

SKW92A 2x2 MIMO WLAN

Module Datasheet

Name: 802.11b/g/n 2x2 MIMO WiFi AP/Router Module

Model No.: SKW92A

Revision: V1.04

Revision History

| Revision | Description | Approved | Date |
|----------|-----------------------------|-----------|----------|
| V1.01 | Initial Release | Sunny Pan | 20151228 |
| V1.02 | Update Pin Description | George He | 20160315 |
| V1.03 | Update Power Consumption | George He | 20170413 |
| V1.04 | Update Ordering Information | George He | 20171016 |

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1. General Description

The SKW92A module includes an 802.11n MAC and baseband, a 2.4GHz radio and FEM, a 580MHz MIPS CPU, a 5-port 10/100 fast Ethernet switch. Solution for low power, low-cost, and highly integrated AP router and consumer electronic devices, the module requires only an external 3.3V power supply. It supports 802.11n operating up to 144 Mbps for 20 MHz and 300 Mbps for 40 MHz channel respectively, and IEEE 802.11b/g data rates. The module supports bridge mode and AP Client mode and Gateway mode. The high performance Module can process advanced applications effortlessly, such as routing, security and VoIP. It also includes a selection of interface to support a variety of applications, such as a USB port for accessing external storage and 3G/TLE modem. Especially in the IOT, a wide range of applications.

2. Applications

- ◆ USB WiFi Camera
- ◆ IOT (internet of things)
- ◆ WiFi AP
- ◆ 3G/4G Wi-Fi Router
- ◆ WiFi Repeater
- ◆ Building Automation
- ◆ Home Automation
- ◆ Smart Home Gateway
- ◆ Industry Control



Figure 1: SKW92A Top View

3. Features

- ◆ Compliant to IEEE 802.11b/g/n.
- ◆ 2T2R mode with support for a 300Mbps PHY data rate.
- ◆ DDR2 memory up to 1024Mb.
- ◆ Flash memory up to 256Mb.
- ◆ 4 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, PCM, I2S(192K/24bits), PWM, SPI slave, UART lite, GPIO.
- ◆ Security: WEP64/128, TKIP, AES, WPA, WPA2, WAPI.
- ◆ Support AP/Client/Router mode.
- ◆ RoHS compliance meets environment-friendly requirement.
- ◆ Conform to FCC/CE/IC/RoHS certification standards.
- ◆ 40.5mm(L) x 25mm(W) x 3.0mm(H) dimension.

4. Application Block Diagram

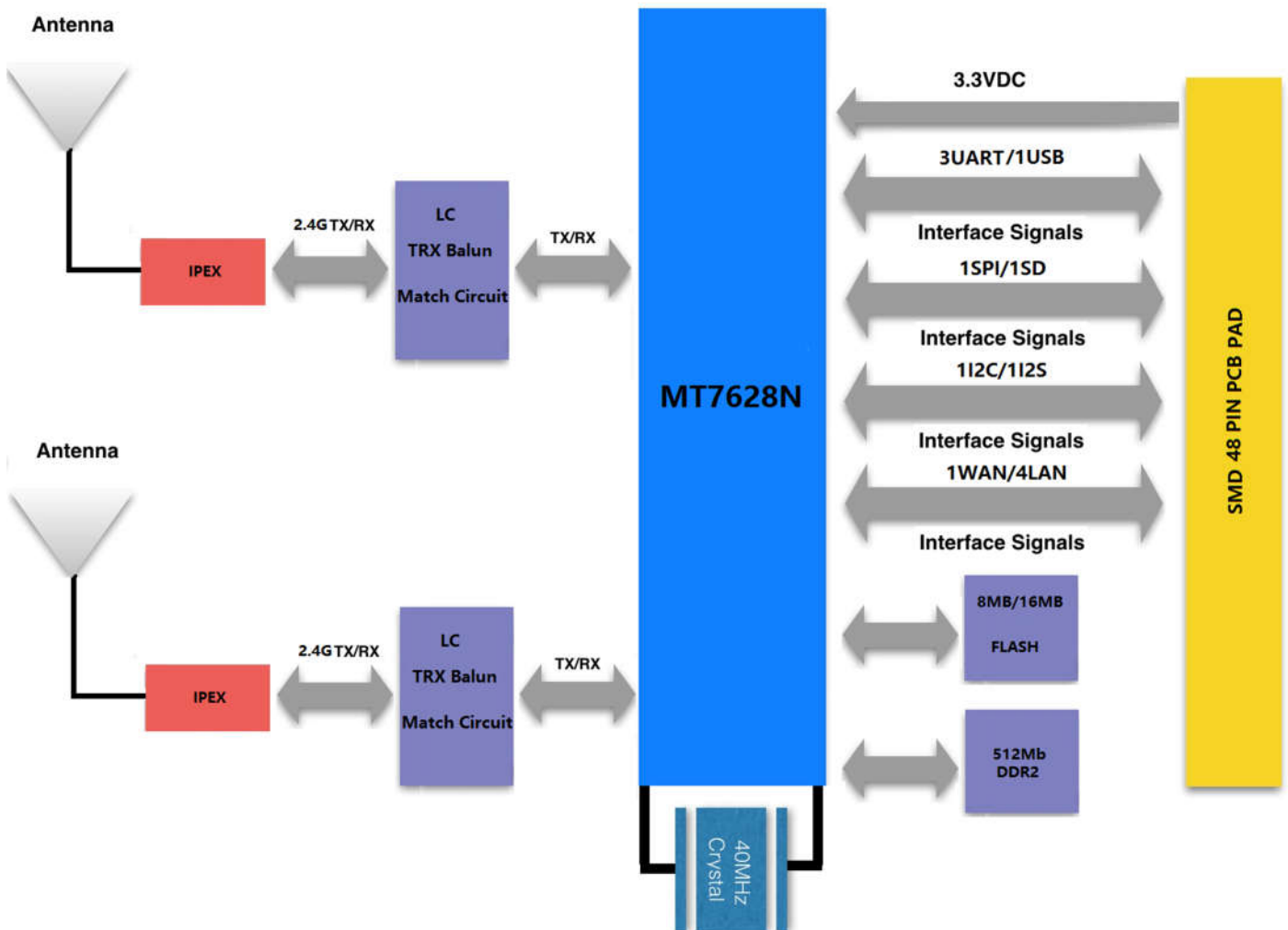


Figure 2: SKW92A Block Diagram

5. Interfaces

USB

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

I2C

| SKW92A Pin Number | Pin Name | GPIO(2'b01) | I2C(2'b00) |
|-------------------|----------|-------------|------------|
| 46 | I2C_SD | GPIO#05 | I2C_SD |
| 47 | I2C_CLK | GPIO#04 | I2C_CLK |

Table5-1: I2C pin share scheme

Note: Controlled by I2C_MODE register

SD

| SKW92A Pin Number | Pin Name(4'b0000) | GPIO(2'b01) | SD(2'b00) |
|-------------------|-------------------|-------------|-----------|
| 24 | LAN_PORT4_TX- | GPIO#29 | SD_D2 |
| 23 | LAN_PORT4_TX+ | GPIO#28 | SD_D3 |
| 22 | LAN_PORT4_RX- | GPIO#27 | SD_CMD |
| 21 | LAN_PORT4_RX+ | GPIO#26 | SD_CLK |
| 16 | LAN_PORT3_RX- | GPIO#25 | SD_D0 |
| 15 | LAN_PORT3_RX+ | GPIO#24 | SD_D1 |
| 14 | LAN_PORT3_TX- | GPIO#23 | SD_CD |
| 13 | 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)

| SKW92A Pin Number | Pin Name | GPIO(2'b01) | I2S(2'b00) | PCM(2'b10) |
|-------------------|----------|-------------|------------|------------|
| 44 | I2S_CLK | GPIO#03 | I2S_CLK | PCMFS |
| 42 | I2S_WS | GPIO#02 | I2S_WS | PCMCLK |
| 43 | I2S_SDO | GPIO#01 | I2S_SDO | PCMDTX |
| 41 | I2S_SDI | GPIO#0 | I2S_SDI | PCMDRX |

Table5-3: I2S/PCM pin share scheme

Note: Controlled by I2S_MODE register

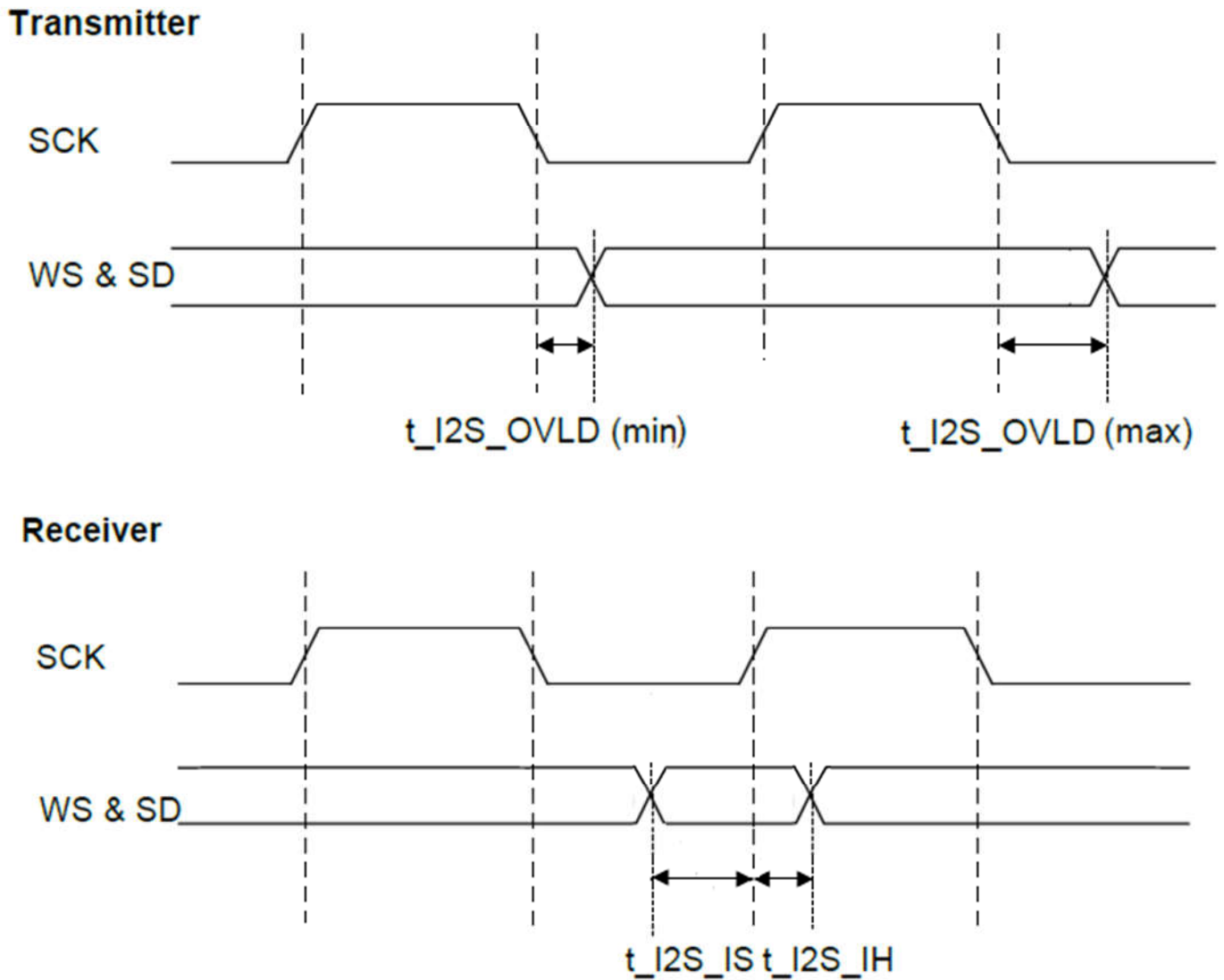


Figure 3: I2S Timing

| 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

PCM

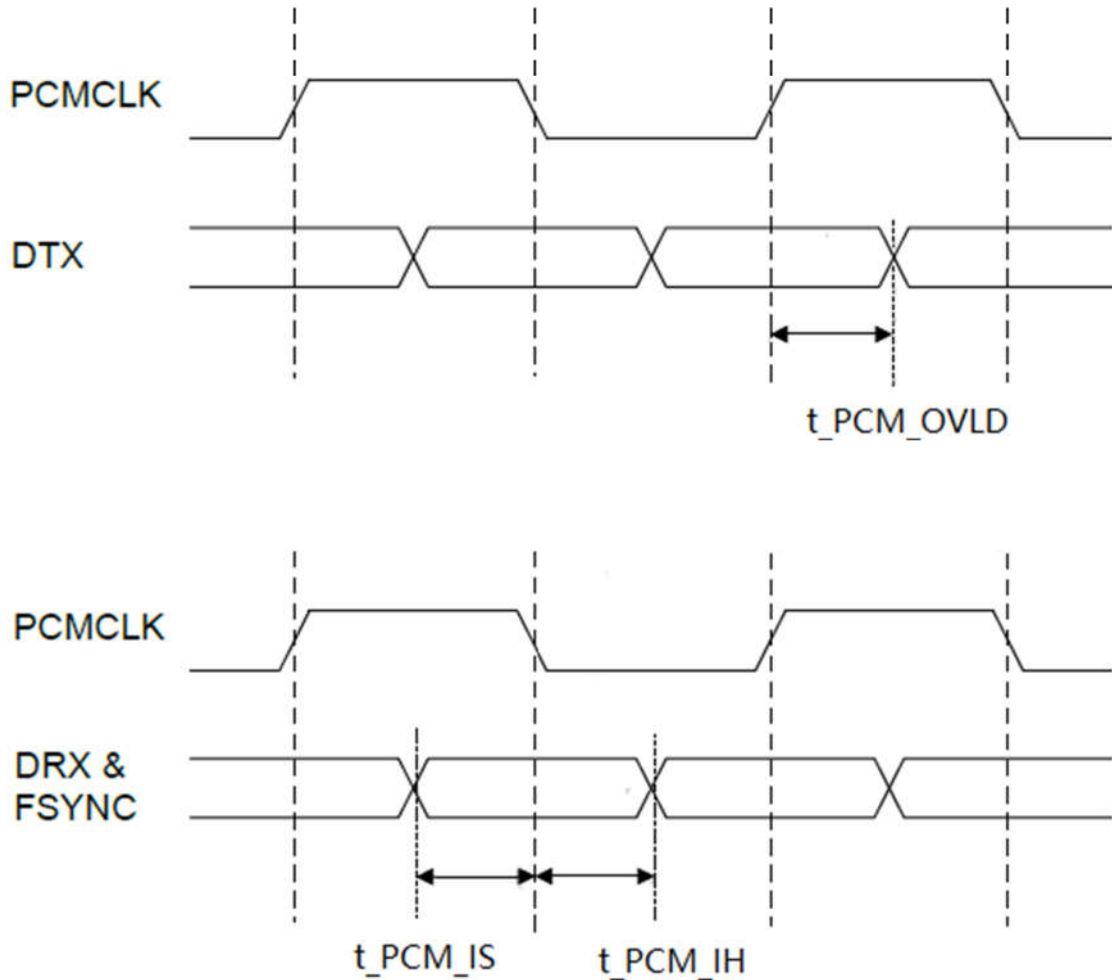


Figure 4: PCM Timing

| 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

| SKW92A Pin Number | Pin Name | GPIO | PWM | Pin Share |
|-------------------|---------------|---------|------|-----------|
| 10 | LAN_PORT2_RX- | GPIO#19 | PWM1 | SD_D6 |
| 9 | LAN_PORT2_RX+ | GPIO#18 | PWM0 | SD_D7 |

Table5-6: PWM pin share scheme

SPI slave

| SKW92A Pin Number | Pin Name(4'b0000) | GPIO(2'b01) | SPIS(2'b00) | 2'b11 |
|-------------------|-------------------|-------------|-------------|-----------|
| 8 | LAN_PORT1_RX- | GPIO#17 | SPIS_MOSI | UART_RXD2 |
| 7 | LAN_PORT1_RX+ | GPIO#16 | SPIS_MISO | UART_TXD2 |
| 6 | LAN_PORT1_TX- | GPIO#15 | SPIS_CLK | PWM_CH1 |
| 5 | LAN_PORT1_TX+ | GPIO#14 | SPIS_CS | PWM_CH0 |

Table5-7: SPIS pin share scheme

Note: Controlled by the EPHY_APGIO_AIO_EN[4:1] and SPIS_MODE register

UARTS lite

The module support 3UART:

| SKW92A Pin Number | Pin Name | GPIO | UART | Pin Share |
|-------------------|---------------|---------|-----------|------------------|
| 25 | UART_RXD0 | GPIO#13 | UART0_RXD | UART0(For Debug) |
| 26 | UART_TXD0 | GPIO#12 | UART0_TXD | |
| 38 | UART_RXD1 | GPIO#46 | UART1_RXD | PWM_CH1 |
| 37 | UART_TXD1 | GPIO#45 | UART1_TXD | PWM_CH0 |
| 12 | LAN_PORT2_TX- | GPIO#21 | UART2_RXD | PWM_CH3/SD_D4 |
| 11 | LAN_PORT2_TX+ | GPIO#20 | UART2_TXD | PWM_CH2/SD_D5 |

Table5-8: UART pin share scheme

GPIO

| SKW92A Pin Number | GPIO | Description | Share function |
|-------------------|---------|-------------|----------------|
| 38 | GPIO#46 | Uart1_RXD | UART1 |
| 37 | GPIO#45 | Uart1_TXD | |
| 36 | GPIO#44 | WLED_N | Wireless LED |
| 35 | GPIO#43 | P0_LED | Port LED |

| | | | |
|----|---------|---------------|---------------------|
| 34 | GPIO#42 | P1_LED | |
| 33 | GPIO#41 | P2_LED | |
| 32 | GPIO#40 | P3_LED | |
| 31 | GPIO#39 | P4_LED | |
| 39 | GPIO#38 | WDT_RST_N | WPS/Factory Setting |
| 40 | GPIO#37 | WPS_LED | WPS LED |
| 24 | GPIO#29 | MDI_TN_P4 | SD-XC |
| 23 | GPIO#28 | MDI_TP_P4 | |
| 22 | GPIO#27 | MDI_RN_P4 | |
| 21 | GPIO#26 | MDI_RP_P4 | |
| 16 | GPIO#25 | MDI_RN_P3 | |
| 15 | GPIO#24 | MDI_RP_P3 | |
| 14 | GPIO#23 | MDI_TN_P3 | |
| 13 | GPIO#22 | MDI_TP_P3 | |
| 12 | GPIO#21 | MDI_TN_P2 | UART2 |
| 11 | GPIO#20 | MDI_TP_P2 | |
| 10 | GPIO#19 | MDI_RN_P2 | PWM1 |
| 9 | GPIO#18 | MDI_RP_P2 | PWM0 |
| 8 | GPIO#17 | MDI_RN_P1 | SPIS |
| 7 | GPIO#16 | MDI_RP_P1 | |
| 6 | GPIO#15 | MDI_TN_P1 | |
| 5 | GPIO#14 | MDI_TP_P1 | |
| 25 | GPIO#13 | UART0_RXD | Uart0(For Debug) |
| 26 | GPIO#12 | UART0_TXD | |
| 48 | GPIO#11 | GPIO0 | GPIO0 |
| 46 | GPIO#05 | I2C_SD | I2C |
| 47 | GPIO#04 | I2C_CLK | |
| 44 | GPIO#03 | I2S_CLK/PCMFS | I2S/PCM |
| 42 | GPIO#02 | I2S_WS/PCMCLK | |

| | | | |
|----|---------|----------------|--|
| 43 | GPIO#01 | I2S_SDO/PCMDTX | |
| 41 | GPIO#0 | I2S_SDI/PCMDRX | |

Table5-9: GPIO pin share scheme

WAN/LAN

The SKW92A module integrates 5-port 10/100Mbps fast Ethernet switch.

6. Module Specifications

| Hardware Features | |
|----------------------|---|
| Model | SKW92A |
| Antenna Type | IPEX |
| Chipset solution | |
| Voltage | 3.3V±5% |
| Dimension(L×W×H) | 40.5mm*25.0mm*3.0mm |
| Wireless Features | |
| Wireless Standards | IEEE 802.11b/g/n |
| Frequency Range | 2.412GHz—2.484GHz |
| 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 |
| | MCS0--MCS7 @ HT40 |
| Receiver Sensitivity | HT40 MCS7 : -70dBm@10% PER(MCS7) |
| | HT20 MCS7 : -73dBm@10% PER(MCS7) |
| | 54M: -77dBm@10% PER |
| | 11M: -89dBm@ 8% PER |
| Modulation Technique | DSSS (DBPSK, DQPSK, CCK) |
| | OFDM (BPSK, QPSK, 16-QAM, 64-QAM) |
| Wireless Security | WPA/WPA2, WEP, TKIP and AES, WPS2.0, WAPI |
| Transmit Power | IEEE 802.11n: 16dBm @HT20/40 MCS7 |
| | IEEE 802.11g: 16dBm @54MHz |

| | |
|----------------------|--|
| | IEEE 802.11b: 18dBm @11MHz |
| Work Mode | Bridge/Gateway/AP Client |
| Others | |
| 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:

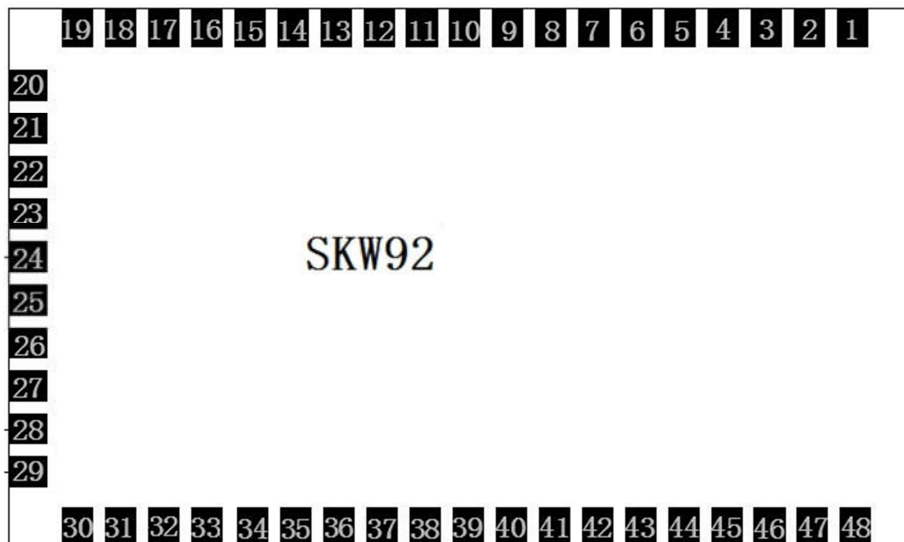


Figure 5: SKW92A Pin Package

Pin Description:

| Pin No. | Pin name | Description | Remark |
|---------|---------------|----------------------|---------------------------|
| 1 | WAN_PORT_RX+ | WAN port | WAN_RX+ |
| 2 | WAN_PORT_RX- | WAN port | WAN_RX- |
| 3 | WAN_PORT_TX+ | WAN port | WAN_TX+ |
| 4 | WAN_PORT_TX- | WAN port | WAN_TX- |
| 5 | LAN_PORT1_TX+ | Ethernet port1 | SPIS_CS / GPIO#14 / PWM0 |
| 6 | LAN_PORT1_TX- | Ethernet port1 | SPIS_CLK / GPIO#15 / PWM1 |
| 7 | LAN_PORT1_RX+ | Ethernet port1 | SPIS_MISO / GPIO#16 / |
| 8 | LAN_PORT1_RX- | Ethernet port1 | SPIS_MOSI / GPIO#17 / |
| 9 | LAN_PORT2_RX+ | Ethernet port2 | GPIO#18 / PWM0 / SD_D7 |
| 10 | LAN_PORT2_RX- | Ethernet port2 | GPIO#19 / PWM1 / SD_D6 |
| 11 | LAN_PORT2_TX+ | Ethernet port2 | GPIO#20 / PWM2 / |
| 12 | LAN_PORT2_TX- | Ethernet port2 | GPIO#21 / PWM3 / |
| 13 | LAN_PORT3_TX+ | Ethernet port3 | SD_WP / GPIO#22 |
| 14 | LAN_PORT3_TX- | Ethernet port3 | SD_CD / GPIO#23 |
| 15 | LAN_PORT3_RX+ | Ethernet port3 | SD_D1 / GPIO#24 |
| 16 | LAN_PORT3_RX- | Ethernet port3 | SD_D0 / GPIO#25 |
| 17 | GND | Ground | GND |
| 18 | USB+ | USB data pin Data+ | USB_D+ |
| 19 | USB- | USB data pin Data- | USB_D- |
| 20 | GND | Ground | GND |
| 21 | LAN_PORT4_RX+ | Ethernet port4 | SD_CLK / GPIO#26 |
| 22 | LAN_PORT4_RX- | Ethernet port4 | SD_CMD/ GPIO#27 |
| 23 | LAN_PORT4_TX+ | Ethernet port4 | SD_D3 / GPIO#28 |
| 24 | LAN_PORT4_TX- | Ethernet port4 | SD_D2 / GPIO#29 |
| 25 | UART_RXD0 | UART0 only for debug | UART0_RX / GPIO#13 |
| 26 | UART_TXD0 | UART0 only for debug | UART0_TX / GPIO#12 / O, |
| 27 | GND | Ground | GND |

| | | | |
|----|-----------|---------------------|--------------------------|
| 28 | 3.3VD | 3.3V input 1000mA | +3.3V |
| 29 | 3.3VD | 3.3V input 1000mA | +3.3V |
| 30 | GND | Ground | GND |
| 31 | P4_LED | LAN_PORT4_LED | P4_LED_N / GPIO#39 |
| 32 | P3_LED | LAN_PORT3_LED | P3_LED_N / GPIO#40 |
| 33 | P2_LED | LAN_PORT2_LED | P2_LED_N / GPIO#41 |
| 34 | P1_LED | LAN_PORT1_LED | P1_LED_N / GPIO#42 |
| 35 | P0_LED | WAN_PORT_LED | P0_LED_N / GPIO#43 |
| 36 | WLED_N | Wireless LED | WLED_N / GPIO#44 |
| 37 | UART_TXD1 | UART1 Serial Data | UART1_TXD / GPIO#45 / O, |
| 38 | UART_RXD1 | UART 1 Serial Data | UART1_RXD / GPIO#46 |
| 39 | WDT_RST_N | WPS/Factory | WDT_RST_N / I2S_MCLK / |
| 40 | WPS_LED | WPS_LED | WPS_LED_N / GPIO#37 |
| 41 | I2S_DI | I2S data input | I2S_SDI/GPIO#0/PCMDRX |
| 42 | I2S_WS | I2S word select | I2S_WS/GPIO#2/PCMCLK |
| 43 | I2S_DO | I2S data output | I2S_SDO |
| 44 | I2S_CLK | I2S clock | I2S_CLK/GPIO#3/PCMFS |
| 45 | HW_RESET | Power on reset | HW_RESET_N# |
| 46 | I2C_SD | I2C Data | I2C_SDA(PU 2K2) / GPIO#5 |
| 47 | I2C_SCLK | I2C clock | I2C_SCL(PU 2K2) / GPIO#4 |
| 48 | GPIO0 | General Purpose I/O | POWER_ON# / GPIO#11/IPD |

8. PCB Footprint and Dimensions

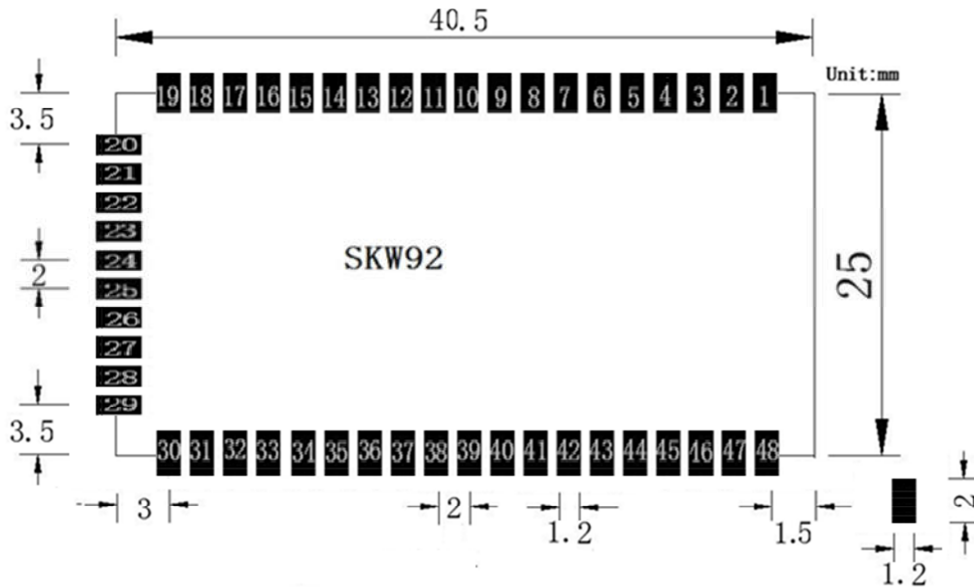


Figure 6: SKW92A Recommend PCB Footprint

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

b) Recommended Operation Ratings

| Parameter | Symbol | Minimum | Typical | Maximum | Unit |
|--------------------|----------|---------|---------|---------|------|
| Extended temp. | 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 | Current (Max.)@3.3V |
|--|---------------------|---------------------|
| Standby | 180 mA | 210 mA |
| Transmit (2.4g; +15 dBm @ TX HT20) | 400 mA | |
| Transmit (2.4g; +18 dBm @ 11b 11Mbps.) | 650 mA | 850 mA |

Table9-3: Power Consumption in Different States

10. Manufacturing Process Recommendations

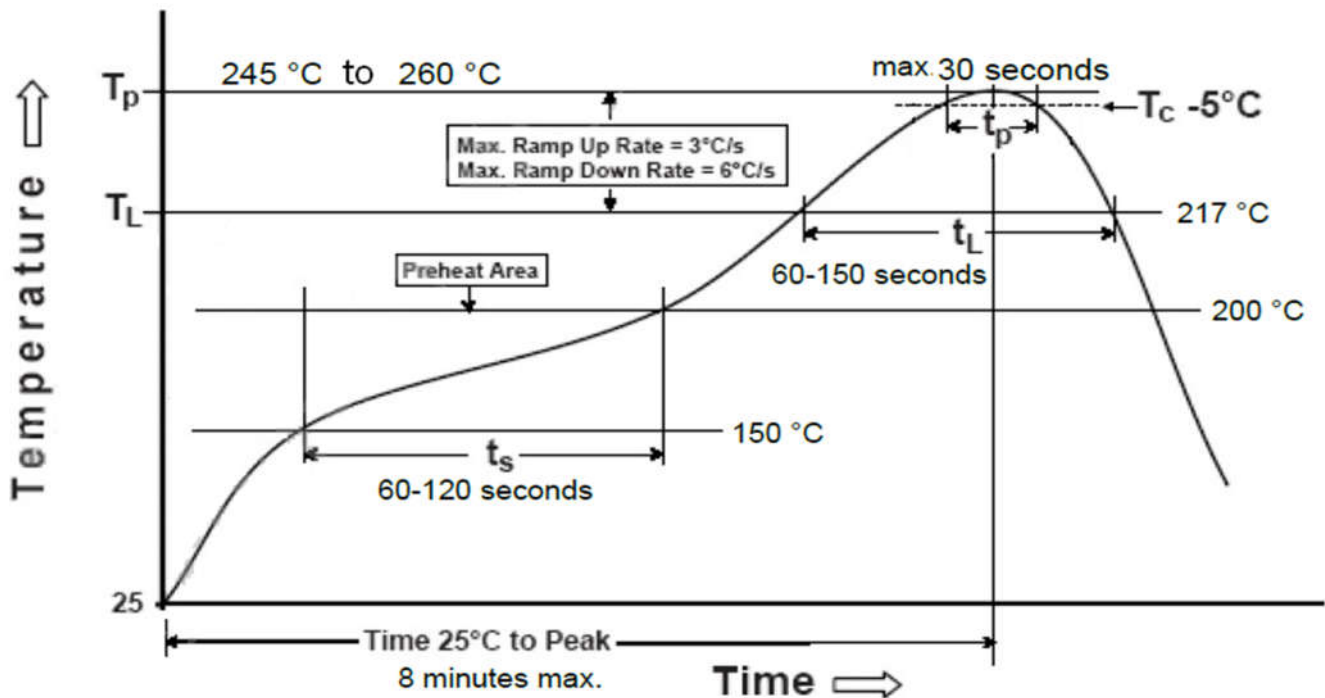


Figure 7: SKW92ATypical Lead-free Soldering Profile

Note : The final soldering temperature chosen at the factory depends on additional external factors like choice of soldering paste , size , thickness and properties of the baseboard , etc. Exceeding the maximum soldering temperature in the recommended soldering profile may permanently damage the module.

11. Ordering Information

| Module No. | SPI Flash Size | DDR2 Size |
|-------------|----------------|------------|
| SKW92A_E8 | 8M Bytes | 512M bits |
| SKW92A_E16 | 16M Bytes | 512M bits |
| SKW92A_E325 | 32M Bytes | 512M bits |
| SKW92A_E321 | 32M Bytes | 1024M bits |

12. Contact Information

Skylab M&C Technology Co., Ltd.

深圳市天工测控技术有限公司

Address: 6 Floor, No.9 Building, Lijincheng Scientific & Technical park, Gongye East Road,
Longhua District, Shenzhen, Guangdong, China

Phone: 86-755 8340 8210 (Sales Support)

Phone: 86-755 8340 8510 (Technical Support)

Fax: 86-755-8340 8560

E-Mail: sales1@skylab.com.cn

Website: www.skylab.com.cn www.skylabmodule.com