

# SN9868x Series

## Multimedia Network Platform

### Overview

The SN9868x Series is ARM926EJ-S-based, operating at a frequency of up to 402 MHz. It supports H.264 and MJPEG codecs, image input through parallel/MIPI interface or USB host, and LCD/TV output interface. To maximize the performance of the ARM core, an UVC ISO accelerator of USB host and the codecs are driven from hardware acceleration to offload some encoding flows from ARM. Video surveillance can be designed without concerns of video format support, constrained network bandwidth, or limited system storage capacity.

The SN9868x Series features image signal processor (ISP) for image quality improvement and triple-path image output. Along with the ISP, the 2.4 GHz RF transceivers, 10/100M Ethernet, USB 2.0 host/device, SD/SDIO, 16-bit ADC, 10-bit DAC, and other programmable peripherals makes the SN9868x Series suitable for various multimedia embedded system applications such as IP cameras, dash-cams, drones, and backup cams.

The SN9868x Series provides optional DDR2 sizes and supports the majority types of CMOS sensors and LCD panels. With Linux and RTOS environment options, the SN9868x Series offers developers flexibility to select the preferred OS environment best suited for their unique designs.

### Specifications

Hardware Feature	Description
CPU	ARM926EJ-S processor 402 MHz with 16 KB I-cache and 16 KB D-cache
Memory	<ul style="list-style-type: none"> <li>Frequency up to 402 MHz, 16-bit data bus</li> <li>SiP DDR2</li> <li>SN98681/SN98683: 64MB</li> <li>SN98682/SN98684: 128MB</li> </ul>
CMOS Sensor Interface	SN98681/SN98682: <ul style="list-style-type: none"> <li>Parallel data input (10-bits RAW and YUV 4:2:2)</li> <li>MIPI CSI-2 (up to 804 Mbps) with two data lanes x1 or one data lane x2 that supports up to two video channel inputs</li> <li>Two UVC cam inputs connected via the USB hosts with an extra USB hub</li> </ul>
	SN98683/SN98684: <ul style="list-style-type: none"> <li>MIPI CSI-2 (up to 804 Mbps) with two data lanes x1</li> <li>Two UVC cam inputs connected via the USB hosts with an extra USB hub</li> </ul>
ISP	Supports 2D and 3D NR/WDR/DIS/vLDC/AE/AWB/AF and alpha-blending OSD
Baseband	<ul style="list-style-type: none"> <li>2.4 GHz RF transceivers supporting AMICCOM A7121 (3 Mbps), AMICCOM A7130 (4 Mbps) and AMICCOM A7196 (6 Mbps)</li> <li>Supports ID paring for security</li> <li>One-way video, two-way audio, and two-way short data</li> <li>Supports point-to-point mode</li> <li>Supports antenna diversity option to improve link performance</li> <li>PA/LNA and Tx/Rx control pin switch for high power RF module control</li> <li>Dynamic transmission power control for each RF channels</li> <li>Firmware protocol based adaptive frequency hopping spreading spectrum (FHSS), meet telecommunication regulations including FCC15.247 and CE ETSI EN 300 328-1</li> <li>Firmware protocol for anti-interference algorithm</li> <li>Supports multi-Tx to one-Rx mode, up to 4T1R</li> </ul>
Video Codec	<ul style="list-style-type: none"> <li>H.264 BP/MP/HP Level 4.1 codec and baseline JPEG codec</li> <li>Rate control supporting auto region of interest (AROI) or manual region of interest (MROI) for eight regions</li> <li>Flexible multi-streams</li> <li>Triple-path output</li> </ul>
Sensor Resolution and Format	Super HD (2304 x 1296), QXGA (2048 x 1536), UXGA (1600 x 1200), 1080P (1920 x 1080), SXGA (1280 x 1024), 720P (1280 x 720), VGA (640 x 480) with CMOS ISP/Bayer RAW sensors

Hardware Feature	Description
LCD	SN98681/SN98682: <ul style="list-style-type: none"> <li>8080 8-bit data width, 2 bytes for 1 pixel, RGB565</li> <li>8080 8-bit data width, 3 bytes for 1 pixel, RGB888</li> <li>RGB-dummy</li> <li>YUV422 sensor interface</li> <li>BT.656/BT.601</li> </ul>
	SN98683/SN98684: <ul style="list-style-type: none"> <li>8080 8/9/16-bit data width</li> <li>AUO LCD controller mode</li> <li>AUO UPS051 6/8-bit data width</li> <li>24-bit data width (DE mode)</li> <li>CVBS output NTSC/PAL</li> <li>RGB-dummy</li> <li>YUV422 sensor interface</li> <li>BT.656/BT.601</li> </ul>
TV Output	<ul style="list-style-type: none"> <li>BT.656/BT.601</li> <li>CVBS output NTSC/PAL</li> </ul>
LCD Resolution	Up to 1920 x 1080 @60 fps
Audio Codec	16-bit sigma-delta ADC and 10-bit R-2R DAC
Ethernet	10/100M EtherMAC with RMII interface x1
USB 2.0	<ul style="list-style-type: none"> <li>Host controller x1</li> <li>Host/device option x1</li> <li>High speed forward compatible with full-speed mode</li> <li>UVB ISO accelerator of USB host</li> </ul>
OSD	<ul style="list-style-type: none"> <li>Text mode in four colors in ISP</li> <li>Graphic mode in 256 colors for image merging</li> <li>Graphic mode in 256 colors for LCD</li> </ul>
SD/SDIO	Three controllers compliant with SD/SDIO specification version 1.0/1.1/2.0 with capacity up to 128 GB
DMA Controller	Four channels supporting memory-to-memory transfers
CRC	CRC-N codec
Timer	Three sets of three independent 32-bit timer programming model
Watchdog Timer	Two sets
I <sup>2</sup> C	Two sets
SPI	One set
UART	<ul style="list-style-type: none"> <li>Two sets, baud rates: 9600, 19200, 38400, 51200, 115200 and up to 12 Mbps</li> <li>Supports flow control (CTS/RTS)</li> </ul>
PWM	16 with pinmux options
GPIO	21 with pinmux options
Voltage	<ul style="list-style-type: none"> <li>Core: 1.05V to 1.15V (1.1V typical)</li> <li>DRAM: 1.7V to 1.9V (1.8V typical)</li> <li>I/O: 3.0V to 3.6V (3.3V typical)</li> </ul>
Package	LQFP128-EP (14 x 14 x 1.4 mm)

## Functional Block Diagram

USB Host	USB Host/Device	EtherMAC	SPI	RF SPI x2
Sensor Input Interface	ISP	Video Codec	LCD	
			TV Output	
Serial Flash	ARM926EJ-S with 16 KB I/D-cache			GPIO x21
I <sup>2</sup> C x2	DMA Controller			UART x2
SD/SDIO x2	64 MB/128 MB DDR2	Audio Codec		PWM x16
5-ch ADC	WDT x2	Timer x3	RTC	I <sup>2</sup> S

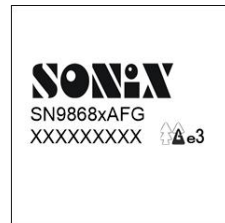
## Absolute Maximum Ratings<sup>1 2</sup>



Parameter	Rating	Unit
Supply voltage ranges	All 1.10V supplies	-0.30 to 1.21
	All 1.80V supplies	-0.30 to 1.90
Supply voltage ranges	All 2.50V supplies	-0.30 to 2.75
	All 3.30V supplies	-0.30 to 3.60
Input voltage ranges	All 1.80V I/Os	-0.30 to 1.90
	All 3.30V I/Os	-0.30 to 3.60
Operating case temperature ranges (T <sub>C</sub> )	0 to 70	°C
Storage temperature ranges (T <sub>STG</sub> )	-40 to 150	

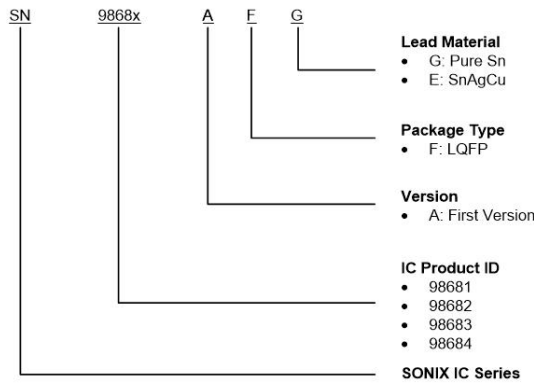
## Electrical Characteristics

Parameter	Conditions	Limits			Unit	
		MIN.	TYP.	MAX.		
Input Voltage, I/O	V <sub>IL</sub>	-0.30	–	0.80	V	
	V <sub>IH</sub>	2.00	–	3.60		
Output Voltage	V <sub>OL</sub>	–	–	0.40	V	
	V <sub>OH</sub>	2.40	–	–		
Output Current	V <sub>OL</sub> = 0.40V	I <sub>OL</sub> 4mA	8.5	12.9	17.4	mA
		I <sub>OL</sub> 8mA	12.7	19.3	25.9	
		I <sub>OL</sub> 12mA	16.9	25.6	34.1	
		I <sub>OL</sub> 16mA	21.0	31.9	42.5	
	V <sub>OH</sub> = 2.40V	I <sub>OH</sub> 4mA	13.4	26.5	45.0	
		I <sub>OH</sub> 8mA	18.7	37.0	62.8	
		I <sub>OH</sub> 12mA	24.0	47.5	80.5	
		I <sub>OH</sub> 16mA	32.0	63.2	107.1	

## Nomenclature



LOGO  
Product ID  
DATACODE +  (SONIX) +  (ECO-Friendly Products)

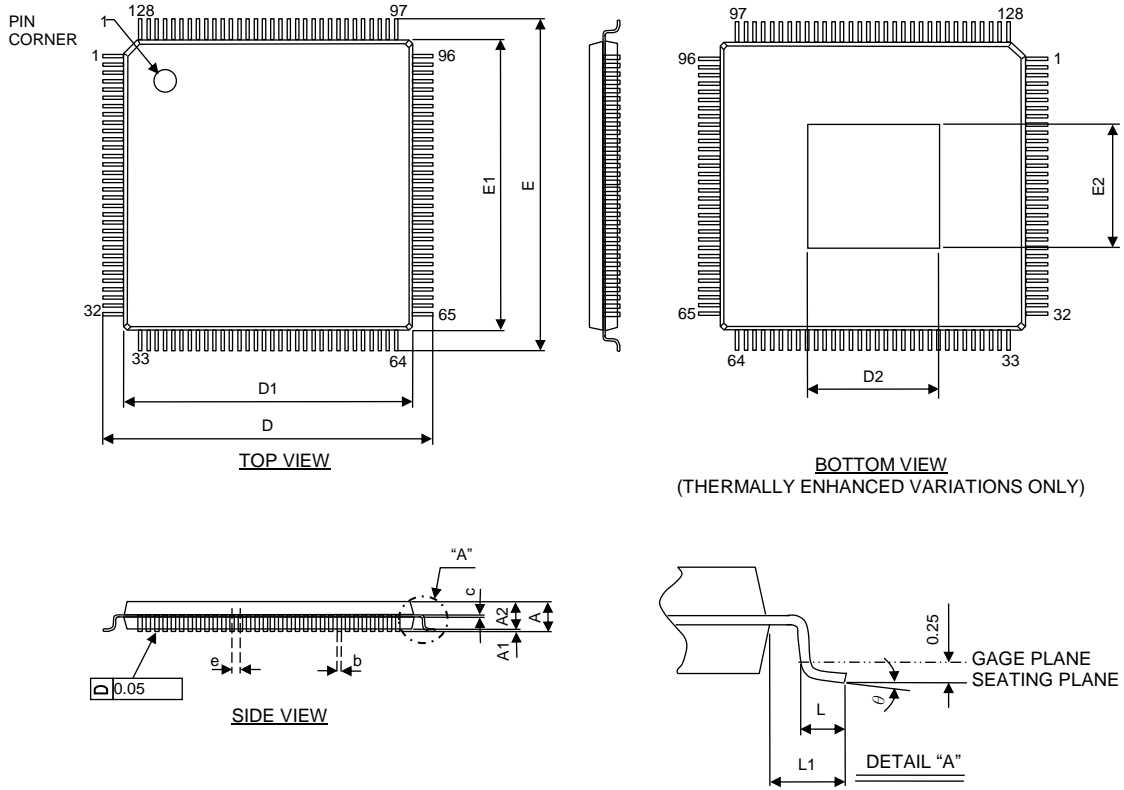


<sup>1</sup> Long-term exposure to absolute maximum ratings may affect device reliability, and permanent damage may occur if the operation exceeds the maximum ratings.

<sup>2</sup> All voltage values are with respect to VSS

### Packaging Dimensions

LQFP128L-EP (14 x 14 x 1.4 mm, Pitch: 0.4 mm)



Symbols	Dimension in mm <sup>3</sup>			Dimension in inch		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	—	—	1.60	—	—	0.063
A1	0.05	—	0.15	0.002	—	0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
b <sup>4</sup>	0.13	0.18	0.23	0.005	0.007	0.009
c	0.09	—	0.20	0.004	—	0.008
D	16.00 BSC			0.630 BSC		
D1 <sup>5</sup>	14.00 BSC			0.551 BSC		
E	16.00 BSC			0.630 BSC		
E1 <sup>5</sup>	14.00 BSC			0.551 BSC		
e	0.40 BSC			0.016 BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1.00 REF			0.039 REF		
θ	0°	3.5°	7°	0°	3.5°	7°
<b>Thermal Enhanced Dimensions</b>						
D2	5.10	6.10	7.10	0.201	0.240	0.280
E2	5.10	6.10	7.10	0.201	0.240	0.280

<sup>3</sup> Controlling dimension: millimeter(mm)

<sup>4</sup> Dimension b does not include dambar protrusion

<sup>5</sup> Dimension D1 and E1 do not include mold protrusion

### Revision History

Date	Revision	Description
19-Oct-2017	Preliminary A	Initial release
09-Nov-2017	Preliminary B	Updated Memory, CMOS Sensor Interface, and LCD of Specifications

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