

PRODUCT SPECIFICATION

Product Name	S500M MT6620 802.11b/g/n, BT 2.1+EDR, FM TX/RX, GPS 4in1 SiP Molding Module
Version	D
Doc No	901-02301
Date	Feb 21,2012

AcSiP's Confidential File
Date:2012.02.24



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A RF SiP module Provider
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Document History

Date	Revise Contents	Revise by	Version
Nov 2 nd , 2011	Initial Version	Kuozheng	A
Dec 7 st , 2011	Update 3-3 Mechanical Dimensions picture text & 6-1 Product Making: Figure 1 Standard Product Marking Diagram- TOP VIEW picture 、 supplement 5-1 Handling item	Kuozheng/ Candice	B
Jan 16 th , 2012	Update 3-4 S500 Recommended Footprint & added 4. Recommended Reflow Profile notes.	Kuozheng	C
Feb 21 th , 2012	Update 1-2 Operation Conditions : Temperature	Kuozheng	D

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1. Description

AcSiP Technology Corp. introduces a low-cost and low-power consumption 4-in-1 SiP molding module. This SiP molding module integrate combine WLAN, Bluetooth, FM and GPS.

The WLAN function follow IEEE 802.11b/g/n standard. The Bluetooth function follow Bluetooth standard Bluetooth 2.1(EDR). The GPS function is host-based structure. The FM function support FM transmitter and receiver.

Feature

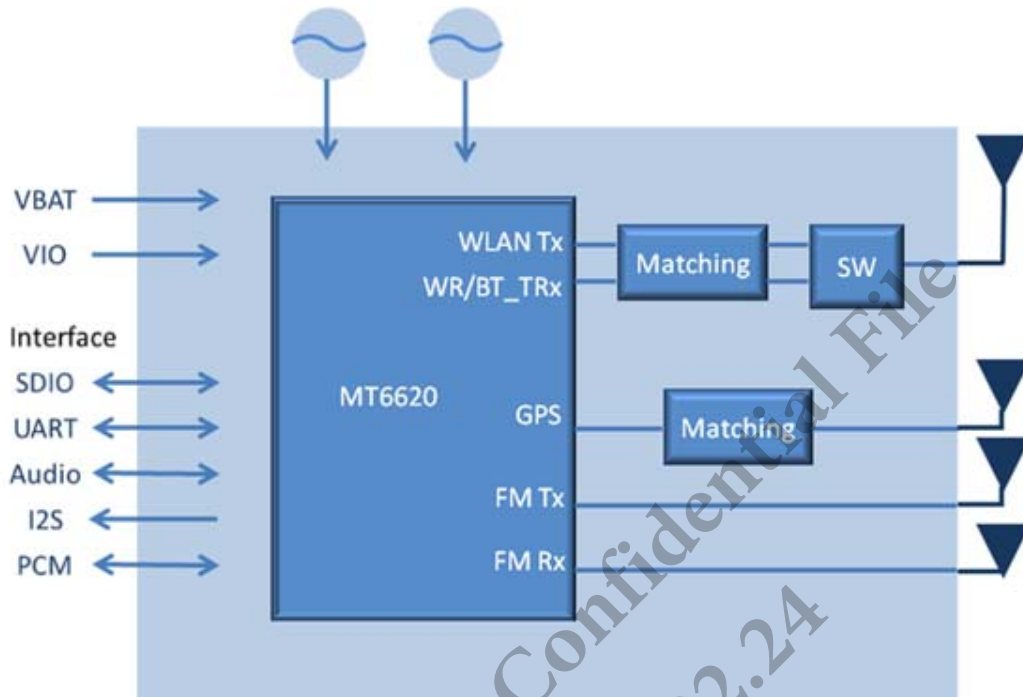
- Small footprint : 8.3 mm X 7.4 mm X 1.0 mm
- Host interface :
 - WLAN : SDIO
 - Bluetooth :UART, PCM
 - FM : UART, Audio, I2S
 - GPS : UART
- Support Bluetooth co-existence
- Support low power consumption sleep mode via 32 kHz clock
- External TCXO required.
- Molding package
- RoHS compliant / Lead free

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1-1. Block Diagram

A simplified block diagram of the S500M SiP molding module is depicted in the figure below.



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1-2. Specification

Model Name	S500M
Product Description	Combo SiP
Network Standard	IEEE 802.11b/g/n, BT 2.1+EDR, FM T/Rx, GPS
Host Interface	SDIO / UART / Audio / PCM / I2S
Operation Conditions	
Temperature	<ul style="list-style-type: none"> ■ Storage : -60°C ~ + 150°C ■ Operating : -45°C ~ +85°C
Humidity	<ul style="list-style-type: none"> ■ Operating : 10 ~ 95% (Non-Condensing) ■ Storage : 5 ~ 95% (Non-Condensing)
Dimension	8.3 mm X 7.4 mm X 1.2 mm (Max.)
Package	LGA
WiFi Part	
Standard	IEEE 802.11 b/g/n
Host Interface	SDIO
Bluetooth Part	
Standard	Bluetooth 2.1+EDR 3.0 + HS compliance V4.0 Low Energy (LE)
Host Interface	<ul style="list-style-type: none"> ■ UART ■ PCM
FM Part	
Function	<ul style="list-style-type: none"> ■ Transmitter ■ Receiver
Host Interface	<ul style="list-style-type: none"> ■ Audio in ■ Audio out ■ I2S
GPS Part	
Type	Host based
Host Interface	UART



2. Electrical Characteristics

2-1. Absolute Maximum Ratings

Symbol	Parameter	Min.	TYP.	MAX.	UNIT
VBAT		-0.3	3.6	5.5	V
WF_PA_VDD		-0.3	3.3	5.5	V
DVDDIO18		-0.3	1.8	3.6	V
DVDDIO_SD1		-0.3	1.8	3.6	V
DVDDIO28		-0.3	2.8	3.6	V

2-2. DC CHARACTERISTICS

Symbol	Parameter	Min.	TYP.	MAX.	UNIT
VBAT	Supply Voltage	2.3	3.6	5.5	V
	Current(PMU_EN=0)		25	35	uA
WF_PA_VDD	Supply Voltage	2.8	3.3	3.6	V
	Current(I _{max})		450		mA
DVDDIO18	Supply Voltage	1.6	1.8	3.6	V
	Current		0.1		uA
DVDDIO_SD1	Supply Voltage	1.6	2.8	3.6	V
	Current		0.1		uA
DVDDIO28	Supply Voltage	1.6	2.8	3.6	V
	Current		0.1		uA

2-3. RF CHARACTERISTICS

2-3-1. RF characteristics for 802.11b

802.11b Transmit					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 1		Channel 14	
Tx Power Level	DQPSK	18	20	22	dBm
Frequency tolerance		-10	5	10	ppm
Spectral Mask	11MHz→22MHz		40		dBr
	>22MHz		53		dBr
Modulation accuracy	All data rate		15		%
802.11b Receiver					
Min. input	1Mbps PER<8%		-96		dBm
	11Mbps PER<8%		-89		dBm
Max. input level	PER<8%			-3.0	dB

2-3-2. RF characteristics for 802.11g

802.11g Transmit					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 1		Channel 14	
Tx Power Level	OFDM	16	18	20	dBm
Frequency tolerance		-10	5	10	
Modulation accuracy	All data rate	-28	-30		dB
802.11g Receiver					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 1		Channel 14	
Min. input	6Mbps PER<10%		-93		dBm
	54 Mbps PER<10%		-75		
Max. input level	PER<10%			-3.0	dBm
Adjacent Channel Rejection (25MHz)	6 Mbps OFDM			40	dB
	54 Mbps OFDM			25	dB



2-3-3. RF characteristics for 802.11n

802.11n Transmit(HT20)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 1		Channel 14	
Tx Power Level	OFDM	16	18	20	dBm
Frequency tolerance		-10	0	10	
Modulation accuracy	All data rate	-28	-30		dB
802.11n Transmit(HT40)					
Tx Power Level	OFDM	14	16	18	dBm
Frequency tolerance		-10	0	10	
Modulation accuracy	All data rate	-28	-30		dB
802.11n Receiver(HT20)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 1		Channel 14	
Min. input	MCS0 PER<10%		-89		dBm
Min. input	MCS7 PER<10%	-64	-70		dBm
Adjacent Channel Rejection (25MHz)	MCS 0			36	dB
	MCS 7			18	dB
802.11n Receiver(HT40)					
Min. input	MCS7 PER<10%	-61	-67		dBm



2-3-4. RF characteristics for Bluetooth

Parameter	Description	Min	Typ	Max	Unit
Basic Rate					
Frequency		2402		2480	MHz
Output Power		9	11	13	dBm
Gain Step		2	4		dB
Modulation characteristic	$\Delta f_{1\text{avg}}$	140	156	175	kHz
	$\Delta f_{2\text{max}}$	115	140		kHz
	$\Delta f_{1\text{avg}} / \Delta f_{2\text{avg}}$	0.8	0.95		
ICFT	Initial carrier frequency tolerance				kHz
Carrier frequency drift	DH1		10		kHz
	DH3		10		kHz
	DH5		10		kHz
	Max drift rate		180	400	Hz/uS
output spectrum	20 dB bandwidth			1	kHz
In-band spurious emission	$\pm 2\text{MHz}$ offset		-43	-20	dBm
	$\pm 3\text{MHz}$ offset		-47	-40	dBm
	$> \pm 3\text{MHz}$ offset		-47	-40	dBm
Sensitivity	BER<0.1%		-92		dBm
Max input	BER<0.1%	-20			dBm



Inter modulation	Max interference level to maintain 0.1%BER,interference signals at 3MHz and 6MHz offset.		TBD		dBm
EDR					
Frequency		2402		2480	MHz
Max transmit Power	$\pi/4$ DQPSK		8		dBm
	8PSK		8		dBm
Relative transmit Power	$\pi/4$ DQPSK		8		dB
	8PSK		8		dB
Frequency stability	ω_c , $\pi/4$ DQPSK	-10	5	10	kHz
	ω_c , 8PSK	-10	5	10	kHz
	ω_s , $\pi/4$ DQPSK	-10	5	10	kHz
	ω_s , 8PSK	-10	5	10	kHz
	$\omega_c+\omega_s$, $\pi/4$ DQPSK	-10	5	10	kHz
	$\omega_c+\omega_s$, 8PSK	-10	5	10	kHz
Modulation accuracy	RMS DEVM		8		%
	99% DEVM		11		%
	Peak DEVM		15		%
In-band spurious emission	± 1 MHz offset		-32	-26	dBm
	± 2 MHz offset		-35	-20	dBm
	± 3 MHz offset		-42	-40	dBm
Sensitivity	$\pi/4$ DQPSK ,BER<0.1%		-92		dBm
	8PSK ,BER<0.1%		-86		dBm
Max input	$\pi/4$ DQPSK ,BER<0.1%	-20			dBm
	8PSK ,BER<0.1%	-20			dBm



2-3-5. System performance for GPS

Parameter	Description	Performance
C/N @ -130 (w/o LNA)		40 dB
Horizontal Position Accuracy(LNA)	Without Aid	3.0 Meter
	DGPS	2.5 Meter
Velocity Accuracy(LNA)	Without Aid	0.1 Meter/sec
	DGPS	0.05 Meter/sec
Sensitivity(LNA)	Autonomous acquisition	-148 dBm
	Warm acquisition	-148 dBm
	Hot acquisition	-160 dBm
	Tracking	-165 dBm
TTFF(LNA)	Cold start	<35 sec
	Warm start	<34 sec
	Hot start	<1 sec
	MS based : GSM coarse time	<20 sec
	MA based : GSM coarse time	<20 sec

2-3-6. RF characteristics for FM Receiver

Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		76		108	MHz
Sensitivity	DQPSK	-100	-109		dBm

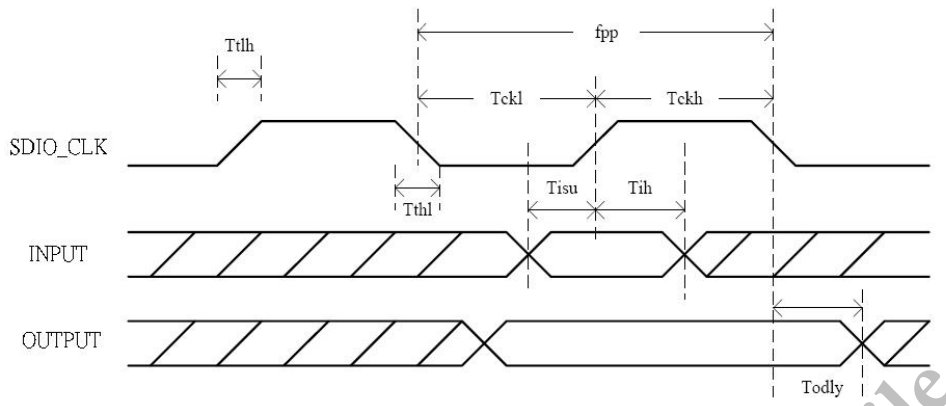
2-3-7. RF characteristics for FM Transmitter

Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		76		108	MHz
Output Power			13		dBm



2-4. SDIO Host Interface Protocol Timing

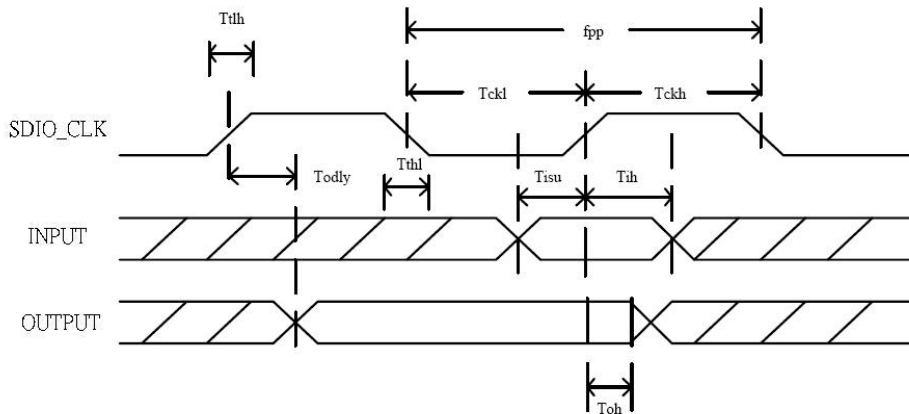
2-4-1. SDIO 25MHz Timing Diagram



Symbol	Parameter	Min.	TYP.	MAX.	UNIT
fpp	Clock Frequency	0		25	MHz
Tckl	Clock Low Time	10			nS
Tckh	Clock High Time	10			nS
Ttlh	Clock Rise Time			10	nS
Tthl	Clock Fall Time			10	nS
Tisu	Input Setup Time	5			nS
Tih	Input Hold Time	5			nS
Todly	Output Delay Time	0		11	nS



2-4-2. SDIO 50MHz Timing Diagram



Symbol	Parameter	Min.	TYP.	MAX.	UNIT
fpp	Clock Frequency			50	MHz
Tckl	Clock Low Time	7			nS
Tckh	Clock High Time	7			nS
Ttlh	Clock Rise Time			3	nS
Tthl	Clock Fall Time			3	nS
Tisu	Input Setup Time	6			nS
Tih	Input Hold Time	2			nS
Toh	Output Hold Time	2.5			
Todly	Output Delay Time	0		12	nS

3. Pin Definition

3-1. Pin Description

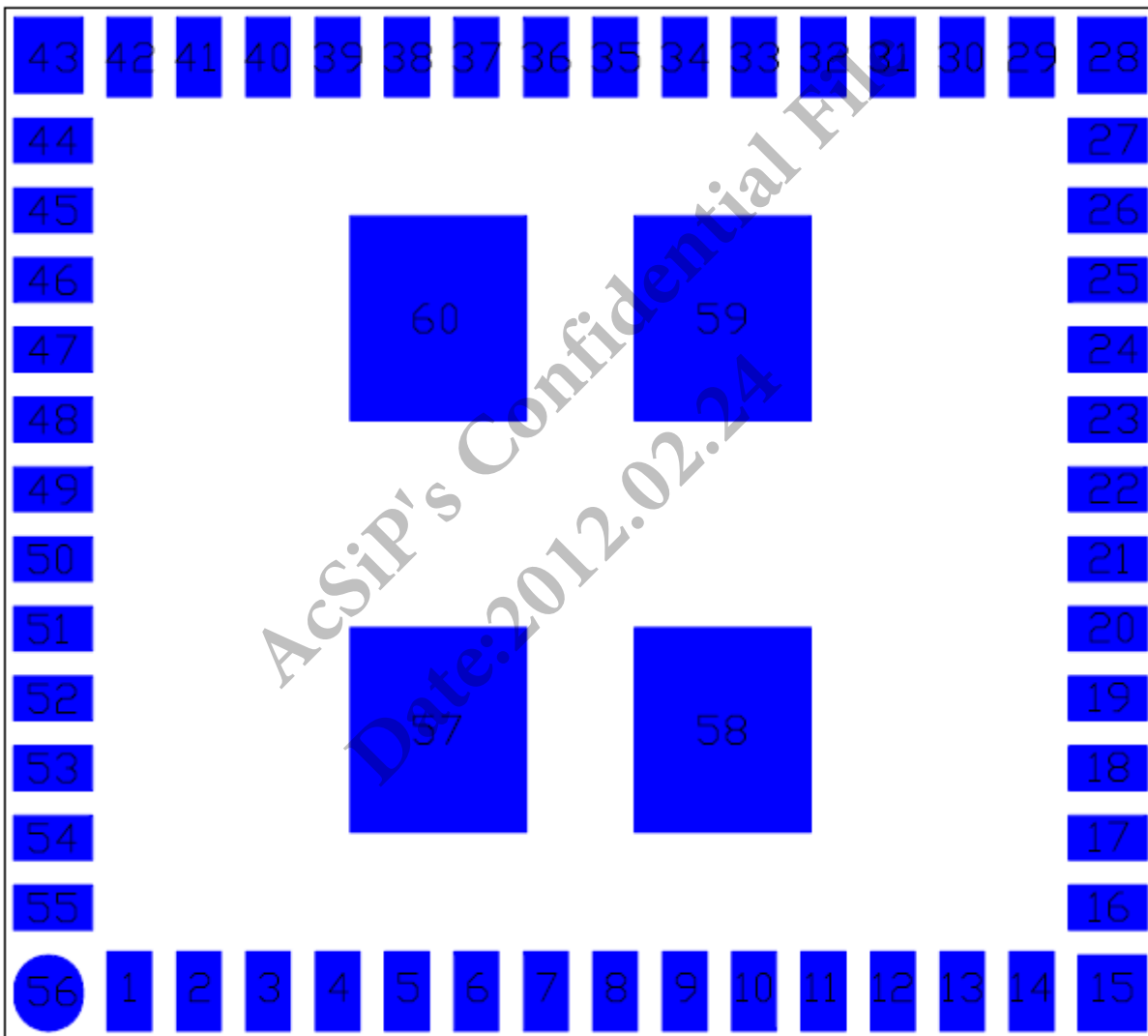
Pin	Definition	I/O	Power	Description
1	SYSRST_B	I		System reset pin
2	BGF_INT_B	I/O		BT/GPS/FM interrupt pin
3	OSC_EN	I/O		external clock request
4	PMU_EN	I		PMU enable pin
5	ANTSEL2	I/O		antenna selection pin use for external switch control
6	ANTSEL3	I/O		antenna selection pin use for external switch control
7	WF_PA_VDD	VDD		WiFi PA VDD supply input, 3.3V
8	WF_PA_LDOOUT	VDD		WiFi PA 3.3V VDD supply output, external 4.7uF required
9	DVDDIO18	VDD		VDD for digital interface IO
10	WIFI_INT_B	I/O		WiFi interrupt pin
11	LXBK	O		Built-in SMPS feedback pin, 4.7uF and 2.2uH required
12	BUCKOUT	O		Built-in SMPS output pin, 4.7uF and 2.2uH required
13	GND_SMPS	VSS		Built-in SMPS ground pins
14	VBAT	VDD		Vbat input pin.
15	DVDDIO_SD1	VDD		VDD for SDIO interface
16	SD1_DAT0	I/O		Data pin of SDIO1
17	SD1_DAT2	I/O		Data pin of SDIO1
18	SD1_CLK	I		Clock pin of SDIO1
19	SD1_CMD	I/O		Command pin of SDIO1
20	SD1_DAT1	I/O		Data pin of SDIO1
21	SD1_DAT3	I/O		Data pin of SDIO1
22	UART1_UTXD	O		TX pin of UART interface
23	UART1_URXD	I		RX pin of UART interface
24	FM_AUOUT_R	O		FM analog output, R channel

25	FM_AUOUT_L	O		FM analog output, L channel
26	FM_AUIN_L	I		FM analog input, L channel
27	FM_AUIN_R	I		FM analog input, R channel
28	GND	VSS		Ground pin
29	FM_TX_OUT	O		FM TX port / FM short antenna input port
30	FM_RX_N	I		FM differential input- N port. A short trace should be reserved and connected to ground
31	FM_RX_P	I		FM long antenna input port
32	VRTC	VDD		VDD of RTC domain
33	RTCCLK_O	O		RTC xtal
34	RTCCLK	I		RTC xtal / external RTC clock input port
35	OSC_IN	I		Xtal / TCXO input port
36	TCXO_LDO	VDD		2.8V / 1.8V output for external TCXO VDD supply
37	AUX_REF	I		support PCTCXO temperature voltage measurement
38	RF_I_CAL	I		support PCTCXO temperature voltage measurement
39	GPS_ANT_P	I		GPS input port
40	EEDI	I/O		stripping pin for TCXO_LDO voltage selection
41	DVDDIO28	VDD		VDD for EEDI / Antenna selection interface
42	GPS_SYNC	I/O		external GPS SYNC signal
43	I2C_DATA_IN	I/O		I2S_DATA_IN
44	I2C_CLK	I/O		I2S_CLK
45	I2C_WS	I/O		I2S_WS
46	I2C_DATA_OUT	I/O		I2S_DATA_OUT
47	PCM1CLK	I		PCM CLK
48	PCM1OUT	O		PCM OUT
49	PCM1IN	I		PCM IN
50	PCM1SYNC	I		PCM SYNC
51	BT_ANT	I/O		BT input/output port
52	GND	VSS		Ground pin
53	WIFI_ANT	I/O		WiFi input/output port

54	FSOURCE	VDD		Efuse enable pin
55	ALL_INT_B	I/O		All system interrupt pin
56~60	GND	VSS		Ground pin

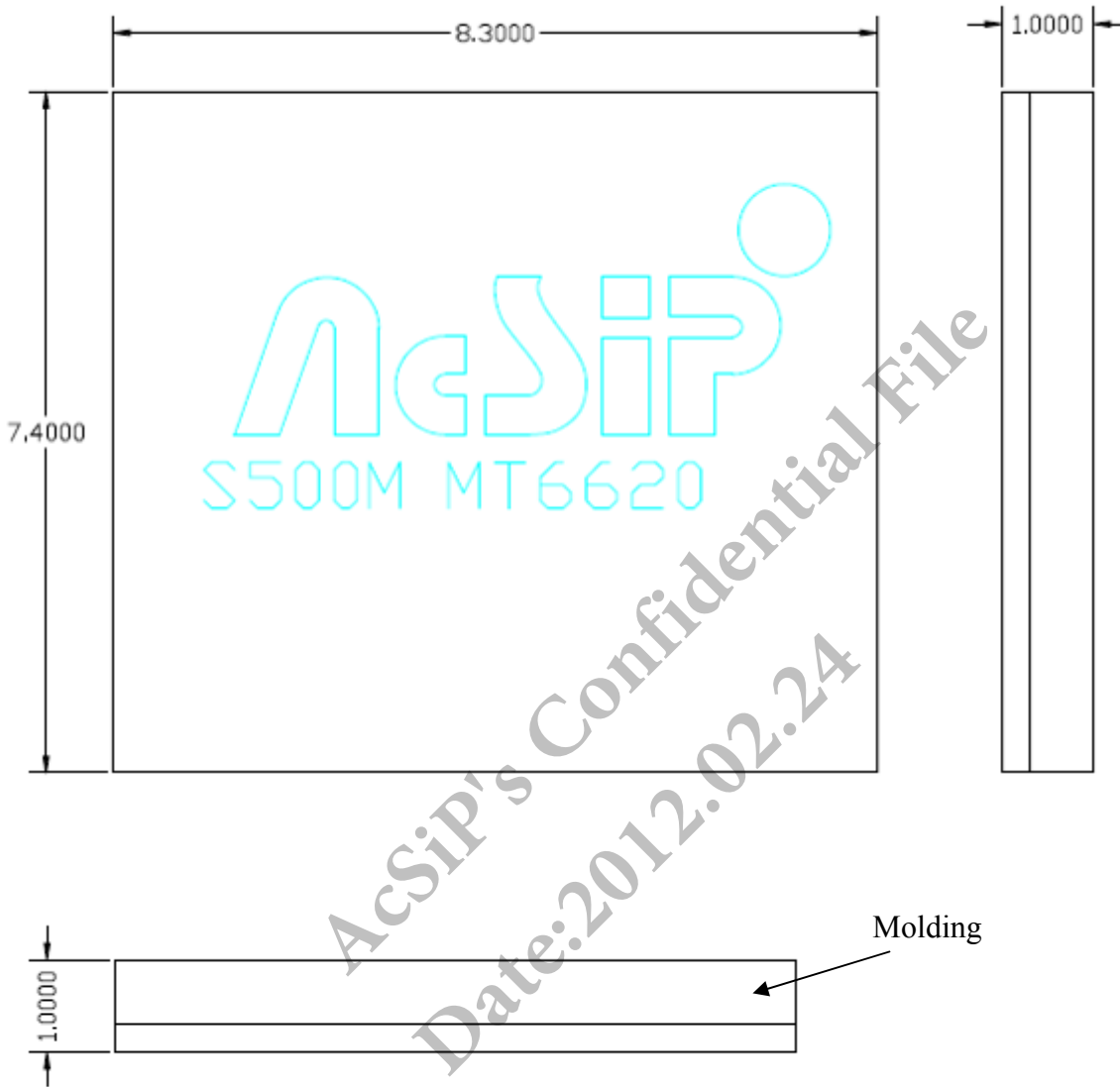
3-2. Pin Assignment

The SiP molding module will conform to the following pin map, shown in the following diagram (top view)



3-3. Mechanical Dimensions

UNIT: mm



ESD Level :

HBM : MIL-STD-883E Method 3015.7 class 1A

MM : ESD-STM5.2-1999 class A

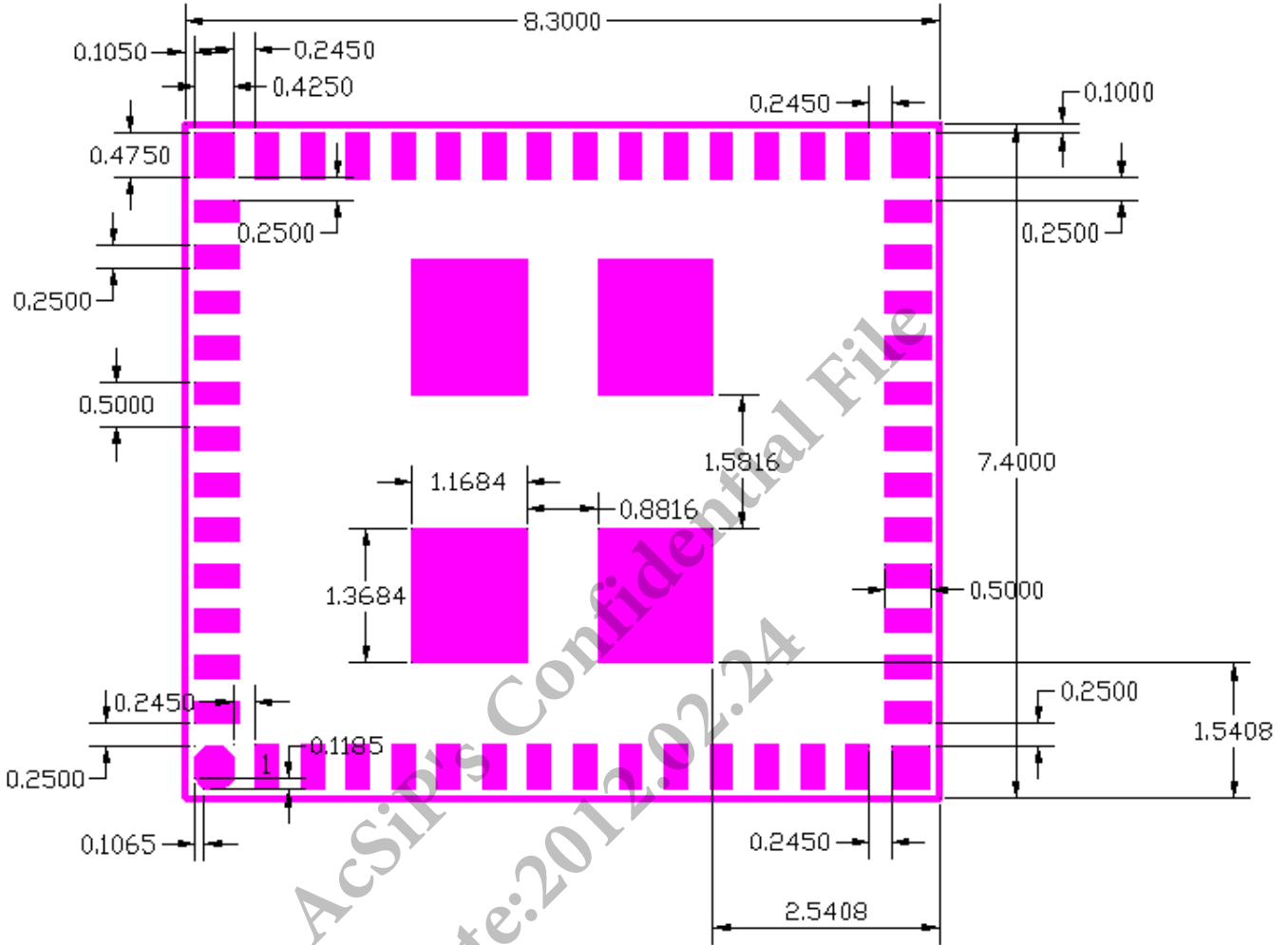
SDM : ANSI/ESD SP5.3.2-2004 class II



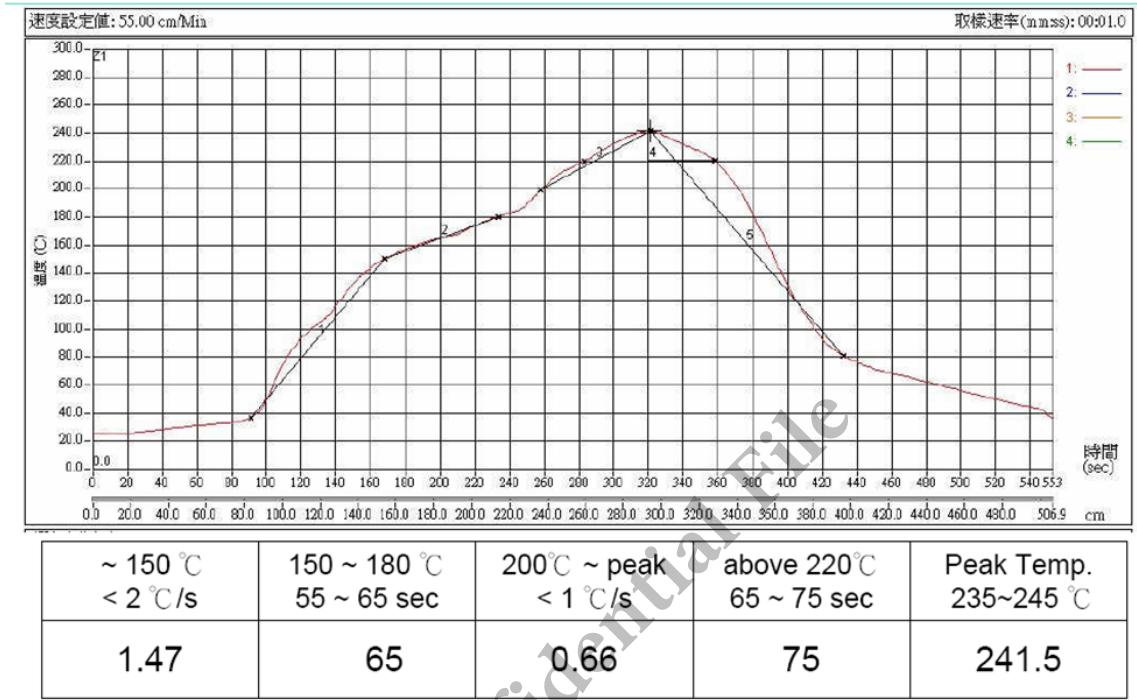
3-4. Recommended Footprint

UNIT: mm

TOP VIEW



4. Recommended Reflow Profile



5. SiP molding module Preparation

5-1. Handling

Handling the module must wear the anti-static wrist strap to avoid ESD damage. After each module is aligned and tested, it should be transport and storage with anti -static tray and packing. This protective package must be remained in suitable environment until the module is assembled and soldered onto the main board.

Base on reliability test result pass MRT L3 criteria, S500M refers to MSL3 criterion.

5-2. SMT Preparation

1. Calculated shelf life in sealed bag: 6 months at 40°C and 90% relative humidity (RH).
2. Peak package body temperature: 250°C .
3. After bag was opened, devices that will be subjected to reflow solder or other high temperature process must.
 - A. Mounted within: 24 hours of factory conditions $30^{\circ}\text{C}/60\%$RH.
 - B. Stored at $\leq 10\%</math>RH with N2 flow box.$
4. Devices require baking, before mounting, if:
 - A. Package bag does not keep in vacuumed while first time open.
 - B. Humidity Indicator Card is $>10\%</math> when read at $23\pm 5^{\circ}\text{C}$.$
 - C. Expose at 3A condition over 8 hours or Expose at 3B condition over 24 hours.
5. If baking is required, devices may be baked for 12 hours at $125\pm 5^{\circ}\text{C}$.



6. Package Information

6-1 Product Making

Figure 1 below details the standard product marking for all AcSiP Corp. products. Cross reference to the applicable line number and table for a full detail of all the variables.

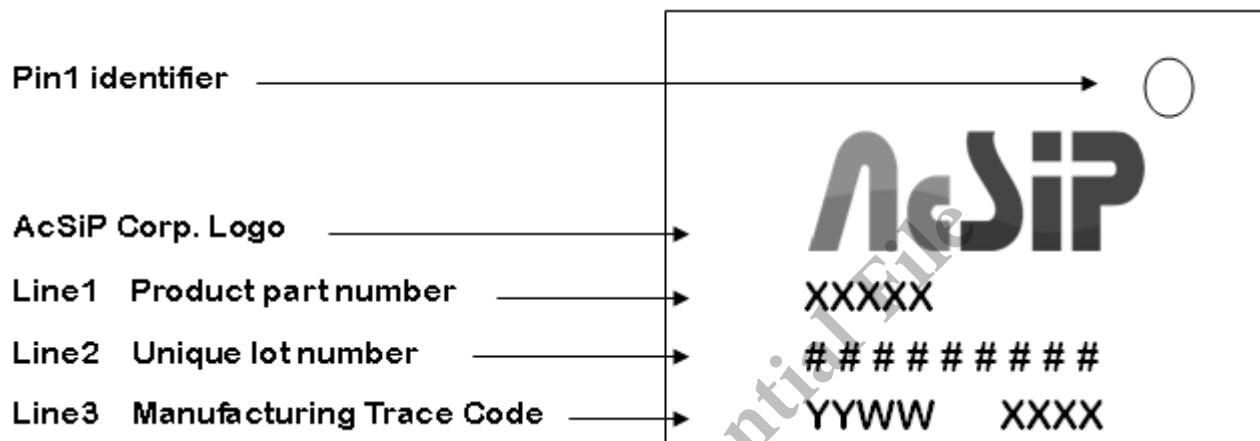


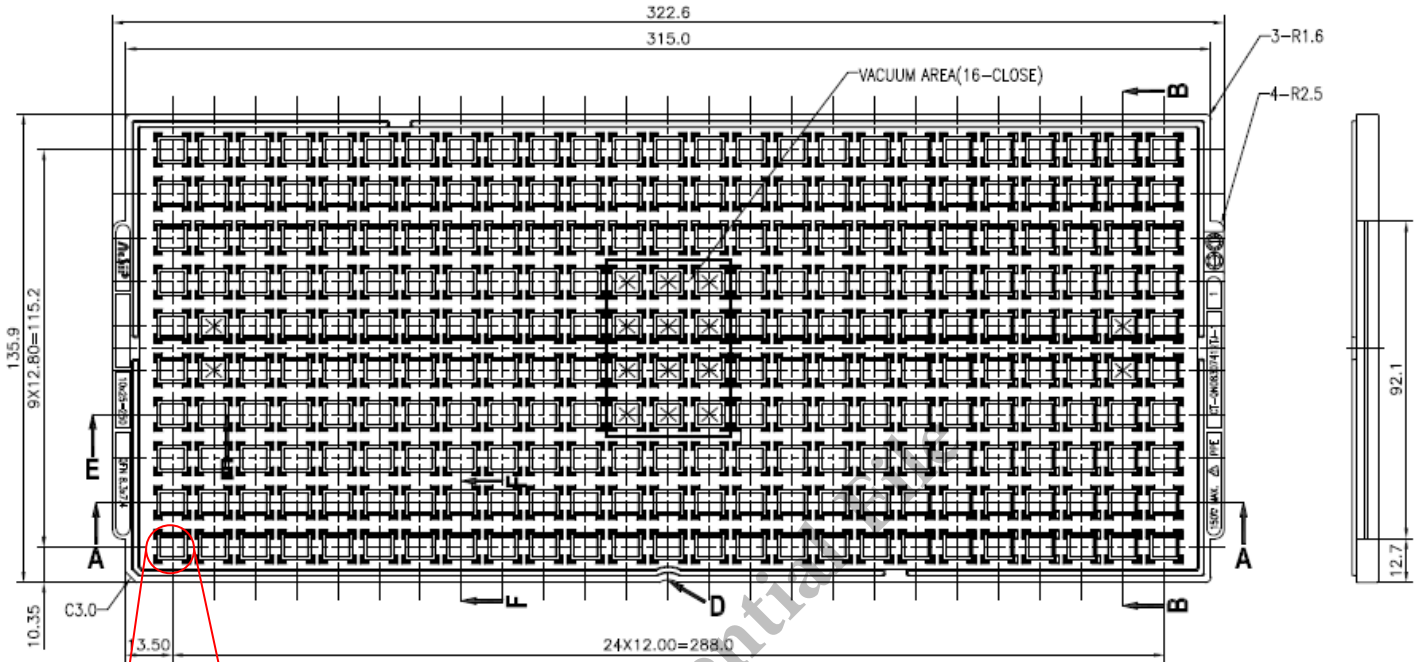
Figure 1 Standard Product Marking Diagram- TOP VIEW

The lines identified above are detailed below in the following tables on a line-by-line basis. This information is based on a 3 line product marking availability.

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6-2 Tray Dimension



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6-3 Packing Information

REVISION HISTORY

REV	DESCRIPTION	RELEASED BY	DATE
00/A	INITIAL RELEASE	Candice	2011/05/05
00/B	Update packing label	Candice	2011/08/18

注意:
NOTE:
1.不足數量部份,需填入填充物避免碰撞損傷。
Squeeze Fillings Into The Unfilled Space Of The Inner Box And Carton To Void The Collision And Damage.
2.二條打包帶應打於盤上之印槽處。(Tray 標號排列由大到小)
Packing Band Shall Be Packed On The Dint Of Tray. (Tray label order of rank from big to small)

MATERIAL(材料)

- PP抗靜電打包帶
- 抗靜電泡棉
- 濕度指示卡, 六點式 125pcs/罐
- 矽膠乾燥劑
- 抗靜電防潮鋁箔袋
- BUBBLE CUSHION(氣泡墊)
- LABEL A/B/C(標籤 A/B/C)
- Seal Tag(封箱貼紙)
- Tape(膠帶)
- Carton(外箱)
- Label D(標籤D)

<p>PROJECTION</p> <p>UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM. ALL PROJECTIONS ARE THIRD ORDER.</p> <p>TOLERANCES:</p> <p>LINEAR X.X ±0.15 X.XX ±0.10 X.XXX ±0.05</p>	<p>APPROVALS</p> <p>DRAWN: Candice</p> <p>CHECKED: —</p> <p>APPROVED: Sam</p> <p>CUSTOMER: —</p>	<p>SIGN</p> <p>DATE</p> <p>2011/08/18</p> <p>2011/08/18</p>	<p>CUSTOMER DRAWING NO:</p> <p>TITLE:</p> <p style="text-align: center; font-weight: bold;">S500 Standard Packing</p> <p>DWG. NO:</p> <p style="text-align: center; font-weight: bold;">S500 PKG</p> <p>SIZE: A4 SCALE: N/A SHEET 1 of 1</p>
	<p>AcSiP Technology Corp.</p> <p>ADD: 3F, No. 22, Dain Rd., Taoyuan City, Taoyuan County, 33067, Taiwan</p> <p>TEL: 886-3-3718889 FAX: 886-3-3716299</p>		
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	<p>REV 01/B</p>		

6-4 Humidity Indicator Card



Dry (乾燥)

Wet (潮濕)

Indicates 指示點:

5%, 10%, 60% relative humidity
5%, 10%, 60% 相對濕度

Color Change 顏色變化:

Brown (Dry) → Blue (Wet)
棕色 (乾燥) → 藍色 (潮濕)