

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **General Description**

The MAX6126 is an ultra-low-noise, high-precision, lowdropout voltage reference. This family of voltage references feature curvature-correction circuitry and high-stability, laser-trimmed, thin-film resistors that result in 3ppm/°C (max) temperature coefficients and an excellent ±0.02% (max) initial accuracy. The proprietary low-noise reference architecture produces a low flicker noise of 1.3µV<sub>P-P</sub> and wideband noise as low as 60nV/√Hz (2.048V output) without the increased supply current usually found in low-noise references. Improve wideband noise to 35nV/\/Hz and AC power-supply rejection by adding a 0.1µF capacitor at the noise reduction pin. The MAX6126 series mode reference operates from a wide 2.7V to 12.6V supply voltage range and load-regulation specifications are guaranteed to be less than  $0.025\Omega$  for sink and source currents up to 10mA. These devices are available over the automotive temperature range of -40°C to +125°C.

The MAX6126 typically draws  $380\mu A$  of supply current and is available in 2.048V, 2.500V, 2.800V, 3.000V, 4.096V, and 5.000V output voltages. These devices also feature dropout voltages as low as 200mV. Unlike conventional shunt-mode (two-terminal) references that waste supply current and require an external resistor, the MAX6126 offers supply current that is virtually independent of supply voltage and does not require an external resistor. The MAX6126 is stable with  $0.1\mu F$  to  $10\mu F$  of load capacitance.

The MAX6126 is available in the tiny 8-pin  $\mu$ MAX<sup>®</sup>, as well as 8-pin SO packages.

#### **Applications**

High-Resolution A/D and D/A Converters

ATE Equipment

High-Accuracy Reference Standard

**Precision Current Sources** 

Digital Voltmeters

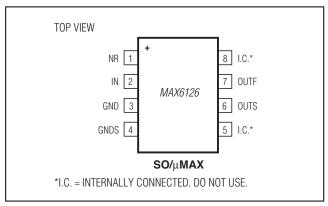
High-Accuracy Industrial and Process Control

 $\mu$ MAX is a registered trademark of Maxim Integrated Products, Inc.

## \_\_\_\_\_ Features

- ♦ Ultra-Low 1.3µVp-p Noise (0.1Hz to 10Hz, 2.048V Output)
- ♦ Ultra-Low 3ppm/°C (max) Temperature Coefficient
- ♦ ±0.02% (max) Initial Accuracy
- ♦ Wide (V<sub>OUT</sub> + 200mV) to 12.6V Supply Voltage Range
- ♦ Low 200mV (max) Dropout Voltage
- ♦ 380µA Quiescent Supply Current
- ◆ 10mA Sink/Source-Current Capability
- ♦ Stable with C<sub>LOAD</sub> = 0.1µF to 10µF
- ♦ Low 20ppm/1000hr Long-Term Stability
- ♦ 0.025Ω (max) Load Regulation
- ♦ 20µV/V (max) Line Regulation
- **♦** Force and Sense Outputs for Remote Sensing

#### Pin Configuration



#### Ordering Information

PART	TEMP RANGE	PIN- PACKAGE	OUTPUT VOLTAGE (V)	MAXIMUM INITIAL ACCURACY (%)	MAXIMUM TEMPCO (-40°C to +85°C) (ppm/°C)
MAX6126AASA21+	-40°C to +125°C	8 SO	2.048	0.02	3
MAX6126BASA21+	-40°C to +125°C	8 SO	2.048	0.06	5
MAX6126A21+	-40°C to +125°C	8 µMAX	2.048	0.06	3

Ordering Information continued at end of data sheet.

+Denotes a lead(Pb)-free/RoHS-compliant package.

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

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **ABSOLUTE MAXIMUM RATINGS**

(All voltages referenced to GND)
GNDS0.3V to +0.3V
IN0.3V to +13V
OUTF, OUTS, NR0.3V to the lesser of ( $V_{IN}$ + 0.3V) or +6V
Output Short Circuit to GND or IN60s
Continuous Power Dissipation ( $T_A = +70$ °C)
8-Pin µMAX (derate 4.5mW/°C above +70°C)362mW
8-Pin SO (derate 5.88mW/°C above +70°C)471mW

Operating Temperature Range	40°C to +125°C
Junction Temperature	+150°C
Storage Temperature Range	65°C to +150°C
Lead Temperature (soldering, 10	Ds)+300°C
Soldering Temperature (reflow)	+260°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—MAX6126\_21 (Vout = 2.048V)

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25^{\circ}C.)$ 

PARAMETER	SYMBOL		CONDITI	ONS	MIN	TYP	MAX	UNITS	
OUTPUT	•				•				
Output Voltage	Vout	T <sub>A</sub> = +25°C				2.048		V	
			A grade	e SO	-0.02		+0.02		
Output Voltage Appure		Referred to	B grade	e SO	-0.06		+0.06	<u> </u>	
Output Voltage Accuracy		V <sub>OUT</sub> , T <sub>A</sub> = +25°C	A grade	e μMAX	-0.06		+0.06	70	
		.A . 20 0	B grade	e μMAX	-0.1		+0.1		
			A grade	e SO		0.5	3		
		T <sub>A</sub> = -40°C to +85°C	B grade	e SO		1	5		
			A grade	e μMAX		1	3	ppm/°C	
Output Voltage Temperature	TCVOUT		B grade	e μMAX		2	7		
Coefficient (Note 1)	10,001	T <sub>A</sub> = -40°C to +125°C	A grade	e SO		1	5		
			B grade	e SO		2	10		
			A grade	e μMAX		2	5		
			B grade	e μMAX		3	12		
Line Regulation	ΔV <sub>OUT</sub> /	2.7V ≤ V <sub>IN</sub> ≤	$T_A = +2$	25°C		2	20		
Line Regulation	$\Delta V_{IN}$	12.6V	$T_A = -40^{\circ}\text{C to } + 125^{\circ}\text{C}$				40	μV/V	
Load Regulation	ΔV <sub>OUT</sub> /	Sourcing: 0 ≤	lou⊤≤ 10r	mA		0.7	25	μV/mA	
Load Regulation	Δlout	Sinking: -10m/	A ≤ I <sub>OUT</sub> :	≤ 0		1.3	25	μν/πΑ	
OUT Short-Circuit Current	loo	Short to GND				160		m Λ	
OUT SHORT-CIrcuit Current	Isc	Short to IN				20		mA	
Thormal Hyptorogia (Note 2)	ΔV <sub>OUT</sub> /	SO			25		nnm		
Thermal Hysteresis (Note 2)	cycle	μΜΑΧ				80		ppm	
Long-Term Stability	ΔV <sub>OUT</sub> /	1000hr at T <sub>A</sub> =	- 125°C	SO		20	·	ppm/	
Long-renn Stability	time	TOOOTH at TA =	- +25 0	μMAX		100		1000hr	

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_21 (VOUT = 2.048V) (continued)**

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25 ^{\circ}C.)$ 

PARAMETER	SYMBOL	CONDITI	ONS	MIN	TYP	MAX	UNITS	
DYNAMIC CHARACTERISTICS								
		f = 0.1Hz to 10Hz			1.3		μV <sub>P-P</sub>	
Noise Voltage	eout	$f = 1kHz, C_{NR} = 0$		60			m)///U=	
		$f = 1kHz$ , $C_{NR} = 0.1\mu F$	o V <sub>OUT</sub> = 0.01% of C <sub>NR</sub> = 0 0.8	IIV/VIIZ				
Turn-On Settling Time	t <sub>R</sub>	To V <sub>OUT</sub> = 0.01% of	$C_{NR} = 0$		0.8		ms	
Turri-Ori Settiing Time		final value	$C_{NR} = 0.1 \mu F$		20			
Capacitive-Load Stability Range	CLOAD	No sustained oscillation	S		0.1 to 10		μF	
INPUT								
Supply Voltage Range	$V_{IN}$	Guaranteed by line-reg	ulation test	2.7		12.6	V	
Out and Out and Out and	Luci	$T_A = +25$ °C			380	550		
Quiescent Supply Current	I <sub>IN</sub>	$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$				725	i μΑ	

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_25 (Vout = 2.500V)**

 $(V_{IN}=5V,\,C_{LOAD}=0.1\mu F,\,I_{OUT}=0,\,T_{A}=T_{MIN}\,to\,T_{MAX},\,unless\,otherwise\,noted.\,Typical\,values\,are\,at\,T_{A}=+25^{\circ}C.)$ 

PARAMETER	SYMBOL	CONE	DITIONS	MIN	TYP	MAX	UNITS	
ОИТРИТ								
Output Voltage	Vout	T <sub>A</sub> = +25°C			2.500		V	
			A grade SO	-0.02		+0.02		
Output Voltage Agguregy		Referred to VOUT,	B grade SO	-0.06		+0.06	%	
Output Voltage Accuracy		$T_A = +25^{\circ}C$	A grade μMAX	-0.06		+0.06	7/0	
			B grade μMAX	-0.1		+0.1		
		$T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$	A grade SO		0.5	3	ppm/°C	
			B grade SO		1	5		
	TOV		A grade µMAX		1	3		
Output Voltage Temperature			B grade μMAX		2	7		
Coefficient (Note 1)	TCV <sub>OUT</sub>		A grade SO		1	5		
		$T_A = -40$ °C to	B grade SO		2	10		
		+125°C	A grade µMAX		2	5		
			B grade μMAX		3	12		
Line Degulation	ΔV <sub>OUT</sub> /	0.71//	T <sub>A</sub> = +25°C		3	20	\/\/	
Line Regulation	$\Delta V_{IN}$	$2.7V \le V_{ N} \le 12.6V$	$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$			40	μV/V	
Load Bagulation	ΔV <sub>OUT</sub> /	Sourcing: 0 ≤ I <sub>OUT</sub> ≤ 10mA			1	25	11)//m /	
Load Regulation	$\Delta$ l $_{ m OUT}$	Sinking: -10mA ≤ I <sub>OU</sub>	T ≤ 0		1.8	25	μV/mA	

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_25 (VOUT = 2.500V) (continued)**

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25 ^{\circ}C.)$ 

PARAMETER	SYMBOL	CONDIT	IONS	MIN	TYP	MAX	UNITS	
Dropout Voltage (Note 2)	\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	ΔV <sub>OUT</sub> = 0.1%	I <sub>OUT</sub> = 5mA		0.06	0.2	V	
Dropout Voltage (Note 3)	VIN - VOUT	$\Delta V \cup U = 0.1\%$	$I_{OUT} = 10mA$		0.12	0.4	V	
OUT Short-Circuit Current	loo	Short to GND			160		m ^	
OOT SHORT-CIRCUIT CUITERI	Isc	Short to IN			20		mA	
The grand I hyptograpia (Nieto O)	ΔV <sub>OUT</sub> /	SO			35			
Thermal Hysteresis (Note 2)	cycle	μΜΑΧ			80		ppm	
Long Town Ctobility	ΔV <sub>OUT</sub> /	1000hr at T 0500	SO		20		ppm/	
Long-Term Stability	time	1000hr at $T_A = +25^{\circ}C$	μMAX		100		1000hr	
DYNAMIC CHARACTERISTICS								
		f = 0.1Hz to 10Hz		1.45			μV <sub>P-P</sub>	
Noise Voltage	eout	$f = 1kHz, C_{NR} = 0$	75			n)/// /U=		
		$f = 1kHz$ , $C_{NR} = 0.1\mu F$		45			nV/√Hz	
Turn On Cottling Times		To V <sub>OUT</sub> = 0.01% of	C <sub>NR</sub> = 0		1			
Turn-On Settling Time	t <sub>R</sub>	final value	$C_{NR} = 0.1 \mu F$		20		ms	
Capacitive-Load Stability Range	CLOAD	No sustained oscillation	S		0.1 to 10		μF	
INPUT								
Supply Voltage Range	VIN	Guaranteed by line-regu	2.7		12.6	V		
Quissaant Supply Current		T <sub>A</sub> = +25°C			380	550	μΑ	
Quiescent Supply Current	I <sub>IN</sub>	$T_A = -40^{\circ}\text{C to } + 125^{\circ}\text{C}$			725			

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_28 (Vout = 2.800V)**

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted. Typical values are at  $T_A = +25 ^{\circ}C$ .)

PARAMETER	SYMBOL	CONDTIONS		MIN	TYP	MAX	UNITS
OUTPUT				•			
Output Voltage	Vout	T <sub>A</sub> = +25°C	A = +25°C		2.800		V
Output Voltage Accuracy		Referred to VOUT, TA =	A grade µMAX	-0.06		+0.06	%
		+25°C	B grade µMAX	-0.10		+0.10	76
		$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	A grade µMAX		1	3	
Output Voltage Temperature Coefficient (Note 1)	TOV	1A = -40 C t0 +65 C	B grade µMAX		2	7	ppm/°C
	TCV <sub>OUT</sub>	$T_A = -40^{\circ}\text{C to } + 125^{\circ}\text{C}$	A grade µMAX		2	5	
			B grade µMAX		3	12	
			T <sub>A</sub> = +25°C		3.5	23	
Line Regulation	ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	$3.0V \le V_{1N} \le 12.6V$	$T_A = -40^{\circ}C$ to $+125^{\circ}C$			45	μV/V
Las I Danielakian	A)/- /A)/	Sourcing: 0 ≤ I <sub>OUT</sub> ≤ 10m	nA		1.3	28	) // A
Load Regulation	ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	Sinking: -10mA ≤ I <sub>OUT</sub> ≤ 0			2.4	28	μV/mA
Draw out Valtage (Nets 2)		AV 0.10/	I <sub>OUT</sub> = 5mA		0.06	0.2	V
Dropout Voltage (Note 3)	V <sub>IN</sub> - V <sub>OUT</sub>	$\Delta V_{OUT} = 0.1\%$	I <sub>OUT</sub> = 10mA		0.12	0.4	

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

## **ELECTRICAL CHARACTERISTICS—MAX6126\_28 (VOUT = 2.800V) (continued)**

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25 ^{\circ}C.)$ 

PARAMETER	SYMBOL	CONDTIC	ONS	MIN	TYP	MAX	UNITS	
OUT Short-Circuit Current	loo	Short to GND		160			mA	
OOT Short-Circuit Current	I <sub>SC</sub>	Short to IN			20		IIIA	
Thermal Hysteresis (Note 2)	$\Delta V_{OUT}$ /cycle	μΜΑΧ			80		ppm	
Long-Term Stability	ΔV <sub>OUT</sub> /time	1000hr at T <sub>A</sub> = +25°C	μΜΑΧ		100		ppm/ 1000hr	
DYNAMIC CHARACTERISTICS								
		f = 0.1Hz to 10Hz		1.45			μV <sub>P-P</sub>	
Noise Voltage	eout	$f = 1kHz, C_{NR} = 0$	75			l nV/√Hz		
		$f = 1kHz$ , $C_{NR} = 0.1\mu F$	$\begin{array}{c} .1 \mu F \\ \text{of} & \frac{C_{NR} = 0}{C_{NR} = 0.1 \mu F} \\ \text{Illations} \\ \text{e-regulation test} \end{array}$		45		110/ 1112	
Turn On Sattling Time	+	To V <sub>OUT</sub> = 0.01% of	$C_{NR} = 0$	1			ma	
Turn-On Settling Time	t <sub>R</sub>	final value	$C_{NR} = 0.1 \mu F$	1.45 75	ms			
Capacitive-Load Stability Range	CLOAD	No sustained oscillation	S		0.1 to 10		μF	
INPUT								
Supply Voltage Range	VIN	Guaranteed by line-regu	3.0		12.6	V		
Quiagaant Supply Current	I	$T_A = +25^{\circ}C$		380	550			
Quiescent Supply Current	IIN	$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$	PAX  On the at $PAX$ and $PAX$			725	μΑ	

#### ELECTRICAL CHARACTERISTICS—MAX6126\_30 (Vout = 3.000V)

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25 ^{\circ}C.)$ 

PARAMETER	SYMBOL	CON	IDITIONS	MIN	TYP	MAX	UNITS
ОИТРИТ							
Output Voltage	Vout	$T_A = +25$ °C			3.000		V
		Referred to V <sub>OUT</sub> , T <sub>A</sub> = +25°C	A grade SO	-0.02		+0.02	
Output Valtage Aggurges			B grade SO	-0.06		+0.06	0/
Output Voltage Accuracy			A grade µMAX	-0.06		+0.06	%
			B grade μMAX	-0.1		+0.1	
		$T_A = -40$ °C to $+85$ °C	A grade SO		0.5	3	ppm/°C
			B grade SO		1	5	
			A grade µMAX		1	3	
Output Voltage Temperature	TOV		B grade μMAX		2	7	
Coefficient (Note 1)	TCV <sub>OUT</sub>		A grade SO		1	5	
		$T_A = -40^{\circ}C$ to	B grade SO		2	10	
		+125°C	A grade µMAX		2	5	
			B grade μMAX		3	12	

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_30 (VOUT = 3.000V) (continued)**

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted. Typical values are at  $T_A = +25$ °C.)

PARAMETER	SYMBOL	CON	IDITI	ONS	MIN	TYP	MAX	UNITS
Line Degulation	ΔV <sub>OUT</sub> /	$3.2V \le V_{IN} \le 12.6V$	Тд	= +25°C		4	25	\/\/
Line Regulation	$\Delta V_{IN}$	3.2V ≤ V N ≤ 12.0V	Тд	$= -40^{\circ}\text{C to } + 125^{\circ}\text{C}$			50	μV/V
Load Degulation	ΔV <sub>OUT</sub> /	Sourcing: 0 ≤ I <sub>OUT</sub> ≤	≤ 10r	nA		1.5	30	11) //m A
Load Regulation	$\Delta$ lout	Sinking: -10mA ≤ IO	UT≤	0		2.8	30	μV/mA
Drangut Voltage (Note 2)	\/\/.a=	A\/au= 0.19/	lo	UT = 5mA		0.06	0.2	
Dropout Voltage (Note 3)	V <sub>IN</sub> - V <sub>OUT</sub>	$\Delta V_{OUT} = 0.1\%$		UT = 10mA		0.11	0.4	V
OLIT Chart Circuit Current	loo	Short to GND				160		
OUT Short-Circuit Current	I <sub>SC</sub>	Short to IN				20		<del>-</del> mA
Thormal Livetorogic (Note 2)	ΔV <sub>OUT</sub> /	SO μMAX			20		nnm	
Thermal Hysteresis (Note 2)	cycle					80		ppm
Long-Term Stability	∆V <sub>OUT</sub> / time	1000hr at T <sub>A</sub> = +25°0		SO		20		ppm/
Long-Term Stability				μΜΑΧ		100		1000hr
DYNAMIC CHARACTERISTICS								
		f = 0.1Hz to 10Hz			1.75			μV <sub>P-P</sub>
Noise Voltage	eout	$f = 1kHz, C_{NR} = 0$			90			>///\[
		$f = 1kHz, C_{NR} = 0.1$	μF			55		nV/√Hz
Capacitive-Load Stability Range	C <sub>LOAD</sub>	No sustained oscilla	tions	3		0.1 to 10		μF
Town On Cattling Time		To V <sub>OUT</sub> = 0.01%	C۱	IR = 0		1.2		
Turn-On Settling Time	t <sub>R</sub>	of final value	CN	IR = 0.1μF		20		ms
INPUT								
Supply Voltage Range	V <sub>IN</sub>	Guaranteed by line-regulation test		3.2		12.6	V	
Outposed Complete Company		T <sub>A</sub> = +25°C			380	550		
Quiescent Supply Current	I <sub>IN</sub>	$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$					725	μA

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_41 (VOUT = 4.096V)**

(VIN = 5V, CLOAD = 0.1µF, IOUT = 0, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.)

PARAMETER	SYMBOL	CON	DITIONS	MIN	TYP MAX	UNITS
ОUТРUТ						
Output Voltage	Vout	T <sub>A</sub> = +25°C			4.096	V
Output Voltage Accuracy			A grade SO	-0.02	+0.02	
		Referred to V <sub>OUT</sub> , T <sub>A</sub> = +25°C	B grade SO	-0.06	+0.06	%
			A grade µMAX	-0.06	+0.06	
			B grade μMAX	-0.1	+0.1	

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **ELECTRICAL CHARACTERISTICS—MAX6126\_41 (VOUT = 4.096V) (continued)**

 $(V_{IN} = 5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted. Typical values are at  $T_A = +25 ^{\circ}C$ .)

$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Voltage Temperature Coefficient (Note 1)         TCVout Tourner Coefficient (Note 1)         A grade μMAX         1         3         3         ppm/°C           Coefficient (Note 1)         TA = -40°C to + 125°C         A grade μMAX         2         7				A grade SO		0.5	3	
Output Voltage Temperature Coefficient (Note 1)         TCVOUT         B grade μMAX         2         7           Coefficient (Note 1)         A grade SO         1         5           TA = -40°C to +125°C         B grade μMAX         2         5           B grade μMAX         3         12           Load Regulation         ΔVOUT/ ΔVIN         4.3V ≤ VIN ≤ 12.6V         TA = +25°C         4.5         30         μV/MA           Dropout Voltage (Note 3)         VIN - VOUT         ΔVOUT = 0.1%         IOUT = 5mA         0.05         0.2         V           OUT Short-Circuit Current         1SC         Short to GND         mA         20         mA           Thermal Hysteresis (Note 2)         ΔVOUT/ cycle         SO         20         ppm         ppm           Long-Term Stability         ΔVOUT/ time         1000hr at TA = +25°C         SO         20         ppm           DYNAMIC CHARACTERISTICS			$T_A = -40$ °C to	B grade SO		1	5	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			+85°C	A grade µMAX		1	3	
A grade SO   1   5   5   10   10   10   10   10	Output Voltage Temperature	TOV		B grade μMAX		2	7	10 C
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Coefficient (Note 1)	ICVOUT		A grade SO		1	5	ppm/c
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			$T_A = -40$ °C to	B grade SO		2	10	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			+125°C	A grade µMAX		2	5	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				B grade μMAX		3	12	
Load Regulation  AVOUT/ AlouT  AlouT  Sinking: -10mA ≤ louT ≤ 0  Sinking: -10mA ≤ louT ≤ 0  Topout Voltage (Note 3)  VIN - VOUT  AVOUT − 0.1%  Short to GND  Short to IN  SO  µMAX  AVOUT/ cycle	Line Degulation	ΔV <sub>OUT</sub> /	4.01/	T <sub>A</sub> = +25°C		4.5	30	1,00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Line Regulation	$\Delta V_{IN}$	$ 4.3V \le V N \le 12.0V$	$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$			60	μν/ν
Dropout Voltage (Note 3)   V <sub>IN</sub> - V <sub>OUT</sub>   ΔV <sub>OUT</sub> = 0.1%   I <sub>OUT</sub> = 5mA   0.05   0.2   V	Load Regulation	ΔV <sub>OUT</sub> /	Sourcing: 0 ≤ I <sub>OUT</sub> ≤	10mA		2	40	μV/mA
Dropout Voltage (Note 3)	Load Regulation	Δlout	Sinking: -10mA ≤ I <sub>OU</sub>	T ≤ 0		5	40	
OUT Short-Circuit Current   ISC   Short to GND   Short to IN   20   Ppm	5	\/\/	AV/ 0.10/	I <sub>OUT</sub> = 5mA		0.05	0.2	V
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Dropout voltage (Note 3)	VIN - VOUT	$\Delta$ VOUT = 0.1%	I <sub>OUT</sub> = 10mA		0.1	0.1 0.4	
Thermal Hysteresis (Note 2) $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	OLIT Chart Circuit Current	Isc	Short to GND			160		mA
Thermal Hysteresis (Note 2) $\frac{\text{Cycle}}{\text{cycle}}$ $\frac{\text{AVOUT}}{\text{time}}$ $\frac{\text{Cycle}}{\text{time}}$ $\frac{\text{AVOUT}}{\text{time}}$ $\frac{\text{AVOUT}}{\text{time}}$ $\frac{\text{AVOUT}}{\text{time}}$ $\frac{\text{SO}}{\text{ppm}}$ $\frac{\text{20}}{\text{ppm}}$ $\frac{\text{ppm}}{\text{ppm}}$ $\frac{\text{AVOUT}}{\text{ppm}}$ $\frac{\text{Noise Voltage}}{\text{ppm}}$ $\frac{\text{F} = 0.1 \text{Hz to } 10 \text{Hz}}{\text{F} = 1 \text{kHz}, \text{C}_{NR} = 0}$ $\frac{\text{F} = 0.1 \text{Hz to } 10 \text{Hz}}{\text{F} = 1 \text{kHz}, \text{C}_{NR} = 0}$ $\frac{\text{F} = 1 \text{kHz}, \text{C}_{NR} = 0}{\text{F} = 1 \text{kHz}, \text{C}_{NR} = 0.1 \text{µF}}$ $\frac{\text{Roo}}{\text{F}}$ $\frac{\text{F}}{\text{SO}}$ $\frac{\text{Ppm}}{\text{ppm}}$ $$	OUT Short-Circuit Current		Short to IN			20		
Thermal Hysteresis (Note 2) $\frac{\text{cycle}}{\text{time}}$ $\frac{\text{pMAX}}{\text{1000hr at TA}} = +25^{\circ}\text{C}$ $\frac{\text{SO}}{\text{pMAX}}$ $\frac{20}{\text{1000hr}}$ $\frac{\text{ppm/}}{\text{1000hr}}$ $\frac{\text{ppm/}}{1$	The amount of the second of th	ΔV <sub>OUT</sub> /	SO			20		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Thermal Hysteresis (Note 2)		μΜΑΧ			80		ppm
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Laran Tamas Otalailita	ΔV <sub>OUT</sub> /	1000km -t T 0500	SO		20		ppm/
Noise Voltage $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Long-Term Stability	time	1000nr at 1A = +25°C	μΜΑΧ		100		
Noise Voltage $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	DYNAMIC CHARACTERISTICS							
			f = 0.1Hz to 10Hz			2.4		μV <sub>P-P</sub>
	Noise Voltage	eout	$f = 1kHz, C_{NR} = 0$			120		\ // (T)
Turn-On Settling Time $t_{R} = \begin{bmatrix} To \ V_{OUT} = 0.01\% \ of \\ final \ value \end{bmatrix} \begin{bmatrix} C_{NR} = 0 \\ C_{NR} = 0.1 \mu F \end{bmatrix} = \begin{bmatrix} 1.6 \\ 20 \end{bmatrix} $ ms $INPUT$ Supply Voltage Range $V_{IN} = \begin{bmatrix} V_{IN} & Guaranteed by line-regulation test \\ T_{A} = +25^{\circ}C \end{bmatrix} = \begin{bmatrix} 4.3 \\ 380 \end{bmatrix} = \begin{bmatrix} 1.6 \\ V \end{bmatrix}$ Outgoing Supply Current			$f = 1kHz$ , $C_{NR} = 0.1\mu F$			80		nv/vHz
INPUT  Supply Voltage Range  V <sub>IN</sub> Guaranteed by line-regulation test  4.3  12.6  V  Ouisescent Supply Current $T_A = +25^{\circ}C$	Capacitive-Load Stability Range	CLOAD	No sustained oscillations			0.1 to 10		μF
INPUT  Supply Voltage Range  V <sub>IN</sub> Guaranteed by line-regulation test  4.3  12.6  V  Ouisescent Supply Current $TA = +25^{\circ}C$	Turn-On Settling Time	t <sub>R</sub>	To V <sub>OUT</sub> = 0.01% of	$C_{NR} = 0$		1.6		
Supply Voltage Range $V_{IN}$ Guaranteed by line-regulation test 4.3 12.6 V  Outgescent Supply Current $I_{IN}$ $T_A = +25^{\circ}C$ 380 550				$C_{NR} = 0.1 \mu F$		20		ms
Ouisecent Supply Current $T_A = +25^{\circ}C$ 380 550	INPUT							
Quiescent Supply Current III	Supply Voltage Range	V <sub>IN</sub>	Guaranteed by line-regulation test		4.3		12.6	V
Quiescent Supply Current $T_A = -40^{\circ}\text{C to} + 125^{\circ}\text{C}$ $725$			T <sub>A</sub> = +25°C			380	550	
		чN	$T_A = -40$ °C to $+125$ °C				725	J μΑ

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

## **ELECTRICAL CHARACTERISTICS—MAX6126\_50 (VOUT = 5.000V)**

 $(V_{IN} = 5.5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25 ^{\circ}C.)$ 

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS	
ОИТРИТ								
Output Voltage	Vout	T <sub>A</sub> = +25°C			5.000		V	
			A grade SO	-0.02		+0.02		
Output Voltage Aggureev		T05°C	B grade SO	-0.06		+0.06	%	
Output Voltage Accuracy		T <sub>A</sub> = +25°C	A grade μMAX	-0.06		+0.06	70	
			B grade μMAX	-0.1		+0.1		
			A grade SO		0.5	3		
		$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	B grade SO		1	5		
		1A = -40 C 10 +65 C	A grade μMAX		1	3		
Output Voltage Temperature	TCV <sub>OUT</sub>		B grade μMAX		2	7	ppm/°C	
Coefficient (Note 1)	10,001		A grade SO		1	5	ррпі, С	
		$T_A = -40$ °C to	B grade SO		2	10	- - -	
		+125°C	A grade μMAX		2	5		
			B grade μMAX		3	12		
Line Regulation	ΔV <sub>OUT</sub> / ΔV <sub>IN</sub>	5.2V ≤ V <sub>IN</sub> ≤ 12.6V	T <sub>A</sub> = +25°C		3	40	\/\/	
			$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$			80	μV/V	
Load Degulation	ΔV <sub>OUT</sub> /	Sourcing: 0 ≤ I <sub>OUT</sub> ≤	10mA		2.5	50	μV/mA	
Load Regulation	Δlout	Sinking: -10mA ≤ I <sub>OUT</sub> ≤ 0			6.5	50	μν/πΑ	
Dropout Voltage (Note 3)	V <sub>IN</sub> - V <sub>OUT</sub>	ΔV <sub>OUT</sub> = 0.1%	I <sub>OUT</sub> = 5mA		0.05	0.2	V	
Diopout Voltage (Note 3)	VIN - VOUT	Δν((()) = 0.176	I <sub>OUT</sub> = 10mA		0.1	0.4	V	
OUT Short-Circuit Current	loo	Short to GND			160		mA	
Out Short-Circuit Current	Isc	Short to IN			20		IIIA	
Thermal Hysteresis (Note 2)	∆V <sub>OUT</sub> /	SO		15			nnm	
mermai riysteresis (Note 2)	cycle	μΜΑΧ		80			ppm	
Long-Term Stability	ΔV <sub>OUT</sub> /	1000hr at T <sub>A</sub> = +25°C	SO		20		ppm/	
Long-Term Stability	time	μΜΑΧ			100	100		
DYNAMIC CHARACTERISTICS		T					1	
		f = 0.1Hz to 10Hz			2.85		μV <sub>P-P</sub>	
Noise Voltage	eout	$f = 1kHz$ , $C_{NR} = 0$			145		nV/√Hz	
		$f = 1kHz$ , $C_{NR} = 0.1\mu F$			95			
Capacitive-Load Stability Range	CLOAD	No sustained oscillations			0.1 to 10		μF	

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### ELECTRICAL CHARACTERISTICS—MAX6126\_50 (VOUT = 5.000V) (continued)

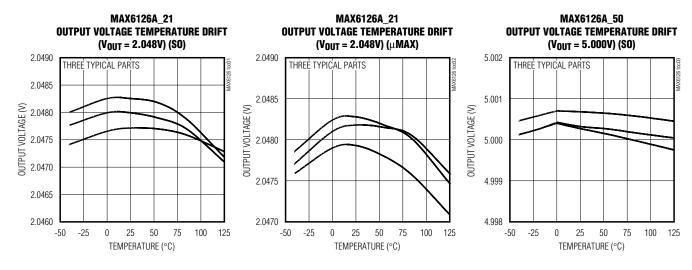
 $(V_{IN} = 5.5V, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } T_A = +25 ^{\circ}C.)$ 

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
T 0 0 W T		To V <sub>OUT</sub> = 0.01% of	C <sub>NR</sub> = 0		2		ms
Turn-On Settling Time	t <sub>R</sub>	final value	$C_{NR} = 0.1 \mu F$		20		
INPUT	INPUT						
Supply Voltage Range	V <sub>IN</sub>	Guaranteed by line-regulation test		5.2		12.6	V
Quianant Supply Current	I <sub>IN</sub>	$T_A = +25^{\circ}C$			380	550	
Quiescent Supply Current		$T_A = -40^{\circ}C \text{ to } +125^{\circ}C$			•	725	μΑ

- Note 1: Temperature coefficient is measured by the "box" method, i.e., the maximum ΔV<sub>OUT</sub> / V<sub>OUT</sub> is divided by the maximum ΔT.
- Note 2: Thermal hysteresis is defined as the change in +25°C output voltage before and after cycling the device from T<sub>MAX</sub> to T<sub>MIN</sub>.
- **Note 3:** Dropout voltage is defined as the minimum differential voltage  $(V_{IN} V_{OUT})$  at which  $V_{OUT}$  decreases by 0.1% from its original value at  $V_{IN} = 5.0V$  ( $V_{IN} = 5.5V$  for  $V_{OUT} = 5.0V$ ).

#### Typical Operating Characteristics

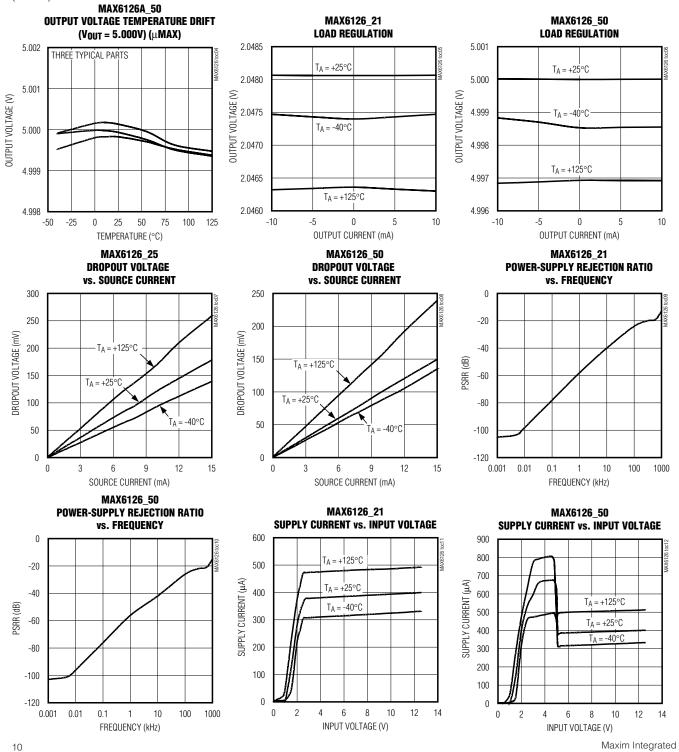
 $(V_{IN}=5V \text{ for MAX6126\_21/25/30/41},\ V_{IN}=5.5V \text{ for MAX6126\_50},\ C_{LOAD}=0.1\mu\text{F},\ I_{OUT}=0,\ T_{A}=+25^{\circ}\text{C},\ unless otherwise specified.})$  (Note 5)



# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### Typical Operating Characteristics (continued)

 $(V_{IN} = 5V \text{ for MAX6126\_21/25/30/41}, V_{IN} = 5.5V \text{ for MAX6126\_50}, C_{LOAD} = 0.1 \mu F, I_{OUT} = 0, T_A = +25 ^{\circ}C, unless otherwise specified.) (Note 5)$ 



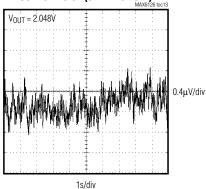
Downloaded from Elcodis.com electronic components distributor

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

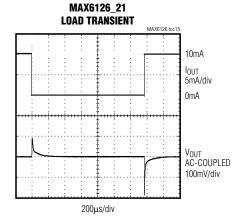
#### Typical Operating Characteristics (continued)

 $(V_{IN} = 5V \text{ for MAX6126}\_21/25/30/41, V_{IN} = 5.5V \text{ for MAX6126}\_50, C_{LOAD} = 0.1 \mu\text{F}, I_{OUT} = 0, T_{A} = +25 ^{\circ}\text{C}, unless otherwise specified.})$  (Note 5)

#### MAX6126\_21 Output noise (0.1Hz to 10Hz)

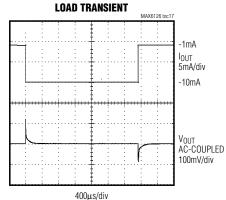


## 1s/div



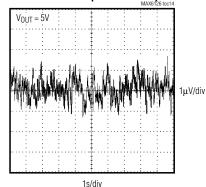
$$\begin{split} C_{LOAD} &= 0.1 \mu F & I_{OUT} = 0 \text{ TO 10mA} \\ V_{IN} &= 5 V & V_{OUT} = 2.048 V \end{split}$$

## MAX6126\_21

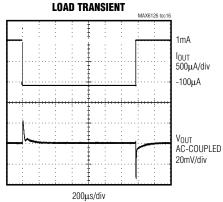


 $\begin{array}{ll} C_{LOAD} = 0.1 \mu F & I_{OUT} = -1 mA \ TO \ -10 mA \\ V_{IN} = 5 V & V_{OUT} = 2.048 V \end{array}$ 

#### MAX6126\_50 OUTPUT NOISE (0.1Hz TO 10Hz)

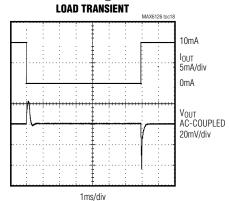


#### MAX6126\_21



 $\begin{array}{ll} C_{LOAD} = 0.1 \mu F & I_{OUT} = -100 \mu A \text{ TO 1mA} \\ V_{IN} = 5 V & V_{OUT} = 2.048 V \end{array}$ 

## MAX6126\_21

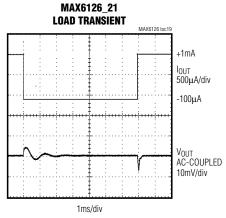


 $\begin{array}{ll} C_{LOAD} = 10 \mu F & I_{OUT} = 0 \text{ TO } 10 \text{mA} \\ V_{IN} = 5 V & V_{OUT} = 2.048 V \end{array} \label{eq:closed}$ 

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

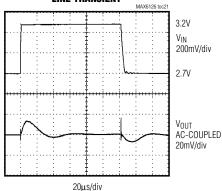
## Typical Operating Characteristics (continued)

 $(V_{IN} = 5V \text{ for MAX6126\_21/25/30/41}, V_{IN} = 5.5V \text{ for MAX6126\_50}, C_{LOAD} = 0.1 \mu\text{F}, I_{OUT} = 0, T_{A} = +25 ^{\circ}\text{C}, unless otherwise specified.})$  (Note 5)



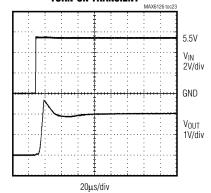
 $\begin{array}{ll} C_{LOAD} = 10 \mu F & \quad I_{OUT} = -100 \mu A \text{ TO 1mA} \\ V_{IN} = 5 V & \quad V_{OUT} = 2.048 V \end{array}$ 

#### MAX6126\_21 LINE TRANSIENT



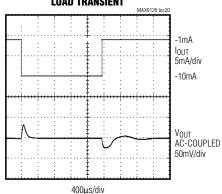
 $V_{OUT} = 2.048V \qquad C_{LOAD} = 0.1 \mu F$ 

#### MAX6126\_21 Turn-on transient



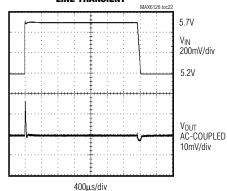
 $\begin{aligned} C_{LOAD} &= 0.1 \mu F \\ V_{OUT} &= 2.048 V \end{aligned}$ 

#### MAX6126\_21 Load transient



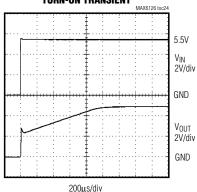
 $\begin{array}{ll} C_{LOAD} = 10 \mu F & I_{OUT} = -1 mA \ TO \ -10 mA \\ V_{IN} = 5 V & V_{OUT} = 2.048 V \end{array}$ 

#### MAX6126\_50 Line transient



 $\begin{array}{ll} V_{IN} = 5.2 V \; T0 \; 5.7 V & C_{L0AD} = 0.1 \mu F \\ V_{OUT} = 5 V & \end{array} \label{eq:vin}$ 

#### MAX6126\_50 Turn-on transient



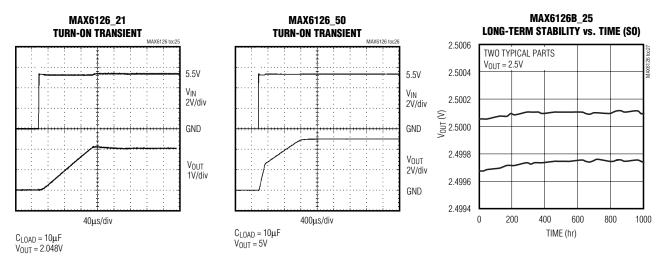
 $C_{LOAD} = 0.1 \mu F$  $V_{OUT} = 5V$ 

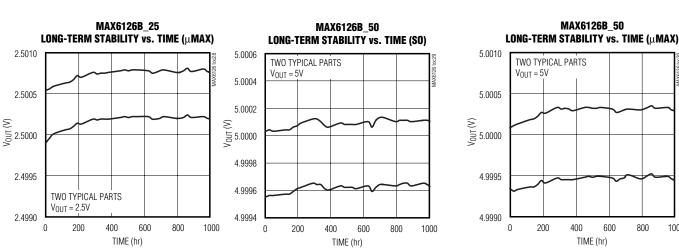
1000

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### Typical Operating Characteristics (continued)

(V<sub>IN</sub> = 5V for MAX6126\_21/25/30/41, V<sub>IN</sub> = 5.5V for MAX6126\_50, C<sub>LOAD</sub> = 0.1µF, I<sub>OUT</sub> = 0, T<sub>A</sub> = +25°C, unless otherwise specified.) (Note 5)





Note 5: Many of the MAX6126 Typical Operating Characteristics are extremely similar. The extremes of these characteristics are found in the MAX6126\_21 (2.048V output) and the MAX6126\_50 (5.000V output). The Typical Operating Characteristics of the remainder of the MAX6126 family typically lie between those two extremes and can be estimated based on their output voltages.

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **Pin Description**

PIN	NAME	FUNCTION
1	NR	Noise Reduction. Connect a 0.1µF capacitor to improve wideband noise. Leave unconnected if not used (see Figure 1).
2	IN	Positive Power-Supply Input
3	GND	Ground
4	GNDS	Ground-Sense Connection. Connect to ground connection at load.
5, 8	I.C.	Internally Connected. Do not connect anything to these pins.
6	OUTS	Voltage Reference Sense Output
7	OUTF	Voltage Reference Force Output. Short OUTF to OUTS as close to the load as possible. Bypass OUTF with a capacitor (0.1µF to 10µF) to GND.

#### **Detailed Description**

#### **Wideband Noise Reduction**

To improve wideband noise and transient power-supply noise, add a 0.1µF capacitor to NR (Figure 1). Larger values do not improve noise appreciably. A 0.1µF NR capacitor reduces the noise from 60nV/ $\sqrt{\text{Hz}}$  to 35nV/ $\sqrt{\text{Hz}}$  for the 2.048V output. Noise in the power-supply input can affect output noise, but can be reduced by adding an optional bypass capacitor between IN and GND, as shown in the *Typical Operating Circuit*.

#### **Output Bypassing**

The MAX6126 requires an output capacitor between  $0.1\mu F$  and  $10\mu F$ . Locate the output capacitor as close to OUTF as possible. For applications driving switching capacitive loads or rapidly changing load currents, it is advantageous to use a  $10\mu F$  capacitor in parallel with a  $0.1\mu F$  capacitor. Larger capacitor values reduce transients on the reference output.

#### **Supply Current**

The quiescent supply current of the series-mode MAX6126 family is typically 380µA and is virtually independent of the supply voltage, with only a 2µA/V (max) variation with supply voltage.

When the supply voltage is below the minimum specified input voltage during turn-on, the device can draw

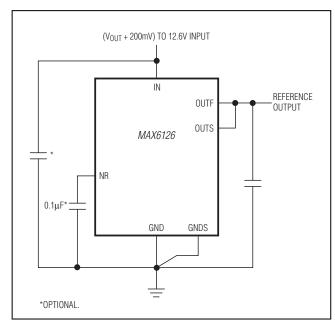


Figure 1. Noise-Reduction Capacitor

up to 300µA beyond the nominal supply current. The input voltage source must be capable of providing this current to ensure reliable turn-on.

#### **Thermal Hysteresis**

Thermal hysteresis is the change of output voltage at  $T_A = +25$ °C before and after the device is cycled over its entire operating temperature range. The typical thermal hysteresis value is 20ppm (SO package).

#### **Turn-On Time**

These devices typically turn on and settle to within 0.1% of their final value in 200µs to 2ms depending on the device. The turn-on time can increase up to 4ms with the device operating at the minimum dropout voltage and the maximum load. A noise reduction capacitor of 0.1µF increases the turn-on time to 20ms.

#### **Output Force and Sense**

The MAX6126 provides independent connections for the power-circuit output (OUTF) supplying current into a load, and for the circuit input regulating the voltage applied to that load (OUTS). This configuration allows for the cancellation of the voltage drop on the lines connecting the MAX6126 and the load. When using the Kelvin connection made possible by the independent current and voltage connections, take the power connection to the load from OUTF, and bring a line from OUTS to join the line from OUTF, at the point where the voltage accu-

## Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

racy is needed. The MAX6126 has the same type of Kelvin connection to cancel drops in the ground return line. Connect the load to ground and bring a connection from GNDS to exactly the same point.

#### **Applications Information**

#### **Precision Current Source**

Figure 2 shows a typical circuit providing a precision current source. The OUTF output provides the bias current for the bipolar transistor. OUTS and GNDS sense the voltage across the resistor and adjust the current sourced by OUTF accordingly. For even higher precision, use a MOSFET to eliminate base current errors.

# High-Resolution DAC and Reference from a Single Supply

Figure 3 shows a typical circuit providing the reference for a high-resolution, 16-bit MAX541 D/A converter.

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

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 4 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 (TMAX - TMIN) 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.

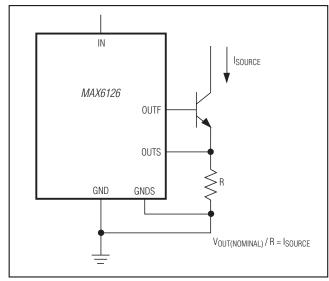


Figure 2. Precision Current Source

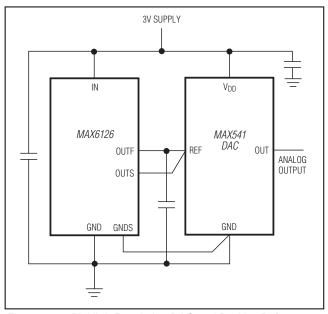


Figure 3. 14-Bit High-Resolution DAC and Positive Reference from a Single 3V Supply

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

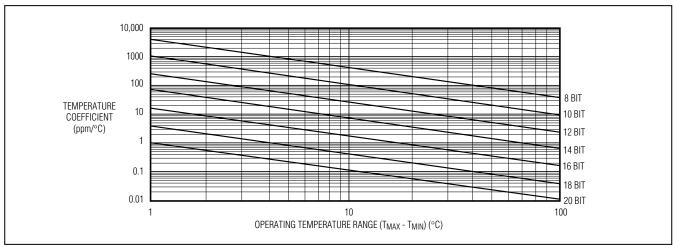
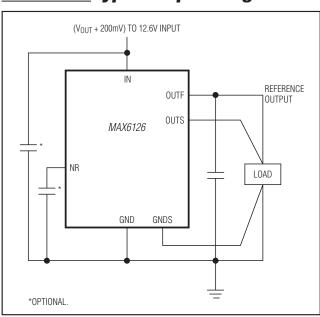


Figure 4. Temperature Coefficient vs. Operating Temperature Range for a 1 LSB Maximum Error

#### **Typical Operating Circuit**

**Chip Information** 



PROCESS: BiCMOS

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **Ordering Information (continued)**

PART	TEMP RANGE	PIN- PACKAGE	OUTPUT VOLTAGE (V)	MAXIMUM INITIAL ACCURACY (%)	MAXIMUM TEMPCO (-40°C to +85°C) (ppm/°C)
MAX6126B21+	-40°C to +125°C	8 µMAX	2.048	0.1	7
MAX6126AASA25+	-40°C to +125°C	8 SO	2.500	0.02	3
MAX6126BASA25+	-40°C to +125°C	8 SO	2.500	0.06	5
MAX6126A25+	-40°C to +125°C	8 µMAX	2.500	0.06	3
MAX6126B25+	-40°C to +125°C	8 µMAX	2.500	0.1	7
MAX6126A28+	-40°C to +125°C	8 µMAX	2.800	0.06	3
MAX6126B28+	-40°C to +125°C	8 µMAX	2.800	0.1	7
MAX6126AASA30+	-40°C to +125°C	8 SO	3.000	0.02	3
MAX6126BASA30+	-40°C to +125°C	8 SO	3.000	0.06	5
MAX6126A30+	-40°C to +125°C	8 µMAX	3.000	0.06	3
MAX6126B30+	-40°C to +125°C	8 µMAX	3.000	0.1	7
MAX6126AASA41+	-40°C to +125°C	8 SO	4.096	0.02	3
MAX6126BASA41+	-40°C to +125°C	8 SO	4.096	0.06	5
MAX6126BASA41/V+	-40°C to +125°C	8 SO	4.096	0.06	5
MAX6126A41+	-40°C to +125°C	8 µMAX	4.096	0.06	3
MAX6126B41+	-40°C to +125°C	8 µMAX	4.096	0.1	7
MAX6126AASA50+	-40°C to +125°C	8 SO	5.000	0.02	3
MAX6126BASA50+	-40°C to +125°C	8 SO	5.000	0.06	5
MAX6126A50+	-40°C to +125°C	8 µMAX	5.000	0.06	3
MAX6126B50+	-40°C to +125°C	8 µMAX	5.000	0.1	7

<sup>+</sup>Denotes a lead(Pb)-free/RoHS-compliant package.

## Package Information (continued)

For the latest package outline information and land patterns (footprints), go to <a href="www.maximintegrated.com/packages">www.maximintegrated.com/packages</a>. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

PACKAGE TYPE	PACKAGE CODE	OUTLINE NO.	LAND PATTERN NO.
8 µMAX	U8+1	<u>21-0036</u>	90-0092
8 SO	S8+4	21-0041	90-0096

<sup>/</sup>V denotes an automotive qualified part.

# Ultra-High-Precision, Ultra-Low-Noise, Series Voltage Reference

#### **Revision History**

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/02	Initial release	_
1	3/03	Remove "future product" and "contact factory" notes	1, 16
2	6/03	Add "A" grade devices	1, 16
3	12/03	Change µMAX part number	1, 16
4	7/04	Add top mark to Ordering Information	1, 16
5	12/10	Add 2.8V option, add lead-free options, update Package Information	1, 2, 4, 15, 16
6	8/12	Added automotive package, MAX6126BASA41/V+ to data sheet	17



Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time. The parametric values (min and max limits) shown in the Electrical Characteristics table are guaranteed. Other parametric values quoted in this data sheet are provided for guidance.

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