

Notes on using Analog Devices' DSP, audio, & video components from the Computer Products Division
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SHARC Internal Power Consumption Measurements

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There have been many customer inquiries concerning typical power consumption of the SHARC processors. As you all know we only supply a maximum Pint which is based on experimentation. Iddin is measured while executing a radix-2 FFT butterfly with instruction in cache, one data fetch from each block of memory and a DMA transfer from internal memory to internal memory. A similar method of experimentation to try to determine "typical power".

The first issue was to determine what "typical" instructions would be so "typical" power can be determined. A guess was taken. The following is a description of the test cases:

Test Case 1 executes an addition, a subtraction, a PM data access and a DM data access.

Test Case 2 executes a multiplication, an addition, a PM data access and a DM data access.

Test case 3 executes a multiplication, an addition, a subtraction, a PM data access and a DM data access.

Test Case 4 executes a multiplication, an addition and a subtraction.

Test Case 5 executes an addition and a subtraction.

Test Case 6 executes a PM data access and a DM data access.

Test cases were selected assuming "typical" instructions would be associated with number crunching. A jump statement was used to sustain these instructions.

The experiments where performed on an ADSP 21062 rev 2.0 using 3 separate clock rates, 25MHz, 33 MHz, and 40 MHz. (A rev 0.6 part with a 24 MHz clock was also tested. The results were almost identical to those of the rev 2.0). Vddin was fixed at 5.25v. The following table describes the results:

Test Case	Iddin @ 24 MHz	Iddin @ 33 MHz	Iddin @ 40 MHz
1	380 mA	410 mA	470 mA
2	400 mA	440 mA	500 mA
3	400 mA	440 mA	510 mA
4	280 mA	330 mA	370 mA
5	280 mA	320 mA	360 mA
6a	320 mA	380 mA	420 mA
(50% Switching)			
6b		390 mA	440 mA
(100% Switching)			

The following is a copy of the program used.

```
#include "def21060.h"
#define N 22

.SEGMENT/DM    seg_dmda;
.VAR buffdm[4] =0x00000000,
                0x55555555,
                0xFFFFFFFF,
                0xAAAAAAAA;

.ENDSEG;

.SEGMENT/PM    seg_pmda;
.VAR buffpm[N] =0x4AA14B47,
                0x8DF675D4,
                0x43D49B8A,
                0xD14BA018,
                0x406E4387,
                0xCDE5483D,
                0x83C36DCA,
                0x113A7239,
                0x805D15C7,
                0x363B3B7C,
                0xC3B24032,
                0x799065C0,
                0x07076A2F,
                0x762A0DBC,
                0x03A1122C,
                0x72C3B5B9,
                0x28A1DB6F,
                0xB618E025,
                0x6BF705B2,
                0xF96E0A21,
                0x6890ADAF,
                0x1E6ED365;

.ENDSEG;

.SEGMENT/PM    seg_rth;
    nop;
    jump start;
```

```

.ENDSEG;

.SEGMENT/PM    seg_pmco;

start:
    l0=@buffdm;
    b0= buffdm;
    m0=  0x1;

    l8=@buffpm;
    b8= buffpm;
    m8=  0x1;

    r0=dm(i0,m0), r4 =pm(i8,m8);
    r8=dm(i0,m0), r12=pm(i8,m8);

    call addsub;

addsub:
    r7=r0+r4, r15=r0-r4,  r0=dm(i0,m0), r4 =pm(i8,m8);
    jump addsub (db);
    r7=r0+r4, r15=r0-r4,  r0=dm(i0,m0), r4 =pm(i8,m8);
    r7=r0+r4, r15=r0-r4,  r0=dm(i0,m0), r4 =pm(i8,m8);

mulacc:
    r7=r0*r4(SSFR), r15=r8+r12, r0=dm(i0,m0), r4
    =pm(i8,m8);
    jump mulacc (db);
    r7=r0*r4(SSFR), r15=r8+r12, r0=dm(i0,m0), r4
    =pm(i8,m8);
    r7=r0*r4(SSFR), r15=r8+r12, r0=dm(i0,m0), r4
    =pm(i8,m8);

mas: r7=r0*r4(SSFR), r15=r8+r12, r14=r8-r12,
r0=dm(i0,m0), r4 =pm(i8,m8);
    jump mas (db);
    r7=r0*r4(SSFR), r15=r8+r12, r14=r8-r12,
r0=dm(i0,m0), r4 =pm(i8,m8);
    r7=r0*r4(SSFR), r15=r8+r12, r14=r8-r12,
r0=dm(i0,m0), r4 =pm(i8,m8);

.ENDSEG;

```