

User's Guide

AM62x SK EVM User's Guide



ABSTRACT

This technical User's Guide describes the hardware architecture of the AM62x SKEVM, a low cost Starter Kit built around the AM62x SoC. The AM62x processor comprises of a Quad-Core 64-bit Arm®-Cortex® A53 microprocessor, Single-core Arm Cortex-R5F MCU and an Arm Cortex-M4F MCU.

The SKEVM allows the user to experience great dual display feature through HDMI (over DPI) and LVDS, as well as industrial communication solutions using serial, Ethernet, USB and other interfaces.

The SKEVM can be used for your display application(for example a HMI or control panel) with either a HDMI display or an external LVDS panel, up to 2K resolution. It's high performance (up to) Quad-A53 ARM cores at 1.4GHz, with rich industrial interfaces, offer control and communication capabilities for a wide ranges of applications, such as PLC, automation control and monitor/supervisor systems. In addition, SKEVM can communicate with other processors or systems, and act as a communication gateway. The embedded emulation logic allows for emulation and debugging using standard development tools such as Code Composer Studio™ from TI.

Note

This evaluation board is a pre-production release and has several known issues that should not be copied into a production system. E1 EVM Shown in product photos.



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1 EVM Revisions and Assembly Variants

The various AM62x SK EVM PCB design revisions, and assembly variants are listed in the table below. Specific PCB revision is indicated in silkscreen on the PCB. Specific assembly variant is indicated with additional sticker label.

Table 1-1. SK EVM PCB design revisions, and assembly variants

OPN	PCB Revision	Assembly Variant	Revision and Assembly Variant Description
SK-AM62	PROC114E1	N/A (single variant produced)	First prototype, early release revision of the AM62x SK EVM. Implements the Sitara™ AM62x MPU with a discrete power solution
SK-AM62	PROC114E2	N/A	Second prototype, early release revision of the AM62x SK EVM. Implements a number of changes and bug fixes focused on enabling 24 bit RGB output via HDMI.
SK-AM62	PROC114E3	N/A	Third prototype, early release revision of the AM62x SK EVM. Implements a number of changes around LVDS and multimedia peripherals.
SK-AM62B	PROC114A	002	Production release of AM62x SK EVM discrete version. Implements HS-FS version of SoC.
SK-AM62-P1	PROC142E1	N/A	First prototype, early release version of the AM62x SK EVM. Implementing the TPS65219 PMIC.
SK-AM62B-P1	PROC142A	002	Production release of AM62x SK EVM PMIC version. Implements HS-FS version of SoC.

2 System Description

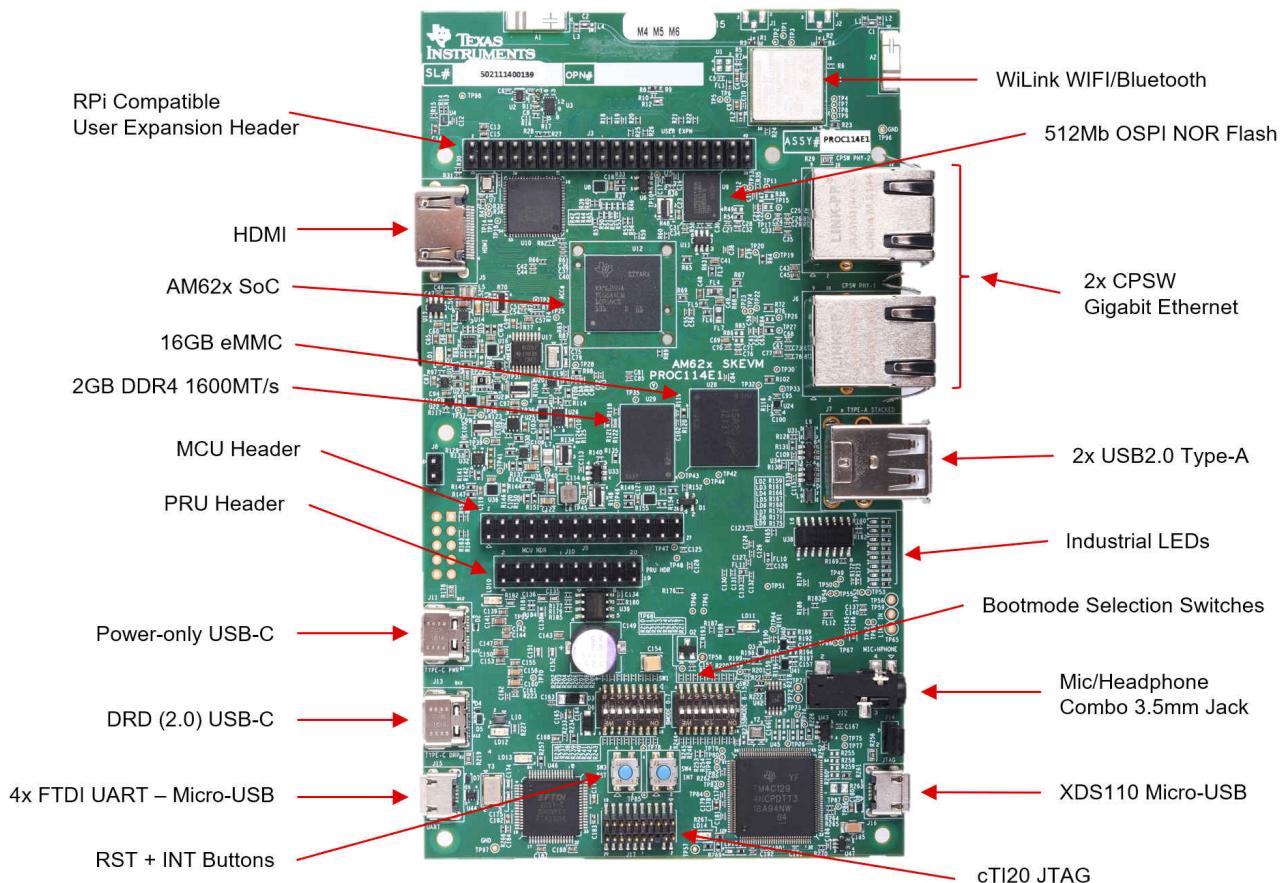


Figure 2-1. SK-AM62 Top View

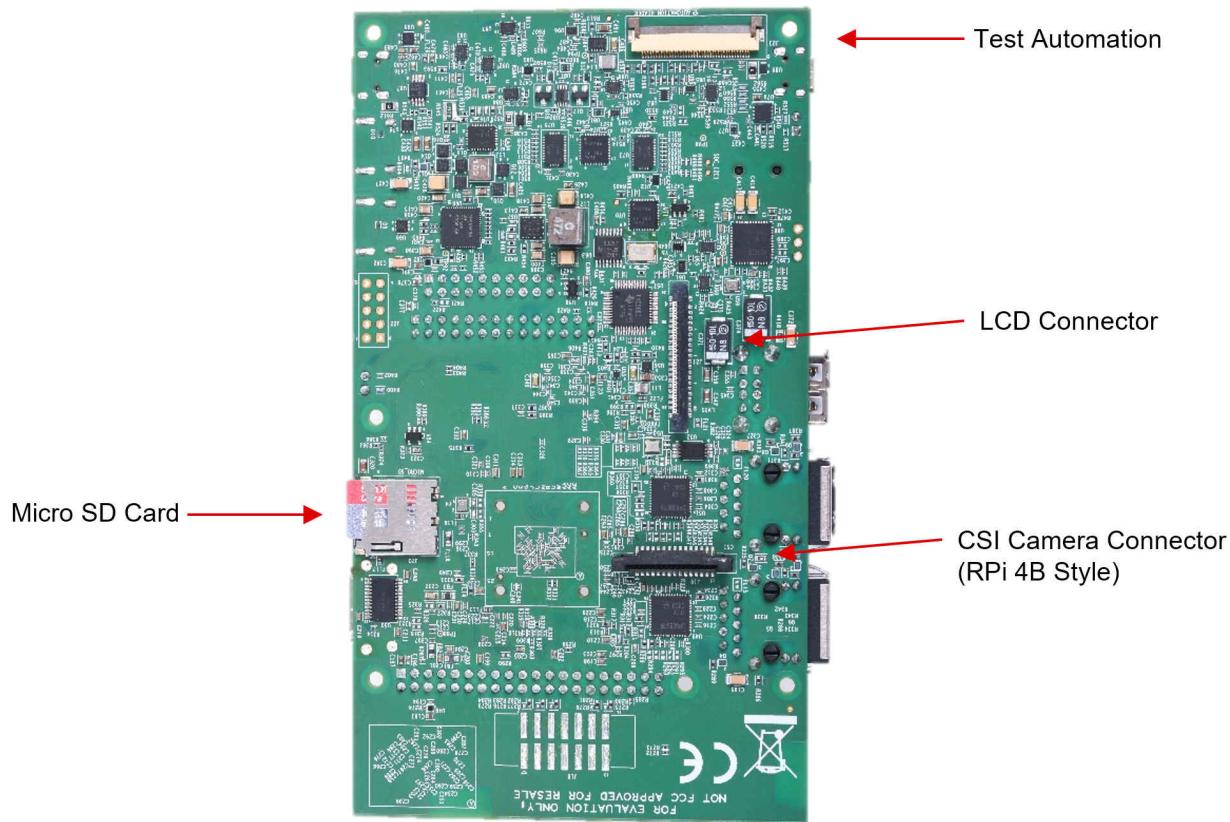


Figure 2-2. SK-AM62 Back View

2.1 Key Features

The AM62x SKEVM is a high performance, standalone development platform that enables users to evaluate and develop industrial applications for the Texas Instrument's AM62x System-on-Chip (SoC).

The following sections discuss the SKEVM's key features.

2.1.1 Thermal Compliance

There is elevated heat on the processor, use caution particularly at elevated ambient temperatures! Although the processor is not a burn hazard, caution should be used when handling the EVM due to increased heat in the area of the SoC.

	Caution	Caution Hot surface. Contact may cause burns. Do not touch!
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2.1.2 Processor

- AM62x SoC, 13 mm x 13 mm, 0.5 mm pitch, 423-pin VCA FBGA

2.1.3 Power Supply

- Two USB Type-C ports (5V-15V input range)
- Optimized Power Solution with Discrete Regulators and LDOs for the Processor and Peripherals

2.1.4 Memory

- 2GB DDR4 supporting data rate up to 1600MT/s.
- Micro SD Card slot with UHS-1 support

- 512Mbit Octal SPI Flash memory
- 512 Kbit Inter-Integrated Circuit (I2C) board ID EEPROM
- 16GB eMMC Flash

2.1.5 JTAG/Emulator

- XDS110 On-Board Emulator
- Supports 20-pin JTAG connection from external emulator

2.1.6 Supported Interfaces and Peripherals

- 1x USB2.0 Type C Interface, support DFP and UFP roles
- 1x USB2.0 Host Interface, Type A
- 1x HDMI Interface
- Audio Line in and Mic + Headphone out
- Wilink WL1837 Module with support for Wi-Fi and Bluetooth
- 2x Gigabit Ethernet ports supporting 10/100/1000 Mbps data rate on two RJ45 connectors.
- Quad port UART to USB circuit over microB USB connector
- Industrial Ethernet LEDs
- INA devices for current monitoring
- 2x Temperature Sensors near SoC and DDR4 for thermal monitoring

2.1.7 Expansion Connectors/Headers to Support Application Specific Add-On Boards

- CSI Camera Header
- LVDS Display connector
- User Expansion connector
- PRU Header
- MCU Header

2.2 Functional Block Diagram (SK-AM62 and SK-AM62B)

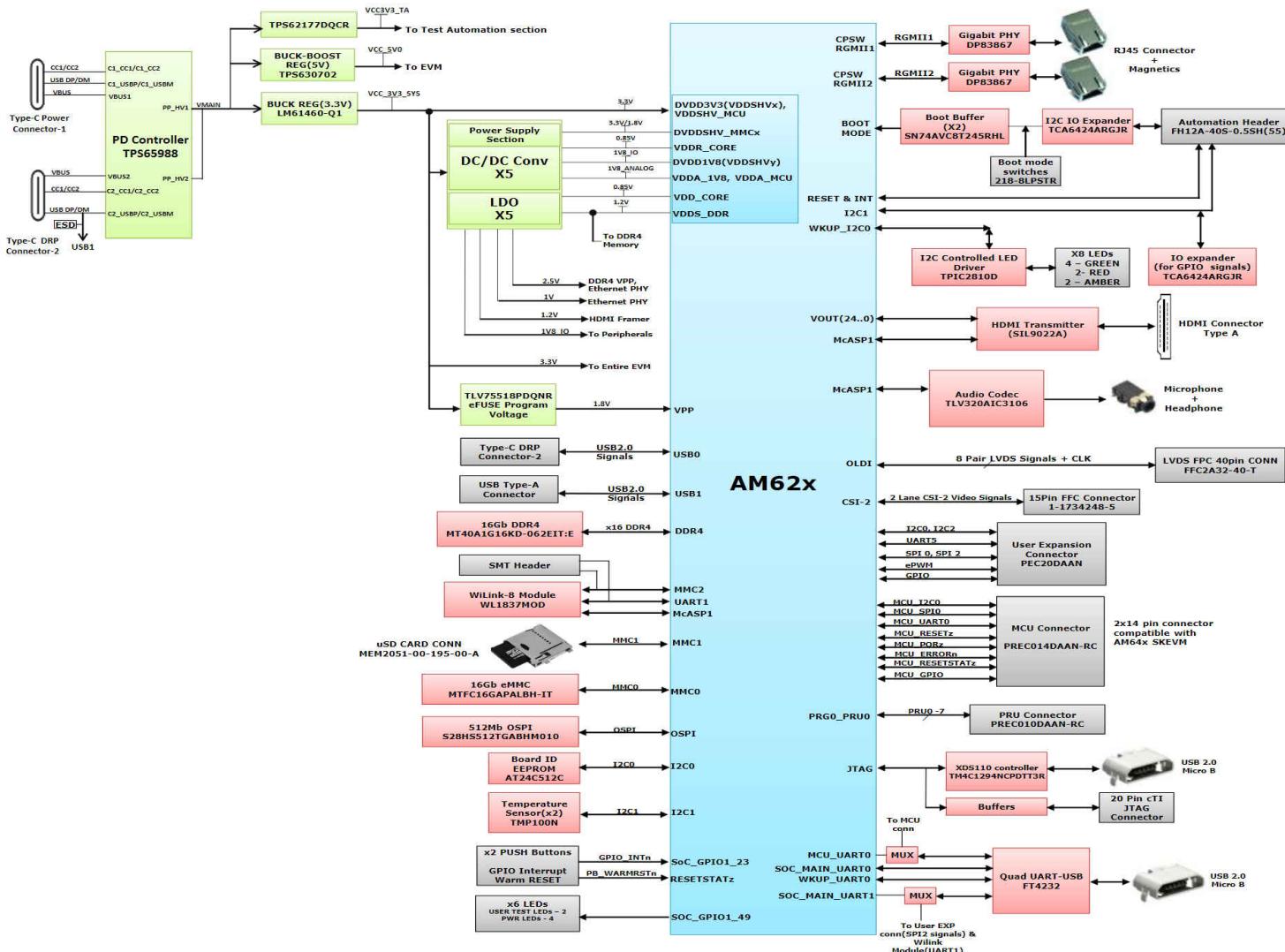


Figure 2-3. Functional Block Diagram of the SK-AM62 Board

System Description

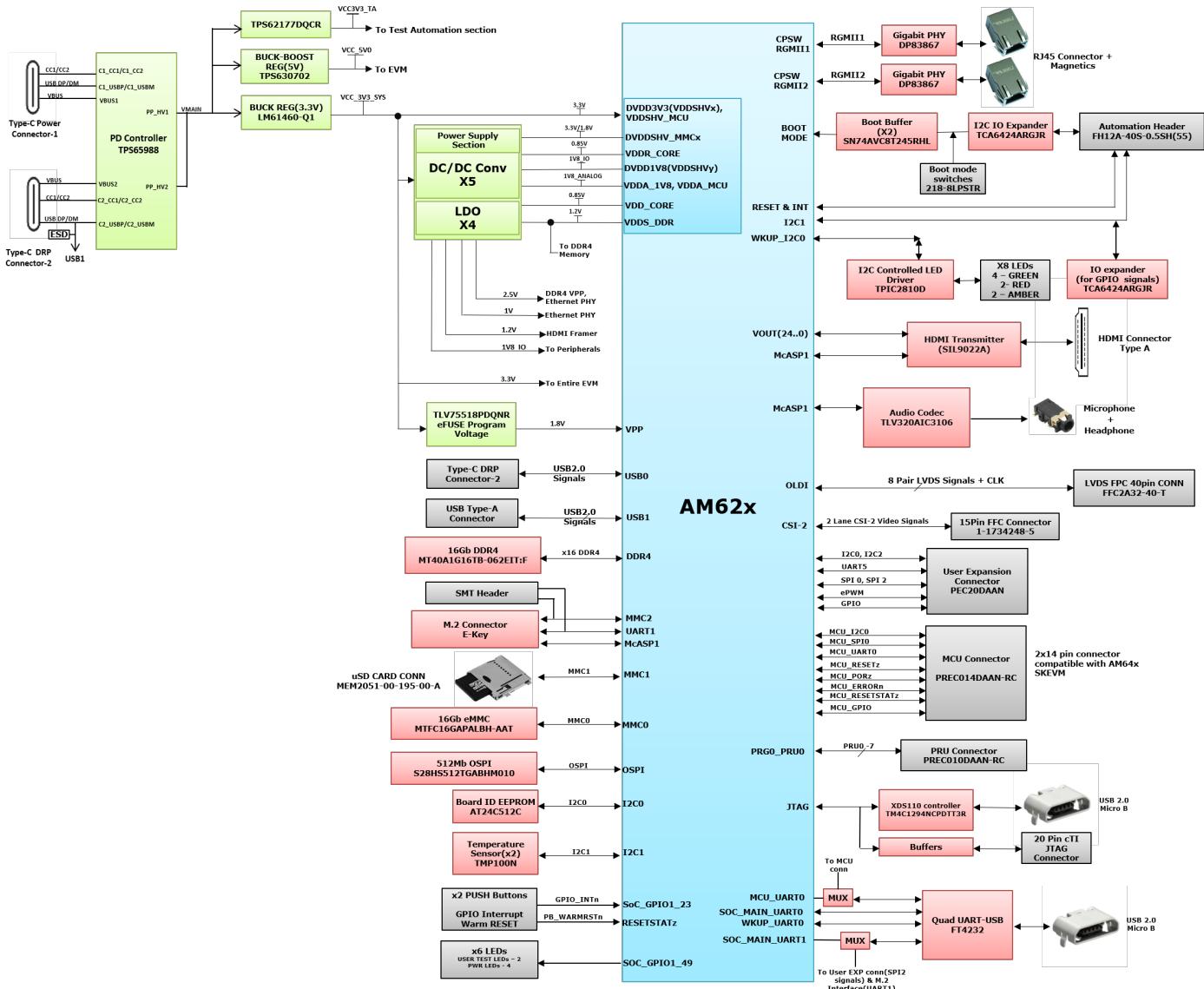


Figure 2-4. Functional Block Diagram of the SK-AM62B Board

2.3 Functional Block Diagram (SK-AM62-P1 and SK-AM62B-P1)

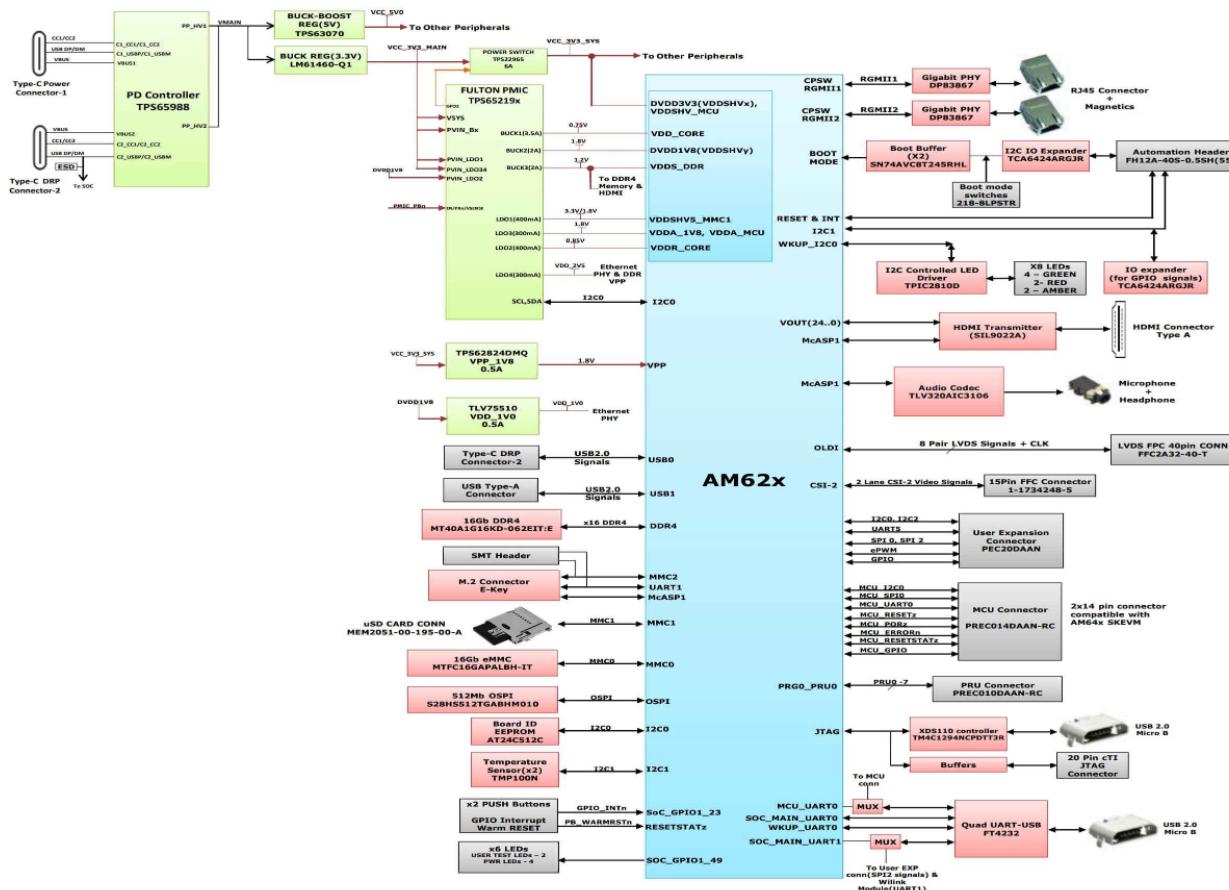


Figure 2-5. Functional Block Diagram of the SK-AM62-P1 Board with TPS65219 PMIC

System Description

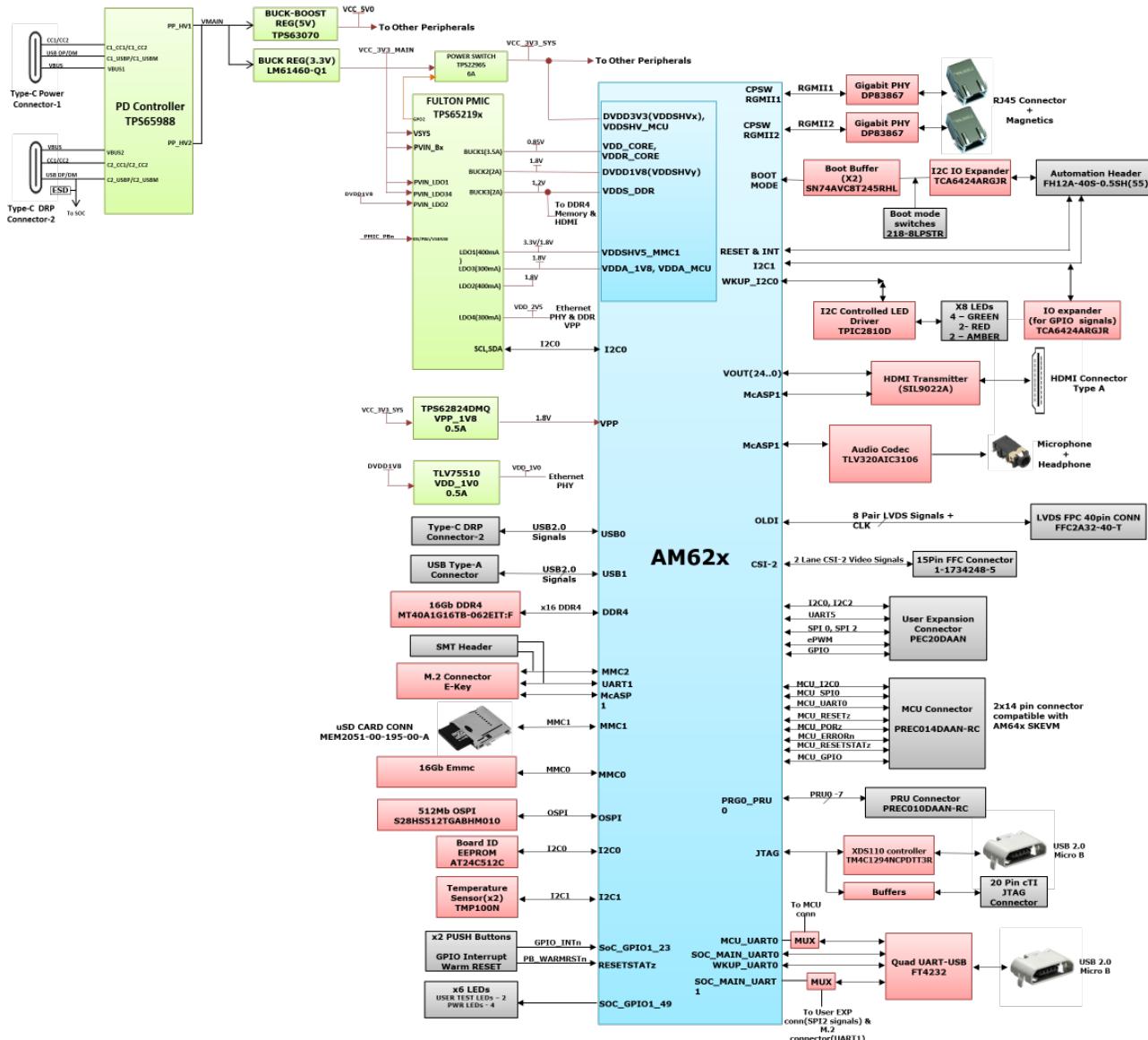


Figure 2-6. Functional Block Diagram of the SK-AM62B-P1 Board with TPS65219 PMIC

2.4 AM62x SKEVM Interface Mapping

[Table 2-1](#) is provided below.

Table 2-1. Interface Mapping

Interface Name	Port on SoC	Device Part Number
Memory – DDR4	DDR0	MT40A1G16KD-062E:E
Memory – OSPI	OSPI0	S28HS512TGABHM010
Memory – Micro SD Socket	MMC1	MEM2051-00-195-00-A
Memory – eMMC	MMC0	MTFC16GAPALBH-IT
Memory – Board ID EEPROM	SoC_I2C0	AT24C512C-MAHM-T
Ethernet 1 – RGMII	SoC_RGMII1	DP83867IRRGZ
Ethernet 2 – RGMII	SoC_RGMII2	DP83867IRRGZ
LED Driver – 8 Communication LEDs	WKUP_I2C0	TPIC2810D
PRU Header – 2x10 HDR	PR0_PRU0_GPO and SoC_I2C0	PREC010DAAN-RC
User Expansion Connector – 2x20 HDR	SPI0, SPI2, UART5, SoC_I2C0, SoC_I2C2 and GPIOs	PEC20DAAN
MCU Header – 2x14 HDR	MCU_UART0, MCU_MCAN0, MCU_SPI0, MCU_I2C0 and MCU GPIOs	PREC014DAAN-RC
USB – 2.0 Type C	USB0	TUSB4020BIPHP + AU-Y1008-2
USB – 2.0 Type A	USB1	-
LVDS Display Connector	OLDI0	FFC2A32-40-T
CSI Interface	CSI0	1-1734248-5
HDMI	VOUT0	Sil9022ACNU + TPD12S016PWR + 10029449-001RLF
Audio Codec	McASP2 and SoC_I2C1	TLV320AIC3106IRGZT + SJ-43514-SMT
GPIO Port Expander	SoC_I2C1	TCA6424ARGJR
UART Terminal (UART-to-USB)	SoC_UART [1:0], WKUP_UART0 and MCU_UART0	FT4232HL + 629105150521
Test Automation Header	SoC_I2C1	FH12A-40S-0.5SH
Temperature Sensors	SoC_I2C1	TMP100NA/3K
Current Monitors	SoC_I2C1	INA231AIYFDR
Connectivity – Wilink Module	MMC2, McASP2 and SoC_UART2	WL1837MODGIMOC

2.5 Power ON/OFF Procedures

Power to the EVM is provided through an external power supply providing PD voltage and current to the either of the two USB Type-C Ports.

2.5.1 Power-On Procedure

1. Place the SKEVM boot switch selectors (SW1, SW2) into selected boot mode. Example boot-modes for SD card and no-boot are shown below.
2. Connect your boot media (if applicable).
3. Attach the PD capable USB Type-C cable to the SKEVM Type-C (J11 or J13) Connector.
4. Connect the other end of the Type-C cable to the source, either AC Power Adapter, or Type C source device (such as a Laptop computer).
5. Visually inspect that either LD10 or LD12 LED are illuminated.
6. XDS110 JTAG and UART debug console output are routed to micro-USB ports J16 and J15, respectively.

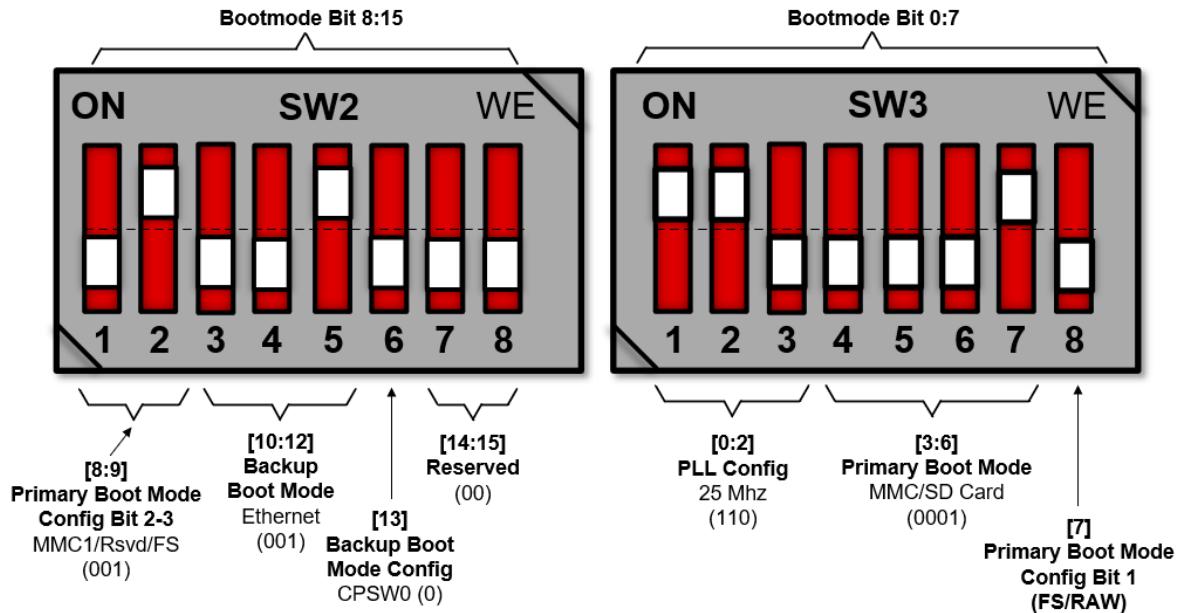
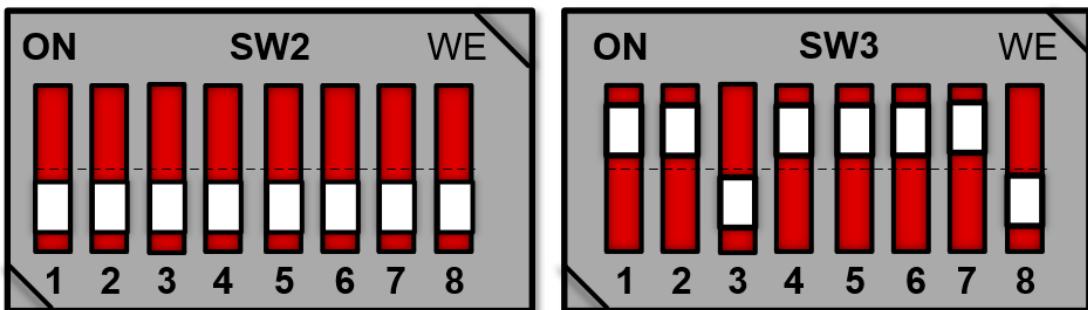
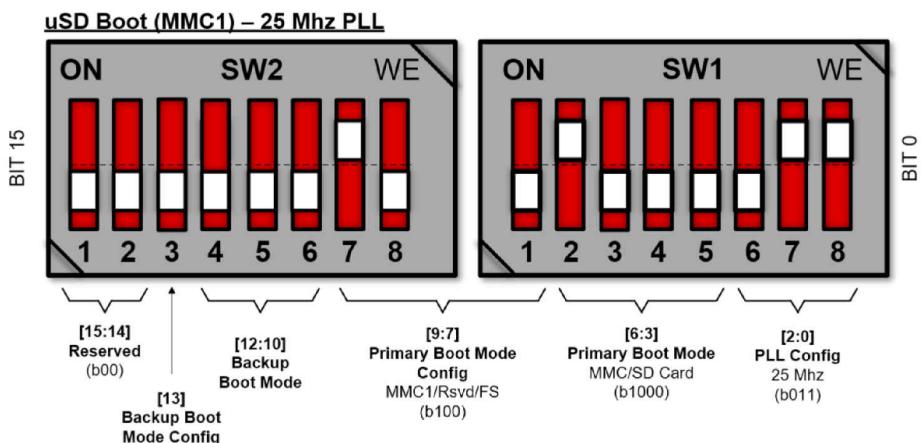
uSD Boot (MMC1) – 25 Mhz PLL – Ethernet (CPSW0) Backup – From Rev E2

No Boot – 25 Mhz PLL – From Rev E2


Figure 2-7. SD Bootmode Switch Setting Example (From E2)



Note: Actual Board Silkscreen May Appear Inverted in this Orientation. Follow Physical Switch Text

Figure 2-8. SD Bootmode Switch Setting Example (E1)

2.5.2 Power-Off Procedure

1. Disconnect AC power from AC/DC converter.
2. Remove the USB Type-C cable from the SKEVM.

2.5.3 Power Test Points

Test points for each power output on the board is mentioned in [Table 2-2](#).

Table 2-2. Power Test Points

SI #	Power Supply	Test Point	Voltage
1	VBUS_TYPEC1	C398.1	5V-15V
2	VBUS_TYPEC2	C415	5V-15V
3	VMAIN	TP95	5V-15V
4	VCC_5V0	TP70	5V
5	VCC_3V3_SYS	TP51	3.3V
6	VDD_2V5	TP42	2.5V
7	VPP_1V8	TP31	1.8V
8	VDD_1V0	TP33	1.0V
9	VDD_1V1	TP44	1.1V
10	VDD_1V2	TP10	1.2V
11	VDDA1V8	TP36	1.8V
12	VCC_1V8	TP41	1.8V
13	VDDSHV_SDIO	TP29	1.8V/3.3V
14	VCC1V2_DDR	TP40	1.2V
15	VCC_CORE	TP45	0.85V
16	VDD_CORE	TP46	0.85V
17	VCC_0V85	TP39	0.85V
18	VDDR_CORE	TP38	0.85V
19	DDR_VREFCA	TP43	0.6V
20	VCC3V3_TA	TP87	3.3V
21	VCC3V3_XDS	TP77	3.3V
22	VCC_3V3_FT4232	C482.1	3.3V

2.6 Peripheral and Major Component Description

The following sections provide an overview of the different interfaces and circuits on the AM62x SK EVM.

2.6.1 Clocking

[Figure 2-9](#) shows the clock architecture of AM62x SKEVM.

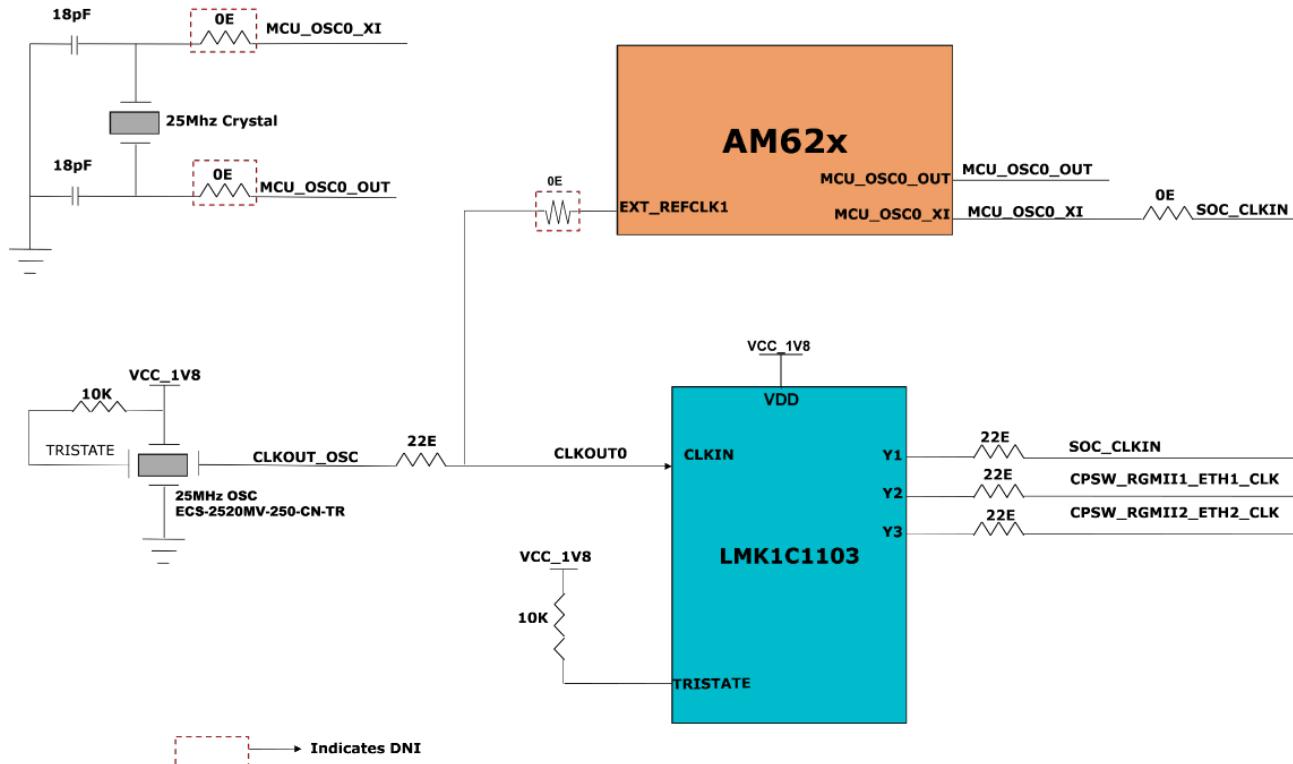


Figure 2-9. Clock Architecture of AM62x SKEVM

A clock generator of part number LMK1C1103PWR is used to drive the 25 MHz clock to the SoC and two Ethernet PHYs. LMK1C1103PWR is a 1:4 LVCMSO clock buffer, which takes the 25 MHz crystal/LVCMSO reference input and provides three 25 MHz LVCMSO clock outputs. The source for the clock buffer shall be either the CLKOUT0 pin from the SoC or a 25 MHz oscillator, the selection is made using a set of resistors. By default, an oscillator is used as input to the clock buffer on the AM62x SKEVM. Output Y2 and Y3 of the clock buffer are used as reference clock inputs] for two Gigabit Ethernet PHYs.

There is one external crystal attached to the AM62x SoC to provide clock to the WKUP domain of the SoC (32.768 KHz).

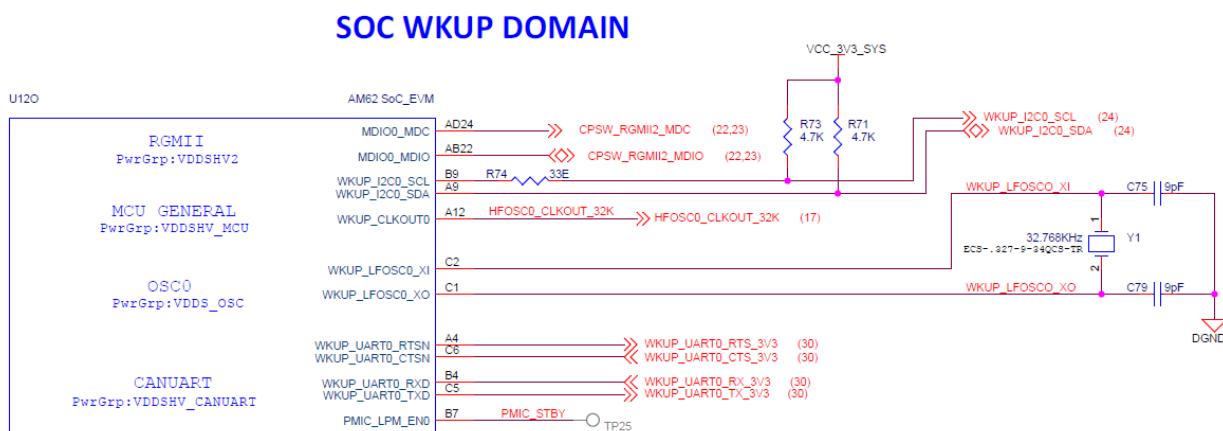


Figure 2-10. SoC WKUP Domain

2.6.1.1 Peripheral Ref Clock

Clock inputs required for peripherals such as XDS110, USB HUB, FT4232, HDMI Transmitter and Audio Codec are generated locally using separate crystals or oscillators. Crystals or Oscillators used to provide the reference clocks to the EVM peripherals are shown in the table below.

Table 2-3. Clock Table

Peripheral	Mfr. Part No.	Description	Frequency
XDS110 emulator	ECS-327-9-34QCS-TR	CRY 32.768 KHz 9pF SMD	32.768 KHz
FT4232 Bridge	ECS-120-18-30B-AGN-TR	CRY 12.000 MHz 18pF SMD	12.000 MHz
Audio Codec	KC2520Z12.2880C1KX00	OSC 12.288 MHz CMOS SMD	12.288 MHz
USB HUB (E1 Only)	ECS-240-20-30B-AGL-TR	CRY 24.000 MHz 20pF SMD	24.000 MHz
HDMI Transmitter	KC2520Z12.2880C1KX00	OSC 12.288 MHz CMOS SMD	12.288 MHz

The clock required by the HDMI Transmitter can be provided by either the on board oscillator or the SoC's AUDIO_EXT_REFCLK1, which can be selected through a resistor mux. SoC's EXT_REFCLK1 is used to provide clock to the User Expansion Connector on the SKEVM. The 32 KHz clock to the Wilink module is provided by WKUP_CLKOUT0 of AM62x SoC through a voltage translational buffer.

2.6.2 Reset

The Reset Architecture of AM62x SKEVM is shown below.

The SoC has the following resets:

- RESETSTATz is the Main domain warm reset status output
- PORz_OUT is the Main domain power ON reset status output
- RESET_REQz is the Main domain warm reset input
- MCU_PORz is the MCU domain power ON/ Cold Reset input
- MCU_RESETz is the MCU domain warm reset input
- MCU_RESETSTATz is the MCU domain warm reset status output

Upon Power on Reset, all peripheral devices connected to the main domain get reset by RESETSTATz.