

ZTE MC8331 Module Technical Specifications

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ZTE CORPORATION

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Foreword

Summary

This manual is applicable for MC8331 modules. This manual takes MC8331 as examples to introduce the appearance, hardware framework, functions, technical specifications and relevant test standard of MC8331 module, which is used for supporting design reference to hardware engineers and product designers.

Object readers

This document is mostly suitable for engineers as below:

- System designers
- Product engineers
- Hardware engineers
- Software engineers
- Test engineers

Brief

This document contains 7 chapters, as following:

Chapter	Contents
1 Summary	Basic functions and characteristics of MC8331 module product
2 Abbreviation	Abbreviations appeared in this document
3 appearance and framework	Appearance figure of MC8331 module
4 functions	Basic functions and interfaces of MC8331 module
5 Technical specifications	Introduce particular technical specifications of MC8331 module
6 reliability test standard	Introduce the reliability test standard of MC8331 module.
7 EMC standard	Introduce EMC standard of MC8331 module

Modified records

Modified records accumulate update notes every time. The latest document version includes all update contents previously.

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1 Summary

ZTE MC8331 module is industrial grade module based on QUALCOMM QSC6010 single chipset platform, which is developed by ZTE with independence patents. With features like stamp-hole connecting and single chipset scheme, its cost is reduced, performance is more stable and body is thinner.

The modules are applicable to such products based on CDMA technology:

- Tracker and individual positioning products
- USB MODEM and wireless data card
- Wireless handsets

The frequency band of MC8331 is shown as below:

Table1-1 the frequency band

Module name	Tx frequency band(MHz)	Rx frequency band(MHz)
MC8331	824 ~ 849	869 ~ 894

2 Abbreviations

Abbr.	Full name
ADC	Analog-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ARFCN	Absolute Radio Frequency Channel Number
ARP	Antenna Reference Point
ASIC	Application Specific Integrated Circuit
BER	Bit Error Rate
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CDG	CDMA Development Group
CS	Coding Scheme
CSD	Circuit Switched Data
CPU	Central Processing Unit
DAI	Digital Audio interface
DAC	Digital-to-Analog Converter
DCE	Data Communication Equipment
DSP	Digital Signal Processor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EGSM	Enhanced GSM

EMC	Electromagnetic Compatibility
EMI	Electro Magnetic Interference
ESD	Electronic Static Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
FR	Full Rate
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IC	Integrated Circuit
IMEI	International Mobile Equipment Identity
ISO	International Standards Organization
ITU	International Telecommunications Union
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Machine Control Unit
MMI	Man Machine Interface
MS	Mobile Station
PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication System
PDU	Protocol Data Unit
PLL	Phase Locked Loop
PPP	Point-to-point protocol
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read-only Memory
RMS	Root Mean Square
RTC	Real Time Clock
SIM	Subscriber Identification Module
SMS	Short Message Service
SRAM	Static Random Access Memory
TA	Terminal adapter
TDMA	Time Division Multiple Access
TE	Terminal Equipment also referred it as DTE
UART	Universal asynchronous receiver-transmitter
UIM	User Identifier Management
USB	Universal Serial Bus
VSWR	Voltage Standing Wave Ratio
ZTE	ZTE Corporation

3 Appearance and framework

Appearance of MC8331 is as following figure 3-1:

Figure 3-1 appearance of MC8331 module



- Dimension (length x width x height) : 36.0 mm x 27.0mm x 2.45mm
- Weight: 7g

4 Functions and interfaces

The basic functions of MC8331 module is as following table 4-1:

Table4-1 basic functions of MC8331 module

item	description
voice	8kEVRC and 13kQCELP high-quality voice
Circuit switch	Circuit switch service(IS707-A.4)
Packet data	Packet data service(IS707-A.5) <i>(only for MC8331)</i>
SMS	CMT-95 standard SMS service
RF	ZIF (Zero Intermediate Frequency)technology
	Call standby/ call forward/ incoming call indication
	VKL(Visually Keep on Line) technology <i>(only for MC8331)</i>
	phonebook
	OTA: support OTASP and OTAPA
	Support RUIM and Non-RUIM mode
	Effective power saving technology/ embedded power management chipset

The basic interfaces of MC8331 module is as following table 4-2:

Table4-2 Basic interfaces of MC8331 module

interface	description
R-UIM	RUIM and Non-RUIM mode
UART	<ul style="list-style-type: none"> ● Single path UART interface ● Support maximum 230.4kbps data rate
Audio	Dual-path audio input/output channel
USB interface	USB1.1 Device, Support full speed (12Mbps)
PCM interface	Support data rate 128kbps
Antenna	50 Ohm input impedance control
AT commands SW interface	Support general AT commands and ZTE exclusive commands

5 Technical specifications

5.1 Communication protocols and technical specifications

The communication protocols and technical specifications of MC8331 module is as following table 5-1:

Table 5-1 communication protocols and technical specifications

Access mode	CDMA (Code-Division-Multiple-Access)
CDMA protocols	IS-95 A/B, IS-98A, IS-126, IS-637A, IS683, IS-707A, IS-2000
Data rate	153.6kbps Max (only for MC8331)
Frequency interval between Tx and Rx	45MHz for 800M Cellular
Voice encoding	8k EVRC, 13k QCELP

5.2 RF receiving

RF features of MC8331 module is shown as following table 5-2:

Table5-2 RF receiving

Frequency range	Each frequency band for Rx
Rx sensitivity	-104 dBm(FER≤0.5%)
Rx signal range	-25 dBm~ -104dBm(FER≤0.5%)
Single voice interference immunity	-101dBm(FER≤1%,-30dBm@±900KHz)
Intermodulation spurious	-101dBm(FER≤1%,-43dBm@±900 KHz /±1700KHz)

	-90dBm(FER≤1%,-32dBm @±900 KHz /±1700KHz)
	-79dBm(FER≤1%,-21dBm @±900 KHz /±1700KHz)
Conductibility spurious emission	<-76dBm/1MHz (Rx frequency band)
	<-61dBm/1MHz (Tx frequency band)
	<-47dBm/30KHz (other frequency)
Forward traffic channel demodulation under AWGN condition	FER≤3.0% (test 1: data rate 1 (9600bps))
	FER≤1.0% (test2: data rate1 (9600bps))
	FER≤0.5% (test 3: data rate1 (9600bps))
	FER≤1.0% (test4: data rate1 (4800bps))
	FER≤1.0% (test5: data rate1 (2400bps))
	FER≤1.0% (test6: data rate1 (1200bps))
	FER≤3.0% (test7: data rate2 (14400bps))
	FER≤1.0% (test8: data rate2 (14400bps))
	FER≤0.5% (test9: data rate2 (14400bps))
	FER≤1.0% (test10: data rate2 (7200bps))
	FER≤1.0% (test11: data rate2 (3600bps))
	FER≤1.0% (test12: data rate2 (1800bps))

5.3 RF emission

RF emission features of MC8331 module is shown as following table5-3:

Table5-3 RF emission

Frequency range	824 ~ 849 MHz
Maximum frequency bias	±300Hz
Maximum output power	23dBm ~ 30dBm
Minimum output power	< -50dBm
Standby output power	<-61dBm
Code domain power	Each code domain power on dimmed code channel should be 23dB less than total output power on I,Q channel
Transmitter time error	±1.0μs
Waveform quality factor	>0.944
Open-loop power control	(test 1: -25dBm/1.23MHz) -48±9.5dBm
	(test 2: -60dBm/1.23MHz) -8±9.5dBm
	(test 3: -93.3dBm/1.23MHz) 20±9.5dBm
Closed loop power control	±24dB(9600bps data rate)
	±24dB(4800bps data rate)
	±24dB(2400bps data rate)
	±24dB(1200bps data rate)
Conductibility spurious emission	-42dBc/30KHz or -54dBm/1.23MHz (Δf : 885KHz~1.98MHz)
	-54dBc/30KHz or -54dBm/1.23MHz (Δf : 1.98MHz~4.00MHz)
	<-36dBm/1kHz (Δf > 4MHz, 9KHz < f < 150KHz,)

	<-36dBm/10kHz (Δf > 4MHz, 150kHz<f<30MHz,)
	<-36dBm/100kHz (Δf > 4MHz, 30MHz<f<1GHz)
	<-30dBm/1MHz (Δf > 4MHz, 1GHz<f<12.75GHz)

5.4 Recommendation of antenna specs

The recommended antenna specs for MC8331 module is as following table 5-4:

Table 5-4 recommended antenna specs

VSWR	1.5:1 maximum
gain	At least 0 dBi in one direction
Input impedance	50Ω
Polarized form	Vertical polarizing

The requirements for antenna's gain are different in different environment. Commonly, in used frequency range, the larger gain, the better capability; otherwise, out of this range, the smaller gain, the better capability.

5.5 Input voltage of module

The input voltage is shown in table 5-5:

Table5-5 input voltage

state	Max. voltage	Typical voltage	Min. voltage
Power supply	4.25 VDC	3.9 VDC	3.3 VDC

5.6 Current values under different conditions

Current values of MC8331 module under different conditions is shown as table 5-6:

Table5-6 current values

Item	Description
Max. current	630mA (@-104dbm)
Call current	230mA (@-75dbm)
Idle current (average)	3mA (@-75dbm)

5.7 Working conditions

- Working temperature: -20°C ~ +55°C
- Storage temperature: -40°C ~ +70°C
- humidity: 5% ~ 95%

6 Reliability test standard

6.1 Low temperature running experiment

Low temperature:

- Temperature request: -30°C
- duration: 16H
- reference standard: GB/T 2423.1-2001

6.2 Low temperature storage experiment

Low temperature:

- Temperature request: -40°C
- duration: 24H
- reference standard: GB/T 2423.1-2001

6.3 High temperature running experiment

High temperature:

- Temperature request: +75°C
- duration: 16H
- reference standard: GB/T 2423.2-2001

6.4 High temperature storage experiment

High temperature:

- Temperature request: +85°C
- duration: 24H
- reference standard: GB/T 2423.2-2001

6.5 High temperature, high humidity experiment

High temperature and humidity:

- Temperature request: +85°C
- Humidity request: 95%RH
- duration: 24H
- reference standard: GB/T 2423.2-2001

6.6 High-low temperature striking experiment

- Circulation times: 5 times

- Temperature range: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- duration: 2h
- resume time: 2h
- reference standard: GB/T 2423.3-2001

7 EMC test standard

7.1 Static discharge (ESD) interference immunity experiment

Experiment level:

- Touchable discharge: $\pm 8\text{KV}$
- Air discharge: $\pm 15\text{KV}$
- reference standard: YD/T1169.1-2001

7.2 RF electromagnetic emission interference immunity experiment

Experiment level:

- Experiment field strength: 3V/m (3 meter test distance)
- Frequency range: $80\text{--}1000\text{MHz}$
- reference standard: YD/T1169.1-2001

7.3 Electrical fast transient/burst immunity experiment

Experiment level (AC port):

- Test voltage: $\pm 2\text{KV}$
- frequency: 5KHz
- waveform: $5/50\text{ns}$

Experiment level (signal port):

- Test voltage: $\pm 1\text{KV}$
- frequency: 5KHz
- waveform: $5/50\text{ns}$

7.4 Lightning and surge immunity experiment

Experiment level (differential mode):

- Experiment waveform (multiple wave) : $8/20\mu\text{s}; 1.2/50\mu\text{s}$
- Combined wave: test voltage: $\pm 1\text{KV}$
- resistor of transmitter: 2Ω
- reference standard: GB/T 17626.5-1999

7.5 RF electromagnetic field conduction interference immunity experiment

Experiment level:

- Modulation voltage: 3V
- Demodulation frequency band: 0.15~80MHz
- Frequency pace: 1%;
- Interference signal: 80% scope modulate to signal through 1k sine wave
- Reference standard: GB/T 17626.6-1998

7.6 Radiated disturbance experiment

- Demodulation mode: quasi-peak demodulation, peak modulation
- Test frequency: 30M~230MHZ (limit value: 40dbuv/m); 230M~1GHZ (limit value: 47dbuv/m)
- Reference standard: YD/T1169.1-2001; GB9254: 1998

7.7 Conducted disturbance experiment

- Demodulation mode: quasi-peak value demodulation, peak value demodulation, average value demodulation, AC L
- Test frequency: 150K~30MHZ
- Reference standard: YD/T1169.1-2001; GB9254: 1998