Application Note
AM62Lx Power Estimation Tool

TEXAS INSTRUMENTS

ABSTRACT

The power estimation spreadsheet provides power consumption estimates based on measured and simulated data; the data are provided *as is* and are not verified within a specified precision. Power consumption depends on electrical parameters, silicon process variations, environmental conditions, and use cases running on the processor during operation. Actual power consumption must be verified in the real system. This tool is meant for estimating active power consumption during realistic operating modes and is not intended for power supply sizing or to model low power modes. The spreadsheet mentioned in this document can be downloaded at AM62L-PET-CALC.

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Trademarks

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1 Introduction

The input part of the spreadsheet consists of the following sections: operating performance point, processor core utilization, LVCMOS IO, peripheral, estimated power, and general. Users must modify the input fields with appropriate usage parameters that represent the specific application use case. Cells designed for user input are in blue. Fields that cannot be modified are red. Fields in green are the output calculated power. Configure the blue cells to a value most closely aligned with your intended scenario.

Note

This tool does not have the complete set of IOs possible on the AM62L. Any IO configuration must be confirmed through the AM62L pinmux tool.

Purpose of each of each section:

- Junction temperature: This section lets the user select the junction temperature (not ambient temperature) in Celsius (°C) up to 125°C.
- Process corner: Typ or Max ('Typ' is the typical power consumption of most devices. 'Max' is the worst-case possible due to silicon variation).
- Processor cores : Allows to configure the A53 frequency of operation and user estimated percentage of computational utilization for each core.
- LVCMOS IO: Subset of commonly used IO with selectable mode and percent utilization.
- Peripherals: Other peripherals with selectable mode and percent utilization.
- Estimated power: Power estimation itemized by supply group. Power supply consolidation/groups rails are aligned with EVM design.

2 Using the Power Estimation Tool

The PET *Summary* tab allow users to represent the use case by entering the frequency and utilization for all COREs as well as the configuration and utilization for peripherals and IOs. The following sections explain the process in more details.

Note

This Power Estimation Tool does not support the enable or disable of power domains or LPSC. All power domains are enabled by default. Similarly, PLLs and HSDIVs are not modifiable fields with the except of Main PLL8_HSDIV0 which is assigned to the A53s and can be modified in the PET.

2.1 Processor Cores

This section allows the user to define a valid Operating Performance Points (OPPs) for the device subsystem and core clocks.

- A53 operating frequency: supports frequencies from PLL bypass to 1250MHz (Speed grade maximum) depending on PLL and HSDIV resolution. Refer to AM62L data sheet and Clock Tree on SysConfig tool for the supported frequency steps.
- Core utilization: This section lets the user load each compute core with utilization between 0%-100% (inclusive). For guidance, 0% is an *off* or *unused* state. 1% is *idle*. 100% is maximum utilization (that is, Dhrystone).

2.2 LVCMOS IO

This section allows the user to select both Mode and Utilization of a subset of commonly used IO's on the AM62L, including UART, SPI, OSPI, GPMC, McASP among others.

- Mode: IO dependent mode and operating speed.
- Utilization (%): Specifies the utilization as a percentage of activity relative to a full load condition.

2.3 Peripherals

This section allows the user to select both Mode and Utilization for peripherals. The "Mode" refers to the peripheral dependent operating mode. Utilization (%) specifies the utilization as a percentage of activity relative to a full load condition.

- Memory Subsystem
  - DDR field: allows to select the memory type between LPDDR4 and DDR4, data rate and data bus. Naming conversion for drop-down menu: MemoryType_DataRate_DataBus. For example, "ddr4_1600_16" is equivalent to DDR4 memory with 1600MT/s and 16-bit data bus. "Sleep" represents the DDR in self-refresh.
  - DDR WR%: In this field users can specify the percentage of DDR write from the total DDR utilization. The default is set to 50%. For example, if the DDR utilization is set to 30% and the DDR_WR is 50%, that results in 15% write, 15% read and 70% Idle.
- High speed interfaces
  - USB: this field allows to select the USB2 operational mode (device or host) along with the speed (high-speed, full-speed, low-speed). The configuration list includes power saving options like idle, sleep and power-down. For example, *power-down* can be selected when the USB is disabled (not used by the application) and supplies are OFF. *Sleep* is used to reduce power consumption when USB is not actively used but must stay enabled to allow for wake-up events.
- Multimedia
  - Display subsystem : This field allows to select the display interface between DSI and DPI. Please note AM62L only supports single display support. For example: if DSI is used, DPI mode must be set to "unused" and utilization to 0%. The naming conversion for the DSI options is as follow: "2p5g4l" means 2.5Gbps data rate with 4 lanes. The naming conversion for DPI is as follow: "SVGA_|_800x600x60_fps_24b_|_3p3V" means 800x600 pixels, 60 frames per second, 24 bit per pixel and 3.3V IO.
- Media and data storage

– MMC, SD: This field allows to select the data transfer clocking method between SDR and DDR, along with the corresponding data rate in MBps. For example, "sdr_50mbs" refers to Single Data Rate, 50MBps.

2.4 Estimated Power Consumption

The power estimation tool generates a power analysis report in this section based on the selected junction temperature and process corner. The report lists voltage in Volts (V) and power consumption in milliwatts (mW) for each power supply groups. Power supply consolidation matches Table 2-1.

Note
The VDDS_LPDDR4 estimated power is from AM62L SOC only, on the EVM this rail includes both SOC and external DDR device power.

Table 2-1. Power Supply Consolidation

PET Supply Group	Voltage (V)	AM62L Supply Pin
VDD_CORE	0.75	VDD_CORE
		VDDA_DDR_PLL0
		VDDA_CORE_USB
		VDDA_CORE_DSI_CLK
		VDDA_CORE_DSI
		VDD_RTC
VDDS_DDR	1.1	VDDS_DDR
VDDA_1V8	1.8	VDDA_PLL0
		VDDA_PLL1
		VDDA_1P8_DSI
		VDDA_1P8_USB
		VDDA_ADC
		VDDS_OSC0
SOC_DVDD1V8	1.8	VDDS0
		VDDS1
		VDDS_WKUP
		VDDSHVx when operating at 1.8V
		VDDS_RTC
SOC_DVDD3V3	3.3	VDDA_3P3_SDIO
		VDDA_3P3_USB
		VDDSHVx when operating at 3.3V

3 Example Use Case

This section shows an example to help users validate the AM62L power estimation tool before entering a specific use case. This example represents a generic HMI use case that uses the parallel display (DSS-DPI), 2xA53 (approximately 80% utilization, 1250MHz) and CPSW at **strong process corner**, nominal voltage and **high temperature**. If the calculated power differs from the numbers shown in Figure 3-1, then TI recommends to check the Excel *system separators* under advanced settings. For proper operation, this spreadsheet uses "." as the decimal separator and "," as the thousands separator.
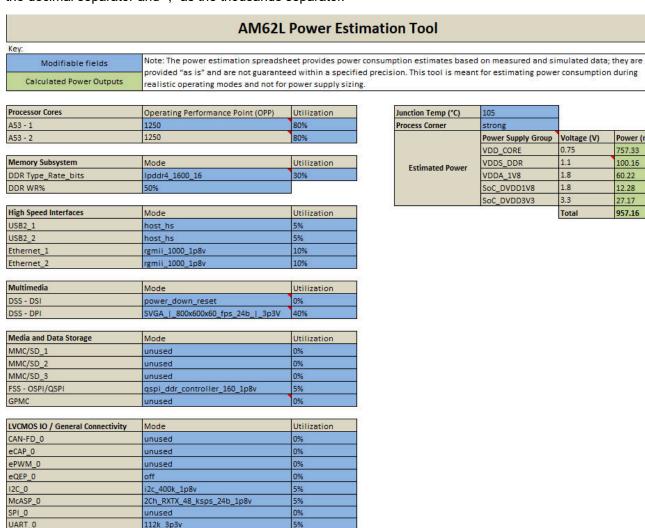
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Key:

	Note: The power estimation spreadsheet provides power consumption estimates based on measured and simulated data; they are provided "as is" and are not guaranteed within a specified precision. This tool is meant for estimating power consumption during realistic operating modes and not for power supply sizing.
Modifiable fields	
Calculated Power Outputs	

Processor Cores	Operating Performance Point (OPP)	Utilization
A53 - 1	1250	80%
A53 - 2	1250	80%

Memory Subsystem	Mode	Utilization
DDR Type_Rate_bits	lpddr4_1600_16	30%
DDR WR%	50%	

High Speed Interfaces	Mode	Utilization
USB2_1	host_hs	5%
USB2_2	host_hs	5%
Ethernet_1	rgmii_1000_1p8v	10%
Ethernet_2	rgmii_1000_1p8v	10%

Multimedia	Mode	Utilization
DSS - DSI	power_down_reset	0%
DSS - DPI	SVGA_|_800x600x60_fps_24b_|_3p3V	40%

Media and Data Storage	Mode	Utilization
MMC/SD_1	unused	0%
MMC/SD_2	unused	0%
MMC/SD_3	unused	0%
FSS - OSPI/QSPI	qspi_ddr_controller_160_1p8v	5%
GPMC	unused	0%

LVCMOS IO / General Connectivity	Mode	Utilization
CAN-FD_0	unused	0%
eCAP_0	unused	0%
ePWM_0	unused	0%
eQEP_0	off	0%
I2C_0	i2c_400k_1p8v	5%
McASP_0	2Ch_RXTX_48_ksps_24b_1p8v	5%
SPI_0	unused	0%
UART_0	112k_3p3v	5%

Junction Temp (°C)	105		
Process Corner	strong		
Estimated Power	Power Supply Group	Voltage (V)	Power (mW)
	VDD_CORE	0.75	757.33
	VDDS_DDR	1.1	100.16
	VDDA_1V8	1.8	60.22
	SoC_DVDD1V8	1.8	12.28
	SoC_DVDD3V3	3.3	27.17
		Total	957.16

Figure 3-1. AM62L PET Front Page

4 Summary

The AM62L Power Estimation Tool allows to estimate the power consumption of the processor in active state. The total power is also itemized by the main SoC supplies: VDD_CORE, VDDR_CORE, VDDA_1V8, VDDS_DDR, SOC_DVDD1V8 and SOC_DVDD3V3. The results are provided as is and are not verified within a specified precision. For any technical questions or feedback, please use the Processors forum on E2E.

5 References

- Texas Instruments, AM62Lx Sitara™ Processors, data sheet.
- Texas Instruments, AM62L Sitara™ Processors, technical reference manual
- Texas Instruments, AM62Lx Power Supply Implementation, application note
- Texas Instruments, AM62L Power Consumption Summary, application note

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