Realtek MM89E00 Module Specification

This document provides a guideline for Low Power Wi-Fi MM89E00 that uses Realtek 8189em Wlan NIC and MCU STM32F427. Functional specification, pin assignment and operating environment are included in this documentation.

PRODUCT FEATURES

- Operate at ISM frequency bands (2.4GHz)
- Bunch of UART/ General SPI/ I2C/ I2S interfaces for peripheral controllers.
- Standards support: 802.11b, 802.11g, 802.11n, 802.11d, 802.11e, , 802.11i
- Enterprise level security complying with WPA/WPA2 certification
- Light weight TCP/IP protocol suite
- One transmitter and one receiver 802.11n WLAN transceiver supports up to 150 Mbps downstream and 150 Mbps upstream PHY rates
- ARM Cortex-M development environment for customer applications

PRODUCT SPECIFICATIONS

Main chipset

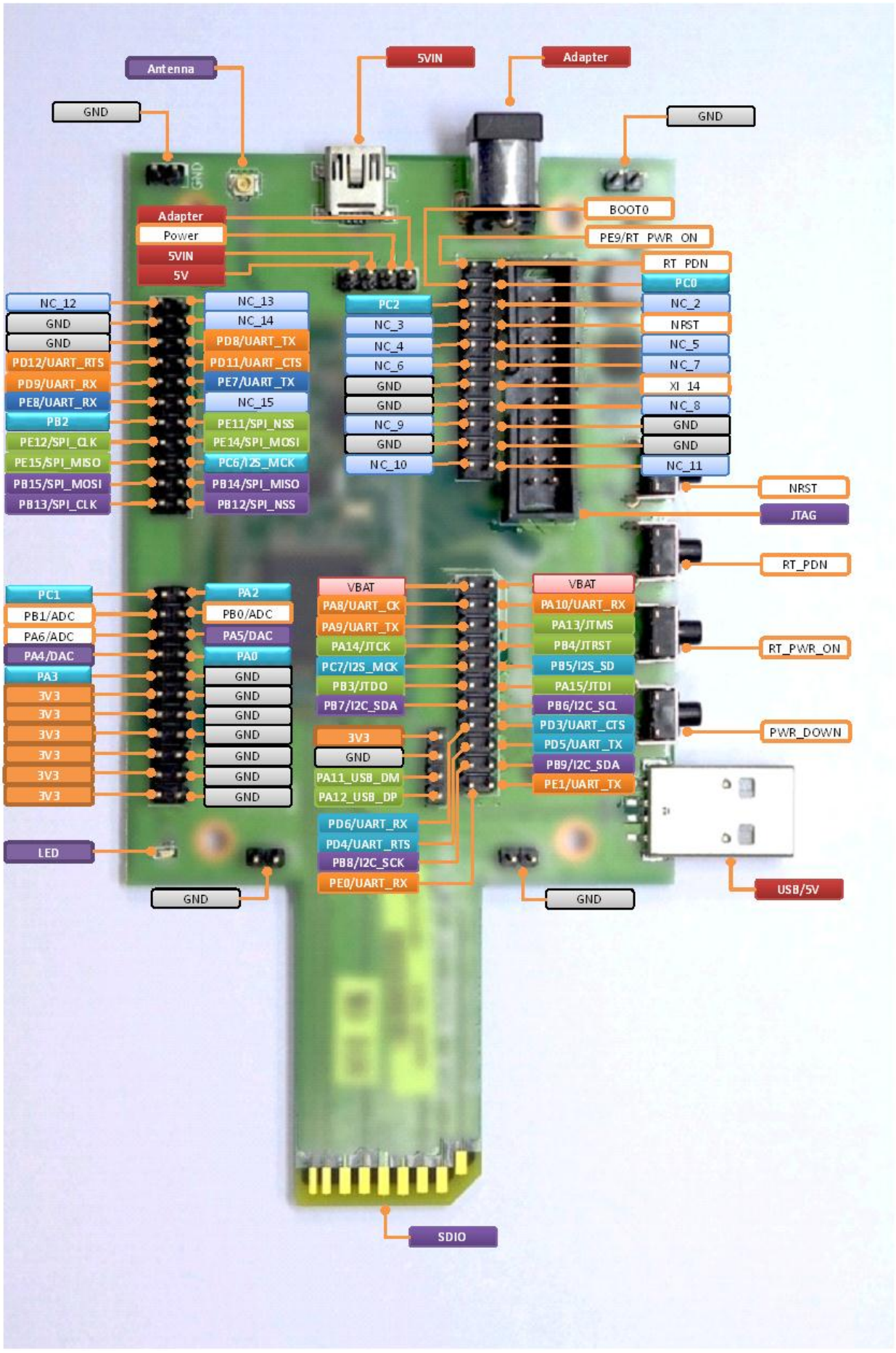
Wi-Fi Single Chip: Realtek RTL8189EM

MCU: STM32F427

Functional Specifications

Standards	***Wi-Fi:*** 802.11b, 802.11g, 802.11n, 802.11d, 802.11e, 802.11h, 802.11i
Peripheral Interface	***UART*** ***SPI*** ***I2C*** ***I2S/ PCM*** ***ADC*** ***DAC***
Form Factor	L*W*H = 25mm*50mm
Data Rate	**802.11b:** 11, 5.5, 2, 1 Mbps **802.11g:** 54, 48, 36, 24, 18, 12, 9, 6 Mbps **802.11n:** MCS 0 to 7 for HT20MHz MCS 0 to 7 for HT40MHz
Network Architecture	***Wi-Fi***: Infrastructure mode Software AP Light-weight TCP/IP Simple Config Light Web Server
Operating Channel	***Wi-Fi 2.4GHz:*** 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan
Frequency Range	2.400GHz ~ 2.4835 GHz

Transmit Output Power – 1x1 **(Tolerance: ±1.5dBm)**	***802.11b@11Mbps*** 18.5dBm	***802.11g@54Mbps*** 15dBm	***802.11n @HT20/40 MCS7*** 14dBm,
Receiver Sensitivity	***802.11b@11Mbps*** -86dBm	***802.11g@54Mbps*** -72dBm	***802.11n@ HT20/40*** -69dBm (MCS7 HT20), -66dBm (MCS7 HT40)
Security	***Wi-Fi*** : WPA-PSK, WPA2-PSK, WEP 64bit & 128bit, IEEE 802.11i		
Operating Voltage	3.3 V ±9% I/O supply voltage		
OS supported	FreeRTOS		
Power Consumption (3.3V) **(Typical)**	***Wi-Fi only*** ***TX Mode: (Conituous mode)*** 160mA (MCS7/BW40/13dBm) ***RX Mode: (Conituous mode)*** 140mA (MCS7/BW40/-60dBm) ***Associated Idle with DTIM=1*** 40mA ***Unassociated Idle:*** 0.552mA ***RF disable Mode:*** 0.552mA		


Antenna
5VIN
Adapter
GND
GND
Adapter
Power
5VIN
5V
BOOT0
PE9/RT_PWR_ON
RT_PDN
PC0
NC_2
NRST
NC_5
NC_7
XI_14
NC_8
GND
GND
NC_11
NC_12
GND
GND
PD12/UART_RTS
PD9/UART_RX
PE8/UART_RX
PB2
PE12/SPI_CLK
PE15/SPI_MISO
PB15/SPI_MOSI
PB13/SPI_CLK
NC_13
NC_14
PD8/UART_TX
PD11/UART_CTS
PE7/UART_TX
NC_15
PE11/SPI_NSS
PE14/SPI_MOSI
PC6/I2S_MCK
PB14/SPI_MISO
PB12/SPI_NSS
PC2
NC_3
NC_4
NC_6
GND
GND
NC_9
GND
NC_10
NRST
JTAG
RT_PDN
RT_PWR_ON
PWR_DOWN
USB/5V
PC1
PB1/ADC
PA6/ADC
PA4/DAC
PA3
3V3
3V3
3V3
3V3
3V3
3V3
PA2
PB0/ADC
PA5/DAC
PA0
GND
GND
GND
GND
GND
GND
GND
VBAT
PA8/UART_CK
PA9/UART_TX
PA14/JTCK
PC7/I2S_MCK
PB3/JTDO
PB7/I2C_SDA
3V3
GND
PA11_USB_DM
PA12_USB_DP
PD6/UART_RX
PD4/UART_RTS
PB8/I2C_SCK
PE0/UART_RX
VBAT
PA10/UART_RX
PA13/JTMS
PB4/JTRST
PB5/I2S_SD
PA15/JTDI
PB6/I2C_SCL
PD3/UART_CTS
PD5/UART_TX
PB9/I2C_SDA
PE1/UART_TX
LED
GND
GND
SDIO

PIN ASSIGNMENT

Symbol	Type	Module Pin No	MB Header Pin No	Description
RT_PWR_ON	I	1	J1-1	Enable RTL8189EM and STM32F427 power
RT_PDn	I	2	J1-2	Reset or shutdown RTL8189EM
BOOT0	I	3	J1-3	Boot selection for STM32F427
PC0	I/O	4	J1-4	STM32F427 GPIO
PC2	I/O	5	J1-5	STM32F427 GPIO
NRST	I	8	J1-8	STM32F427 Reset
GND	GND	13	NA	Ground
XI_14		14	J1-14	XTAL clock input from external clock source
GND	GND	15, 18	NA	Ground
WL_RF_IO	AIO	19	NA	RTL8189EM RF TRX signal
GND	GND	20, 25, 27	NA	Ground
PD8/UART_TX	IO	28	J4-6	STM32F427 GPIO. Configured as UART TX from MCU.
PD12/UART_RTS	IO	29	J4-7	STM32F427 GPIO. Configured as UART RTS from MCU.
PD11/UART_CTS	IO	30	J4-8	STM32F427 GPIO. Configured as UART CTS to MCU.
PD9/UART_RX	IO	31	J4-9	STM32F427 GPIO. Configured as UART RX to MCU.
PE7/UART_TX	IO	32	J4-10	STM32F427 GPIO. Configured as UART TX from MCU.
PE8/UART_RX	IO	33	J4-11	STM32F427 GPIO. Configured as UART RX to MCU.
NC	IO	34	J4-12	Reserved for I2C SDA. Not used in this module.
PB2/GPIO	IO	35	J4-13	STM32F427 GPIO. Reserved for I2C SCK. Not used in this module.
PE11/SPI_NSS	IO	36	J4-14	STM32F427 GPIO. Configured as SPI CS from MCU as master mode or SPI CS to MCU as slave mode.

Symbol	Type	Module Pin No	MB Header Pin No	Description
PE12/SPI_CLK	IO	37	J4-15	STM32F427 GPIO. Configured as SPI CLK from MCU as master mode or SPI CLK to MCU as slave mode.
PE14/SPI_MOSI	IO	38	J4-16	STM32F427 GPIO. Configured as SPI TX from MCU as master mode or SPI RX to MCU as slave mode.
PE15/SPI_MISO	IO	39	J4-17	STM32F427 GPIO. Configured as SPI RX from MCU as master mode or SPI TX to MCU as slave mode.
PC6/I2S_MCK	IO	40	J4-18	STM32F427 GPIO. Configured as I2S MCK.
PB15/SPI_MOSI	IO	41	J4-19	STM32F427 GPIO. Configured as SPI TX from MCU as master mode or SPI RX to MCU as slave mode. It is also configured as I2S SD.
PB14/SPI_MISO	IO	42	J4-20	STM32F427 GPIO. Configured as SPI RX from MCU as master mode or SPI TX to MCU as slave mode.
PB13/SPI_CK	IO	43	J4-21	STM32F427 GPIO. Configured as SPI CLK from MCU as master mode or SPI CLK to MCU as slave mode. It is also configured as I2S SCK.
PB12/SPI_NSS	IO	44	J4-22	STM32F427 GPIO. Configured as SPI CS from MCU as master mode or SPI CS to MCU as slave mode. It is also configured as I2S WS.
PC1/GPIO	IO	45	J3-1	STM32F427 GPIO. Configured as ADC input.
PA2/GPIO	IO	46	J3-2	STM32F427 GPIO. Configured as ADC input.
PB1/ADC	IO	47	J3-3	STM32F427 GPIO. Reserved for ADC input.
PB0/ADC	IO	48	J3-4	STM32F427 GPIO. Reserved for ADC input.
PA6/ADC	IO	49	J3-5	STM32F427 GPIO. Configured as ADC input.
PA5/DAC	IO	50	J3-6	STM32F427 GPIO. Configured as DAC output.
PA4/DAC	IO	51	J3-7	STM32F427 GPIO. Configured as DAC output.
PA0	IO	52	J3-8	STM32F427 GPIO. Reserved for SDIO SD_D1.
PA3	IO	53	J3-9	STM32F427 GPIO. Reserved for SDIO SD_D0.
PB11	IO	54	NA	STM32F427 GPIO. Reserved for SDIO SD_CLK.

Symbol	Type	Module Pin No	MB Header Pin No	Description
PC3	IO	55	NA	STM32F427 GPIO. Reserved for SDIO SD_CMD.
PA1	IO	56	NA	STM32F427 GPIO. Reserved for SDIO SD_D3.
PA7	IO	57	NA	STM32F427 GPIO. Reserved for SDIO SD_D2.
PC4	IO	58	NA	STM32F427 GPIO. Reserved for SDIO SD Card Detection.
PC5	IO	59	NA	STM32F427 GPIO. Reserved for SDIO SD Write Protect.
GND_USB	GND	60	NA	USB interface GND.
PA11	IO	61	J10-3	STM32F427 GPIO. Configured as USB HSDM.. Reserved for UART_CTS to MCU .
PA12	IO	62	J10-4	STM32F427 GPIO. Configured as USB HSDP. Reserved for UART_RTS from MCU.
VD33	PWR	63	J3.11, J3.13, J3.15, J3.17, J3.19, J3.21	External 3.3V source.
GND	GND	64-66	NA	Ground.
VBAT	PWR	67-68	J6.1, J6.2	Battery voltage source for STM32F427 RTC or backup SRAM.
PA8/UART_CK	IO	69	J6-3	STM32F427 GPIO.
PA10/UART_RX	IO	70	J6-4	STM32F427 GPIO. Configured as UART_RX to MCU.
PA9/UART_TX	IO	71	J6-5	STM32F427 GPIO. Configured as UART_TX from MCU.
PA13/GPIO/JTMS	IO	72	J6-6	STM32F427 GPIO. Configured as JTMS or SWDIO.
PA14/GPIO/JTCK	IO	73	J6-7	STM32F427 GPIO. Configured as JTCK or SWDCK.
PB4/GPIO/TIM3/JTRST	IO	74	J6-8	STM32F427 GPIO. Configured as NJTRST. Also configured as I2S ext_SD.

Symbol	Type	Module Pin No	MB Header Pin No	Description
PC7/SPI/I2S_MCK	IO	75	J6-9	STM32F427 GPIO. Also configured as I2S MCK.
PB5/SPI/I2S-SD	IO	76	J6-10	STM32F427 GPIO. Also configured as I2S SD.
PB3/SPI/I2S_CLK/JTDO	IO	77	J6-11	STM32F427 GPIO. Configured as JTDO. Also configured as I2S CK.
PA15/SPI/I2S_WS/JTDI	IO	78	J6-12	STM32F427 GPIO. Configured as JTDI. Also configured as I2S WS.
PB7/I2C_SDA	IO	79	J6-13	STM32F427 GPIO. Configured as I2C SDA.
PB6/I2C_SCL	IO	80	J6-14	STM32F427 GPIO. Configured as I2C SCK.
PD6/UART_RX	IO	81	J6-15	STM32F427 GPIO. Configured as UART RX to MCU.
PD3/UART_CTS	IO	82	J6-16	STM32F427 GPIO. Configured as UART CTS to MCU.
PD4/UART_RTS	IO	83	J6-17	STM32F427 GPIO. Configured as UART RTS from MCU.
PD5/UART_TX	IO	84	J6-18	STM32F427 GPIO. Configured as UART TX from MCU.
PB8/I2C/SPI	IO	85	J6-19	STM32F427 GPIO. Configured as I2C SCK.
PB9/I2C/SPI	IO	86	J6-20	STM32F427 GPIO. Configured as I2C SDA.
PE0/UART_RX	IO	87	J6-21	STM32F427 GPIO. Configured as UART RX to MCU.
PE1/UART_TX	IO	88	J6-22	STM32F427 GPIO. Configured as UART TX from MCU.

ENVIRONMENTAL

Operating

Operating Temperature:	0°C to +70 °C
Relative Humidity:	5-90% (non-condensing)

Storage

Temperature:	-40°C to +80°C (non-operating)
Relevant Humidity:	5-95% (non-condensing)

MTBF caculation

Over 150,000hours