

# SKW93A 3x3 MIMO WLAN Module Datasheet

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**This document applicable to the following products:**

Product name	Type number	Product status
802.11a/b/g/n/ac WiFi AP/Router Module	SKW93A (09269)	Mass Production
	SKW93A (0926901)	

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## 1 General Description

The SKW93A module compliant to 802.11 a/b/g/n/ac Wi-Fi Solution, It integrates a dual-core MIPS1004Kc (580MHz), 3-port switch, USB2.0, SD-XC, I2S. The module is suitable for 802.11ac, LTE cat4/5, edge, hotspot, VPN, AC (Access Control). For consumer electronic devices, the module requiring only an external 3.3V power supply.

The module integrates a 2.4GHz 2x2 MIMO wlan chip with internal PA and LNA and integrates a 5GHz 1x1 wlan chip with internal PA and LNA. It supports 2.4GHz operations up to 144 Mbps for 20 MHz and 300 Mbps for 40 MHz channel respectively, and supports 5GHz operations up to 433 Mbps for 80 MHz channel respectively.

The module supports AP mode and client mode and router mode.

## 2 Applications

- ◆ USB WiFi Camera
- ◆ 802.11ac Router
- ◆ VPN
- ◆ 3G/4G WiFi Router
- ◆ WiFi Audio
- ◆ UART 5GHz WiFi
- ◆ Home Automation
- ◆ Smart Home Gateway
- ◆ Industry Control



Figure 1: SKW93A Top View

### 3 Features

- ◆ Compliant to IEEE 802.11a/b/g/n/ac.
- ◆ 3T3R mode with support for a 733Mbps PHY data rate.
- ◆ DDR2 memory up to 1024Mb.
- ◆ Flash memory up to 256Mb.
- ◆ 2 LAN ports and 1 WAN port.
- ◆ Support USB 2.0 slave device for USB disk and USB 3G/4G dongle and USB camera.
- ◆ Support SD card.
- ◆ Support interface: I2C, SDIO, I2S(192K/24bits), PWM, UART lite, GPIO.
- ◆ Security: WEP64/128, TKIP, AES, WPA, WPA2, WAPI.
- ◆ Support AP/Client/Router mode.
- ◆ RoHS compliance meets environment-friendly requirement.
- ◆ CE/FCC compliance
- ◆ 36.4mm(L) x 30.5mm(W) x 14.8mm(H) dimension.

## 4 Application Block Diagram

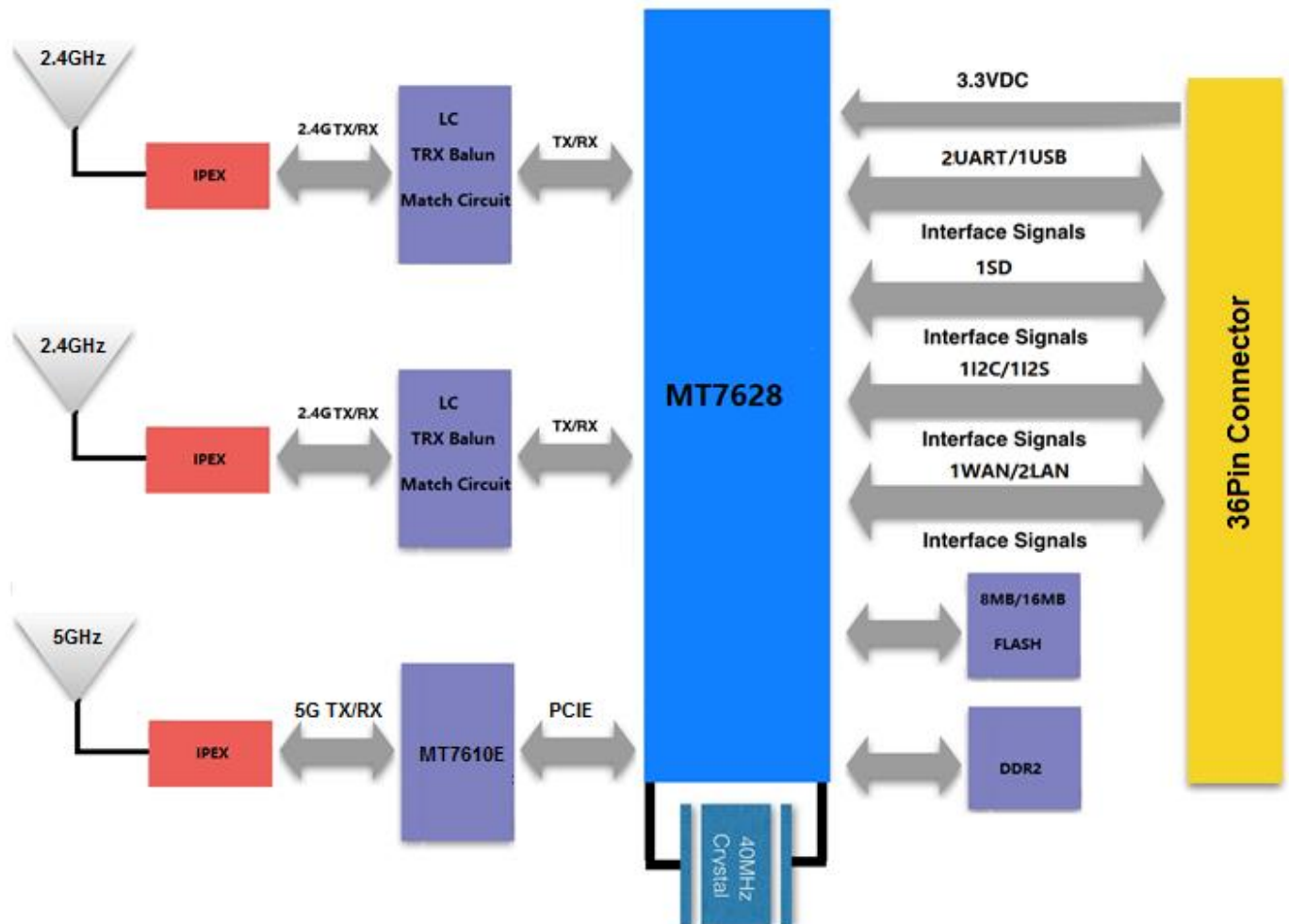


Figure 2: SKW93A Block Diagram

## 5 Interfaces

### USB

The USB interface support USB slave devices for USB disk and USB 3G/4G dongle and USB camera.

### I2C

SKW93A Pin Number	Pin Name	GPIO(2'b01)	I2C(2'b00)
27	I2C_SD	GPIO#05	I2C_SD
28	I2C_CLK	GPIO#04	I2C_CLK

Table5-1: I2C pin share scheme

**Note:** Controlled by I2C\_MODE register

**SD**

SKW93A Pin Number	Pin Name(4'b0000)	GPIO(2'b01)	SD(2'b00)
14	LAN_PORT4_TX-	GPIO#29	SD_D2
13	LAN_PORT4_TX+	GPIO#28	SD_D3
12	LAN_PORT4_RX-	GPIO#27	SD_CMD
11	LAN_PORT4_RX+	GPIO#26	SD_CLK
10	LAN_PORT3_RX-	GPIO#25	SD_D0
9	LAN_PORT3_RX+	GPIO#24	SD_D1
8	LAN_PORT3_TX-	GPIO#23	SD_CD
7	LAN_PORT3_TX+	GPIO#22	SD_WP

**Table5-2: SD pin share scheme**

Note: Controlled by the EPHY\_APGIO\_AIO\_EN[4:1] and SD\_MODE register

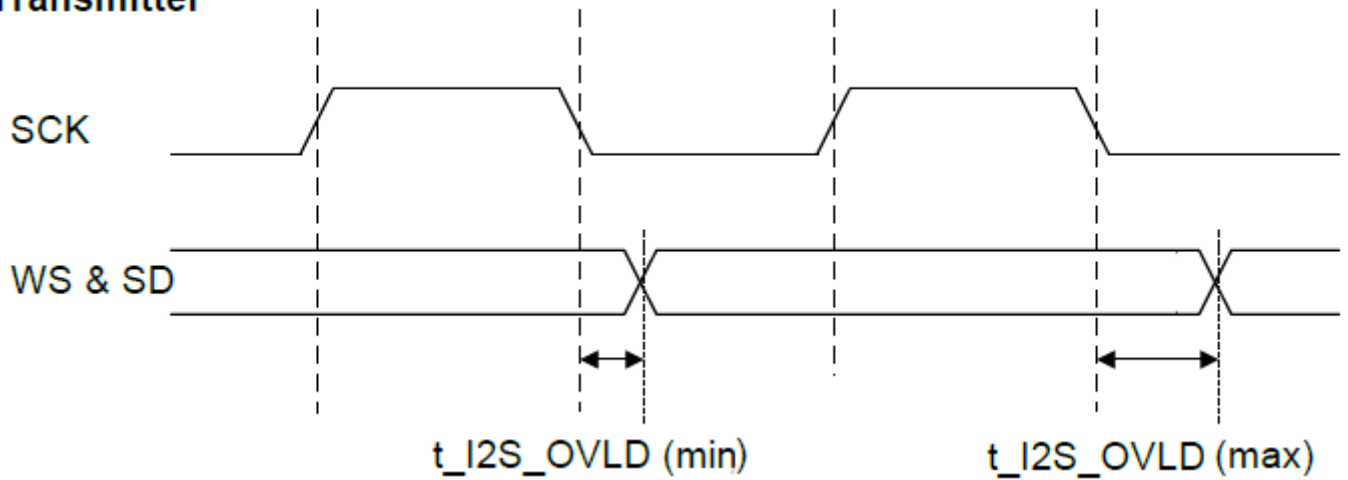
**I2S(192K/24bits)**

SKW93A Pin Number	Pin Name	GPIO(2'b01)	I2S(2'b00)	PCM(2'b10)
37	I2S_CLK	GPIO#03	I2S_CLK	PCMFS
35	I2S_WS	GPIO#02	I2S_WS	PCMCLK
36	I2S_SDO	GPIO#01	I2S_SDO	PCMDTX
34	I2S_SDI	GPIO#0	I2S_SDI	PCMDRX

**Table5-3: I2S/PCM pin share scheme**

**Note:** Controlled by I2S\_MODE register

**Transmitter**



**Receiver**

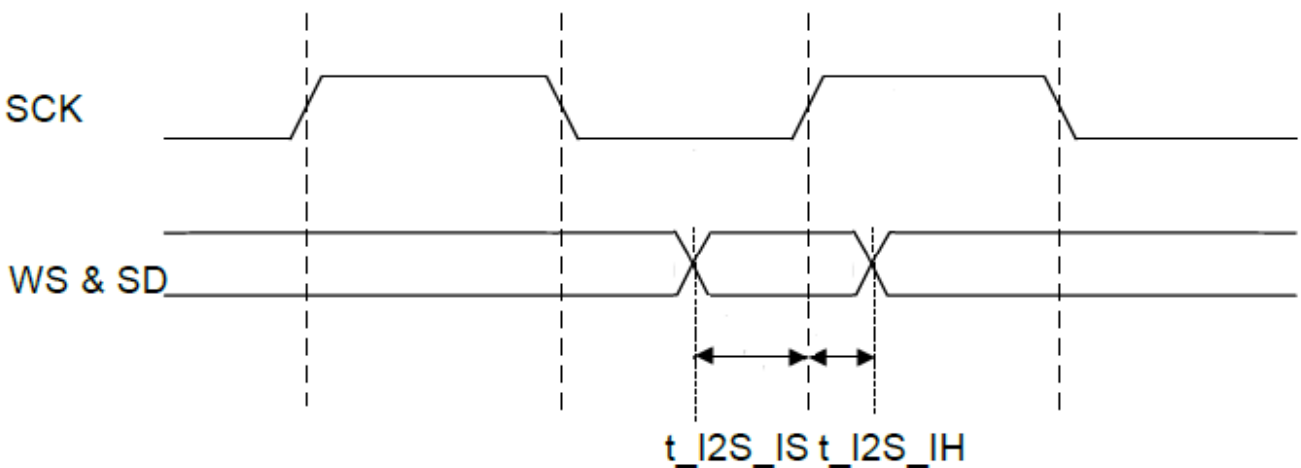


Figure 3: I2S Timing

Symbol	Description	Min	Max	Unit
$t_{I2S\_IS}$	Setup Time for I2S input(data & WS)	3.5		ns
$t_{I2S\_IH}$	Hold Time for I2S input(data & WS)	0.5		ns
$t_{I2S\_OVLD}$	I2S_CLK to I2S output(data & WS) valid	2.5	10	ns

Table5-4: I2S Interface Diagram Key



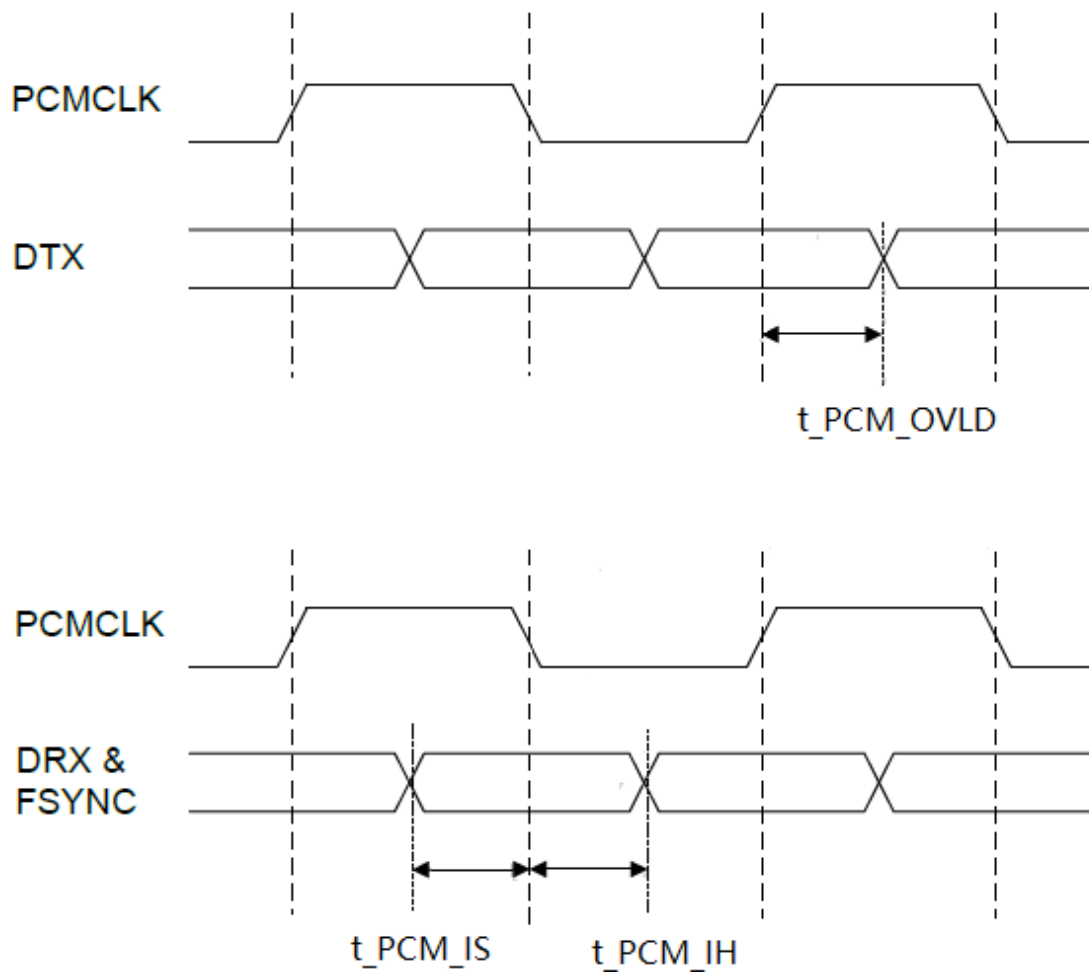


Figure 4: PCM Timing

## PCM

Symbol	Description	Min	Max	Unit
t_PCM_IS	Setup Time for PCM input to PCM_CLK fall	3.5		ns
t_PCM_IH	Hold Time for PCM input to PCM_CLK fall	1.0		ns
t_PCM_OVLD	PCM_CLK to PCM output valid	10.0	35.0	ns

Table5-5: PCM Interface Diagram Key

## PWM

SKW93A Pin Number	Pin Name	GPIO	PWM	Pin Share
38	LAN_PORT2_TX-	GPIO#21	UART2_RXD	PWM_CH3/SD_D4

39	LAN_PORT2_TX+	GPIO#20	UART2_TXD	PWM_CH2/SD_D5
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**Table5-6: PWM pin share scheme**

## UARTS lite

The module support 3UART:

SKW93A Pin Number	Pin Name	GPIO	UART	Pin Share
16	UART_RXD0	GPIO#13	UART0_RXD	UART0(For Debug)
17	UART_TXD0	GPIO#12	UART0_TXD	
32	UART_RXD1	GPIO#46	UART1_RXD	PWM_CH1
31	UART_TXD1	GPIO#45	UART1_TXD	PWM_CH0
38	LAN_PORT2_TX-	GPIO#21	UART2_RXD	PWM_CH3/SD_D4
39	LAN_PORT2_TX+	GPIO#20	UART2_TXD	PWM_CH2/SD_D5

**Table5-7: UART pin share scheme**

## WAN/LAN

The SKW93A module integrates 3-port 10/100Mbps fast Ethernet switch.

## 6 Module Specifications

Hardware Features	
Model	SKW93A
Antenna Type	IPEX
Chipset solution	
Voltage	3.3V±5%
Dimension(L×W×H)	36.4 x 30.5 x 14.8mm
Wireless Features	
Wireless Standards	IEEE 802.11a/b/g/n/ac
Frequency Range	2412---2484MHz & 5180---5825MHz
Data Rates	IEEE 802.11b : 1,2,5.5,11Mbps
	IEEE 802.11g : 6,9,12,18,24,36,48,54Mbps

	IEEE 802.11n : MCS0--MCS7 @ HT20 /2.4GHz band
	MCS0--MCS7 @ HT40 /2.4GHz band
	MCS0--MCS9 @ HT40 /5GHz band
	IEEE 802.11ac : MCS0--MCS9 @ VHT80 /5GHz band
Receiver Sensitivity	VHT80 MCS9 : -60dBm@10% PER(MCS9) /5GHz band
	HT40 MCS9 : -63dBm@10% PER(MCS9) /5GHz band
	HT40 MCS7 : -70dBm@10% PER(MCS7) /2.4GHz band
	HT20 MCS7 : -71dBm@10% PER(MCS7) /2.4GHz band
	54M: -76dBm@10% PER
	11M: -88dBm@ 8% PER
Modulation Technique	DSSS (DBPSK, DQPSK, CCK)
	OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 125-QAM, 256-QAM)
Wireless Security	WPA/WPA2, WEP, TKIP and AES, WPS2.0, WAPI
Transmit Power	IEEE 802.11ac: 13dBm @HT80 MCS9 /5GHz band
	IEEE 802.11ac: 16dBm @HT80 MCS0 /5GHz band
	IEEE 802.11n: 14dBm @HT20/40 MCS7 /5GHz band
	IEEE 802.11n: 16dBm @HT20/40 MCS0 /5GHz band
	IEEE 802.11n: 16dBm @HT20/40 MCS7 /2.4GHz band
	IEEE 802.11g: 16dBm @54MHz
	IEEE 802.11b: 18dBm @11MHz
Work Mode	Bridge/Gateway/AP Client
<b>Others</b>	
Certification	RoHS

Environment	Operating Temperature: -20°C~55°C
	Storage Temperature: -40°C~125°C
	Operating Humidity: 10%~90% non-condensing
	Storage Humidity: 5%~90% non-condensing

## 7 Module Pinout and Pin Description

### Module Pinout:

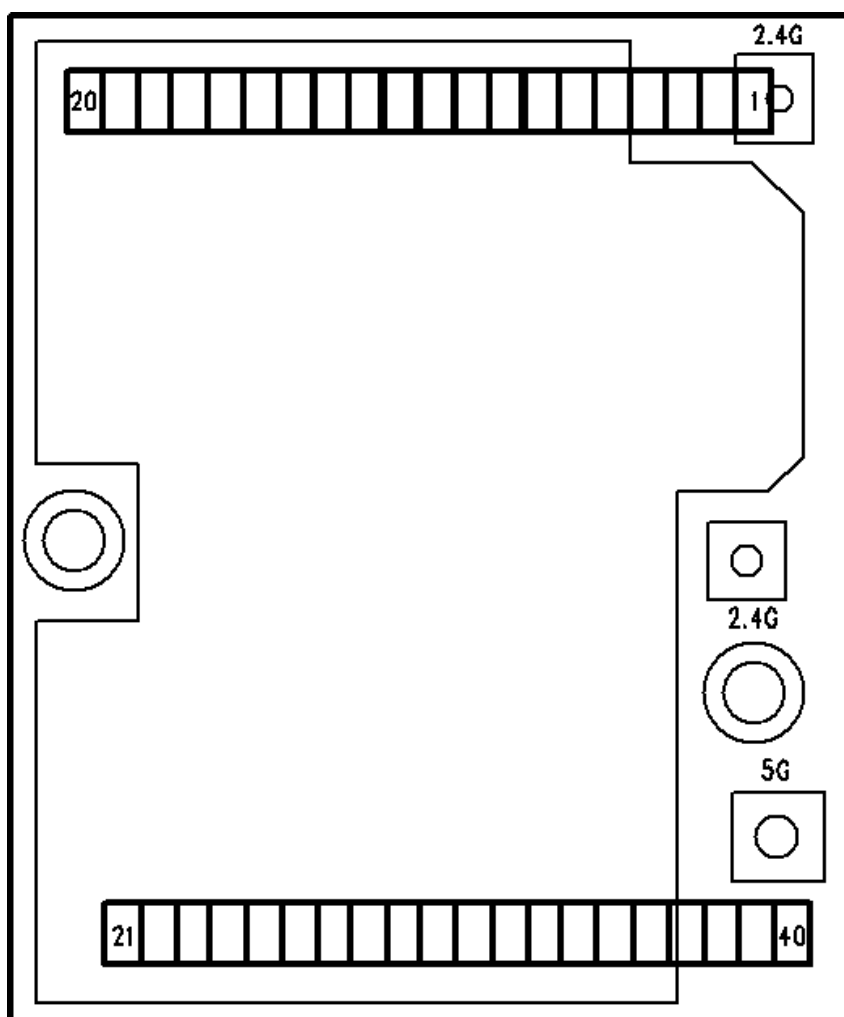


Figure 5: SKW93A Pin

### Pin

Package  
Description:

Pin No.	Pin name	Description	Remark
1	NC	Not Connect	
2	GPIO0	General Purpose I/O	POWER_ON# / GPIO#11/IPD

3	WAN_PORT_RX+	WAN port	WAN_RX+
4	WAN_PORT_RX-	WAN port	WAN_RX-
5	WAN_PORT_TX+	WAN port	WAN_TX+
6	WAN_PORT_TX-	WAN port	WAN_TX-
7	LAN_PORT3_TX+	Ethernet port3	SD_WP / GPIO#22
8	LAN_PORT3_TX-	Ethernet port3	SD_CD / GPIO#23
9	LAN_PORT3_RX+	Ethernet port3	SD_D1 / GPIO#24
10	LAN_PORT3_RX-	Ethernet port3	SD_D0 / GPIO#25
11	LAN_PORT4_RX+	Ethernet port4	SD_CLK / GPIO#26
12	LAN_PORT4_RX-	Ethernet port4	SD_CMD/ GPIO#27
13	LAN_PORT4_TX+	Ethernet port4	SD_D3 / GPIO#28
14	LAN_PORT4_TX-	Ethernet port4	SD_D2 / GPIO#29
15	WLED_N	Wireless LED	WLED_N / GPIO#44
16	UART_RXD0	UART0 only for debug	UART0_RX / GPIO#13
17	UART_TXD0	UART0 only for debug	UART0_TX / GPIO#12 / O, IPD
18	GND	Ground	GND
19	USB-	USB data pin Data-	USB_D-
20	USB+	USB data pin Data+	USB_D+
21	3.3VD	3.3V input 1000mA	+3.3V
22	3.3VD	3.3V input 1000mA	+3.3V
23	GND	Ground	GND
24	GND	Ground	GND
25	P4_LED	LAN_PORT4_LED	P4_LED_N / GPIO#39
26	P3_LED	LAN_PORT3_LED	P3_LED_N / GPIO#40
27	I2C_SD	I2C Data	I2C_SDA(PU 2K2) / GPIO#5
28	I2C_SCLK	I2C clock	I2C_SCL(PU 2K2) / GPIO#4
29	WDT_RST_N	WPS/RST	WDT_RST_N / GPIO#38/O, IPU
30	P0_LED	WAN_PORT_LED	P0_LED_N / GPIO#43
31	UART_TXD1	UART1 Serial Data Output	UART1_TXD / GPIO#45 / O, IPU
32	UART_RXD1	UART 1 Serial Data Input	UART1_RXD / GPIO#46
33	WPS_LED	WPS_LED	I2S_MCLK/WPS_LED_N / GPIO#37
34	I2S_DI	I2S data input	I2S_SDI/GPIO#0/PCMDRX
35	I2S_WS	I2S word select	I2S_WS/GPIO#2/PCMCLK
36	I2S_DO	I2S data output	I2S_SDO /GPIO#1/PCMDTX/IPD
37	I2S_CLK	I2S clock	I2S_CLK/GPIO#3/PCMFS
38	PWM3	PWM	GPIO#21 / PWM3 / UART2_RXD
39	PWM2	PWM	GPIO#20 / PWM2 / UART2_TXD
40	GND	Ground	GND

## 8 PCB Footprint and Dimensions

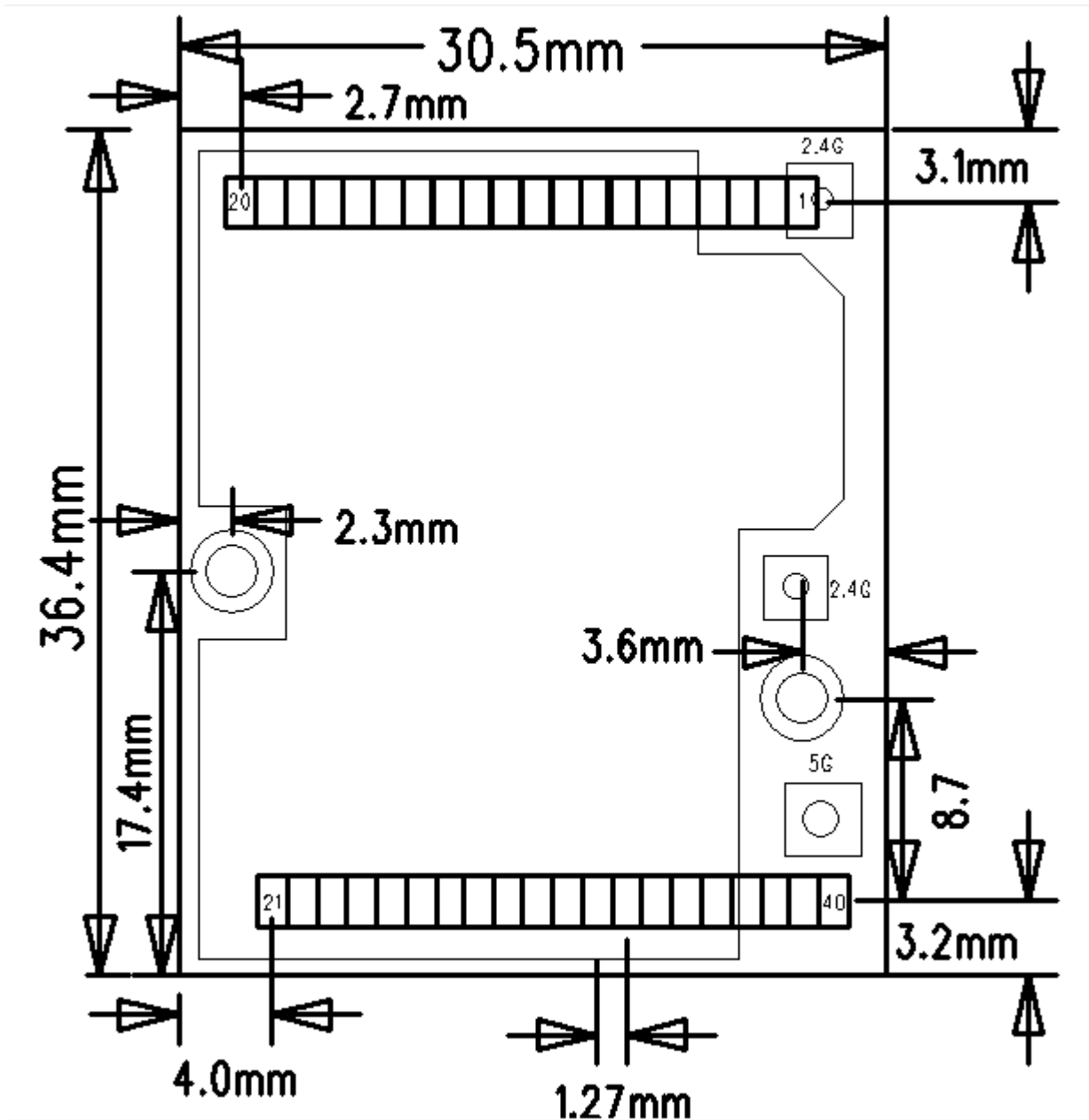


Figure 6: SKW93A Recommend PCB Footprint

## 9 Electrical Characteristics

### a) Absolute Maximum Ratings

Parameter	Condition	Min	Typ.	Max.	Unit
Storage temperature range		-40		125	°C
ESD Protection	VESD	/		2000	V
Supply voltage	VDD_3.3V	0		3.6	V
Voltage on any I/O pin		-0.3		3.63	V

Table9-1: Absolute Maximum Ratings

Note: Absolute maximum ratings are stress ratings only, and functional operation at the maxims is not guaranteed. Stress beyond the limits specified in this table may affect device reliability or cause permanent damage to the device. For functional operating conditions, refer to the operating conditions tables as follow.

\*SKW93A series modules are Electrostatic Sensitive Devices and require special precautions while handling.



#### ESD precautions

The SKW93A series modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the SKW93A series modules without proper ESD protection may destroy or damage them permanently.

The SKW93A series modules are electrostatic sensitive devices (ESD) and require special ESD precautions typically applied to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling, transportation and operation of any application that incorporates the SKW93A series module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the mode.

### b) Recommended Operation Ratings

Parameter	Symbol	Minimum	Typical	Maximum	Unit
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Extended temp. range	TA	-20		55	°C
Power Supply	VDD_3.3V	3.14	3.3	3.46	V
Input Low Voltage	VIL	-0.3		0.8	V
Input High Voltage	VIH	2		3.63	V

Table9-2: Operating Conditions

### c) Measurement Conditions

System state	Current (Typ.)@3.3V
Standby	280 mA
Transmit (2.4/5g; +13 dBm @ TX HT20 MCS7.)	590 mA
Transmit (2.4/5g; +16 dBm @ TX HT20 MCS7.)	850 mA

Table9-3: Power Consumption in Different States

## 10 Ordering Information

Module No.	DDR2 Flash Size	SPI Flash Size
SKW93A_8	64M Bytes	8M Bytes
SKW93A_16	64M Bytes	16M Bytes

## 11 Revision History

Revision	Description	Approved	Date
V1.01	Initial Release	George He	20170928
V1.02	Update wireless features	George He	20180605



## 12 Contact Information

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