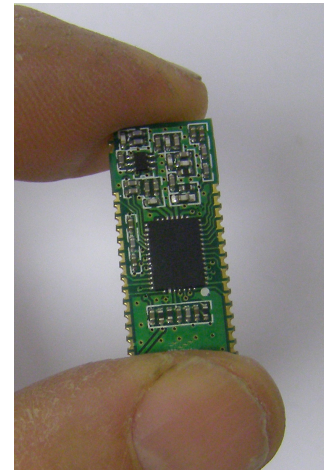


RF Trans-controller

- RF Transceiver combined with
- Onboard 8051 μ controller
- Upto 2km Range
- Operates from 3.6 - 0.9V
- Dimensions: 25 x 11mm



Features

- Ultra Low Power: 0.9 to 3.6 V Operation
- Typical sleep mode current < 0.1 μ A; retains state and RAM contents over full supply range; fast wakeup of < 2 μ s
- Less than 600 nA with RTC running
- Less than 1 μ A with RTC running and radio state retained
- Two built-in brown-out detectors cover sleep and active modes

10-Bit Analog to Digital Converter

- Up to 300 ksp/s
- Up to 18 external inputs
- External pin or internal VREF (no external capacitor required)
- Built-in temperature sensor
- External conversion start input option
- Auto burst mode c/w 16-bit auto averaging accumulator

Dual Comparators

- Programmable hysteresis and response time
- Configurable as interrupt or reset source
- Low current (< 0.5 μ A)

On-Chip Debug

- On-chip debug circuitry facilitates full-speed, non-intrusive in-system debug (No emulator required)
- Provides breakpoints, single stepping
- Inspect/modify memory and registers

High-Speed 8051 μ C Core

- Pipelined instruction architecture; executes 70% of instructions in 1 or 2 system clocks
- Up to 25 MIPS throughput with 25 MHz clock

Memory

- 4352 bytes internal data RAM (256 + 4096)
- 64 kB Flash; In-system programmable in 1024-byte sectors—1024 bytes are reserved in the 64 kB device

Transceiver Features

- Frequency range = 433,470,868,915MHz ISM Band
- Sensitivity = -121 dBm
- FSK, GFSK, and OOK modulation
- Max output power = +20 dBm
- RF power consumption
 - $\Rightarrow$ 18.5mA receive
 - $\Rightarrow$ 18 mA @+1 dBm transmit
 - $\Rightarrow$ 40mA @+13 dBm transmit
 - $\Rightarrow$ 100mA @+20 dBm transmit
- Data rate = 0.123 to 256 kbps
- Auto-frequency calibration (AFC)
- transmit/receive switch control
- Programmable packet handler
- TX and RX 64 byte FIFOs
- Frequency hopping capability
- On-chip crystal tuning

Digital Peripherals

- 19 or 16 port I/O plus 3 GPIO pins; Hardware enhanced UART, SPI, and I2C serial ports available concurrently
- Low power 32-bit SmartClock

Four general purpose 16-bit counter/timers; six channel programmable counter array (PCA)

Clock Sources

- Precision internal oscillators: 24.5 MHz with $\pm 2\%$ accuracy supports UART operation; spread-spectrum mode for reduced EMI; Low power 20 MHz internal oscillator
- External oscillator: Crystal, RC, C, CMOS clock
- SmartClock oscillator: 32.768 kHz crystal or self-oscillate
- Can switch between clock sources on-the-fly; useful in power saving modes and in implementing various power saving modes

I/O Port

- 19 or 20 port I/O (5 V tolerant except for GPIO_2)

Applications

- Remote Control
- Remote Networking
- Remote Switching
- Remote Traffic Lights
- inventory tracking,
- trash and vending monitoring,
- data links and barcode reading .
- lighting and water controls,
- security and access systems,
- gate controls,
- remote activation,
- scoreboards,
- ordering and paging systems

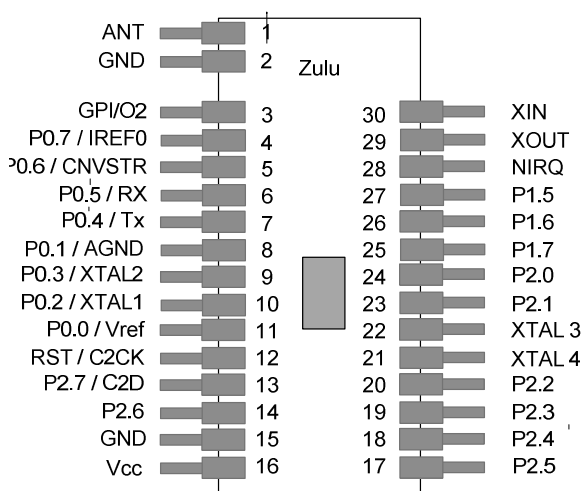
General Description of Operation

The ZULU Transceiver Module provides a highly integrated 'plug and play' Radio solution. Based on the Silicon Labs1013 Chipset, the Zulu Transceiver integrates a high power RF Transmitter (+20dBm) with high sensitivity receiver (-121dBm), and 8051microcontroller, and a DC-DC converter enabling ultra lower battery operation to 0.9V
For detail operation of the device please see Silicon Labs Datasheet.

Ordering Information

Part No	Description
ZULU-433	Zulu Module DIP Package 433MHz
ZULU-433-SO	Zulu Module SMT Package 433MHz
ZULU-868	Zulu Module DIP Package 868MHz
ZULU-868-SO	Zulu Module SMT Package 868MHz
ZULU-915	Zulu Module DIP Package 915MHz
ZULU-915-SO	Zulu Module SMT Package 915MHz

Pinout



Pin Description

Pin No	Name	Direction	Description
1	ANT	A In/Out	Antenna Input / Output 50ohm Impedance
2, 15	GND	In	Connect to Ground
3	GPIO2	D In/Out Or A In/Out	General Purpose I/O controlled by the RF22 peripheral. May be configured thro the RF22 registers to perform various functions including: Clock Output, FIFO status. POR, Wake-up timer, Low Battery Detect, TRSW, Ant Diversity control. Refer to RF22 GPIO Config Registers.
4	P0.7 IREF0	D In/Out or A In A Out	Port 0.7 See RF50 Port I/O section for complete description External Convert Start Input for ADC0. See RF50 ADC0 section for complete description.
5	P0.6 CNVSTR	D In / Out or A In	Port 0.6 See RF50 Port I/O section for complete description External Convert Start Input for ADC0. See ADC0 section. See RF50 ADC0 for complete description.
6	P0.5 RX	D In / Out or A In D In	Port 0.5 See RF50 Port I/O section for complete description UART RX Pin. See RF50 Port I/O section
7	P0.4 TX	D In / Out or A In D Out	Port 0.4 See RF50 Port I/O section for complete description UART TX Pin. See RF50 Port I/O section
8	P0.1 AGND	D In / Out or A In GND	Port 0.1 See RF50 Port I/O section for complete description Optional Analogue GND See RF50 Port I/O section

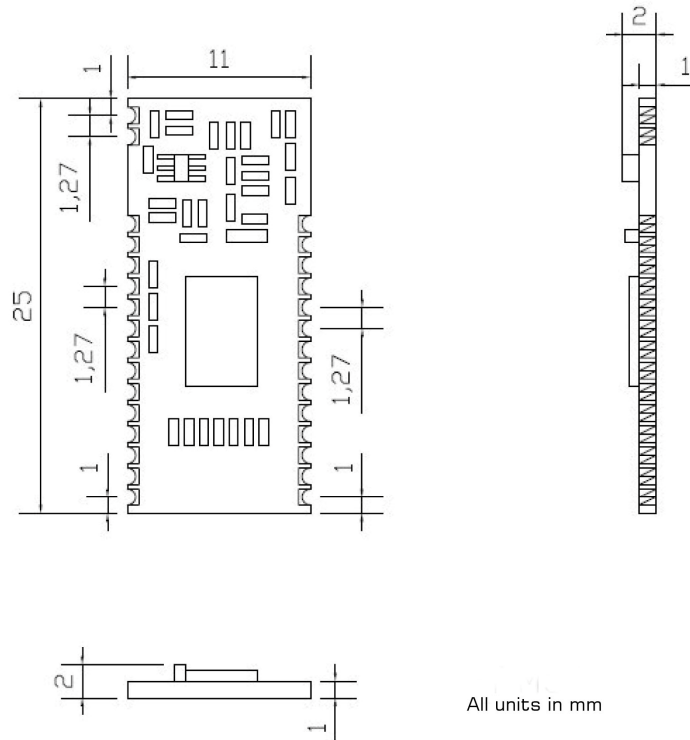
Pin Description (continued)

Pin No	Name	Direction	Description
9	P0.3	D In / Out or A In	Port 0.3 See RF50 Port I/O section for complete description
	XTAL2	A Out	External Clock Output. This pin is the excitation driver for an external crystal or resonator.
		D In	External Clock Input. This pin is the external clock input in external CMOS clock mode.
		A In	External Clock Input. This pin is the external clock input in capacitor or RC oscillator configurations. See RF50 Oscillator section for complete details.
10	P0.2	D In/Out or A In	Port 0.2. See RF50 Port I/O Section for a complete description.
	XTAL1	A In	External Clock Input. This pin is the external oscillator return for a crystal or resonator. See RF50 Oscillator section.
11	P0.0	D In/Out or A In	Port 0.0. See RF50 Port I/O section for a complete description.
	VREF	AI	External VREF Input.
		AO	Internal VREF Output. External VREF decoupling capacitors are recommended. See RF50 Voltage Reference section.
12	RST	D In/Out	Device Reset. Open-drain output of internal POR or VDD monitor. An external source can initiate a system reset by driving this pin low for at least 15 μ s. A 1–5k pull-up to VDD_MCU is recommended. See Reset Sources section for a complete description.
	C2CK		Clock signal for the C2 Debug Interface
13	P2.7	D In/Out	Port 2.7. This pin can only be used as GPIO. The Crossbar cannot route signals to this pin and it cannot be configured as an analog input. See RF50 Port I/O section for a complete description.
	C2D		Bi-directional data signal for the C2 Debug Interface.
14	P2.6	D In / Out or A In	Port 2.6. See RF50 Port I/O section for a complete description.
16	Vcc	In	Positive power supply, 1.8 to 3.6 V.

Pin Description (continued)

Pin No	Name	Direction	Description
17	P2.5	D In / Out or A In	Port 2.5. See RF50 Port I/O section for a complete description.
18	P2.4	D In / Out or A In	Port 2.4. See RF50 Port I/O section for a complete description.
19	P2.3	D In/Out or A In	Port 2.3. See RF50 Port I/O section for a complete description.
20	P2.2	D In/Out or A In	Port 2.2. See RF50 Port I/O section for a complete description.
21	XTAL4	AO	SmaRTClock Oscillator Crystal Output.
22	XTAL3	A in	SmaRTClock Oscillator Crystal Input.
23	P2.1	D In/Out or A In	Port 2.1. See RF50 Port I/O section for a complete description.
24	P2.0	D In/Out or A In	Port 2.0. See RF50 Port I/O section for a complete description.
25	P1.7	D In/Out or A In	Port 1.7. See RF50 Port I/O section for a complete description.
26	P1.6	D In/Out or A In	Port 1.6. See RF50 Port I/O section for a complete description.
27	P1.5	D In/Out or A In	Port 1.5. See RF50 Port I/O section for a complete description.
28	NIRQ	D Out	RF22 peripheral interrupt status pin. Will be set low to indicate a pending RF22 interrupt event. See the RF22 Control Logic Registers for more details. This pin is an open-drain output with a 220k internal pull-up resistor. An external pull-up resistor is recommended.
29	XOUT	A Out	AO RF22 peripheral crystal oscillator output. Connect to an external 30 MHz crystal or leave floating if driving the XIN pin with an external signal source.
30	XIN	A in	RF22 peripheral crystal oscillator input. Connect to an external 30 MHz crystal or to an external source. If using an external clock source with no crystal, dc coupling with a nominal 0.8 VDC level is recommended with a minimum ac amplitude of 700 mVpp.

Mechanical Dimensions



Range

The antenna choice and position directly controls the system range. Keep it clear of other metal in the system. The best position by far, is protruding vertically from the top of the product. This is often not desirable for practical reasons and thus a compromise may be needed. Note that the space around the antenna is as important as the antenna itself. All radio systems are dependant on a radio signal being received through airspace.

The range quoted is the optimal in direct line of sight without obstacles and in good atmospheric conditions.

Range is affected by many things, for example local environmental conditions, atmospheric conditions, interference from other radio transmitters. For evaluating the local environment please see our RF Meter (DS006)

In very worse case applications the range quoted may be reduced below 30% of the optimal range stated.

Recommended Miniature Antenna 868MHz

The BEAD Antenna provides a Miniature PCB mounting solution where a high performance is required from a small space .

Available as straight or 90 degree mount this antenna is a general purpose omni-directional. Please see Datasheet ANT-BEAD-868



Electrical Characteristics: Absolute Maximums:

Parameter	Min	Max	Units
Supply Voltage	-0.3	3.6	V
Voltage on any Digital Input	-0.3	V _{cc} +0.3	V
Voltage on any Analogue Input	-0.3	V _{cc} +0.3	V
Max Input power (thro Antenna)		+10	dBm
Storage Temperature	-55	+125	°C
Soldering Temperature (10seconds)		+260	°C

Recommended Working Specifications DC Characteristics:

Parameter	Notes	Min	Typical	Max	Units
Supply Voltage		2.2		3.6	V
Operating Temperature		-40		+85	°C
Zulu Tx Supply Current: When Transmitting	Tx P _{out} = +20dBm Tx P _{out} = +13dBm Tx P _{out} = +1dBm		100 40 18		mA
Zulu Rx Supply Current: When Receiving			18.5		mA
Standby Current	Low Power Digital Regulator ON (Register values retained) and Main Digital Regulator, and RC Oscillator OFF		450	800	nA
Sleep Current	Sleep current RC Oscillator and Low Power Digital Regulator ON (Register values retained) and Main Digital Regulator OFF		1		uA

Transmitter AC Characteristics

Parameter	Notes	Min	Typical	Max	Units
TX Operating Frequency	433 Band	413	433	453	MHz
	868 Band	848	868	888	
	915 Band	895	915	935	
FSK Raw RF Data Rate		0.123		256	Kbps
OOK Raw RF Data Rate		0.123		40	Kbps
Modulation Deviation	433.470MHz	+/-0.625		+/-320	KHz
	868, 915MHz	+/-0.625		+/-160	
Modulation Deviation Resolution			0.625		KHz
Output Power Range		+1		+20	dBm
Tx RF Output Steps	Controlled by Txpow		3		dBm

Receiver AC Characteristics

Parameter	Notes	Min	Typical	Max	Units
Rx Operating Frequency	433 Band	413	433	453	MHz
	868 Band	848	868	888	
	915 Band	895	915	935	
Zulu Rx Sensitivity	(BER < 0.1%) (2 kbps, GFSK, BT = 0.5, f = 5 kHz)3		-121		dBm
	(BER < 0.1%) (40 kbps, GFSK, BT = 0.5, f = 20 kHz)3		-108		dBm
	(BER < 0.1%) (125 kbps, GFSK, BT = 0.5, f = 62.5 kHz)		-101		dBm
	(BER < 0.1%) (4.8 kbps, 350 kHz BW, OOK)3		-110		dBm
	(BER<0.1%)(1.2Kbps, FD=35KHz,BW=105KHz,		-116		dBm
Rx Ch Bandwidth		2.6		620	KHz
RSSI Resolution			+/-0.5		dB
RSSI Range		-120		20	dB

Reader Response

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