C3-470C Jnavi SPECSHEET

JCOM MODEL NAME	**C3-470C**	
CODE NO.	**6081307**	
CUSTOMER MODEL NAME	**C3-470C**	
INVESTIGATION	**INSPECTION**	**APPROVAL**
200 . . .	200 . . .	200 . . .

200 . . .

J communications co., Ltd.

Contents

1. Functional Description

1.1 Features

Fully self-contained GPS receiver

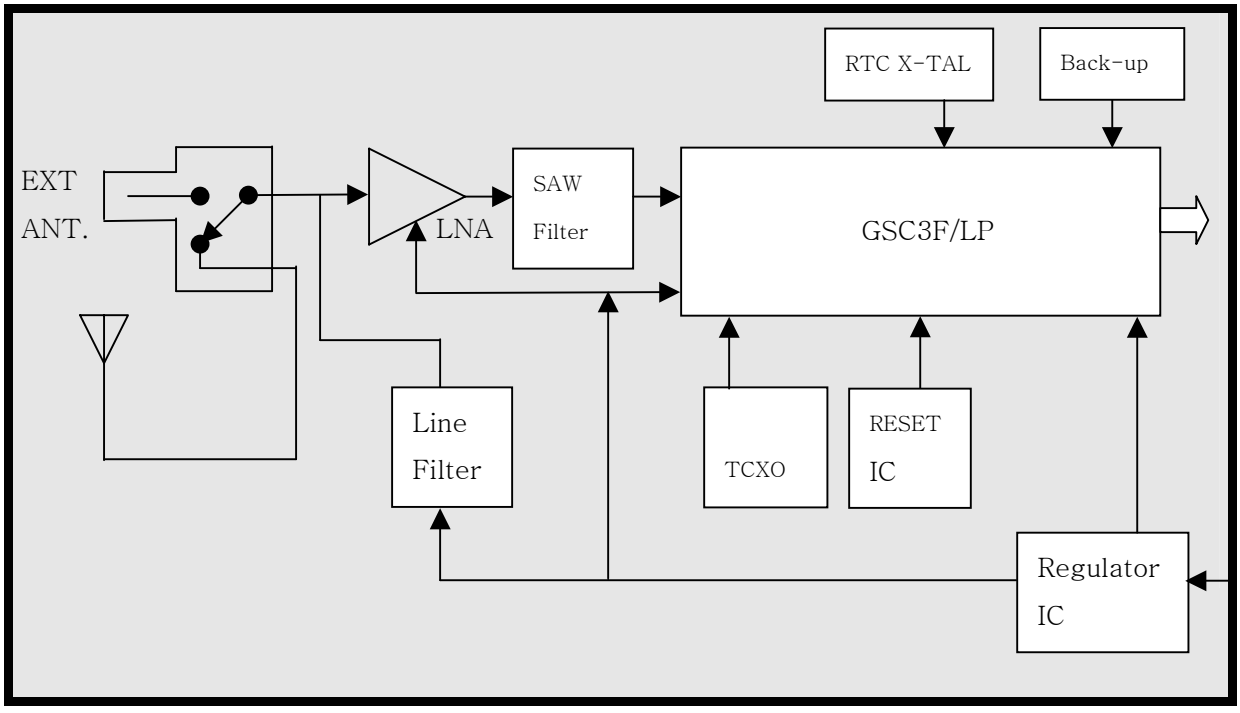
Fully shield

Full implementation of SiRFstar™III GPS architecture

- GSC3F/LP(High Performance GPS Single Chip)

  GPS DSP with integrated real time clock(RTC) ARM7TDMI CPU
- 4Mbit FLASH memory
- Low noise amplifiers and SAW filters.
- TCXO, Reset & Regulator etc
- Built-In Back-up Battery
- GPS receiver With Patch Antenna
- Selectable internal/external RF connector
- Patch Antenna Size : 35(w)mm X 35(d)mm X 3(h)mm
- Size : 39.0(w)mm X 35.5(d)mm X 8.0(h)mm
- Weight : 21 grams

1.2 Block Diagram



1.3 Receiving Unit Specifications

Receiver type	: L1 frequency, C/A Code, 20-channel
Max up-date rate	: 1 sec
Accuracy (SA off)	: Position < 10m 3DRMS
3D Tracking Sensitivity	: -155dBm 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 poison, the approximate time and the constellation almanac.

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

c) Hot Start < 3sec (typical)

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

Re-acquisition time 5sec 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 2.3 Serial Interface Setting)

Output Messages

Table 1-1 lists each of the NMEA output messages specifically developed and defined by SiRF for use within SiRF products.

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.
150	OK to send message.

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

Table 1-2 provides a summary of supported SiRF NMEA output messages by the specific SiRF platforms.

Table 1-2 Supported NMEA

Message	**SiRF Software Options**
GGA	Yes
GLL	Yes
GSA	Yes
GSV	Yes
RMC	Yes
VTG	Yes

GGA –Global Positioning System Fixed Data

Table 1-3 contains the values for the following example:

$GPGGA, 161229.487,3723.2475,N,12158.3416,W,1.07,1.0,9.0,M….0000*18

Table 1-3 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Time	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N-north or s-south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	I		See Table 1-4
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	Meters	
Units	M	Meters	
Geoid Separation		Meters	
Units	M	Meters	
Age of Diff. Corr.		Second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

Table 1-4 Position Fix Indicator

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3-5	Not supported
6	Dead Reckoning Mode, fix valid

Note – A valid position fix indicator is derived from the SiRF Binary M.I.D. 2position mode1

See the SiRF Binary Reference Manual

GLL-Geographic Position-Latitude/Longitude

Table 1-5 contains the values for following example:

$GPGLL, 3723.2475,N,12158.3416,W,161229.487,A,A*41

Table 1-5 GLL Data Format

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Time	161229.487		hhmmss.sss
Status	A		A= data valid or V=data not valid
Mode	A		A=Autonomous, D=DGPS, E=DR
Checksum	*41		
<CR><LF>			End of message termination

GSA-GNSSDOP and Active Satellites

Table 1-6 contains the values for the following example:

$GPGSA,A,3, 07,02,26,27,09,04,15,,,,,,,1.8,1.0,1.5*33

Table 1-6 GSA Data Format

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 1-7
Mode 2	3		See Table 1-8
Satellite Used[1]	07		Sv on Channel 1
Satellite Used[1]	02		Sv on Channel 2
….			….
Satellite Used[1]			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR><LF>			End of message termination

1. Satellite used in solution

Table 1-7 Mode 1

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	2Dautomatic-allowed to automatically switch 2D/3D

Table 1-8 Mode 2

Value	Description
1	Fix not Available
2	2D(<4SV's used)
3	3D(>3SV's used)

GSV-GNSS Satellite in View

Table 1-9 contains the values for the following example:

$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71

$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41

Table 1-9 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Messages[1]	2		Range 1 to 3
Message Number[1]	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1 (Range 1 to 32)
Elevation	79	degrees	Channel 1 (Maximum 90)
Azimuth	048	degrees	Channel 1 (True, Range 0 to 359)
SNR(c/No)	42	dBHz	Range 0 to 99, null when not tracking
….			….
Satellite ID	27		Channel 4 (Range 1 to 32)
Elevation	27	degrees	Channel 4 (Maximum 90)
Azimuth	138	degrees	Channel 4 (True, Range 0 to 359)
SNR(C/No)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR><LF>			End of message termination

1. Depending on the number of satellites tracked multiple messages of GSV data may be required.

RMC-Recommended Minimum Specific GNSS Data

Table 1-11 contains the values for the following example:

$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10

Table 1-11 RMC Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Time	161229.487		hhmmss.mmmm
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		ddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed over Ground	0.13	knots	
Course over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation		degrees	E=east or W=west
Checksum	*10		
<CR><LF>			End of message termination

1. A valid status is derived from the SiRF Binary. M.I.D 2 position mode 1. See the SiRF Binary Reference Manual.
2. SiRF Technology Inc. dose not support magnetic declination. All “course over ground” data are geodetic WGS84 directions.

VTG-Course Over Ground and Ground Speed

Table 1-12 contains the values for the following example:

$GPVTG,309.62,T, ,M,0.13,N,0.2,K,A*23

table 1-12 VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course	309.62	degrees	Measured herding
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic[1]
Speed	0.13	knots	Measured Horizontal speed
Units	N		knots
Speed	0.2	km/hr	Measured horizontal speed
Units	K		Kilometers per hour
Mode	A		A=Autonomouse, D=DGPS, E=DR
Checksum	*23		
<CR><LF>			End of message termination

1. SiRF Technology Inc. dose not support magnetic declination. All “course over ground” data are geodetic WGS84 directions.

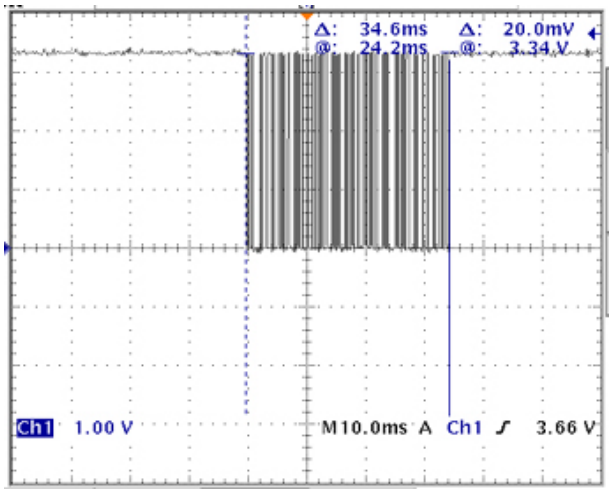
2. Interface Specification

2.1. Pin Description

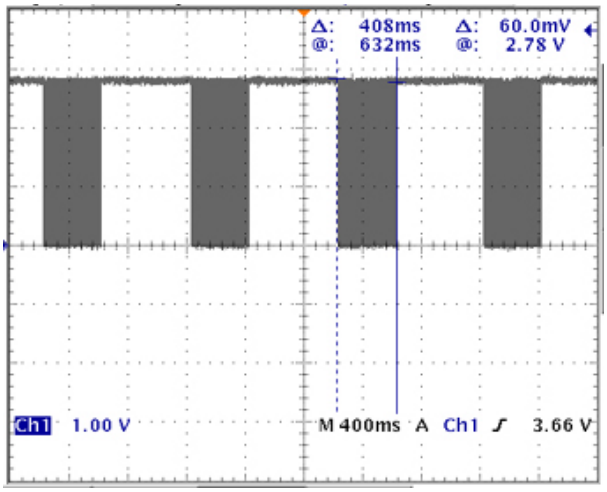
Pin no	Name	Pin Description	I/O	Note
1	EN	Supply regulator enable	I	Open or low then enable 2.0v~VCC then disable
2	VCC(5.0V)	Supply Voltage	I	Used
3	TXA	Serial TX Port A	O	Used
4	RXA	Serial RX Port A	I	Used
5	GND	Ground		
6	BOOT	Module Boots Port 5.0V : Boot ON N.C : Boot OFF	I	Module boots into special debug Mode if VCC during reset

2.2 I/O Pin Commend Level

RXA Input Level



TXA Output Level



2.3 Serial Interfaces Setting

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
NMEA → SiRF Binary (Change Data in SRAM)	$PSRF100,0,9600,8,1,0*0C ※ This command is temporary message. ※ The evaluation Receiver restarts using the saved parameters.

Switch to SiRF binary protocol at 9600,8,N,1(Change Data in SRAM)

$PSRF100,0,9600,8,1,0*0C

2.4 Set Serial Port Data Format

Name	Example	Units	Description
Message ID	$PSRF		Protocol Header
	100		Measured heading(Change Data in SRAM)
Protocol	0		0=SiRF Binary, 1=NMEA
Baud	9600	bps	4800, 9600, 19200, 38400
DataBits	8		8,7[1]
StopBits	1		0,1
Parity	0		0=None, 1=Odd, 2=Even
Checksum	*0C		See Below*[1]
<CR><LF>			End of message termination

1. SiRF protocol is only valid for 8 data bits, 1stop bit, and no parity.

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.

3. Electrical Specification

3.1 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power supply voltage(VCC)	3.6	5.5	V
Serial port Input pin voltage	-0.3	5.0	V
Storage temperature	-20	+80	℃

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.

3.2 Operating Conditions

3.2.1 DC Characteristics (Test Temperature : 25℃)

Parameter	Condition	Min	Typical	Max	Unit
Operating supply voltage	VCC	3.6	5.0	5.5	V
Operating supply ripple voltage				50	mV_{pp}
Sustained supply current	VCC=5.0V	38	44	47	mA
Peak supply current	VCC=5.0V		63	65	mA
RXA TTL H Level	VCC=5.0V	2.1		VCC	V
RXA TTL L Level	VCC=5.0V	0		0.9	V
TXA TTL H Level	VCC=5.0V	2.1		2.8	V
TXA TTL L Level	VCC=5.0V	0		0.8	V
External Antenna Output Voltage	VCC=5.0V	2.7	2.8	2.9	V
External Antenna Output Current	VCC=5.0V	-	-	20	mA
Operating temperature *	VCC=5.0V	-20	+25	+60	℃

* Operating Temperature

GPS DEVICE : -40℃ ~ +80℃

BACK-UP BATTERY : -20℃ ~ +60℃

(Lithium-Ion Rechargeable Battery)

3.2.2 AC Characteristics

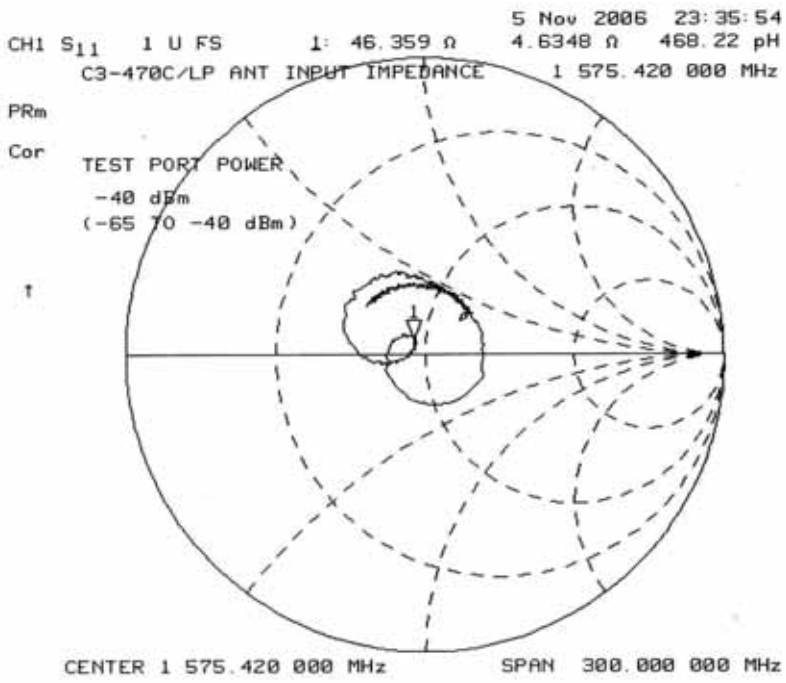
(Test Temperature : 25℃ VCC = 5.0V Internal Antenna Input : Conducted)

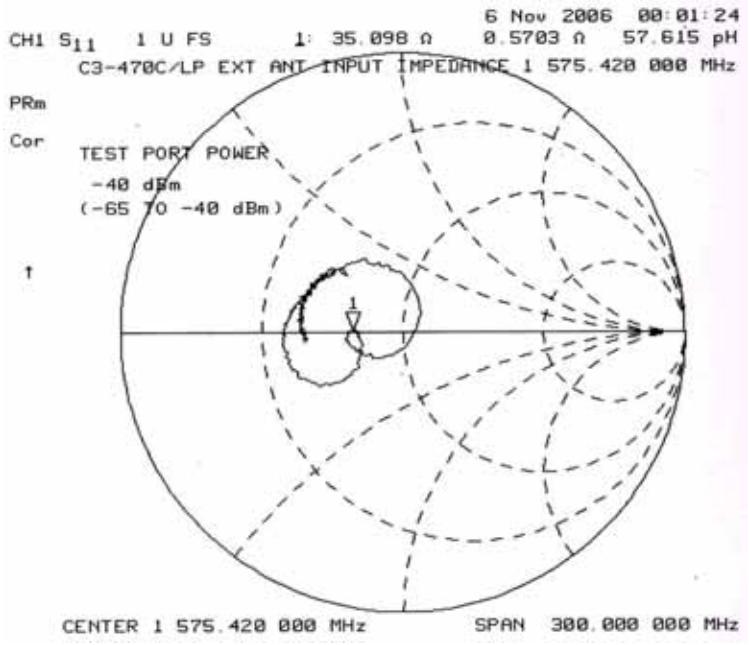
Parameter	Condition	Min	Typical	Max	Unit
Tracking Sensitivity (C/N)	3D (C/N avg. 13dBHz)		-156		dBm
Re-acquisition Sensitivity (C/N)	3D (C/N avg. 19dBHz)		-150		dBm
Cold start Sensitivity (C/N)	3D (SV 9EA in view)		-141		dBm
Cold start time(TTFF)	-126 dBm(2D) (SV 9EA)		60		sec
Hot start time	-126 dBm(2D) (SV 9EA)		1		sec
Re-acquisition time (5 sec)	-126 dBm(3D) (SV 9EA)		3		sec
Re-acquisition time (60 sec)	-126 dBm(3D) (SV 9EA)		3		sec
Position error (Latitude, Longitude)	-126 dBm(SV 9EA in View)		10		m
Position error (Elevation)	-126 dBm(SV 9EA in View)		50		m
External ANT Connector Impedance		25	50	100	Ω

3.2.3 Active Antenna Selection Guide Recommend

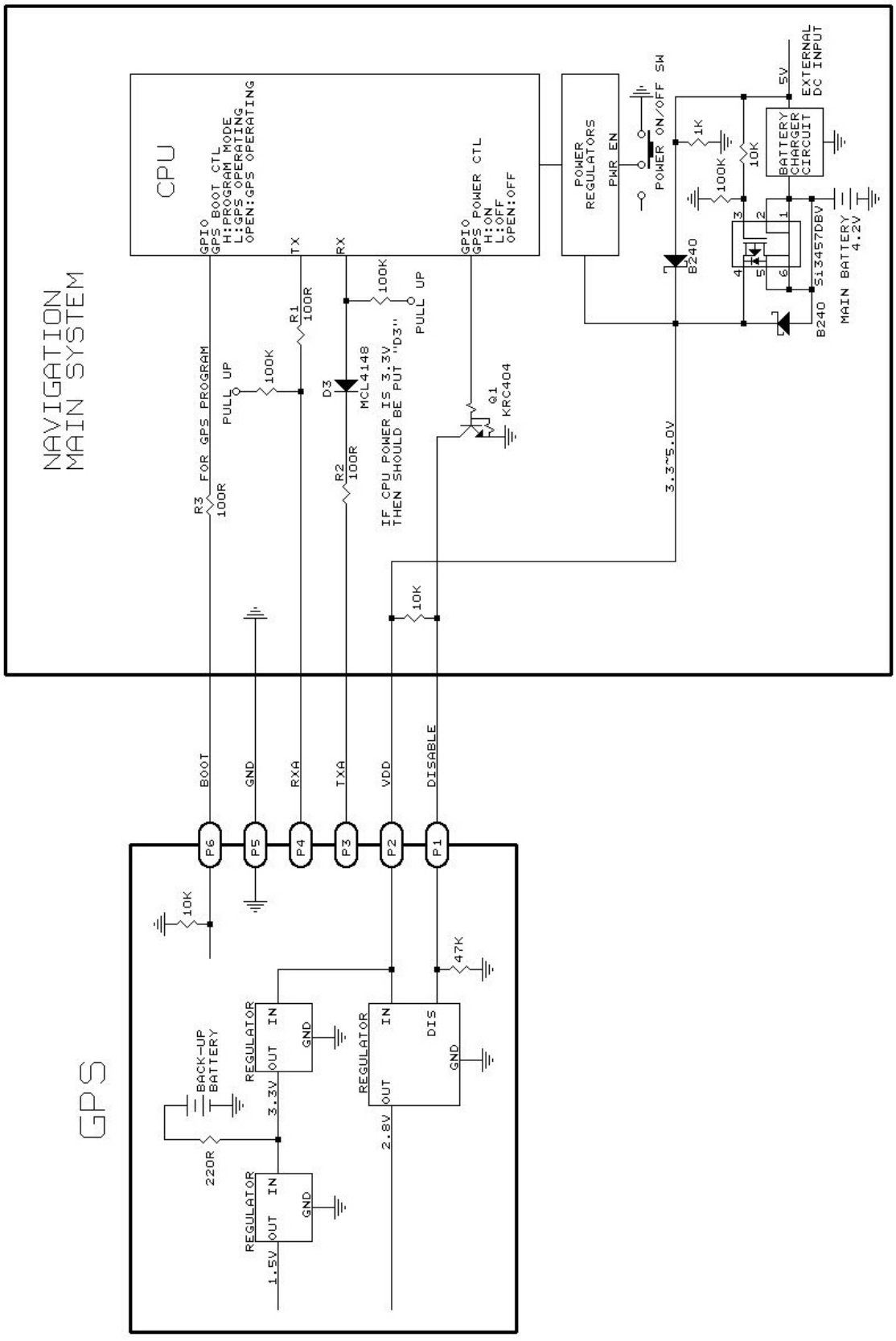
Parameter	Condition
Frequency	1575.42MHz
Polarization	RHCP
V.S.W.R	Less than 2.0
Impedance	50Ω
LNA Gain	26dB±2dB
Noise Figure	1.5dB(Max)
Axial Ratio	3dB(Max)
Band Attenuation	20dB(Min) @F_O±50MHz
Voltage	DC 3V(±10%)
Current	20mA(Max)

3.2.4 RF Input Impedance



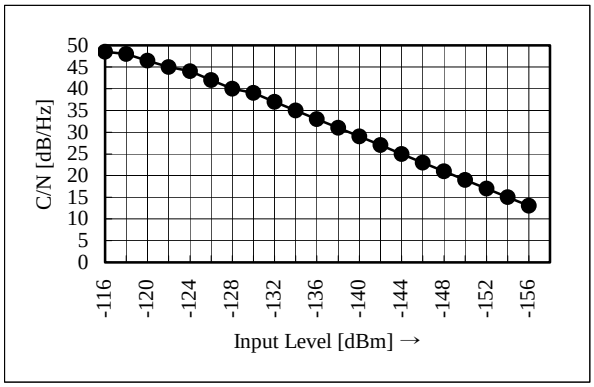


3.2.5 Application Schematic

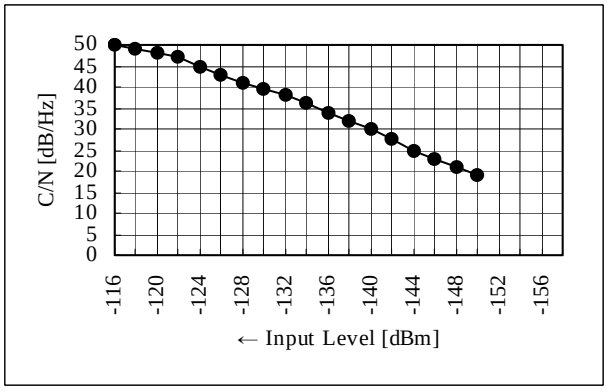


4. Performance Specification

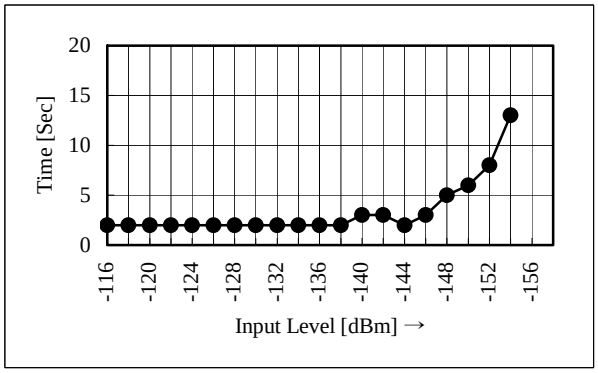
< 3D Tracking Sensitivity >



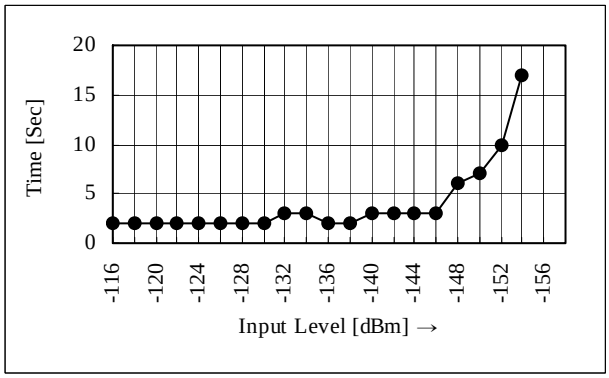
< 3D Re-Tracking Sensitivity >



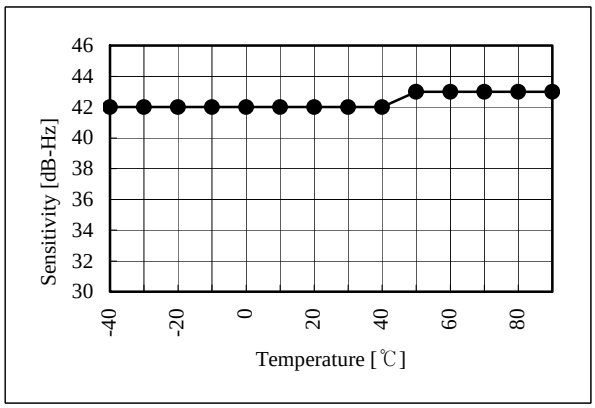
< Re-Acquisition Time (After 5Sec) >



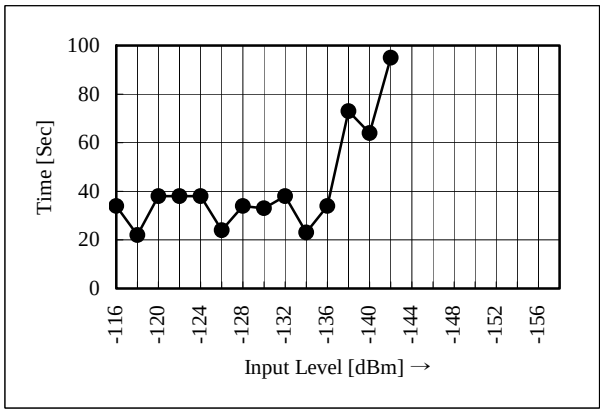
< Re-Acquisition Time (After 60Sec) >



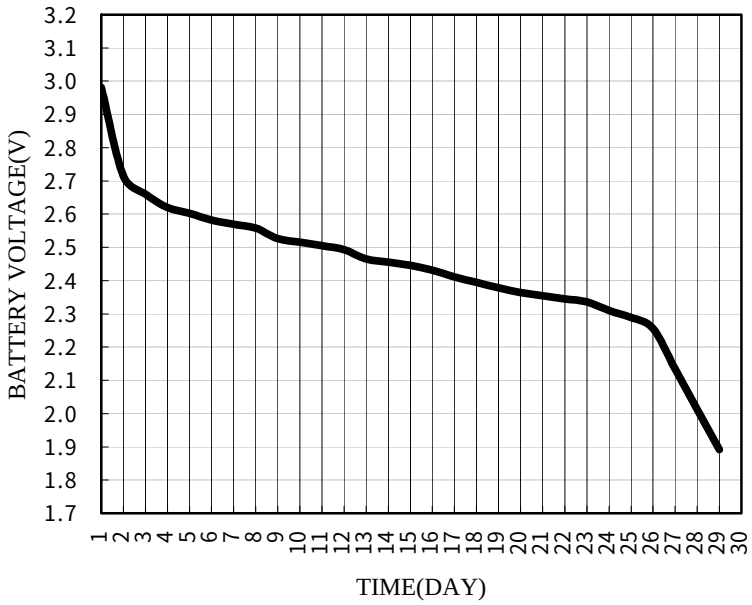
< Temperature & Sensitivity(Input : -127dBm) >



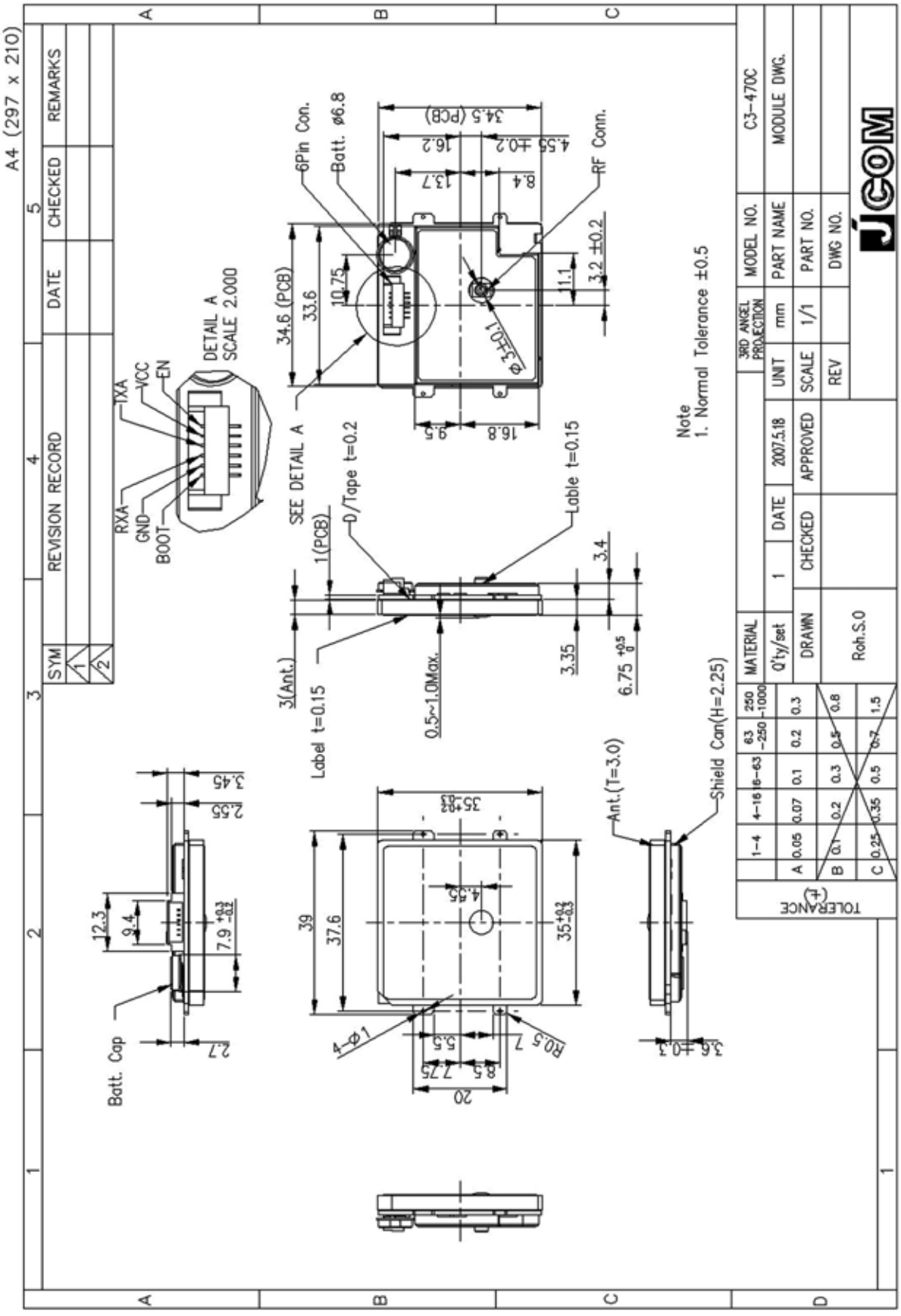
< Cold Start Time (TTFF) >

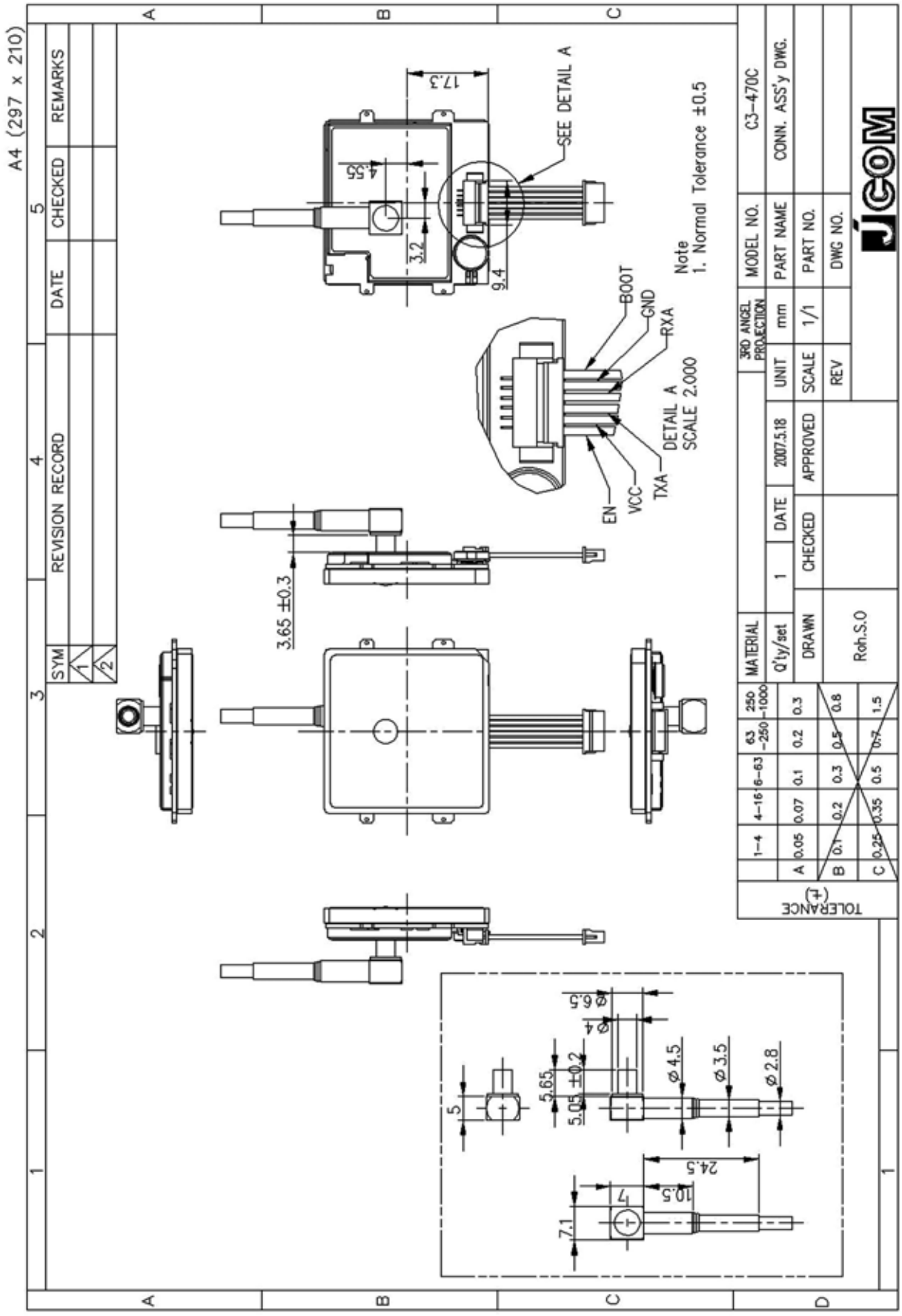


Back-up Battery Discharge Graph



5. Mechanical Dimension & Pin Description




A4 (297 x 210)
REVISION RECORD
SYM
DATE
CHECKED
REMARKS
SEE DETAIL A
17.3
4.55
3.2
9.4
Note
1. Normal Tolerance ±0.5
BOOT
GND
RXA
DETAIL A
SCALE 2.000
EN
VCC
TXA
3.65 ±0.3
C3-470C
CONN. ASS'y DWG.
MODEL NO.
PART NAME
PART NO.
DWG NO.
3RD ANGEL PROJECTION
UNIT
mm
SCALE
1/1
REV
MATERIAL
Q'ty/set
1
DRAWN
CHECKED
DATE
2007.5.18
APPROVED
Roh.S.O
TOLERANCE (±)
Ø6.5
Ø4
Ø4.5
Ø3.5
Ø2.8
5.65
5.05 ±0.2
5
24.5
10.5
7
7.1

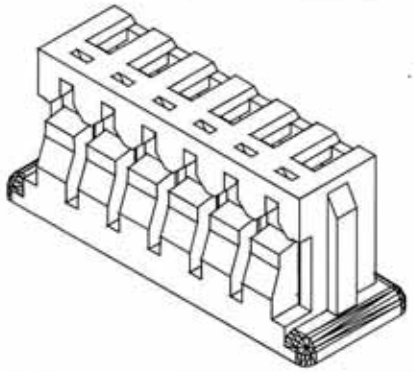
Wire to Board Wafer: http://yeonho.com/pdf/12505WR.pdf 12505WR-06A00

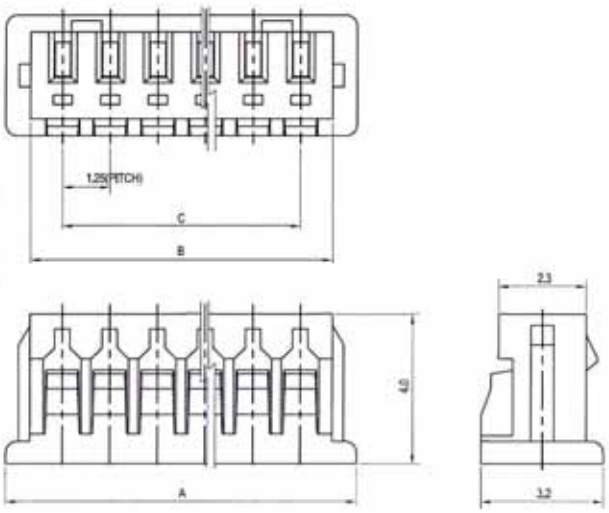
Wire to Board Housing: http://yeonho.com/pdf/12505HS.pdf 12505HS-06000

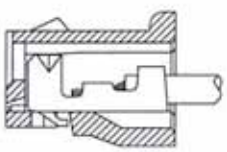
1.25mm (0.049") PITCH CONNECTOR

Wire-to-Board Housing

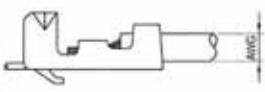
12505HS Series







TERMINAL ASSEMBLY DRAWING



AWG : #28 ~ #32

Material

NO	DESCRIPTION	TITLE	MATERIAL
1	HOUSING	12505HS	PA66, UL 94V Grade

Available Pin

PARTS NO.	A	B	C
12505HS-02000	4.25	2.95	1.25
12505HS-03000	5.50	4.20	2.50
12505HS-04000	6.75	5.45	3.75
12505HS-05000	8.00	6.70	5.00
12505HS-06000	9.25	7.95	6.25
12505HS-07000	10.50	9.20	7.50
12505HS-08000	11.75	10.45	8.75
12505HS-09000	13.00	11.70	10.00
12505HS-10000	14.25	12.95	11.25
12505HS-11000	15.50	14.20	12.50
12505HS-12000	16.75	15.45	13.75
12505HS-13000	18.00	16.70	15.00
12505HS-14000	19.25	17.95	16.25
12505HS-15000	20.50	19.20	17.50

Specification

ITEM	SPEC
Voltage Rating	AC/DC 125V
Current Rating	AC/DC 1A
Operating Temperature	-25℃~+85℃
Contact Resistance	30mΩ MAX
Withstanding Voltage	AC250V/1min
Insulation Resistance	100MΩ MIN
Applicable Wire	AWG #28~#32
Applicable P.C.B	-
Applicable FPC/FFC	-
Solder Height	-
Crimp Tensile Strength	-
UL FILE NO	E108706

Application Terminal : 12505TS (32 Page)

6. Packing Description