19-2561; Rev 2; 7/04

MAXIM

+5V Precision Voltage Reference

General Description

The MAX675 is a precision voltage reference that is pretrimmed to within ±0.15% of 5V. The reference features excellent temperature stability (as low as 12.0ppm/°C guaranteed), low current drain and low noise. It is supplied in the space-saving narrow SO package, as well as, the standard 8-pin Plastic DIP package.

Features

- ♦ **Pretrimmed to +5V, ±0.15%**
- ♦ **Excellent Temperature Stability: 12ppm/°C**
- ♦ **Low Noise: 10µVP-P**
- ♦ **Low Supply Current: 1.4mA (max)**
- ♦ **Short-Circuit Protected**
- ♦ **Load Regulation 0.001%/mA**
- ♦ **Pin-for-Pin Compatible with REF02**

Applications

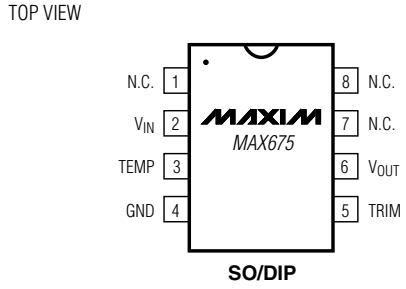
A/D Converters
D/A Converters
Digital Voltmeters
Voltage Regulators
Threshold Detectors

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	TEMPCO (ppm/°C)	INITIAL ERROR (mV)
MAX675CPA	0°C to +70°C	8 PDIP	12	7
MAX675CSA	0°C to +70°C	8 Narrow SO	12	7
MAX675EPA	-40°C to +85°C	8 PDIP	15	7
MAX675ESA	-40°C to +85°C	8 Narrow SO	15	7

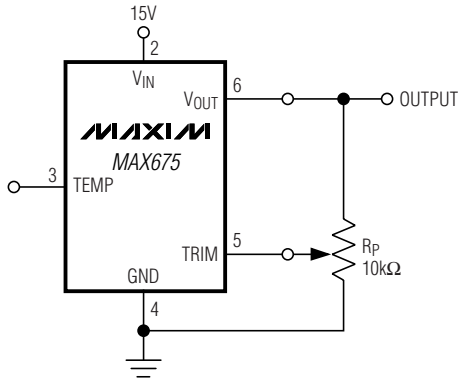
Ordering Information continued at end of data sheet.

Pin Configurations



Pin Configurations continued at end of data sheet.

Typical Operating Circuit



REFERENCE WITH TRIMMED OUTPUT

For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

+5V Precision Voltage Reference

ABSOLUTE MAXIMUM RATINGS

Input Voltage 40V
Power Dissipation
  TO-99 (TV) (derate at 7.1mW/ C above +80°C).....500mW
  CERDIP (J) (derate at 6.7mW/ C above +75°C).....500mW
  Plastic DIP (P) (derate at 5.6mW/ C above +36°C).....500mW
  Narrow SO (S) (derate at 5.0mW/ C above +55°C).....300mW
Storage Temperature Range .....-65°C to +150°C
Operating Temperature Range
  MAX675C .....0°C to +70°C
  MAX675E .....-40°C to +85°C
  MAX675M .....-55°C to +125°C
Dice Junction Temperature (T_J) .....-65°C to +150°C
Output Short-Circuit Duration
  (to Ground or V_{IN}).....Indefinite
Lead Temperature (soldering, 60s) .....+300°C

Stresses beyond 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 beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{IN} = +15V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage Tolerance		I_L = 0mA			±7	mV
Output Voltage Temperature Coefficient (Note 1)	TCV_O	MAX675CTV/CPA/CSA			12	ppm/°C
		MAX675ETV/EJA/EPA/ESA			15	
		MAX675MTV/MJA			20	
Output Adjustment Range	V_{TRIM}	Rp = 10	±150	±300		mV
Line Regulation (Note 2)		V_{IN} = 18V to 33V		0.006	0.01	%/V
Load Regulation (Note 2)		I_L = 0 to 10mA		0.001	0.002	%/mA
Turn-On Settling Time	t_{ON}	To ±0.1% of final value		5		µs
Quiescent Supply Current	I_Q	No load		750	1400	µA
Noise (Note 3)	$e_{N(P-P)}$	0.1Hz to 10Hz		10	15	$µV_{P-P}$
Sink Current	I_S		0.3	0.5		mA
Short-Circuit Current	I_{SC}	V_{OUT} = 0V		30		mA
Current Temperature Voltage Output	V_T	(Note 4)		630		mV

Note 1: Temperature Coefficient is measured by the "box" method, i.e., the maximum ΔV_{OUT} is divided by ΔT.
Note 2: Line and Load Regulation specifications include the effect of self-heating.
Note 3: Guaranteed by design for MAX675CPA, MAX675CSA, MAX675EPA, MAX675ESA; sample tested for all other grades and packages.
Note 4: Limit current in or out of pin 3 to 50nA and capacitance on pin 3 to 30pF.

Output Adjustment

The MAX675 trim terminal can be used to adjust the output voltage over a 5V ±150mV range. This feature allows system errors to be trimmed by setting the reference to a voltage other than 5V such as 5.120V for binary applications (see *Typical Operating Circuit*). 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/°C for each 100mV of output adjustment from its initial value.

Temperature Voltage Output

The MAX675 provides a temperature-dependent output voltage on the TEMP pin. This voltage is proportional to the absolute temperature, and has a scale factor of approximately 2.1mV/°C (Figure 2).

Output Voltage = 2.1(T + 273)mV

where T = Temperature in °C

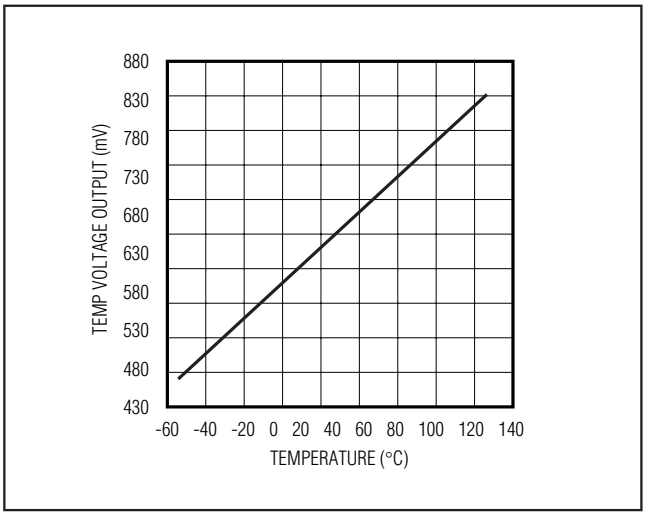
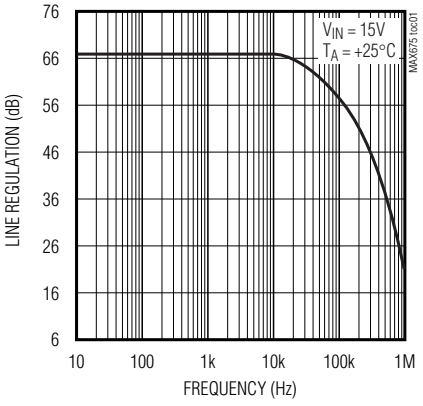


Figure 2. MAX675 Temperature Voltage Output vs. Temperature

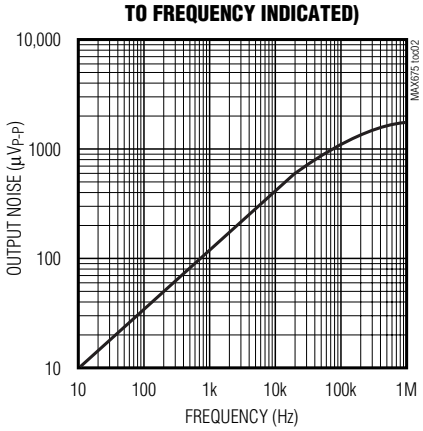
Typical Operating Characteristics

(T_A = +25°C, unless otherwise noted.)

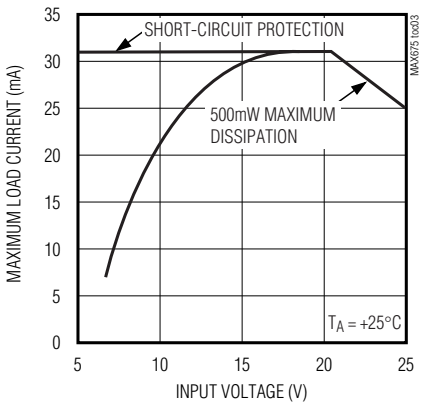
LINE REGULATION vs. FREQUENCY



MAX675 OUTPUT WIDEBAND NOISE vs. BANDWIDTH (0.1Hz TO FREQUENCY INDICATED)



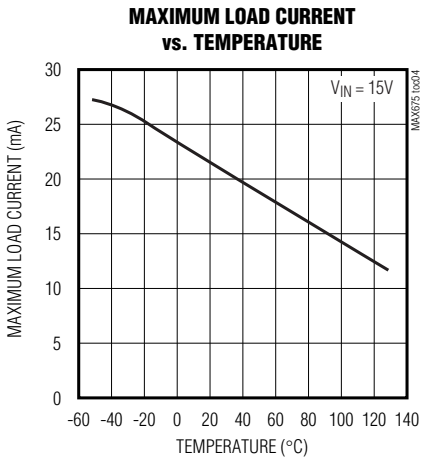
MAXIMUM LOAD CURRENT vs. INPUT VOLTAGE

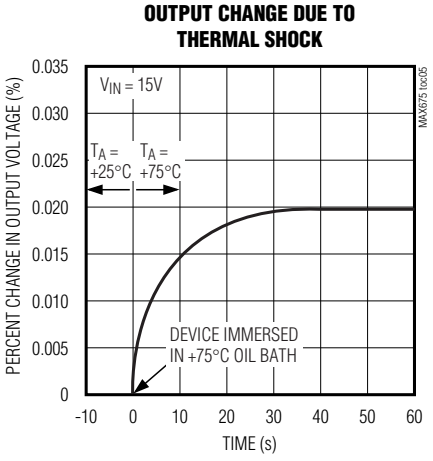


+5V Precision Voltage Reference

Typical Operating Characteristics (continued)

(T_A = +25°C, unless otherwise noted.)





Typical Applications

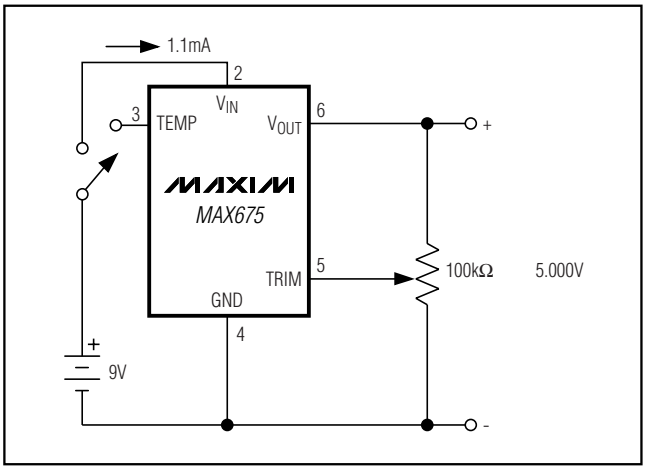


Figure 3. Precision Calibration Standard

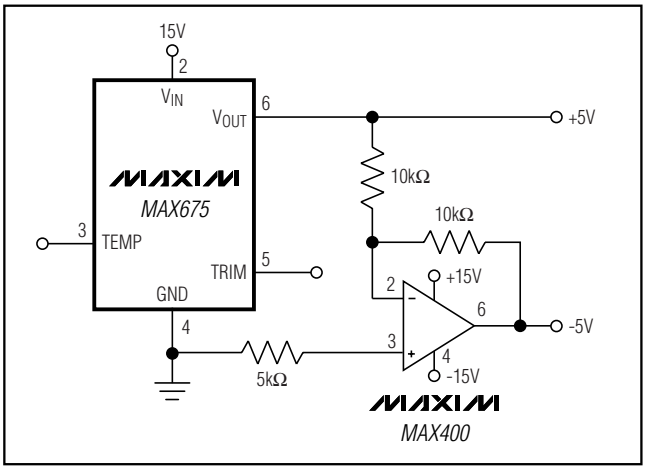


Figure 4. ±5V Reference

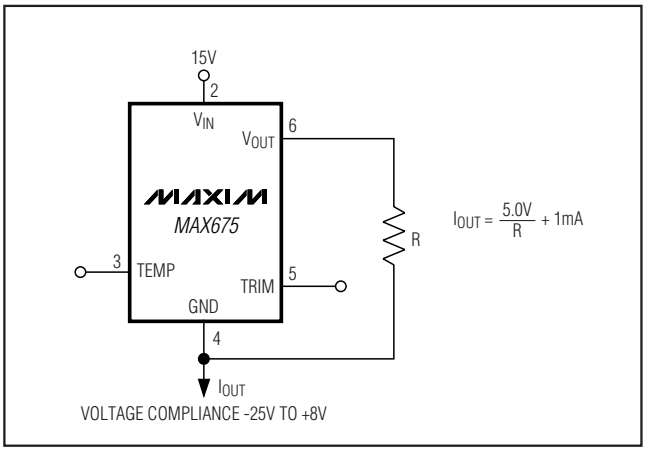


Figure 5. Current Source

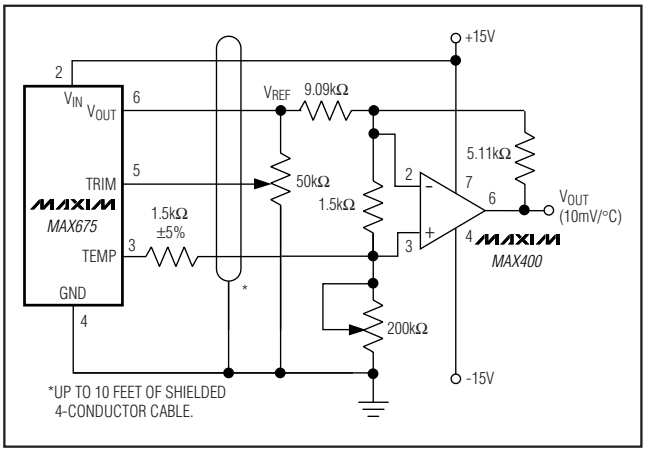
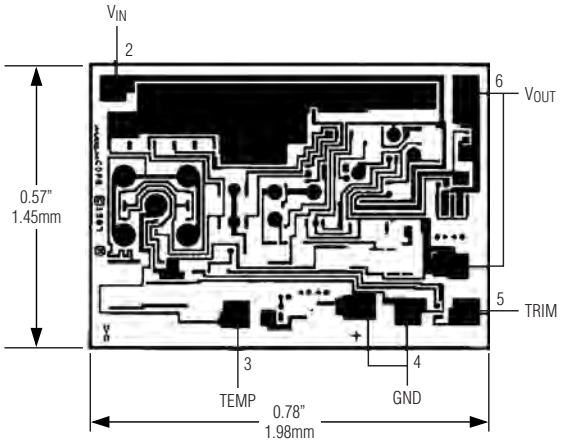
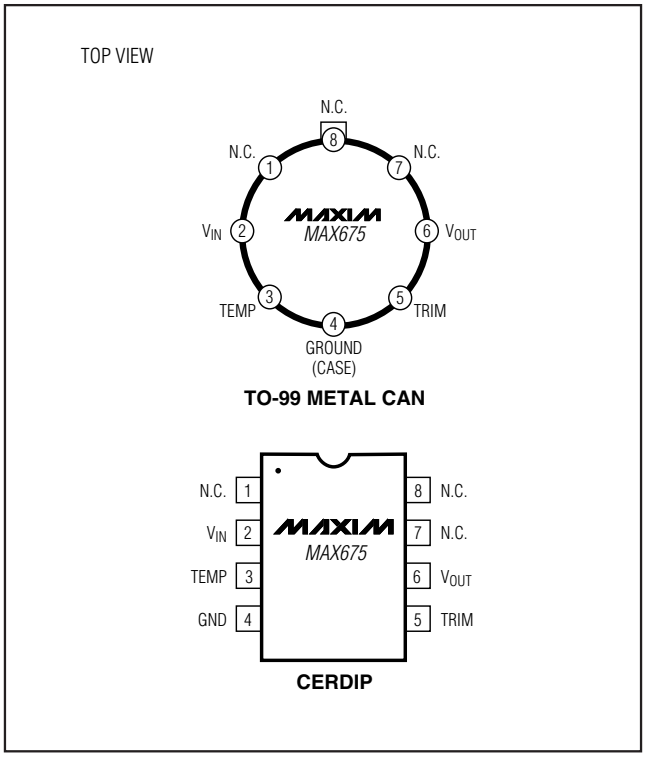


Figure 6. Precision Temperature Transducer with Remote Sensor

Chip Topography



Pin Configurations (continued)



Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	TEMPCO (ppm/°C)	INITIAL ERROR (mV)
MAX675CTV*	0°C to +70°C	8 TO-99	12	7
MAX675ETV*	-40°C to +85°C	8 TO-99	15	7
MAX675EJA*	-40°C to +85°C	8 CERDIP	15	7
MAX675MTV*	-55°C to +125°C	8 TO-99	20	7
MAX675MJA*	-55°C to +125°C	8 CERDIP	20	7

**Contact factory for availability. Not recommended for new designs.*

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