



HoopsWare, Inc.
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ACPIC V1.1
Alarm Controller Chip

Application Notes
and
Technical Specifications

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Overview:

The ACPIC from HoopsWare is a preprogrammed microcontroller that functions as a 4-zone alarm controller.

Possible security applications include:

- Automotive**
- Portable/Personal Protection**
- Residential**
- Kiosk**
- Marine**
- Storage**

This one small part, the ACPIC, provides all these features:

- 4 independent zones with zone reporting
- 1 independent 24 hour/panic zone with reporting
- Momentary Arm/Disarm, edge-sensitive
- Arm/Disarm, level sensitive
- Entry/Exit adjustable delay
- Alarm Active adjustable delay
- Clear to Arm indicator
- Armed/Disarmed indicator
- Status indicator
- Alarm indicator

Electrical Characteristics:

- Ambient temperature range
-50 to +120 degrees Celsius
- Operating voltage range
2.5V to 6.0V
- Power consumption
25uA @ 3V typical
- Target operating frequency
32767Hz
- Maximum output currents for LED, BUZZER, ALARM, and READ/READY each are:
Source 20ma
Sunked 25ma
- Maximum input currents for Z1-Z5, ArmDisarm, MomArm, AD, EED, Read/Ready and Reset each is +/-500uA.

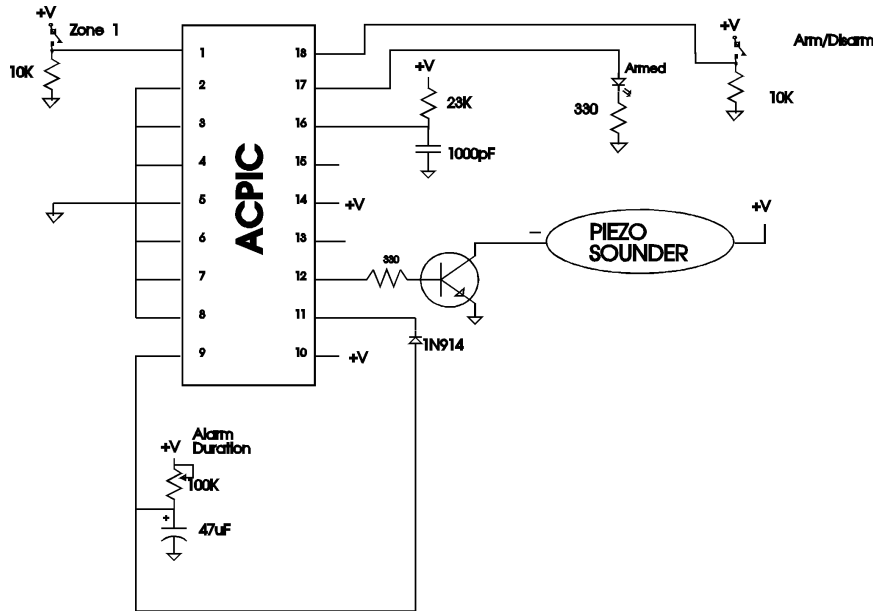
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Minimum Application:

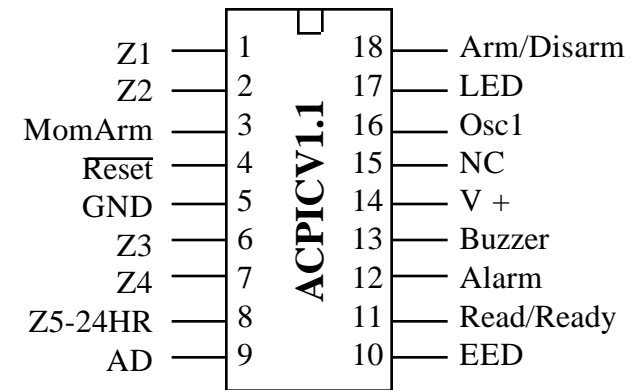
Below is a circuit for a single zone simple alarm. This circuit illustrates the simplicity this part can bring to an alarm application. The following circuit will simply arm and disarm and activate an alarm. Thus, even the armed indicator portion is optional, reducing the part count to ten components not counting sensor(s), arming switch, sounding device and power.



In all applications, the resistor and capacitor on pin 14 determine the part's clock frequency. This should approximate 32767Hz. A higher frequency will result in shorter debouncing times, entry exit and alarm delays. It will also cause the part to consume more power. Too high of frequency, and the part may not function at all. Too low of a frequency may result in the part not responding quickly enough to a sensor input and exit, entry and alarm delays which are too long.

Pinout:

Caution: Part is sensitive to static!



Signal Descriptions:

Z1 - Zone 1. A high level will register a trip at this zone in the Armed mode or cause the Read/Ready line to go low in the Disarmed mode. This pin and Z2-Z5 are debounced internally.

Z2 - Zone 2. Same as Z1, but indicated as Z2 after a trip has occurred.

Z3 - Zone 3. Same as Z1, but indicated as Z3 after a trip has occurred.

Z4 - Zone 4. Same as Z1, but indicated as Z4 after a trip has occurred.

Z5-24Hr - Zone 5, 24hr panic. A high will register a trip on this zone. It will immediately begin the Alarm condition whether Armed or Disarmed.

MomArm - Momentary Arm/Disarm. A rising edge will toggle the Armed/Disarmed status. Once a rising edge has been detected here, the ArmDis pin is no longer monitored. THERE IS NO DEBOUNCING logic for this pin.

Signal Descriptions (cont.):

GND - Power ground (negative) connection.

Reset - A low on this pin will cause a reset condition. This will force a reread of delay settings and a "pulse readout" of those settings before the part is ready for operation (also occurs for power-on).

AD - Alarm time delay sense. This is used by the ACPIC upon power-up or after a Reset to read the delay value for the alarm condition.

Arm/Disarm - This is a level sensitive input which will put the part in a Disarmed state when low and begin an arming sequence when first set high after a low (Disarm). This pin is debounced internally. The state of this pin will become irrelevant if the rising edge is ever detected on the MomArm pin.

LED - Arm/Disarm status. This Pin will go high once the part is in an Armed state and low when the part is in a Disarmed state. It is intended to drive a simple LED.

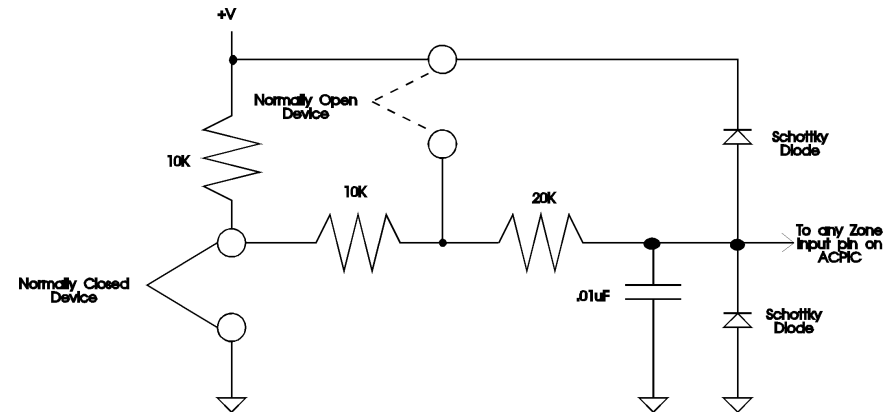
OSC1 - Connection for RC type oscillator. See sample application.

NC - No connection.

Buzzer - Buzzer/Annunciator. This pin is used to "pulse out" information or that the part is about to become "Armed". It will pulse when powered-on, indicating the time for exit and entry and alarm. It will then remain low until the part is told to "arm". It will then pulse high and low until the part has expired its Exit delay and then remain off. Once a Zone 1-4 has been tripped, it will remain on until the part is Disarmed or the Entry delay expires and the Alarm condition begins.

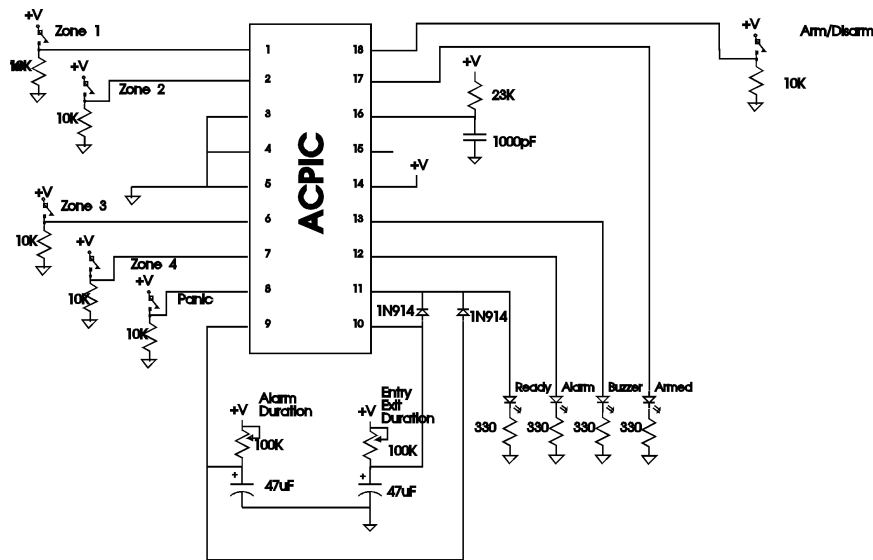
Hardy zone input circuit:

While logic level inputs may suffice, consideration of static of induced currents over long line is reflected in the following circuit. This circuit also incorporates a normally open/normally closed option.

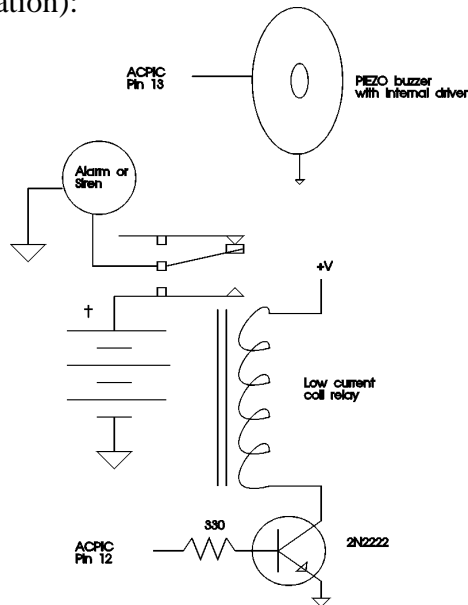


This circuit can be duplicated for each zone.

Simple test circuit:



This example does not make use of the momentary Arm/Disarm feature. To do so, ground pin 18, free pin 3 and clock pin 3 to arm or disarm. This circuit only uses LEDs as controlled devices. The following depicts use of a PIEZO buzzer and relay (typical application):



Signal Descriptions (cont.):

Alarm - Alarm active. This pin will only go high during an actual alarm. It will remain high until the Alarm delay has expired then go low. It is intended to activate a siren or some other device.

Read/Ready - This pin will go low upon a power-up or Reset condition to discharge the timing delay capacitors. Then, after the readings have been taken, it will remain high unless Z1-4 is tripped. It will remain low while any of Z1-4 is tripped and clear quickly after the Zone is cleared.

EED - Entry/Exit delay sense. This pin is used upon power-up or reset conditions to read the Entry/Exit time delay.

Operation of the ACPI:

The ACPI is designed to be powered up for most of its operation whether armed or disarmed. When the part is first powered on, it will discharge the timing capacitors. This is accomplished by pulling the Read/Ready pin low for a moment. Then, it will wait for the EED pin to go high. Once the EED pin is considered high, it will save this time value as the Entry and Exit delay value. It will then pull the Read/Ready line low again for a moment to discharge the capacitors and then wait for the AD pin to go high. Again, when the AD pin is considered high, it will save that timing value as the delay for which the alarm is to be active. These timing values attempt to approximate seconds. However, variation is common.

The part is now ready to report its readings. It first reports the number of approximate seconds for delay during Entry and Exit that it read from the Entry/Exit timing RC circuit. It does so by pulsing the Buzzer line once for each second it will count. This can be from 1 to 255 seconds. It then waits a moment to prevent confusion between the Entry/Exit value and the Alarm delay value. It then pulses the Buzzer line once for every 5.5 approximate seconds that the Alarm pin would be high during an alarm condition. This value would be 1 to 255 for an alarm duration of 5.5 seconds to over 23 minutes.

Next, it begins to monitor the Zones and Arm/Disarm lines. If the part is not Armed, the Read/Ready Line will go low whenever

Zones 1-4 are activated (made high). This is typically used to drive an indicator such as an LED. When the indicator is off, a Zone is currently violated and the system should not be armed until the zone or zones are cleared.

When the part detects an Arm signal from either Arm/Disarm or MomArm, it begins an Arming sequence. Such is indicated by the Buzzer line pulsing in approximate second intervals until the

Entry/Exit delay time has expired. Once this has occurred, the LED pin is made high, used to drive an indicator showing that the system is now armed.

If Zones 1 - 4 are brought high from this time forward, it will activate a countdown of the entry/exit time. During this countdown, the Buzzer line will be held high. Once this period has expired, the Alarm pin will be held high until the alarm duration time has expired. If the Arm/Disarm pin is brought low during the alarm or entry delay, the part will go back to a disarmed mode. If the alarm condition occurred, when the part is disarmed, the zone that tripped the alarm will cause the buzzer to pulse X times (where X = Zone number) repeatedly until an arm and then disarm signal is received.

Signals on the MomArm pin will cause the functions described above. However, once a signal is received on this pin, the Arm/Disarm pin becomes inactive and only further signals on the MomArm pin will be acknowledged.

In the case of a high signal on Zone 5 (Panic/24hr) the alarm condition will begin immediately until the alarm delay has expired. This will take place whether the part is armed or disarmed. If the part is disarmed when the Zone 5 trip occurs, the part must be armed and disarmed again to clear the alarm. Once cleared, the buzzer will pulse five times between intervals indicating that Zone 5 was tripped. As in the condition of a complete alarm, the part must be armed and disarmed to clear the zone violation indication.