250MHz, Triple and Single RGB Multiplexer with Amplifiers

FEATURES

- 100MHz Pixel Switching
- –3dB Bandwidth: 250MHz
- Channel Switching Time: 2.5ns
- Expandable to Larger Arrays
- Drives Cables Directly
- High Slew Rate: 1100V/μs
- Low Switching Transient: 50mV
- Shutdown Supply Current: 100μA
- Output Short-Circuit Protected
- Available in Small 16-Pin SSOP Package

APPLICATIONS

- RGB Switching
- Workstation Graphics
- Pixel Switching
- Coaxial Cable Drivers
- High Speed Signal Processing

DESCRIPTION

The LT®1675 is a high speed RGB multiplexer designed for pixel switching and fast workstation graphics. Included on chip are three SPDT switches and three current feedback amplifiers. The current feedback amplifiers drive double-terminated 50Ω or 75Ω cables and are configured for a fixed gain of 2, eliminating six external gain setting resistors. The SPDT switches are designed to be break-before-make to minimize unwanted signals coupling to the input.

The LT1675-1 is a single version with two inputs, a single output and is ideal for a single channel application such as video sync.

The key to the LT1675 fast switching speed is Linear Technology's proprietary high speed bipolar process. This MUX can toggle between sources in excess of 100MHz, has a slew rate over 1000V/μs and has a –3dB bandwidth of 250MHz. Power supply requirements are ±4V to ±6V and power dissipation is only 300mW on ±5V, or 100mW for the LT1675-1. The expandable feature uses the disable pin to reduce the power dissipation to near 0mW in the off parts.

Unlike competitive solutions that are in bulky high pin count packages, the LT1675 is in a 16-lead narrow body SSOP. This small footprint, the size of an SO-8, results in a very clean high performance solution. The LT1675-1 is available in the tiny MSOP and the SO-8.

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LT1675/LT1675-1

**ABSOLUTE MAXIMUM RATINGS**  
(Note 1)

Supply Voltage .................................................................. ±6.3V
Inputs, ENABLE and SELECT, Current ................... ±20mA
Output Short-Circuit Duration (Note 2)......... Continuous
Specified Temperature Range ......................... 0°C to 70°C
Operating Temperature Range (Note 3) .. −40°C to 85°C
Storage Temperature Range ......................... −65°C to 150°C
Junction Temperature (Note 4) ......................... 150°C
Lead Temperature (Soldering, 10 sec)................. 300°C

**PACKAGE/ORDER INFORMATION**

<table>
<thead>
<tr>
<th>ORDER PART NUMBER</th>
<th>MS8 PART MARKING</th>
<th>ORDER PART NUMBER</th>
<th>S8 PART MARKING</th>
<th>ORDER PART NUMBER</th>
<th>GN PART MARKING</th>
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</thead>
<tbody>
<tr>
<td>LT1675CMS8-1</td>
<td>LTGX</td>
<td>LT1675CS8-1</td>
<td>16751</td>
<td>LT1675CGN</td>
<td>1675</td>
</tr>
</tbody>
</table>

Order Options  
Tape and Reel: Add #TR

Consult LTC Marketing for parts specified with wider operating temperature ranges.
### ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the specified temperature range, otherwise specifications are at $T_a = 25^\circ C$, $V_S = \pm 5V$, $R_L = \infty$, $V_{IN} = 0V$ LT1675 (Pins 1, 2, 3, 6, 7, 8), LT1675-1 (Pins 1, 3), ENABLE = 0V, unless otherwise specified.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Offset Voltage</td>
<td>Any Input Selected</td>
<td>●</td>
<td>20</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Output Offset Matching</td>
<td>Between Outputs R1 to R2, G1 to G2, B1 to B2</td>
<td>●</td>
<td>5</td>
<td>20</td>
<td>mV</td>
</tr>
<tr>
<td>Input Current</td>
<td>Any Input Selected</td>
<td>●</td>
<td>–12</td>
<td>–30</td>
<td>μA</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>$V_{IN} = \pm 1V$</td>
<td>●</td>
<td>100</td>
<td>700</td>
<td>kΩ</td>
</tr>
<tr>
<td>PSRR</td>
<td>$V_S = \pm 2.6V$ to $\pm 6V$, Measured at Output</td>
<td>●</td>
<td>38</td>
<td>50</td>
<td>dB</td>
</tr>
<tr>
<td>DC Gain Error 0V to 1V</td>
<td>$V_{IN} = 1V$, $R_L = \infty$</td>
<td>●</td>
<td>3</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = 1V$, $R_L = 150\Omega$</td>
<td>●</td>
<td>4</td>
<td>8</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = 1V$, $R_L = 75\Omega$</td>
<td>●</td>
<td>5</td>
<td>10</td>
<td>%</td>
</tr>
<tr>
<td>DC Gain Error 0V to –1V</td>
<td>$V_{IN} = –1V$, $R_L = \infty$</td>
<td>●</td>
<td>3</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = –1V$, $R_L = 150\Omega$</td>
<td>●</td>
<td>4</td>
<td>8</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = –1V$, $R_L = 75\Omega$</td>
<td>●</td>
<td>8</td>
<td>20</td>
<td>%</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>$V_{IN} = 2V$, $R_L = \infty$</td>
<td>●</td>
<td>3.1</td>
<td>3.4</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = 2V$, $R_L = 150\Omega$</td>
<td>●</td>
<td>2.7</td>
<td>3.0</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = 2V$, $R_L = 75\Omega$</td>
<td>●</td>
<td>2.4</td>
<td>2.8</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = –2V$, $R_L = \infty$</td>
<td>●</td>
<td>–3.1</td>
<td>–3.3</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = –2V$, $R_L = 150\Omega$</td>
<td>●</td>
<td>–2.6</td>
<td>–3.0</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = –2V$, $R_L = 75\Omega$</td>
<td>●</td>
<td>–2.3</td>
<td>–2.6</td>
<td>V</td>
</tr>
<tr>
<td>Disabled Output Impedance</td>
<td>ENABLE Open</td>
<td>●</td>
<td>1.1</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum Output Current</td>
<td>$V_{IN} = \pm 1V$, $V_O = 0V$</td>
<td>●</td>
<td>50</td>
<td>70</td>
<td>mA</td>
</tr>
<tr>
<td>Supply Current</td>
<td>LT1675</td>
<td>ENABLE = 0V</td>
<td>●</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENABLE = 4.7V</td>
<td>●</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>LT1675-1</td>
<td>ENABLE = 0V</td>
<td>●</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENABLE = 4.7V</td>
<td>●</td>
<td>0.3</td>
<td>33</td>
</tr>
<tr>
<td>ENABLE Pin Current</td>
<td>LT1675</td>
<td>ENABLE = 0V</td>
<td>●</td>
<td>450</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>LT1675-1</td>
<td>ENABLE = 0V</td>
<td>●</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>SELECT Pin Current</td>
<td>LT1675</td>
<td>SELECT = 0V</td>
<td>●</td>
<td>90</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>LT1675-1</td>
<td>SELECT = 0V</td>
<td>●</td>
<td>30</td>
<td>60</td>
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<tr>
<td>SELECT Low</td>
<td>SELECT (See Truth Table)</td>
<td>●</td>
<td>0.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>SELECT High</td>
<td>SELECT (See Truth Table)</td>
<td>●</td>
<td>2</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>
### AC CHARACTERISTICS

$T_A = 25^\circ C$, $V_S = \pm 5V$, $R_L = 150\Omega$, $V_{IN} = 0V$ LT1675 (Pins 1, 2, 3, 6, 7, 8), LT1675-1 (Pins 1, 3), $ENABLE = 0V$, unless otherwise specified.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
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</thead>
<tbody>
<tr>
<td>Slew Rate</td>
<td>$V_{OUT} = 5V_{P-P}$</td>
<td>1100</td>
<td>V/µs</td>
<td></td>
<td></td>
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<tr>
<td>Full Power Bandwidth (Note 5)</td>
<td>$V_{OUT} = 6V_{P-P}$</td>
<td>58</td>
<td>MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small-Signal 3dB Bandwidth</td>
<td>Less Than 1dB Peaking</td>
<td>250</td>
<td>MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>Less Than 0.1dB</td>
<td>70</td>
<td>MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Matching</td>
<td>$R$ to $G$ to $B$ $R_{1}$ to $R_{2}$, $G_{1}$ to $G_{2}$, $B_{1}$ to $B_{2}$, LT1675-1 $V_{IN1}$ to $V_{IN2}$</td>
<td>0.10</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.01</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel-to-Channel Select Time</td>
<td>$R_1 = 0V$, $R_2 = 1V$</td>
<td>5.0</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay Time</td>
<td>Measured from Time SELECT Pin Crosses Logic Threshold</td>
<td></td>
<td>ns</td>
<td></td>
<td></td>
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<tr>
<td>Switching Time</td>
<td>Time for $V_{OUT}$ to Go from 0V to 1V</td>
<td>2.5</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable Time</td>
<td></td>
<td>10</td>
<td>ns</td>
<td></td>
<td></td>
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<tr>
<td>Disable Time</td>
<td></td>
<td>100</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Pin Capacitance</td>
<td></td>
<td>2</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELECT Pin Capacitance</td>
<td>LT1675</td>
<td>2.2</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LT1675-1</td>
<td>1.5</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENABLE Pin Capacitance</td>
<td>LT1675</td>
<td>2.1</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LT1675-1</td>
<td>1.5</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Pin Capacitance (Disabled)</td>
<td>ENABLE Open</td>
<td>4.4</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small-Signal Rise Time</td>
<td>$V_{IN} = 300mV_{P-P}$, $R_L = 100\Omega$</td>
<td>1.85</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propagation Delay</td>
<td>$V_{IN} = 300mV_{P-P}$, $R_L = 100\Omega$</td>
<td>3</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overshoot</td>
<td>$V_{IN} = 300mV_{P-P}$, $R_L = 100\Omega$</td>
<td>10</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Channel to Off-Channel Crosstalk</td>
<td>Measured at 10MHz</td>
<td>60</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chip Disable Crosstalk</td>
<td>Measured at 10MHz, ENABLE Open</td>
<td>90</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Select Output Transient</td>
<td>Measured Between Back Termination and Load</td>
<td>50</td>
<td>mV_{P-P}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Gain (Note 6)</td>
<td></td>
<td>0.07</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Phase (Note 6)</td>
<td></td>
<td>0.05</td>
<td>DEG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Note 2:** May require a heat sink.

**Note 3:** The LT1675/LT1675-1 are guaranteed to meet specified performance from 0°C to 70°C and are designed, characterized and expected to meet these extended temperature limits, but are not tested at -40°C and 85°C. Guaranteed I grade parts are available; consult factory.

**Note 4:** $T_J$ is calculated from the ambient temperature $T_A$ and power dissipation $P_D$ according to the following formula:

\[
T_J = T_A + \left( \frac{P_D}{120^\circ C/W} \right)
\]

\[
T_J = T_A + \left( \frac{P_D}{250^\circ C/W} \right)
\]

\[
T_J = T_A + \left( \frac{P_D}{150^\circ C/W} \right)
\]

**Note 5:** Full power bandwidth is calculated from the slew rate measurement:

\[
FPBW = \frac{SR}{2\pi V_{PEAK}}
\]

**Note 6:** Differential Gain and Phase are measured using a Tektronix TSG120 YC/NTSC signal generator and a Tektronix 1780R Video Measurement Set. The resolution of this equipment is 0.1% and 0.1°. Nine identical MUXs were cascaded giving an effective resolution of 0.011% and 0.011°.

#### Truth Table

<table>
<thead>
<tr>
<th>SELECT</th>
<th>ENABLE</th>
<th>RED OUT</th>
<th>GREEN OUT</th>
<th>BLUE OUT</th>
<th>VOUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>RED 1</td>
<td>GREEN 1</td>
<td>BLUE 1</td>
<td>VIN1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>RED 2</td>
<td>GREEN 2</td>
<td>BLUE 2</td>
<td>VIN2</td>
</tr>
<tr>
<td>X</td>
<td>1</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>
**TYPICAL PERFORMANCE CHARACTERISTICS**

**Gain and Phase vs Frequency**

**Frequency Response with Capacitive Loads**

**Gain vs Frequency**

**-3dB Bandwidth vs Supply Voltage**

**Crosstalk Rejection vs Frequency**

**Crosstalk Rejection vs Frequency**

**Crosstalk Rejection vs Frequency (Disabled)**

**Power Supply Rejection Ratio vs Frequency**

**Undistorted Output Swing vs Frequency**
TYPICAL PERFORMANCE CHARACTERISTICS

**Input Bias Current vs Temperature**

- **Input Bias Current (µA)**
- **Temperature (°C)**

**Output Offset Voltage vs Temperature**

- **Output Offset Voltage (mV)**
- **Temperature (°C)**

**Toggling RED 2 to RED 1**

- **Select Pin 10**
- **RED OUT Pin 15**

**Slew Rate**

- **RED 1 IN**
- **RED OUT Pin 15**

**Small-Signal Rise Time**

- **V_{GEN}**
- **V_{OUT}**

**Enable and Disable**

- **ENABLE PIN 9**
- **RED OUT Pin 15**

---

**Notes:**

- **VS = ±5V**
- **VIN = 0V**

**Measures:**

- **Enable and Disable of Uncorrelated SineWave**
- **RL = 150Ω**

**Other Measurements:**

- **Enable and Disable with Uncorrelated SineWave**
  - **RL = 150Ω**
  - **10pF Scope Probe**
  - **SR = 1100V/µs**

**Small-Signal Rise Time:**

- **RED 1 IN**
- **RED 2 = Uncorrelated SineWave**
- **RL = 150Ω, 10pF Scope Probe**

**Enable and Disable:**

- **RED OUT Pin 15**
- **RED 1 IN**
- **RED 2 = UNCINRELATED SINEWAVE**

**Miscellaneous:**

- **Input Bias Current (µA)**
- **Temperature (°C)**

---

**Additional Notes:**

- **50mV/DIV**
- **1V/DIV**
- **2V/DIV**

**Additional Measurements:**

- **Enable and Disable with Uncorrelated SineWave**
- **RL = 150Ω**
- **10pF Scope Probe**

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**LT1675/LT1675-1**

**Page 7**
PIN FUNCTIONS

LT1675

RED 1 (Pin 1): Red 1 Input. The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT RED will clip. The input must be terminated.

GREEN 1 (Pin 2): Green 1 Input. The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT GREEN will clip. The input must be terminated.

BLUE 1 (Pin 3): Blue 1 Input. The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT BLUE will clip. The input must be terminated.

GND (Pins 4, 5): Signal Ground. Connect to ground plane.

RED 2 (Pin 6): Red 2 Input. The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT RED will clip. The input must be terminated.

GREEN 2 (Pin 7): Green 2 Input. The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT GREEN will clip. The input must be terminated.

BLUE 2 (Pin 8): Blue 2 Input. The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT BLUE will clip. The input must be terminated.

ENABLE (Pin 9): Chip Enable. Ground this pin for normal operation. Take this pin to within 300mV of V+, or open to shut down the part. This pin is also used for router applications. When the part is disabled, the supply current is 1µA.

SELECT (Pin 10): Channel Select. Use this pin to select between RGB1 inputs and RGB2 inputs. Use this pin for fast toggling. HIGH Selects RGB1.

V– (Pins 11, 12): Negative Power Supply. Connect these pins to –5V and bypass with a good tantalum capacitor (4.7µF). The pin may also require a 0.1µF or 0.01µF depending on layout.

VOUT BLUE (Pin 13): Blue Output. It is twice BLUE 1 or BLUE 2 depending on which channel is selected by Pin 10. VOUT BLUE drives 50Ω or 75Ω double-terminated cables. Do not add capacitance to this pin.

VOUT GREEN (Pin 14): Green Output. It is twice GREEN 1 or GREEN 2 depending on which channel is selected by Pin 10. VOUT GREEN drives 50Ω or 75Ω double-terminated cables. Do not add capacitance to this pin.

VOUT RED (Pin 15): Red Output. It is twice RED 1 or RED 2 depending on which channel is selected by Pin 10. VOUT RED drives 50Ω or 75Ω double-terminated cables. Do not add capacitance to this pin.

V+ (Pin 16): Positive Power Supply. Connect this pin to 5V and bypass with a good tantalum capacitor (4.7µF). The pin may also require a 0.1µF or 0.01µF depending on layout.

LT1675-1

VIN1 (Pin 1): The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT will clip. The input must be terminated.


VIN2 (Pin 3): The 1V video input signal to be switched is applied to this pin. If 2V is applied to this pin, VOUT will clip. The input must be terminated.

V– (Pin 4): Connect this pin to –5V and bypass with good tantalum capacitor (4.7µF). The pin may also require a 0.1µF or 0.01µF depending on layout.

SELECT (Pin 5): Use this pin to select VIN1 or VIN2. Use this pin for fast toggling. HIGH Selects VIN1.

VOUT (Pin 6): It is twice VIN1 or VIN2 depending on which channel is selected by Pin 5. VOUT drives 50Ω or 75Ω double-terminated cables. Do not add capacitance to this pin.

ENABLE (Pin 7): Ground this pin for normal operation. Take this pin to within 300mV of V+, or open to shut down the part. This pin is also used for router applications. When the part is disabled, the supply current is 0.3µA.

V+ (Pin 8): Connect this pin to 5V and bypass with a good tantalum capacitor (4.7µF). The pin may also require a 0.1µF or 0.01µF depending on layout.
APPLICATIONS INFORMATION

Power Supplies

The LT1675 will function with supply voltages below ±2V (4V total), however, to ensure a full 1Vp-p video signal (2Vp-p at the output pins), the power supply voltage should be between ±4V to ±6V. The LT1675 is designed to operate on ±5V, and at no time should the supplies exceed ±6V. The power supplies should be bypassed with quality tantalum capacitors. It may be necessary to add a 0.01µF or 0.1µF in parallel with the tantalum capacitors if there is excessive ringing on the output waveform. Even though the LT1675 is well behaved, bypass capacitors should be placed as close to the LT1675 as possible.

Smallest Package and PC Board Space

The LT1675 has the internal gain set for +2V/V or 6dB, because it is designed to drive a double-terminated 50Ω or 75Ω cable that has an inherent 6dB loss. There are several advantages to setting the gain internally. This topology eliminates six gain set resistors, reduces the pin count of the package and eliminates stray capacitance on the sensitive feedback node. The LT1675 fits into the small SSOP package, and these advantages lead to the smallest PC board footprint with enhanced performance. The LT1675-1 eliminates two gain set resistors and is available in the tiny MSOP package and the cost-effective SO-8 package.

Fast Switching

The key to the LT1675 fast switching speed is Linear Technology’s proprietary high speed bipolar process. Internal switches can change state in less than 1ns, but the output of the MUX switches in about 2.5ns, as shown in Figure 1. The additional delay is due to the finite bandwidth and the slew rate of the current feedback amplifier that drives the cable.

For minimum ringing, it is important to minimize the load capacitance on the output of the part. This is normally not a problem in a controlled impedance environment, but stray PC board capacitance and scope probe capacitance can degrade the pulse fidelity. Figure 2 shows the response of the output to various capacitive loads measured with a 10pF scope probe.
Switching Transients

This MUX includes fast current steering break-before-
make SPDT switches that minimize switching glitches.
The switching transients of Figure 3 are input-referred
(measured between 75Ω back termination and the 75Ω
load). The glitch is only 50mV_{P-P} and the duration is just
5ns. This transient is small and fast enough to not be
visible on quality graphics terminals. Additionally, the
break-before-make SPDT switch is open before the alter-
nate channel is connected. This means there is no input
feedthrough during switching. Figure 4 shows the amount
of alternate channel that is coupled at the input.

Expanding Inputs

In video routing applications where the ultimate speed is
not mandatory, as it is in pixel switching, it is possible to
expand the number of MUX inputs by shorting the
LT1675 outputs together and switching with the
ENABLE pins. The internal gain set resistors have a nomi-
nal value of 750Ω and cause a 1500Ω shunt across the
75Ω cable termination. Figure 5 shows schematically the
effect of expanding the number of inputs. The effect of this
loading is to cause a gain error that can be calculated by
the following formula:

\[
\text{Gain Error (dB)} = 6\text{dB} + 20\log\left(\frac{\frac{1575\Omega}{n-1}}{75\Omega} + \frac{1575\Omega}{75}\right)\text{dB}
\]

where \(n\) is total number of LT1675s. For example, using
ten LT1675s (20 Red, 20 Green and 20 Blue) the Gain Error
is only \(-1.7\)dB per channel.

Figure 6 shows a 4-input RGB router. The response from
RED 1 Input to Red Output is shown in Figure 7 for a
25MHz square wave with Chip Select = 0V. In this case the
Gain Error is \(-0.23\)dB. Toggling with Chip Select between
IC #1 and IC #2 is shown in Figure 8. In this case RED 1
Input is connected to 0V and RED 3 Input is connected to
an uncorrelated sinewave.
APPLICATIONS INFORMATION

Figure 5. Off Channels Load the Cable Termination with 1575Ω Each

n
... 1575
n – 1
R2
75Ω

R1
75Ω

CABLE
75Ω

n = NUMBER OF LT1675s IN PARALLEL

Figure 6. Two LT1675s Build a 4-Input RGB Router

Figure 7. 4-Input Router Response

Figure 8. 4-Input Router Toggling
This circuit is useful for viewing photographic negatives on video. A single channel can be used for composite or monochrome video. The inverting amplifier stages are only switched in during active video so the blanking, sync and color burst (if present) are not disturbed. To prevent video from swinging negative, a voltage offset equal to the peak video signal is added to the inverted signal.
This circuit highlights a section of the picture under control of a synchronous key signal. It can be used for adding the logo (also called a “bug”) you see in the bottom corner of commercial television pictures or any sort of overlay signal, such as a crosshair or a reticule. The key signal has 2 bits of control so there can be four levels of highlighting: unmodified video, video plus 33% white, video plus 66% white and 100% white. The two LT1675s are configured as a 2-bit DAC. The resistors on the outputs set the relative bit weights. The output of the LT1675 labeled B in the schematic is one half the weight of the A device. To properly match the 75Ω video cable, the output resistors are selected so the parallel combination of the two is 75 ohms. The output will never exceed peak white, which is 0.714V for this NTSC-related RGB video. The reference white signal is adjustable to lower than peak white to make the effect less intrusive, if desired.
PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

** GN Package **
16-Lead Plastic SSOP (Narrow 0.150)
(LTC DWG # 05-08-1641)

** MS8 Package **
8-Lead Plastic MSOP
(LTC DWG # 05-08-1660)

** S8 Package **
8-Lead Plastic Small Outline (Narrow 0.150)
(LTC DWG # 05-08-1610)

* DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE
** DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010" (0.254mm) PER SIDE
An RGB color bar test pattern is easily generated by dividing down a suitable clock. To form a stable pattern, the clock must be synchronous with the horizontal scan rate. Four times subcarrier, or 14.318MHz, is a readily available frequency, which when divided by 91, gives 157.343kHz. Dividing this signal by two, four and eight, gives the blue, red and green signals, respectively. This timing gives eight bars including white and black that fill the 52.6μs active video time. The digital signals are run through a 74ACT04 inverter because the CMOS output swings rail-to-rail. The inverter output is scaled to make video (0.714V peak, for NTSC-related RGB). The LT1675 drives the cable and adds sync to the RGB signals by switching in −0.286V. If no sync is required, this voltage can be set to zero and composite blanking can be used to drive the select pin of the LT1675 in order to provide a more precise blanking level.