REYAX
TECHNOLOGY CORPORATION, LTD

01-JAN-2022 56312E39

RYLR993

868/915MHz LoRaWAN® Transceiver Module

Helium Compatible

Datasheet





13mm*13mm*2.2mm

Represented by:

first FC components

FIRST Components s.r.l.
www.first-components.com
sales@first-components.com
+39 0332 1888005

PRODUCT DESCRIPTION

The RYLR993 868/915MHz LoRaWAN® Transceiver Module feature the LoRa long range modem that provides ultra-long range spread spectrum communication and high interference immunity whilst minimising current consumption.

FEATURES

- Helium Compatible.
- Industrial LoRa® SOC Engine.
- Customized firmware design service is available.
- AT Command over UART interface
- High sensitivity.
- Temperature sensor.
- Low power consumption.
- AES128 CCM Data encryption
- LoRaWAN® class A, B & C support
- LoRaWAN® and LoRa® Proprietary selection.
- Support bands : US915, EU868, AS923, IN865, KR920, RU864
- Support REYAX RYLR998 proprietary mode

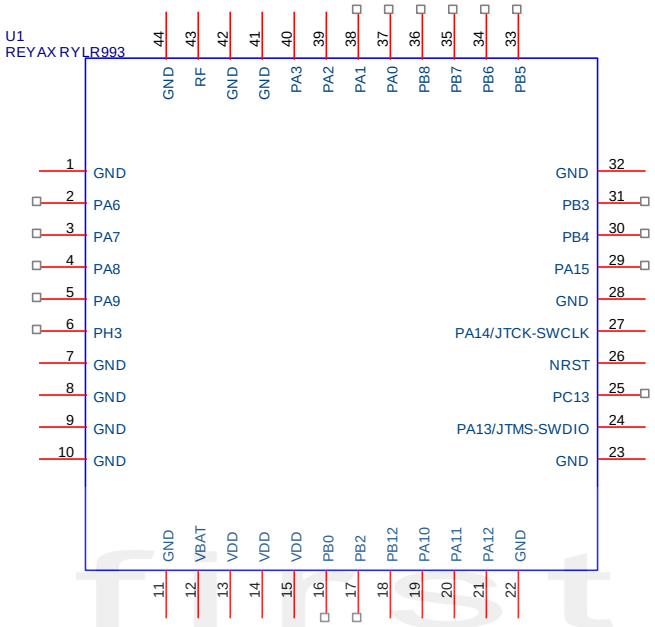
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APPLICATIONS

- IoT Applications
- Mobile Equipment
- Home Security
- Industrial Monitoring and Control Equipment
- Car Alarm

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PIN DESCRIPTION



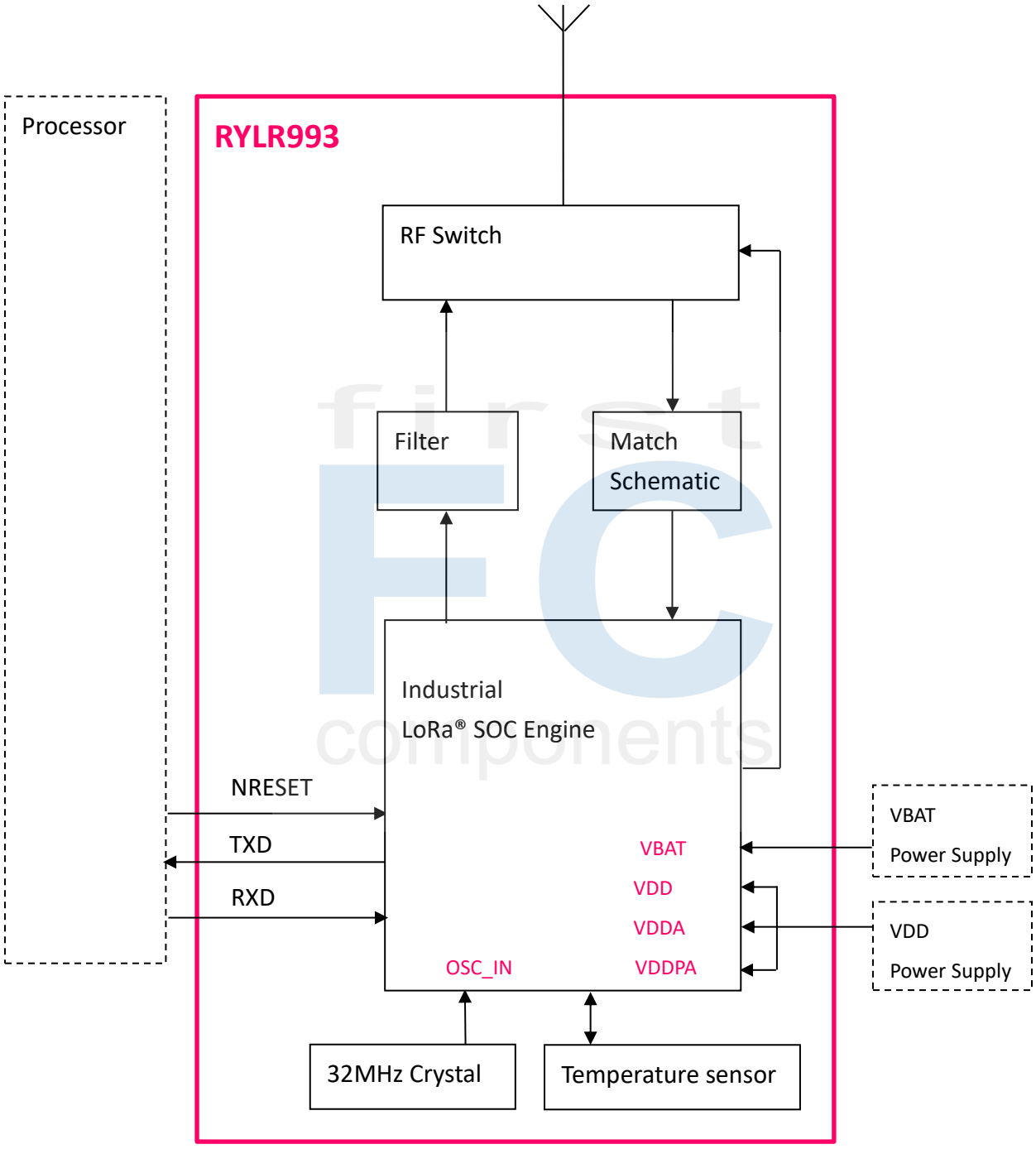
Pin	Name	I/O	Condition
1	GND	-	Ground
2	PA6	I/O	Not Connected, Reserved for future applications
3	PA7	I/O	Not Connected, Reserved for future applications
4	PA8	I/O	Not Connected, Reserved for future applications
5	PA9	I/O	Not Connected, Reserved for future applications
6	PH3	I	Add a 10KΩ resistor between GND and PH3.
7	GND	-	Ground
8	GND	-	Ground
9	GND	-	Ground
10	GND	-	Ground
11	GND	-	Ground
12	VBAT	I	The RTC and the backup registers power supply
13	VDD	I	VDD, VDDA, VDDPA Power supply
14	VDD	I	VDD, VDDA, VDDPA Power supply
15	VDD	I	VDD, VDDA, VDDPA Power supply
16	PB0	I/O	Not Connected, Reserved for future applications
17	PB2	I/O	Not Connected, Reserved for future applications

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18	PB12	I	L=LoRaWAN, H=LoRa Proprietary
19	PA10	O	RF_RX_ACTIVE Indicator, When data is received, This pin will output high for 500 ms.
20	PA11	O	RF_TX_ACTIVE Indicator, When data is transmitted, This pin will output high for 500 ms.
21	PA12	O	LoRaWAN Link indicator, When the RYLR993 not connect to LoRa gateway, This pin will output Hi 500ms and Low 500ms continuously.
22	GND	-	Ground
23	GND	-	Ground
24	PA13/JTMS-SWDIO	I/O	Not Connected, Reserved for future applications
25	PC13	I/O	Not Connected, Reserved for future applications
26	NRST	I	Low reset trigger input
27	PA14/JTCK-SWCLK	I/O	Not Connected, Reserved for future applications
28	GND	-	Ground
29	PA15	I/O	Not Connected, Reserved for future applications
30	PB4	I/O	Not Connected, Reserved for future applications
31	PB3	I/O	Not Connected, Reserved for future applications
32	GND	-	Ground
33	PB5	I/O	Not Connected, Reserved for future applications
34	PB6	I/O	Not Connected, Reserved for future applications
35	PB7	I/O	Not Connected, Reserved for future applications
36	PB8	I/O	Not Connected, Reserved for future applications
37	PA0	I/O	Not Connected, Reserved for future applications
38	PA1	I/O	Not Connected, Reserved for future applications
39	PA2/TXD	O	UART Data Output
40	PA3/RXD	I	UART Data Input
41	GND	-	Ground
42	GND	-	Ground
43	RF	I/O	RF Input/Output
44	GND	-	Ground

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BLOCK DIAGRAM



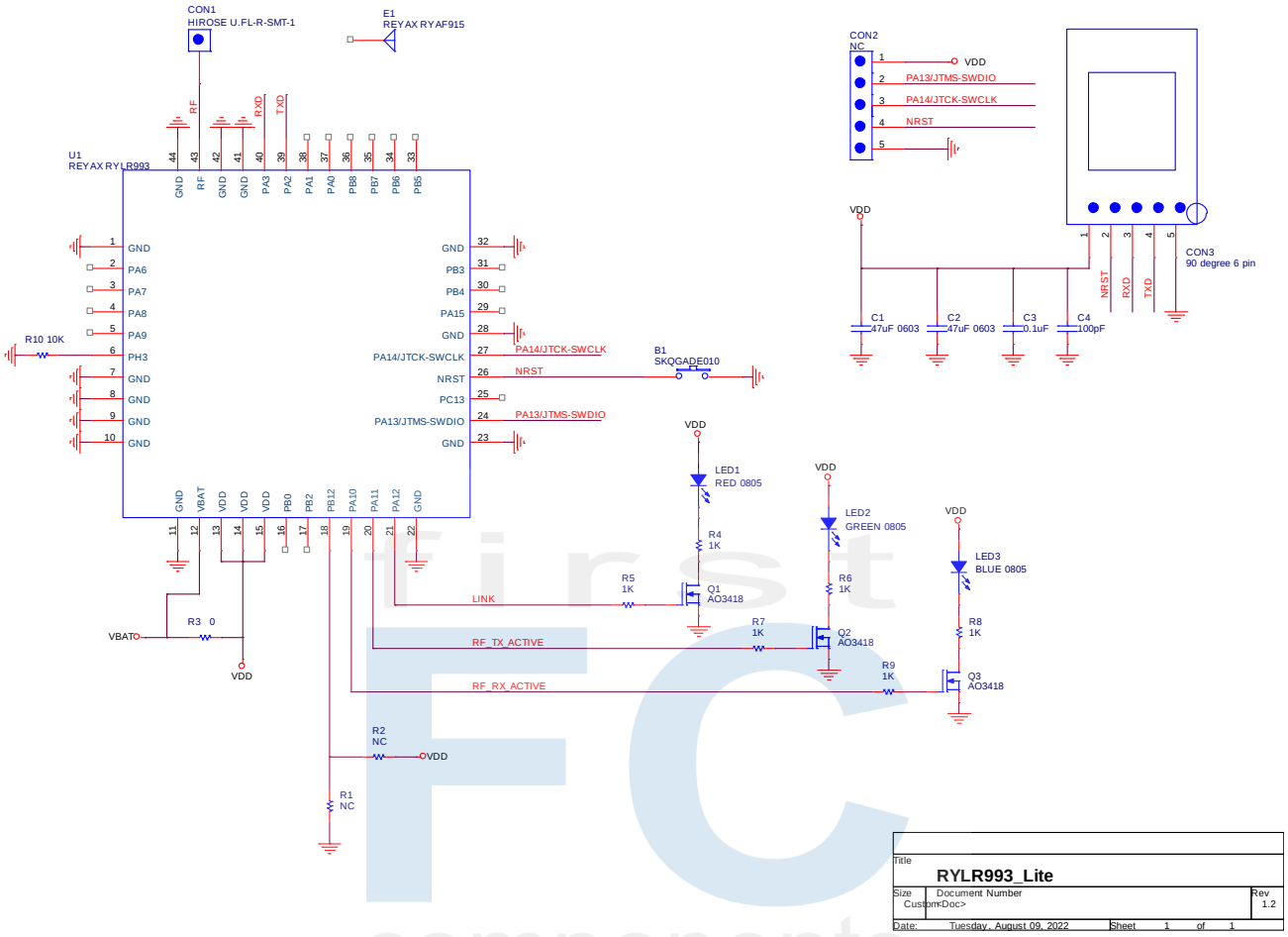
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SPECIFICATION

Item	Min.	Typical	Max.	Unit	Condition
VDD Power Supply	1.8	3.3	3.6	V	
VBAT Power Supply	1.55	3.3	3.6	V	
Frequency Accuracy		±5		ppm	at 25℃ ±3℃
RF Output Power Range	-4	20	22	dBm	
RF Harmonic			-36	dBm	
RF sensitivity	-148			dBm	
RF Input Level			10	dBm	
Filter insertion loss	1	2	3	dB	
Frequency Range	820	868/915	960	MHz	
Transmit Current		140		mA	RFOP = +22 dBm
Class A Current		5		uA	
Class B & C Current		5		mA	
Baud rate		9600		bps	8, N, 1
Temperature sensor Accuracy		2		℃	
Digital input level high	0.8		VDD	V	VIH
Digital input level low			0.2	V	VIL
Digital output level high	0.9			V	VOH Imax = 1 mA
Digital output level low			0.1	V	VOL Imax = -1 mA
Operating Temperature	-40	25	+85	˚C	
Dimensions					13mm*13mm*2.2mm
Weight		1		g	

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APPLICATION SCHEMATIC



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REFLOW SOLDERING

Consider the "IPC-7530 Guidelines for temperature profiling for mass soldering (reflow and wave) processes, published 2001.

Preheat phase

Initial heating of component leads and balls. Residual humidity will be dried out. Please note that this preheat phase will not replace prior baking procedures.

- Temperature rise rate: max. 3 °C/s If the temperature rise is too rapid in the preheat phase it may cause excessive slumping.
- Time: 60 - 120 s If the preheat is insufficient, rather large solder balls tend to be generated. Conversely, if performed excessively, fine balls and large balls will be generated in clusters.
- End Temperature: 150 - 200 °C If the temperature is too low, non-melting tends to be caused in areas containing large heat capacity.

Heating/ Reflow phase

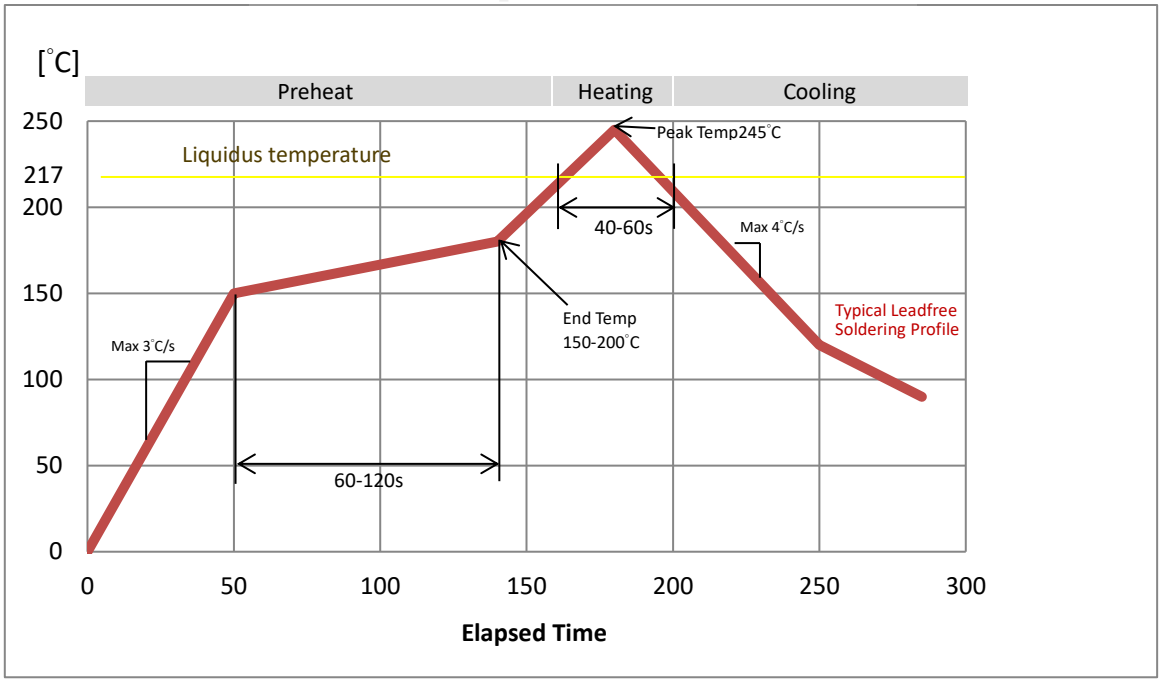
The temperature rises above the liquidus temperature of 217°C. Avoid a sudden rise in temperature as the slump of the paste could become worse.

- Limit time above 217 °C liquidus temperature: 40 - 60 s
- Peak reflow temperature: 245 °C

Cooling phase

A controlled cooling avoids negative metallurgical effects (solder becomes more brittle) of the solder and possible mechanical tensions in the products. Controlled cooling helps to achieve bright solder fillets with a good shape and low contact angle.

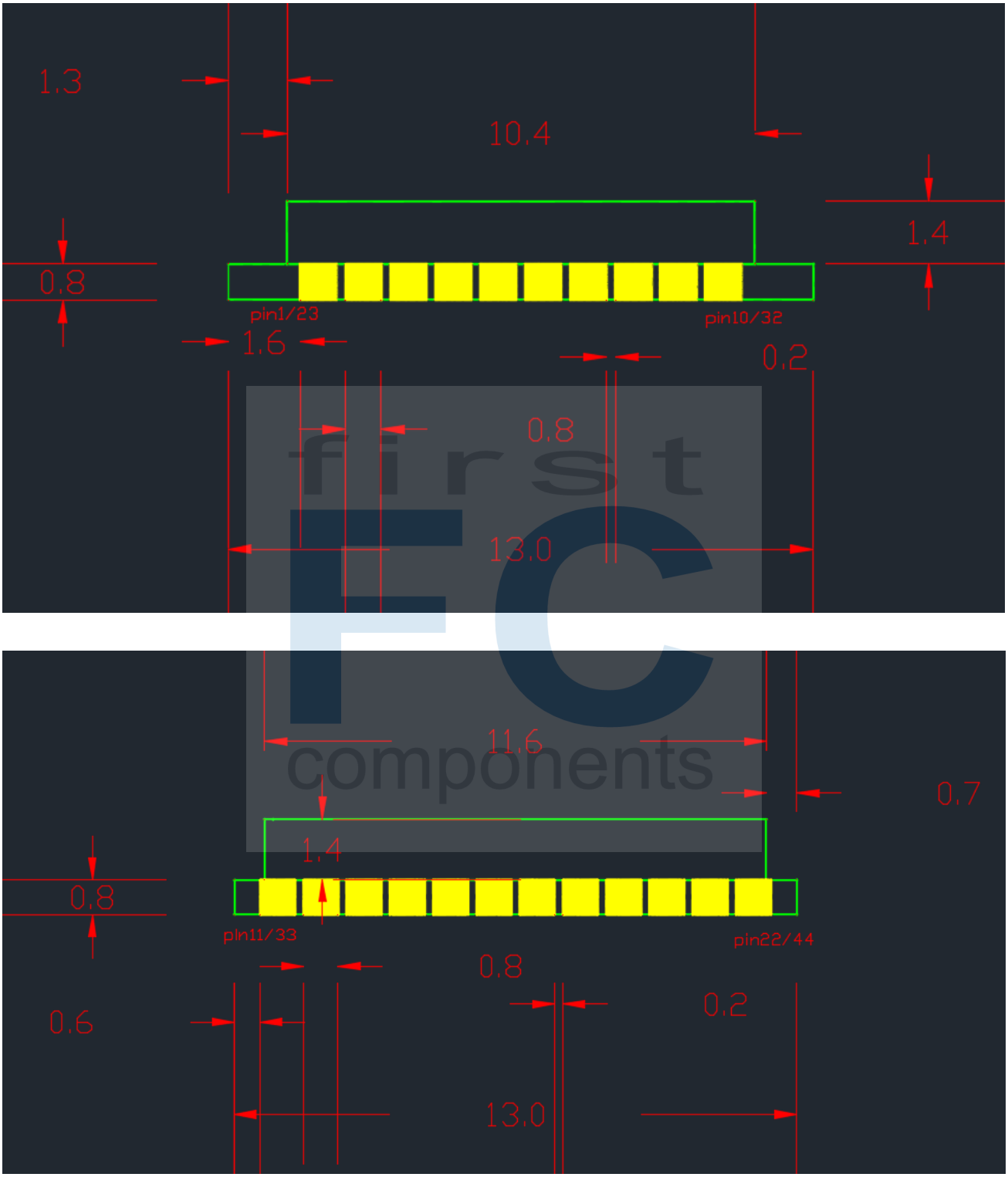
- Temperature fall rate: max 4 °C/s To avoid falling off, the REYAX module should be placed on the topside of the motherboard during soldering.



Recommended soldering profile

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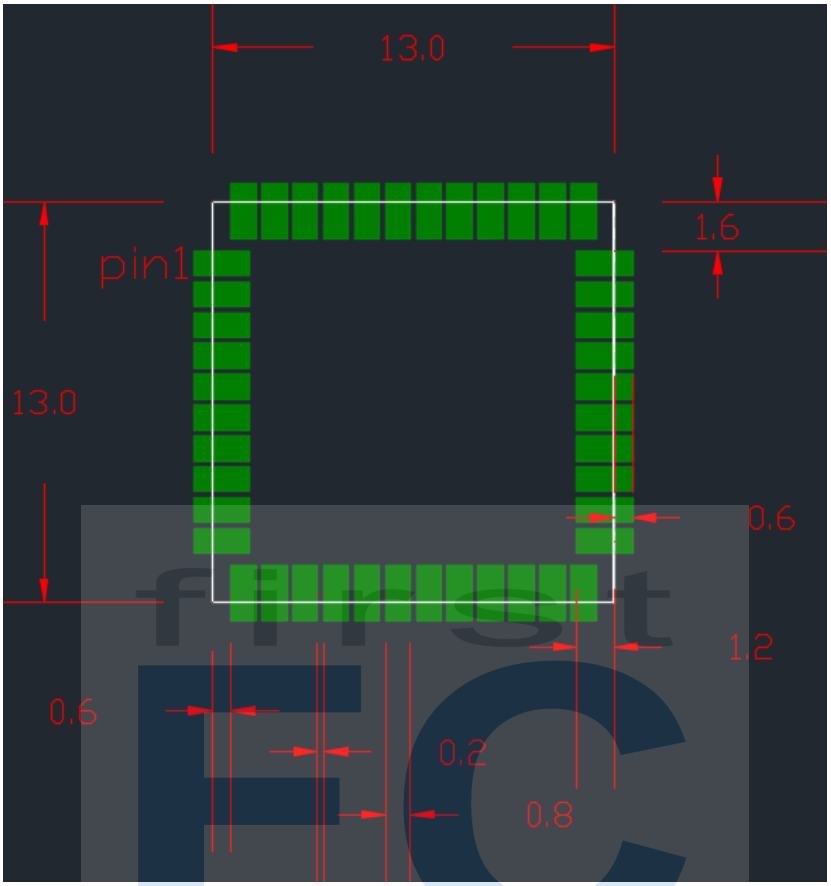
DIMENSIONS



Unit : mm

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LAYOUT FOOTPRINT RECOMMENDATIONS



Unit : mm

ORDER INFORMATION

Ordering No.	Support Bands
RYLR993	US915, EU868, AS923, IN865, KR920, RU864

REYAX
TECHNOLOGY CORPORATION, LTD

E-mail : sales@reyax.com
Website : **http://reyax.com**

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