



DesignNews

BeagleBone Black Primer

Day 3: Riding the BeagleBone Black Bus

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Fred Eady

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AGENDA

- **BeagleBone Black I²C Primer**
- **BeagleBone Black SPI Primer**
- **BeagleBone Black Serial Primer**



BeagleBone Black I²C Primer
i2c-tools

P9			
Function	Physical Pins		Function
DGND	1	2	DGND
VDD 3.3 V	3	4	VDD 3.3 V
VDD 5V	5	6	VDD 5V
SYS 5V	7	8	SYS 5V
PWR_BUT	9	10	SYS_RESET
UART4_RXD	11	12	GPIO_60
UART4_TXD	13	14	EHRPWM1A
GPIO_48	15	16	EHRPWM1B
SPIO_CSO	17	18	SPIO_D1
I2C2_SCL	19	20	I2C_SDA
SPIO_DO	21	22	SPIO_SLCK
GPIO_49	23	24	UART1_TXD
GPIO_117	25	26	UART1_RXD
GPIO_115	27	28	SP11_CSO
SP11_DO	29	30	GPIO_112
SP11_SCLK	31	32	VDD_ADC
AIN4	33	34	GND_ADC
AIN6	35	36	AIN5
AIN2	37	38	AIN3
AIN0	39	40	AIN1
GPIO_20	41	42	ECAPWMO
DGND	43	44	DGND
DGND	45	46	DGND



LEGEND

Power, Ground, Reset

Digital Pins

PWM Output

1.8 Volt Analog Inputs

Shared I2C Bus

Reconfigurable Digital

P8			
Function	Physical Pins		Function
DGND	1	2	DGND
MMC1_DAT6	3	4	MMC1_DAT7
MMC1_DAT2	5	6	MMC1_DAT3
GPIO_66	7	8	GPIO_67
GPIO_69	9	10	GPIO_68
GPIO_45	11	12	GPIO_44
EHRPWM2B	13	14	GPIO_26
GPIO_47	15	16	GPIO_46
GPIO_27	17	18	GPIO_65
EHRPWM2A	19	20	MMC1_CMD
MMC1_CLK	21	22	MMC1_DAT5
MMC1_DAT4	23	24	MMC1_DAT1
MMC1_DAT0	25	26	GPIO_61
LCD_VSYNC	27	28	LCD_PCLK
LCD_HSYNC	29	30	LCD_AC_BIAS
LCD_DATA14	31	32	LCD_DATA15
LCD_DATA13	33	34	LCD_DATA11
LCD_DATA12	35	36	LCD_DATA10
LCD_DATA8	37	38	LCD_DATA9
LCD_DATA6	39	40	LCD_DATA7
LCD_DATA4	41	42	LCD_DATA5
LCD_DATA2	43	44	LCD_DATA3
LCD_DATA0	45	46	LCD_DATA1

BeagleBone Black I²C Primer
i2c-tools

```
debian@beaglebone: /dev
File Edit View Search Terminal Help

debian@beaglebone:/dev$ apt show i2c-tools
Package: i2c-tools
Version: 4.1-1
Priority: optional
Section: utils
Maintainer: Aurelien Jarno <aurel32@debian.org>
Installed-Size: 252 kB
Depends: libc6 (>= 2.7), libi2c0, perl:any, adduser, udev
Recommends: read-edid
Suggests: libi2c-dev, python-smbus
Conflicts: lm-sensors (< 1:3.0.0-1)
Homepage: https://www.kernel.org/pub/software/utils/i2c-tools/
Tag: hardware::detection, role::program, scope::utility
Download-Size: 72.8 kB
APT-Manual-Installed: yes
APT-Sources: http://deb.debian.org/debian buster/main armhf Packages
Description: heterogeneous set of I2C tools for Linux

debian@beaglebone:/dev$
```


BeagleBone Black I²C Primer
i2c-tools

```
debian@beaglebone: /dev

File Edit View Search Terminal Help

fuse          ppp           tty17         tty43         tty02         vcsu1
gpiochip0     ptmx          tty18         tty44         tty03         vcsu2
gpiochip1     ptp0          tty19         tty45         tty04         vcsu3
gpiochip2     pts           tty2           tty46         tty05         vcsu4
gpiochip3     random        tty20         tty47         ttyS0         vcsu5
hwrng         remoteproc    tty21         tty48         ttyS1         vcsu6
i2c-0         rfkill        tty22         tty49         ttyS2         vhci
i2c-1         rtc           tty23         tty5           ttyS3         watchdog
i2c-2         rtc0          tty24         tty50         ttyS4         watchdog0
iio:device0   shm           tty25         tty51         ttyS5         watchdog1
initctl       snapshot      tty26         tty52         ubi_ctrl      zero
input         snd           tty27         tty53         uhid
ion           spidev0.0     tty28         tty54         uinput
kmsg          spidev0.1     tty29         tty55         urandom
log           spidev1.0     tty3          tty56         vcs

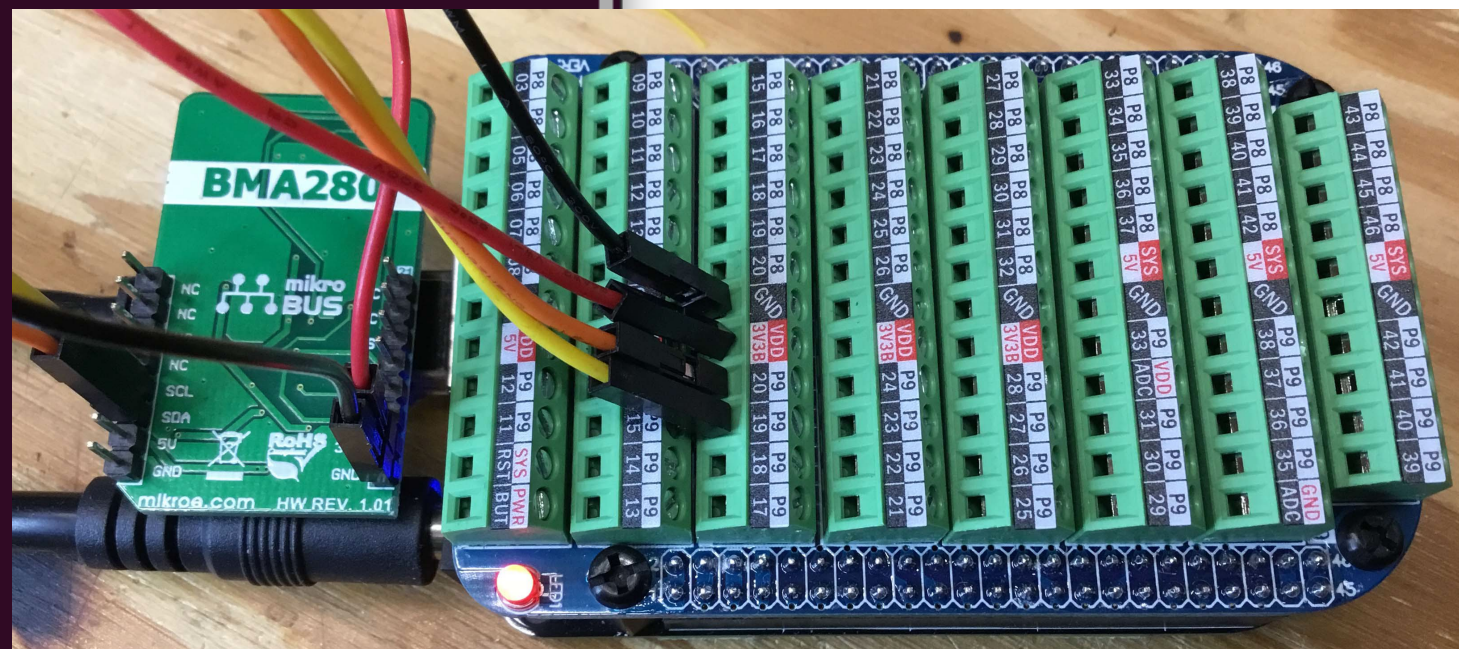
debian@beaglebone:/dev$ ls -la i2c*
crw-rw---- 1 root i2c 89, 0 Apr 27 22:21 i2c-0
crw-rw---- 1 root i2c 89, 1 Apr 27 22:21 i2c-1
crw-rw---- 1 root i2c 89, 2 Apr 27 22:21 i2c-2

debian@beaglebone:/dev$ i2cdetect -l
i2c-1  i2c          OMAP I2C adapter      I2C adapter
i2c-2  i2c          OMAP I2C adapter      I2C adapter
i2c-0  i2c          OMAP I2C adapter      I2C adapter

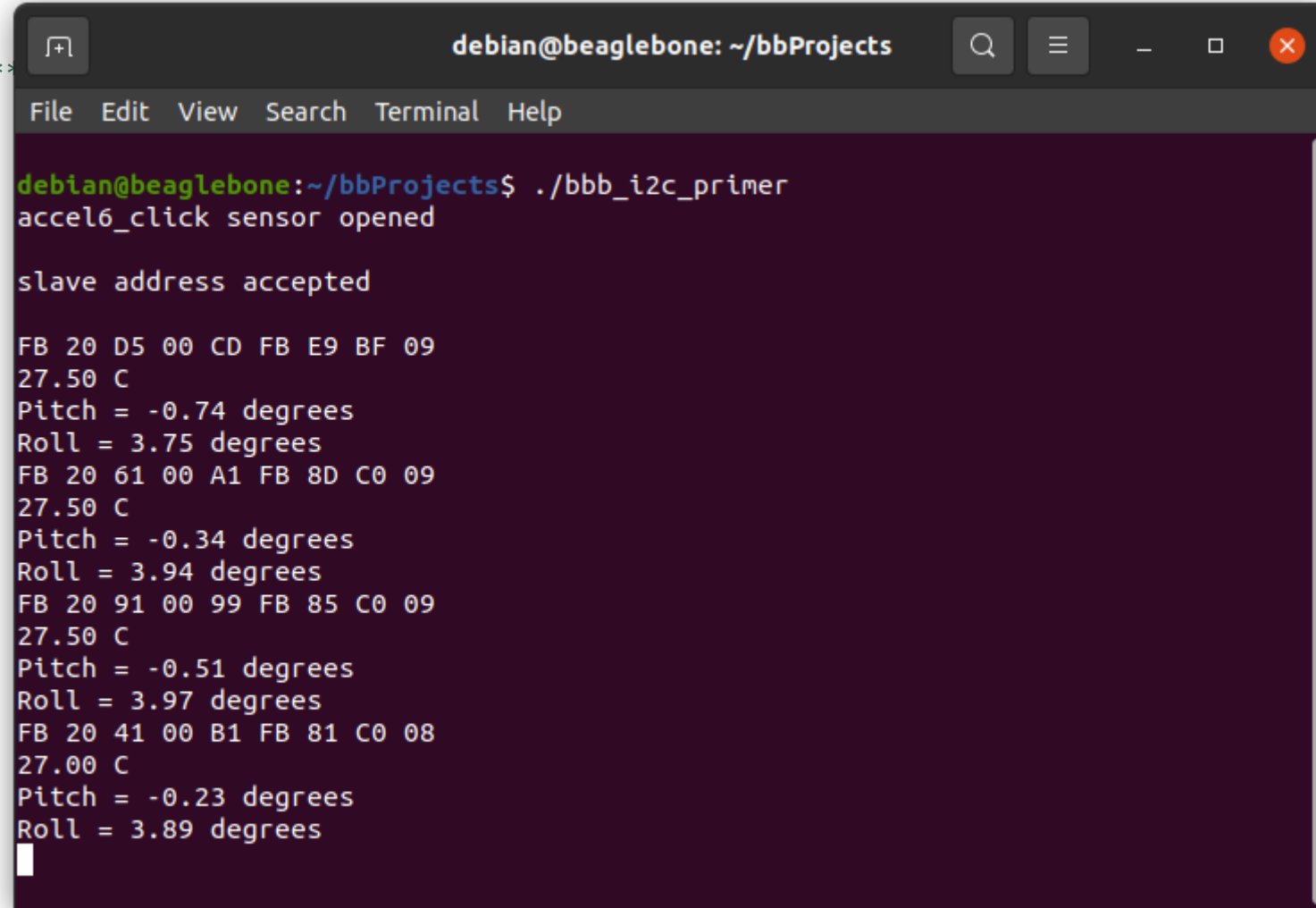
debian@beaglebone:/dev$
```


BeagleBone Black I²C Primer
i2c-tools

```
debian@beaglebone: ~  
File Edit View Search Terminal Help  
  
debian@beaglebone:~$ i2cdetect -r 2  
WARNING! This program can confuse your I2C bus, cause data loss and worse!  
I will probe file /dev/i2c-2 using receive byte commands.  
I will probe address range 0x03-0x77.  
Continue? [Y/n] Y  
  0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f  
00:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
10:  --  --  --  --  --  --  --  --  18  --  --  --  --  --  --  --  
20:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
30:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
40:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
50:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
60:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
70:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  
debian@beaglebone:~$
```




```
/**
 * OPEN I2C PORTAL to ACCEL6 CLICK
 */
void init(void)
{
    sprintf(filename, "/dev/i2c-2");
    accel6_click = open(filename, O_RDWR);
    if(accel6_click < 0)
    {
        puts("open accel6_click failed\r\n");
        exit(1);
    }
    puts("accel6_click sensor opened\r\n");
    if(ioctl(accel6_click, I2C_SLAVE, 0x18) < 0)
    {
        puts("failed to register slave address\r\n");
        exit(1);
    }
    puts("slave address accepted\r\n");
    char buf[1] = {0x00};
    if(write(accel6_click, buf, 1) != 1)
    {
        puts("initial addr write failed\r\n");
    }
}
```



```
debian@beaglebone: ~/bbProjects
File Edit View Search Terminal Help

debian@beaglebone:~/bbProjects$ ./bbb_i2c_primer
accel6_click sensor opened

slave address accepted

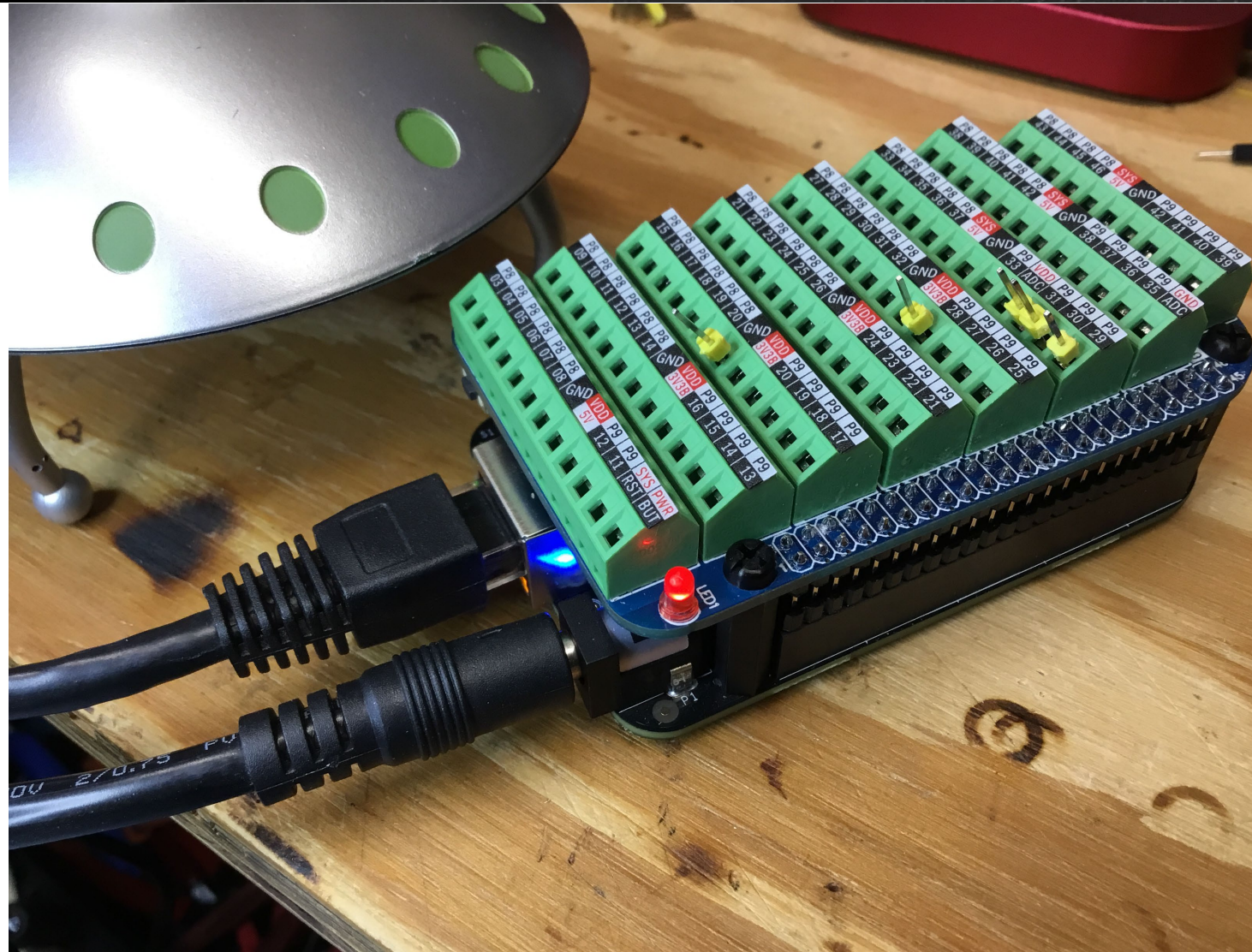
FB 20 D5 00 CD FB E9 BF 09
27.50 C
Pitch = -0.74 degrees
Roll = 3.75 degrees
FB 20 61 00 A1 FB 8D C0 09
27.50 C
Pitch = -0.34 degrees
Roll = 3.94 degrees
FB 20 91 00 99 FB 85 C0 09
27.50 C
Pitch = -0.51 degrees
Roll = 3.97 degrees
FB 20 41 00 B1 FB 81 C0 08
27.00 C
Pitch = -0.23 degrees
Roll = 3.89 degrees
```

BeagleBone Black SPI Primer

Identify and Target SPI1 I/O Pins

P9

DGND	1	2	DGND
VDD_3V3	3	4	VDD_3V3
VDD_5V	5	6	VDD_5V
SYS_5V	7	8	SYS_5V
PWR_BUTTON	9	10	SYS_RESETN
GPIO_30	11	12	GPIO_60
GPIO_31	13	14	GPIO_50
GPIO_48	15	16	GPIO_51
SPIO_CS0	17	18	SPIO_D1
SPI1_CS1	19	20	SPI1_CS0
SPIO_D0	21	22	SPIO_SCLK
GPIO_49	23	24	GPIO_15
GPIO_117	25	26	GPIO_14
GPIO_115	27	28	SPI1_CS0
SPI1_D0	29	30	SPI1_D1
SPI1_SCLK	31	32	VDD_ADC
AIN4	33	34	GNDA_ADC
AIN6	35	36	AIN5
AIN2	37	38	AIN3
AIN0	39	40	AIN1
GPIO_20	41	42	SPI1_CS1
DGND	43	44	DGND
DGND	45	46	DGND



BeagleBone Black SPI Primer

Enable SPI1 I/O Pins Using Device Tree Overlay

```

/*
 * Free up the pins used by the cape from the pinmux helpers.
 */
&ocp {
    P9_28_pinmux { status = "disabled"; }; /* P9_28 (C12) mcasp0_ahclkcr.spi1_cs0 */
    P9_30_pinmux { status = "disabled"; }; /* P9_30 (D12) mcasp0_axr0.spi1_d1 */
    P9_29_pinmux { status = "disabled"; }; /* P9_29 (B13) mcasp0_fsx.spi1_d0 */
    P9_31_pinmux { status = "disabled"; }; /* P9_31 (A13) mcasp0_aclkx.spi1_sclk */
};

&am33xx_pinmux {
    bb_spi1_pins: pinmux_bb_spi1_pins {
        pinctrl-single,pins = <
            AM33XX_PADCONF(AM335X_PIN_MCASP0_ACLKX, PIN_INPUT, MUX_MODE3) /* P9_31 (A13) mcasp0_aclkx.spi1_sclk */
            AM33XX_PADCONF(AM335X_PIN_MCASP0_FSX, PIN_INPUT, MUX_MODE3) /* P9_29 (B13) mcasp0_fsx.spi1_d0 */
            AM33XX_PADCONF(AM335X_PIN_MCASP0_AXR0, PIN_INPUT, MUX_MODE3) /* P9_30 (D12) mcasp0_axr0.spi1_d1 */
            AM33XX_PADCONF(AM335X_PIN_MCASP0_AHCLKR, PIN_INPUT, MUX_MODE3) /* P9_28 (C12) mcasp0_ahclkcr.spi1_cs0 */
        >;
    };
};

&spi1 {
    #address-cells = <1>;
    #size-cells = <0>;

    status = "okay";
    pinctrl-names = "default";
    pinctrl-0 = <&bb_spi1_pins>;

    /*
     * Select the D0 pin as output and D1 as
     * input. The default is D0 as input and
     * D1 as output.
     */
    //ti,pindir-d0-out-d1-in;

```

P9

DGND	1	2	DGND
VDD_3V3	3	4	VDD_3V3
VDD_5V	5	6	VDD_5V
SYS_5V	7	8	SYS_5V
PWR_BUT	9	10	SYS_RESETN
GPIO_30	11	12	GPIO_60
GPIO_31	13	14	GPIO_50
GPIO_48	15	16	GPIO_51
SPIO_CS0	17	18	SPIO_D1
SPI1_CS1	19	20	SPI1_CS0
SPIO_D0	21	22	SPIO_SCLK
GPIO_49	23	24	GPIO_15
GPIO_117	25	26	GPIO_14
GPIO_115	27	28	SPI1_CS0
MISO SPI1_D0	29	30	SPI1_D1 MOSI
SPI1_SCLK	31	32	VDD_ADC
AIN4	33	34	GNDA_ADC
AIN6	35	36	AIN5
AIN2	37	38	AIN3
AIN0	39	40	AIN1
GPIO_20	41	42	SPI1_CS1
DGND	43	44	DGND
DGND	45	46	DGND

BeagleBone Black SPI Primer

Enable SPI1 I/O Pins Using Device Tree Overlay

```

debian@beaglebone: /lib/firmware
File Edit View Search Terminal Help

debian@beaglebone:/lib/firmware$ ls -la BB-SPIDEV*
-rw-r--r-- 1 root root 1495 Aug 21 2021 BB-SPIDEV0-00A0.dtbo
-rw-r--r-- 1 root root 1495 Aug 21 2021 BB-SPIDEV1-00A0.dtbo
debian@beaglebone:/lib/firmware$

```

```

debian@beaglebone: /boot
File Edit View Search Terminal Help

GNU nano 3.2      uEnv.txt

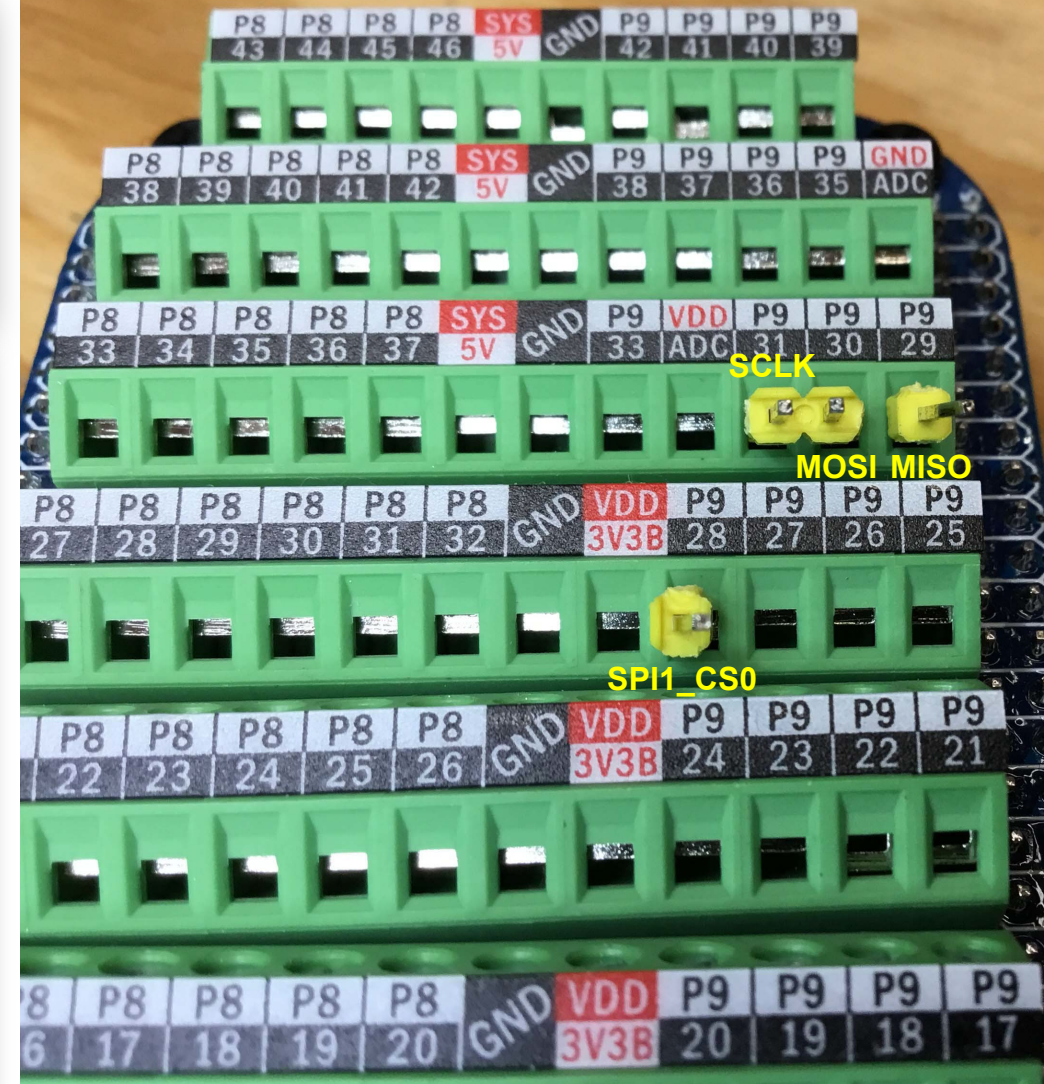
###
###Cape Universal Enable
enable_uboot_cape_universal=1
###
###Debug: disable uboot autoload of Cape
#disable_uboot_overlay_addr0=1
#disable_uboot_overlay_addr1=1
#disable_uboot_overlay_addr2=1
#disable_uboot_overlay_addr3=1
###
###U-Boot fdt tweaks... (60000 = 384KB)
#uboot_fdt_buffer=0x60000
###U-Boot Overlays###
uboot_overlay_addr5=/lib/firmware/BB-SPIDEV1-00A0.dtbo
cmdline=coherent_pool=1M net.ifnames=0 lpj=1990656 rng_core.default_quality=100$

#In the event of edid real failures, uncomment this next line:
#cmdline=coherent_pool=1M net.ifnames=0 lpj=1990656 rng_core.default_quality=10$

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell  ^_ Go To Line

```

Add Manually

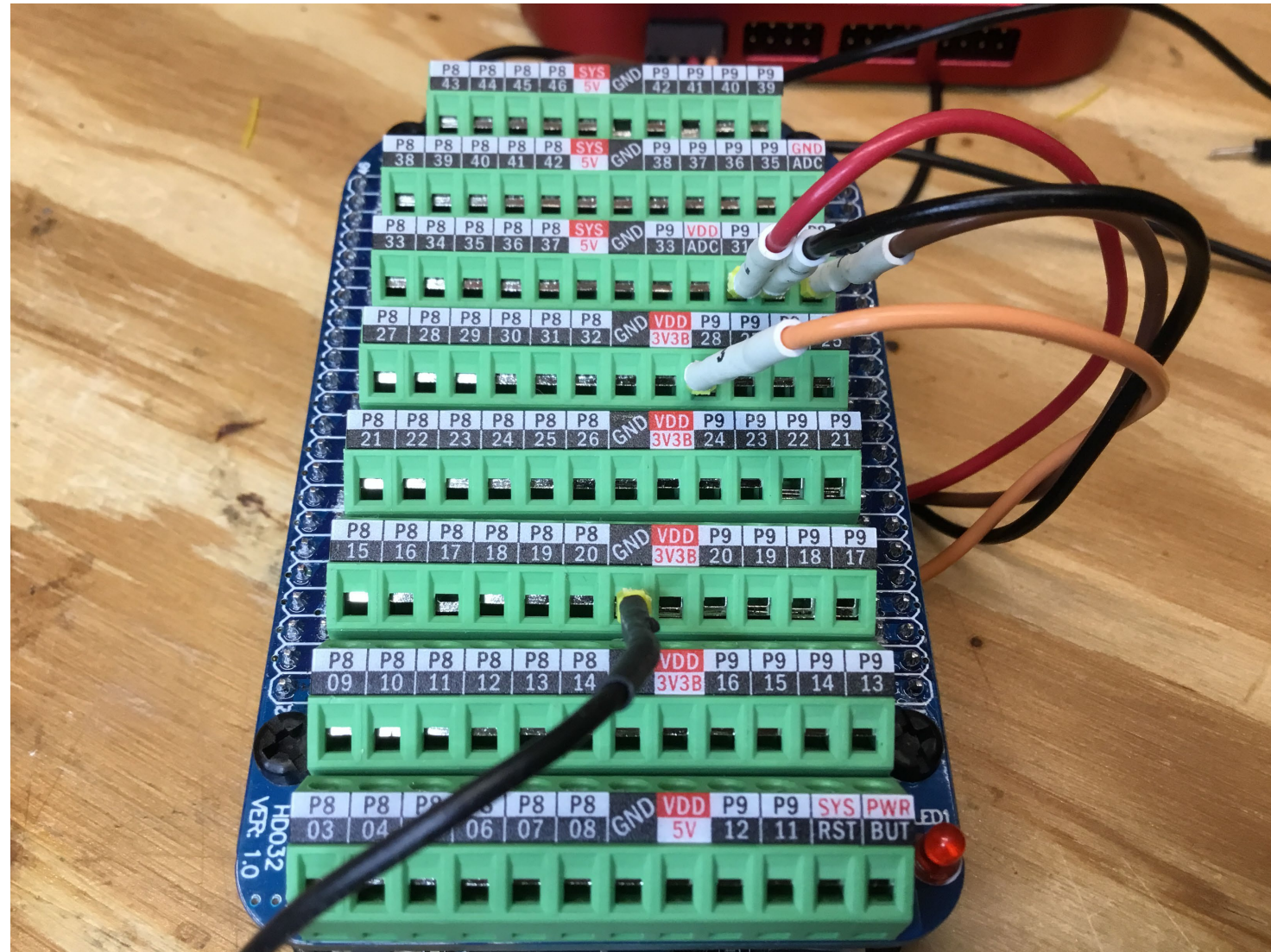


BeagleBone Black SPI Primer
SPI Code

```

//*****
//* OPEN AND INITIALIZE SPI PORTAL
//*****
void init_spi0(void)
{
    sprintf(filename, "/dev/spidev1.0");
    spi_fd = open(filename, O_RDWR);
    if(spi_fd < 0)
    {
        puts("open spi_fd failed\r\n");
        exit(1);
    }
    puts("spi_fd opened\r\n");
}

```

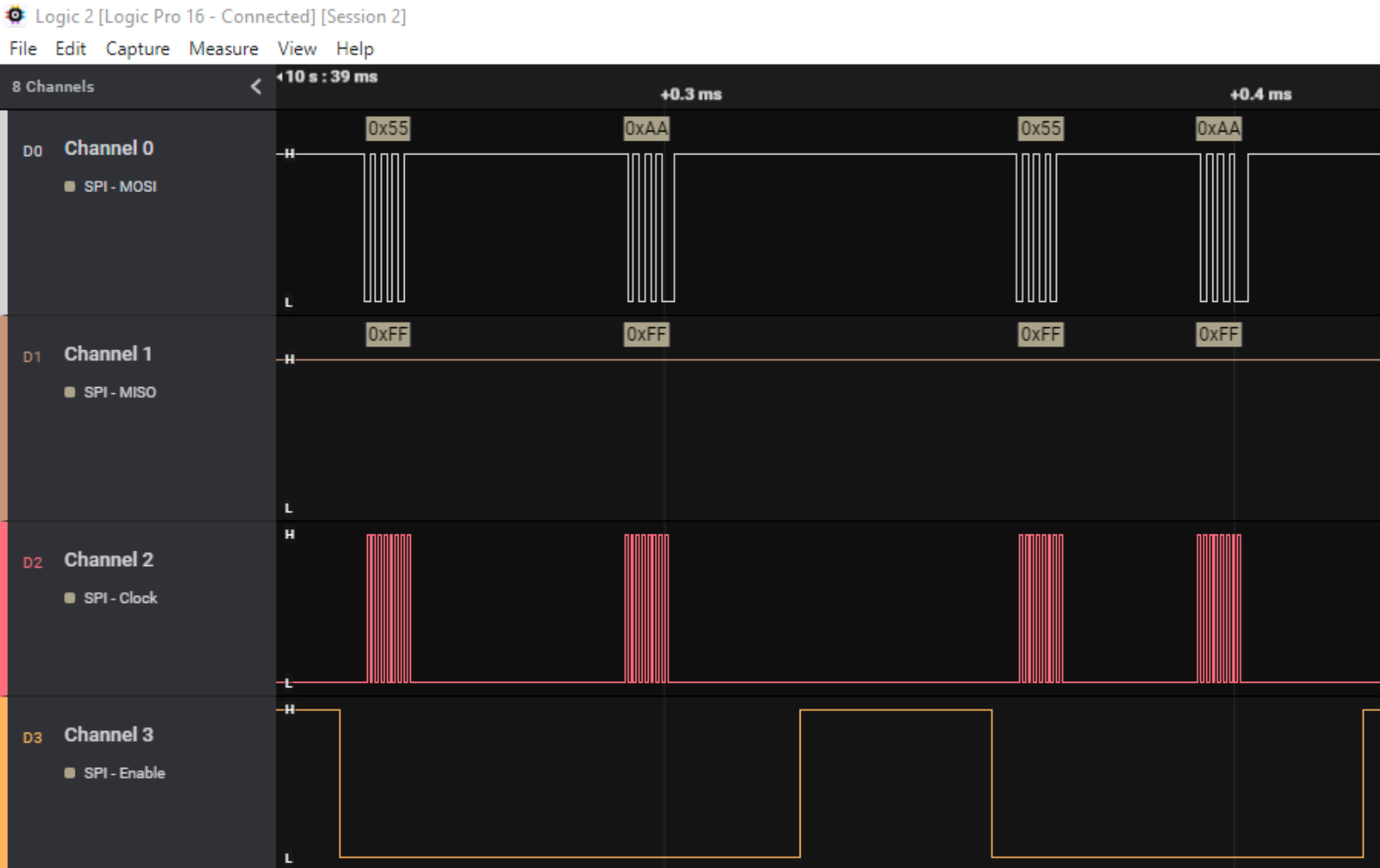


```

//*****
/* SPI TRANSFER FUNCTION
//*****
int spi_xfer(int fd,int msglen)
{
    xfer.len = msglen;
    msgStatus = ioctl(fd,SPI_IOC_MESSAGE(1),&xfer);
    if(msgStatus < 1)
    {
        printf("Send Message Failed with %u\r\n",msgStatus);
        return -1;
    }
    return msgStatus;
}

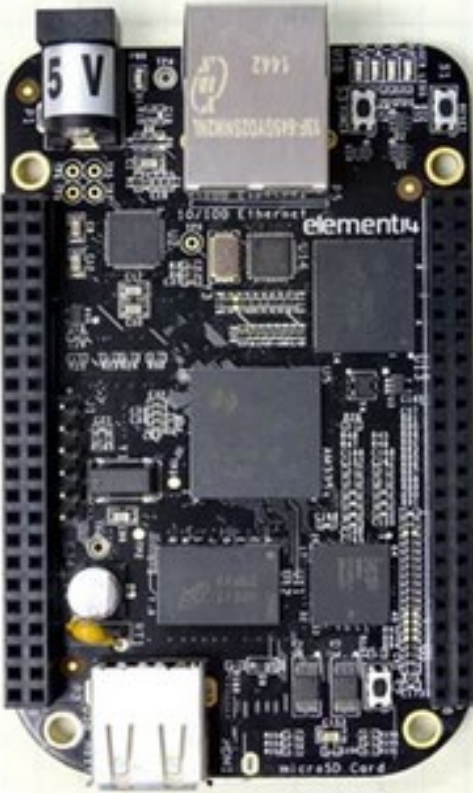
//*****
/* MAIN
//*****
int main(int argc, char *argv[])
{
    init_spi0();
    while(1)
    {
        spiTxBuf[0] = 0x55;
        spiTxBuf[1] = 0xAA;
        spi_xfer(spi_fd,2);
    }
    return 0;
}

```



BeagleBone Black Serial Primer
Target UART1

P9					P8			
Function	Physical Pins		Function		Function	Physical Pins		Function
DGND	1	2	DGND		DGND	1	2	DGND
VDD 3.3 V	3	4	VDD 3.3 V		MMC1_DAT6	3	4	MMC1_DAT7
VDD 5V	5	6	VDD 5V		MMC1_DAT2	5	6	MMC1_DAT3
SYS 5V	7	8	SYS 5V		GPIO_66	7	8	GPIO_67
PWR_BUT	9	10	SYS_RESET		GPIO_69	9	10	GPIO_68
UART4_RXD	11	12	GPIO_60		GPIO_45	11	12	GPIO_44
UART4_TXD	13	14	EHRPWM1A		EHRPWM2B	13	14	GPIO_26
GPIO_48	15	16	EHRPWM1B		GPIO_47	15	16	GPIO_46
SPIO_CSO	17	18	SPIO_D1		GPIO_27	17	18	GPIO_65
I2C2_SCL	19	20	I2C_SDA		EHRPWM2A	19	20	MMC1_CMD
SPIO_DO	21	22	SPIO_CLK		MMC1_CLK	21	22	MMC1_DAT5
GPIO_49	23	24	UART1_TXD		MMC1_DAT4	23	24	MMC1_DAT1
GPIO_117	25	26	UART1_RXD		MMC1_DAT0	25	26	GPIO_61
GPIO_115	27	28	SPIO_CSO		LCD_VSYNC	27	28	LCD_PCLK
SP11_DO	29	30	GPIO_112		LCD_HSYNC	29	30	LCD_AC_BIAS
SP11_SCLK	31	32	VDD_ADC		LCD_DATA14	31	32	LCD_DATA15
AIN4	33	34	GND_ADC		LCD_DATA13	33	34	LCD_DATA11
AIN6	35	36	AIN5		LCD_DATA12	35	36	LCD_DATA10
AIN2	37	38	AIN3		LCD_DATA8	37	38	LCD_DATA9
AIN0	39	40	AIN1		LCD_DATA6	39	40	LCD_DATA7
GPIO_20	41	42	ECAPWMO		LCD_DATA4	41	42	LCD_DATA5
DGND	43	44	DGND		LCD_DATA2	43	44	LCD_DATA3
DGND	45	46	DGND		LCD_DATA0	45	46	LCD_DATA1



5 V

element14

microSD Card

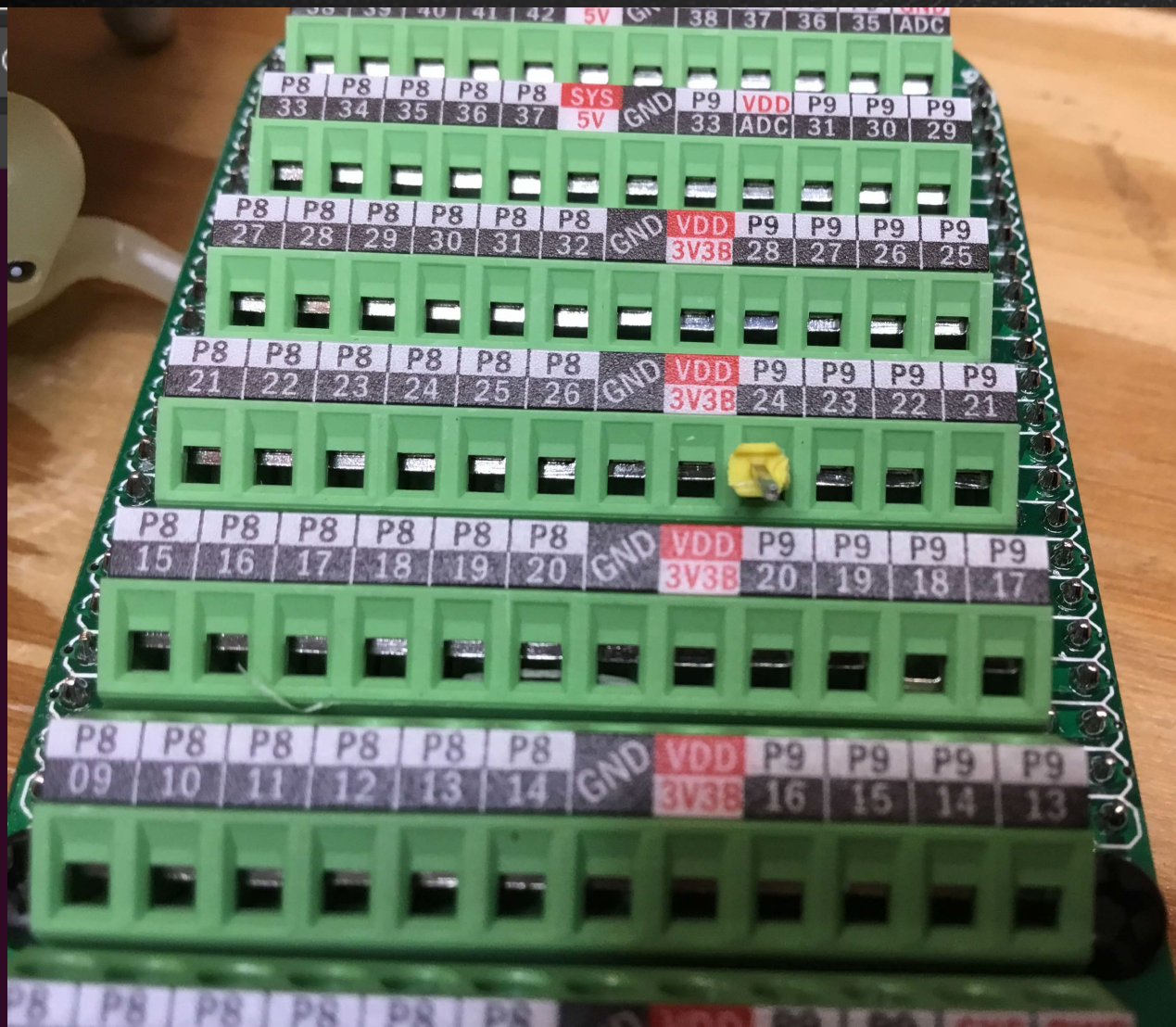
LEGEND	
Power, Ground, Reset	
Digital Pins	
PWM Output	
1.8 Volt Analog Inputs	
Shared I2C Bus	
Reconfigurable Digital	

BeagleBone Black Serial Primer
Target UART1

```
debian@beaglebone: /dev

File Edit View Search Terminal Help

debian@beaglebone:/dev$ ls -la tty0*
lrwxrwxrwx 1 root root 5 Apr 29 22:14 tty00 -> ttyS0
lrwxrwxrwx 1 root root 5 Apr 29 22:14 tty01 -> ttyS1
lrwxrwxrwx 1 root root 5 Apr 29 22:14 tty02 -> ttyS2
lrwxrwxrwx 1 root root 5 Apr 29 22:14 tty03 -> ttyS3
lrwxrwxrwx 1 root root 5 Apr 29 22:14 tty04 -> ttyS4
lrwxrwxrwx 1 root root 5 Apr 29 22:14 tty05 -> ttyS5
debian@beaglebone:/dev$
```



BeagleBone Black Serial Primer

Enable UART1 Using Device Tree Overlay

```

/*
 * Free up the pins used by the cape from the pinmux helpers.
 */
fragment@1 {
    target = <&ocp>;
    __overlay__ {
        P9_24_pinmux { status = "disabled"; };/* uart1_txd */
        P9_26_pinmux { status = "disabled"; };/* uart1_rxd */
    };
};

fragment@2 {
    target = <&am33xx_pinmux>;
    __overlay__ {
        bb_uart1_pins: pinmux_bb_uart1_pins {
            pinctrl-single,pins = <
                BONE_P9_24 (PIN_OUTPUT | MUX_MODE0)// uart1_txd.uart1_txd
                BONE_P9_26 (PIN_INPUT | MUX_MODE0)// uart1_rxd.uart1_rxd
                //BONE_P9_19 (PIN_OUTPUT | MUX_MODE0)// uart1_rtsn.uart1_rtsn
                //BONE_P9_20 (PIN_INPUT | MUX_MODE0)// uart1_ctsn.uart1_ctsn
            >;
        };
    };
};

fragment@3 {
    target = <&uart1>;
    __overlay__ {
        status = "okay";
        pinctrl-names = "default";
        pinctrl-0 = <&bb_uart1_pins>;
    };
};

```

P9			
Function	Physical Pins		Function
DGND	1	2	DGND
VDD 3.3 V	3	4	VDD 3.3 V
VDD 5V	5	6	VDD 5V
SYS 5V	7	8	SYS 5V
PWR_BUT	9	10	SYS_RESET
UART4_RXD	11	12	GPIO_60
UART4_TXD	13	14	EHRPWM1A
GPIO_48	15	16	EHRPWM1B
SPIO_CSO	17	18	SPIO_D1
I2C2_SCL	19	20	I2C_SDA
SPIO_DO	21	22	SPIO_SCLK
GPIO_117	23	24	UART1_TXD
GPIO_117	25	26	UART1_RXD
GPIO_115	27	28	SP11_CCS
SP11_DO	29	30	GPIO_112
SP11_SCLK	31	32	VDD_ADC
AIN4	33	34	GND_ADC
AIN6	35	36	AIN5
AIN2	37	38	AIN3
AIN0	39	40	AIN1
GPIO_20	41	42	ECAPWMO
DGND	43	44	DGND
DGND	45	46	DGND

P8			
Function	Physical Pins		Function
DGND	1	2	DGND
MMC1_DAT6	3	4	MMC1_DAT7
MMC1_DAT2	5	6	MMC1_DAT3
GPIO_66	7	8	GPIO_67
GPIO_69	9	10	GPIO_68
GPIO_45	11	12	GPIO_44
EHRPWM2B	13	14	GPIO_26
GPIO_47	15	16	GPIO_46
GPIO_27	17	18	GPIO_65
EHRPWM2A	19	20	MMC1_CMD
MMC1_CLK	21	22	MMC1_DAT5
MMC1_DAT4	23	24	MMC1_DAT1
MMC1_DAT0	25	26	GPIO_61
LCD_VSYNC	27	28	LCD_PCLK
LCD_HSYNC	29	30	LCD_AC_BIAS
LCD_DATA14	31	32	LCD_DATA15
LCD_DATA13	33	34	LCD_DATA11
LCD_DATA12	35	36	LCD_DATA10
LCD_DATA8	37	38	LCD_DATA9
LCD_DATA6	39	40	LCD_DATA7
LCD_DATA4	41	42	LCD_DATA5
LCD_DATA2	43	44	LCD_DATA3
LCD_DATA0	45	46	LCD_DATA1

LEGEND

Power, Ground, Reset

Digital Pins

PWM Output

1.8 Volt Analog Inputs

Shared I2C Bus

Reconfigurable Digital

BeagleBone Black Serial Primer

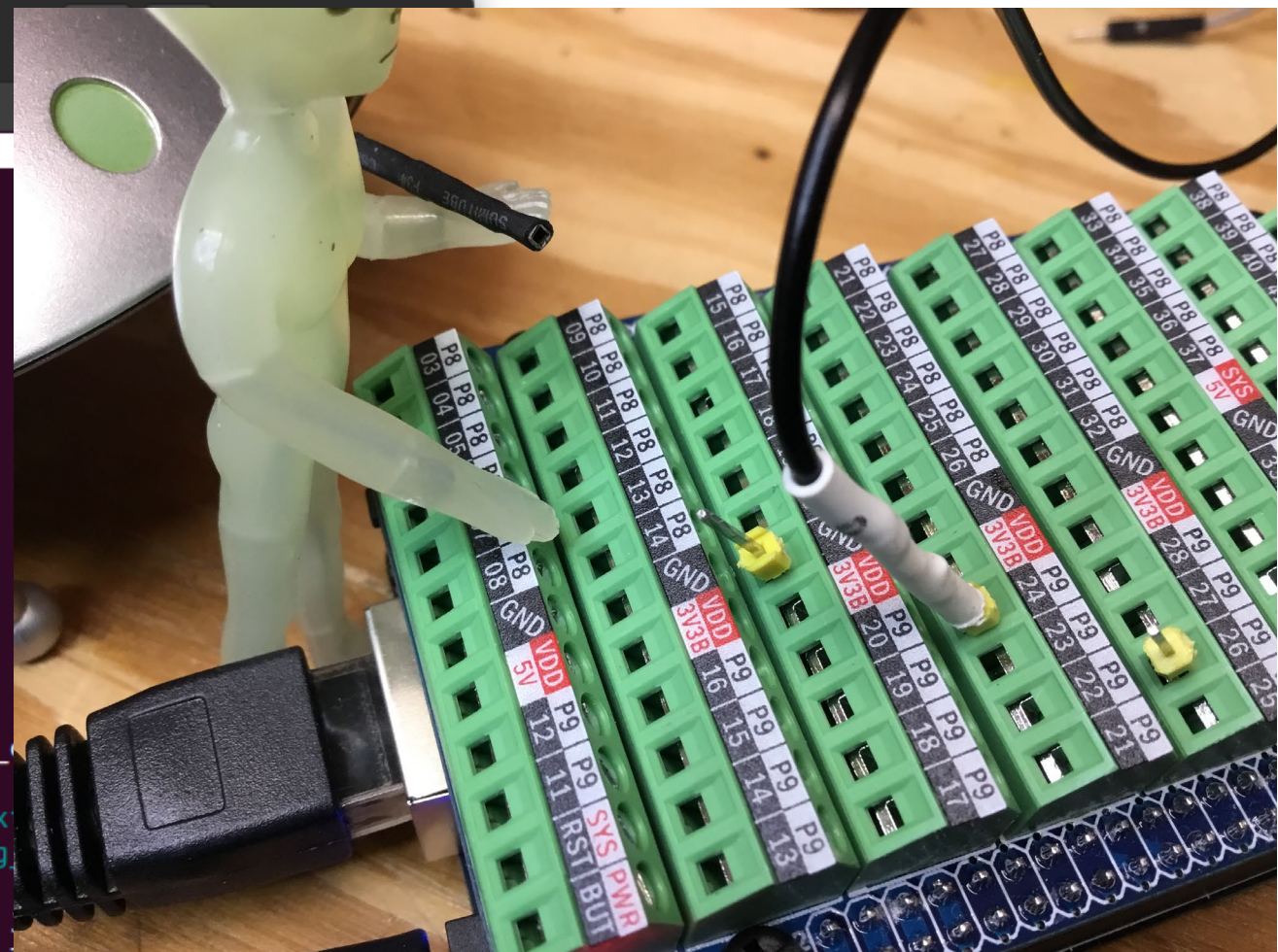
Enable UART1 Using Device Tree Overlay

```
debian@beaglebone: /boot
File Edit View Search Terminal Help
GNU nano 3.2 uEnv.txt

###
###Cape Universal Enable
enable_uboot_cape_universal=1
###
###Debug: disable uboot autoload of Cape
#disable_uboot_overlay_addr0=1
#disable_uboot_overlay_addr1=1
#disable_uboot_overlay_addr2=1
#disable_uboot_overlay_addr3=1
###
###U-Boot fdt tweaks... (60000 = 384KB)
#uboot_fdt_buffer=0x60000
###U-Boot Overlays###
uboot_overlay_addr5=/lib/firmware/BB-SPIDEV1-00A0.dtbo
uboot_overlay_addr6=/lib/firmware/BB-UART1-00A0.dtbo
cmdline=coherent_pool=1M net.ifnames=0 lpj=1990656 rng_

#In the event of edid real failures, uncomment this next line
#cmdline=coherent_pool=1M net.ifnames=0 lpj=1990656 rng_

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

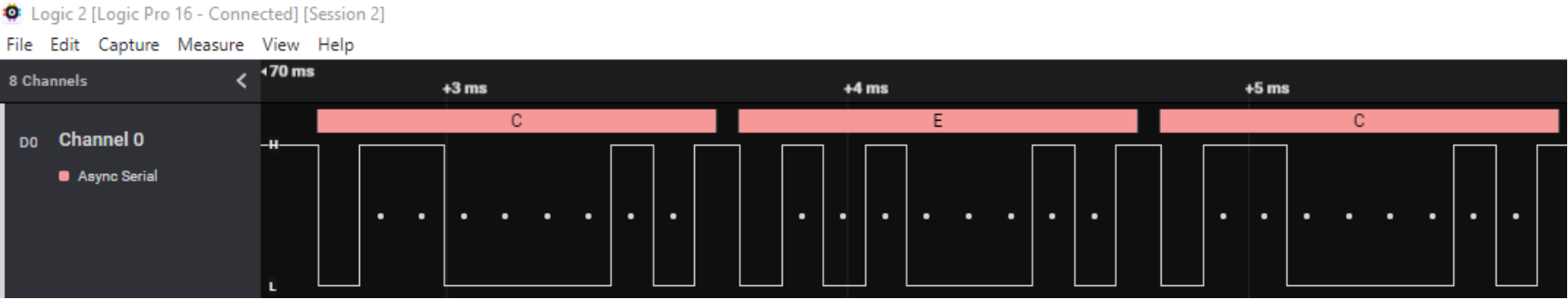



```

//*****
//* UART1 INIT FUNCTION
//*****
void uart1_init(void)
{
    //9600 bps
    uart1_fd=open("/dev/ttyO1",O_RDWR);
    tcgetattr(uart1_fd,&tty);
    fcntl(uart1_fd,F_SETFL,0);
    tty.c_cflag |= B9600 | CS8 | CREAD | CLOCAL;
    tty.c_lflag &= ~(ICANON | ECHO | ECHOE | ISIG);
    tty.c_cc[VMIN] = 0;
    tty.c_cc[VTIME] = 10;
    tcsetattr(uart1_fd,TCSANOW,&tty);
    tcflush(uart1_fd,TCIFLUSH);
    tcflush(uart1_fd,TCOFLUSH);
}
//*****
//* MAIN
//*****
int main(int argc, char *argv[])
{
    uart1_init();

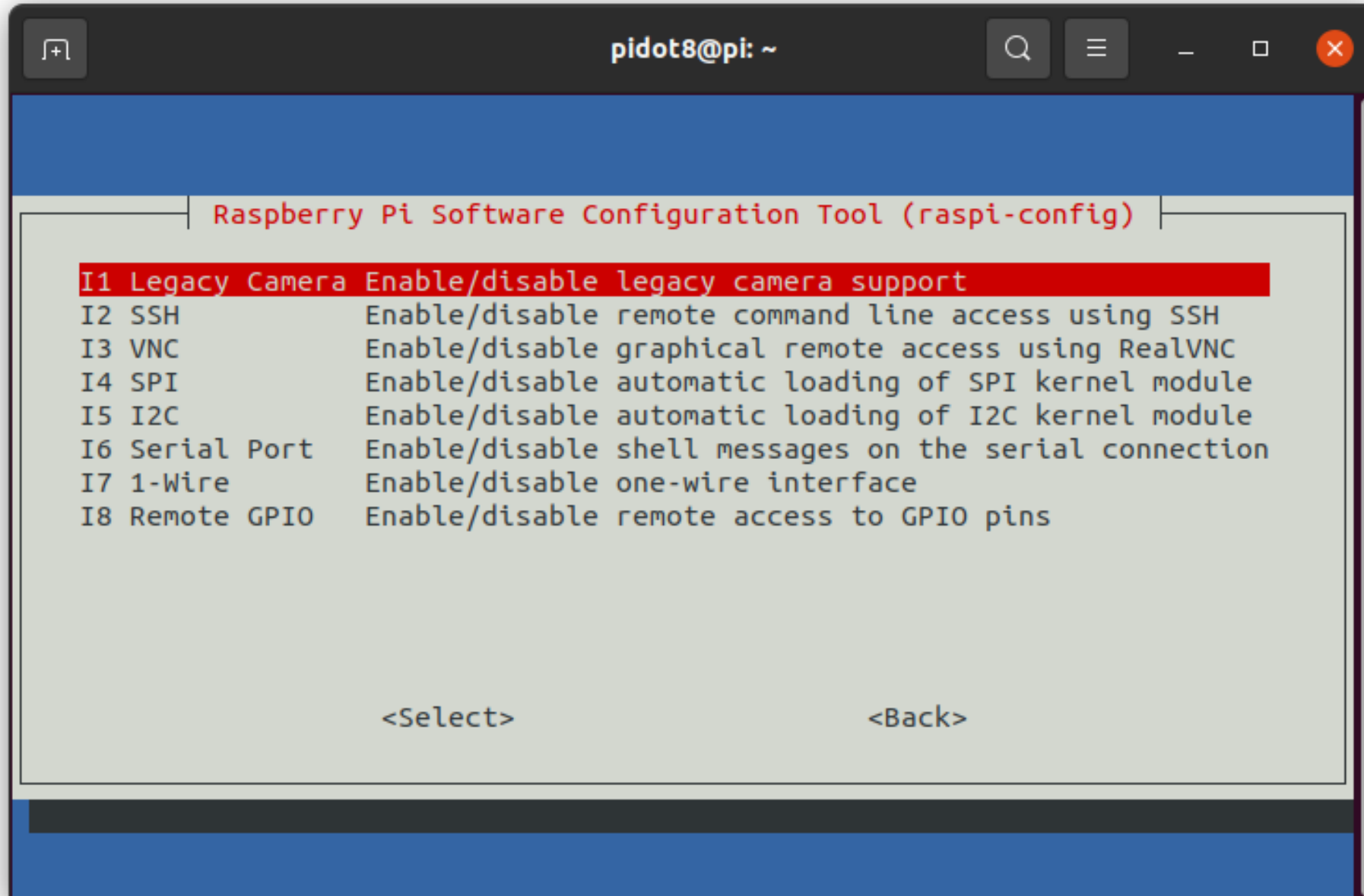
    do{
        txBuf[0] = 'C';
        txBuf[1] = 'E';
        txBuf[2] = 'C';
        write(uart1_fd,txBuf,3);
        msleep(100);
    }while(1);
}

```



BeagleBone Black Serial Primer

BeagleBone Black versus Raspberry Pi 4B

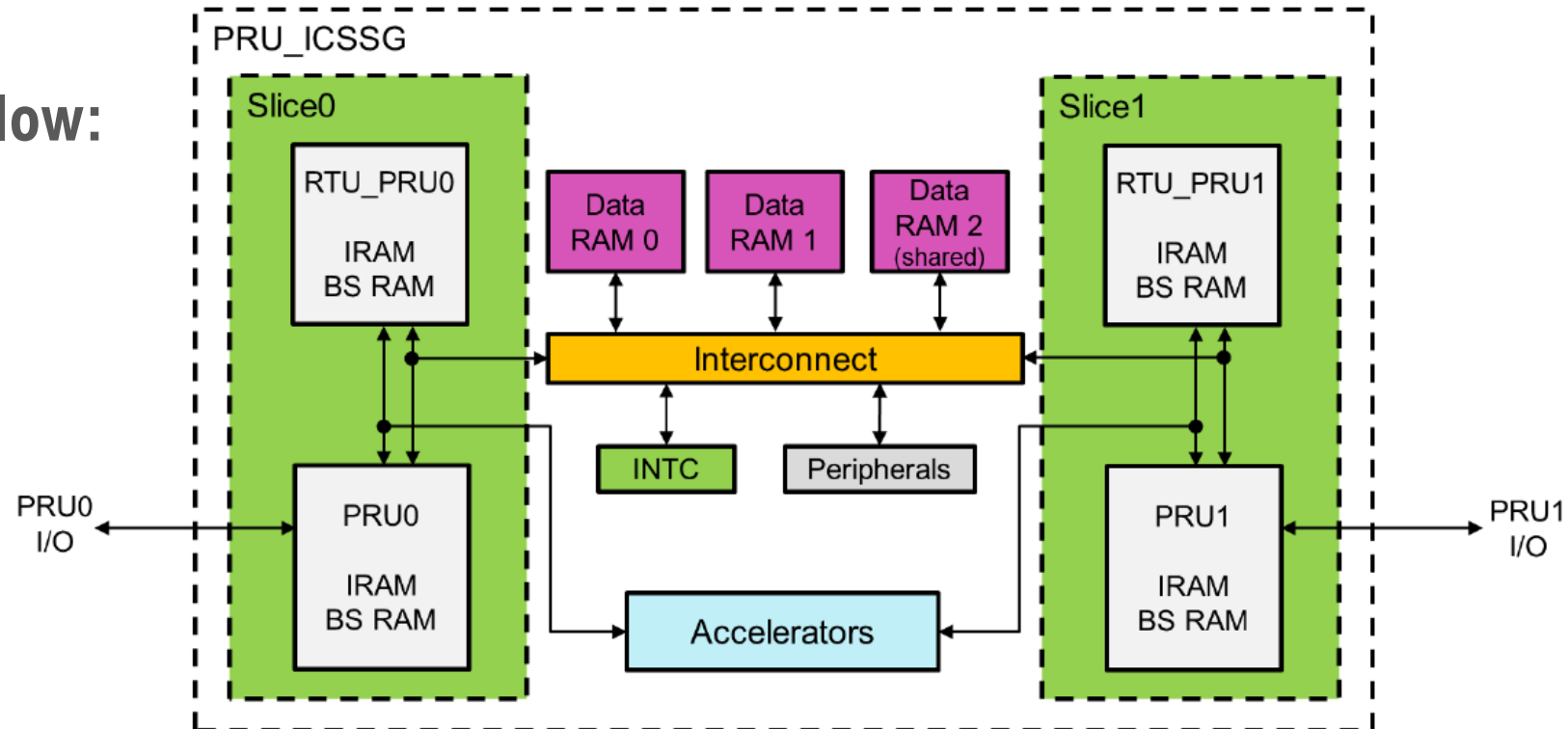


Thank you for attending!!!

Please consider the resources below:

- [BeagleBone Black How-To PDF](#)
- [BeagleBone.org](#)

MORE TO COME..



Today's download package is available at:
www.edtp.com/bbb/day3.zip



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