

# 66AK2G12 Power Consumption Summary

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*Catalog Proccsors*

## 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].

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## 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: FT2232H 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]
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]
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]
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]
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]
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/FT2232H-MINI-MODULE/768-1030-ND/2027252>

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