SIM7600 Series_Open Linux UART&SPI_Application Note

LTE Module
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About Document

Version History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Owner</th>
<th>What is new</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2.00</td>
<td>2020.8.6</td>
<td>Zhichong Huang</td>
<td>Update document format</td>
</tr>
</tbody>
</table>
Contents

About Document.......................................................................................................................... 3
   Version History......................................................................................................................... 3
   Scope........................................................................................................................................... 错误！未定义书签。

Contents........................................................................................................................................ 4

1.   Document Overview.................................................................................................................. 5

2.   Hardware interface.................................................................................................................... 6
   2.1 Description of related PIN..................................................................................................... 6

3.   UART......................................................................................................................................... 7
   3.1 High speed UART.................................................................................................................. 7
      3.1.1 PIN6-9 Configure high speed UART.................................................................................. 7
      3.1.2 PIN6-9 Configures BT....................................................................................................... 9
      3.1.3 PIN66-71 configures high speed UART............................................................................. 10
   3.2 Low speed UART.................................................................................................................. 11
      3.2.1 PIN7,8 configure low speed UART.................................................................................... 11
      3.2.2 PIN68,71 configures low speed UART............................................................................. 13

4.   SPI.......................................................................................................................................... 14
   4.1 PIN6-9 configures SPI.......................................................................................................... 14
   4.2 PIN66-71 configures SPI....................................................................................................... 17
1. Document Overview

This document explains the compilation and configuration of the module's UART interface and SPI interface.
2. Hardware interface

2.1 Description of related PIN

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>PIN name</th>
<th>Default Function</th>
<th>Function1</th>
<th>Function2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>SPI_CLK</td>
<td>UART_RTS</td>
<td>SPI_CLK</td>
<td>UART_RTS</td>
</tr>
<tr>
<td>7</td>
<td>SPI_MISO</td>
<td>UART_RX</td>
<td>SPI_MISO</td>
<td>UART_RX</td>
</tr>
<tr>
<td>8</td>
<td>SPI_MOSI</td>
<td>UART_TX</td>
<td>SPI_MOSI</td>
<td>UART_TX</td>
</tr>
<tr>
<td>9</td>
<td>SPI_CS</td>
<td>UART_CTS</td>
<td>SPI_CS</td>
<td>UART_CTS</td>
</tr>
<tr>
<td>66</td>
<td>UART_RTS</td>
<td>UART_RTS</td>
<td>UART_RTS</td>
<td>SPI_CLK</td>
</tr>
<tr>
<td>67</td>
<td>UART_CTS</td>
<td>UART_CTS</td>
<td>UART_CTS</td>
<td>SPI_CS</td>
</tr>
<tr>
<td>68</td>
<td>UART_RX</td>
<td>UART_RX</td>
<td>UART_RX</td>
<td>SPI_MISO</td>
</tr>
<tr>
<td>71</td>
<td>UART_TX</td>
<td>UART_TX</td>
<td>UART_TX</td>
<td>SPI_MOSI</td>
</tr>
</tbody>
</table>
3. UART

3.1 High speed UART

3.1.1 PIN6-9 Configure high speed UART

```

.blsp1_uart3: uart@78b1000 {
  compatible = "qcom,msm-hsuart-v14";
  reg = <0x78b1000 0x200>,
    <0x7884000 0x2b000>;
  reg-names = "core_mem", "bam_mem";
  interrupt-names = "core_irq", "bam_irq";
  #address-cells = <0>;
  interrupt-parent = <&blsp1_uart3>;
  interrupts = <0 1>;
  #interrupt-cells = <1>;
  interrupt-map-mask = <0xffffffff>;
  interrupt-map = <0 &intc 0 119 0
    1 &intc 0 238 0>;

  qcom,bam-tx-ep-pipe-index = <4>;
  qcom,bam-rx-ep-pipe-index = <5>;
  qcom,master-id = <86>;
  qcom,dev-id = <0>;
  clock-names = "core_clk", "iface_clk";
  clocks = <&clock_gcc clk_gcc_blsp1_uart3_apps_clk>,
    <&clock_gcc clk_gcc_blsp1_ahb_clk>;
  pinctrl-names = "sleep", "default";
  pinctrl-0 = <&blsp1_uart3_sleep>;
  pinctrl-1 = <&blsp1_uart3_active>;
  qcom,msm-bus,name = "blsp1_uart3";
  qcom,msm-bus,num-cases = <2>;
  qcom,msm-bus,num-paths = <1>;
}
```
Modify as shown above, PIN6,7,8,9 are configured as UART function, and the system generates /dev/ttyHS0 device node after system start up.

qcom,dev-id = <0>; Determine the generated device node serial number

The above configuration does not support RX wake-up. Applications are required to manage device power, and configuration can also be modified to support RX wake-up sleep.
3.1.2 PIN6-9 Configures BT

Modify the file:

```c
./kernel/arch/arm/boot/dts/qcom/mdm9607.dtsi:
blsp1_uart3: uart@78b1000 {
    compatible = "qcom,msm-hsuart-v14";
    reg = <0x78b1000 0x200>,
        <0x7884000 0x2b000>;
    reg-names = "core_mem", "bam_mem";
    interrupt-names = "core_irq", "bam_irq", "wakeup_irq";
    #address-cells = <0>;
    interrupt-parent = <&blsp1_uart3>;
    interrupts = <0 1 2>;
    #interrupt-cells = <1>;
    interrupt-map-mask = <0xffffffff>;
    interrupt-map = <0 &intc 0 119 0 1 &intc 0 238 0 2 &tlmm_pinmux 1 0>;

    qcom,inject-rx-on-wakeup;
    qcom,rx-char-to-inject = <0xFD>;
    qcom,bam-tx-ep-pipe-index = <4>;
    qcom,bam-rx-ep-pipe-index = <5>;
    qcom,master-id = <86>;
    qcom,dev-id = <0>;
    clock-names = "core_clk", "iface_clk";
    clocks = <&clock gcc clk gcc_blsp1_uart3_apps_clk>,
             <&clock gcc clk gcc_blsp1_ahb_clk>;
    pinctrl-names = "sleep", "default";
    pinctrl-0 = <&blsp1_uart3_sleep>;
    pinctrl-1 = <&blsp1_uart3_active>;
    qcom,msm-bus,name = "blsp1_uart3";
    qcom,msm-bus,num-cases = <2>;
    qcom,msm-bus,num-paths = <1>;
    qcom,msm-bus,vectors-KBps =
        <86 512 0 0>,
```

Modify as shown above, the Bluetooth application can use ttyHS0 to communicate with the Bluetooth chip. After the Bluetooth application and the Bluetooth chip stop communicating for 3 seconds, ttyHS0 automatically goes to sleep.

3.1.3 PIN66-71 configures high speed UART

Modify the file:

```c
udi kernel/arch/arm/boot/dts/qcom mdm9607.dtsi:
blsp1_uart2: uart@78b0000 {  
    compatible = "qcom,msm-hsuart-v14";
    reg = <0x78b0000 0x200>,
         <0x7884000 0x2b000>;
    reg-names = "core_mem", "bam_mem";
    interrupt-names = "core_irq", "bam_irq";
    #address-cells = <0>;
    interrupt-parent = <&blsp1_uart2>;
    interrupts = <0 1>;
    #interrupt-cells = <1>;
    interrupt-map-mask = <0xffffffff>;
    interrupt-map = <0 &intc 0 108 0
                    1 &intc 0 238 0>;
    qcom,bam-tx-ep-pipe-index = <2>;
    qcom,bam-rx-ep-pipe-index = <3>;
```
Modify as shown above, PIN66, 67, 68, 71 are configured as UART function. After the system starts up, the /dev/ttyHS1 device node is generated. The UART is generally controlled by using the DTR (PIN72) to wake up the device.

### 3.2 Low speed UART

#### 3.2.1 PIN7,8 configures low speed UART

The low speed UART does not support flow control and DMA. Large amount of data communication
will certainly lose data, generally used for module console.

Modify the file:

```c
//kernel/arch/arm/boot/dts/qcom/mdm9607.dtsi:
blsp1_uart3: serial@78b1000 {
  /* BLSP1 UART3 */
  compatible = "qcom,msm-lsuart-v14";
  reg = <0x78b3000 0x200>
  interrupts = <0 119 0>
  clocks = <&clock_gcc clk_gcc_blsp1_uart3_apps_clk>,
           <&clock_gcc clk_gcc_blsp1_ahb_clk>
  clock-names = "core_clk", "iface_clk"
  status = "disabled"
};
```

```c
//kernel/arch/arm/boot/dts/qcom/mdm9607-mtp.dtsi:
&blsp1_uart3 {
  status = "ok"
  pinctrl-names = "default"
  pinctrl-0 = <&uart3_console_sleep>
};
```

```c
//kernel/arch/arm/boot/dts/qcom/mdm9607-pinctrl.dtsi
uart3_console_sleep: uart3_console_sleep {
  mux {
    pins = "gpio0", "gpio1";
    function = "blsp_uart3"
  }
  config {
    pins = "gpio0", "gpio1"
    drive-strength = <2>
    bias-pull-down
  }
};
```

Modify as shown above. PIN 7,8 is configured as a low-speed UART function. After the system starts up, the /dev/ttyHSL1 device node is generated. In this way, PIN 6, 9 can be configured for other functions. If the UART is required for the console, then execute /sbin/getty -L ttyHSL1 115200 console or add S1:2345:respawn:/sbin/getty -L ttyHSL1 115200 console to /etc/inittab.
3.2.2 PIN68,71 configures low speed UART

Modify the file:

```c
./kernel/arch/arm/boot/dts/qcom/mdm9607.dtsi:
  blsp1_uart2: serial@78b0000 { /* BLSP1 UART2 */
      compatible = "qcom,msm-lsuart-v14";
      reg = <0x78b0000 0x200>;
      interrupts = <0 108 0>;
      clocks = <&clock_gcc clk_gcc_blsp1_uart2_apps_clk>,
               <&clock_gcc clk_gcc_blsp1_ahb_clk>;
      clock-names = "core_clk", "iface_clk";
      status = "disabled";
  };

./kernel/arch/arm/boot/dts/qcom/mdm9607-mtp.dtsi:
&blsp1_uart2 {
    status = "ok";
    pinctrl-names = "default";
    pinctrl-0 = <&uart2_console_sleep>;
};

./kernel/arch/arm/boot/dts/qcom/mdm9607-pinctrl.dtsi
  uart2_console_sleep: uart2_console_sleep {
     mux {
          pins = "gpio4", "gpio5";
          function = "blsp_uart2";
      };
      config {
          pins = "gpio4", "gpio5";
          drive-strength = <2>;
          bias-pull-down;
      };
  };
```

Modify as shown above. The PIN 68, 71 is configured as a low-speed UART function. After the system is booted, the /dev/ttyHSL1 device node is generated so that the PINs 66, 67 can be configured for other functions. If the UART is required for the console, then execute /sbin/getty -L ttyHSL1 115200 console or add S1:2345:respawn:/sbin/getty -L ttyHSL1 115200 console to /etc/inittab.
4. SPI

4.1 PIN6-9 configures SPI

Modify the file:

```c
./kernel/arch/arm/boot/dts/qcom/mdm9607.dtsi:
aliases {
    /* smdttty devices */
    smd7 = &smdtty_data1;
    smd8 = &smdtty_data4;
    smd11 = &smdtty_data11;
    smd21 = &smdtty_data21;
    smd36 = &smdtty_loopback;
    smd38 = &smdtty_data38;
    /* spi device */
    spi1 = &spi_1;
    spi2 = &spi_2;
    i2c4 = &i2c_4;
    sdhc2 = &sdhc_2; /* SDC2 SD card slot */
    i2c5 = &i2c_5; /* Add by sunxiang */
};
```

```c
spi_2: spi@78b7000 { /* BLSP1 QUP2 */
    compatible = "qcom,spi-qup-v2";
    #address-cells = <1>;
    #size-cells = <0>;
    reg-names = "spi_physical", "spi_bam_physical";
    reg = <0x78b7000 0x600>,
        <0x7884000 0x2b000>;
    interrupt-names = "spi_irq", "spi_bam_irq";
    interrupts = <0 97 0>, <0 238 0>;
    spi-max-frequency = <19200000>;
    pinctrl-names = "spi_default", "spi_sleep";
    pinctrl-0 = <&spi2_default &spi2_cs0_active>;
    pinctrl-1 = <&spi2_sleep &spi2_cs0_sleep>;
    clocks = <&clock_gcc clk_gcc_blsp1_ahb_clk>,
```
clock-names = "iface_clk", "core_clk";
qcom, infinite-mode = <0>;
qcom, use-bam;
qcom, use-pinctrl;
qcom, ver-reg-exists;
qcom, bam-consumer-pipe-index = <16>;
qcom, bam-producer-pipe-index = <17>;
qcom, master-id = <86>;
status = "disabled";
}

_spii_2 {
    status = "ok";
};

/\* remove uart3 config \*/
&blsp1_uart3 {
    status = "ok";
};

spi2 {
    spi2_default: spi2_default {
    /* active state */
    mux {
        /* MOSI, MISO, CLK */
        pins = "gpio0", "gpio1", "gpio3";
        function = "blsp_spi3";
    };  

    config {
        pins = "gpio0", "gpio1", "gpio3";
        drive-strength = <12>; /* 12 MA */
        bias-pull-up; /* PULL UP */
    };
    
    spi2_sleep: spi2_sleep {
/* suspended state */
mux {
    /* MOSI, MISO, CLK */
    pins = "gpio0", "gpio1", "gpio3";
    function = "gpio";
};

config {
    pins = "gpio0", "gpio1", "gpio3";
    drive-strength = <2>; /* 2 MA */
    bias-pull-down; /* PULL Down */
};

spi2_cs0_active: spi2_cs0_active {
    /* CS */
    mux {
        pins = "gpio2";
        function = "blsp_spi3";
    }
    config {
        pins = "gpio2";
        drive-strength = <12>
        bias-pull-up;
    }
};

spi2_cs0_sleep: spi2_cs0_sleep {
    /* CS */
    mux {
        pins = "gpio2";
        function = "gpio";
    }
    config {
        pins = "gpio2";
        drive-strength = <12>
        bias-pull-up;
    }
};
4.2 PIN66-71 configures SPI

```c
./kernel/arch/arm/boot/dts/qcom/mdm9607-mtp.dtsi:
  &spi_1 {
      status = "ok";
  };

/* remove uart2 config
 &blsp1_uart2 {
      status = "ok";
  };
 */
```