

XE0092 Surface-Mount DAA Module

DESCRIPTION

The XE0092 is a complete telephone line interface or DAA (Data Access Arrangement) in a compact, surface-mount module. It offers an alternative to a discrete DAA for a multitude of voice, audio, DTMF, fax and data applications. The XE0092 replaces 25 to 30 discrete components with a single, fully-assembled and fully-tested unit.

The XE0092 does not sacrifice performance for small size and surface-mount convenience. The wide bandwidth, low distortion design provides sufficient bandwidth for a 56K bps analog modem.

Like all Cermetek DAA modules, the XE0092 supplies a complete telephone line interface. It includes a 2-4 wire converter, loop current holding circuit, hook switch and ring indicator. It also supports Caller ID pass through. The XE0092 complies with FCC Part 68 rules for direct connection to the telephone line.

Cermetek offers the XE0092 in three lead styles; the XE0092 with gull-wing leads, the leadless XE0092LCC, and the XE0092T through-hole model. All versions offer the same outstanding performance.

MODELS

XE0092 - Leaded Surface Mount, 0° to +70°C

XE0092LCC - Leadless Surface Mount, 0° to +70°C

XE0092T - Leaded Through-Hole, 0° to +70°C

XE0092-ITR - Leaded Surface Mount, -40° to +85°C

XE0092LCC-ITR - Leadless Surface Mount, -40° to +85°C

XE0092T-ITR - Leaded Through-Hole, -40° to +85°C

FEATURES

- * Low-profile, surface-mount package;
- * Meets technical specifications requirements for reliable V.90 and V.92 communications;
- * Typical Second Harmonic Distortion of -80 dB;
- * Part 68 Compliant;
- * Integrated 2-to-4 wire converter with 40 dB Transhybrid Loss;
- * Supports Caller ID signal pass through;
- * Integrated Ring Detection,
- * Low power operation: Just 10 milliamps from a single + 3.3 Volt Power Supply;
- * Solid-State Hook Switch Control;

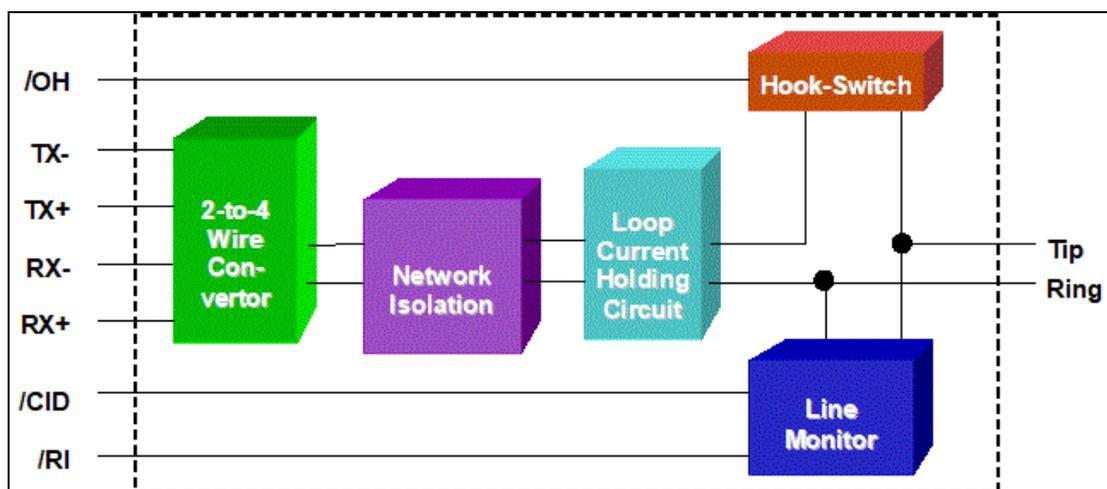


Figure 1: Functional Block Diagram of XE0092

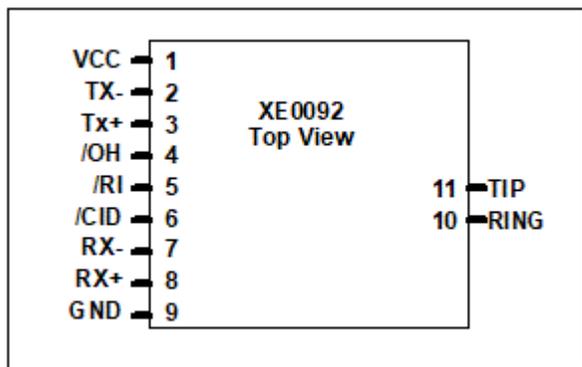


Figure 2: XE0092 Pin Descriptions

Pin Name Description

<p>1 VCC +3.3 or 5 Volt power source for the XE0092.</p> <p>2 TX- TX- together with TX+ forms the differential transmit signal input to the XE0092. If the host system uses a single ended signal output, connect that output to TX- and ground TX+.</p> <p>3 TX+ TX+ together with TX- forms the differential transmit signal input to the XE0092. If the host system uses a single ended signal output, connect that output to TX- and ground TX+.</p> <p>4 /OH The /OH input controls the Switch-Hook in the XE0092. /OH is active LOW. Driving /OH LOW closes the switch-hook creating the electrical connection between the XE0092 and the local telephone line. The XE0092 drops the connection when /OH returns HIGH.</p> <p>The host can pulse /OH to simulate rotary dialing. The pulse rate in the US is ten pulses per second. A delay between digits of at least one hundred milliseconds is required.</p> <p>5 /RI The XE0092 Ring Indicate output, /RI, is active LOW. /RI goes LOW for the duration of each incoming ring, and returns HIGH between rings.</p>

Pin Name Description

<p>6 /CID /CID is an active LOW input to the XE0092. Driving /CID LOW after the first ring opens the signal path for the analog Caller ID signal to be presented on the RX- and RX+ outputs.</p> <p>7 RX- RX- together with RX+ forms the differential received signal output from the XE0092. If the host system uses a single ended received signal input, connect that input to RX+ and leave the RX- output open.</p> <p>8 RX+ RX+ together with RX- forms the differential received signal output to the host system. If the host system uses a single ended received signal input, connect that input to RX+ and leave the RX- output open.</p> <p>9 GND Ground connection to the XE0092. This signal provides the reference for the /OH input and /RI output. This pin should be connected to the systems digital ground.</p> <p>10 Ring Ring together with Tip forms the two-wire local telephone line connection (RJ11 Pin 3). 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. Cermetek recommends 0.100 inch spacing between traces connected to Ring and all other conductors to preserve this isolation</p> <p>11 Tip Tip together with Ring forms the two wire local telephone line connection (RJ11 Pin 4). The telephone company places a DC "Battery" voltage across Tip and Ring on all public switched telephone lines. The XE0092 accept this line battery voltage without regard to its polarity.</p>
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XE0092 APPLICATION NOTES

Dialing:

The public switched telephone network permits tone and rotary (pulse) dialing. Either can be used with the XE0092. Tone dialing requires an external signal source to generate the dialing tones. The dialing tones can be passed through the XE0092 after it is taken off-hook, /OH LOW. Create dialing pulses with the XE0092 by toggling the /OH line.

Pulse Dialing: The XE0092 generates dialing pulses through momentary closures of the switch-hook using /OH. A series of switch-hook closures form each digit, one pulse to dial a one up to ten pulses to dial a zero. The required pulse rate in North America is ten pulses per second. The correct duty cycle of the pulses is 31 milliseconds ON and 69 milliseconds OFF. An inter-digit delay of at least one hundred milliseconds separates the digits.

Tone Dialing: To permit tone dialing the XE0092 goes off-hook, /OH LOW. To dial each digit a unique DTMF, Dual Tone Multiple Frequency, tone pair is applied to TX+ and TX-. The higher frequency tone is always larger than the lower frequency tone. Transmit the tones for a minimum of 70 milliseconds, and leave a minimum of 70 milliseconds between digits.

The following chart shows the correct DTMF signal frequencies for each digit.

<u>Digit</u>	<u>Lower Tone</u>	<u>Upper Tone</u>
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

Signal Levels:

FCC Part 68 Rules set the allowable amplitude in the US for all signals placed on the telephone line other than live voice. Other countries have similar regulations. Signal levels are measured in dBm. 0 dBm is 1 milliWatt through a 600 ohm load. The 0 dB insertion loss of the XE0092 means that the signal placed on the telephone line will be the same amplitude as the signal presented on TX+ and TX-.

Distortion:

Distortion is the most common measure of the quality of the signal path provided by the DAA. The primary source of this distortion is the line current holding circuit, although board layout and other factors can introduce distortion.

Distortion varies with frequency. The voice band of the telephone line is limited to frequencies less than 4000 Hz. High speed modems such as 33.6K bps and 56K bps require virtually all of this bandwidth for signal transmission. Even if the distortion through a device is good in the center portion of the spectrum, signal quality is compromised if distortion greatly increases at the outer limits of the voice band. The XE0092 provides a low distortion, typically -80 dB, across the entire voice band.

Caller ID Reporting:

The telephone network typically sends the Caller ID signal between the first and second ring signals. To capture the Caller ID signal with the XE0092 the /CID input must be activated, /CID LOW, before the end of the first ring. The Caller ID signal is then passed through the XE0092 to the host through the RX+ and RX- pins.

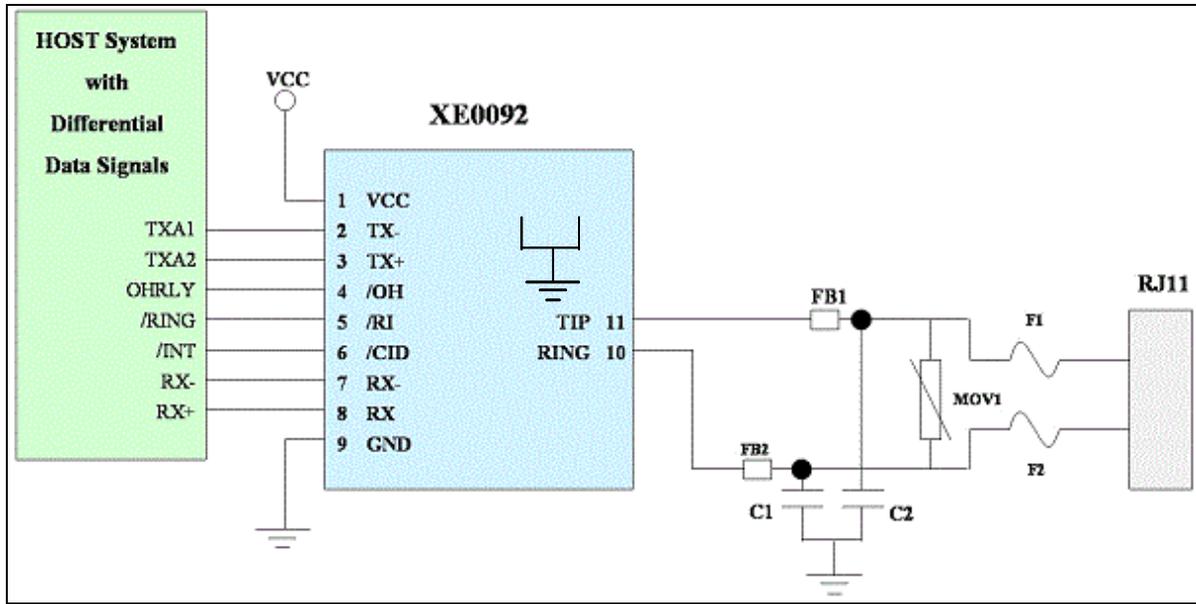


Figure 3: Typical Connections Diagram for North America and Japan

Component Description

- C1, C2 470 pFd, minimum 1500 Volts; these capacitors work in conjunction with Ferrites FB1 And FB2 to prevent unintended radiation when the telephone cable is attached to your system. These capacitors must be rated at a minimum of 1500 volts to maintain the isolation required by FCC Part 68 Rules.
- FB1, FB2 FB1 and FB2 are ferrites which work with Capacitors C1 and C2 to prevent unintended radiation when the phone cable is attached to your system. Cermetek recommends the TDK MMZ0402EUC181CTFOW which provides more than 100 ohms impedance at frequencies above 100 MHz.
- MOV1 MOV1 protects against damage from indirect lightning strikes on the telephone line. Cermetek recommends the Littlefuse P3100SDLRP Sidactor to provide this protection.
- F1, F2 F1 and F2 prevent damage to the system when a power line crosses with the telephone line. Cermetek recommends the Poly-Fuse TR600-150 for this function. The TR600-150 is a PTC device which automatically resets after use.

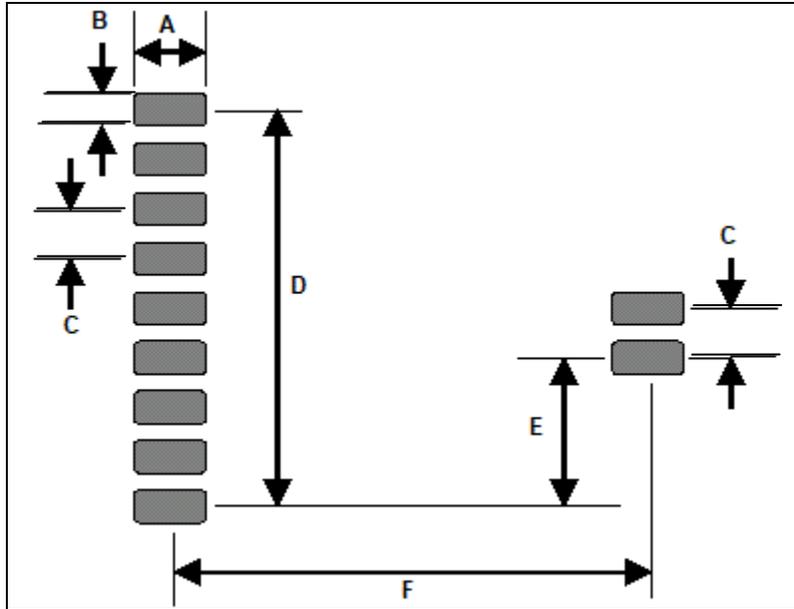


Figure 4: XE0092 Surface-Mount PCB Layout Recommendations

Table 1: Recommended Layout Dimensions

Dimensions	Typical (Inches)	Description
A	0.10	Pad Length
B	0.06	Pad Width
C	0.10	Space between adjacent pads
D	0.80	Distance from Pin 1 to Pin 9
E	0.30	Vertical Distance from Pin 9 to Pin 10
F	1.20	Row to Row Spacing

Note: To prevent possible violation of the 1500 Volt isolation barrier no components or traces should be placed under the XE0092LCC module.

XE0092 Surface-Mount Soldering Instructions

The XE0092 is subject to damage if over-exposed to heat during solder reflow operations. Following the soldering instructions below will ensure that the process of soldering the module to the board does not damage the modem.

Maximum Temperature	250° C
Maximum Time above 235° C	15 Seconds
Maximum Time in reflow zone (217° C)	90 Seconds
Maximum Preheat Dwell Time	180 Seconds

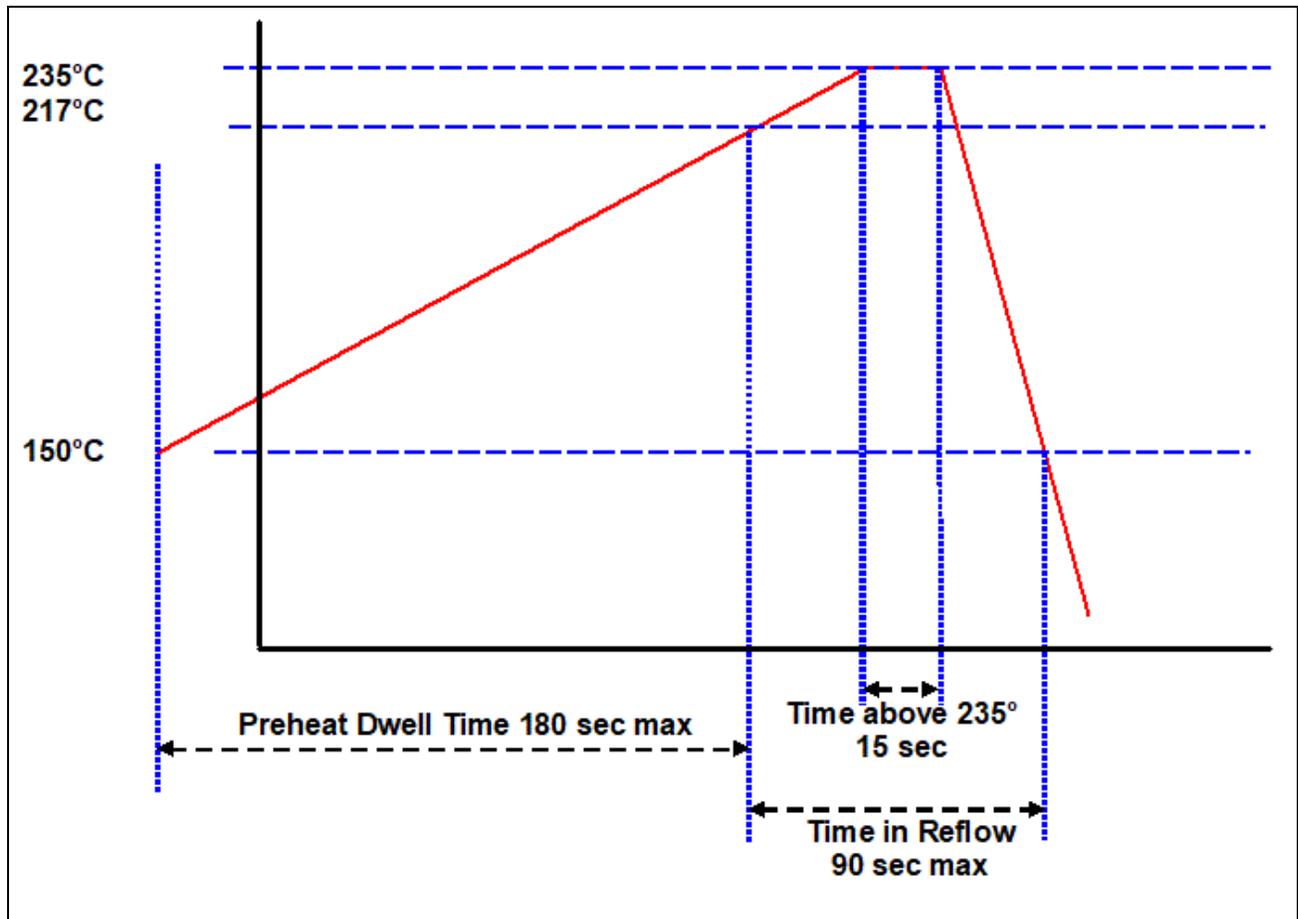


Figure 5: XE0092 Maximum Solder Temperature Profile

Table 2: XE0092 Electrical Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Units
Power Supply Voltage		3.0	3.3	5.0	DC Volts
Power Supply Current	Off-hook	-	10	-	mA
	On-hook	-	0.5	-	
Transhybrid Loss	600 Ohm impedance, 1800 Hz	-	40		dB
Transmit Insertion Loss	600 Ohm impedance, 1800 Hz	-0.2	0	0.2	dB
Receive Insertion Loss	600 Ohm impedance, 1800 Hz	-0.2	0	0.2	dB
Line Impedance	Off-Hook	-	600	-	Ohms
Second Harmonic Distortion	600 ohms, 200 to 4000 Hz	-	-80	-	dB
Ring Detect Sensitivity	Measured Across Tip & Ring, Type B Ringer	28	90	150	Vrms
RI Output Voltage	Ring Present	-	-	0.4	Volts
	No Ring Signal	Vcc-0.4	-	-	
Hook Switch Control Voltage	On: (off-hook)	-	0.2	0.5	Volts
	Off: (on-hook)	2.0	3.0	-	
Hook Switch Control Current	On: (off-hook)	-	-	-120	μA
	Off: (on-hook)	-120	-	-	
Loop Current	Off-Hook	10	-	100	mA
DC On-Hook Impedance	Hook-Switch Open	10	-	-	MOhms

XE0092 Absolute Maximum Ratings

Storage Temperature -40° C to +125° C

Operating Temperature Range * 0° C to +85° C

* The XE0092 can be ordered with an Operating Temperature of -40° C to +85° C at extra cost. Products tested to the higher temperature standard will be marked as -ITR.

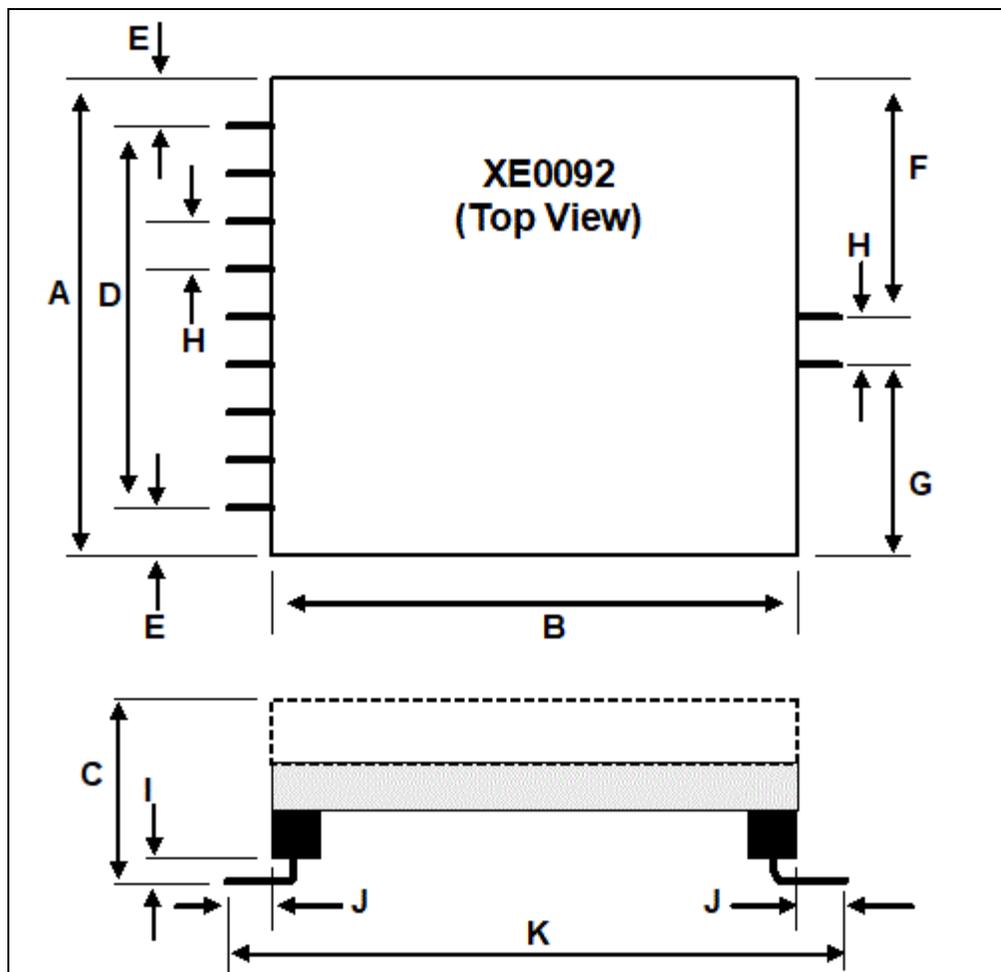


Figure 6: XE0092 Mechanical Specifications

Table 3: XE0092 Dimensions

Dimensions	Inches	Millimeters	Description
A	1.00	25.40	Product Length
B	1.20	30.48	Product Width
C	0.30	7.62	Product Height at the tallest component
D	0.80	20.32	Pin Row length Pin 1 to Pin 9
E	0.10	2.54	Distance from Pin 1 or Pin 9 to the edge of the product
F	0.50	12.70	Distance from Pin 11 to the Edge of the product
G	0.40	10.16	Distance from Pin 10 to the Edge of the product
H	0.10	2.54	Distance between adjacent pins
I	0.05	1.27	Total height of the interface pin
J	0.05	1.27	Distance the pin extends beyond the product edge
K	1.30	33.02	Total distance across the product including pin spread

NOTE: All interface pins are 0.25 inches square, Gold plated.

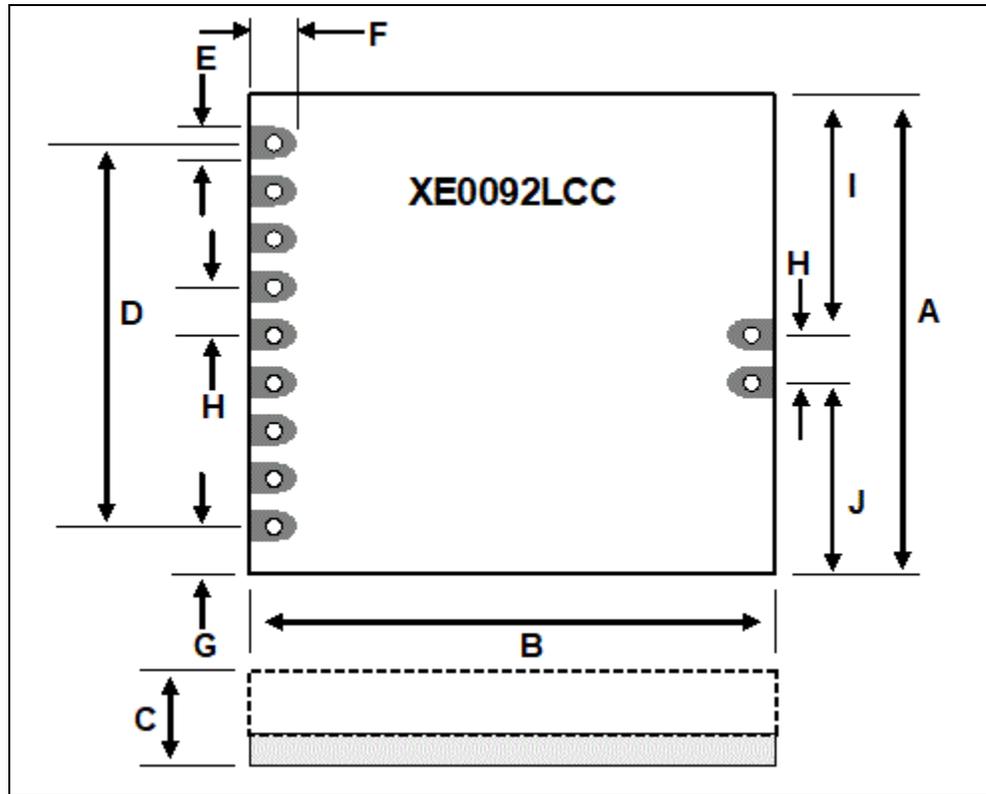


Figure 7: XE0092LCC Mechanical Specifications

Table 4: XE0092LCC Dimensions

Dimensions	Inches	Millimeters	Description
A	1.00	25.40	Product Length
B	1.20	30.48	Product Width
C	0.15	3.81	Product Height at the tallest component
D	0.80	20.32	Pin Row length Pin 1 to Pin 9
E	0.05	1.27	Width of Solder Pad
F	0.075	1.90	Length of Solder Pad
G	0.10	10.16	Distance from Pin 1 or 9 to the Edge of the product
H	0.10	2.54	Distance between adjacent pins
I	0.50	1.27	Distance from Pin 11 to the Edge of the product
J	0.40	1.27	Distance from Pin 10 to the Edge of the product

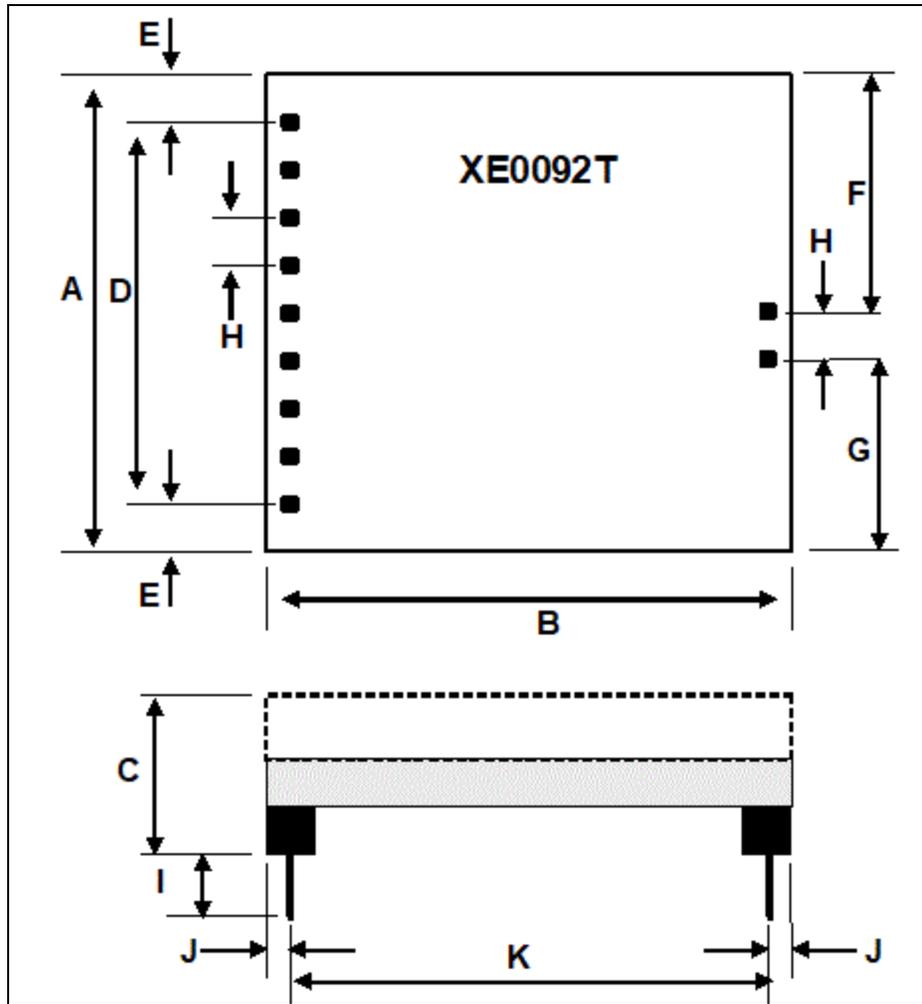


Figure 8: XE0092T Mechanical Specifications

Table 5: XE0092T Dimensions

Dimensions	Inches	Millimeters	Description
A	1.00	25.40	Product Length
B	1.20	30.48	Product Width
C	0.30	7.62	Product Height at the tallest component
D	0.80	20.32	Pin Row length Pin 1 to Pin 9
E	0.10	2.54	Distance from Pin 1 or Pin 9 to the edge of the product
F	0.50	12.70	Distance from Pin 11 to the Edge of the product
G	0.40	10.16	Distance from Pin 10 to the Edge of the product
H	0.10	2.54	Distance between adjacent pins
I	0.15	3.81	Total height of the interface pin
J	0.05	1.27	Distance the pin extends beyond the product edge
K	1.10	27.94	Distance between Pin Rows

NOTE: All interface pins are 0.25 inches square, Gold plated.

FCC Part 68 Information

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) which complies with regulations of 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 define tests of the product to ensure that it meets the requirements. These requirements protect the telephone system from damage and protect the user from high voltage transients (such as lightning strikes) which may come down the telephone line.

The XE0092 meets 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:

Table 6: Out of Band Energy Limits

Frequency Range	Max Power Allowed
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	-15dBm

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 at least 2 seconds is required after the time the XE0092 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 XE0092 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 XE0092. This is generally accomplished through an independent testing lab which tests the System and submits the proper paperwork to the FCC for approval.

Model Numbers

Cermetek offers a several variations of the XE0092. Variants include pin variations; surface-mount pins, through-hole pins and no pins. All pin variations are available in the standard 0° to 70° C operating range or in an extended operating temperature range of -40° to +85° C. The table below lists the available XE0092 models.

Table 7: XE0092 Model Numbers

Model	Summary of Features
XE0092	Low cost DAA for voice or data with surface-mount leads, 0° to 70° C operation
XE0092LCC	Low cost, Leadless DAA for voice or data, 0° to 70° C operation
XE0092T	Low cost DAA for voice or data with through-hole leads, 0° to 70° C operation
XE0092-ITR	Low cost DAA for voice or data with surface-mount leads, -40° to 85° C operation
XE0092LCC-ITR	Low cost, Leadless DAA for voice or data, -40° to 85° C operation
XE0092T-ITR	Low cost DAA for voice or data with through-hole leads, -40° to 85° C operation

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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. Cermetek reserves the right to make changes in specifications at any time and without notice. The information furnished by Cermetek in this publication is believed to be accurate and reliable. However, Cermetek assumes no responsibility for its use, or for any infringements of patents or other rights of third parties resulting from its use. No license is granted under any patents or patent rights of Cermetek.

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