



Application Note

Astra™ Machina SL-Series Power Consumption for Typical Use Case Configurations

Abstract: This document summarizes power consumption across typical use case configurations for the Astra Machina Evaluation System, with SL1680, SL1640 and SL1620 SoCs

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1. Introduction

The Synaptics Astra SL-Series of embedded processors are highly integrated AI-Native Linux® and Android™ SoCs optimized for consumer, enterprise and industrial IoT workloads with hardware accelerators for multimodal edge inferencing, security, video, graphics, and audio.

This document focuses on the Astra Machina edge AI evaluation system, and covers the SL1600 Series SoCs (SL1680, SL1640, and SL1620).

1.1. Typical Power Consumption: SL1680, SL1640 & SL1620

In practical applications, when Dynamic Voltage Frequency Scaling (DVFS) is implemented, the software works alongside the hardware to automatically adjust voltage and frequency values according to the specific use case requirements. Therefore, the overall system power consumption depends on both software optimization and how the system hardware is implemented.

1.1. Power Measurement Conditions

- CPU @ 1.8GHz for all of the testing cases.
 - DVFS: Dynamic Voltage/Frequency Scaling
 - WFI: Wake From Interrupt
 - WOL: Wake On Lan
 - BT: Bluetooth
 - GE: Gigabit Ethernet
 - CEC: Consumer Electronics Control
- DRAM Configuration
 - SL1680: Micron 16Gb x32 4266 LP4: MT53E512M32D1ZW-O46 WT:B x2
 - SL1640: Micron 32Gb x32 4266 LP4: MT53E1G32D2FW-O46 WT:C
 - SL1620: Samsung 8Gb x16 2666 DDR4: K4A8G165WC-BCTD x2
- Wakeup Mode:
 - Mode A: IR/Ethernet/Timer/CEC/BT/WIFI/

1.1.1. SL1680 Power Consumption Measurement Conditions & Results

Table 1. SL1680 Power Consumption Measurement Conditions

Item	Power Mode	SM	CORE	CPU	Video Display /GPU (on for display)	NPU	Audio DSP / Codec	DDR	Wakeup Modes
6	Active - CPU-A + Camera/O/I + Display 4K + GPU	On	On	CPU1 On (DVFS), 2/3/4 WFI	Yes/Yes	No	Yes	Normal	—
5	Active - CPU-A + Camera	On	On	CPU1 On (DVFS), 2/3/4 WFI	No/No	No	No	Normal	—
4	Active - CPU-A + Display 4K + GPU	On	On	CPU1 On (DVFS), 2/3/4 WFI	Yes/Yes	No	Yes	Normal	—
3	Active - CPU-A + NPU (Offline google_fpn_uint8)	On	On	CPU1 On (DVFS), 2/3/4 WFI	No/No	Yes	No	Normal	—
2	Active - Lite (MCU: Active - MPU: Sleep)	On	On (clock gating)	CPU1 is in WFI, 2/3/4 CPU OFF	No/No	No	No	Self-refresh	Wakeup Mode A
1	Suspend to Memory	On	Off	Off	No/No	No	No	Self-refresh	Wakeup Mode A

Table 2. SL1680 Power Consumption Measurement Results

Item	Power Mode	SM_0.8V	CPU	Core	DDR/LPDDR PHY	DDR/LPDDR Device	1.8V	3.3V	SOC_TOTAL
		Power (Avg): Typ part at Tj = 30 degC (mW)							
6	Active - CPU-A + CameraO/I + Display 4k + GPU	2	486	2,500	190	290	60	120	3,358
5	Active - CPU-A + Camera	2	486	1,300	120	180	40	100	2,048
4	Active - CPU-A + Display 4k + GPU	2	486	2,300	190	290	50	100	3,128
3	Active - CPU-A + NPU (Offline google_fpn_uint8)	2	486	2,100	210	300	40	90	2,928
2	Active - Lite (MCU: Active - MPU: Sleep)	1	19	450	5	4	38	35	548
1	Suspend to Memory	1	—	—	—	4	12	15	28

1.1.2. SL1640 Power Consumption Measurement Conditions & Results

Table 3. SL1640 Power Consumption Measurement Conditions

Item	Power Mode	SM	Core	CPU	Video Display/GPU (on for display)	NPU	Audio DSP/Codec	DDR	Wakeup Modes
5	Active - CPU-A + Display 4k + GPU	On	On	CPU1 On (DVFS), 2/3/4 WFI	Yes/Yes	No	Yes	Normal	—
4	Active - CPU-A + Display 4k	On	On	CPU1 On (DVFS), 2/3/4 WFI	Yes/No	No	Yes	Normal	—
3	Active - CPU-A + NPU (Offline google_fpn_ulnt8)	On	On	CPU1 On (DVFS), 2/3/4 WFI	No/No	Yes	No	Normal	—
2	Active - Lite (MCU: Active - MPU: Sleep)	On	On (clock gating)	CPU1 is in WFI, 2/3/4 CPU Off	No/No	No	No	Self-refresh	Wakeup Mode A
1	Suspend to Memory	On	Off	Off	No/No	No	No	Self-refresh	Wakeup Mode A

Table 4. SL1640 Power Consumption Measurement Results

Item	Power Mode	SM_0.8V	CPU	Core	DDR/LPDDR PHY	DDR/LPDDR Device	1.8V	3.3V	SOC_TOTAL
5	Active - CPU-A + Display 4k + GPU	2	213	1,650	230	330	50	90	2,235
4	Active - CPU-A + Display 4k	2	213	850	190	280	40	90	1,385
3	Active - CPU-A + NPU (Offline google_fpn_ulnt8)	2	213	1,510	220	320	40	80	2,065
2	Active - Lite (MCU: Active - MPU: Sleep)	1	10	450	5	4	38	35	539
1	Suspend to Memory	1	—	—	—	4	12	15	28

1.1.3. SL1620 Power Consumption Measurement Conditions & Results

Table 5. SL1620 Power Consumption Measurement Conditions

Item	Power Mode	Core	CPU	Video Display/GPU (on for display)	NPU	Audio DSP/Codec	DDR	Wakeup Modes
4	Active – CPU-A + Display 4k + GPU	On	CPU1 On (DVFS), 2/3/4 WFI	Yes/Yes	No	Yes	Normal	–
3	Active – CPU-A + Display 4k	On	CPU1 On (DVFS), 2/3/4 WFI	Yes/No	No	Yes	Normal	–
2	Active – Lite (CPU1 idle; CPU2/3/4 WFI)	On	CPU1 idle (DVFS), 2/3/4 WFI	No/No	No	No	Normal	–
1	Active – Standby	On (clock gating)	CPU1 is in WFI, 2/3/4 CPU Off	No/No	No	No	Self-refresh	Wakeup Mode A

Table 6. SL1620 Power Consumption Measurement Results

Item	Power Mode	Core	DDR/LPDDR PHY	DDR/LPDDR Device	1.8V	3.3V	SOC_TOTAL
		Power (Avg): Typ part at Tj = 30 degC (mW)					
4	Active – CPU-A + Display 4k + GPU	885	46	95	50	46	1,027
3	Active – CPU-A + Display 4k	285	35	73	50	46	416
2	Active – Lite (CPU1 idle; CPU2/3/4 WFI)	175	26	46	38	28	267
1	Active – Standby	15	5	2	9	9	38

2. References

- *SL1680 Embedded IoT Processor Datasheet* (PN: 505-001413-01)
- *SL1680 Dynamic Voltage/Frequency Scaling Application Note* (PN: 506-001369-01)
- *SL1640 Embedded IoT Processor Datasheet* (PN: 505-001415-01)
- *SL1640 Dynamic Voltage/Frequency Scaling Application Note* (PN: 506-001368-01)
- *SL1620 Embedded IoT Processor Datasheet* (PN: 505-001428-01)
- *SL1620 Dynamic Voltage/Frequency Scaling Application Note* (PN: 506-001423-01)

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3. Revision History

Revision	Description
A	Initial release.
B	Updated section 1.1 (Power Average Consumption of SL1680, SL1640 and SL1620) and 1.2 (Optimized Power Average Consumption of SL1680, SL1640 and SL1620).
C	Revised to reflect typical use case configurations for the Astra Machina Evaluation System.

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