



*everyday genius*

# MT7628 DATASHEET

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## Overview

The MT7628 router-on-a-chip includes an 802.11n MAC and baseband, a 2.4 GHz radio and FEM, a 580 MHz MIPS® 24K™ CPU core, a 5-port 10/100 fast ethernet switch. The MT7628 includes everything needed to build an AP router from a single chip. The embedded high performance CPU can process advanced applications effortlessly, such as routing, security and VoIP. The MT7628 also includes a selection of interfaces to support a variety of applications, such as a USB port for accessing external storage.

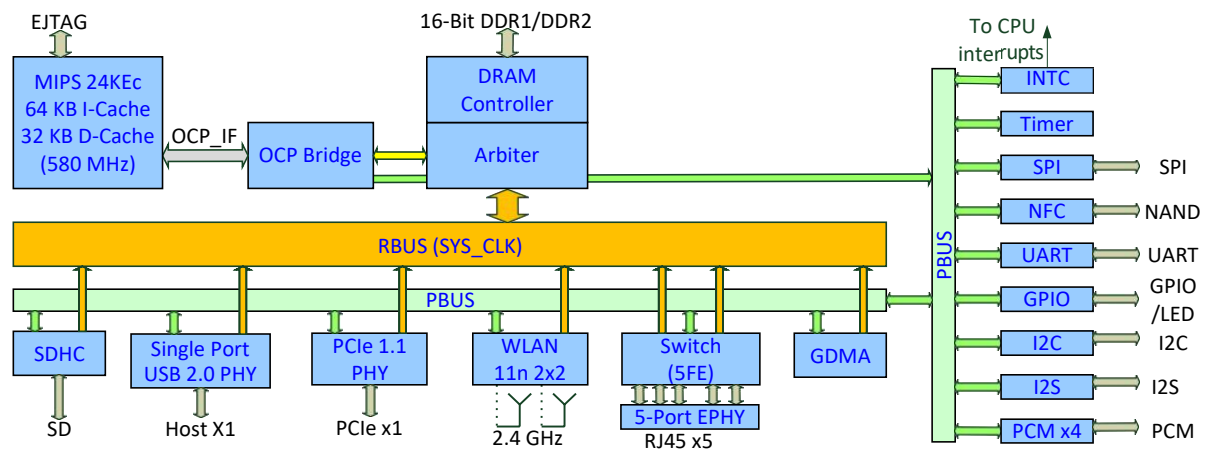
### Applications:

- Routers
- NAS devices
- Dual band concurrent routers

## Features

- Embedded MIPS24KEc (580 MHz) with 64 KB I-Cache and 32 KB D-Cache
- 2T2R 2.4 GHz with 300 Mbps PHY data rate
- Legacy 802.11b/g and HT 802.11n modes
- 20/40 MHz channel bandwidth
- Legacy 802.11b/g and HT 802.11n modes
- Reverse Data Grant (RDG)
- Maximal Ratio Combining (MRC)
- Space Time Block Coding (STBC)
- MCM 8 Mbytes DDR1 KGD (MT7628KN)
- 16-bit DDR1/2 up to 128/256 Mbytes (MT7628NN/KN)
- SPI/SD-XC/eMMC
- x1 USB 2.0 Host, x1 PCIe Root Complex
- 5-port 10/100 FE PHY
- Internet Of Thing
- An optimized PMU
- Green AP
  - Intelligent Clock Scaling (exclusive)
  - DDRII: ODT off, Self-refresh mode
- I2C, I2S, SPI, PCM, UART, JTAG, GPIO
- 16 Multiple BSSID
- WEP64/128, TKIP, AES, WPA, WPA2, WAPI
- QoS: WMM, WMM-PS
- WPS: PBC, PIN
- Voice Enterprise: 802.11k+r
- AP Firmware: Linux 2.6 SDK, eCOS with IPv6

## Functional Block Diagram



## Ordering Information

| Part Number | Package<br>(Green/RoHS Compliant) |
|-------------|-----------------------------------|
| MT7628NN    | DR-QFN 156 pin<br>(12 mm x 12 mm) |
| MT7628KN    | DR-QFN 120 pin<br>(10 mm x 10 mm) |

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## 1. Main Features

The following table covers the main features offered by the MT7628KN and MT7628NN. Overall, the MT7628KN supports the requirements of an entry-level AP/router, while the more advanced MT7628NN supports a number of interfaces together with a large maximum RAM capacity.

| Features                         | MT7628KN                                                 | MT7628NN                                                 |
|----------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| <b>CPU</b>                       | MIPS24KEc (580 MHz)                                      | MIPS24KEc (580 MHz)                                      |
| <b>Total DMIPs</b>               | 580 x 1.6 DMIPs                                          | 580 x 1.6 DMIPs                                          |
| <b>I-Cache, D-Cache</b>          | 64 KB, 32 KB                                             | 64 KB, 32 KB                                             |
| <b>L2 Cache</b>                  | n/a                                                      | n/a                                                      |
| <b>Memory</b>                    |                                                          |                                                          |
| <b>DRAM Device width support</b> | 16 bits                                                  | 16 bits                                                  |
| <b>DDR1</b>                      | 64 Mb (MCM), 193 MHz                                     | 2 Gb, 193 MHz                                            |
| <b>DDR2</b>                      | n/a                                                      | 2 Gb, 193 MHz                                            |
| <b>SPI Flash</b>                 | 3B addr mode (max 128Mbit)<br>4B addr mode (max 512Mbit) | 3B addr mode (max 128Mbit)<br>4B addr mode (max 512Mbit) |
| <b>SD</b>                        | n/a                                                      | SD-XC (class 10)                                         |
| <b>RF</b>                        | 2T2R 802.11n 2.4 GHz                                     | 2T2R 802.11n 2.4 GHz                                     |
| <b>PCIe</b>                      | 1                                                        | 1                                                        |
| <b>USB 2.0</b>                   | 1                                                        | 1                                                        |
| <b>Switch</b>                    | 5p FE SW                                                 | 5p FE SW                                                 |
| <b>I2S</b>                       | 1                                                        | 1                                                        |
| <b>PCM</b>                       | 1                                                        | 1                                                        |
| <b>I2C</b>                       | 1                                                        | 1                                                        |
| <b>UART</b>                      | 2 (Lite)                                                 | 2 (Lite)                                                 |
| <b>JTAG</b>                      | 1                                                        | 1                                                        |
| <b>Package</b>                   | DR-QFN120- 10 mm x 10 mm                                 | DR-QFN156- 12 mm x 12 mm                                 |

Table 1-1 Main Features

## 2. Pins

### 2.1 MT7628NN DR-QFN (12 mm x 12 mm) 156-Pin Package Diagram

#### 2.1.1 Up-left side

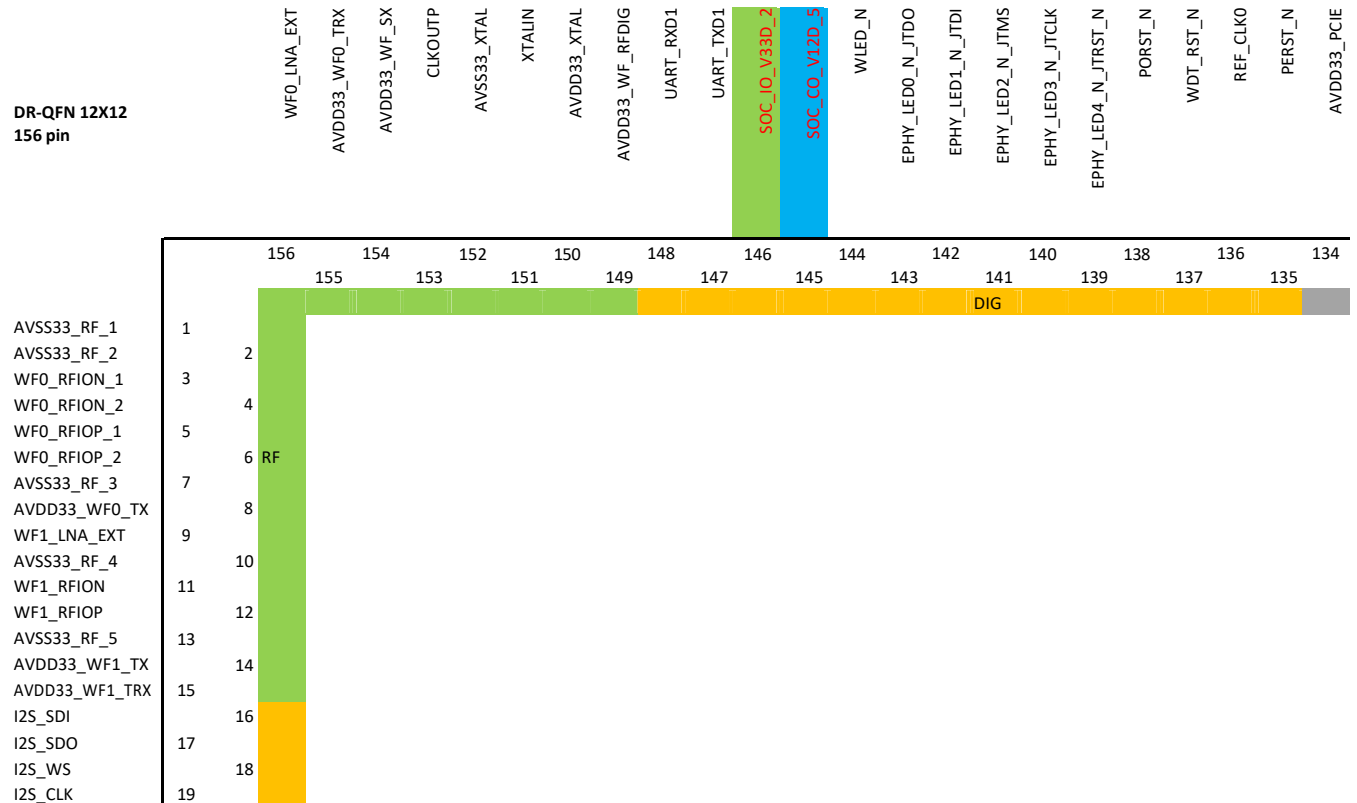


Figure 2-1 MT7628NN DR-QFN Pin Diagram (up-left view)

### 2.1.2 Down-left side

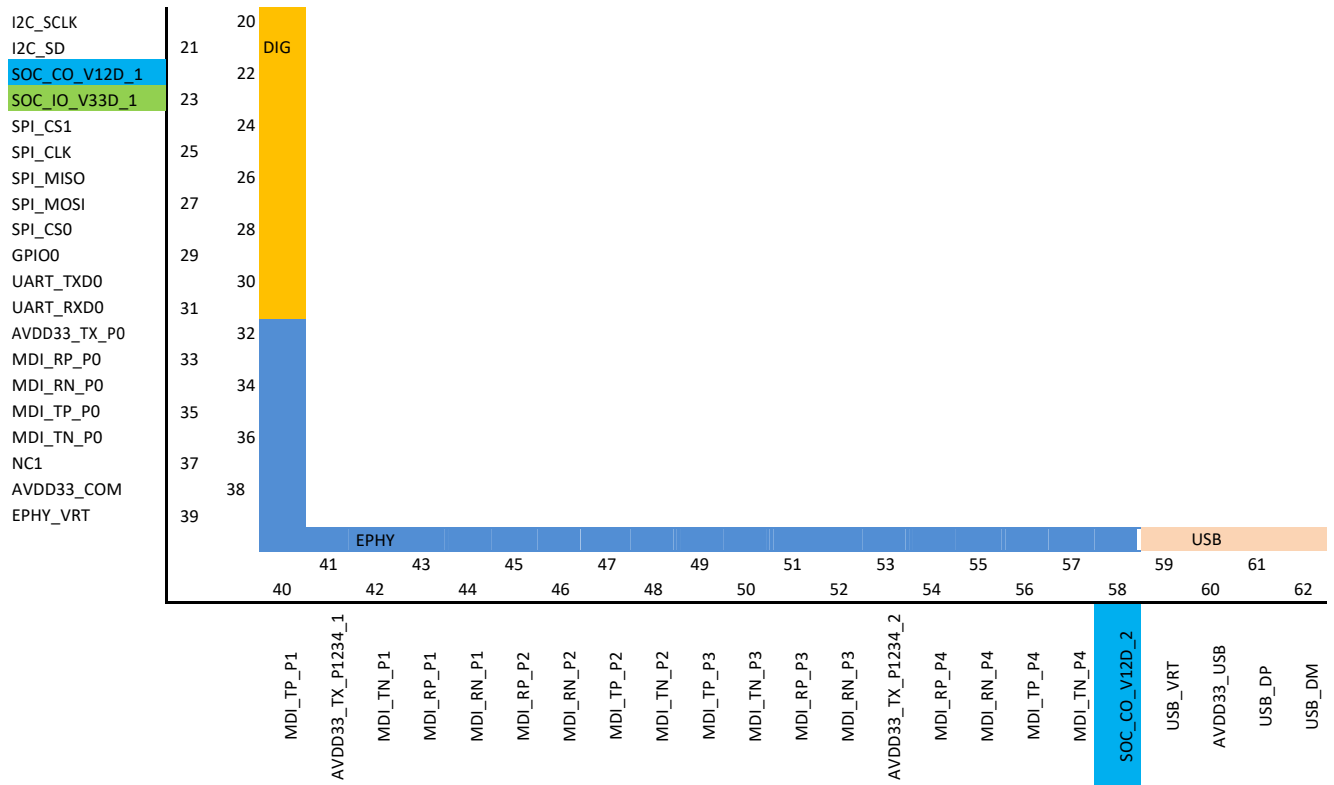


Figure 2-2 MT7628NN DR-QFN Pin Diagram (down-left view)

### 2.1.3 Down-right side

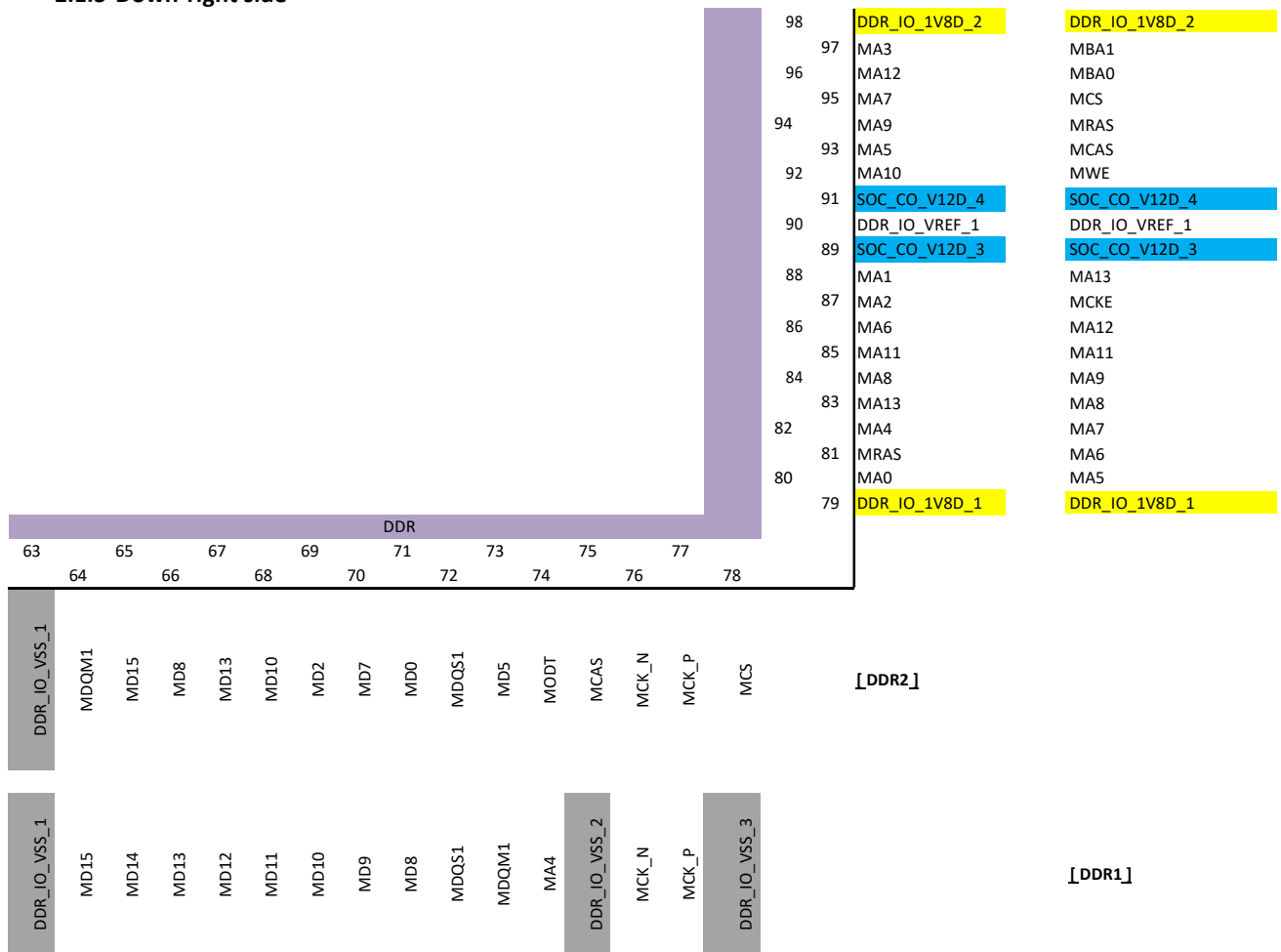


Figure 2-3 MT7628NN DR-QFN Pin Diagram (down-right view)

Note: DR-QFN support DDR1 and DDR2 pin shuffle depend on the bootstrap.

### 2.1.4 Up-right side

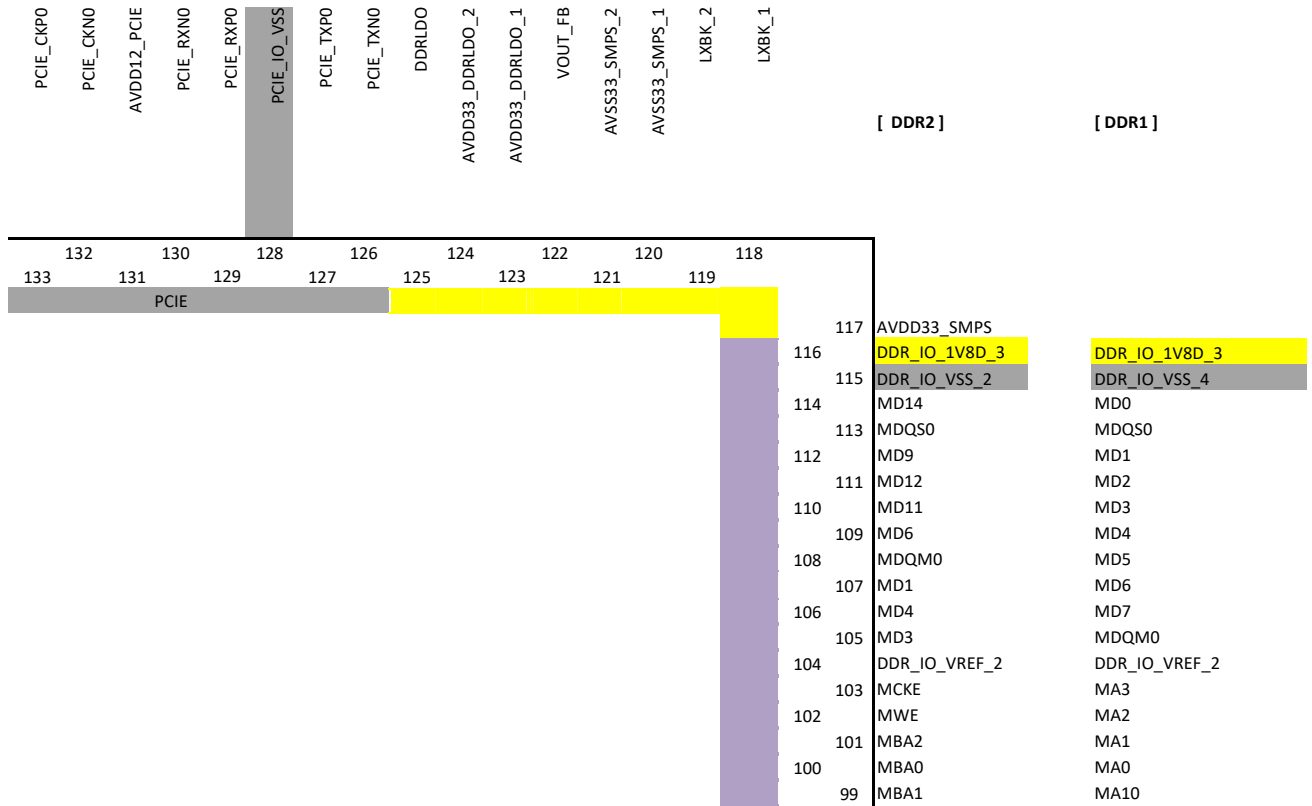


Figure 2-4 MT7628NN DR-QFN Pin Diagram (up-right view)

### 2.1.5 Pin Description

| Pins              | Name                       | Type     | Driv. | Description                               |
|-------------------|----------------------------|----------|-------|-------------------------------------------|
| <b>RF</b>         |                            |          |       |                                           |
| 3,4               | WF0_RFION_1<br>WF0_RFION_2 | A        |       | WF0 main path RF I/O                      |
| 5,6               | WF0_RFIOP_1<br>WF0_RFIOP_2 | A        |       | WF0 main path RF I/O                      |
| 11                | WF1_RFION                  | A        |       | WF1 main path RF I/O                      |
| 12                | WF1_RFIOP                  | A        |       | WF1 main path RF I/O                      |
| 9                 | WF1_LNA_EXT                | A        |       | WF1 aux. path LNA input                   |
| 156               | WF0_LNA_EXT                | A        |       | WF0 aux. path LNA input                   |
| 151               | XTALIN                     | I        |       | Crystal oscillator input                  |
| 153               | CLKOUTP                    | O        |       | XO reference clock output                 |
| 152               | AVDD33_XTAL                | P        |       | 3.3V XTAL Power Supply Pin                |
| 150               | AVSS33_XTAL                | G        |       | 3.3V XTAL Ground Pin                      |
| 8                 | AVDD33_WF0_TX              | P        |       | 3.3V RF Channel 0 Supply Power            |
| 14                | AVDD33_WF1_TX              | P        |       | 3.3V RF Channel 1 Supply Power            |
| 15                | AVDD33_WF1_TRX             | P        |       | 1.65V to 3.3V RF Channel 1 Supply Power   |
| 149               | AVDD33_WF_RFDIG            | P        |       | 1.65V to 3.3V RF DIG and AFE Supply Power |
| 154               | AVDD33_WF_SX               | P        |       | 1.65V to 3.3V RF Supply Power             |
| 155               | AVDD33_WF0_TRX             | P        |       | 1.65V to 3.3V RF Channel 0 Supply Power   |
| 1,2<br>7,13       | AVSS33_RF                  | G        |       | 3.3V RF Shielding Ground Pin              |
| <b>WLAN LED</b>   |                            |          |       |                                           |
| 144               | WLED_N                     | O        | 4 mA  | WLAN Activity LED                         |
| <b>UART0 Lite</b> |                            |          |       |                                           |
| 31                | RXD0                       | I        | 4 mA  | UART0 Lite RXD                            |
| 30                | TXD0                       | O, IPD   | 4 mA  | UART0 Lite TXD                            |
| <b>UART1 Lite</b> |                            |          |       |                                           |
| 147               | TXD1                       | O, IPU   | 4 mA  | UART1 Lite TXD                            |
| 148               | RXD1                       | I        | 4 mA  | UART1 Lite RXD                            |
| <b>I2S</b>        |                            |          |       |                                           |
| 16                | I2S_SDI                    | O        | 4 mA  | I2S data input                            |
| 17                | I2S_SDO                    | I/O, IPD | 4 mA  | I2S data output                           |
| 18                | I2S_WS                     | O        | 4 mA  | I2S word select                           |
| 19                | I2S_CLK                    | I/O      | 4 mA  | I2S clock                                 |
| <b>I2C</b>        |                            |          |       |                                           |
| 21                | I2C_SD                     |          | 4 mA  | I2C Data                                  |

| Pins               | Name                | Type     | Driv. | Description                                                      |
|--------------------|---------------------|----------|-------|------------------------------------------------------------------|
| 20                 | I2C_SCLK            | I/O      | 4 mA  | I2C Clock                                                        |
| <b>SPI</b>         |                     |          |       |                                                                  |
| 26                 | SPI_MISO            | I/O      | 4 mA  | SPI Master input/Slave output                                    |
| 27                 | SPI_MOSI            | I/O, IPD | 4 mA  | SPI Master output/Slave input                                    |
| 25                 | SPI_CLK             | O, IPU   | 4 mA  | SPI clock                                                        |
| 28                 | SPI_CS0             | O        | 4 mA  | SPI chip select0                                                 |
| 24                 | SPI_CS1             | O, IPD   | 4 mA  | SPI chip select1                                                 |
| <b>GPIO</b>        |                     |          |       |                                                                  |
| 29                 | GPIO0               | I/O, IPD | 4 mA  | General Purpose I/O                                              |
| <b>5-Port EPHY</b> |                     |          |       |                                                                  |
| 143                | EPHY_LED0_N_JTDO    | I/O      | 4 mA  | 10/100 PHY Port #0 activity LED, JTAG_TDO                        |
| 142                | EPHY_LED1_N_JTDI    | I/O      | 4 mA  | 10/100 PHY Port #1 activity LED, JTAG_TDI                        |
| 141                | EPHY_LED2_N_JTMS    | I/O      | 4 mA  | 10/100 PHY Port #2 activity LED, JTAG_TMS                        |
| 140                | EPHY_LED3_N_JTCLK   | I/O      | 4 mA  | 10/100 PHY Port #3 activity LED, JTAG_CLK                        |
| 139                | EPHY_LED4_N_JTRST_N | I/O,     | 4 mA  | 10/100 PHY Port #4 activity LED, JTAG_TRST_N                     |
| 39                 | EPHY_VRT            | A        |       | Connect to an external resistor to provide accurate bias current |
| 33                 | MDI_RP_P0           | A        |       | 10/100 PHY Port #0 RXN                                           |
| 34                 | MDI_RN_P0           | A        |       | 10/100 PHY Port #0 RXP                                           |
| 35                 | MDI_TP_P0           | A        |       | 10/100 PHY Port #0 TXN                                           |
| 36                 | MDI_TN_P0           | A        |       | 10/100 PHY Port #0 TXP                                           |
| 40                 | MDI_TP_P1           | A        |       | 10/100 PHY Port #1 RXN                                           |
| 42                 | MDI_TN_P1           | A        |       | 10/100 PHY Port #1 RXP                                           |
| 43                 | MDI_RP_P1           | A        |       | 10/100 PHY Port #1 TXN                                           |
| 44                 | MDI_RN_P1           | A        |       | 10/100 PHY Port #1 TXP                                           |
| 45                 | MDI_RP_P2           | A        |       | 10/100 PHY Port #2 RXN                                           |
| 46                 | MDI_RN_P2           | A        |       | 10/100 PHY Port #2 RXP                                           |
| 47                 | MDI_TP_P2           | A        |       | 10/100 PHY Port #2 TXN                                           |
| 48                 | MDI_TN_P2           | A        |       | 10/100 PHY Port #2 TXP                                           |
| 49                 | MDI_TP_P3           | A        |       | 10/100 PHY Port #3 RXN                                           |
| 50                 | MDI_TN_P3           | A        |       | 10/100 PHY Port #3 RXP                                           |
| 51                 | MDI_RP_P3           | A        |       | 10/100 PHY Port #3 TXN                                           |
| 52                 | MDI_RN_P3           | A        |       | 10/100 PHY Port #3 TXP                                           |
| 54                 | MDI_RP_P4           | A        |       | 10/100 PHY Port #4 RXN                                           |
| 55                 | MDI_RN_P4           | A        |       | 10/100 PHY Port #4 RXP                                           |
| 56                 | MDI_TP_P4           | A        |       | 10/100 PHY Port #4 TXN                                           |

| Pins            | Name                                   | Type   | Driv. | Description                                                           |
|-----------------|----------------------------------------|--------|-------|-----------------------------------------------------------------------|
| 57              | MDI_TN_P4                              | A      |       | 10/100 PHY Port #4 TXP                                                |
| 32              | AVDD33_TX_P0                           | P      |       | 3.3V Supply Power for P0                                              |
| 38              | AVDD33_COM                             | P      |       | 3.3V Supply Power for EPHY COM                                        |
| 41              | AVDD33_TX_P1234_1<br>AVDD33_TX_P1234_2 | P      |       | 3.3V Supply Power for P1 ~ P4                                         |
| <b>Misc.</b>    |                                        |        |       |                                                                       |
| 136             | REF_CLKO                               | O, IPD | 4 mA  | Reference Clock Ouptut                                                |
| 138             | PORST_N                                | I, IPU | 4 mA  | Power on reset                                                        |
| 137             | WDT_RST_N                              | O      | 4 mA  | Watchdog timeout reset                                                |
| <b>USB PHY</b>  |                                        |        |       |                                                                       |
| 129             | AVDD33_USB                             | P      |       | 3.3 V USB PHY analog power supply                                     |
| 130             | USB_VRT                                | I/O    |       | Connect to an external 5.1 kΩ resistor for band-gap reference circuit |
| 62              | USB_DM                                 | I/O    |       | USB Port0 data pin Data-                                              |
| 61              | USB_DP                                 | I/O    |       | USB Port0 data pin Data+                                              |
| <b>PCIe PHY</b> |                                        |        |       |                                                                       |
| 135             | PERST_N                                | O, IPD | 4mA   | PCIe device reset                                                     |
| 134             | AVDD12_PCIE                            | P      |       | 1.2 V PCIe PHY digital power supply                                   |
| 129             | AVDD33_PCIE                            | P      |       | 3.3 V USB PHY analog power supply                                     |
| 128             | PCIE_IO_VSS                            | P      |       | PCIe PHY Ground Pin                                                   |
| 133             | PCIE_CKPO                              | I/O    |       | External reference clock output (positive)                            |
| 132             | PCIE_CKN0                              | I/O    |       | External reference clock output (negative)                            |
| 127             | PCIE_TXP0                              | I/O    |       | PCIe0 differential transmit TX -                                      |
| 126             | PCIE_TXN0                              | I/O    |       | PCIe0 differential transmit TX -                                      |
| 129             | PCIE_TXP0                              | I/O    |       | PCIe0 differential receiver RX -                                      |
| 130             | PCIE_TXN0                              | I/O    |       | PCIe0 differential receiver RX -                                      |
| <b>DDR2</b>     |                                        |        |       |                                                                       |
| 65              | MD15                                   | I/O    | 8 mA  | DDR2 Data bit #15                                                     |
| 114             | MD14                                   | I/O    | 8 mA  | DDR2 Data bit #14                                                     |
| 67              | MD13                                   | I/O    | 8 mA  | DDR2 Data bit #13                                                     |
| 111             | MD12                                   | I/O    | 8 mA  | DDR2 Data bit #12                                                     |
| 110             | MD11                                   | I/O    | 8 mA  | DDR2 Data bit #11                                                     |
| 68              | MD10                                   | I/O    | 8 mA  | DDR2 Data bit #10                                                     |
| 112             | MD9                                    | I/O    | 8 mA  | DDR2 Data bit #9                                                      |
| 66              | MD8                                    | I/O    | 8 mA  | DDR2 Data bit #8                                                      |
| 70              | MD7                                    | I/O    | 8 mA  | DDR2 Data bit #7                                                      |
| 109             | MD6                                    | I/O    | 8 mA  | DDR2 Data bit #6                                                      |

| Pins | Name         | Type | Driv. | Description          |
|------|--------------|------|-------|----------------------|
| 73   | MD5          | I/O  | 8 mA  | DDR2 Data bit #5     |
| 106  | MD4          | I/O  | 8 mA  | DDR2 Data bit #4     |
| 105  | MD3          | I/O  | 8 mA  | DDR2 Data bit #3     |
| 69   | MD2          | I/O  | 8 mA  | DDR2 Data bit #2     |
| 107  | MD1          | I/O  | 8 mA  | DDR2 Data bit #1     |
| 71   | MD0          | I/O  | 8 mA  | DDR2 Data bit #0     |
| 83   | MA13         | O    | 8 mA  | DDR2 Address bit #13 |
| 96   | MA12         | O    | 8 mA  | DDR2 Address bit #12 |
| 85   | MA11         | O    | 8 mA  | DDR2 Address bit #11 |
| 92   | MA10         | O    | 8 mA  | DDR2 Address bit #10 |
| 94   | MA9          | O    | 8 mA  | DDR2 Address bit #9  |
| 84   | MA8          | O    | 8 mA  | DDR2 Address bit #8  |
| 95   | MA7          | O    | 8 mA  | DDR2 Address bit #7  |
| 86   | MA6          | O    | 8 mA  | DDR2 Address bit #6  |
| 93   | MA5          | O    | 8 mA  | DDR2 Address bit #5  |
| 82   | MA4          | O    | 8 mA  | DDR2 Address bit #4  |
| 97   | MA3          | O    | 8 mA  | DDR2 Address bit #3  |
| 87   | MA2          | O    | 8 mA  | DDR2 Address bit #2  |
| 88   | MA1          | O    | 8 mA  | DDR2 Address bit #1  |
| 80   | MA0          | O    | 8 mA  | DDR2 Address bit #0  |
| 101  | MBA2         | O    | 8 mA  | DDR2 MBA #2          |
| 99   | MBA1         | O    | 8 mA  | DDR2 MBA #1          |
| 100  | MBA0         | O    | 8 mA  | DDR2 MBA #0          |
| 74   | MODT         | O    | 8 mA  | DDR2 ODT             |
| 81   | MRAS         | O    | 8 mA  | DDR2 MRAS_N          |
| 75   | MCAS         | O    | 8 mA  | DDR2 MCAS_N          |
| 102  | MWE          | O    | 8 mA  | DDR2 MWE_N           |
| 77   | MCK_P        | O    | 8 mA  | DDR2 MCK_P           |
| 76   | MCK_N        | O    | 8 mA  | DDR2 MCK_N           |
| 64   | MDQM1        | O    | 8 mA  | DDR2 MDQM#1          |
| 108  | MDQM0        | O    | 8 mA  | DDR2 MDQM#0          |
| 78   | MCS          | O    | 8 mA  | DDR2 MCS             |
| 72   | MDQS1        | I/O  | 8 mA  | DDR2 MDQS#1          |
| 113  | MDQS0        | I/O  | 8 mA  | DDR2 MDQS#0          |
| 103  | MCKE         | O    | 8 mA  | DDR2 MCKE            |
| 63   | DDR_IO_VSS_1 | G    |       | DDR IO Ground pins   |
| 115  | DDR_IO_VSS_2 |      |       |                      |

| Pins | Name          | Type | Driv. | Description           |
|------|---------------|------|-------|-----------------------|
| 79   | DDR_IO_1V8D_1 | P    |       | DDR io Supply power   |
| 98   | DDR_IO_1V8D_2 |      |       |                       |
| 116  | DDR_IO_1V8D_3 |      |       |                       |
| 90   | DDR_IO_VREF_1 | A    |       | DDR reference voltage |
| 104  | DDR_IO_VREF_2 |      |       |                       |
| DDR1 |               |      |       |                       |
| 64   | MD15          | I/O  | 8 mA  | DDR1 Data bit #15     |
| 65   | MD14          | I/O  | 8 mA  | DDR1 Data bit #14     |
| 66   | MD13          | I/O  | 8 mA  | DDR1 Data bit #13     |
| 67   | MD12          | I/O  | 8 mA  | DDR1 Data bit #12     |
| 68   | MD11          | I/O  | 8 mA  | DDR1 Data bit #11     |
| 69   | MD10          | I/O  | 8 mA  | DDR1 Data bit #10     |
| 70   | MD9           | I/O  | 8 mA  | DDR1 Data bit #9      |
| 71   | MD8           | I/O  | 8 mA  | DDR1 Data bit #8      |
| 106  | MD7           | I/O  | 8 mA  | DDR1 Data bit #7      |
| 107  | MD6           | I/O  | 8 mA  | DDR1 Data bit #6      |
| 108  | MD5           | I/O  | 8 mA  | DDR1 Data bit #5      |
| 109  | MD4           | I/O  | 8 mA  | DDR1 Data bit #4      |
| 110  | MD3           | I/O  | 8 mA  | DDR1 Data bit #3      |
| 111  | MD2           | I/O  | 8 mA  | DDR1 Data bit #2      |
| 112  | MD1           | I/O  | 8 mA  | DDR1 Data bit #1      |
| 114  | MD0           | I/O  | 8 mA  | DDR1 Data bit #0      |
| 88   | MA13          | O    | 8 mA  | DDR1 Address bit #13  |
| 86   | MA12          | O    | 8 mA  | DDR1 Address bit #12  |
| 85   | MA11          | O    | 8 mA  | DDR1 Address bit #11  |
| 99   | MA10          | O    | 8 mA  | DDR1 Address bit #10  |
| 84   | MA9           | O    | 8 mA  | DDR1 Address bit #9   |
| 83   | MA8           | O    | 8 mA  | DDR1 Address bit #8   |
| 82   | MA7           | O    | 8 mA  | DDR1 Address bit #7   |
| 81   | MA6           | O    | 8 mA  | DDR1 Address bit #6   |
| 80   | MA5           | O    | 8 mA  | DDR1 Address bit #5   |
| 74   | MA4           | O    | 8 mA  | DDR1 Address bit #4   |
| 103  | MA3           | O    | 8 mA  | DDR1 Address bit #3   |
| 102  | MA2           | O    | 8 mA  | DDR1 Address bit #2   |
| 101  | MA1           | O    | 8 mA  | DDR1 Address bit #1   |
| 100  | MA0           | O    | 8 mA  | DDR1 Address bit #0   |
| 97   | MBA1          | O    | 8 mA  | DDR1 MBA #1           |

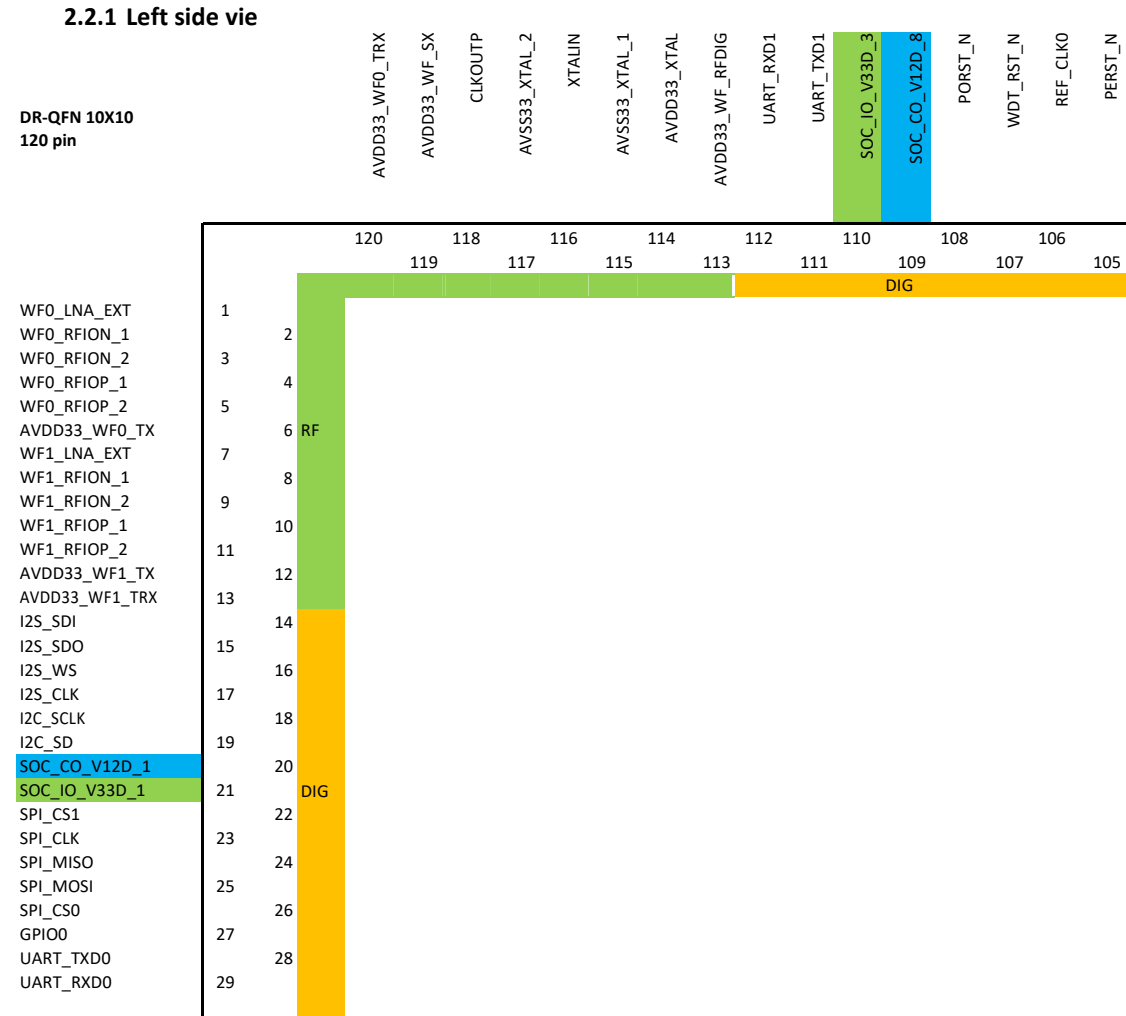
| Pins  | Name            | Type | Driv. | Description                     |
|-------|-----------------|------|-------|---------------------------------|
| 96    | MBA0            | O    | 8 mA  | DDR1 MBA #0                     |
| 94    | MRAS            | O    | 8 mA  | DDR1 MRAS_N                     |
| 93    | MCAS            | O    | 8 mA  | DDR1 MCAS_N                     |
| 92    | MWE             | O    | 8 mA  | DDR1 MWE_N                      |
| 77    | MCK_P           | O    | 8 mA  | DDR1 MCK_P                      |
| 76    | MCK_N           | O    | 8 mA  | DDR1 MCK_N                      |
| 73    | MDQM1           | O    | 8 mA  | DDR1 MDQM#1                     |
| 105   | MDQM0           | O    | 8 mA  | DDR1 MDQM#0                     |
| 95    | MCS             | O    | 8 mA  | DDR1 MCS                        |
| 72    | MDQS1           | I/O  | 8 mA  | DDR1 MDQS#1                     |
| 113   | MDQS0           | I/O  | 8 mA  | DDR1 MDQS#0                     |
| 87    | MCKE            | O    | 8 mA  | DDR1 MCKE                       |
| 63    | DDR_IO_VSS_1    | G    |       | DDR IO Ground pins              |
| 75    | DDR_IO_VSS_2    |      |       |                                 |
| 78    | DDR_IO_VSS_3    |      |       |                                 |
| 115   | DDR_IO_VSS_4    |      |       |                                 |
| 79    | DDR_IO_1V8D_1   | P    |       | DDR IO Supply power             |
| 98    | DDR_IO_1V8D_2   |      |       |                                 |
| 116   | DDR_IO_1V8D_3   |      |       |                                 |
| 90    | DDR_IO_VREF_1   | A    |       | DDR reference voltage           |
| 104   | DDR_IO_VREF_2   |      |       |                                 |
| PMU   |                 |      |       |                                 |
| 118   | LXBK_1          | O    |       | Buck Switching node             |
| 119   | LXBK_2          |      |       |                                 |
| 122   | VOUT_FB         | A    |       | Buck vout feedback pin          |
| 59    | AVDD33_SMPS     | P    |       | Buck 3.3V Supply power          |
| 120   | AVSS33_SMPS_1   | G    |       | Buck Gound pin                  |
| 121   | AVSS33_SMPS_2   |      |       |                                 |
| 123   | AVDD33_DDRLDO_1 | G    |       | DDRLDO 3.3V Supply power        |
| 124   | AVDD33_DDRLDO_2 |      |       |                                 |
| 56    | DDRLDO          | O    |       | DDRLDO 1.8V/2.5V output voltage |
| Power |                 |      |       |                                 |
| 23    | SOC_IO_V33D_1   | P    |       | 3.3 V digital I/O power supply  |
| 146   | SOC_IO_V33D_2   |      |       |                                 |
| 22    | SOC_CO_V12D_1   | P    |       | 1.2 V digital core power supply |
| 58    | SOC_CO_V12D_2   |      |       |                                 |
| 89    | SOC_CO_V12D_3   |      |       |                                 |
| 91    | SOC_CO_V12D_4   |      |       |                                 |
| 145   | SOC_CO_V12D_5   |      |       |                                 |
| EPAD  | GND             | G    |       | Ground pin                      |

| Pins | Name | Type | Driv. | Description |
|------|------|------|-------|-------------|
|------|------|------|-------|-------------|

**Total: 156 pins**

Note:  
 IPD : Internal pull-down  
 IPU : Internal pull-up  
 I : Input  
 O : Output  
 IO : Bi-directional  
 P : Power  
 G : Ground  
 NC : Not connected

## 2.2 MT7628KN DR-QFN (10 mm x 10 mm) 120-Pin Package Diagram



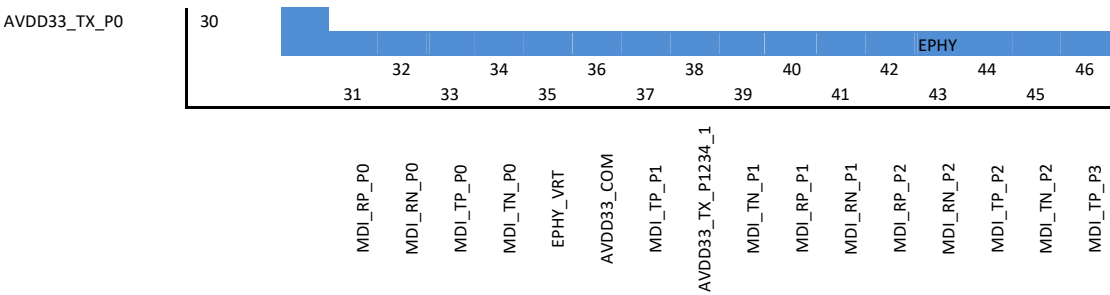


Figure 2-5 MT7628KN DR-QFN Pin Diagram (left view)

### 2.2.2 Right side view

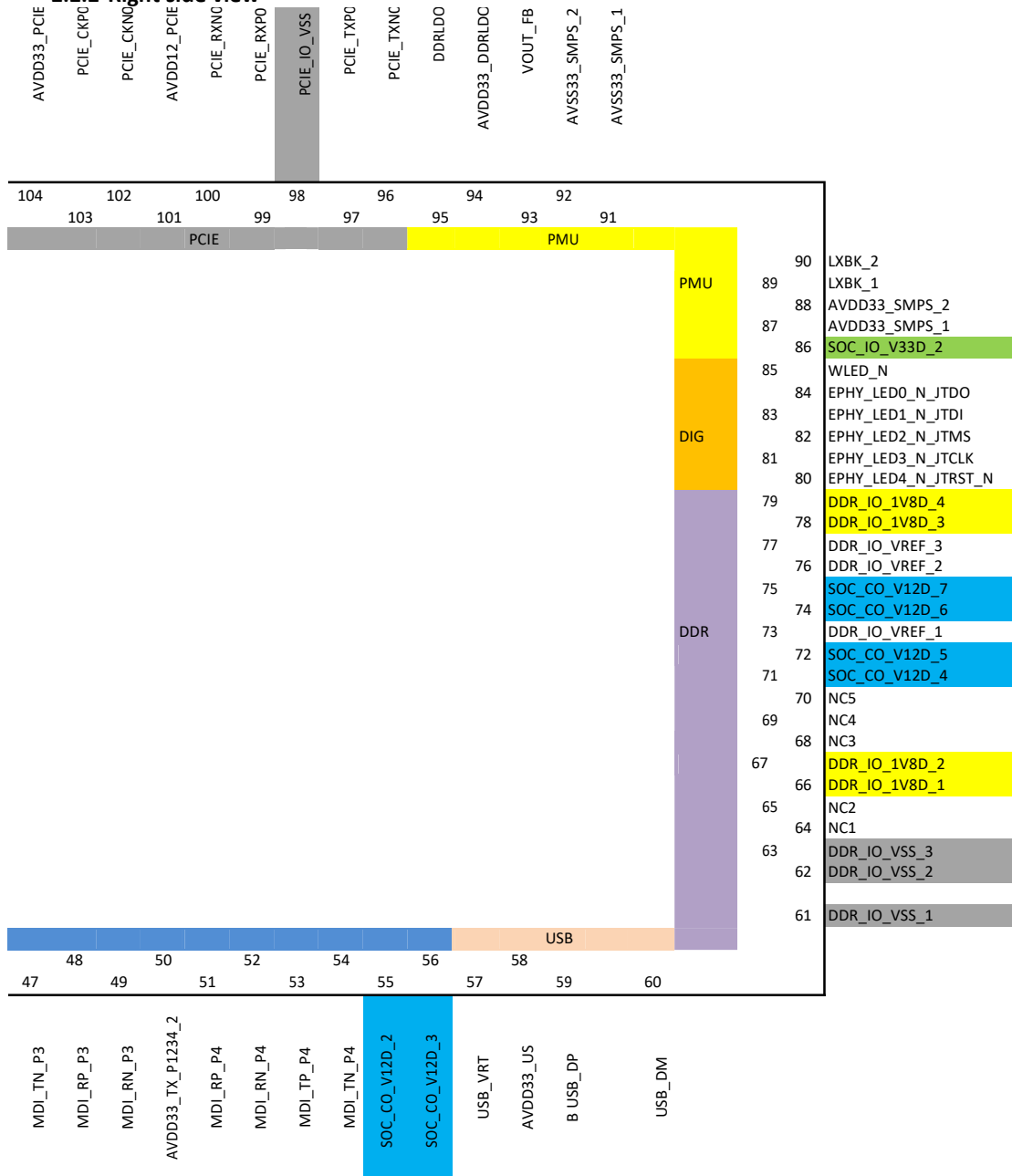


Figure 2-6 MT7628KN DR-QFN Pin Diagram (right side view)

### 2.2.3 Pin Description

| Pins              | Name            | Type   | Driv. | Description                               |
|-------------------|-----------------|--------|-------|-------------------------------------------|
| <b>RF</b>         |                 |        |       |                                           |
| 2                 | WF0_RFION_1     | A      |       | WF0 main path RF I/O                      |
| 3                 | WF0_RFION_2     |        |       |                                           |
| 4                 | WF0_RFIOP_1     | A      |       | WF0 main path RF I/O                      |
| 5                 | WF0_RFIOP_2     |        |       |                                           |
| 8                 | WF1_RFION_1     | A      |       | WF1 main path RF I/O                      |
| 9                 | WF1_RFION_2     |        |       |                                           |
| 10                | WF1_RFIOP_1     | A      |       | WF1 main path RF I/O                      |
| 11                | WF1_RFIOP_2     |        |       |                                           |
| 7                 | WF1_LNA_EXT     | A      |       | WF1 aux. path LNA input                   |
| 1                 | WF0_LNA_EXT     | A      |       | WF0 aux. path LNA input                   |
| 116               | XTALIN          | I      |       | Crystal oscillator input                  |
| 118               | CLKOUTP         | O      |       | XO reference clock output                 |
| 114               | AVDD33_XTAL     | P      |       | 3.3V XTAL Power Supply Pin                |
| 115               | AVS33_XTAL_1    | G      |       | 3.3V XTAL Ground Pin                      |
| 117               | AVS33_XTAL_2    |        |       |                                           |
| 6                 | AVDD33_WF0_TX   | P      |       | 3.3V RF Channel 0 Supply Power            |
| 12                | AVDD33_WF1_TX   | P      |       | 3.3V RF Channel 1 Supply Power            |
| 13                | AVDD33_WF1_TRX  | P      |       | 1.65V to 3.3V RF Channel 1 Supply Power   |
| 113               | AVDD33_WF_RFDIG | P      |       | 1.65V to 3.3V RF DIG and AFE Supply Power |
| 119               | AVDD33_WF_SX    | P      |       | 1.65V to 3.3V RF Supply Power             |
| 120               | AVDD33_WF0_TRX  | P      |       | 1.65V to 3.3V RF Channel 0 Supply Power   |
| <b>WLAN LED</b>   |                 |        |       |                                           |
| 85                | WLED_N          | O      | 4 mA  | WLAN Activity LED                         |
| <b>UART0 Lite</b> |                 |        |       |                                           |
| 28                | TXD0            | O, IPD | 4 mA  | UART0 Lite TXD                            |
| 29                | RXD0            | I      |       | UART0 Lite RXD                            |
| <b>UART1 Lite</b> |                 |        |       |                                           |
| 111               | TXD1            | O, IPU | 4 mA  | UART1 Lite TXD                            |
| 112               | RXD1            | I      |       | UART1 Lite RXD                            |
| <b>I2S</b>        |                 |        |       |                                           |
| 14                | I2S_SDI         | I/O    | 4 mA  | I2S data input                            |
| 15                | I2S_SDO         | O, IPD | 4 mA  | I2S data output                           |
| 16                | I2S_WS          | O      | 4 mA  | I2S word select                           |
| 17                | I2S_CLK         | I/O    | 4 mA  | I2S clock                                 |
| <b>I2C</b>        |                 |        |       |                                           |
| 19                | I2C_SD          | I/O    | 4 mA  | I2C Data                                  |

| Pins               | Name                | Type     | Driv. | Description                                                      |
|--------------------|---------------------|----------|-------|------------------------------------------------------------------|
| 18                 | I2C_SCLK            | I/O      | 4 mA  | I2C Clock                                                        |
| <b>SPI</b>         |                     |          |       |                                                                  |
| 24                 | SPI_MISO            | I/O      | 4 mA  | SPI Master input/Slave output                                    |
| 25                 | SPI_MOSI            | I/O, IPD | 4 mA  | SPI Master output/Slave input                                    |
| 22                 | SPI_CLK             | O, IPU   | 4 mA  | SPI clock                                                        |
| 26                 | SPI_CS0             | O        | 4 mA  | SPI chip select0                                                 |
| 22                 | SPI_CS1             | O, IPD   | 4 mA  | SPI chip select1                                                 |
| <b>GPIO</b>        |                     |          |       |                                                                  |
| 27                 | GPIO0               | I/O, IPD | 4 mA  | General Purpose I/O                                              |
| <b>5-Port EPHY</b> |                     |          |       |                                                                  |
| 84                 | EPHY_LED0_N_JTDO    | I/O      | 4 mA  | 10/100 PHY Port #0 activity LED, JTAG_TDO                        |
| 83                 | EPHY_LED1_N_JTDI    | I/O      | 4 mA  | 10/100 PHY Port #1 activity LED, JTAG_TDI                        |
| 82                 | EPHY_LED2_N_JTMS    | I/O      | 4 mA  | 10/100 PHY Port #2 activity LED, JTAG_TMS                        |
| 81                 | EPHY_LED3_N_JTCLK   | I/O      | 4 mA  | 10/100 PHY Port #3 activity LED, JTAG_CLK                        |
| 80                 | EPHY_LED4_N_JTRST_N | I/O,     | 4 mA  | 10/100 PHY Port #4 activity LED, JTAG_TRST_N                     |
| 35                 | EPHY_VRT            | A        |       | Connect to an external resistor to provide accurate bias current |
| 31                 | MDI_RP_P0           | A        |       | 10/100 PHY Port #0 RXN                                           |
| 32                 | MDI_RN_P0           | A        |       | 10/100 PHY Port #0 RXP                                           |
| 33                 | MDI_TP_P0           | A        |       | 10/100 PHY Port #0 TXN                                           |
| 34                 | MDI_TN_P0           | A        |       | 10/100 PHY Port #0 TXP                                           |
| 37                 | MDI_TP_P1           | A        |       | 10/100 PHY Port #1 RXN                                           |
| 39                 | MDI_TN_P1           | A        |       | 10/100 PHY Port #1 RXP                                           |
| 40                 | MDI_RP_P1           | A        |       | 10/100 PHY Port #1 TXN                                           |
| 41                 | MDI_RN_P1           | A        |       | 10/100 PHY Port #1 TXP                                           |
| 42                 | MDI_RP_P2           | A        |       | 10/100 PHY Port #2 RXN                                           |
| 43                 | MDI_RN_P2           | A        |       | 10/100 PHY Port #2 RXP                                           |
| 44                 | MDI_TP_P2           | A        |       | 10/100 PHY Port #2 TXN                                           |
| 45                 | MDI_TN_P2           | A        |       | 10/100 PHY Port #2 TXP                                           |
| 46                 | MDI_TP_P3           | A        |       | 10/100 PHY Port #3 RXN                                           |
| 47                 | MDI_TN_P3           | A        |       | 10/100 PHY Port #3 RXP                                           |
| 48                 | MDI_RP_P3           | A        |       | 10/100 PHY Port #3 TXN                                           |
| 49                 | MDI_RN_P3           | A        |       | 10/100 PHY Port #3 TXP                                           |
| 51                 | MDI_RP_P4           | A        |       | 10/100 PHY Port #4 RXN                                           |
| 52                 | MDI_RN_P4           | A        |       | 10/100 PHY Port #4 RXP                                           |
| 53                 | MDI_TP_P4           | A        |       | 10/100 PHY Port #4 TXN                                           |

| Pins            | Name              | Type   | Driv. | Description                                                           |
|-----------------|-------------------|--------|-------|-----------------------------------------------------------------------|
| 54              | MDI_TN_P4         | A      |       | 10/100 PHY Port #4 TXP                                                |
| 30              | AVDD33_TX_P0      | P      |       | 3.3V Supply Power for P0                                              |
| 36              | AVDD33_COM        | P      |       | 3.3V Supply Power for EPHY COM                                        |
| 38              | AVDD33_TX_P1234_1 | P      |       | 3.3V Supply Power for P1 ~ P4                                         |
| 50              | AVDD33_TX_P1234_2 |        |       |                                                                       |
| <b>Misc.</b>    |                   |        |       |                                                                       |
| 106             | REF_CLKO          | O, IPD | 4 mA  | Reference Clock Ouptut                                                |
| 108             | PORST_N           | I      |       | Power on reset                                                        |
| 107             | WDT_RST_N         | O      | 4 mA  | Watchdog Reset                                                        |
| <b>USB PHY</b>  |                   |        |       |                                                                       |
| 58              | AVDD33_USB        | P      |       | 3.3 V USB PHY analog power supply                                     |
| 57              | USB_VRT           | A      |       | Connect to an external 5.1 kΩ resistor for band-gap reference circuit |
| 60              | USB_DM            | I/O    |       | USB Port0 data pin Data-                                              |
| 59              | USB_DP            | I/O    |       | USB Port0 data pin Data+                                              |
| <b>PCIe PHY</b> |                   |        |       |                                                                       |
| 105             | PERST_N           | O, IPD | 4mA   | PCIe device reset                                                     |
| 98              | PCIE_IO_VSS       | G      |       | PCIe Ground pin                                                       |
| 101             | AVDD12_PCIE       | P      |       | 1.2 V PCIe PHY digital power supply                                   |
| 104             | AVDD33_PCIE       | P      |       | 3.3 V USB PHY analog power supply                                     |
| 103             | PCIE_CKPO         | O      |       | External reference clock output (positive)                            |
| 102             | PCIE_CKN0         | O      |       | External reference clock output (negative)                            |
| 97              | PCIE_TXP0         | I/O    |       | PCIe0 differential transmit TX -                                      |
| 96              | PCIE_TXN0         | I/O    |       | PCIe0 differential transmit TX -                                      |
| 99              | PCIE_RXP0         | I/O    |       | PCIe0 differential receiver RX -                                      |
| 100             | PCIE_RXN0         | I/O    |       | PCIe0 differential receiver RX -                                      |
| <b>PMU</b>      |                   |        |       |                                                                       |
| 89              | LXBK_1            | O      |       | Buck Switching node                                                   |
| 90              | LXBK_2            |        |       |                                                                       |
| 93              | VOUT_FB           | A      |       | Buck vout feedback pin                                                |
| 87              | AVDD33_SMPS_1     | P      |       | Buck 3.3V Supply power                                                |
| 88              | AVDD33_SMPS_2     |        |       |                                                                       |
| 91              | AVSS33_SMPS_1     | G      |       | Buck Gound pin                                                        |
| 92              | AVSS33_SMPS_2     |        |       |                                                                       |
| 94              | AVDD33_DDRLDO     | P      |       | DDR LDO 3.3V Supply power                                             |
| 95              | DDR LDO           | O      |       | DDR LDO 1.8V/2.5V output voltage                                      |
| <b>Power</b>    |                   |        |       |                                                                       |

| Pins | Name          | Type | Driv. | Description                     |
|------|---------------|------|-------|---------------------------------|
| 21   | SOC_IO_V33D_1 | P    |       | 3.3 V digital I/O power supply  |
| 86   | SOC_IO_V33D_2 |      |       |                                 |
| 110  | SOC_IO_V33D_3 |      |       |                                 |
| 20   | SOC_CO_V12D_1 | P    |       | 1.2 V digital core power supply |
| 55   | SOC_CO_V12D_2 |      |       |                                 |
| 56   | SOC_CO_V12D_3 |      |       |                                 |
| 71   | SOC_CO_V12D_4 |      |       |                                 |
| 72   | SOC_CO_V12D_5 |      |       |                                 |
| 74   | SOC_CO_V12D_6 |      |       |                                 |
| 75   | SOC_CO_V12D_7 |      |       |                                 |
| 109  | SOC_CO_V12D_8 |      |       |                                 |
| EPAD | GND           | G    |       | Ground pin                      |

**Total: 120 pins**

**Note:**

IPD : Internal pull-down  
 IPU : Internal pull-up  
 I : Input  
 O : Output  
 IO : Bi-directional  
 P : Power  
 G : Ground  
 NC : Not connected

## 2.3 Pin Sharing Schemes

Some pins are shared with GPIO to provide maximum flexibility for system designers. The MT7628 provides up to 41 GPIO pins. Users can configure GPIO1\_MODE and GPIO2\_MODE registers in the System Control block to specify the pin function, or they can use the registers specified below. For more information, see the Programmer's Guide. Unless specified explicitly, all the GPIO pins are in input mode after reset.

### 2.3.1 GPIO pin share scheme

| I/O Pad Group | Normal Mode                  | GPIO Mode |
|---------------|------------------------------|-----------|
| UART1         | UART_RXD1                    | GPIO#46   |
|               | UART_TXD1                    | GPIO#45   |
| WLED_AN       | WLED_N (7628AN)              | GPIO#44   |
| P0_LED_AN     | EPHY_LED0_N_JTDO (7628AN)    | GPIO#43   |
| P1_LED_AN     | EPHY_LED1_N_JTDI (7628AN)    | GPIO#42   |
| P2_LED_AN     | EPHY_LED2_N_JTMS (7628AN)    | GPIO#41   |
| P3_LED_AN     | EPHY_LED3_N_JTCLK (7628AN)   | GPIO#40   |
| P4_LED_AN     | EPHY_LED4_N_JTRST_N (7628AN) | GPO#39    |
| WDT           | WDT_RST_N                    | GPO#38    |
| REFCLK        | REF_CLKO                     | GPIO#37   |

| I/O Pad Group | Normal Mode                  | GPIO Mode |
|---------------|------------------------------|-----------|
| PERST         | PERST_N                      | GPIO#36   |
| WLED_KN       | WLED_N (7628KN)              | GPIO#35   |
| P0_LED_KN     | EPHY_LED0_N_JTDO (7628KN)    | GPIO#34   |
| P1_LED_KN     | EPHY_LED1_N_JTDI (7628KN)    | GPIO#33   |
| P2_LED_KN     | EPHY_LED2_N_JTMS (7628KN)    | GPIO#32   |
| P3_LED_KN     | EPHY_LED3_N_JTCLK (7628KN)   | GPIO#31   |
| P4_LED_KN     | EPHY_LED4_N_JTRST_N (7628KN) | GPIO#30   |
| SD            | MDI_TN_P4                    | GPIO#29   |
|               | MDI_TP_P4                    | GPIO#28   |
|               | MDI_RN_P4                    | GPIO#27   |
|               | MDI_RP_P4                    | GPIO#26   |
|               | MDI_RN_P3                    | GPIO#25   |
|               | MDI_RP_P3                    | GPIO#24   |
|               | MDI_TN_P3                    | GPIO#23   |
|               | MDI_TP_P3                    | GPIO#22   |
|               | MDI_TN_P2                    | GPIO#21   |
|               | MDI_TP_P2                    | GPIO#20   |
| PWM1          | MDI_RN_P2                    | GPO#19    |
| PWM0          | MDI_RP_P2                    | GPO#18    |
| SPIS          | MDI_RN_P1                    | GPIO#17   |
|               | MDI_RP_P1                    | GPIO#16   |
|               | MDI_TN_P1                    | GPO#15    |
| UART0         | MDI_TP_P1                    | GPIO#14   |
|               | UART_RXD0                    | GPIO#13   |
|               | UART_TXD0                    | GPIO#12   |
| GPIO          | GPIO0                        | GPIO#11   |
| SPI           | SPI_CS0                      | GPIO#10   |
|               | SPI_MISO                     | GPIO#9    |
|               | SPI_MOSI                     | GPIO#8    |
| SPI_CS1       | SPI_CLK                      | GPIO#7    |
|               | SPI_CS1                      | GPIO#6    |
|               | I2C_SD                       | GPO#5     |
| I2S           | I2C_SCLK                     | GPO#4     |
|               | I2S_CLK                      | GPIO#3    |
|               | I2S_WS                       | GPIO#2    |
|               | I2S_SDO                      | GPIO#1    |
|               | I2S_SDI                      | GPO#0     |



### 2.3.2 UART1 pin share scheme

Controlled by the UART1\_MODE register.

| Pin Name  | 2'b00<br>UART-Lite #1 | 2'b01<br>GPIO | 2'b10<br>PWM | 2'b11<br>TRX_SW |
|-----------|-----------------------|---------------|--------------|-----------------|
| UART1_RXD | UART1_RXD             | GPIO#46       | PWM_CH1      |                 |
| UART1_TXD | UART1_TXD             | GPIO#45       | PWM_CH0      |                 |

### 2.3.3 MT7628NN EPHY LED pin share scheme

Controlled by the P#\_LED\_AN\_MODE registers

| Pin Name            | Bootstrapping<br>(DBG_JTAG_MODE=1) | Bootstrapping<br>(DBG_JTAG_MODE=0) |                          |
|---------------------|------------------------------------|------------------------------------|--------------------------|
|                     |                                    | P4_LED_AN_MODE<br>=2'b00           | P4_LED_AN_MODE<br>=2'b01 |
| EPHY_LED4_N_JTRST_N | JTAG_RST_N                         | EPHY_LED4_N                        | GPIO#39                  |
|                     |                                    | P3_LED_AN_MODE<br>=2'b00           | P3_LED_AN_MODE<br>=2'b01 |
| EPHY_LED3_N_JTCLK   | JTAG_CLK                           | EPHY_LED3_N                        | GPIO#40                  |
|                     |                                    | P2_LED_AN_MODE<br>=2'b00           | P2_LED_AN_MODE<br>=2'b01 |
| EPHY_LED2_N_JTMS    | JTAG_TMS                           | EPHY_LED2_N                        | GPIO#41                  |
|                     |                                    | P1_LED_AN_MODE<br>=2'b00           | P1_LED_AN_MODE<br>=2'b01 |
| EPHY_LED1_N_JTDI    | JTAG_TDI                           | EPHY_LED1_N                        | GPIO#42                  |
|                     |                                    | P0_LED_AN_MODE<br>=2'b00           | P0_LED_AN_MODE<br>=2'b01 |
| EPHY_LED0_N_JTDO    | JTAG_TDO                           | EPHY_LED0_N                        | GPIO#43                  |

### 2.3.4 MT7628NN WLAN LED pin share scheme

Controlled by the WLED\_AN\_MODE registers

| Pin Name | 2'b00  | 2'b01   |
|----------|--------|---------|
| WLED_N   | WLED_N | GPIO#44 |

### 2.3.5 MT7628KN EPHY LED pin share scheme

Controlled by the P#\_LED\_KN\_MODE registers

| Pin Name | Bootstrapping<br>(DBG_JTAG_MODE=1) | Bootstrapping<br>(DBG_JTAG_MODE=0) |                          |
|----------|------------------------------------|------------------------------------|--------------------------|
|          |                                    | P4_LED_KN_MODE<br>=2'b00           | P4_LED_KN_MODE<br>=2'b01 |

| Pin Name            | Bootstrapping<br>(DBG_JTAG_MODE=1) | Bootstrapping<br>(DBG_JTAG_MODE=0) |                          |
|---------------------|------------------------------------|------------------------------------|--------------------------|
|                     |                                    | P4_LED_KN_MODE<br>=2'b00           | P4_LED_KN_MODE<br>=2'b01 |
| EPHY_LED4_N_JTRST_N | JTAG_RST_N                         | EPHY_LED4_N                        | GPIO#30                  |
|                     |                                    | P3_LED_KN_MODE<br>=2'b00           | P3_LED_KN_MODE<br>=2'b01 |
| EPHY_LED3_N_JTCLK   | JTAG_CLK                           | EPHY_LED3_N                        | GPIO#31                  |
|                     |                                    | P2_LED_KN_MODE<br>=2'b00           | P2_LED_KN_MODE<br>=2'b01 |
| EPHY_LED2_N_JTMS    | JTAG_TMS                           | EPHY_LED2_N                        | GPIO#32                  |
|                     |                                    | P1_LED_KN_MODE<br>=2'b00           | P1_LED_KN_MODE<br>=2'b01 |
| EPHY_LED1_N_JTDI    | JTAG_TDI                           | EPHY_LED1_N                        | GPIO#33                  |
|                     |                                    | P0_LED_KN_MODE<br>=2'b00           | P0_LED_KN_MODE<br>=2'b01 |
| EPHY_LED0_N_JTDO    | JTAG_TDO                           | EPHY_LED0_N                        | GPIO#34                  |

### 2.3.6 MT7628KN WLAN LED pin share scheme

Controlled by the WLED\_KN\_MODE registers

| Pin Name | 2'b00  | 2'b01   |
|----------|--------|---------|
| WLED_N   | WLED_N | GPIO#35 |

### 2.3.7 PERST\_N pin share scheme

Controlled by the PERST\_MODE register.

| Pin Name | 1'b0    | 1'b1    |
|----------|---------|---------|
| PERST_N  | PERST_N | GPIO#36 |

### 2.3.8 WDT\_RST\_N pin share scheme

Controlled by the WDT\_MODE register.

| Pin Name  | 1'b0      | 1'b1    |
|-----------|-----------|---------|
| WDT_RST_N | WDT_RST_N | GPIO#37 |

### 2.3.9 REF\_CLKO pin share scheme

Controlled by the REFCLK\_MODE register.

| Pin Name | 1'b0     | 1'b1    |
|----------|----------|---------|
| REF_CLKO | REF_CLKO | GPIO#38 |

### 2.3.10 UART0 pin share scheme

Controlled by the UART0\_MODE register.

| Pin Name  | 1'b0      | 1'b1    |
|-----------|-----------|---------|
| UART_TXD0 | UART_TXD0 | GPIO#12 |
| UART_TXD0 | UART_RXD0 | GPIO#13 |

### 2.3.11 GPIO0 pin share scheme

Controlled by GPIO\_MODE register.

| Pin Name | 2'b00   | 2'b01   | 2'b10    | 2'b11   |
|----------|---------|---------|----------|---------|
| GPIO0    | GPIO#11 | GPIO#11 | REF_CLKO | PERST_N |

### 2.3.12 SPI pin share scheme

Controlled by SPI\_MODE register.

| Pin Name | 1'b0     | 1'b1    |
|----------|----------|---------|
| SPI_CLK  | SPI_CLK  | GPO#7   |
| SPI_MOSI | SPI_MOSI | GPO#8   |
| SPI_MISO | SPI_MISO | GPIO#9  |
| SPI_CS0  | SPI_CS0  | GPIO#10 |

### 2.3.13 SPI\_CS1 pin share scheme

Controlled by SPI\_CS1\_MODE register.

| Pin Name | 2'b00   | 2'b01  | 2'b10    |
|----------|---------|--------|----------|
| SPI_CS1  | SPI_CS1 | GPIO#6 | REF_CLKO |

### 2.3.14 I2C pin share scheme

Controlled by I2C\_MODE register.

| Pin Name | 2'b00    | 2'b01  |
|----------|----------|--------|
| I2C_SCLK | I2C_SCLK | GPIO#4 |
| I2C_SD   | I2C_SD   | GPIO#5 |

### 2.3.15 I2S pin share scheme

Controlled by I2S\_MODE register.

| Pin Name | 2'b00    | 2'b01  | 2'b10  |
|----------|----------|--------|--------|
| I2S_SDI  | I2C_SCLK | GPIO#0 | PCMDRX |
| I2S_SDO  | I2C_SD   | GPIO#1 | PCMDTX |
| I2S_WS   | I2C_SCLK | GPIO#2 | PCMCLK |
| I2S_CLK  | I2C_SD   | GPIO#3 | PCMFS  |



### 2.3.16 SD pin share scheme

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

| Pin Name  | EPHY_APGIO_AIO_EN[4:1]<br>=4'b0000 | EPHY_APGIO_AIO_EN[4:1]<br>=4'b1111 | SD_MODE<br>=2'b00 | SD_MODE<br>=2'b01 |
|-----------|------------------------------------|------------------------------------|-------------------|-------------------|
|           |                                    |                                    |                   |                   |
| MDI_TP_P3 | MDI_TP_P3                          |                                    | SD_WP             | GPIO#22           |
| MDI_TN_P3 | MDI_TN_P3                          |                                    | SD_CD             | GPIO#23           |
| MDI_RP_P3 | MDI_RP_P3                          |                                    | SD_D1             | GPIO#24           |
| MDI_RN_P3 | MDI_RN_P3                          |                                    | SD_D0             | GPIO#25           |
| MDI_RP_P4 | MDI_RP_P4                          |                                    | SD_CLK            | GPIO#26           |
| MDI_TN_P4 | MDI_TN_P4                          |                                    | SD_D2             | GPIO#27           |
| MDI_RN_P4 | MDI_RN_P4                          |                                    | SD_CMD            | GPIO#28           |
| MDI_TP_P4 | MDI_TP_P4                          |                                    | SD_D3             | GPIO#29           |

### 2.3.17 UART2 pin share scheme

Controlled by the EPHY\_APGIO\_AIO\_EN[4:1] and UART2\_MODE registers

| Pin Name  | 4'b0000   |  | 4'b1111   |         |               |
|-----------|-----------|--|-----------|---------|---------------|
|           |           |  | 2'b00     | 2'b01   | 2'b10 2'b11   |
| MDI_TP_P2 | MDI_TP_P2 |  | UART_TXD2 | GPIO#20 | PWM_CH2 SD_D5 |
| MDI_TN_P2 | MDI_TN_P2 |  | UART_RXD2 | GPIO#21 | PWM_CH3 SD_D4 |

### 2.3.18 PWM\_CH0 pin share scheme

Controlled by the EPHY\_APGIO\_AIO\_EN[4:1] and PWM0\_MODE registers

| Pin Name  | 4'b0000   |  | 4'b1111 |         |             |
|-----------|-----------|--|---------|---------|-------------|
|           |           |  | 2'b00   | 2'b01   | 2'b10 2'b11 |
| MDI_RP_P2 | MDI_RP_P2 |  | PWM_CH0 | GPIO#18 | SD_D7       |

### 2.3.19 PWM\_CH1 pin share scheme

Controlled by the EPHY\_APGIO\_AIO\_EN[4:1] and PWM1\_MODE registers

| Pin Name  | 4'b0000   |  | 4'b1111 |         |             |
|-----------|-----------|--|---------|---------|-------------|
|           |           |  | 2'b00   | 2'b01   | 2'b10 2'b11 |
| MDI_RN_P2 | MDI_RN_P2 |  | PWM_CH1 | GPIO#19 | SD_D6       |

### 2.3.20 SPIS pin share scheme

Controlled by the EPHY\_APGIO\_AIO\_EN[4:1] and SPIS\_MODE registers

| Pin Name | 4'b0000 | 4'b1111 |       |       |       |
|----------|---------|---------|-------|-------|-------|
|          |         | 2'b00   | 2'b01 | 2'b10 | 2'b11 |

| Pin Name  | 4'b0000   | 4'b1111   | 2'b01   | 2'b10 | 2'b11     |
|-----------|-----------|-----------|---------|-------|-----------|
| MDI_TP_P1 | MDI_TP_P1 | SPIS_CS   | GPIO#14 |       | PWM_CH0   |
| MDI_TN_P1 | MDI_TN_P1 | SPIS_CLK  | GPIO#15 |       | PWM_CH1   |
| MDI_RP_P1 | MDI_RP_P1 | SPIS_MISO | GPIO#16 |       | UART_TXD2 |
| MDI_RN_P1 | MDI_RN_P1 | SPIS_MOSI | GPIO#17 |       | UART_RXD2 |

### 2.3.21 Pin share function description

| Pin Share Name | I/O | Pin Share Function description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCMDTX         | O   | PCM Data Transmit<br>DATA signal sent from the PCM host to the external codec.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| PCMDRX         | I   | PCM Data Receive<br>DATA signal sent from the external codec to the PCM host.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| PCMCLK         | I/O | PCM Clock<br>The clock signal can be generated by the PCM host (Output direction), or provided by an external clock (input direction). The clock frequency should match the slot configuration of the PCM host.<br>e.g.<br>4 slots, PCM clock out/in should be 256 kHz.<br>8 slots, PCM clock out/in should be 512 kHz.<br>16 slots, PCM clock out/in should be 1.024 MHz.<br>32 slots, PCM clock out/in should be 2.048 MHz.<br>64 slots, PCM clock out/in should be 4.096 MHz.<br>128 slots, PCM clock out/in should be 8.192 MHz. |
| PCMFS          | I/O | PCM SYNC signal.<br>In our design, the direction of this signal is independent of the direction of PCMCLK. Its direction and mode is configurable.                                                                                                                                                                                                                                                                                                                                                                                   |
| PWM_CH0        | O   | Pulse Width Modulation Channle 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PWM_CH1        | O   | Pulse Width Modulation Channle 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PWM_CH2        | O   | Pulse Width Modulation Channle 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PWM_CH3        | O   | Pulse Width Modulation Channle 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### 2.4 Bootstrapping Pins Description

| Pin Name  | Boot Strapping Signal Name | Description                           |
|-----------|----------------------------|---------------------------------------|
| UART_TXD1 | DBG_JTAG_MODE              | 0: JTAG_MODE<br>1: EPHY_LED (default) |
| PERST_N   | XTAL_FREQ_SEL              | 0: 25 MHz DIP<br>1: 40 MHz SMD        |

| Pin Name                          | Boot Strapping Signal Name | Description                                                                                                                                                                                                                                               |
|-----------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I2S_SDO                           | DRAM_TYPE                  | 1: DDR1<br>0: DDR2<br>[note] This pin is valid for MT7628NN only. It needs to be pull-low for 7628KN which only supports DDR1.                                                                                                                            |
| {SPI_CS1<br>SPI_CLK,<br>SPI_MOSI} | CHIP_MODE[2:0]             | A vector to set chip function/test/debug modes.<br>000: Boot from PLL (boot from SPI 3-Byte Addr)<br>001: Boot from PLL (boot from SPI 4-Byte Addr)<br>010: Boot from XTAL (boot from SPI 3-Byte Addr)<br>011: Boot from XTAL (boot from SPI 4-Byte Addr) |
| PAD_TXD0                          | EXT_BGCK                   | 1: Test Mode<br>0: Normal (default)                                                                                                                                                                                                                       |

### 3. Maximum Ratings and Operating Conditions

#### 3.1 Absolute Maximum Ratings

|                               |                          |
|-------------------------------|--------------------------|
| I/O supply voltage            | 3.63 V                   |
| Input, Output, or I/O Voltage | GND -0.3 V to Vcc +0.3 V |

Table 3-1 Absolute Maximum Ratings

#### 3.2 Maximum Temperatures

|                                                |        |
|------------------------------------------------|--------|
| Maximum Junction Temperature (Plastic Package) | 125 °C |
| Maximum Lead Temperature (Soldering 10 s)      | 260 °C |

Table 3-2 Maximum Temperatures

#### 3.3 Operating Conditions

|                           |               |
|---------------------------|---------------|
| I/O supply voltage        | 3.3 V +/- 10% |
| DDR1 supply voltage       | 2.5 V +/- 5%  |
| DDR2 supply voltage       | 1.8 V +/- 5%  |
| Core supply voltage       | 1.2 V +/- 10% |
| Ambient Temperature Range | -20 to 55 °C  |

Table 3-3 Operating Conditions

#### 3.4 Thermal Characteristics

Thermal characteristics without an external heat sink in still air conditions.

MT7628KN:

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| Thermal Resistance $\theta_{JA}$ (°C /W) for JEDEC 2L system PCB | 26.1°C/W  |
| Thermal Resistance $\theta_{JA}$ (°C /W) for JEDEC 4L system PCB | 17.72°C/W |
| Thermal Resistance $\theta_{JC}$ (°C /W) for JEDEC               | 6.5°C/W   |
| Thermal Resistance $\psi_{Jt}$ (°C /W) for JEDEC 2L system PCB   | 1.81°C/W  |
| Thermal Resistance $\psi_{Jt}$ (°C /W) for JEDEC 4L system PCB   | 1.18°C/W  |

MT7628NN:

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| Thermal Resistance $\theta_{JA}$ (°C /W) for JEDEC 2L system PCB | 27.01°C/W |
| Thermal Resistance $\theta_{JA}$ (°C /W) for JEDEC 4L system PCB | 18.15°C/W |
| Thermal Resistance $\theta_{JC}$ (°C /W) for JEDEC               | 6.9°C/W   |
| Thermal Resistance $\psi_{Jt}$ (°C /W) for JEDEC 2L system PCB   | 2.41 °C/W |
| Thermal Resistance $\psi_{Jt}$ (°C /W) for JEDEC 4L system PCB   | 1.51 °C/W |

Table 3-4 Thermal Characteristics

### 3.5 Storage Conditions

The calculated shelf life in a sealed bag is 12 months if stored between 0 °C and 40 °C at less than 90% relative humidity (RH). After the bag is opened, devices that are subjected to solder reflow or other high temperature processes must be handled in the following manner:

- Mounted within 168 hours of factory conditions, i.e. < 30 °C at 60% RH.
- Storage humidity needs to maintained at < 10% RH.
- Baking is necessary if the customer exposes the component to air for over 168 hrs, baking conditions: 125 °C for 8 hrs.

### 3.6 External Xtal Specification

|                  |                 |
|------------------|-----------------|
| Frequency        | 25 MHz/ 40 Mhz  |
| Frequency offset | +/-20 ppm       |
| VIH/VIL          | Vcc-0.3 V/0.3 V |
| Duty cycle       | 45% to 55%      |

Table 3-5 External Xtal Specifications

### 3.7 DC Electrical Characteristics

| Parameters                  | Sym    | Conditions | Min   | Typ | Max   | Unit |
|-----------------------------|--------|------------|-------|-----|-------|------|
| 3.3 V supply voltage (IO)   | Vddc33 |            | 2.97  | 3.3 | 3.63  | V    |
| 2.5V supply voltage (DDR1)  | Vdd25  |            | 2.375 | 2.5 | 2.625 | V    |
| 1.8 V supply voltage (DDR2) | Vdd18  |            | 1.71  | 1.8 | 1.89  | V    |
| 1.2 V supply voltage        | Vdd12  |            | 1.08  | 1.2 | 1.32  | V    |
| 3.3 V current consumption   | Icc33  |            |       |     |       | mA   |
| 1.5 V current consumption   | Icc15  |            |       |     |       | mA   |
| 1.2 V current consumption   | Icc12  |            |       |     |       | mA   |
| DDR2 Current                | Icc18  |            |       |     |       | mA   |

Table 3-6 DC Electrical Characteristics

| Vdd=2.5V<br>(DDR2) | Min       | Typ | Max       |
|--------------------|-----------|-----|-----------|
| Vdd                | 2.375     | 2.5 | 2.625     |
| VIH                | VREF+0.15 |     | Vdd25+0.3 |
| VIL                | -0.3      |     | VREF-0.15 |
| VOH                | 0.8*Vdd25 |     |           |
| VOL                |           |     | 0.2*Vdd25 |

|     |  |  |  |
|-----|--|--|--|
| IOL |  |  |  |
| IOH |  |  |  |

Table 3-7 Vdd 2.5V Electrical Characteristics

| Vdd=1.8V<br>(DDR2) | Min        | Typ | Max        |
|--------------------|------------|-----|------------|
| Vdd                | 1.71       | 1.8 | 1.89       |
| VIH                | VREF+0.125 |     | Vdd18+0.3  |
| VIL                | -0.3       |     | VREF-0.125 |
| VOH                | 1.42       |     |            |
| VOL                |            |     | 0.28       |
| IOL                |            |     |            |
| IOH                |            |     |            |

Table 3-8 Vdd 1.8V Electrical Characteristics

| Vdd=3.3V | Min   | Typ  | Max       |
|----------|-------|------|-----------|
| Vdd      | 2.97V | 3.3V | 3.63V     |
| VIH      | 2.0V  |      | Vdd33+0.3 |
| VIL      | -0.3  |      | 0.8V      |
| VOH      | 2.4V  |      |           |
| VOL      |       |      | 0.4V      |
| IOL      |       |      |           |
| IOH      |       |      |           |

Table 3-9 Vdd 3.3V Electrical Characteristics

### 3.8 AC Electrical Characteristics

### 3.8.1 DDR2 SDRAM Interface

The DDR2 SDRAM interface complies with 200 MHz timing requirements for standard DDR2 SDRAM. The interface drivers are SSTL\_18 drivers matching the EIA/JEDEC standard JESD8-15A.

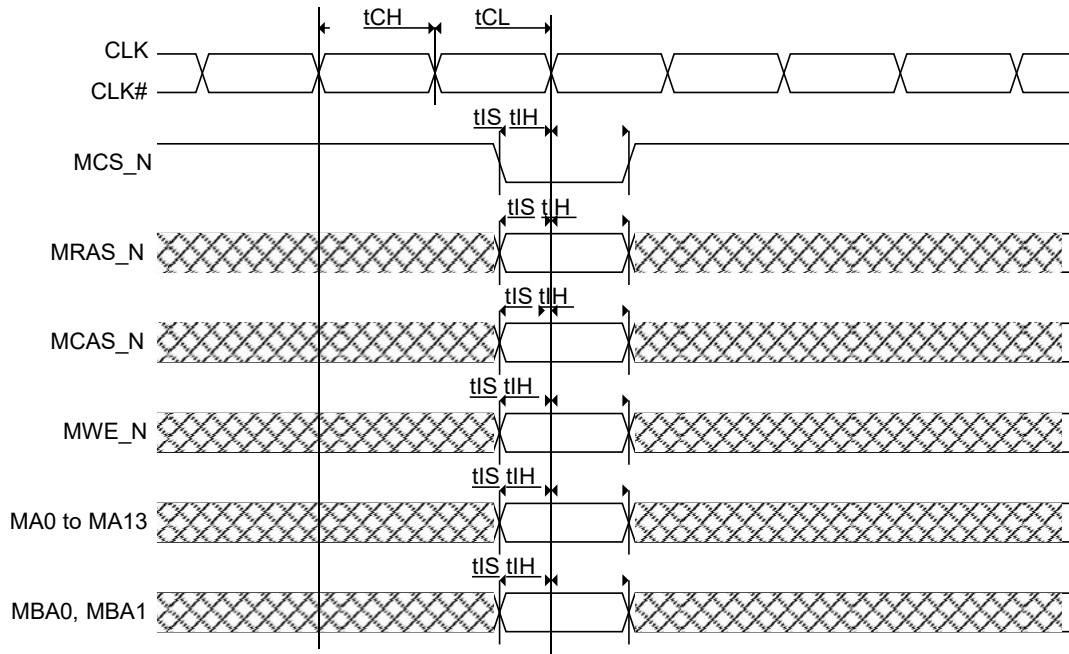


Figure 3-1 DDR2 SDRAM Command

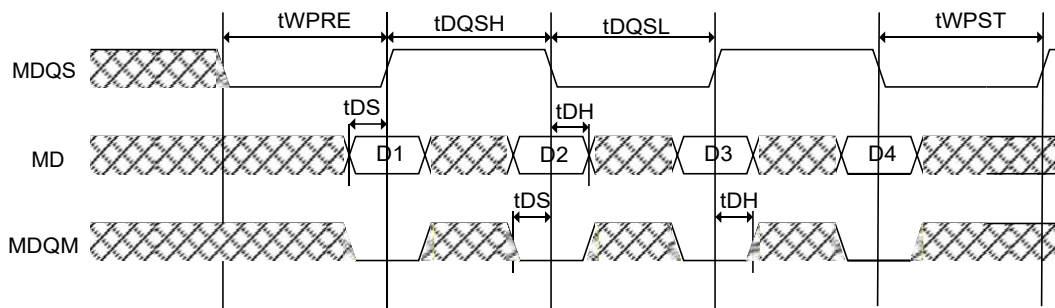


Figure 3-2 DDR2 SDRAM Write data

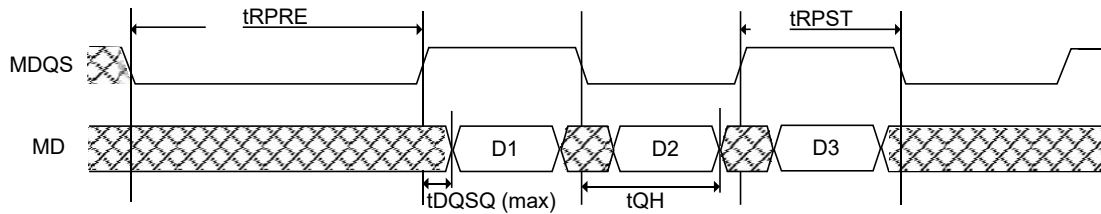


Figure 3-3 DDR2 SDRAM Read data

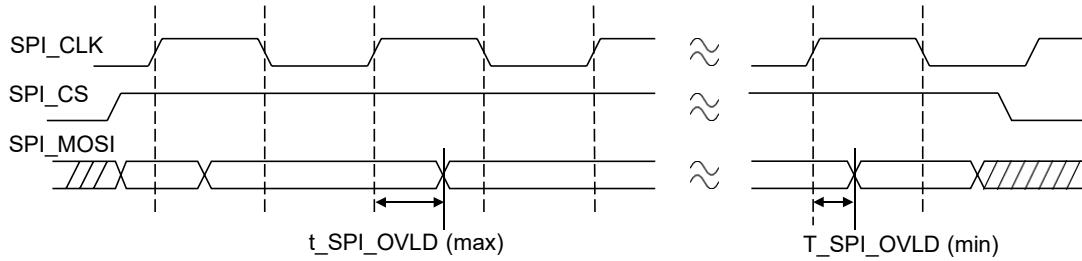
| Symbol   | Description                               | Min          | Max  | Unit     | Remark |
|----------|-------------------------------------------|--------------|------|----------|--------|
| tCK(avg) | Clock cycle time                          | 5            | -    | ns       |        |
| tAC      | DQ output access time from SDRAM CLK      | -0.6         | 0.6  | ns       |        |
| tDQSCK   | DQS output access time from SDRAM CLK     | -0.5         | 0.5  | ns       |        |
| tCH      | SDRAM CLK high pulse width                | 0.48         | 0.52 | tCK(avg) |        |
| tCL      | SDRAM CLK low pulse width                 | 0.48         | 0.52 | tCK(avg) |        |
| tHP      | SDRAM CLK half period                     | Min(tCH,tCL) | -    | ns       |        |
| tIS      | Address and control input setup time      | 0.75         | -    | ns       |        |
| tIH      | Address and control input hold time       | 0.75         | -    | ns       |        |
| tDQSQ    | Data skew of DQS and associated DQ        | -            | 0.4  | ns       |        |
| tQH      | DQ/DQS output hold time from DQS          | tHP-0.5      | -    | ns       |        |
| tRPRE    | DQS read preamble                         | 0.9          | 1.1  | tCK      |        |
| tRPST    | DQS read postamble                        | 0.4          | 0.6  | tCK      |        |
| tDQSS    | DQS rising edge to CK rising edge         | -0.25        | 0.25 | tCK      |        |
| tDQSH    | DQS input-high pulse width                | 0.35         | -    | tCK      |        |
| tDQSL    | DQS input-low pulse width                 | 0.35         | -    | tCK      |        |
| tDSS     | DQS falling edge to SDRAM CLK setup time  | 0.2          | -    | tCK      |        |
| tDSH     | DQS falling edge hold time from SDRAM CLK | 0.2          | -    | tCK      |        |
| tWPRE    | DQS write preamble                        | 0.35         | -    | tCK      |        |
| tWPST    | DQS write postamble                       | 0.4          | 0.6  | tCK      |        |
| tDS      | DQ and DQM input setup time               | *0.4         | -    | ns       |        |
| tDH      | DQ and DQM input hold time                | *0.4         | -    | ns       |        |

*Table 3-10 DDR2 SDRAM Interface Diagram Key*

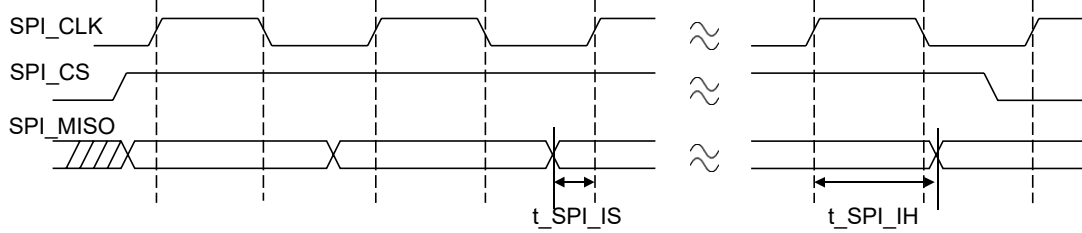
NOTE: Depends on slew rate of DQS and DQ/DQM for single ended DQS.

### 3.8.2 SPI Interface

Write operation (driven by clock rising edge)



Read operation (Driven by clock rising edge (slave-device) and latched by clock rising edge)



NOTE: 1) SPI\_CLK is a gated clock.  
2) SPI\_CS is controlled by software

Figure 3-4 SPI Interface

| Symbol     | Description                 | Min  | Max | Unit | Remark            |
|------------|-----------------------------|------|-----|------|-------------------|
| t_SPI_IS   | Setup time for SPI input    | 6.0  | -   | ns   |                   |
| t_SPI_IH   | Hold time for SPI input     | -1.0 | -   | ns   |                   |
| t_SPI_OVLD | SPI_CLK to SPI output valid | -2.0 | 3.0 | ns   | output load: 5 pF |

Table 3-11 SPI Interface Diagram Key

### 3.8.3 I<sup>2</sup>S Interface

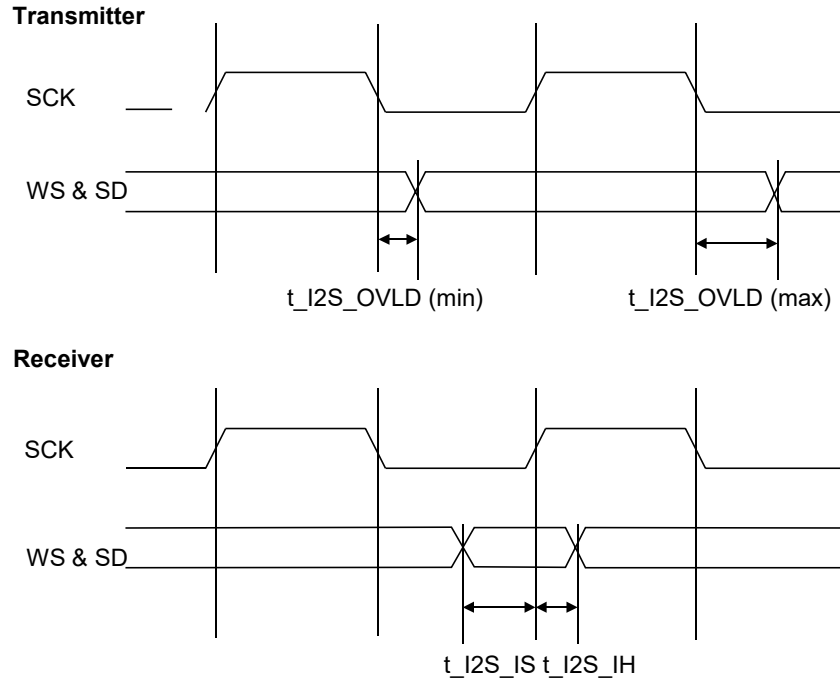


Figure-3-5 I2S Interface

| Symbol          | Description                             | Min | Max  | Unit | Remark            |
|-----------------|-----------------------------------------|-----|------|------|-------------------|
| $t_{I2S\_IS}$   | 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 | 10.0 | ns   | output load: 5 pF |

Table 3-12 I2S Interface Diagram Key

### 3.8.4 PCM Interface

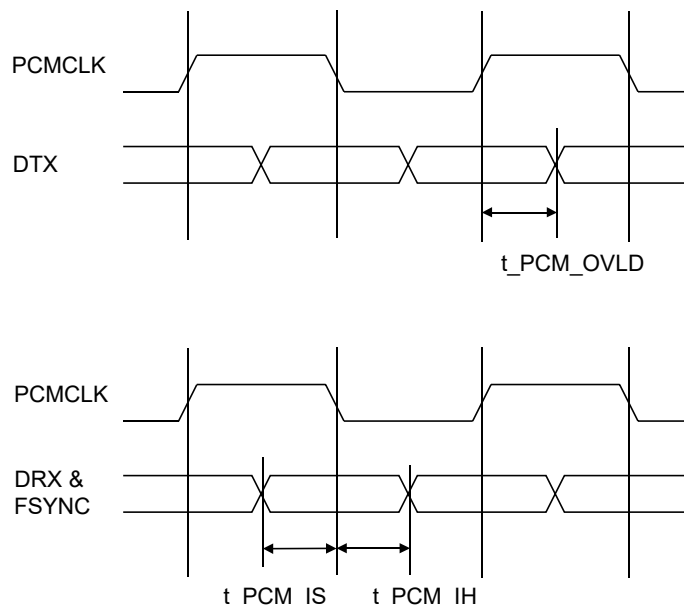


Figure 3-6 PCM Interface

| Symbol     | Description                              | Min  | Max  | Unit | Remark            |
|------------|------------------------------------------|------|------|------|-------------------|
| t_PCM_IS   | Setup time for PCM input to PCM_CLK fall | 3.0  | -    | ns   |                   |
| t_PCM_IH   | Hold time for PCM input to PCM_CLK fall  | 1.0  | -    | ns   |                   |
| t_PCM_OVLD | PCM_CLK rise to PCM output valid         | 10.0 | 35.0 | ns   | output load: 5 pF |

Table 3-13 PCM Interface Diagram Key

3.8.5 Power On Sequence

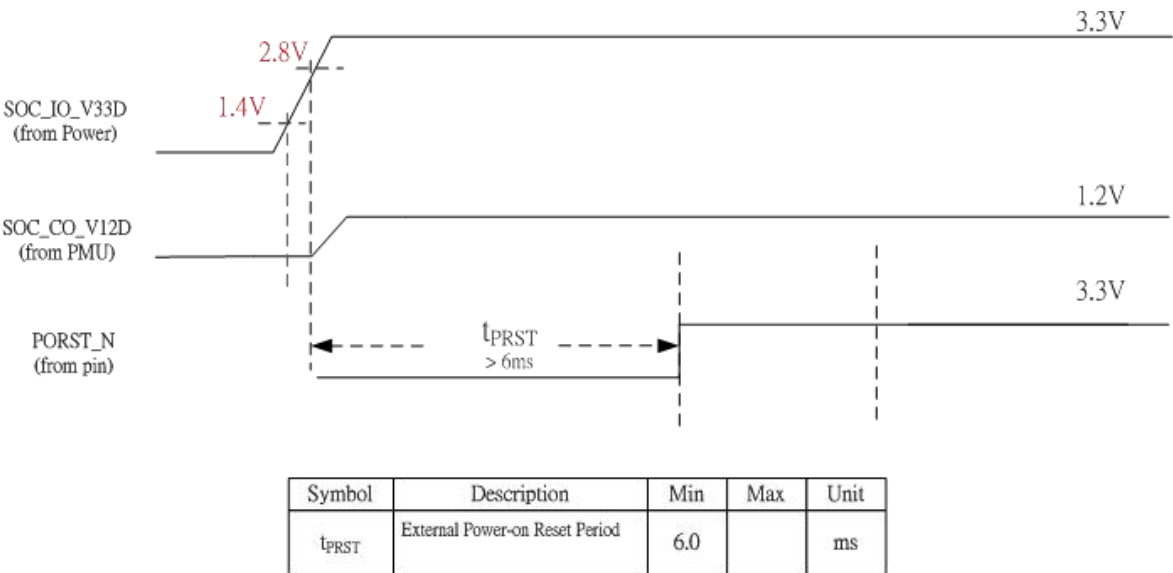


Figure 3-7 Power ON Sequence

Table 3-14 Power ON Sequence Diagram Key

### 3.9 Package Physical Dimensions

#### 3.9.1 DR-QFN (10 mm x 10 mm) 128 pins

##### 3.9.1.1 Top View

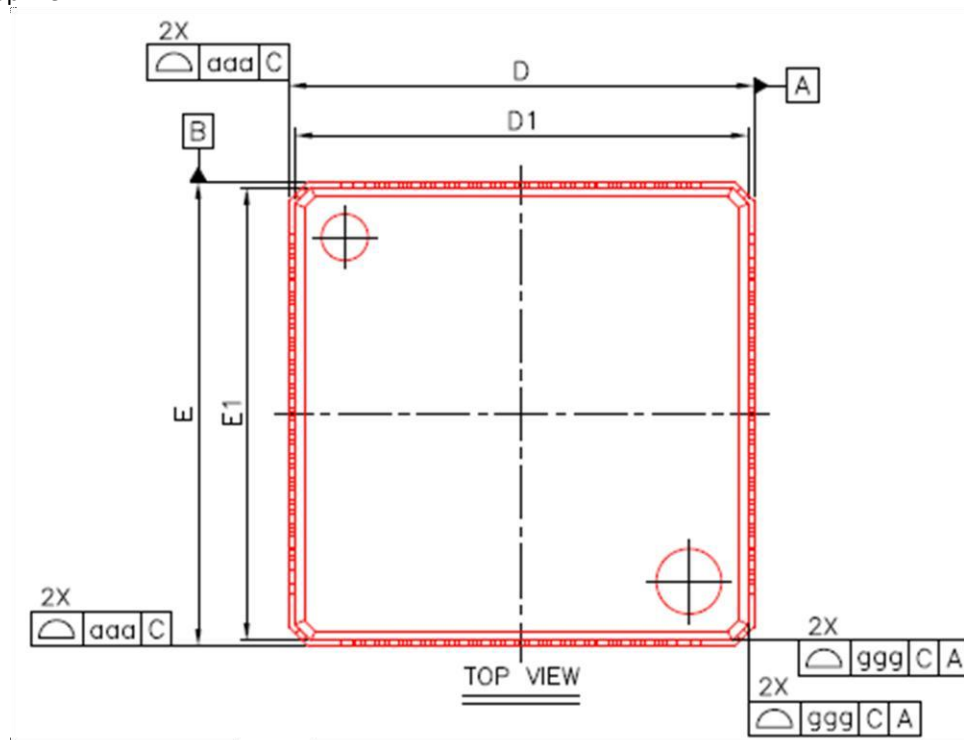


Figure 3-8 Top View

##### 3.9.1.2 Side View

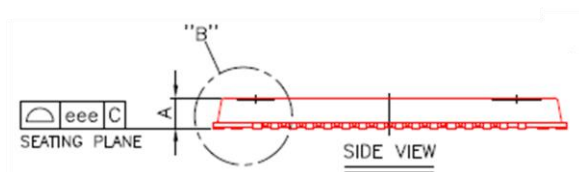


Figure 3-9 Side View

##### 3.9.1.3 "B" Expanded

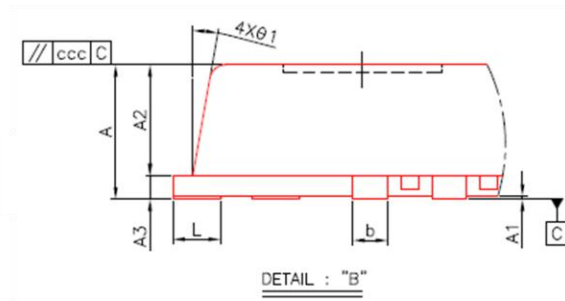


Figure 3-10 "B" Expanded

### 3.9.1.4 Bottom View

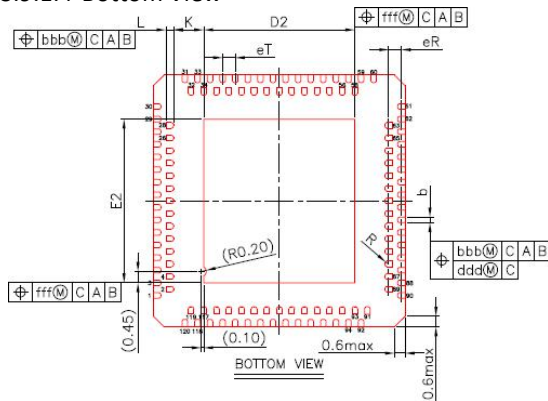


Figure 3-11 Bottom view

### 3.9.1.5 Package Diagram Key

| Item                         | SYMBOL | MIN.      | NOM.  | MAX.  |
|------------------------------|--------|-----------|-------|-------|
| TOTAL THICKNESS              | A      | 0.80      | 0.85  | 0.90  |
| LEAD STAND OFF.              | A1     | 0.00      | 0.02  | 0.05  |
| MOLD THICKNESS               | A2     | 0.65      | 0.70  | 0.75  |
| L/F THICKNESS                | A3     | 0.15 REF. |       |       |
| LEAD WIDTH                   | b      | 0.18      | 0.22  | 0.30  |
| PACKAGE SIZE                 | D      | 9.90      | 10.00 | 10.10 |
|                              | E      |           |       |       |
| Mold Edge size               | D1     | 9.75 BSC  |       |       |
|                              | E1     | 9.75 BSC  |       |       |
| E-PAD size                   | D2     | 5.90      | 6.00  | 6.10  |
|                              | E2     | 6.40      | 6.50  | 6.60  |
| LEAD LENGTH                  | L      | 0.20      | 0.30  | 0.40  |
| LEAD PITCH (BSC.)            | eT     | 0.50 BSC  |       |       |
| LEAD PITCH (BSC.)            | eR     | 0.50 BSC  |       |       |
| ANGLE                        | θ1     | 5°        | ---   | 15°   |
| LEAD ARC                     | R      | 0.09      | ---   | 0.14  |
| Lead to E-PAD Toler-ance     | K      | 0.20      | ---   | ---   |
| PKG EDGE TOLER-ANCE          | aaa    | 0.10      |       |       |
| PACKAGE PROFILE OF A SURFACE | bbb    | 0.10      |       |       |
| LEAD PROFILE OF A SURFACE    | ccc    | 0.10      |       |       |
| LEAD POSITION                | ddd    | 0.05      |       |       |
| LEAD PROFILE OF A SURFACE    | eee    | 0.08      |       |       |
| EPAD POSTION                 | fff    | 0.10      |       |       |
| Mold edge OF A & C SURFACE   | ggg    | 0.20      |       |       |

### 3.9.2 DR-QFN (12 mm x 12 mm) 156 pins

#### 3.9.2.1 Top View

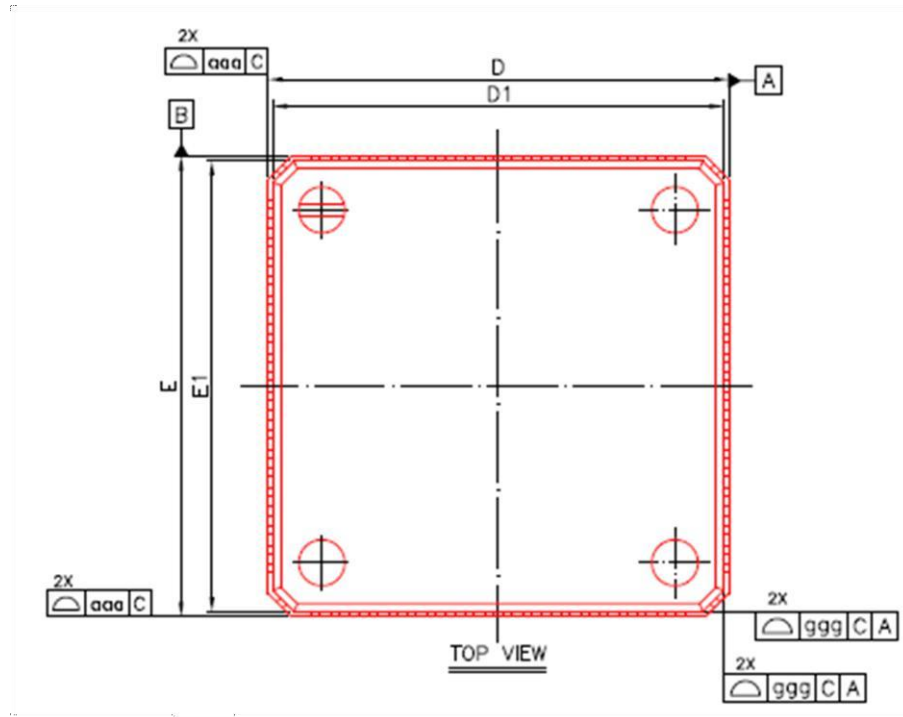


Figure 3-12 Top View

#### 3.9.2.2 Side View

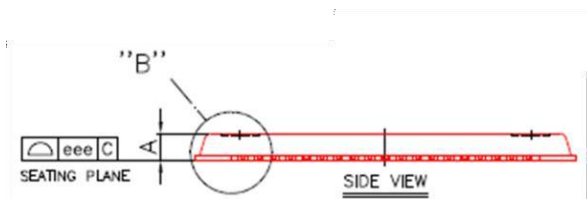


Figure 3-13 Side View

#### 3.9.2.3 "B" Expanded

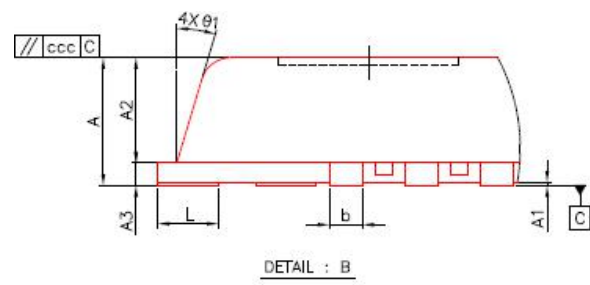


Figure 3-14 "B" Expanded

### 3.9.2.4 Bottom View

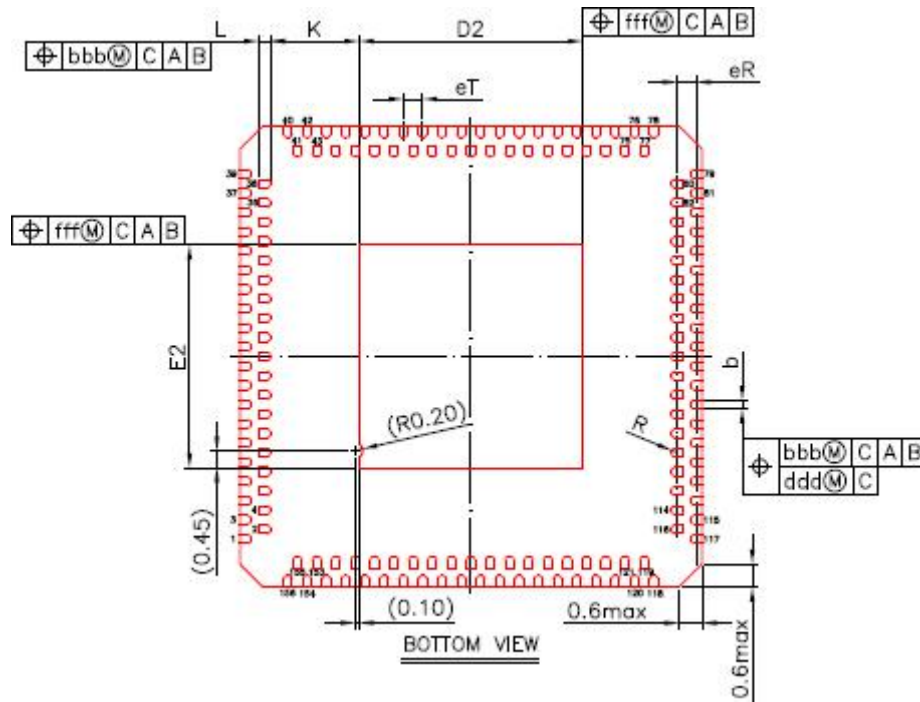


Figure 3-15 Bottom View

### 3.9.2.5 Package Diagram Key

| Item                         | SYMBOL | MIN.      | NOM.  | MAX.  |
|------------------------------|--------|-----------|-------|-------|
| TOTAL THICKNESS              | A      | 0.80      | 0.85  | 0.90  |
| LEAD STAND OFF.              | A1     | 0.00      | 0.02  | 0.05  |
| MOLD THICKNESS               | A2     | 0.65      | 0.70  | 0.75  |
| L/F THICKNESS                | A3     | 0.15 REF. |       |       |
| LEAD WIDTH                   | b      | 0.18      | 0.22  | 0.30  |
| PACKAGE SIZE                 | D      | 11.90     | 12.00 | 12.10 |
|                              | E      |           |       |       |
| Mold Edge size               | D1     | 11.75 BSC |       |       |
|                              | E1     | 11.75 BSC |       |       |
| E-PAD size                   | D2     | 5.70      | 5.80  | 5.90  |
|                              | E2     | 5.70      | 5.80  | 5.90  |
| LEAD LENGTH                  | L      | 0.20      | 0.30  | 0.40  |
| LEAD PITCH (BSC.)            | eT     | 0.50 BSC  |       |       |
| LEAD PITCH (BSC.)            | eR     | 0.50 BSC  |       |       |
| ANGLE                        | θ1     | 5°        | ---   | 15°   |
| LEAD ARC                     | R      | 0.09      | ---   | 0.14  |
| Lead to E-PAD Toler-ance     | K      | 0.20      | ---   | ---   |
| PKG EDGE TOLER-ANCE          | aaa    | 0.10      |       |       |
| PACKAGE PROFILE OF A SURFACE | bbb    | 0.10      |       |       |
| LEAD PROFILE OF A SURFACE    | ccc    | 0.10      |       |       |
| LEAD POSITION                | ddd    | 0.05      |       |       |
| LEAD PROFILE OF A SURFACE    | eee    | 0.08      |       |       |
| EPAD POSTION                 | fff    | 0.10      |       |       |
| Mold edge OF A & C SURFACE   | ggg    | 0.20      |       |       |

### 3.9.3 MT7628 AN/KN marking



**YYWW:** Date code  
**LLLLLLLLL :** Lot number  
**“.” :** Pin #1 dot

*Figure 3-16 MT7620AN top marking*



**YYWW:** Date code  
**LLLLLLLLL :** Lot number  
**“.” :** Pin #1 dot

*Figure 3-17 MT7628KN top marking*

### 3.9.4 Reflow profile guideline

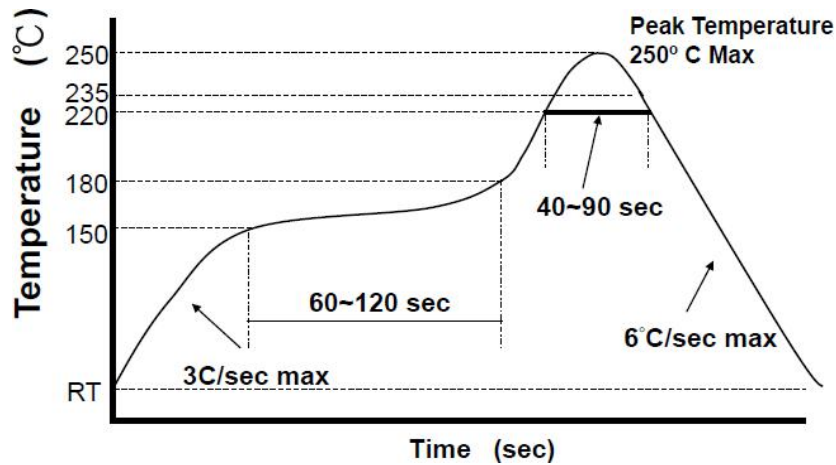


Figure 3-18 Reflow profile for MT7628

Notes;

1. Reflow profile guideline is designed for SnAgCu lead-free solder paste.
2. Reflow temperature is defined at the solder ball of package/or the lead of package.
3. MTK would recommend customer following the solder paste vendor's guideline to design a profile appropriate your line and products.
4. Appropriate N2 atmosphere is recommended since it would widen the process window and mitigate the risk for having solder open issues.

## 4. Abbreviations

| Abbrev. | Description                                                                  |
|---------|------------------------------------------------------------------------------|
| AC      | Access Category                                                              |
| ACK     | Acknowledge/ Acknowledgement                                                 |
| ACPR    | Adjacent Channel Power Ratio                                                 |
| AD/DA   | Analog to Digital/Digital to Analog converter                                |
| ADC     | Analog-to-Digital Converter                                                  |
| AES     | Advanced Encryption Standard                                                 |
| AGC     | Auto Gain Control                                                            |
| AIFS    | Arbitration Inter-Frame Space                                                |
| AIFSN   | Arbitration Inter-Frame Spacing Number                                       |
| ALC     | Asynchronous Layered Coding                                                  |
| A-MPDU  | Aggregate MAC Protocol Data Unit                                             |
| A-MSDU  | Aggregation of MAC Service Data Units                                        |
| AP      | Access Point                                                                 |
| ASIC    | Application-Specific Integrated Circuit                                      |
| ASME    | American Society of Mechanical Engineers                                     |
| ASYNC   | Asynchronous                                                                 |
| BA      | Block Acknowledgement                                                        |
| BAC     | Block Acknowledgement Control                                                |
| BAR     | Base Address Register                                                        |
| BBP     | Baseband Processor                                                           |
| BGSEL   | Band Gap Select                                                              |
| BIST    | Built-In Self-Test                                                           |
| BSC     | Basic Spacing between Centers                                                |
| BJT     |                                                                              |
| BSSID   | Basic Service Set Identifier                                                 |
| BW      | Bandwidth                                                                    |
| CCA     | Clear Channel Assessment                                                     |
| CCK     | Complementary Code Keying                                                    |
| CCMP    | Counter Mode with Cipher Block Chaining Message Authentication Code Protocol |
| CCX     | Cisco Compatible Extensions                                                  |
| CF-END  | Control Frame End                                                            |
| CF-ACK  | Control Frame Acknowledgement                                                |
| CLK     | Clock                                                                        |

| Abbrev. | Description                                         |
|---------|-----------------------------------------------------|
| CPU     | Central Processing Unit                             |
| CRC     | Cyclic Redundancy Check                             |
| CSR     | Control Status Register                             |
| CTS     | Clear to Send                                       |
| CW      | Contention Window                                   |
| CWmax   | Maximum Contention Window                           |
| CWmin   | Minimum Contention Window                           |
| DAC     | Digital-To-Analog Converter                         |
| DCF     | Distributed Coordination Function                   |
| DDONE   | DMA Done                                            |
| DDR     | Double Data Rate                                    |
| DFT     | Discrete Fourier Transform                          |
| DIFS    | DCF Inter-Frame Space                               |
| DMA     | Direct Memory Access                                |
| DSP     | Digital Signal Processor                            |
| DW      | DWORD                                               |
| EAP     | Expert Antenna Processor                            |
| EDCA    | Enhanced Distributed Channel Access                 |
| EECS    | EEPROM chip select                                  |
| EEDI    | EEPROM data input                                   |
| EEDO    | EEPROM data output                                  |
| EEPROM  | Electrically Erasable Programmable Read-Only Memory |
| eFUSE   | electrical Fuse                                     |
| EESK    | EEPROM source clock                                 |
| EIFS    | Extended Inter-Frame Space                          |
| EIV     | Extend Initialization Vector                        |
| EVM     | Error Vector Magnitude                              |
| FDS     | Frequency Domain Spreading                          |
| FEM     | Front-End Module                                    |
| FEQ     | Frequency Equalization                              |
| FIFO    | First In First Out                                  |
| FSM     | Finite-State Machine                                |
| GF      | Green Field                                         |
| GND     | Ground                                              |
| GP      | General Purpose                                     |
| GPO     | General Purpose Output                              |
| GPIO    | General Purpose Input/Output                        |

| Abbrev.          | Description                                       |
|------------------|---------------------------------------------------|
| HCCA             | HCF Controlled Channel Access                     |
| HCF              | Hybrid Coordination Function                      |
| HT               | High Throughput                                   |
| HTC              | High Throughput Control                           |
| ICV              | Integrity Check Value                             |
| IFS              | Inter-Frame Space                                 |
| iNIC             | Intelligent Network Interface Card                |
| IV               | Initialization Vector                             |
| I <sup>2</sup> C | Inter-Integrated Circuit                          |
| I <sup>2</sup> S | Integrated Inter-Chip Sound                       |
| I/O              | Input/Output                                      |
| IPI              | Idle Power Indicator                              |
| IQ               | In phase/Quadrature phase                         |
| JEDEC            | Joint Electron Devices Engineering Council        |
| JTAG             | Joint Test Action Group                           |
| kbps             | kilo (1000) bits per second                       |
| KB               | Kilo (1024) Bytes                                 |
| LDO              | Low-Dropout Regulator                             |
| LDODIG           | LDO for DIGital part output voltage               |
| LED              | Light-Emitting Diode                              |
| LNA              | Low Noise Amplifier                               |
| LO               | Local Oscillator                                  |
| L-SIG            | Legacy Signal Field                               |
| MAC              | Medium Access Control                             |
| MCU              | Microcontroller Unit                              |
| MCS              | Modulation and Coding Scheme                      |
| MDC              | Management Data Clock                             |
| MDIO             | Management Data Input/Output                      |
| MEM              | Memory                                            |
| MFB              | MCS Feedback                                      |
| MFS              | MFB Sequence                                      |
| MIC              | Message Integrity Code                            |
| MIMO             | Multiple-Input Multiple-Output                    |
| MLNA             | Monolithic Low Noise Amplifier                    |
| MM               | Mixed Mode                                        |
| MOSFET           | Metal Oxide Semiconductor Field Effect Transistor |
| MPDU             | MAC Protocol Data Units                           |
| MSB              | Most Significant Bit                              |

| Abbrev. | Description                                 |
|---------|---------------------------------------------|
| NAV     | Network Allocation Vector                   |
| NAS     | Network-Attached Server                     |
| NAT     | Network Address Translation                 |
| NDP     | Null Data Packet                            |
| NVM     | Non-Volatile Memory                         |
| ODT     | On-die Termination                          |
| Oen     | Output Enable                               |
| OFDM    | Orthogonal Frequency-Division Multiplexing  |
| OSC     | Open Sound Control                          |
| PA      | Power Amplifier                             |
| PAPE    | Provider Authentication Policy Extension    |
| PBC     | Push Button Configuration                   |
| PBF     | Packet Buffer                               |
| PCB     | Printed Circuit Board                       |
| PCF     | Point Coordination Function                 |
| PCM     | Pulse-Code Modulation                       |
| PHY     | Physical Layer                              |
| PIFS    | PCF Interframe Space                        |
| PLCP    | Physical Layer Convergence Protocol         |
| PLL     | Phase-Locked Loop                           |
| PME     | Physical Medium Entities                    |
| PMU     | Power Management Unit                       |
| PN      | Packet Number                               |
| PROM    | Programmable Read-Only Memory               |
| PSDU    | Physical layer Service Data Unit            |
| PSI     | Power supply Strength Indication            |
| PSM     | Power Save Mode                             |
| PTN     | Packet Transport Network                    |
| QoS     | Quality of Service                          |
| RDG     | Reverse Direction Grant                     |
| RAM     | Random Access Memory                        |
| RF      | Radio Frequency                             |
| RGMII   | Reduced Gigabit Media Independent Interface |
| RH      | Relative Humidity                           |
| RoHS    | Restriction on Hazardous Substances         |
| ROM     | Read-Only Memory                            |

| Abbrev. | Description                                     |
|---------|-------------------------------------------------|
| RSSI    | Received Signal Strength Indication (Indicator) |
| RTS     | Request to Send                                 |
| RvMII   | Reverse Media Independent Interface             |
| Rx      | Receive                                         |
| RXD     | Received Data                                   |
| RXINFO  | Receive Information                             |
| RXWI    | Receive Wireless Information                    |
| S       | Stream                                          |
| SDXC    | Secure Digital eXtended Capacity                |
| SDIO    | Secure Digital Input Output                     |
| SDRAM   | Synchronous Dynamic Random Access Memory        |
| SEC     | Security                                        |
| SGL     | Short Guard Interval                            |
| SIFS    | Short Inter-Frame Space                         |
| SoC     | System-on-a-Chip                                |
| SPI     | Serial Peripheral Interface                     |
| SRAM    | Static Random Access Memory                     |
| SSCG    | Spread Spectrum Clock Generator                 |
| STBC    | Space-Time Block Code                           |
| SW      | Switch Regulator                                |
| TA      | Transmitter Address                             |
| TBTT    | Target Beacon Transmission Time                 |
| TDLS    | Tunnel Direct Link Setup                        |
| TKIP    | Temporal Key Integrity Protocol                 |
| TRSW    | Tx/Rx Switch                                    |
| TSF     | Timing Synchronization Function                 |

| Abbrev. | Description                                    |
|---------|------------------------------------------------|
| TSSI    | Transmit Signal Strength Indication            |
| Tx      | Transmit                                       |
| TxBF    | Transmit Beamforming                           |
| TXD     | Transmitted Data                               |
| TXDAC   | Transmit Digital-Analog Converter              |
| TXINFO  | Transmit Information                           |
| TXOP    | Opportunity to Transmit                        |
| TXWI    | Tx Wireless Information                        |
| UART    | Universal Asynchronous Rx/ Tx                  |
| USB     | Universal Serial Bus                           |
| UTIF    | Universal Test Interface                       |
| VGA     | Variable Gain Amplifier                        |
| VCO     | Voltage Controlled Amplifier                   |
| VIH     | High Level Input Voltage                       |
| VIL     | Low Level Input Voltage                        |
| VoIP    | Voice over IP                                  |
| WCID    | Wireless Client Identification                 |
| WEP     | Wired Equivalent                               |
| WI      | Wireless Information                           |
| WIV     | Wireless Information Valid                     |
| WMM     | Wi-Fi Multimedia                               |
| WPA     | Wi-Fi Protected Access                         |
| WPDMA   | Wireless Polarization Division Multiple Access |
| WS      | Word Select                                    |

## 5. Revision History

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| Rev | Date       | Description                      |
|-----|------------|----------------------------------|
| 1.0 | 2012/07/09 | Initial Release                  |
| 1.1 | 2012/07/18 | Update SPI_WP/SPI_HOLD GPO table |
| 1.2 | 2012/08/20 | Fix DRQFN internal pad size typo |
| 1.3 | 2012/09/12 | Add IR reflow guideline          |

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