Datasheet

ZM2106C Z-Wave Module Datasheet

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1 INTRODUCTION

1.1 Purpose

The purpose of this datasheet is to describe the ZM2106C Z-Wave Module. The ZM2106C Z-Wave Module contains the ZM2102 Z-Wave Module, EEPROM, HW interface protection circuitry and antenna matching circuitry. The ZM2106C Z-Wave Module has the same physical form factor as the ZW0102 based ZM1206 Z-Wave Module, which enables easy migration to the new ZW0201 Z-Wave Single Chip platform.

1.2 Audience and prerequisites

The audiences are OEM customers who are using any $6cm^2$ form factor Z-Wave Module and who want to migrate from their existing platform to the ZW0201 Z-Wave Single Chip platform.

2 ZM2106C Z-WAVE MODULE

The ZM2106C Z-Wave Module contains a ZM2102 Z-Wave Module, an EEPROM, HW Interface protection circuitry, antenna matching circuitry and ADC input selection circuitry. An OEM customer who are using the ZM1206 Z-Wave Module and who want to migrate to the ZW0201 Z-Wave Single Chip platform can use the ZM2106C Z-Wave Module. The block diagram of the ZM2106C Module is shown in Figure 1.

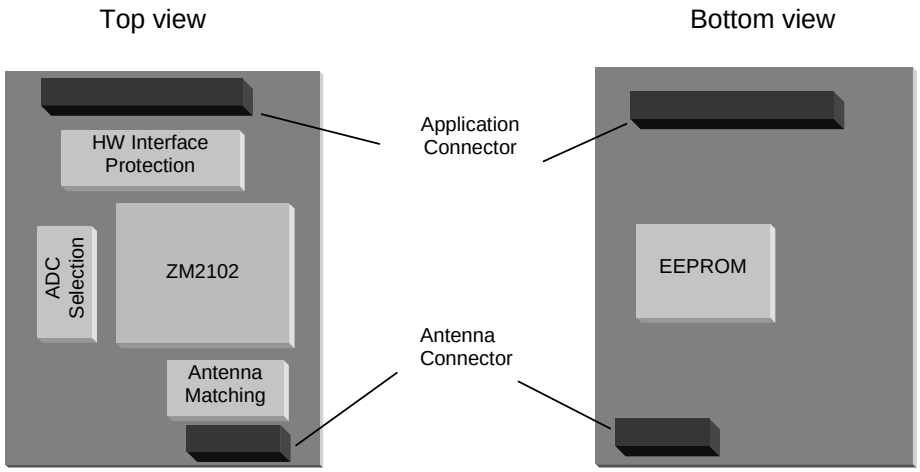

Figure 1 ZM2106C Z-Wave Module

2.1 HW Specifications

2.1.1 Application Connector Specification

The Application Connector (J1 Figure 5) interfacing the ZM2106C Z-Wave Module with the Application Module is a 2x8 2mm. pitch pin row. The Application Connector layout is shown in Table 2.

Pin No.	Pin Name	Pin Name	Pin No.
1	GND	+3.3V	2
3	TRIAC (P0.1/ADC1)	SCK (P1.4)	4
5	ZEROX (P0.0/ADC0)	MOSI (P1.3)	6
7	TXD (P1.0/ADC2)	P1.5	8
9	RXD (P1.1/ADC3)	INT1_N (P1.7)	10
11	PWM (P1.6/INT0)	ADC[1] (ADC0 or ADC2)	12
13	N.C.	MISO (P1.2)	14
15	GND	RESET_N	16

(1) ADC0 or ADC2 is can be selected by resistor R9 or R11. By default none of the two resistors are mounted.

Table 1 ZM2106C Z-Wave Module Application Connector Layout,

Name	Pin#	I/O	Description
+3.3V	2	Power	Module 3.3V supply input.
ADC[3:0]	3, 5, 7, 9, 12	I	Analog-to-Digital Converter input. The ADC is 12/8 bit and can use VCC, an internal or an external voltage as reference. ADC3: input ADC2: input ADC1: input/lower reference ADC0: input/higher reference See section 2.2.1 for further description.
GND	1, 15	Power	Ground signal
INT[1:0]	10, 11	I/O	Interrupt: The signals can be either level or edge trigged. When in power down mode, the ZM2102 Z-Wave Module's MCU can be woken up by asserting the interrupt signal (level trigged only).
P[0.1-0.0], P[1.7-1.0]	3, 4, 5, 6, 7, 8, 9, 10, 11, 14	I/O	In/Out: General purpose I/O signal.
MISO[1]	14	I/O	Master-In-Slave-Out SPI interface: output in slave mode operation and input in master mode operation.
MOSI[1]	6	I/O	Master Out Slave In SPI interface: input in slave mode operation and output in master mode operation.
PWM	11	I/O	Pulse Width Modulator Output: Used for frequency variation applications.
RESET_N	16	I/O	Reset: Active low reset. The ZW0201 Single Chip has an integrated Power-On-Reset and Brown-out detection circuitry.
RXD	9	I/O	UART Receive Data: Supports 9.6kbaud, 38.4kbaud, 115.2kbaud.
SCK[1]	4	I/O	SPI Clock: Can be used as either master SPI clock output or slave SPI clock input.
TRIAC	3	I/O	TRIAC Control: A triac controller is implemented in the ZW0201 Single Chip that can control a triac on the Application Module like light dimmer modules etc.
TXD	7	I/O	UART Transmit Data: Supports 9.6kbaud, 38.4kbaud, 115.2kbaud.
ZEROX	5	I/O	Zero Cross Detection: Used on dimmer modules for detecting 120/240V zero crossing.

1. Please note that the SPI interface (MISO, MOSI and SCK) is not available for the Application SW in some Z-Wave protocol API's, see [3].

Table 2 Application Connector Signal Descriptions

All signals in Table 2 except '+3.3V' and 'GND' are connected through a 1kohm resistor to the corresponding signals on the ZM2102 Z-Wave Module (U1 Figure 5). A detailed description of these signals is given in the ZW0201 Z-Wave Single Chip datasheet [1].

2.2 SPI Interface

The SPI interface is in some SW API's used by the protocol to store routing tables etc in an external EEPROM. When these SW API's are used, the Application SW must *not* use the SPI interface. Table 3 lists the available SW API's and shows in which the SPI can be used by the Application SW.

SW API	External EEPROM used by Protocol API
Slave	No
Routing Slave	No
Enhanced Slave	Yes
Controller	Yes
Static Controller	Yes
Installer	Yes
Bridge	Yes

Table 3 SW API / SPI availability

The SPI interface is used to access the EEPROM and the 'P1.5_N' signal (EP5) is used by the Z-Wave Protocol as EEPROM Chip Select. To assure proper control of the EEPROM chip select signal during reset and power-up, a pull up resistor on the P1.5 should be implemented as shown in Figure 2.

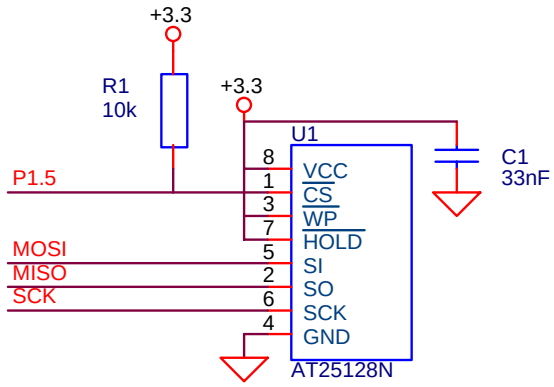

Figure 2 External EEPROM (ZM2120C)

Only a part of the EEPROM is used for protocol data storage. The Application SW can use the remaining memory area using an API call (see [3]). For the EEPROM memory area requirements of the different protocol API's please see [3].

2.2.1 ADC

The ADC pin on the Application Connector can be connected to either ADC0 or ADC2 by mounting R9 or R11 respectively.

2.3 Power

The minimum supply voltage for the ZM2106C Z-Wave Module depends on whether the EEPROM is mounted and what type of EEPROM is mounted. The ZM2106C has been designed to use an Atmel 128kbit SPI based EEPROM, which is available in different supply voltage options as listed in Table 4.

EEPROM	Minimum Supply Voltage
Not Mounted	2.1V
AT25xxxxN-10Sx-2.7	2.7V
AT25xxxxN-10Sx-1-8	2.1V

Table 4 Minimum Supply Voltage

2.4 EMC

As default, a 1000R@100MHz Ferrite Bead is mounted between the Application Connector '+3.3V' and module '+3.3V' (L1 Figure 5) to reduce noise from the Application Circuitry.

As mounting option, a 1000R@100MHz Ferrite Bead can also be mounted in series with the TRIAC signal and the ZEROX signal (L2 and L3) to reduce the noise from noisy triac circuitry. As default, two zero ohm resistors are mounted on L2 and L3.

2.4.1 Antenna

In order to implement the ZM2106C Z-Wave Module in various products, different types of antennas can be implemented to get the best RF performance, i.e. range and reliability. The ZM2106C Z-Wave Module is equipped with a connector footprint (J2) where a wire antenna can directly be fixed.

If another antenna type is chosen, such as a PCB antenna or a whip antenna using a SMA connector, it has to be implemented on the Application Module. In the Application note: Antennas for Short Range Devices [4], a good overview of the different antennas is given as well as their pro's and con's. The connection between the ZM2106C Z-Wave Module and the antenna is done via a 2mm pitch pin row. A ZMxx06 Converter Module (see [5]) developed by Zensys can, during prototype development, be used as an Antenna Module as it contains both a PCB Antenna and a SMA connector, which allow the use of a Whip antenna.

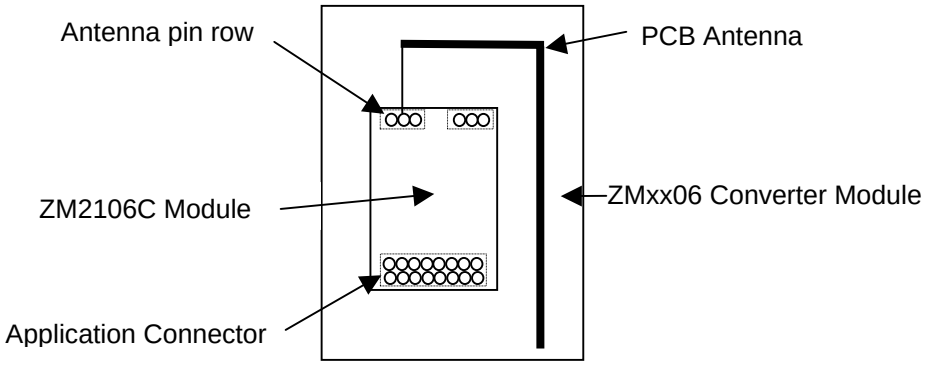

Figure 2: ZM2106C Z-Wave Module connected to PCB antenna via Antenna Module (ZMxx06 Converter Module)

2.5 Z-Wave Module Programming

The ZM2106C Z-Wave Module is programmed using the SPI interface and the RESET_N signal. For programming instruction and recommended programming tool(s) see [2] and [3].

2.6 ZW0201 MCU Specification

MCU	Description
MCU Type	Optimized 8-bit 8051 MCU core.
MCU speed	16 MHz (integrated clock divider, 32MHz external crystal)
Flash	32kbyte. Programmed through the SPI interface.
SRAM	2kbyte
SRAM (CPU)	256byte
MCU Peripherals	12/8-bit ADC, UART, SPI, 3x16 bit timers one with PWM mode, Watch Dog Timer, Wake Up Timer, Power-on Reset/Brown-Out Detector.
Interrupt sources	Internal and external.

Table 5 MCU Specifications

2.7 ZW0201 Single Chip Peripherals

Peripherals	Description
Crystal	System Clock: 32 MHz, ±10ppm@25°C, ±14ppm@-15°C to +85°C, 3ppm aging per 5 years. Alternative: 32 MHz, ±8ppm@25°C, ±8ppm@-15°C to +85°C, 3ppm aging per year.
Optional Peripherals	EEPROM

Table 6 MCU external peripherals

2.8 RF Specification

RF	Description
RF Data rate	9.6 kbps
RF frequency (center frequency)	US: 908.42 MHz EU: 868.42 MHz
Modulation	Frequency Shift Keying (FSK)
Frequency deviation	Center frequency ± 25kHz
Signal coding	Manchester Encoded
RF filter	SAW Filter US: Center frequency = 908MHz, BW = 20MHz EU: Center frequency = 868MHz, BW = 20MHz
Typical RF receiver sensitivity	-101dBm (including SAW filter)
ZW0201 RF Output Power (transceiver output)	-20dBm to +3dBm
RF Input/Output Impedance	50ohm @ respective EU/US frequencies
Range (typical)	Indoor >30 meters line of sight, in unobstructed environment. Outdoor > 60 meters line of sight
RF regulatory	US: FCC Part 15 EU: R&TTE Directive 1999/5/EC, EN 300 220-3/2000

Table 7 RF Specifications

2.9 Electrical Specification

The “Absolute Maximum Ratings” specifies the conditions in which the ZM2106C Module is guaranteed not to be damaged but correct operations are not guaranteed. Exceeding the “Absolute Maximum Ratings” may destroy the ZM2106C Module. See “DC Characteristics” for guaranteed operation limits.

2.9.1 Absolute Maximum Ratings

Electrical	Value
Operating Temperature	-15°C to +85°C
Storage Temperature	-40°C to +85°C
Voltage on input pins	-0.3V to VCC+0.3V (5V max)
Minimum Operating Voltage (VCC)	-0.3V
Maximum Operating Voltage (VCC)	5V

Table 8 Absolute Maximum Ratings

2.9.2 DC Characteristics

The following DC characteristics are for the ZM2106C Z-Wave Module. DC characteristics related to the ZW0102 Single Chip are to be found in [1] and are not listed in this datasheet.

T_A = 25°C, Vcc = 3.3V (unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Units
Vcc	Main Supply voltage		2.1	3.3	3.6	V
R_{AC}	Application Connector Serial Resistor	All signals	0.9	1.0	1.1	KΩ
I_C[2]	Continuous Output Current	One GPIO	-20		20	mA
I_{CTOT}[2]	Total continuous output source/sink current	All GPIO	-100		100	mA
I_{CC}	Transmitting (16MHz system clock)	-5dBm (transceiver output power) +3dBm (transceiver output power)		23 39		mA
	Receiving (16MHz system clock)			21		mA
	Power Down	WUT active (POR enabled[1])		2.5		µA
		WUT disabled (POR enabled[1])		2.5		µA
T_{OP}	Operating Temperature		-15		85	°C
H_{OP}	Operating Relative Humidity		8		80	%

(1) POR cannot be disabled.
(2) If serial 1K ohm resistor is replaced with 0 ohm resistor.

Table 9 DC Characteristics

2.10 Physical Specification

Physical	Description
Dimension (H x W x D)	8 mm x 21 mm x 30 mm
Shielding	Four indentations on the side of the PCB

Table 10 Physical Specifications

The Application Connector is a standard 2mm pitch 2x8 pin-row. When implementing the ZM2106C Z-Wave Module in a product, together with an Application Module, a 2mm pitch 1x3 pin-row (J3 Figure 3) can be used for mechanical stability. Another 2mm pitch 1x3 pin row (J2 Figure 3) can be used to connect the ZM2106C Z-Wave Module to a PCB antenna or a SMA connector on the Application Module.

2.11 Z-Wave Module Component Placement

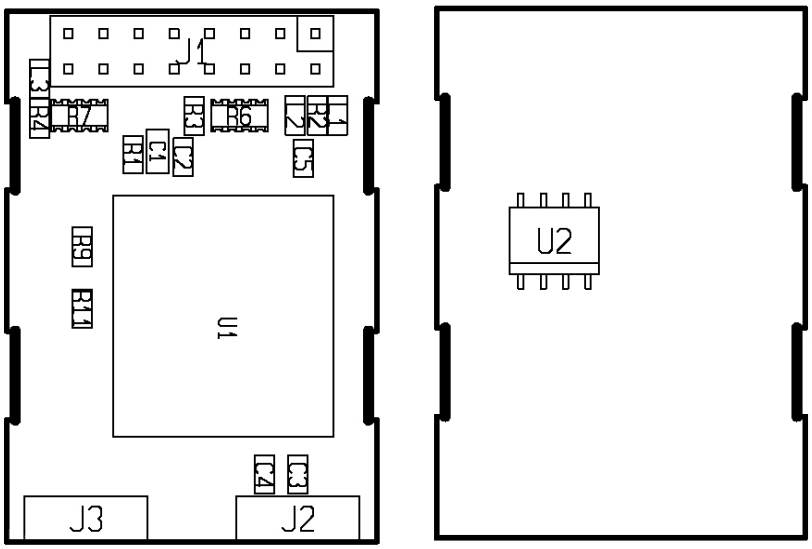

Figure 3 ZM2106C Z-Wave Module Component Placement

2.12 Module Naming:

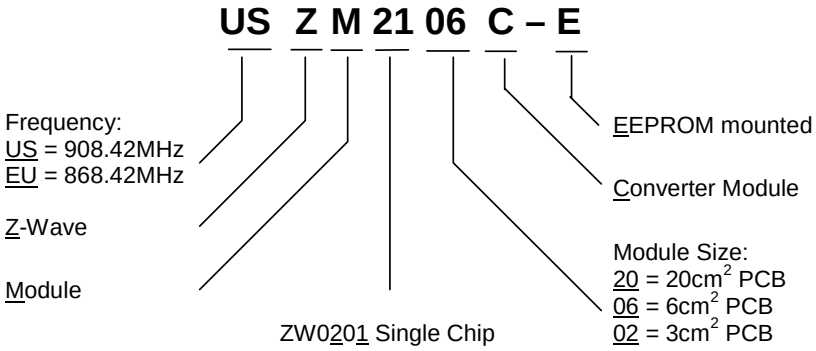

Figure 4 ZW0201 Single Chip based Z-Wave Module Naming

2.13 ZM2106C Blueprint

The ZM2106C Z-Wave Module has been developed by Zensys A/S and has been extensively tested on both digital signal integrity and RF performances. The ZM2106C has been RF/EMC tested and has passed requirements of the FCC part 15 and R&TTE Directives.

All necessary documentation for pre-production of the ZM2106C Z-Wave Module, including schematics, BOMs, PCB documentation, production test documents, etc. is available as a Blueprint package. This enables OEM customers to reduce time to market of their Z-Wave enabled products. For further information on Blueprint content, please contact Zensys A/S.

3 REFERENCES

[1] Datasheet, ZW0201 Z-Wave Single Chip, Doc. P/N: 90350036xx
[2] Appl. Note, Programming the 200-Series Z-Wave Single Chip Flash, Doc. P/N: 9039009xx
[3] Ins, Z-Wave ZW0102/ZW0201 Appl. Prg. Guide, Doc. P/N: 9002060xx
[4] Appl. Note, Antennas for Short Range Devices, Doc. P/N: 9039003xx
[5] Datasheet, ZMxx06 Converter Module, Doc. P/N: 9035019xx

APPENDIX A Schematic

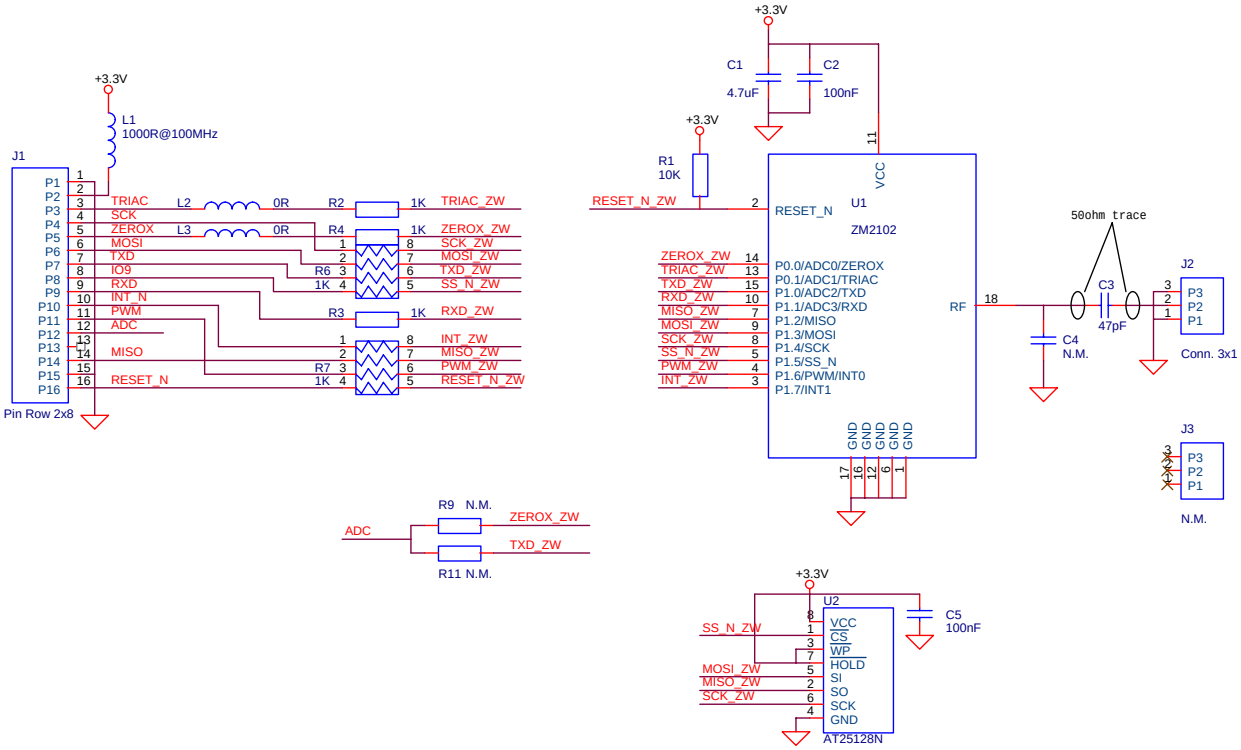

Figure 5 ZM2106C Schematic