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# MSP430FR5969: Current measurement

sadasivam arumu... Intellectual 940 points
Community Member

**Part Number:** MSP430FR5969
**Other Parts Discussed in Thread:** MSP430FR5739

Hi Sir,

I am working on MSP430FR5969 Launchpad for getting current consumption of LPM state. When I used the example code(*msp430fr59xx_lpm4-5_02.c*) and made a current measurement, I am getting I=3.41 mA.(LPM4.5).

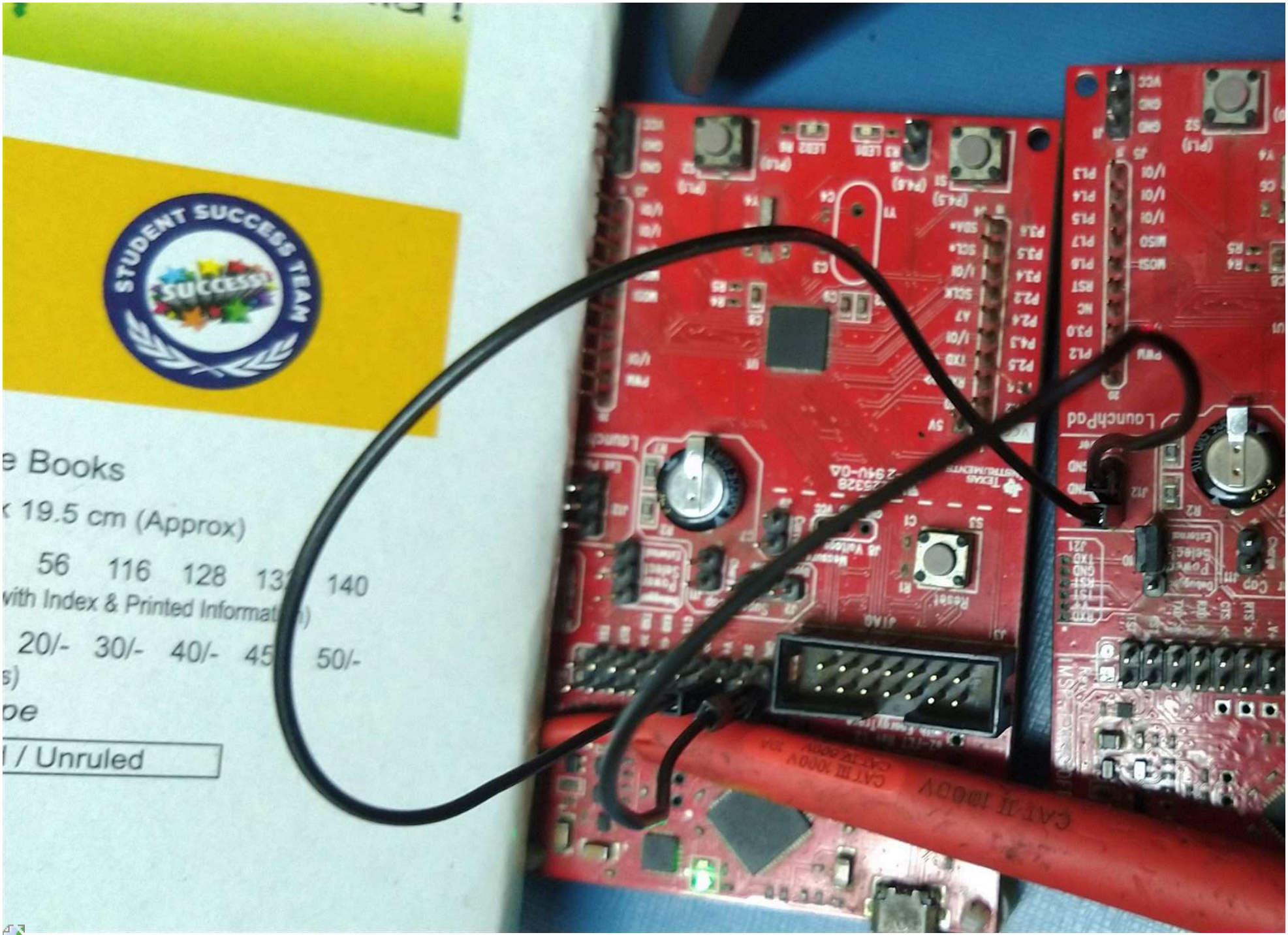
Expected is,

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $I_{LPM4.5}$ | Low-power mode 4.5, excludes SVS(8) (also see Figure 5-5) | 2.2 V | 0.02 | 0.02 | 0.02 | 0.08 | | µA |
| | | 3.0 V | 0.02 | 0.02 | 0.02 | 0.08 | 0.35 | |

And, you have mentioned in other query that, it may happen due to other modules be open there.

Now in my code i am refering only to GPIO and Clock modules. But, it is taking more current. So, kindly give the steps for exact current measurement. After getting clear idea on current, then I can able to make it for all modules with referring to example codes. Kindly do the needful. Thanks.

And my current measurement setup-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SUCCESS
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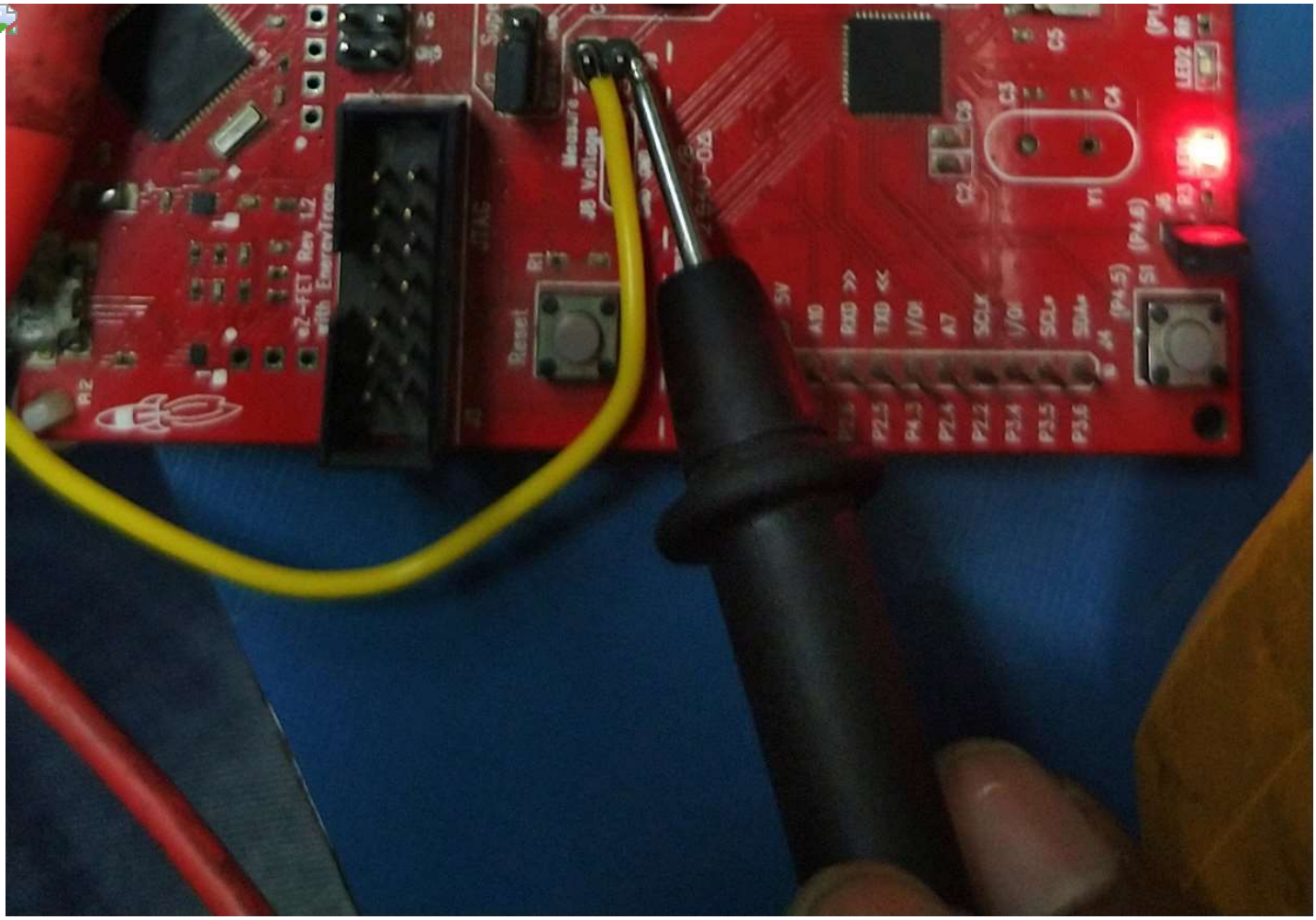
LaunchPad


eZ-FET Rev 1.2
with EnergyTrace
JS Voltage
Reset
LED2
P2.5
P4.3
P2.4
P2.2
P2.1
P3.6


FLUKE
17B+ DIGITAL MULTIMETER
3.43
DC
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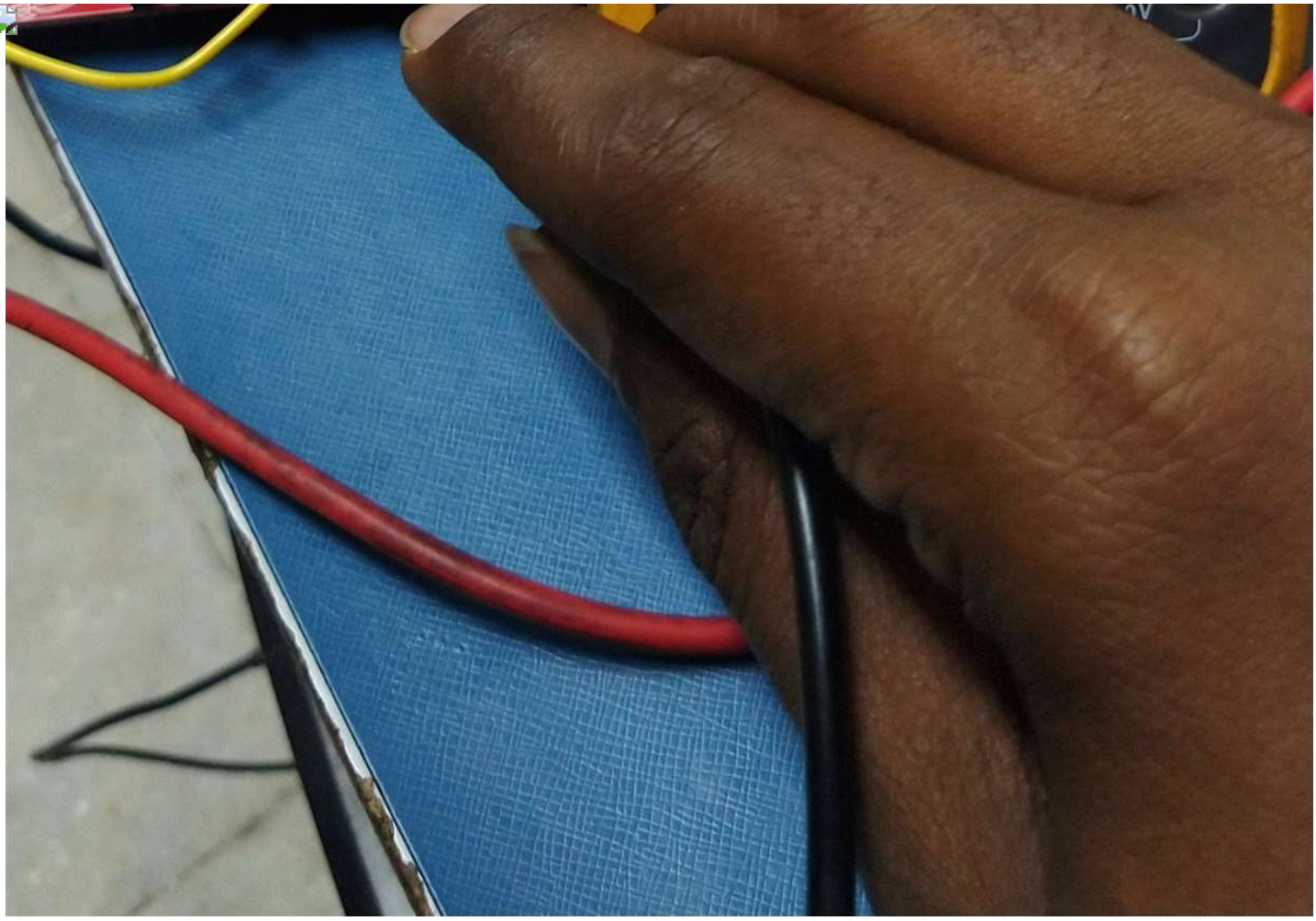
OFF
COM



over 6 years ago

Johnson He *over 6 years ago*

TI__Mastermind 28496 points

Hi sadasivam,

I am testing and analyzing, I will reply you later.

Best Regards

Johnson

Johnson He *over 6 years ago*

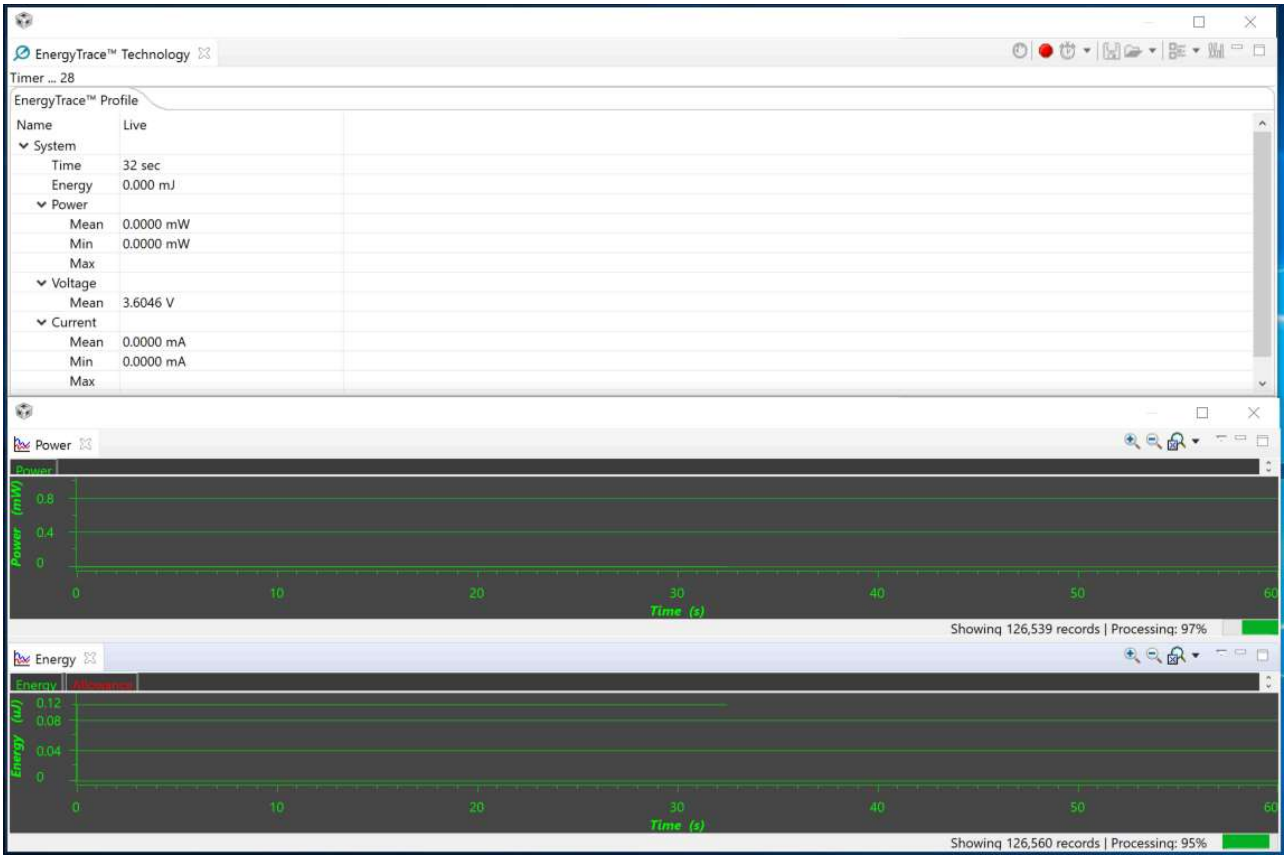
TI__Mastermind 28496 points

Hi sadasivam,

You should disconnect J6 during the test, and the current consumed by the LED 1 when measuring the current of about 3.5ma. It is not consumed by LPM4.5.

And you also can measuring the current though our tools of EneryTrace. In order to ensure the accuracy of the measurement results, please disconnect all connections of J13 when using this tool, except GND and V+, like this :


VICTOR VC9802A+
DIGITAL MULTIMETER
POWER APO
HOLD
AUTO POWER OFF
TEST
TRUE RMS
2/20A
mAμA
COM




Best Regards

Johnson

sadasivam arumugam *over 6 years ago in reply to Johnson He*

Intellectual 940 points

Hi Sir,

Thank you for your reply. I am working on it. Now I am getting 0.1 uA(max. 0.4 uA for SVS including) from the set up you have mentioned. And will try all examples and get cleared on current measurement.

sadasivam arumugam *over 5 years ago in reply to Johnson He*

Intellectual 940 points

Hi Sir,

Now I am trying to interface USCI_A0 and USCI_A1 for SPI communication for my custom board. For that, I have configured as SPI in selection registers. And I am waking at when I press button interrupt.

But for entering into LPM4.5, in posts ***"msp430fr5739: LPM4.5 Issue with SPI", if we use peripherals, all has to reset.***

My question in this regard is, before entering into LPM4.5, after RESET the SPI function and whether we have to configure it as GPIO pins or not. And can you please suggest me what are the steps needed to go before LPM4.5. And is BIC = GIE is needed.

And after LPM4.5 exit, I expected to wake in Pin ISR. But, if I check with (if(SYSRSTIV == SYSRSTIV_LPM5WU): condition, the loop enters during the unknown time. Question is: Whether we want to check like this or we can check as specified in Userguide: PMMLPM5IFG check. is there a sample code for verifying my issue.

Johnson He *over 5 years ago in reply to sadasivam arumugam* TI_Mastermind 28496 points

Hi sadasivam,

I am sorry to reply you so late.

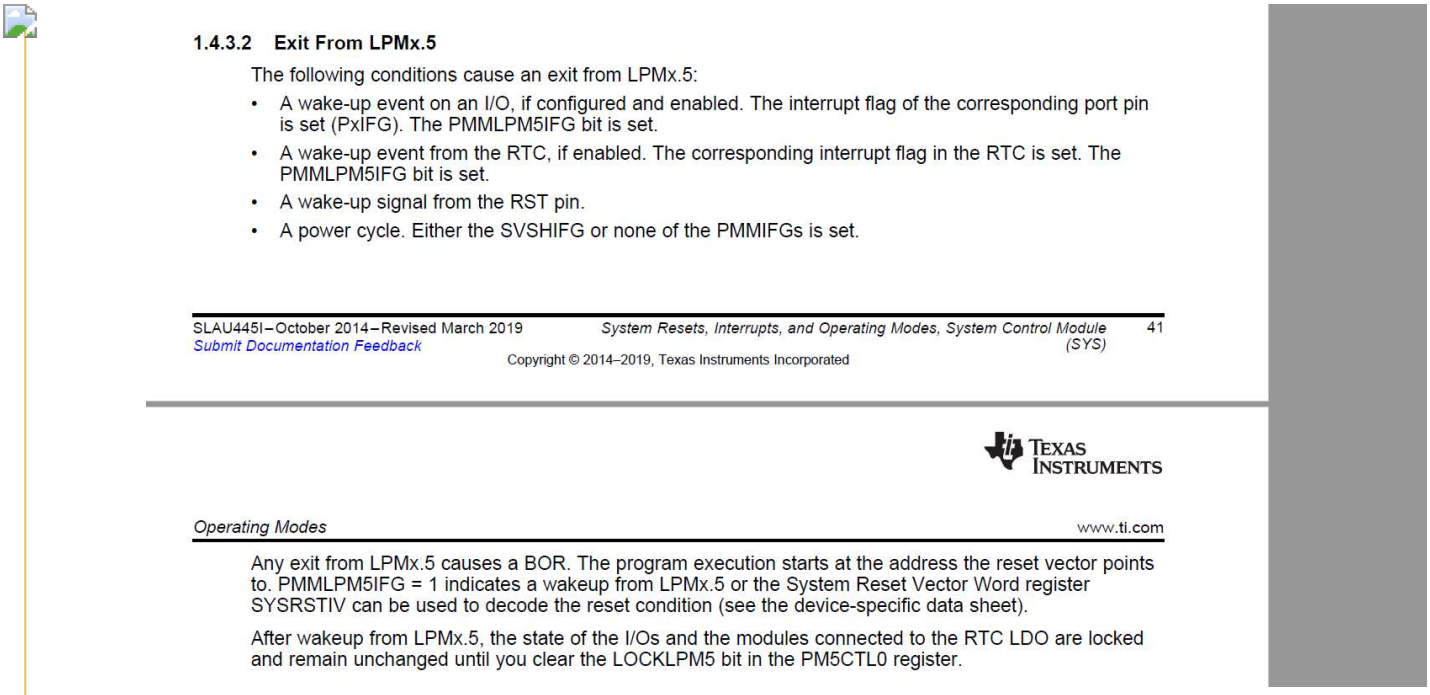
You can refer to the user's guide for entering and exiting the LPM4.5 mode. As shown in the figure below,

**1.4.3.1 Enter LPMx.5**

Follow these steps to enter LPMx.5:

1. Store any information that must be available after wakeup from LPMx.5 in FRAM.
2. For LPM4.5 set all ports to general-purpose I/Os (PxSEL0 = 00h and PxSEL1 = 00h).
   For LPM3.5 if the LF crystal oscillator is used do not change the settings for the I/Os shared with the LF-crystal-oscillator. These pins must be configured as LFXIN and LFXOUT. Set all other port pins to general-purpose I/Os with PxSEL0 and PxSEL1 bits equal to 0.
3. Set the port pin direction and output bits as necessary for the application.
4. To enable a wakeup from an I/O do the following:
   a. Select the wakeup edge (PxIES)
   b. Clear the interrupt flag (PxIFG)
   c. Set the interrupt enable bit (PxIE)
5. For LPM3.5, the modules that stay active must be enabled. For example, the RTC must be enabled if necessary. Only modules connected to the RTC LDO can stay active.
6. For LPM3.5, enable any interrupt sources from these modules as wakeup sources, if necessary. See the corresponding module chapter.
7. Disable the watchdog timer WDT if it is enabled and in watchdog mode. If the WDT is enabled and in watchdog mode, the device does not enter LPMx.5.
8. Clear the GIE bit:
   ```
   BIC #GIE, SR
   ```
9. Do the following steps to set the PMMREGOFF bit in the PMMCTL0 register:
   a. Write the correct PMM password to get write access to the PMM control registers.
      ```
      MOV.B #PMMPW_H, &PMMCTL0_H
      ```
   b. Set PMMREGOFF bit in the PMMCTL0 register.
      ```
      BIS.B #PMMREGOFF, &PMMCTL0_L
      ```
   c. To disable the SVS during LPMx.5, clear the SVSHE bit in PMMCTL0.
      ```
      BIC.B #SVSHE, &PMMCTL0_L
      ```
   d. Write an incorrect PMM password to disable the write access to the PMM control registers.
      ```
      MOV.B #000h, &PMMCTL0_H
      ```
10. Enter LPMx.5 with the following instruction:
    ```
    BIS #CPUOFF+OSCOFF+SCG0+SCG1, SR
    ```

The device enters LPM3.5 if any module that is connected to the RTC LDO is enabled. The device enters LPM4.5 if none of the modules that are connected to the RTC LDO are enabled.



1.4.3.2 Exit From LPMx.5

The following conditions cause an exit from LPMx.5:

- A wake-up event on an I/O, if configured and enabled. The interrupt flag of the corresponding port pin is set (PxIFG). The PMMLPM5IFG bit is set.
- A wake-up event from the RTC, if enabled. The corresponding interrupt flag in the RTC is set. The PMMLPM5IFG bit is set.
- A wake-up signal from the RST pin.
- A power cycle. Either the SVSHIFG or none of the PMMIFGs is set.






Any exit from LPMx.5 causes a BOR. The program execution starts at the address the reset vector points to. PMMLPM5IFG = 1 indicates a wakeup from LPMx.5 or the System Reset Vector Word register SYSRSTIV can be used to decode the reset condition (see the device-specific data sheet).

After wakeup from LPMx.5, the state of the I/Os and the modules connected to the RTC LDO are locked and remain unchanged until you clear the LOCKLPM5 bit in the PM5CTL0 register.

Attach reference code:

http://dev.ti.com/tirex/explore/node?node=AEvNk7PABcHF-blXtGUaqA__IOGqZri__LATEST

http://dev.ti.com/tirex/explore/node?node=ANvWtA-nx2O3wEpZfkZVOw__IOGqZri__LATEST

Best Regards

Johnson

sadasivam arumugam *over 5 years ago in reply to Johnson He* Intellectual 940 points

Hi Sir,

Sorry, I could not get it. I want to know if I am using SPI, Timer, RTC, GPIO functionality, how to set the pins before going into LPM4.5.

I suspect of declaring those pins as GPIO/ disable their functionality is enough though. Thanks for the repy.

Johnson He *over 5 years ago in reply to sadasivam arumugam* TI__Mastermind 28496 points

Hi sadasivam,

In order to reduce the current consumption in PLM4.5 mode, all pins need to be set as output pins before entering 4.5 mode, and SPI, RTC and other functions can be configured after waking up from LPM4.5 mode.

If I/O is configured as a SPI or other function before entering LPM4.5, it may cause leakage current due to connection with an external circuit, resulting in large power consumption in LPM4.5 mode.

Best Regards

Johnson

sadasivam arumugam *over 5 years ago in reply to Johnson He*

Intellectual 940 points

Hi Sir,

Thank you for your reply. I will test accordingly and give you the result.

Johnson He *over 5 years ago in reply to sadasivam arumugam*

TI_Mastermind 28496 points

Hi sadasivam,

This post has been around for a long time, and the problem (Current measurement) has been solved. In order to make it easier for other community members to view, I set this post to *close*. If you have other questions, you can create a new post to discussion,in order for us to see this kind of issue that you discussed earlier, you can attach this post link when you create a new post, we will further support you. Of course, you can also privately discuss me by letter.

thank you~

Best Regards

Johnson

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