

CH1807 Low Cost, DTMF Data Access Arrangement Module

Technology patent pending.

INTRODUCTION

The Cermetek CH1807 is a very low cost Data Access Arrangement (DAA) which connects a Dual Tone Multi Frequency (DTMF) transceiver directly to a Public Switched Telephone Network line (PSTN).

The device provides the necessary isolation and parametric compliance between the PSTN and the user's circuitry to be FCC Part 68 approved. The CH1807 meets or exceeds FCC Part 68 requirements and can thus be expeditiously approved when used as specified. The CH1807 provides ring detect, hook switch control, 2 to 4 wire conversion and surge protection, as well as isolation.

The CH1807 can be used with a variety of DTMF transceivers, transmitter receivers, chips or microprocessors programmed to transmit and/or receive DTMF. DTMF signalling over the PSTN is used in a variety of low speed applications as a modem replacement, to provide or receive control or numerical information. Alarm systems, industrial controllers, and service and diagnostic applications are some examples of use. The CH1807 resides between the RJ-11 jack for the Tip and Ring of the PSTN telephone line and the DTMF source.

The CH1807 is 1.0" x 1.0" x 0.35" and is thus easy to integrate into a compact design. It is also PCB through-hole mounted. The CH1807 operates on a single 5 Volt source. The cost of the CH1807 is very low, which makes it ideal for high volume applications.

FUNCTIONAL DESCRIPTION

RI, Output: Opto-coupler, 30K Ω pull-up
Active low
Square wave 15-68 Hz (Typ. 20 Hz)
Sensitivity: 38 Vrms across Tip & Ring

Hook Switch Control

The OFFHK input is used to take the DAA Off-Hook. When the input is low, the DAA is On-Hook which indicates to the telephone company's central office (CO) that it is ready to receive calls. When OFFHK is high, the DAA allows the CO supplied loop current to flow, indicating either it is answering a call or preparing to place a call.

OFFHK, Input: Active high
OFFHK active current: 4 mA

FEATURES

- Low Profile
- Complete DTMF DAA function
- * Ring detection
- Off-hook control
- Built in 2-wire to 4-wire conversion
- Ultra small size: 1.0" x 1.0" x 0.35"
- Lightweight
- Creates more board space
- +5 V operation
- 1500 Volt isolation
- 800 Volt surge protection
- Compatible with most DTMF sources

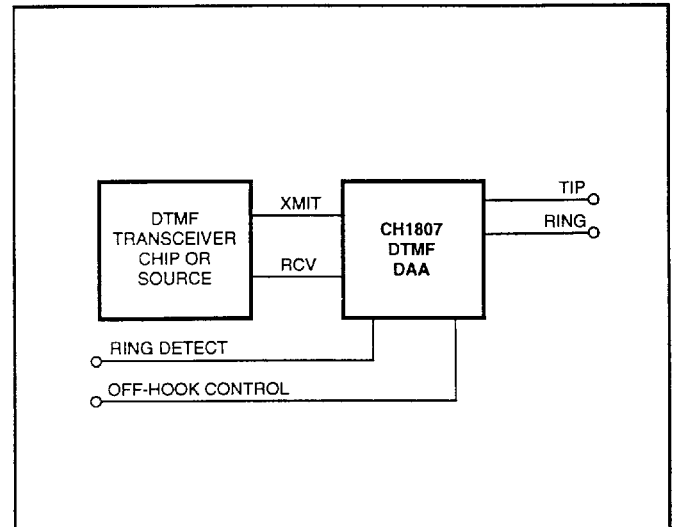


Figure 1. CH1807 Application Block Diagram

Transmit Signal

The outgoing DTMF signal to be transmitted through the phone line should be applied to the XMIT pin (with respect to GND) and must be AC coupled as shown in Figure 2. The DAA attenuates the transmit signal by 6.5 dB. Therefore, a transmit signal of 0 dB applied to XMIT will comply with the FCC Part 68 requirement for control signals of -6 dBm across Tip and Ring. The FCC does not currently maintain specific signal strength requirements for

voice signals or DTMF dialing signals. DTMF dialing signals have a "recommended" strength of -6 to -2 dBm.

XMIT, Input: Attenuation: 6.5 dB
Input impedance: 150K Ω
Typical input signal: 0 dBm, or 0.775 Vrms
Signal referenced to GND
AC coupling required

Receive Signal

The incoming DTMF signal appearing between Tip and Ring is presented at RCV with respect to GND and must be AC coupled to your receive input. Receive signals can vary from a maximum strength of 0 dBm to below -50 dBm.

RCV, Output: Gain: 0 dB
Output impedance: 100 Ω
Typ. output signal: 0 dBm to -50 dBm, or 0.775 Vrms to 2.5 mVrms
Signal referenced to GND
AC coupling required

2-Wire to 4-Wire Hybrid Converter

This block has two functions: 1) It applies the XMIT signal to the phone line and 2) It subtracts this signal from the total signal on the phone line to derive the RCV signal. The accuracy of this derivation depends on how closely the impedance of the

phone line matches 600 Ohms. Generally, a small amount of the XMIT signal will appear at RCV. The ratio of the applied XMIT signal to the received XMIT signal is called Trans-Hybrid Rejection, or Trans-Hybrid Loss.

APPLICATIONS

The CH1807 can interface to a variety of DTMF transceivers, receivers or transmitters.

Some suggested sources of DTMF transceivers (common type 8880):

- TELTON - M8888, M8880
- MITEL - MT8880
- CMD MICRO - MT8880

Some suggested sources of DTMF receivers (common type 8870):

- MITEL - MT8870
- SIERRA - SC11270, SC11202
- TELTON - M927, M957, M967, 8870

Some suggested sources of DTMF generators (common type 5089):

- ITT - SRA5089
- NATIONAL - TP5089
- TI - TCM5089
- STC - 5089
- UMC - UM95089

Figure 3 shows a CH1807 connection to a common type DTMF transceiver type 8880.

Figure 4 shows a CH1807 connected to both a common type receiver 8870 and a common type DTMF transmitter 5089.

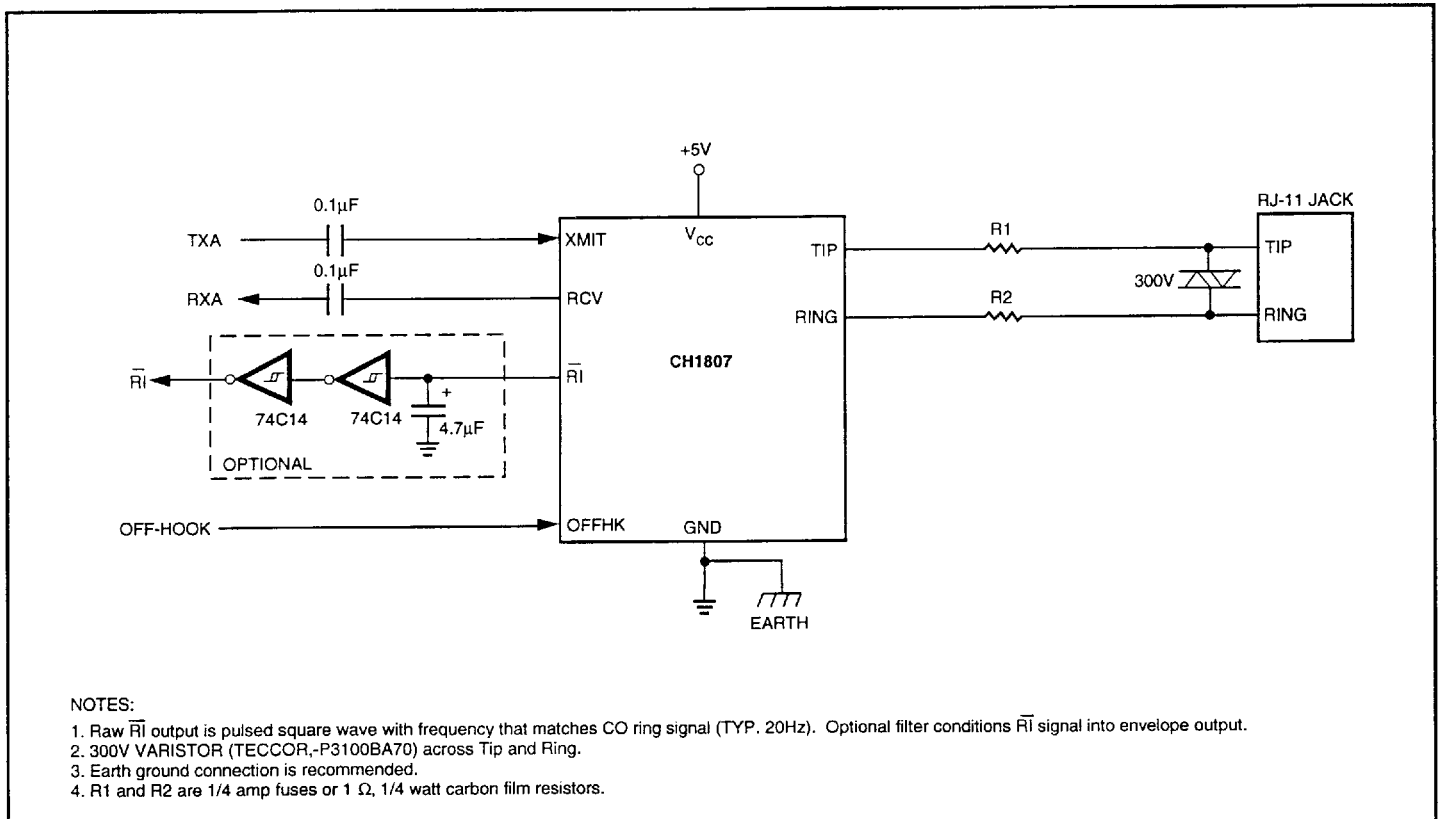


Figure 2. Typical Application

Table 1. CH1807 Pin Descriptions

NAME	I/O	FUNCTION
TIP	I/O	Direct telephone line connection.
RING	I/O	Direct telephone line connection.
OFFHK	I	When set LOW, the DAA is placed On-Hook. When set HIGH, the DAA is placed Off-Hook to answer or place a call. This input can also be used for pulse dialing. NOTE: When answering incoming calls in response to a ring indication on RI, internal relay contact degradation may occur if OFFHK is set HIGH before RI returns to its HIGH state.
\overline{RI}	O	It is asserted LOW by producing a square wave in coincidence with the AC Ring signal during the typically 2 second ON telephone ringing cycle and is asserted high during the 4 second idle period between rings. The square wave can be suppressed to produce an envelope of the AC ring with the application circuit shown in Figure 2.
RCV	O	This provides the signal or audio output with respect to ground and must be AC coupled with a 0.1 μ F capacitor to eliminate DC offset.
N/C	—	No user connection on this pin. Please leave unconnected.
V _{CC}	I	+5 Volts \pm 5%.
XMIT	I	Input an AC coupled DTMF signal with respect to ground.
GND	I	Ground — must be tied to signal and earth ground close to the DAA.

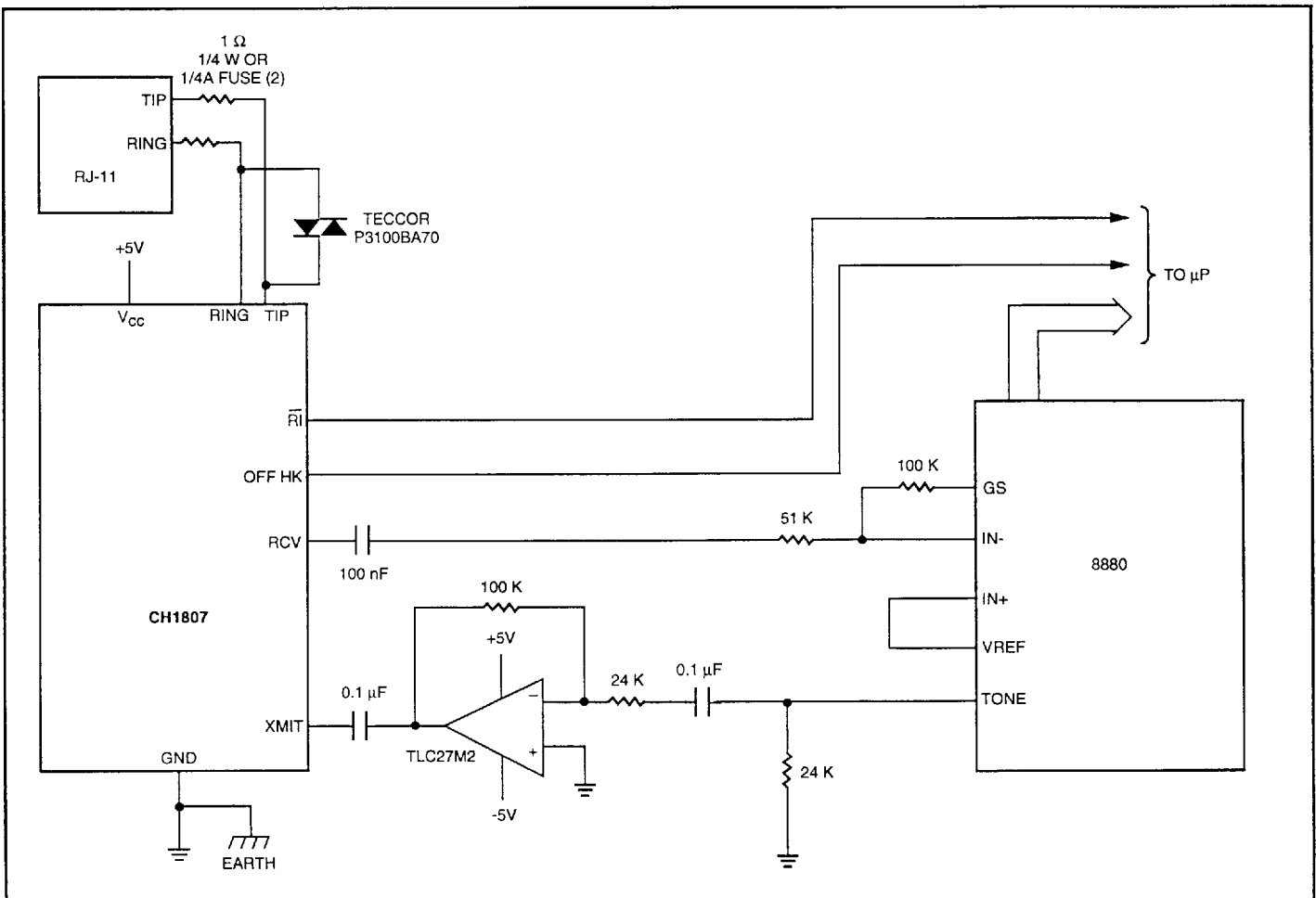


Figure 3. Tranceiver DTMF Modem with CH1807

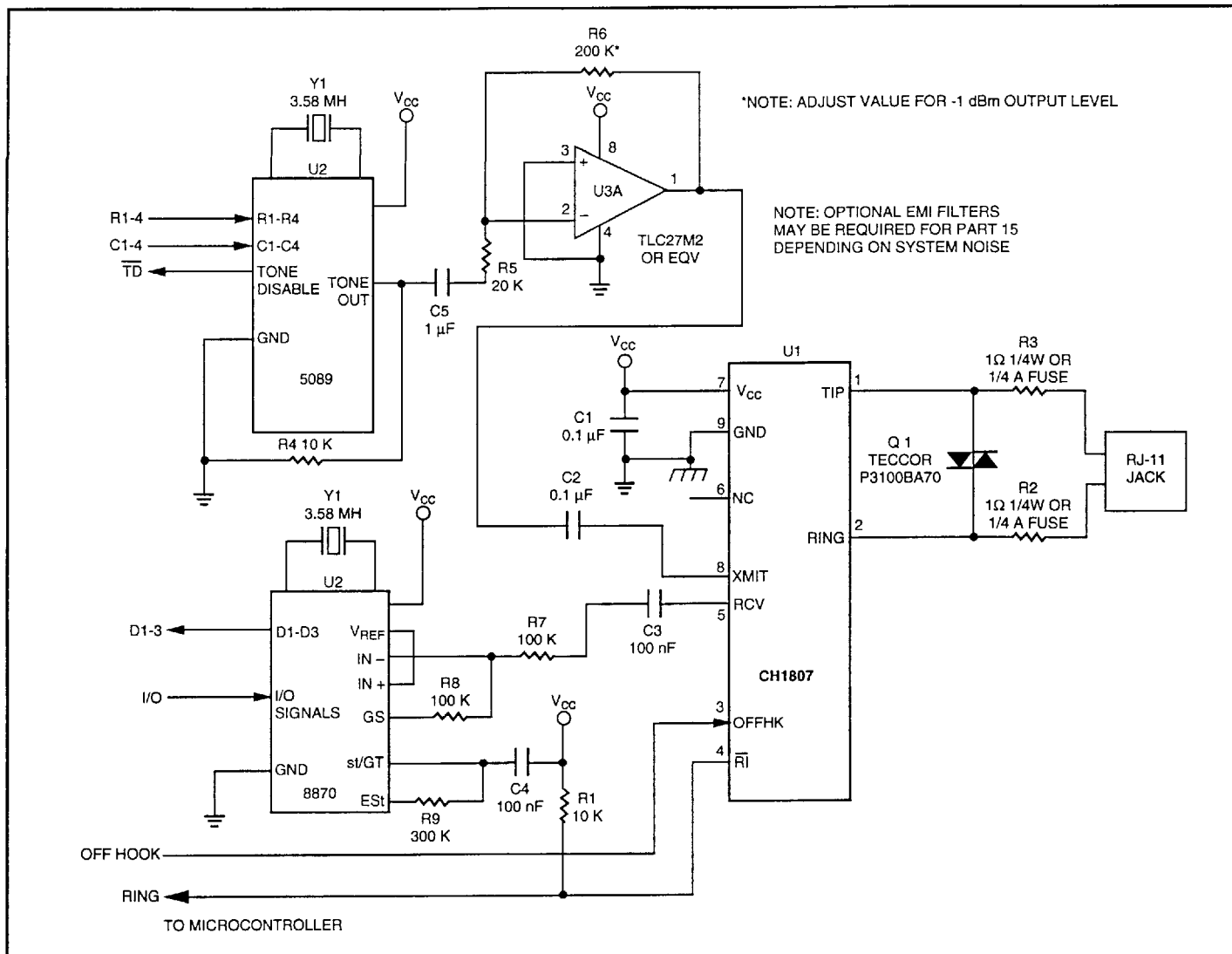


Figure 4. DTMF Generator and/or Receiver with CH1807

DESIGN CONSIDERATIONS

The DAA includes circuits that couple the modem signals to the phone line and provides FCC required isolation and protection. The FCC registration process by the host product can be minimized provided that the following guidelines are followed.

- 1) The mounting of the DAA in the final assembly must be made so that it is isolated from exposure to any hazardous voltages within the assembly. Adequate separation and restraint of cables and cords must be provided.
- 2) Connection to the phone line should be made through a standard FCC approved RJ-11C jack or equivalent.
- 3) Circuit board traces from the DAA's TIP and RING pins must exceed 0.1 inch spacing from all other traces or other conducting material. The purpose for this spacing is to maintain 1500 VDC isolation between the phone line and the other traces. Traces should have a nominal width of 0.020 inches or greater.
- 4) RING and TIP traces should be as short as possible and should be oriented to prevent direct or induced coupling with other signals on the host circuit card.
- 5) The DAA Module is a sensitive subsystem that should be treated as any other integrated component. Pay special attention to the power supply to the DAA. The device handles signals in the millivolt range. Even though it is designed to handle noise in the power supply, steps should be taken to assure the noise level does not exceed 50 mV peak-to-peak.
- 6) For DTMF calls, Part 68 rules require silence on the phone line for at least 2 seconds after a data call has been completed to allow central offices to exchange billing information and specifies the transmit level must not exceed 0 dBm. The FCC rules also require that for voice calls the final system meet the requirements of Part 68 for Out-of-Band Energy, and DTMF Transmit Levels. Because the DAA already meets FCC requirements for Part 68 registration for High Voltage Isolation and Surge Protection, the certification of the product is normally a sim-

Table 2.
CH1807 DAA Electrical Specifications

$V_{CC} = +5 \text{ VDC} \pm 5\%$, $T_A = 0^\circ \text{ to } 55^\circ \text{ C}$

Parameter	Conditions	Min.	Typ.	Max.	Units
Supply Current	Off Hook,		4	6	mA
	On Hook		0.6	1.5	mA
Transmission Insertion Loss	Attenuation between transmit input and telephone line at 1800 Hz with 600 Ohm termination	6.0	6.5	7.0	dB
Receive Gain	Gain between telephone line and receive output at 1800 Hz with 600 Ohm termination	-0.5	0.0	0.5	dB
Telephone Line Input Impedance	at 1800 Hz	550	600	650	Ohm
Trans-Hybrid Loss	Attenuation between the transmitter input and receiver output at 1800 Hz with 600 Ohm termination	18	23		dB
Transmit Input Impedance	at 1800 Hz	120	150	200	kOhm
Receive Output Impedance	at 1800 Hz		100	1000	Ohm
Ring Detect Sensitivity	AC voltage between Tip and Ring	38			V_{rms}
Ringer Equivalency Number (REN)	Type "A"		0.2		A
Hook Switch Control Current			4		mA
Loop Current		20		80	mA
Weight			10		gm

ple process that often can be completed directly with the FCC. If desired, independent testing labs are available that can test the system and submit the required paperwork to the FCC for approval. Cermetek can assist with the registration.

- 7) The DAA as is meets or exceeds the hazardous voltage, surge and leakage requirements of the FCC. For applications that connect to Canadian phone lines, governed by the DOC (Department of Communications) and to further protect the DAA from field failure on excessively poor quality lines, a higher level of transient protection is required, thereby making mandatory the circuit consisting of two fuses and one varistor as shown in Figure 2. Adding these three devices will not affect FCC registration.

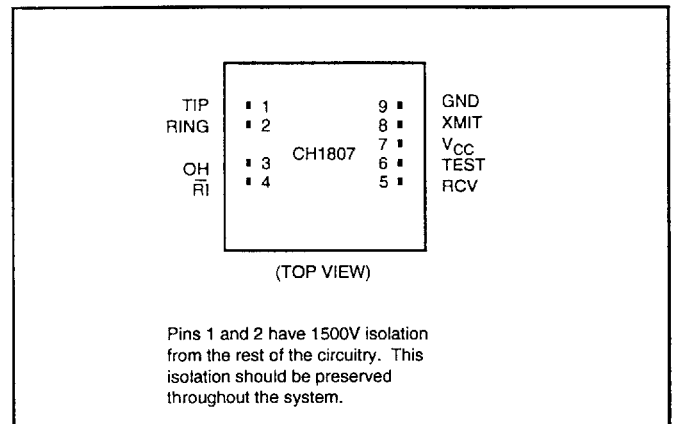
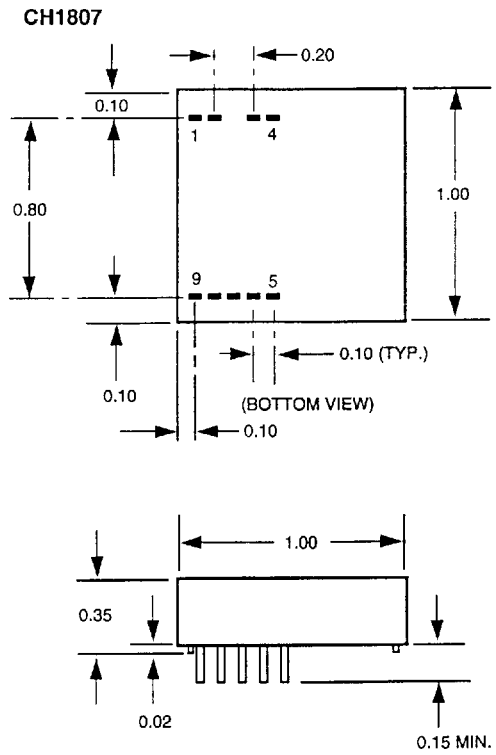


Figure 5. Pin Connections



- Notes:**
1. Pins are 0.010 inches x 0.020 inches
 2. All dimensions are in inches
 3. Nominal tolerance ± 0.01 inch
 4. Non-encapsulated. Height profile is irregular, but not to exceed 0.35 inches.

Figure 6. Mechanical Specifications



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