ADVANCED ANALOG

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3040

QUAD MONITOR/ALARM

DESCRIPTION

The 3040 monolithic integrated circuit monitors up to four different voltage levels. If any of these levels change by more than a selected percentage, ±5%, ±10%, or ±20%, the alarm is activated. Two outputs are available: a steady output capable of driving an LED, lamp or TTL input, and a pulsating tone output to drive a loud-speaker or flash a light. A very stable, externally accessible 2.4-volt reference is built in. Supply voltage is 4.5 to 18 volts.

FEATURES

- **Drives External Speaker Directly with Frequency Adjustable Tone**
- **Steady TTL Compatible Output, Capable of Driving LED or Lamp**
- **±5%, ±10%, or ±20% Calibration Tolerance**
- **Accurate 2.4-Volt Reference**
- **Large Supply Voltage Range, 4.5 to 18 Volts**
- **Monitors AC Ripple**
- **Low Current Drain**

APPLICATIONS

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

BLOCK DIAGRAM

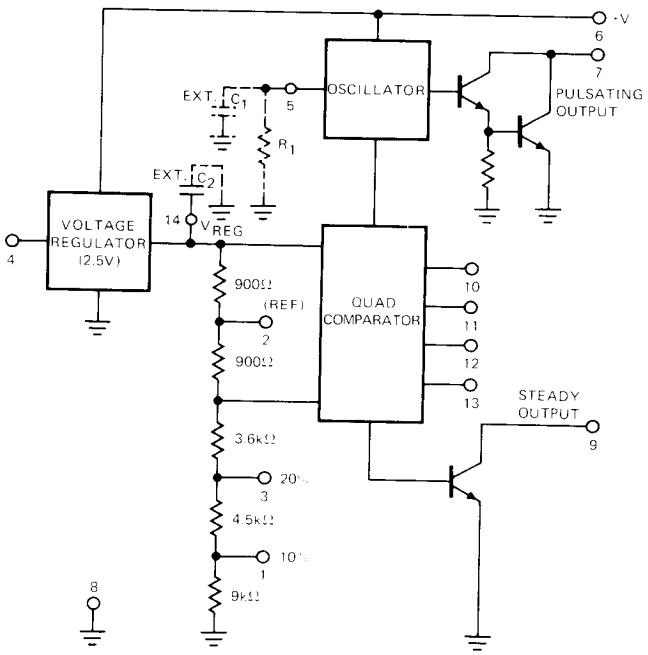
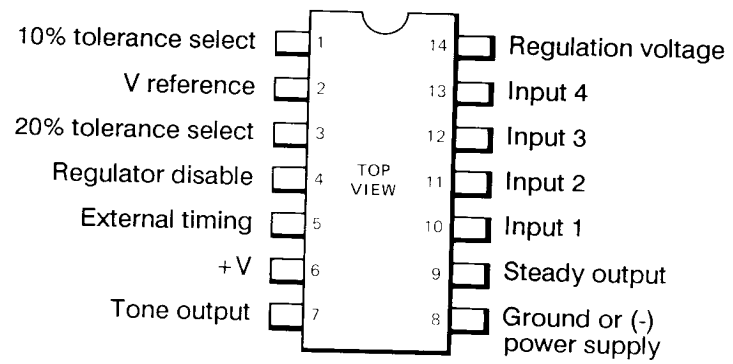


Figure 1: Block Diagram of 3040 Calibration Monitor.

PIN DESIGNATION

14 Pin Dual-In-Line



Note: For 5%, do not connect pin 1 or 3.

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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		1.5	3	mA
$V_{CC} = 15V$, alarm off		3	6	mA
$V_{CC} = 5V$, alarm on		3		mA
$V_{CC} = 15V$, alarm on		6		mA
Input Trigger Current				
Each input		1	10	μA
Input Trigger Accuracy*				
At 5% setting	4.5		5.5	%
At 10% setting	9		11	%
At 20% setting	18		22	%
Reference Voltage	2.3		2.5	V
Temperature Stability of Reference Voltage		±50		ppm/°C
Steady Output				
On voltage drop				
At 10 mA		0.3	0.5	V
At 100 mA		1	2	V
OFF leakage current at 15V		0.1	10	μA
Oscillating Output				
ON Voltage drop at 100 mA		1	1.8	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: *Measured at full rated load, trip point measured going from in band to out of band. Each input measured with other inputs tied to V_{Ref}.

**See Figure 10.

MAXIMUM RATINGS

Supply Voltage	+18V
Input Voltage	+5V
Steady Output Current	100 mA
Oscillating Output	100 mA
Operating Temperature Range	−25°C to +85°C
Storage Temperature Range	−55°C to +125°C

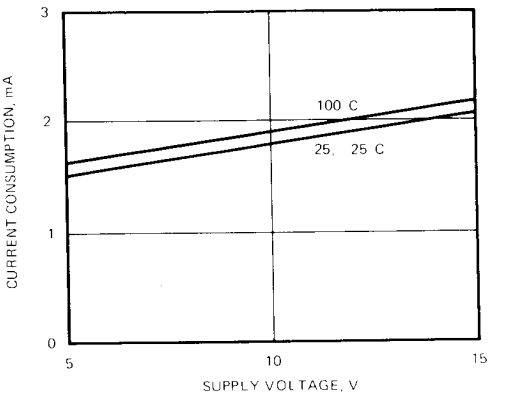

Figure 2: Current Consumption vs. Supply Voltage (Standby Mode).

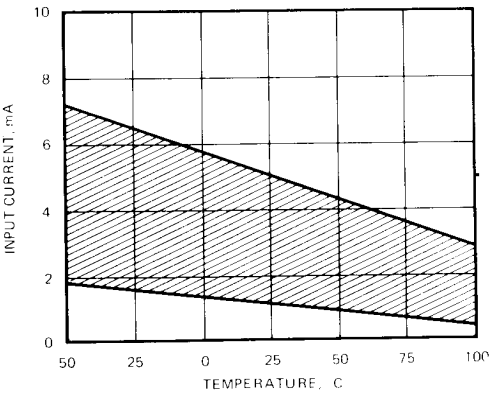

Figure 3: Supply Current vs. Temperature.

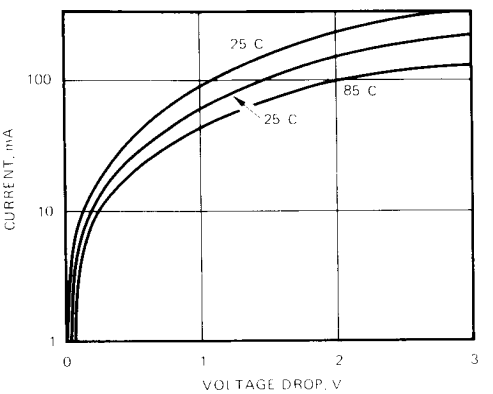

Figure 4: Voltage Drop of Steady Output vs. Current.

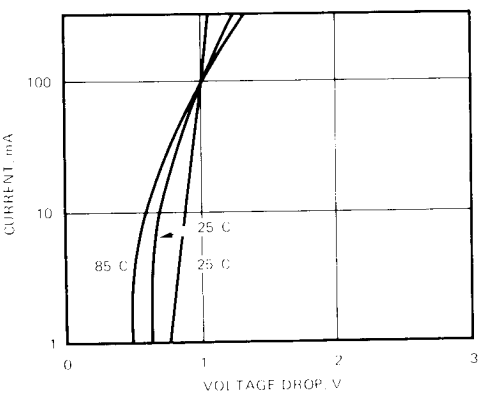

Figure 5: Voltage Drop of Pulsating Output vs. Current.

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APPLICATION NOTES

The block diagram of the quad-monitor is shown in Figure 1. A built-in voltage regulator produces approximately 2.5 volts across a resistive voltage divider. The resistor ratios are chosen such that, without any external connections, the voltage across the upper 900Ω resistor is precisely 5% of the total regulated voltage. This 95% of the total voltage is thus used as a reference potential in a quad comparator. If any of the inputs 10, 11, 12, or 13 move beyond the reference potential, both a steady output NPN transistor and an oscillator are turned on. The oscillator drives the Darlington NPN output stage.

The resistive divider also has two additional taps. If the lower tap (pin 1) is connected to ground then the resistor ratio becomes 10% instead of 5%. If pin 3 is moved to ground the resistor ratio increases to 20%.

Typical performance of the 3040 quad-monitor is shown in Figures 2 through 9. Notice that the frequency and duty cycle of the oscillator will be chosen with an external resistor and capacitor over a wide range. The basic external connection of the quad-monitor is shown in Figure 10. In this configuration, all four inputs are used to monitor positive voltages.

APPLICATIONS

If it is necessary to monitor negative as well as positive voltages it is recommended that the quad-monitor be connected to the most negative potential instead of ground. In this way all voltages are monitored with respect to the most negative potential but no special connection is necessary. An alternate way of monitoring mixed potentials is shown in Figure 11. Here the negative voltage is monitored with respect to +5 volts. This requires that the 5-volt supply be more stable than the others (depending on the magnitude of the monitored negative voltage, the alarm will trip when the 5-volt supply drifts by as little as 2.4%). Also note that in this configuration the tolerance settings are slightly altered. Instead of 5% the trip level becomes 4.54%, instead of 10%, 8.3%, and instead of 20%, 14.2%.

If fewer than four voltages are to be monitored any unused input is simply tied back to pin 2, as shown in Figure 12. The same figure also shows the connection for a tone output and a steady-light-emitting diode connection. Instead of an LED, pin 9 can also drive a lamp or a relay.

The quad-monitor is also capable of sensing AC ripple or oscillation. This feature is gained by connecting a capacitor across the potentiometer as shown in Figure 13. While the DC voltage is divided by the potentiometer the AC is conducted directly to the input by the capacitor. The calibration monitor will respond to a peak AC voltage of 120 mV with the 5% setting, 230 mV with the 10% setting, and 420 mV with the 20% setting. The value of the capacitor is solely determined by the lowest desired frequency and the value of the external potentiometer.

SETTING UP IN BAND VOLTAGES

The setup procedure for the quad-monitor is as follows: First the tolerance is set for 5, 10, or 20% by either ignoring pins 1 and 3 or connecting one of them to ground as shown in the diagram. Then the voltage to be monitored (which must be greater than 2.5 volts) is precisely set using an independent instrument. Next the potentiometer connected to the respective calibration monitor input is turned so that the voltage between the input terminal and pin 2 (the reference pin) becomes 0. This procedure is repeated for all inputs.

Notice that the decoupling (roll-off) capacitor must always be present at the regulated voltage output. This output can also be used as a general purpose reference voltage. It is capable of carrying a current of 5 mA and has a source impedance of 10Ω. Notice that the TTL output (pin 9) is returned to a separate lower supply voltage. Within the voltage rating of the device this can be done with any output since their collectors are uncommitted.

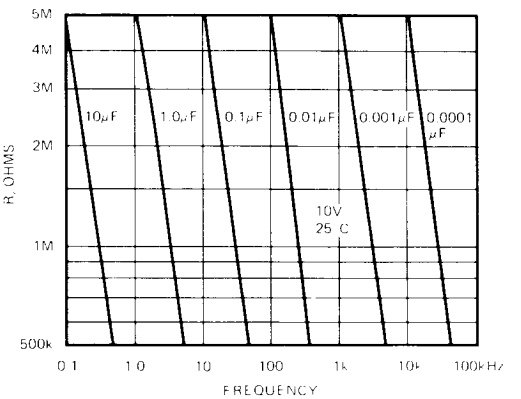

Figure 6: Frequency of Oscillator vs. R and C.

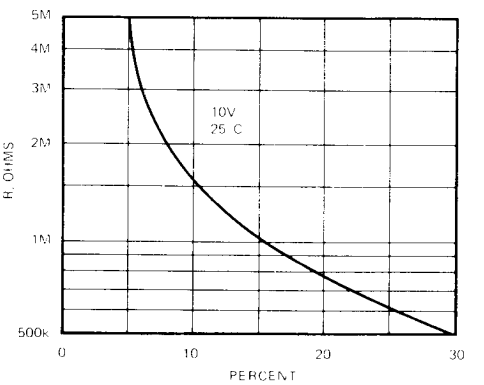

Figure 7: Duty Cycle of Oscillator vs. R.

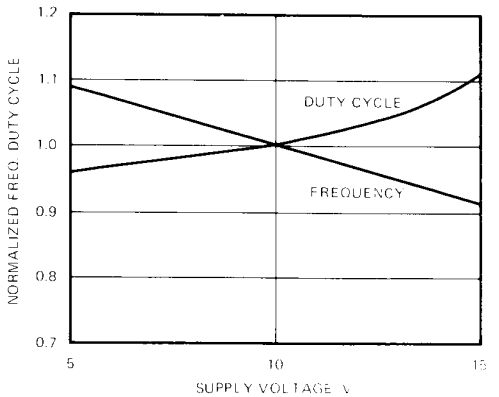

Figure 8: Normalized Frequency and Duty Cycle of Oscillator vs. Supply Voltage.

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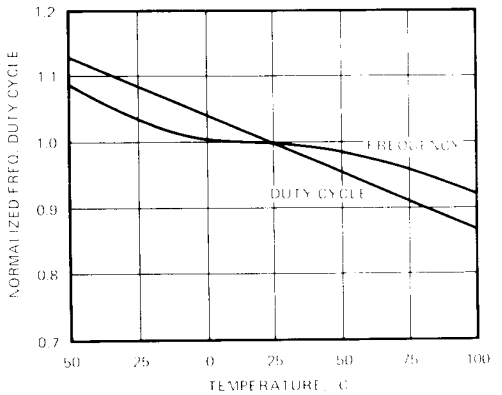


Figure 9: Normalized Frequency and Duty Cycle of Oscillator vs. Temperature.

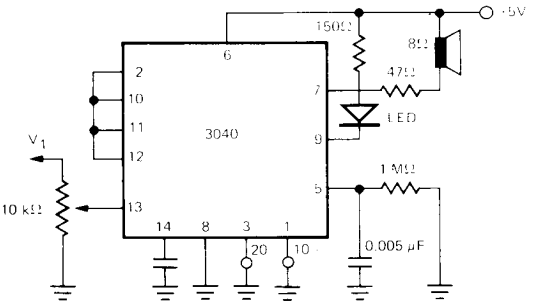


Figure 12: Connections for Unused Inputs and Loudspeaker Output.

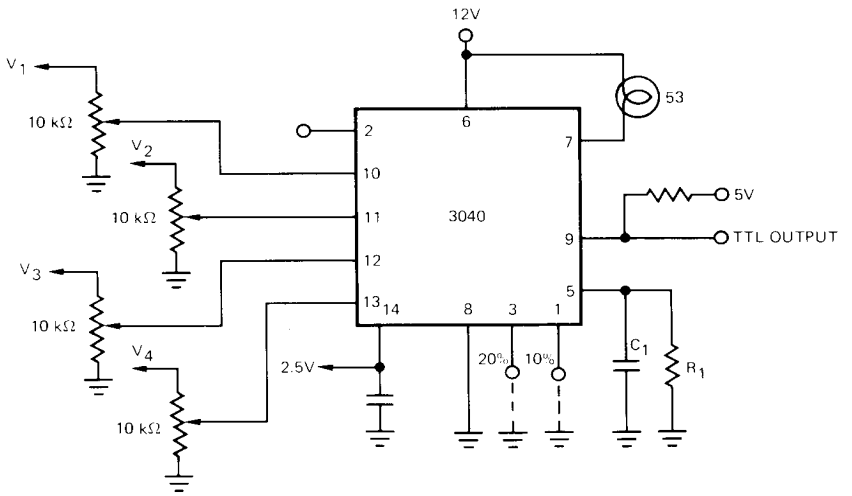


Figure 10: Basic Connection of Quad Monitor.

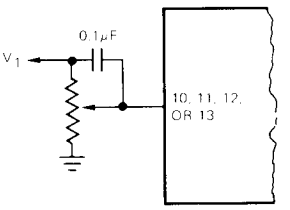


Figure 13:

Monitoring of AC Ripple or Oscillation may be Included with the Addition of a Capacitor.

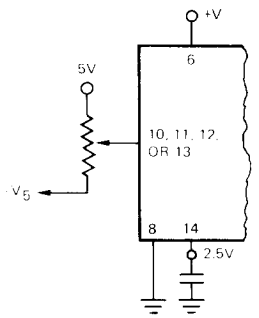
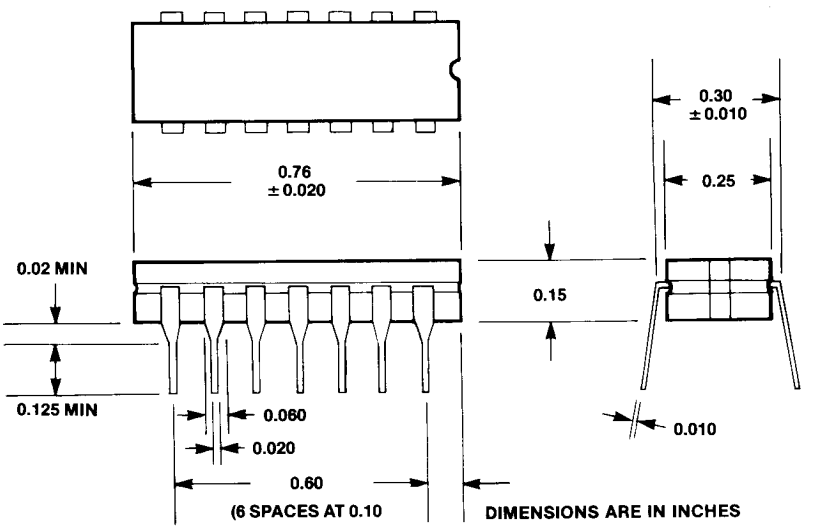


Figure 11:
Connection for Monitoring Negative Voltage.

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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