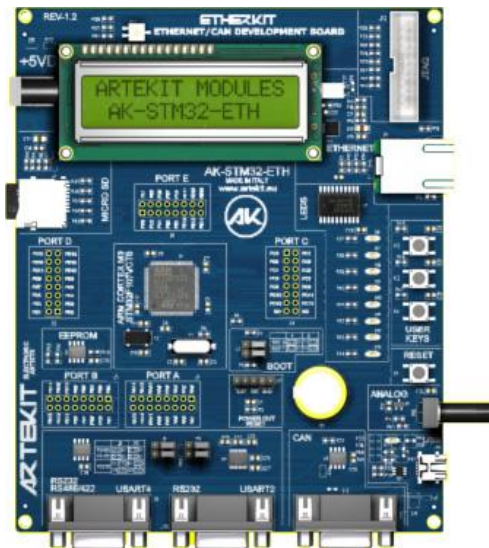




ARTEKIT
electronic artists

AK-STM32-ETH Development Board

Reference manual





Contents

About this document	3
Revision history	3
Contact information.....	3
Life support policy.....	3
Copyright information.....	3
Specifications	4
General description.....	4
Main components	4
Block diagram	Error! Bookmark not defined.
Environmental requirements	4
Handling the board	4
Board overview	4
Components description	5
MPU	5
Clocks.....	5
Battery	6
Power	6
GPS.....	Error! Bookmark not defined.
Micro SD socket	6
JTAG connector	6
RS232 connector.....	6
EEPROM.....	6
Display.....	7
MCU connections	8
Hardware description	9
1 - External power supply connector	Error! Bookmark not defined.
2 - JTAG connector	9
3 & 4 - Jumper settings.....	10

About this document

Revision history

The table below displays the revision history for the chapters in this manual.

Chapter	Date	Revision	Changes made
All	November 2011	1.0	First publication

Contact information

For the latest news, upgrades and information about Artekit products, visit the Artekit web site at <http://www.artekit.eu>

For technical support on this product, visit the support page at <http://www.artekit.eu/support>

For additional information about Artekit products, consult the sources below.

Information type	Resource
Technical support	support@artekit.eu
Literature	www.artekit.eu
Sales	sales@artekit.eu
Products forum	www.artekit.eu

Life support policy

Artekit Italy products are not indented or authorized for use as critical components in life support devices or systems without the express written approval from Artekit Italy. Those devices may include devices for supporting or sustaining life, devices for surgical implant into the body or any other device whose failure to perform correctly could result in life support failure.

Copyright information

This document is copyright © 2012 Artekit Italy. All rights reserved. Any person may view, copy, print and distribute this document or any portion of this document for informational purposes only as long as the copyright notice remains included.

Specifications

General description

The AK-STM32-ETH development board is a full-featured hardware platform to evaluate the STMicroelectronics STM32F107 Connectivity Line ARM Cortex M3 MPU. This board support 10/100 Ethernet adapter, CAN 2.0, RS-232/485, USB OTG, 2x16 LCD display, 8KB EEPROM and MicroSD socket. The complete schematics of the boards are provided allowing the users to experiment with the MPU peripherals, to add external devices and enabling designers to begin the development or testing custom systems.

Main components

The AK-STM32-ETH Development board features the following components:

- ST Microelectronics STM32F107VCT6 ARM Cortex M3 in TQFP100 packaging.
- 10/100 Mb Ethernet adapter with link/speed LED's.
- M24C64 8KB EEPROM.
- 1 RS232 (TX/RX only).
- 1 RS232/RS485.
- USB OTG 2.0 FULL SPEED.
- CAN 2.0
- 2 lines x16 characters LCD display (5x7 matrix).
- Backup RTC battery.
- Micro SD socket.
- Precision voltage reference for AD.
- Potentiometer for AD testing.
- 8 User LED's.
- 3 User KEY's.
- Standard 20-pin ARM JTAG connector .
- Powered from USB cable or external 5V DC power supply.

Environmental requirements

The AK-STM32-ETH development board must be stored between -40°C and 100°C . The recommended operating temperature is between 0°C and 55°C .

The AK-STM32-ETH development board can be damaged without proper anti-static handling.

Handling the board

When handling the board, it is important to observe the following precaution:

Static discharge precaution — Without proper anti-static handling the board can be damaged. Therefore, take anti-static precautions while handling the board.

Components description

The following section describes in detail the main components of the development board.

MPU

ST Microelectronics STM32F107VCT6 ARM Cortex M3 MPU

- Core: ARM 32-bit Cortex™-M3 CPU – 72 MHz maximum frequency, 1.25 DMIPS/MHz (Dhrystone 2.1) performance at 0 wait state memory access – Single-cycle multiplication and hardware division
- Memories: 256 Kbytes of Flash memory – 64 Kbytes of SRAM 20KB static RAM,
- Clock, reset and supply management – 2.0 to 3.6 V application supply and I/Os – POR, PDR, and programmable voltage detector (PVD)
- 4-to-16 MHz crystal oscillator – Internal 8 MHz factory-trimmed RC – Internal 40 kHz RC – PLL for CPU clock – 32 kHz oscillator for RTC with calibration
- Low power – Sleep, Stop and Standby modes – VBAT supply for RTC and backup registers
- 2 x 12-bit, 1 μ s A/D converters (up to 16 channels) – Conversion range: 0 to 3.6 V – Dual-sample and hold capability – Temperature sensor
- 2 x 12-bit D/A converters
- DMA – 12-channel DMA controller – Peripherals supported: timers, ADCs, DAC, I2Ss, SPIs, I2Cs and USARTs
- Up to 80 I/Os, all mappable on 16 external interrupt vectors, and almost all 5 V-tolerant except for analog inputs
- Debug mode – Serial wire debug (SWD) & JTAG interfaces
- Timers: 10 timers – Four 16-bit timers, each with up to 4 IC/OC/PWM or pulse counter
- 1 x 16-bit motor control PWM timer with dead-time generation and emergency stop
- 2 x watchdog timers (Independent and Window)
- SysTick timer: a 24-bit downcounter
- 2 x 16-bit basic timers to drive the DAC
- Up to 14 communication interfaces with pinout remap capability
- Up to 2 x I2C interfaces (SMBus/PMBus) – Up to 3 USARTs (ISO 7816 interface, LIN, IrDA capability, modem control)
- Up to 2 x I2C interfaces (SMBus/PMBus)
- Up to 5 USARTs (ISO 7816 interface, LIN,
- USB 2.0 full-speed interface IrDA capability, modem control)
- Up to 3 SPIs (18 Mbit/s), 2 with a multiplexed I2S interface that offers audio class accuracy via advanced PLL schemes
- 2 x CAN interfaces (2.0B Active) with 512 bytes of dedicated SRAM
- USB 2.0 full-speed device/host/OTG controller with on-chip PHY that supports HNP/SRP/ID with 1.25 Kbytes of dedicated SRAM
- 10/100 Ethernet MAC with dedicated DMA and SRAM (4 Kbytes): IEEE1588 hardware support, MII/RMII available on all packages

Clocks

- Main clock at 25MHz, on board quartz.
- RTC Clock at 32768 Hz, on board quartz.

Battery

3V Non rechargeable LiMg battery for MCU RTC retention.

Power

1 power regulators.

- LD1117-3.3 LDO Regulator - 3.3V 800mA board power supply

NOTE: The board can be fully powered through the standard USB cable.

Micro SD socket

Standard micro SD socket.

- Access mode: SPI
- Card detect: Yes
- Write protect: No

JTAG connector

Standard 20-pin ARM JTAG connector

- 2 rows 10 pin 2.54mm
- Support any ARM JTAG cable

NOTE: The board was tested with the following JTAG adapters:

- Artekit AK-LINK
- OpenJTAG Project (<http://www.openjtag.org>)
- Egnite Turtelizer2 (<http://www.ethernut.de>)
- Keil ULINK2
- Keil ULINK-ME
- Segger J-Link

Ethernet connector

10/100 Mb with LINK and SPEED LED's

RS232 connectors

The RS232 connector enables the communication from the MPU with the external world. The jumpers J8 and J15 set the MCU communication using RS232 or RS485/422 modes. Please refer to jumper setting options.

EEPROM

The board has an 8KB EEPROM to store user data. The component is a STMicroelectronics M24C64-WMN6TP device, connected to the MCU through I2C interface. The device features are:

- 400 KHz Fast Mode
- 100 KHz Standard Mode
- 2.5 to 5V

- Write Control Input
- Byte and Page write
- Random and Sequential Read modes
- Self-timed programming cycle
- Automatic address incrementing
- Enhanced ESD/latch-up protection
- More than 1 Million write cycles
- More than 40-year data retention

Display

Gleichman Electronics Model GE-C1602B-NYG-ET/R.

- 16 characters x 2 Lines
- 7x5 matrix
- Powered at 5V
- 4 bit data bus
- Backlight: No
- Dimension: 80.0 x 36.0 x 13.5(MAX) mm.
- View area: 66.0 x 16.0 mm.
- Active area: 56.20 x 11.5 mm.
- Dot size: 0.55 x 0.65 mm.
- Dot pitch: 0.60 x 0.70 mm.
- Character size: 2.95 x 5.55 mm.
- Character pitch: 3.55 x 5.95 mm.
- LCD type: STN Negative, Blue Transmissive.
- Duty: 1/16
- View direction: 6 o'clock

CAN Connector

CAN 2.0B connector



MCU connections

PIN NAME	PIN #	DESCRIPTION	COMMENTS
PA0	23	User key 4 (K4)	Active low
PA1	24	Drive clock to the DP83848J Ethernet MAC	
PA2	25	Drive MDIO signal to the DP83848J Ethernet MAC	
PA3	26	USER I/O	Unprotected
PA4	29	USER I/O	Unprotected
PA5	30	SPI1_SCK. Connected to SD Memory	
PA6	31	SPI1_MISO. Connected to SD Memory	
PA7	32	SPI1_MOSI. Connected to SD Memory	
PA8	67	USER I/O	Unprotected
PA9	68	+VBUS detect. Detect external USB power	Active high
PA10	69	USB ID signal	Active high - Unprotected
PA11	70	USB_M. Connected to USB-B connector	
PA12	71	USB_P. Connected to USB-B connector	
PA13	72	JTAG TMS/SWDIO	Unprotected
PA14	76	JTAG TCK/SWCLK	Unprotected
PA15	77	JTAG TDI	Unprotected
PB0	35	RS485 DE control	Active high
PB1	36	RS485 RE control	Active low
PB2	37	Boot control. Could be used as I/O. See J2 switch	Unprotected
PB3	89	JTAG TDO	Unprotected
PB4	90	JTAG TRST	Unprotected
PB5	91	USER I/O	Unprotected
PB6	92	USER I/O	Unprotected
PB7	93	User key 2 (K2)	Active low
PB8	95	I2C_SCL. Connected to EEPROM	
PB9	96	I2C_SDA. Connected to EEPROM	
PB10	47	USER I/O	Unprotected
PB11	48	Drive TXEN signal to the DP83848J Ethernet MAC	
PB12	51	Drive TXD0 signal to the DP83848J Ethernet MAC	
PB13	52	Drive TXD1 signal to the DP83848J Ethernet MAC	
PB14	53	USER I/O	Unprotected
PB15	54	USER I/O	Unprotected
PC0	15	Analog input from potentiometer. Used for test AD	Analog 0 to 3.3V
PC1	16	Drive MDC signal to the DP83848J Ethernet MAC	
PC2	17	USER I/O	Unprotected
PC3	18	USER I/O	Unprotected
PC4	33	USER I/O	Unprotected
PC5	34	USER I/O	Unprotected
PC6	63	USER I/O	Unprotected
PC7	64	USER I/O	Unprotected
PC8	65	FAULT signal from USB Power Protection Device STMP2141	Active low
PC9	66	ENABLE signal to USB Power Protection Device STMP2141	Active low
PC10	78	USART4 TX	
PC11	79	USART4 RX	
PC12	80	USER I/O	Unprotected
PC13	7	USER I/O	Unprotected
PC14	8	OSC32IN. Connected to the 32768 Hz quartz	
PC15	9	OSC32OUT. Connected to the 32768 Hz quartz	



PD0	81	OSCIN. Connected to the 25 MHz quartz	
PD1	82	OSCOU. Connected to the 25 MHz quartz	
PD2	83	USER I/O	Unprotected
PD3	84	USER I/O	Unprotected
PD4	85	USER I/O	Unprotected
PD5	86	USART2 TX	
PD6	87	USART2 RX	
PD7	88	USER I/O	Unprotected
PD8	55	Drive CRS/DV/LED_CFG signal to the DP83848J Ethernet MAC	
PD9	56	Drive RDX_0/PHYAD1 signal to the DP83848J Ethernet MAC	
PD10	57	Drive RDX_0/PHYAD2 signal to the DP83848J Ethernet MAC	
PD11	58	USER I/O	Unprotected
PD12	59	USER I/O	Unprotected
PD13	60	USER I/O	Unprotected
PD14	61	USER I/O	Unprotected
PD15	62	USER I/O	Unprotected
PE0	97	Drive DATA7 signal to LCD	
PE1	98	Drive DATA6 signal to LCD	
PE2	1	Drive DATA5 signal to LCD	
PE3	2	Drive DATA4 signal to LCD	
PE4	3	Drive RS signal to LCD	
PE5	4	Drive R/W signal to LCD	
PE6	5	Drive E signal to LCD	
PE7	38	USER I/O	Unprotected
PE8	39	Drive USER LED1 signal	Active high
PE9	40	Drive USER LED2 signal	Active high
PE10	41	Drive USER LED3 signal	Active high
PE11	42	Drive USER LED4 signal	Active high
PE12	43	Drive USER LED5 signal	Active high
PE13	44	Drive USER LED6 signal	Active high
PE14	45	Drive USER LED7 signal	Active high
PE15	46	Drive USER LED8 signal	Active high
BOOT	94	BOOT. MPU Boot mode. Input through J4 switch	Active high, unprotected
RESET	14	Power-On reset. Connected to reset button and JTAG connector	Active low, unprotected

Hardware description

JTAG connector pinout

PIN #	DESCRIPTION	PIN #	DESCRIPTION
1	VCC 3.3V	2	VCC 3.3V
3	TRST	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCLK	10	GND
11	RTCK – Not Connected	12	GND
13	TDO	14	GND
15	SRST – To MCU Reset	16	GND
17	Not Connected	18	GND
19	Not Connected	20	GND

Jumper settings

The AK-STM32-ETH board is auto-documented. Please see the jumper position printed on the board closed to the jumper.

J2 Special Boot Modes Jumper

NOTE: For special MCU Boot Modes, please read the STM32F10x reference manual.

MODE	NORMAL	SPECIAL BOOT MODES
BOOT0	4 – 6 short. Leave 2 open (Default)	2 – 4 short. Leave 6 open
BOOT1	3 – 5 short. Leave 1 open (Default)	1 – 3 short. Leave 5 open

J8 and J15 RS232/485 Switch

J8 – RX/TX to driver input

GPS UART DIRECTION	JUMPER SETTINGS
To drive input to RS232	1 – 3 short, 2 – 4 short. Leave 5 and 6 open (Default)
To drive input to RS485	3 – 5 short, 4 – 6 short. Leave 1 and 2 open

J15 – RX/TX driver output

EXT. UART DIRECTION	JUMPER SETTINGS
To drive output to RS232	1 – 3 short, 2 – 4 short. Leave 5 and 6 open (Default)
To drive output to RS485	3 – 5 short, 4 – 6 short. Leave 1 and 2 open

CAUTION: Do not change jumper switches while the board is powered, and do not try another jumpers combinations. The board could be permanent damaged.



NOTES