RV-8263 Linux driver documentation

Bootlin

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Contents

Building the driver

out of tree

Simply use `make` in the driver directory.

```
$ make
make -C /lib/modules/`uname -r`/build M=$PWD
make[1]: Entering directory '/usr/src/linux-headers-4.19.0-1-amd64'
  CC [M]  /usr/src/rv8263/rtc-rv8263.o
  Building modules, stage 2.
```

```
  MODPOST 1 modules
  CC      /husr/src/rv8263/rtc-rv8263.mod.o
  LD [M]  /usr/src/rv8263/rtc-rv8263.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.19.0-1-amd64'
```

If cross-compiling or if the kernel headers directory detection fails, pass `KDIR`:

```
$ make KDIR=/usr/src/linux
make -C /usr/src/linux/ M=$PWD
make[1]: Entering directory '/usr/src/linux'
  CC [M]  /usr/src/rv8263/rtc-rv8263.o
  Building modules, stage 2.
  MODPOST 1 modules
  CC      /husr/src/rv8263/rtc-rv8263.mod.o
  LD [M]  /usr/src/rv8263/rtc-rv8263.ko
make[1]: Leaving directory '/usr/src/linux'
```

in-tree

For Linux 4.19 :

```
$ git apply < 0001-rtc-pcf85063-add-Microcrystal-AG-RV-8263-support.patch
```

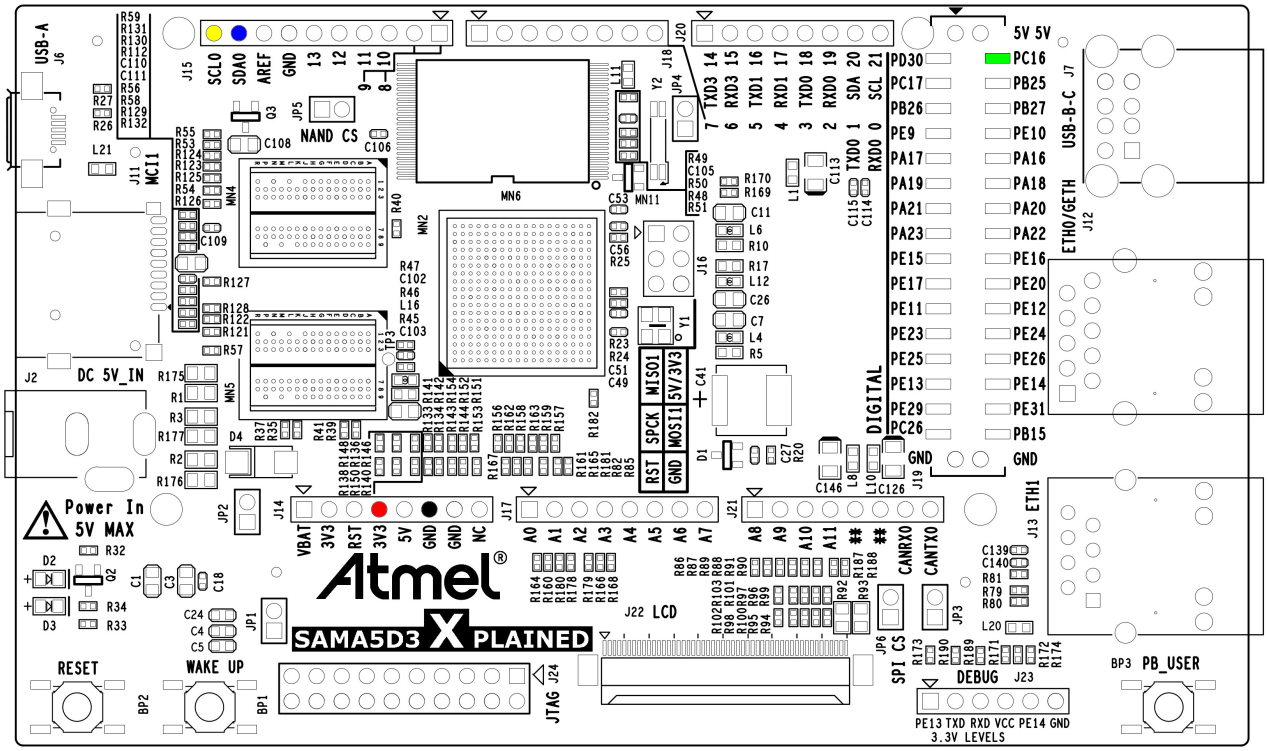
Then select `CONFIG_RTC_DRV_pCF85063` in your kernel configuration.

Connecting the RV-8263 development board

Atmel Sama5d3 Xplained

The following configuration has been tested:

RV-8263	SAMA5D3 Xplained	
VDD	J14 3V3	
VSS	J14 GND	
SDA	J15 SDA0	
SCL	J15 SCL0	
nINT	J19 PC16	



Device Tree

In the SAMA5D3 Xplained devicetree (`arch/arm/boot/dts/at91-sama5d3_xplained.dts`), the rtc node should be added as a child of the existing i2c0 node. The end result should look like:

```
i2c0: i2c@f0014000 {
    pinctrl-0 = <&pinctrl_i2c0_pu>;
    status = "okay";

    rtc: rv8263@51 {
        compatible = "microcrystal,rv8263";
        reg = <0x51>;
        status = "okay";
        pinctrl-0 = <&pinctrl_rtc_int>;
        interrupts-extended = <&pioC 16 GPIO_ACTIVE_HIGH>;
    };
};
```

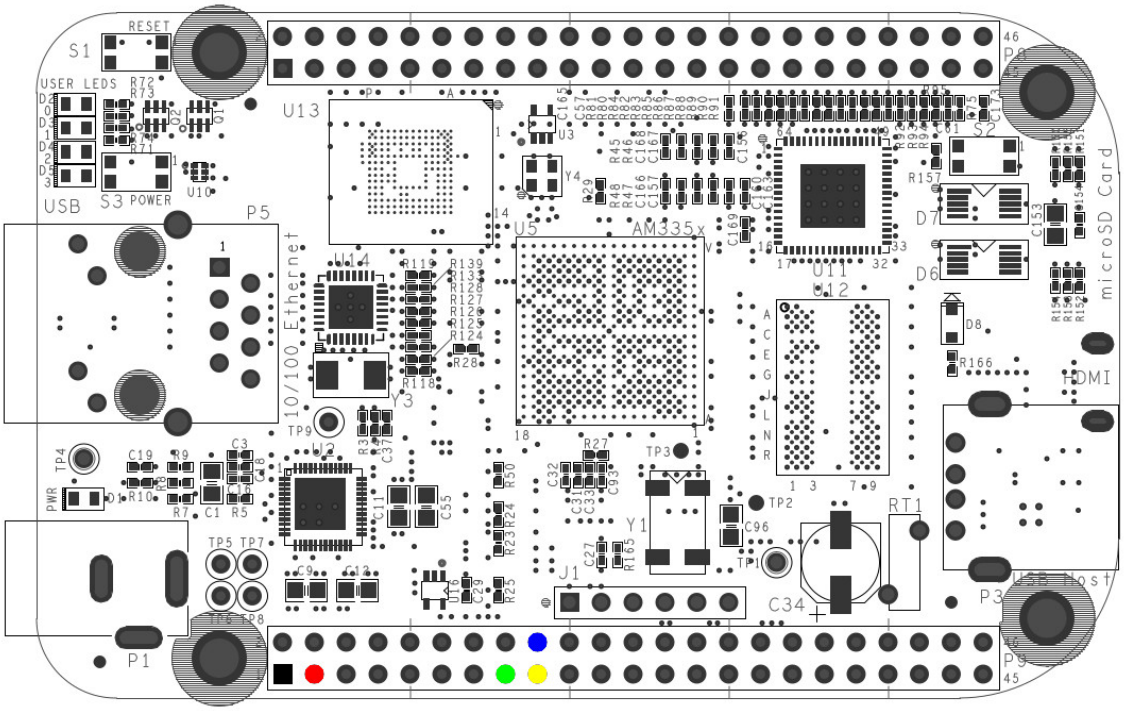
A pinctrl definition has to be added in the pinctrl node:

```
pinctrl@fffff200 {
    rtc {
        pinctrl_rtc_int: rtc_int {
            atmel,pins =
                <AT91_PIOC 16 AT91_PERIPH_GPIO AT91_PINCTRL_PULL_UP_DEGLITCH>;
        };
    };
```

Beaglebone Black

The following configuration has been tested:

RV-8263	Beaglebone (P9)	
VDD	3	
VSS	1	
SDA	18	
SCL	17	
nINT	15	



Device Tree

In the Beaglebone Black device tree (`arch/arm/boot/dts/am335x-boneblack.dts`), i2c1 should be enabled and the rtc node added as a child. The end result should look like:

```
&i2c1 {
    status = "okay";
    clock-frequency = <100000>;

    pinctrl-names = "default";
    pinctrl-0 = <&i2c1_pins>;

    rv8263: rtc@51 {
        compatible = "microcrystal,rv8263";
        reg = <0x51>;
        status = "okay";
        pinctrl-0 = <&rtc_nint_pins>;
        interrupts-extended = <&gpio1 16 GPIO_ACTIVE_HIGH>;
    };
};
```

Pinctrl definitions have to be added in the pinctrl node:

```
&am33xx_pinmux {
    rtc_nint_pins: pinmux_rtc_nint_pins {
        pinctrl-single,pins = <
            0x040 (PIN_INPUT | MUX_MODE7)     /* gpmc_a1.gpio1_16 */
        >;
    };

    /* Pins 17 (I2C1_SCL) and 18 (I2C1_SDA) of connector P9 */
    i2c1_pins: pinmux_i2c1_pins {
        pinctrl-single,pins = <
            0x158 (PIN_INPUT_PULLUP | MUX_MODE2)     /* spi0_d1.i2c1_sda */
            0x15c (PIN_INPUT_PULLUP | MUX_MODE2)     /* spi0_cs0.i2c1_scl */
        >;
    };
};
```

Using the RTC

Loading the driver

If the driver has been built statically in the kernel, nothing has to be done. If it is built as a module, then load it with:

```
$ modprobe rtc-rv8263
```

or if that is not working:

```
$ insmod /path/to/rtc-rv8263.ko
```

Finding the RTC device

On initialization, the driver will log the following message:

```
$ dmesg | grep pcf85063
rtc-pcf85063 1-0051: registered as rtc1
```

This means that `rtc1` is the RV-8263 rtc.

Reading the date

```
$ hwclock -r -f /dev/rtc1
```

You'll get the following message when the date is invalid:

```
hwclock: RTC_RD_TIME: Invalid argument
```

You will also see the following message in your kernel log:

```
$ dmesg | grep pcf85063
rtc rtc1: Power loss detected, invalid time
```

Setting the date

Set the system date:

```
$ date -s "2016-04-20 09:30"
```

Write the date to the RTC:

```
$ hwclock -w -f /dev/rtc1
```

Writing the date will clear the voltage low flags.

Reading and clearing the Voltage Low flags

The RTC_VL_READ and RTC_VL_CLR ioctls are implemented. The following program will read the flags then clear them and read again:

```
#include <errno.h>
#include <fcntl.h>
#include <stdio.h>
#include <stdlib.h>
#include <linux/rtc.h>

#ifndef RTC_VL_READ
#include <linux/ioctl.h>

#define RTC_VL_READ     _IOR('p', 0x13, int)     /* Voltage low detector */
#define RTC_VL_CLR      _IO('p', 0x14)           /* Clear voltage low informat
#endif

int main(int argc, char **argv)
{
        int fd, retval;
        const char *rtc = "/dev/rtc1";
        int vl;

        fd = open(rtc, O_RDWR);

        if ( fd == -1 ) {
                perror(rtc);
                exit(errno);
        }

        retval = ioctl(fd, RTC_VL_READ, &vl);
        if (retval < 0) {
                perror("RTC_VL_READ failed");
                exit(errno);
        }
        printf("%s flags: %d\n", rtc, vl);

        retval = ioctl(fd, RTC_VL_CLR, NULL);
        if (retval < 0) {
                perror("RTC_VL_CLR failed");
                exit(errno);
        }

        retval = ioctl(fd, RTC_VL_READ, &vl);
```

```
        if (retval < 0) {
                perror("RTC_VL_READ failed");
                exit(errno);
        }
        printf("%s flags: %d\n", rtc, vl);

        close(fd);

        return 0;
}
```

Reading and setting the crystal frequency offset

The `/sys/class/rtc/rtcX/offset` file exposes the current frequency offset correction in parts per billion.

For example, to read the offset:

```
# cat /sys/class/rtc/rtc1/offset
4069
```

And to set the offset:

```
# echo 4300 > /sys/class/rtc/rtc1/offset
# cat /sys/class/rtc/rtc1/offset
4340
```

You can notice that the closest value is automatically chosen.