Low Cost Slim-Link® PLCC DAA for Voice, Data Fax

Description

The XE014J supplies a complete DAA in a modified 68-pin PLCC package. It is a low cost alternative to discrete DAA's for voice, fax, and data communications. The XE014J replaces 25 to 30 discrete components with a single, low cost unit. The XE014J leads to savings in purchasing and assembly while insuring quality.

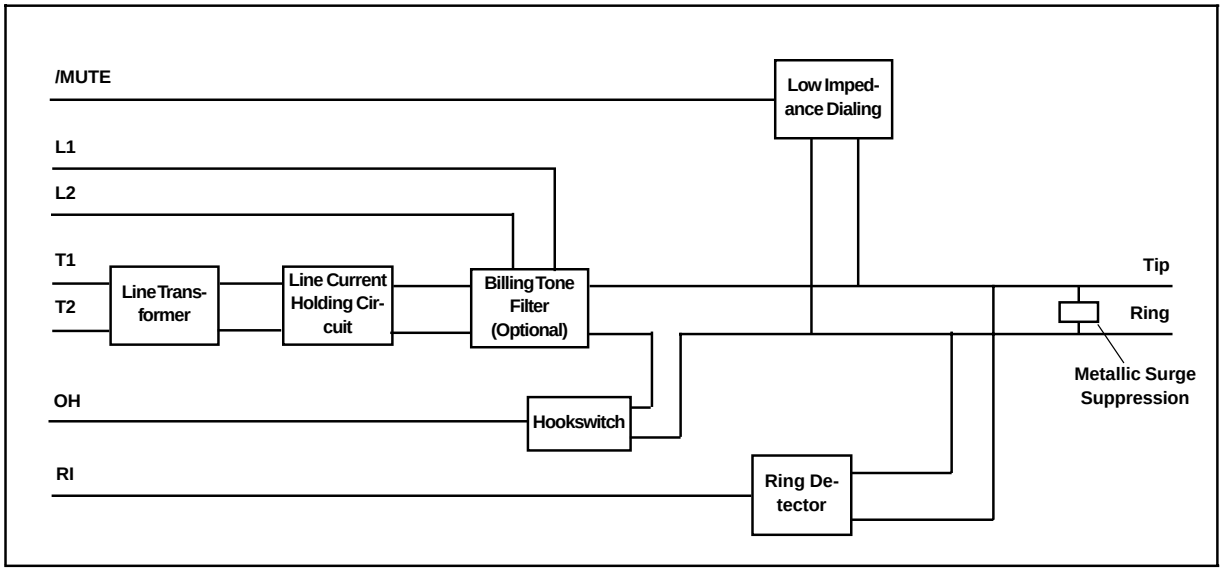
The XE014J is a complete DAA. It includes the line transformer, loop current holding circuit, hookswitch, metallic surge protection and ring indicator. Its PLCC package permits automated, high-volume assembly. By using the XE014J rather than a multitude of discrete components, assembly and purchasing costs are reduced.

Xecom delivers the XE014J as a fully integrated, fully tested assembly versus an assemblage of untested discrete components. Test and rework time can be reduced by selecting the XE014J as the integrated solution.

Features

* Low Total Cost Solution for Adding Voice, fax, or data Communications
* PLCC package for high-volume assembly
* FCC Part 68 Compliant
* Meets requirements for Canada and Japan
* Integrated Telephone Line Transformer
* Embedded Ring Detect Circuit
* Solid-State Hookswitch included
* Internal Metallic surge protection
* Operates on +5 Volt or +3 Volt Power
* Standard Operating Temperature Range 0 to 70 C
* Extended Temperature Ranges available

XE014J Block Diagram

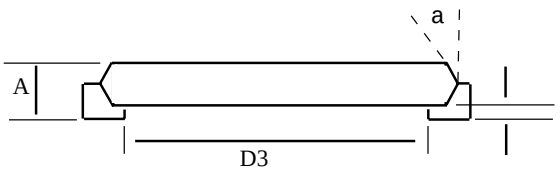


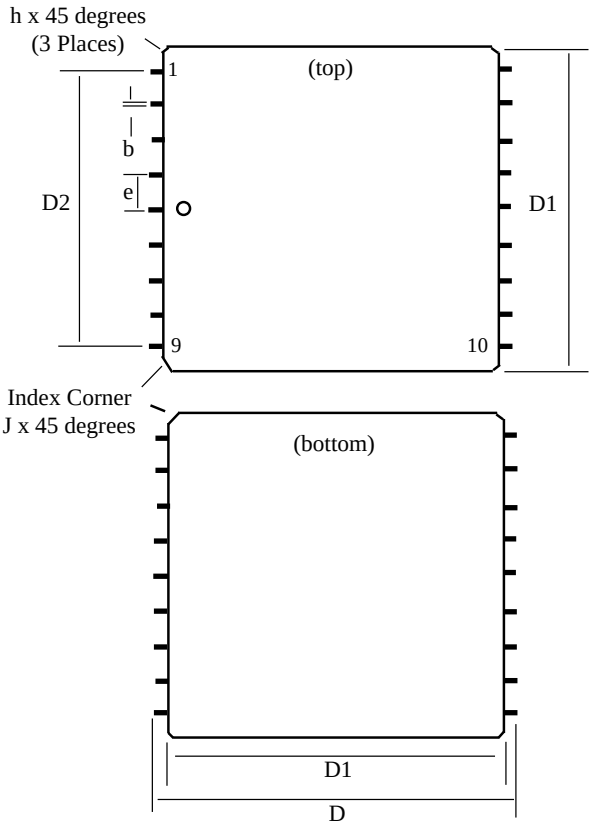
XE014J Ordering Information

The standard version of the XE014J is the XE014JLHGU. The L indicates that the off-hook control is an active low; the H indicates that the Ring Indicate output is an active high; the G indicates General Purpose feature set, and the U indicates the North American country configuration.

There are a number of variations of the XE014J which can be provided on special order. We offer a choice in the polarity of the Ring Indicate and Off-Hook signals plus variations for many different countries. We also anticipate adding many new features and options in future versions of this product. Please contact your Xecom sales representative for the correct model number when ordering any of these special versions of the XE014J.

XE014J Mechanical Specifications

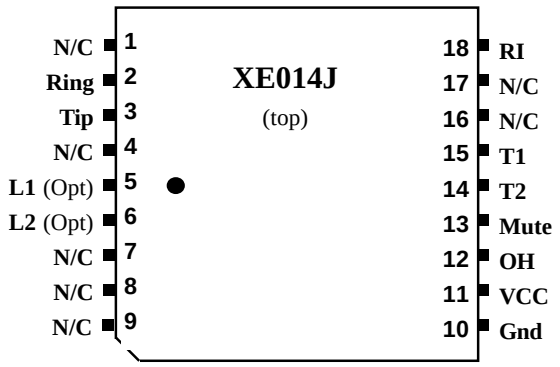




	Inches		Millimeters	
Dim	**Min**	**Max**	**Min**	**Max**
A	0.280	0.300	7.11	7.62
A1	0.020 REF		0.508 REF	
b	0.017	0.021	0.432	0.533
D	0.985	0.995	25.02	25.27
D1	0.952 REF		24.18 REF	
D2	0.800 REF		20.32 REF	
D3	0.910	0.930	23.11	23.62
e	0.100 BSC		2.54 BSC	
h	0.010 TYP		0.254 TYP	
J	0.045 Typ		1.15 TYP	
a	45^o TYP		45^o TYP	
Coplanarity	0.004 Max		0.10 Max	

XE014J Pin Descriptions

PIN NAME DESCRIPTION



XE014J Pin Configuration

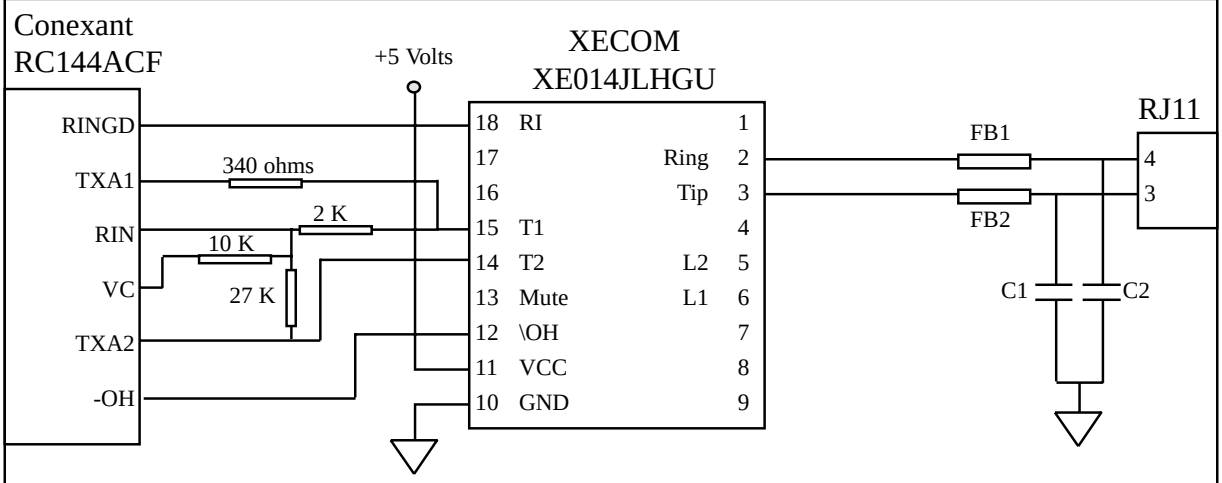
Pin	Name	Description
1	N/C	No Connection
2	Ring	Ring is one wire of the two-wire telephone line connection (RJ11 Pin 4). FCC Part 68 Rules require a 1500 volt isolation barrier between the telephone line and all other circuits. This isolation must be preserved throughout the system. Xecom recommends 0.100 inch spacing between traces connected to Ring and all other conductors to preserve this isolation.
3	Tip	Tip is one wire of the two-wire telephone line connection (RJ11 Pin 3). The telephone company places a DC "Battery" voltage across Tip and Ring on all public switched telephone lines. The XE014J accept this line battery voltage without regard to its polarity.
4	N/C	No Connection
5, 6	L2	L1 and L2 provide the points to connect a five millihenry inductor. This inductor completes the 16 KHz German billing tone filter.
7-9	N/C	No Connection
10	GND	Ground connection to the XE014J. This signal provides the reference for the OH output and RI input. This pin should be connected to the systems digital ground.
11	VCC	+5 or +3 Volt power source for the XE014J. VCC powers the RI and OH control lines.
12	OH	Switch-hook control to the modem. OH is normally an active low input. OH is available as an active high input by special order. Activating OH closes the switch-hook causing the XE014J to seize the local telephone line. The telephone line connection is dropped when OH is deactivated. The host can pulse OH to simulate rotary dialing. The pulse rate in the US is ten pulses per second. Each digit is dialed as a series of pulses created by closure of the hook-switch. (one pulse for the digit one to ten pulses for the digit zero) The pulses must be asymmetrical so that the hook-switch is closed for thirty-one milliseconds and open for sixty-nine milliseconds. An inter-digit delay of at least one hundred milliseconds is required.
13	Mute	Mute is an optional signal on the XE014J. Countries which require low impedance dialing, such as Italy, use the Mute signal rather than the OH signal to pulse dial.
14	T2	T2 in conjunction with T1 provides the differential input/output for the analog signal. T2 connects directly to the secondary side of the line transformer embedded into the XE014J. To match the impedance of the DAA to the 600 ohm telephone line, a 340 ohm resistor is required on T1 or T2.
15	T1	T1 in conjunction with T2 provides the differential input/output for the analog signal. T1 connects directly to the secondary side of the line transformer embedded into the XE014J. To match the impedance of the DAA to the 600 ohm telephone line, a 340 ohm resistor is required on T1 or T2.
16-17	N/C	No Connection
18	RI	Ring Indicate output from the modem. RI is normally active high. RI is available as an active low output by special order. RI provides a square wave representation of the Ring signal present across Tip and Ring. This permits intelligent monitoring of the incoming ring. The XE014J recognizes ring voltages of thirty-eight to one hundred fifty volts RMS in the frequency range of sixteen to sixty-eight Hertz.

XE014J ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-25^{O} C to +85^{O} C
Operating Temperature Range *	0^{O} C to +70^{O} C
Maximum Solder Temperature	220^{O} C
Maximum Time Above Eutectic (183^{O} C)	90 seconds
Preheat Dwell Time	120 to 180 seconds

* The XE014J can be ordered with an Operating Temperature of -40^{O} C to +85^{O} C at extra cost.

Typical Connections Diagram for North America and Japan



Recommended Parts

Designation	Description
C1, C2	47 picofarad, 3000 Volts (Sprague Part Number 30GA-T47)
FB1, FB2	Ferrite Beads (TDK Part Number CB30-453215B)

Dialing:

The public switched telephone network permits tone and rotary dialing. The XE014J supports both types. Tone dialing requires an external signal source to provide the dialing tones to the XE014J. Rotary dialing is accomplished by pulsing the OH line on the XE014J.

Tone Dialing: When tone dialing, the XE014J seizes the line, OH active. The DTMF, Dual Tone Multiple Frequency, dialing tones are placed across T1 and T2. Each digit uses a unique tone pair. The higher frequency tone is always larger than the lower frequency one. Transmit the tones for a minimum of 70 milliseconds, and leave a minimum of 70 milliseconds between digits.

The chart below shows the correct frequencies for each digit.

Digit	Lower Tone	Upper Tone
1	697	1209
2	697	1336
3	697	1477
4	770	1209
5	770	1336
6	770	1477
7	852	1209
8	852	1336
9	852	1477
0	941	1336
*	941	1209
#	941	1477

Pulse Dialing: The XE014J generates dialing pulses through momentary closures of the switch-hook. Each digit is dialed as a series of pulses, one pulse for the digit one, ten pulses for a zero. The pulse rate is ten pulses per second. The dialing pulses are asymmetrical. The correct duty cycle varies from country to country. An interdigit delay of at least one hundred milliseconds is required to separate the digits.

Some countries, notably Italy, require low impedance values during pulse dialing. For these countries, the XE014J provides a Mute switch to generate the dialing pulses rather than OH. .

Signal Levels:

FCC Part 68 Rules set the allowable level of all signals placed on the telephone line other than live voice. For the most common certification type, a "Permissive" connection, data, fax, synthesized voice and other information signals are limited to -9 dBm. Zero dBm is 1 milliwatt through a 600 ohm load. The rules provide for a different limit for DTMF, Dual Tone Multiple Frequency, tones. The combined power of the two tones may be as high as 0 dBm with the higher frequency tone at least 2 dBm larger than the lower tone.

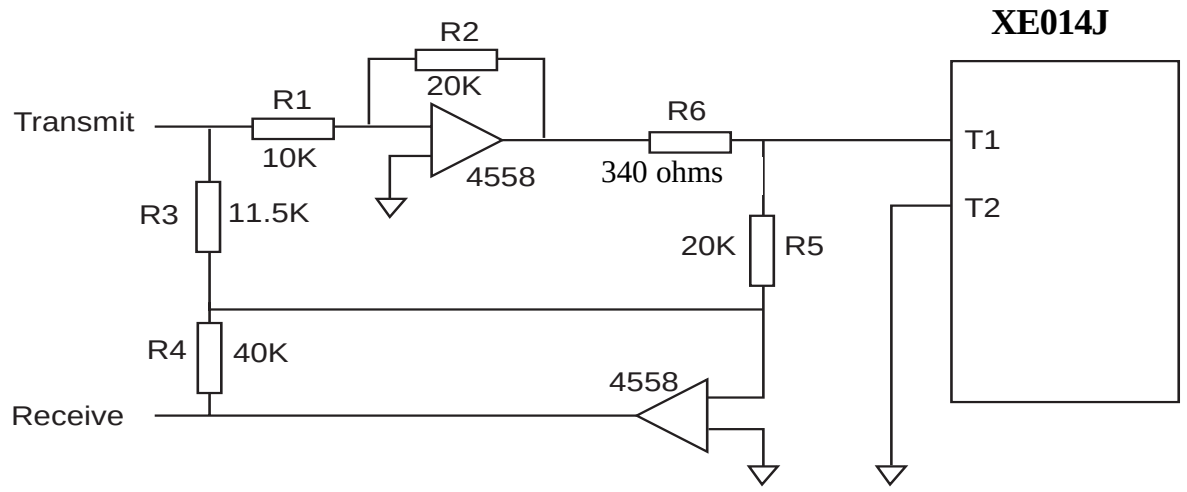
Insertion Loss: There is some loss of signal power as the information signal passes through the XE014J. This "insertion" loss should be taken into account when placing signals across T1 and T2 for transmission. The typical insertion loss of the XE014J is 3 dB.

2/4 Wire Conversion:

Full Duplex communications over a two-wire telephone line requires that transmit and receive signal share the available bandwidth. The two-to-four wire convertor separates these signals at the host interface. Many modem analog front end chips incorporate an internal 2/4 wire convertor making it unnecessary to provide one in the DAA.

If you are using the XE014J for an application other than a modem, such as voice processing, or your modem analog front end does not provide the 2/4 wire convertor, you will need to provide a discrete 2/4 wire convertor. Figure 6 shows a simple 2/4 wire convertor circuit.

XE014J Applications Notes (continued)



2/4 Wire convertor

The performance of the 2/4 wire convertor is measured by its Transhybrid Loss. The Transhybrid Loss shows how much the 2/4 wire convertor attenuates the transmit signal on the received data line. The circuit above provides a typical Transhybrid Loss of 20 dB.

The Transhybrid Loss will vary with the quality of the impedance match to the telephone line. Even when the recommended value for the impedance matching resistor, R6, is used variations from line to line alter the impedance match. The value of R3 can be changed to improve the Transhybrid Loss.

The 2/4 wire convertor also amplifies the transmit and receive signals to compensate for the insertion loss of the DAA. This circuit provides 6 dB gain of both the transmit and receive signals. The values of R1 and R2 set the transmit gain. The values of R4 and R5 set the receive gain.

Electrical Specification *(Vcc=+5v ±10%, Ta=0 to 70 deg C)*

Parameter	Conditions	Min	Typ	Max	Units
Power Supply Current	Off-hook		10		mA
	On-hook		0.5		mA
Transmit Insertion loss	600 Ohm Impedance, 1800 Hz		3		dB
Receive Insertion loss	600 Ohm Impedance, 1800 Hz		3		dB
Line Matching Impedance	Input to T1 and T2 (600 ohm line)		340		ohms
Line Impedance	RM equal to 340 ohms	540	600	660	ohms
Total Harmonic Distortion	600 Ohm Impedance, 500 to 4000 Hz		-76		dB
Ring Detect Sensitivity	Min. AC voltage between Tip & Ring Type B ringer	38		150	Vrms
Ring Frequencies Detected		16		68	Hz
RI Output Voltage	Ring signal present, Active low		0.2	0.5	Volts
	Ring signal present, Active High	2.0		5.0	Volts
Hookswitch Control Voltage (active low)	ON: (off-hook)		0.2	0.5	Volts
	OFF: (on-hook)	2.0	3.0		Volts
Hookswitch Control Voltage (active high)	ON: (off-hook)	2.0	3.0		Volts
	OFF: (on-hook)		0.2	0.5	Volts
Hookswitch Control Current	ON: (off-hook)		5	10	milliamps
	OFF: (on-hook)			5	microamps
Loop Current	Off-Hook current draw from Telephone Line	20		100	mA
DC On-Hook Impedance	Hookswitch Open	10			M Ohms

FCC Part 68 Instructions

When developing a product to be connected to the telephone line, it is necessary to use a circuit known as a Data Access Arrangement (DAA) approved by the appropriate governmental agency. In the US this agency is the Federal Communications Commission (FCC), while in Canada it is Industry Canada (IC). These agencies test and approve the product to ensure that it meets their specifications, thereby protecting the telephone system from damage and protecting the user from high voltage transients (such as lightning strikes) which may come down the telephone line.

The XE014J has been designed to meet all FCC Part 68 requirements for hazardous voltage, line impedance and leakage current. If the system transmits data, synthesized voice, or DTMF tones on the telephone line, the user must certify that the signals transmitted meet basic FCC requirements for maximum transmission levels, out of band energy and billing delay. Full details may be obtained from the FCC under Part 68 of the FCC Rules and Regulations, or in Title 47 of the Code of Federal Regulations, however the basic requirements are as follows:

1. Maximum Transmit Level

For the normal "permissive" (standard) telephone line, equipment which transmits data (such as a modem) must not exceed a transmission level of -9 dBm.

2. Out of Band Energy

Data equipment must not transmit "out of band" energy on the telephone line which exceeds the following limits:

Frequency		Range	Max. Power
3995 Hz	to	4005 Hz	-27 dBm
4005 Hz	to	12 kHz	-20 dBm
12 kHz	to	90 kHz	-55 dBm
90 kHz	to	270 kHz	-55 dBm
270 kHz	to	6 MHz	-15 dBm

3. DTMF Transmission Level

If the system is capable of DTMF dialing, the maximum DTMF transmission level must be less than 0 dBm averaged over a 3 second interval.

4. Billing Delay

A delay of 2 seconds or greater is required after the time the XE014J is taken "off hook" and before any information is transmitted. This is required to ensure that billing information may be exchanged between telephone company central offices without interference.

The user of the XE014J must certify to the FCC that the final system meets the requirements of Part 68 which include the criteria above as well as the high voltage protection provided by the XE014J. This is generally accomplished through an independent testing lab which tests the System and submits the proper paperwork to the FCC for approval. Since the XE014J already complies with FCC Part 68 rules, this is a relatively simple process.

Terms of Sale

Devices sold by XECOM are covered by the warranty provisions appearing in its Terms of Sale only. XECOM makes no warranty, express, statutory, implied, or by description regarding the information set forth herein, or regarding the freedom of the described devices from patent infringement. XECOM makes no warranty of merchantability or fitness for any purposes. XECOM reserves the right to discontinue production and change specifications and prices at any time and without notice. This product is intended for use in normal commercial applications. Applications requiring extended temperature range, unusual environmental requirements, or high reliability applications, such as military, medical life-support or life-sustaining equipment, are specifically not recommended without additional processing and authorization by XECOM for such application.

Xecom assumes no responsibility for the use of any circuitry other than circuitry embodied in a Xecom product. No other circuits, patents, or licenses are implied.

Life Support Policy

Xecom's products are not authorized for use as Critical Components in Life Support Devices or Systems.

Life Support Devices or Systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions provided in the labeling, can be reasonably expected to result in significant injury to the user.

A Critical Component is any component of a life support device or system whose failure to perform can be reasonably expected to cause failure of the life support device or system, or to affect its safety or effectiveness.

Xecom Incorporated
374 Turquoise Street, Milpitas, CA 95035
Ph:408-945-6640 Fax:408-942-1346
Email: info@xecom.com