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## Preliminary F20 SoC Datasheet



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## 2 Introduction

The F20 SoC is a small, low cost, and low power hardware file system solution. Through the F20 SoC, simple UART serial commands are used to access files on SD, SDHC, and MMC memory cards.

Throughout this document, the F20 SoC will be referred to as the F20. For detailed command descriptions and device behavior, please see the file system user manual.

For advanced electrical characteristics and details on the underlying STM32F070 processor, please consult the processor's datasheet.

### 2.1 Key Features

- Serial UART command interface
- File reading, writing, and deleting
- Long File Name support
- FAT16 and FAT32
- SPI-based SD access
- Built in crystal
- TSSOP20 6.5 x 6.5 mm
- 22 mA run and 0.020 mA sleep
- -40°C to +85°C operational
- RoHS Lead Free

### 2.2 Example Applications

- Data loggers
- Automated machinery
- Consumer products

### 3 Pinout Table

Any pin with no function or note must be left unconnected.

Pin	Function	Pin	Function
1 <sup>1</sup>		11	SD CLOCK
2		12	SD MISO
3		13	SD MOSI
4 <sup>2,3</sup>	RESET	14 <sup>3,4</sup>	SD CARD DETECT
5	3.3 V	15	GND
6	LDR   WAKEUP	16	3.3 V
7 <sup>3</sup>	BAUD CONTROL	17	SERIAL TX
8	BUSY	18 <sup>5</sup>	SERIAL RX
9 <sup>4,5</sup>	SD WRITE PROTECT	19	
10	SD CHIP SELECT	20	

<sup>1</sup>Requires a 10,000  $\Omega$  pull-down resistor

<sup>2</sup>Requires a 10,000  $\Omega$  pull-up resistor

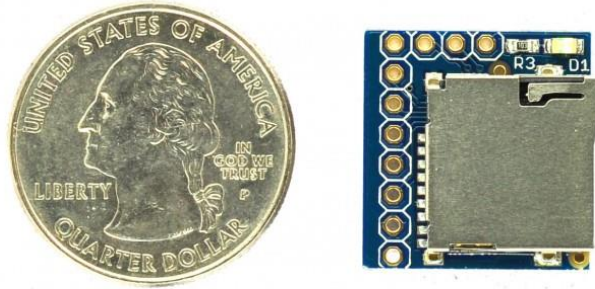
<sup>3</sup>Active low

<sup>4</sup>Connect to GND if unused

<sup>5</sup>5 V tolerant

## 4 Reference Design

The F20-uSD is a 20 x 19.5 mm OEM board combining the F20 with a Micro SD socket. It is an excellent starting point and reference design for anyone interested in evaluating and developing with the F20. See the product catalog entry for more information and additional resources.



## 5 Device Startup

The F20 is held in reset when the reset pin is low. Releasing it will begin the system startup process.

There are two different components of the device firmware:

1. GHI Bootloader: initializes the system, updates the firmware when needed, and executes the firmware.
2. Firmware: responds to host commands and interfaces with the SD card.

Which component gets executed on startup is controlled by manipulating the LDR pin. It is pulled high on startup by default. When low, the device waits in the GHI Bootloader. Otherwise, the firmware is executed.

When the firmware first executes, it will print a startup banner followed by a response with a result code of 00.

## 6 Supported Commands

The F20 uses GHI Electronics's standard file-system solution command set. Please see the File System User Manual for detailed information. Commands not listed below are not supported.

Command	Function	Notes
I	Initialize Media	I M:>2 only
O	Open File	
W	Write File	
R	Read File	
F	Flush File	
C	Close File	
P	Seek File	
Y	Tell File	
D	Delete File	
?	Find File	
@	Initialize File and Folder List	
N	Get Next File	
K	Free Size	
Q	Format	
T	Initialize Date/Time	T S only
S	Set Date/Time	
G	Get Date/Time	
Z	Device Control	Z 0 and Z 3 only
B	Set Baud Rate	
V	Version	
J	Get Status	J 0 only

## 7 Limitations

In addition to supporting a smaller command set, the F20 has the following additional limitations:

- Long file names can only be 247 characters including the path.
- Only the first four file handles are supported.
- Many error codes will be the generic operation failed.
- The command buffer is only 255 bytes.
- SD-Reader mode and keyboards are not supported.



## 8 Design Considerations

### 8.1 Required Pins

Exposing LDR and the UART pins is required in every design to enable device programming, updates, and recovery.

### 8.2 Power Supply

A typical clean power source, suited for digital circuitry, is needed to power the F20. Voltages should be within 10% of 3.3 V. Decoupling capacitors of 0.1  $\mu$ F are needed near every power pin. A large capacitor, typically 47  $\mu$ F, should be near the F20 if the power supply is more than few inches away. Lastly, 22  $\mu$ F or larger capacitors are needed near the SD card.

### 8.3 Performance

The brand, age, and quality of the media used greatly affects its performance. Continuously writing to the media also degrades its performance. The F20 does its best to buffer the data and only write to the actual media when necessary or when a file is flushed. Care must be taken when to flush the open files.

While the F20 fully supports FAT16 and FAT32, some media may not work. Reasons can include insufficient power, unstable power, the clock is too high, or the card does not completely comply with the standards.

### 8.4 UART Interface

The default baud rate is 115,200 with no parity, eight data bits, and one stop bit. The default baud rate of the firmware and bootloader may be changed on power up to 9,600 using the BAUD CONTROL pin. All signals are 3.3 V TTL levels. If RS232 is desired, adding an RS232 level shifter is required.

## 9 Legal Notice

### 9.1 Licensing

The F20, with all its built-in software components, is licensed for commercial and non-commercial use. No additional fee or licensing is required. Software, firmware, and libraries provided for the F20 are licensed for use on the F20 only.

### 9.2 Trademarks

F20 is a trademark of GHI Electronics, LLC.

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### 9.3 Disclaimer

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## 10 Revision History

Revision	Date	Change
1.0	2016-06-16	Initial preview release.