

AM572x Power Consumption Summary

ABSTRACT

This application report discusses the power consumption for common system application usage scenarios for the AM572x Sitara™ processors. The metrics contained in this document serve to provide users with a better understanding of AM572x active power behaviors: making it easier to determine a suitable configuration to meet a given power budget.

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1 Introduction

Power consumption is highly dependent on the individual user's application; however, this document focuses on providing several AM572x 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 internal AM572x boards with on-board power measurement device (TI INA226).

For additional details about the AM572x processor, see the [AM5728](#) product page.

1.1 Power Measurement Setup

The following section details power measurements taken on a AM572x platform for typical use case applications. These measurements have been performed on an internal test evaluation reference system and not on the AM572x evaluation module (TMDXEVM5728).

NOTE: The software being used is a TI Linux Core SDK for AM57X Sitara Processors. Static power or leakage current consumption varies across manufacturing process, temperature and voltage. All of the readings shown here are taken at room temperature (25°C).

1.2 AM572x Power Supplies

Table 1 describes the power supplies for AM572x.

Table 1. AM572x Power Supplies

Power Supply Group	Signal	Description
VDD_CORE	vdd	Core voltage domain supply
VDD_MPU	vdd_mpu	MPU voltage domain supply
VDD_DSP	vdd_dsp	DSP voltage domain supply
VDD_IVA	vdd_iva	IVA voltage domain supply
VDD_GPU	vdd_gpu	GPU voltage domain supply
VDDS_DDR (1.35 V/1.5 V)	vdds_dds1	EMIF1 power supply
	vdds_dds2	EMIF2 power supply
Analog PHY (1.8 V)	vdda_usb1	DPLL_USB and HS USB1 analog power supply
	vdda_usb2	HS USB2 analog power supply
	vdda_usb3	DPLL_USB_OTG_SS and USB3.0 RX/TX analog power supply
	vdda_sata	DPLL_SATA and SATA RX/TX analog power supply
	vdda_pcie	DPLL_PCIE_REF and PCIe analog power supply
	vdda_pcie0	PCIe ch0 RX/TX analog power supply
	vdda_pcie1	PCIe ch1 RX/TX analog power supply
Analog DPLL (1.8 V)	vdda_osc	HFOSC analog power supply
	vdda_iva	DPLL_IVA analog power supply
	vdda_gpu	DPLL_GPU analog power supply
	vdda_debug	DPLL_DEBUG analog power supply
	vdda_dsp_eve	DPLL_DSP analog power supply
	vdda_video	DPLL_VIDEO1 and DPLL_VIDEO2 analog power supply
	vdda_hdmi	PLL_HDMI and HDMI analog power supply
	vdda_gmac_core	DPLL_CORE and CORE HSDIVIDER analog power supply
	vdda_dds	DPLL_DDR and DDR HSDIVIDER analog power supply
	vdda_mpu	DPLL_MPU analog power supply
	vdda_abe_per	DPLL_ABE, DPLL_PER, and PER HSDIVIDER analog power supply
Analog USB PHY (3.3 V)	vdda33v_usb1	HS USB1 3.3 V analog power supply
	vdda33v_usb2	HS USB2 3.3 V analog power supply
1.8 V I/O	vdds_mlbp	MLB Power Supply
	vdds18v_dds1	EMIF1 bias power supply
	vdds18v_dds2	EMIF2 bias power supply
	vdds18v	1.8V power supply
3.3 V I/O	vddshv[1-11]	Dual voltage power supply

2 High-Level Summary

The following tables contain a high-level summary of the total device power (measured in milliwatts) for each application use case and configuration.

2.1 OS Idle

In this measurement, no application is running on Linux.

Table 2. OS Idle

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	2314.3
OD	NOM	NOM	NOM	2433.7
HIGH	NOM	NOM	NOM	2679.1
HIGH	HIGH	HIGH	HIGH	2815.4

2.2 Dhrystone - Single Core

In this measurement, the Dhrystone benchmark application is running on single Coretex-A15 core.

Table 3. Dhrystone - Single Core

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	3115.8
OD	NOM	NOM	NOM	3514.6
HIGH	NOM	NOM	NOM	4194.7

2.3 Dhrystone - Dual Core

In this measurement, the Dhrystone benchmark application is running on single Coretex-A15 core.

Table 4. Dhrystone - Dual Core

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	3993.5
OD	NOM	NOM	NOM	4759.3
HIGH	NOM	NOM	NOM	6493.8

2.4 Graphics - 3D Chameleon Man

In this measurement, the 3D Graphics application is showing a matrix skinned character in combination with bump mapping.

Table 5. Graphics - 3D Chameleon Man

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	3145.9
HIGH	HIGH	HIGH	HIGH	4055.0

2.5 Video - H.264 Decode

In this measurement, the H.264 decode application is running a gstreamer playbin pipeline to decode H264 using IVAHD and playing back audio as well.

Table 6. Video - H.264 Decode

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	2638.0

2.6 Ethernet

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

Table 7. Ethernet

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	3279.8

2.7 USB

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

Table 8. USB

MPU	GPU	DSP	IVA	Power (mW)
NOM	NOM	NOM	NOM	3136.9

3 AM572x Power Measurement Results

3.1 OS Idle: All Domains at NOM

3.1.1 OPP

Table 9. OS Idle: All Domains at NOM - OPP

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.1.2 Power Consumption

Table 10. OS Idle: All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	645.2	641.9
VDD_MPU	1.05	280.3	295.4
VDD_DSP	1.00	270.0	270.7
VDD_IVA	1.00	11.3	11.3
VDD_GPU	1.03	181.1	185.8
VDDS_DDR	1.35	278.3	375.7
Analog PHY	1.78	100.8	179.9
Analog DPLL	1.79	35.9	64.1
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	103.2	186.5
3.3V IO	3.27	30.0	98.1
Total Power			2314.3
VDD_DDR	1.34	431.0	578.1

3.2 OS Idle: MPU Domain at OD

3.2.1 OPP

Table 11. OS Idle: MPU Domain at OD - OPP

MPU	GPU	DSP	IVA
OD	NOM	NOM	NOM

3.2.2 Power Consumption

Table 12. OS Idle: MPU Domain at OD - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	651.1	647.8
VDD_MPU	1.11	349.7	389.8
VDD_DSP	1.00	275.3	276.0
VDD_IVA	1.00	12.3	12.4
VDD_GPU	1.03	183.8	188.6
VDDS_DDR	1.35	280.5	378.7
Analog PHY	1.78	101.0	180.2
Analog DPLL	1.79	36.2	64.7
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	106.5	192.6
3.3V IO	3.27	30.0	98.1
Total Power			2433.7
VDD_DDR	1.34	438.0	587.7

3.3 OS Idle: MPU Domain at HIGH

3.3.1 OPP

Table 13. OS Idle: MPU Domain at HIGH - OPP

MPU	GPU	DSP	IVA
HIGH	NOM	NOM	NOM

3.3.2 Power Consumption

Table 14. OS Idle: MPU Domain at HIGH - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	658.4	655.1
VDD_MPU	1.20	504.4	603.4
VDD_DSP	1.00	280.0	280.7
VDD_IVA	1.00	12.5	12.5
VDD_GPU	1.03	190.0	195.0
VDDS_DDR	1.35	281.6	380.1
Analog PHY	1.78	101.1	180.3
Analog DPLL	1.79	35.8	63.8
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	113.5	205.2
3.3V IO	3.27	30.0	98.1
Total Power			2679.1
VDD_DDR	1.34	439.6	589.7

3.4 OS Idle: All Domains at HIGH

3.4.1 OPP

Table 15. OS Idle: MPU Domain at HIGH - OPP

MPU	GPU	DSP	IVA
HIGH	HIGH	HIGH	HIGH

3.4.2 Power Consumption

Table 16. OS Idle: All Domains at HIGH - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	660.5	657.2
VDD_MPU	1.20	502.8	601.5
VDD_DSP	1.06	342.5	364.3
VDD_IVA	1.12	23.8	26.7
VDD_GPU	1.08	216.3	232.7
VDDS_DDR	1.35	281.2	379.6
Analog PHY	1.78	101.2	180.5
Analog DPLL	1.79	35.5	63.4
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	114.3	206.6
3.3V IO	3.27	30.0	98.1
Total Power			2815.4
VDD_DDR	1.34	439.9	590.1

3.5 Dhrystone: Single Core - All Domains at NOM

3.5.1 OPP

Table 17. Dhrystone: Single Core - All Domains at NOM - OPP

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.5.2 Power Consumption

Table 18. Dhrystone: Single Core - All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	656.3	653.0
VDD_MPU	1.06	990.6	1050.1
VDD_DSP	1.00	277.2	277.9
VDD_IVA	1.00	13.8	13.8
VDD_GPU	1.03	197.8	203.0
VDDS_DDR	1.35	277.6	374.8
Analog PHY	1.78	101.1	180.4
Analog DPLL	1.79	36.0	64.3
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	108.3	195.7
3.3V IO	3.27	30.0	98.1
Total Power			3115.8
VDD_DDR	1.34	431.4	578.7

3.6 Dhrystone: Single Core - MPU Domain at OD

3.6.1 OPP

Table 19. Dhrystone: Single Core - MPU Domain at OD - OPP

MPU	GPU	DSP	IVA
OD	NOM	NOM	NOM

3.6.2 Power Consumption

Table 20. Dhrystone: Single Core - MPU Domain at OD - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	665.3	662.6
VDD_MPU	1.12	1255.0	1410.1
VDD_DSP	1.00	284.7	285.4
VDD_IVA	1.00	15.0	15.0
VDD_GPU	1.03	206.3	211.7
VDDS_DDR	1.35	279.6	377.5
Analog PHY	1.78	101.1	180.3
Analog DPLL	1.79	36.3	64.7
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	113.0	204.3
3.3V IO	3.27	30.0	98.1
Total Power			3514.6
VDD_DDR	1.34	437.4	586.8

3.7 Dhrystone: Single Core - MPU Domain at HIGH

3.7.1 OPP

Table 21. Dhrystone: Single Core - MPU Domain at HIGH - OPP

MPU	GPU	DSP	IVA
HIGH	NOM	NOM	NOM

3.7.2 Power Consumption

Table 22. Dhrystone: Single Core - MPU Domain at HIGH - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	681.7	679.2
VDD_MPU	1.21	1671.6	2018.4
VDD_DSP	1.00	294.1	295.1
VDD_IVA	1.00	17.5	17.5
VDD_GPU	1.03	226.1	232.0
VDDS_DDR	1.35	280.6	378.8
Analog PHY	1.78	101.3	180.6
Analog DPLL	1.79	36.0	64.3
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	124.8	225.8
3.3V IO	3.27	30.0	98.1
Total Power			4194.7
VDD_DDR	1.34	439.6	589.8

3.8 Dhrystone: Dual Core - All Domains at NOM

3.8.1 OPP

Table 23. Dhrystone: Dual Core - All Domains at NOM

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.8.2 Power Consumption

Table 24. Dhrystone: Dual Core - All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	676.3	673.7
VDD_MPU	1.07	1730.9	1847.8
VDD_DSP	1.00	289.1	290.1
VDD_IVA	1.00	16.4	16.4
VDD_GPU	1.03	231.4	237.5
VDDS_DDR	1.35	280.7	378.9
Analog PHY	1.78	101.0	180.2
Analog DPLL	1.79	36.3	64.7
Analog USB PHY	3.30	1.6	5.3
1.8V IO	1.81	116.8	211.1
3.3V IO	3.27	26.9	87.8
Total Power			3993.5
VDD_DDR	1.34	435.3	584.2

3.9 Dhrystone: Dual Core - MPU Domain at OD

3.9.1 OPP

Table 25. Dhrystone: Dual Core - MPU Domain at OD - OPP

MPU	GPU	DSP	IVA
OD	NOM	NOM	NOM

3.9.2 Power Consumption

Table 26. Dhrystone: Dual Core - MPU Domain at OD - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	696.9	695.1
VDD_MPU	1.13	2227.5	2523.3
VDD_DSP	1.00	304.7	305.8
VDD_IVA	1.00	20.0	20.1
VDD_GPU	1.03	257.5	264.6
VDDS_DDR	1.35	281.9	380.6
Analog PHY	1.78	101.3	180.7
Analog DPLL	1.79	36.5	65.2
Analog USB PHY	3.30	1.7	5.7
1.8V IO	1.81	126.3	228.4
3.3V IO	3.27	27.5	89.9
Total Power			4759.3
VDD_DDR	1.34	443.5	595.1

3.10 Dhrystone: Dual Core - MPU Domain at HIGH

3.10.1 OPP

Table 27. Dhrystone: Dual Core - MPU Domain at HIGH - OPP

MPU	GPU	DSP	IVA
HIGH	NOM	NOM	NOM

3.10.2 Power Consumption

Table 28. Dhrystone: Dual Core - MPU Domain at HIGH - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	747.7	746.7
VDD_MPU	1.23	3307.8	4052.1
VDD_DSP	1.00	333.1	334.6
VDD_IVA	1.00	28.8	28.8
VDD_GPU	1.03	323.4	332.7
VDDS_DDR	1.35	281.8	380.4
Analog PHY	1.78	101.7	181.4
Analog DPLL	1.79	36.5	65.2
Analog USB PHY	3.30	1.8	5.8
1.8V IO	1.81	152.7	276.2
3.3V IO	3.27	27.5	89.9
Total Power			6493.8
VDD_DDR	1.34	445.4	597.8

3.11 Graphics 3D Chameleon Man: All Domains at NOM

3.11.1 OPP

Table 29. Graphics 3D Chameleon Man: All Domains at NOM - OPP

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.11.2 Power Consumption

Table 30. Graphics 3D Chameleon Man: All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	666.9	663.5
VDD_MPU	1.06	412.5	435.2
VDD_DSP	1.00	213.8	214.0
VDD_IVA	1.00	12.0	12.0
VDD_GPU	1.04	670.8	694.4
VDDS_DDR	1.35	358.3	483.7
Analog PHY	1.78	101.4	180.8
Analog DPLL	1.79	36.3	64.7
Analog USB PHY	3.30	1.5	4.9
1.8V IO	1.81	115.4	208.7
3.3V IO	3.27	56.3	183.8
Total Power			3145.9
VDD_DDR	1.34	505.6	678.2

3.12 Graphics 3D Chameleon Man: All Domains at HIGH

3.12.1 OPP

Table 31. Graphics 3D Chameleon Man: All Domains at HIGH - OPP

MPU	GPU	DSP	IVA
HIGH	HIGH	HIGH	HIGH

3.12.2 Power Consumption

Table 32. Graphics 3D Chameleon Man: All Domains at HIGH - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	714.1	712.3
VDD_MPU	1.20	780.3	935.4
VDD_DSP	1.06	302.5	321.8
VDD_IVA	1.12	32.5	36.5
VDD_GPU	1.09	795.8	865.4
VDDS_DDR	1.35	366.9	495.8
Analog PHY	1.78	101.3	180.7
Analog DPLL	1.79	36.3	64.7
Analog USB PHY	3.30	1.7	5.5
1.8V IO	1.81	138.3	250.1
3.3V IO	3.27	57.2	186.8
Total Power			4055.0
VDD_DDR	1.34	528.5	708.9

3.13 Video: H.264 Decode - All Domains at NOM

3.13.1 OPP

Table 33. Video: H.264 Decode - All Domains at NOM - OPP

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.13.2 Power Consumption

Table 34. Video: H.264 Decode - All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	674.5	671.4
VDD_MPU	1.05	393.1	414.5
VDD_DSP	1.00	250.6	251.3
VDD_IVA	1.00	54.8	55.1
VDD_GPU	1.03	195.9	201.1
VDDS_DDR	1.35	321.1	433.4
Analog PHY	1.78	102.2	182.2
Analog DPLL	1.79	37.1	66.3
Analog USB PHY	3.30	1.8	5.8
1.8V IO	1.81	111.7	201.8
3.3V IO	3.27	47.5	155.2
Total Power			2638.0
VDD_DDR	1.34	451	604.9

3.14 Ethernet: All Domains at NOM

3.14.1 OPP

Table 35. Ethernet: All Domains at NOM - OPP

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.14.2 Power Consumption

Table 36. Ethernet: All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	675.2	672.6
VDD_MPU	1.06	900.3	953.5
VDD_DSP	1.00	279.4	280.1
VDD_IVA	1.00	16.3	16.3
VDD_GPU	1.03	225.5	231.4
VDDS_DDR	1.35	294.9	398.1
Analog PHY	1.78	101.5	181.1
Analog DPLL	1.79	36.5	65.2
Analog USB PHY	3.30	1.6	5.2
1.8V IO	1.81	118.4	214.1
3.3V IO	3.27	80.3	262.3
Total Power			3279.8
VDD_DDR	1.34	435.9	585.0

3.15 USB: All Domains at NOM

3.15.1 OPP

Table 37. USB: All Domains at NOM - OPP

MPU	GPU	DSP	IVA
NOM	NOM	NOM	NOM

3.15.2 Power Consumption

Table 38. USB: All Domains at NOM - Power Consumption

Power Supply Group	Voltage [V]	Current [mA]	Power [mW]
VDD_CORE	1.00	684.7	682.1
VDD_MPU	1.06	857.5	908.1
VDD_DSP	1.00	281.9	282.6
VDD_IVA	1.00	15.0	15.0
VDD_GPU	1.03	219.4	225.1
VDDS_DDR	1.35	280.3	378.3
Analog PHY	1.78	103.1	183.9
Analog DPLL	1.79	36.5	65.2
Analog USB PHY	3.30	3.5	11.5
1.8V IO	1.81	113.5	205.2
3.3V IO	3.27	55.0	179.7
Total Power			3136.9
VDD_DDR	1.34	436.0	585.1

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