
Embeddable Analog HD Mini DVR

Model 4067

Hardware Manual
Ver. 1.0.2 | December 2023

SENSORAY | embedded electronics



Designed and manufactured in the U.S.A

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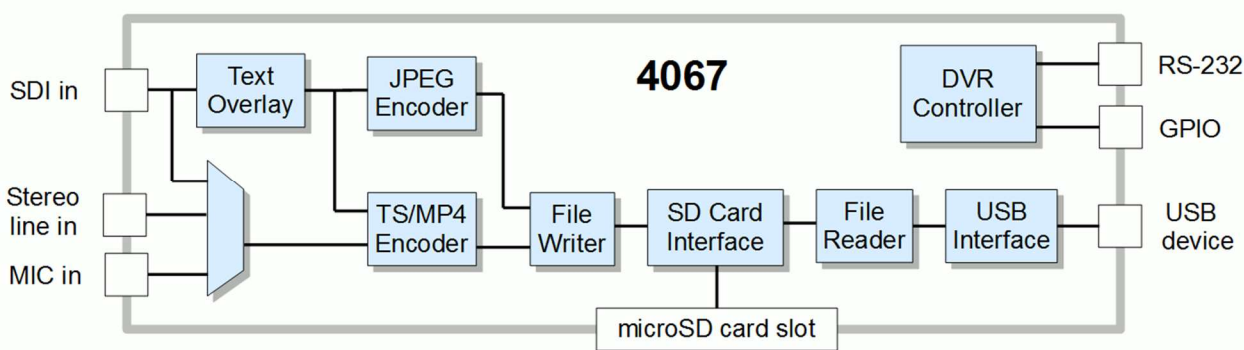
Introduction

Model 4067 is a compact digital video recorder, designed for embedded OEM applications. It captures video from SDI sources in resolutions up to 1080p30, and records to a microSD card. Audio can be extracted from the SDI signal or captured from a microphone or a line source.

The video processor implements H.264 or MJPEG video compression, producing output data formatted as MPEG transport stream (MPEG-TS), MP4 or AVI file formats. Audio compression is performed using AAC-LC. The stream multiplexer employs high precision hardware timestamps to ensure perfect audio-video sync during playback. Snapshot capture is also supported, with MJPEG compression available for both snapshots and AVI streams.

Model 4067 provides a general-purpose IO line that could be used to start/stop the recording or trigger a snapshot. The unit can also be configured to automatically start recording on power up. The delay between applying the power and start of recording doesn't exceed 20 seconds. With MPEG-TS recording format the recording is preserved after power is turned off without issuing a Stop record command. Model 4067 can be also controlled over RS-232 with the help of a command protocol.

A device USB interface for connecting to a computer allows configuring DVR operation, retrieving recordings from the microSD card, and updating firmware.



Operation

Recording

The 4067 is designed primarily for autonomous embedded operation. However, it can be used as a user-controlled DVR.

In an embedded application the 4067 starts recording automatically after the power has been applied. The startup time is approximately 15-20 seconds. The recording continues until there is no more free space on the media, or the power is turned off. The recording format must be transport stream (.ts), so that recorded files are valid even when the recording is terminated by the power off event. Recordings are placed in "DCIM" directory, named with the date and time, e.g. 20190504_134928.ts.

The SD card must be formatted as FAT32. If necessary, please use a formatting utility <http://www.verbatim.com/index/search.php?words=fat32+tool>

Retrieving the files

When the 4067 is connected to a host computer with a USB cable, it is detected as a Mass Storage device. The recorded videos are in /DCIM directory.

Firmware updates

Model 4067 features flash memory that contains the firmware used to operate the hardware on the device. This firmware can be updated in the field to fix problems or add new features. Please follow the procedures below.

1. Obtain the latest firmware file, `s2263.fw`, from Sensoray.
2. Disconnect the 4067 from the power supply. Connect it to the PC using a USB cable.
3. After the 4067 has booted up, it will appear as a Mass Storage Device with the name matching that of the microSD card plugged into the 4067.
4. Eject the device. In Windows right click on the device in the File Manager and select Eject.
5. The Mass Storage device will disappear and reappear as another device named Update2263 containing a `README.txt` and `config.txt` files.
6. Copy `s2263.fw` to Update2263.
7. Wait until Update2263 disappears, and A Mass Storage device reappears.

Once the copy process has completed, disconnect the 4067 from the PC, and reconnect it to the power supply. Do not have the 4067 powered from both USB and external

power simultaneously. This will conclude the firmware update. The firmware version is displayed in `README.txt` file.

Using config.txt

Changing operating parameters of the 4067 is possible using `config.txt` file. When the 4067 is in update mode, a file `config.txt` is present in the root directory of Update2263 drive. This file reflects the operating parameters of the 4067.

To change operating parameters, copy `config.txt` to the host computer, make necessary changes and copy the file back to Update2263 drive. Please note that the values of parameters highlighted in bold below may not be correct in the original file. Those should be set to default values (provided in comments) regardless of the values contained in the original `config.txt`.

```
Video[0].StreamMode = 0 // 0 = TransportStream (H264+audio)
Video[0].BitRate = 2000000 // in bits-per-second 100k-20M
Video[0].RateMode = 0 // 0=CVBR 1=VBR-best 2=FixedQP
2=VBR-good 3=VBR-average 4=VBR-bad 5=VBR-worst
Video[0].Interlaced = 1 // 0=interpolated 1=interlaced en-
coding (ignored when progressive input)
Video[0].Flip = 0 // bit 0: vertical flip, bit 1:
horizontal flip
Video[0].GOPSize = 30 // Group-Of-Pictures size (1 to 255)
Video[0].FrameRate = 30 // Converted internally to integer
frame rate divider)
Video[0].H264Level = 40 // 9=1.0b 10=1.0 11=1.1 12=1.2
13=1.3 20=2.0 21=2.1 22=2.2 30=3.0 31=3.1 32=3.2 40=4.0(default)
41=4.1 42=4.2 50=5.0
Video[0].H264Profile = 100 // 66=Baseline 77=Main 100=High
Video[0].IntraFrameQP = 23 // used with RateMode=2 (0-51)
Video[0].InterPFrameQP = 23 // used with RateMode=2 (0-51)
Video[0].OSD.X = 0
Video[0].OSD.Y = 0
Video[0].OSD.Message =
Video[0].OSD.DateFormat = 0 // 0=MM-DD-YYYY 1=DD-MM-YYYY 2=MM-
DD-YY 3=DD-MM-YY 4=MMM-DD-YYYY 5=DD-MMM-YYYY 6=MMM-DD-YY 7=DD-
MMM-YY 8=MMM DD, YYYY 9=DDMMMYYYY 10=MMM DD, YY 11=DDMMMYY
12=YYYYMMDD 13=YYYYMMDD 14=YMMDD 15=YMMMDD
Video[0].OSD.TimeFormat = 0 // seconds shown: 0=whole 1=tenths
2=hundredths 3=thousandths 4=HH:MM 5=HH:MM AM/PM 6=HH:MM a/p
Video[0].OSD.Transparent = 0 // 0=black background
1=transparent background 2=shaded 50% 3=shaded 75%
```

```

Video[0].OSD.Enabled = 0          // 0=disabled 1=8x14 2=16x16
Audio.VolumeLeft = 0              // 0-119 note: when AGC is on,
volume control isn't used
Audio.VolumeRight = 0            // 0-119
Audio.AGCLeft = 0                // 0=off 1=AGC
Audio.AGCRight = 0              // 0=off 1=AGC
Audio.Input = 0                  // 0=Mic 1=Line 2=Digital
Audio.OutVolumeLeft = 100        // 0-100
Audio.OutVolumeRight = 100       // 0-100
Audio.Channels = 2               // 1=mono 2=stereo
Audio.MonoMode = 0              // 0=mix left&right, 1=left only,
2=right only
Audio.BitRate = 192000           // 32k-512k in bps
Audio.SampleRate = 48000         // 48kHz or 44.1kHz
Audio.Mute = 0                   // 0=not muted 1=mute left 2=mute
right 3=mute both
Capture.Brightness = 128         // video adjustment (0-255)
Capture.Saturation = 128        // video adjustment (0-255)
Capture.Hue = 0                  // video adjustment (-127 to +127)
Capture.Contrast = 128          // video adjustment (0-255)
Recording.Filename =             // 4067 default "DCIM/^d_^t.ts"
Recording.Source = 0           // 4067 default 1
Recording.StartMode = 0       // 4067 default 1=start recording
automatically
Recording.Format = 0         // 4067 default 0

```

Parameters not listed above should not be modified.

If any of the parameters need to be modified, please follow the following procedure.

1. Copy config.txt from Update2263 drive to the host.
2. Edit config.txt.
3. Copy the file back to Update2263 drive.

Once the unit is disconnected from the USB port and powered from a power supply, the new settings take effect.

Setting date and time

The clock is set using the following procedure:

1. Bring the unit into the firmware update mode (follow steps 2-5 listed in "Firmware

Updates” chapter, p.5).

2. Create a file named clock-N.txt, where N is the offset in hours for the current time zone from UTC. For example, PST and PDT would use clock-8.txt and clock-7.txt, respectively. In Rome, Italy, those files will be clock+1.txt and clock+2.txt, for CET and CEST, respectively. The date is calculated from the timestamp on the file (stored as UTC) adjusted by the time zone offset, before being stored in the real-time clock. To create a file from a Windows computer, open the Update2263 device in File Manager, right click on the right pane, and select New/Text document. Change the name from New Text Document.txt to a name reflecting the desired time zone.
3. Eject the Update2263 device. Please note that the next time the unit is brought into the Firmware Update mode, the clock-N.txt file will no longer be present.

Connectors

All mating connectors use crimping contacts Molex 0500798100 for 26-28 AWG wire. Contacts labeled "reserved" should be left unconnected.

USB, J1

Molex 53047-0410. Mating part: Molex 0510210400.

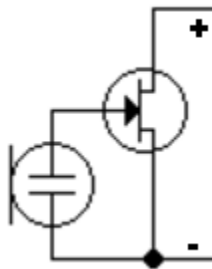
Pin	Signal
1	Ground
2	DP
3	DM
4	VBUS

Audio, JP1

Molex 0532610771. Mating part: Molex 51021-0700.

Pin	Signal
1	ground
2	microphone in +
3	microphone in -
4	ground
5	line input right
6	ground
7	line input left

Note: microphone input expects an electret condenser microphone:



RS232, GPIO, power, JP2

Molex 0532610671. Mating part: Molex 0510210600.

Pin	Signal
1	power (+5V)
2	Ground
3	RS2323 RX
4	RS232 TX
5	Ground
6	GPIO

MicroSD card extension, JP3

Molex 0532610871. Mating part: Molex 0510210800.

Pin	Signal
1	Data2
2	CD/Data3
3	CMD
4	VDD
5	CLK
6	VSS
7	Data0
8	Data1

Specifications

Video Input	
Data rates	270 Mbps, 1.483 Gbps, 1.485 Gbps
Standards	SMPTE 259M(C), SMPTE 292M
Maximum resolution/frame rate	1920x1080p30
Connector	BNC, 75 Ohm
Output video streams	
H.264	High Profile @ Level 3 (MP4, AVI, transport stream)
JPEG	Single snapshots, AVI
Audio inputs	
Stereo line	10 kOhm
Microphone	electret type
Electrical, mechanical and environmental	
Dimensions	26.9x59.4 mm (PCB outline, does not include the BNC connector)
Mass	23 g (without an enclosure)
Operating temperature	-20° to 70° C (active cooling may be required)
Interface	USB 2.0
Power	5 V, 0.5 A max

Thermal Considerations

Measures must be taken to remove about 1 W of heat from the integrated circuit U1 on the video processor board (marked as model 2960). The implementation choice depends on the mechanical and environmental requirements of the particular application.

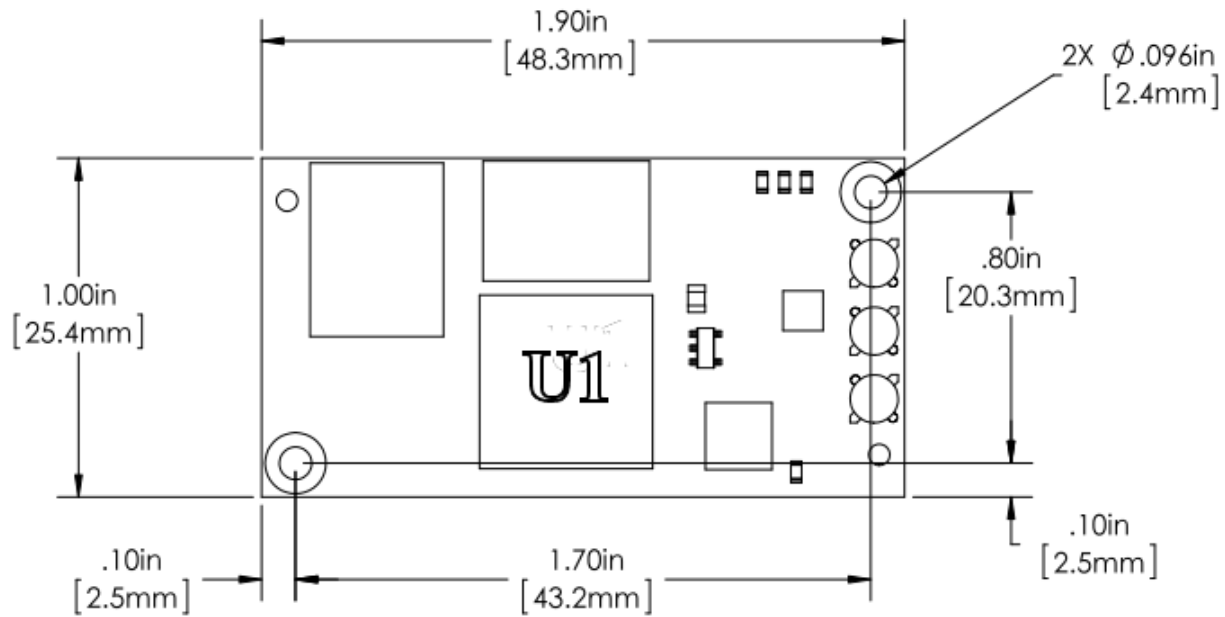


Fig.2. Location of U1 on model 2960 board.

One approach is to use a miniature self-adhesive heat sink, for example Advance Thermal Solutions ATS-54150D-C1-R0.

Alternatively, a heat conducting path may be provided between U1 and the product's enclosure. To ensure good thermal contact and avoid damaging the device we recommend using Bergquist (or equivalent) thermal pads with the highest thermal conductivity possible (5.0 W/m²K), for example, GPHC5.0 or GP5000S35 of the smallest possible thickness.

In any case the temperature of U1 should not exceed 85°C during operation.

Revision history

Version	Notes
1.0.2, December 2023	Added SD card formatting information.
1.0.1, July 2020	Clock setting procedure description detailed.
1.0.0, June 2020	Initial release.