ADVANCED ANALOG

A Division of **intech**

3041

MONITOR ALARM

FEATURES

- **Directly Drives External Speaker With Frequency Adjustable Tone**
- **Steady TTL Compatible Output, Capable of Driving LED or Lamp**
- **Accurate Reference Voltage**
- **Large Supply Voltage Range, 4.5 to 18 Volts**
- **Monitors AC Ripple**
- **Low Current Drain**

DESCRIPTION

The Intech 3041 is a dual input, monolithic integrated, monitor/alarm circuit designed to give reliable performance at low cost. This device will monitor two different input voltages and give an indication if either input level changes by more than a preselected percentage. Two types of outputs are available: a steady output capable of driving an LED, lamp or TTL input, and a tone output capable of directly driving a loud-speaker or flashing a light. The 3041 is packaged in a MiniDIP and contains a precision dual-input voltage comparator, a very stable externally accessible 2.4-volt reference and oscillator. See Figure 1. Supply voltage is 4.5 to 18 volts. When combined with only six passive, external components, the 3041 makes a most cost effective approach to solving the many monitoring and alarm applications.

APPLICATIONS

- **Process Control Monitoring**
- **Equipment Guard Band Monitoring**
- **Medical Alert Alarms**
- **Calibration Monitoring**

BLOCK DIAGRAM

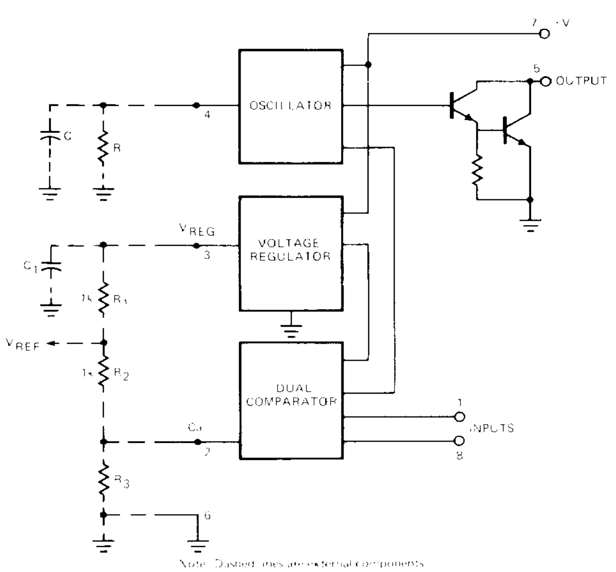
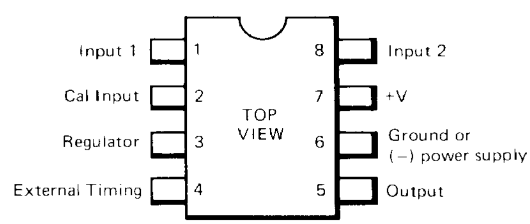


Figure 1: Functional Block Diagram.

PIN DESIGNATION



8 Pin MiniDIP

3-8509

SPECIFICATIONS ($T_A = 25\,°C$, $V_{CC} = +5$ to $+15V$)

PARAMETER	MIN	TYP	MAX	UNIT
Supply Voltage Range	4.5		18	V
Supply Current				
$V_{CC} = 5V$, alarm off		3	6	mA
$V_{CC} = 15V$, alarm off		5	8	mA
$V_{CC} = 5V$, alarm on		8	13	mA
$V_{CC} = 15V$, alarm on		16	20	mA
Input Trigger Current				
Each input		3	15	μV
Input Trigger Uncertainty		5	25	mV
Regulated Voltage (Pin 3)	2.2		2.7	V
Temperature Stability of Regulated Voltage (Pin 3)		± 50		ppm/°C
Output				
On Voltage Drop				
At 8 mA		0.3	0.4	V
At 30 mA		0.8	1.6	V
OFF Leakage Current at 15V		0.1	10	μA
Frequency Range*	0.1		10,000	Hz
Duty Cycle Range**	5		40	%
Operating Temperature	− 25		+ 85	°C
Storage Temperature	− 55		+ 125	°C

Notes: *See Figures 5, 6, 7, 8.

MAXIMUM RATINGS

Supply Voltage	+ 18V
Input Voltage (ea. input)	5V
Output Current	30 mA
Operating Temperature Range	− 25 °C to + 85 °C
Storage Temperature Range	− 55 °C to + 125 °C

OPERATION

The functional block diagram of the dual-input monitor/alarm circuit is shown in Figure 1. A built-in precision voltage regulator produces nominally 2.5 volts (pin 3) to be applied across an external resistive voltage divider network. The resistor values are chosen by first selecting the tolerance desired (typically 5 to 25%) and then finding the required values from Table 1. The dual-input comparator monitors the two input voltages on pins 1 and 8 and compares them with the reference voltage—(V_{ref}). The reference voltage is obtained from the external resistance divider at the junction of R_1 and R_2. Capacitor C_1 should be used to filter the voltage regulator and reduce any possible noise to the comparator thus allowing a high resolution trip point.

SETTING UP IN BAND VOLTAGES

External resistors R_1, R_2, R_3 set up the tolerance band. The voltage at the cal input (pin 2) is used as the reference voltage to the comparator. However, the junction resistor R_1 and R_2, labeled V_{ref} in Figure 1, more accu-

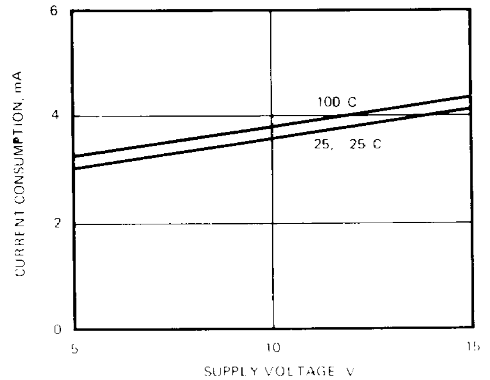


Figure 2: Current Consumption vs. Supply Voltage (Standby Mode).

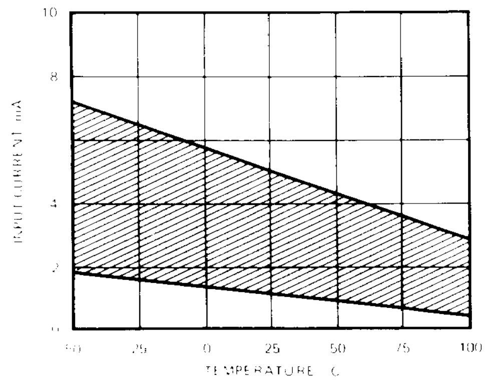


Figure 3: Supply Current vs. Temperature.

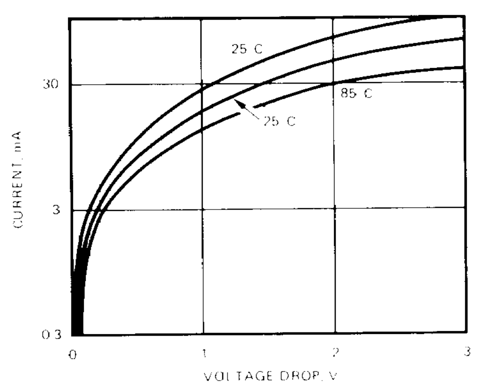


Figure 4: Voltage Drop of Steady Output vs. Current (DC Operation).

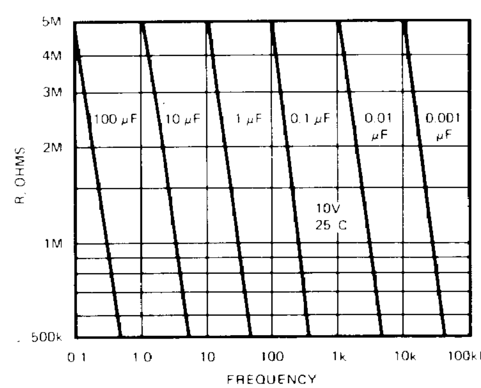


Figure 5: Typical Frequency of Oscillator vs. R and C

rately simulates the actual voltage that the inputs will be compared to. It is necessary to normalize the input voltages to the reference voltage (V_{ref}) for center mid-band point. If only one input is used then the unused input must be connected to the V_{ref} point.

The set-up procedure for the dual-input monitor/alarm is to first set the desired tolerance range, from 5 to 25%. This is accomplished by connecting resistor R_1 and R_2 (1 kΩ recommended) as shown in Figure 1, and then selecting resistor R_3 from Table 1 for the desired pre-set tolerance. Accuracies of resistor R_1, R_2 and R_3 will affect the accuracy of the tolerance setting by 10:1. As an example, if R_3 is high by 5%, the tolerance setting will be off by 0.5%.

TABLE 1

The following values of R_3 are calculated with resistors R_1 and R_2 as 1 kΩ.

Tolerance%	± 5	± 10	± 15	± 20	± 25
R_3 (kΩ)	19	9	5.666	4	3

For other tolerance calculate R_3 as follows:

$$R_3 = \frac{1 \times 10^5}{\text{Tolerance in } \%} - 1000$$

OSCILLATOR SET UP

The internal oscillator can be operated in two modes of operation, either as a steady output capable of driving an LED, lamp or TTL input or a tone output capable of driving a loud speaker or flashing a light. For a steady output mode of operation, the oscillator timing input (pin 4) is grounded. This will inhibit the oscillator allowing a voltage change to occur when the selected tolerance is exceeded. For a tone output mode of operation an external R and C are required from the oscillator timing input (pin 4) to ground. The internal oscillator can be selected for a wide range of frequencies by selecting the proper values for R and C (external). See Figure 5 for R and C values.

Since the output is an open collector, any current up to 30 mA and voltages up to 18 volts are allowable. The output (pin 5) is OFF (HI with pull-up resistor) when either input voltage is within tolerance and ON (LO) when either input is out of tolerance. The comparator and oscillator stages both have very high gain and will therefore switch the output rapidly once the reference has been exceeded. There is also a small amount of hysteresis provided in the comparator to prevent any trigger point uncertainty.

Further typical performance curves of the 3041 dual-input monitor/alarm are shown in Figs. 2 and 8.

APPLICATIONS

A typical set-up for monitoring two separate voltages is shown in Fig. 9. In this example the tolerance selected is ± 5% and thus if V_1 or V_2 voltages vary ± 5% (plus or minus the trigger uncertainty of 5 mV typically) from V_{ref}, the speaker will produce an audible 1 kHz tone. No output will be preset when voltages V_1 and V_2 are within the ± 5% band. Actual set-up is done by adjusting the two 10 kΩ potentiometers at the inputs for the voltage monitored at V_{ref}.

It is also possible to monitor negative as well as positive voltages. This is accomplished by connecting the ground (pin 6) of the 3041 to the most negative potential instead of ground. In this way all voltages are monitored with respect to the most negative potential. See Fig. 10.

The dual input monitor/alarm is also capable of sensing AC ripple or oscialiations. This feature is gained by connecting a capacitor across the potentiometer as shown in Fig. 11. While the DC voltage is divided by the potentiometer, the AC component is coupled directly to the input by the capacitor. The calibration monitor as shown will respond to a peak AC voltage of 120 mV with a 5% setting, 230 mV with a 10% setting, and 420 mV with a 20% setting. The value of the capacitor is solely determined by the lowest frequency desired and the value of the external potentiometer.

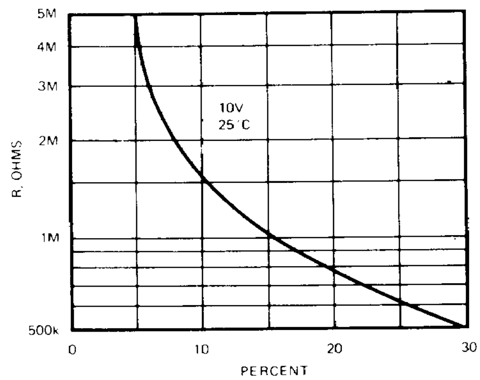


Figure 6: Duty Cycle of Oscillator vs. R.

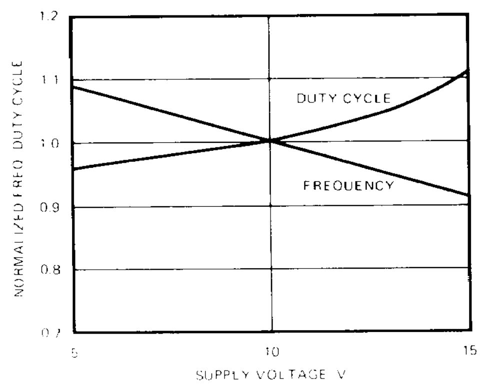


Figure 7: Normalized Frequency and Duty Cycle of Oscillator vs. Supply Voltage.

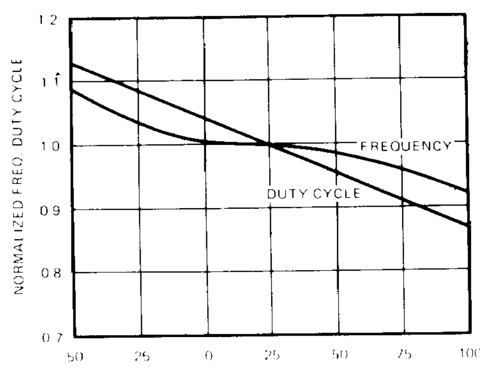
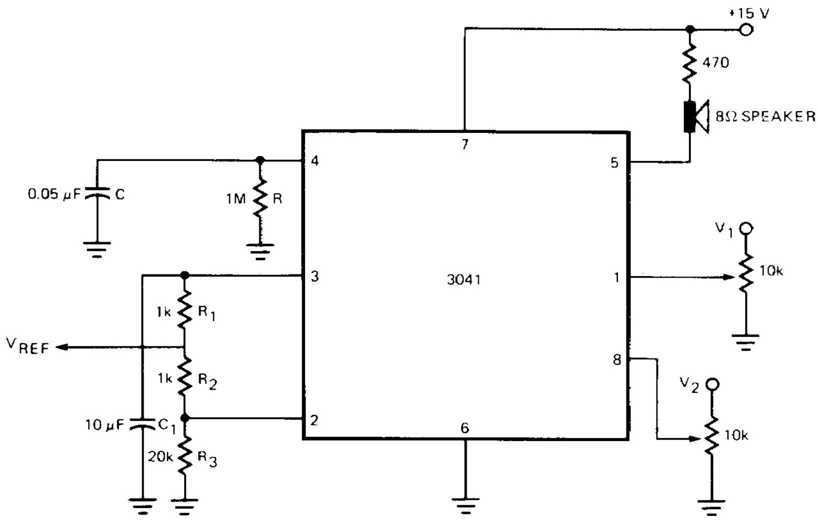


Figure 8: Normalized Frequency and Duty Cycle of Oscillator vs. Temperature.



* Values shown are for 5% tolerance.

Figure 9

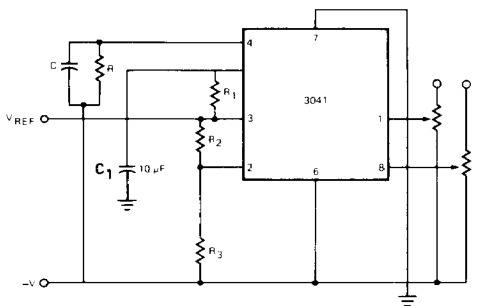


Figure 10: Connection for Monitoring Negative Voltage.

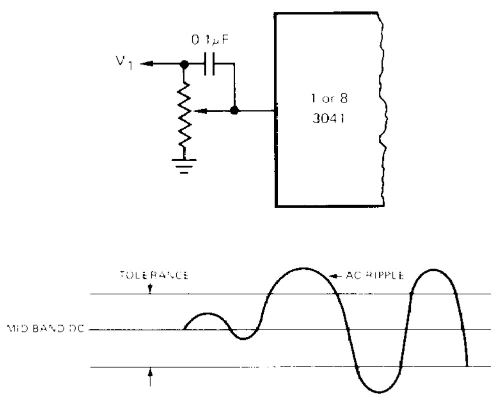
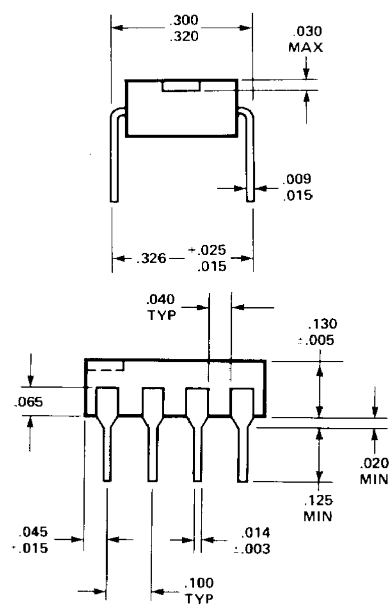


Figure 11: Monitoring of AC Ripple or Oscillation may be included with the addition of a Capacitor.

MECHANICAL OUTLINE



The information in this data sheet has been carefully checked and is believed to be accurate, however, no responsibility is assumed for possible errors. The specifications are subject to change without notice.

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