

# HD226, HD1026

BrightSign HD226 and HD1026 media players can be used to decode images, audio, and video for digital-signage and kiosk applications. They have the following new features:

- Improved video and graphics performance
- A 100 Base-T ethernet port (in addition to the standard 1000 Base-T port) for remote control of attached displays and identification
- An internal micro-SD card reader (in addition to the external reader) for greater security
- A SIM card slot
- An M.2 connector for WiFi
- An M.2 connector for an internal cellular modem for wireless 4G player networking.
  - Note that only one module can be fitted at a time since there is only one set of SMA antenna connections

The players can be controlled with various networked and built-in interfaces and include a Real Time Clock (RTC) with supercapacitor that backs up the clock settings when it is power cycled.

## Interfaces

### HD226



Front

**FRONT**

WiFi antenna connector (1 of 2) for WiFi or cellular modem

Ethernet (Control)

IR in/out

3.5mm audio out (combo)

GPIO (16 pins)

4 Status LEDs

WiFi antenna connector (2 of 2) for WiFi or cellular modem

**BACK**

12V 3A power supply

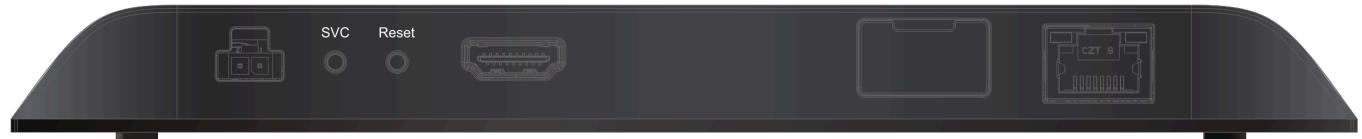
Service button (SVC)

Reset button (Reset)

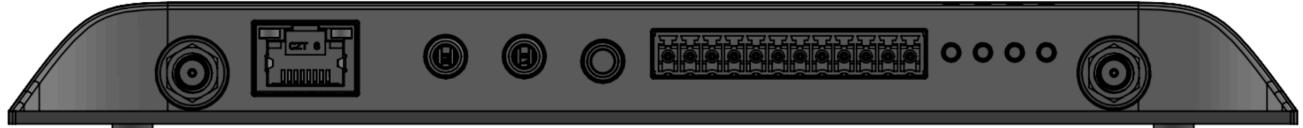
HDMI® out

micro-SD card slot

Ethernet (RJ45 LAN)



Back

**HD1026**

Front

FRONT	BACK
WiFi antenna connector (1 of 2) for WiFi or cellular modem	12V 3A power supply
Ethernet (Control)	Service button (SVC)
IR in/out	Reset button (Reset)
3.5mm serial	HDMI® out
3.5mm audio out (combo)	USB A 2.0 port
GPIO (16 pins)	micro-SD card slot
4 Status LEDs	Ethernet (RJ45 LAN)
WiFi antenna connector (2 of 2) for WiFi or cellular modem	



Back

# HD6 Hardware Interfaces

This section describes the characteristics and operation of all connectors on the HD226 and HD1026.

## Ethernet

An RJ45 jack is provided for connection that supports 10/100/1000 Base-T operations. A second RJ45 jack that supports 10/100/ Base-T operations provides a network connection. It is intended to create an internal network amongst a number of screens for the purpose of screen identification and control.

## Power Connector

The power connector for the HD226 and HD1026, which connects the power cord to the device, is rated for 12V@3A. When looking directly at the device's power socket, right-side positive power:

- Ground signal is the pin nearest to the edge of the product
- 12V power signal is the pin nearest the push buttons

## HDMI Output

The HDMI-out connector on the HD226 and HD1026 is used to send digital video and audio to HDMI-enabled sink devices. The HDMI® output on these players is HDMI 2.0a. CEC control is supported over the HDMI interface independently.

The HD226 and HD1026 support HDR video as well as:

- 3840×2160×60p 10-bit video decode and display
- 3840×2160×60p video rotation
- 3840×2160 graphics plane resolution support

## GPIO

HD226/HD1026 players have a 12-pin GPIO switch and LED connector, which allows the player to control external LEDs or other devices requiring 24mA of current or less.

The GPIO port is a standard design manufactured by Phoenix Contact, Wurth Electronics, and others. Pluggable GPIO terminal blocks can be inserted into the GPIO connector to make bare-wire contacts (see here for an example part). These terminal blocks can be purchased from the BrightSign Store. If you wish to source your own terminal blocks, make sure to use 4-pin or 6-pin blocks (12-pin blocks are extremely difficult to remove from the GPIO port).

Connect the LED outputs to the LED ANODE and connect the LED CATHODE to the ground. If you want to connect another device, then the output is capable of sourcing or sinking up to 3.3V at 24mA, but there is a series resistor of  $100\Omega$  in each line.

The GPIO also allows for connecting of external contact closures to the ground. In order to connect a switch, connect one side of the switch to the switch input, and connect the other side to one of the ground pins on the GPIO connector. The connector can also supply 3.3V at up to 500mA to an external device. The 3.3V output is polyfuse-protected and can source up to 500mA.

If one BrightSign player is driving the inputs on another BrightSign player, then you can drive at most three inputs from one output. The following calculations explain this limitation:

The GPIO outputs have  $100\Omega$  series resistors; the GPIO inputs have 1K pullup resistors to 3.3V; and the input threshold is 2V high and .8V low. The high voltage is not problematic, but the low voltage can be if there are too many inputs connected to one output.

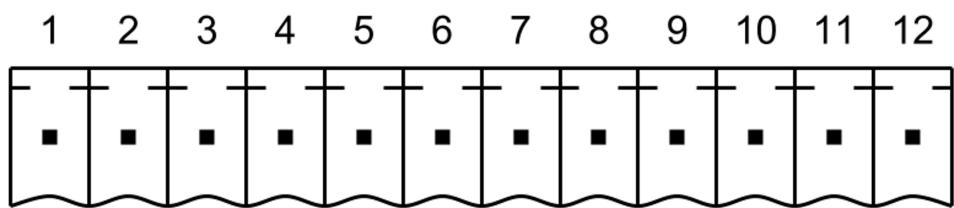
1 out driving 1 in	$V=3.3*100/(100+1,000)=0.3$
1 out driving 2 in	$V=3.3*100/(100+500)=0.55$
1 out driving 3 in	$V=3.3*100/(100+333.3)=0.76$
1 out driving 4 in	$V=3.3*100/(100+250)=.94$ (This is too high, so 1 output driving 3 inputs is the maximum)

## GPIO Pinout

The following table illustrates the pinout of the GPIO on the HD226 and HD1026:

Pin	Function	Pin_1	Function_1
1	GND	7	GND
2	3.3V	8	3.3V
3	BUTTON 0	9	BUTTON 4
4	BUTTON 1	10	BUTTON 5
5	BUTTON 2	11	BUTTON 6
6	BUTTON 3	12	BUTTON 7

The following schematic illustrates the pinout of the GPIO connector.



## IR Input / Output

The IR blaster generates or receives a space-encoded NEC or Pronto Hex signal. RC5 encoding is also supported. The two transported bit values of the signal (0 and 1) are encoded using differing lengths of low-time IR pulses.

The 3.5mm IR in/out port has the following pinout:

- **Tip:** 3.3V@50mA
- **Ring:** IR Input
- **Sleeve:** IR Output

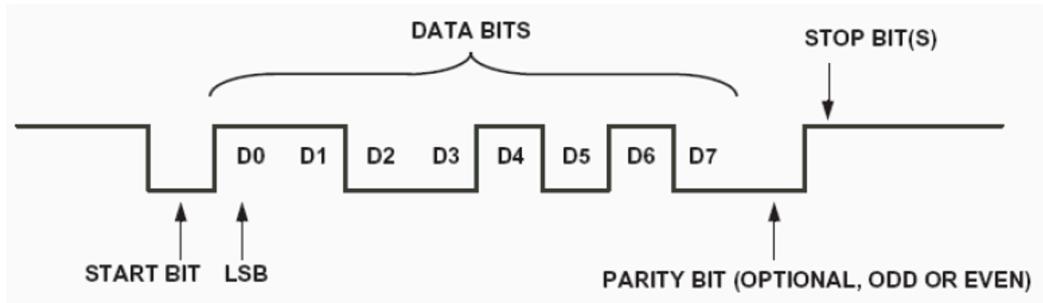
The sleeve is used as a ground during input operations.

## Serial Input/Output

The HD1026 contains an UART (asynchronous serial) interface. It is a 3.5mm (1/8") jack that connects a serial modem or other devices that use a serial connector, and it uses TTL for

communication. The receiver will tolerate input voltages between -30V and +30V, with anything below 3V interpreted as a logical 1. The transmitter drives +5V for logical 0 and 0V for logical 1.

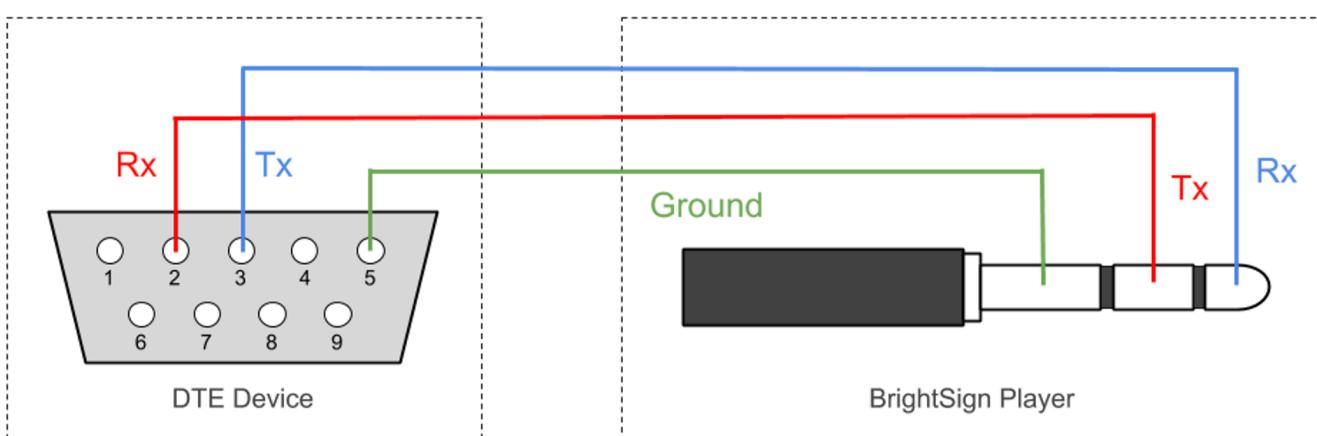
The default baud rate of the interface is 115200, with no parity, 8 data bits, and 1 stop bit. These settings can be configured in the software. The serial interface supports TX, RX, and ground only—RTS/CTS hardware flow control is not supported. The following diagram illustrates the behavior of the TX and RX signal:



The 3.5mm serial port has the following configuration (from the perspective of the player):

- **Tip:** Transmit
- **Ring:** Receive
- **Sleeve:** Ground

BrightSign players are DTE devices, so communication with another DTE device that uses a 3.5mm port would require a null-modem cable or converter that transposes the TX/RX signals. If the device communicating with the player uses a DE9 serial port, the serial cable should be wired as shown in the following diagram:



The HD226 does not support Serial I/O.

# Audio Connector

HD226/HD1026 players have a dedicated 3.5mm stereo audio port and a combination analog/optical audio jack. To transmit a digital audio signal, use an optical audio cable. Analog and digital audio cannot be transmitted simultaneously. Dolby audio is supported as a paid license.

The full-scale voltage output of the analog audio is 2V RMS. The minimum load impedance is  $32\Omega$ .

The analog audio connector has the following pinout:

- **Tip:** Left audio
- **Ring:** Right audio
- **Sleeve:** Ground for audio signal

# USB

The HD1026 has a USB-A 2.0 port to connect USB-compatible devices. This device provides 5V 1A over each USB port for peripheral devices.

The HD226 does not have a USB port.

# WiFi & Antennas

HD6 players are fitted with a E-key M.2 connector which supports 2230 form factor M.2 cards for WiFi (PCIe interface) and Bluetooth[CW1] (USB interface) connectivity. The recommended card is sold separately as BrightSign WD-105 kit which includes two internal antenna cables and two external antennas which are fitted to the external SMA connectors. The internal cables are pre-attached to the card (IPEX4 MHF4 type) and must also be attached to the motherboard connectors (IPEX MHF 4L type) behind the SMAs.

# Cellular Modem

HD6 players are fitted with a B-key M.2 connector which supports 4230 form factor M.2 cards for cellular modem (USB interface) connectivity. The recommended card is the Quectel EM05-G IoT/M2M-optimized LTE Cat 4 module. The external SMA connectors can be used to mount two 4G/5G antennas appropriate for the region of intended use. Two internal cables with appropriate connectors will need to be sourced to connect the card to the antennas.

A nano size SIM card socket is located on the PCB Assembly. The player supports the EM05-G cellular module.

## SSD Interface

HD6 players will accept NVMe SSDs in M.2 2242 or 2280 (but not 2260) form factors of SX id type (single-sided form factor). Double-sided drives (DX id type)\* will not fit because the back side of the SSD is essentially flush against the motherboard. For example, a 2280-S1 module will fit a BrightSign player but a 2280-D2 module would not.

NVMe drives with heat sinks are not compatible with our players.

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\*D4 drives may fit but have not been tested

# HD6 Environmental & Power

## Environmental

The HD226/HD1026 are designed for sustained ambient temperatures between 0°C and 50°C. Non-operational (transportation or storage) temperatures can range from -20°C to 85°C. Units should be allowed time to acclimate before being powered up.

Operating the players above 50°C ambient for prolonged periods may reduce the operational life of the product and result in intermittent resetting of the device.

Exposing a cold player to warm air at high relative humidity may cause water to condense inside the player, leading to component failure. Damage due to such internal condensation is not covered by warranty. If a player is cold, allow several hours for it to acclimatize to ambient conditions before applying power.

## Power

### Power Adapter

The HD226 and HD1026 are supplied with 12V@3A power supply:

Ports Supplying Power	Estimated Power Budget
USB-A	5V @ 1.5Amps
GPIO	3.3V @ 0.5Amps
WiFi	3.3V @ 0.8Amps
SSD	3.3V @ 0.8Amps
Cell Modem	3.3V @ 0.8Amps

# HD6 Theory of Operation

This section describes how specific components operate on the HD226 and HD1026.

## On-Board LEDs

The four on-board LEDs have the following indicators:

LED	Indication
Green power ( <b>Pwr</b> )	Displays when the board is powered up and not in reset mode. Flashes during firmware update process.
Green file-system activity ( <b>Bsy</b> )	Flashes any time there is file-system activity (on any storage device)
Blue ( <b>WiFi</b> )	Illuminates when WiFi/Cell modem is connected and flashes when searching for a connection
Red status ( <b>Err</b> )	Flashes a certain number of times to indicate which error is occurring. The flash codes are described below: 2: Unspecified error 3: Network recovery script is preparing to run on a device configured for network recovery 4: No upgrade file found 5: Failed to load kernel module 6: Board is not capable of running the current firmware version 7: A piece of on-board hardware is not working correctly 8: Problem related to the storage device (either the USB drive or MicroSD card) 9: Problem related to the registry/NAND 10: The autorun script encountered a load/run error 11: WiFi-related error 12: Unable to find bootable image

## On-Board Switch / SVC Button

The on-board switch is connected to the GPIO02, which is pulled low when the service (SVC) button is pressed. Conversely, a pull-up on the button normally sets the GPIO02 to be pulled high.

## Reset Switch / GPIO Button

The on-board switch is connected to the reset circuit. Pressing down the reset button will send an initial signal to the system software and holding the reset button low for approximately 6 seconds will cause a hard reset.

## microSD Slot

The HD226 and HD1026 have two SD ports, one external and one internal. The internal SD card reader will support speeds up to SDR104, while the external SD card reader will support speeds up to DDR50. There is no inherent limit on the storage capacity of microSD cards used with the player.

## Wireless Module/M.2 Connector

HD6 players have a dual antenna connection which allows users to install a BrightSign wireless module. BrightSign modules are configured to work with 802.11.N or 802.11.AC access points.

The wireless module also offers Bluetooth functionality.

## Cellular Modem

The XD236/XD1036 are fitted with a B-key M.2 connector which supports 4230 form factor M.2 cards for cellular modem (USB interface) connectivity. The recommended card is the Quectel EM05-G IoT/M2M-optimized LTE Cat 4 module. The external SMA connectors can be used to mount two 4G/5G antennas appropriate for the region of intended use. Two internal cables with appropriate connectors will need to be sourced to connect the card to the antennas.

A nano size SIM card socket is located on the PCB Assembly. Note that cellular modem cards with components on the rear will not fit.

# HD6 Dimensions



# HD6 Mounting

HD226/HD1026 players can be mounted on a wall using the sealed mounting holes on the front and back. It is recommended that you mount the device using four screws (one for each hole). The screws should have a major diameter between 3.5mm and 4.2mm.

**Nails should not be used to mount the device.**