

Fallguy *MINI*
**UNIVERSAL EMBEDDED MP3 MODULE
WITH COMPACT FLASH CARD SLOT
AND SERIAL INTERFACE**

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www.loetronic.com
info@loetronic.com

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1. Overview

The Fallguy MINI MP3 module is an universal and compact embedded module in credit-card size for playing compressed audio data (MP3). The module was designed for use in embedded systems and for integration in customer specific environment. It is a versatile audio module for working in rough industrial applications.

The module has a Compact Flash (CF) card slot for using with CF cards type I or II.

Controlling the module could be done either by button or digital and analog inputs. The internal firmware of the module could be adapted to the customer needs. The playback behaviour is defined through the programmed firmware.

2. Technical data

Microcontroller:

- 16-Bit microcontroller MC9S12C32 with 25 MHz
- 32 kByte flash memory for the internal firmware
- 2 kByte RAM

MP3-Decoder:

- Hardwaredecoder (DSP) STA013
- Decodes MPEG1, MPEG2 and MPEG2.5 Layer III (MP3) with up to 320 kbit/s or variable bitrate
- Volume and equalizer control

Audio-D/A-Converter:

- High quality 24 bit / 96 dB D/A converter CS4334

Amplifier for headphones:

- 80 mW amplifier MAX4409
- DirectDrive technology
- Rejects common-mode noise

Compact Flash slot:

- Compact Flash cards from 64 MB up to 128 GB
- FAT32 file format
- Playback length (example) with 4 GB memory and 128 kbit/s MP3 encoding about 72 hours

Operating temperature:

- -20 °C to +85 °C

Operating voltage:

- 9 V to 12 V (DC) un stabilised

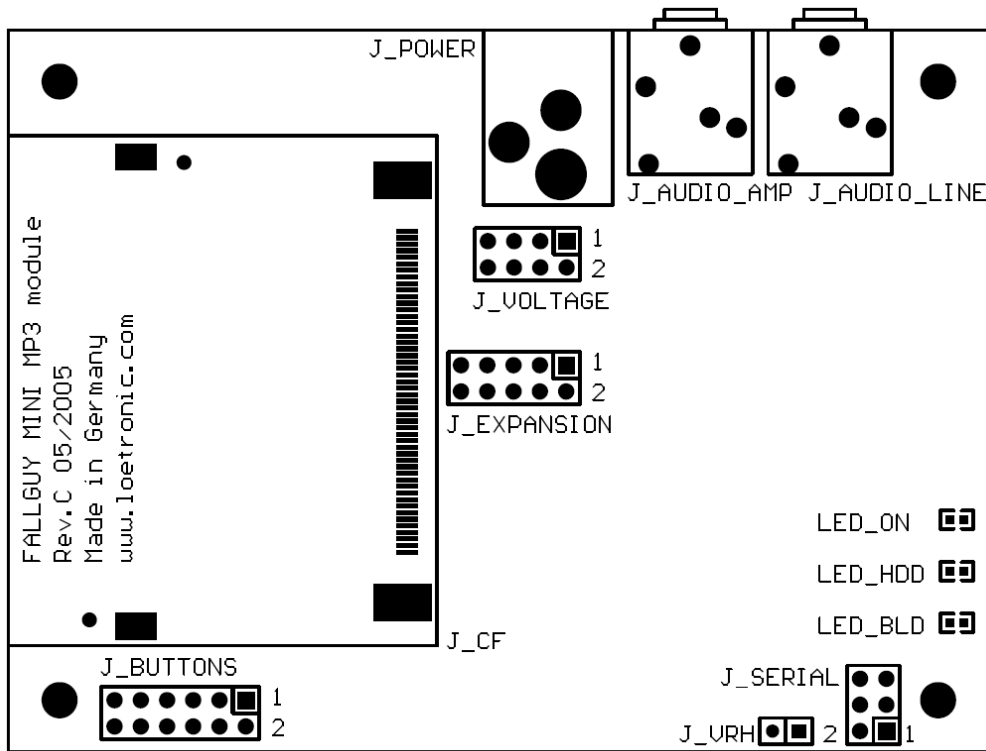
Current consumption:

- 135 mA (typical) with CF card

Interfaces:

- 6 debounced button inputs for direct control with buttons, sensors or relays
- 2 analog or digital inputs
- 8 digital in- or outputs
- 1 asynchronous serial interface (TTL-level)
- Plug for LINE OUT – stereo
- Plug for headphone – stereo

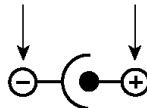
3. Connection possibilities



Picture 3.1 Fallguy MINI MP3 module Rev.C - Connections

J_POWER

- Connection for a 9 V to 12 V (DC) unstabilised voltage source.
- **CAUTION: The inner pole is the plus pole!**



J_CF

- The Compact Flash card slot is compatible with all CF cards available.

J_VRH

- If the internal A/D converter of the MINI module is used, J_VRH must be bridged.

J_EXPANSION

- The J_EXPANSION interface is for connecting external periphery. The internal firmware of the module must be programmed to use the in- and outputs from this interface. Every MINI module is equipped with the standard firmware or a customer specific firmware and is delivered with a datasheet describing all functions of this interface.
- Depending on the functions external PullUp oder PullDown logic must be added!
- All in- and outputs of the J_EXPANSION interface are connected directly to the microcontroller on the module. If they are used, they must be protected by series resistors and the voltage level must be maintained.
- **Non conforming voltage levels could damage the microcontroller on the module!**

Assignment:

Pin-No.	Name	Description
1	Trigger 6	Analog or digital input (0 – 5 Volt)
2	Trigger 7	Analog or digital input (0 – 5 Volt)
3	In/Out 0	Digital in- or output (TTL-Level)
4	In/Out 1	Digital in- or output (TTL-Level)
5	In/Out 2	Digital in- or output (TTL-Level)
6	In/Out 3	Digital in- or output (TTL-Level)
7	In/Out 4	Digital in- or output (TTL-Level)
8	In/Out 5	Digital in- or output (TTL-Level)
9	In/Out 6	Digital in- or output (TTL-Level)
10	In/Out 7	Digital in- or output (TTL-Level)

J_BUTTONS

- 6 buttons or relais could be directly connected to the J_BUTTONS interface. The button input must be bridged with ground to activate. The corresponding action of the input depends from the programmed firmware of the MINI module. Every MINI module is equipped with the standard firmware or a customer specific firmware and is delivered with a datasheet describing all functions of this interface.

Assignment:

Pin-No.	Name	Description
1	Button 1	Button input 1
2	Ground	Ground
3	Button 2	Button input 2
4	Ground	Ground
5	Button 3	Button input 3
6	Ground	Ground
7	Button 4	Button input 4
8	Ground	Ground
9	Button 5	Button input 5
10	Ground	Ground
11	Button 6	Button input 6
12	Ground	Ground

J_SERIAL

- The MINI module could be connected with an external PC or microcontroller via the J_SERIAL interface. The voltage level of the serial interface conforms to the TTL level.
- An universal and mighty ASCII based protocol was developed for interfacing through J_SERIAL.
- If a PC with RS232 interface should be connected to the MINI module, the EXPANSION III adapter (Article-No.0081) from LOETRONIC could be used. This adapter could be stucked easily on the module and connected via the delivered flat cable and a null modem cable to the PC. The settings for this interface are defined through the programmed firmware. Every MINI module is equipped with the standard firmware or a customer specific firmware and is delivered with a datasheet describing all functions, settings and the ASCII protocol of this interface.

Assignment:

Pin-No.	Name	Description
1	Internal 5 V	5 Volt power source for external devices – Max. 50 mA!
2	Ground	Ground
3	Receive Data	Receive line of the microcontroller on the MINI module (TTL)
4	Transmit Data	Send line of the microcontroller on the MINI module (TTL)
5	CTS Handshake	Hardware flow control line – „Clear to Send“
6	RTS Handshake	Hardware flow control line – „Request to Send“

J_VOLTAGE

- The J_VOLTAGE interface is for connecting an external switch to the MINI module to switch it off and on. The internal 5 Volt and 3 Volt could also be taken from there, if external devices must be powered. Pin 3 and Pin 4 are bridged by a jumper by default, when the module is delivered.

Assignment:

Pin-No.	Name	Description
1	External Voltage	External voltage source (9 Volt – 12 Volt DC, unstabilised)
2	External Ground	Ground
3	Switch	Connection for an external switch
4	Switch	Connection for an external switch
5	Internal 5 V	5 Volt voltage source for external devices – Max. 50 mA!
6	Ground	Ground
7	Internal 3 V	3 Volt voltage source for external devices – Max. 50 mA!
8	Ground	Ground

LED_ON

- The power led LED_lights up red, when the module is powered.
-

LED_HDD

- The CF activity led LED_HDD lights up green, when the module reads data from the CF card.
-

LED_BLD

- The bootloader led LED_BLD lights up yellow, when the module is in bootloader mode. It flashes at frequent intervals, if the bootloader has detected an error while updating the firmware.
-

J_AUDIO_AMP

- A stereo headphone could be connected to the J_AUDIO_AMP jack.
-

J_AUDIO_AMP

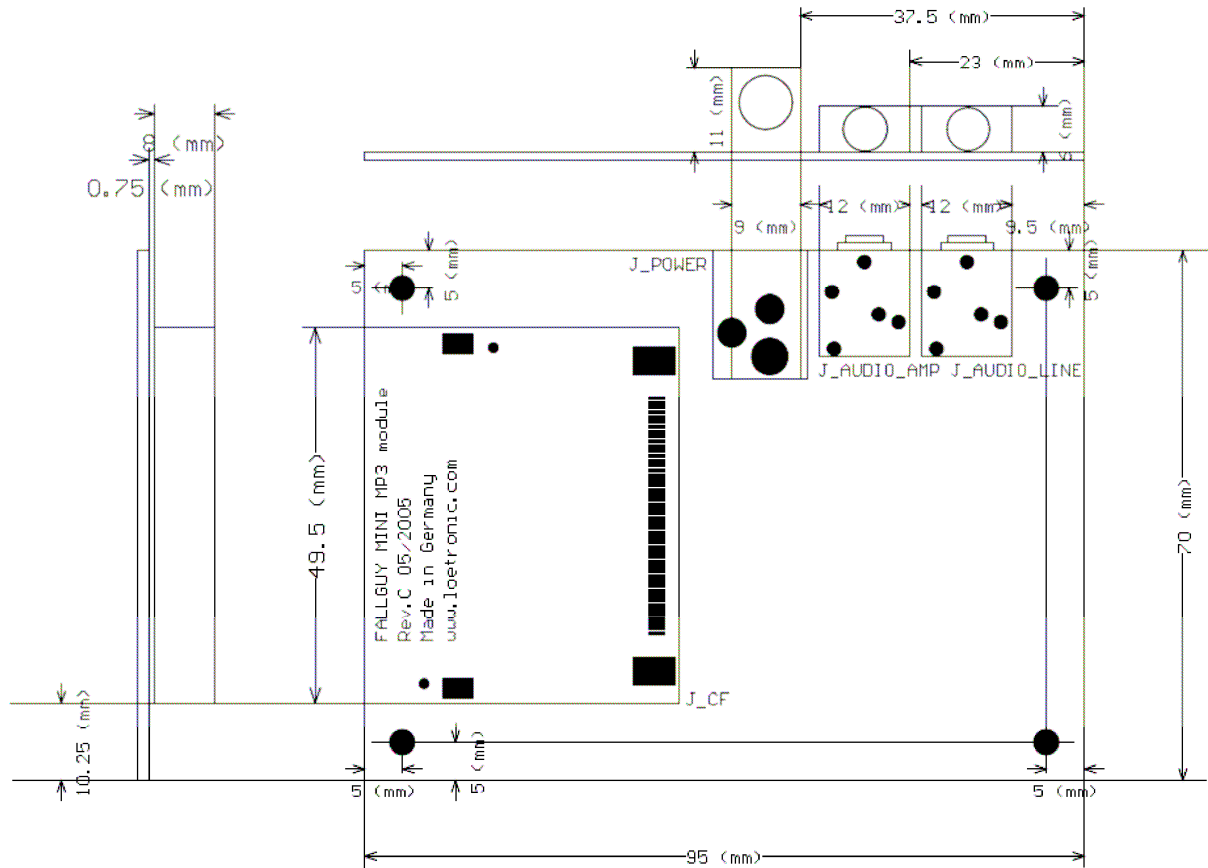
- An external stereo amplifier could be connected to the J_AUDIO_LINE jack.
-

**For connecting external devices to the MINI module we recommend normal 1/10 inch IDC sockets.
(for example Reichelt Elektronik PFL 10 / PFL 14, www.reichelt.de).**

4. Mechanical dimensions

Dimensions:

- Length: 95 mm / 3.74 inch, Width: 70 mm / 2.76 inch, Depth: 12,5 mm / 0.49 inch
- A AutoCAD file (DXF) with all dimensions of the plugs and strips on the module could be downloaded on www.loetronic.com.



Picture 4.1 Fallguy MINI MP3 module Rev.C - Dimensions

5. Getting started

The Fallguy MINI module must be connected with the a voltage source of 9 – 12 Volt (DC). Via J_AUDIO_LINE the module is connected with an external amplifier. Via J_AUDIO_AMP a stereo headphone could be connected.

Any Compact Flash card – type I or II - could be used with the CF card slot. The CF card must be formatted in **FAT32** with standard settings and there must only be one partition on it.

The playback attitude is defined through the programmed firmware and is not described in this datasheet. Every MINI module is equipped with the standard firmware or a customer specific firmware and is delivered with a datasheet describing all functions, settings and the ASCII protocol of this interface.

6. Firmware updates with the integrated bootloader

To program a new firmware file into the internal flash memory of the microcontroller, the firmware file (*.LOE) must be in the main directory of the CF card. There should be only one firmware file in the main directory!

Deleting and programming the internal flash memory is done by the bootloader of the MINI module. When the module is off, the first button (**Button 1**) must be pressed (bridged with ground) and then it must be turned on with the button pressed down. The MINI module will now boot up the bootloader and the Bootloader LED (LED_BLD) will light up. Now the button could be relinquished. By pressing the second button (**Button 2**) the programming sequence is initiated, this means the module reads the firmware file in the main directory (*.LOE), erases the memory and programs it with the new firmware. As it is ready, the module will boot up the new firmware and the Bootloader LED will go off.

To display errors and to diagnose them, the Bootloader LED is used. It will blink every 0,5 s up, if there was a problem initialising the CF card or programming the flash memory. The counts of blinking up represent the error and will repeated every 3 s.

Error messages MINI BOOTLOADER V1.00:

- 1 – Sector could not be erased
- 2 – Erased sector could not be verified
- 3 – Sector could not be programmed
- 4 – Programmed sector could not be verified
- 5 – Firmware file (*.LOE) is not correct
- 6 – Partition signature not found
- 7 – Partition table not found
- 8 – Fixed media value not found
- 9 – Firmware file (*.LOE) not found in main directory