19-1659; Rev 0; 4/00

Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

MAX6061–MAX6067

General Description

The MAX6061–MAX6067 are precision, low-dropout, micropower voltage references. These three-terminal devices operate with an input voltage range from (V_{OUT} + 50mV typ) to 12.6V and are available with output voltage options of 1.25V, 2.048V, 2.5V, 3V, 4.096V, 4.5V, and 5V. They feature a proprietary curvature-correction circuit and laser-trimmed thin-film resistors that result in a very low temperature coefficient of 20ppm/°C (max) and an initial accuracy of ±0.02% (max). Specifications apply to the extended temperature range (-40°C to +85°C).

The MAX6061–MAX6067 typically draw only 90µA of supply current and can source 5mA or sink 2mA of load current. Unlike conventional shunt-mode (two-terminal) references that waste supply current and require an external resistor, these devices offer a supply current that is virtually independent of the supply voltage (8µA/V variation) and do not require an external resistor. Additionally, the internally compensated devices do not require an external compensation capacitor and are stable with up to 1µF of load capacitance. Eliminating the external compensation capacitor saves valuable board area in space-critical applications. Low dropout voltage and supply independent, ultra-low supply current make these devices ideal for battery-operated, high-performance, low-voltage systems.

The MAX6061–MAX6067 are available in a 3-pin SOT23 package.

Applications

Analog-to-Digital Converters (ADCs)
Portable Battery-Powered Systems
Notebook Computers
PDAs, GPS, DMMs
Cellular Phones
Precision 3V/5V Systems

Typical Operating Circuit appears at end of data sheet.

Selector Guide

PART	OUTPUT VOLTAGE (V)	INPUT VOLTAGE (V)
MAX6061	1.250	2.5 to 12.6
MAX6062	2.048	2.5 to 12.6
MAX6066	2.500	(V_{OUT} + 200mV) to 12.6
MAX6063	3.000	(V_{OUT} + 200mV) to 12.6
MAX6064	4.096	(V_{OUT} + 200mV) to 12.6
MAX6067	4.500	(V_{OUT} + 200mV) to 12.6
MAX6065	5.000	(V_{OUT} + 200mV) to 12.6

Features

- ♦ **Ultra-Small 3-Pin SOT23 Package**
- ♦ **±0.2% max Initial Accuracy**
- ♦ **20ppm/°C max Temperature Coefficient**
- ♦ **5mA Source Current at 0.5mV/mA**
- ♦ **2mA Sink Current at 1.3mV/mA**
- ♦ **Stable with C_{LOAD} = 0 to 1µF**
- ♦ **90µA typ Quiescent Supply Current**
- ♦ **200mV max Dropout at 1mA Load Current**
- ♦ **+10µV/V Line Regulation**
- ♦ **Output Voltage Options: 1.25V, 2.048V, 2.5V, 3V, 4.096V, 4.5V, 5V**
- ♦ **13µVp-p Noise 0.1Hz to 10Hz (MAX6061)**

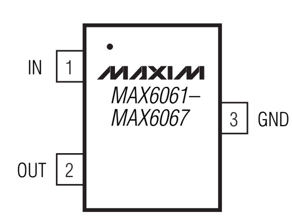
Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE	TOP MARK
MAX6061AEUR-T	-40°C to +85°C	3 SOT23-3	FZFP
MAX6061BEUR-T	-40°C to +85°C	3 SOT23-3	FZFQ
MAX6062AEUR-T	-40°C to +85°C	3 SOT23-3	FZFY
MAX6062BEUR-T	-40°C to +85°C	3 SOT23-3	FZFZ
MAX6063AEUR-T	-40°C to +85°C	3 SOT23-3	FZFV
MAX6063BEUR-T	-40°C to +85°C	3 SOT23-3	FZFW
MAX6064AEUR-T	-40°C to +85°C	3 SOT23-3	FZGB
MAX6064BEUR-T	-40°C to +85°C	3 SOT23-3	FZGC
MAX6065AEUR-T	-40°C to +85°C	3 SOT23-3	FZGE
MAX6065BEUR-T	-40°C to +85°C	3 SOT23-3	FZGF
MAX6066AEUR-T	-40°C to +85°C	3 SOT23-3	FZFM
MAX6066BEUR-T	-40°C to +85°C	3 SOT23-3	FZFN
MAX6067AEUR-T	-40°C to +85°C	3 SOT23-3	FZFS
MAX6067BEUR-T	-40°C to +85°C	3 SOT23-3	FZFT

Note: *There is a minimum order increment of 2500 pieces for SOT packages.*

Pin Configuration

TOP VIEW



SOT23-3

Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

ABSOLUTE MAXIMUM RATINGS

(Voltages Referenced to GND)
IN ....-0.3V to +13.5V
OUT ....-0.3V to (V_{IN} + 0.3V)
Output Short-Circuit Duration to GND or IN (V_{IN} < 6V) ...Continuous
Output Short-Circuit Duration to GND or IN ($V_{IN} \geq$ 6V)................60s
Continuous Power Dissipation (T_A = +70°C)
3-Pin SOT23 (derate 4.0mW/°C above +70°C)............320mW
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—MAX6061, V_{OUT} = 1.25V

(V_{IN} = +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 Voltage	V_{OUT}	T_A = +25°C	MAX6061A	1.245	1.250	1.255	V
			MAX6061B	1.243	1.250	1.257	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6061A			6	20	ppm/°C
		MAX6061B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	2.5V ≤ V_{IN} ≤ 12.6V			10	250	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 4mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			1.3	3.0	
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle				130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			13		µVp-p
		f = 10Hz to 10kHz			15		μV_{RMS}
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			86		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			50		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		2.5		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	2.5V ≤ V_{IN} ≤ 12.6V			3.4	8.0	µA/V

ELECTRICAL CHARACTERISTICS—MAX6062, V_{OUT} = 2.048V

(V_{IN} = +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 Voltage	V_{OUT}	T_A = +25°C	MAX6062A	2.043	2.048	2.053	V
			MAX6062B	2.040	2.048	2.056	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6062A			6	20	ppm/°C
		MAX6062B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	2.5V ≤ V_{IN} ≤ 12.6V			33	130	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 5mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			1.5	4	
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle	(Note 2)			130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			22		µVp-p
		f = 10Hz to 10kHz			25		μV_{RMS}
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			86		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			115		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		2.5		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	2.5V ≤ V_{IN} ≤ 12.6V			3.3	8.0	µA/V

Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

ELECTRICAL CHARACTERISTICS—MAX6066, V_{OUT} = 2.500V

(V_{IN} = +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 Voltage	V_{OUT}	T_A = +25°C	MAX6066A	2.495	2.500	2.505	V
			MAX6066B	2.490	2.500	2.510	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6066A			6	20	ppm/°C
		MAX6066B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			60	220	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 5mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			1.6	5	
Dropout Voltage (Note 5)	V_{IN} - V_{OUT}	I_{OUT} = 1mA			50	200	mV
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle				130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			27		µVp-p
		f = 10Hz to 10kHz			30		$µV_{RMS}$
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			86		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			115		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		V_{OUT} + 0.2		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			3.3	8.0	µA/V

ELECTRICAL CHARACTERISTICS—MAX6063, V_{OUT} = 3.0V

(V_{IN} = +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 Voltage	V_{OUT}	T_A = +25°C	MAX6063A	2.994	3.000	3.006	V
			MAX6063B	2.988	3.000	3.012	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6063A			6	20	ppm/°C
		MAX6063B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			90	300	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 5mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			2.0	5.0	
Dropout Voltage (Note 5)	V_{IN} - V_{OUT}	I_{OUT} = 1mA			50	200	mV
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle				130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			35		µVp-p
		f = 10Hz to 10kHz			40		$µV_{RMS}$
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			76		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			115		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		V_{OUT} + 0.2		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			3.4	8.0	µA/V

Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

ELECTRICAL CHARACTERISTICS—MAX6064, V_{OUT} = 4.096V

(V_{IN} = +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 Voltage	V_{OUT}	T_A = +25°C	MAX6064A	4.088	4.096	4.104	V
			MAX6064B	4.080	4.096	4.112	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6064A			6	20	ppm/°C
		MAX6064B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			130	300	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 5mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			2.2	7	
Dropout Voltage (Note 5)	V_{IN} - V_{OUT}	I_{OUT} = 1mA			50	200	mV
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle				130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			50		µVp-p
		f = 10Hz to 10kHz			50		μV_{RMS}
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			72		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			190		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		V_{OUT} + 0.2		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			3.2	8.0	µA/V

ELECTRICAL CHARACTERISTICS—MAX6067, V_{OUT} = 4.500V

(V_{IN} = +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 Voltage	V_{OUT}	T_A = +25°C	MAX6067A	4.491	4.500	4.509	V
			MAX6067B	4.482	4.500	4.518	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6067A			6	20	ppm/°C
		MAX6067B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			170	450	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 5mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			2.4	8	
Dropout Voltage (Note 5)	V_{IN} - V_{OUT}	I_{OUT} = 1mA			50	200	mV
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle				130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			55		µVp-p
		f = 10Hz to 10kHz			55		$µV_{RMS}$
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			70		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			230		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		V_{OUT} + 0.2		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			3.2	8.0	µA/V

Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

ELECTRICAL CHARACTERISTICS—MAX6065, 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)

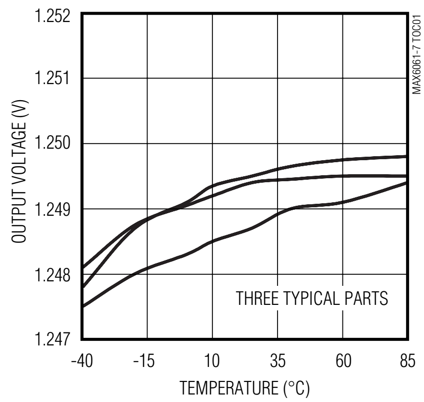
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	T_A = +25°C	MAX6065A	4.990	5.000	5.010	V
			MAX6065B	4.980	5.000	5.020	
Output Voltage Temperature Coefficient (Note 2)	TCV_{OUT}	MAX6065A			6	20	ppm/°C
		MAX6065B			6	30	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			180	400	µV/V
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Sourcing: 0 ≤ I_{OUT} ≤ 5mA			0.5	0.9	mV/mA
		Sinking: -2mA ≤ I_{OUT} ≤ 0			2.4	8.0	
Dropout Voltage (Note 5)	V_{IN} - V_{OUT}	I_{OUT} = 1mA			50	200	mV
OUT Short-Circuit Current	I_{SC}	Short to GND			25		mA
		Short to IN			25		
Long-Term Stability	ΔV_{OUT}/time	1000h at +25°C			62		ppm/1000h
Output Voltage Hysteresis (Note 3)	ΔV_{OUT}/cycle				130		ppm
DYNAMIC CHARACTERISTICS							
Noise Voltage	e_{OUT}	f = 0.1Hz to 10Hz			60		µVp-p
		f = 10Hz to 10kHz			60		μV_{RMS}
Ripple Rejection	$\Delta V_{OUT}/\Delta V_{IN}$	V_{IN} = 5V ±100mV, f = 120Hz			65		dB
Turn-On Settling Time	t_R	To V_{OUT} = 0.1% of final value, C_{OUT} = 50pF			300		µs
Capacitive-Load Stability Range (Note 4)	C_{OUT}			0		1.0	µF
INPUT CHARACTERISTICS							
Supply Voltage Range	V_{IN}	Guaranteed by line-regulation test		V_{OUT} + 0.2		12.6	V
Quiescent Supply Current	I_{IN}				90	125	µA
Change in Supply Current	I_{IN}/V_{IN}	(V_{OUT} + 0.2V) ≤ V_{IN} ≤ 12.6V			3.2	8.0	µA/V

Note 1: All devices are 100% production tested at T_A = +25°C and are guaranteed by design for T_A = T_{MIN} to T_{MAX}, as specified.
Note 2: Temperature Coefficient is measured by the "box" method, i.e., the maximum ΔV_{OUT} is divided by the maximum Δt.
Note 3: Temperature Hysteresis is defined as the change in +25°C output voltage before and after cycling the device from T_{MIN} to T_{MAX}.
Note 4: Not production tested. Guaranteed by design.
Note 5: Dropout voltage is the minimum input voltage at which V_{OUT} changes ≤ 0.2% from V_{OUT} at V_{IN} = 5.0V (V_{IN} = 5.5V for MAX6065).

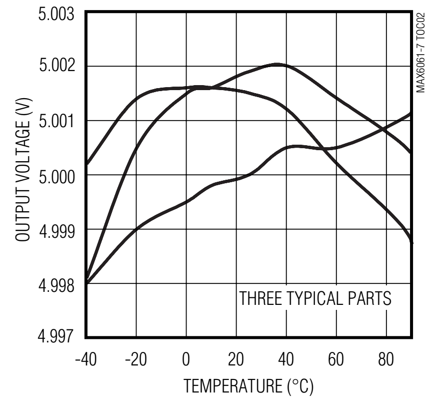
Typical Operating Characteristics

(V_{IN} = +5V MAX6061/2/3/4/6/7, V_{IN} = +5.5V MAX6065, I_{OUT} = 0, T_A = +25°C, unless otherwise noted.) (Note 6)

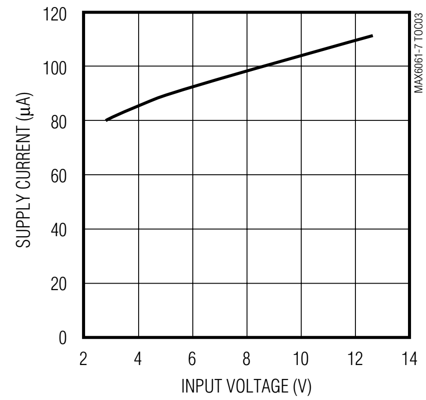
MAX6061
OUTPUT VOLTAGE TEMPERATURE DRIFT



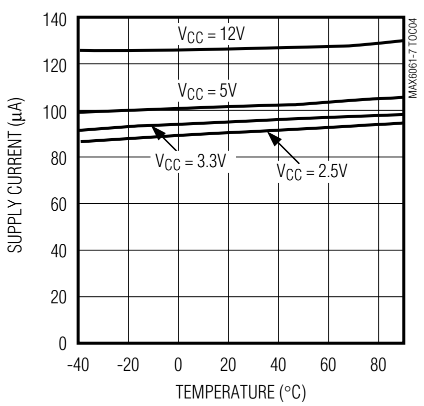
MAX6065
OUTPUT VOLTAGE TEMPERATURE DRIFT



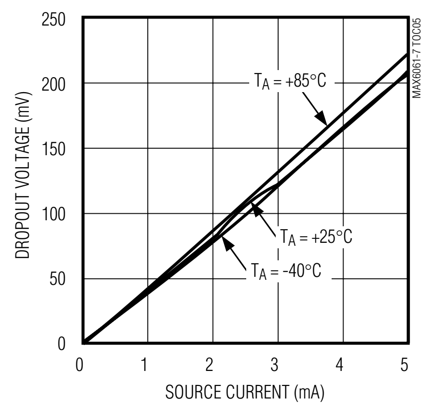
MAX6066
SUPPLY CURRENT vs. INPUT VOLTAGE



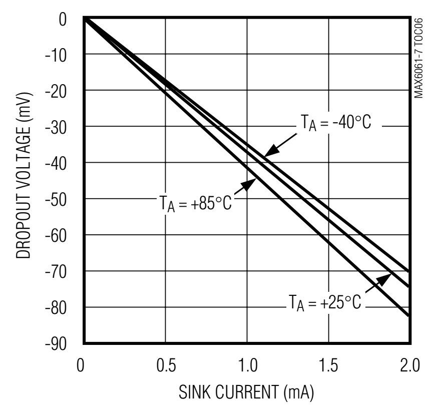
SUPPLY CURRENT vs. TEMPERATURE



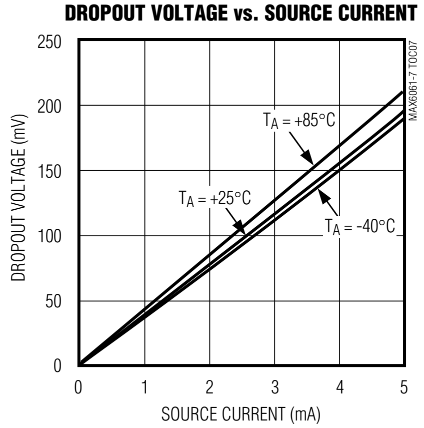
MAX6066
DROPOUT VOLTAGE vs. SOURCE CURRENT



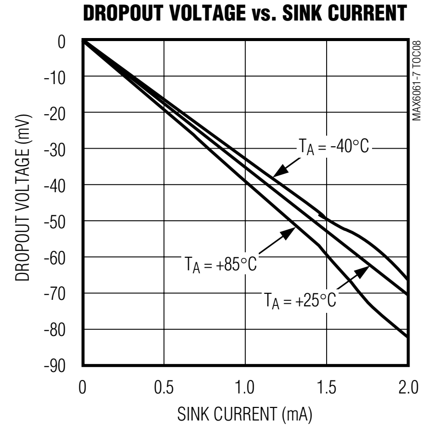
MAX6066
DROPOUT VOLTAGE vs. SINK CURRENT



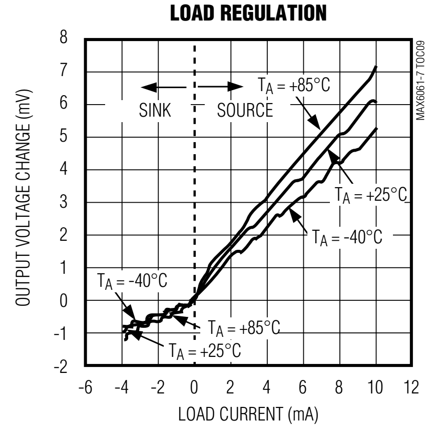
MAX6065
DROPOUT VOLTAGE vs. SOURCE CURRENT



MAX6065
DROPOUT VOLTAGE vs. SINK CURRENT



MAX6066
LOAD REGULATION

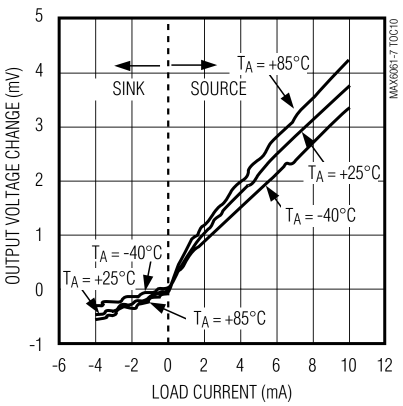


Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

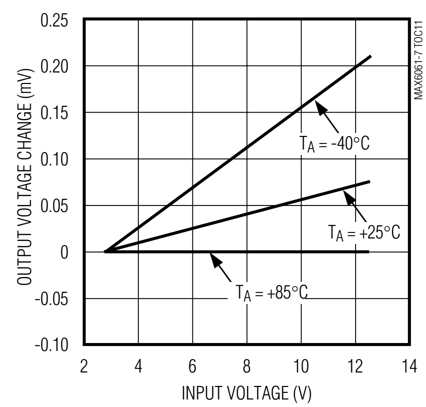
Typical Operating Characteristics (continued)

(V_{IN} = +5V MAX6061/2/3/4/6/7, V_{IN} = +5.5V MAX6065, I_{OUT} = 0, T_A = +25°C, unless otherwise noted.) (Note 6)

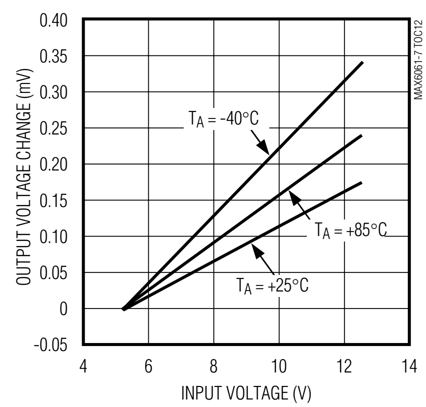
MAX6065 LOAD REGULATION



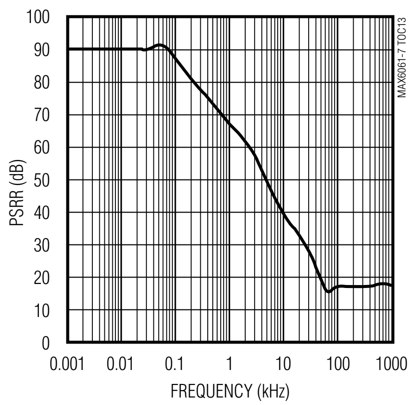
MAX6066 LINE REGULATION



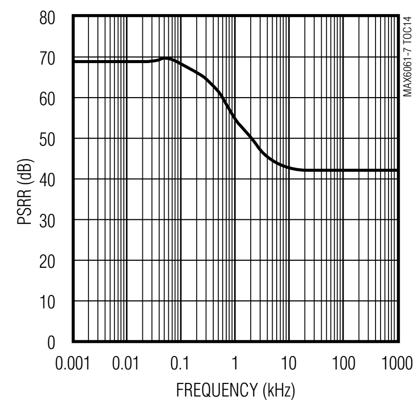
MAX6065 LINE REGULATION



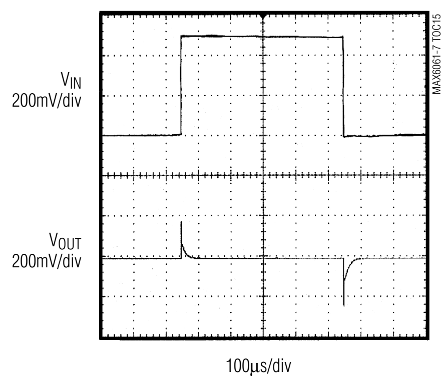
MAX6066 POWER-SUPPLY REJECTION RATIO vs. FREQUENCY



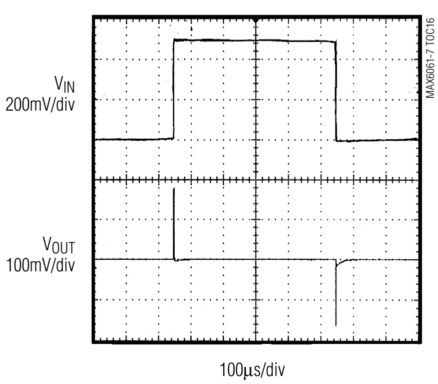
MAX6065 POWER-SUPPLY REJECTION RATIO vs. FREQUENCY



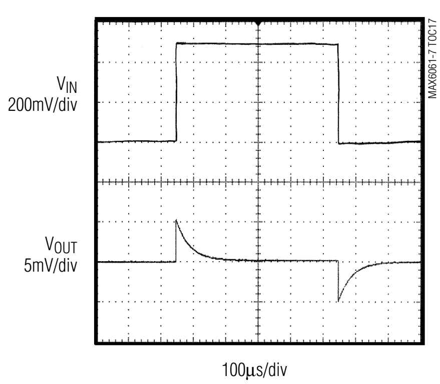
MAX6061 LINE-TRANSIENT RESPONSE



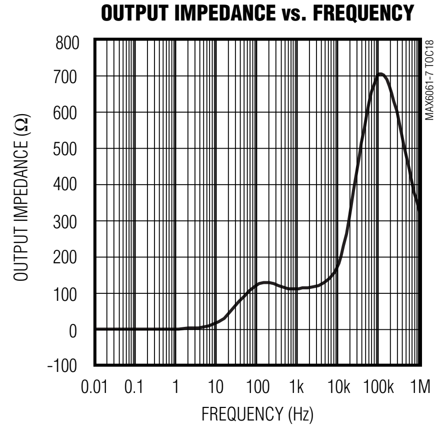
MAX6066 LINE-TRANSIENT RESPONSE



MAX6065 LINE-TRANSIENT RESPONSE



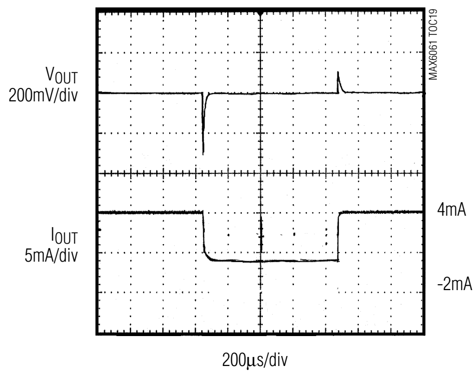
OUTPUT IMPEDANCE vs. FREQUENCY



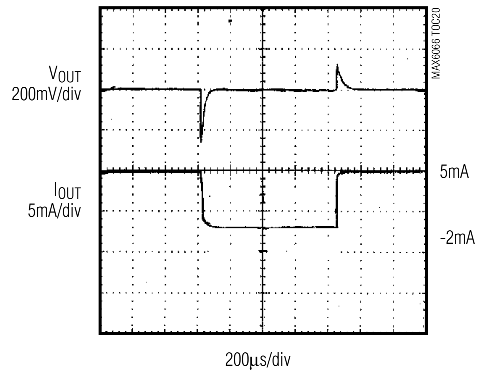
Typical Operating Characteristics (continued)

(V_{IN} = +5V MAX6061/2/3/4/6/7, V_{IN} = +5.5V MAX6065, I_{OUT} = 0, T_A = +25°C, unless otherwise noted.) (Note 6)

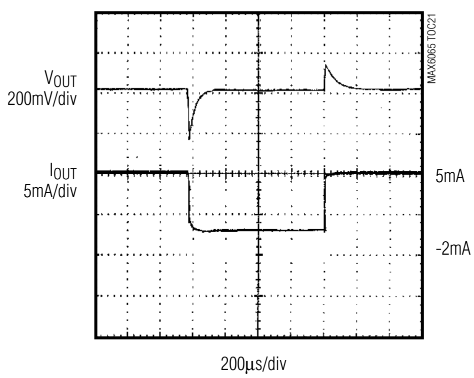
MAX6061
LOAD-TRANSIENT RESPONSE



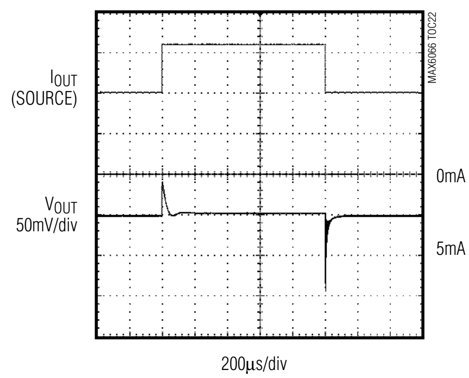
MAX6066
LOAD-TRANSIENT RESPONSE (C_{LOAD} = 0)



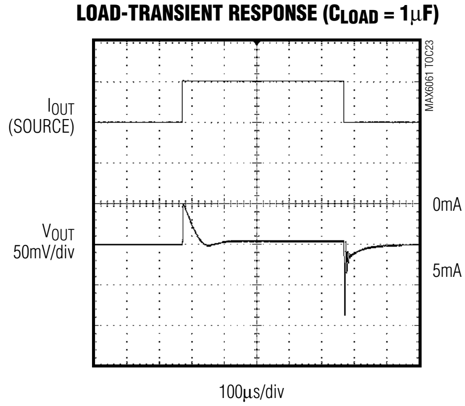
MAX6065
LOAD-TRANSIENT RESPONSE (C_{LOAD} = 0)



MAX6066
LOAD-TRANSIENT RESPONSE (C_{LOAD} = 1µF)



MAX6065
LOAD-TRANSIENT RESPONSE (C_{LOAD} = 1µF)

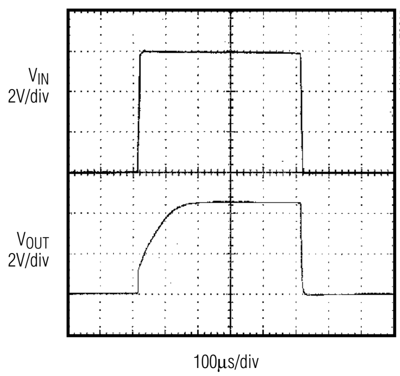


Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

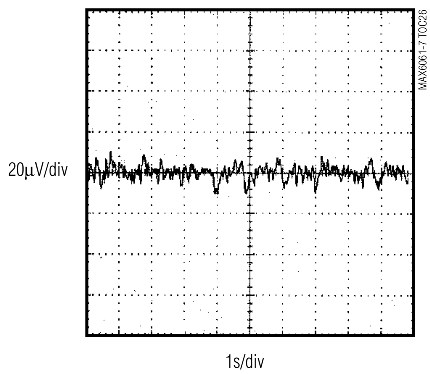
Typical Operating Characteristics (continued)

(V_{IN} = +5V MAX6061/2/3/4/6/7, V_{IN} = +5.5V MAX6065, I_{OUT} = 0, T_A = +25°C, unless otherwise noted.) (Note 6)

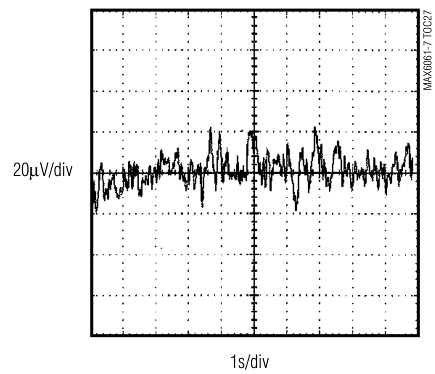
MAX6065 TURN-ON TRANSIENT



MAX6066 0.1Hz TO 10Hz OUTPUT NOISE



MAX6065 0.1Hz TO 10Hz OUTPUT NOISE



Note 6: Many of the MAX6061 family *Typical Operating Characteristics* are extremely similar. The extremes of these characteristics are found in the MAX6061 (1.25V output) and the MAX6065 (5.0V output). The *Typical Operating Characteristics* of the remainder of the MAX6061 family typically lie between these two extremes and can be estimated based on their output voltage.

Pin Description

PIN	NAME	FUNCTION
1	IN	Input Voltage
2	OUT	Reference Output
3	GND	Ground

Applications Information

Input Bypassing

For the best line-transient performance, decouple the input with a 0.1µF ceramic capacitor as shown in the *Typical Operating Circuit*. Locate the capacitor as close to IN as possible. Where transient performance is less important, no capacitor is necessary.

Output/Load Capacitance

Devices in the MAX6061 family do not require an output capacitance for frequency stability. They are stable for capacitive loads from 0 to 1µF. However, in applications where the load or the supply can experience step changes, an output capacitor will reduce the amount of overshoot (undershoot) and improve the circuit's transient response. Many applications do not require an external capacitor, and the MAX6061 family can offer a significant advantage in these applications when board space is critical.

Supply Current

The quiescent supply current of the series-mode MAX6061 family is typically 90µA and is virtually independent of the supply voltage, with only an 8µA/V (max) variation with supply voltage. Unlike series references, shunt-mode references operate with a series resistor connected to the power supply. The quiescent current of a shunt-mode reference is thus a function of the input voltage. Additionally, shunt-mode references have to be biased at the maximum expected load current, even if the load current is not present at the time. In the MAX6061 family, the load current is drawn from the input voltage 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. When the supply voltage is below the minimum specified input voltage (as during turn-on), the devices can draw up to 400µA beyond the nominal supply current. The input voltage source must be capable of providing this current to ensure reliable turn-on.

Output Voltage Hysteresis

Output voltage 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. Hysteresis is caused by differential package stress appearing across the bandgap core transistors. The typical temperature hysteresis value is 130ppm.

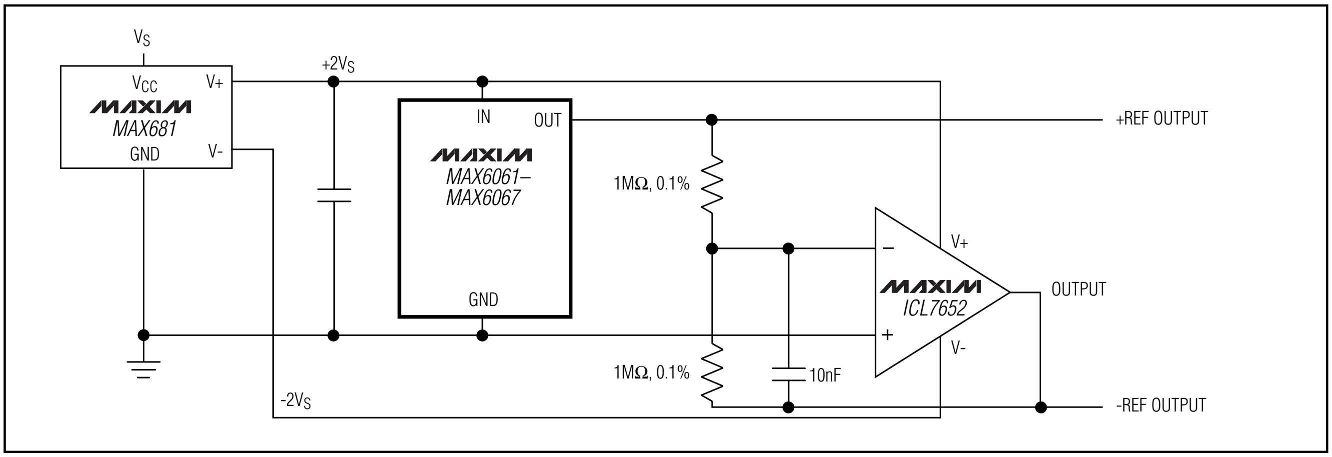
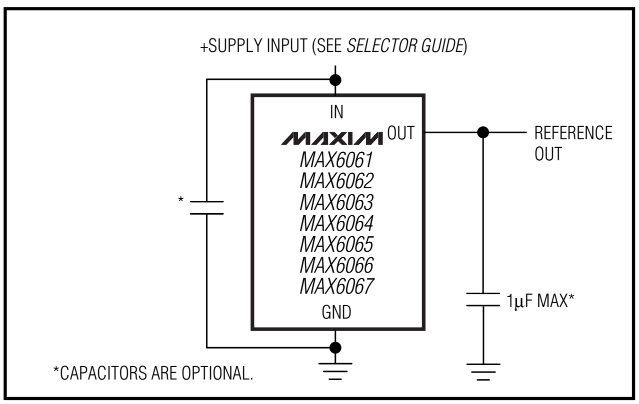


Figure 1. Positive and Negative References from Single +3V or +5V Supply

Typical Operating Circuit



Turn-On Time

These devices typically turn on and settle to within 0.1% of their final value in 50µs to 300µs, depending on the device. The turn-on time can increase up to 1.5ms with the device operating at the minimum dropout voltage and the maximum load.

Positive and Negative Low-Power Voltage Reference

Figure 1 shows a typical method for developing a bipolar reference. The circuit uses a MAX681 voltage doubler/inverter charge-pump converter to power an ICL7652, thus creating a positive as well as a negative reference voltage.

Chip Information

TRANSISTOR COUNT: 117

PROCESS: BiCMOS

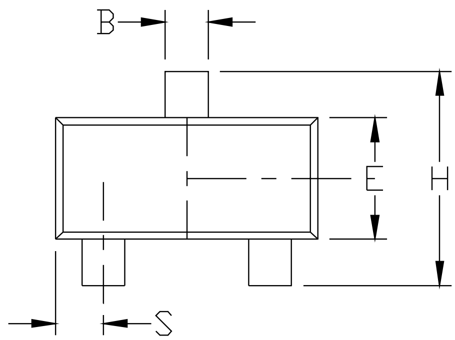
Package Information

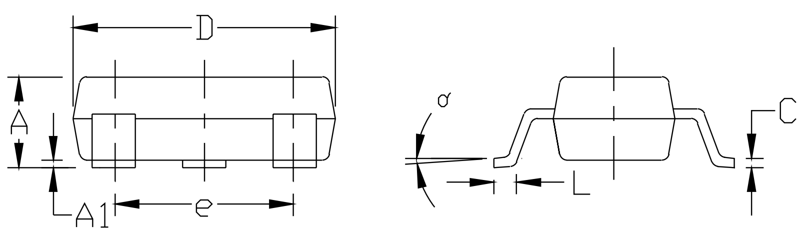
SOTPO3L.EPS

NOTES:

1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
3. CONTROLLING DIMENSION: MILLIMETER

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.031	0.047	0.787	1.194
A1	0.001	0.005	0.025	0.127
B	0.014	0.022	0.356	0.559
C	0.0034	0.006	0.086	0.152
D	0.105	0.120	2.667	3.048
E	0.047	0.055	1.194	1.397
e	0.070	0.080	1.778	2.032
H	0.082	0.098	2.083	2.489
L	0.004	0.012	0.102	0.305
S	0.017	0.022	0.432	0.559
α	0°	8°	0°	8°





MAXIM

PROPRIETARY INFORMATION

TITLE:

PACKAGE OUTLINE,SOT-23, 3L

APPROVAL	DOCUMENT CONTROL NO.	REV	
	21-0051	C	1/1

NOTES

Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

NOTES