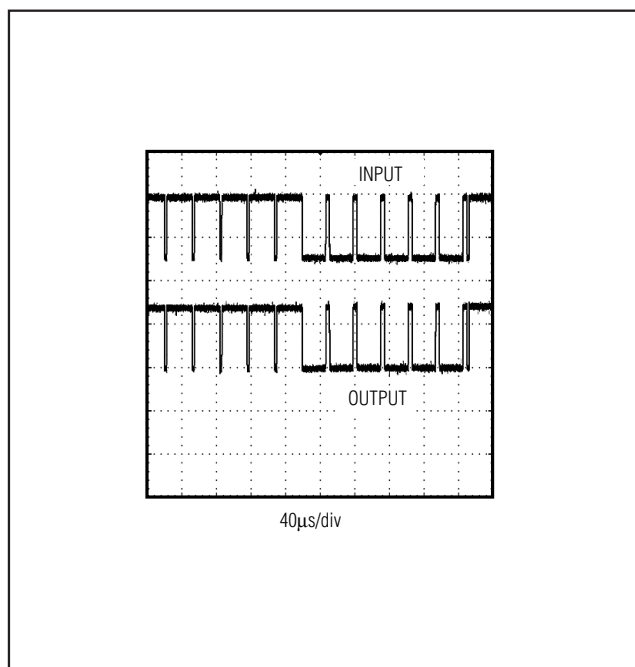
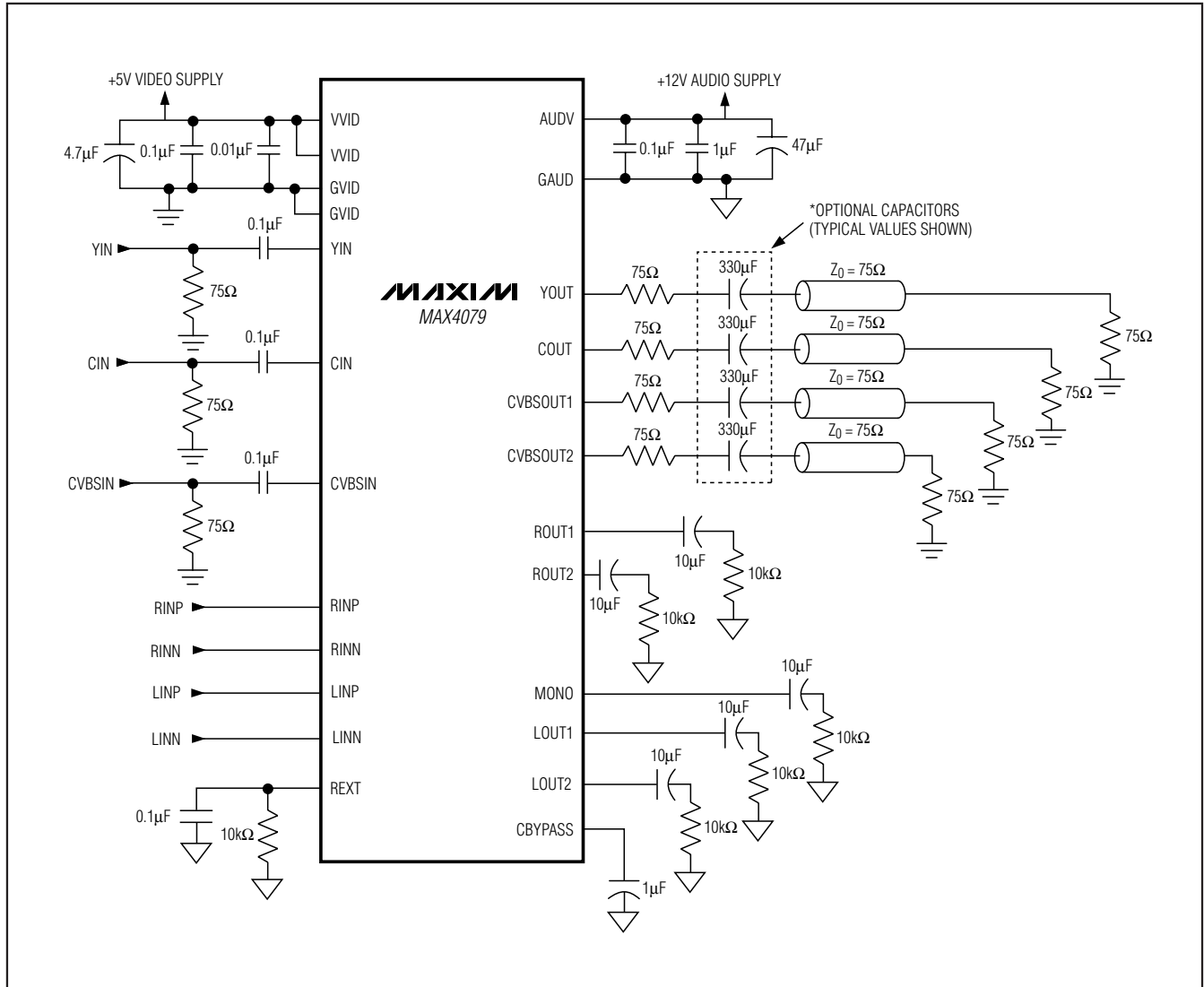


Figure 6. Vertical Sync Interval

# Complete Audio/Video Backend Solution

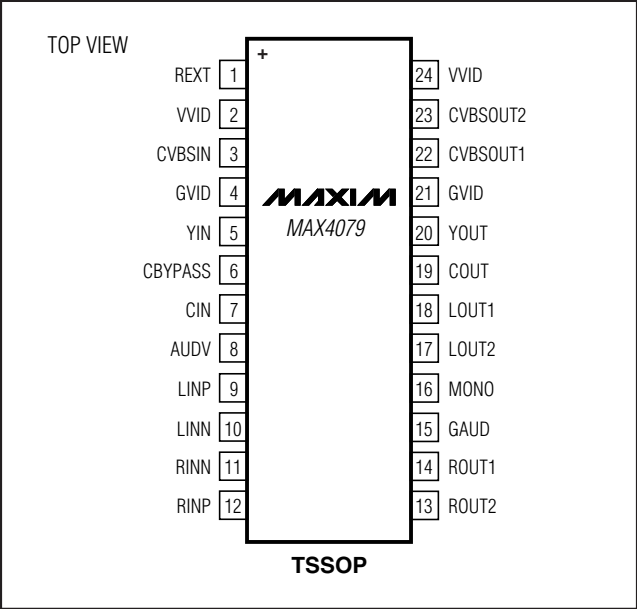
## Typical Operating Circuit

MAX4079



# Complete Audio/Video Backend Solution

## Pin Configuration



## Chip Information

PROCESS: BiCMOS

# Complete Audio/Video Backend Solution

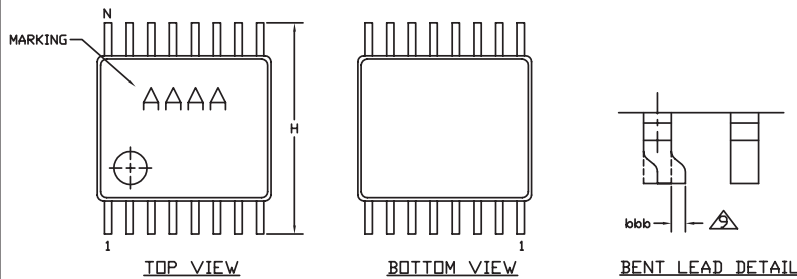
## Package Information

For the latest package outline information and land patterns, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).

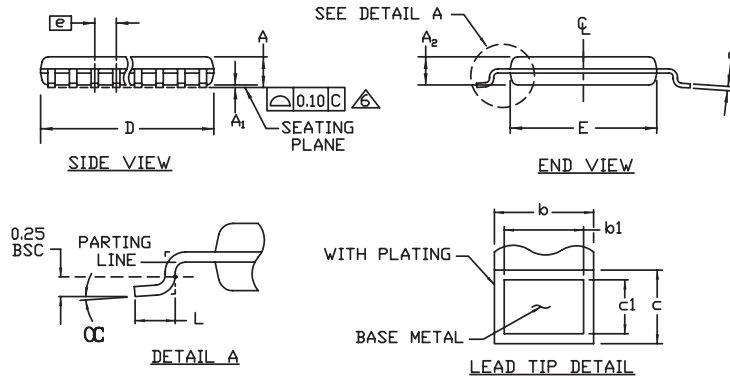
| PACKAGE TYPE | PACKAGE CODE | DOCUMENT NO.            |
|--------------|--------------|-------------------------|
| 24 TSSOP     | U24+1        | <a href="#">21-0066</a> |

MAX4079

TSSOP 4.40mm EPS



|                | COMMON DIMENSIONS |      |                |      |
|----------------|-------------------|------|----------------|------|
|                | MILLIMETERS       |      | INCHES         |      |
|                | MIN.              | MAX. | MIN.           | MAX. |
| A              | —                 | 1.10 | .002           | .043 |
| A <sub>1</sub> | 0.05              | 0.15 | .002           | .006 |
| A <sub>2</sub> | 0.85              | 0.95 | .033           | .037 |
| b              | 0.19              | 0.30 | .007           | .012 |
| b <sub>1</sub> | 0.19              | 0.25 | .007           | .010 |
| c              | 0.09              | 0.20 | .004           | .008 |
| c <sub>1</sub> | 0.09              | 0.14 | .004           | .006 |
| D              | SEE VARIATIONS    |      | SEE VARIATIONS |      |
| E              | 4.30              | 4.50 | .169           | .177 |
| e              | 0.65 BSC          |      | .026 BSC       |      |
| H              | 6.25              | 6.55 | .246           | .258 |
| L              | 0.50              | 0.70 | .020           | .028 |
| N              | SEE VARIATIONS    |      | SEE VARIATIONS |      |
| α              | 0°                | 8°   | 0°             | 8°   |
| bbb            | 0.10 MAX          |      |                |      |



### NOTES

- DIMENSIONS D AND E DO NOT INCLUDE FLASH
- MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm PER SIDE
- CONTROLLING DIMENSION: MILLIMETER
- MEETS JEDEC OUTLINE MD-153. SEE JEDEC VARIATIONS TABLE
- "N" REFERS TO NUMBER OF LEADS
- LEAD COPLANARITY 0.10 MM MAX.
- NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY
- MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY
- BENT LEAD 0.10 MM MAX.
- ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PBFREE (+) PKG. CODES.

—DRAWING NOT TO SCALE—

| JEDEC<br>MD-153 | N  | PKG.<br>CODES               | VARIATIONS  |      |        |      |
|-----------------|----|-----------------------------|-------------|------|--------|------|
|                 |    |                             | MILLIMETERS |      | INCHES |      |
|                 |    |                             | MIN.        | MAX. | MIN.   | MAX. |
| AB-1            | 14 | D U14-1;<br>U14-2           | 4.90        | 5.10 | .193   | .201 |
| AB              | 16 | D U16-1;<br>U16-2           | 4.90        | 5.10 | .193   | .201 |
| AC              | 20 | D U20-2;<br>U20M-2<br>U20-3 | 6.40        | 6.60 | .252   | .260 |
| AD              | 24 | D U24-1                     | 7.70        | 7.90 | .303   | .311 |
| AE              | 28 | D U28-1;<br>U28-2;<br>U28-3 | 9.60        | 9.80 | .378   | .386 |

**MAXIM**

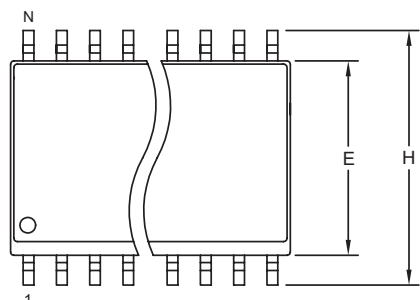
TITLE:  
PACKAGE OUTLINE,  
TSSOP 4.40mm BODY

| APPROVAL | DOCUMENT CONTROL NO. | REV. | 1/1 |
|----------|----------------------|------|-----|
|          | 21-0066              | J    |     |

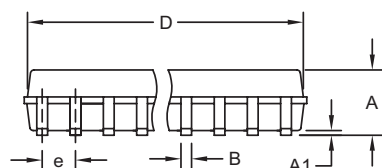
# Complete Audio/Video Backend Solution

## Package Information (continued)

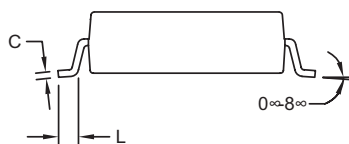
For the latest package outline information and land patterns, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).



TOP VIEW



FRONT VIEW



SIDE VIEW

### NOTES:

1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS013.
6. N = NUMBER OF PINS.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.093  | 0.104 | 2.35        | 2.65  |
| A1  | 0.004  | 0.012 | 0.10        | 0.30  |
| B   | 0.014  | 0.019 | 0.35        | 0.49  |
| C   | 0.009  | 0.013 | 0.23        | 0.32  |
| e   | 0.050  |       | 1.27        |       |
| E   | 0.291  | 0.299 | 7.40        | 7.60  |
| H   | 0.394  | 0.419 | 10.00       | 10.65 |
| L   | 0.016  | 0.050 | 0.40        | 1.27  |

### VARIATIONS:

| DIM | INCHES |       | MILLIMETERS |       | N  | MS013 |
|-----|--------|-------|-------------|-------|----|-------|
|     | MIN    | MAX   | MIN         | MAX   |    |       |
| D   | 0.398  | 0.413 | 10.10       | 10.50 | 16 | AA    |
| D   | 0.447  | 0.463 | 11.35       | 11.75 | 18 | AB    |
| D   | 0.496  | 0.512 | 12.60       | 13.00 | 20 | AC    |
| D   | 0.598  | 0.614 | 15.20       | 15.60 | 24 | AD    |
| D   | 0.697  | 0.713 | 17.70       | 18.10 | 28 | AE    |

|                                                                                                                      |                      |                                                                                       |     |
|----------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------|-----|
|  <b>DALLAS</b><br>SEMICONDUCTOR |                      |  |     |
| PROPRIETARY INFORMATION                                                                                              |                      |                                                                                       |     |
| TITLE:                                                                                                               |                      |                                                                                       |     |
| PACKAGE OUTLINE, .300" SOIC                                                                                          |                      |                                                                                       |     |
| APPROVAL                                                                                                             | DOCUMENT CONTROL NO. | REV.                                                                                  | 1/1 |
|                                                                                                                      | 21-0042              | B                                                                                     |     |

SOICWEP5

# Complete Audio/Video Backend Solution

## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION                               | PAGES<br>CHANGED |
|--------------------|------------------|-------------------------------------------|------------------|
| 0                  | 8/05             | Initial release                           | —                |
| 1                  | 3/09             | Changes to remove SO package, style edits | 1–7, 12, 13, 14  |

MAX4079

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

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