

## CH1804/A and CH1809/A

### Family of Line Detection and Monitoring Products

#### INTRODUCTION

The CH1804/A and CH1809/A are line status detectors that are used to monitor line off-hook status for shared lines, or to detect a severed or cut telephone line. The CH1804/A is a single line monitor. The CH1809/A is a dual line device allowing two telephone lines to be monitored simultaneously and contains two CH1804/A circuits (See Figure1). For ease of convertibility, both devices share the same pin out configuration.

The primary application for CH1804 and CH1809 products are security systems where detection of severed telephone lines is required. In this mode, a voltage of less than 2.6VDC is detected as a cut line. An alternate application is collision avoidance in systems where multiple access to a shared line is allowed. In this mode, the CH1804A and CH1809A will indicate when the telephone line voltage drops below 20VDC thereby detecting an off-hook condition.

Since the CH1804A/9A products access the PSTN system, FCC Part 68 approved is required. Cermetek provides this approval via conveyed registration. A registration label is supplied for placement on the host equipment in compliance with FCC Part 68 requirements. The CH1804/A and CH1809/A devices operate on a single 5-volt supply and provide a separate active high indication when either of the two attached lines is cut. The product is contained in a single in-line package 1.0" long and 0.5" high, requiring minimal PCB area.

#### OPERATION

**General.** Each device contains either one or two CH1804/A independent line detector circuits. Each circuit contains separate TIP and RING inputs and separate active high outputs. A common 5-volt supply provides power. The output of each detector circuit has a 45K ohm pull up resistance to 5 volts and a 2.2μF capacitance to ground. This is provided to filter out zero crossing pulses which can occur during ringing. Refer to Figure 1.

If the output drive current of the CH1804A/9A is not sufficient, it is permissible to add a lower value resistor (this resistor should not be less than 1K ohms) between the output and 5 volts. However, this will allow zero crossing pulses to occur. If more drive current is needed while retaining zero crossing filtering, an external capacitor must be added to preserve the original RC time constant. See Figure 2.

**Off-Hook Detection.** The CH1804A and CH1809A detector circuits will indicate an Off-Hook condition when the voltage between the TIP and RING drops below 20.0VDC. The Off-Hook condition is indicated by the CH1804A (CH1809A) when the output of OUT1 (OUT2) is  $\geq 3.5V$ .

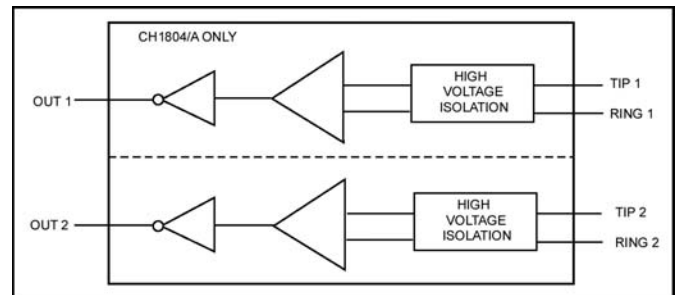
**Cut Line Detection.** The CH1804 and CH1809 detector circuits will indicate a Cut Line condition when the voltage between TIP and RING drops below 2.6VDC. The Cut Line condition is indicated by the CH1804A (CH1809A) when the output of OUT1 (OUT2) is  $\geq 3.5V$ .

#### FEATURES

- FCC Part 68 approved with conveyed registration.
- Usable on public switched telephone lines and wet leased lines.
- Detects a severed telephone cable. Does not require polling.
- Single in line package (SIP) requires minimum PCB area.
- Low power operation. Single 5V operation.

**Table 1. Features Available By Product.**

Detection Feature	Number of Lines			
	CH1804	CH1809	CH1804A	CH1809A
Cut Line	1	2		
Off-Hook			1	2



**Figure 1. CH1804/A, CH1809/A Functional Block Diagram**

#### ISOLATION REQUIREMENTS

For maximum detection flexibility, incoming telephone lines should not share a common TIP or RING line. In addition, the ground of the PSTN system should not be common to the ground of the system where the CH1804A/9A is installed. If either of these conditions

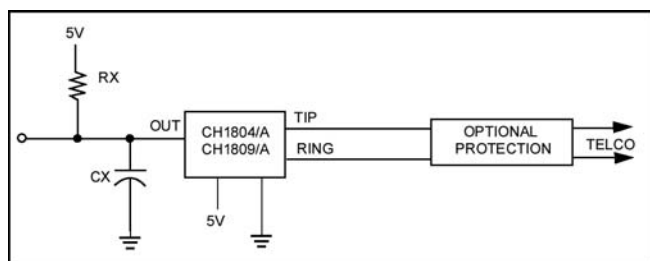
occur in an installation, the CH1804/9 will only detect when TIP and RING are both cut. However, regardless of the installation wiring, the CH1804A/CH1809A products will always detect an off-hook condition. If it is required to detect and identify which line (i.e., either TIP or RING) has been cut, then a voltage sense device is required, such as the Cermetek CH1808 line status detector product.

## APPLICATION RECOMENDATIONS

**Failure to Detect Cut Line.** When using either the CH1804 or the CH1809 products, external leakage and capacitance on TIP and RING must be minimized. Differential leakage to TIP and RING in excess of 0.1 microamperes may appear as a central office battery voltage thereby causing the CH1804/9 to fail to detect a cut line. Additionally, Common mode leakage to TIP and RING in excess of 1 microampere is also undesirable. Thus, the circuit board layout and external wiring for TIP and RING must be well insulated.

**Off-Hook Indication Delay.** Capacitance on TIP and RING should be minimized as it could retain charge after a transition and appear as a central office battery voltage. This will delay detection of an Off-Hook condition for many tens of seconds. The input impedance of the detector circuit is approximately 10M ohms to ground, and the capacitance may have to be discharged for 3 or 4 time constants to indicate a detection depending on initial conditions. Thus, it would be desirable to keep capacitance well below 1 $\mu$ F to keep the delay from exceeding ten seconds.

**Normal Operation.** If the CH1804/A or the CH1809/A is the only device on the telephone line, leakage and differential capacitance will tend not to affect normal operation, since the line capacitance in the central office or the local loop are minimal. The more devices that share a given local loop, such as modems and extension telephones, the greater the capacitance and leakage possibilities. Sources of capacitance, when On-Hook, include ring detection circuits in modems.



**Figure 2. Application Diagram indicating external components to increase output drive, decrease false line cut indications and provide additional overvoltage protection.**

**Potential False Indication.** The CH1804/A and CH1809/A products reside on the telephone line and, as such, are subject to transients produced by electrical discharge and ring voltage transitions. These may cause momentary false Cut Line or Off-Hook indications. The use of additional external capacitance on the output may be required to reduce these false indications. The capacitance value to add to each output should be determined by appropriate analysis and testing for the particular application. Cermetek recommends that the outputs be level detected as opposed to edge detected to minimize false indications on excessively noisy lines. Referring to Figure 2, typical values are 0.1 $\mu$ f and 30K ohms for CX and RX, respectively.

## SUPPLEMENTAL PROTECTION

If the CH1804A/9A products are being used on telephone lines that are prone to high voltage transients, an FCC Part 15 A/B suppressor may be required. This consists of 1.25 A fuses in both TIP and RING lines and a 350V voltage suppressor between TIP and RING for transient protection. A ferrite bead inductor and 0.1 $\mu$ F capacitor (1500V) to ground may also be required for EMI/RFI suppression. See Cermetek Application Note # 126. If the CH1804A/9A is being used with another Cermetek device where the supplemental protection is already planned for or available, the CH1804A/9A can share the protection if a parallel connection to the TIP and RING pins is made in front of the protective network.

## DESIGN CONSIDERATION FOR FCC CONFORMANCE

The CH1804A/9A products include circuits that couple to the phone line and provide FCC required isolation and protection. The following guidelines should be followed to maintain the conveyed FCC Part 68 registration:

- 1) CH1804A/9A must be mounted away from hazardous voltages.
- 2) Connection of the CH1804A/9A devices to PSTN lines should be made through a standard RJ-11C jack or another approved connector device.
- 3) Circuit board traces to the CH1804A/9A TIP and RING pins must have a spacing of greater than 0.10 inch from all adjacent traces. TIP and RING traces should have a width of 0.020 inches.
- 4) TIP and RING traces should be as short as possible to prevent coupling to other signals lines. Mount the CH1804A/9A as close to the telephone line connection as possible.

- 5) The registration label included must be affixed to the outside of the host product.

### USER MANUAL

The following information should be provided in the host product user manual.

**Type of Service:** The (insert product name) is designed to be used on standard device telephone lines. It connects to the telephone line by means of a standard jack called the USOC RJ-11C (or USOC RJ45S). Connection to telephone-company-provided coin service (central office implemented systems) is prohibited. Connection to party lines service is subject to state tariffs.

**Telephone Company Procedures:** The goal of the telephone company is to provide you with the best service it can. In order to do this, it may occasionally be necessary for them to make changes in their equipment, operations or procedures. If these changes might affect your service or the operation of your equipment, the telephone company will give you notice, in writing, to allow you to make any changes necessary to maintain uninterrupted service.

In certain circumstances, it may be necessary for the telephone company to request information from you concerning the equipment you have connected to your telephone line. Upon request of the telephone company, provide the FCC registration number and the ringer equivalence number (REN); both of these items are listed on the equipment label. The sum of all of the REN's for a given PSTN line should be less than five to ensure proper service from the telephone company. In some cases, REN=5 may excessive.

**If Problems Arise:** If any of your telephone equipment is not operating properly, remove it immediately from the PSTN line, as it may cause harm to the telephone network. If the telephone company notes a problem, they may temporarily discontinue service. When practical, they will notify you in advance of this disconnection.

**Table 2A. CH1804/A Pin Description**

PIN	DESCRIPTION FOR CH1804/A
1	TIP 1 –Telco 1
2	RING 1 –Telco 1
3	N.C.
4	Out 1 –Active High Output 1
5	V <sub>CC</sub> – 5 Volts ± 10%
6	Gnd –Ground
7	N.C.
8	N.C.
9	N.C.
10	N.C.

**Table 2B. CH1809/A Pin Description**

PIN	DESCRIPTION FOR CH1809/A
1	TIP 1 –Telco 1
2	RING 1 –Telco 1
3	N.C.
4	Out 1 –Active High Output 1
5	V <sub>CC</sub> – 5 Volts ± 10%
6	Gnd –Ground
7	Out 2 –Active High Output 2
8	N.C.
9	TIP 2 –Telco 2
10	RING 2 –Telco 2

**Table 3**  
**CH1804/A and CH1809/A Electrical Specifications**

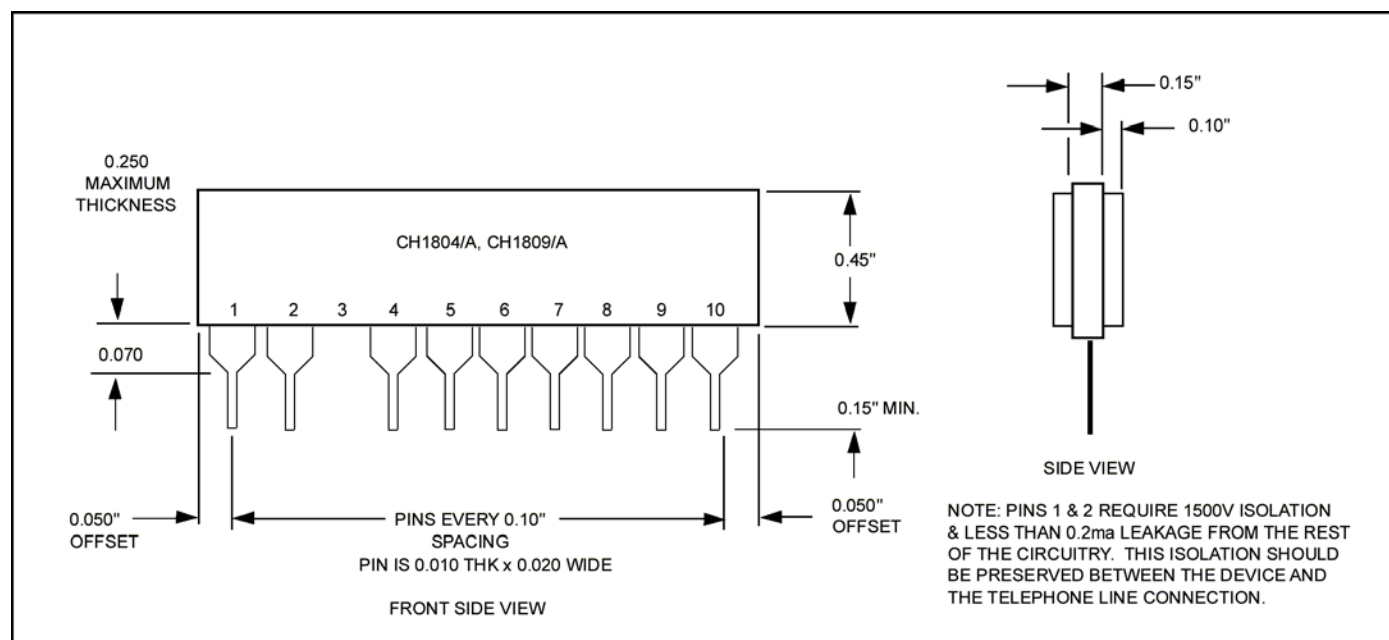
$V_{CC}=5V \pm 5\%$

$T_A=0 \text{ to } +55^\circ\text{C}$

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
LOGIC Output HIGH Output LOW	$V_{CC}$ $V_{CC}$	$I_{OH}=0.05\mu A$ $I_{OL}=2.0mA$	2.4		0.4	V V
TELEPHONE LINE INTERFACE						M ohms
Input Resistance	R	TIP or RING to any other pin	8			
Surge Protection		Conforms to all FCC Part 68 surge, hazardous voltage, and leakage requirements			1500	V
V Input (CH1804/1809 only)	$V_I$	Voltage required between TIP and RING to cause a Cut Line Indication			2.6	V
V Input (CH1804A/1809A)	$V_I$	Voltage required between TIP and RING to cause an Off-Hook Indication	20		32	V
Leakage Current	$I_{LK}$	Leakage to TIP or RING			$\pm 0.1$	$\mu A$
Detection Time	$T_D$	$C_X=0.001 \mu F$ (TIP or RING to GND) $V_{CX}=50V$ (TIP to RING)			1	sec
FCC REGISTRATION Ring Equivalence Power	$I_{CC}$	Label Supplied with Unit +5V Supply Voltage (CH1804/A, CH1809/A)		0.3	0.0A 1	REN mA

**Table 4. Summary CH1804/A and CH1809/A Family of Products**

Model	Summary of Features	Operating Temperature
CH1804	Cut Line Detector. Single Line, FCC Part 68 Approved, UL1459 Listed.	0°C to 70°C
CH1809	Cut Line Detector. Dual Line, FCC Part 68 Approved, UL1459 Listed.	0°C to 70°C
CH1804A	Off-Hook Detector. Single Line, FCC Part 68 Approved, UL1459 Listed.	0°C to 70°C
CH1809A	Off-Hook Detector. Dual Line, FCC Part 68 Approved, UL1459 Listed.	0°C to 70°C

**Figure 3. CH1804/A and CH1809/A Physical Dimensions**

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