# DB3020

# DB3020 Module Specification 1.0.2



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[DB-xxxxxxx] ([Development Status][x]), ref [DB-yyyyyyy] ([Development Status][y])

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# Revision History

| Issue No. | Issue Date | Details of Change |
|---|---|---|
| 1.0.1 | 2016.4.12 | Initialization |
| 1.0.2 | 2016.10.31 | Update PIN definition; Remove application circuits |

# Table of Contents

# 1 DESCRIPTION

DB3020 is a highly integrated single-chip router module. It combines an MIPS 24Kc MCU, WLAN MAC, a 2T2R capable WLAN baseband, and RF in a single chip. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

DB3020 integrates internal memories for complete WiFi protocol functions. The optional DDR memory and Flash rom configuration also provides customize application development.

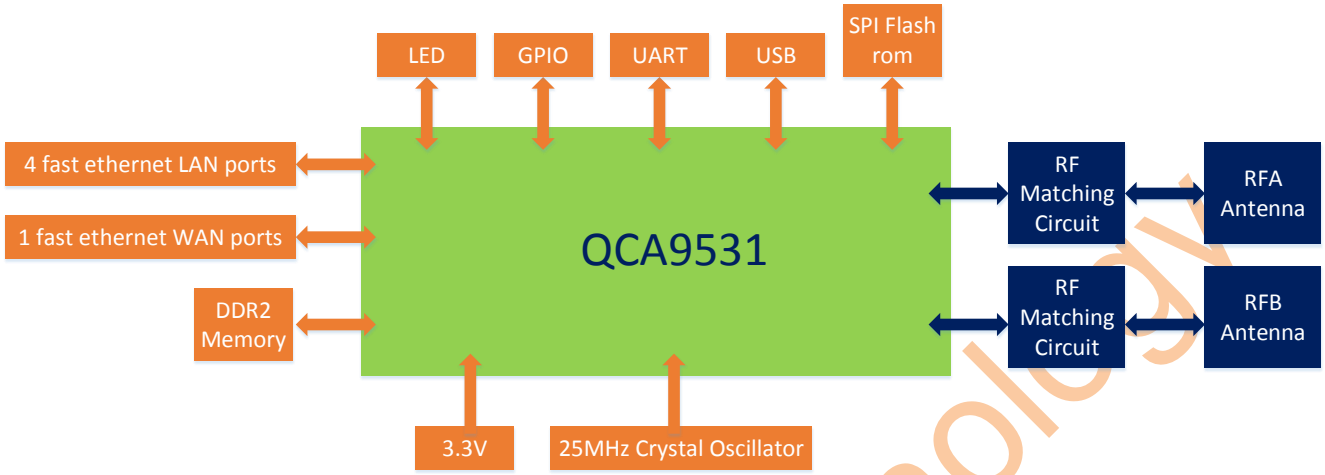
## 2 FEATURES

- Operates in 2.4 GHz frequency bands
- 2T2R MIMO technology improves effective throughput and range over existing 802.11 b/g products
- Data rates: 2T2R up to 300Mbps.
- DDR2 memory up to 1Gb.
- Flash memory up to 128Mb.
- BPSK, QPSK, 16 QAM, 64 QAM modulation schemes.
- WEP64/128, TKIP, and AES, WPA, WPA2, WAPI hardware encryption schemes
- 4 LAN ports and 1 WAN port.
- High-speed UART for console support.
- USB 2.0 host/device mode support.
- GPIO/LED support.
- RoHS compliance.

## 3 APPLICATION

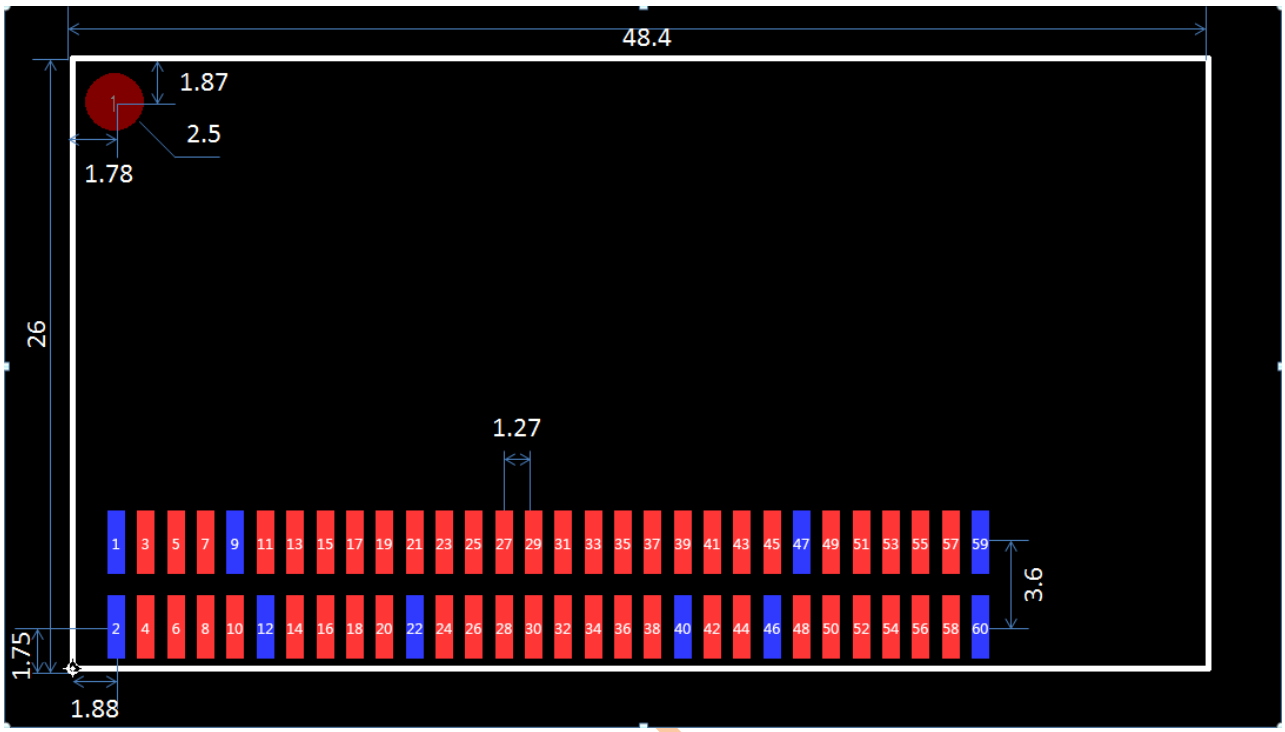
- Smart home automation
- Internet of things
- Mini Router

# 4 FUNCTIONAL BLOCK DIAGRAM




Block Diagram

## 5 PIN ASSIGNMENT (BOTTOM VIEW)



# 6 PIN DEFINITION

| Pin | Signal | Input /Output | Description |
|---|---|---|---|
| 1 | GND | Power | Ground |
| 2 | GND | Power | Ground |
| 3 | LAN_PORT3_LED | Output | LAN Port 3 LED |
| 4 | LAN_PORT1_RXP | Input | Ethernet LAN Port 1 |
| 5 | LAN_PORT2_LED | Output | LAN Port 2 LED |
| 6 | LAN_PORT1_RXN | Input | Ethernet LAN Port 1 |
| 7 | LAN_PORT1_LED | Output | **LAN Port 1 LED**[1] |
| 8 | LAN_PORT1_TXP | Output | Ethernet LAN Port 1 |
| 9 | GND | Power | GPIOE and GPIOC group IO power |
| 10 | LAN_PORT1_TXN | Output | Ethernet LAN Port 1 |
| 11 | LAN_PORT0_TXP | Output | Ethernet LAN Port 0 |
| 12 | GND | Power | Ground |
| 13 | LAN_PORT0_TXN | Output | Ethernet LAN Port 0 |
| 14 | LAN_PORT2_TXP | Output | Ethernet LAN Port 2 |
| 15 | LAN_PORT0_RXP | Input | Ethernet LAN Port 0 |
| 16 | LAN_PORT2_TXN | Output | Ethernet LAN Port 2 |
| 17 | LAN_PORT0_RXN | Input | Ethernet LAN Port 0 |
| 18 | LAN_PORT2_RXP | Input | Ethernet LAN Port 2 |
| 19 | VDD33 | Power | 3.3V DC Power Input |
| 20 | LAN_PORT2_RXN | Input | Ethernet LAN Port 2 |
| 21 | VDD33 | Power | 3.3V DC Power Input |
| 22 | GND | Power | Ground |
| 23 | GPIO0 | I/O | General Purpose I/O |
| 24 | WAN_PORT_RXP | Input | Ethernet WAN Port |
| 25 | GPIO1 | I/O | General Purpose I/O |
| 26 | WAN_PORT_RXN | Input | Ethernet WAN Port |
| 27 | GPIO2 | I/O | General Purpose I/O |
| 28 | WAN_PORT_TXP | Output | Ethernet WAN Port |
| 29 | NC | NC | Should be floating |
| 30 | WAN_PORT_TXN | Output | Ethernet WAN Port |
| 31 | NC | NC | Should be floating |
| 32 | LAN_PORT3_RXP | Input | Ethernet LAN Port 3 |
| 33 | NC | NC | Should be floating |
| 34 | LAN_PORT3_RXN | Input | Ethernet LAN Port 3 |
| 35 | USB_DP | I/O | USB Function |
| 36 | LAN_PORT3_TXP | Output | Ethernet LAN Port 3 |
| 37 | USB_DN | I/O | USB Function |
| 38 | LAN_PORT3_TXN | Output | Ethernet LAN Port 3 |

| | | | |
|---|---|---|---|
| 39 | SYS_LED | Output | **SYSTEM LED**[2] |
| 40 | GND | Power | Ground |
| 41 | VDD25_O | Power | I/O Voltage Output |
| 42 | VDD20_O | Power | I/O Voltage Output for Ethernet transformer |
| 43 | RESET | Input | Hardware reset pin |
| 44 | VDD20_O | Power | I/O Voltage Output for Ethernet transformer |
| 45 | GPIO17_BUTTON | Input | GPIO17 for Button Function |
| 46 | GND | Power | Ground |
| 47 | GND | Power | Ground |
| 48 | NC | NC | Should be floating |
| 49 | VDD33 | Power | 3.3V DC Power Input |
| 50 | NC | NC | Should be floating |
| 51 | VDD33 | Power | 3.3V DC Power Input |
| 52 | NC | NC | Should be floating |
| 53 | WAN_LED | Output | **WAN Port LED**[3] |
| 54 | LAN_PORT0_LED | Output | **LAN Port 0 LED**[4] |
| 55 | NC | NC | Should be floating |
| 56 | WLAN_LED | Output | WIFI LED |
| 57 | UART_RX | Input | UART Data Input |
| 58 | UART_TX | Output | **UART Data Output**[5] |
| 59 | GND | Power | Ground |
| 60 | GND | Power | Ground |

**Note:**

**[1] Has been pulled down in module, do not pull up**

**[2] Should be pulled down by customer, if need to enable USB Host Mode.**

**[3] Has been pulled down in module, do not pull up**

**[4] Has been pulled up in module, do not pull down**

**[5] Has been pulled down in module, do not pull up**

# 7 GENERAL RF GUIDELINES

Follow these steps for optimal performance.

- The RF trace impedance should be controlled under 50 ohm.
- The length of RF trace should be minimized.
- Route traces on the top layer as much as possible and use a continuous reference ground plane underneath them.
- DO NOT route any digital or analog signal traces cross the RF traces and clearance area.
- Please have an excellent ground contact in clearance area.
- DO NOT put any metal shielding in the surrounding area of module and try to leave the module placed in the corner of chassis board as close as possible.

# 8 FUNCTIONAL SPECIFICATION

| | |
|---|---|
| **Product Description** | |
| **WLAN Standard** | IEEE802.11b/g/n, Wi-Fi compliant |
| **Main Chip** | DB3050 |
| **Interface** | SPI,UART,USB,GPIO |
| **Antenna** | I-PEX Connector |
| **Dimension** | 26.0mm x 48.4mm |
| **Package** | 60 Pins connector module |
| **Electrical Specifications** | |
| **Frequency Range** | 2.412 to 2.484 GHz |
| **Data Rate** | 802.11b: 11, 5.5, 2, 1 Mbps DSSS<br>802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps OFDM<br>802.11n: HT20 MCS0~7, HT40 MCS0~7 |
| **Modulation Technique** | 802.11b: CCK, DQPSK, DBPSK<br>802.11g: 64 QAM, 16 QAM, QPSK, BPSK<br>802.11n: BPSK, QPSK, 16-QAM, 64-QAM |
| **Operational Channel** | **2.4GHz:**<br>11: (Ch. 1-11) – United States<br>13: (Ch. 1-13) – Europe<br>14: (Ch. 1-14) – Japan |
| **Security** | WPA, WPA2, TKIP, AES, WAPI, WEP 64bit & 128bit, IEEE 802.11x, IEEE 802.11i |
| **Operating Voltage** | 3.3V |

# 9 TEMPERATURE LIMIT RATINGS

| Parameter | Min. | Max. | Units |
|---|---|---|---|
| Storage Temperature | -40 | +100 | $^{o}$C |
| Ambient Operating Temperature | -30 | +70 | $^{o}$C |

## 10 ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| VDD | Module power supply | -0.3 to 3.6 | V |

## 11 RECOMMENDED OPERATING RANGE

| Symbol | Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| VDD | Module power supply | 3.0 | 3.3 | 3.6 | V |

## 12 RF CHARACTERISTICS

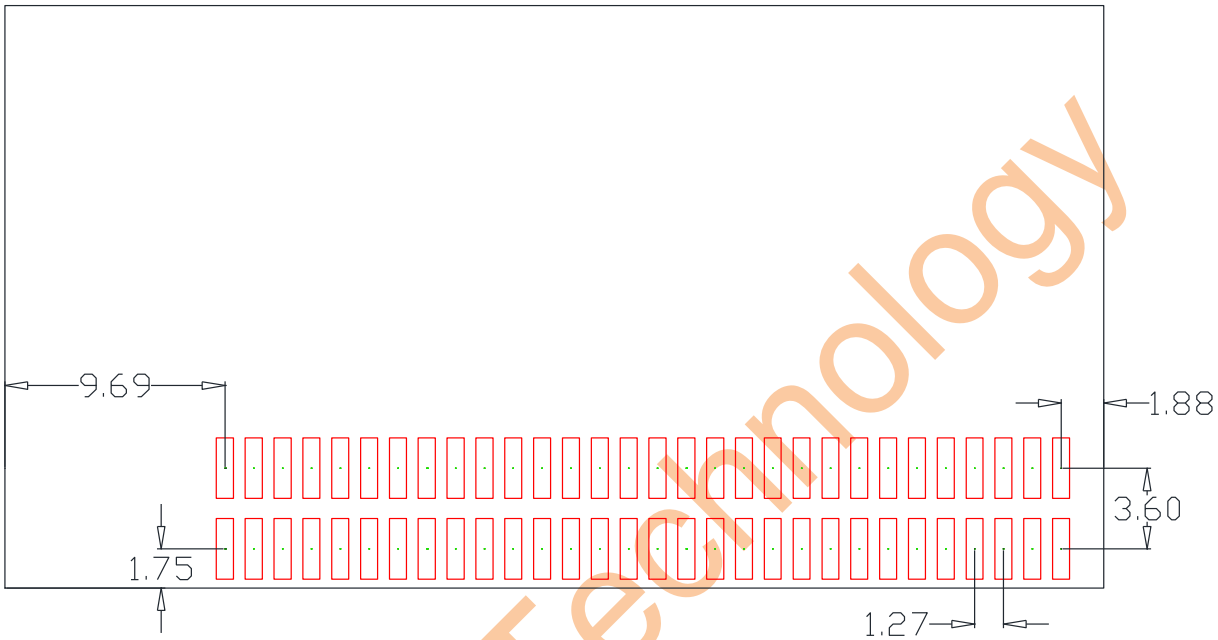
| Parameter | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Frequency Range | | 2412 | 2442 | 2484 | MHz |
| Output Power | 802.11b, 1~11Mbps DSSS | | 17 | | dBm |
| | 802.11g, 6~54Mbps OFDM | | 15 | | dBm |
| | 802.11n, HT20 MCS0~7 | | 13 | | dBm |
| | 802.11n, HT40 MCS0~7 | | 13 | | dBm |
| TX Power Accuracy | | | ±1.5 | | dBm |
| RX Sensitivity | 1 Mbps DSSS | | | | dBm |
| | 2 Mbps DSSS | | | | dBm |
| | 5.5 Mbps DSSS | | | | dBm |
| | 11 Mbps DSSS | -76 | | | dBm |
| RX Sensitivity | 6 Mbps OFDM | -82 | | | dBm |
| | 9 Mbps OFDM | | | | dBm |
| | 12 Mbps OFDM | | | | dBm |
| | 18 Mbps OFDM | | | | dBm |
| | 24 Mbps OFDM | | | | dBm |
| | 36 Mbps OFDM | | | | dBm |
| | 48 Mbps OFDM | | | | dBm |
| | 54 Mbps OFDM | -65 | | | dBm |
| RX Sensitivity BW=20MHz Green Field 800nS Guard Interval Non-STBC | MCS 0 | -82 | | | dBm |
| | MCS 1 | | | | dBm |
| | MCS 2 | | | | dBm |
| | MCS 3 | | | | dBm |
| | MCS 4 | | | | dBm |
| | MCS 5 | | | | dBm |
| | MCS 6 | | | | dBm |
| | MCS 7 | -64 | | | dBm |
| RX Sensitivity BW=40MHz Green Field 800nS Guard Interval Non-STBC | MCS 0 | -79 | | | dBm |
| | MCS 1 | | | | dBm |
| | MCS 2 | | | | dBm |
| | MCS 3 | | | | dBm |
| | MCS 4 | | | | dBm |
| | MCS 5 | | | | dBm |
| | MCS 6 | | | | dBm |
| | MCS 7 | -61 | | | dBm |

## 13 POWER CONSUMPTION CHARACTERISTICS

| Description | Performance | |
|---|---|---|
| | TYP | UNITS |
| STA mode, unassociated Idle | TBD | mA |
| AP mode, unassociated Idle | TBD | mA |
| Tx mode, HT40, MCS 7 @ 13dBm | TBD | mA |
| Tx mode, HT20, MCS 7 @ 13dBm | TBD | mA |
| Tx mode, OFDM, 54M @ 14 dBm | TBD | mA |
| Tx mode, CCK, 11M @ 16 dBm | TBD | mA |
| Rx mode, Continuous Rx | TBD | mA |

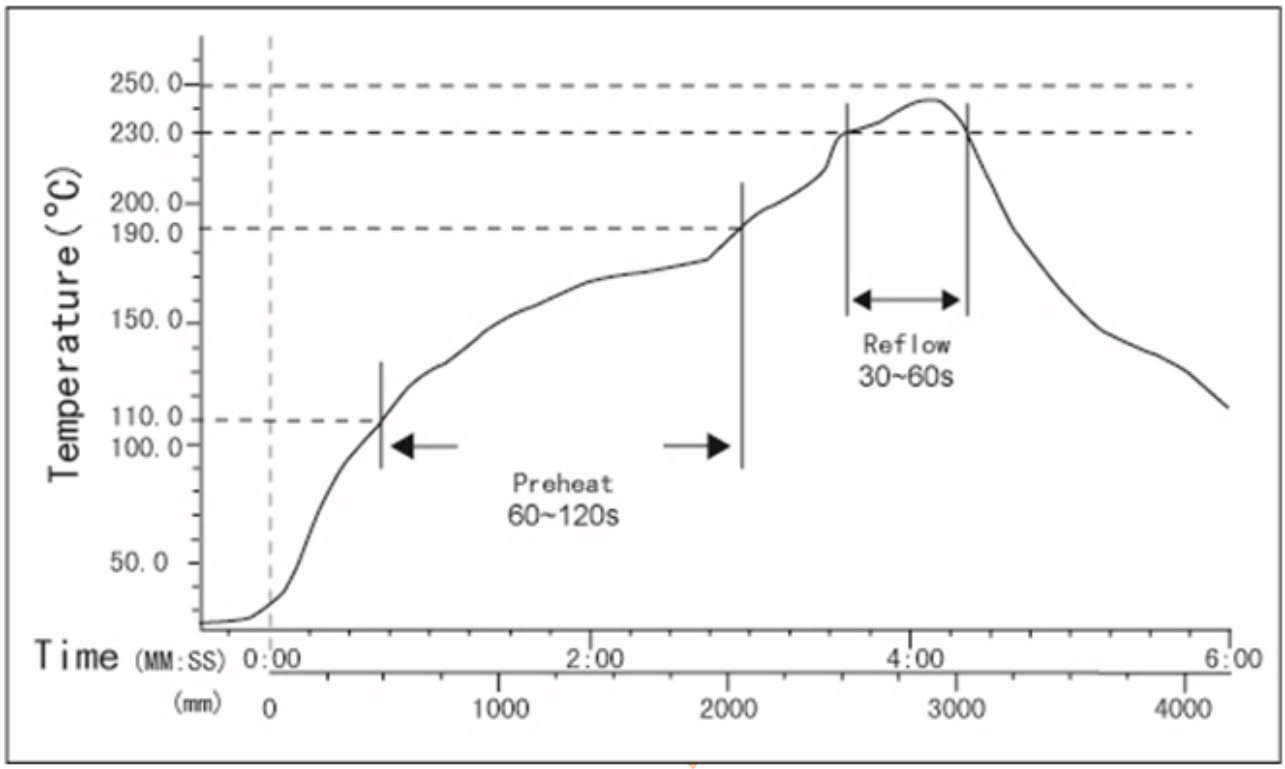
## 14 LAYOUT DESIGN GUIDE

The recommended layout pads for module are shown below. (module Bottom view)




All dimensions are in millimeters.
Tolerance: +- 0.1mm

## 15 REFERENCE TEMPERATURE REFLOW CHART




Note:

1. If the system PCBA is double side design please reflow the side without this module first.
2. Don't let the solder machine temperature over 250℃ or follow solder paste vender's recommended temperature.
3. The Ramp-up temperature speed is 1~4 °C per second, the Ramp-down temperature speed is 1~4 °C per second.
4. This temperature reflow chart is for reference only, it depends on the manufaturing machine's characters requirement.