

# MAXIM

## +10V Precision Voltage Reference

MAX674

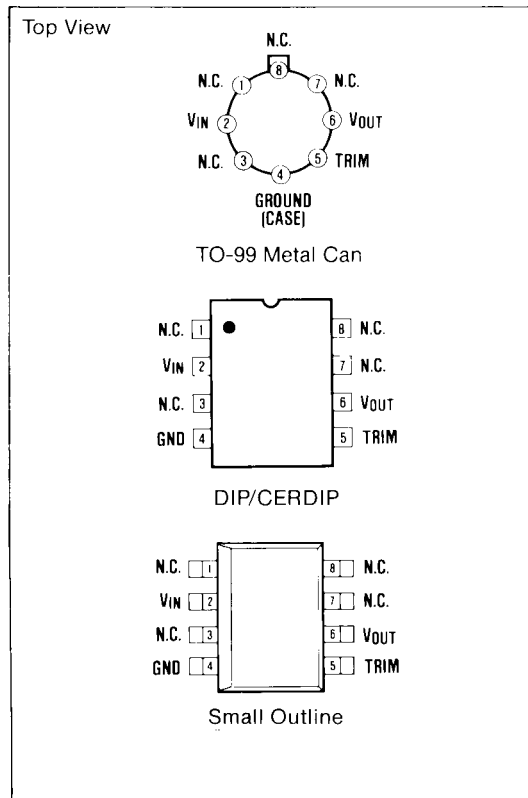
### General Description

The MAX674 is a precision voltage reference that is pretrimmed to within  $\pm 0.15\%$  of 10V. The reference features excellent temperature stability (as low as 12.0ppm/ $^{\circ}\text{C}$  guaranteed), low current drain and low noise. It is supplied in the space-saving narrow Small Outline package, as well as, the standard 8-pin TO-99 Metal Can, Plastic DIP and CERDIP packages.

### Applications

A/D Converters  
D/A Converters  
Digital Voltmeters  
Voltage Regulators  
Threshold Detectors

### Pin Configuration



### Features

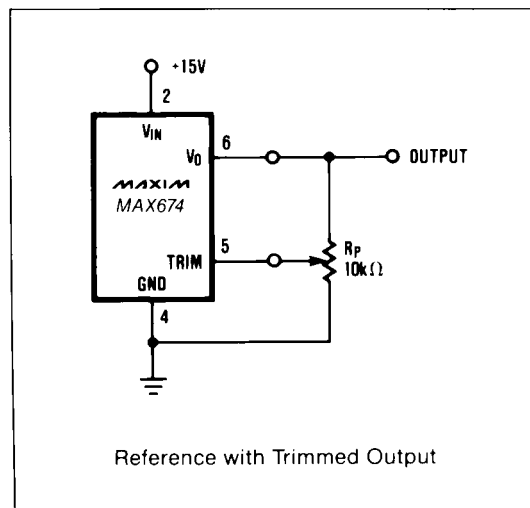
- ◆ Pretrimmed to +10V,  $\pm 0.15\%$
- ◆ Excellent Temperature Stability: 12ppm/ $^{\circ}\text{C}$
- ◆ Low Noise:  $20\mu\text{V}_{\text{p-p}}$
- ◆ Low Supply Current: 1.4mA Max
- ◆ Short-Circuit Proof
- ◆ Load Regulation 0.001%/mA
- ◆ Pin-For-Pin Compatible with REF01

### Ordering Information

| PART                                                                                      | PACKAGE*    | TEMP. COEFFICIENT<br>ppm/ $^{\circ}\text{C}$ | INITIAL ERROR<br>mV |
|-------------------------------------------------------------------------------------------|-------------|----------------------------------------------|---------------------|
| <b>TEMP. RANGE: <math>0^{\circ}\text{C}</math> to <math>+70^{\circ}\text{C}</math></b>    |             |                                              |                     |
| MAX674CTV                                                                                 | TO-99       | 12                                           | 15                  |
| MAX674CPA                                                                                 | Plastic DIP | 12                                           | 15                  |
| MAX674CSA                                                                                 | Narrow SO   | 12                                           | 15                  |
| <b>TEMP. RANGE: <math>-40^{\circ}\text{C}</math> to <math>+85^{\circ}\text{C}</math></b>  |             |                                              |                     |
| MAX674ETV                                                                                 | TO-99       | 15                                           | 15                  |
| MAX674EJA                                                                                 | CERDIP      | 15                                           | 15                  |
| MAX674EPA                                                                                 | Plastic DIP | 15                                           | 15                  |
| MAX674ESA                                                                                 | Narrow SO   | 15                                           | 15                  |
| <b>TEMP. RANGE: <math>-55^{\circ}\text{C}</math> to <math>+125^{\circ}\text{C}</math></b> |             |                                              |                     |
| MAX674MTV                                                                                 | TO-99       | 20                                           | 15                  |
| MAX674MJA                                                                                 | CERDIP      | 20                                           | 15                  |

\*All devices — 8-pin packages

### Typical Operating Circuit



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### ABSOLUTE MAXIMUM RATINGS

|                                                  |                 |                                             |                 |
|--------------------------------------------------|-----------------|---------------------------------------------|-----------------|
| Input Voltage                                    | 40V             | Operating Temperature Range                 |                 |
| Power Dissipation                                |                 | MAX674C                                     | 0°C to +70°C    |
| TO-99 (TV) (Derate at 7.1mW/°C above +80°C)      | 500mW           | MAX674E                                     | -40°C to +85°C  |
| CERDIP (J) (Derate at 6.7mW/°C above +75°C)      | 500mW           | MAX674M                                     | -55°C to +125°C |
| Plastic DIP (P) (Derate at 5.6mW/°C above +36°C) | 500mW           | Lead Temperature (Soldering, 60 sec)        | +300°C          |
| Narrow Small Outline (S)                         |                 | DICE Junction Temperature (T <sub>J</sub> ) | -65°C to +150°C |
| (Derate at 5.0mW/°C above +55°C)                 | 300mW           | Output Short-Circuit Duration               |                 |
| Storage Temperature Range                        | -65°C to +150°C | (to Ground or V <sub>IN</sub> )             | Indefinite      |

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability.

### ELECTRICAL CHARACTERISTICS (V<sub>IN</sub> = +15V, T<sub>A</sub> = +25°C, unless otherwise noted.)

| PARAMETER                              | SYMBOL             | CONDITIONS                                                  | MIN  | TYP   | MAX            | UNITS             |
|----------------------------------------|--------------------|-------------------------------------------------------------|------|-------|----------------|-------------------|
| Output Voltage Tolerance               |                    | I <sub>L</sub> = 0mA                                        |      |       | ±15            | mV                |
| Output Voltage Change with Temperature | TCV <sub>O</sub>   | MAX674CTV/CPA/CSA<br>MAX674ETV/EJA/EPA/ESA<br>MAX674MTV/MJA |      |       | 12<br>15<br>20 | ppm/°C            |
| Output Adjustment Range                | V <sub>TRIM</sub>  | R <sub>P</sub> = 10                                         | ±300 | ±600  |                | mV                |
| Line Regulation (Note 1)               |                    | V <sub>IN</sub> = 13V to 33V                                |      | 0.006 | 0.01           | %/V               |
| Load Regulation (Note 1)               |                    | I <sub>L</sub> = 0 to 10mA                                  |      | 0.001 | 0.002          | %/mA              |
| Turn-on Settling Time                  | t <sub>ON</sub>    | To ±0.1% of final value                                     |      | 5     |                | μs                |
| Quiescent Supply Current               | I <sub>Q</sub>     | No load                                                     |      | 750   | 1400           | μA                |
| Noise (Note 2)                         | e <sub>n p-p</sub> | 0.1Hz to 10Hz                                               |      | 20    | 30             | μV <sub>p-p</sub> |
| Sink Current                           | I <sub>S</sub>     |                                                             | -0.3 | -0.5  |                | mA                |
| Short-Circuit Current                  | I <sub>SC</sub>    | V <sub>O</sub> = 0                                          |      | 30    |                | mA                |

**Note 1:** Line and Load Regulation specifications include the effect of self heating.

**Note 2:** Noise is sample tested.

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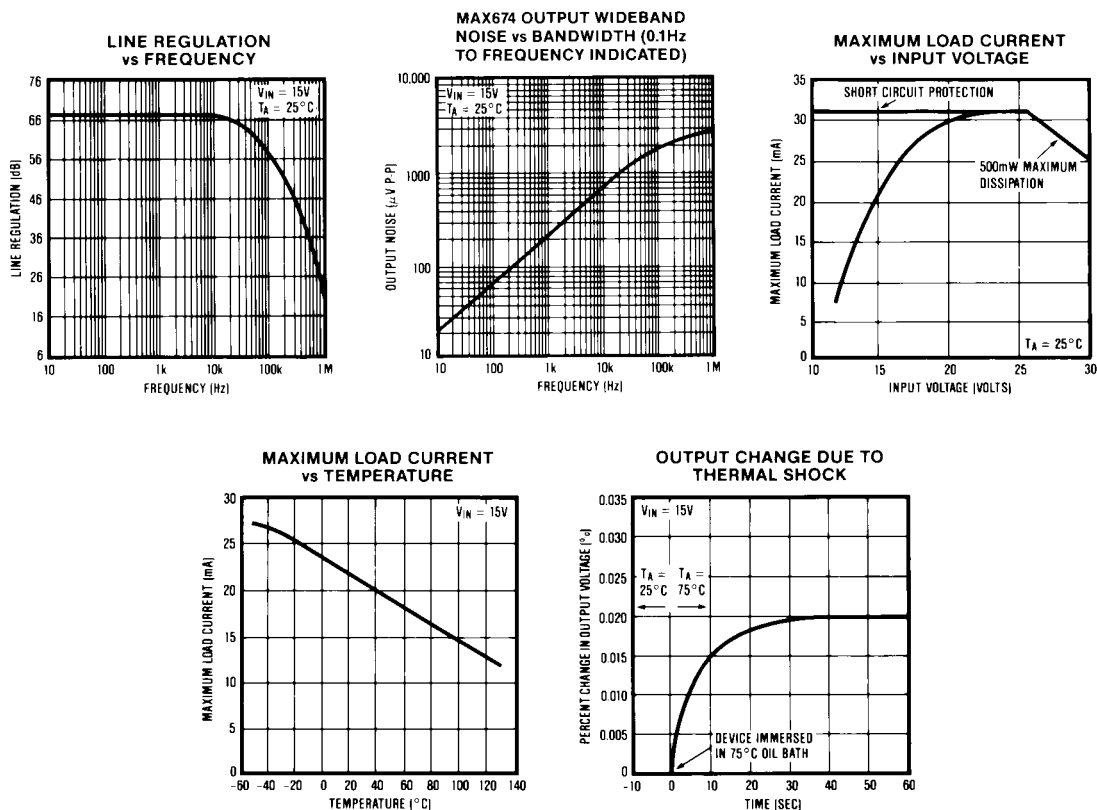
### Output Adjustment

The MAX674 trim terminal can be used to adjust the output voltage over a  $10V \pm 300mV$  range. This feature allows system errors to be trimmed by setting the reference to a voltage other than 10V such as 10.240V for binary applications (see "Typical Operating Circuit"

on first page). The trim terminal may, of course, be left open if no adjustment is needed.

Adjustment of the output does not significantly affect the temperature performance of the device. The temperature coefficient change is approximately  $0.7ppm/^{\circ}C$  for 100mV of output adjustment from its initial value.

### Typical Operating Characteristics



# **+10V Precision Voltage Reference**

## **Typical Applications**

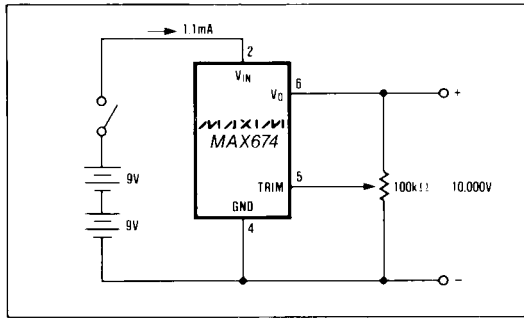


Figure 2. Precision Calibration Standard

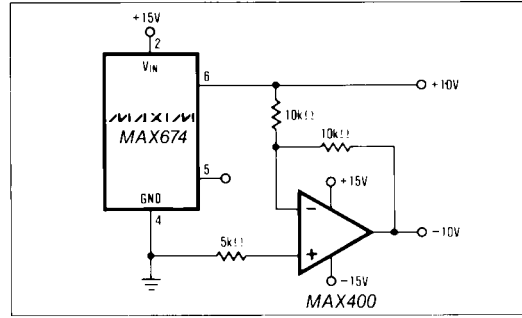


Figure 3. +10V Reference

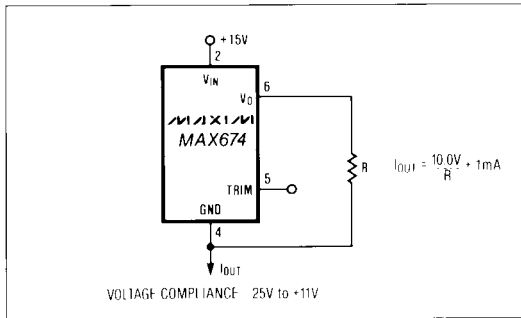
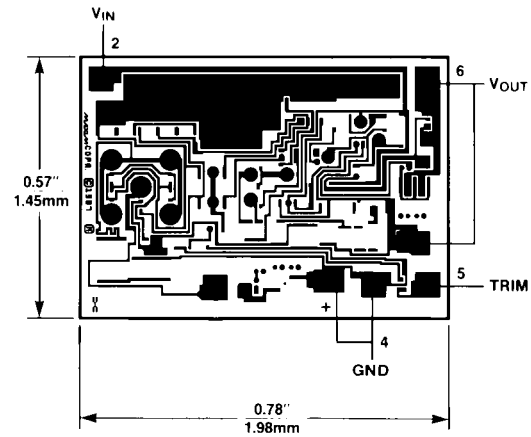


Figure 4. Current Source

## **Chip Topography**



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