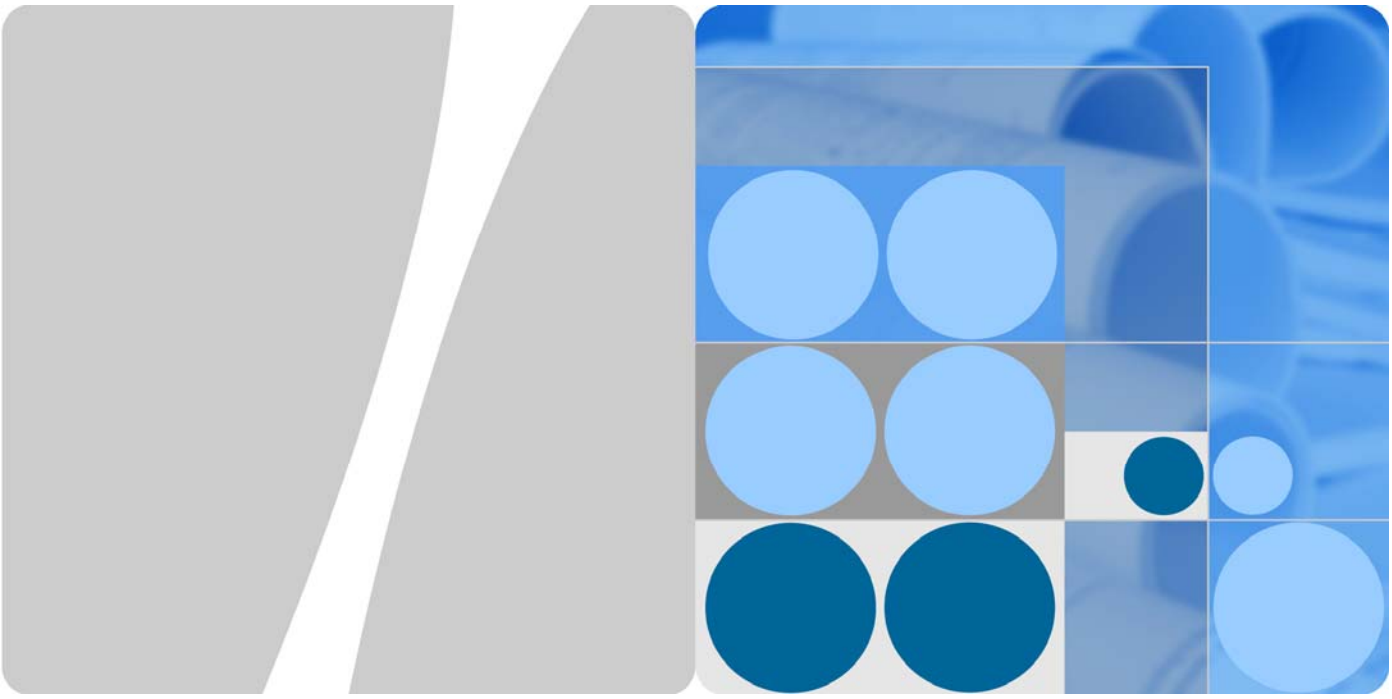
Product Description



MC703 CDMA EV-DO Wireless Module
V100R001

Issue 1.00

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About This Document

History

Issue	Details	Date	Author	Approved by
V1.00	Initial formal release.	2009-8-24	Zhang Jun	zhou Zhaoxing

Contents

Figures

Tables

1 Product Overview

1.1 About This Chapter

This chapter provides an overview of the MC703 Code Division Multiple Access (CDMA) Evolution-Data Only (EV-DO) module, with the following information included:

- Functions of the MC703 CDMA EV-DO Module
- Application Block Diagram of the MC703 CDMA EV-DO Module

1.2 Functions of the MC703 CDMA EV-DO Module

The MC703 CDMA EV-DO module has the following functions:

- Supporting the frequency bands of CDMA 800 MHz and/or CDMA 1900 MHz
- Supporting the diversity receiving antenna
- Supporting the Global Positioning System (GPS), optional
- Supporting voice, short message, data, and supplementary services
- Providing various user signal interfaces including the following:

1. Power supply interface
2. One 9-wire serial interface
3. Two analog audio interfaces
4. One Removable User Identity Module (RUIM) card interface (supporting the 3.0 V RUIM card)
5. One full-speed Universal Serial Bus (USB) 2.0 interface
6. Eight General Purpose Input/Output (GPIO) interfaces
7. Two Analog-to-Digital Converter (ADC) interfaces

- Providing two kinds of antenna interfaces: antenna pad and antenna connector
- Supporting the standard AT command set and the extended AT command set of Huawei
- Complying with the Restriction of Hazardous Substances (RoHS) certification

Table 1-1 shows the features of the MC703 CDMA EV-DO module.

Table 1-1 Product features

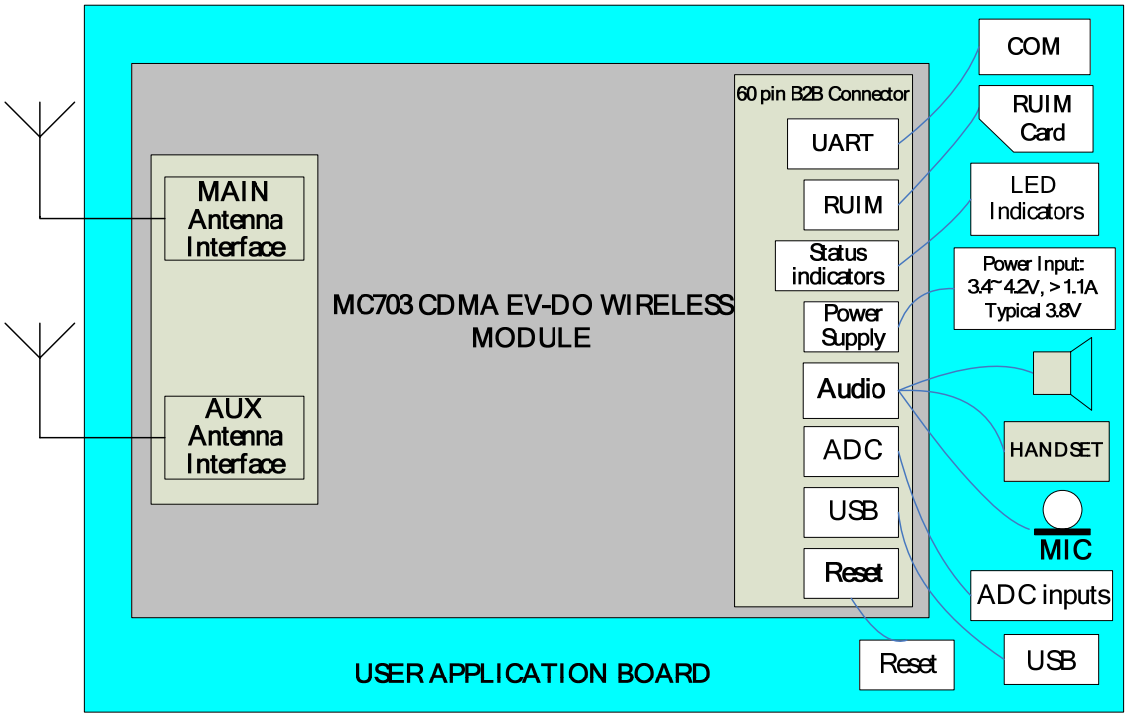
Product Feature	Description
Frequency bands	CDMA: Double bands including 800 MHz and 1900 MHz
	GPS: 1574.42 MHz to 1576.42 MHz
Technical standards	CDMA 2000 1XRTT Compatible to CDMA IS-95 A/B 800/1900MHz CDMA 2000 1x EV-DO Rev.0 800/1900 MHz CDMA 2000 1x EV-DO Rev.A 800/1900 MHz
Maximum transmit power	CDMA 800 MHz: +23 dBm (Power Class 3) CDMA 1900 MHz: +23 dBm (Power Class 2)
Operating temperature	Normal operation temperature: –30℃ to +75℃
	Extended operation temperature: –35℃ to +80℃
	Storage temperature: –40℃ to +90℃
Power supply voltage	3.4 V to 4.2 V (The voltage of 3.8 V is recommended.)
Power consumption (current)	Shutdown mode: < 10 uA
	Standby mode: < TBD mA
	Operating current under the maximum power consumption: < 680 mA
Data services	EV-DO Rev.A data services of up to DL 3.1 Mbit/s and UL 1.8 Mbit/s
AT commands	Standard AT command set Extended AT command set of Huawei
60-pin board-to-board (BTB) connector	One 9-wire Universal asynchronous receiver-transmitter (UART) interface
	One standard RUIM card interface (3 V)
	Eight GPIO interfaces
	One hardware reset interface
	Two analog audio interfaces
	Two ADC interfaces
	Power supply interface
Antenna interfaces	Supporting the main antenna interface and receiving diversity antenna interface (The GPS antenna shares the connector with the receiving diversity antenna.)
	Astron 51-3612-50-H RF connector and antenna pad
Voice services	FR, EFR, HR, and AMR voice coding
Short message service (SMS)	Mobile Originated (MO) and Mobile Terminated (MT)
	Point-to-point broadcast and cell broadcast
	Short messages in text mode

Product Feature	Description
Supplementary services	Caller ID display, call forwarding, call holding, call waiting, and three-way calling
Physical characteristics	Dimensions: 31 mm x 45 mm x 5 mm Weight: 9.8±0.2 g
RoHS	Complying with the RoHS standards
CE certification	Complying with the Conformite Europeenne (CE) standards (CE0168)

1.3 Application Block Diagram of the MC703 CDMA EV-DO Module

Figure 1-1 shows the application block diagram of the MC703 CDMA EV-DO module.

Figure 1-1 Application block diagram of the MC703 CDMA EV-DO module



2 Interface Description

2.1 About This Chapter

This chapter describes the signal interfaces of the MC703 CDMA EV-DO module, with the following interfaces included:

- Signal Connector Interface
- Antenna Interfaces

2.2 Signal Connector Interface

2.2.1 Interface Signals

The MC703 CDMA EV-DO module adopts the 60-pin B2B connector as the external signal interface.

Table 2-1 shows the function definition of the signals on the signal connector interface of the MC703 CDMA EV-DO module.

Table 2-1 Functions of the signals on the signal connector interface

No.	Signal Name	IO	Function	Remarks
1	VBAT	P	Power supply input	The voltage ranges from 3.4 V to 4.2 V. The voltage of 3.8 V is recommended.
2	GND	P	Ground	
3	VBAT	P	Power supply input	The voltage ranges from 3.4 V to 4.2 V. The voltage of 3.8 V is recommended.
4	GND	P	Ground	
5	VBAT	P	Power supply input	The voltage ranges from 3.4 V to 4.2 V. The voltage of 3.8 V is recommended.

No.	Signal Name	IO	Function	Remarks
6	GND	P	Ground	
7	VBAT	P	Power supply input	The voltage ranges from 3.4 V to 4.2 V. The voltage of 3.8 V is recommended.
8	GND	P	Ground	
9	VBAT	P	Power supply input	The voltage ranges from 3.4 V to 4.2 V. The voltage of 3.8 V is recommended.
10	GND	P	Ground	
11	MODE_LED	AO	Mode indicator	This pin is a current sink output.
12	VCOIN	P	Input of the backup power supply	This pin can be connected to a button-type battery or a capacitor of large capacitance.
13	STATUS_LED	AO	Status indicator	This pin is a current sink output.
14	VREG_MSMP	P	Output of the 2.6 V voltage	This pin provides voltage for peripherals. See Note 1.
15	NC	-	-	This pin must be left unconnected.
16	RESET_N	DI	Reset	Active low.
17	NC	-	-	This pin must be left unconnected.
18	TERM_ON	DI	Power-on	Active low.
19	NC	-	-	This pin must be left unconnected.
20	UART1_RTS	DO	Request To Send (RTS) signal of UART1	
21	FORCE_LOAD_N	DI	Force-load signal	Active low.
22	UART1_RING	DO	Ringing signal of UART1	
23	UART1_RD	DI	RD signal of UART1	
24	UART1_DSR	DO	Data set ready (DSR) signal of UART1	
25	GPIO_7	IO	GPIO 7	
26	UART1_CTS	DO	Clear to Send (CTS) signal of UART1	

No.	Signal Name	IO	Function	Remarks
27	UART1_TD	DO	TD signal of UART1	
28	UART1_DTR	DI	Data terminal ready (DTR) signal of UART1	
29	GPIO_8	IO	GPIO 8	
30	UART1_DCD	DO	Data carrier detect (DCD) signal of UART1	
31	NC	-	-	This pin must be left unconnected.
32	GPIO_1	IO	GPIO 1	
33	GPIO_2	IO	GPIO 2	
34	MODULE_WAKE UP	DI	Signal to wake up the module by the host	
35	GPIO_3	IO	GPIO 3	
36	USB_D-	IO	USB data signal, negative	
37	GPIO_4	IO	GPIO 4	
38	USB_D+	IO	USB data signal, positive	
39	GPIO_5	IO	GPIO 5	
40	HOST_WAKEUP	DO	Signal to wake up the host by the module	
41	GPIO_6	IO	GPIO 6	
42	RUIM_CLK	DO	Clock signal of the RUIM interface	
43	I2C_SCL	IO	Clock signal of the I2C bus	Reserved
44	VREG_RUIM	P	Power supply of the RUIM interface	
45	I2C_SDA	IO	Data signal of the I2C bus	Reserved
46	RUIM_IO	IO	Data signal of the RUIM interface	
47	EAR1_N	AO	Negative pole of the output of the first audio interface	
48	RUIM_RST	DO	Reset signal of the RUIM interface	
49	EAR1_P	AO	Positive pole of the output of the first audio interface	
50	RUIM_IN	DI	Signal for detecting the presence of the RUIM card	

No.	Signal Name	IO	Function	Remarks
51	MIC1_N	AI	Negative pole of the input of the first audio interface	See section 4.4 "Audio Interfaces."
52	GND	P	Ground	
53	MIC1_P	AI	Positive pole of the input of the first audio interface	
54	SPKR_OUT_N	AO	Negative pole of the output of the second audio interface	
55	GND	P	Ground	
56	SPKR_OUT_P	AO	Positive pole of the output of the second audio interface	
57	ADC_1	AI	Input of the first ADC channel	The input voltage ranges from 0 V to 2.6 V.
58	MIC2_N	AI	Negative pole of the input of the second audio interface	
59	ADC_2	AI	Input of the second ADC channel	The input voltage ranges from 0 V to 2.6 V.
60	MIC2_P	AI	Positive pole of the input of the second audio interface	

NOTE

Note 1: The VREG_MSMP pin exports the voltage of 2.6 V with the capability of 50 mA.

Note 2: Terms description:

AI: Analog Input.

AO: Analog Output.

P: Power/Ground.

IO: Digital Input/Digital Output.

DI: Digital Input.

DO: Digital Output.

NC: Not Connected.

2.3 Antenna Interfaces

2.3.1 Antenna Interface Circuits

The MC703 CDMA EV-DO module supports the main antenna interface and the diversity antenna interface. Both of these two antenna interfaces include two connection types, a RF connector and an antenna pad. Either of these two antenna connection types can be selected for use. The selected cable and antenna must have an impedance of 50 ohm.

The MC703 CDMA EV-DO module adopts the 51-3612-50-H RF connector supplied by Astron. Figure 2-1 shows the dimensions of the RF connector.

Figure 2-1 Dimensions of the RF connector

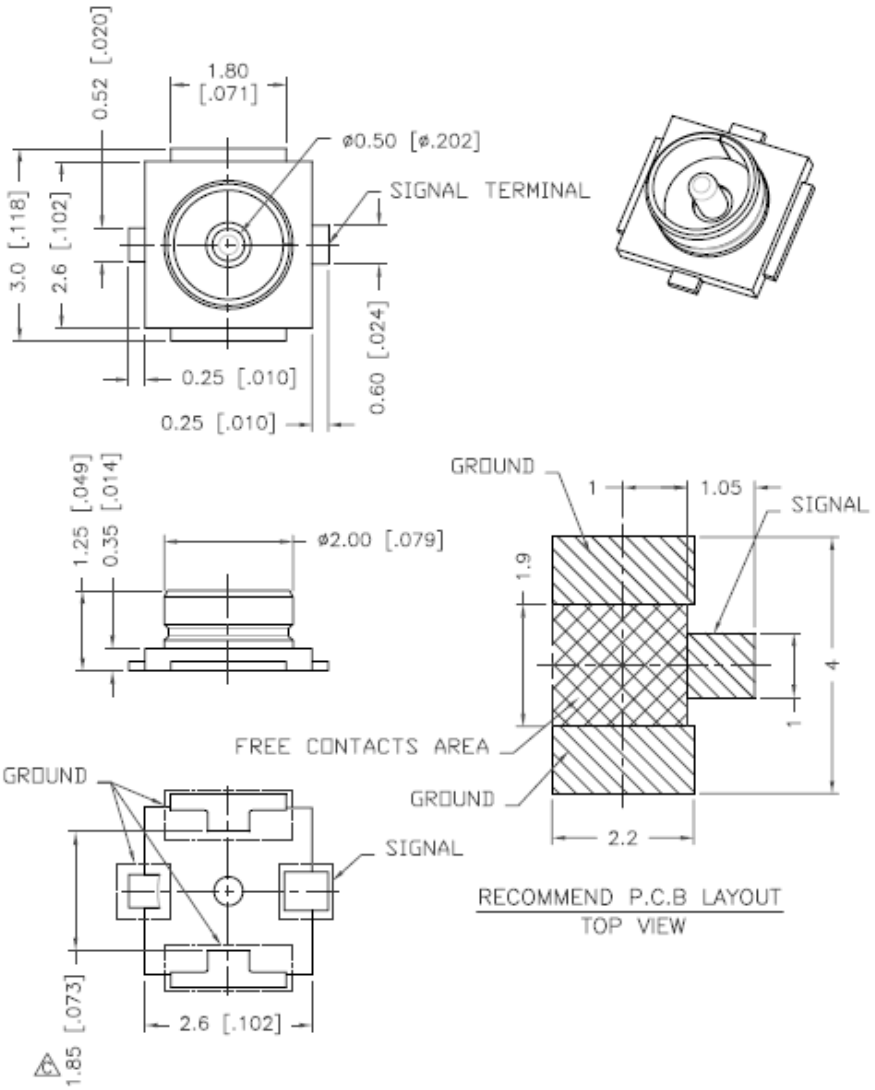


Figure 2-2 shows the RF connector. The two interfaces on the RF connector are pointed by the red arrows. The antenna pad is located at the bottom of the RF connector. A coaxial cable can be soldered on the antenna pad for connecting an external antenna to the MC703 CDMA EV-DO module. The interface marked with M is the main diversity antenna interface and the interface marked with A is the interface used by both the diversity antenna and the GPS antenna.

The RF connector and antenna pad can only be applied alternatively. When using the antenna pad, make sure that the surface of the soldering points is smooth to reduce the impact of the soldering on RF signals.

Figure 2-2 RF connector

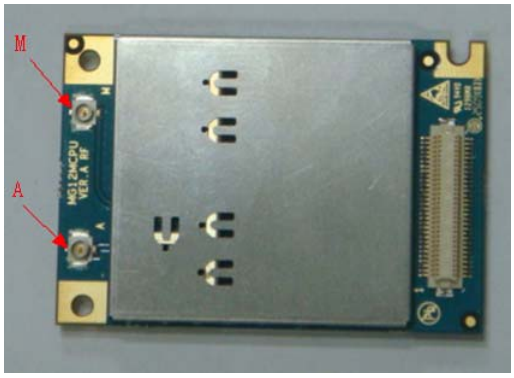


Table 2-2 and Table 2-3 show the RF performance of the antenna interfaces.

Table 2-2 RF performance of the main diversity antenna interface

Frequency Band	Frequency Range (MHz)		Maximum Transmit Power (dBm)			Receiving Sensitivity of the Antenna Interface (dBm)		
	Uplink	Downlink	Minimum Value	Typical Value	Maximum Value	Minimum Value	Typical Value	Maximum Value
CDMA 800	824 to 849	869 to 894	23	24.5	26	/	– 107.5	– 106
CDMA 1900	1850 to 1910	1930 to 1990	23	24.5	26	/	– 107.5	– 106

Table 2-3 RF performance of the diversity antenna and GPS antenna interface

Frequency Band	Frequency Range (MHz)	Receiving Sensitivity of the Antenna Interface (dBm)
CDMA 800	869 to 894	< – 106
CDMA 1900	1930 to 1990	< – 106
GPS	1575.42	< – 155.8 (50% Time)

The antenna whose gain value is less than 1 dBi is recommended.

According to the layout of the circuit board, adjust the reference value of each component. You can connect an inductor of 68 nH to 100 nH for electrostatic discharge (ESD) protection to the ground. Pay special attention to the impedance matching of the antenna and ESD protection capability or lightning protection capability.

3 Electrical Features of the Interfaces

3.1 About This Chapter

This chapter describes the electrical features of the interfaces of the MC703 CDMA EV-DO module with the following features included:

- Application Extremes
- Operating and Storage Temperature
- Levels of the I/O Interface
- Power Supply Features
- Reliability Features
- ESD Features

NOTE

This chapter describes mainly the electrical features of the external interfaces of the MC703 CDMA EV-DO module.

3.2 Application Extremes

Table 3-1 shows the extreme application values of the MC703 CDMA EV-DO module. When a voltage lower or higher than the limit values is used, a permanent damage may be caused to the MC703 CDMA EV-DO module.

Table 3-1 Extreme application values of the MC703 CDMA EV-DO module

Parameter	Description	Minimum Value	Maximum Value	Unit
VBAT	Input voltage of the MC703 CDMA EV-DO module	– 0.5	5.0	V
VIN	Input voltage of the I/O interface	– 0.5	5.0	V

3.3 Operating and Storage Temperature

Table 3-2 shows the temperature ranges of the MC703 CDMA EV-DO module.

Table 3-2 Temperature ranges of the MC703 CDMA EV-DO module

Parameter	Minimum Value	Maximum Value	Unit
Normal operating temperature	－30	75	℃
Extended operating temperature	－35	80	℃
Storage temperature	－40	90	℃

3.4 Levels of the I/O Interface

Table 3-3 shows the levels of the I/O interfaces on the MC703 CDMA EV-DO module.

Table 3-3 Levels of the I/O interfaces on the MC703 CDMA EV-DO module (V_{DD_PX} = 2.6 V)

Parameter	Description	Minimum Value	Maximum Value	Unit
V_{IH}	High-level input voltage	0.65 x V_{DD_PX}	V_{DD_PX} + 0.3	V
V_{IL}	Low-level input voltage	－0.3	0.35 x V_{DD_PX}	V
V_{OH}	High-level output voltage	V_{DD_PX} － 0.45	V_{DD_PX}	V
V_{OL}	Low-level output voltage	0	0.45	V
I_{IH}	Current leakage during high-level input	-	1	μA
I_{IL}	Current leakage during low-level input	－1	-	μA
C_{IN}	Input capacitance	-	7	pF

3.5 Power Supply Features

3.5.1 Input Power Supply

Table 3-4 shows the input power supply range of the MC703 CDMA EV-DO module.

Table 3-4 Input power supply range of the MC703 CDMA EV-DO module

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
VBAT	3.4	3.8	4.2	V

CAUTION

The time when any interface on the MC703 CDMA EV-DO module is powered on must not be earlier than the time when the module is powered on. Otherwise, the MC703 CDMA EV-DO module may be abnormal or damaged.

3.5.2 Operating Current

Table 3-5 shows the operating current of the MC703 CDMA EV-DO module.

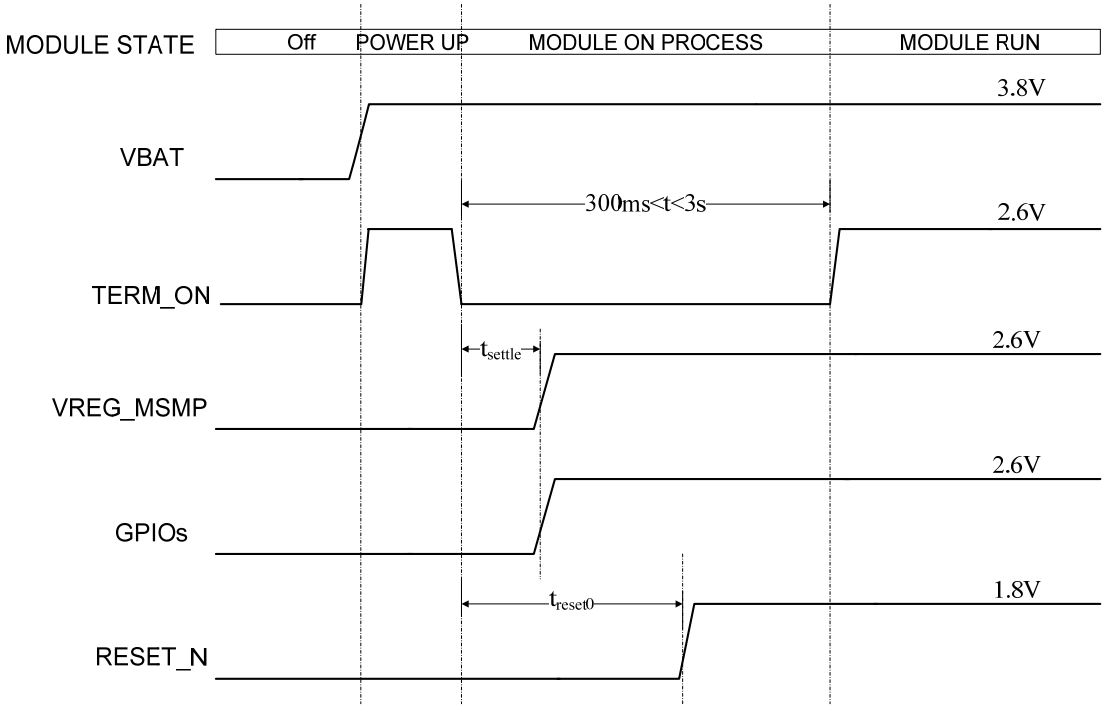
Table 3-5 Operating current of the MC703 CDMA EV-DO module (TBD)

Operating Mode	Minimum Value	Typical Value	Maximum Value	Unit
Idle state	-	-	TBD	mA
Calling state	-	TBD	-	mA
EV-DO data transmission state	-	TBD	-	mA
Off state	-	TBD	TBD	μA

3.5.3 Power-on, Power-off, and Reset Processes

When the voltage of the power supplied to the MC703 CDMA EV-DO module is higher than 3.4 V and the TERM_ON pin is driven low for at least 300 ms, the MC703 CDMA EV-DO module can be powered on. Figure 3-1 shows the power-on process of the MC703 CDMA EV-DO module.

Figure 3-1 Power-on process of the MC703 CDMA EV-DO module



CAUTION

If the power supply with the lower voltage (for example 3.4 V) is used, the cable connecting the external power supply and the module should be as short as possible and the power supply input should be configured with a capacitor of higher than 1000 µF. Otherwise, the voltage that is actually imported to the MC703 CDMA EV-DO module may be lower than 3.4 V, resulting in the deterioration of RF indicators and unstable operation of the MC703 CDMA EV-DO module.

The power-off process is classified into normal power-off and urgent power-off.

Normal power-off

An external CPU drives the TERM_ON pin low for more than 3s. Then, the MC703 CDMA EV-DO module is normally powered off. During the normal power-off process, the MC703 CDMA EV-DO module can save information and log out of the network.

Figure 3-2 shows the normal power-off process.

Figure 3-2 Normal power-off process of the MC703 CDMA EV-DO module

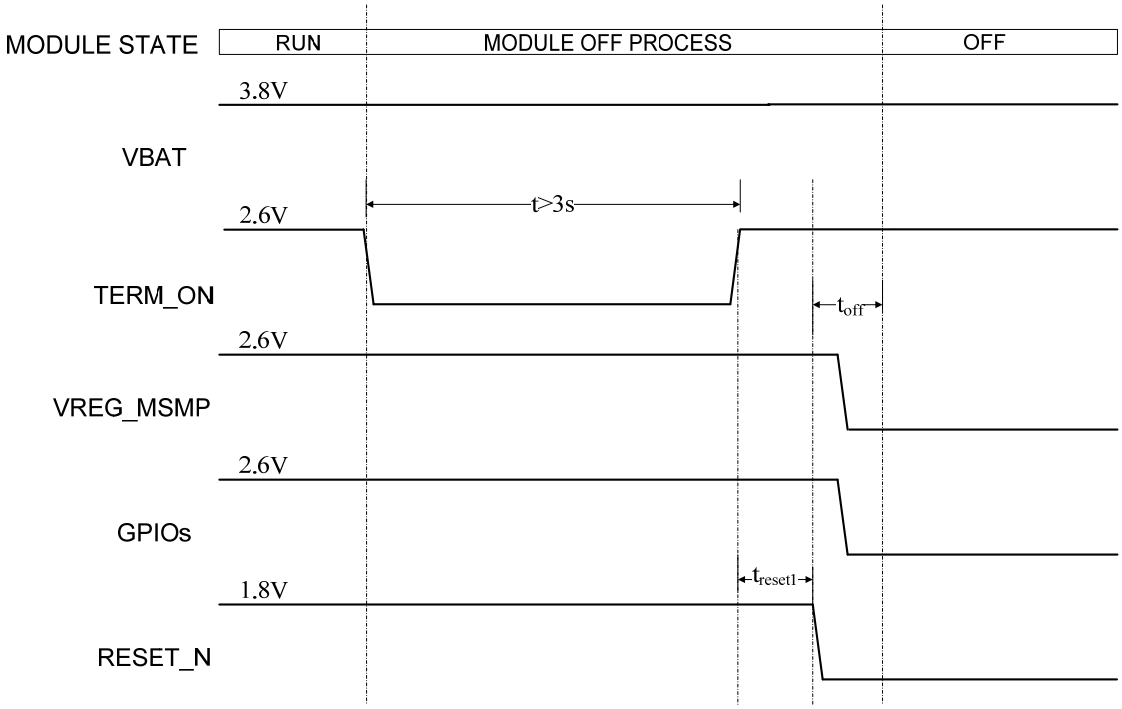


Table 3-6 shows the parameters in the power-on process and power-off process.

Table 3-6 Parameters in the power-on process and power-off process

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
t_{settle}	0.36	6.36	10.36	ms
t_{reset0}	10.72	26.72	40.72	ms
t_{reset1}	400	500	600	ms
t_{off}	7.27	10.6	15.6	ms

Urgent power-off

An external CPU sends the **AT%MSO** command to the MC703 CDMA EV-DO module to directly cut off the power supply to the VBAT pin. Then, the MC703 CDMA EV-DO module can be directly powered off.

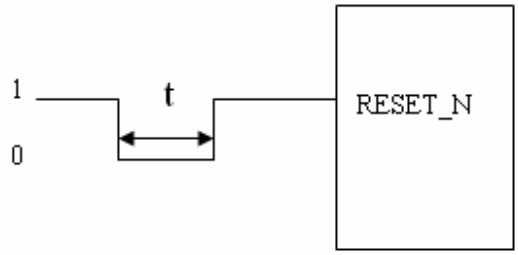
During the urgent power-off process, the MC703 CDMA EV-DO module cannot perform the operation of logging out of the network.

NOTE

For the details about the **AT%MSO** command, refer to the *HUAWEI MC703 Wireless Module AT Command Interface Specification*.

When the RESET_N pin is driven low for 50 ms, the MC703 CDMA EV-DO module can be reset. Figure 3-3 shows the reset process of the MC703 CDMA EV-DO module.

Figure 3-3 Reset process of the MC703 CDMA EV-DO module



NOTE

The RESET_N pin is sensitive to interference. Therefore, the lines on the interface board of the MC703 CDMA EV-DO module should be not longer than 2 cm. Otherwise, the MC703 CDMA EV-DO module may be reset because of interference.

3.5.4 RTC Power Supply

The power supply pin for the real-time clock (RTC) can obtain current from the VBAT pin through software enabling to charge the backup battery of the RTC. The power supply input is monitored by a CPU.

The MC703 CDMA EV-DO module defines the VCOIN pin for the input of the backup power supply on the 60-pin B2B connector to implement the power supply input for the RTC.

Table 3-7 VCOIN pin for the input of the RTC power supply

PIN	Name	I/O	Function	Remarks
12	VCOIN	P	Input of the backup power supply	This pin is connected to a button-type battery or a capacitor of large capacitance.

If the RTC backup battery is not used, you can connect the pin to the primary power supply, or use an electrolytic capacitor of large capacitance.

Table 3-8 Parameters of the RTC power supply pin

Parameter	Comments	Min	Typ	Max	Units
Target regulator voltage[1]	V_{IN} > 3.3 V, I_{CHG} = 100 µA	3.00	3.10	3.20	V
Target series resistance[2]		800		2100	Ω
Coin cell charger voltage error	I_{CHG} = 0 µA	-5		+5	%
Coin cell charger resistor error		-20		+20	%
Ground current, charger enabled	PMIC = off; VCOIN = open; VBAT = 3.7 V		4.5	8	µA

3.6 Reliability Features

Table 3-9 shows the conditions and results of the part mechanical reliability tests performed on the MC703 CDMA EV-DO module.

Table 3-9 Conditions and results of the part mechanical reliability tests

Test Item	Test Condition	Test Standard
Random vibration	Frequency range: 5 Hz to 20 Hz, PSD: 1.0 m^2/s^3; Frequency range: 20 Hz to 200 Hz, – 3 dB/oct; Three axial directions with one hour for each direction	IEC 68-2-6
Shock test	Half sine wave shock Acceleration: 20 g Shock period: 11 ms Six axial directions with one shock in each direction (± x, y, and z)	TIA/EIA 603 3.3.5 GB/T15844.2 4.1
Temperature shock	Low temperature: – 40°C±2°C High temperature: 85°C±2°C Changeover time: < 30s Test duration: 1 hour Repetition times: 100	IEC 68-2-14 Na
Damp heat cyclic	High temperature: 55°C±2°C Low temperature: 25°C±2°C Humidity: 95% Repetition times: 4 Test duration: 12 hours + 12 hours	IEC 68-2-30 Db
Low-temperature operation	Temperature: – 30°C±2°C Test period: 24 hours	IEC 68-2-1 Ab
High-temperature operation	Temperature: 75°C±2°C Test period: 24 hours	IEC 68-2-2 Bb
Low-temperature storage	Temperature: –60°C±2°C Test period: 24 hours	IEC 68-2-1 Ab
High-temperature storage	Temperature: 90°C±2°C Test period: 24 hours	IEC 68-2-2 Bb
Salt spray test	Temperature: 35°C Density of the NaCl solution: 5%±1% Spraying duration: 48 hours Duration of exposing the module to the temperature of 35 ºC: 16 hours	IEC 68-2-11

3.7 ESD Features

3.7.1 Overview

When the MC703 CDMA EV-DO module is in use, the ESD protection should be considered. The ESD performance of the MC703 CDMA EV-DO module has been tested according to the EN61000-4-2 standard. Table 3-10 shows the test results.

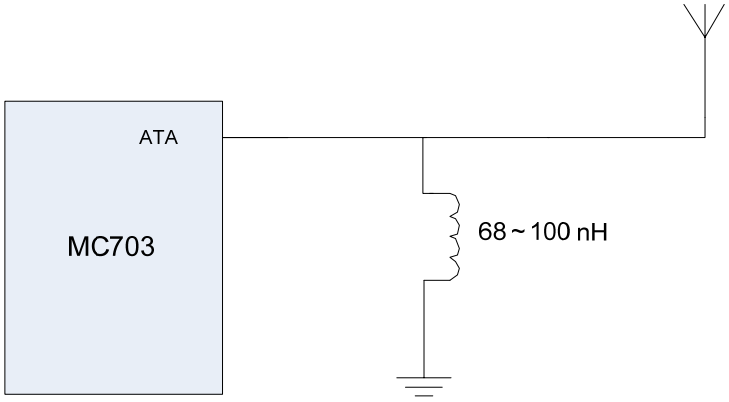
Table 3-10 ESD performance

Interface	Air Discharge	Contact Discharge
RUIM card interface	±8000 V	±4000 V
USB interface	±8000 V	±4000 V

3.7.2 ESD Protection on the Antenna Interface

The antenna interface of the MC703 CDMA EV-DO module is sensitive to ESD. Poor ESD protection may cause permanent damage to internal RF components. Figure 3-4 shows the recommended circuit for the ESD protection on the antenna interface.

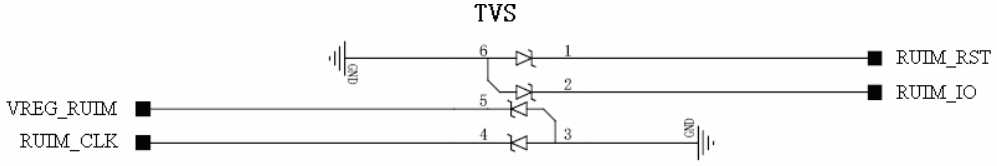
Figure 3-4 Recommended circuit for the ESD protection on the antenna interface



3.7.3 ESD Protection on the RUIM Card Interface

Figure 3-5 shows the recommended circuit for the ESD protection on the RUIM card interface of the MC703 CDMA EV-DO module. The transient voltage suppressor (TVS) diode should be placed as close to the RUIM card seat as possible.

Figure 3-5 Recommended circuit for ESD protection on the RUIM card interface



4 Interface Applications

4.1 About This Chapter

This chapter describes the applications of the interfaces of the MC703 CDMA EV-DO module, with the following interfaces included:

- UART Interface
- RUIM Card Interface
- Audio Interfaces
- Power Supply Interface
- USB Bus
- GPIO Interface
- ADC Interfaces
- Status Indication Pins
- Pin Sequence

4.2 UART Interface

The MC703 CDMA EV-DO module has one UART interface, that is, UART1. UART1 is a 9-wire serial interface supporting the flow control function and a maximum transmission rate of 4 Mbit/s.

UART1 supports data services. You can set up the Point-to-Point Protocol (PPP) dial-up connection for data services through UART1.

UART1 supports programmable data width, data stop bit, and parity check (or no parity check). In addition, UART1 supports a maximum baud rate of 230.4 kbps and a default baud rate of 115.2 kbps. The set baud rate can be saved even if the interface is powered off.

Figure 4-1 Connections between the DCE and DTE

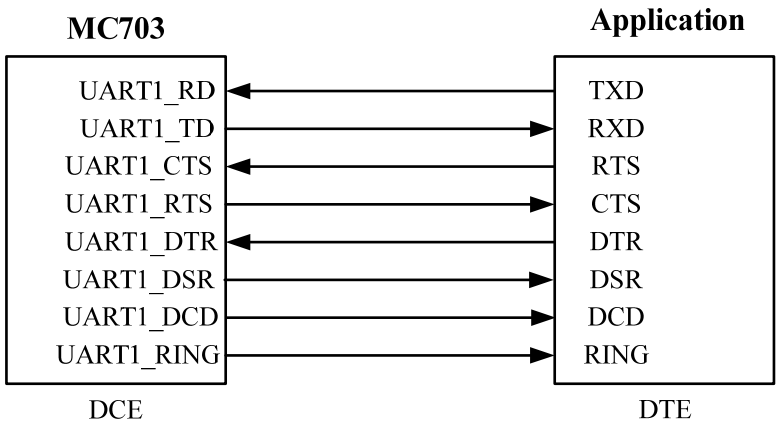


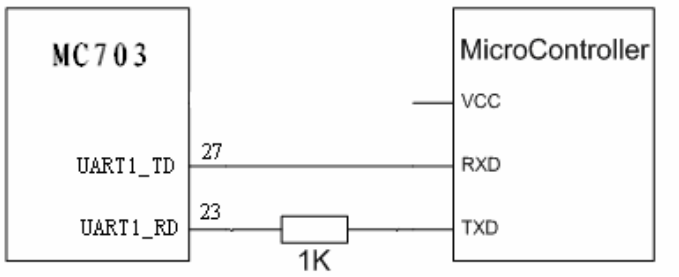
Table 4-1 shows the definitions of the interface signals.

Table 4-1 Signals on UART1 of the MC703 CDMA EV-DO module

Pin Number	Signal Name	Description	Feature	Direction
27	UART1_TD	Data transmission end of the module	The Date Terminal Equipment (DTE) receives serial data.	DCE – DTE
23	UART1_RD	Data receiving end of the module	The DTE transmits serial data.	DTE – DCE
22	UART1_RING	Ringing indication of the module	The DTE is notified of a remote call.	DCE – DTE
20	UART1_RTS	RTS on the module	The DTE notifies the Data Communications Equipment (DCE) of sending requests.	DCE – DTE
28	UART1_DTR	DTR on the module	The DTE is ready.	DTE – DCE
24	UART1_DSR	DSR on the module	The DCE is ready.	DCE – DTE
26	UART1_CTS	CTS on the module	The DCE switches to the receiving mode.	DTE – DCE
30	UART1_DCD	DCD on the module	Data links are connected.	DCE – DTE

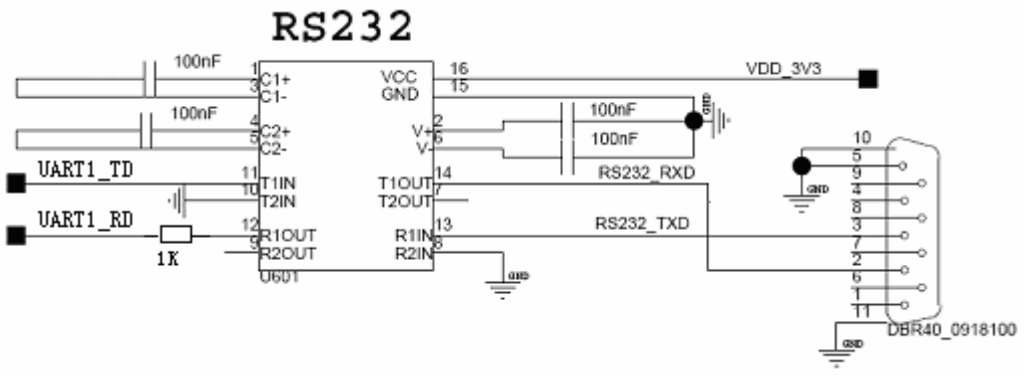
When MC703 CDMA EV-DO module is connected to a 3V single-chip microcontroller. a 1000-ohm resistor should be added between the pin UART1_RD and the pin TXD of the microcontroller.

Figure 4-2 Connections between the serial interface and the 3 V single-chip microcontroller



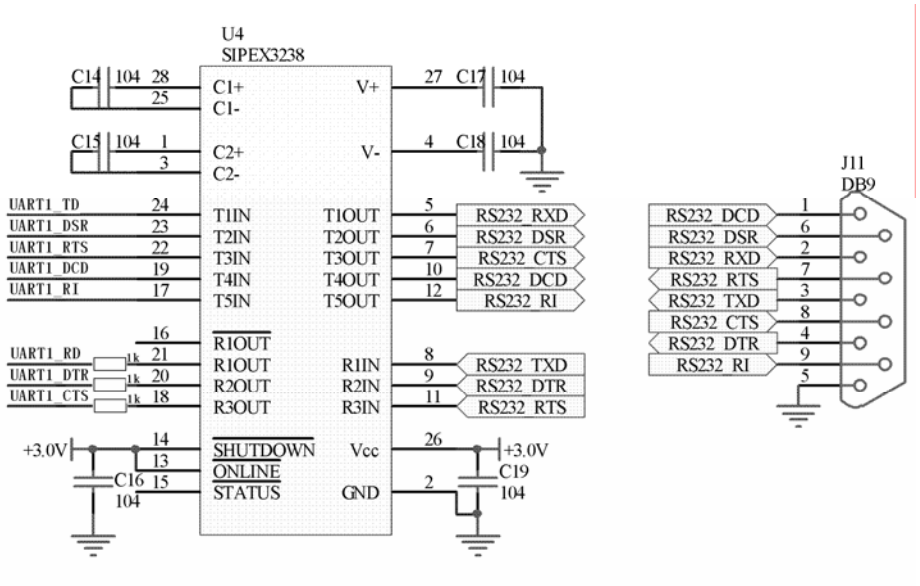
You can use a Category 232 chip to connect the MC703 CDMA EV-DO module to a standard RS-232-C interface. In the case of a 3-wire serial interface, the MAX3232 chip is recommended. The UART1-RD pin of the module connects to the TXD pin of the DTE after being converted through the MAX3232 chip, and the TXD pin of the DTE connects to the UART1_TD pin of the module after being converted through the MAX232 chip.

Figure 4-3 Connections for the 3-wire serial interface



In the case of a full-serial interface, the MAX3232, SP3238, or MAX3238 chip is recommended.

Figure 4-4 Electrical connections for the 9-wire serial interface with the flow control function



4.3 RUIM Card Interface

The MC703 CDMA EV-DO module can connect to a 3 V or a 1.8 V RUIM card. Table 4-2 shows the signals of the RUIM card interface. The level of the RUIM card interface is 3 V or 1.8 V.

Table 4-2 Pins of the RUIM card interface

Pin Number	Signal Name	Description
44	VREG_RUIM	Power supply of the RUIM card
48	RUIM_RST	Reset signal of the RUIM card
42	RUIM_CLK	Clock signal of the RUIM card
46	RUIM_IO	Data signal of the RUIM card
	GND	Ground

Figure 4-5 Circuits of the RUIM card interface

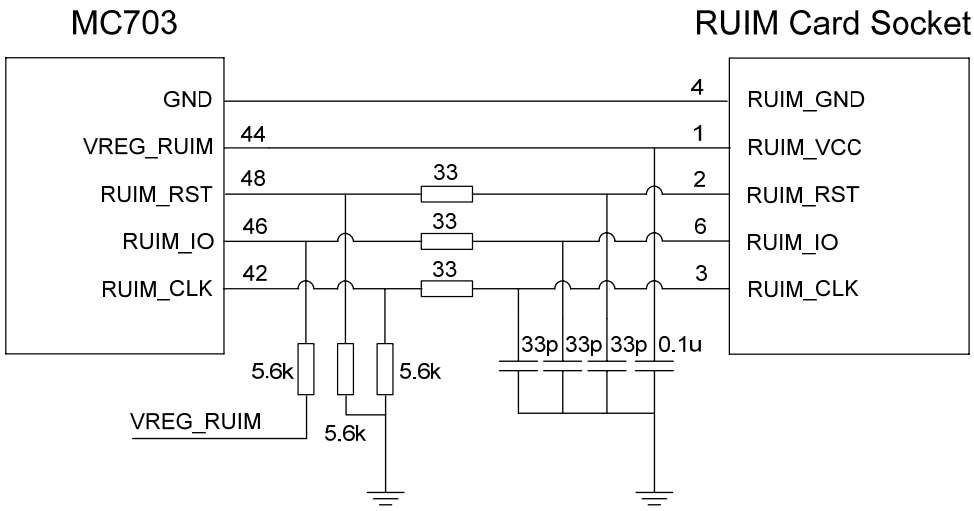


Figure 4-6 Sequence of the pins of the RUIM card

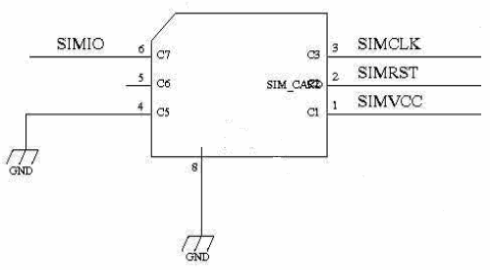
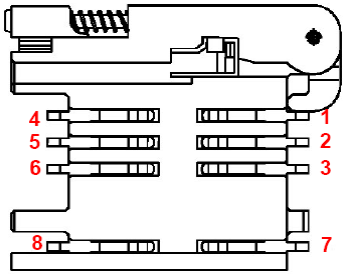


Figure 4-7 Sequence of the pins of a RUIM card socket



The typical rate of the RUIM card interface is about 3.25 MHz. Therefore, the RUIM card seat should be as close to the module interface as possible and the line should not exceed 10 cm. This prevents the communications quality of signals from being affected by serious waveform distortion because of too long lines. Ground lines should be used to enclose the lines used for transmitting RUIM_CLK signals and RUIM_IO signals.

To filter out the interference from antenna signals, you need to add a 0.1μF or a 0.22μF capacitor to the RUIM_VCC signal and a 33pF capacitor to the RUIM_CLK, RUIM_IO, and RUIM_RST signals based on the GND network. In addition, you need to add TVS diodes to

these four signals for ESD protection. The TVS diodes should be placed as close to the RUIM card socket as possible.

4.4 Audio Interfaces

The MC703 CDMA EV-DO module provides two audio channels and each channel includes one input and one output interfaces. Table 4-3 shows the signals of the audio interfaces.

Table 4-3 Signals of the audio interfaces

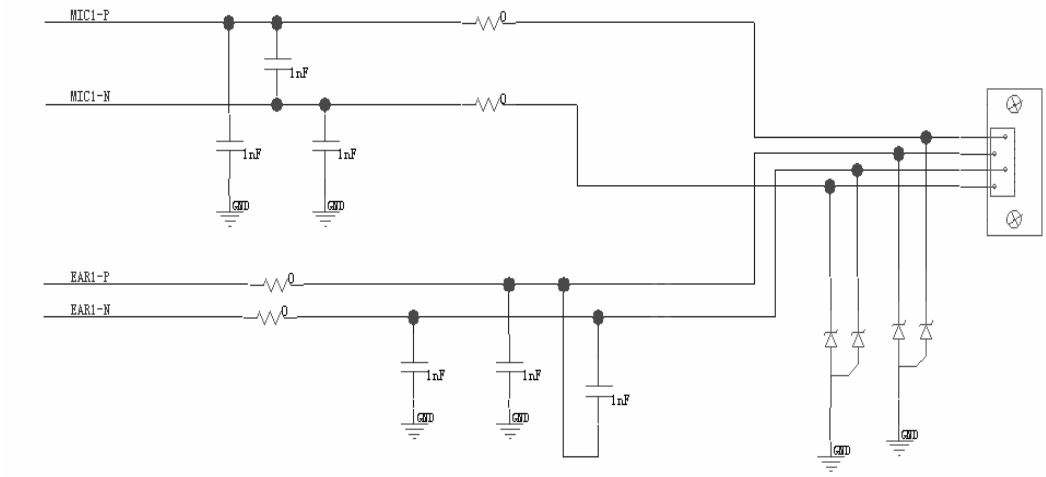
Pin Number	Signal Name	Description
51	MIC1_N	Negative pole of the input of the first audio interface
53	MIC1_P	Positive pole of the input of the first audio interface
47	EAR1_N	Negative pole of the output of the first audio interface
49	EAR1_P	Positive pole of the output of the first audio interface
58	MIC2_N	Negative pole of the input of the second audio interface
60	MIC2_P	Positive pole of the output of the second audio interface
54	SPKR_OUT_N	Negative pole of the output of the second audio interface
56	SPKR_OUT_P	Positive pole of the output of the second audio interface

The input and output signals on the first audio interface are fully differential and thus have good performance of resisting RF interference. This audio interface can be used in handset connection mode without any external audio frequency amplifier (AFA).

As the audio signals are in differential pairs, the lines on the printed circuit board (PCB) should be equidistantly laid in parallel with each other. The lines should be as short as possible, the filter circuits of the two sides should be symmetric, the differential pair signals should be close to each other, and the grounding is required. The differential pair signals of the audio output and the differential pair signals of the audio output should be effectively separated through grounding. In addition, the signals should be away from the circuits of the power supply, RF, and antenna.

Differentiate and isolate functional modules during PCB design of the application board which the MC703 CDMA EV-DO module is applied on.

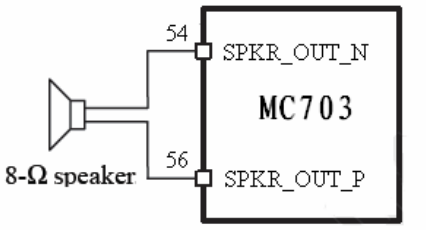
Figure 4-8 Circuits of the first audio interface



Differential signals are transmitted on the first audio interface. By reserving a place for the resistor in the loop, you can adjust the quality and volume of the voice. It is recommended that you place a TVS on the related interface to provide protection against ESD and protect components such as the internal integrated circuit (IC) component.

The output signals of the second audio interface can directly drive an 8-ohm speaker.

Figure 4-9 Connections between the MC703 CDMA EV-DO module and the 8-ohm speaker

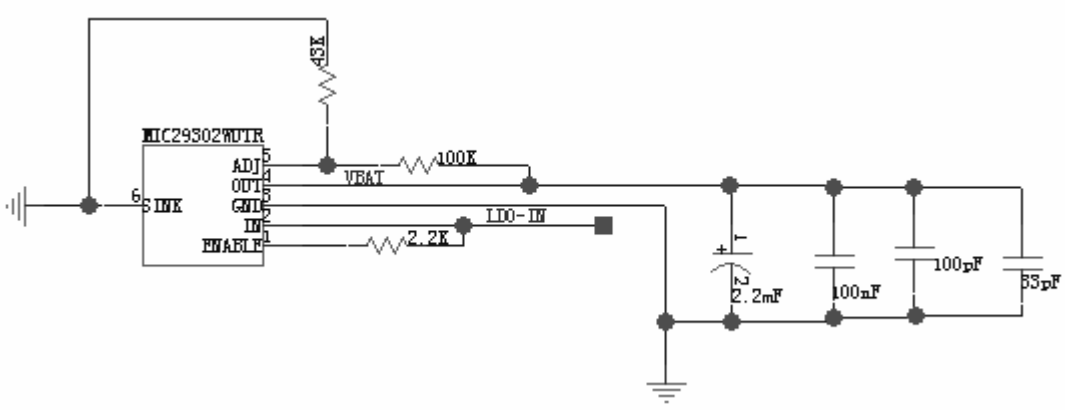


4.5 Power Supply Interface

An external power supply with the voltage of 3.3 V to 4.2 V (the typical value is 3.8 V) powers the MC703 CDMA EV-DO module through the VBAT pin. When the network signals are weak, the antenna transmits signals with the highest power and the maximum transient current can be up to 1.1A. In this case, it is recommended that you use a low dropout (LDO) regulator or a switching-mode power supply whose current is higher than 1.1 A.

Considering the voltage drop that may occur during the transmission with high power, you can add a large capacitor on the power supply interface of the module. The electrolytic capacitor of over 220 µF is recommended.

Figure 4-10 Reference circuits for the design of the LDO power supply



4.6 USB Bus

Working with the drives of a PC, the USB interface can be mapped to a serial interface of the PC. The USB interface is mainly used for updating module applications, capturing software logs, and testing module applications.

Table 4-4 Signals of the USB interface

Pin Number	Signal Name	Description
36	USB_D-	USB data line
38	USB_D+	USB data line

4.7 GPIO Interface

The MC703 CDMA EV-DO module supports up to eight GPIO interfaces. Table 4-5 shows the signals of the GPIO interfaces.

Table 4-5 Signals of the GPIO interfaces

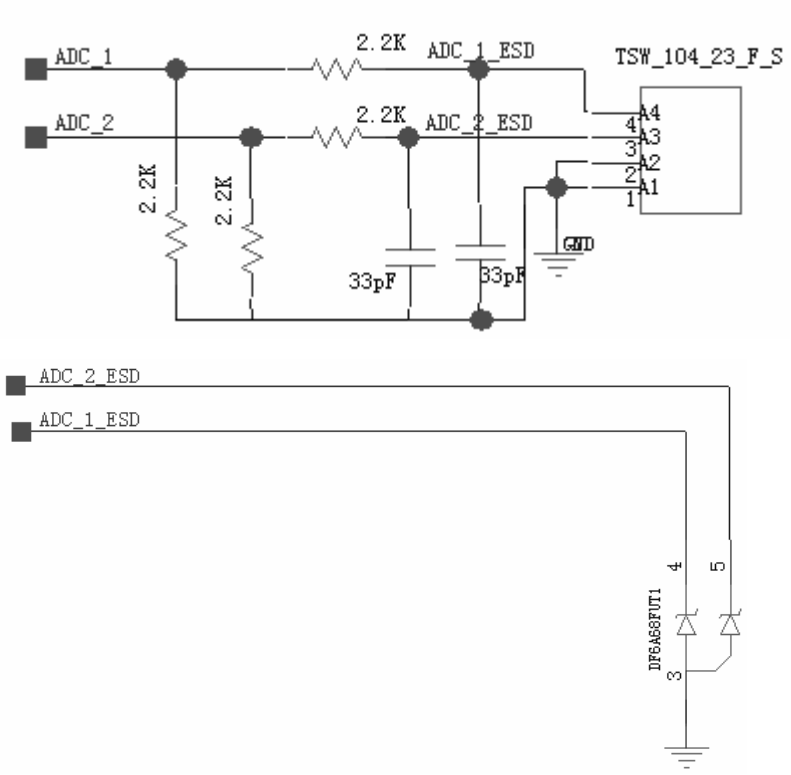
Pin Number	Signal	I/O	Description
32	GPIO_1	I/O	GPIO 1
33	GPIO_2	I/O	GPIO 2
35	GPIO_3	I/O	GPIO 3
37	GPIO_4	I/O	GPIO 4
39	GPIO_5	I/O	GPIO 5
41	GPIO_6	I/O	GPIO 6

Pin Number	Signal	I/O	Description
25	GPIO_7	I/O	GPIO 7
29	GPIO_8	I/O	GPIO 8

4.8 ADC Interfaces

The MC703 CDMA EV-DO module supports two ADC interfaces for monitoring analog variables, such as the environmental temperature variable.

Figure 4-11 Reference circuits of the design of the ADC interfaces



4.9 Status Indication Pins

4.9.1 LED Circuits

The MC703 CDMA EV-DO module supplies two signals which can be used to light the LEDs. One LED indicates the network mode and the other LED indicates the signal status. The LEDs are controlled by the current sink. The high voltage is the voltage of VBAT (with the typical value of 3.8 V).

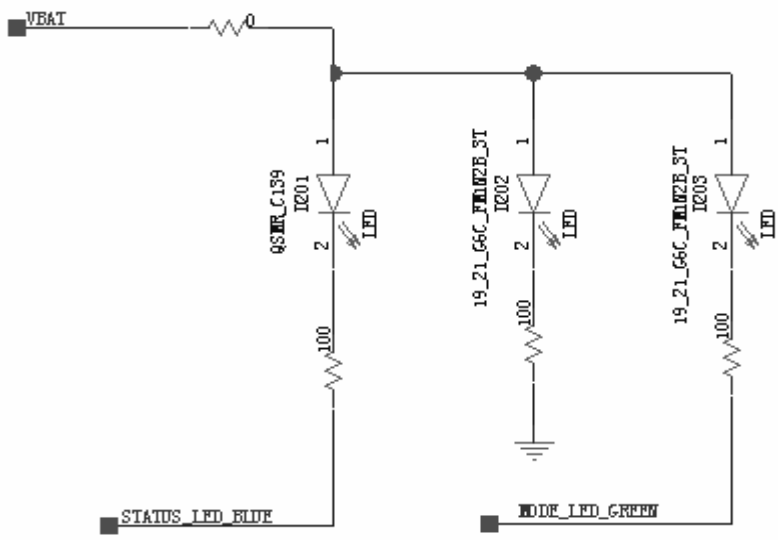
Table 4-6 shows the status of the LEDs.

Table 4-6 Status of the LEDs

Operating Mode of the MC703 CDMA EV-DO Module	LED Status
The module is searching for a network or no network is available.	The LED flashes once. (The LED is on for 100 ms and off for 0.9s. Each cycle lasts 1s.)
The module finds out a 2G network.	The LED flashes once. (The LED is on for 100 ms and off for 1.9s. Each cycle lasts 2s.)
The module finds out a 3G network.	The LED flashes once. (The LED is on for 100 ms and off for 2.9s. Each cycle lasts 3s.)
The module is processing the CDMA 1X data services through the dial-up service.	The LED flashes twice. (The LED is on for 100 ms and off for 300 ms, and then on for 100 ms and off for 1.5s. Each cycle lasts 2s.)
The module is processing the EV-DO data services through the dial-up service.	The LED flashes twice. (The LED is on for 100 ms and off for 200 ms, and then on for 100 ms and off for 600 ms. Each cycle lasts 1s.)
The module is in factory test mode (FTM).	The LED flashes slowly. (The LED is on for 1s and off for 1s. Each cycle lasts 2s.)
The module is upgrading software.	The LED flashes quickly. (The LED is on for 100 ms and off for 100 ms. Each cycle lasts 0.2s.)

Figure 4-12 shows the recommended circuits of the LED pins.

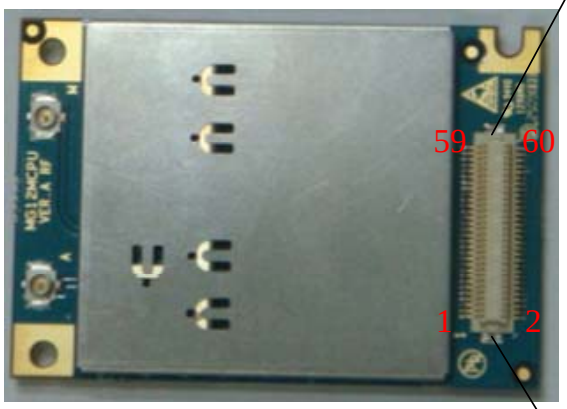
Figure 4-12 Recommended circuits of the LED pins



4.10 Pin Sequence

Figure 4-13 shows the sequence of the pins on the 60-pin B2B connector of the MC703 CDMA EV-DO module.

Figure 4-13 Sequence of the pins on the MC703 CDMA EV-DO module



序号	信号名称	序号	信号名称
1	VBAT	2	GND
3	VBAT	4	GND
5	VBAT	6	GND
7	VBAT	8	GND
9	VBAT	10	GND
11	MODE_LED	12	VCOIN
13	STATUS_LED	14	VREG_MSMP
15	NC	16	RESET_N
17	NC	18	TERM_ON
19	NC	20	UART1_RTS
21	FORCE_LOAD_N	22	UART1_RING
23	UART1_RD	24	UART1_DSR
25	GPIO_7	26	UART1_CTS
27	UART1_TD	28	UART1_DTR
29	GPIO_8	30	UART1_DCD
31	NC	32	GPIO_1
33	GPIO_2	34	MODULE_WAKEUP
35	GPIO_3	36	USB_D-
37	GPIO_4	38	USB_D+
39	GPIO_5	40	HOST_WAKEUP
41	GPIO_6	42	RUIM_CLK
43	I2C_SCL	44	VREG_RUIM
45	I2C_SDA	46	RUIM_IO
47	EAR1_N	48	RUIM_RST
49	EAR1_P	50	RUIM_IN
51	MIC1_N	52	GND
53	MIC1_P	54	SPKR_OUT_N
55	GND	56	SPKR_OUT_P
57	ADC_1	58	MIC2_N
59	ADC_2	60	MIC2_P

5 Mechanics

5.1 Overview

This chapter describes the mechanical dimensions of the MC703 CDMA EV-DO module, with the following dimensions included:

- Mechanical Dimensions of the MC703 CDMA EV-DO Module
- Mechanical Dimensions of the B2B Connector

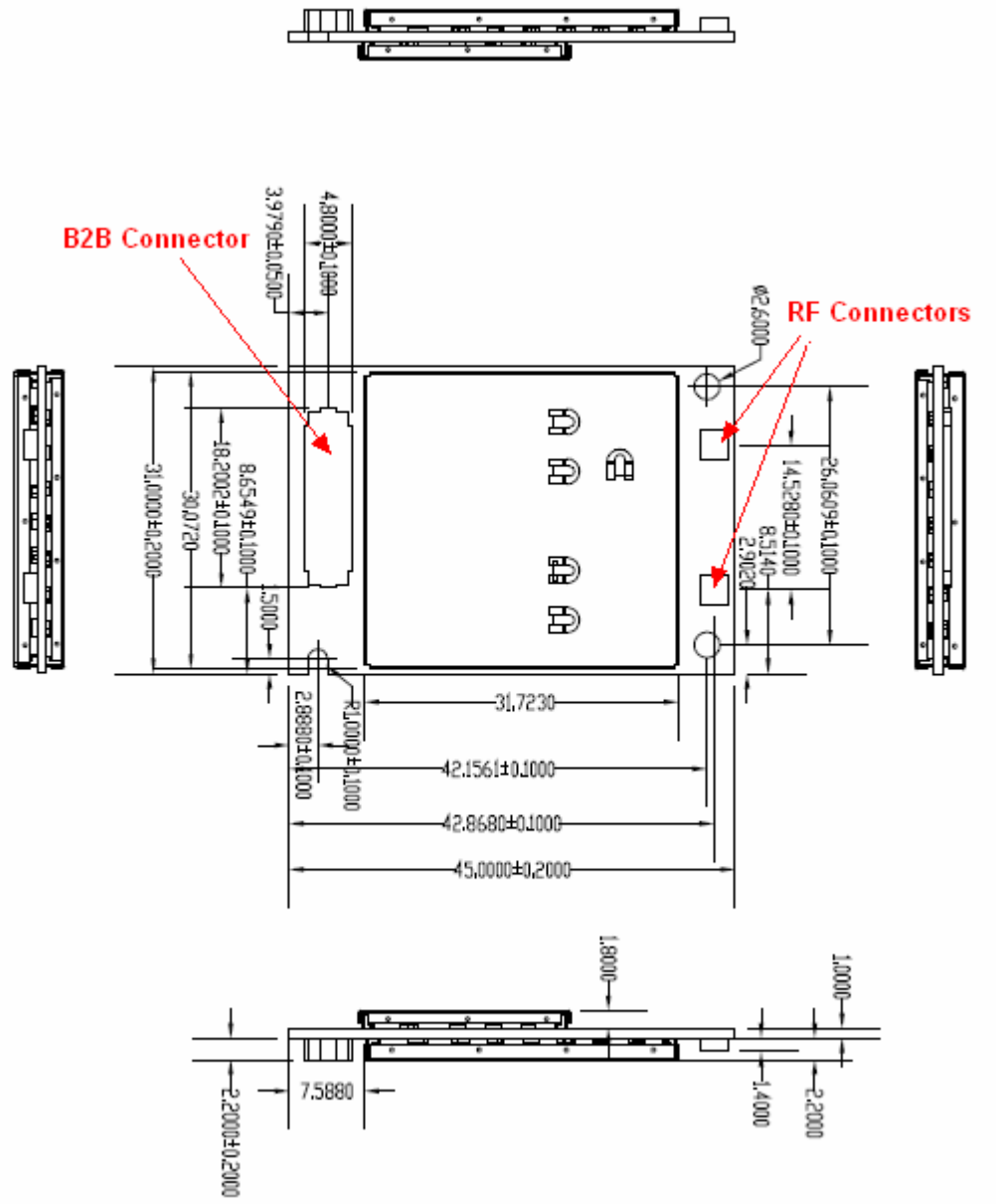
5.2 Mechanical Dimensions of the MC703 CDMA EV-DO Module

Dimensions: 31±0.20 mm x 45±0.20 mm x 5±0.20 mm

Weight: 9.8 (±0.2) g

Figure 5-1 shows the mechanical dimensions of the MC703 CDMA EV-DO module.

Figure 5-1 Mechanical dimensions of the MC703 CDMA EV-DO module (unit: mm)



NOTE

If the MC703 CDMA EV-DO module is required to be compatible with other products, such as the MU103 module, it is recommended that the mounting hole close to the B2B connector on the user application board should be designed to be track-shaped, as shown in Figure 5-2.

Figure 5-2 Recommended shape of the toaling hole close to the B2B connector on the user application board

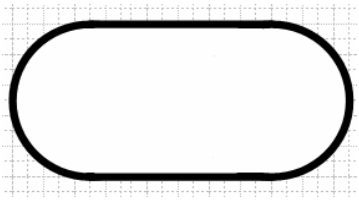
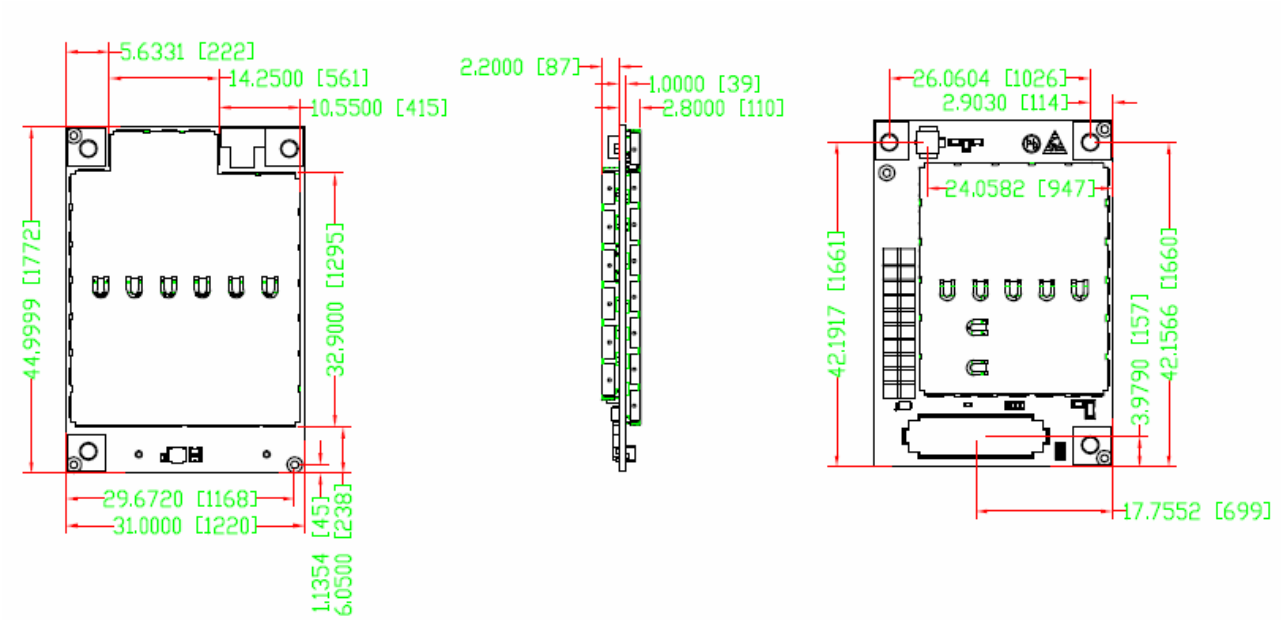


Figure 5-3 Mechanical dimensions of the MU103 module



5.3 Mechanical Dimensions of the B2B Connector

The MC703 CDMA EV-DO module adopts the DF12(3.0)-60DS-0.5V(86) 60-pin B2B connector supplied by HRS, with the pin spacing of 0.5 mm, the stacking height of 3 mm, and pluggable times of less than 50. The connector can be mated with the DF12(3.0)-60DP-0.5V(86), DF12(3.5)-60DP-0.5V(86), DF12(4.0)-60DP-0.5V(86), and DF12(5.0)-60DP-0.5V(86) supplied by HRS.

Figure 5-4 HRS DF12(3.0)-60DS-0.5V(86) connector on the MC703 CDMA EV-DO module

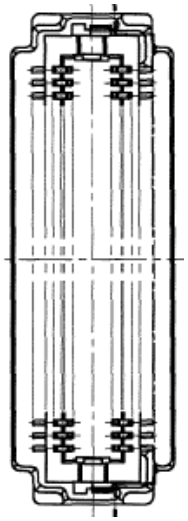


Figure 5-5 HRS DF12(3.0)-60DP-0.5V(86) mating header on the user board

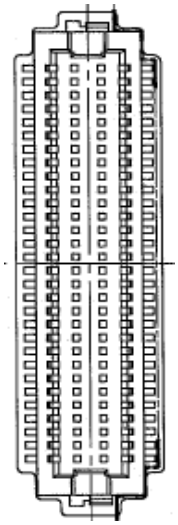
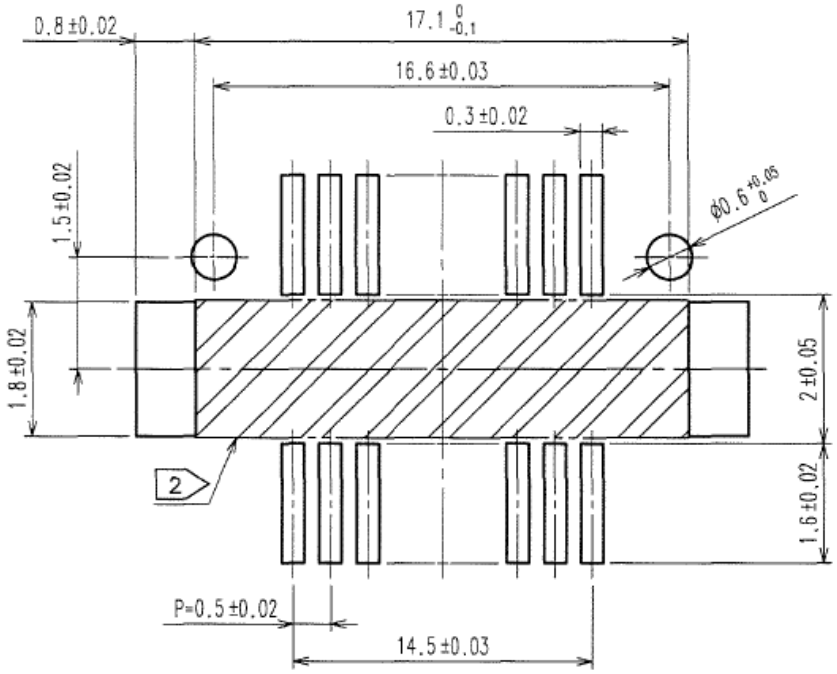


Table 5-1 DF12 series that are compatible with the MC703 CDMA EV-DO module

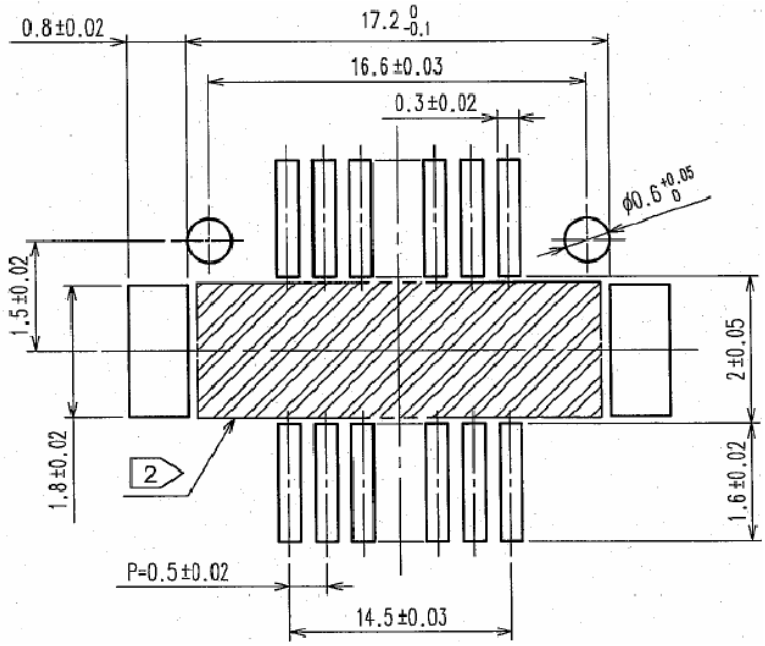
Product	Model	Stacking Height (mm)	HRS Number
Connector used on the MC703 CDMA EV-DO module	DF12(3.0)-60DS-0.5V(86)	3.0	537-0611-1-86
Headers on the interface board	DF12(3.0)-60DP-0.5V(86)	3.0	537-0731-3-86

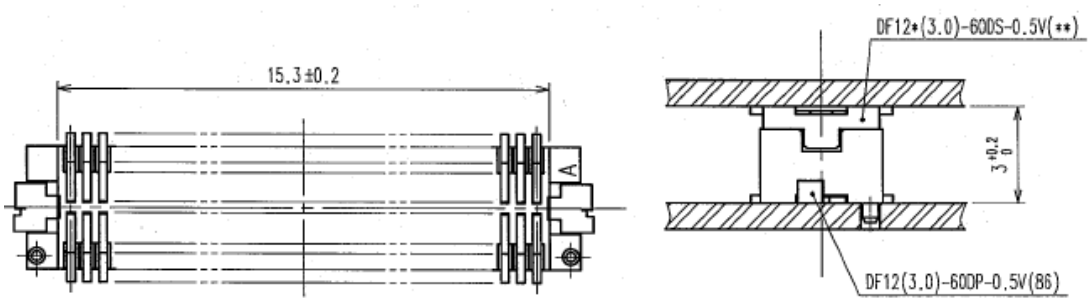
Figure 5-6 Dimensions of the connector on the MC703 CDMA EV-DO module (unit: mm)



For more information about the connectors of Hirose, access http://www.hirose-connectors.com.

Figure 5-7 Dimensions of the connector pad on the user interface board of the MC703 CDMA EV-DO module




15.3±0.2
A
DF12*(3.0)-60DS-0.5V(**)
3 +0.2 0
DF12(3.0)-60DP-0.5V(86)

A Acronyms and Abbreviations

AMR	Adaptive Multi-rate
BER	Bit Error Rate
BTS	Base Transceiver Station
B2B	Board-to-Board Connector
CSD	Circuit Switched Data
DSP	Digital Signal Processor
DCE	Data circuit-terminating equipment
DTE	Data terminal equipment
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GMSK	Gaussian Minimum Shift Keying
IMEI	International Mobile Equipment Identity
I/O	Input/Output
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
LED	Light Emitting Diode
MO	Mobile Originated
MT	Mobile Terminated

NTC	Negative Temperature Coefficient
PCS	Personal Cellular System
PCL	Power Control Level
PCS	Personal Communication System
PPP	Point-to-point protocol
QPSK	Quadrate Phase Shift Keying
RTC	Real Time Clock
UART	Universal asynchronous receiver-transmitter
EV-DO	Evolution-Data Only
VSWR	Voltage Standing Wave Ratio