



STM32L496G DISCOVERY

STM32L496G discovery kit

Revision 1



Hello, and welcome to this presentation of the STM32L496G Discovery kit (32L496GDISCOVERY). It covers the main features of the Discovery board dedicated to the STM32L4 series. The demos included with the STM32L496G Discovery kit will allow you to become more familiar with this new high-performance, ultra-low-power microcontroller.



- Discover the ultra-low-power STM32L496 MCU
 - Enables a wide diversity of applications
 - Benefits from audio, multi-sensor, graphics, security, video and high-speed connectivity features
 - Embedded ammeter measures consumption in Run and low-power modes
 - Comes with various packaged software examples and an embedded debugger

Application benefits

- Instantly measure power dissipation on real silicon
- Turn-key demonstration firmware
- Develop your own application

The STM32L496G Discovery kit offers everything required for users to get started quickly and develop applications more easily.

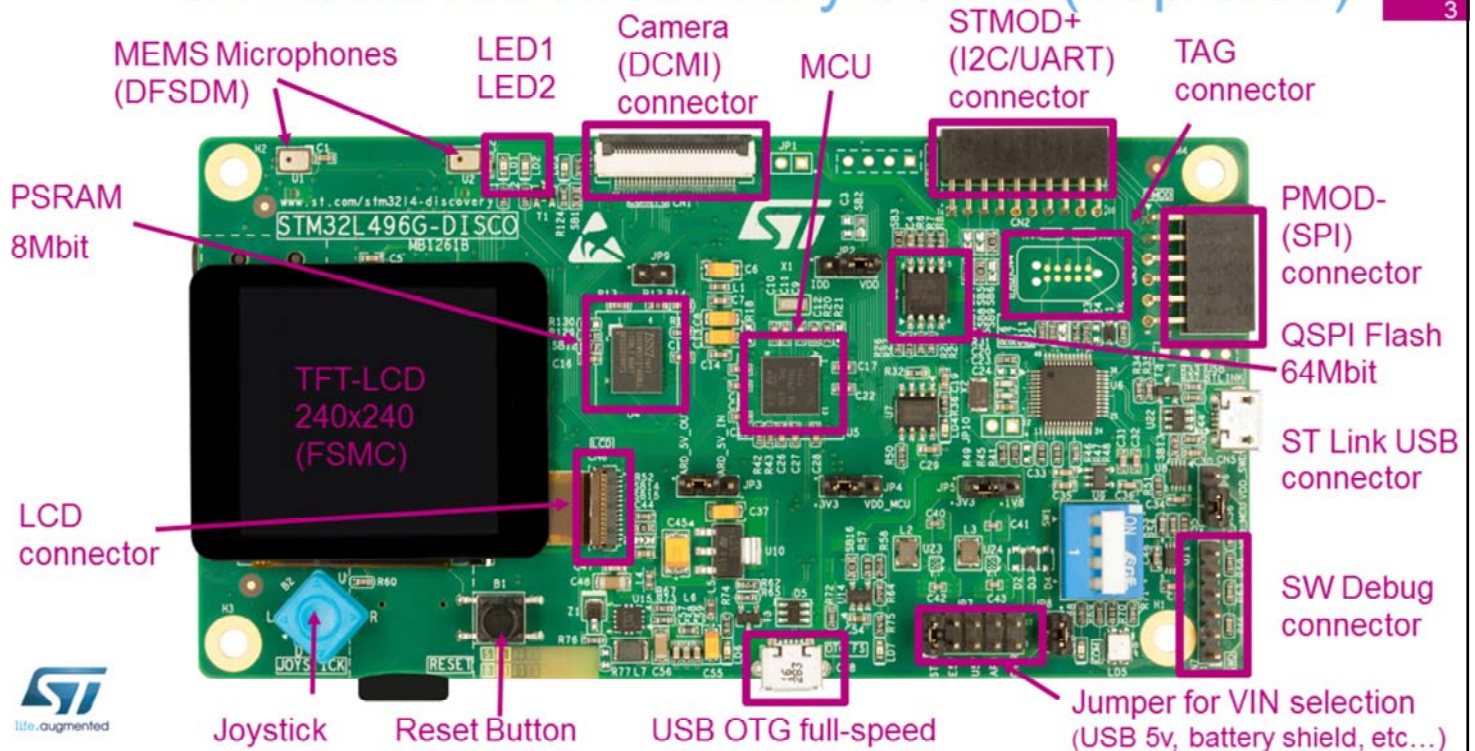
This board enables a wide diversity of applications taking benefit from audio, multiple sensors, graphics, security, video and high-speed connectivity features.

It embeds a high-precision ammeter for measuring the current consumption of the STM32L496 microcontroller in Run and low-power modes.

The STM32L496G Discovery board comes with the STM32 comprehensive software package including a HAL library together with various packaged software examples. It also embeds a debugger that helps you develop your own applications from the existing examples.

STM32L496 Discovery board (Top side)

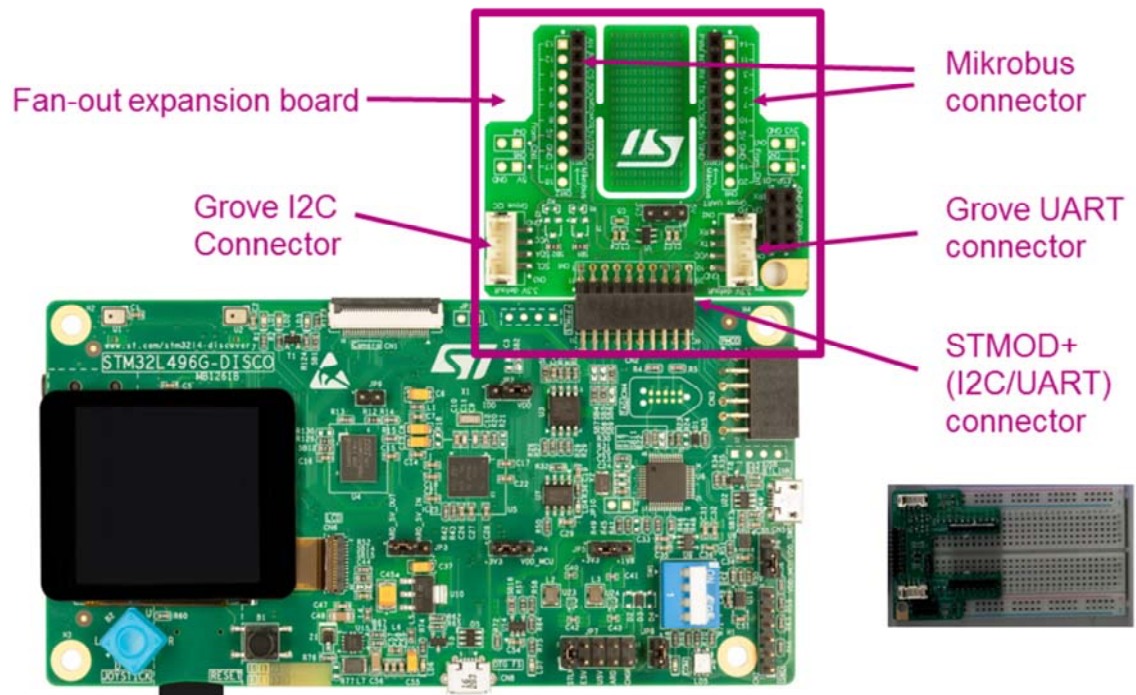
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This is the STM32L496G Discovery board.

The top side is covered by the LCD display with 2 MEMS microphones on the side, camera, STmod+/Pmod- pins and USB full-speed connectors.

Expansion board



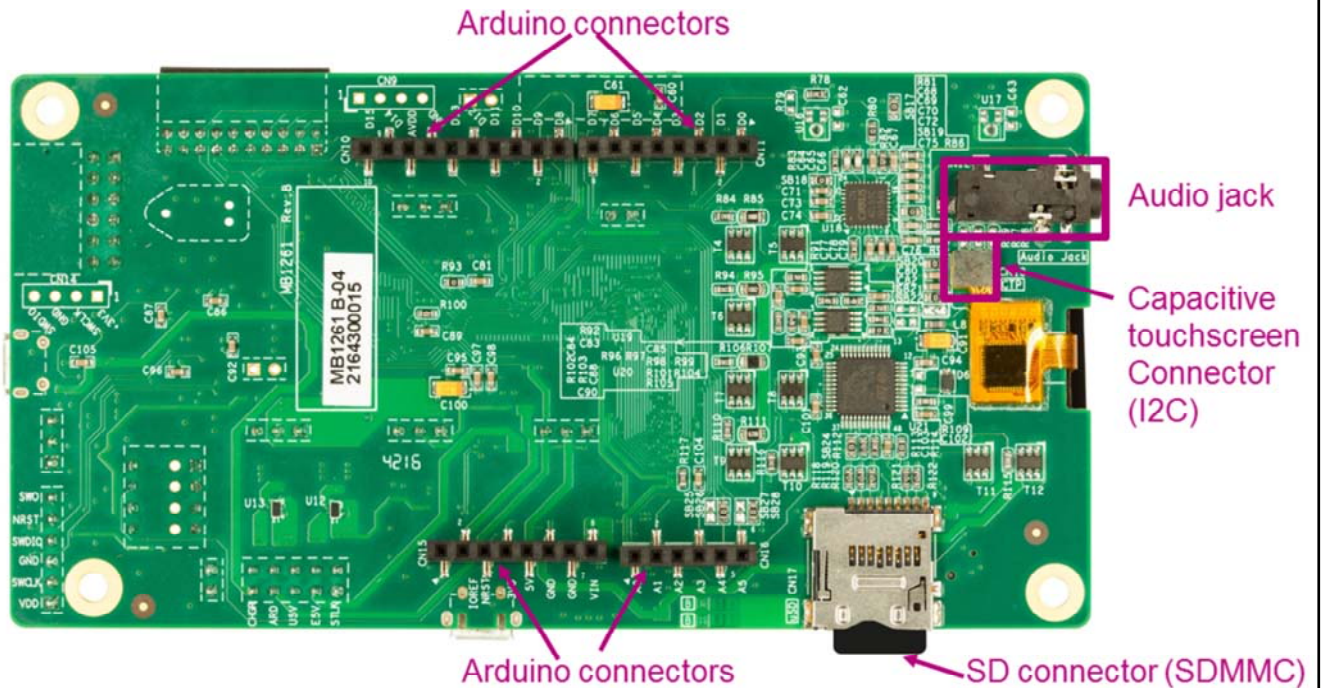
STmod+/Pmod- pins offer I2C, UART and SPI connectivity. It is also possible to extend the capabilities of this board by connecting a fan-out expansion board thanks to the STMOD+ connector.

This small board brings support for Grove and Mikrobus compatible connectors.

Space is also provided on this expansion board for headers to use with breadboards.

STM32L496 Discovery board (Bottom side)

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The bottom side offers audio and memory card connectors. The Arduino connectivity support provides unlimited expansion capabilities with a large choice of specialized add-on boards. This board will help us to demonstrate STM32L4 performance and versatility thanks to its large peripheral set.



Key features

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- STM32L496AG microcontroller in a 169-ball UFBGA package
 - ARM® Cortex®-M4F core @ 80 MHz
 - 1 Mbyte of Flash memory / 320 Kbytes of RAM
- Board features
 - 8 Mbytes of Quad-SPI Flash memory, 1 Mbyte of PSRAM
 - Full-speed USB OTG
 - 8-bit camera interface, 9-axis motion sensors and MEMs digital microphone
 - Connectors for microSD card
 - MCU current ammeter with 4 ranges and auto-calibration function
 - SAI Audio codec with a stereo headset jack, including analog microphone input
 - 1.54 inch, 240x240 pixel, color LCD-TFT with capacitive touchscreen
 - Embedded ST-LINK/V2-1 debugger/programmer
 - Compatible Arduino™ Uno V3 connectors



The STM32L496AG microcontroller (MCU) features an ARM® Cortex®-M4F core running at up to 80 MHz, 1 Mbyte of Flash memory and 320 Kbytes of RAM.

It also features a rich set of peripherals including:

- 8 Mbytes of Quad-SPI Flash memory to store large data arrays or program code
- 1 Mbyte of PSRAM
- USB On-The-Go allowing a direct connection with other USB devices without the need for a host computer
- A Digital Camera Module Interface (DCMI) to capture high-speed uncompressed and JPEG compressed images
- 2 ST MEMS-based digital microphones
- ST's own high-performance MEMS motion sensors, including a 3-axis accelerometer, 3-axis magnetometer and 3-axis gyroscope
- A high-precision current ammeter with 4 ranges and auto-calibration, based on an STM32L152 MCU

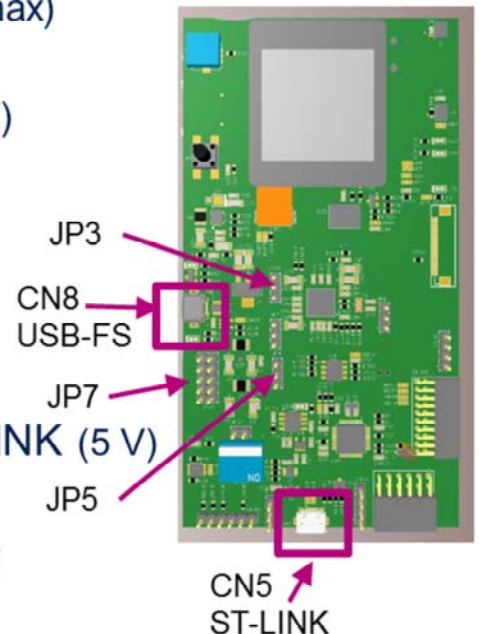
- A Serial Audio Interface with a stereo headset jack, including analog microphone input
- A 1.54 inch, 240x240 pixel, TFT color LCD
- An embedded ST-LINK/V2-1 debugger/programmer for connecting your favorite development tools
- Compatible Arduino™ Uno V3 connectors

This board incorporates 3 distinct STM32 devices: the target, the debugger and the MCU used to measure the current.

Power supply modes

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- ST-LINK USB connector CN5 (5 V, 500 mA max)
 - Jumper JP7 set to STLK
- Arduino™ connector CN15 VIN pin (6 to 9 V)
 - Jumper JP7 set to E5V
- Arduino™ connector (5 V)
 - Jumper JP7 set to STLK / JP3 set to ARD_5V_IN
- USB FS connector CN8 (5 V)
 - Jumper JP7 set to E5V
- DC power charger connected to USB ST-LINK (5 V)
 - Jumper JP7 set to USB
- It is possible to supply MCU under 1.8 or 3.3 V
 - Jumper JP5 set to 1V8 or 3V3



The Discovery kit has five power supply modes.

It can be supplied by ST-LINK USB connector if you plug in a Mini-B USB cable. For this, make sure:

- The JP7 jumper is set to STLK
- In this configuration the current is limited to 500 mA

It can be supplied with 6 to 9 V DC from the VIN pin of Arduino™ compatible connector CN15. For this, make sure:

- The JP7 jumper is set to E5V

It can be supplied with 5V from the Arduino™ compatible connector CN15. For this, make sure:

- The JP7 jumper is set to STLK
- The JP3 jumper is set to ARD_5V_IN

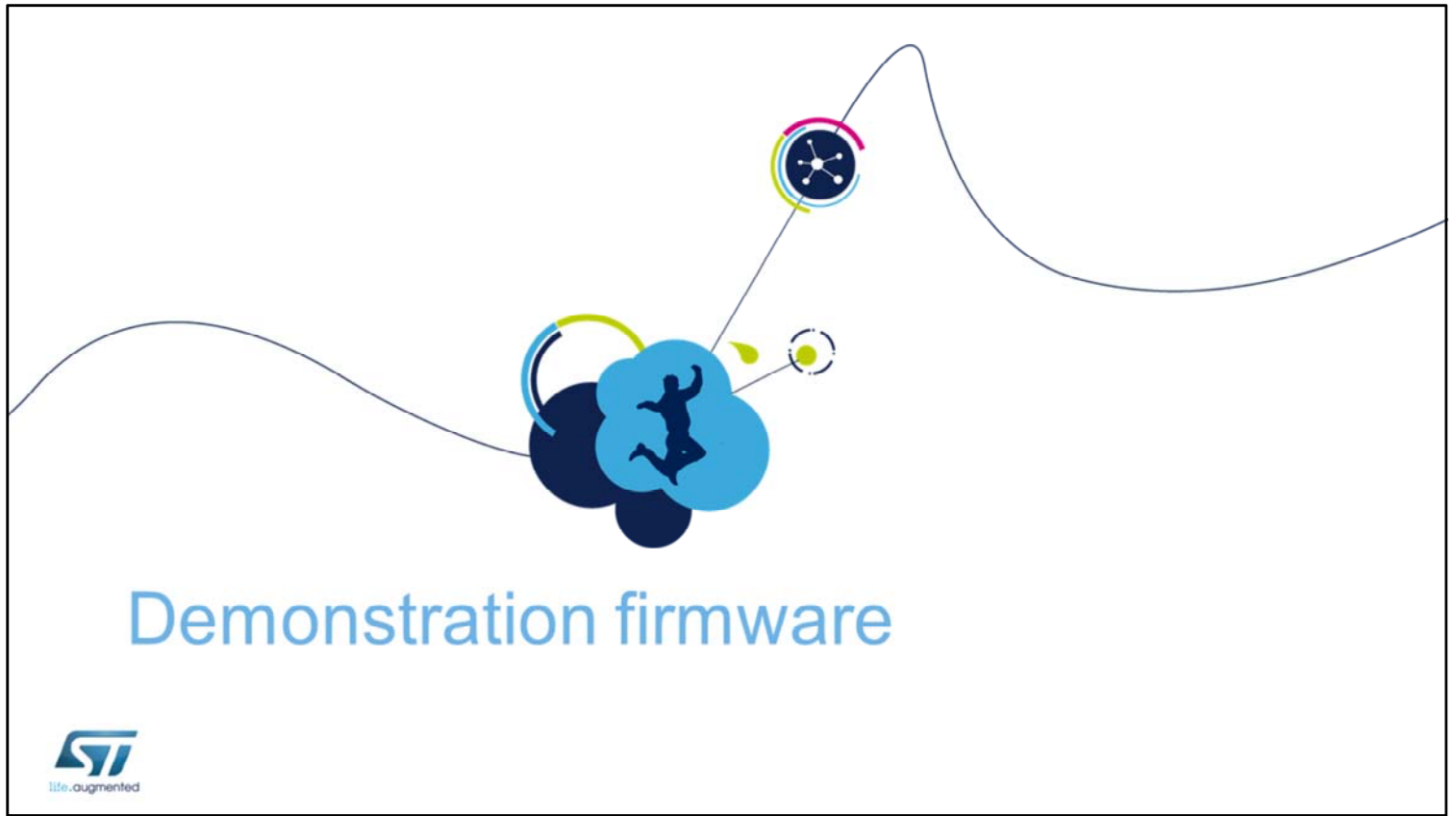
It can be supplied by 5V DC from the User USB FS connector CN8. For this, make sure:

- The JP7 jumper is set to E5V

It can be supplied by 5V DC power charger connected to USB ST-LINK (CN5). For this, make sure:

- The JP7 jumper is set to USB

Please note that it is possible to supply the MCU under 1.8V or 3.3V by setting the JP5 jumper accordingly.

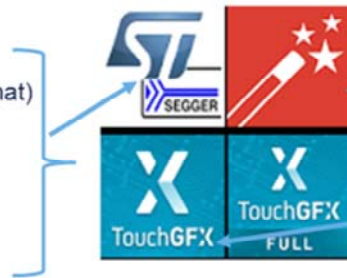


Now, let's look at the demos included in the STM32L496G Discovery kit.

Demo Presentation 9

- STemWin based demos:

- Audio Player (WAV format)
- Video player (motion JPEG format)
- Audio Recorder (WAV format)
- USB
- Clock
- System info
- Current (power consumption) measurements



- Graphic Partners demos:

- Embedded Wizzard (Tara systems)
- Touch GFX (Draupner) 'light' and 'full graphic' versions

- Demonstrations selection is done by navigating from one screen to another thru TouchScreen: 4 features displayed per screen

- From one display to another: columns move left wise (resp. right wise) with a left (resp. right) finger move



Now let's run the various applications by touching the menu icons. The demonstration software is preloaded in the STM32L496AG Flash memory. The latest versions of the demonstration source code and associated documentation can be downloaded from www.st.com/stm32l4-Discovery.

The touchscreen enables navigation through the demonstration menus on the LCD screen.

The demonstration firmware features 10 applications:

The Audio player application plays back WAV files from a USB drive.

The Video player application plays back video files loaded in Flash memory.

The Audio recorder shows the signal processing capability in real-time conditions.

The USB application shows mass storage capabilities using a Micro SD memory card.

The Clock application shows analog time adjustment using the RTC configuration.

The Current consumption application measures and displays the MCU consumption depending on the selected power mode.

The System info menu displays various board information such as firmware version, CPU speed and core type.

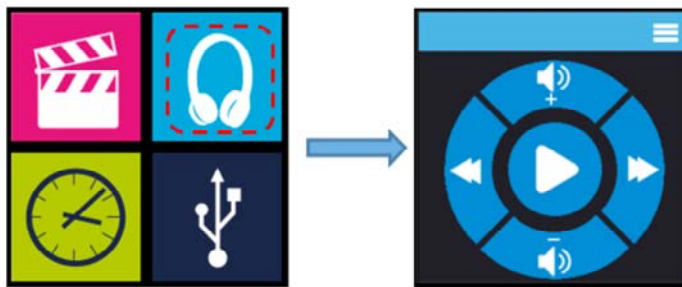
3 partners Graphic application demonstrates the graphics capabilities of the platform (Embedded Wizzard from Tara Systems, Touch GFX in “light” and “full graphic” version from Draupner).

Audio Player demonstration 10

- **PLAYER application**

- Uses CS42L51 audio DAC and 3.5 mm jack output
- Audio playback from microSD memory card
- The audio player is started from the main desktop menu as shown below:

Audio player module startup



The **PLAYER application** plays back WAV files stored in the microSD memory card. It uses a CS42L51 audio codec to output the audio data on the 3.5 mm jack. Earphone volume can be adjusted during playback.

Audio Recorder demonstration

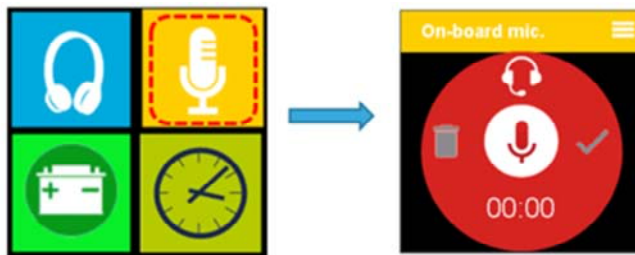
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- **RECORD** application

- 16-bit audio samples @ 16 kHz or 32KHz in WAV format stored in microSD memory card
- Embeds quick audio player
- Uses MP34DT01 MEMS microphone
- Only 8 Kbytes of RAM required for audio processing



Audio Recorder module startup



The **RECORD** application uses the MP34DT01 MEMS digital microphone to record 16-bit audio samples at 16 or 32 kHz in WAV format. The recorded audio file is stored in the microSD memory card.

Video Player demonstration

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- **PLAYER application**

- Based on the STM32L4xxx and the STemWin movie APIs.
- Supports AVI video format, frame rate up to 13 fps
- Video files are stored in the microSD memory card

Video player module startup

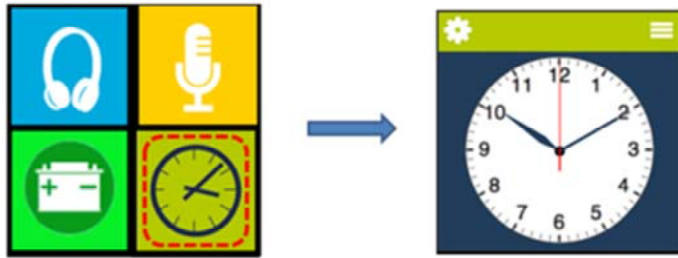


The **Video PLAYER application** plays video AVI files stored in the microSD memory card. It allows frame rates up to 13 fps.

Analog clock demonstration 13

- Analog Clock application
 - Shows and adjusts the analog time by changing the RTC configuration.

Analog clock module startup



Press the Settings button:

- first time to adjust the minutes
- second time to adjust the hours



The **Analog clock application** shows and adjusts the analog time by changing the RTC configuration.

USB Device Mass Storage

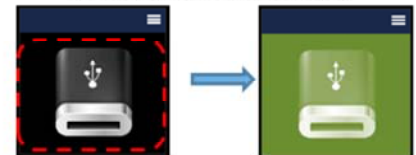
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- USB Device mass storage application
 - Allow reading of data from PC on USB (Host) and copy on the Discovery board's microSD memory card (USB Device).

USB module startup



Connect the USB device (Discovery board) to the PC by touching the screen (except the header zone)



The **USB Device Mass storage application** is used to read data from a PCB through a USB connection and copy the data into the Discovery board's microSD memory card.

Current consumption demonstration

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- IDD current consumption application
 - Measures and displays in real time the MCU current consumption depending on the selected power mode:

Current Consumption startup



The Current consumption application measures and displays in real time the MCU current consumption depending on the selected power mode.

The current is measured and calculated thanks to a second microcontroller on the board which is a STM32L1 MCU.

- System Information application
 - Shows the main demonstration information such as:
 - Board part number, CPU clock and firmware version

System Information module startup



The **System Information application** provides various information on the main demonstration such as the board reference, the CPU clock speed and the demonstration FW version.

Partner Graphical demo application

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- Graphical demo application
- Partners graphic capabilities illustration (analog or digital watch, activity monitoring, power consumption measurement, game, audio player sub-menus)

Partner graphical module startup



- Embedded Wizzard (by **Tara systems**)
- Touch GFX (by **Draupner**) 'light' and 'full graphic' versions
 - For Quad-SPI size limitation reasons, the TouchGFX full demo first automatically downloads code and graphic resources from the SD card to the embedded Flash and the Quad-SPI.
 - This operation overwrites the Embedded Wizzard and TouchGFX light demonstration resources present by default.
 - User can come back to Embedded Wizzard and TouchGFX light demonstrations. Launching either one requires another download operation to restore the graphic resources.



Partners graphical demonstrations are started directly by pressing one of the corresponding icons.

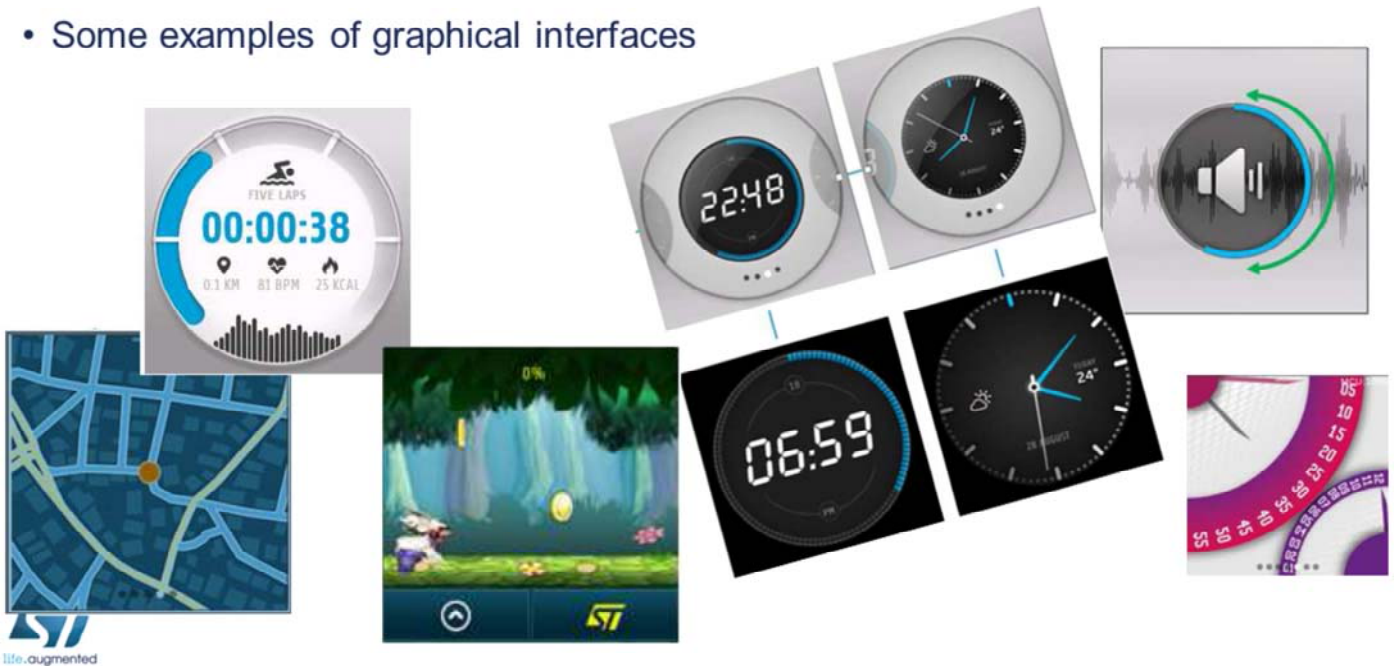
They demonstrate some of the graphics capabilities of the platform such as analog or digital watch, activity monitoring, power consumption measurement, game and menus.

The TouchGFX Full graphic demonstration requires downloading the code from the SD card overwriting the Embedded Wizzard and TouchGFX light demonstration resources present by default.

Partner Graphical demo application

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- Some examples of graphical interfaces



Here are a few examples of the graphical capabilities demonstrated in the partner's applications.

- Refer to www.st.com/stm32l4-discovery
 - Ordering information
 - Getting started manual, user's manual and application notes
 - Board schematics
 - Application development environment support
 - Demonstration firmware sources
- Video available on YouTube and st.com
 - "Getting started with the STM32L496G Discovery kit for ultra-low-power & performance applications"



For more information on the ultra-low-power STM32L496G Discovery kit, visit www.st.com/STM32L4-DISCOVERY. You can also watch our videos on our YouTube channel.

Thank you.