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MSP430g2553 1mhz or 16mhz? how to set it?

By L.R.A,
July 7, 2013 in Energia - MSP

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L.R.A
Level 3

Members
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598 posts
LocationPortugal

Posted July 7, 2013   •••

I have here some msp430g2553 wich i don't know the frequency. Since sometimes i need a low consuption (and i don't know sleep mode) and others a faster uControler i need to know how to set the frequency of the clock.

How can this be done with energia?

➕   Quote

JWoodrell
Level 3

Members
⊕ **285**
445 posts

Posted July 7, 2013   •••

see this post.

energia defaults to 16mhz for the g2553, but can be changed if required

➕   Quote

L.R.A
Level 3

Members
⊕ 78
598 posts
Location Portugal

Posted July 8, 2013

•••

> ⌄ **On 7/7/2013 at 9:55 PM, JWoodrell said:**
>
> see this <u>post</u>.
>
> energia defaults to 16mhz for the g2553, but can be changed if required

So if i have a 1Mhz msp430 and i chose in boards the 16mhz energia automaticaly changes it?

➕ Quote

JWoodrell
Level 3

Members
⊕ 285
445 posts

Posted July 8, 2013

•••

all the MSP430s can be set to any clock frequency generated by the DCO internally up to a max f i think 18MHZ or so, but they are most accurate frequency wise at 16MHZ, and 1MHZ which are the calibration point. but you can set the DCO much lower than that to save power, and run it through internal dividers to make the effective frequency lower still.

➕ Quote

L.R.A
Level 3

Members
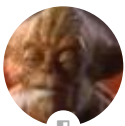⊕ 78
598 posts
Location Portugal

Posted July 8, 2013

•••

That i know. I just don't know how to actualy set the DCO to the frequency i want. Does energia do that automaticaly to the board selected?

➕ Quote

---

spirilis
Level 5

Members
⊕ 1,265
3,399 posts
Location Baltimore, MD
Github Repository

Posted July 8, 2013

•••

Energia initializes it on poweron, yes.

The DCO is configured using some SFR (special function registers) for which there happen to be some pre-calibrated values built into the chip's flash (Info_A segment to be technical). The two SFRs in question are called DCOCTL and BCSCTL1.

Energia actually does this inside "wiring.c":

```
#if defined(CALBC1_16MHZ_) && F_CPU >= 16000000L
        BCSCTL1 = CALBC1_16MHZ;
        DCOCTL = CALDCO_16MHZ;
```

There's nothing to say that, in your code, you can't do:

DCOCTL = CALDCO_1MHZ;

BCSCTL1 = CALBC1_1MHZ;

However from what I've been able to gather, the current Energia release uses that DCO for operating its millis() clock, so your millis() will be inaccurate as a result (clock will appear to run 1/16th as fast as it should). This is because the app is hard-compiled with "F_CPU" of 16MHz which is used to derive the clock ticks vs. milliseconds.

(Those CALDCO_1MHZ and CALBC1_1MHZ constants are #define's provided by TI's headers that point to the location of those calibration constants in the Info_A segment, btw, so you don't have to think about figuring out where they are.)

Optionally, you can edit Energia's boards.txt file and create your own "board"...

Boards.txt entry for the G2553 looks like this:

```
lpmsp430g2553.name=LaunchPad w/ msp430g2553 (16MHz)
lpmsp430g2553.upload.protocol=rf2500
lpmsp430g2553.upload.maximum_size=16384
lpmsp430g2553.build.mcu=msp430g2553
lpmsp430g2553.build.f_cpu=16000000L
lpmsp430g2553.build.core=msp430
lpmsp430g2553.build.variant=launchpad
```

You can create your own version that runs exclusively at 1MHz by adding a new section to the end with the name changed (including the keyword prefix for those config settings), e.g.:

```
lpmsp430g2553mhz1.name=LaunchPad w/ msp430g2553 (1MHz)
lpmsp430g2553mhz1.upload.protocol=rf2500
lpmsp430g2553mhz1.upload.maximum_size=16384
lpmsp430g2553mhz1.build.mcu=msp430g2553
lpmsp430g2553mhz1.build.f_cpu=1000000L
lpmsp430g2553mhz1.build.core=msp430
lpmsp430g2553mhz1.build.variant=launchpad
```

Note how I added "mhz1" to the end of the prefix, and changed the "(16MHz)" to "(1MHz)".

The operative change, though, is changing "build.f_cpu" to 1000000. This should trigger the #define's in Energia's core that make it run & clock at 1MHz instead. Using this method, you should have an accurate millis() clock but the chip really will run at 1MHz all the time.

Of course, in that instance, you could always do the opposite strategy and up-clock it to 16MHz for critical math-intensive processing sections, so long as you can accept the fact that your millis() will get skewed during the duration of that section...

/* spin up the CPU... */

DCOCTL = CALDCO_16MHZ;

BCSCTL1 = CALBC1_16MHZ;

/* run some math-intense code..... */

DCOCTL = CALDCO_1MHZ;

BCSCTL1 = CALBC1_1MHZ;

/* back to normal. */

＋   Quote

L.R.A
Level 3

Posted July 8, 2013
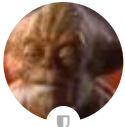
I see that is very usefull.

I got to learn more about the cores and more advanced stuff. I didn't know that i could change the clock speed for each part of the code i need.

So in millis() if i see like 1 second it's actualy 16 seconds more or less?

Members
+ 78
598 posts
LocationPortugal

+ Quote

---

spirilis
Level 5

Members
+ 1,265
3,399 posts
LocationBaltimore, MD
Github Repository

Posted July 8, 2013

> **On 7/8/2013 at 11:46 AM, L.R.A said:**
>
> I see that is very usefull.
>
> I got to learn more about the cores and more advanced stuff. I didn't know that i could change the clock speed for each part of the code i need.
>
> So in millis() if i see like 1 second it's actualy 16 seconds more or less?

Yeah, if your boards.txt spec has f_cpu of 16MHz and then you manually clock it down to 1MHz, that's what will happen.

+ Quote

L.R.A
Level 3

Members
+ 78
598 posts
LocationPortugal

Posted July 8, 2013

> **On 7/8/2013 at 12:28 PM, spirilis said:**
>
> Yeah, if your boards.txt spec has f_cpu of 16MHz and then you manually clock it down to 1MHz, that's what will happen.

ah! i see. I thought it was an error in Energia. It's actualy just the way it's configured when it compiles. Thanks!

+ Quote

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grahamf72
Level 2

Members
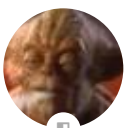**+ 169**
189 posts
LocationAustralia

Posted July 8, 2013

I have a question about power use at 1mhz vs 16mhz. I know the processor uses less power at 1mhz, but if you spend most of your time in LPM3, waking up to do small tasks, it will take 16x longer to do those tasks at 1mhz. So do you actually gain anything by running at 1mhz?

+ Quote

---

spirilis
Level 5

Posted July 8, 2013

Not a whole lot but it depends on your power source I guess. Plus from what I gather Energia doesn't gracefully manage LPM3 so it's a hack either way.

Sent from my Galaxy Note II with Tapatalk

+   Quote   grahamf72   ♥   1

grahamf72
Level 2

G

Posted July 10, 2013   •••
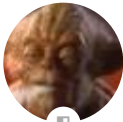
Thanks @ @spirilis , that's what I suspected - I figured it would take the same number of microamp-seconds to perform a certain routine, regardless of whether it was done at 1mhz or 16mhz.

As for LPM3, I've made a few mods to my libraries so that it is handled a little more gracefully. But like everything there are drawbacks.

+   Quote

spirilis
Level 5

Posted July 10, 2013   •••

> ⌄ **On 7/10/2013 at 4:23 PM, grahamf72 said:**   ⤴
>
> Thanks @ @spirilis , that's what I suspected - I figured it would take the same number of microamp-seconds to perform a certain routine, regardless of whether it was done at 1mhz or 16mhz.
>
> As for LPM3, I've made a few mods to my libraries so that it is handled a little more gracefully. But like everything there are drawbacks.

Can you elaborate a bit on your experiences with LPM3 in Energia? I am mulling over some ideas to contribute to the Energia core to properly support LPM3 but I'm curious what kind of things already work.

Sent from my Galaxy Note II with Tapatalk

+   Quote

orso2020
Member
● ●

Posted July 15, 2013   •••

here is what i used:

I defined those constants to reference data written to the flash with the "Calibrate DCO With Checksum" program. There should be a copy of lnk_msp430g2231.cmd buried in the working directory for the compiler, renamed to lnk_msp430g2231_mod.cmd that has the new constants in it. You can check out this thread which explains clock calibration with the MSP430, custom clock calibration constants that result from running the calibration program, and what to do to be able to use those constants: http://www.43oh.com/forum/viewtopic.php?f=10&t=239

Basically, the MSP430G2XXX series does not have clock constants for anything higher than 1 MHz, so to be able to run the processor any faster (like what you'd need to be able to do the I2C stuff), then you have to manually make those constants.

Anyways, check out that thread.

+   Quote

spirilis
Level 5

Members
 1,265
3,399 posts
LocationBaltimore, MD
Github Repository

G2xx2 and G2xx3 do have constants for 1MHz, 8MHz, 12MHz and 16MHz. G2xx1's don't.

+ Quote

orso2020 ♥ 1

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