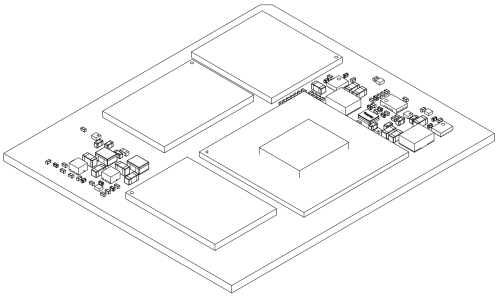
Grinn AstraSOM-1680 Datasheet



1 Features

- LGA196 package
- Simple design of the end device
- Quad-core Arm® Cortex® -A73 processor with Security Extensions
- Each core with up to 2.1 GHz and dedicated ARM NEON™ and VFPU
- ARM TrustZone®
- 16GB eMMC memory
- 2x 2GB LPDDR4x RAM
- Dedicated NPU for localized neural network (NN)/ML applications (up to 7.9+ TOPS)
- Support for multiple DNN frameworks: TensorFlow Lite™ Android™ NNAPI, and SyNAP™
- AV1 Main Profile (8- or 10-bit, YUV 4:2:0) 2160p60
- H.265 main 8-bit and 10-bit (ITU-R BT.2020)
- VP9 Profiles 0 and 2 (8- or 10-bit, YUV 4:2:2)
- H.264 Baseline, Main and High Profiles; MVC (Multiview Video Coding)
- MPEG-2 Simple and Main Profiles
- VP8
- Flexible support for PIP (2160p60/2160p60) and Multi-View (1 x 2160p60 and 3 x 1080p60)
- Support for single-stream 2160p H.265/VP9 decode that can reach up to 90-100 fps
- Support for up to 1080p120 single-stream decode
- Still Picture - H.264, MPEG2 I picture decode
- Support for up to two streams encoding: 1080p60: H.264 or VP8 (per stream)
- Support for simultaneous 2160p60 decode and 1080p60 transcode
- Two independent display output paths
- Integrated ISP
- HDMI Rx and Tx
- MIPI DSI® v1.2 output
- MIPI CSI-2 input with dual camera support
- Audio decoding/processing, including far-field voice (FFV) and keyword detection
- GPU: Imagination™ PowerVR™ Series9XE GE9920
- Video/graphics display pipeline supporting dual display with QDEO™
- 1xUSB2.0 1xUSB3.0 1xPCIE 2xSPI 3xUART 4xI2C 2xADC 3xI2S 2xSTS 1xSPDIF
- Up to 73 GPIOs

2 Applications

- Multi-Camera Object Detection
- Natural Language Processing
- Medical Imaging and Analysis
- Autonomous Mobile Robots (AMRs)

3 Description

End-to-end solution based on the high-performance multimedia SoC Synaptics SL1680 which combines a quad-core Arm® Cortex®-A73 processor with a neural processing unit (NPU). Engineered for robust edge AI processing in smart display IoT applications. Seamless integration of video, smart speaker, and local touch display. The SoC benefits from integration with the SyNAP toolkit, enabling swift development and refinement of secure machine learning (ML) and AI applications tailored for video, vision, and audio domains. Additionally, integrated MIPI CSI-2 and ISP functionality furnish camera inputs for edge-based vision inference, minimizing the need for external components.

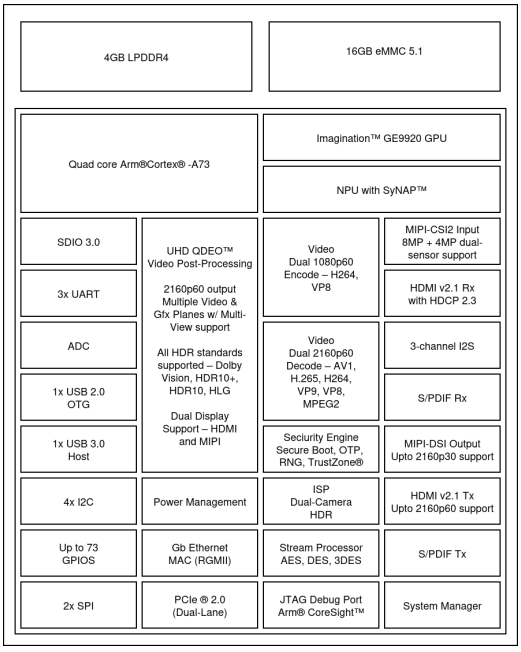


Figure 1: Functional block diagram

Contents

4 Boot options

Grinn AstraSOM-1680 can be booted from:

- SPI
- eMMC Memory
- USB drive

Boot devices are selected via physical pins configuration. `software_strap[0]` and `boot_src[0...1]` states are read after power-on and determine the boot flow. Pull-up or pull-down resistors should be used to drive these inputs to the appropriate state.

SOM Pad	CPU Pin	CPU Pin Name	Primary CPU Pin Name	Default state startup
B9	BK59	boot_src[1]	SPDIFO	1b
B13	BP61	boot_src[0]	I2S2_MCLK	0b
AJ11	K61	software_strap[0]	SPI1_SDO	1b

4.1 System Boot Mode Selectors

software_strap[0]	boot_src[1:0]	Description
0b	-	Boot from USB
1b	00b	ROM boot from SPI
1b	01b	Reserved
1b	10b	ROM boot from EMMC
1b	11b	Direct boot from SPI (Reserved for factory use only)

4.2 System Software Strap

Pins `software_strap[1..3]` are used by software to recognize the hardware version of the board. The default value for these pins is 011b. Changing these settings is possible using external pull-up or pull-down resistors, but this is not recommended.

5 Functional Description

5.1 Main Components

5.1.1 Hardware Resources

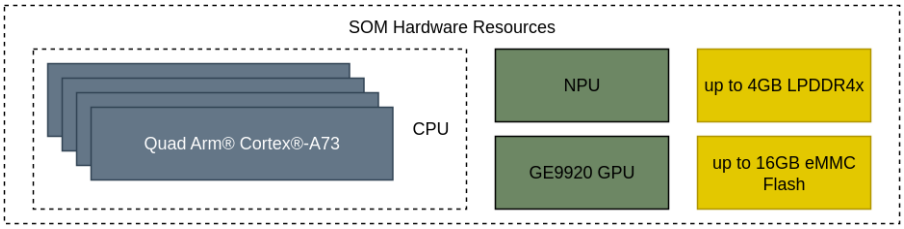


Figure 2: Grinn AstraSOM-1680 interfaces overview

Grinn AstraSOM-1680 is based on VideoSmart™ SL1680 high-performance multimedia SoC. Powered by Arm Cortex®-A73 and a dedicated NPU. The SoC is accompanied by SyNAP™ toolkit which enables customers to build optimized ML/AI applications for video vision and audio AI. SL1680 is designed for application with audio and video processing with the help of neural networks. Grinn AstraSOM-1680 can be equipped with up to 4GB LPDDR4x RAM and up to 16GB eMMC Flash memory.

5.2 Padmap

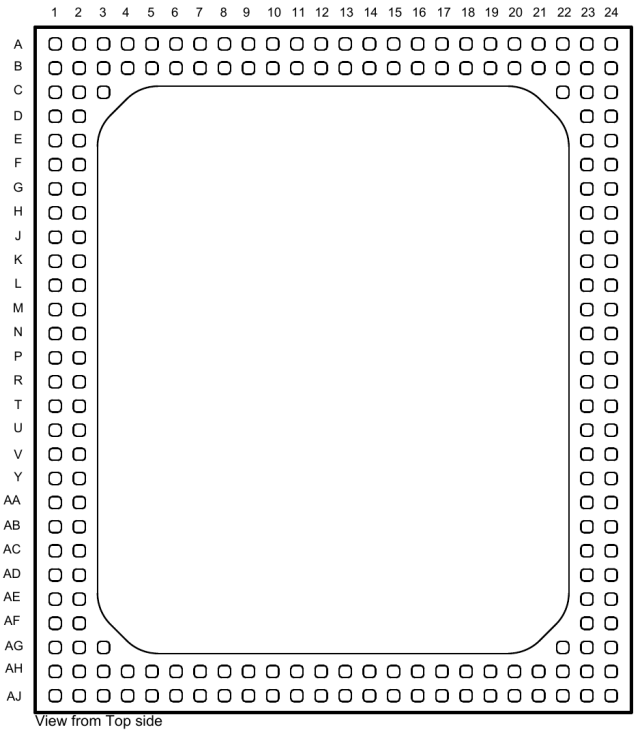


Figure 3: Grinn AstraSOM-1680 pads (top view)

5.3 Pad Description

Table 1: SOM pinout

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
A1	AW51	SM_URT0_RXD	SM_URT0_RXD/SM_GPIO18	I/O	-	1.8V	-
A2	AW55	SM_URT0_TXD	SM_URT0_TXD/SM_GPIO19/SM_STRP0	Output	-	1.8V	-
A3	BF60	I2S1_DO1	GPIO17/I2S1_DO1/STS2_CLK/AVIO_DBG5	I/O	-	1.8V	-
A4	BG55	I2S1_LRCK	GPIO21/I2S1_LRCK/PWM0/ARC_TEST_OUT/AVIO_DBG0	I/O	-	1.8V	-
A5	BH60	I2S1_BCLK	GPIO20/I2S1_BCLK/PWM1/AVIO_DBG1	I/O	-	1.8V	-
A6	BH61	I2S1_DO2	GPIO16/I2S1_DO2/PWM2/STS2_SD/PDMB_DI2/AVIO_DBG6	I/O	-	1.8V	-
A7	AC47	TW0_SCL	GPIO47/TW0_SCL/PHY_DBG10	I/O	-	1.8V	-
A8	BC55	SM_ADCI0		Input	-	1.8V	-
A9	BL59	SPDIFI	GPIO4/SPDIFI/PDMC_DI	I/O	-	1.8V	-
A10	BM60	I2S2_LRCK	GPIO13/I2S2_LRCK	I/O	-	1.8V	-
A11	BT61	I2S2_DI2	GPIO9/I2S2_DI2/PDMA_DI1/STS4_CLK	I/O	-	1.8V	-
A12	BT60	I2S2_DI3	GPIO8/I2S2_DI3/PDMA_DI0/STS4_SD	I/O	-	1.8V	-
A13	BT59	I2S2_DI0	GPIO11/I2S2_DI0/PDMA_DI3	I/O	-	1.8V	-
A14	AL49	SM_POR_EN		Input	-	1.8V	-
A15	BV59	I2S3_LRCK	GPIO3/I2S3_LRCK/STS3_CLK	I/O	-	1.8V	-
A16	CA59	I2S3_DI	GPIO0/I2S3_DI/STS3_VALD	I/O	-	1.8V	-
A17	BJ43	HDMI_TX_HPD		Input	-	-	-
A18	BL49	HDMI_TX_EDDC_SCL	HDMI_TX_EDDC_SCL/GPIO6	I/O	-	1.8V	-
A19	BY56	HDMI_TX_HEACp		Input	96.14	-	-
A20	BY52	HDMI_TX_D2p		Output	124.79	-	-
A21	-	GND		Power	-	-	-
A22	BY51	HDMI_TX_D1p		Output	98.4	-	-
A23	BY48	HDMI_TX_D0p		Output	105.21	-	-
A24	BW46	HDMI_TX_CKp		Output	116.24	-	-
AA1	AC53	RGMII_RXD0	RGMII_RXD0/GPIO35	I/O	274	1.8V	-
AA2	AC51	RGMII_TXCTL	RGMII_TXCTL/GPIO22/PLLBYPS	Output	268.3	1.8V	-
AA23	-	GND		Power	-	-	-
AA24	-	GND		Power	-	1.8V	-
AB1	-	PWR_1V8_CTL		Output	-	1.8V	-
AB2	-	PWR_1V8		Output	-	1.8V	-
AB23	CA16	PCIE_TX1n		Output	96.86	-	100nF AC cap required

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
AB24	BY16	PCIE_TX1p		Output	96.86	-	100nF AC cap required
AC1	-	PWR_3V3_CTL		Output	-	3.3V	-
AC2	-	PWR_3V3		Output	-	3.3V	-
AC23	BW11	USB3_Dn		I/O	95.57	-	-
AC24	BY11	USB3_Dp		I/O	95.57	-	-
AD1	-	GND		Power	-	-	-
AD2	-	GND		Power	-	-	-
AD23	CA10	USB3_TXp		Output	76.25	-	100nF AC cap required
AD24	BY10	USB3_TXn		Output	76.55	-	100nF AC cap required
AE1	-	GND		Power	-	-	-
AE2	-	GND		Power	-	-	-
AE23	-	GND		Power	-	-	-
AE24	-	GND		Power	-	-	-
AF1	-	VSYS		Input	-	5V	-
AF2	-	VSYS		Input	-	5V	-
AF23	BW6	USB3_RXp		Input	86.08	-	100nF AC cap required
AF24	BW8	USB3_RXn		Input	86.54	-	100nF AC cap required
AG1	-	VSYS		Input	-	5V	-
AG2	-	VSYS		Input	-	5V	-
AG3	-	GND		Power	-	-	-
AG22	-	GND		Power	-	-	-
AG23	BN23	USB3_VBUS		Input	-	-	Connected through 30 kΩ series resistor
AG24	BL27	USB3_ID		Input	-	-	-
AH1	R51	STS0_SOP	GPIO42/STS0_SOP/SYSPLL_CLKO/STS5_CLK/URT3_TXD/PHY_DBG1	I/O	-	1.8V	-
AH2	W49	STS0_SD	GPIO41/STS0_SD/MEMPLL_CLKO/URT3_CTSn/PHY_DBG2	I/O	-	1.8V	-
AH3	L47	SDIO_WP	SDIO_WP/GPIO44/TW1A_SDA	I/O	-	1.8V	-
AH4	N43	SDIO_DATA0		I/O	357.05	1.8V/3.3V mode dependent	-
AH5	B50	SDIO_CMD		I/O	284.36	1.8V/3.3V mode dependent	-
AH6	C46	SDIO_DATA2		I/O	292.91	1.8V/3.3V mode dependent	-
AH7	-	GND		Power	-	-	-
AH8	R55	STS1_SOP	GPIO38/STS1_SOP/PWM1/STS6_CLK/PHY_DBG5	I/O	-	1.8V	-
AH9	R57	STS1_CLK	GPIO39/STS1_CLK/PMW0/PHY_DBG4	I/O	-	1.8V	-

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
AH10	F59	SPI1_SS1n	GPIO53/SPI1_SS1n/STS7_VALD/PWM1/PHY_DBG14	I/O	-	1.8V	-
AH11	L59	SPI1_SCLK	SPI1_SCLK/GPIO49/DBG_CLK	I/O	-	1.8V	-
AH12	BH1	MIPI_CSI0_D3n		Input	203.66	-	-
AH13	BD3	MIPI_CSI0_D2n		Input	181.47	-	-
AH14	-	GND		Power	-	-	-
AH15	BK3	MIPI_CSI0_D1n		Input	208.5	-	-
AH16	BL3	MIPI_CSI0_D0n		Input	194.9	-	-
AH17	BP2	MIPI_CSI0_CKn		Input	143.43	-	-
AH18	-	GND		Power	-	-	-
AH19	BV3	MIPI_CSI1_D1n		Input	128.44	-	-
AH20	BT3	MIPI_CSI1_D0n		Input	179.78	-	-
AH21	BY3	MIPI_CSI1_CKn		Input	149.88	-	-
AH22	W53	USB2_DRV_VBUS	USB2_DRV_VBUS/GPIO55	Output	-	-	-
AH23	BL11	USB2_VBUS		Input	-	-	Connected through 30 kΩ series resistor
AH24	BL13	USB2_ID		Input	-	-	-
AJ1	R53	STS0_VALD	GPIO40/STS0_VALD/STS5_SD/URT3_RTSn/PHY_DBG3	I/O	-	1.8V	-
AJ2	W47	STS0_CLK	GPIO43/STS0_CLK/CPUPLL_CLKO/URT3_RXD/PHY_DBG0	I/O	-	1.8V	-
AJ3	J47	SDIO_CDn	SDIO_CDn/GPIO45/TW1A_SCL	I/O	-	1.8V	-
AJ4	C44	SDIO_DATA1		I/O	285.8	1.8V/3.3V mode dependent	-
AJ5	B48	SDIO_CLK		Output	294.82	1.8V/3.3V mode dependent	-
AJ6	G47	SDIO_DATA3		I/O	321.84	1.8V/3.3V mode dependent	-
AJ7	P60	STS1_VALD	GPIO36/STS1_VALD/PWM3/STS6_SD/PHY_DBG7	I/O	-	1.8V	-
AJ8	P59	STS1_SD	GPIO37/STS1_SD/PWM2/PHY_DBG6	I/O	-	1.8V	-
AJ9	H59	SPI1_SS0n	SPI1_SS0n/GPIO54/SOFTWARE_STRAP1	Output	-	1.8V	-
AJ10	M59	SPI1_SDI	SPI1_SDI/GPIO48	I/O	-	1.8V	-
AJ11	K61	SPI1_SDO	SPI1_SDO/GPIO50/SOFTWARE_STRAP0	Output	-	1.8V	-
AJ12	BH2	MIPI_CSI0_D3p		Input	203.95	-	-
AJ13	BF3	MIPI_CSI0_D2p		Input	181.72	-	-

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
AJ14	-	GND		Power	-	-	-
AJ15	BK2	MIPI_CSI0_D1p		Input	208.46	-	-
AJ16	BM3	MIPI_CSI0_D0p		Input	194.18	-	-
AJ17	BP1	MIPI_CSI0_CKp		Input	143.18	-	-
AJ18	-	GND		Power	-	-	-
AJ19	BW3	MIPI_CSI1_D1p		Input	128.69	-	-
AJ20	BT2	MIPI_CSI1_D0p		Input	179.77	-	-
AJ21	CA3	MIPI_CSI1_CKp		Input	149.39	-	-
AJ22	-	GND		Power	-	-	-
AJ23	BW4	USB2_Dp		I/O	134.75	-	-
AJ24	BY4	USB2_Dn		I/O	134.7	-	-
B1	AR53	SM_TW3_SDA	SM_GPIO10/SM_TW3_SDA/PWM3	I/O	-	1.8V	External 2.4 kΩ pull-up to 1.8 V
B2	AR51	SM_TW3_SCL	SM_GPIO9/SM_TW3_SCL/PWM2	I/O	-	1.8V	External 2.4 kΩ pull-up to 1.8 V
B3	BF59	I2S1_DO3	GPIO15/I2S1_DO3/PWM3/STS2_VALD/PDMB_DI3/AVIO_DBG7	I/O	-	1.8V	-
B4	BD59	I2S1_DO0	GPIO19/I2S1_DO0/AVIO_DBG4	I/O	-	1.8V	-
B5	BG53	I2S1_MCLK	GPIO18/I2S1_MCLK/STS2_SOP/AVIO_DBG3	I/O	-	1.8V	-
B6	-	GND		Power	-	-	-
B7	AC49	TW0_SDA	GPIO46/TW0_SDA/PHY_DBG11	I/O	-	1.8V	-
B8	BC53	SM_ADCI1		Input	-	1.8V	-
B9	BK59	SPDIF0	GPIO14/SPDIF0/AVPLL_CLK0/BOOT_SRC1	I/O	-	1.8V	-
B10	BB61	SM_HDMI_RX_PWR5V	SM_HDMI_RX_PWR5V/SM_GPIO21	I/O	-	1.8V	-
B11	BM59	I2S2_DI1	GPIO10/I2S2_DI1/PDMA_DI2/STS4_VALD	I/O	-	1.8V	-
B12	BP60	I2S2_BCLK	GPIO12/I2S2_BCLK/PDMA_CLKIO	I/O	-	1.8V	-
B13	BP61	I2S2_MCLK	GPIO7/I2S2_MCLK//PDMB_CLKIO/HDMI_FBCLK/BOOT_SRC0	I/O	-	1.8V	-
B14	AL55	SM_RSTIn		Input	-	1.8V	-
B15	CA58	I2S3_BCLK	GPIO2/I2S3_BCLK/STS3_SD	I/O	-	1.8V	-
B16	BY59	I2S3_DO	GPIO1/I2S3_DO/STS3_SOP/AVIO_DBG2	I/O	-	1.8V	-
B17	BL51	HDMI_TX_EDDC_SDA	HDMI_TX_EDDC_SDA/GPIO5	I/O	-	1.8V	-
B18	-	GND		Power	-	-	-
B19	BY54	HDMI_TX_HEACn		Input	96.08	-	-
B20	CA52	HDMI_TX_D2n		Output	124.69	-	-
B21	-	GND		Power	-	-	-

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
B22	BY50	HDMI_TX_D1n		Output	98.41	-	-
B23	CA48	HDMI_TX_D0n		Output	105.02	-	-
B24	BW44	HDMI_TX_CKn		Output	116.18	-	-
C1	AY59	SM_SPI2_SS3n	SM_PWR_OK/SM_SPI2_SS3n/SM_GPIO14/PWM1/SM_TIMER1/URT2_RXD/SM_URT1_CTSn	I/O	-	1.8V	-
C2	AT59	SM_SPI2_SS2n	MON_VDD1P8_OUT/SM_SPI2_SS2n/SM_GPIO15/PWM0/SM_TIMER0/URT2_TXD/CLK_25M	I/O	-	1.8V	-
C3	-	GND		Power	-	-	-
C22	-	GND		Power	-	-	-
C23	BY43	HDMI_RX_D2n		Input	128.05	-	-
C24	BW43	HDMI_RX_D2p		Input	127.8	-	-
D1	AY60	SM_SPI2_SDO	SM_SPI2_SDO/SM_GPIO13/URT2_RTSn/SM_STRP1	Output	-	1.8V	-
D2	AV59	SM_SPI2_SCLK	SM_SPI2_SCLK/SM_GPIO11	I/O	-	1.8V	-
D23	-	GND		Power	-	-	-
D24	-	GND		Power	-	-	-
E1	AW57	SM_SPI2_SDI	SM_SPI2_SDI/SM_GPIO12//URT2_CTSn	I/O	-	1.8V	-
E2	-	GND		Power	-	-	-
E23	CA42	HDMI_RX_D1n		Input	99.53	-	-
E24	BY42	HDMI_RX_D1p		Input	99.78	-	-
F1	AR61	SM_SPI2_SS0n	SM_SPI2_SS0n/SM_GPIO17/PORB_AVDD33_LV/SM_STRP2	Output	-	1.8V	-
F2	AH60	SM_HDMI_CEC	SM_GPIO3/SM_HDMI_CEC	I/O	-	1.8V	-
F23	BW38	HDMI_RX_D0n		Input	72.49	-	-
F24	BW40	HDMI_RX_D0p		Input	72.74	-	-
G1	AR55	SM_SPI2_SS1n	SM_GPIO16/SM_SPI2_SS1n/SM_URT1_RTSn/VDD_CPU_PORB/SM_STRP3	Output	-	1.8V	-
G2	AG60	SM_HDMI_TX_HPD	SM_GPIO2/SM_HDMI_TX_HPD	I/O	-	1.8V	-
G23	BY36	HDMI_RX_CKn		Input	89.4	-	-
G24	BW36	HDMI_RX_CKp		Input	89.41	-	-
H1	AR60	SM_TDO	SM_TDO/SM_GPIO8	Output	-	1.8V	-
H2	AK59	SM_TEST_EN		Input	-	1.8V	-
H23	-	GND		Power	-	-	-
H24	-	GND		Power	-	-	-
J1	AP60	SM_TDI	SM_TDI/SM_GPIO7/PWM1	I/O	-	1.8V	-
J2	AL51	SM_TRSTn		Input	-	1.8V	-

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
J23	BY30	MIPI_DSI_D3n		Output	68.54	-	-
J24	BW30	MIPI_DSI_D3p		Output	68.29	-	-
K1	AM59	SM_TCK		Input	-	1.8V	-
K2	AH61	SM_JTAG_SEL		Input	-	1.8V	-
K23	BW34	MIPI_DSI_D2n		Output	36.62	-	-
K24	BW32	MIPI_DSI_D2p		Output	37.09	-	-
L1	AP59	SM_TMS	SM_TMS/SM_GPIO6/PWM0	I/O	-	1.8V	-
L2	AD59	SM_TW2_SDA	RX_EDID_SDA/SM_TW2A_SDA/SM_GPIO1	I/O	-	1.8V	-
L23	BY28	MIPI_DSI_CKn		Output	40.64	-	-
L24	CA28	MIPI_DSI_CKp		Output	40.49	-	-
M1	AF59	SM_TW2_SCL	RX_EDID_SCL/SM_TW2A_SCL/SM_GPIO0	I/O	-	1.8V	-
M2	-	GND		Power	-	-	-
M23	-	GND		Power	-	-	-
M24	-	GND		Power	-	-	-
N1	AG47	RGMII_TXD1	RGMII_TXD1/GPIO26/PHY_DBG15/SOFTWARE_STRAP3	Output	302.62	1.8V	External 2.2 kΩ pull-up to 1.8 V
N2	AG51	RGMII_RXD3	RGMII_RXD3/GPIO32	I/O	273.61	1.8V	-
N23	BW26	MIPI_DSI_D1n		Output	35.1	-	-
N24	BW27	MIPI_DSI_D1p		Output	35.35	-	-
P1	W59	RGMII_TXD2	RGMII_TXD2/GPIO25/CPURSTBYPS	Output	267.17	1.8V	-
P2	T60	RGMII_MDC	RGMII_MDC/GPIO29/PHY_DBG8	I/O	240.72	1.8V	-
P23	BY24	MIPI_DSI_D0n		Output	26.06	-	-
P24	BW24	MIPI_DSI_D0p		Output	26.29	-	-
R1	Y59	RGMII_TXD3	RGMII_TXD3/GPIO24/PLLPWRDOWN	Output	283.54	1.8V	-
R2	-	GND		Power	-	-	-
R23	BY22	PCIE_CLKn		Output	24.39	-	-
R24	CA22	PCIE_CLKp		Output	24.53	-	-
T1	V59	RGMII_TXD0	RGMII_TXD0/GPIO27/SOFTWARE_STRAP2	Output	282.41	1.8V	External 2.2 kΩ pull-up to 1.8 V
T2	T61	RGMII_TXC	RGMII_TXC/GPIO23/LEGACY_BOOT	Output	267.5	1.8V	-
T23	-	GND		Power	-	-	-
T24	-	GND		Power	-	-	-
U1	AB61	RGMII_RXD1	RGMII_RXD1/GPIO34	I/O	310.06	1.8V	-
U2	AG49	RGMII_RXC	RGMII_RXC/GPIO31	I/O	244.96	1.8V	-

Pad	CPU Pin	Signal Name	Mux	Type	Signal Length[ps]	Power Domain	Note
U23	BW18	PCIE_RX0n		Input	43.16	-	100nF AC cap required
U24	BY18	PCIE_RX0p		Input	42.88	-	100nF AC cap required
V1	Y60	RGMII_RXD2	RGMII_RXD2/GPIO33	I/O	319.54	1.8V	-
V2	-	GND		Power	-	-	-
V23	BW19	PCIE_TX0n		Output	61.28	-	100nF AC cap required
V24	BW20	PCIE_TX0p		Output	61.41	-	100nF AC cap required
Y1	AC55	RGMII_RXCTL	RGMII_RXCTL/GPIO30	I/O	265.14	1.8V	-
Y2	W55	RGMII_MDIO	RGMII_MDIO/GPIO28/PHY_DBG9	I/O	244.97	1.8V	-
Y23	BW14	PCIE_RX1n		Input	59.6	-	100nF AC cap required
Y24	BW12	PCIE_RX1p		Input	59.75	-	100nF AC cap required

5.4 Power Management Unit

The power management unit consists of 5 buck converters. PMU is controlled via I2C. There are four pads for the Grinn AstraSOM-1680 power supply: `VSYS` (AF1, AF2, AG1, and AG2). All other power supplies are derived from `VSYS` using buck converters.

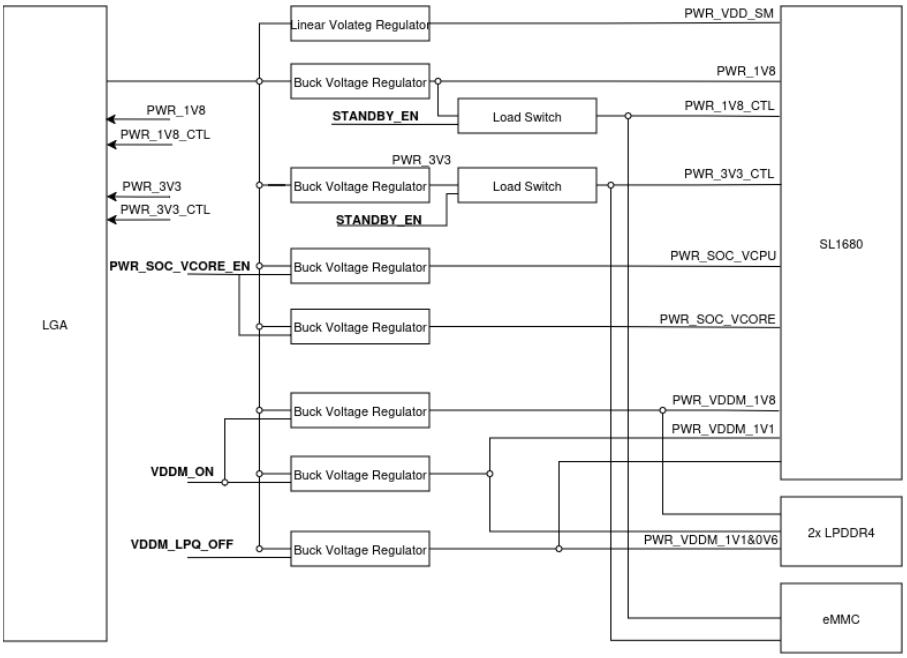


Figure 4: Power supply routing

Expander Pin	Signal
GPIO0	PWR_SOC_VCORE_EN
GPIO2	VDDM_ON
GPIO3	VDDM_LPQ_OFF
GPIO4	STANDBY_EN

GPIO expander is driven via the TW3 interface (address 0x43). Do not change the function of the `SM_TW3_SCL` and `SM_TW3_SDA` pins nor place other devices with the same address on this interface, otherwise incorrect power-related behavior may occur.

See section 6 - Electrical characteristics for additional information.

5.5 Interfaces

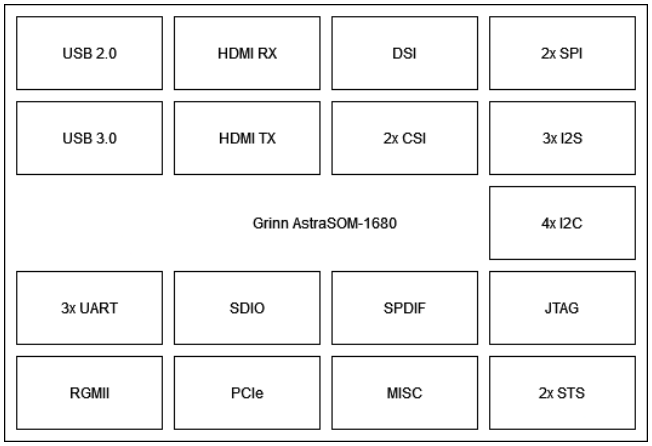


Figure 5: Grinn AstraSOM-1680 interfaces overview

- USB 2.0 OTG (Universal Serial Bus On The Go)
- USB 3.0 host interface (Universal Serial Bus)
- PCIe (Peripheral Component Interconnect Express - 2.0 2-lane)
- 2x MIPI CSI (Camera Serial Interface - 1x 2-lane + 1x 4-lane)
- MIPI DSI (Display Serial Interface - 1 x 4-lane)
- HDMI RX (High Definition Multimedia Interface - v2.1)
- HDMI Tx (v2.1)
- 3x UART (universal asynchronous receiver-transmitter)
- 2x SPI (Serial Peripheral Interface)
- 3x I^2S (Inter-Integrated Sound)
- 3x SPDIF (SONY/Philips Digital Interface Format)
- SDIO (Secure Digital Input Output)
- JTAG (Joint Test Action Group)
- 3x TW (Two Wire)
- MISC (Miscellaneous - includes, eg. GPIO, ADC)
- RGMII (Reduced gigabit media-independent interface)
- 2x STS (Serial Transport Interface)

5.5.1 Video Interfaces

Synaptics SL1680 processor offers two independent display outputs and three inputs. Processor contains AV1, H.265, VP9, H.264, MPEG-2 and VP8 video decoders with 2x 2160p@60fps or 1x 2160p@60fps + 3x 1080p@60fps. MCU supports for up to two streams encoding: 1080p@60fps: H.264 or VP8 (per stream) or simultaneous 2160p@60fps decode and 1080p@60fps transcode. Combined with the MPU and GPU capabilities, it enables the creation of powerful and complex graphical pipelines.

Available video interfaces:

- 2x MIPI CSI (1x 2-lane + 1x 4-lane)
- MIPI DSI (1 x 4-lane)
- HDMI Rx (v2.1)
- HDMI Tx (v2.1)

5.5.2 Audio Interfaces

Grinn AstraSOM-1680 is equipped with Far-Field Voice (FFV) and Keyword Detection, multiple input processing, and audio decompression of various formats and post-processing.

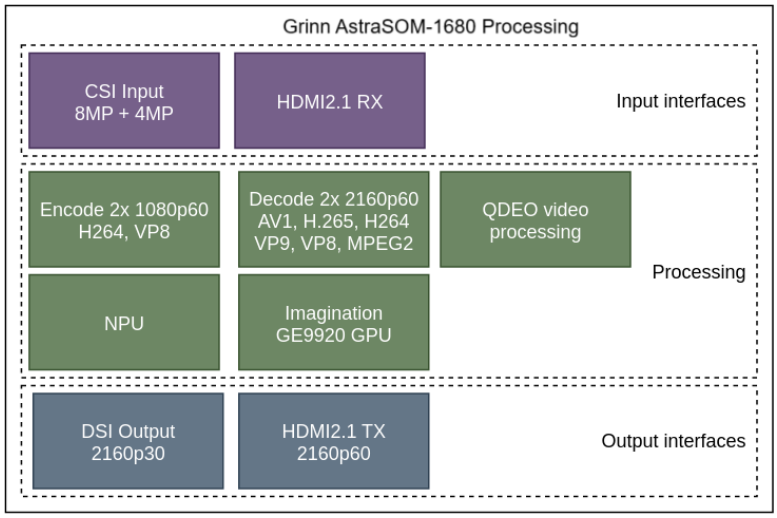


Figure 6: Grinn AstraSOM-1680 video processing

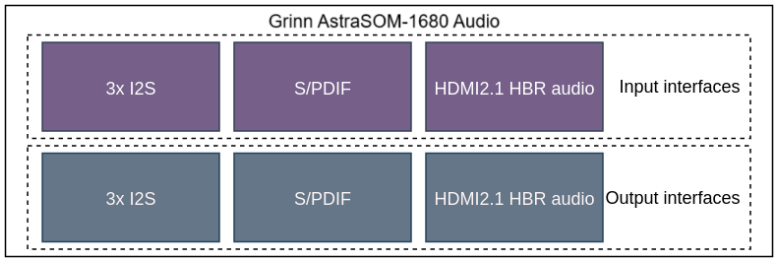


Figure 7: Grinn AstraSOM-1680 audio interfaces

Available audio interfaces:

- up to three I2S output or input
- S/PDIF output or input
- HDMI HBR audio

5.5.3 Peripheral Interfaces

Multiple available peripheral interfaces can be used for communication with external devices.

- USB 2.0 OTG
- USB 3.0 Host
- PCIe 2.0 2-lane
- up to two SPI interfaces
- up to three high-speed UART
- up to four I2C interfaces
- up to two STS (Serial Transport Interface) interfaces
- SPDIF

The TW1A and TW2A interfaces are internally used on the SOM for power management communication (PMU control). As a result, the availability and functionality of TW1B and TW2B interfaces may be limited. For detailed information regarding alternative usage or reconfiguration, please refer to Synaptics SL1680 documentation.

6 Electrical Characteristics

6.1 Absolute Maximum Ratings

	Maximum	Unit
Supply voltage VSYS	5.5	V

6.2 Recommended Operating Conditions

	Minimum	Nominal	Maximum	Unit
Supply voltage VSYS	3.7	5.0	5.5	V
Ambient operating temperature (consumer grade)	0	—	70	°C
Ambient operating temperature (industrial grade)	-40	—	85	°C

6.3 Power Sections

The board must be powered up with a single `VSYS` input. However, two output voltages are available to the user: 1.8V and 3.3V. Each output type is split into two rails, which are powered depending on whether the board is in active or standby mode.

- Active Mode: Both `PWR_1V8_CTL` and `PWR_3V3_CTL` are enabled, providing 1.8V and 3.3V power rails.
- Standby Mode: `PWR_1V8_CTL` and `PWR_3V3_CTL` are automatically disabled. However, the `PWR_1V8` and `PWR_3V3` rails remain available.

The `CTL` lines can handle a maximum current load of 2A each. However, the `PWR_1V8` and `PWR_3V3` rails can supply up to 3A, but this value must include:

- the current drawn from the corresponding `CTL` line
- the current consumption of the components on the Grinn AstraSOM-1680 itself

It is necessary to ensure that the Grinn AstraSOM-1680 does not overheat under maximum load, as it is not equipped with a heatsink.

Prolonged use of 1.8V and 3.3V outputs may lead to significant overheating of the Power Management Unit (PMU).

7 Mechanical Characteristics

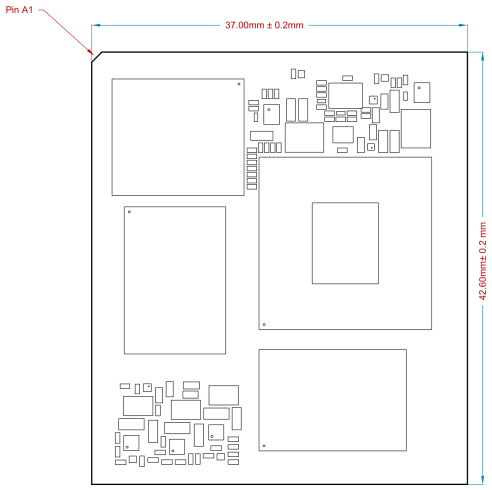


Figure 8: Grinn AstraSOM-1680 top view dimensions

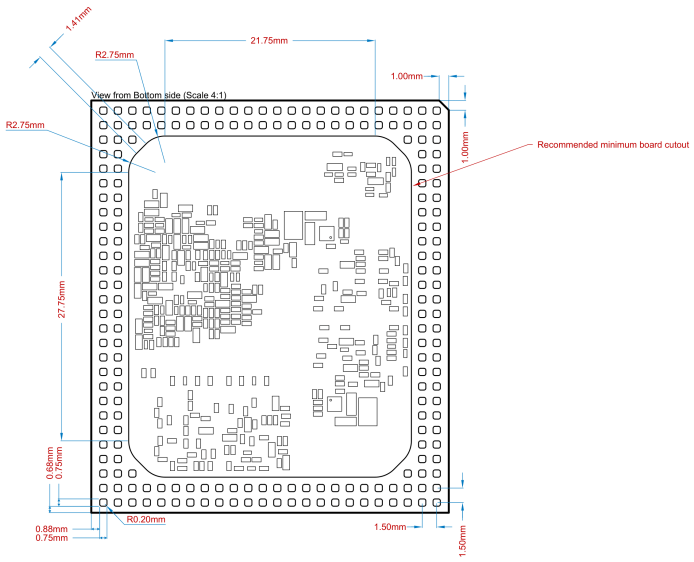
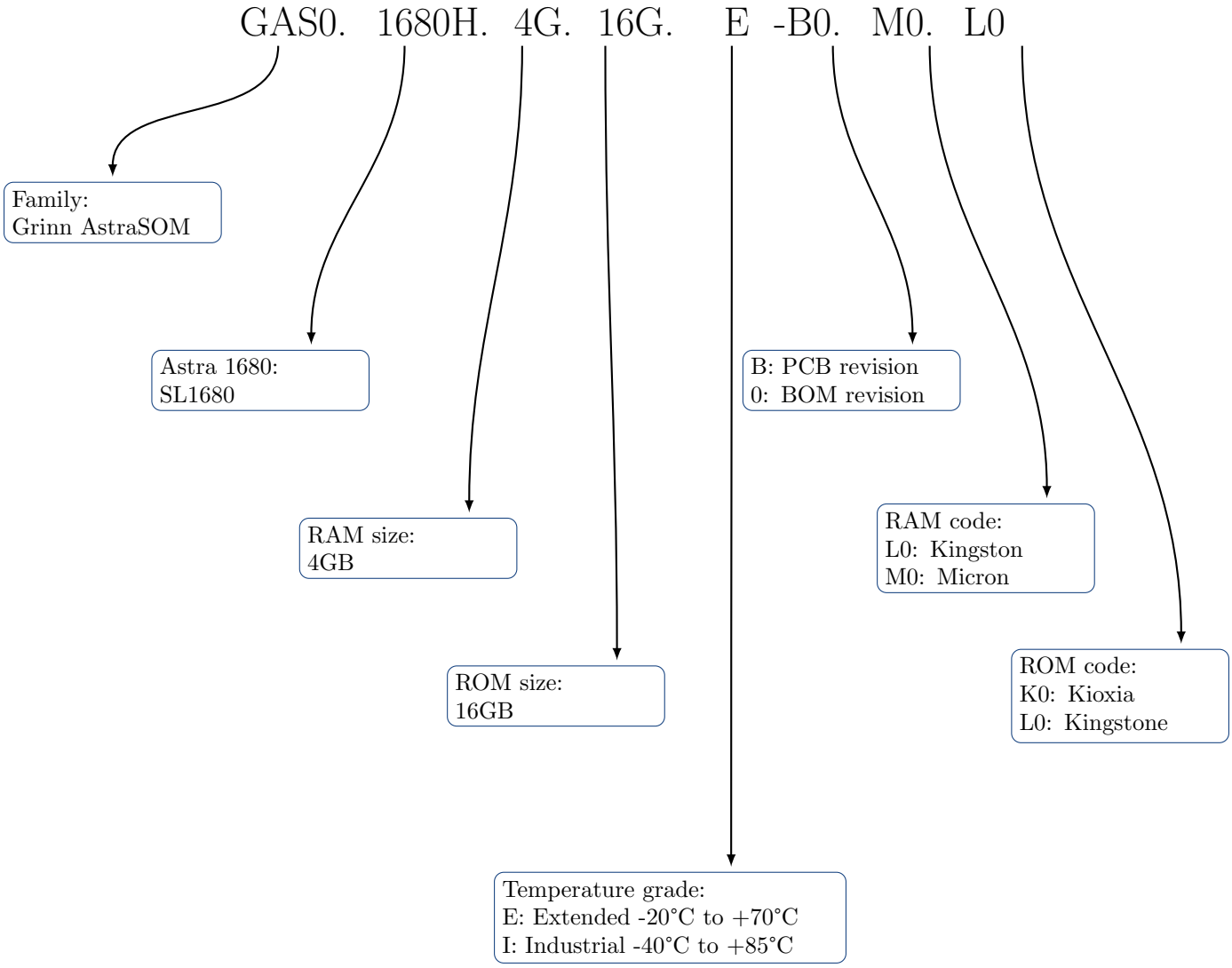


Figure 9: Grinn AstraSOM-1680 bottom view dimensions

8 Ordering Information



9 Revision History

Revision	Changes
1.0	Initial revision.
1.1	Changed section names and order.
1.2	Updated SOM name.
1.3	Updated links.
1.4	Updated part number.
1.5	PCB rev. and RAM code updated.
1.6	Updated power section, figures, and electrical details; added pull-up and VBUS resistor info; noted TW1A/TW2A usage limits.

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