

ZTE MG3030 Module Technical Specifications

VERSION: V1.2

ZTE CORPORATION

This manual is also applicable for MG3036 module.

Foreword

Summary

The corresponding product to this document is MG3030 and MG3036 modules. It introduces the appearance, hardware framework, functions, technical specifications and relevant test standard of MG3030 module as an example, 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	Background, concepts and applications of MG3030
2 Abbreviation	Abbreviations appeared in this document
3 appearance and framework	Appearance figure of MG3030 module
4 functions	Basic functions of MG3030 module
5 interfaces	Basic interfaces of MG3030 module
6 Technical specifications	Introduce particular technical specifications of MG3030 module
7 reliability test standard	Introduce the reliability test standard of MG3030 module.
8 EMC/EMI standard	Introduce EMC/EMI standard of MG3030 module

Modified records

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

Document version V1.2 (2007-08-17)

Released formally for the 3rd time, the update contents include:
Change ME for MG.

Document version V1.1 (2007-07-09)

Released formally for the 2st time, the update contents include:
Add this manual is also applicable for MG3036 module.

Modify MG3030's frequency.

Modify 6.Reliability test standard

Document version V1.0 (2007-05-31)

Released formally for the 1st time

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1 Summary

ZTE MG3030 and MG3036 modules is GSM/GPRS wireless modules, with abundant voice, SMS, data service functions and so on. Since designed with stamp holes connection and thinner body, their current became lower. The modules can be applied in handsets, wireless data cards, USB modem, trackers, etc.

This document take MG3030 module as an example, introduces the appearance, hardware framework, functions, technical specifications and relevant test standards for module in detail.

2 Abbreviation

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

The lands are distributed at both short sides since MG3030 module adopts stamp-hole connection. There are 18 pins at each side. Appearance of MG3030 is as following figure 3-1:

Figure 3-1 appearance of MG3030 module



- Dimension (length x width x height) : 38.0 mm x 28.0mm x 2.3mm
- Weight: 8g

4 Functions

Please refer to Table 4-1 for the Main Functions and Features.

Table 4-1 Main functions and features

Item	Description
Voice	Double channels and High-quality voice
SMS	Support TEXT and PDU
Data	✓ Support internal TCP/IP stack ✓ GSM maximum up-link data rate 42.8kbps, maximum down-link data rate 85.6kbps.
Frequency	MG3030: EGSM 900/DCS 1800
	MG3036: GSM 850/EGSM 900/DCS 1800/PCS 1900

5 Interfaces

Please refer to Table 5-1 for the Interfaces.

Table 5-1 Interfaces of the modules

Item	Description
UART interface	Download software to update Data communication Maximum data rate 230.4kbps through the port
Audio interface	Double audio I/O channel.
SIM card interface	SIM card interface
Antenna interface	50 Ohm input impedance control

6 Technical specifications

6.1 Technical parameters

Please refer to Table 6-1 for the Technical parameters

Table 6-1 Technical parameters

Item	Description
Working temperature	-20°C ~ +55°C
Input voltage	3.3V-4.25V
Maximum current	1800mA @ -102 dBm
Idle current	10mA @ -75 dBm
Call current	150mA @ -75 dBm
Sensitivity	-102dBm
Tx power	GSM850,EGSM900:Class4(2W) GSM1800, PCS1900:Class1(1W)
Frequency range	GSM850 Tx: 824~849 MHz Rx: 869~894MHz
	EGSM900 Tx: 880~915 MHz Rx: 925~960MHz
	DCS1800 Tx: 1710~1785MHz Rx 1805~1880MHz
	PCS1900 Tx: 1850~1910MHz Rx: 1930~1990MHz

6.2 RF emission

6.2.1 Frequency and phase bias

The frequency and phase bias of transmitter means the difference between the actual frequency and phase values and the theoretic ones.

- The frequency bias of each GSM frequency band should be less than 0.1ppm
- RMS on each channel and power level should not over 5°.
- Peak value phase bias on each channel and power level should not over 20°.

6.2.2 Frequency and phase bias under multi-path interference

It's the carrier frequency bias of MS under Doppler frequency-shift, multiple-path Rx and interference. The frequency bias in each frequency band permitted by GSM standard is as following table 6-2:

Table6-2 frequency bias

GSM 850 and GSM 900		DCS 1800		PCS 1900	
Spread condition	Allowable frequency bias	Spread condition	Allowable frequency bias	Spread condition	Allowable frequency bias
RA250	±300Hz	RA130	±400Hz	RA130	±420Hz
HT100	±180Hz	HT100	±350Hz	HT100	±370Hz
TU50	±160Hz	TU50	±260Hz	TU50	±280Hz
TU3	±230Hz	TU1.5	±320Hz	TU1.5	±330Hz

6.2.3 Tx peak value power and pulse envelop timing

Carrier peak value power of transmitter is the average value on a burst pulse's useful information bit time.

Outburst pulse timing is the interval between Rx and Tx of MS.

Under normal and ultra test conditions, every carrier peak value power on each power level of GSM frequency band should be in the contents of following table:

- GSM 850 and GSM 900:

Power class				Power control level	Transmitter output power dBm	Tolerances	
2	3	4	5			normal	extreme
.	.	.	.	2	39	±2 dB	±2,5 dB
.	.	.	.	3	37	±3 dB (note)	±4 dB (note)
.	.	.	.	4	35	±3 dB	±4 dB
.	.	.	.	5	33	±3 dB (note)	±4 dB (note)
.	.	.	.	6	31	±3 dB	±4 dB
.	.	.	.	7	29	±3 dB (note)	±4 dB (note)
.	.	.	.	8	27	±3 dB	±4 dB
.	.	.	.	9	25	±3 dB	±4 dB
.	.	.	.	10	23	±3 dB	±4 dB
.	.	.	.	11	21	±3 dB	±4 dB
.	.	.	.	12	19	±3 dB	±4 dB
.	.	.	.	13	17	±3 dB	±4 dB
.	.	.	.	14	15	±3 dB	±4 dB
.	.	.	.	15	13	±3 dB	±4 dB
.	.	.	.	16	11	±5 dB	±6 dB
.	.	.	.	17	9	±5 dB	±6 dB
.	.	.	.	18	7	±5 dB	±6 dB
.	.	.	.	19	5	±5 dB	±6 dB

NOTE: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

- DCS 1800:

Power class			Power control level	Transmitter output power dBm	Tolerances	
1	2	3			normal	extreme
-	-	-	29	36	±2,0 dB	±2,5 dB
-	-	-	30	34	±3,0 dB	±4,0 dB
-	-	-	31	32	±3,0 dB	±4,0 dB
-	-	-	0	30	±3,0 dB (note)	±4 dB (note)
-	-	-	1	28	±3 dB	±4 dB
-	-	-	2	26	±3 dB	±4 dB
-	-	-	3	24	±3 dB (note)	±4 dB (note)
-	-	-	4	22	±3 dB	±4 dB
-	-	-	5	20	±3 dB	±4 dB
-	-	-	6	18	±3 dB	±4 dB
-	-	-	7	16	±3 dB	±4 dB
-	-	-	8	14	±3 dB	±4 dB
-	-	-	9	12	±4 dB	±5 dB
-	-	-	10	10	±4 dB	±5 dB
-	-	-	11	8	±4 dB	±5 dB
-	-	-	12	6	±4 dB	±5 dB
-	-	-	13	4	±4 dB	±5 dB
-	-	-	14	2	±5 dB	±6 dB
-	-	-	15	0	±5 dB	±6 dB

NOTE: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

● PCS 1900:

Power class			Power control level	Transmitter output power dBm	Tolerances	
1	2	3			Normal	Extreme
-	-	-	30	33	±2,0 dB	±2,5 dB
-	-	-	31	32	±2,0 dB	±2,5 dB
-	-	-	0	30	±3,0 dB (note)	±4 dB (note)
-	-	-	1	28	±3 dB	±4 dB
-	-	-	2	26	±3 dB	±4 dB
-	-	-	3	24	±3 dB (note)	±4 dB (note)
-	-	-	4	22	±3 dB	±4 dB
-	-	-	5	20	±3 dB	±4 dB
-	-	-	6	18	±3 dB	±4 dB
-	-	-	7	16	±3 dB	±4 dB
-	-	-	8	14	±3 dB	±4 dB
-	-	-	9	12	±4 dB	±5 dB
-	-	-	10	10	±4 dB	±5 dB
-	-	-	11	8	±4 dB	±5 dB
-	-	-	12	6	±4 dB	±5 dB
-	-	-	13	4	±4 dB	±5 dB
-	-	-	14	2	±5 dB	±6 dB
-	-	-	15	0	±5 dB	±6 dB

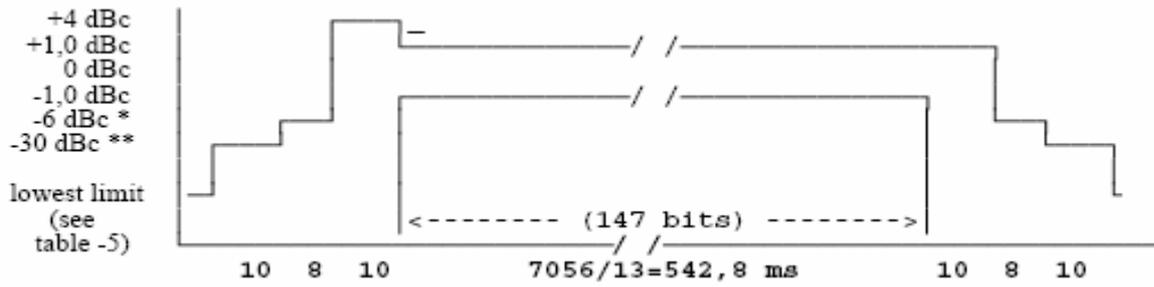
NOTE: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

Under the same frequency and test condition, the difference between two TX carrier peak value power of closer power control level should be no less than 0.5dB and no more than 3.5dB. For PCS 1900, when power level is 3, the difference between two TX carrier peak value power, whose power control level is 30 and 31 respectively control level is 30 or 31, should be no less than 0dB and no more than 2dB

Under normal and ultra test condition, power/time envelop on each power control level should be in the power/time envelop range shown in following figure.

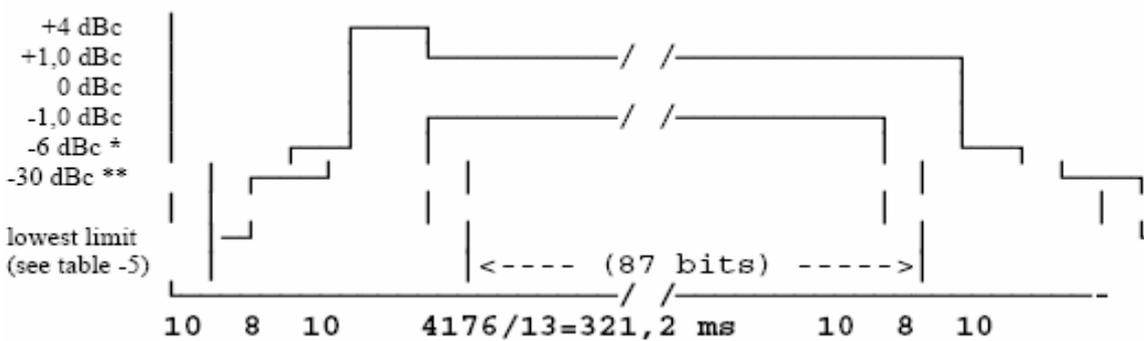
Power/time envelop framework under normal test condition is as following figure 6-1:

Figure6-1 Power/time envelop framework under normal test condition



- For GSM 850 and GSM 900
 1. -4dBc power control level 16
 2. -2dBc power control level 17
 3. -1dBc power control level 18,19-31
- For DCS 1800 and PCS 1900
 1. -4dBc power control level 11
 2. -2dBc power control level 12
 3. -1dBc power control level 13,14 and 15-28
- For GSM 850 and GSM 900
 1. select larger value between -30dBc and -17dBm
- For DCS 1800 and PCS 1900
 1. select larger value between -30dBc and -20dBm
 2. minimum limit value
- For GSM 850 and GSM 900
 1. select larger value between -59dBc and -54dBm 中
 2. for DCS 1800 and PCS 1900: select larger value between -48dBc and -48dBm
 3. power/time envelop framework under ultra test condition is as following figure 6-2:

Figure6-2 power/time envelop framework under ultra test condition



- for GSM 850 and GSM 900
 1. -4dBc power control level 16
 2. -2dBc power control level 17
 3. -1dBc power control level 18,19-31
- For DCS 1800 and PCS 1900
 1. -4dBc power control level 11

- 2. -2dBc power control level 12
- 3. -1dBc power control level 13,14 and 15-28
- For GSM 850 and GSM 900
 - 1. select larger value between -30dBc and -17dBm
- For DCS 1800 and PCS 1900
 - 1. select larger value between -30dBc and -20dBm
 - 2. the time bias of emission burst pulse timing is ± 1 bit, and transmission time is $\pm 3.69\mu s$

6.2.4 TX output spectrum

TX output spectrum is a RF spectrum yielded on the sideband close to carrier frequency by MS because of modulation and power switch etc, which contains modulation spectrum and switch temporary spectrum..

The power level on GSM 850 and GSM 900 modulation sideband should not exceed following table:

power levels in dB relative to the measurement at FT					
Power level	Frequency offset (kHz)				
(dBm)	0-100	200	250	400	600 to <1800
39	+0,5	-30	-33	-60	-66
37	+0,5	-30	-33	-60	-64
35	+0,5	-30	-33	-60	-62
<= 33	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-51

The power level on DCS 1800 modulation sideband should not exceed following table:

power levels in dB relative to the measurement at FT					
Power level	Frequency offset (kHz)				
(dBm)	0-100	200	250	400	600 to <1800
<= 36	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-56

The power level on PCS1900 modulation sideband should not exceed following table:

power levels in dB relative to the measurement at FT						
Power level	Frequency offset (kHz)					
(dBm)	0-100	200	250	400	600 to <1200	1200 to <1800
<= 33	+0,5	-30	-33	-60	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.						
	-36	-36	-36	-36	-56	-56

The power level on GSM 850 and GSM 900 power switch sideband should not exceed following table:

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

The power level on DCS1800 power switch sideband should not exceed following table:

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1200 kHz	1 800 kHz
36 dBm	-16 dBm	-21 dBm	-21 dBm	-24 dBm
34 dBm	-18 dBm	-21 dBm	-21 dBm	-24 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

The power level on PCS1900 power switch sideband should not exceed following table:

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
33 dBm	-19 dBm	-22 dBm	-22 dBm	-25 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

- The tested max current level should be no larger than -79dBm in frequency range 869MHz~894MHz
- The tested max current level should be no larger than -79dBm in frequency range 935MHz~960MHz
- The tested max current level should be no larger than -71dBm in frequency range 1805MHz~1880MHz
- The tested max current level should be no larger than -71dBm in frequency range 1930MHz~1990MHz

6.3 RF receiving

6.3.1 Reference sensitivity

- Full-speed traffic channel

The reference sensitivity of full-speed traffic channel (TCH/FS) means the smallest input electrical level of receiver under stated BER or FER condition.

When input level is the reference sensitivity level (-102dBm), the FER of reference sensitivity in full-speed traffic channel, data channel and control channel under different conditions and different channels can not exceed the limit value displayed in following table.

Error rate tested in each channel of GSM 850 and GSM 900 is as following table6-3:

Table6-3 error rate tested in each channel of GSM 850 and GSM 900

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	6,742* α	8 900					0,122* α	164 000
class Ib(RBER)	0,42/ α	1 000 000					0,41/ α	20 000 000
class II(RBER)	8,333	120 000	7,5	24 000	9,333	60 000	2,439	8 200

Error rate tested in each channel of DCS 1800 and PCS 1900 is as following table 6-4:

Table6-4 error rate tested in each channel of DCS 1800 and PCS 1900

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	4,478* α	13 400					0,122* α	164 000
class Ib(RBER)	0,32/ α	1 500 000					0,41/ α	20 000 000
class II(RBER)	8,333	60 000	7,5	24 000	9,333	30 000	2,439	8 200

notice: the value range of parameter α is 1-1.6. the value of α from Ib type RBER test should be equal to the one in FER test under the same test condition.

- Half-speed traffic channel

The reference sensitivity of half-speed traffic channel (TCH/HS) means the smallest Rx input level of receiver under situation that stated BER,FER or UFR voice frame is received.

When input level is the reference sensitivity level (-102dBm), the FER of reference sensitivity in half-speed traffic channel, data channel and control channel under different conditions and different channels can not exceed the limit value displayed in following table.

Error rate tested in each channel of GSM 850 and GSM 900 is as following table6-5:

Table6-5 error rate tested in each channel of GSM 850 and GSM 900

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS (FER)	4,598	13050	7,600	20000	8,500	20000
TCH/HS Class Ib (BFI=0)	0,404	148500				
TCH/HS Class II (BFI=0)	7,725	25500				
TCH/HS (UFR)	6,250	9600				
TCH/HS Class Ib ((BFI or UFI)=0)	0,269	227000				

Error rate tested in each channel of DCS 1800 and PCS 1900 is as following table6-6.

Table6-6 error rate tested in each channel of CS 1800 and PCS 1900

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS (FER)	4,706	12750	7,600	20000	8,735	20000
TCH/HS Class Ib (BFI=0)	0,426	141000				
TCH/HS Class II (BFI=0)	7,725	25500				
TCH/HS (UFR)	6,383	9400				
TCH/HS Class Ib ((BFI or UFI)=0)	0,291	206000				

6.3.2 Available input level

The available input level of receiver means the input level range can be used by receiver under situation that stated BER or FER is received.

When RF input level of receiver is in the range displayed below, the error rate should not exceed the limit values in following table.

	GSM 850 and GSM 900		DCS 1800 and PCS 1900	
Spread condition	FER limit (%)	Minimum quantity of samples	FER limit (%)	Minimum quantity of samples
static<73dBμVemf()	0.012	1640000	0.012	1640000
static98dBμVemf()	0.122	164000		
static90dBμVemf()			0.122	164000
EQ	3.25	120000	3.25	60000

6.3.3 Co-channel suppression

Co-channel suppression means if there is an useless modulation signal at the standard frequency of receiver, the capability that performance could not less than fixed target when receive a useful modulation signal.

When useless signal is 9dB less than useful one, the error rate tested in each full-speed channel should not exceed values given in following table. The error rate limit and minimum quantity of samples are shown in table 6-7:

Table6-7 error rate limit and minimum quantity of samples in each full-speed channel

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/FS	FER	TUlow/No FH	24*α	25 000
TCH/FS Class Ib	RBER	TUlow/No FH	2,091/α	3 300 000
TCH/FS Class II	RBER	TUlow/No FH	4,3	2 000 000
TCH/FS	FER	TUhigh/FH	3,371*α	17 800
TCH/FS class Ib	RBER	TUhigh/FH	0,215/α	2 000 000
TCH/FS class II	RBER	TUhigh/FH	8,333	1 200 000

When useless signal is 9dB less than useful one, the error rate tested in each half-speed channel should not exceed values given in following table. Error rate limit and minimum quantity of samples in each half-speed channel of GSM850 and GSM900 are in the table 6-8:

Table 6-8 error rate limit and minimum quantity of samples in each half-speed channel of GSM 850 and GSM 900

Channel/Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/HS FER	TUhigh/FH	5,607	10 700
TCH/HS Class Ib RBER (BFI=0)	TUhigh/FH	0,325	184 700
TCH/HS Class II RBER (BFI=0)	TUhigh/FH	7,961	25 500
TCH/HS UFR	TUhigh/FH	6,834	8 780
TCH/HS Class Ib RBER ((BFI or UFI)=0)	TUhigh/FH	0,235	255 000

Error rate limit and minimum quantity of samples in each half-speed channel of DCS 1800 and PCS 1900 are shown in table 6-9:

Table6-9 error rate limit and minimum quantity of samples in each half-speed channel of DCS 1800 and PCS 1900

Channel/Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/HS FER	TUhigh/FH	5,607	10 700
TCH/HS Class Ib RBER (BFI=0)	TUhigh/FH	0,325	184 700
TCH/HS Class II RBER (BFI=0)	TUhigh/FH	7,961	25 500
TCH/HS UFR	TUhigh/FH	6,834	8 780
TCH/HS Class Ib RBER ((BFI or UFI)=0)	TUhigh/FH	0,235	255 000

6.3.4 Adjacent channel suppression

Adjacent channel suppression means if there is an useless signal in adjacent channel of receiver, the capability that performance could not less than fixed target when receive a useful modulation signal.

When 200kHz adjacent frequency interference signal is 9dB higher than useful signal, 400kHz interference signal is 41dB higher than useful signal, error rate tested in each channel should not exceed the values displayed in following table:

			GSM 850 and GSM 900		DCS 1800 and PCS 1900	
interference	channel	Measure type	FER limit (%)	Minimum quantity of samples	FER limit (%)	Minimum quantity of samples
200kHz	TCH/FS	FER	6.742*α	8900	3.371*α	17800
	Ib type	RBER	0.420/α	1000000	0.270/α	2000000

	bit					
	II type bit	RBER	8.333	600000	8.333	1200000
	FACCH/ F	FER	10.640	5639	3.808	15756
400kHz	TCH/FS	FER	11.461* α	8900	5.714* α	10500
	Ib type bit	RBER	0.756/ α	1000000	0.483/ α	1200000
	II type bit	RBER	9.167	600000	9.167	720000
	FACCH/ F	FER	19.152	3133	6.832	8782

notice: the value range of parameter α is 1-1.6. the value of α from Ib type RBER test should be equal to the one in FER test under the same test condition.

6.3.5 Intermodulation suppression

Intermodulation suppression means if there are two or more useless signal that has special frequency relationship with useful signal, the capability that performance could not less than fixed target when receiver incept useful modulation signal.

Error rate in each channel should not exceed the given values in following table:

		GSM 850 and GSM 900			DCS 1800 and PCS 1900		
Channel/spread condition	Measure type	FER (%)	limit	Minimum quantity of samples	FER (%)	limit	Minimum quantity of samples
TCH/FS II type/static	RBER	2.439		8200			
FACCH/F/TU high without jump frequency	FER	8.961		6696	4.368		13736

6.3.6 Blocking and spurious respond

- Blocking

Blocking means if there is an strong useless signal at non-spurious respond or adjacent channel frequency, the capability that performance could not less than fixed target when receiver incept useful modulation signal.

The useless signal level of GSM 900 and DCS 1800 is shown in table 6-10:

Table6-10 the useless signal level of GSM 900 and DCS 1800

FREQUENCY	GSM 900		DCS 1 800
	Small MS	Other MS	
	LEVEL IN dB μ Vemf()		
FR \pm 600 kHz to FR \pm 800 kHz	70	75	70
FR \pm 800 kHz to FR \pm 1,6 MHz	70	80	70
FR \pm 1,6 MHz to FR \pm 3 MHz	80	90	80
915 MHz to FR - 3 MHz	90	90	-
FR + 3 MHz to 980 MHz	90	90	-
1 785 MHz to FR - 3 MHz	-	-	87
FR + 3 MHz to 1 920 MHz	-	-	87
835 MHz to < 915 MHz	113	113	
> 980 MHz to 1 000 MHz	113	113	
100 kHz to < 835 MHz	90	90	
> 1 000 MHz to 12,75 GHz	90	90	
100 kHz to 1 705 MHz	-	-	113
> 1 705 MHz to < 1 785 MHz	-	-	101
> 1 920 MHz to 1 980 MHz	-	-	101
> 1 980 MHz to 12,75 GHz	-	-	90

The useless signal level of PCS 1900 is shown in table 6-11:

Table6-11 The useless signal level of PCS 1900

FREQUENCY	PCS 1 900 LEVEL IN dB μ Vemf()
FR \pm 600 kHz to FR \pm 800 kHz	70
FR \pm 800 kHz to FR \pm 1,6 MHz	70
FR \pm 1,6 MHz to FR \pm 3 MHz	80
1 910 MHz to FR - 3 MHz	87
FR + 3 MHz to 2 010 MHz	87
100 kHz to 1 830 MHz	113
> 1 830 MHz to < 1 910 MHz	101
> 2 010 MHz to 2 070 MHz	101
> 2 070 MHz to 12,75 GHz	90

The useless signal level of GSM 850 is shown in table 6-12:

Table6-12 The useless signal level of GSM 850

FREQUENCY	GSM 750	GSM 850
	LEVEL IN dB μ Vemf()	
FR \pm 600 kHz to FR \pm 800 kHz	70	70
FR \pm 800 kHz to FR \pm 1,6 MHz	70	70
FR \pm 1,6 MHz to FR \pm 3 MHz	80	80
727 MHz to FR - 3 MHz	90	-
FR + 3 MHz to 782 MHz	90	-
849 MHz to FR - 3 MHz	-	90
FR + 3 MHz to 914 MHz	-	90
100 kHz to < 727 MHz	113	-
> 782 MHz to 12,75 GHz	113	-
100 kHz to < 849 MHz	-	113
> 914 MHz to 12,75 GHz	-	113

At upwards fixed useless signal level, when the quantity of tested samples is less than minimum quantity of samples, error rate of mistaken events should not exceed given values in following table. Error rate limit and minimum quantity of samples in each channel are as following table 6-13:

Table6-13 Error rate limit and minimum quantity of samples in each channel

GSM 850 and GSM 900	DCS 1800 and PCS 1900
---------------------	-----------------------

channel	Measure type	FER limit (%)	minimum quantity of samples	FER limit (%)	minimum quantity of samples
TCH/FS II type	RBER	2.439	8200		
FACCH/F	FER	8.961	6696	4.368	13736

● Spurious respond

In the range of FR±45MHz frequency (not including FR±800kHz), under normal test condition:

1. for GSM 850 and GSM900, 6 failed frequencies are permitted
2. for DCS1800 and PCS 1900, 12 failed frequencies are permitted
3. for GSM 850 in the range of 100kHz~849MHz and 914MHz~12.75GHz, under normal test condition, 24 failed frequencies are permitted; if failed frequencies continue as a group, the number of frequencies in each group could not more than 3.
4. for GSM 900 in the range of 100kHz~915MHz and 980MHz~12.75GHz, under normal test condition, 24 failed frequencies are permitted; if failed frequencies continue as a group, the number of frequencies in each group could not more than 3.
5. for DCS 1800 in the range of 100kHz~785MHz and 1920MHz~12.75GHz, under normal test condition, 24 failed frequencies are permitted; if failed frequencies continue as a group, the number of frequencies in each group could not more than 3.
6. for GSM 850 in the range of 100kHz~1910MHz and 2010MHz~12.75GHz, under normal test condition, 24 failed frequencies are permitted; if failed frequencies continue as a group, the number of frequencies in each group could not more than 3.

Upwards failed frequencies are spurious respond frequencies, when the interference signal level decrease to 70dBµV (emf) at these frequencies, error rate of mistaken events should not exceed values given in table 6-13

6.4 Recommendation of antenna specs

The recommended antenna specs are as following table 6-14:

Table6-14 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.

The antenna seat's type of MG3030 module is MM9329-2700B.

6.5 Power supply

6.5.1 Input voltage

The input voltage is shown in table 6-15:

Table6-15 input voltage

state	Max. voltage	Typical voltage	Min. voltage
Power supply	4.25 VDC	3.90 VDC	3.30 VDC

6.6 Working conditions

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

7 Reliability test standard

7.1 Low temperature running experiment

- Required Temperature: -20℃
- Duration Time: 16H
- Reference standard: GB/T 2423.1-2001

7.2 Low temperature storage experiment

- Required Temperature: -40℃
- Duration Time: 24H
- Reference standard: GB/T 2423.1-2001

7.3 High temperature running experiment

- Required Temperature: +80℃
- Duration Time: 16H
- Reference standard: GB/T 2423.2-2001

7.4 High temperature storage experiment

- Required Temperature: +85℃
- Duration Time: 24H
- Reference standard: GB/T 2423.2-2001

7.5 High temperature, high humidity experiment

- Required Temperature: +40°C
- Required Humidity: 85%RH
- Duration Time: 48H
- Reference standard: GB/T 2423.2-2001

7.6 High-low temperature striking experiment

- Cycles: 5
- Temperature Range: -20°C ~ +80°C
- Duration Time: 2h
- recovery time: 2h
- Reference standard: GB/T 2423.3-2001

8 EMC/EMI test standard

8.1 Static discharge (ESD) interference immunity experiment

Experiment level: stated experiment levels are shown in table8-1, this product use level 4.

Table8-1 static experiment level

Touch discharge		Air discharge	
level	Experiment voltage (kV)	level	Experiment voltage (kV)
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	special	X	special

8.2 RF electromagnetic emission interference immunity experiment

Experiment level: stated experiment levels are shown in table8-2, this product use level 3.

Table8-2 emission anti-interference experiment level

Level	Experiment field power V/m
1	1
2	3
3	10
X	exclusive
notice: the frequency range is 80MHz ~ 1000MHz.	

8.3 Electrical fast transient/burst immunity experiment

Experiment level: stated experiment levels are shown in table8-3, this product use level 3.

Table8-3 Electrical fast-changed pulse group anti-interference experiment level

Level	Power supply and ground protection ports		Signal and control ports	
	Peak value of voltage (kV)	Repeat ratio (kHz)	Peak value of voltage (kV)	Repeat ratio(kHz)
1	0.5	5	0.25	5
2	1	5	0.5	5
3	2	5	1	5
4	4	2.5	2	5
5	special	special	special	special

8.4 Lightning and surge strike immunity experiment

Experiment level: stated experiment levels are shown in table8-4, this product use level 2.

Table8-4 Lightning and surge strike anti-interference experiment

Level	Open-circuit experiment voltage(kV)
1	0.5
2	1.0
3	2.0
4	4.0
X	special

- Experiment wave shape: 1.2/50us combine wave

8.5 RF electromagnetic field conduction interference immunity experiment

Experiment level: stated experiment levels are shown in table8-5, this product use level 2.

Table8-5 conduction anti-interference experiment level

Level	Experiment voltage V
1	1
2	3
3	10
X	special
notice: the frequency range is 0.15 ~ 80 MHz.	

- Examine frequency range: 0.15~230MHz;
- Frequency pace: 1%;
- modulation: AM 1KHz 80%。

8.6 Radiated disturbance experiment

- Demodulation method: quasi-peak value demodulation, peak value demodulation.
- Reference standard: YD/T1169.1-2001; GB9254: 1998

8.7 Conducted disturbance experiment

- Demodulation method: quasi-peak value demodulation, peak value demodulation, average value demodulation, AC L
- Reference standard: YD/T1169.1-2001; GB9254: 1998