19-2758; Rev 1; 11/09

MAXIM

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

MAX4023–MAX4026

## General Description

The MAX4023–MAX4026 family of voltage feedback multiplexer-amplifiers combine low-glitch switching and excellent video specifications with fixed or settable gain. The MAX4024/MAX4026 are triple and quad 2:1 multiplexers, respectively, with amplifiers that have a fixed gain of +2. The MAX4023/MAX4025 are triple and quad 2:1 multiplexers, respectively, with adjustable gain amplifiers optimized for unity-gain stability. All devices have 25ns channel switching time and low 10mV$_{P-P}$ switching transients, making them ideal for high-speed video-switching applications. These devices operate from a single +4.5V to +11V supply or from dual supplies of ±2.25V to ±5.5V, and feature an input common-mode voltage range that extends to the negative supply rail. A low-power disable mode places the output in a high-impedance state.

The MAX4023/MAX4025 have -3dB bandwidths of 260MHz and up to 330V/µs slew rates with a settable gain to equalize long cable runs. The MAX4024/MAX4026, with 200MHz -3dB bandwidths and 363V/µs slew rates, have a fixed gain of +2 for driving short back-terminated cables. The MAX4023/MAX4025 internal amplifiers maintain an open-loop output impedance of only 18Ω over the full output voltage range, and minimize the gain error and bandwidth changes under loads typical of most rail-to-rail amplifiers. These devices are ideal for broadcast video applications with differential gain and phase errors of 0.07% and 0.07°, respectively.

## Applications

Set-Top Boxes
In-Car Navigation/Entertainment
Servers
Security Systems
Video Projectors
Notebook Computers
Broadcast Video
Video Crosspoint Switching

## Features

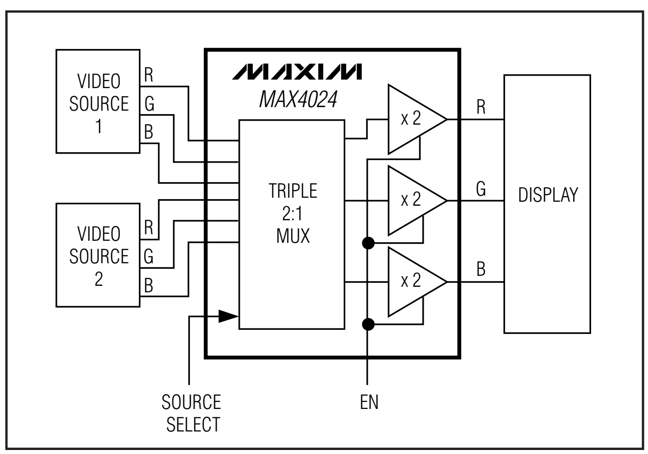
- ♦ **Single +5V or Dual ±5V Operation**
- ♦ **260MHz -3dB Bandwidth (MAX4023/MAX4025)**
- ♦ **200MHz -3dB Bandwidth (MAX4024/MAX4026)**
- ♦ **363V/µs Slew Rate (MAX4024/MAX4026)**
- ♦ **25ns Channel Switching Time**
- ♦ **Ultra-Low 20mV$_{P-P}$ Switching Transient**
- ♦ **0.012%/0.05° Differential Gain/Phase Error**
- ♦ **Input Common-Mode Range Includes Negative Rail (MAX4023/MAX4025)**
- ♦ **Low-Power Disable Mode**
- ♦ **Available in Space-Saving 14-Pin TSSOP and 16-Pin QSOP Packages**

## Ordering Information

| PART | TEMP RANGE | PIN-PACKAGE |
|---|---|---|
| **MAX4023**EEE | -40°C to +85°C | 16 QSOP |
| MAX4023ESE | -40°C to +85°C | 16 Narrow SO |
| **MAX4024**EUD | -40°C to +85°C | 14 TSSOP |
| MAX4024ESD | -40°C to +85°C | 14 Narrow SO |
| **MAX4025**EUP | -40°C to +85°C | 20 TSSOP |
| MAX4025EWP | -40°C to +85°C | 20 Wide SO |
| **MAX4026**EUP | -40°C to +85°C | 20 TSSOP |
| MAX4026EWP | -40°C to +85°C | 20 Wide SO |

***Selector Guide and Pin Configurations appear at end of data sheet.***

## Typical Operating Circuit



## ABSOLUTE MAXIMUM RATINGS

Supply Voltage ($V_{CC}$ to $V_{EE}$) .................................................12V
IN_A, IN_B, FB_ ...............................($V_{EE}$ - 0.3V) to ($V_{CC}$ + 0.3V)
REF, EN, A/B ...................................($V_{EE}$ - 0.3V) to ($V_{CC}$ + 0.3V)
Current Into IN_A, IN_B, FB_ ...........................................±20mA
Short-Circuit Duration (OUT_ to GND or $V_{EE}$) ...........Continuous
Short-Circuit Duration (OUT_ to $V_{CC}$) .............................(Note 1)
Continuous Power Dissipation ($T_A$ = +70°C)
14-Pin TSSOP (derate 9.1mW/°C above +70°C) .........727mW
14-Pin Narrow SO (derate 8.3mW/°C above +70°C) ...667mW
16-Pin QSOP (derate 8.3mW/°C above +70°C)...........667mW
16-Pin Narrow SO (derate 8.7mW/°C above +70°C) ...696mW
20-Pin TSSOP (derate 10.9mW/°C above +70°C) .......879mW
20-Pin Wide SO (derate 10mW/°C above +70°C)........800mW
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

**Note 1:** Do not short OUT_ to $V_{CC}$.

*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—Dual Supply

($V_{CC}$ = +5V, $V_{EE}$ = -5V, $R_L$ = ∞, EN = +5V, $V_{CM}$ = REF = OUT_ = 0V, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Operating Supply Voltage Range | $V_S$ | Guaranteed by PSRR | | ±2.25 | | ±5.5 | V |
| Quiescent Supply Current | $I_S$ | OUT = 0V | MAX4023/MAX4024 | | 25 | 36 | mA |
| | | | MAX4025/MAX4026 | | 34 | 48 | |
| Disable Supply Current | | EN = 0V | MAX4023/MAX4024 | | 3.6 | 6 | mA |
| | | | MAX4025/MAX4026 | | 4.4 | 6 | |
| Input Voltage Range | $V_{IN}$ | MAX4023/MAX4025, inferred from CMRR | | $V_{EE}$ | | $V_{CC}$ - 2.8 | V |
| | | MAX4024/MAX4026, inferred from $A_{VCL}$ | | $V_{EE}$ + 2.9 | | $V_{CC}$ - 2.8 | |
| Input Offset Voltage | $V_{OS}$ | MAX4023/MAX4025 | | | ±0.5 | ±15 | mV |
| | | MAX4024/MAX4026 | | | ±1 | ±18 | |
| Input Offset Voltage Matching | $\Delta V_{OS}$ | MAX4023/MAX4025 | | | ±1 | | mV |
| | | MAX4024/MAX4026 | | | ±1.5 | | |
| Input Offset Voltage Drift | $TC_{VOS}$ | MAX4023/MAX4025 | | | 15 | | µV°C |
| | | MAX4024/MAX4026 | | | 23 | | |
| Input Bias Current | $I_B$ | | | | 4 | 14 | µA |
| Input Offset Current | $I_{OS}$ | MAX4023/MAX4025 | | | ±0.1 | ±2 | µA |
| Differential Input Resistance | $R_{IND}$ | MAX4023/MAX4025, -10mV < $V_{IND}$ < +10mV | | | 50 | | kΩ |
| Input Resistance | $R_{IN}$ | MAX4023/MAX4025, common mode | | | 4.5 | | MΩ |
| | | MAX4024/MAX4026, single ended | | | 4.5 | | |
| Output Resistance | $R_{OUT}$ | MAX4023/MAX4025 | Open loop | | 18 | | Ω |
| | | | Closed loop, $A_{VCL}$ = +1 | | 0.025 | | |
| | | MAX4024/MAX4026 | | | 0.15 | | |

## DC ELECTRICAL CHARACTERISTICS—Dual Supply (continued)

($V_{CC}$ = +5V, $V_{EE}$ = -5V, $R_L$ = ∞, EN = +5V, $V_{CM}$ = REF = OUT_ = 0V, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Disable Output Resistance | $R_{OUT}$ | MAX4023/MAX4025, EN = 0V | | 75 | | kΩ |
| | | MAX4024/MAX4026, EN = 0V | | 1 | | |
| Power-Supply Rejection Ratio | PSRR | ±2.25V < $V_S$ < ±5.5V | 50 | 64 | | dB |
| Common-Mode Rejection Ratio | CMRR | MAX4023/MAX4025, $V_{EE}$ < $V_{CM}$ < $V_{CC}$ - 2.8V | 50 | 68 | | dB |
| Open-Loop Gain | $A_{VOL}$ | MAX4023/MAX4025, $R_L$ = 150Ω, -4.3V < $V_{OUT}$ < +4.3V | 70 | 85 | | dB |
| Voltage Gain | $A_{VCL}$ | MAX4024/MAX4026, $R_L$ = 150Ω, $V_{EE}$ + 2.9V < $V_{IN}$ < $V_{CC}$ - 2.8V | 5.5 | 6.0 | 6.5 | dB |
| Gain Matching | $\Delta A_{VCL}$ | MAX4024/MAX4026 | | 1 | | % |
| Output Voltage Swing | $V_{OUT}$ | MAX4023/MAX4025, $R_L$ = 150Ω | $V_{CC}$ - 0.7 | $V_{CC}$ - 0.5 | | V |
| | | | | $V_{EE}$ + 0.5 | $V_{EE}$ + 0.7 | |
| | | MAX4023/MAX4025, $R_L$ = 75Ω | $V_{CC}$ - 1.2 | $V_{CC}$ - 0.8 | | |
| | | | | $V_{EE}$ + 0.8 | $V_{EE}$ + 1.2 | |
| | | MAX4024/MAX4026, $R_L$ = 150Ω | $V_{CC}$ - 0.7 | $V_{CC}$ - 0.5 | | |
| | | | | $V_{EE}$ + 0.3 | $V_{EE}$ + 0.7 | |
| | | MAX4024/MAX4026, $R_L$ = 75Ω | $V_{CC}$ - 1.2 | $V_{CC}$ - 0.8 | | |
| | | | | $V_{EE}$ + 0.5 | $V_{EE}$ + 1.2 | |
| **LOGIC INPUT CHARACTERISTICS** | | | | | | |
| Logic-Low Threshold | $V_{IL}$ | EN, A/B | | | $V_{CC}$ - 3.85 | V |
| Logic-High Threshold | $V_{IH}$ | EN, A/B | $V_{CC}$ - 3.3 | | | V |
| Logic-Low Input Current | $I_{IL}$ | EN, A/B; EN or A/B = 0V | | 5 | 10 | µA |
| Logic-High Input Current | $I_{IH}$ | EN, A/B; EN or A/B = $V_{CC}$ | | 2 | 8 | µA |

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

## DC ELECTRICAL CHARACTERISTICS—Single Supply

($V_{CC}$ = +5V, $V_{EE}$ = 0V, $R_L$ = ∞, EN = +5V, $V_{CM}$ = REF = OUT = 0.5V, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Operating Supply Voltage Range | $V_S$ | Guaranteed by PSRR | 4.5 | | 11 | V |
| Quiescent Supply Current | $I_S$ | MAX4023/MAX4024, OUT = 0V | | 19 | 32 | mA |
| | | MAX4025/MAX4026, OUT = 0V | | 31 | 43 | |
| Disable Supply Current | | MAX4023/MAX4024, EN = 0V | | 3.3 | 6 | mA |
| | | MAX4025/MAX4026, EN = 0V | | 3.9 | 6 | |
| Input Voltage Range | $V_{IN}$ | MAX4023/MAX4025, inferred from CMRR | $V_{EE}$ | | $V_{CC}$ - 2.8 | V |
| | | MAX4024/MAX4026, inferred from $A_{VCL}$ | $V_{EE}$ + 0.28 | | $V_{CC}$ - 2.8 | |
| Input Offset Voltage | $V_{OS}$ | MAX4023/MAX4025 | | ±1 | ±18 | mV |
| | | MAX4024/MAX4026 | | ±3 | ±20 | |
| Input Offset Voltage Matching | $\Delta V_{OS}$ | MAX4023/MAX4025 | | ±1 | | mV |
| | | MAX4024/MAX4026 | | ±1.5 | | |
| Input Offset Voltage Drift | $TC_{VOS}$ | MAX4023/MAX4025 | | 9 | | µV°C |
| | | MAX4024/MAX4026 | | 13 | | |
| Input Bias Current | $I_B$ | | | 4.5 | 14 | µA |
| Input Offset Current | $I_{OS}$ | MAX4023/MAX4025 | | ±0.1 | ±2 | µA |
| Differential Input Resistance | $R_{IND}$ | MAX4023/MAX4025, -10mV < $V_{IND}$ < +10mV | | 50 | | kΩ |
| Input Resistance | $R_{IN}$ | MAX4023/MAX4025, common mode | | 4.5 | | MΩ |
| | | MAX4024/MAX4026, single ended | | 4.5 | | |
| Output Resistance | $R_{OUT}$ | MAX4023/MAX4025, Open loop | | 18 | | Ω |
| | | MAX4023/MAX4025, Closed loop, $A_{VCL}$ = +1 | | 0.025 | | |
| | | MAX4024/MAX4026 | | 0.15 | | |
| Disable Output Resistance | $R_{OUT}$ | MAX4023/MAX4025, EN = 0V | | 75 | | kΩ |
| | | MAX4024/MAX4026, EN = 0V | | 1 | | |
| Power-Supply Rejection Ratio | PSRR | ±4.5V < $V_S$ < ±11V | 50 | 64 | | dB |
| Common-Mode Rejection Ratio | CMRR | MAX4023/MAX4025, $V_{EE}$ < $V_{CM}$ < $V_{CC}$ - 2.8V | 50 | 91 | | dB |
| Open-Loop Gain | $A_{VOL}$ | MAX4023/MAX4025, $R_L$ = 150Ω, 0.3V < $V_{OUT}$ < 4.3V | 70 | 85 | | dB |
| Voltage Gain | $A_{VCL}$ | MAX4024/MAX4026, $R_L$ = 150Ω, $V_{EE}$ + 0.28V < $V_{IN}$ < $V_{CC}$ - 2.8V | 5.5 | 6.0 | 6.5 | dB |
| Gain Matching | $\Delta A_{VCL}$ | MAX4024/MAX4026 | | 1 | | % |

## DC ELECTRICAL CHARACTERISTICS—Single Supply (continued)

($V_{CC}$ = +5V, $V_{EE}$ = 0V, $R_L$ = ∞, EN = +5V, $V_{CM}$ = REF = OUT = 0.5V, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Output Voltage Swing | $V_{OUT}$ | MAX4023/MAX4025 | $R_L$ = 150Ω to GND | $V_{CC}$ - 1.1 | $V_{CC}$ - 0.5 | | V |
| | | | | | $V_{EE}$ + 0.03 | $V_{EE}$ + 0.175 | |
| | | | $R_L$ = 75Ω to GND | $V_{CC}$ - 1.1 | $V_{CC}$ - 0.8 | | |
| | | | | | $V_{EE}$ + 0.03 | $V_{EE}$ + 0.175 | |
| | | MAX4024/MAX4026 | $R_L$ = 150Ω to GND | $V_{CC}$ - 1.1 | $V_{CC}$ - 0.5 | | |
| | | | | | $V_{EE}$ + 0.03 | $V_{EE}$ + 0.09 | |
| | | | $R_L$ = 75Ω to GND | $V_{CC}$ - 1.1 | $V_{CC}$ - 0.8 | | |
| | | | | | $V_{EE}$ + 0.04 | $V_{EE}$ + 0.08 | |
| **LOGIC INPUT CHARACTERISTICS** | | | | | | | |
| Logic-Low Threshold | $V_{IL}$ | EN, A/B | | | | $V_{CC}$ - 3.85 | V |
| Logic-High Threshold | $V_{IH}$ | EN, A/B | | $V_{CC}$ - 3.3 | | | V |
| Logic-Low Input Current | $I_{IL}$ | EN, A/B; EN or A/B = 0V | | | 5 | 10 | µA |
| Logic-High Input | $I_{IH}$ | EN, A/B; EN or A/B = $V_{CC}$ | | | 2 | 8 | µA |

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

## AC ELECTRICAL CHARACTERISTICS—Dual Supply

($V_{CC}$ = +5V, $V_{EE}$ = -5V, $R_{IN}$ = 75Ω to GND, $R_L$ = 150Ω to GND, EN = +5V, $V_{CM}$ = 0V, REF = 0V, $A_{VCL}$ = +1 (MAX4023/MAX4025). Typical values are at $T_A$ = +25°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Small-Signal -3dB Bandwidth | $BW_{SS}$ | $V_{OUT}$ = 100m$V_{P-P}$ | MAX4023/MAX4025 | | 260 | | MHz |
| | | | MAX4024/MAX4026 | | 200 | | |
| Large-Signal -3dB Bandwidth | $BW_{LS}$ | $V_{OUT}$ = 2$V_{P-P}$ | MAX4023/MAX4025 | | 85 | | MHz |
| | | | MAX4024/MAX4026 | | 110 | | |
| Small-Signal 0.1dB Gain-Flatness Bandwidth | $BW_{0.1dBSS}$ | $V_{OUT}$ = 100m$V_{P-P}$ | MAX4023/MAX4025 | | 30 | | MHz |
| | | | MAX4024/MAX4026 | | 32 | | |
| Large-Signal 0.1dB Gain-Flatness Bandwidth | $BW_{0.1dBLS}$ | $V_{OUT}$ = 2$V_{P-P}$ | MAX4023/MAX4025 | | 22 | | MHz |
| | | | MAX4024/MAX4026 | | 24 | | |
| Slew Rate | SR | $V_{OUT}$ = 2$V_{P-P}$ | MAX4023/MAX4025 | | 300 | | V/µs |
| | | | MAX4024/MAX4026 | | 363 | | |
| Settling Time to 0.1% | $t_S$ | $V_{OUT}$ = 2V step | MAX4023/MAX4025 | | 32 | | ns |
| | | | MAX4024/MAX4026 | | 32 | | |
| Power-Supply Rejection Ratio | PSRR | f = 100kHz | | | 60 | | dB |
| Output Impedance | | f = 10MHz | | | 1.5 | | Ω |
| Differential Gain Error | DG | NTSC, PAL, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 0.012 | | % |
| | | | MAX4024/MAX4026 | | 0.015 | | |
| Differential Phase Error | DP | NTSC, PAL, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 0.05 | | Degrees |
| | | | MAX4024/MAX4026 | | 0.077 | | |
| Group Delay | D/dT | f = 3.58MHz or 4.43MHz, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 1.6 | | ns |
| | | | MAX4024/MAX4026 | | 1.8 | | |
| Peak Signal to RMS Noise | SNR | $V_{OUT}$ = 2$V_{P-P}$, 10MHz BW, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 90 | | dB |
| | | | MAX4024/MAX4026 | | 86 | | |
| Crosstalk | | f = 10MHz | | | -61 | | dB |
| **SWITCHING CHARACTERISTICS** | | | | | | | |
| Channel Switching Time | $t_{SW}$ | MAX4023/MAX4025 | | | 25 | | ns |
| | | MAX4024/MAX4026 | | | 25 | | |
| Enable Time | $t_{ON}$ | $V_{IN}$ = 0.5V | | | 60 | | ns |
| Disable Time | $t_{OFF}$ | $V_{IN}$ = 0.5V | | | 0.45 | | µs |
| Switching Transient | | MAX4023/MAX4025 | | | 20 | | m$V_{P-P}$ |
| | | MAX4024/MAX4026 | | | 20 | | |

## AC ELECTRICAL CHARACTERISTICS—Single Supply

($V_{CC}$ = +5V, $V_{EE}$ = 0V, $R_{IN}$ = 75Ω to $V_{CM}$, $R_L$ = 150Ω to GND, EN = +5V, $V_{CM}$ = 0.5V, REF = $V_{CM}$, $A_{VCL}$ = +1 (MAX4023/MAX4025). Typical values are at $T_A$ = +25°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Small-Signal -3dB Bandwidth | $BW_{SS}$ | $V_{OUT}$ = 100mV$_{P-P}$ | MAX4023/MAX4025 | | 260 | | MHz |
| | | | MAX4024/MAX4026 | | 200 | | |
| Large-Signal -3dB Bandwidth | $BW_{LS}$ | $V_{OUT}$ = 2V$_{P-P}$ | MAX4023/MAX4025 | | 83 | | MHz |
| | | | MAX4024/MAX4026 | | 110 | | |
| Small-Signal 0.1dB Gain-Flatness Bandwidth | $BW_{0.1dBSS}$ | $V_{OUT}$ = 100mV$_{P-P}$ | MAX4023/MAX4025 | | 40 | | MHz |
| | | | MAX4024/MAX4026 | | 44 | | |
| Large-Signal 0.1dB Gain-Flatness Bandwidth | $BW_{0.1dBLS}$ | $V_{OUT}$ = 2V$_{P-P}$ | MAX4023/MAX4025 | | 22 | | MHz |
| | | | MAX4024/MAX4026 | | 25 | | |
| Slew Rate | SR | $V_{OUT}$ = 2V$_{P-P}$ | MAX4023/MAX4025 | | 300 | | V/µs |
| | | | MAX4024/MAX4026 | | 363 | | |
| Settling Time to 0.1% | $t_S$ | $V_{OUT}$ = 2V step | MAX4023/MAX4025 | | 32 | | ns |
| | | | MAX4024/MAX4026 | | 32 | | |
| Power-Supply Rejection Ratio | PSRR | f = 100kHz | | | 60 | | dB |
| Output Impedance | | f = 10MHz | | | 1.5 | | Ω |
| Differential Gain Error | DG | NTSC, PAL, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 0.016 | | % |
| | | | MAX4024/MAX4026 | | 0.02 | | |
| Differential Phase Error | DP | NTSC, PAL, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 0.054 | | Degrees |
| | | | MAX4024/MAX4026 | | 0.085 | | |
| Group Delay | D/dT | f = 3.58MHz or 4.43MHz, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 1.6 | | ns |
| | | | MAX4024/MAX4026 | | 1.9 | | |
| Peak Signal to RMS Noise | SNR | $V_{OUT}$ = 2V$_{P-P}$, 10MHz BW, $A_{VCL}$ = +2 | MAX4023/MAX4025 | | 90 | | dB |
| | | | MAX4024/MAX4026 | | 86 | | |
| Crosstalk | | f = 10MHz | | | -61 | | dB |
| **SWITCHING CHARACTERISTICS** | | | | | | | |
| Channel Switching Time | $t_{SW}$ | MAX4023/MAX4025 | | | 25 | | ns |
| | | MAX4024/MAX4026 | | | 25 | | |
| Enable Time | $t_{ON}$ | $V_{IN}$ = 0.5V | | | 90 | | ns |
| Disable Time | $t_{OFF}$ | $V_{IN}$ = 0.5V | | | 0.45 | | µs |
| Switching Transient | | MAX4023/MAX4025 | | | 10 | | mV$_{P-P}$ |
| | | MAX4024/MAX4026 | | | 10 | | |

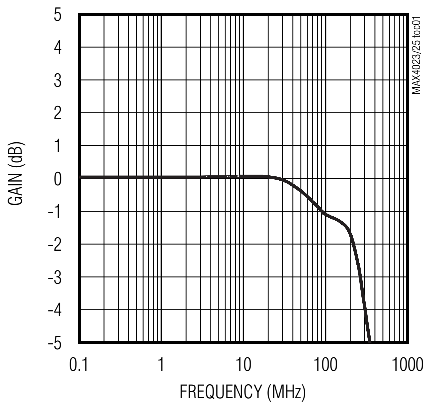
**Note 2:** All devices are 100% production tested at $T_A$ = +25°C. Specifications over temperature are guaranteed by design.

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

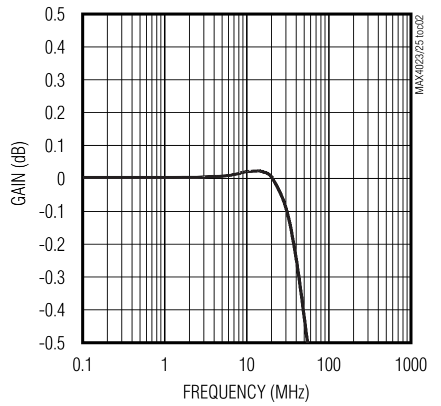
## Typical Operating Characteristics—±5V Dual Supply

($V_{CC}$ = +5V, $V_{EE}$ = -5V, $V_{CM}$ = REF = 0V, EN = +5V, $R_{IN}$ = 75Ω to GND, $R_L$ = 150Ω to GND, $A_{VCL}$ = +1V/V (MAX4023/MAX4025), $A_{VCL}$ = +2V/V (MAX4024/MAX4026), $T_A$ = +25°C, unless otherwise noted.)

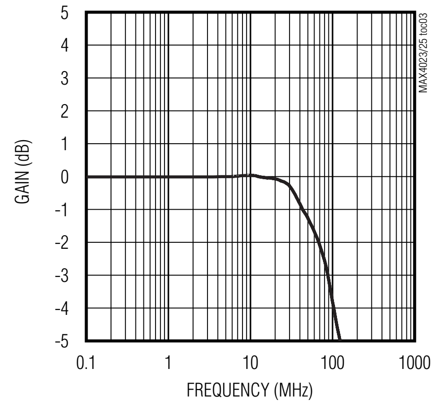
**MAX4023/MAX4025**
**SMALL-SIGNAL BANDWIDTH vs. FREQUENCY**



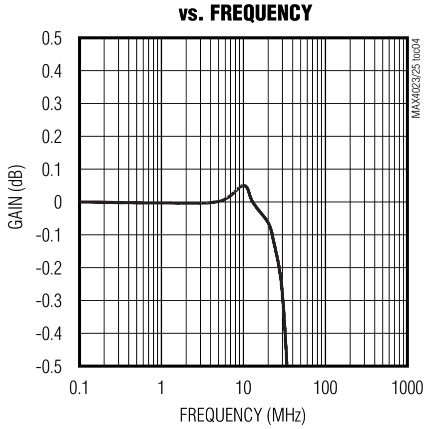

**MAX4023/MAX4025**
**SMALL-SIGNAL GAIN FLATNESS vs. FREQUENCY**



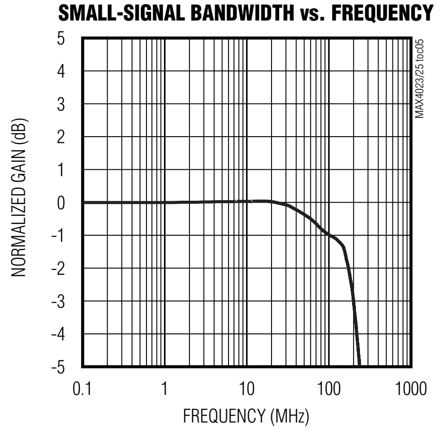

**MAX4023/MAX4025**
**LARGE-SIGNAL BANDWIDTH vs. FREQUENCY**



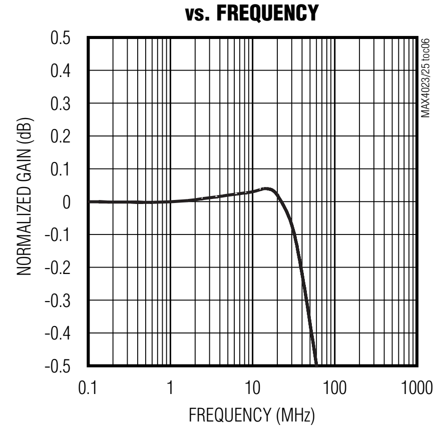

**MAX4023/MAX4025**
**LARGE-SIGNAL GAIN FLATNESS**
**vs. FREQUENCY**



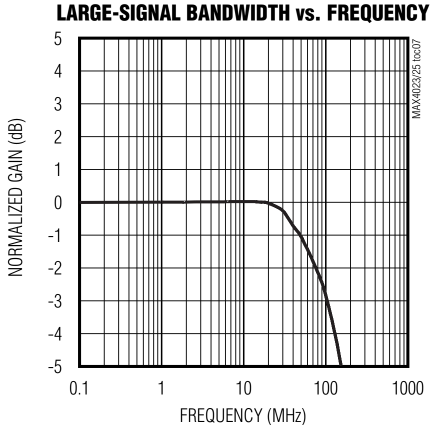

**MAX4024/MAX4026**
**SMALL-SIGNAL BANDWIDTH vs. FREQUENCY**



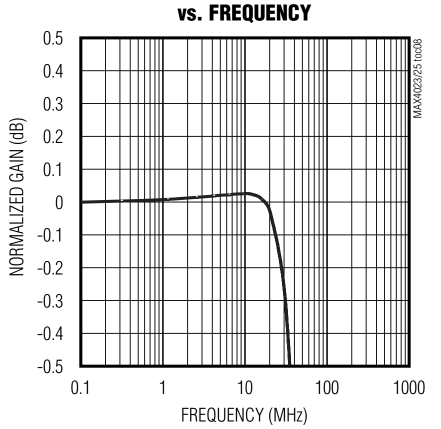

**MAX4024/MAX4026**
**SMALL-SIGNAL GAIN FLATNESS**
**vs. FREQUENCY**



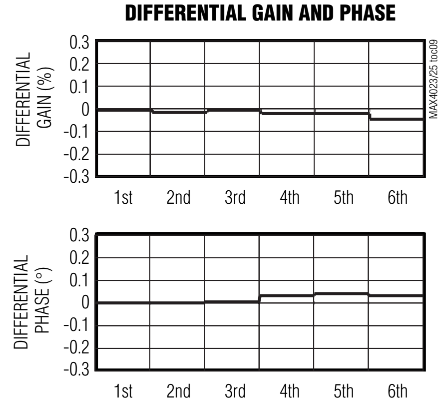

**MAX4024/MAX4026**
**LARGE-SIGNAL BANDWIDTH vs. FREQUENCY**




**MAX4024/MAX4026**
**LARGE-SIGNAL GAIN FLATNESS**
**vs. FREQUENCY**




**MAX4023/MAX4025**
**DIFFERENTIAL GAIN AND PHASE**

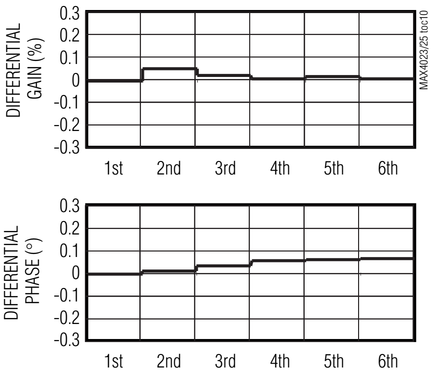


# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

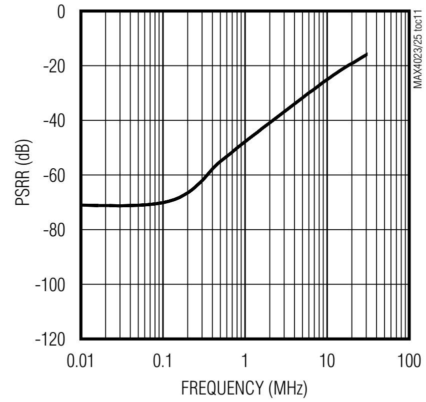
## Typical Operating Characteristics—±5V Dual Supply (continued)

($V_{CC}$ = +5V, $V_{EE}$ = -5V, $V_{CM}$ = REF = 0V, EN = +5V, $R_{IN}$ = 75Ω to GND, $R_L$ = 150Ω to GND, $A_{VCL}$ = +1V/V (MAX4023/MAX4025), $A_{VCL}$ = +2V/V (MAX4024/MAX4026), $T_A$ = +25°C, unless otherwise noted.)

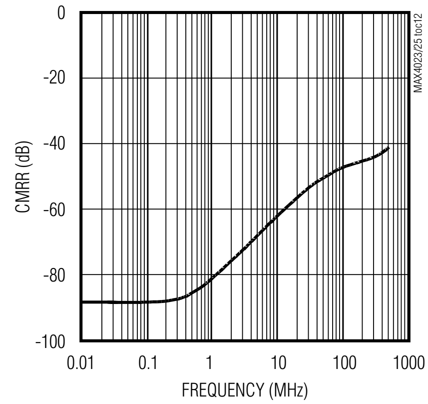
**MAX4024/MAX4026 DIFFERENTIAL GAIN AND PHASE**



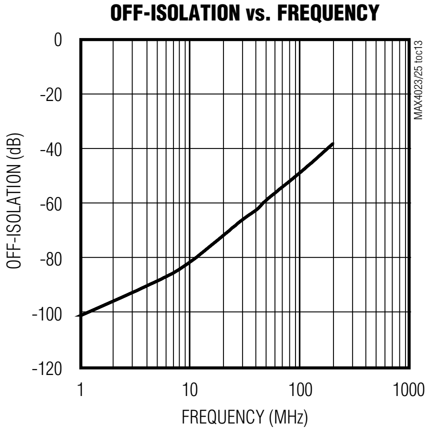

**POWER-SUPPLY REJECTION RATIO vs. FREQUENCY**



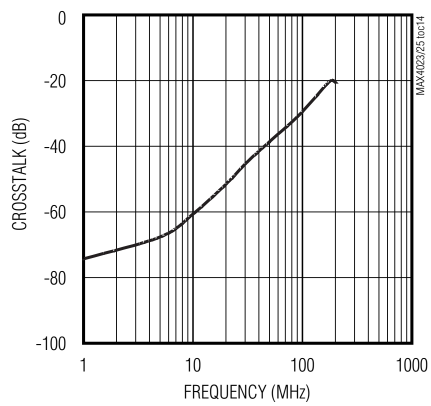

**MAX4023/MAX4025 COMMON-MODE REJECTION RATIO vs. FREQUENCY**



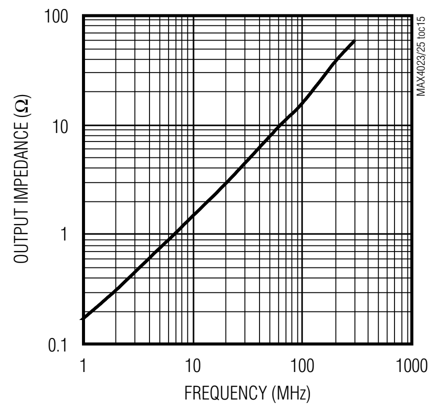

**OFF-ISOLATION vs. FREQUENCY**



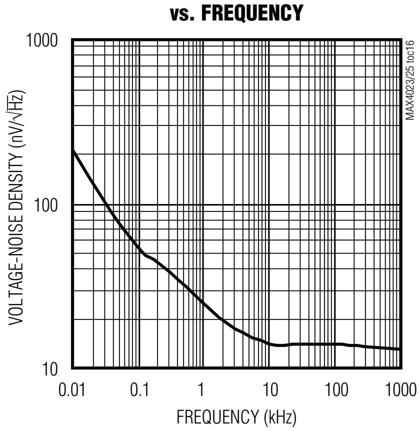

**ALL-HOSTILE CROSSTALK vs. FREQUENCY**



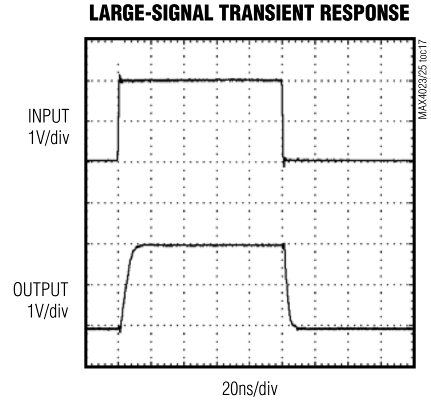

**OUTPUT IMPEDANCE vs. FREQUENCY**



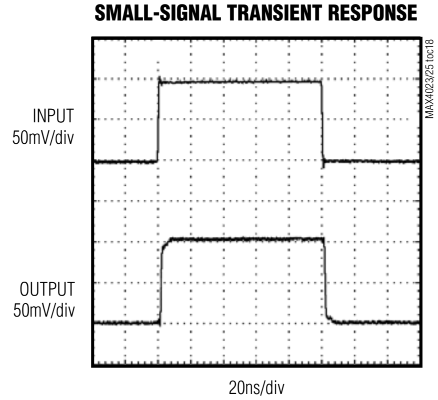

**INPUT VOLTAGE-NOISE DENSITY vs. FREQUENCY**




**MAX4023/MAX4025 LARGE-SIGNAL TRANSIENT RESPONSE**



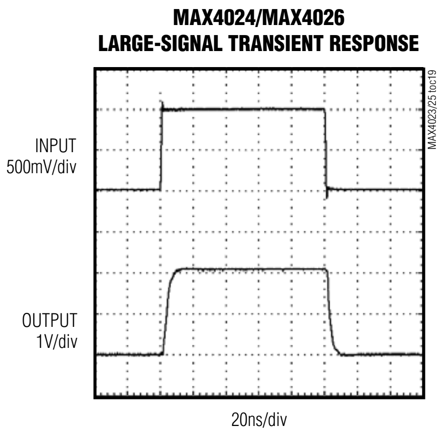

**MAX4023/MAX4025 SMALL-SIGNAL TRANSIENT RESPONSE**

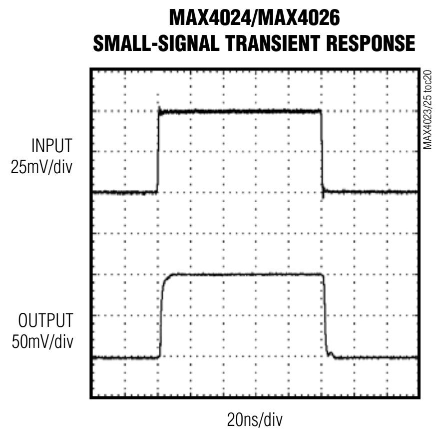


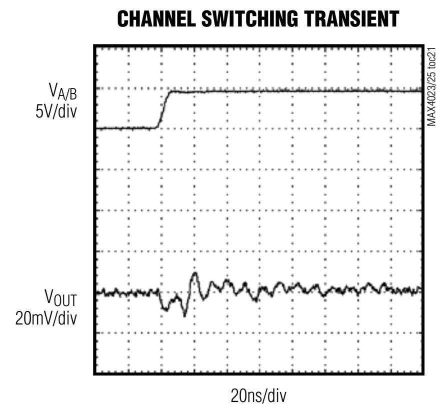
# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

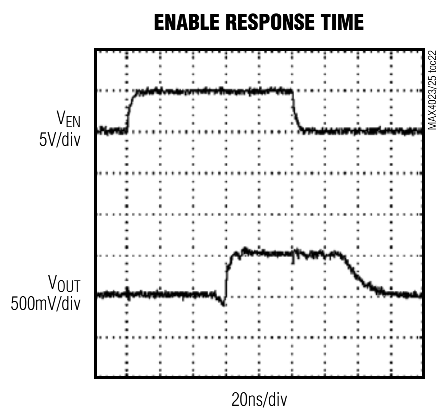
## Typical Operating Characteristics—±5V Dual Supply (continued)

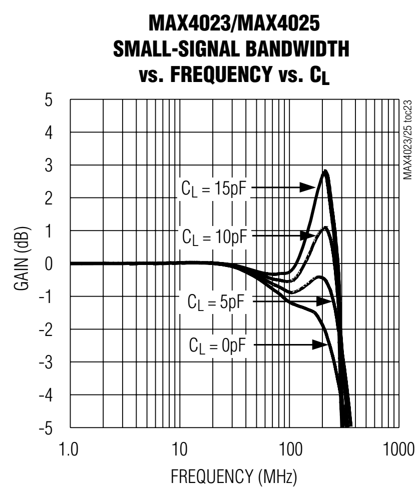
($V_{CC}$ = +5V, $V_{EE}$ = -5V, $V_{CM}$ = REF = 0V, EN = +5V, $R_{IN}$ = 75Ω to GND, $R_L$ = 150Ω to GND, $A_{VCL}$ = +1V/V (MAX4023/MAX4025), $A_{VCL}$ = +2V/V (MAX4024/MAX4026), $T_A$ = +25°C, unless otherwise noted.)

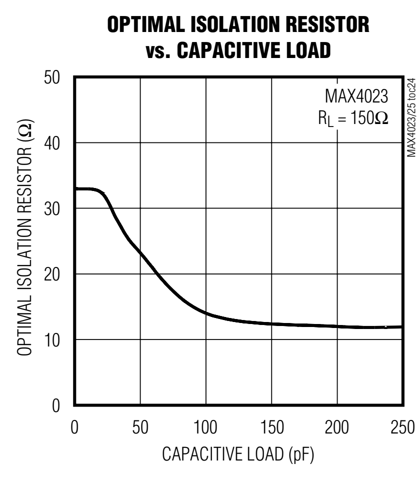


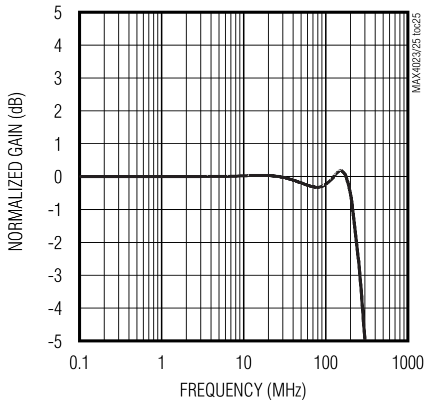



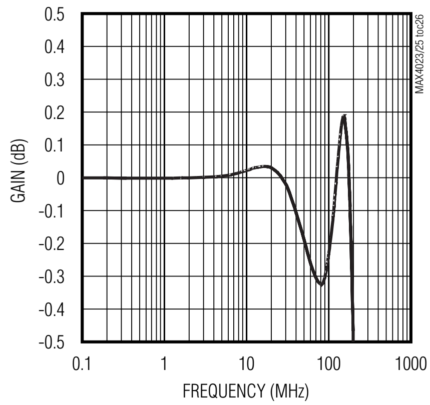
## Typical Operating Characteristics—+5V Single Supply

($V_{CC}$ = +5V, $V_{EE}$ = 0V, $V_{CM}$ = 0.5V, $V_{REF}$ = $V_{CM}$, EN = +5V, $R_{IN}$ = 75Ω to $V_{CM}$, $R_L$ = 150Ω to GND, $A_{VCL}$ = +1V/V (MAX4023/MAX4025), $A_{VCL}$ = +2V/V (MAX4024/MAX4026), $T_A$ = +25°C, unless otherwise noted.)

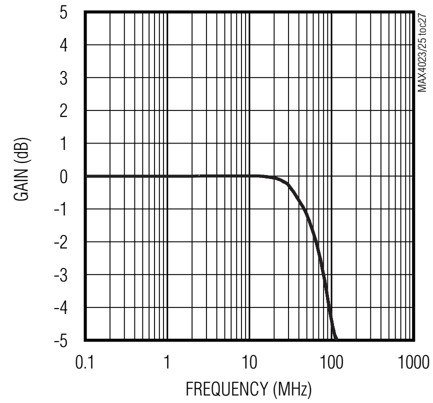
**MAX4023/MAX4025 SMALL-SIGNAL BANDWIDTH vs. FREQUENCY**



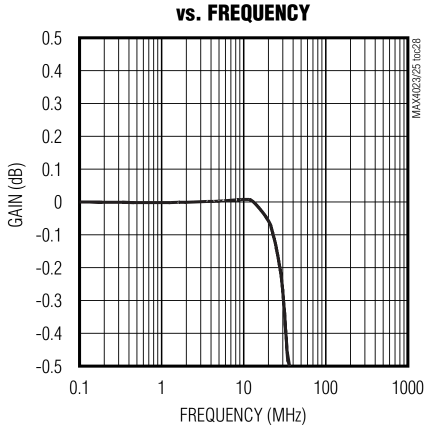

**MAX4023/MAX4025 SMALL-SIGNAL GAIN FLATNESS vs. FREQUENCY**



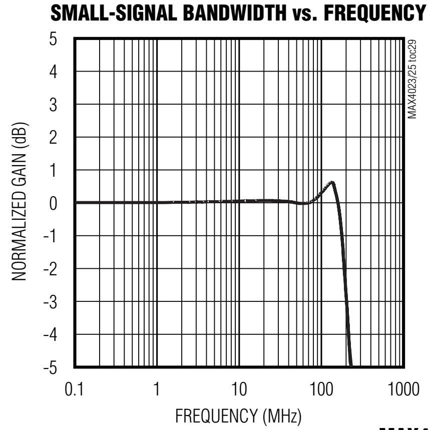

**MAX4023/MAX4025 LARGE-SIGNAL BANDWIDTH vs. FREQUENCY**



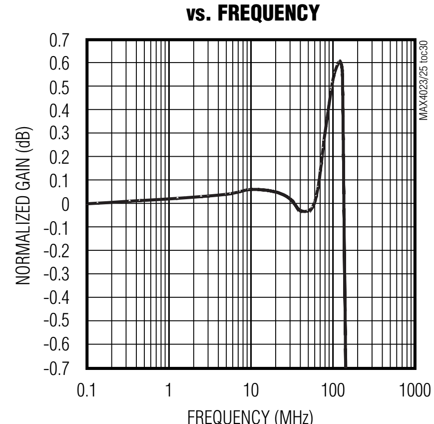

**MAX4023/MAX4025 LARGE-SIGNAL GAIN FLATNESS vs. FREQUENCY**



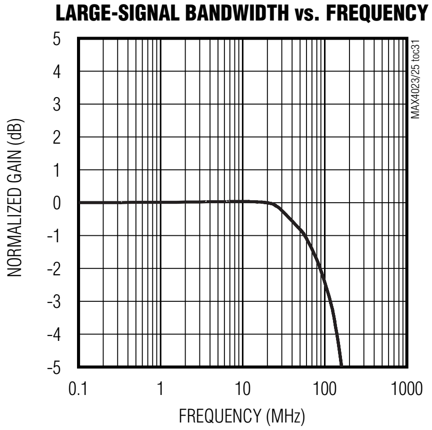

**MAX4024/MAX4026 SMALL-SIGNAL BANDWIDTH vs. FREQUENCY**



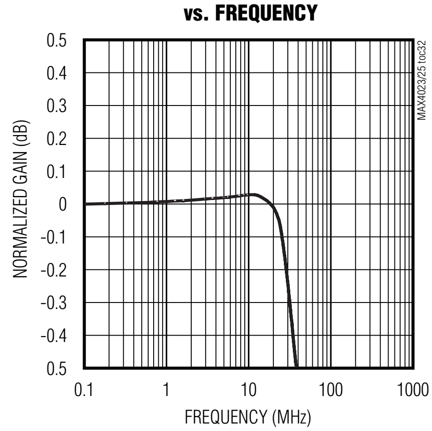

**MAX4024/MAX4026 SMALL-SIGNAL GAIN FLATNESS vs. FREQUENCY**




**MAX4024/MAX4026 LARGE-SIGNAL BANDWIDTH vs. FREQUENCY**



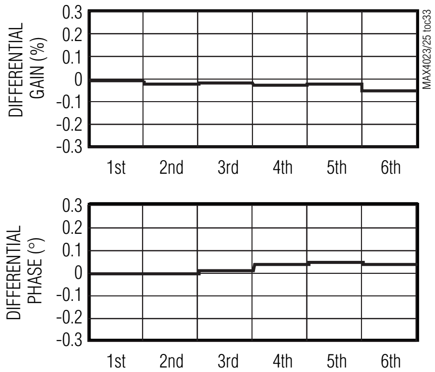

**MAX4024/MAX4026 LARGE-SIGNAL GAIN FLATNESS vs. FREQUENCY**



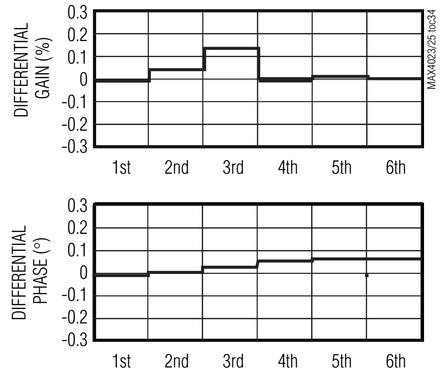
## Typical Operating Characteristics—+5V Single Supply (continued)

($V_{CC}$ = +5V, $V_{EE}$ = 0V, $V_{CM}$ = 0.5V, $V_{REF}$ = $V_{CM}$, EN = +5V, $R_{IN}$ = 75Ω to $V_{CM}$, $R_L$ = 150Ω to GND, $A_{VCL}$ = +1V/V (MAX4023/MAX4025), $A_{VCL}$ = +2V/V (MAX4024/MAX4026), $T_A$ = +25°C, unless otherwise noted.)

MAX4023/MAX4025
DIFFERENTIAL GAIN AND PHASE




MAX4024/MAX4026
DIFFERENTIAL GAIN AND PHASE



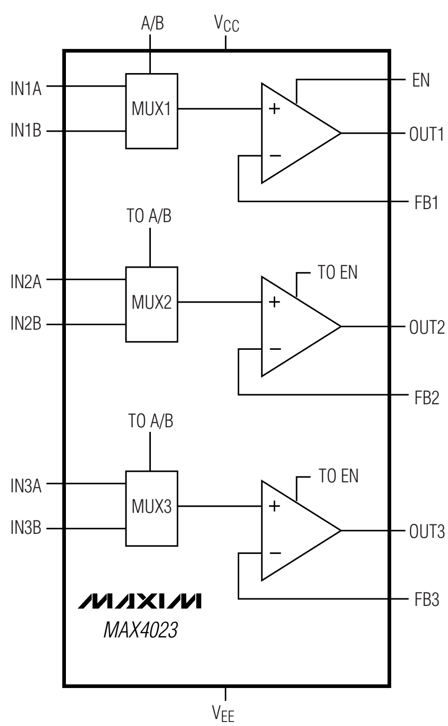

## Pin Description

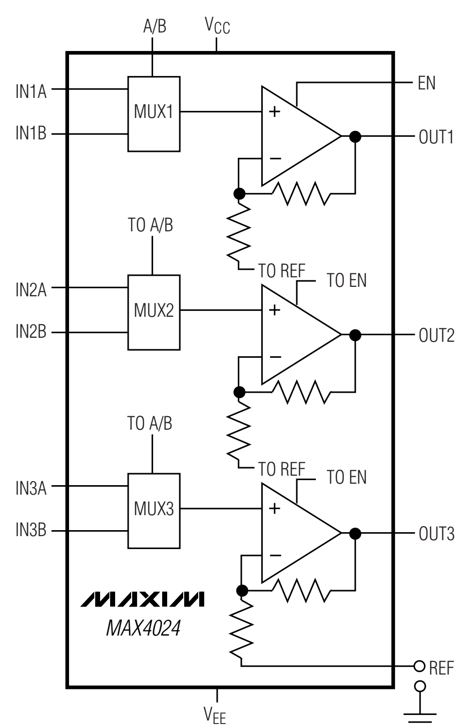
| PIN | | | | NAME | FUNCTION |
|---|---|---|---|---|---|
| MAX4023 SO/QSOP | MAX4024 SO/TSSOP | MAX4025 SO/TSSOP | MAX4026 SO/TSSOP | | |
| 1 | 1 | 1 | 1 | IN1A | Amplifier Input 1A |
| 2 | 2 | 2 | 2 | IN2A | Amplifier Input 2A |
| 3 | 3 | 3 | 3 | IN3A | Amplifier Input 3A |
| 4 | 4 | 5 | 5, 6 | $V_{EE}$ | Negative Power-Supply Voltage. Bypass $V_{EE}$ to GND with a 0.1µF capacitor. Connect $V_{EE}$ to GND for single-supply operation. |
| 5 | 13 | 6 | 17 | A/B | Channel Select Input. Pull A/B high to select channel A. Drive A/B low to select channel B. |
| 6 | 5 | 7 | 7 | IN1B | Amplifier Input 1B |
| 7 | 6 | 8 | 8 | IN2B | Amplifier Input 2B |
| 8 | 7 | 9 | 9 | IN3B | Amplifier Input 3B |
| 9 | — | 14 | — | FB3 | Amplifier Feedback Input for Amplifier 3 |
| 10 | 9 | 13 | 13 | OUT3 | Amplifier Output 3 |
| 11 | 10 | 18 | 18 | OUT2 | Amplifier Output 2 |
| 12 | — | 17 | — | FB2 | Amplifier Feedback Input for Amplifier 2 |
| 13 | 11 | 15 | 14 | EN | Enable Input. Pull EN high for normal operation. Drive EN low to disable all outputs. |

## Pin Description (continued)

| PIN | | | | NAME | FUNCTION |
|---|---|---|---|---|---|
| **MAX4023 SO/QSOP** | **MAX4024 SO/TSSOP** | **MAX4025 SO/TSSOP** | **MAX4026 SO/TSSOP** | | |
| 14 | 12 | 16 | 15, 16 | $V_{CC}$ | Positive Power-Supply Voltage. Bypass $V_{CC}$ to GND with a 0.1µF capacitor. |
| 15 | 14 | 19 | 19 | OUT1 | Amplifier Output 1 |
| 16 | — | 20 | — | FB1 | Amplifier Feedback Input for Amplifier 1 |
| — | 8 | — | 11, 20 | REF | Reference Pin for Internal Gain Resistor Network |
| — | — | 4 | 4 | IN4A | Amplifier Input 4A |
| — | — | 10 | 10 | IN4B | Amplifier Input 4B |
| — | — | 11 | — | FB4 | Amplifier Feedback Input for Amplifier 4 |
| — | — | 12 | 12 | OUT4 | Amplifier Output 4 |

## Functional Diagrams



## Detailed Description

The MAX4024/MAX4026 combine three and four 2:1 multiplexers, respectively, with a fixed gain of 2 amplifier. The MAX4023/MAX4025 combine three and four 2:1 multiplexers, respectively, with an adjustable gain output amplifier optimized for a closed-loop gain of +1 or greater. These devices operate from a single-supply voltage of +4.5V to +11V or from dual supplies of ±2.25V to ±5.5V. The outputs may be placed in a high-impedance state and the supply current minimized by forcing the EN pin low. The input multiplexers feature short 25ns channel-switching times and small $10mV_{P-P}$ switching transients. These devices feature voltage-feedback output amplifiers that achieve up to 363V/µs slew rates and up to 220MHz -3dB bandwidths. They also feature excellent differential gain/phase performance.

The MAX4023–MAX4026 feature an A/B pin, which is an input pin for selecting either channel A or B. Drive A/B high to select channel A or drive A/B low to select channel B. Channel A is automatically selected if A/B is left unconnected.

## Applications Information

### Feedback and Gain Resistor Selection (MAX4023/MAX4025)

Select the MAX4023/MAX4025 gain-setting feedback $R_F$ and $R_G$ resistors to fit your application. Large resistor values increase voltage noise and interact with the amplifier's input and PC board capacitance. This can generate undesirable poles and zeros, and can decrease bandwidth or cause oscillations.

Stray capacitance at the FB pin produces peaking in the frequency-response curve. Keep the capacitance at FB as low as possible by using surface-mount resistors and by avoiding the use of a ground plane beneath or beside these resistors and the FB pin. Some capacitance is unavoidable. If necessary, its effects can be neutralized by adjusting $R_F$. Use 1% resistors to maintain gain accuracy.

### Low-Power Shutdown Mode

All parts feature a low-power shutdown mode that is activated by driving the EN input low. Placing the amplifier in shutdown mode reduces the quiescent supply current to below 4mA and places the output into a high-impedance state, typically 75kΩ (MAX4023/MAX4025). Multiple devices may be paralleled to construct larger switch matrices by connecting the outputs of several devices together and disabling all but one of the paralleled amplifiers' outputs.

For MAX4023/MAX4025 application circuits operating with a closed-loop gain of +1 or greater, consider the external-feedback network impedance of all devices used in the mux application when calculating the total load on the output amplifier of the active device. The MAX4024/MAX4026 have a fixed gain of +2 that is internally set with two 500Ω thin-film resistors. The impedance of the internal feedback resistors must be taken into account when operating multiple MAX4024/MAX4026s in large multiplexer applications.

For normal operation, drive EN high. Note that the MAX4023–MAX4026 have internal pullup circuitry on EN, so if left unconnected, it is automatically pulled up to $V_{CC}$.

### Layout and Power-Supply Bypassing

The MAX4023–MAX4026 have high bandwidths and consequently require careful board layout, including the possible use of constant-impedance microstrip or stripline techniques.

To realize the full AC performance of these high-speed amplifiers, pay careful attention to power-supply bypassing and board layout. The PC board should have at least two layers: a signal and power layer on one side, and a large, low-impedance ground plane on the other side. The ground plane should be as free of voids as possible, with one exception: The feedback (FB) should have as low a capacitance to ground as possible. Whether or not a constant-impedance board is used, it is best to observe the following guidelines when designing the board:

1) Do not use wire-wrapped boards or breadboards.
2) Do not use IC sockets; they increase parasitic capacitance and inductance.
3) Keep signal lines as short and straight as possible. Do not make 90° turns; round all corners.
4) Observe high-frequency bypassing techniques to maintain the amplifier's accuracy and stability.
5) Use surface-mount components. They generally have shorter bodies and lower parasitic reactance, yielding better high-frequency performance than through-hole components.

The bypass capacitors should include a 0.1µF ceramic surface-mount capacitor between each supply pin and the ground plane, located as close to the package as possible. Optionally, place a 10µF tantalum capacitor at the power-supply's point of entry to the PC board to ensure the integrity of incoming supplies. The power-supply traces should lead directly from the tantalum capacitor to the $V_{CC}$ and $V_{EE}$ pins. To minimize para-

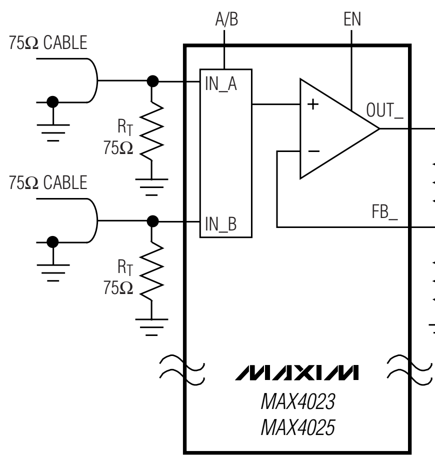



*Figure 1. MAX4023/MAX4025 Noninverting Gain Configuration*

sitic inductance, keep PC traces short and use surface-mount components.

If input termination resistors and output back-termination resistors are used, they should be surface-mount types, and should be placed as close to the IC pins as possible.

### *Video Line Driver*

The MAX4024/MAX4026 are well suited to drive short coaxial transmission lines when the cable is terminated at both ends (as shown in Figure 2a) where the fixed gain of +2 compensates for the loss in the resistors. The MAX4023/MAX4025 have settable gain to equalize long cables. The MAX4023/MAX4025 allow adding functions that normally require additional op amps. For example, a cable driver can “boost” the high frequencies for long runs, making the part perform multiple functions. Figure 2b shows the “cable booster” using the MAX4023/MAX4025.

### *Driving Capacitive Loads*

A correctly terminated transmission line is purely resistive and presents no capacitive load to the amplifier. Reactive loads decrease phase margin and may produce excessive ringing and oscillation (see *Typical Operating Characteristics*).

Another concern when driving capacitive loads is the amplifier’s output impedance, which appears inductive at high frequencies. This inductance forms an L-C resonant circuit with the capacitive load, which causes peaking in the frequency response and degrades the amplifier’s phase margin.

Although the MAX4023–MAX4026 are optimized for AC performance and are not designed to drive highly capacitive loads, they are capable of driving up to 33pF without oscillations. However, some peaking may occur in the frequency domain (Figure 3). To drive larger capacitive loads or to reduce ringing, add an isolation resistor between the amplifier’s output and the load (Figure 4). The value of $R_{ISO}$ depends on the circuit’s gain and the capacitive load (Figure 5). Also note that the isolation resistor forms a divider that decreases the voltage delivered to the load.

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

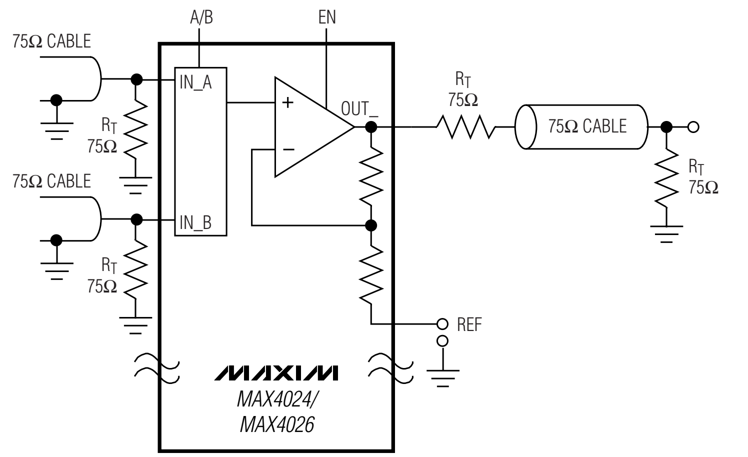



*Figure 2a. Video Line Driver*

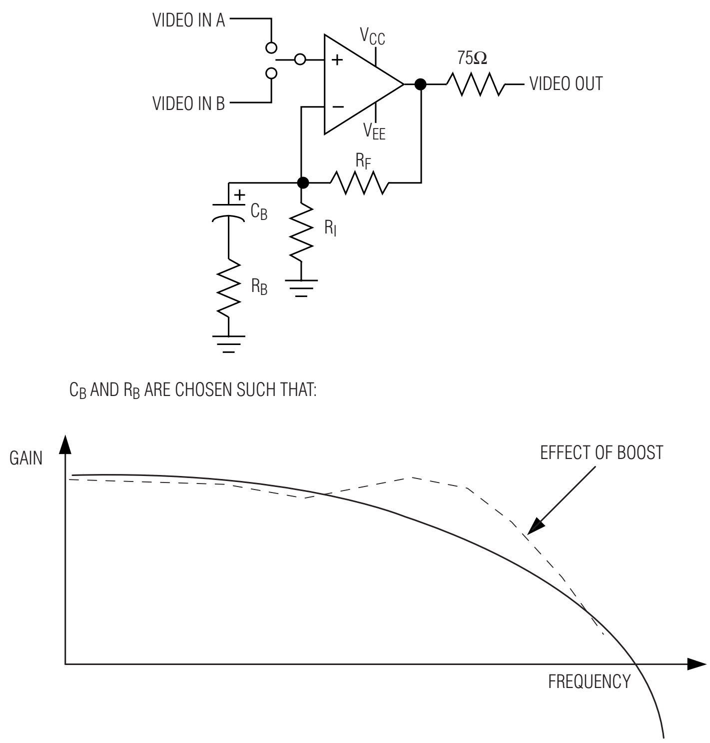



*Figure 2b. Cable Booster Using the MAX4023/MAX4025*

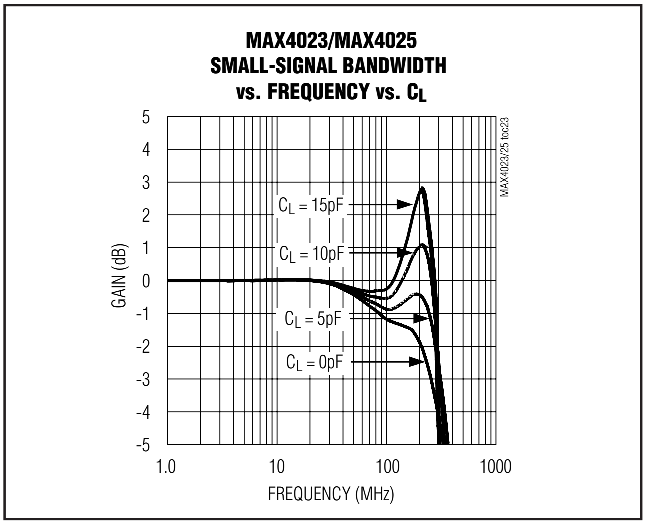



Figure 3. Small-Signal Bandwidth vs. Frequency with Capacitive Load and No Isolation Resistor

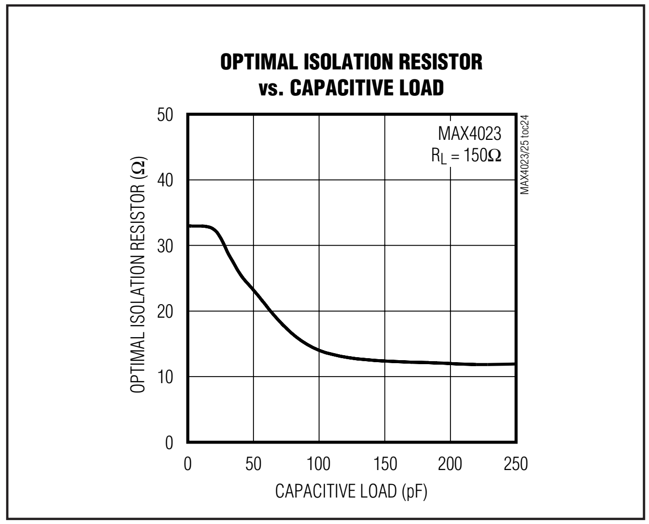



Figure 5. Optimal Isolation Resistance vs. Capacitive Load

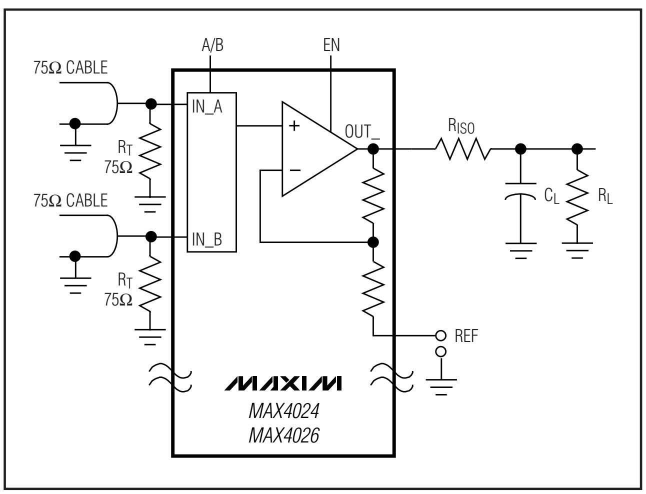



Figure 4. Using an Isolation Resistor ($R_{ISO}$) for a High-Capacitive Load

## Selector Guide

| PART | PIN-PACKAGE | NO. OF VIDEO MUX-AMPS | AMPLIFIER GAIN (V/V) |
|---|---|---|---|
| MAX4023 | 16 SO/QSOP | 3 | ≥+1 |
| MAX4024 | 14 SO/TSSOP | 3 | +2 |
| MAX4025 | 20 SO/TSSOP | 4 | ≥+1 |
| MAX4026 | 20 SO/TSSOP | 4 | +2 |

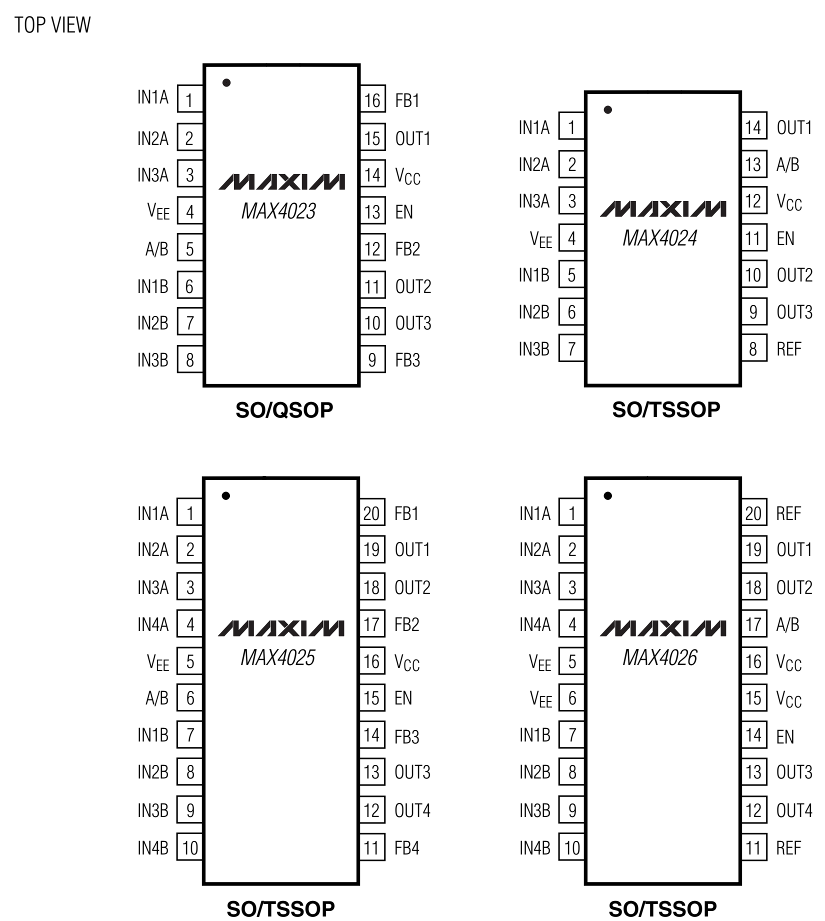
## Chip Information

TRANSISTOR COUNT: 655

PROCESS: Bipolar

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

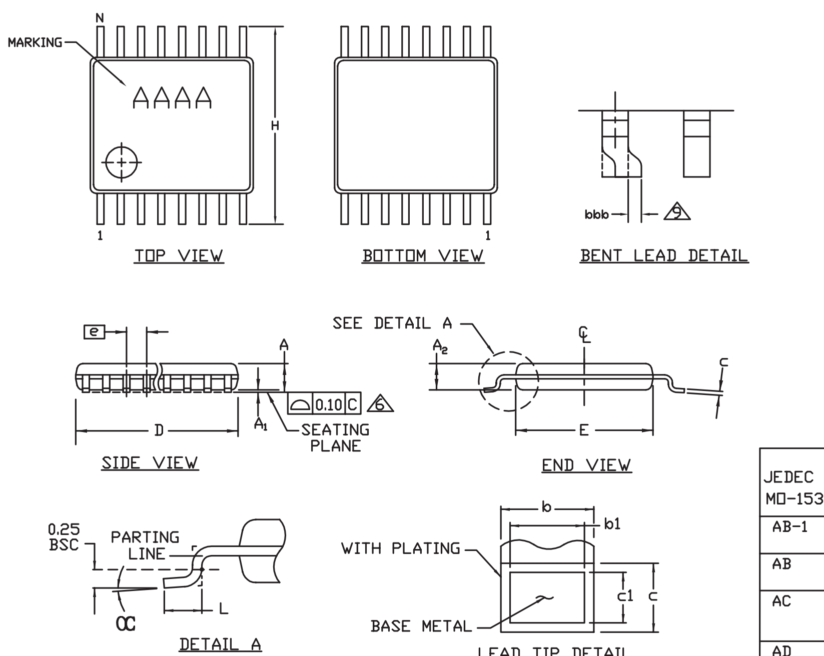
## Pin Configurations



## Package Information

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

| PACKAGE TYPE | PACKAGE CODE | DOCUMENT NO. |
|---|---|---|
| 14, 20 TSSOP | U14-2, U20-2 | **21-0066** |
| 14, 16 SOIC | S14-1, S16-1 | **21-0041** |
| 16 QSOP | E16-1 | **21-0055** |
| 20 SOIC | W20-1 | **21-0042** |




TSSOP4.40mm.EPS

| SYMBOL | COMMON DIMENSIONS | | | |
|---|---|---|---|---|
| | MILLIMETERS | | INCHES | |
| | MIN. | MAX. | MIN. | MAX. |
| A | — | 1.10 | | .043 |
| $A_1$ | 0.05 | 0.15 | .002 | .006 |
| $A_2$ | 0.85 | 0.95 | .033 | .037 |
| b | 0.19 | 0.30 | .007 | .012 |
| $b_1$ | 0.19 | 0.25 | .007 | .010 |
| c | 0.09 | 0.20 | .004 | .008 |
| $c_1$ | 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 | | | |

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

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

-DRAWING NOT TO SCALE-

MAXIM

TITLE: PACKAGE OUTLINE, TSSOP 4.40mm BODY

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

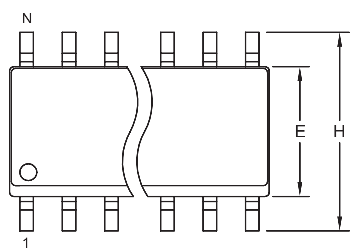
# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

## Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

SOICN .EPS

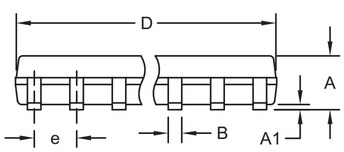
| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | 0.053 | 0.069 | 1.35 | 1.75 |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 |
| B | 0.014 | 0.019 | 0.35 | 0.49 |
| C | 0.007 | 0.010 | 0.19 | 0.25 |
| e | 0.050 BSC | | 1.27 BSC | |
| E | 0.150 | 0.157 | 3.80 | 4.00 |
| H | 0.228 | 0.244 | 5.80 | 6.20 |
| L | 0.016 | 0.050 | 0.40 | 1.27 |



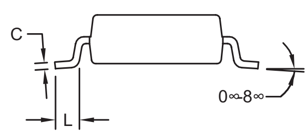

TOP VIEW

VARIATIONS:

| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX | N | MS012 |
|---|---|---|---|---|---|---|
| D | 0.189 | 0.197 | 4.80 | 5.00 | 8 | AA |
| D | 0.337 | 0.344 | 8.55 | 8.75 | 14 | AB |
| D | 0.386 | 0.394 | 9.80 | 10.00 | 16 | AC |




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 MS012.
6. N = NUMBER OF PINS.

DALLAS SEMICONDUCTOR MAXIM

PROPRIETARY INFORMATION

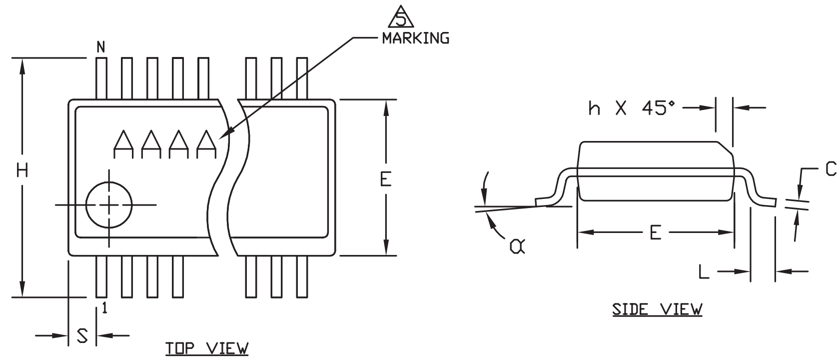
TITLE: PACKAGE OUTLINE, .150" SOIC

| APPROVAL | DOCUMENT CONTROL NO. | REV. | |
|---|---|---|---|
| | 21-0041 | B | 1/1 |

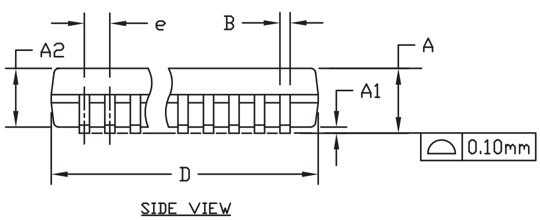
## Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

QSOP.EPS




| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .053 | .069 | 1.35 | 1.75 |
| A1 | .004 | .010 | .102 | .254 |
| A2 | .049 | .065 | 1.245 | 1.651 |
| B | .008 | .012 | 0.20 | 0.30 |
| C | .0075 | .0098 | 0.191 | 0.249 |
| D | SEE VARIATIONS | | | |
| E | .150 | .157 | 3.81 | 3.99 |
| e | .025 BSC | | 0.635 BSC | |
| H | .230 | .244 | 5.84 | 6.20 |
| h | .010 | .016 | 0.25 | 0.41 |
| L | .016 | .035 | 0.41 | 0.89 |
| N | SEE VARIATIONS | | | |
| α | 0° | 8° | 0° | 8° |




VARIATIONS:

| | INCHES MIN. | INCHES MAX. | MILLIMETERS MIN. | MILLIMETERS MAX. | N | PKG CODES |
|---|---|---|---|---|---|---|
| D | .189 | .196 | 4.80 | 4.98 | 16 | E16-1, E16M-1, E16-4, E16-5, E16-6, E16-8F |
| S | .0020 | .0070 | 0.05 | 0.18 | | |
| D | .337 | .344 | 8.56 | 8.74 | 20 | E20-1, E20-2 |
| S | .0500 | .0550 | 1.270 | 1.397 | | |
| D | .337 | .344 | 8.56 | 8.74 | 24 | E24-1, E24-2 |
| S | .0250 | .0300 | 0.635 | 0.762 | | |
| D | .386 | .393 | 9.80 | 9.98 | 28 | E28-1, E28M-1, E28-2 |
| S | .0250 | .0300 | 0.635 | 0.762 | | |

NOTES:
1. D & E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .006" PER SIDE.
3. CONTROLLING DIMENSIONS: INCHES.
4. MEETS JEDEC MO137.
5. MARKING SHOWN IS FOR PKG. ORIENTATION ONLY.
6. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PbFREE (+) PKG. CODES.

-DRAWING NOT TO SCALE-

MAXIM

TITLE: PACKAGE OUTLINE QSOP .150", .025" LEAD PITCH

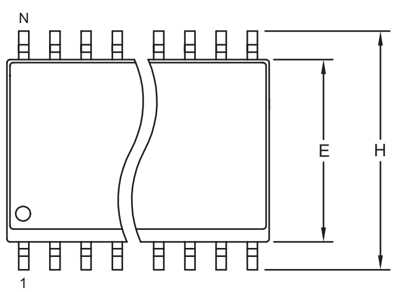
| APPROVAL | DOCUMENT CONTROL NO. | REV. | |
|---|---|---|---|
| | 21-0055 | H | 1/1 |

# Triple and Quad, 2:1 Video Multiplexer-Amplifiers with Fixed and Settable Gain

## Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

SOICW.EPS

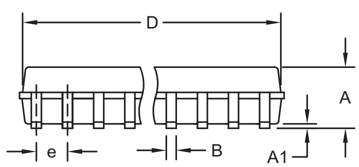



TOP VIEW

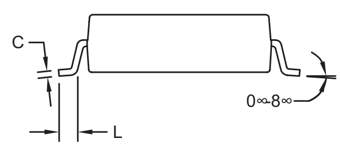
| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.093 | 0.104 | 2.35 | 2.65 |
| A1 | 0.004 | 0.012 | 0.10 | 0.30 |
| B | 0.014 | 0.019 | 0.35 | 0.49 |
| C | 0.009 | 0.013 | 0.23 | 0.32 |
| e | 0.050 | | 1.27 | |
| E | 0.291 | 0.299 | 7.40 | 7.60 |
| H | 0.394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

VARIATIONS:

| | INCHES | | MILLIMETERS | | | |
|---|---|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX | N | MS013 |
| 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 |




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.

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

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 1/03 | Initial release | — |
| 1 | 11/09 | Updated TOC16 | 9 |