Keywords: Loss of sync, LOS, Loss-of-Sync Alarm, SD video, Automotive, Security Systems, Rear Seat Entertainment, Back up Parking Camera

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APPLICATION NOTE 4133

Using the MAX7461 Loss-of-Sync Alarm to Enable Simple, but Rapid Detection of Standard-Definition Video

By: David Fry

Abstract: The MAX7461 loss-of-sync alarm provides composite sync detection in NTSC, PAL, and SECAM applications. This device is simple to design in and quickly detects the presence or loss of sync within a few lines. The MAX7461 also has the capability to differentiate between SDTV and HDTV syncs. It therefore provides a complete solution to detect the presence or loss of sync with no external components. This enables a system processor to rapidly determine if video signals with valid syncs are present without the overhead of software polling and processing of one or more video inputs.

Device Functional Description

Within the MAX7461, a video signal is first sync-tip clamped to establish the DC level (see **Figure 1**). This removes low-frequency noise, such as a 50Hz or 60Hz hum. It also reduces DC bounce if multiple sources are switched onto the input.

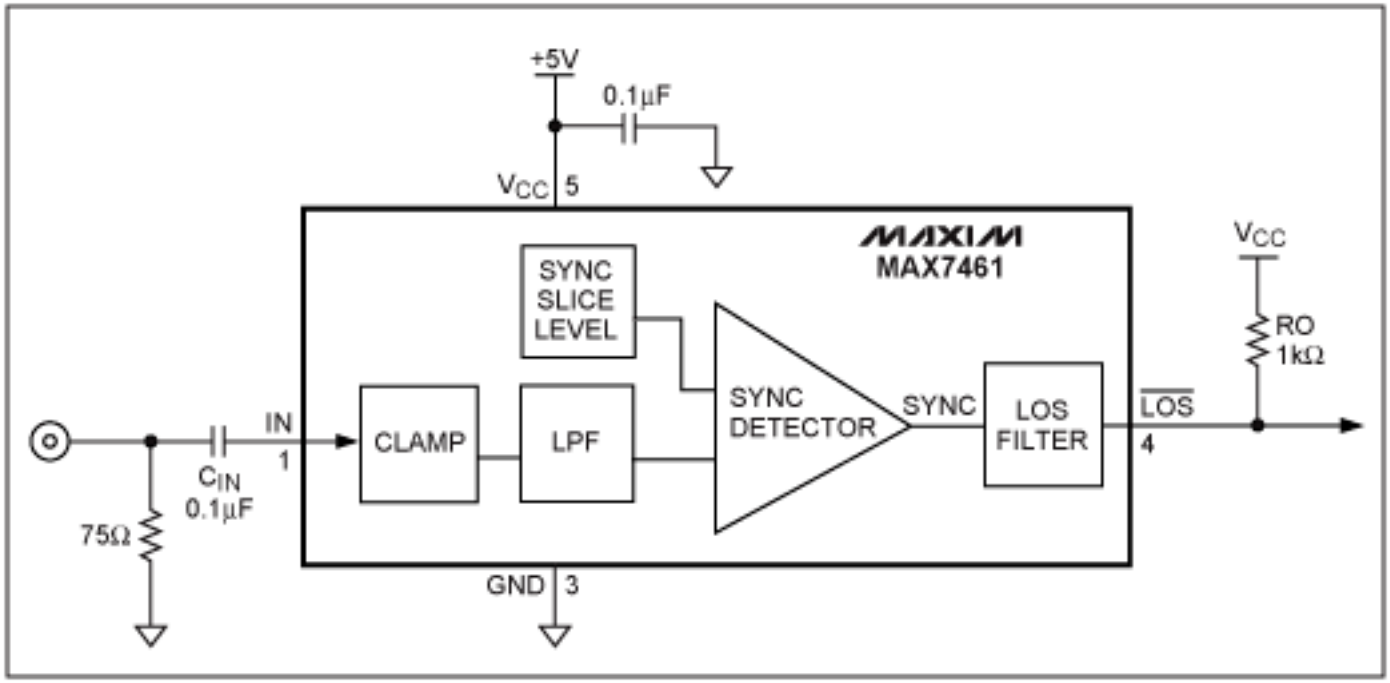

Figure 1. The MAX7461 block diagram.

After clamping, the signal is lowpass-filtered. This prevents false sync detection by removing the burst and chrominance. It also increases noise immunity. The clamped and filtered video is then sliced to extract the syncs by comparing with a sync slice level.

The resulting sync train is applied to the LOS filter, which is the block that enables the device to reliably and rapidly detect syncs. The LOS filter measures both the sync width and the sync frequency.

Device Performance

The MAX7461 needs not only to detect that syncs are present, but to validate them. It does this by measuring their width and frequency, as shown in **Figure 2**.

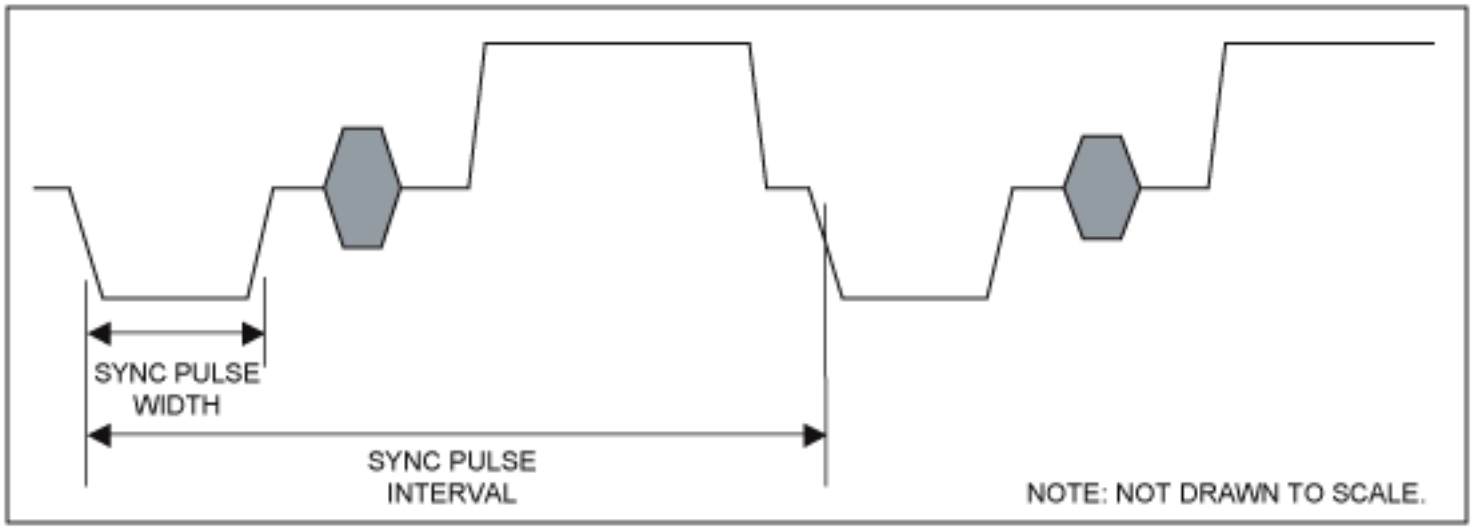

Figure 2. Measurement of sync timing parameters.

The typical value for the sync pulse width is 4.7µs. The typical values for the sync pulse interval are 63.55µs for NTSC and 64µs for PAL. However, due to the large number of color standards in use, it is possible to have sync pulse widths between 4.19µs and 5.76µs. In exceptional cases, sync pulse intervals can even be 63.492µs. The device therefore sets a window for sync pulse width and sync pulse interval. For a signal to show valid syncs, the device must also detect several syncs within the windows for typically 2.2ms. Once valid syncs are detected, they must be lost for typically 3.4ms before the device indicates loss of sync. The tolerances on the detection and release time are shown below in **Table 1**.

Table 1. MAX7461LOS Detect and Release Times

Parameter	Symbol	Min	Typ	Max	Units
LOS release time	t_{RT}	1.7	2.2	2.7	ms
LOS detect time	t_{DT}	1.9	3.4	4.9	

These algorithms, measuring sync width, sync interval over multiple syncs, and hysteresis lead to a very rugged and noise-immune method of detecting syncs.

The sync width and interval windows are set internally to allow all SDTV sync patterns to be detected reliably. If HDTV syncs are input, the device will show a loss of sync. This is important in mixed-standard environments where there is a possibility that HD signals may be inadvertently connected to SD inputs.

Hence, for the MAX7461 to detect valid syncs, it must detect syncs within both width and interval windows for at least 2.2ms. Once it has done this, the valid syncs must be lost for at least 3.4ms, which is equivalent to 53 lines. The typical and tolerated values are shown in **Table 2**.

Table 2. Typical and Tolerated Sync Period Values

Sync Period	Parameter	Symbol	Min	Typ	Max	Units
64µs	LOS release time	t_{RT}	27	35	43	Lines
	LOS detect time	t_{DT}	30	54	77	
63.55µs	LOS release time	t_{RT}	27	35	43	

	LOS detect time	t_{DT}	30	54	78	

Applications and Advantages

Typical CCTV, automotive entertainment, and consumer applications are shown in this section. The processors in such systems are often stretched by their primary functions. Loss of sync can be regarded as a secondary, though still a very important function.

The loss-of-sync function can be performed by the system processors. However, it has to be done in real time and can easily soak up a lot of processing power. Therefore, implementing the loss-of-sync function with a single, simple device removes this real-time processing load from system processors.

CCTV Security System

In a typical CCTV security system (as in **Figure 3**), it is critical that the system processor knows if any of the video sources are not working. Most systems have the ability to monitor and record only a selected number of the cameras attached to the system, as in a room that is monitored by several cameras. Some systems can be programmed such that if a camera source becomes damaged, another camera in the same room will immediately be monitored and recorded. It is, therefore, critical to switch between sources as quickly as possible.

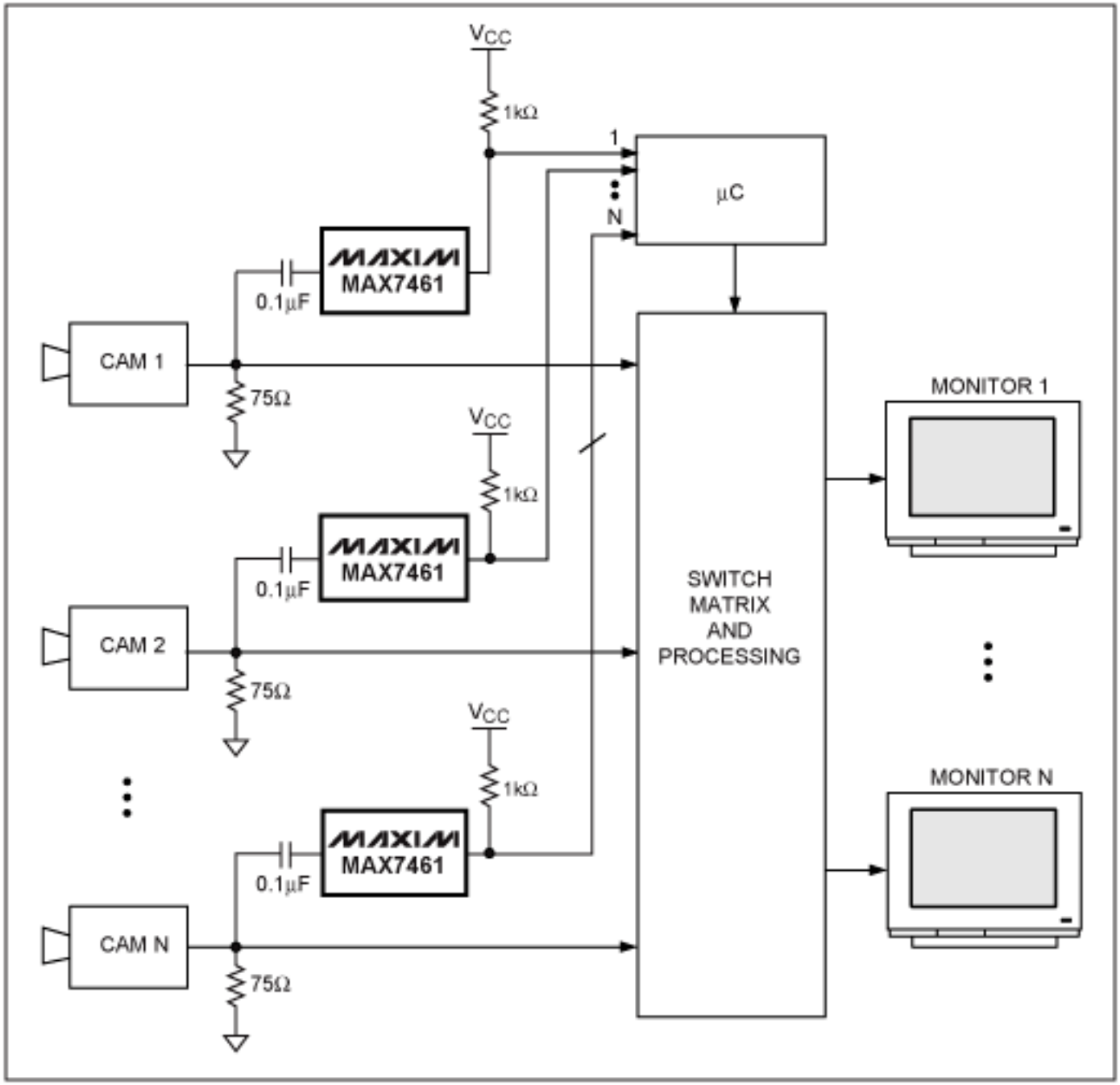

Figure 3. The MAX7461 in a typical CCTV security system.

Automotive Entertainment System Incorporating a Backup Camera

Automotive entertainment systems are becoming increasingly more complex. For example, backup cameras are now being incorporated so that drivers can easily see behind them to make reversing easier. In such an application (see **Figure 4**), particularly at night when visibility is impaired, it is essential that the video signal from a backup camera is monitored continually and the system responds immediately if the signal fails. The MAX7461 takes the load off the system processor so that signal failures are spotted immediately.

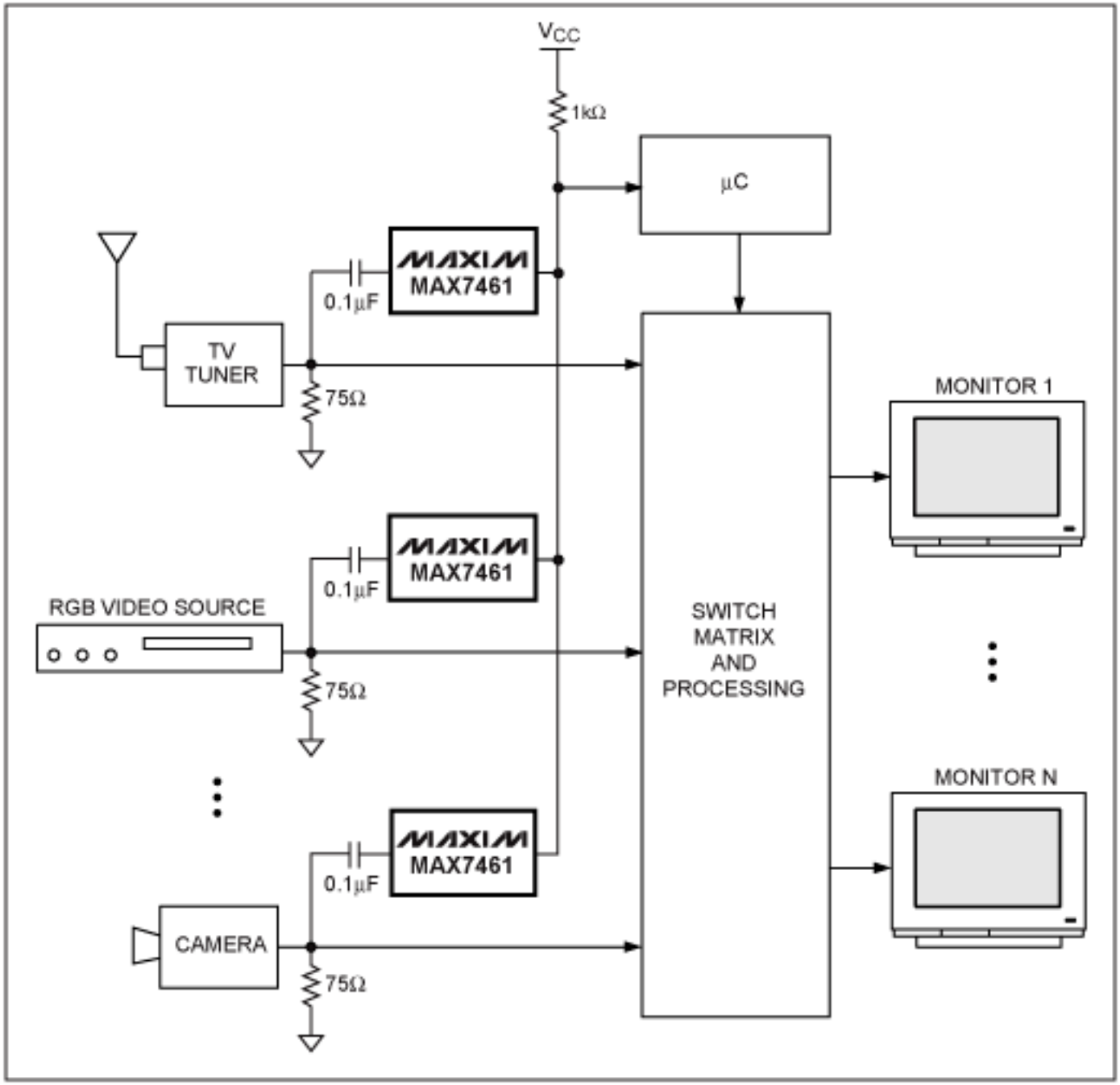

Figure 4. The MAX7461 is shown in a typical automotive backup camera application.

Personal Video Recorder (PVR) System

A typical PVR system often has the ability to record not only from its own internal decoder, but also from auxiliary analog inputs. PVR systems incorporate complex system processors that are heavily utilized in processing video signals. It is, therefore, advantageous to use an external loss-of-sync detector to avoid loading the processor further. A typical block diagram for a PVR application utilizing the MAX7461 is shown in **Figure 5**.

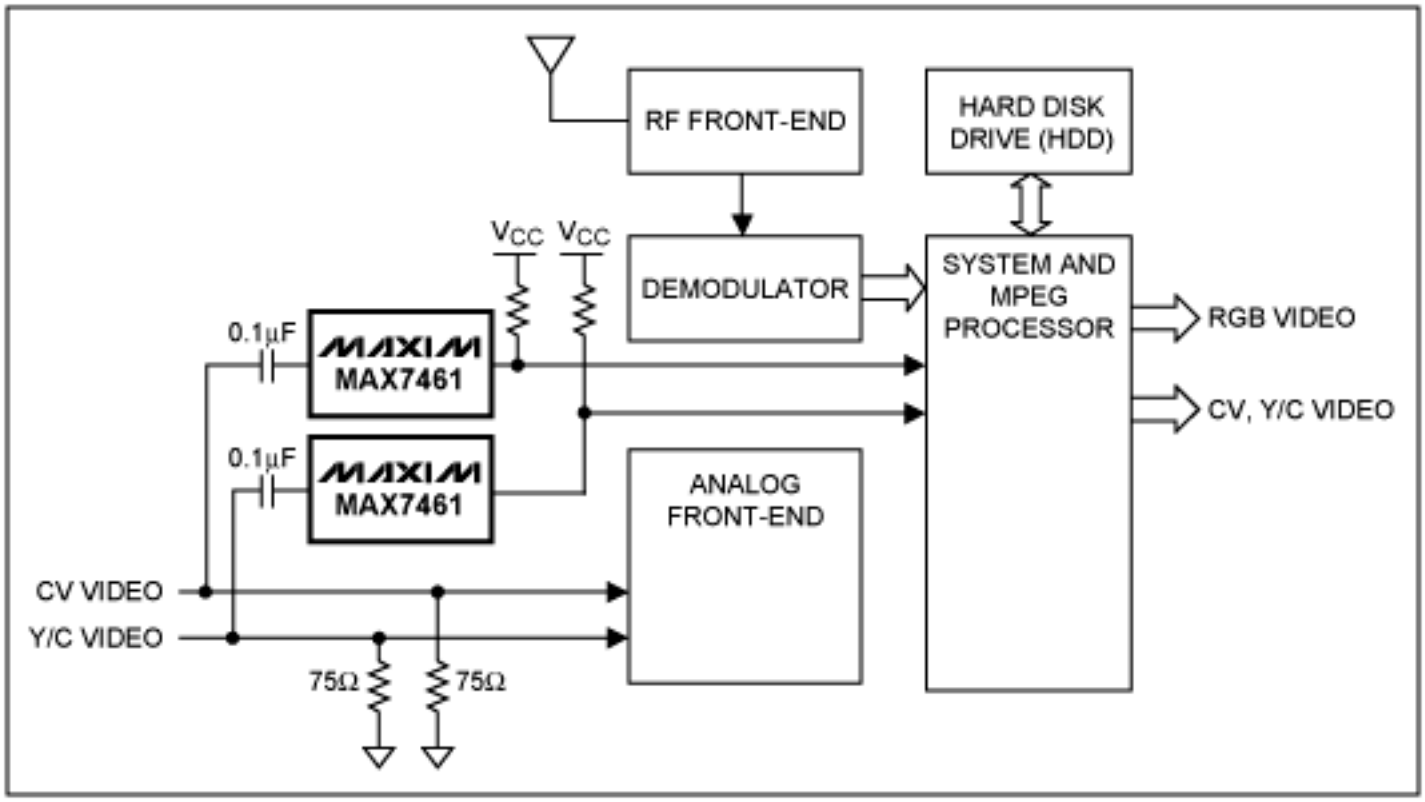

Figure 5. A typical PVR system that incorporates the MAX7461.

Conclusion

This application note describes in detail how the MAX7461 operates to detect the presence and loss of sync in a variety of systems. It shows that the MAX7461 is easy to implement and provides a simple way to reduce the real-time software load on system processors.

Application Note 4133: www.maxim-ic.com/an4133

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