

66AK2G12 Power Consumption Summary

Catalog Procissors

ABSTRACT

This application report focuses on providing several 66AK2G12 application-usage case scenarios and the environment settings that were used to perform such power measurements. This collection of real power measurements was measured on the EVMK2G [1] using its onboard INA226 power measurement devices. For additional details about the 66AK2G12 processor, visit the online product page [2].

Contents

1	Introduction	2
2	66AK2G12 Test Set-Up	2
3	66AK2G12 Power Measurement Results.....	3
4	References	5

List of Tables

1	66AK2G12 Power Supply Rails.....	2
2	66AK2G12 Power Measurement Results	3
3	OS Idle	3
4	Dhrystone	3
5	Ethernet	4
6	USB Read	4
7	USB Write.....	4
8	Memory Test	5
9	OpenCL	5

Trademarks

All trademarks are the property of their respective owners.

1 Introduction

The measurements contained in this document serve to provide a better understanding of the 66AK2G12 active power behaviors making it easier to determine a suitable configuration to meet a given power budget. However, power consumption is highly dependent on the individual user's application. Static power or leakage current consumption varies across manufacturing process, temperature, and voltage as well.

2 66AK2G12 Test Set-Up

The power measurements have been performed at room temperature (25°C) on the following platforms:

- 600 MHz: Texas Instruments EVMK2G with 66AK2G12 and TPS659118 0.90 V PMIC.
- 1000 MHz: Texas Instruments EVMK2G with 66AK2G12 and TPS65911A 1.00 V PMIC

The test set-up details are as follows:

- SD card with Processor SDK Linux [3] (here we used v4.01 [4])
- Powertool [5]
- Option 1: BeagleBone Black [6] and Windows computer
- Option 2: FT232RL Mini Module [7] and Linux computer

Powertool is used to communicate with the I2C bus containing INA226 devices onboard the EVMK2G. It comes with a config file that will work with the EVMK2G so make sure to use that. The README of Powertool contains the information needed to proceed with option 1 or option 2. In the case of option 2, the powertool is compiled on the Linux PC and powertool uses the FTDI Mini Module as a USB-to-I2C converter. With option 1, the powertool is compiled on the BeagleBone Black (BBB) and it uses the available I2C1 or I2C2 bus for power measurements. With powertool compiled, run it with the below command:

```
./ptool -c configs/k2g_evm.conf -e
```

2.1 66AK2G12 Power Supplies

Table 1 describes the power supplies for 66AK2G12:

Table 1. 66AK2G12 Power Supply Rails

Signal	Description	600 MHz	1000 MHz
CVDD	Core voltage domain supply	0.90 V	1.00V
CVDD1	Core memory array power supply	0.90 V	1.00V
AVDDA_DDRPLL	DDR PLL supply	1.80 V	
AVDDA_DSSPLL	DSS PLL supply	1.80 V	
AVDDA_MAINPLL	CORE PLL supply	1.80 V	
AVDDA_NSSPLL	NSS PLL supply	1.80 V	
AVDDA_UARTPLL	UART PLL supply	1.80 V	
AVDDA_ICSSPLL	ICSS PLL supply	1.80 V	
AVDDA_ARMPLL	ARM PLL supply	1.80 V	
DVDD_DDRDLL	DDR PHY DLL supply	1.80 V	
VDDAHV	SERDES 1.8-V supply	1.80 V	
DVDD_DDR	DDR supply	1.35 V	
DVDD18	I/O supply	1.80 V	
DVDD33	I/O supply	3.3 V	
DVDD33_USB	USB 3.3-V supply	3.3 V	

2.2 66AK2G12 Power Consumption High-level Summary

Table 2 through Table 9 contain a high-level summary of the total device power (measured in milliwatts) for each application use case and/or configuration.

Table 2. 66AK2G12 Power Measurement Results

Application	600 MHz (mW)	1000 MHz (mW)
OS Idle	1786.31	2844.70
Dhrystone	2159.59	3680.51
Ethernet	1804.05	2965.65
USB Read	2032.50	3353.34
USB Write	2026.62	3384.83
Memory Test	2180.96	3290.61
OpenCL	2054.49	3366.22

3 66AK2G12 Power Measurement Results

3.1 OS Idle

In this measurement, no application is running on Linux.

Table 3. OS Idle

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1104.05	998.76	1.00	1933.97	1938.97
CVDD1	0.90	67.71	62.48	1.00	168.33	162.46
DVDD_DDR	1.35	253.04	350.04	1.35	294.74	392.816
SOC_1V8	1.81	134.47	249.95	1.80	133.24	249.94
SOC_3V3	3.30	40	125.09	3.27	34.08	100.52
Total Power			1786.31			2844.70

3.2 Dhrystone

In this measurement, the Dhrystone benchmark application (runDhrystone) is running on single Cortex-A15 core.

Table 4. Dhrystone

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1552.70	1397.28	1.00	2735.79	2748.23
CVDD1	0.90	75.32	62.48	1.00	175.75	181.87
DVDD_DDR	1.35	252.82	349.91	1.35	295.90	400.40
SOC_1V8	1.81	134.47	249.94	1.81	133.00	249.94
SOC_3V3	3.30	29.99	99.98	3.28	33.76	100.06
Total Power			2159.59			3680.51

3.3 Ethernet

In this measurement, Ethernet throughput benchmark application (iperf) is running on Linux.

Table 5. Ethernet

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1120.73	1015.50	1.00	1996.12	1998.97
CVDD1	0.90	72.91	62.48	1.00	174.09	186.37
DVDD_DDR	1.35	252.78	349.91	1.35	295.76	397.07
SOC_1V8	1.81	134.47	249.94	1.80	133.19	249.94
SOC_3V3	3.30	40.06	126.22	3.28	44.04	137.47
Total Power			1804.05			2969.81

3.4 USB Read

In this measurement, USB benchmark application (Bonnie++) is running on Linux.

Table 6. USB Read

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1372.29	1239.20	1.00	2410.31	2414.99
CVDD1	0.90	73.63	62.48	1.00	176.34	187.45
DVDD_DDR	1.35	253.02	349.91	1.35	297.39	403.57
SOC_1V8	1.81	136.02	249.94	1.80	135.47	249.94
SOC_3V3	3.30	37.07	125.09	3.30	40.88	128.88
Total Power			2026.62			3384.83

3.5 USB Write

In this measurement, USB benchmark application (Bonnie++) is running on Linux.

Table 7. USB Write

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1378.99	1240.2	1.00	2373.95	2375.04
CVDD1	0.90	74.85	62.48	1.00	177.29	187.20
DVDD_DDR	1.35	257.04	351.41	1.35	298.92	406.07
SOC_1V8	1.81	136.34	249.94	1.80	135.47	249.94
SOC_3V3	3.30	38.46	128.47	3.28	41.67	135.09
Total Power			2032.50			3353.34

3.6 Memory Test

In this measurement, DDR memory test application (memtester) is running on Linux.

Table 8. Memory Test

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1446.17	1299.93	1.00	2333.38	2339.59
CVDD1	0.90	74.53	62.48	1.00	178.40	187.45
DVDD_DDR	1.35	328.71	441.52	1.35	304.20	413.65
SOC_1V8	1.81	143.47	249.54	1.80	133.63	249.94
SOC_3V3	3.30	40.05	127.09	3.30	33.99	99.98
Total Power			2180.96			3290.61

3.7 OpenCL

In this measurement, OpenCL test application (runOclVecadd) is running on Linux.

Table 9. OpenCL

Operating Frequency	600 MHz			1000 MHz		
Power Supply Group	Voltage [V]	Current [mA]	Power [mW]	Voltage [V]	Current [mA]	Power [mW]
CVDD	0.90	1392.60	1260.44	1.00	2377.50	2384.50
CVDD1	0.90	74.62	62.48	1.00	178.77	187.45
DVDD_DDR	1.35	262.13	355.91	1.35	298.83	406.69
SOC_1V8	1.80	134.47	249.94	1.80	133.13	249.94
SOC_3V3	3.30	40.01	125.72	3.28	43.76	137.64
Total Power			2054.49			3366.22

4 References

1. [EVMK2G](#)
2. [66AK2G12](#)
3. [Processor SDK for 66AK2Gx Processors - Linux and TI-RTOS Support](#)
4. [PROCESSOR-SDK-LINUX-K2G 04_01_00_06](#)
5. <http://github.com/nmenon/powertool>
6. [BEAGLEBK](#)
7. <http://www.digikey.com/product-detail/en/FT232H-MINI-MODULE/768-1030-ND/2027252>

IMPORTANT NOTICE FOR TI DESIGN INFORMATION AND RESOURCES

Texas Instruments Incorporated ("TI") technical, application or other design advice, services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using any particular TI Resource in any way, you (individually or, if you are acting on behalf of a company, your company) agree to use it solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources.

You understand and agree that you remain responsible for using your independent analysis, evaluation and judgment in designing your applications and that you have full and exclusive responsibility to assure the safety of your applications and compliance of your applications (and of all TI products used in or for your applications) with all applicable regulations, laws and other applicable requirements. You represent that, with respect to your applications, you have all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. You agree that prior to using or distributing any applications that include TI products, you will thoroughly test such applications and the functionality of such TI products as used in such applications. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

You are authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING TI RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY YOU AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You agree to fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of your non-compliance with the terms and provisions of this Notice.

This Notice applies to TI Resources. Additional terms apply to the use and purchase of certain types of materials, TI products and services. These include; without limitation, TI's standard terms for semiconductor products (<http://www.ti.com/sc/docs/stdterms.htm>), [evaluation modules](#), and [samples](http://www.ti.com/sc/docs/sampterm.htm) (<http://www.ti.com/sc/docs/sampterm.htm>).

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2018, Texas Instruments Incorporated