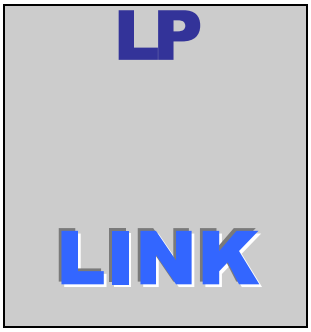

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Chapter 1

Overview

A view into the environment…

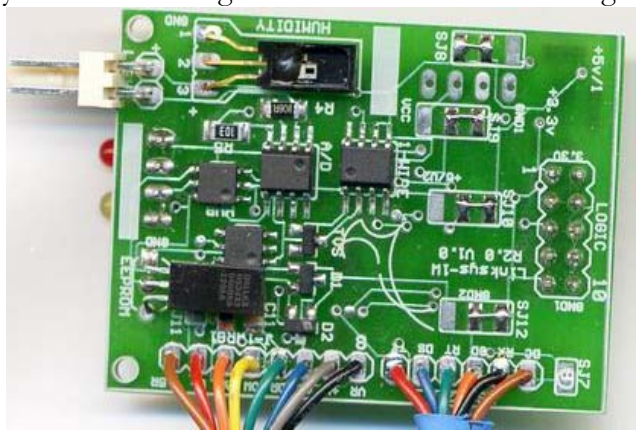
LP-LINSYS-1W Overview

The LP-LINKSYS-1W is designed to allow wireless or wired Ethernet access to 1-Wire networks. It may also include several environmental monitoring functions typically found in separate devices into a single 1-wire compatible unit. These functions are temperature, humidity and light monitoring .

Though designed to be low cost, the adapter is also designed for maximum versatility. Its small physical size is designed for easy mounting in a the original LINKSYS case with minimal airflow impact. It uses a 2x5 header connection to the LINKSYS PCB and is designed to use mini-din connectors to the outside world for the 1-Wire and optional RS232-F console ports. These are attached to the adapter with short lengths of cable. Other connectors may be used if desired, but these were carefully selected to fit in the case with minimal case alterations and drilling needed.

Besides offering basic 1-wire interface abilities to the LINKSYS unit the adapter can have installed the optional 1-wire monitor features. These include the ability to monitor temperature, a RTC, a light sensor and a humidity sensor.

The on board photodiode light radiance sensor interface allows a wide variety of optional sensors to function with this unit. These sensors can be mounted either directly on the board or optionally connected through a short extension cable through a pin header.



Relative humidity can be monitored by the LP-LINKSYS-1W by using the optional high precision Honeywell humidity sensor. This optional sensor is supplied with factory calibration data for optimum performance and software calibration. If desired an additional optional light sensor, the PNA4603H can be used instead of the humidity sensor. This sensor must be externally mounted from the board as its pin outs are different than the humidity sensors..

Now that we have talked in general about the board lets begin the process of how to assemble your unit.

We suggest that before beginning that you read through this instruction manual before beginning. That way you will have a feel for the flow of assembly and can make any adjustments that you may wish to in your particular assembly. Work slowly and carefully.

Chapter 2

The Assembly Environment

General warning!

The LP-LINKSYS-1W unit is built using smt (surface mount) components and is not recommended for the first time kit builder or those not used to smt assembly. When in doubt of your abilities we suggest you purchase an assembled unit instead. Kit versions are sold as "AS-IS" groups of parts and carry no warranty due to the fact that we do not control the environment or techniques used in their assembly. We cannot help you with assembly problems or fix partially assembled units. We can only guarantee functional parts as they leave our factory.

While all this may seem like a lot of warnings, it is meant to let you know that kit building of smt components is not for everyone. It can be done though by those willing to invest in learning the proper techniques and have practiced doing smt assembly. These are not good "learning" boards, although they are not at all hard to do once you have a little skill. That said, lets look at some of the suggested tools you will need.

On Tools and Procedures

Suggested Assembly Tools

- A Non-conductive assembly surface
- Grounding Strap
- Non-conductive tweezers (ESD safe), and placement tools
- A strong magnifier (x10 or better) can make dealing with smt components much easier
- Good strong even lighting of the workspace
- A Good temperature controlled soldering iron
- Solder and a Flux Pen
- Solder Wick (for removing excess solder)
- General PCB cleaner (99% Isopropyl Alcohol is a good choice)
- Flux Remover (For general flux removal and final board cleaning)
- Optional Conformal Coating Spray

For the connivance of the infrequent builder we have pulled together a couple pictures of some low cost versions of these components. They are easily available at most electronic specialty stores. You can also purchase them from http://www.mouser.com/ and Circuit specialist

Static Wrist Strap

An example of a very low cost Light/Magnifier system

An example of low cost head magnifier

Typical parts placement tools

Flux Remover to remove solder flux and 99.9% Isopropyl Alcohol for general PCB cleaning

Conformal Coating to protect the finished board

Example of a low cost (<$90) Hot air gun for smt work

An example low cost hot air re-work station ($140+)

A low cost temperature controlled Soldering Station

Chapter

3

General Soldering Tips

Overview of Soldering SMT

Solder Joints

When designing the boards the decision was made to try to use 1206 size smt components as much as possible. While smaller smt are easily available and sometime slightly cheaper it was decided that the 1206 size components would be the easiest for most experienced builders to handle and the reduction in size offered by other size would not make that much of difference to the over-all board size to be worth it.

Rules for soldering SMT Parts

Most of the rules applicable to soldering through hole parts apply to SMT parts. Good soldering technique comes with practice, but these tips will guide you in the right direction.

1). Keep the circuit board clean. We use 99.8% Isopropyl for removing light oils and general board cleaning (note this is **not** the 91% version found in most local supermarkets).

2.) Use the right soldering iron for the job. A good temperature controlled soldering station will do (we like to use a small tip for smt work), or if you prefer there are some low cost hot-air soldering irons around instead when using solder paste techniques. The use of special SMT tips or a SMT hot gas re-flow station, while nice, is not needed for these boards. They can be assembled using a low cost solder station or a low cost hot air unit.

3.) Use L.M.P (Low Melting Point Solder) is handy. LMP solder is very similar to 60/40 solder, except that it contains 2% Silver. This Silver "loading" has two effects. It lowers the melting point and it reduces the rate at which component metalization leeches into the solder itself.

SMT resistors, capacitors, ferrite beads, etc. all make there electrical connections via metalized pads. The metal used is often Nickel or a related alloy. One problem with soldering the same joint several times is that each time the joint is heated; some of the Nickel leaves the component and joins the solder. This is called "leeching". Leeching is

only a problem when the solder joint of a metalized component is heated several times. Leeching occurs at a faster rate with standard 60/40 solder than what it does with LMP solder. The downside of LMP solder is that it is about 3 times the price of 60/40 solder and harder to obtain. A good 60/40 fine pitch solder used with plenty of flux works well though

4.) Use solder flux! One of the biggest problems with soldering SMT parts is that the amount of flux within the solder core is not sufficient for the joint. Professional SMT manufacturers use "solder cream" and controlled temperature ovens. However, soldering iron temperatures are far less controlled and often the flux has evaporated before the joint has solidified, leading to dry joint, which is often dull in complexion.

Solder flux has other advantages too. It increases the conduction of heat from the iron tip to joint and increases the surface tensions of the molten solder. This helps to achieve a nice concave joint and minimizes the chance of bridging finely spaced pins.

We find the use of a Flux Pen makes circuit assembly very easy. We always flux the solder pads before placing the part of the pad. The slightly tacky flux helps hold the parts in place while you solder and makes SMT soldering much easier with increased solder joint reliability. It's a must!

5.) Use a good magnifying lamp or other magnification source. SMT parts are generally very small. SMT solder joints are at least four times smaller again. Since it's the solder joint that should concern you most (especially if you want to build something reliable) it is often worth investing in a decent magnification lamp or other strong magnifying source. Inspect your solder joints often.

Most people with reasonable eyesight should be able to solder without magnification and check the joint under magnification later. For those who have relatively poor eyesight, special "jeweler's eyes" that sit on the head can help. Remember, **STRONG** magnification and good lighting go hand in hand. Inspect you work often. We cannot stress this enough!

6.) Use a good pair of ESD (Static safe) tweezers. You will be amazed how much easier SMT soldering becomes. Other placement tools are also handy

How to Solder Small SMT Parts

The following technique should be used for soldering small SMT parts such as resistors, capacitors, inductors, transistors, etc. This is just one of many techniques possible.

1.) Add a small amount of flux to the area and add a small amount of solder to one pad.

2.) Pick up component in tweezers making sure component is horizontal. Alternatively, just move the component until it is close to the final position.

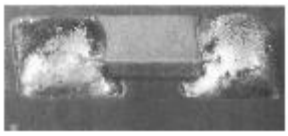
3.) Whilst holding the component with your tweezers, melt the solder on the pad and move the component into position.

4.) Remove your iron but continue holding the component until the solder has solidified. Check to see that the component is sitting flat on the PCB. If not, re-melt solder whilst pushing gently on top of the component with tweezers.

5.) Solder the other side of the component. Re-melt the first solder joint and let solidify.

6.) Check your work under magnification.

The joint should be shiny and concave. If you added too much solder, wick up with some small solder wick and try again. .

1206 - Insufficient Solder	1206 - Adequate Solder	1206 - Excessive solder
		
SOT - Insufficient Solder	SOT - Adequate Solder	SOT - Excessive Solder
		

How to solder SMT Integrated Circuits

IC's require a similar but slightly different technique.

1.) Add flux (use your flux pen) to the pads where the IC is to be soldered.

2.) Add a very small amount of solder to one of the corner pin pads.

3.) Line up the IC with the pads on the PCB. Double-check the IC orientation. Some components take practice to recognize pin 1 on the chip, as they are not well marked. Dallas Semiconductor parts are not very well marked. Look for a notch or a dimple on the chip. It may be hard to see but it is there.

4.) Melt the solder with your iron and move the IC into position with your tweezers. Let the solder solidify. Make sure the IC is flush with the board. Make sure once again that the IC is properly oriented. Better that you undo one joint than many!

5.) Solder the diagonally opposite pin. Check under magnification that all pins line up with there respective pads. Again make sure the part is flush with the board.

6.) Solder the rest of the pins and check work under magnification.

Chapter

4

LP-LINKSYS-1W Assembly

Assembly Part 1

General Instructions

In the following steps we will walk you through the assembly and testing of the LP-LINKSYS-1W adapter. Be sure you read and understand the step before beginning and that you complete each step before moving on to the next. We have also provided you a check off box next to each step to check off as you complete the step.

Depending on which options you have ordered, you may not have all the parts kits used in this instruction manual. We have tried to mark with color each time an optional parts kit is used in a step for ease of identification. If you do not have the kit you can skip that instruction.

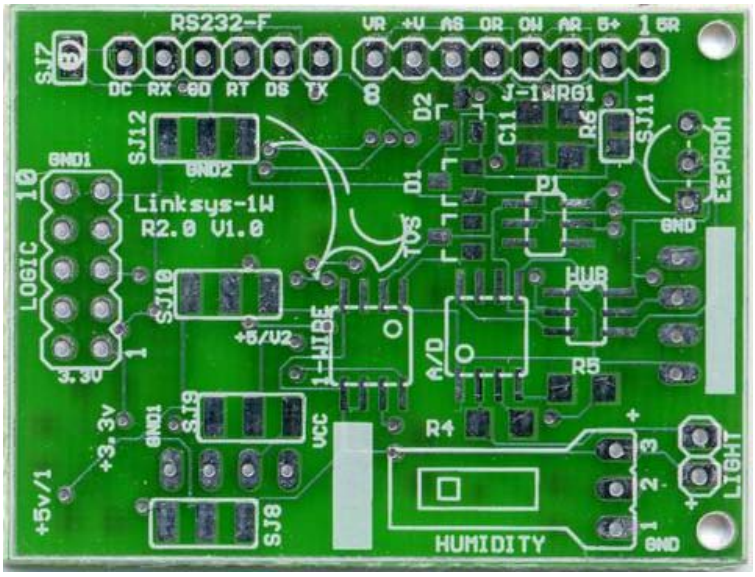


Figure 1 – Front/Top side of LP-LINKSYS-1W PCB

Board assembly preparation

1.) Sand the PCB edges

The **PCB** is in Package #1, the PCB. The PCB's are cut to size by our board house; this leaves a slight amount of extra overhang on all four edges. This is not normally a problem, but for a smoother feel or to fit in some cases you may wish to knock off these rough edges and bring the board back to exact dimensions. Adapters that will be fitted inside a LINKSYS case do not require this step.

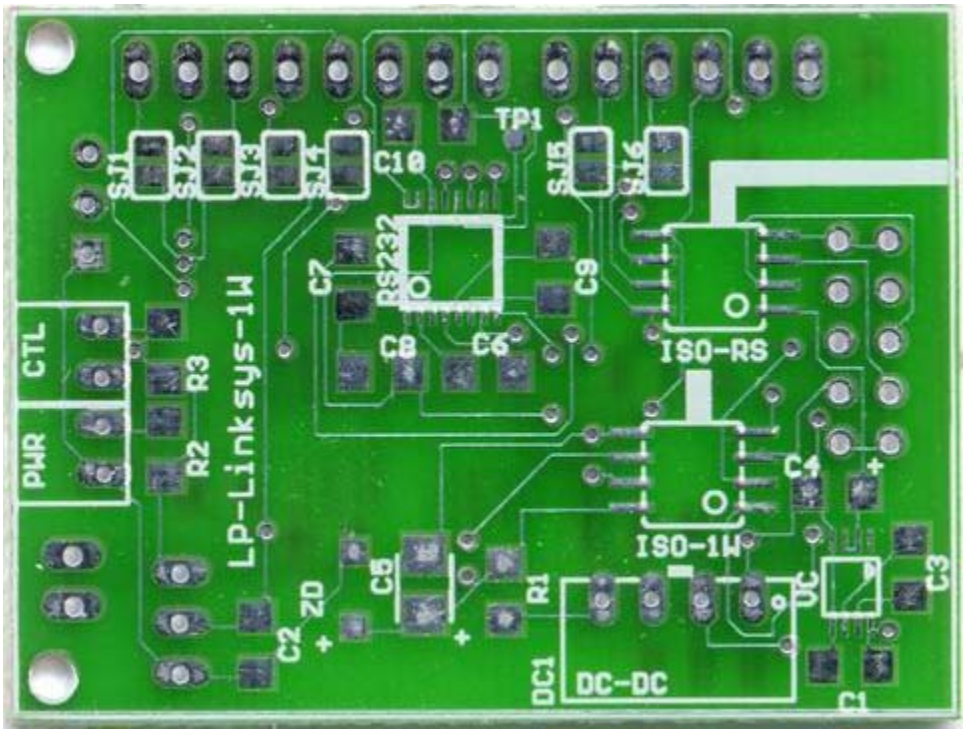


Figure 2 - Back/Bottom Side of LP-LINKSYS-1W PCB

Use medium grit sandpaper on a flat surface and holding the boards vertically remove any excess PCB material. Avoid proper techniques to avoid breathing any of the PCB dust. Check for fit frequently if installing in a small case. Normally it only takes a few passes to square the board up and remove any excess material for a smooth straight edge.

☐ **2.) Clean the printed circuit board**

Clean the board to remove any excess fiberglass and oils left from your hands after you have achieved a perfect fit for your enclosure of choice. Handle the board on the edges from now on. You are now ready to begin actual electrical assembly work.

Assembly Part 2

Parts Placement

Important: While parts placement order is not as tight as many boards it is still useful to place parts in the order given in order to ease soldering of parts. Several parts have extremely small pin pitch and care must be used during assembly to avoid solder bridges. We have assembled boards using nothing but a regular temperature controlled soldering iron with a fine tip (1/64) and also with a low cost hot air iron. Both will work equally well (the assembly techniques are different but the basic procedures are the same). We prefer the hot air approach for when working with fine pitch parts such as found on this board as being slightly quicker for us.

We highly recommend the use of a flux pen when you hand solder for best results. The flux is slightly tacky and will help hold the parts in position while you solder. Be sure to check your joints as you go and fix any bad solder connection before continuing.

The LP-LINKSYS-1W adapter differs from many PCB's in that there are parts that need to be placed on BOTH sides of the PCB. In general the Front./Top side of the PCB holds all the 1-Wire circuitry and the Back/Bottom holds the basic power and optional isolation and RS232-F circuitry. We will start assembly with the Back/Bottom side of the board.

The DC power regulator

We like to start by installing the power regulation circuitry first. That way you can test the voltage supply circuitry and test it before installing too many other components.

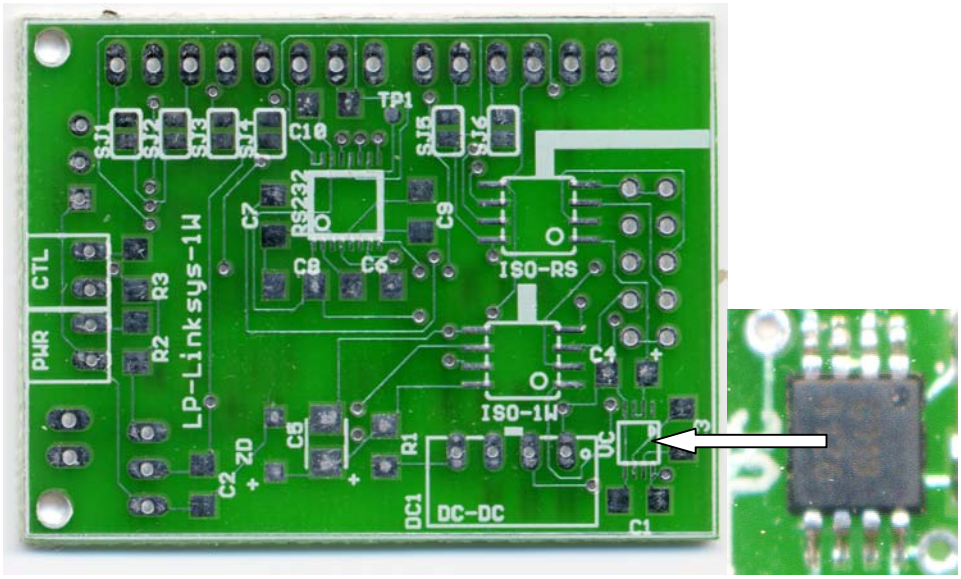


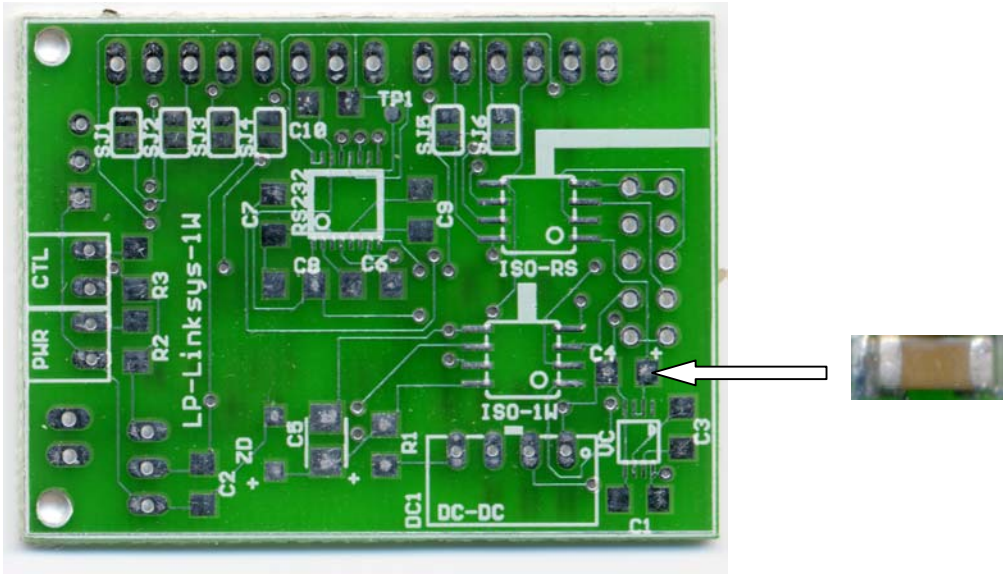
Figure 3 – Arrow show location of the VC regulator (note pin 1 location on silk-screen)

3.) Install the DC-DC converter

VC is a REG711EA-5, a switched capacitor voltage converter, which is used to step up the 3.3-volt supply from the LINKSYS to a regulated 5 volts. The letters is C11B on top of the VSSOP size package. The capacitor can be found in package #2a, Basic Kit Components.

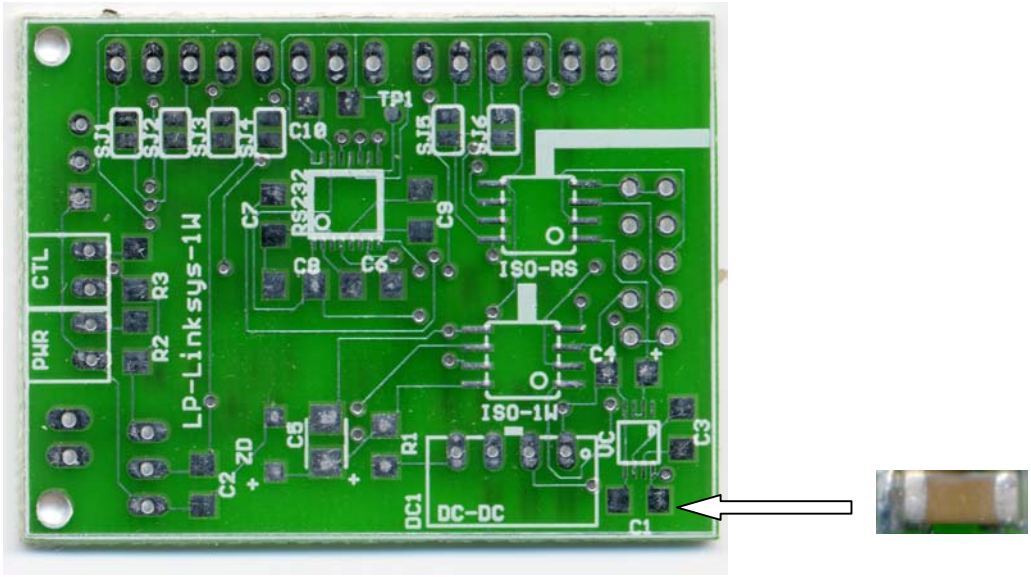
Flux the pads on the PCB and place the regulator using your tweezers. Be sure to align pin 1 with the marked indicator on the silk-screen. Carefully align the pads until centered and the IC's pads are aligned on the board..

If you are manually soldering, this is a good time to solder in the regulator as once the surrounding caps are installed it will be a bit harder to do. Be sure to check for solder bridges between the fine pitch pads of the regulator. Use a high power magnifier to help you visually perform the check. Use solder wick to carefully remove any solder bridges found and don't proceed till you have good clean joints with no solder bridges.



4.) Install the supply input filter capacitor

C4 is a 2.2µf ceramic capacitor. It is unmarked but is part of a strip of 2 units in the package (C1 and C4) and is generally a darker color than the other caps. The capacitor can be found in package #2a, Basic Kit Components.

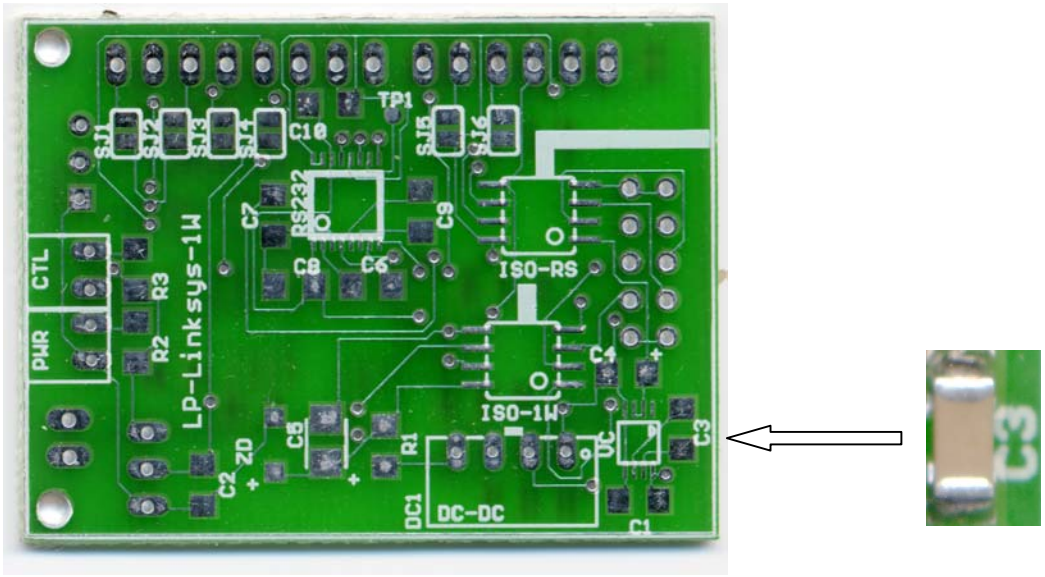


5.) Install the supply output filter capacitor

C1 is a 2.2µf ceramic capacitor. It is unmarked but is part of a strip of 2 units in the package (C1 and C4) and is generally a darker color than the other caps. The capacitor can be found in package #2a, Basic Kit Components.

6.) Install the regulators charge pump capacitor

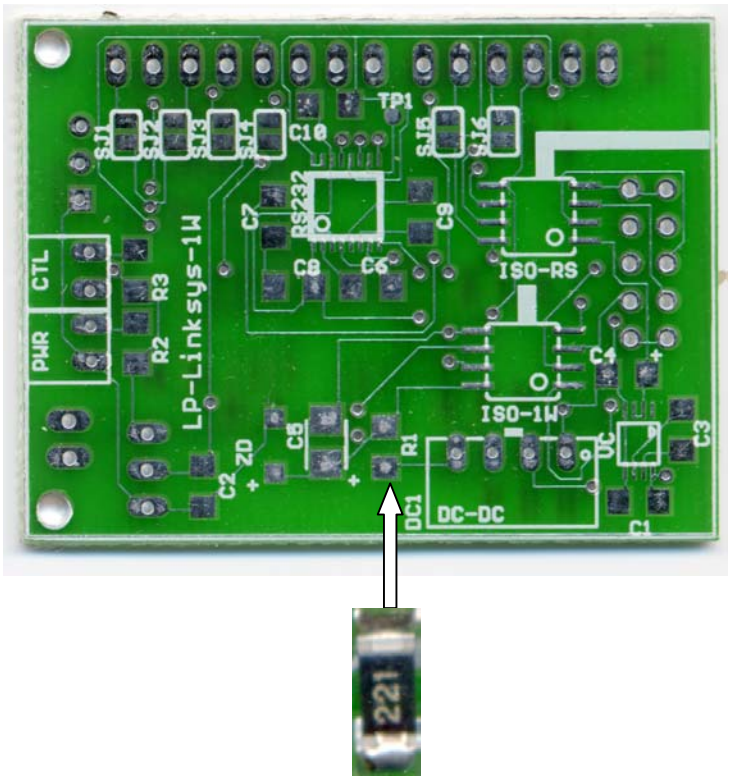
C3 is a .22µf ceramic capacitor. It is unmarked and is a single unit in the package (it's a bit lighter in color than then the C1 and C2 capacitors just installed). The capacitor can be found in package #2a, Basic Kit Components.



You have now completed installing the basic switched capacitor voltage converter circuitry. And we will move on to install the rest of the power circuitry along with the level converters before testing the power supply for the 1st time.

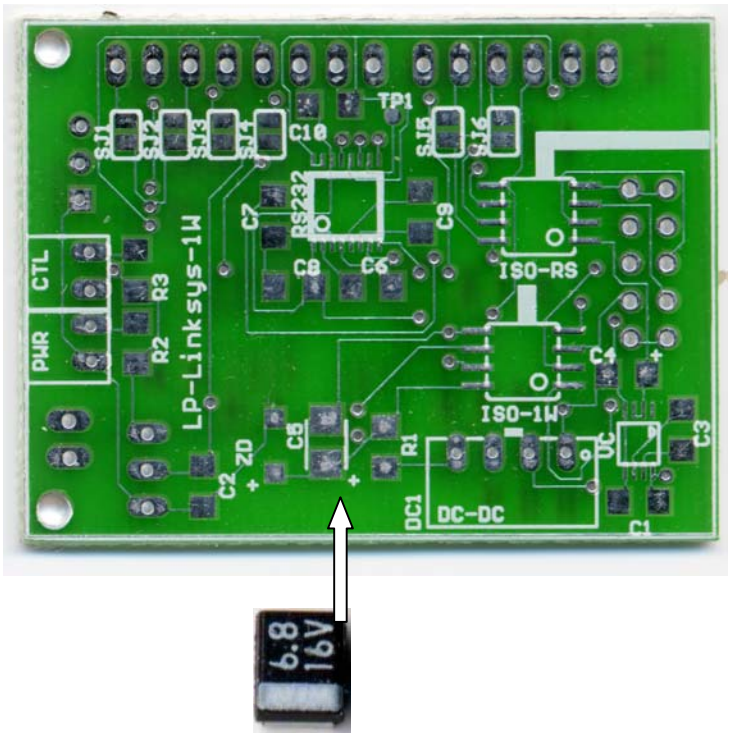
7.) Install the resistive load resistor

R1 is a 22 ohm 1206 size, resistor that is used to help place a minimum load on the optional power isolation module when installed. The resistor can be found in package #5, Optional Power Isolation Kit



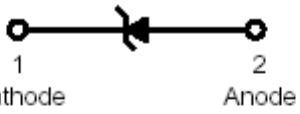
8.) Install the Output main filter capacitor

C5 is a 6.8µf tantalum capacitor. It is marked as 6.8 16v on the case with a white bar indicating the positive side of the capacitor. The capacitor can be found in package #5, Optional Power Isolation Kit. Be sure to pay attention to the silk-screen markings for the positive side, the image below shows the proper orientation for the capacitor.



8.) Install the optional Zener Diode limiter

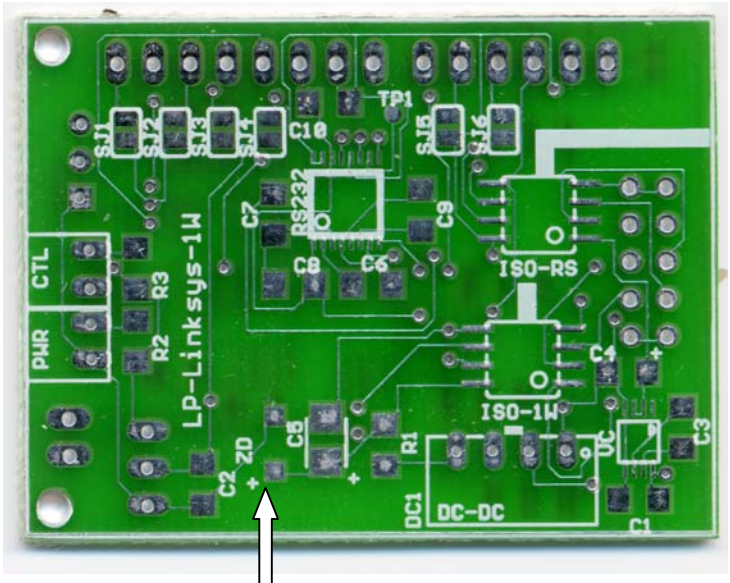
ZD is a MMSZ5V1T1 SOD-123 case, zener diode that is used to limit output of the optional DC power isolation module to 5 volts due to light circuit loading. It is marked as 6.8 16v on the case with a white bar indicating the positive side of the capacitor. The capacitor can be found in package #5, Optional Power Isolation Kit



SOD−123
CASE 425
Style 1

MARKING DIAGRAM

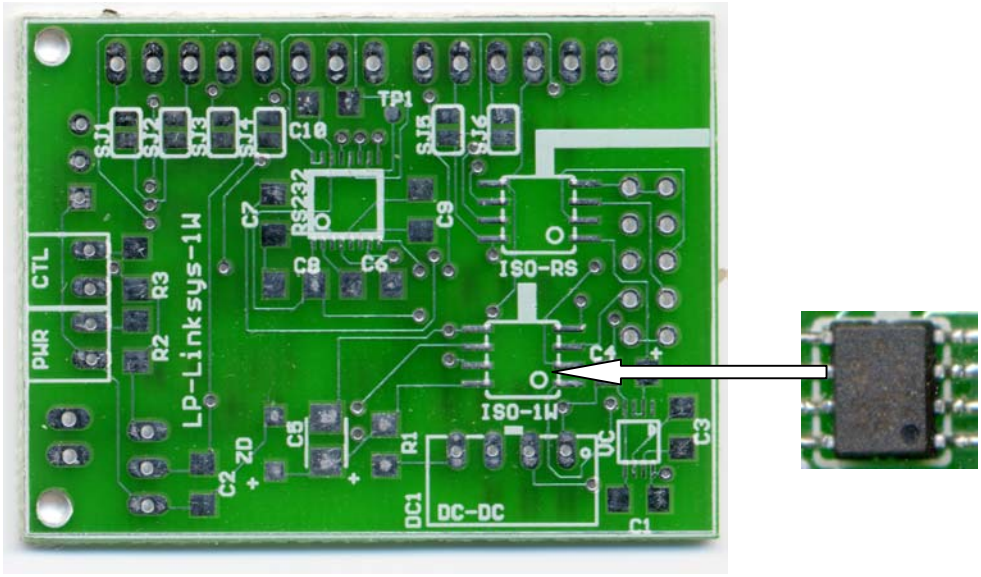
xx = Specific Device Code
M = Date Code



Pay attention to the markings on the zener diode as the bar (which is hard to see in the image) is the cathode side of the diode and should be places nearest the + silk-screen marking on the PCB. This is indicated by the arrow to the right of the zener device here.

9.) Install the ISO-1W level shifter

ISO-1W is a ADUM1201 is a dual channel digital isolator. Besides providing isolation (assuming the isolation package is also installed) they perform level shifting functions for the board. They shift the logic level from the LINKSYS from 3.3-volt (or 5-volt) logic to 5-volt logic. The IC can be found in package #2a, Basic Kit Components. It's marked on the case as AD1201AR.

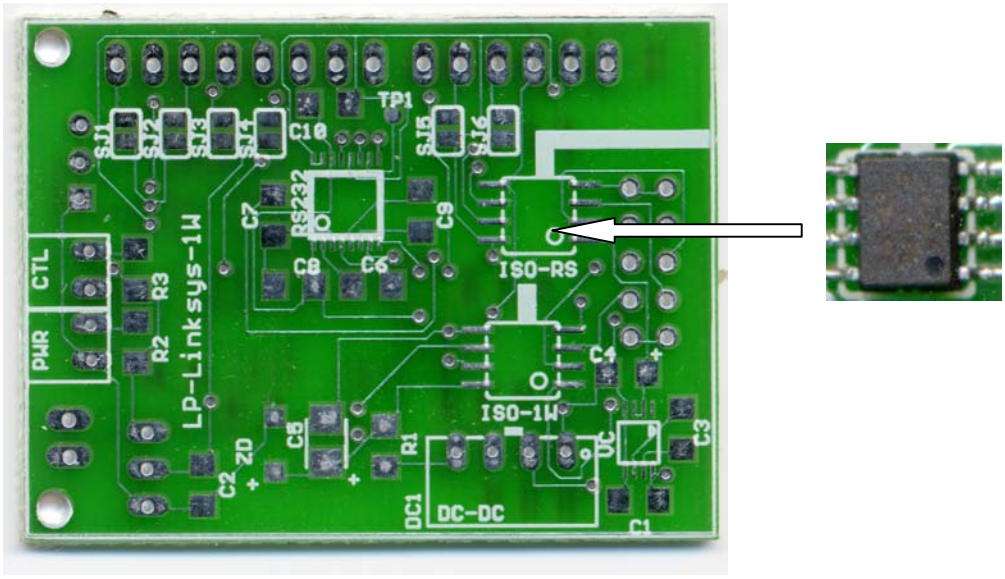


Flux the pads on the PCB and place the regulator using your tweezers. Be sure to align pin 1 with the marked indicator on the silk-screen. Carefully align the pads until centered and the IC's pads are aligned on the board..

If you are manually soldering, this is a good time to solder in the ISO-1W as once the header pins are installed it will be harder to access. Be sure to check for solder bridges between the fine pitch pads of the IC. Use a high power magnifier to help you visually perform the check. Use solder wick to carefully remove any solder bridges found and don't proceed till you have good clean joints with no solder bridges.

10.) Install the ISO-RS level shifter

If you have the optional RS232-F kit, then this is a good time to also install the ISO-RS IC. The ISO-RS is a ADUM1201 is a dual channel digital isolator. Besides providing isolation (assuming the isolation package is also installed) they perform level shifting functions for the board. They shift the logic level from the LINKSYS from 3.3-volt (or 5-volt) logic to 5-volt logic. The IC can be found in package #4, RS232-F Console Option Kit. It is marked on the case as AD1201AR.

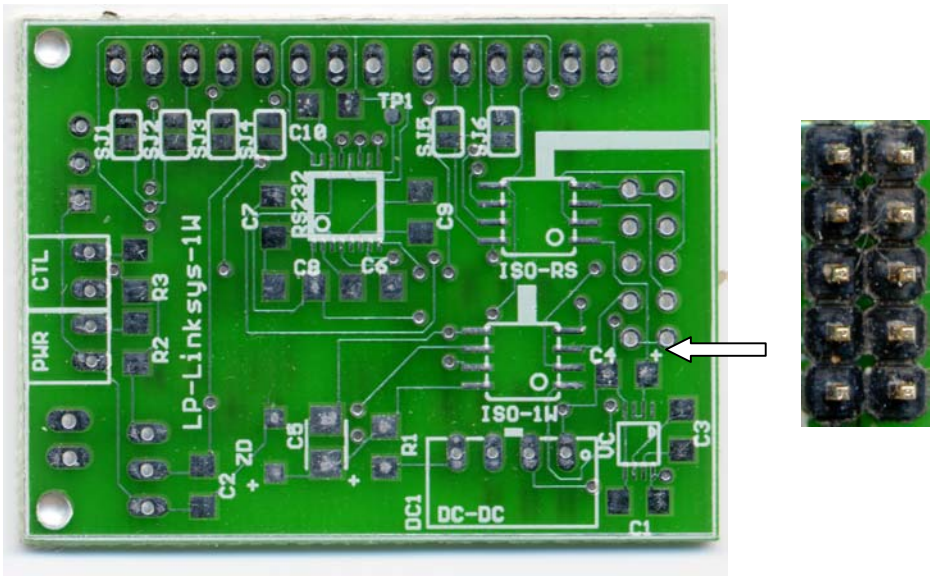


Flux the pads on the PCB and place the regulator using your tweezers. Be sure to align pin 1 with the marked indicator on the silk-screen. Carefully align the pads until centered and the IC's pads are aligned on the board..

If you are manually soldering, this is a good time to solder in the ISO-RS as once the header pins are installed it will be harder to access. Be sure to check for solder bridges between the fine pitch pads of the IC. Use a high power magnifier to help you visually perform the check. Use solder wick to carefully remove any solder bridges found and don't proceed till you have good clean joints with no solder bridges.

11.) Install the male header pins

Now that the level converters are soldered in place we can install the male header pins (2x5) connector that is used to connect the adapter to the LINKSYS PCB. It is installed with the long side of the pins up (towards us in the image below).



We will take this time to also indicate that the positive power input from the LINKSYS is pin 1 of the male header (nearest the REG711 converter) and that it is indicated by a + on the silk-screen on this side of the board. And is indicated by the arrow also in the drawing above. This is important to remember, as the connector is not indexed.

Testing the power supply

Now that we have the board's power supply circuitry installed we can test the DC up regulator. To do this we need a source for a 3.3-volt regulated supply. A regulated wall wart supply will work fine or a bench power system will work also.

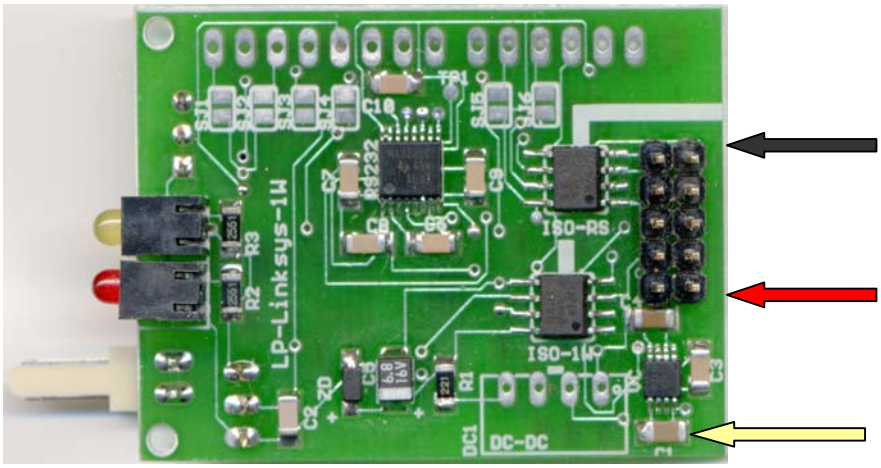


Figure 4 – Adapter in the picture has more components installed than required at this point but is used for the purposes of identification of key parts for testing.

12.) Test the 3.3Volt to 5 Volt converter

Connect the positive regulated 3.3-volt supply line to pin 1 of the header (pointed to by the red arrow above) and the ground line to pin 9 (pointed to by the black arrow). Apply power and check that you measure 5 volts at the end of capacitor C1 (pointed to by the yellow arrow).

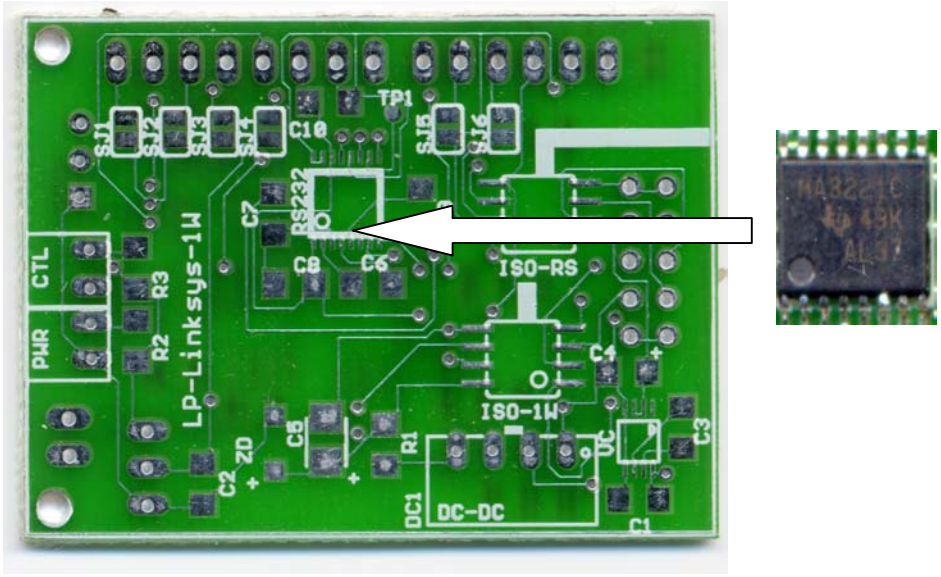
If you don't, go back and check for solder bridges or other errors in assembly.

Installing the optional RS232-F Kit

You will need to do these steps only if you are installing the RS232-F option kit. Otherwise skip to step 20

13.) Install the RS232-F Line Driver/Receiver

The MAX3221C consists of one line driver, one line receiver, and a dual charge-pump circuit with ±15-kV ESD protection pin to pin (serial-port connection pins, including GND). The device meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3-V to 5.5-V supply. These devices operate at data signaling rates up to 250 kbit/s and a maximum of 30-V/µs driver output slew rate. The IC can be found in package #4, RS232-F Console Option Kit. It is marked on the case as MAX3221C.

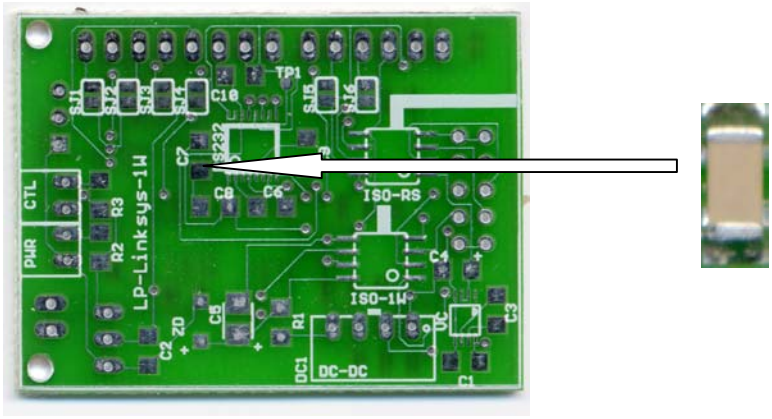


Flux the pads on the PCB and place the regulator using your tweezers. Be sure to align pin 1 with the marked indicator on the silk-screen. Carefully align the pads until centered and the IC's pads are aligned on the board.

If you are manually soldering, this is a good time to solder in the RS232 as once the surrounding capacitors are installed it will be harder to access. Be sure to check for solder bridges between the fine pitch pads of the IC. Use a high power magnifier to help you visually perform the check. Use solder wick to carefully remove any solder bridges found and don't proceed till you have good clean joints with no solder bridges.

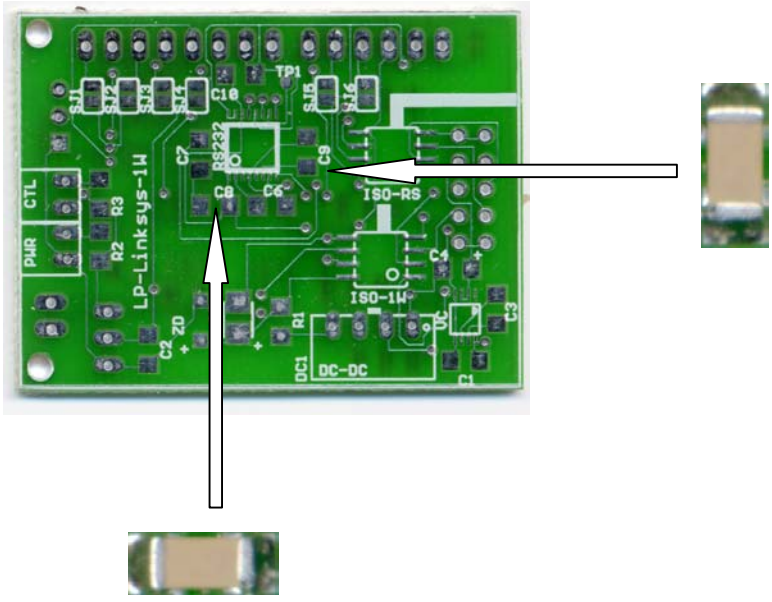
14.) Install the Charge pump capacitor C7

C7 is one of 3 .47 uf Ceramic 1206 size capacitors that are used as part of the charge pump for the RS232-F converter. We will be installing all three in this and the next two steps. The capacitors can be found in package #4, RS232-F Console Option Kit and are unmarked. (Be sure to use the strip of 3, not the strip of 2 which are a different value but look almost the same).



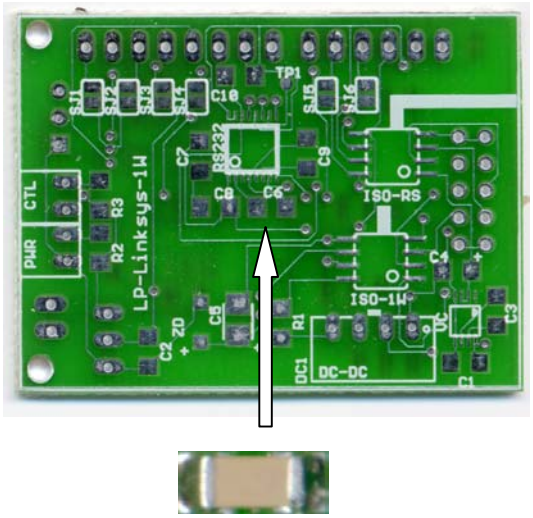
15.) Install the remaining Charge pump capacitors C8, C9

C8mC9 are the remaining .47 uf Ceramic 1206 size capacitors that are used as part of the charge pump for the RS232-F converter. This is the 2nd and 3rd devices of that value we are installing The capacitors can be found in package #4, RS232-F Console Option Kit and are unmarked. (Be sure to take from the strip of 3, not the strip of 2 which are a different value but look almost the same).



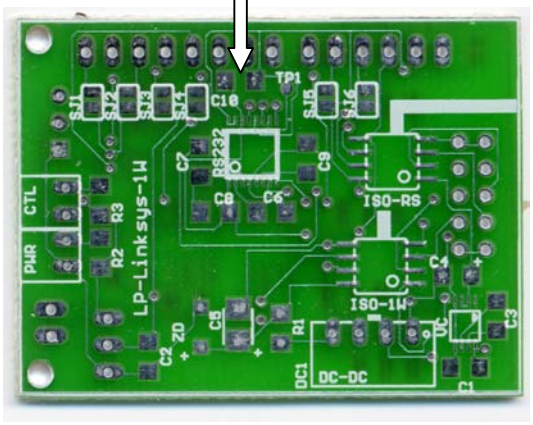
16.) Install the Charge pump capacitor C6

C6 is one of 2 .1 uf Ceramic 1206 size capacitors used as part of the Rs232-F kit. The capacitors can be found in package #4, RS232-F Console Option Kit and are unmarked. (Be sure to take from the strip of 2, not the strip of 3 which are a different value but look almost the same).



17.) Install the decoupling capacitor C10

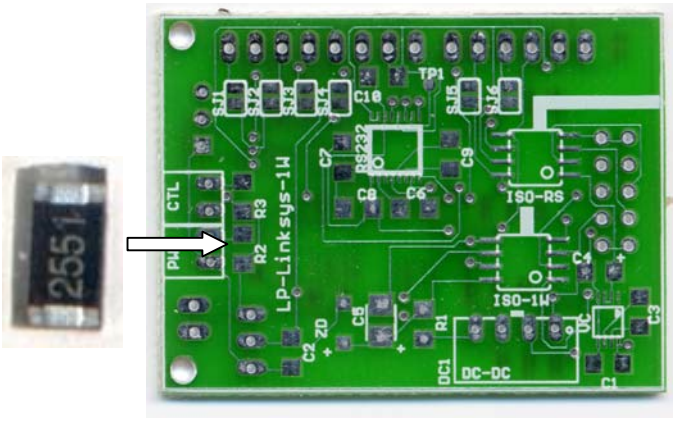
C10 is one of 2 .1 uf Ceramic 1206 size capacitors used as part of the Rs232-F kit. The capacitors can be found in package #4, RS232-F Console Option Kit and are unmarked. (Be sure to take from the strip of 2, not the strip of 3 which are a different value but look almost the same). ISO-RS was installed during step 10 so you have now completed the installation of the RS232-F option parts on the board.



Finishing the bottom of the board

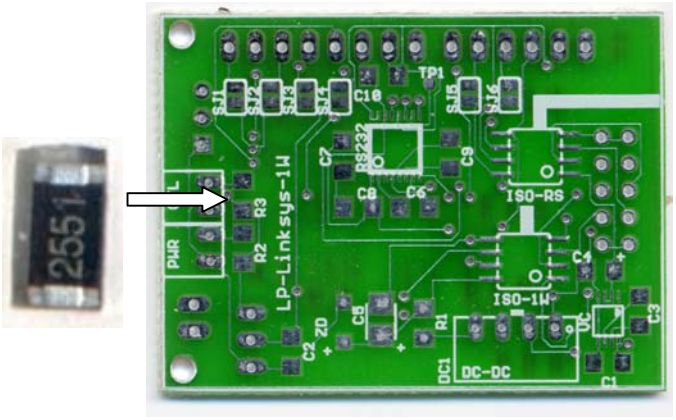
18.) Install PWR LED current limiting resistor

R2 is a 2.5K-ohm resistor in a 1206 size package. It is used to limit the current flow through the red LED power indicator. The resistor can be found in package #2, Basic Kit Components and is marked 2551 as shown in the picture.



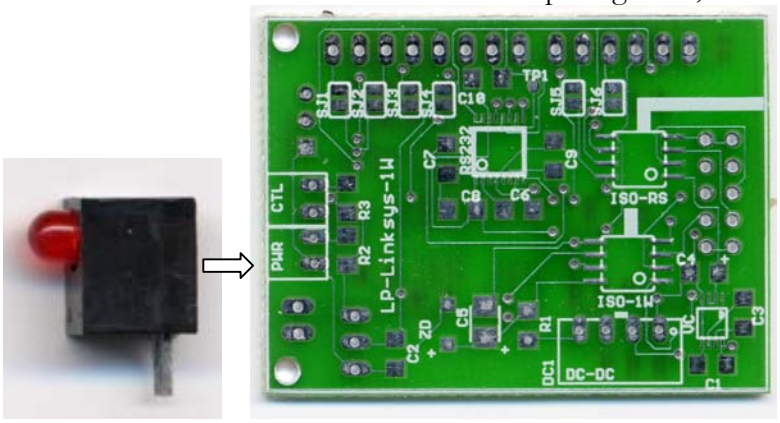
19.) Install CNTL LED current limiting resistor

R3 is a 2.5K-ohm resistor in a 1206 size package. It is used to limit the current flow through the red LED power indicator. The resistor can be found in package #3, Optional 1-Wire Monitor Kit Components and is marked 2551 as shown in the picture.



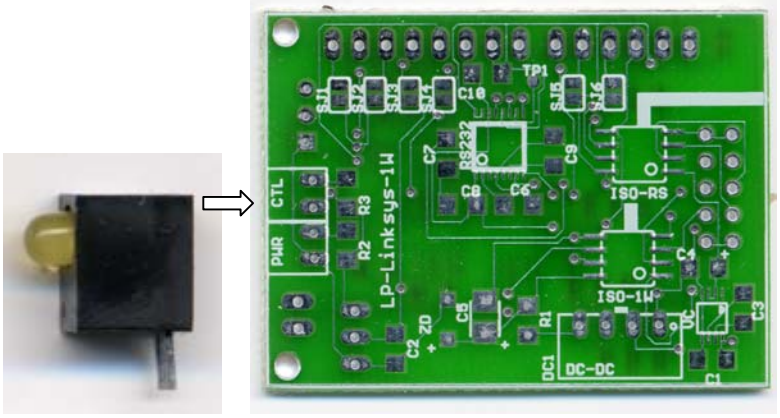
20.) Install the RED POWER LED

PWR is a right angle RED LED and is used to indicate +5 volt power from the converter. The LED can be found in package #2, Basic Kit Components.



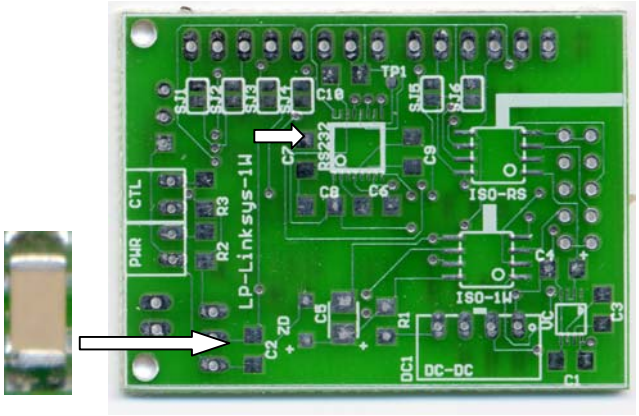
21.) Install the YELLOW CTL LED

CTL is a right angle RED LED and is used to indicate +5 volt power from the converter. The LED can be found in package #3, Optional 1-Wire monitor.



21.) Install the VAD Filter cap

C2 is a .01uf ceramic capacitor and along with R5 make up a sample filter for the optional DS2438 A/D unit. The capacitor can be found in package #3, Optional 1-Wire monitor



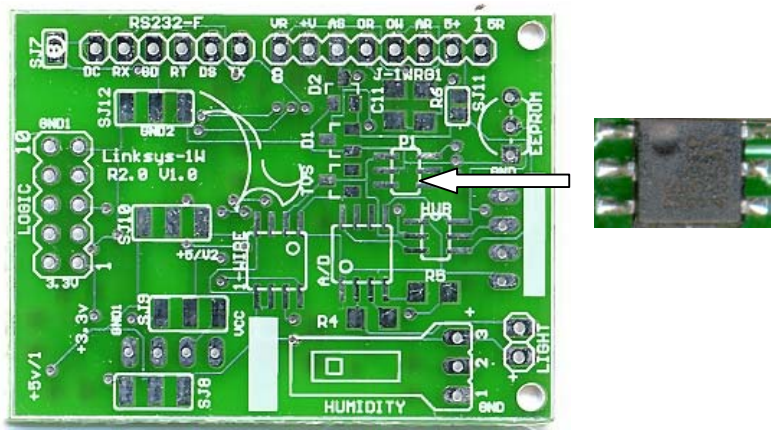
22.) Checking your work

At this point you have completed the surface mount components for this side of the board and can begin adding the 1-wire parts on the other side of the board. This is a good time to pause and review your work by looking for bad solder joints, solder bridges or other problems.

Assembly Part 3

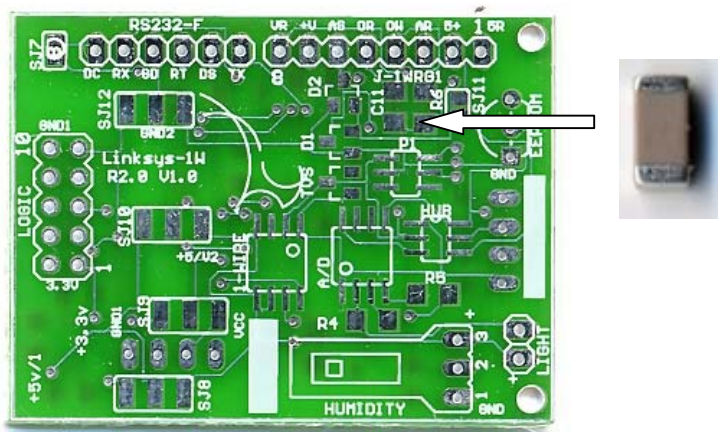
23.) Install the ESD Protection

P1 is DS9503 ESD Protection diode with snapback action.. It is used to help protect the 1-wire against ESD events. The IC can be found in package #2a, Basic Kit Components and is marked DS9503 on the case.



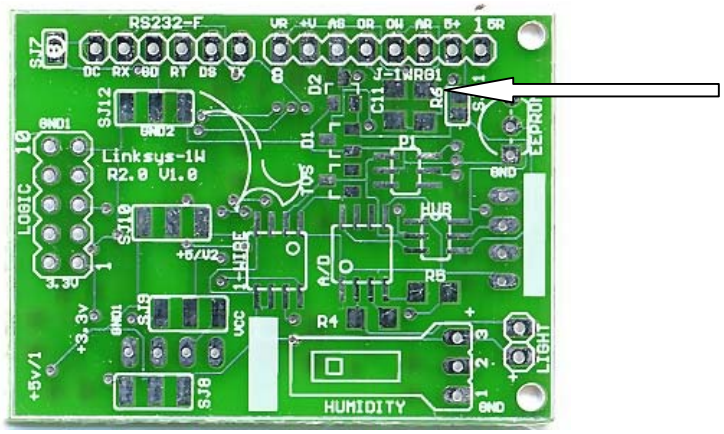
24.) Install the 1-Wire Line Filter capacitor

C11 is a 4700pf 1206 size ceramic capacitor that is part of the 1-wire line filter circuit. The capacitor can be found in package #2a, Basic Kit Components and is unmarked but is the only single capacitor in the kit.



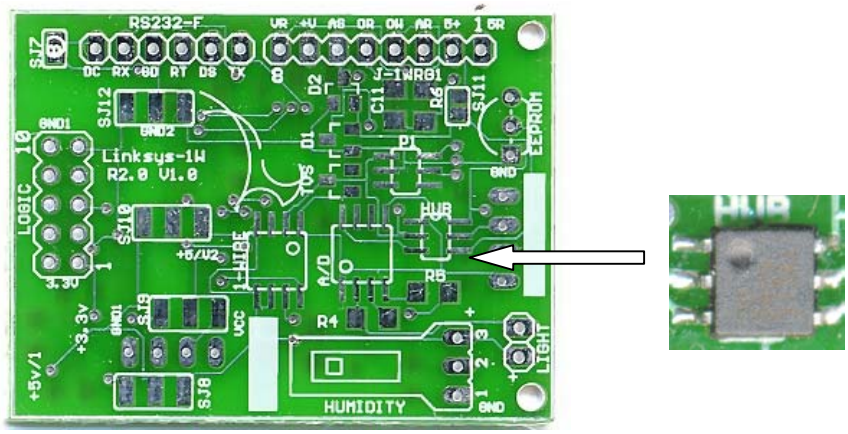
25.) Install the 1-Wire Line Filter resistor

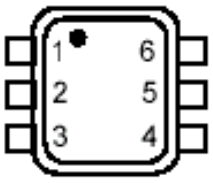
R6 is a 100 1206 size resistor that is part of the 1-wire line filter circuit. The resistor can be found in package #2, Basic Kit Components and is marked 101 on the case.



26.) Install the 1-Wire HUB

HUB is a DS2409 coupler that is used to provide selection control of the 1-Wire environmental circuitry. Install the HUB or MicroLan coupler chip, the **DS2409**. This chip is in a 6-pin TSOC package and requires the care when soldering to avoid solder bridges and to make good contacts when soldering by hand. It acts as the prime 1-wire interface to the network and helps reduce 1-wire network loading by selecting only the desired 1-wire chips required for the network. In addition it will automatically disable the unit from the network if one of the other 1-wire chips gets shorted to ground. So it acts basically as a device selection chip in this circuit. Look for the dot to identify pin 1 on the chip. There is a matching silk-screen circle on the PCB. The coupler can be found in package #3, Optional 1-Wire monitor Kit Components.





TOP VIEW
3.7mm X 4.0mm X 1.5 mm

The DS2409 is a 6-pin device, you may have to look very carefully to find pin 1, as Dallas doesn't mark their chips very well in some cases.

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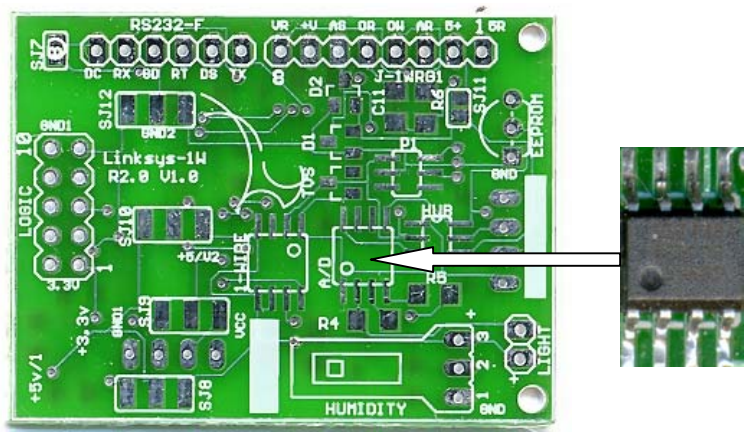
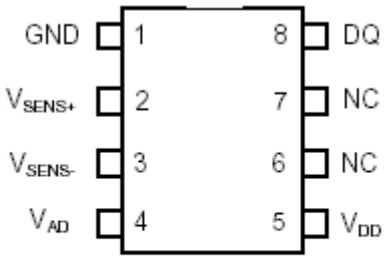
27.) Install the 1-Wire A/D

AD is a DS2438 that is used to measure temperature, act a real time clock and monitor the current sense input (used for light sensing) and the voltage sense input (used for the humidity sensor. Install the **DS2438** Smart Battery Monitor A/D chip. This chip is slightly larger and easier to hand solder than the DS2409. It is the functional heart of the 1-Wire monitor circuitry and is connected to the MAIN line of the DS2409. It provides the means of monitoring the available voltage from the regulator (5 volts) and by using the VAD input it connects to the optional voltage sensor (Either the humidity sensor (a HIH-3610-003) or a voltage light sensor (the PNA46-3H-ND). The Current sensing inputs can be used to monitor the optional photodiode light sensor (typically a BS520). In addition the chip has an onboard temperature sensor, and EEPROM abilities. Making it a favorite chip in the 1-wire world. Again a circle on the silk-screen indicates Pin 1 on the PCB. The IC can be found in package #3, Optional 1-Wire monitor Kit Components



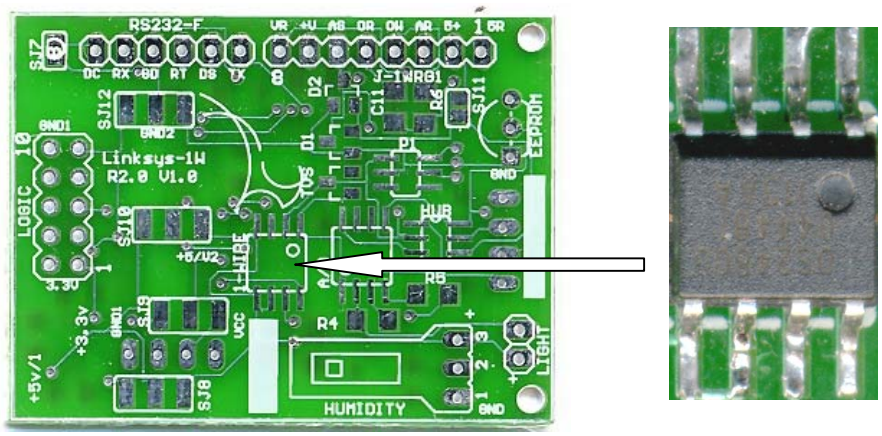


DS2438Z, DS2438AZ
8-Pin SOIC (150-mil)

The circle on the chip indicates to pin 1 of the DS2438 A/D converter. Note the small silk-screen circle on the board that also marks pin 1 on the board.

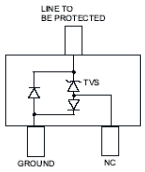
28.) Install the 1-Wire Bus master

1-Wire is a DS2480B that is used as the 11-wire driver for the adapter. This IC can be found in package #2a, Basic Kit Components and is marked on the top of the IC DS2480B. The IC can be found in package #2a, Basic Kit Components and is marked on the top of the case.



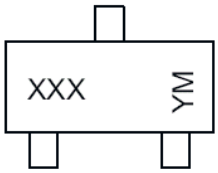
29.) Install the TVS diode

TVS is a low capacitance Unidirectional TVS, the **DLP05LC.** Unlike most TVS units its capacitance is < 2 pf. So it has very little effect on the 1-wire signal it is protecting. The letters A05 on top of SOT-23 package can identify it. The TVS can be found in package #2a, Basic Kit Components and is marked as indicated below.



Marking: A05 + Date Code

Marking Information

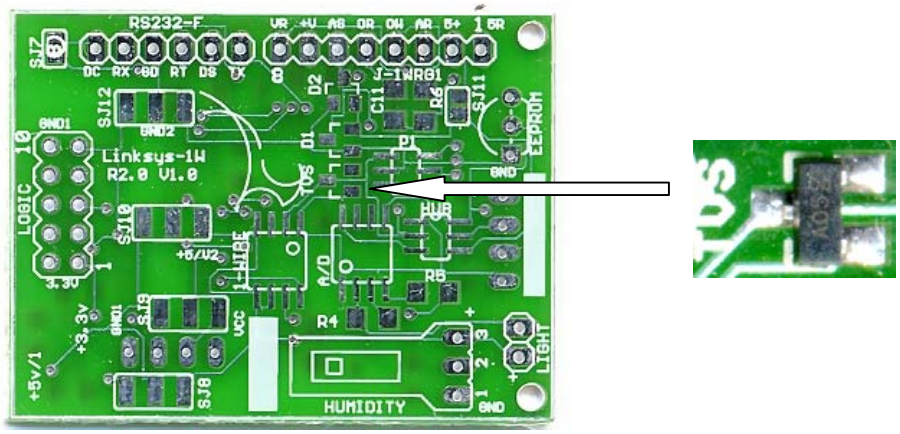


XXX = Product Type Marking Code
YM = Date Code Marking
Y = Year ex: N = 2002
M = Month ex: 9 = September

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004
Code	J	K	L	M	N	O	P

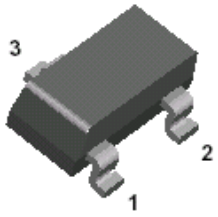
Month	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D



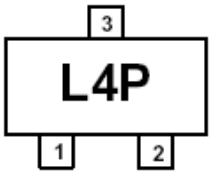
30.) Install the 1-Wire Clamp diode

D1 is a **BAT54S** Schottky Diode; it is used to provide fast transient clamping of the 1-wire data line. The letters L44 located on the top of the SOT-23 size chip can identify it. Flux the pads on the PCB and place the diode using your tweezers. Carefully align the pads until centered. The diode can be found in package #2a, Basic Kit Components and is marked as shown below.

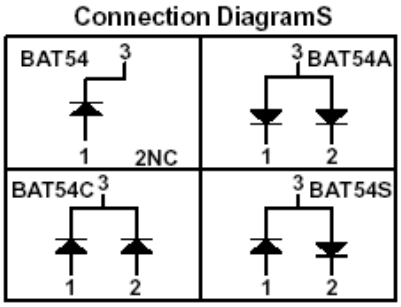
BAT54/A/C/S



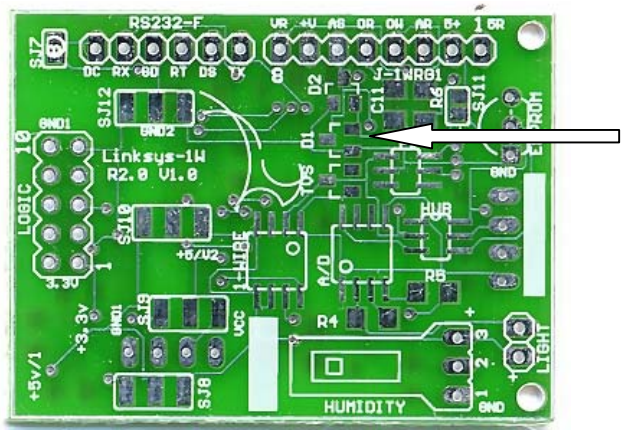
SOT-23

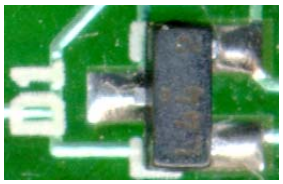


MARKING
BAT54 = L4P BAT54A = L42
BAT54C = L43 BAT54S = L44



Pointer to Diode Location

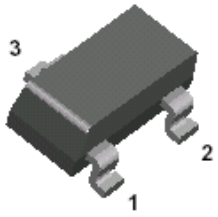




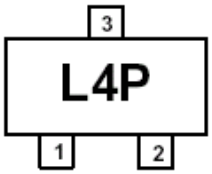
31.) Install the A_SIG Clamp diode

D2 is a **BAT54S** Schottky Diode; it is used to provide fast transient clamping of the 1-wire data line. The letters L44 located on the top of the SOT-23 size chip can identify it. Flux the pads on the PCB and place the diode using your tweezers. Carefully align the pads until centered. It can be found in package #3, Optional 1-Wire monitor Kit Components

BAT54/A/C/S

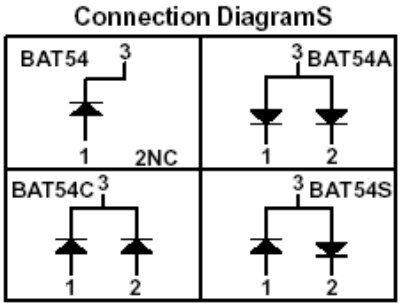


SOT-23

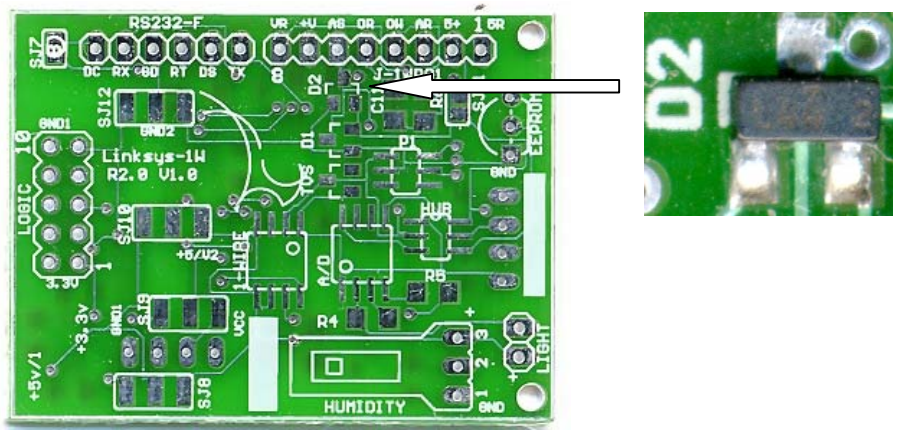


MARKING

BAT54 = L4P BAT54A = L42
BAT54C = L43 BAT54S = L44

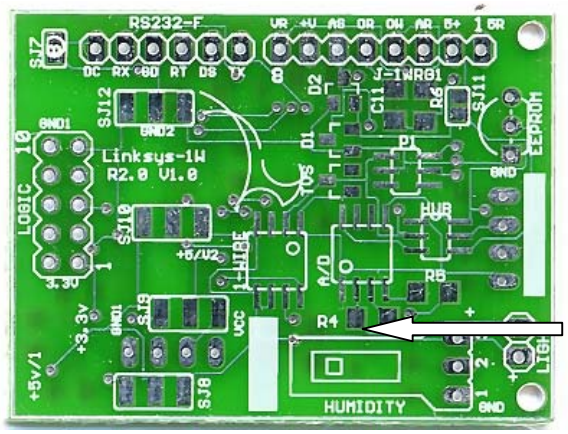


Pointer to Diode Location



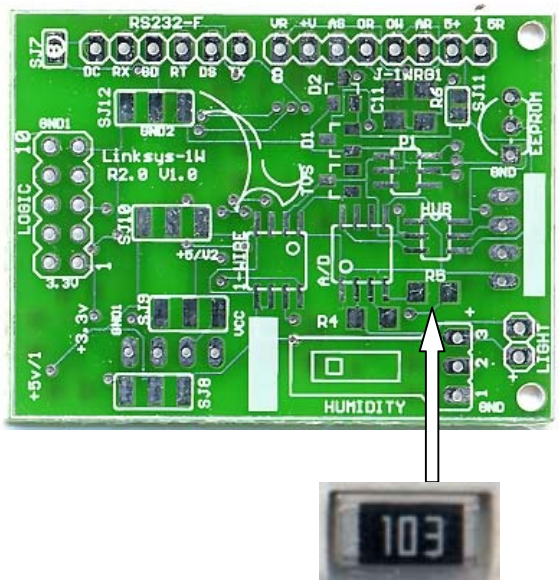
32.) Install the current sense resistor

R4 is the current setting resistor for the optional photodiode sensor. We find a value of about **806** ohms or 1K (marked 806R, 1206 size smt resistor package) works well in most cases but this value may need to be adjusted according to which sensor you use and its lens mounting arrangement. The resistor can be found in package #3, Optional 1-Wire monitor Kit Components



33.) Install the A/D filter resistor

R5 is a **10K** ohm 1206 size smt resistor marked (103). This resistor is located next to the humidity sensor. And along with C3 acts a low pass filter for that sensor. The part can be found in package #2, Passive Components. The resistor can be found in package #3, Optional 1-Wire monitor Kit Components



34.) Set the Jumpers

Using the supplied ¼ watt resistor cut four small 1/8 inch sections of wire These are used as bridge wires on the solder paste jumpers configuring the 4 solder paste jumpers, SJ8,SJ9,SJ10 and SJ12. All pins should be set to pins 1-2 of each jumper if the optional optional power isolation DC-DC converter is **NOT** installed on the board. Pin 1 is always the nearest one closest to the solder paste jumper silkscreen label.

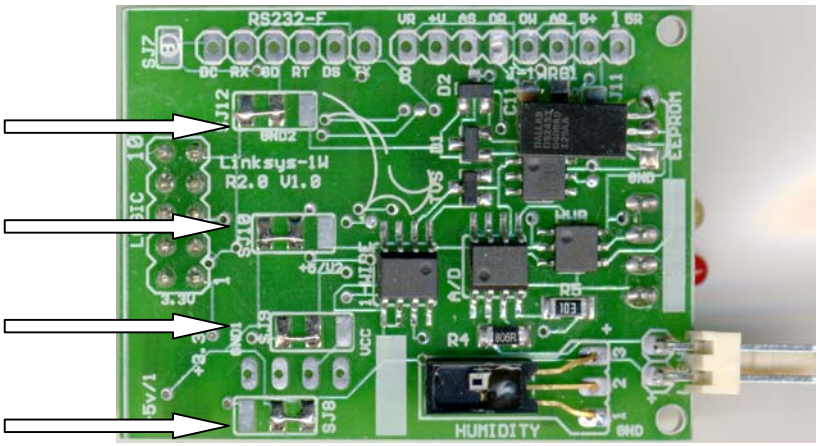


Figure 5 - Showing solder paste jumpers installed in positions 1-2

(Optional power isolation unit not installed)

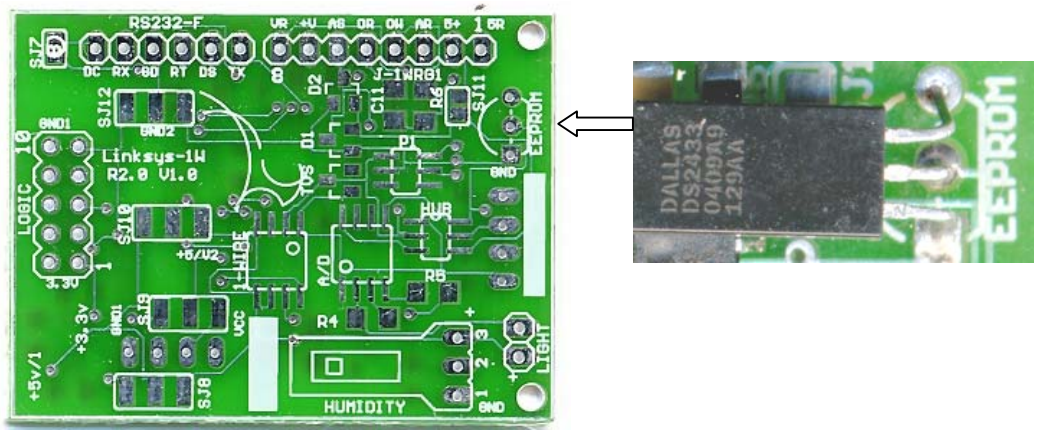
However if the optional isolation DC-DC Converter kit is installed and you wish to enable isolation for both the serial and 1-wire then set the jumpers to pins 2-3 (not shown)

34.) Clean and check the board.

This is an important step. At this time you can use a flux remover to make sure all your solder connections are clean and no excess flux remains on the board. We have not yet installed the sensors because they can be damaged by any excess flux cleaner getting onto them, so this is the time to give it a good scrub (we use a flux cleaning brush at this stage). Clean both sides of the board.. After cleaning double check your solder joints and look for any problems. Make sure the board is thoroughly dry before continuing beyond this step.

35.) Install the 1-wire EEPROM chip

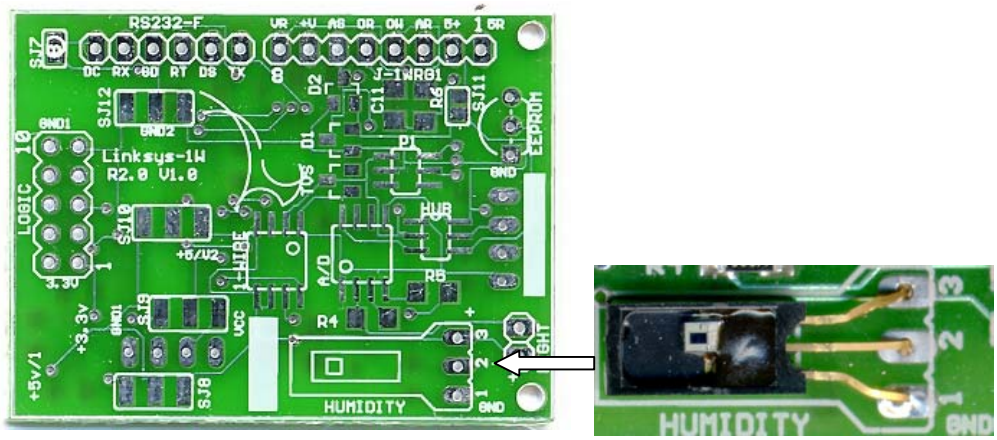
The EEPROM used is a **DS2433,** a 4k bit (512 byte) chip that can be programmed to hold non-volatile information for the network without any special voltages. So you can program the chip while it is installed in the network. It is most often used for tagging purposes, to describe the LP-LINKSYS-1W as a device to the network. It also allows special parameters such as a calibrated HIH-3610-003 to be described to the network software. This chip is an easy install PR-35 package (which looks like an extended transistor). The silk-screened outline shows the chips orientation. Flat side goes toward the edge of the board. Since this chip is primarily used for tagging purposes it does not need to be on the 1-wire network unless selected. So it is connected to the AUX side of the DS2409. Thus making an easily manipulated system. If you read the AUX side chips first, you can detect all the tagging information needed for proper operation of the board. The part can be found in package #3, Semiconductors. Note how we bent the leads and bent the chip down to lay flat on the board. (Note that solder paste jumper SJ11 is partly hidden when we do so, if you need to set this jumper you will have to bend up the chip to gain access to it. Since it is normally not used, this is not a problem).



Install the optional sensors

36.) Install the optional HIH-3610-003 humidity sensor

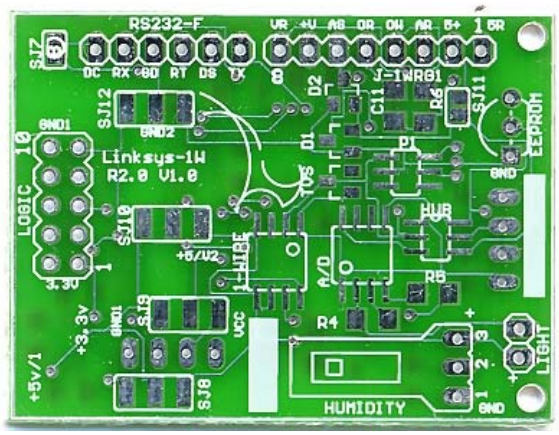
The part can be found in package #5, Optional Sensors.



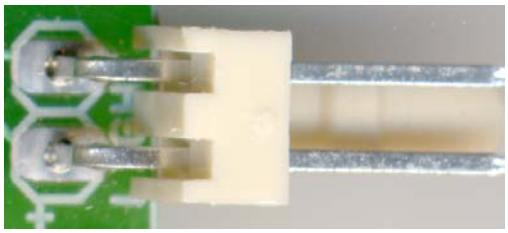
The arrow points to the location for the humidity sensor. The sensors pins are marked 1, 2, and 3. Pin 1 is the ground, Pin 2 is the sensor output voltage, and pin 3 is the 5 volt supply voltage to the sensor. The sensor is radiometric, the results change in ratio to the supply voltage so complete accuracy of the supply line voltage is not needed. Bend the leads and install. The "sensor" side should be up (as in the picture), with the opposite flat side of the sensor with the label on it flat against the board. All calibrated sensors have this small label indicating the unit number from the calibration process on the hidden side of the sensor. Don't lose you sensors calibration data as we do not keep records of it. Note that the humidity sensor is sensitive to light so it needs to be protected from direct sun light.

37.) Install the optional photodiode

The arrow points to the location for the appropriate pin of the optional **BS520** photodiode. LIGHT. Note that the image of the photodiode shows the window side of the unit. This should be upright and pointing off the right edge of the board when the photodiode is turned upright. The bottom pin of the photodiode goes to in the hole marked with a + symbol on the PCB. The part can be found in package #5, Optional Sensors.



Optionally a 2 pin polarized header may be installed which makes it easier to install the sensor in the case where it may receive light on its sensing window. And allow easy connection of the sensor during the final installation procedure.



38.) Optional test sequence of 1-wire operation

At this time your board can be tested for 1-wire operation if desired. When we do a quick check of the board, we normally use the 1-wire viewer software for this check using the special cross over cable described elsewhere to supply power and connect the serial input to the 1-wire bus master. This makes it easy to verify the boards is fully operational before installing into your Linksys for the 1st time.. We check the LED operation, and toggle the channels of the DS2409 on the board, checking the operation of the DS2438 devices, and also making sure the DS2433 shows up. Just enough to insure the 1-wire communications to the board is working.

☐ **39.) Apply optional final conformal coating**

If you are going to conformal coat or spray the board with a coasting, be sure to shield the sensors and switch from coating with the spray materials to avoid any potential problems. Cut some light cardboard to the shape of the sensors and tape over the sensors. Spraying either sensor can fatally damage these expensive components so be sure of what you are doing. Spraying may also be done before you install these components if needed.

Final Test of the boards operation

☐ **40.) Test the boards operation.**

Follow the instructions in the **Test Procedure document** on this CDROM.

☐ **41.) Write the EEPROM files**

Follow the steps outlined in the **Tagging Procedure document** on this CDROM

☐ **42.) Store the board till ready to install**

At this time the board is read to be installed in an enclosure or put aside until you are ready to install it in the field.

If installing in an enclosure, refer to the **Enclosure mounting document** on this CDROM for further advice.

Place the unit in the static sensitive bag that the semiconductors came in (package #3) until ready for your final field installation. Refer to the Field installation manual for further advice on doing field installations.

Final thoughts

A General Warning

With careful assembly it is easy to assemble the LP-LINKSYS-1W. The circuitry is not complex and a basic understanding of 1-wire components and functions can make trouble shooting very easy. If you have any doubts on you ability to do these steps we recommend that you consider buying an already assembled and tested unit instead.

The ideas presented in this document are part of Springbok Digitronics efforts to widen its focus by looking in a broad manner at particular problems. No implied suitability for manufacturing or use is implied but all rights are reserved.

Chapter 5

Reference

Datasheet Reference for Semiconductors

Dallas Semiconductor 1-Wire Components

☐	1	DS2409P	DS2409P	MICROLAN HUB
☐	1	DS2433	DS2433PR-35	512K Byte EEPROM
☐	1	DS2438Z	DS2438Z	A/D

Voltage Regulator

☐ 1

Protection Devices

☐	1	DLP05LC	DLP05LC	T1 – TVS Low Capacitance
☐	1	BAT54S	BAT54S	D1 - Schottky.Diode

☐