# Ultra-Low-Power Precision Series Voltage Reference

## ABSOLUTE MAXIMUM RATINGS

IN to GND ..............................................................-0.3V to +13V
OUT to GND ..............-0.3V to the lower of +6V and ($V_{IN}$ + 0.3V)
Output to GND Short-Circuit Duration........................Continuous
Continuous Power Dissipation ($T_A$ = +70°C)
5-Pin SOT23 (derate 7.1mW/°C above +70°C)...........571mW
8-Pin SO (derate 5.9mW/°C above +70°C)..............470.6mW

Operating Temperature Range ...........................-40°C to +85°C
Storage Temperature Range .............................-65°C to +150°C
Lead Temperature (soldering, 10s) .................................+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—MAX6029_21 ($V_{OUT}$ = 2.048V)

($V_{IN}$ = 2.5V, $I_{OUT}$ = 0, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | |
| Output Voltage | $V_{OUT}$ | $T_A$ = +25°C | 2.0449 | 2.0480 | 2.0511 | V |
| Output Voltage Temperature Coefficient | $TCV_{OUT}$ | (Notes 2, 3) | | | 30 | ppm/°C |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 2.5V to 12.6V | | 27 | 200 | µV/V |
| Load Regulation | $\Delta V_{OUT}/\Delta I_{OUT}$ | $I_{OUT}$ = 0 to 4mA | | 0.22 | 0.7 | µV/µA |
| | | $I_{OUT}$ = 0 to -1mA | | 2.4 | 5.5 | |
| Output Short-Circuit Current | $I_{SC}$ | | | 60 | | mA |
| Long-Term Stability | $\Delta V_{OUT}$/time | 1000 hours at +25°C | | 150 | | ppm |
| Thermal Hysteresis | | (Note 4) | | 140 | | ppm |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Noise Voltage | $e_{OUT}$ | f = 0.1Hz to 10Hz | | 30 | | $µV_{P-P}$ |
| | | f = 10Hz to 1kHz | | 115 | | $µV_{RMS}$ |
| Ripple Rejection | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 2.5V ±200mV, f = 120Hz | | 43 | | dB |
| Turn-On Settling Time | $t_R$ | To $V_{OUT}$ = 0.1% of final value | | 450 | | µs |
| **INPUT** | | | | | | |
| Supply Voltage Range | $V_{IN}$ | | 2.5 | | 12.6 | V |
| Supply Current | $I_{IN}$ | | | | 5.25 | µA |
| Change in Supply Current | $I_{IN}/V_{IN}$ | $V_{IN}$ = 2.5V to 12.6V | | | 1.5 | µA/V |

## ELECTRICAL CHARACTERISTICS—MAX6029_25 ($V_{OUT}$ = 2.500V)

($V_{IN}$ = 2.7V, $I_{OUT}$ = 0, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | | |
| Output Voltage | $V_{OUT}$ | $T_A$ = +25°C | MAX6029EUK | 2.4963 | 2.5000 | 2.5038 | V |
| | | | MAX6029ESA | 2.495 | 2.500 | 2.505 | |
| Output Voltage Temperature Coefficient | $TCV_{OUT}$ | (Notes 2, 3) | | | | 30 | ppm/°C |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 2.7V to 12.6V | | | 30 | 230 | µV/V |
| Load Regulation | $\Delta V_{OUT}/\Delta I_{OUT}$ | $I_{OUT}$ = 0 to 4mA | | | 0.1 | 0.6 | µV/µA |
| | | $I_{OUT}$ = 0 to -1mA | | | 2.5 | 6.2 | |
| Dropout Voltage (Note 5) | $V_{IN}$ - $V_{OUT}$ | $I_{OUT}$ = 0 | | | | 100 | mV |
| | | $I_{OUT}$ = 4mA | | | | 200 | |
| Output Short-Circuit Current | $I_{SC}$ | | | | 60 | | mA |
| Long-Term Stability | $\Delta V_{OUT}$/time | 1000 hours at +25°C | | | 150 | | ppm |
| Thermal Hysteresis | | (Note 4) | | | 140 | | ppm |
| **DYNAMIC CHARACTERISTICS** | | | | | | | |
| Noise Voltage | $e_{OUT}$ | f = 0.1Hz to 10Hz | | | 39 | | $µV_{P-P}$ |
| | | f = 10Hz to 1kHz | | | 137 | | $µV_{RMS}$ |
| Ripple Rejection | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 2.7V ±200mV, f = 120Hz | | | 34 | | dB |
| Turn-On Settling Time | $t_R$ | To $V_{OUT}$ = 0.1% of final value | | | 700 | | ms |
| **INPUT** | | | | | | | |
| Supply Voltage Range | $V_{IN}$ | | | 2.7 | | 12.6 | V |
| Supply Current | $I_{IN}$ | | | | | 5.75 | µA |
| Change in Supply Current | $I_{IN}/V_{IN}$ | $V_{IN}$ = 2.7V to 12.6V | | | | 1.5 | µA/V |

# Ultra-Low-Power Precision Series Voltage Reference

## ELECTRICAL CHARACTERISTICS—MAX6029_30 ($V_{OUT}$ = 3.000V)

($V_{IN}$ = 3.2V, $I_{OUT}$ = 0, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | |
| Output Voltage | $V_{OUT}$ | $T_A$ = +25°C | 2.9955 | 3.0000 | 3.0045 | V |
| Output Voltage Temperature Coefficient | $TCV_{OUT}$ | (Notes 2, 3) | | | 30 | ppm/°C |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 3.2V to 12.6V | | 15 | 250 | µV/V |
| Load Regulation | $\Delta V_{OUT}/\Delta I_{OUT}$ | $I_{OUT}$ = 0 to 4mA | | 0.1 | 0.6 | µV/µA |
| | | $I_{OUT}$ = 0 to -1mA | | 2.4 | 6.5 | |
| Dropout Voltage (Note 5) | $V_{IN}$ - $V_{OUT}$ | $I_{OUT}$ = 0 | | | 100 | mV |
| | | $I_{OUT}$ = 4mA | | | 200 | |
| Output Short-Circuit Current | $I_{SC}$ | | | 60 | | mA |
| Long-Term Stability | $\Delta V_{OUT}$/time | 1000 hours at +25°C | | 150 | | ppm |
| Thermal Hysteresis | | (Note 4) | | 140 | | ppm |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Noise Voltage | $e_{OUT}$ | f = 0.1Hz to 10Hz | | 39 | | $\mu V_{P-P}$ |
| | | f = 10Hz to 1kHz | | 161 | | $\mu V_{RMS}$ |
| Ripple Rejection | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 3.2V ±200mV, f = 120Hz | | 37 | | dB |
| Turn-On Settling Time | $t_R$ | To $V_{OUT}$ = 0.1% of final value | | 775 | | µs |
| **INPUT** | | | | | | |
| Supply Voltage Range | $V_{IN}$ | | 3.2 | | 12.6 | V |
| Supply Current | $I_{IN}$ | | | | 6.75 | µA |
| Change in Supply Current | $I_{IN}/V_{IN}$ | $V_{IN}$ = 3.2V to 12.6V | | | 1.5 | µA/V |

## ELECTRICAL CHARACTERISTICS—MAX6029_33 ($V_{OUT}$ = 3.300V)

($V_{IN}$ = 3.5V, $I_{OUT}$ = 0, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | |
| Output Voltage | $V_{OUT}$ | $T_A$ = +25°C | 3.2951 | 3.3000 | 3.3050 | V |
| Output Voltage Temperature Coefficient | $TCV_{OUT}$ | (Notes 2, 3) | | | 30 | ppm/°C |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 3.5V to 12.6V | | 30 | 270 | µV/V |
| Load Regulation | $\Delta V_{OUT}/\Delta I_{OUT}$ | $I_{OUT}$ = 0 to 4mA | | 0.1 | 0.6 | µV/µA |
| | | $I_{OUT}$ = 0 to -1mA | | 2.4 | 7 | |
| Dropout Voltage (Note 5) | $V_{IN}$ - $V_{OUT}$ | $I_{OUT}$ = 0 | | | 100 | mV |
| | | $I_{OUT}$ = 4mA | | | 200 | |
| Output Short-Circuit Current | $I_{SC}$ | | | 60 | | mA |
| Long-Term Stability | $\Delta V_{OUT}$/time | 1000 hours at +25°C | | 150 | | ppm |
| Thermal Hysteresis | | (Note 4) | | 140 | | ppm |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Noise Voltage | $e_{OUT}$ | f = 0.1Hz to 10Hz | | 56 | | $\mu V_{P-P}$ |
| | | f = 10Hz to 1kHz | | 174 | | $\mu V_{RMS}$ |
| Ripple Rejection | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 3.5V ±200mV, f = 120Hz | | 38 | | dB |
| Turn-On Settling Time | $t_R$ | To $V_{OUT}$ = 0.1% of final value | | 1 | | ms |
| **INPUT** | | | | | | |
| Supply Voltage Range | $V_{IN}$ | | 3.5 | | 12.6 | V |
| Supply Current | $I_{IN}$ | | | | 7.25 | µA |
| Change in Supply Current | $I_{IN}/V_{IN}$ | $V_{IN}$ = 3.5V to 12.6V | | | 1.5 | µA/V |

## ELECTRICAL CHARACTERISTICS—MAX6029_41 ($V_{OUT}$ = 4.096V)

($V_{IN}$ = 4.3V, $I_{OUT}$ = 0, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | | |
| Output Voltage | $V_{OUT}$ | $T_A$ = +25°C | MAX6029EUK | 4.0899 | 4.0960 | 4.1021 | V |
| | | | MAX6029ESA | 4.088 | 4.096 | 4.104 | |
| Output Voltage Temperature Coefficient | $TCV_{OUT}$ | (Notes 2, 3) | | | | 30 | ppm/°C |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 4.3V to 12.6V | | | 30 | 310 | µV/V |
| Load Regulation | $\Delta V_{OUT}/\Delta I_{OUT}$ | $I_{OUT}$ = 0 to 4mA | | | 0.1 | 0.6 | µV/µA |
| | | $I_{OUT}$ = 0 to -1mA | | | 2.5 | 8.5 | |
| Dropout Voltage (Note 5) | $V_{IN}$ - $V_{OUT}$ | $I_{OUT}$ = 0 | | | | 100 | mV |
| | | $I_{OUT}$ = 4mA | | | | 200 | |
| Output Short-Circuit Current | $I_{SC}$ | | | | 60 | | mA |
| Long-Term Stability | $\Delta V_{OUT}$/time | 1000 hours at +25°C | | | 150 | | ppm |
| Thermal Hysteresis | | (Note 4) | | | 140 | | ppm |
| **DYNAMIC CHARACTERISTICS** | | | | | | | |
| Noise Voltage | $e_{OUT}$ | f = 0.1Hz to 10Hz | | | 72 | | $µV_{P-P}$ |
| | | f = 10Hz to 1kHz | | | 210 | | $µV_{RMS}$ |
| Ripple Rejection | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 4.3V ±200mV, f = 120Hz | | | 36 | | dB |
| Turn-On Settling Time | $t_R$ | To $V_{OUT}$ = 0.1% of final value | | | 1.2 | | ms |
| **INPUT** | | | | | | | |
| Supply Voltage Range | $V_{IN}$ | | | 4.3 | | 12.6 | V |
| Supply Current | $I_{IN}$ | | | | | 8.75 | µA |
| Change in Supply Current | $I_{IN}/V_{IN}$ | $V_{IN}$ = 4.3V to 12.6V | | | | 1.5 | µA/V |

## ELECTRICAL CHARACTERISTICS—MAX6029_50 ($V_{OUT}$ = 5.000V)

($V_{IN}$ = 5.2V, $I_{OUT}$ = 0, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise noted. Typical values are at $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | |
| Output Voltage | $V_{OUT}$ | $T_A$ = +25°C | 4.9925 | 5.0000 | 5.0075 | V |
| Output Voltage Temperature Coefficient | $TCV_{OUT}$ | (Notes 2, 3) | | | 30 | ppm/°C |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 5.2V to 12.6V | | 34 | 375 | µV/V |
| Load Regulation | $\Delta V_{OUT}/\Delta I_{OUT}$ | $I_{OUT}$ = 0 to 4mA | | 0.3 | 0.8 | µV/µA |
| | | $I_{OUT}$ = 0 to -1mA | | 3.3 | 9 | |
| Dropout Voltage (Note 5) | $V_{IN}$ - $V_{OUT}$ | $I_{OUT}$ = 0 | | | 100 | mV |
| | | $I_{OUT}$ = 4mA | | | 200 | |
| Output Short-Circuit Current | $I_{SC}$ | | | 60 | | mA |
| Long-Term Stability | $\Delta V_{OUT}$/time | 1000 hours at +25°C | | 150 | | ppm |
| Thermal Hysteresis | | (Note 4) | | 140 | | ppm |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Noise Voltage | $e_{OUT}$ | f = 0.1Hz to 10Hz | | 90 | | $µV_{P-P}$ |
| | | f = 10Hz to 1kHz | | 245 | | $µV_{RMS}$ |
| Ripple Rejection | $\Delta V_{OUT}/\Delta V_{IN}$ | $V_{IN}$ = 5.2V ±200mV, f = 120Hz | | 38 | | dB |
| Turn-On Settling Time | $t_R$ | To $V_{OUT}$ = 0.1% of final value | | 1.4 | | ms |
| **INPUT** | | | | | | |
| Supply Voltage Range | $V_{IN}$ | | 5.2 | | 12.6 | V |
| Supply Current | $I_{IN}$ | | | | 10.5 | µA |
| Change in Supply Current | $I_{IN}/V_{IN}$ | $V_{IN}$ = 5.2V to 12.6V | | | 1.5 | µA/V |

**Note 1:** MAX6029 is 100% production tested at $T_A$ = +25°C and is guaranteed by design for $T_A$ = $T_{MIN}$ to $T_{MAX}$ as specified.

**Note 2:** Temperature coefficient is defined by box method: $(V_{MAX} - V_{MIN})/(\Delta T \times V_{+25°C})$.

**Note 3:** Not production tested. Guaranteed by design.

**Note 4:** Thermal hysteresis is defined as the change in $T_A$ = +25°C output voltage before and after temperature cycling of the device (from $T_A$ = $T_{MIN}$ to $T_{MAX}$). Initial measurement at $T_A$ = +25°C is followed by temperature cycling the device to $T_A$ = +85°C then to $T_A$ = -40°C and another measurement at $T_A$ = +25°C is compared to the original measurement at $T_A$ = +25°C.

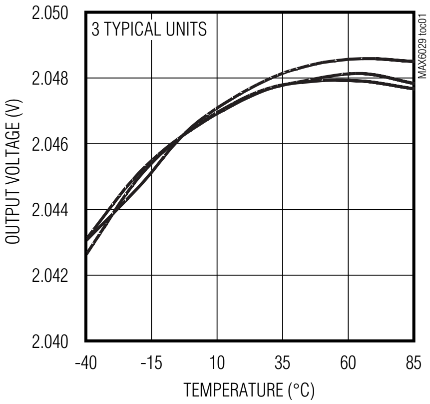
**Note 5:** Dropout voltage is the minimum input voltage at which $V_{OUT}$ changes by 0.1% from $V_{OUT}$ at rated $V_{IN}$ and is guaranteed by Load Regulation Test.

# Ultra-Low-Power Precision Series Voltage Reference

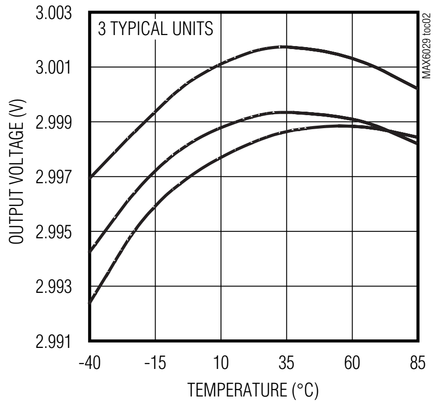
## Typical Operating Characteristics

($V_{IN}$ = 2.5V for MAX6029EUK21, $V_{IN}$ = 3.2V for MAX6029EUK30, and $V_{IN}$ = 5.2V for MAX6029EUK50, $I_{OUT}$ = 0, $T_A$ = +25°C, unless otherwise noted.)

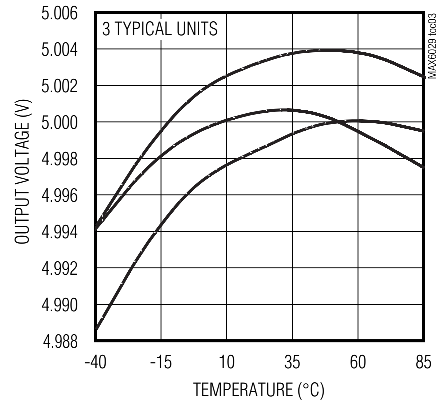
**OUTPUT VOLTAGE vs. TEMPERATURE ($V_{OUT}$ = 2.048V)**



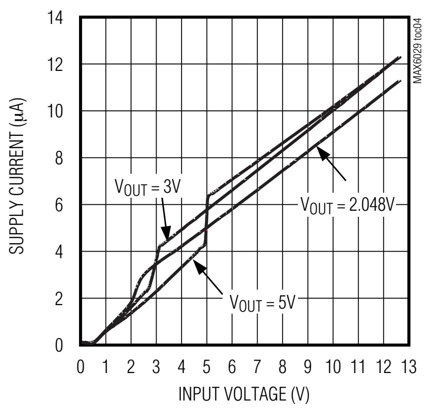

**OUTPUT VOLTAGE vs. TEMPERATURE ($V_{OUT}$ = 3V)**



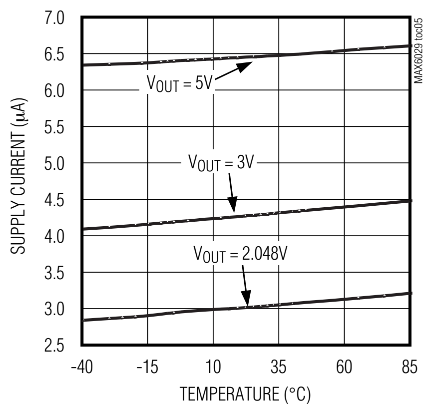

**OUTPUT VOLTAGE vs. TEMPERATURE ($V_{OUT}$ = 5V)**



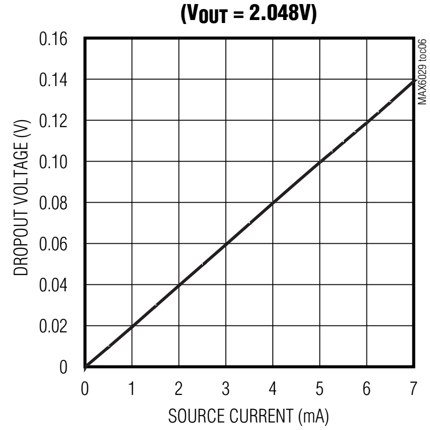

**SUPPLY CURRENT vs. INPUT VOLTAGE**



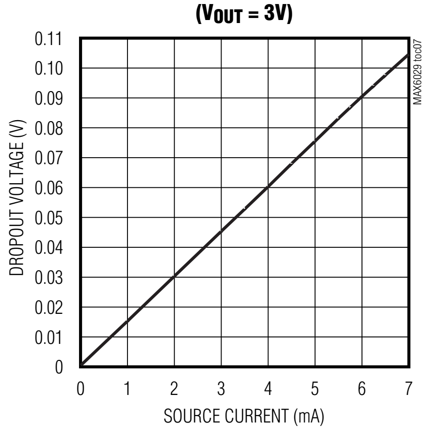

**SUPPLY CURRENT vs. TEMPERATURE**



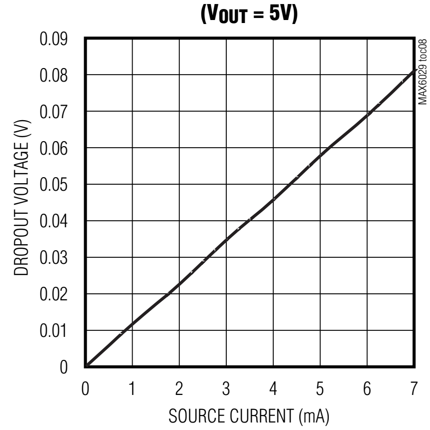

**DROPOUT VOLTAGE vs. SOURCE CURRENT ($V_{OUT}$ = 2.048V)**



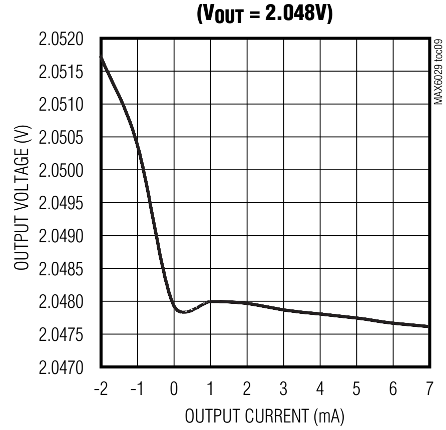

**DROPOUT VOLTAGE vs. SOURCE CURRENT ($V_{OUT}$ = 3V)**




**DROPOUT VOLTAGE vs. SOURCE CURRENT ($V_{OUT}$ = 5V)**



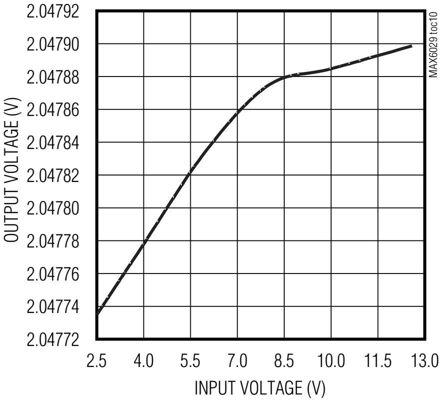

**LOAD REGULATION ($V_{OUT}$ = 2.048V)**



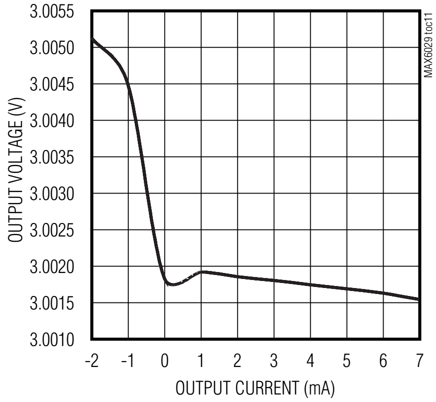
## Typical Operating Characteristics (continued)

($V_{IN}$ = 2.5V for MAX6029EUK21, $V_{IN}$ = 3.2V for MAX6029EUK30, and $V_{IN}$ = 5.2V for MAX6029EUK50, $I_{OUT}$ = 0, $T_A$ = +25°C, unless otherwise noted.)

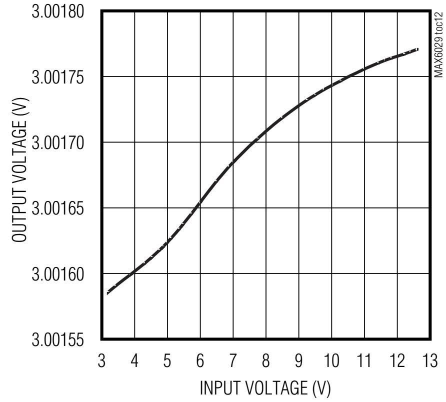
**LINE REGULATION ($V_{OUT}$ = 2.048V)**



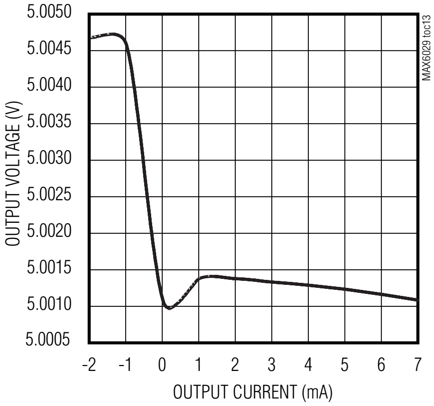

**LOAD REGULATION ($V_{OUT}$ = 3V)**



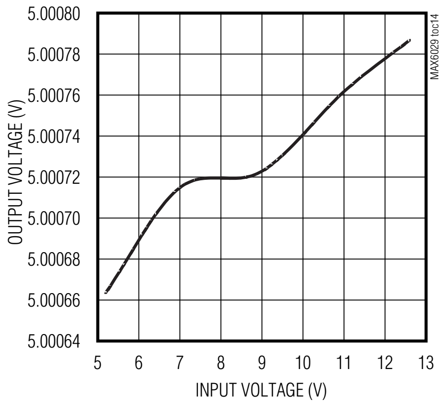

**LINE REGULATION ($V_{OUT}$ = 3V)**



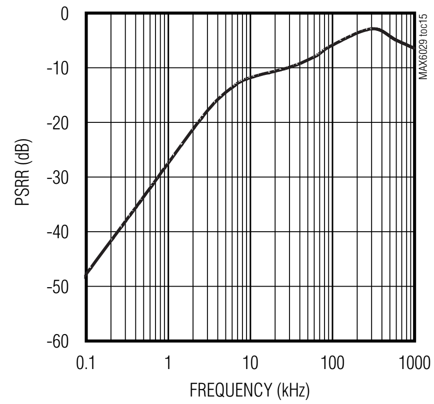

**LOAD REGULATION ($V_{OUT}$ = 5V)**



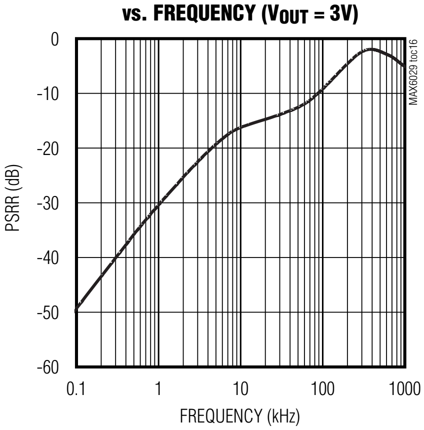

**LINE REGULATION ($V_{OUT}$ = 5V)**



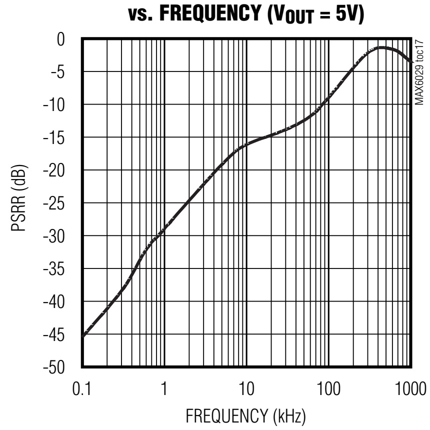

**POWER-SUPPLY REJECTION RATIO vs. FREQUENCY ($V_{OUT}$ = 2.048V)**



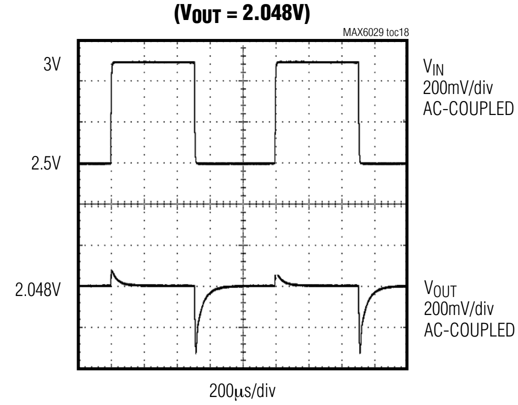

**POWER-SUPPLY REJECTION RATIO vs. FREQUENCY ($V_{OUT}$ = 3V)**




**POWER-SUPPLY REJECTION RATIO vs. FREQUENCY ($V_{OUT}$ = 5V)**




**LINE-TRANSIENT RESPONSE ($V_{OUT}$ = 2.048V)**

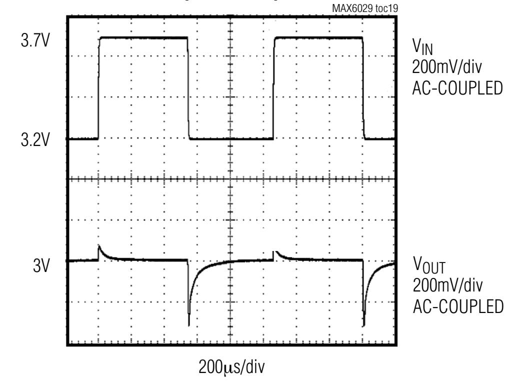


# Ultra-Low-Power Precision Series Voltage Reference

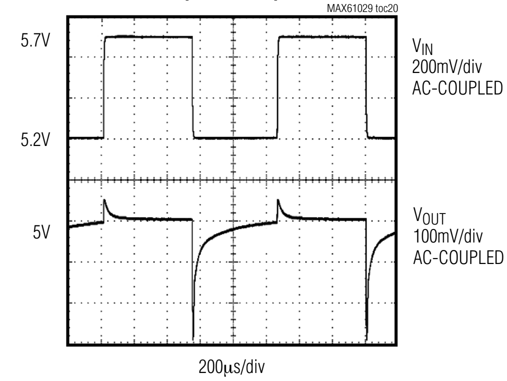
## Typical Operating Characteristics (continued)

($V_{IN}$ = 2.5V for MAX6029EUK21, $V_{IN}$ = 3.2V for MAX6029EUK30, and $V_{IN}$ = 5.2V for MAX6029EUK50, $I_{OUT}$ = 0, $T_A$ = +25°C, unless otherwise noted.)

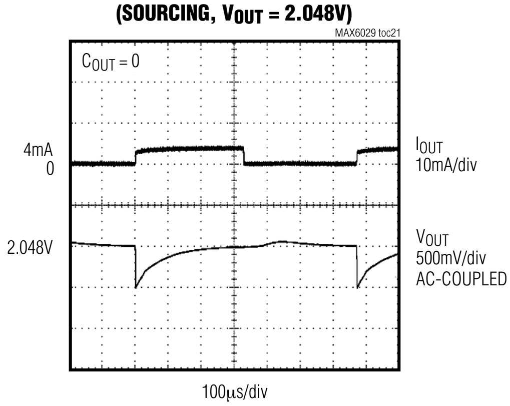
**LINE-TRANSIENT RESPONSE ($V_{OUT}$ = 3V)**



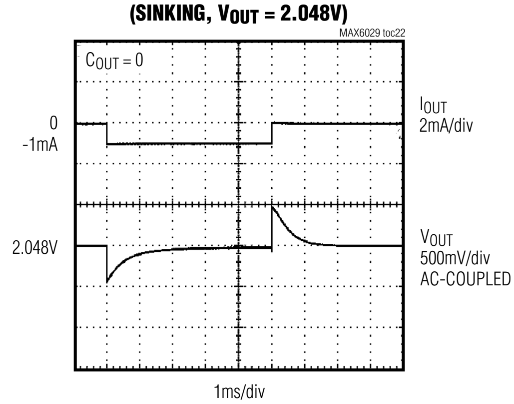

**LINE-TRANSIENT RESPONSE ($V_{OUT}$ = 5V)**



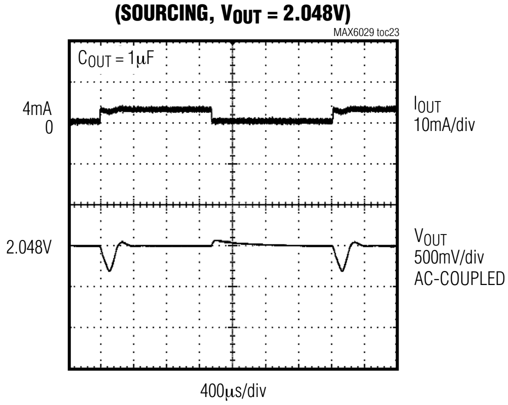

**LOAD-TRANSIENT RESPONSE (SOURCING, $V_{OUT}$ = 2.048V)**



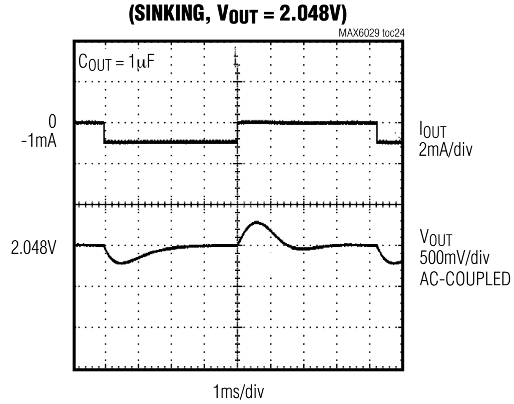

**LOAD-TRANSIENT RESPONSE (SINKING, $V_{OUT}$ = 2.048V)**




**LOAD-TRANSIENT RESPONSE (SOURCING, $V_{OUT}$ = 2.048V)**



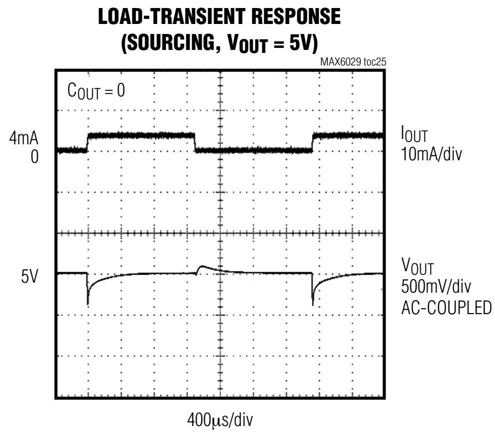

**LOAD-TRANSIENT RESPONSE (SINKING, $V_{OUT}$ = 2.048V)**

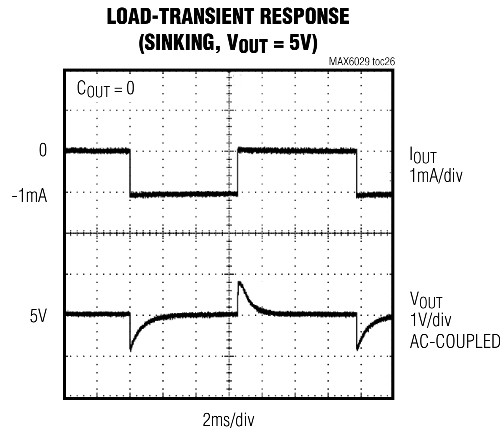


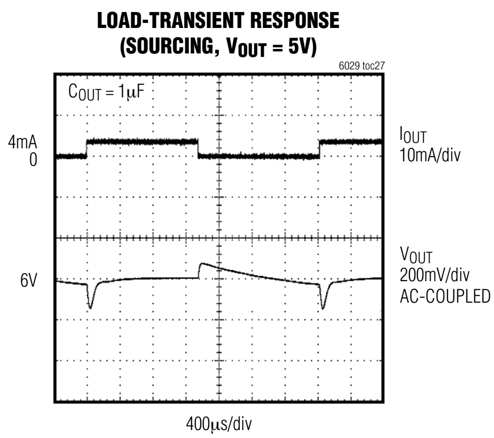
# Ultra-Low-Power Precision Series Voltage Reference

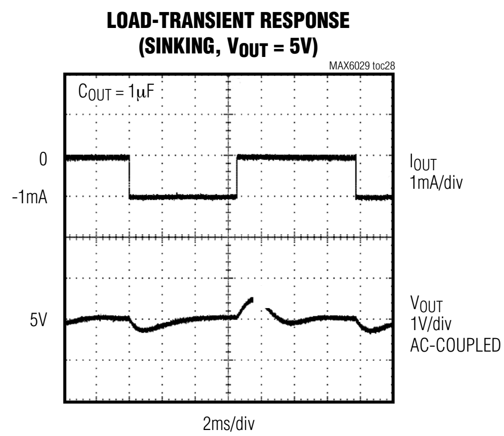
## Typical Operating Characteristics (continued)

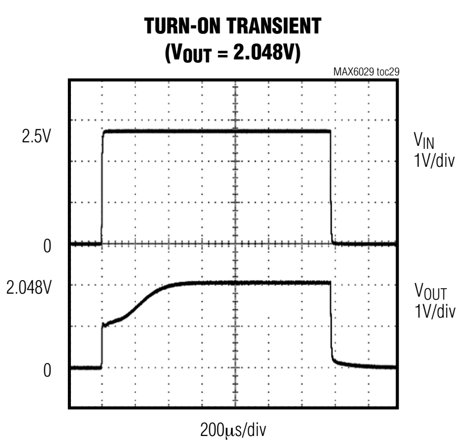
($V_{IN}$ = 2.5V for MAX6029EUK21, $V_{IN}$ = 3.2V for MAX6029EUK30, and $V_{IN}$ = 5.2V for MAX6029EUK50, $I_{OUT}$ = 0, $T_A$ = +25°C, unless otherwise noted.)

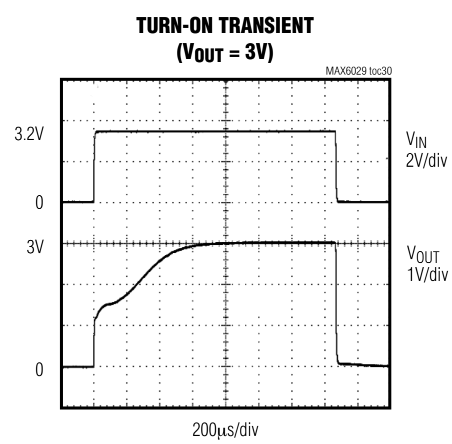


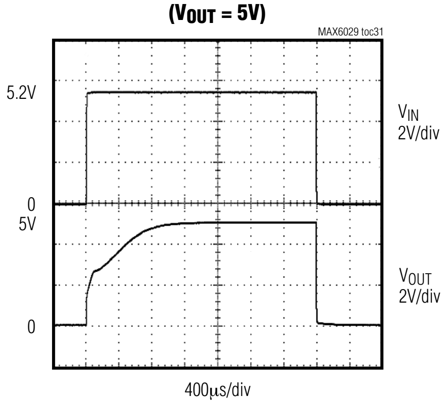



# Ultra-Low-Power Precision Series Voltage Reference

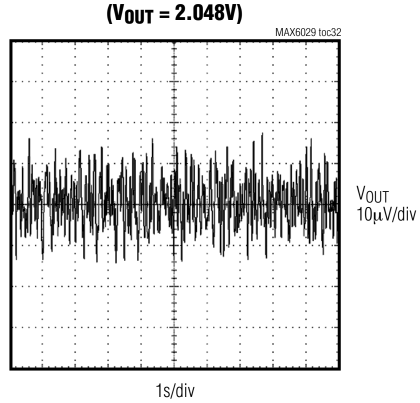
## Typical Operating Characteristics (continued)

($V_{IN}$ = 2.5V for MAX6029EUK21, $V_{IN}$ = 3.2V for MAX6029EUK30, and $V_{IN}$ = 5.2V for MAX6029EUK50, $I_{OUT}$ = 0, $T_A$ = +25°C, unless otherwise noted.)

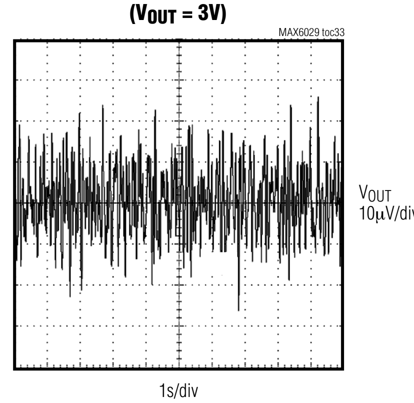
**TURN-ON TRANSIENT ($V_{OUT}$ = 5V)**



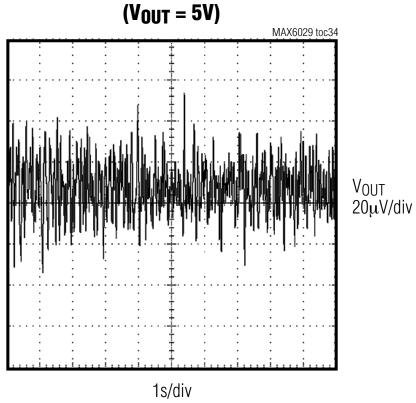

**0.1Hz TO 10Hz OUTPUT NOISE ($V_{OUT}$ = 2.048V)**



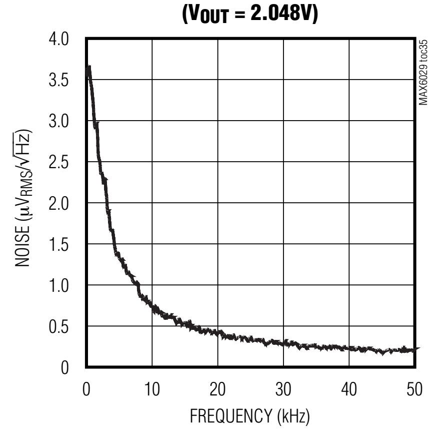

**0.1Hz TO 10Hz OUTPUT NOISE ($V_{OUT}$ = 3V)**



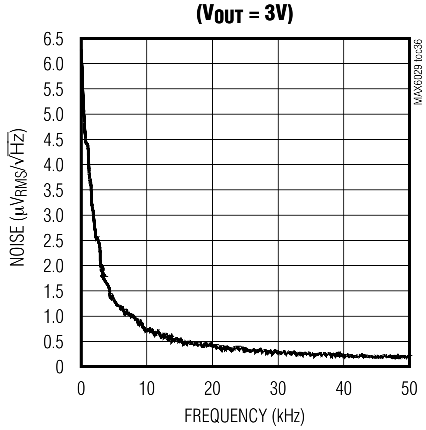

**0.1Hz TO 10Hz OUTPUT NOISE ($V_{OUT}$ = 5V)**



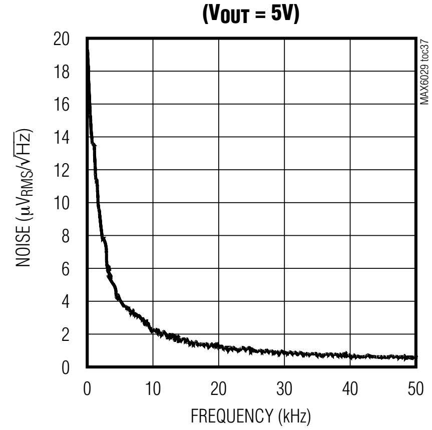

**NOISE vs. FREQUENCY ($V_{OUT}$ = 2.048V)**




**NOISE vs. FREQUENCY ($V_{OUT}$ = 3V)**




**NOISE vs. FREQUENCY ($V_{OUT}$ = 5V)**



## Pin Description

| PIN | | NAME | FUNCTION |
|---|---|---|---|
| SOT23 | SO | | |
| 1 | 2 | IN | Positive Voltage Supply |
| 2 | 4 | GND | Ground |
| 3, 4 | 1, 3, 5, 7, 8 | N.C. | No Connection. Leave unconnected or connect to ground. |
| 5 | 6 | OUT | Reference Output |

## Applications Information

### Input Bypassing

The MAX6029 does not require an input bypass capacitor. For improved transient performance, bypass the input to ground with a 0.1µF ceramic capacitor. Place the capacitor as close to IN as possible.

### Load Capacitance

The MAX6029 does not require an output capacitor for stability. The MAX6029 is stable driving capacitive loads from 0 to 100pF and 0.1µF to 10µF when sourcing current and from 0 to 0.4µF when sinking current. In applications where the load or the supply can experience step changes, an output capacitor reduces the amount of overshoot (undershoot) and improves the circuit's transient response. Many applications do not require an external capacitor, and the MAX6029 offers a significant advantage in applications where board space is critical.

### Supply Current

The quiescent supply current of the series-mode MAX6029 is very small, 5.25µA (max), and is very stable against changes in the supply voltage with only 1.5µA/V (max) variation with supply voltage. The MAX6029 family draws load current from the input voltage source only when required, so supply current is not wasted and efficiency is maximized at all input voltages. This improved efficiency reduces power dissipation and extends battery life.

### Output Thermal Hysteresis

Output thermal hysteresis is the change of the output voltage at $T_A$ = +25°C before and after the device is cycled over its entire operating temperature range. Hysteresis is caused by differential package stress appearing across the device.

### Temperature Coefficient vs. Operating Temperature Range for a 1LSB Maximum Error

In a data converter application, the reference voltage of the converter must stay within a certain limit to keep the error in the data converter smaller than the resolution limit through the operating temperature range. Figure 1 shows the maximum allowable reference voltage temperature coefficient to keep the conversion error to less than 1 LSB, as a function of the operating temperature range ($T_{MAX}$ - $T_{MIN}$) with the converter resolution as a parameter. The graph assumes the reference-voltage temperature coefficient as the only parameter affecting accuracy.

In reality, the absolute static accuracy of a data converter is dependent on the combination of many parameters such as integral nonlinearity, differential nonlinearity, offset error, gain error, as well as voltage reference changes.

### Turn-On Time

These devices turn on and settle to within 0.1% of their final value in less than 1ms. The turn-on time increases when heavily loaded and operating close to dropout.

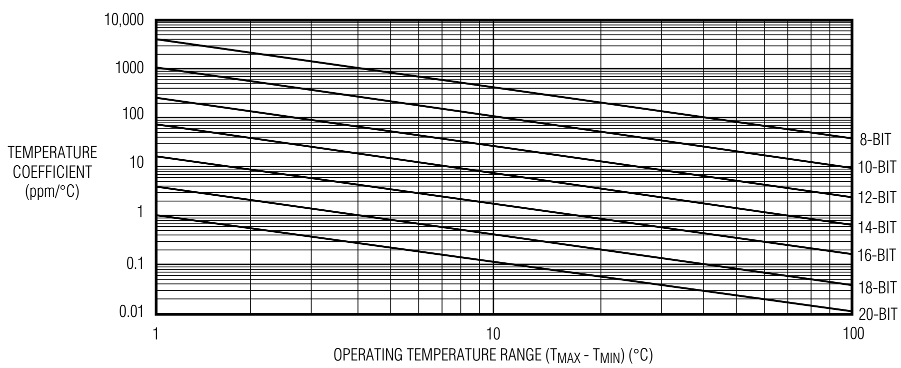
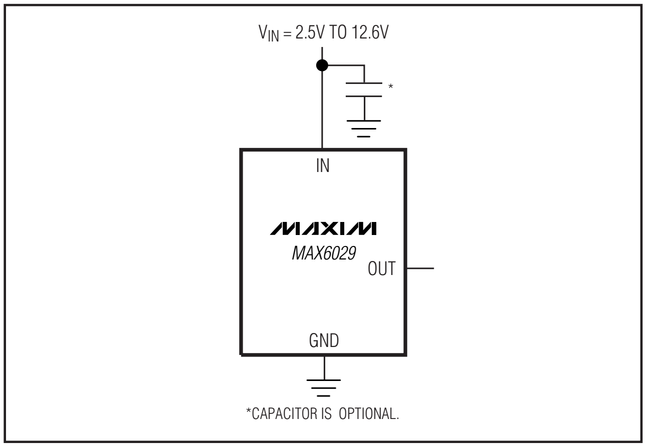



*Figure 1. Temperature Coefficient vs. Operating Temperature Range for a 1 LSB Maximum Error*

# Ultra-Low-Power Precision Series Voltage Reference

## Typical Operating Circuit




## Chip Information

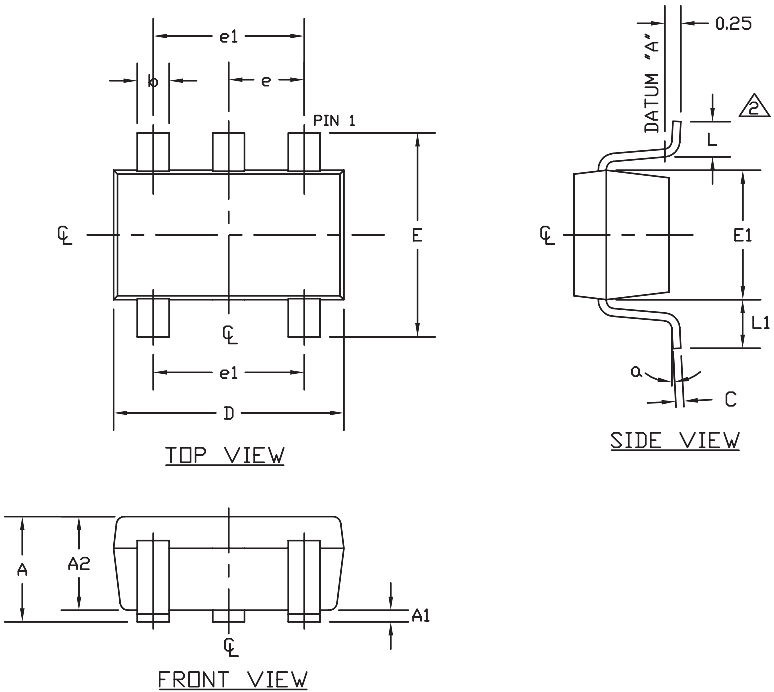
TRANSISTOR COUNT: 30

PROCESS: BiCMOS

## Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/packages**.)

SOT-23 5L .EPS




| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.90 | 1.25 | 1.45 |
| A1 | 0.00 | 0.05 | 0.15 |
| A2 | 0.90 | 1.10 | 1.30 |
| b | 0.35 | 0.40 | 0.50 |
| C | 0.08 | 0.15 | 0.20 |
| D | 2.80 | 2.90 | 3.00 |
| E | 2.60 | 2.80 | 3.00 |
| E1 | 1.50 | 1.625 | 1.75 |
| L | 0.35 | 0.45 | 0.60 |
| L1 | 0.60 REF | | |
| e | 0.95 BSC. | | |
| e1 | 1.90 BSC. | | |
| α | 0° | 2.5° | 8° |
| PKG CODES: U5-1, U5-2 | | | |

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. FOOT LENGTH MEASURED AT INTERCEPT POINT BETWEEN DATUM A & LEAD SURFACE.
3. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & METAL BURR. MOLD FLASH, PROTRUSION OR METAL BURR SHOULD NOT EXCEED 0.25 MM.
4. PACKAGE OUTLINE INCLUSIVE OF SOLDER PLATING.
5. MEETS JEDEC MO178, VARIATION AA.
6. LEADS TO BE COPLANAR WITHIN 0.10 mm.
7. SOLDER THICKNESS MEASURED AT FLAT SECTION OF LEAD BETWEEN 0.08mm AND 0.15mm FROM LEAD TIP.

DALLAS SEMICONDUCTOR MAXIM
PROPRIETARY INFORMATION
TITLE: PACKAGE OUTLINE, SOT-23, 5L
APPROVAL | DOCUMENT CONTROL NO. 21-0057 | REV. F | 1/1

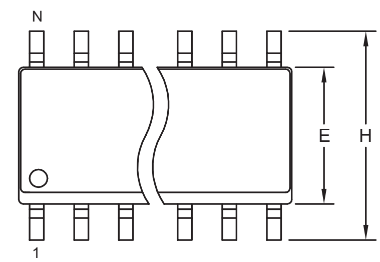
# Ultra-Low-Power Precision Series Voltage Reference

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/packages**.)

SOICN .EPS

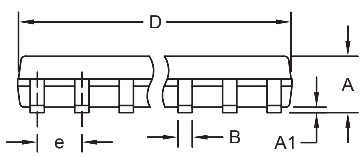
| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | 0.053 | 0.069 | 1.35 | 1.75 |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 |
| B | 0.014 | 0.019 | 0.35 | 0.49 |
| C | 0.007 | 0.010 | 0.19 | 0.25 |
| e | 0.050 BSC | | 1.27 BSC | |
| E | 0.150 | 0.157 | 3.80 | 4.00 |
| H | 0.228 | 0.244 | 5.80 | 6.20 |
| L | 0.016 | 0.050 | 0.40 | 1.27 |



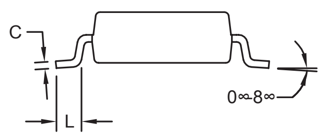

TOP VIEW

VARIATIONS:

| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX | N | MS012 |
|---|---|---|---|---|---|---|
| D | 0.189 | 0.197 | 4.80 | 5.00 | 8 | AA |
| D | 0.337 | 0.344 | 8.55 | 8.75 | 14 | AB |
| D | 0.386 | 0.394 | 9.80 | 10.00 | 16 | AC |




FRONT VIEW




SIDE VIEW

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS012.
6. N = NUMBER OF PINS.

DALLAS SEMICONDUCTOR MAXIM
PROPRIETARY INFORMATION
TITLE: PACKAGE OUTLINE, .150" SOIC
APPROVAL | DOCUMENT CONTROL NO. 21-0041 | REV. B | 1/1

## Revision History

Pages changed at Rev 1: 1, 2, 13, 15, 16
Pages changed at Rev 2: 1, 3, 6, 16