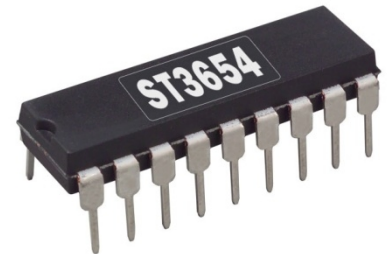


ST3654 – Serial Interface IC for RF Transceiver based on CC1100/CC2500

ST3654 Serial Interface IC supports any RF based modules/transceiver which is based on Texas Instrument's Chipcon ICs like CC1100/CC1101(433 Mhz) and CC2500(2.4 Ghz). It provides a simple UART interface for transmission and reception of serial data at various baud rates. It can be used for applications that need two way wireless data transmission. The communication protocol is self controlled and completely transparent to user interface. The IC can be embedded to your current design so that wireless communication can be set up easily.

ST3654 replaces our earlier chip ST1197 with similar functionality but different IC package.



Features

- Automatic switching between TX and RX mode with LED indication
- Adjustable baud rate setting of 9600, 4800, 38400 and 19200
- Frequency Channel can be set to operating multiple pairs in same area
- FSK technology, half duplex mode, robust interference
- Protocol translation is self controlled, easy to use
- High sensitivity, optimized transmission range.
- Standard UART interface, TTL(3-5V) logic level with any microcontroller
- Very reliable, small size, easier mounting
- No tuning required, PLL based self tuned
- Error checking(CRC) to prevent corrupted data output at receiver

Application

- Robotics, Sensor Networks, Wireless metering & Weather stations
- Remote control/measurement system, Access control & Identity discrimination
- Data collection, IT home appliance, Smart house products, Security Systems

Specification

Parameter	Value
Working Voltage	3V-5V DC
UART Interface	Adjustable 9600, 4800, 38400, 19200 bps, 8 bit data, no parity, 1 stop bit at 3V level
Supported RF ICs	Chipcon's CC1100/CC1101 and CC2500
Note	ST3654 is a microcontroller programmed by us to work as per details in this datasheet



Interfacing with RF Transceiver – 2.4 GHz, CC2500 based

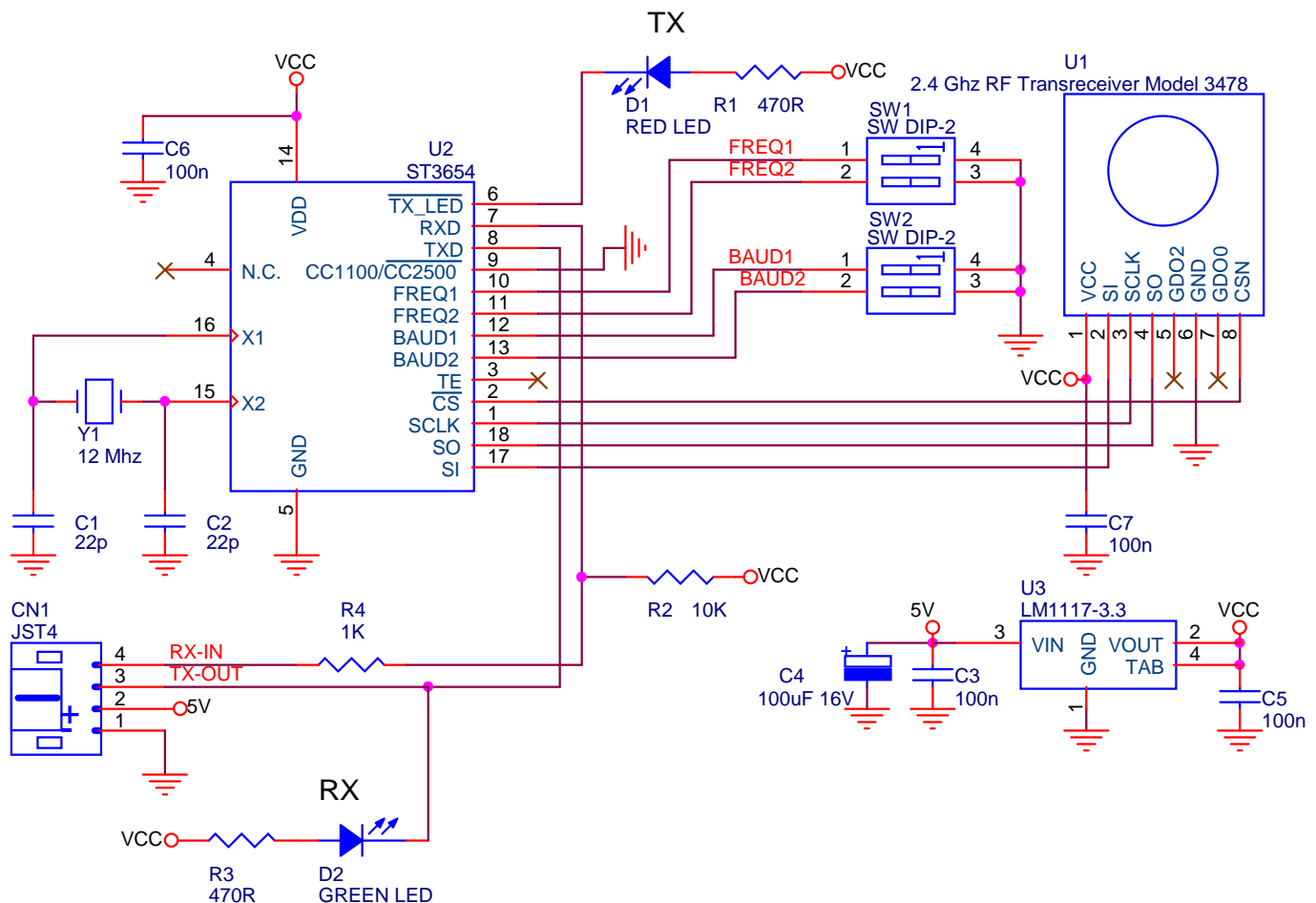


RF Transceiver - 2.4 GHz – 30 mts Range Model 3478, Antenna Onboard
 Products Page: <http://www.sunrom.com/p-797.html>



RF Transceiver - 2.4 GHz – 100 mts Range Model 3521, External Antenna
 Products Page: <http://www.sunrom.com/p-849.html>

RF Module and ST3654 are working at 3V level so a 3V regulator is required as shown. Operating RF module at 5V will permanently damage it. The UART interface can be interfaced with either 3V or 5V logic level circuits since it has a 1K resistor(R8) in series to RXD which will drop down the 5V level of serial data.



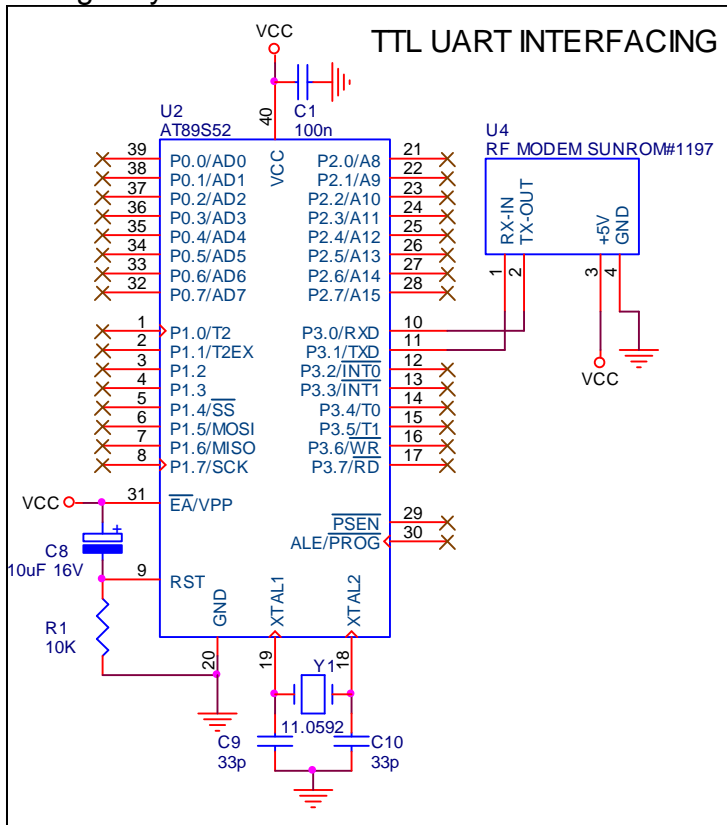
Sunrom Technologies		http://www.sunrom.com	
Title ST3654			
Code 1197			
Date: Wednesday, November 24, 2010		Rev 1	
Sheet 1		of 1	

Note: Pin layout of RF transceiver model 3521 is little different from model 3478 which is shown in schematic. Everything else remains same. Kindly check model 3521's datasheet before wiring your board. For interfacing with CC1100/C1101 based 433 Mhz RF module everything will remain same except the pin#9 CC1100/CC2500 which should be connected to VCC instead of ground.

Interfacing with microcontroller

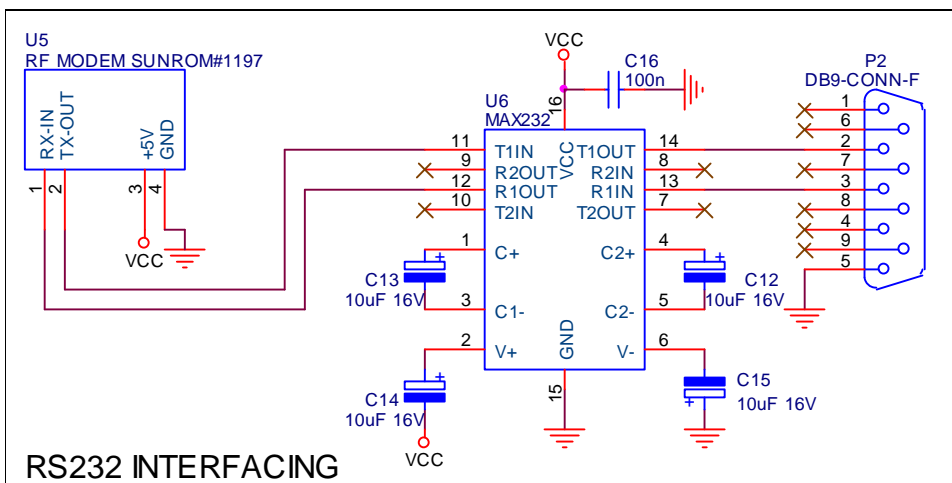
RF modem means a combination of ST3654 & RF transceiver which can be interfaced with simple 4 pins. Two pin for data and two pins for supply.

We will take an example of interfacing with microcontroller AT89S52 having UART at 5V level. Configure your microcontroller to communicate at baud rate set as per switch in RF modem.



Interfacing with RS232

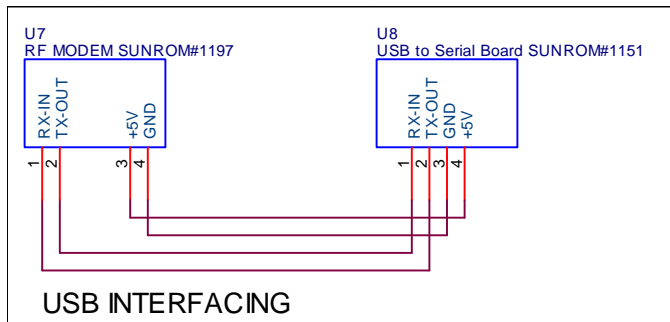
If you wish to interface the module with RS232 level like a PC serial port or any other device you need a level convertor such as MAX232 as shown below.



You can also use our
Max232 Board Model 1104

<http://www.sunrom.com/p-245.html>

Interfacing to USB Port and Powering from USB Port



You can use our
USB to Serial Board
Model 1151



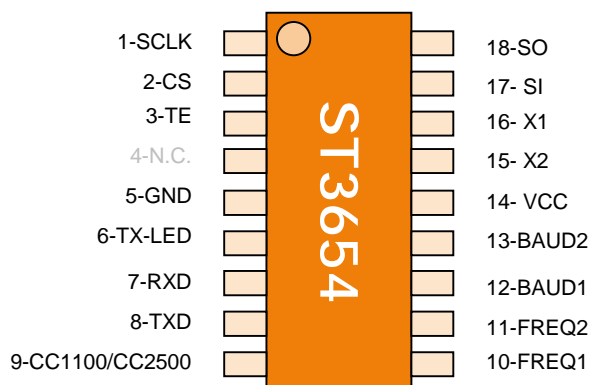
<http://www.sunrom.com/p-244.html>

It will appear as virtual serial port on PC to which you can communicate two ways through any software which can transmit / receive by this serial port like hyperterminal or custom made software.

Pin Details

Pin	Pin	Name	Details
1	SCLK	Serial Clock	Serial Clock pin of RF Module
2	CS	Chip Select	Chip Select pin for RF Module
3	TE	Transmit Enable	This pin goes HIGH during transmit mode. It can be used to enable PA if any on RF module. Pin can be left unconnected if there is no PA pin in RF module
5	GND	Ground	Ground level of power supply.
6	TX-LED	TX Indicator LED	This pin goes LOW during transmit mode. LED can be connected to indicate if module is transmitting.
7	RXD	Receive Input	Input serial data of 3 or 5V logic level, In applications usually connected to TXD pin of microcontrollers working at 5V or 3V. If your MCU is working at 5V and ST3654 is working at 3V then insert a 1K resistor in series to reduce 5V level to 3V.
8	TXD	Transmit Output	Output serial data of 3V or 5V logic level, Usually connected to RXD pin of microcontrollers working at 5V or 3V.
9	CC1100/CC2500	Chip Type	For CC1100/CC1101 RF Module this pin needs to be high For CC2500 RF Module this pin needs to be low
10	FREQ1	Frequency channel Set	See next page for setting details
11	FREQ2	Frequency channel Set	
12	BAUD1	Baud rate Set	See next page for setting details
13	BAUD2	Baud rate Set	
14	VCC	Power Supply Input	Regulated 3V-5V supply input. If your RF module works on 3V then use 3V supply.
15, 16	X1-X2	Crystal Pins	Connect a 12 Mhz crystal with 22pF load capacitors
17	SI	Serial In	Serial In pin of RF Module
18	SO	Serial Out	Serial Out pin of RF Module

Pin Details – 18 pin DIP package



Baud Rate Setting

BAUD1 and BAUD2 pins will be default HIGH if left unconnected. The pin status is read only during power up. Any changes to these pin during operation will have no effect. If you need default baud rate of 9600 bps then you can leave pins unconnected. The pin status is read only during power up. Any changes to these pin during operating will have no effect.

BAUD1	BAUD2	Mode
HIGH	HIGH	9600 bps
LOW	HIGH	4800 bps
HIGH	LOW	38400 bps
LOW	LOW	19200 bps

Frequency Channel Setting

FREQ1 and FREQ2 pins will be default HIGH if left unconnected. The pin status is read only during power up. Any changes to these pin during operating will have no effect.

Setting Frequency Channel can be used to have multiple sets operating at same time but without interfering each other. The pair having same Channel setting will be able to communicate with each other. Frequency channel has to be set when unit is OFF, as the switches are read only during power up. Modifying during operation will have no effect on operation of module. If you need default channel#1 then you can leave the pins unconnected.

FREQ1	FREQ2	Mode
HIGH	HIGH	Channel #1
LOW	HIGH	Channel #2
HIGH	LOW	Channel #3
LOW	LOW	Channel #4

Working

This IC works in half-duplex mode. Means it can either transmit or receive but not both at same time. After each transmission, IC will be switched to receiver mode automatically. The LED for TX and RX indicates whether IC is currently receiving or transmitting data. The data sent is checked for CRC error if any. If chip is transmitting and any data is input to transmit, it will be kept in buffer for next transmission cycle. It has internal 64 bytes of buffer for incoming data.

When you power on the unit, the TX LED will briefly blink indicating that initialization is complete and it has detected Chipcon based tranreceiver RF module. If LED remains continuous on then the problem could be related to connection between IC and RF Module or RF module is faulty. The problem can also be a faulty crystal of the ST3654.

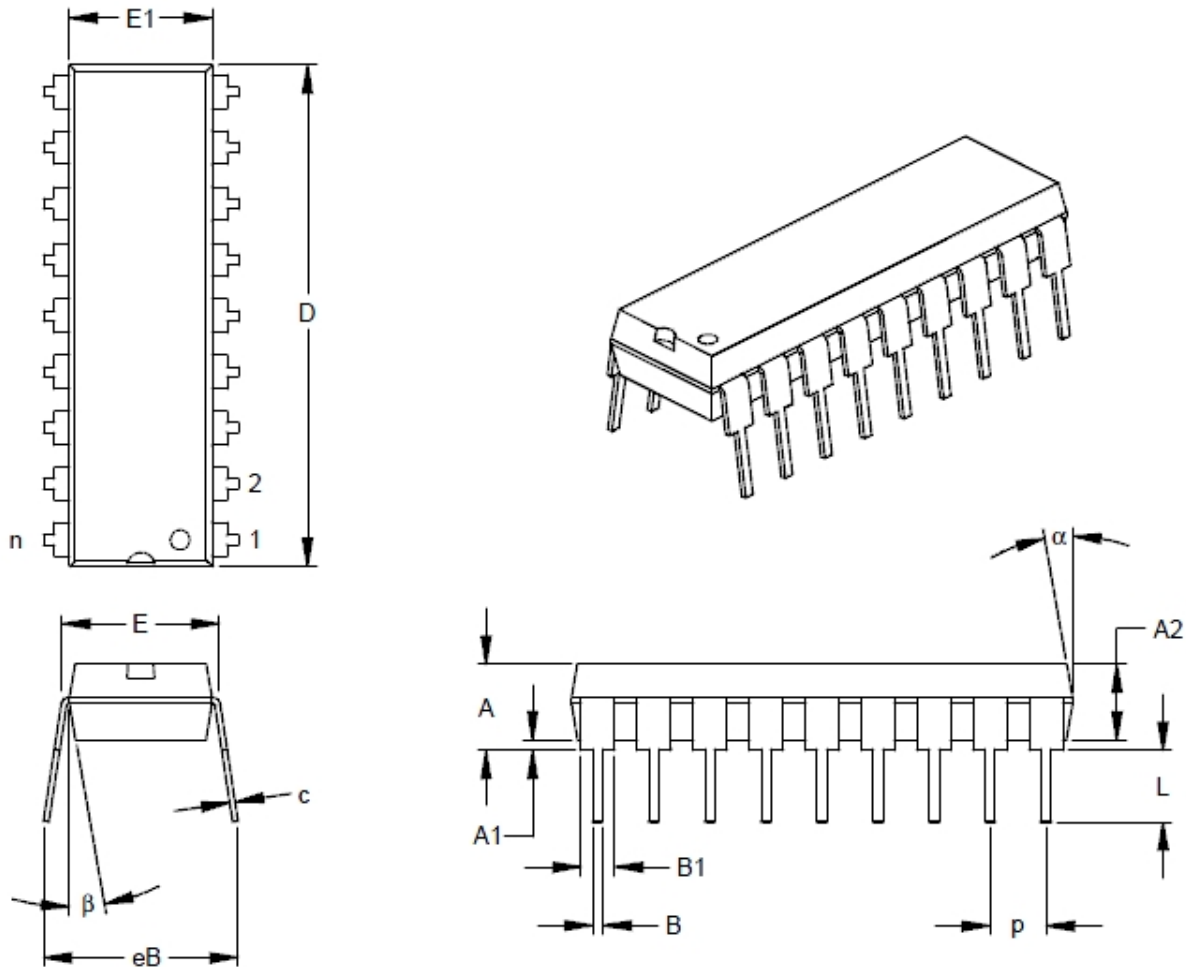
The RX LED is put directly on TX OUT pin to indicate that data is received and being output.

All chipcon ICs, CC1100/CC1101 and CC2500 operating on 3V so the ST3654 also has to be operating on 3V due to communication required at this level.

If you are interested in knowing RF related working details you can search for CC1100 and CC2500 in google. This will lead you to texas instrument site with details of the ICs and lots of application notes.

Package Information – 18 pin DIP

Dimensions - 18-lead (0.300"/7.62 mm Wide) Plastic Dual Inline Package (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.890	.898	.905	22.61	22.80	22.99
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	§ eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

§ Significant Characteristic

Related Products



RF Modem, 2.4 Ghz, 30 mts range

Ready to use Transceiver module based on ST3654+RF module 3478

<http://www.sunrom.com/p-874.html>



RF Modem, 2.4 Ghz, 100 mts range

Ready to use Transceiver module based on ST3654+RF module 3521

<http://www.sunrom.com/p-875.html>



USB to Serial TTL Board

If you wish to power and communicate through USB, you can use our model 1151

<http://www.sunrom.com/p-244.html>



MAX232 Board

If you wish to convert the TTL voltage level of serial data to RS232 level to be connected to serial port you can use this board.

<http://www.sunrom.com/p-245.html>



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