

# ANDROID / EMBEDDED SYSTEM TRAINER

## SM9-Smart



*SM9-Smart is the best Embedded Equipment for Experiment supporting LPDDR3 memory, Mali-T628 MP6 GPU, USB 3.0 and HDMI 1.4a, developed to cultivate high value added Manpower in Embedded/Android Platform and to study Samsung Exynos 5422 based Heterogeneous Octa Core Platform.*

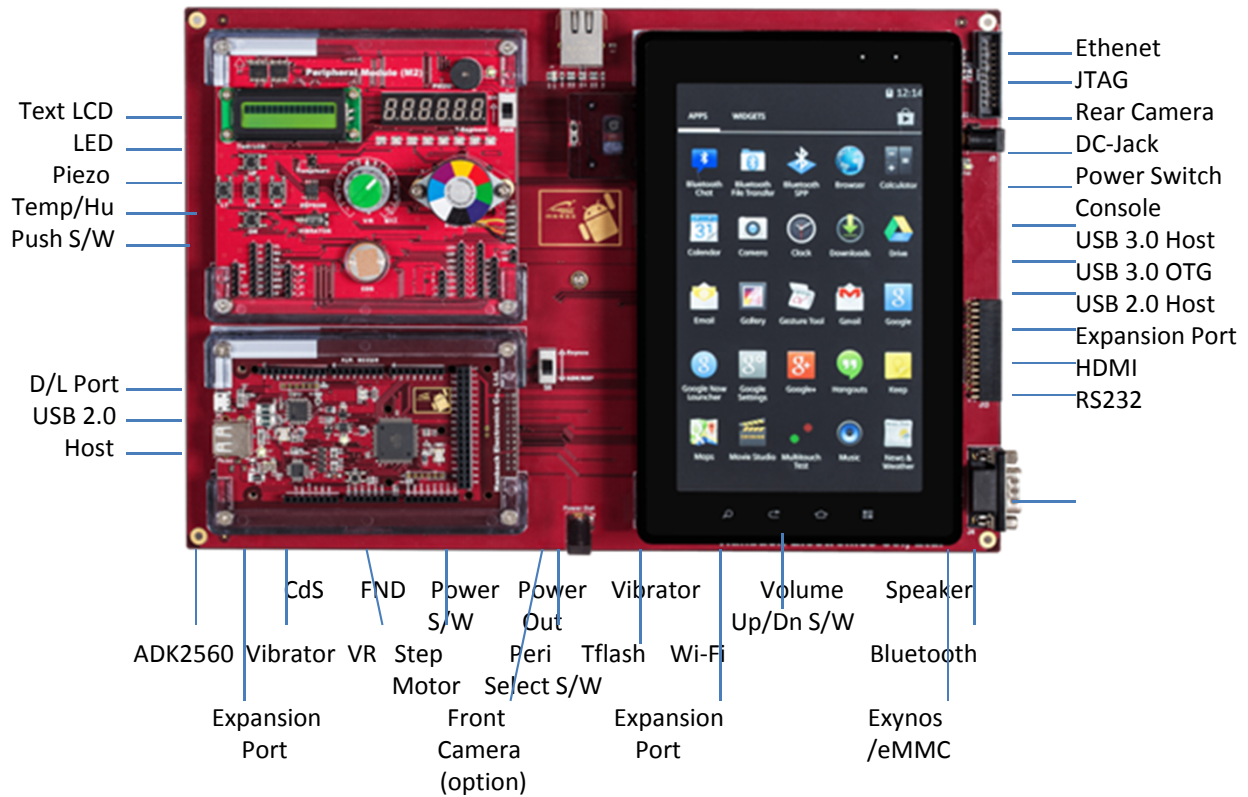
- Samsung Exynos 5422 Application Processor based Embedded Device
- Octa Core CPU(Cortex-A15 Quad + Cortex-A7 Quad) and LPDDR3 2GByte Memory
- Wide Viewing Angle and 7" 800 x 1280 IPS display of high Brightness and Contrast Range
- Support of USB 3.0 and Bluetooth V4.0, Wi-Fi 802.11 b/g/n and 10/100Mbps Ethernet
- Support of Digital Audio, HDMI V1.4 based Digital Video
- Peripheral Device for Embedded Research directly connected with Processor  
GPIO/Interrupt/ADC included

### Features

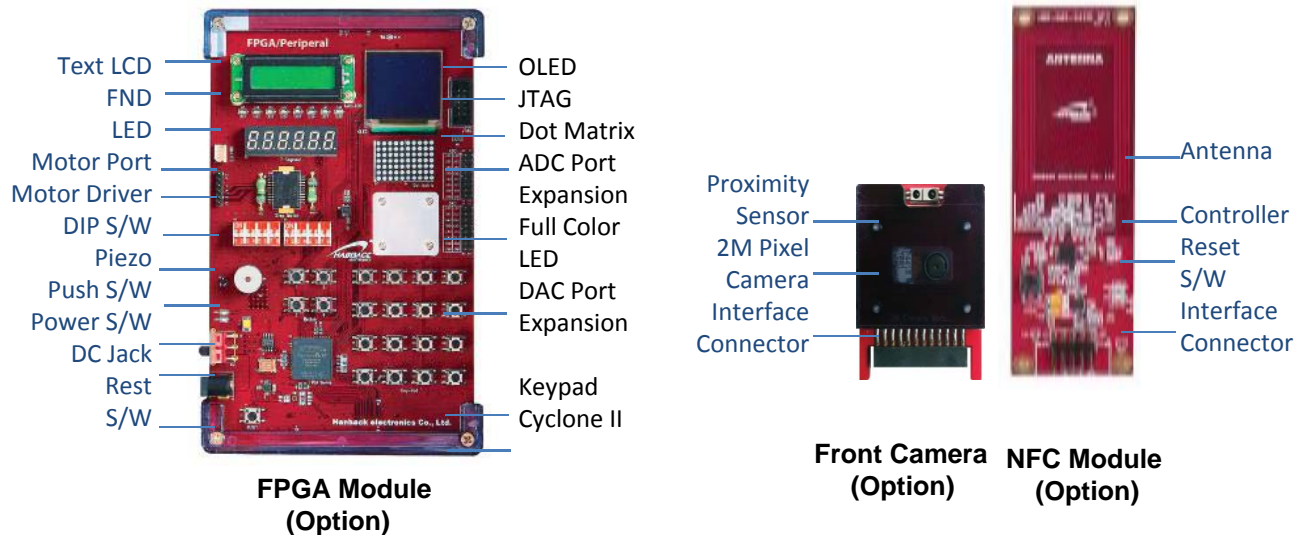
- Providing Knowledge and Experience to test Smart Device and develop the Next Smart Convergence Service in the latest 32bit Octa Core Processor by the best Embedded Module and Embedded Peripheral Device Module for research directly controlled by Processor.
- Optimum Performance and Reliability by installing Heterogeneous Octa Core Processor, Exynos 5422 to Embedded Module. Especially, providing 15% improved Performance by HMP(Heterogeneous Multi-Processing) effect than existing Exynos 5420 and the high performance Memory, LPDDR3 2Gbyte RAM and GPU, Mali- 628 MP6 not to make Performance delayed.
- Providing Brightness(450nits) and Color Sense(800:1 contrast range) enough to show User Experience(UX) by installing 7" LG Display of 800x1280 pixel resolution preventing Diff used Reflection and supporting Wide Viewing Angle 170°/170° to up/down and left/right.
- Providing Intenerated Development Environment to build Linux Kernel, generate and build Device Driver Project and install it to Target in Windows without other Linux Host Environment.
- Providing the Research/Development Environment of Peripheral Device the same as that of the latest Smart Phone and Smart TV through Peripheral Device for research directly connected with GPIO/Interrupt and ADC Interface of Processor in order to design and study Embedded Peripheral Device.
- Providing Experimental Contents using ADK-2560 and SmartCAR as Smart Terminal through USB 3.0/Bluetooth 4.0 for creative Convergence Application Experience.

## Configuration and Names

## SM9-Smart

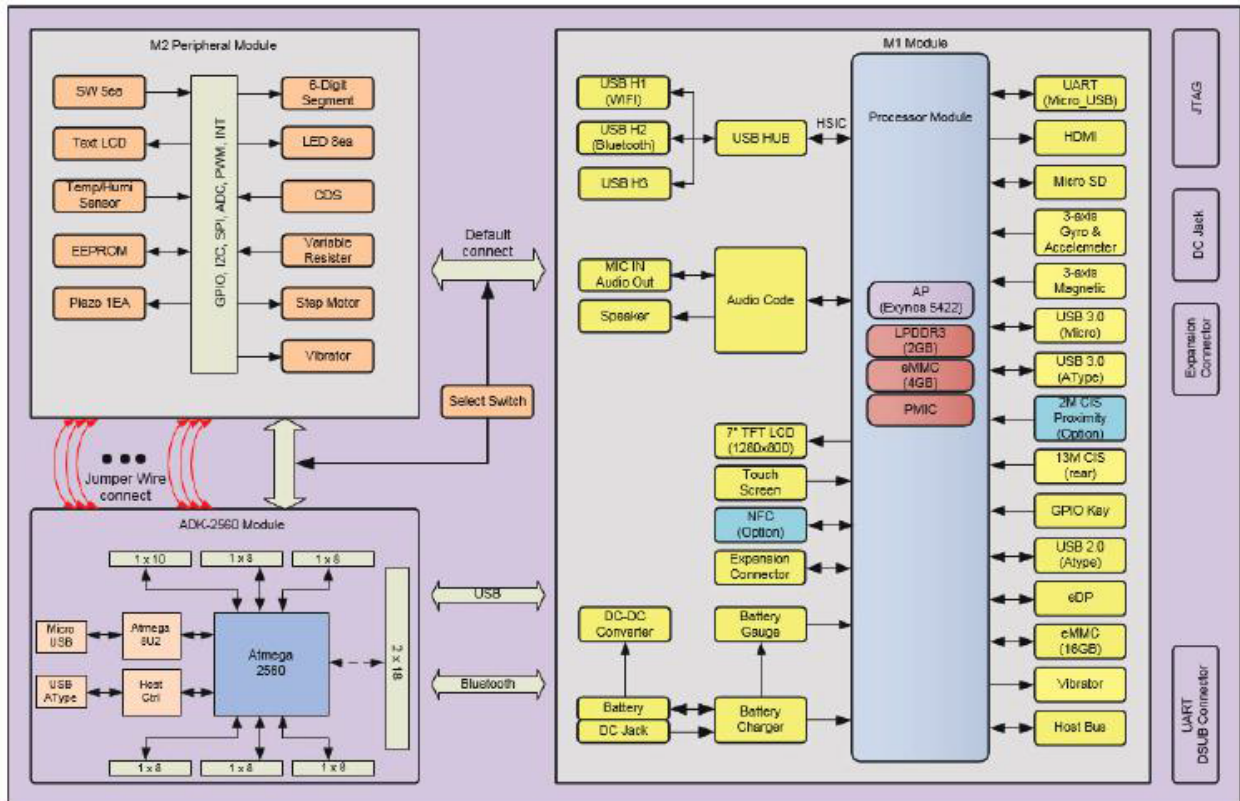


### [Basic Configuration]



### [Option Module]

## Block Diagram



## Expected Effect

- Able to execute the latest Smart Phone Contents Education by selecting Heterogeneous Octa Core Application Processor, the same specifications with Galaxy S5.
- Due to Modular Design, able to separate Embedded Module for independent use as needed and able to design Peripheral Device Module for research to the Module of other functions User need again.
- Providing Embedded Lecture Note as a Textbook, used for holders of Samsung during several years in order to educate Embedded Platform for the industries.
- Widows based Embedded Platform integrated Development Environment (AndroX Studio) not requesting to educate Linux and to build complicate Development Environment in order for developmental education of Embedded Linux Kernel and Device Driver.
- Support of App Inventor provided by MIT in addition to Java to write Android Application Program, in order to help Specialization of High School and University and Minimization of Time and Efforts spent to implement Application Program when operating Capstone Design.

### Hardware Specification

#### • Basic Configuration

List		Specifications
M1 Module (Main Module)	Processor	Samsung Exynos5422 Octa ARM CortexTM-A15 Quad 2.1Ghz and CortexTM-A7 Quad 1.5GHz CPUs
	Memory	2Gbyte LPDDR3 (800MHz)
	3D Accelerator	MaliTM-T628 MP6
	Display	7 inch 800x1280(WXGA) pixels IPS LCD, DSI(Display Serial Interface)
	Touch Screen	7 inch 10 point Capacitive Multi-Touch Screen
	Touch Key	4EA Capacitive Touch Key
	Storage	eMMC 4GByte (eMMC 5.0) 8/16/32GByte MicroSD Card(default: 8GByte)
	Network	802.11 b/g/n Wireless LAN
	Bluetooth	4.0+EDR, 1.1/1.2/2.0/2.1+EDR compatible (*max data speed 3Mbps)
	PMIC	Power Management IC
	Digital Video	HDMI 1.4 Video Out(1080p)
	Sensor	3-axis Acceleration Sensor, Gyroscope Sensor, Magnetic Field Sensor
	Haptic	Vibration Motor
	Audio	Audio Codec, Standard 3.5mm headphone jack
	USB	USB 3.0 Host (Super Speed standard A Type Connector x 1port) USB 3.0 Device (Super Speed USB Micro A-B Type Connector x 1port) USB 2.0 Host (High Speed standard A Type Connector x 3ports)
	UART	1 Port Serial to USB (Micro Type, default: debugging UART)
	Battery	3.7V Lithium Polymer Battery (4400mAh)
	Charger	Lithium Polymer Battery Charger
	Expansion	2x7(1EA)
	Camera	13M Pixel CMOS Camera (rear), CSI (Camera Serial Interface)
M2 Module (Peripheral Module)	Interrupt Device	Button Switch 5EA
	Display Device	2x16 Text LCD, 1x8 LED s, 6-Digit Seven Segment
	Actuator	Step Motor, Vibrator
	I2C Device	Humidity and Temperature Sensor
	SPI Device	EEPROM
	ADC Device	CdS, VR (Variable Resister)
	PWM Device	Piezo
ADK-2560 Module	Microcontroller	ATmega2560
	Clock	7.3728MHz
	USB Controller	ATmega8U2
	GPIO Socket	2x18(1EA), 1x10(1EA), 1x8(5EA)
Base Board	UART	1 Port RS232 Level UART (9p D-sub Connector)
	JTAG	2x10 Box Header
	Ethernet	10/100 Base-T, RJ-45
	Expansion	2x15(1EA)

• Option Module

List		Specifications
M3 (FPGA/ Peripheral) Module	FPGA	Altera Cyclone-2 (EP2C8F256C8)
	Clock	50MHz
	Input Device	Key Pad(4 x 4), Dip Switch(8P x 2), Tact Switch 4EA
	Display Device	2x16 Text LCD, 1x8 LED s, 6-Digit Seven Segment, Full Color LED 4EA,
	PWM Device	Piezo
	Dot Matrix	7x5 2EA
	ADC	SPI Interface 8bit/8-Channel
	DAC	SPI Interface 8bit/8-Channel
	Actuator	Step Motor Driver, Motor(Optional)
NFC Module	Microcontroller	ATSAM3X8EA-AU (ARM®Cortex®-M3 up to 84MHz)
	Clock	12MHz
	NFC Controller	NXP PN544
	Communication	1 Port I2C
	Frequency	13.56MHz Baseband
	Detect Range	Max 5cm detection range
	Antenna	PCB Antenna
Camera Module		2M Pixel CMOS Camera

## Software Specifications

List		Specifications
IDE		AndroX Studio 2.1.4
Boot Loader		U-boot 1.3.4
Operating System		Linux Kernel 3.10.9
Platform		Android kitkat 4.4.2
M1 (Embedded Module)	Display	MIPI base display driver
	Touch Screen	Touch screen driver
	Audio	Audio driver, ALSA
	Bluetooth	Bluetooth driver, Bluez
	Wi-Fi	Wi-Fi driver, wpa_supplicant, iwconfig, libnetutils, Connection Manager
	Network Server	SSH Server, SFTP Server
	USB	USB gadget driver, USB accessory gadget (ADK 2011 Support)
	Ethernet Device	Ethernet driver, Connection Manager
M2 (Peripheral Module)	Interrupt Device	Button Switch Linux Device Drivers/Linux Native Applications/Android Applications
	Display Device	Text LCD/ 7-Segment Linux Device Drivers/Linux Native Applications/Android Applications
	Output Device	LED/ Piezo Linux Device Drivers/Linux Native Applications/Android Applications
	Actuator Device	Vibrator/ Step Motor Linux Device Drivers/Linux Native Applications/Android Applications

## Software Specifications

List		Specifications
M2 (Peripheral Module)	I2C Device	Humidity and Temperature Sensor Linux Device Driver/Linux Native Application/Android Application
	SPI Device	EEPROM Linux Device Driver/Linux Native Application/Android Application
	ADC Device	CdS/ VR(Variable Resister) Linux Device Driver/Linux Native Application/Android Application
ADK-2560 Module (Integration Firmware)	Interrupt Device	Button Switch Firmware
	Display Device	Text LCD/ 7-Segment Firmware
	Output Device	LED/ Piezo Firmware
	Actuator Device	Vibrator/ Step Motor Firmware
	I2C Device	Humidity and Temperature Sensor Firmware
	SPI Device	EEPROM Firmware
	ADC Device	CdS/ VR(Variable Resister) Firmware

## Product Configuration



**HBE-SM9-Smart**  
1EA



**User Guide**  
book 1EA



**AndroX**  
Studio DVD 1EA



**Platform DVD**  
1EA



**Micro To A type**  
USB Cable 2EA



**Charger(5V 4A)**  
1EA