RXD-315-KH
RXD-418-KH
RXD-433-KH

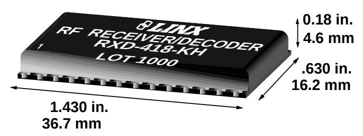
WIRELESS MADE SIMPLE

KH SERIES RF RECEIVER W/INTEGRATED DECODER

DESCRIPTION:

The KH Series is ideally suited for volume use in OEM applications such as remote control/command and keyless entry. It combines an RF receiver with an on-board decoder. When paired with a matching KH series transmitter/encoder module, a highly reliable wireless link is formed, capable of transferring the status of 1 to 8 parallel inputs along with 3^{10} address information for distances in excess of 300 Feet. Packaged in a compact SMD package, the KH module utilizes a highly optimized SAW architecture to achieve an unmatched blend of performance, size, efficiency and cost. No external RF components, except an antenna, are required, making design integration straightforward.

PHYSICAL DIMENSIONS



PINOUTS (BOTTOM VIEW)

28	ANT	NC	1
27	GND	D0	2
26	NC	D1	3
25	NC	GND	4
24	A9	VCC	5
23	A8	PDN	6
22	A7	D2	7
21	A6	D3	8
20	A5	D4	9
19	A4	DATA	10
18	A3	VT	11
17	A2	D5	12
16	A1	D6	13
15	A0	D7	14

FEATURES:

- Low Cost
- On-Board Decoder
- 8 Parallel Binary Outputs Allow Direct Connection of Peripherals
- 3^{10} Address Lines for Security and Uniqueness
- No External RF Components Required
- Ultra-Low Power Consumption
- Compact Surface-Mount Package
- Stable SAW-Based Architecture
- Received Data Output
- Transmission Validation
- No Production Tuning

APPLICATIONS INCLUDE:

- Remote Control/Command
- Keyless Entry
- Garage / Gate Openers
- Lighting Control
- Call Systems
- Home / Industrial Automation
- Fire / Security Alarms
- Remote Status Monitoring
- Wire Elimination

ORDERING INFORMATION

PART #	DESCRIPTION
EVAL-***-KH	KH Evaluation Kit
TXE-315-KH	TX/Encoder 315 MHZ
TXE-418-KH	TX/Encoder 418 MHZ
TXE-433-KH	TX/Encoder 433 MHZ
RXD-315-KH	RX/Decoder 315 MHZ
RXD-418-KH	RX/Decoder 418 MHZ
RXD-433-KH	RX/Decoder 433 MHZ

*** Insert Frequency

KH modules are supplied in tube packaging.

Revised 2/28/01

PERFORMANCE DATA FOR RXD-***-KH

ABOUT THESE MEASUREMENTS

The performance parameters listed below are based on module operation at 25°C from a 3VDC supply unless otherwise noted. Figure 1 at the right illustrates the connections necessary for testing and operation. It is recommended all ground pins be connected to the groundplane. The pins marked NC have no physical connection and are designed only to add support.

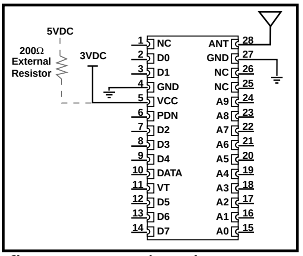


figure 1: Test/Basic Application Circuit (Top View)

ABSOLUTE MAXIMUM RATINGS

Supply voltage V_{CC}	-0.3	to	+4.2	VDC
	-0.3	to	+5.2	VDC (SEE NOTES 4, 5)
Operating temperature	-30°C	to	+70°C	
Storage temperature	-45°C	to	+85°C	
Soldering temperature	+225°C for 10 sec.			
RF input, pin 16	0 dBm			
Any input or output pin	-0.3	to	Vcc	

***NOTE* Exceeding any of the limits of this section may lead to permanent damage to the device. Furthermore, extended operation at these maximum ratings may reduce the life of this device.**

Parameters KH-RX 315, 418, 433 MHz	Designation	Min.	Typical	Max.	Units	Notes
Operating Voltage Pin 5	V_{CC}	2.7	–	4.2	VDC	–
w/Dropping Resistor	V_{CC}	4.7	–	5.2	VDC	4
Current Continuous	I_{CC} (V_{CC}=3V)	5.0	7.0	8.0	mA	
Current in Sleep	I_{SLP} (V_{CC}=3V)	–	700	950	µA	
Data Out Voltage Logic Low	V_{OL}	0	–	.3	VDC	–
Data Out Voltage Logic High	V_{OH}	V_{CC}-0.3	–	V_{CC}	VDC	–
	V_{OH}	2.7	3.4	V_{CC} (Note 6)	VDC	5
Frequency Accuracy	F_C	-75		+75	KHz	–
IF BW		–	280	–	KHz	–
Sensitivity @10^{-5} BER		-92	-97	-100	dBm	1
Receiver Baud Rate		100	–	4,800	bps	2
Decoder Oscillator	F_{ENC}		70		KHz	
Decoder Drive Current		.6	1	1.2	mA	3

Notes:

1. Sensitivity is affected by antenna SWR. See figure 3.
2. Potential rate of data recovered at RX data (pad 10). Decoder rate is internally fixed.
3. Maximum drive capability of data outputs.
4. *CRITICAL* In order to operate the device over this range it is necessary for a 200Ω resistor to be placed in-line with VCC.
5. When operating from a 5 volt source it is important to consider that the output will swing to well less than 5 volts as a result of the required dropping resistor. Please verify that the minimum voltage will meet the high threshold requirment of the device to which data is being sent.
6. Maximum output voltage measured after in-line dropping resistor.

TYPICAL RECEIVER PERFORMANCE GRAPHS

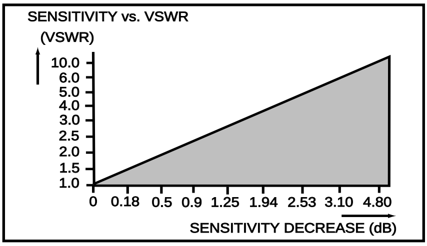


figure 2: Sensitivity vs. VSWR

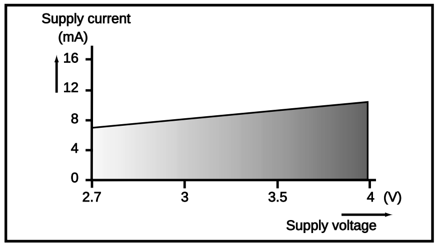


figure 3: Consumption vs. Supply Voltage

DECODER OPERATION

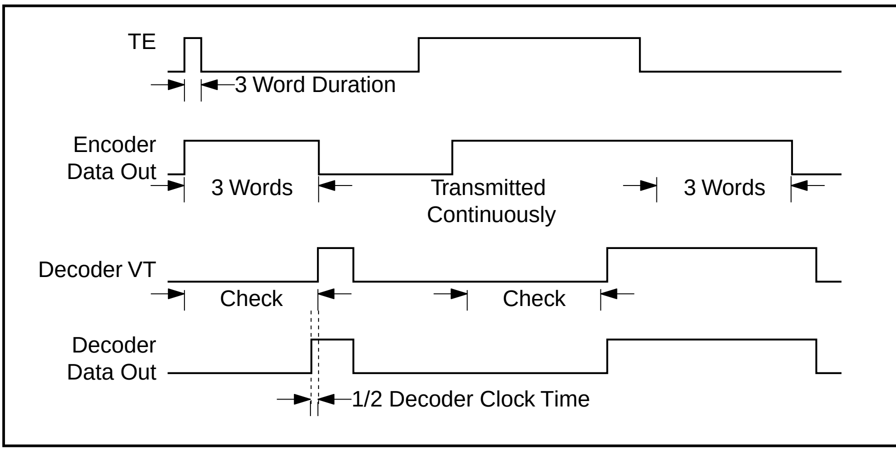


figure 4: Encoder/Decoder Timing Diagram

DECODER OPERATION

The decoder receives the data transmission and interprets the first 10 bits of code period as address and the last 8 bits as data. The decoder checks the received address twice. If all the received addresses match the decoder's local setting the 8 data lines are set to correspond with those of the transmitter device. In addition, the transmission verify line (Pad 11) is set high to indicate the decoder's acceptance of the incoming data.

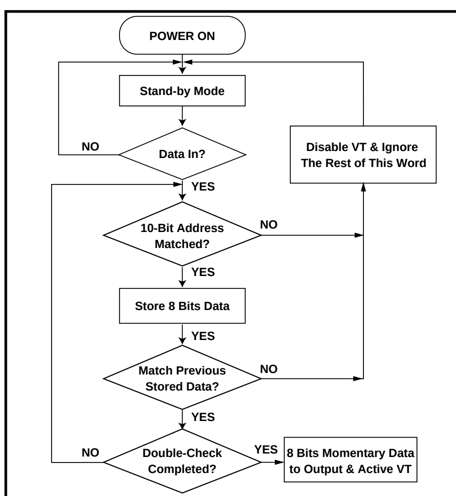


figure 5: Decoder Flowchart

PRODUCTION GUIDELINES

The KH modules are packaged in a hybrid SMD package. Versions are available to support hand- or automated-assembly techniques. Since KH devices contain discrete components internally, the assembly procedures are critical to insuring the reliable function of the KH product. The following procedures should be reviewed with and practiced by all assembly personnel.

PAD LAYOUT

The following pad layout diagrams are designed to facilitate both hand and automated assembly.

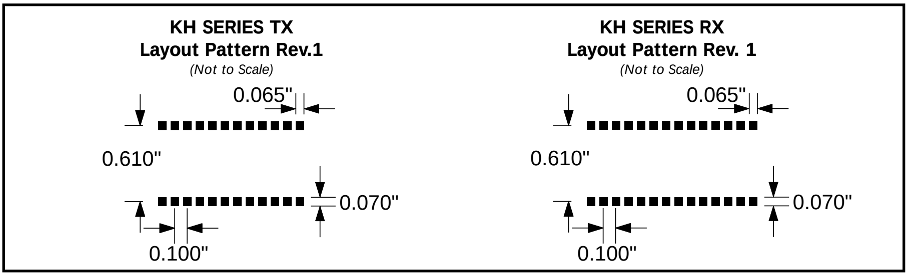


figure 6: Recommended Pad Layout

RECEIVER HAND ASSEMBLY

If the recommended pad guidelines (Rev. 3) have been followed, the modules, pins and pads will protrude slightly past the module edges. Use a fine soldering tip to heat the board pad, then introduce solder to the pad at the module's edge. The solder will wick underneath the module providing reliable attachment. As with the transmitter it is usually best to secure a corner and then work around the device.

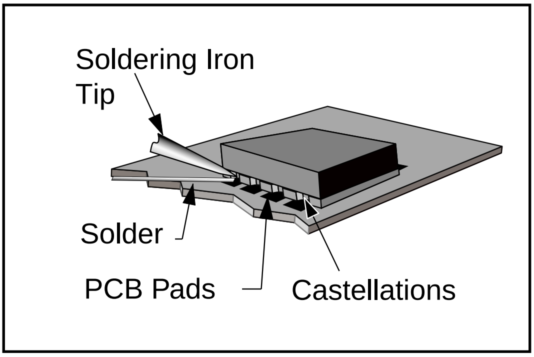


figure 7: Castellation Soldering Technique

Absolute Maximum Solder Times

Hand-Solder Temp. TX +225°C for 10 Sec.
Hand-Solder Temp. RX +225°C for 10 Sec.
Recommended Solder Melting Point +180°C
Reflow Oven: +220° Max. (See adjoining diagram)

For high-volume assembly most users will want to auto-place the modules. The modules have been designed to maintain compatibility with reflow-processing techniques; however, due to the module's hybrid nature certain aspects of the assembly process are far more critical than for other component types.

Following are brief discussions of the primary areas where caution must be observed.

Reflow Temperature Profile

The single most critical stage in the automated-assembly process is the reflow process. The reflow profile below should be closely followed since excessive temperatures or transport times during reflow will irreparably damage the modules. Assembly personnel will need to pay careful attention to the oven's profile to ensure that it meets the requirements necessary to successfully reflow all components while still meeting the limits mandated by the modules themselves.

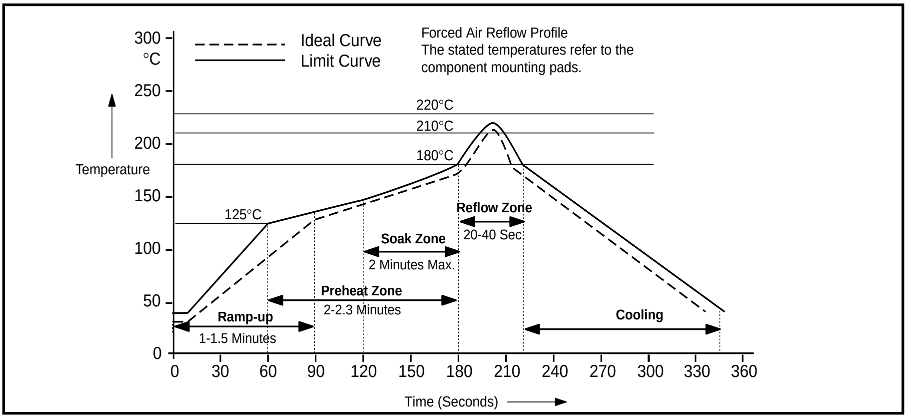


figure 8: Required Reflow Profile *Revision 2 - 11/98*

Shock During Reflow Transport

Since some internal module components may reflow along with the components placed on the board being assembled, it is imperative that the module not be subjected to shock or vibration during the time solder is liquidus.

Washability

The modules are wash resistant, but are not hermetically sealed. They may be subject to a standard wash cycle; however, a twenty-four-hour drying time should be allowed before applying electrical power to the modules. This will allow any moisture that has migrated into the module to evaporate, thus eliminating the potential for shorting during power-up or testing.

PHYSICAL PACKAGING

The receiver is packaged as a hybrid SMD module with 28 pads spaced 0.100" on center. The leaded SMD package allows for easy prototyping or hand assembly. Modules are supplied in tube packaging.

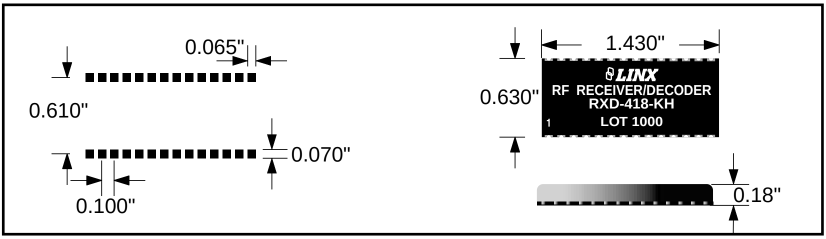


figure 9: KH Series Receiver Package Dimensions

PAD DESCRIPTIONS:

Pad 1, 25, 26 NO CONNECTION

Attach to an isolated pad to provide support for the module. Do not make electrical connection.

Pad 4, 27 GROUND

Connect to PCB groundplane.

Pad 2, 3, 7 ,8 , 9, 12, 13, 14 DATA OUT LINES

Status of transmitter data lines is output on these pins if addresses match those of the transmitter.

Pad 5 POSITIVE SUPPLY (Vcc 2.7-4.2 VDC)

The supply must be clean (<20 mV pp), stable and free of high-frequency noise. A supply filter is recommended unless the module is driven from its own regulated supply or battery.

Pad 6   POWER DOWN

Pull this line low to put the receiver in sleep mode. Leave floating or pull high to enable the receiver.

Pad 10 RX DATA

Direct incoming data prior to encoder. Output voltage during a high bit will average VCC- 0.3V.

Pad 11 VALID TRANSMISSION

This pin goes high when a transmission is received and tx/rx addresses match.

Pad 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 ADDRESS PINS

Ten tri-state address inputs are used to set receiver address to avoid contention and create unique tx/rx relationships. Note: tri-state means that the address lines have three distinct states; high, low, and floating. All address pin states must match that of the KH transmitter module for transmission to be recognized.

Pad 28 RF IN

The receiver antenna connects to this input. It has nominal RF impedance of 50Ω and is capacitively isolated from the internal circuitry.

MODULE DESCRIPTION

The KH Series module combines the popular Linx KH series receiver with a decoder IC in a convenient SMD package. The module is ideal for general-purpose remote control and command applications. When paired with a matching Linx KH Series transmitter/encoder a highly reliable RF link capable of transferring control and command over line-of-sight distances in excess of 300 feet (90M) is formed. The on-board receiver/decoder combination provides eight switched outputs which correspond to the state of the data lines on the transmitter's encoder. Ten tri-state address lines are also provided to allow up to 59,049 unique identification codes.

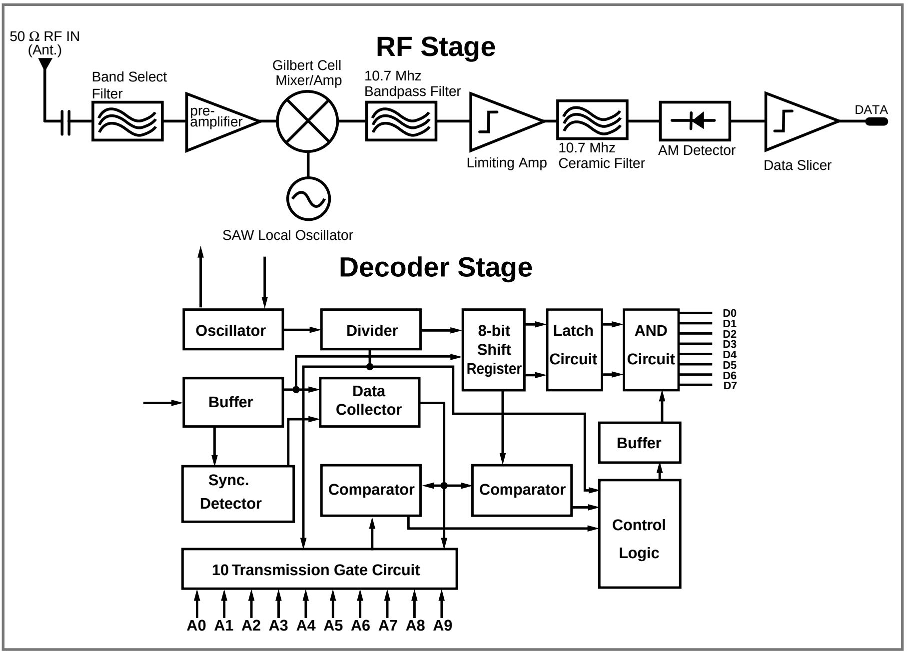


figure 10: KH Series Receiver Block Diagram

THEORY OF OPERATION

The KH module is designed to receive transmissions from a matching KH transmitter module or other compatible Linx transmitter product. When transmitted data is received, the data is presented to the on-board decoder. If the incoming address data matches with the local address settings, the decoders output(s) are set to replicate the state of the transmitter's data lines.

The RF section of the KH module utilizes an advanced single-conversion superhet design which incorporates a SAW device, high IF frequency and multi-layer ceramic filters. The SAW device provides a highly accurate L/O frequency source with excellent immunity to frequency shift due to age or temperature. The use of SAW devices in both the KH transmitter and receiver modules allows the receiver's pass opening to be quite narrow, thus increasing sensitivity and reducing susceptibility to near-band interference.

POWER SUPPLY REQUIREMENTS

The KH receiver/decoder module requires a clean, well-regulated power source. While it is preferable to power the unit from a battery, the unit can also be operated from a power supply as long as noise and 'hash' are less than 20 mV. A 10Ω resistor in series with the supply followed by a 10µF tantalum capacitor from VCC to ground will help in cases where the quality of supply power is poor.

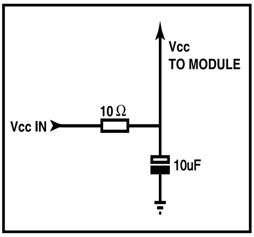


figure 11: Supply Filter

SETTING THE RECEIVER ADDRESS

The module provides 10 tri-state address pins. This allows for the formation of up to 59,049 unique Receiver-Transmitter relationships. Tri-State means that the address lines have three distinct states: high, low, and floating. These pins may be hardwired or configured via a microprocessor, DIP switch or jumpers. NOTE: Address pin states must match the transmitter's exactly for a transmission to be recognized.

DATA OUTPUT

When data is received and the incoming address data matches with the local address settings, the module's eight data output(s) are set to replicate the state of the transmitter's data lines. In addition, Transmission Verify (pad 11) will go high to indicate reception and decoding of the data. The data lines have a low sink and source capability so external buffering is generally required if loads are to be driven directly.

In addition to the decoded data outputs raw data is also available via a CMOS-compatible data output on pad 10. The output of this pad is the actual received data stream and is always active regardless of address line status. It is made available for troubleshooting or monitoring internal data flow. It can also be used in mixed mode systems where data may come from another source in addition to a KH encoder module. This data can then be channeled to an off-board processor for decoding.

CONTENTION CONSIDERATIONS

An infinite number of receivers may be present in proximity at the same time; however, it is important to understand that only one transmitter at a time can be active within a reception area. While the transmitted signal consists of encoded digital data, only one carrier of any frequency can occupy airspace without contention at any given time. If more than one transmitter is active the receiver will produce unusable output.

There are several methods for eliminating or minimizing contention in applications where more than one unit may be activated. A method well suited to simplex links, such those formed using the KH series, is based on the concept of creating time domain randomness. This is useful when the designer can limit the duration of transmission and accept a statistical probability for occasional contention. To illustrate the concept, suppose that two users both push buttons on separate remote units at approximately the same time. Although the buttons appeared to be pressed at the same time some finite difference is actually present. If the actual transmission is extremely short, the potential for contention will be naturally reduced. The probability of contention may be further reduced by the introduction of redundant transmissions incorporating variable delays .

TYPICAL APPLICATION

Figure 16 shows an example of a basic remote control receiver utilizing a decoder chip from Holtek. When a key is pressed at the transmitter, a corresponding pad at the receiver goes high. A schematic for the transmitter/encoder circuit may be found in the KH transmitter guide. These circuits can be easily modified and clearly demonstrate the ease of using the Linx KH modules for remote control applications.

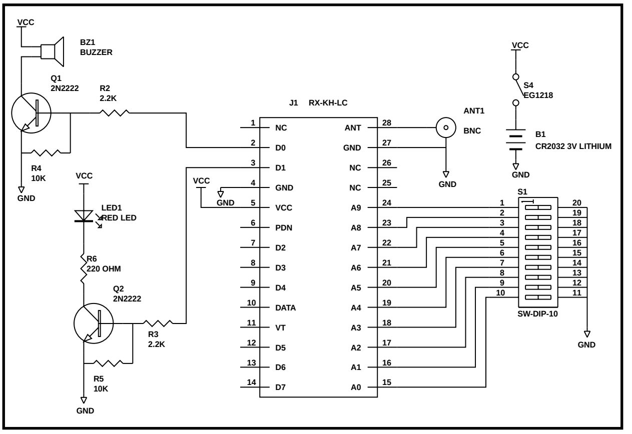
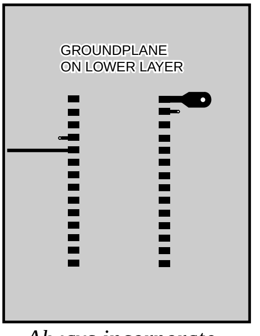


figure 12: Basic Remote Control Receiver

BOARD LAYOUT CONSIDERATIONS

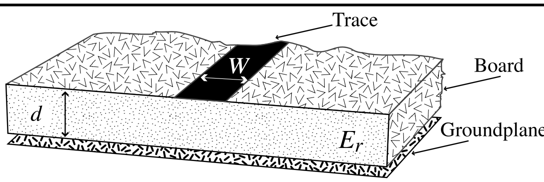
If you are at all familiar with RF devices you may be concerned about specialized board layout requirements. Fortunately, because of the care taken by Linx in designing the KH series, integrating the KH receiver is very straightforward. This ease of application is a result of the advanced multi-layer isolated construction of the module. By adhering to good layout principles and observing a few basic design rules you can enjoy a straightforward path to RF success.



Always incorporate adequate groundplane

1. No conductive items should be placed within .15 in. of the module's top or sides.
2. A groundplane should be placed under the module as shown. In most cases, it will be placed on the bottom layer. The amount of overall plane area is also critical for the correct function of many antenna styles and is covered in the next section.
3. Keep the module away from interference sources. Any frequency of sufficient amplitude to enter the receiver's front end will reduce system range, cause bit errors, and may even prevent reception entirely. There are many possible sources of internally generated interference. High speed logic is one of the worst in this respect, as fast logic edges have harmonics which extend into the UHF band and the PCB tracks efficiently radiate these harmonics. Microprocessors, switching power supplies, oscillators, even relays can also be significant sources of potential interference. Here again, the single best weapon against such problems is attention to placement and layout. Filter the supply as described previously. Place adequate groundplane under all potential sources of noise.

4. Observe appropriate layout practice between the module and its antenna. A simple trace may suffice for runs of less than .25" but longer distances should be covered using 50Ω coax or a 50Ω microstrip transmission line. This is because the trace leading to the module can effectively contribute to the length of the antenna thus lowering its resonant bandwidth. In order to minimize loss and detuning, a microstrip transmission line is commonly utilized. The term microstrip refers to a PCB trace running over a ground-plane, the width of which has been calculated to serve as a 50Ω transmission line between the module and antenna. This effectively removes the trace as a source of detuning. The correct trace width can be easily calculated using the information below.



$$E_e = \frac{E_r+1}{2} + \frac{E_r-1}{2} \cdot \frac{1}{\sqrt{1+12d/W}}$$

$$Z_0 = \begin{cases} \dfrac{60}{\sqrt{E_e}} \cdot \ln\left(\dfrac{8d}{W} + \dfrac{W}{4d}\right) & \text{For } \dfrac{W}{d} \le 1 \\[2ex] \dfrac{120\pi}{\sqrt{E_e} \cdot \left(\dfrac{W}{d} + 1.393 + 0.667 \cdot \ln\left(\dfrac{W}{d} + 1.444\right)\right)} & \text{For } \dfrac{W}{d} \ge 1 \end{cases}$$

figure 13: Microstrip Formulas (E_r = Dielectric constant of pc board material)

Dielectric Constant	Width/Height (W/d)	Effective Dielectric Constant	Characteristic Impedance
4.8	1.8	3.59	50.0
4	2	3.07	51.0
2.55	3	2.12	48.0

RECEIVER ANTENNA CONSIDERATIONS

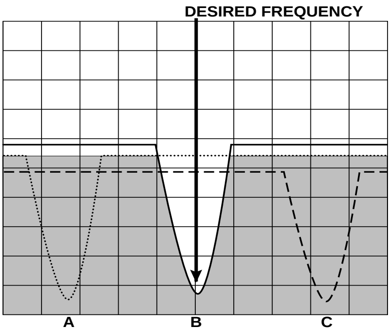
The choice of antennas is one of the most critical and often overlooked design considerations. The range, performance, and legality of an RF link is critically dependent upon the type of antenna employed. Proper design and matching of an antenna is a complex task requiring sophisticated test equipment and a strong background in principles of RF propagation. While adequate antenna performance can often be obtained by trial and error methods, you may also want to consider utilizing a professionally designed antenna such as those offered by Linx. Our low-cost antenna line is designed to ensure maximum performance and compliance with Part 15 attachment requirements. The purpose of the following sections is to give you a basic idea of some of the considerations involved in the design and selection of antennas. For a more comprehensive discussion please review Linx applications note #00500 “Antennas: Design, Application, Performance”.

THE RECEIVER ANTENNA

A receiving antenna should give its optimum performance at the frequency or in the band for which a receiver was designed, and capture as little as possible of other off-frequency signals. The efficiency of the receiver's antenna is critical to maximizing range-performance. Unlike the transmitter antenna, where legal operation may mandate a reduction in antenna efficiency or attenuation, the receiver's antenna should be optimized as much as is practical.

It is usually best to utilize a basic quarter-wave whip for your initial concept evaluation. Once the prototype product is operating satisfactorily, a production antenna should be selected to meet the cost, size and cosmetic requirements of the product.

Maximum antenna efficiency is always obtained when the antenna is at resonance. If the antenna is too short, capacitive reactance is present; if it is too long, inductive reactance will be present. The indicator of resonance is the minimum point in the VSWR curve. You will see from the following example that antenna (A) is resonant at too low a frequency, indicating excessive length, while antenna (C) is resonant at too high a frequency, indicating the antenna is too short. Antenna (B), however, is "just right."



Antenna resonance should not be confused with antenna impedance. The difference between resonance and impedance is most easily understood by considering the value of VSWR at its lowest point. The lowest point of VSWR indicates the antenna is resonant, but the value of that low point is determined by the quality of the match between the antenna, the transmission line, and the device to which it is attached.

To fully appreciate the importance of an antenna that is both resonant and matched consider that an antenna with a VSWR of 1.5 will effectively transmit approximately 95% of its power while an antenna with a VSWR of 10 will only transmit about 30%.

GENERAL ANTENNA RULES

The following general rules should help in maximizing antenna performance:

1. Proximity to objects such as a user's hand or body, or metal objects will cause an antenna to detune. For this reason the antenna shaft and tip should be positioned as far away from such objects as possible.
2. Optimum performance will be obtained from a 1/4- or 1/2-wave straight whip mounted at a right angle to the groundplane. In many cases this isn't desirable for practical or ergonomic reasons; thus, an alternative antenna style such as a helical, loop, patch, or base-loaded whip may be utilized.
3. If an internal antenna is to be used, keep it away from other metal components, particularly large items like transformers, batteries, and PCB

tracks and groundplanes. In many cases, the space around the antenna is as important as the antenna itself.

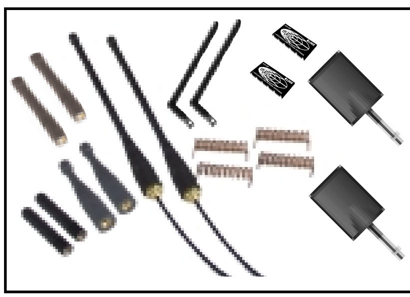
4. In many antenna designs, particularly 1/4-wave whips, the groundplane acts as a counterpoise, forming, in essence, a 1/2-wave dipole. For this reason adequate groundplane area is essential. As a general rule the groundplane to be used as counterpoise should have a surface area ≥ the overall length of the 1/4-wave radiating element.

5. Remove the antenna as far as possible from potential interference sources. Any frequency of sufficient amplitude to enter the receiver's front end will reduce system range, cause increased bit errors, and can even prevent reception entirely. There are many possible sources of internally generated interference. Switching power supplies, oscillators, even relays can also be significant sources of potential interference. Here again, the single best weapon against such problems is attention to placement and layout. Filter the module's power supply with a high-frequency bypass capacitor. Place adequate groundplane under all potential sources of noise. Shield noisy board areas whenever practical.

6. In some applications it is advantageous to place the receiver and its antenna away from the main equipment. This avoids interference problems and allows the antenna to be oriented for optimum RF performance. Always use 50Ω coax such as RG-174 for the remote feed.

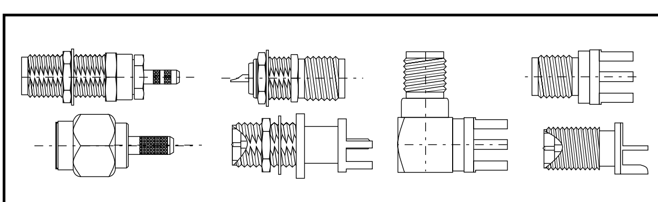
LINX ANTENNA OPTIONS

Linx offers a full line of antennas which are optimized for the frequencies at which our modules operate. The antennas are cost-effectively priced in volume and designed to maximize the performance of your product. For complete details,visit the Linx website at www.linxtechnologies.com, or contact the Linx literature department at (800)736-6677.



LINX CONNECTOR OPTIONS

The FCC requires that antennas designed for use on Part 15 products be either permanently attached, or utilize a unique and proprietary connector not available to the general public. Linx offers a full line of connectors designed to comply with these requirements.

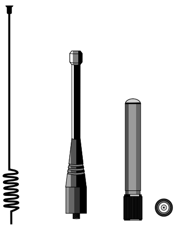


Part 15-Compliant Connectors

COMMON ANTENNA STYLES

There are literally hundreds of antenna styles that can be successfully employed with the KH Series. Following is a brief discussion of the three styles most commonly utilized in compact RF designs. Additional antenna information can be found in Linx application notes #00500, #00100, #00126 and #00140. Linx also offers a broad line of antennas and connectors which have outstanding performance and cost-effectiveness.

Whip Style



1/4-wave wire lengths for LC frequencies:

315Mhz=8.9"
418Mhz=6.7"
433Mhz=6.5"

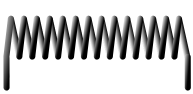
A whip-style monopole antenna provides outstanding overall performance and stability. A low-cost whip can be easily fabricated from wire or rod, but most product designers opt for the improved performance and cosmetic appeal of a professionally made model. To meet this need, Linx offers a wide variety of straight and reduced-height whip-style antennas in permanent and connectorized mounting styles.

The wavelength of the operational frequency determines an antenna's overall length. Since a full wavelength is often quite long, a partial 1/4-wave antenna is normally employed. Its size and natural radiation resistance make it well matched to Linx modules. The proper length for a 1/4-wave antenna can be easily found using the formula below. It is also possible to reduce the overall height of the antenna by using a helical winding. This decreases the antenna's bandwidth but is an excellent way to minimize the antenna's physical size for compact applications.

$$L = \frac{234}{F_{\text{MHz}}}$$

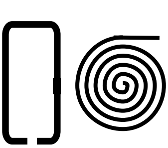
Where:
L=length in feet of quarter-wave length
F=operating frequency in megahertz

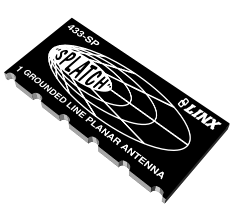
Helical Style



A helical antenna is precisely formed from wire or rod. A helical antenna is a good choice for low-cost products requiring average range-performance and internal concealment. A helical can detune badly in proximity to other objects and its bandwidth is quite narrow so care must be exercised in layout and placement.

Loop Style





A loop- or trace-style antenna is normally printed directly on a product's PCB. This makes it the most cost-effective of antenna styles. There are a variety of shapes and layout styles which can be utilized. The element can be made self-resonant or externally resonated with discrete components. Despite its cost advantages, PCB antenna styles are generally inefficient and useful only for short-range applications. Loop-style antennas are also very sensitive to changes in layout or substrate dielectric which can introduce consistency issues into the production process. In addition, printed styles initially are difficult to engineer, requiring the use of expensive equipment including a network analyzer. An improperly designed loop will have a high SWR at the desired frequency which can introduce substantial instability in the RF stages.

Linx offers a low-cost planar antenna called the “SPLATCH” which is an excellent alternative to the sometimes problematic PCB trace style. This tiny antenna mounts directly to a product's PCB and requires no testing or tuning. Its design is stable even in compact applications and it provides excellent performance in light of its compact size.

LEGAL CONSIDERATIONS

NOTE: KH Series Modules are designed as component devices. The modules are intended to allow for full Part 15 compliance; however, they are not approved by the FCC or any other agency worldwide. The purchaser understands that approvals may be required prior to the sale or operation of the device, and agrees to utilize the component in keeping with all laws governing its operation in the country of operation.

When working with RF, a clear distinction must be made between what is technically possible and what is legally acceptable in the country where operation is intended. Many manufacturers have avoided incorporating RF into their products as a result of uncertainty and even fear of the approval and certification process. Here at Linx our desire is not only to expedite the design process, but also to assist you in achieving a clear idea of what is involved in obtaining the necessary approvals to market your completed product legally.

In the United States the approval process is actually quite straightforward. The regulations governing RF devices and the enforcement of them are the responsibility of the Federal Communications Commission. The regulations are contained in the Code of Federal Regulations (CFR), Title 47. Title 47 is made up of numerous volumes; however, all regulations applicable to this module are contained in volume 0-19. It is strongly recommended that a copy be obtained from the Government Printing Office in Washington, or from your local government book store. Excerpts of applicable sections are included with Linx evaluation kits or may be obtained from the Linx Technologies web site (www.linxtechnologies.com). In brief, these rules require that any device which intentionally radiates RF energy be approved, that is, tested, for compliance and issued a unique identification number. This is a relatively painless process. Linx offers full EMC pre-compliance testing in our HP/Emco-equipped test center. Final compliance testing is then performed by one of the many independent testing laboratories across the country. Many labs can also provide other certifications the product may require at the same time, such as UL, CLASS A/B, etc. Once your completed product has passed, you will be issued an ID number which is then clearly placed on each product manufactured.

Questions regarding interpretations of the Part 2 and Part 15 rules or measurement procedures used to test intentional radiators, such as the KH modules, for compliance with the Part 15 technical standards, should be addressed to:

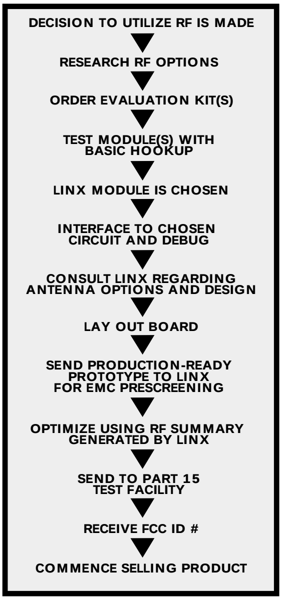
Federal Communications Commission
Equipment Authorization Division
Customer Service Branch, MS 1300F2
7435 Oakland Mills Road
Columbia, MD 21046
Tel: (301) 725-1585 / Fax: (301) 344-2050 E-Mail: labinfo@fcc.gov

International approvals are slightly more complex, although many modules are designed to allow all international standards to be met. If you are considering the export of your product abroad, you should contact Linx Technologies to determine the specific suitability of the module to your application.

All Linx modules are designed with the approval process in mind and thus much of the frustration that is typically experienced with a discrete design is eliminated. Approval is still dependent on many factors such as the choice of antennas, correct use of the frequency selected, and physical packaging. While some extra cost and design effort are required to address these issues, the additional usefulness and profitability added to a product by RF makes the effort more than worthwhile.

SURVIVING AN RF IMPLEMENTATION

Adding an RF stage brings an exciting new dimension to any product. It also means that additional effort and commitment will be needed to bring the product successfully to market. By utilizing premade RF modules, such as the KH series, the design and approval process will be greatly simplified. It is still important, however, to have an objective view of the steps necessary to insure a successful RF integration. Since the capabilities of each customer vary widely it is difficult to recommend one particular design path, but most projects follow steps similar to those shown at the right.



TYPICAL STEPS FOR IMPLEMENTING RF

In reviewing this sample design path you may notice that Linx offers a variety of services, such as antenna design, and FCC prequalification, that are unusual for a high-volume component manufacturer. These services, along with an exceptional level of technical support, are offered because we recognize that RF is a complex science requiring the highest caliber of products and support. “Wireless Made Simple” is more than just a motto, it’s our commitment. By choosing Linx as your RF partner and taking advantage of the resources we offer, you will not only survive implementing RF, you may even find the process enjoyable.

HELPFUL APPLICATION NOTES FROM LINX

It is not the intention of this manual to address in depth many of the issues that should be considered to ensure that the modules function correctly and deliver the maximum possible performance. As you proceed with your design you may wish to obtain one or more of the following application notes, which address in depth key areas of RF design and application of Linx products.

NOTE #	LINX APPLICATION NOTE TITLE
00500	Antennas: Design, Application, Performance
00125	Considerations for operation in the 260 Mhz to 470 Mhz band
00100	RF 101: Information for the RF challenged
00140	The FCC Road: Part 15 from concept to approval
00150	Use and design of T-Attenuation Pads

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