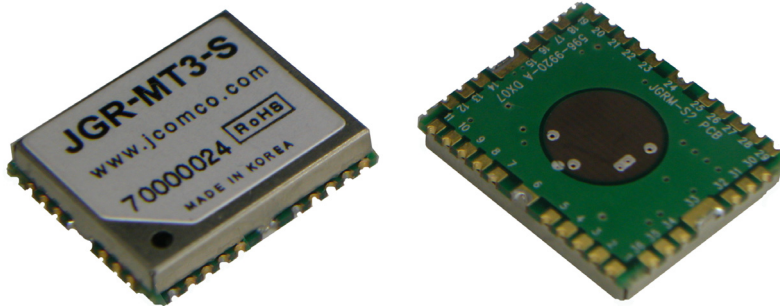


JGR-MT3-S

GPS RECEIVER MICRO-COMPONENT

DATA SHEET



JCOM MODEL NAME	JGR – MT3 – S	
JCOM CODE NO.	6998201	
CUSTOMER MODEL NAME	JGR – MT3 – S	
INVESTIGATION	INSPECTION	APPROVAL
200 . . .	200 . . .	200 . . .

200 . . .

J communications co., Ltd.

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1. Functional Description

1.1 Features

Full self-contained GPS receiver

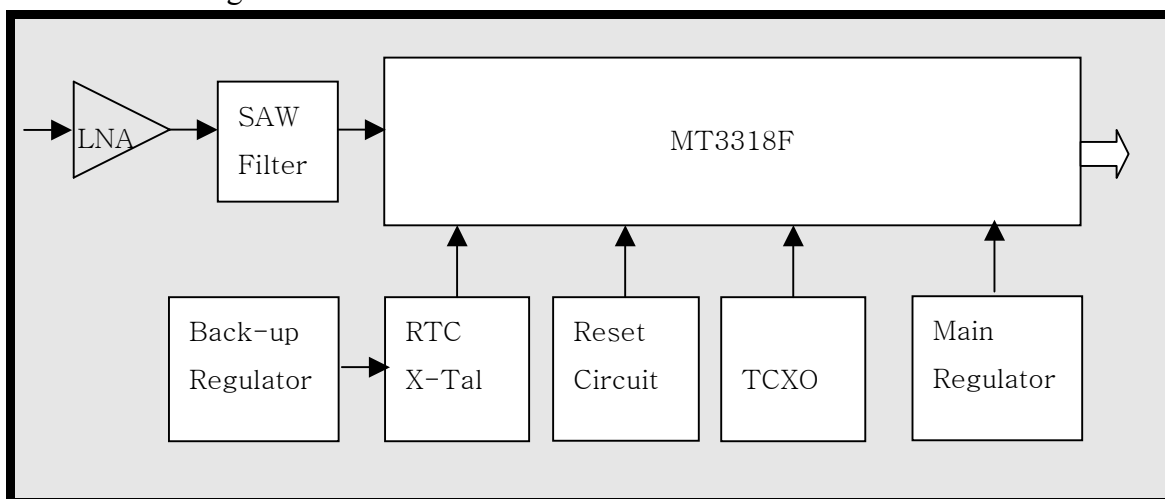
Fully shielded design

- High Performance GPS Single Chip
GPS DSP with integrated real time clock(RTC) ARM7EJ-S CPU
- 4Mbit FLASH memory
- Low noise amplifier
- SAW filter
- TCXO

GPS receiver in a micro-component package

- Postage stamp type package
- Fully automatic assembly : Reflow solderable
- No RF connector
- Size : 13.1mm X 15.9mm X 2.7mm
- Weight : 1.1 grams

1.2 Block Diagram



1.3 Receiving Unit Specifications

Receiver type	: L1 frequency, C/A Code, 32-channel
Max up-date rate	: 1 sec
Accuracy (SA off)	: Position < 10m 3D RMS
3D Tracking Sensitivity	: -157dBm at the receiver input(typical)
Re- Tracking Sensitivity	: -150dBm at the receiver input(typical)
Operational Limits	: Altitude < 18,000m (60,000ft) Velocity < 515m/s (1,000knots)

Time To First Fix (TTFF)

a) Cold Start 60sec (typical)

In a 'Cold Start' scenario, the receiver has no knowledge of position, time or the satellite constellation. The receiver starts to search for signals blindly.

Cold start time is the longest startup for this module

b) Warm Start 40sec (typical)

In a 'Warm Start' scenario, due to a backup battery the receiver knows its last position, the approximate time and the constellation almanac.

Thanks to this it can quickly acquire satellites and get a position fix faster than in 'Cold Start' mode.

c) Hot Start < 1sec (typical)

In a 'Hot Start' scenario, the receiver has been powered off for less than 2 hours since the last valid navigation solution. The GPS uses its last Ephemeris data to calculate a position fix.

Re-acquisition time 3sec typical (within 60sec GPS signal obstruction)

1.4 Protocols

Default : WGS-84 NMEA 0183 9600bps

Activated message : GGA, GSA, GSV, RMC all with checksum enabled

User programmable setting for baud rate, NMEA & Interval time by user define message setting Command.

(see 1.6 User programmable setting command)

Output Messages

Table 1-1 NMEA Output Message

Option	Description
GGA	Time, position and fix type data.
GLL	Latitude, longitude, UTC time of position fix and status.
GSA	GPS receiver operating mode, satellites used in the position solution, and DOP values.
GSV	The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values
RMC	Time, date, position, course and speed data.
VTG	Course and speed information relative to the ground.

A full description and definition of the listed NMEA messages are provided by the next sections of this chapter.

1.5 Start commands

MESSAGE	COMMAND
COLD START	\$PSRF101,0,0,0,000,0,0,12,4*10
WARM START	\$PSRF101,0,0,0,000,0,0,12,2*16
HOT START	\$PSRF101,0,0,0,000,0,0,12,1*15
FACTORY RESET	\$PSRF101,0,0,0,000,0,0,12,8*1C

1.6 User programmable setting command

**Customer Define Message Setting Command
(Change Data in Flash Memory)**

User programmable setting for baud rate, NMEA & Interval time by user define message setting Command. (see 2.5 Serial Interface Setting)

Table 2.5 contains the values for the following example:

\$PSRF109,NMEA9600,NULL38400,GGA1,GLL0,GSA1,GSV1,RMC1,VTG0,USER0*15

2.5 Data Format Table

Name	Example	Units	Description
Message ID	\$PSRF		Protocol Header
	109		Measured heading(Change Data in Flash Memory)
Protocol(Port A)	NMEA	Data Format	NULL,NMEA, Jcom(Customer Dependency)
Baudrate(Port A)	9600	bps	4800, 9600, 19200, 38400, 57600
Protocol(Port B)	NULL	Data Format	NULL, NMEA, Jcom(Customer Dependency)
Baudrate(Port B)	38400	bps	4800, 9600, 19200, 38400, 57600
GGA Interval Time	GGA1	sec	GGA Data Output Interval Time 1sec (0~10sec Selectable)
GLL Interval Time	GLL0	sec	GLL Data Output Off (0~10sec Selectable)
GSA Interval Time	GSA1	sec	GSA Data Output Interval Time 1sec (0~10sec Selectable)
GSV Interval Time	GSV1	sec	GSV Data Output Interval Time 1sec (0~10sec Selectable)
RMC Interval Time	RMC1	sec	RMC Data Output Interval Time 1sec (0~10sec Selectable)
VTG Interval Time	VTG0	sec	VTG Data Output Off(0~10sec Selectable)
USER Interval Time	USER0		Customer Option(Default 0)
Checksum	*0D		See Below* ¹
<CR><LF>			End of message termination

1. Checksum Delimiter and Field: *hh

hh = The absolute value calculated by exclusive-OR'ing the 8 data bits (no start bits or stop bits) of each char in the Sentence, between, but excluding "\$" and "*".

The hexadecimal value of the most significant and least significant 4 bits of the result are converted to two ASCII characters (0-9,A-F) for transmission.

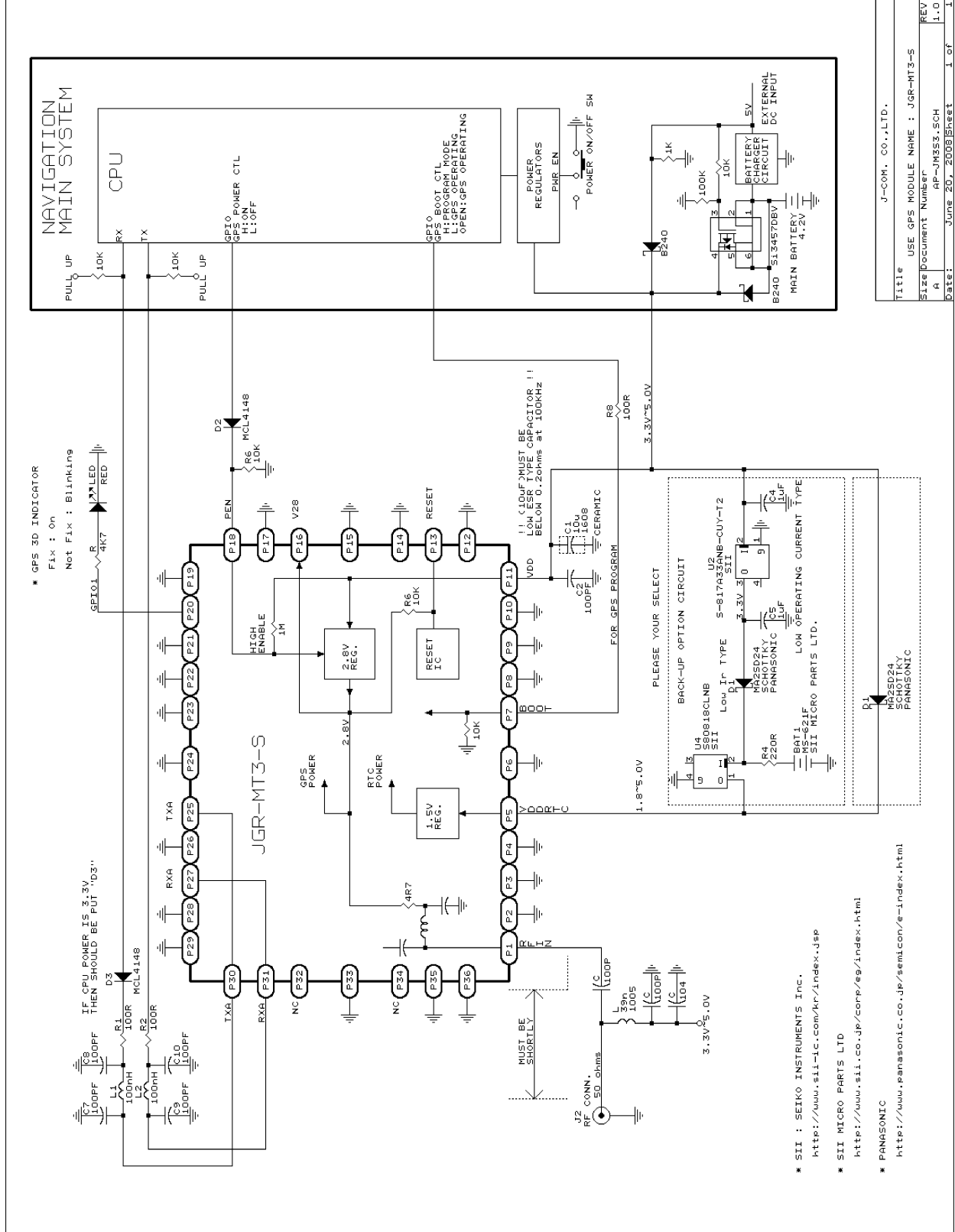
The most significant character is transmitted first.

2. Interface Specification (I/O Pin Description)

Pin	Name	Pin Description	I/O	Note
1	RF-IN	GPS signal from Antenna	I	50Ω (1.57542GHz)
2-4	GND	Ground		
5	V _{DD} RTC	Backup Power Input for RTC and SRAM	I	1.8~5.0V If Input voltage is below than 1.8V, V _{DD} RTC must be zero voltage
6	GND	Ground		
7	BOOT	Module boots into flash memory program mode if VCC during reset	I	Leave unconnected if not used. Use only factory production
8-10	GND	Ground		
11	VDD	Supply Voltage	I	3.0~4.2V
12	GND	Ground		
13	RESET	Internal put on reset circuit	I/O	Leave unconnected if not used.
14-15	GND	Ground		
16	V28	Internal regulator power out	O	Out voltage : 2.8V
17	GND	Ground		
18	PEN	Supply regulator enable	I	Open then enable (Internal 1MΩ Pull-up to VDD) 0V~1.0V then disable
19	GND	Ground		
20	GPIO1	GPS Tracking indication output	O	Not fix : blinking fix : on
21-24	GND	Ground		
25	TXA	Serial Port A	O	
26	GND	Ground		
27	RXA	Serial Port A	I	Open if not used
28-29	GND	Ground		
30	TXA	Serial Port A	O	
31	RXA	Serial Port A	I	Open if not used
32	NC	Electrically Open		
33	GND	Ground		
34	NC	Electrically Open		
35-36	GND	Ground		

3. Electrical Specification

3.1 Application Schematic



Title	J-COM, Co.,LTD.
USE GPS MODULE NAME	JGR-MT3-S
Size	Document Number
REV	AF-JM553.SCH
	1.0
Date:	June 20, 2005 Sheet 1 of 1

3.2 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power supply voltage(VCC)		5.0	V
Serial port Input pin voltage	-0.3	5.0	V
I/O port voltage	-0.3	VCC+0.3	V
I/O port current		±20	mA
Storage temperature	-40	85	°C

Warning – Stressing the device beyond the “Absolute Maximum Ratings” may cause permanent damage. These are stress ratings only. Operation beyond “Operating conditions” is not recommended and extended exposure beyond the “Operating condition” may affect device reliability.

IMPORTANT : This module is not protected against over voltage, reversed voltage or short current of RF_IN port.

3.3 Operating Conditions

3.3.1 DC Characteristics (Test Temperature : 25°C)

Parameter	Condition	Min.	Typical	Max.	Unit
Operating supply voltage	VCC port	3.0	3.3	4.2	V
Operating supply ripple voltage				50	mV
V _{DD} RTC input voltage	V _{DD} RTC port	1.8	3.0	5.0	V
I/O input low level				0.3xVCC	V
I/O input high level		0.7xVCC			V
I/O output high level	I _{oh} =2mA	2.4			V
I/O output low level	I _{ol} =2mA			0.4	V
Antenna output DC Voltage	0mA	2.75	2.8	2.85	V
Antenna output DC Voltage	20mA	2.65	2.7	2.75	V
Sustained supply current	VCC=3.3V	36	38	40	mA
Peak supply current	VCC=3.3V		57	60	mA
Standby V _{DD} RTC current	V _{BAT} =3.0V	5.0	6.5	15	uA
Operating temperature	VCC=3.3V	-40	25	+80	°C

3.3.2 AC Characteristics (Test Temperature : 25°C VCC = 3.3V)

(Test Temperature : 25°C VCC = 3.3V RF Input : Conducted)

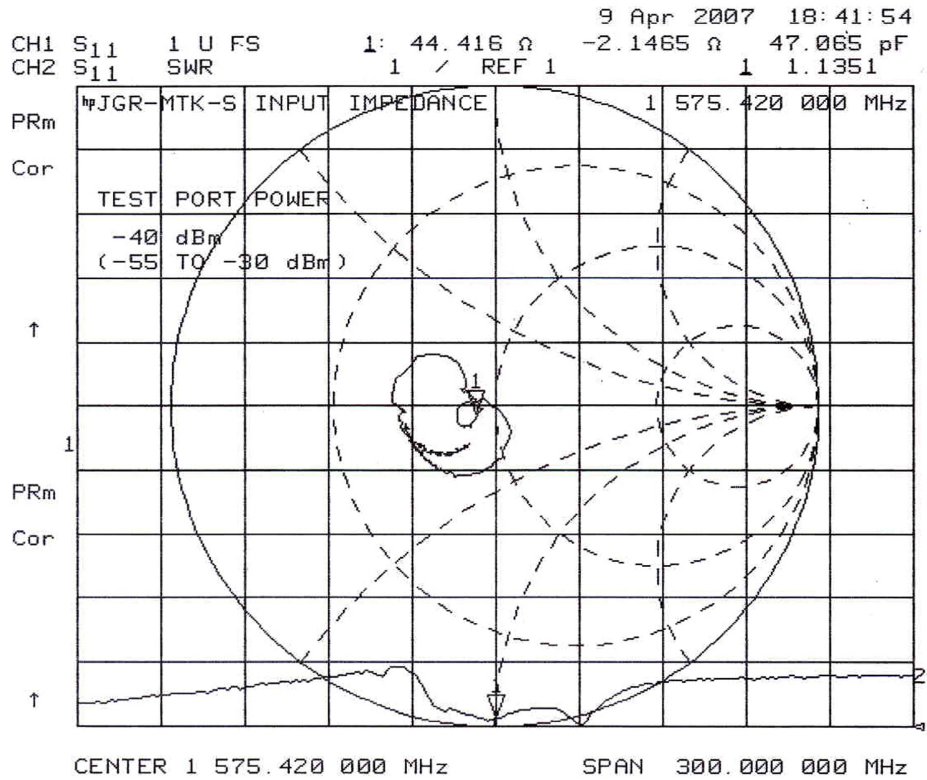
Parameter	Condition	Min	Typical	Max	Unit
RF_IN Input level				-40	dBm
Tracking Sensitivity (C/N)	3D (C/N avg. 15dBHz)		-157		dBm
Re- Tracking Sensitivity (C/N)	3D (C/N avg. 18dBHz)		-150		dBm
Cold start Sensitivity (C/N)	3D (SV 9EA in view)		-144		dBm
Cold start time(TTFF)	-130 dBm(2D) (SV 9EA)		60		sec
Hot start time	-130 dBm(2D) (SV 9EA)		1		sec
Re-acquisition time (5 sec)	-130 dBm(3D) (SV 9EA)		3		sec
Re-acquisition time (60 sec)	-130 dBm(3D) (SV 9EA)		3		sec
Position error (Latitude, Longitude)	-130 dBm(SV 9EA in View)		10		m
Position error (Elevation)	-130 dBm(SV 9EA in View)		50		m

3.2.3 Active Antenna Selection Guide Recommend

Parameter	Condition
Frequency	1575.42MHz
Polarization	RHCP
V.S.W.R	Less than 2.0
Impedance	50Ω
LNA Gain	16dB±2dB
Noise Figure	1.5dB(Max)
Axial Ratio	3dB(Max)
Band Attenuation	20dB(Min) @F _o ±50MHz
Voltage	DC 2.7V(±10%)
Current	20mA(Max)

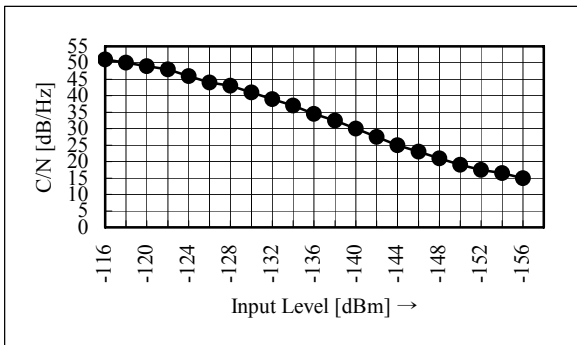
3.4 Typical Electrical Characteristics

3.4.1 RF Input Impedance

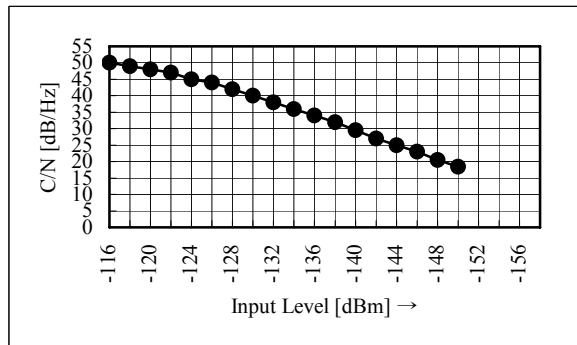


4. Performance Specification

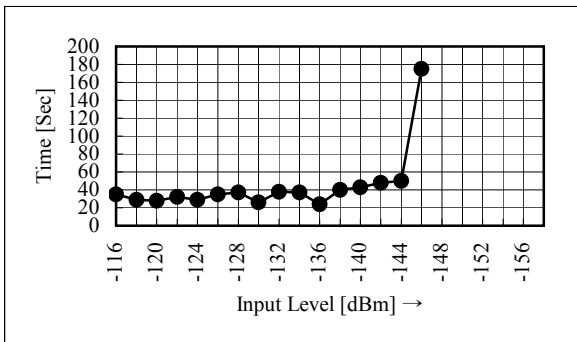
3D Tracking Sensitivity



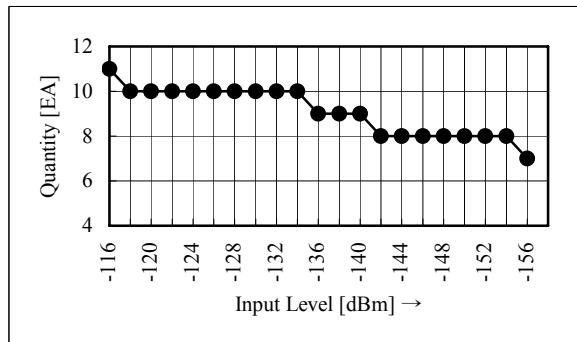
3D Re-Tracking Sensitivity



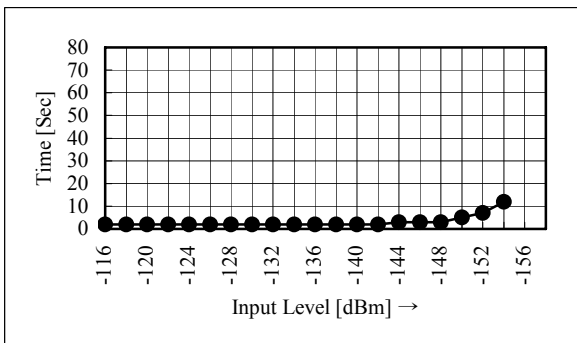
Cold Start Time (TTFF)



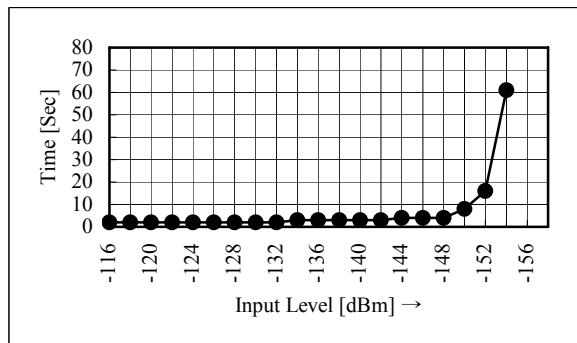
SV Quantity



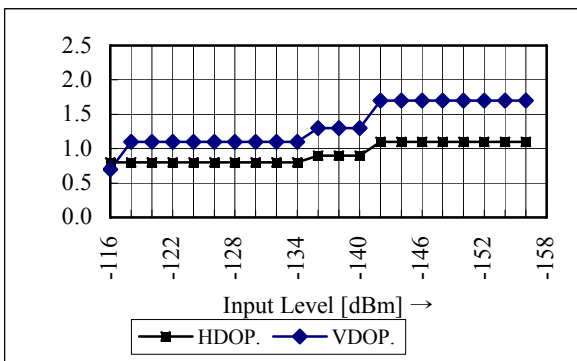
Re-Acquisition Time (After 5Sec)



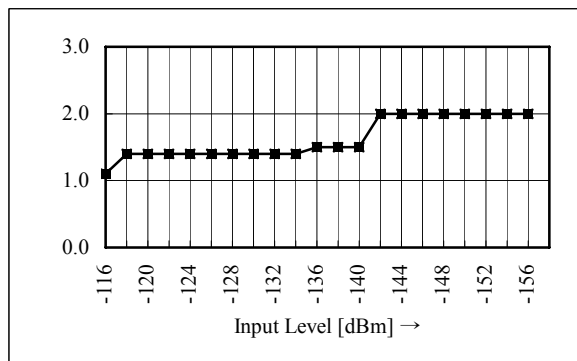
Re-Acquisition Time (After 60Sec)



HDOP & VDOP

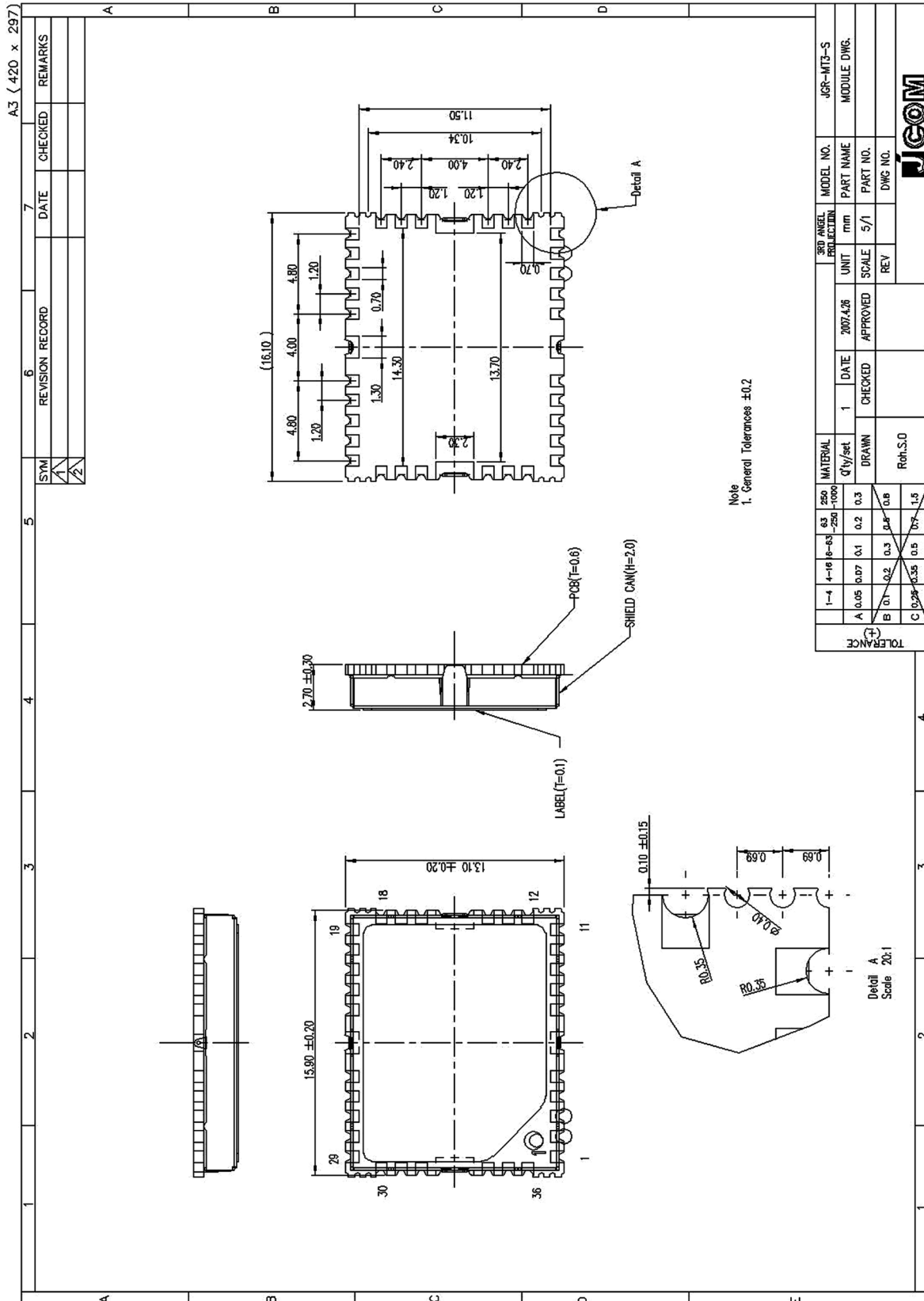


PDOP

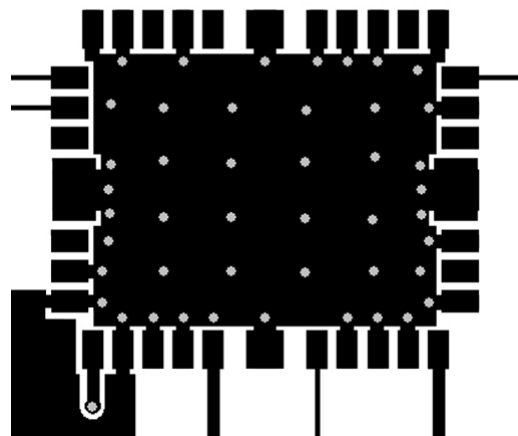
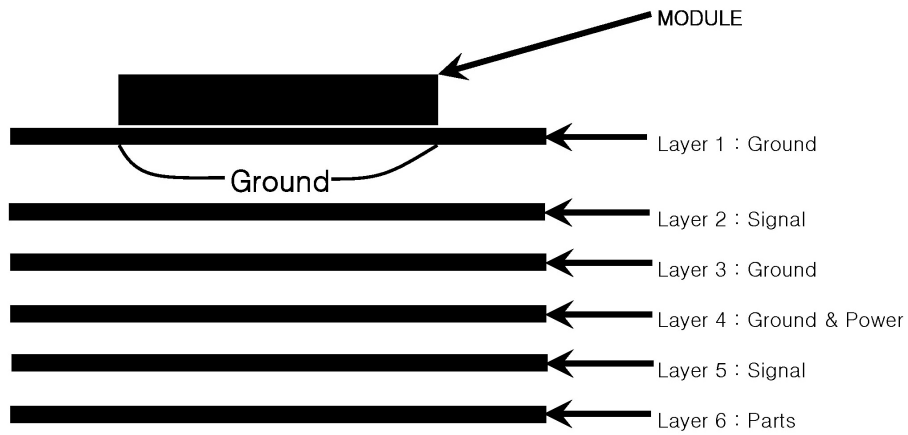
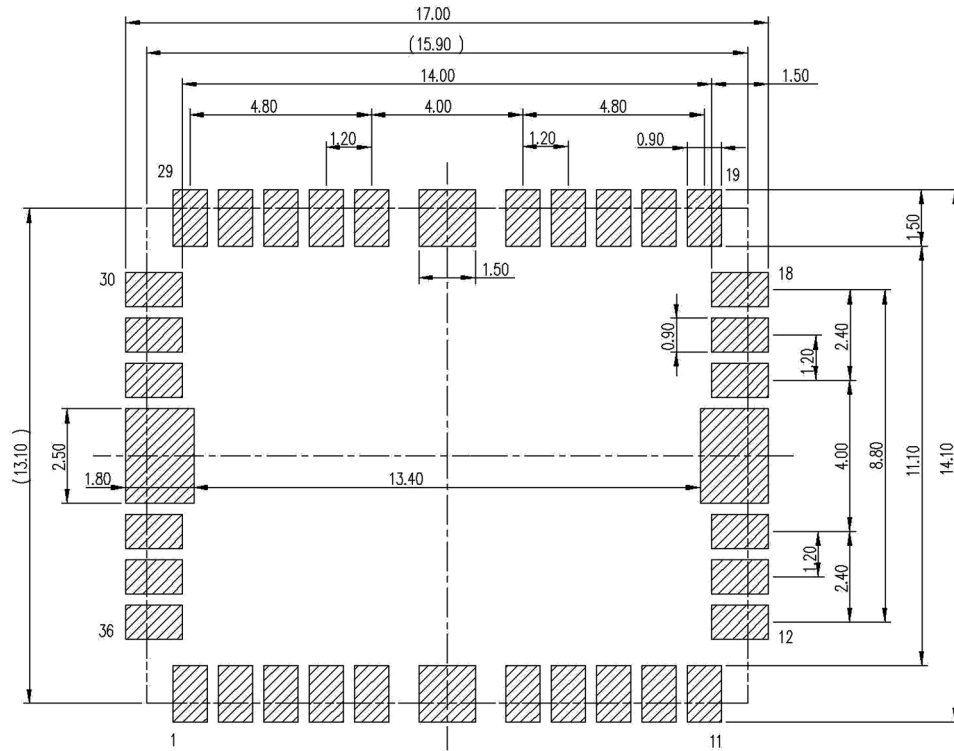


5. Mechanical Specification

5.1 Outline Drawing

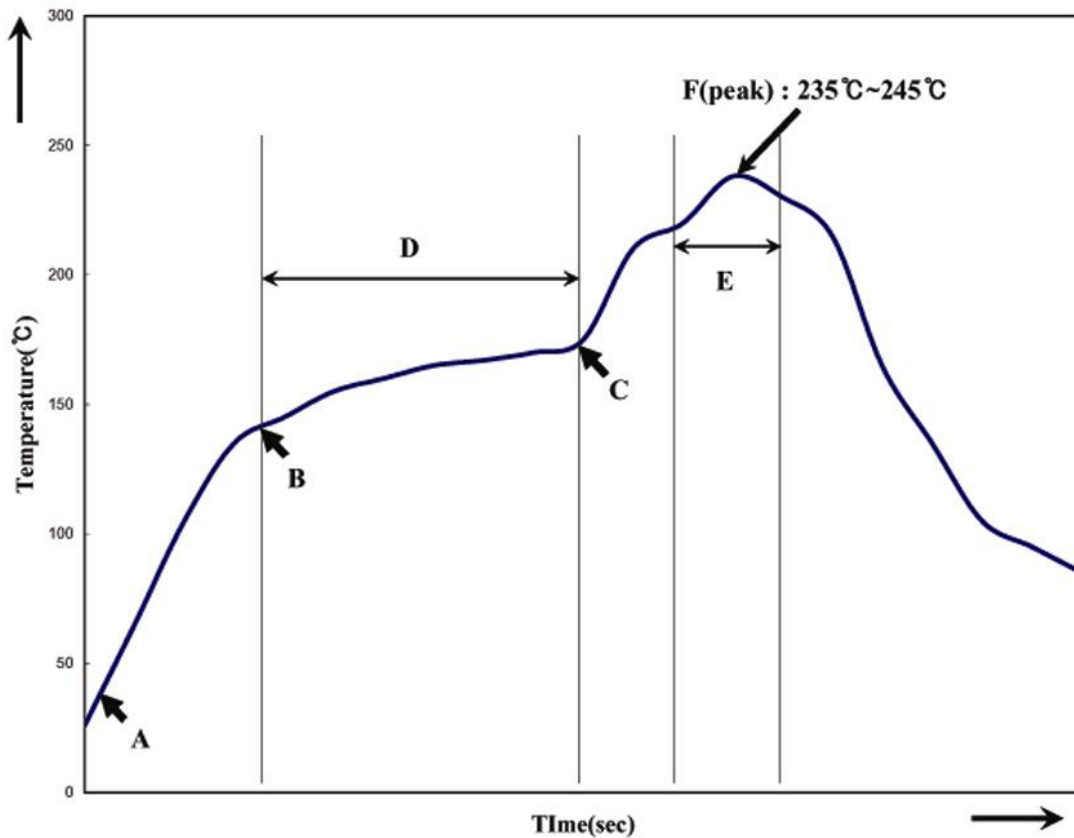


5.2 Recommend PCB Layout



5.3 Reflow profile

Recommendable Temperature Profile



Setting temperature

A : 20~30°C, B: 130~140°C, C: 180~190°C, F(peak): 235~245°C

Setting time

A ⇒ B : 40~60sec
 B ⇒ C(D Section) : 80~120sec
 Over 220°C : 40~60sec

Slope

A ⇒ B : 2~4°C/sec
 C ⇒ F : 1~3°C/sec

Revision History

Revision	Date	Description	Check	APPR.
Ver 1.0	08.03.15	Original Approval	T.H.Kim	J.S.Kim
Ver 1.1	08.06.20	Page8 (pin13:nc→reset, pin16:nc→v28)	T.H.Kim	J.S.Kim
		Page9(Application Schematic Change)		