19-1797; Rev 3; 12/09

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

General Description

The MAX4493/MAX4494/MAX4495 single/dual/quad general-purpose operational amplifiers are designed for use in systems powered with dual supplies from ±2.25V to ±5.5V or with a single supply of +4.5V to +11V. These op amps provide a unity-gain bandwidth of 5MHz with only 770µA of quiescent current per amplifier. The wide input common-mode range extends from 200mV beyond the negative rail to within 1.5V of the positive supply rail while the output swings within 10mV (R_L = 100kΩ) of either rail.

These amplifiers have excellent (110dB) open-loop gain with very low THD+N of 0.002% (f = 1kHz). The single MAX4493 is available in a tiny 5-pin SC70 package and the dual MAX4494 is available in the space-saving 8-pin SOT23. The quad MAX4495 is available in both 14-pin TSSOP and 14-pin SO packages. All products are rated at the automotive temperature range of -40°C to +125°C.

Applications

Battery-Powered Systems

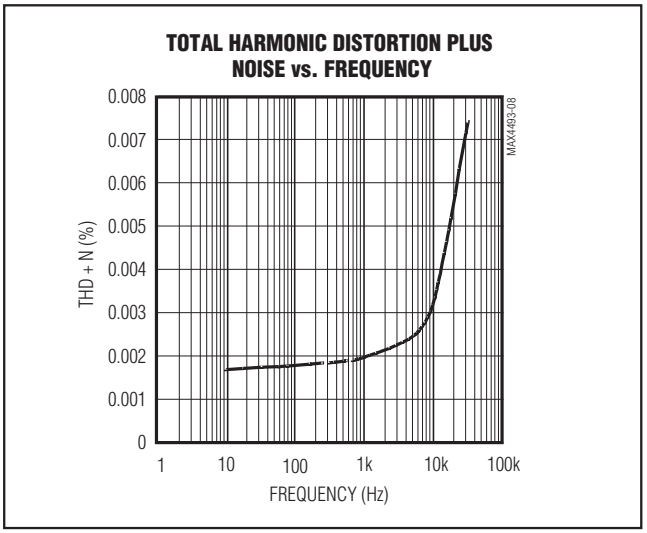
DAC Output Amplifiers

Industrial Control Systems

Voltage Reference Generators

Signal Conditioning

Typical Operating Characteristic



Typical Operating Circuit appears at end of data sheet.

Features

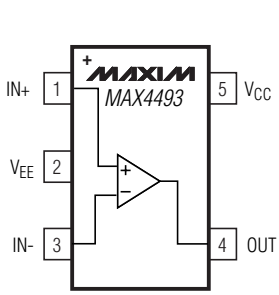
- **770µA Supply Current per Amplifier**
- **Operates from Dual ±2.25V to ±5.5V Supplies**
- **5MHz Gain-Bandwidth Product**
- **Rail-to-Rail Output Swing**
- **Input Voltage Range Extends 200mV Below the Negative Rail**
- **110dB Open-Loop Gain (R_L = 100kΩ)**
- **Low THD+N of 0.002% (f = 1kHz)**
- **No Phase Reversal for Overdriven Inputs**
- **Unity-Gain Stable**
- **Available in Space-Saving Packages**
  - **5-Pin SC70 (MAX4493)**
  - **8-Pin SOT23 (MAX4494)**
  - **14-Pin TSSOP (MAX4495)**

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	TOP MARK
MAX4493AXK+T	-40°C to +125°C	5 SC70	ABR
MAX4493AXK/V+T	-40°C to +125°C	5 SC70	+AUE
MAX4493AUK+T	-40°C to +125°C	5 SOT23	ADPG
MAX4494AKA+T	-40°C to +125°C	8 SOT23	AAEM
MAX4494AKA/V+T	-40°C to +125°C	8 SOT23	+AEQP
MAX4494AUA+	-40°C to +125°C	8 µMAX	—
MAX4494ASA+	-40°C to +125°C	8 SO	—
MAX4495AUD+	-40°C to +125°C	14 TSSOP	—
MAX4495ASD+	-40°C to +125°C	14 SO	—

+Denotes a lead(Pb)-free/RoHS-compliant package.
/V denotes an automotive qualified part.
T = Tape and reel.

Pin Configurations



SC70/SOT23-5

Pin Configurations continued at end of data sheet.

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

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC} to V_{EE}).....+12V
Voltage from Any Pin to Ground or
Any Other Pin.....(V_{EE} - 0.3V) to (V_{CC} + 0.3V)
Output Short-Circuit Duration to
V_{CC}, V_{EE}, or Ground .....Continuous
Continuous Power Dissipation (T_A = +70°C)
5-Pin SC70 (derate 3.1mW/°C above +70°C).....247mW
5-Pin SOT23 (derate 7.1mW/°C above +70°C).....571mW
8-Pin SOT23 (derate 9.1mW/°C above +70°C).....727mW
8-Pin µMAX® (derate 4.5mW/°C above +70°C).....362mW
8-Pin SO (derate 5.9mW/°C above +70°C).....471mW
14-Pin TSSOP (derate 9.1mW/°C above +70°C) 727mW
14-Pin SO (derate 8.3mW/°C above +70°C).....667mW
Operating Temperature Range .....-40°C to +125°C
Storage Temperature Range .....-65°C to +150°C
Lead Temperature (soldering, 10s) .....+300°C

µMAX is a registered trademark of Maxim Integrated products, Inc.

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.

DC ELECTRICAL CHARACTERISTICS

(V_{CC} = +5V, V_{EE} = -5V, R_L = 100kΩ to ground, T_A = -40°C to +125°C. Typical values are at T_A = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Supply Voltage Range	V_S	Guaranteed by PSRR test	±2.25		±5.5	V
Quiescent Supply Current per Amplifier	I_S			770	1100	µA
Input Offset Voltage	V_{OS}	T_A = +25°C		0.3	5	mV
		T_A = T_{MIN} to T_{MAX}			10	
Input Offset Voltage Drift	TCV_{OS}			3		µV/°C
Input Offset Voltage Channel Matching		MAX4494 and MAX4495		1		mV
Input Bias Current	I_B			0.2	1	µA
Input Offset Current	I_{OS}			5	300	nA
Input Resistance	R_{IN}	Differential mode (-1V ≤ V_{IN} ≤ +1V)		250		kΩ
		Common mode (V_{EE} - 0.2V ≤ V_{CM} ≤ V_{CC} - 1.5V)		110		MΩ
Common-Mode Input Voltage Range	V_{CM}	Guaranteed by CMRR test	V_{EE} - 0.2V		V_{CC} - 1.5V	V
Common-Mode Rejection Ratio	CMRR	V_{EE} - 0.2V ≤ V_{CM} ≤ V_{CC} - 1.5V	65	90		dB
Power-Supply Rejection Ratio	PSRR	V_S = ±2.25V to ±5.5V	65	80		dB
Large-Signal Voltage Gain	A_{VOL}	R_L = 100kΩ, V_{EE} + 0.25V ≤ V_{OUT} ≤ V_{CC} - 0.25V	85	110		dB
		R_L = 1kΩ, V_{EE} + 0.5V ≤ V_{OUT} ≤ V_{CC} - 0.5V	65	90		
Output Voltage Swing	V_{OUT}	R_L = 100kΩ, V_{CC} - V_{OH} and V_{OL} - V_{EE}		10	150	mV
		R_L = 1kΩ, V_{CC} - V_{OH} and V_{OL} - V_{EE}		200	450	
Output Short-Circuit Current	I_{SC}	Sourcing or sinking		15		mA

Note 1: All devices are 100% production tested at T_A = +25°C. Limits over the operating temperature range are guaranteed by design and not production tested.

AC ELECTRICAL CHARACTERISTICS

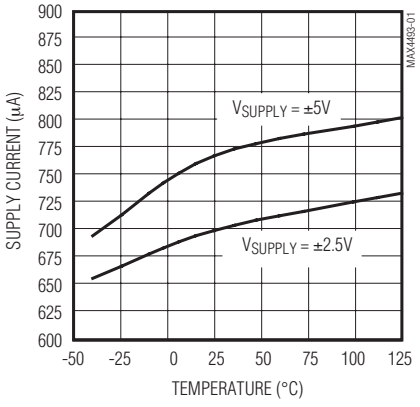
(V_{CC} = +5V, V_{EE} = -5V, R_L = 100kΩ to ground, C_L = 15pF, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Gain-Bandwidth Product	GBWP			5		MHz
Full-Power Bandwidth	FPBW	V_{OUT} = 5Vp-p		190		kHz
Slew Rate	SR	V_{OUT} = 5Vp-p		3		V/µs
Phase Margin				75		degrees
Gain Margin				15		dB
Total Harmonic Distortion Plus Noise	THD+N	f = 1kHz, V_{OUT} = 5Vp-p, A_V = +1V/V		0.002		%
Settling Time to 0.01%	t_S	A_V = +1V/V, V_{OUT} = 5V step		4		µs
Input Capacitance	C_{IN}			2		pF
Input Noise Voltage Density	e_{IN}	f = 1kHz		8		nV/√Hz
Input Noise Current Density	i_{IN}	f = 1kHz		0.2		pA/√Hz
All-Hostile Crosstalk		f = 1kHz, MAX4494 and MAX4495		-100		dB
Capacitive-Load Stability		A_V = +1V/V, no sustained oscillations		300		pF
Power-Up Time	t_{ON}	V_{OUT} = 1V, 1µs power supply rise-time		3		µs

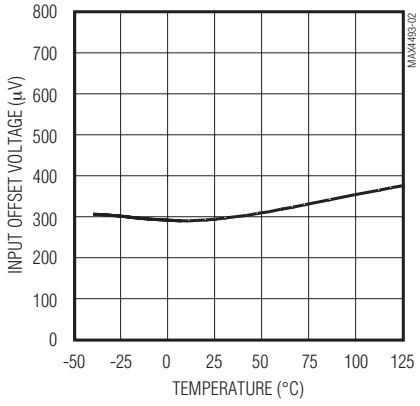
Typical Operating Characteristics

(V_{CC} = +5V, V_{EE} = -5V, V_{CM} = 0V, R_L = 100kΩ to ground, C_L = 15pF, T_A = +25°C, unless otherwise noted.)

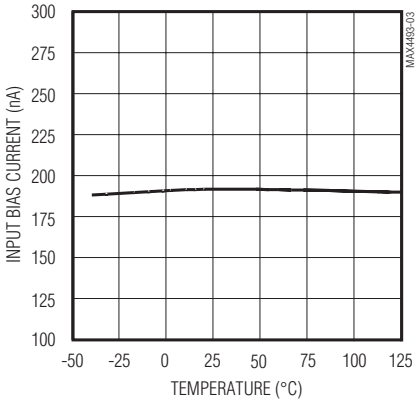
SUPPLY CURRENT vs. TEMPERATURE



INPUT OFFSET VOLTAGE vs.TEMPERATURE



INPUT BIAS CURRENT vs.TEMPERATURE

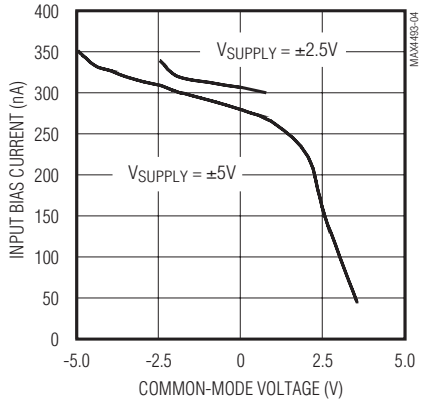


SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

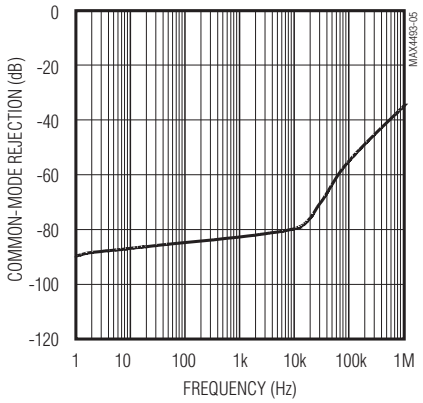
Typical Operating Characteristics (continued)

(V_{CC} = +5V, V_{EE} = -5V, V_{CM} = 0V, R_L = 100kΩ to ground, C_L = 15pF, T_A = +25°C, unless otherwise noted.)

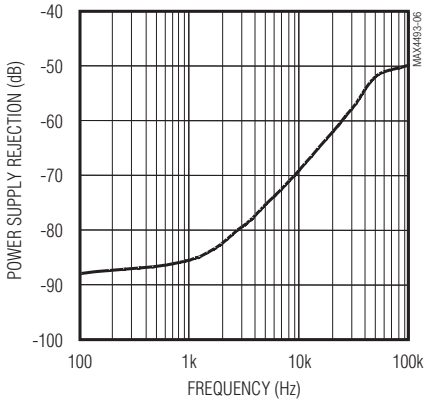
INPUT BIAS CURRENT vs. COMMON-MODE VOLTAGE



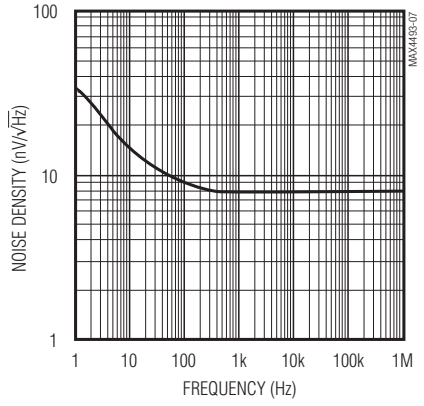
COMMON-MODE REJECTION vs. FREQUENCY



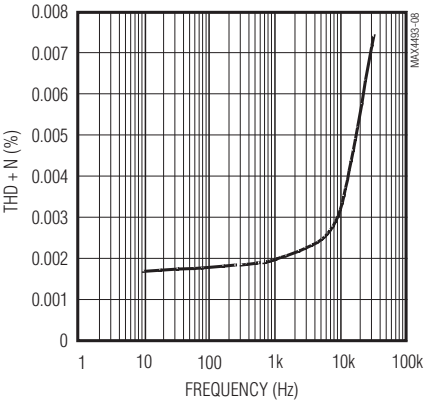
POWER-SUPPLY REJECTION vs. FREQENCY (V_{SUPPLY} = ±2.5V to ±5.5V)



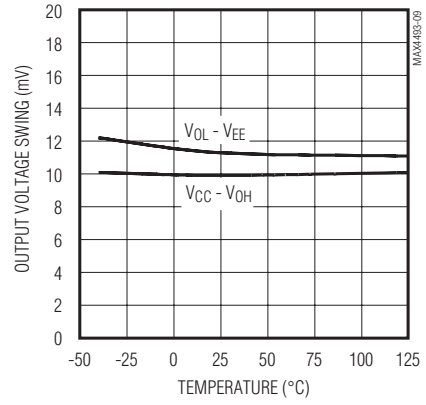
INPUT VOLTAGE NOISE DENSITY vs. FREQUENCY



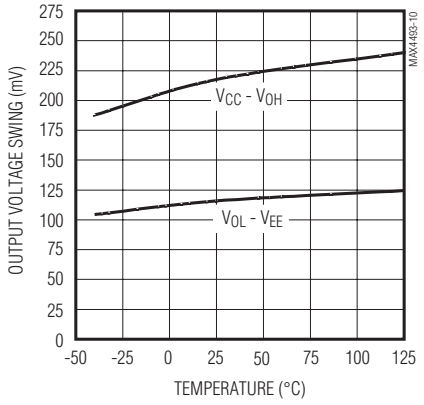
TOTAL HARMONIC DISTORTION PLUS NOISE vs. FREQUENCY



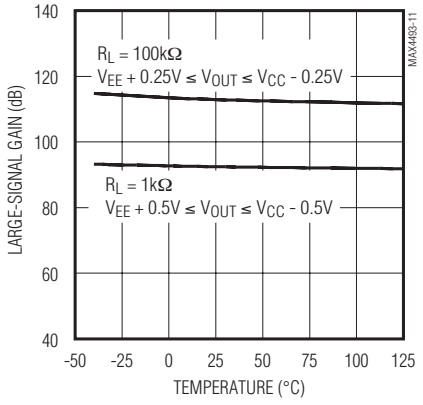
OUTPUT VOLTAGE SWING vs. TEMPERATURE (R_L = 100kΩ)



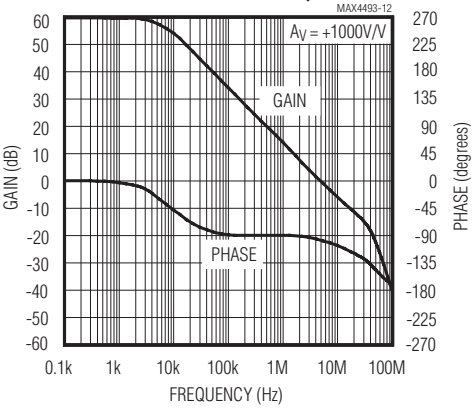
OUTPUT VOLTAGE SWING vs. TEMPERATURE (R_L = 1kΩ)



LARGE-SIGNAL GAIN vs. TEMPERATURE



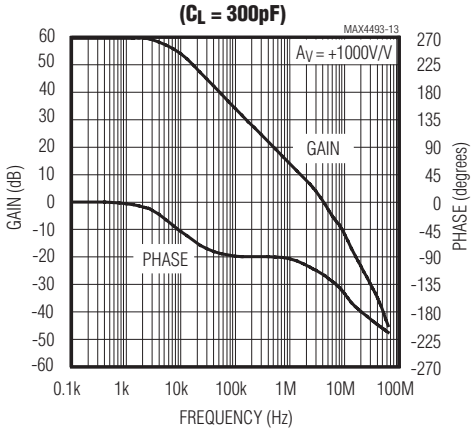
GAIN AND PHASE vs. FREQUENCY



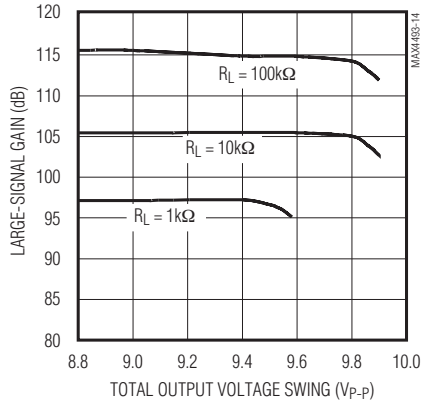
Typical Operating Characteristics (continued)

(V_{CC} = +5V, V_{EE} = -5V, V_{CM} = 0V, R_L = 100kΩ to ground, C_L = 15pF, T_A = +25°C, unless otherwise noted.)

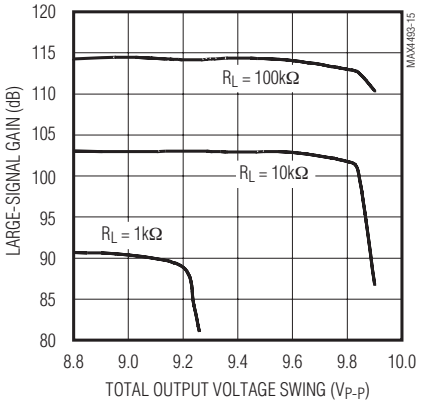
GAIN AND PHASE vs. FREQUENCY (C_L = 300pF)



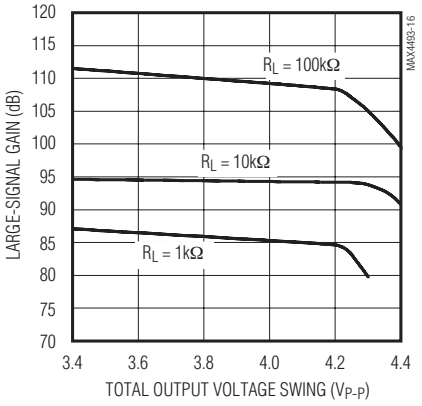
LARGE-SIGNAL GAIN vs. OUTPUT VOLTAGE SWING (R_L TO V_{CC}, V_{CC} = +5V, V_{EE} = -5V)



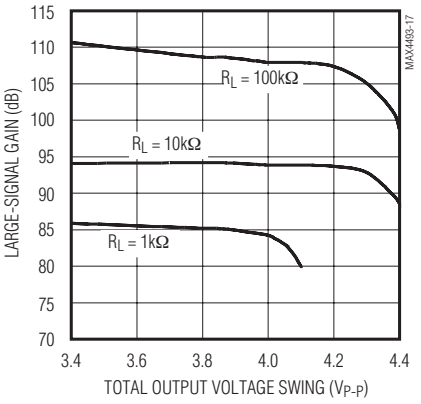
LARGE-SIGNAL GAIN vs. OUTPUT VOLTAGE SWING (R_L TO V_{EE}, V_{CC} = +5V, V_{EE} = -5V)



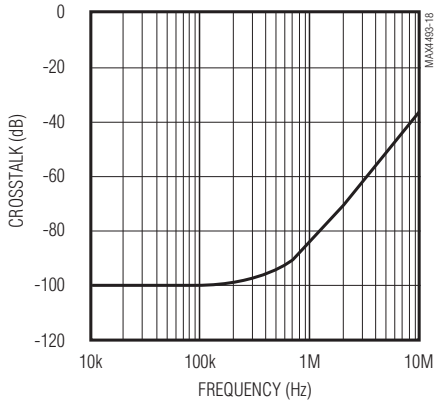
LARGE-SIGNAL GAIN vs. OUTPUT VOLTAGE SWING (R_L TO V_{CC}, V_{CC} = +2.25V, V_{EE} = -2.25V)



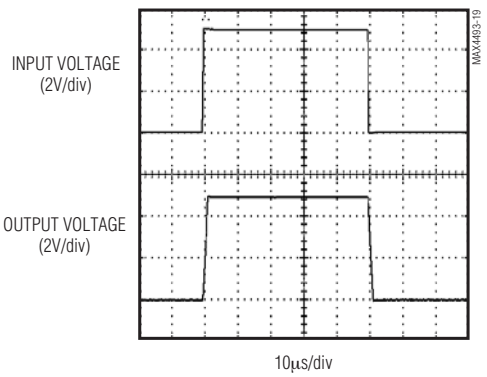
LARGE-SIGNAL GAIN vs. OUTPUT VOLTAGE SWING (R_L TO V_{EE}, V_{CC} = +2.25V, V_{EE} = -2.25V)



MAX4494/MAX4495 CROSSTALK vs. FREQUENCY



LARGE-SIGNAL TRANSIENT RESPONSE



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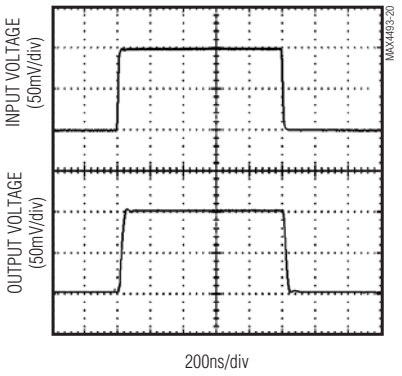
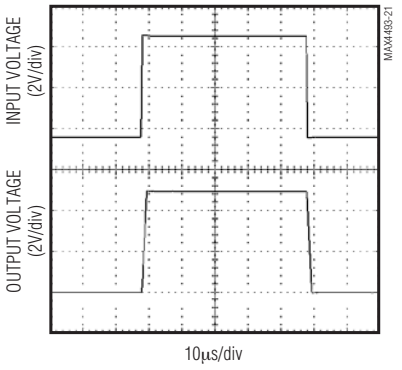
Typical Operating Characteristics (continued)

(V_{CC} = +5V, V_{EE} = -5V, V_{CM} = 0V, R_L = 100kΩ to ground, C_L = 15pF, T_A = +25°C, unless otherwise noted.)

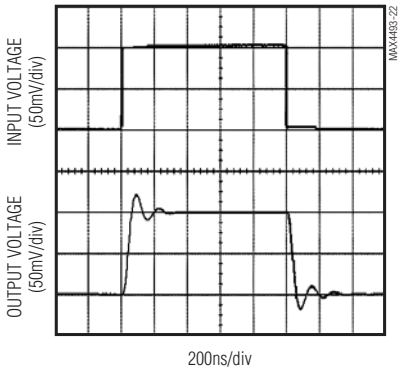
SMALL-SIGNAL TRANSIENT RESPONSE



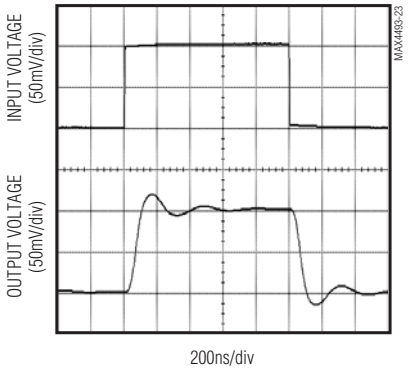
LARGE-SIGNAL CAPACITIVE-LOAD STABILITY (C_L = 1200pF)



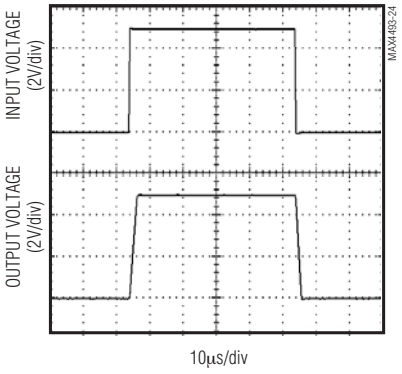
SMALL-SIGNAL CAPACITIVE-LOAD STABILITY (C_L = 300pF)



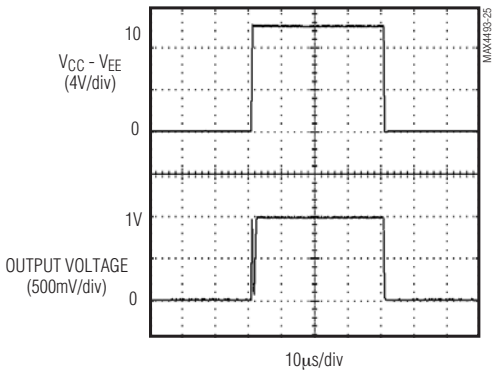
SMALL-SIGNAL TRANSIENT RESPONSE (R_{ISO} = 15Ω, C_L = 1000pF)



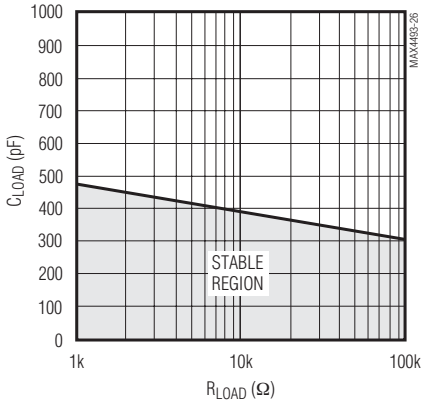
LARGE-SIGNAL TRANSIENT RESPONSE (R_{ISO} = 15Ω, C_L = 0.01µF)



POWER-UP TIME (V_{IN} = +1V)



STABILITY vs. CAPACITIVE AND RESISTIVE LOADS



Pin Description

PIN			NAME	FUNCTION
MAX4493	MAX4494	MAX4495		
—	1	1	OUTA	Channel A Output
—	2	2	INA-	Channel A Inverting Input
—	3	3	INA+	Channel A Noninverting Input
—	7	7	OUTB	Channel B Output
—	6	6	INB-	Channel B Inverting Input
—	5	5	INB+	Channel B Noninverting Input
—	—	8	OUTC	Channel C Output
—	—	9	INC-	Channel C Inverting Input
—	—	10	INC+	Channel C Noninverting Input
—	—	14	OUTD	Channel D Output
—	—	13	IND-	Channel D Inverting Input
—	—	12	IND+	Channel D Noninverting Input
4	—	—-	OUT	Output
1	—	—	IN+	Noninverting Input
3	—	—	IN-	Inverting Input
5	8	4	V_{CC}	Positive Supply
2	4	11	V_{EE}	Negative Supply

Applications Information

Rail-to-Rail Output Stage

The MAX4493/MAX4494/MAX4495 output stage can drive up to 1kΩ and still swing within 200mV of the rails.

Capacitive-Load Stability

Driving large capacitive loads can cause instability in many op amps. The MAX4493/MAX4494/MAX4495 are stable with capacitive loads up to 300pF. The Capacitive-Load Stability graph in the *Typical Operating Characteristics* gives the stable operation region for capacitive versus resistive load. Stability with higher capacitive loads can be improved by adding an isolation resistor in series with the op-amp output, as shown in Figure 1. This resistor improves the circuit's phase margin by isolating the load capacitor from the amplifier's output. As seen in the *Typical Operating Characteristics*, driving capacitive loads with an isolation resistor exhibits some overshoot, but no oscillation.

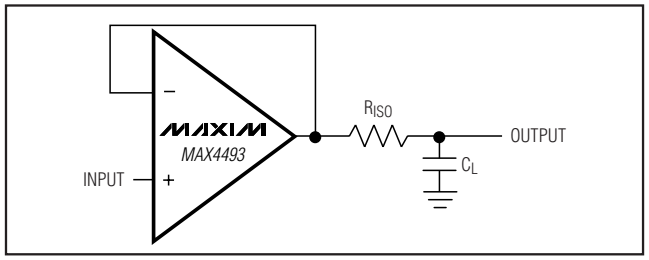


Figure 1. Capacitive Load Driving Circuit

Full-Power Bandwidth

The FPBW is given by:

$$FPBW(Hz) = \frac{SR}{\pi\left[V_{OUTp-p(max)}\right]}$$

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where the slew rate (SR) is 3V/µs. Figure 2 shows the full-power bandwidth as a function of the peak-to-peak AC output voltage.

Power-Up Conditions

The MAX4493/MAX4494/MAX4495 typically settle within 3µs after power-up. See Power-Up Time in *Typical Operating Characteristics*.

Power Supplies and Layout

The MAX4493/MAX4494/MAX4495 operate with dual supplies from ±2.25V to ±5.5V. Bypass both V_{CC} and V_{EE} with their own 0.1µF capacitor to ground.

Good layout technique helps optimize performance by decreasing the amount of stray capacitance at the op amp's inputs and outputs. To decrease stray capacitance, minimize trace lengths by placing external components close to the op amp's pins.

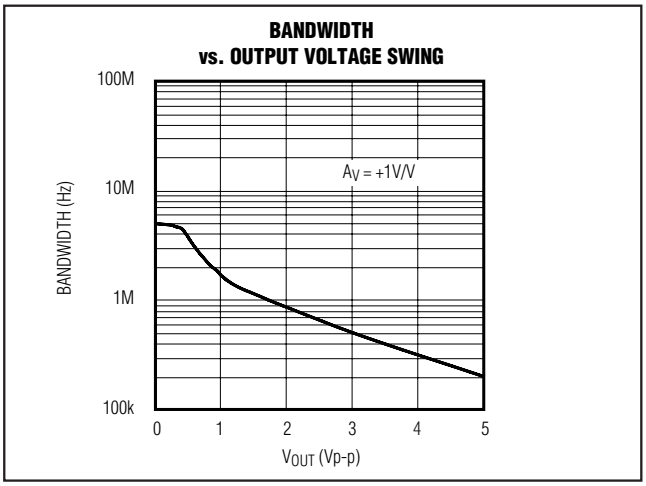
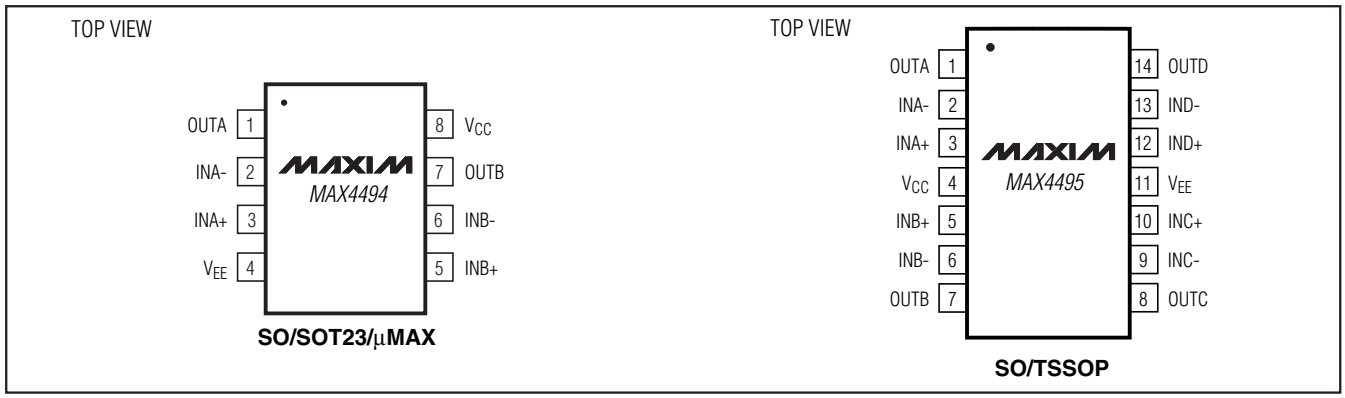
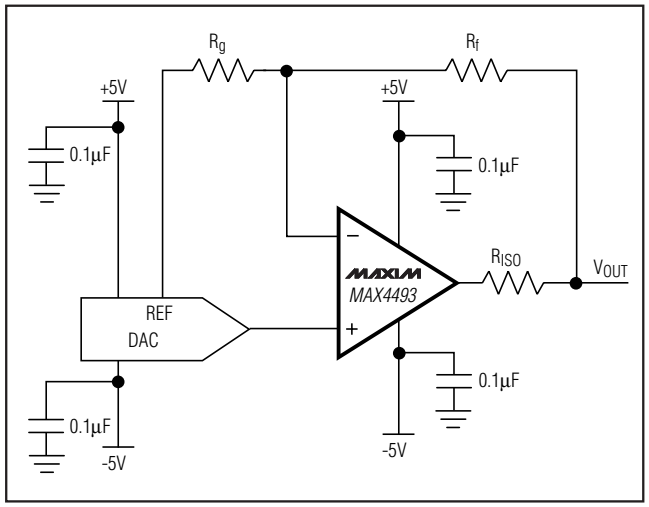


Figure 2. Bandwidth vs. Peak-to-Peak AC Voltage Plot

Pin Configurations (continued)



Typical Operating Circuit



Chip Information

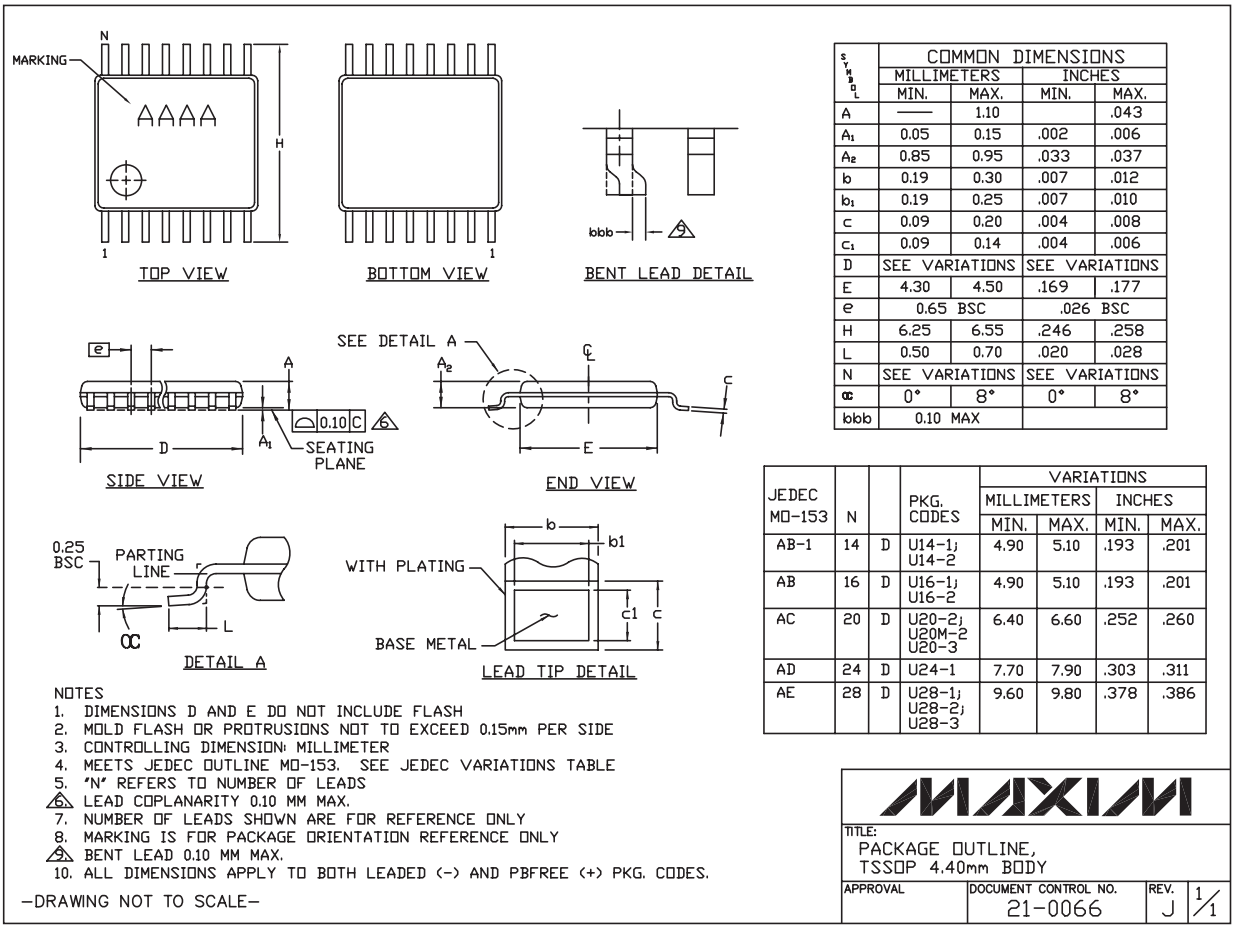
PROCESS: Bipolar

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

Package Information

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. 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	DOCUMENT NO.
14 TSSOP	U14-1	21-0066
5 SOT23	U5-1	21-0057
5 SC70	X5-1	21-0076
8 SO	S8-2	21-0041
8 SOT23	K8-5	21-0078
8 µMAX	U8-1	21-0036
14 SO	S14-1	21-0041



SYMBOL	COMMON DIMENSIONS			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	——	1.10		.043
A_1	0.05	0.15	.002	.006
A_2	0.85	0.95	.033	.037
b	0.19	0.30	.007	.012
b_1	0.19	0.25	.007	.010
c	0.09	0.20	.004	.008
c_1	0.09	0.14	.004	.006
D	SEE VARIATIONS		SEE VARIATIONS	
E	4.30	4.50	.169	.177
e	0.65 BSC		.026 BSC	
H	6.25	6.55	.246	.258
L	0.50	0.70	.020	.028
N	SEE VARIATIONS		SEE VARIATIONS	
α	0°	8°	0°	8°
bbb	0.10 MAX			

JEDEC MO-153	N		PKG. CODES	VARIATIONS			
				MILLIMETERS		INCHES	
				MIN.	MAX.	MIN.	MAX.
AB-1	14	D	U14-1; U14-2	4.90	5.10	.193	.201
AB	16	D	U16-1; U16-2	4.90	5.10	.193	.201
AC	20	D	U20-2; U20M-2 U20-3	6.40	6.60	.252	.260
AD	24	D	U24-1	7.70	7.90	.303	.311
AE	28	D	U28-1; U28-2; U28-3	9.60	9.80	.378	.386

NOTES
1. DIMENSIONS D AND E DO NOT INCLUDE FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm PER SIDE
3. CONTROLLING DIMENSION: MILLIMETER
4. MEETS JEDEC OUTLINE MO-153. SEE JEDEC VARIATIONS TABLE
5. "N" REFERS TO NUMBER OF LEADS
6. LEAD COPLANARITY 0.10 MM MAX.
7. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY
8. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY
9. BENT LEAD 0.10 MM MAX.
10. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PBFREE (+) PKG. CODES.

—DRAWING NOT TO SCALE—

MAXIM

TITLE: PACKAGE OUTLINE, TSSOP 4.40mm BODY

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0066	J	1/1

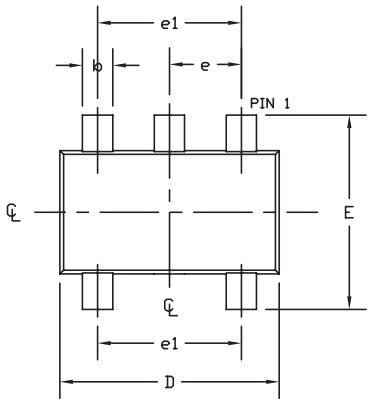
TSSOP4.40mm.EPS

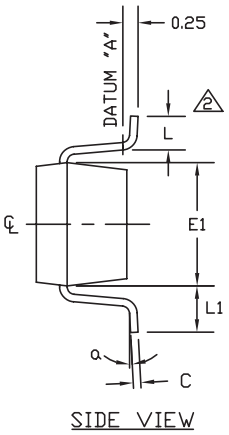
SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

Package Information (continued)

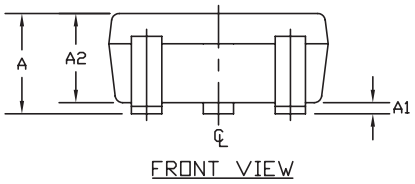
For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

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

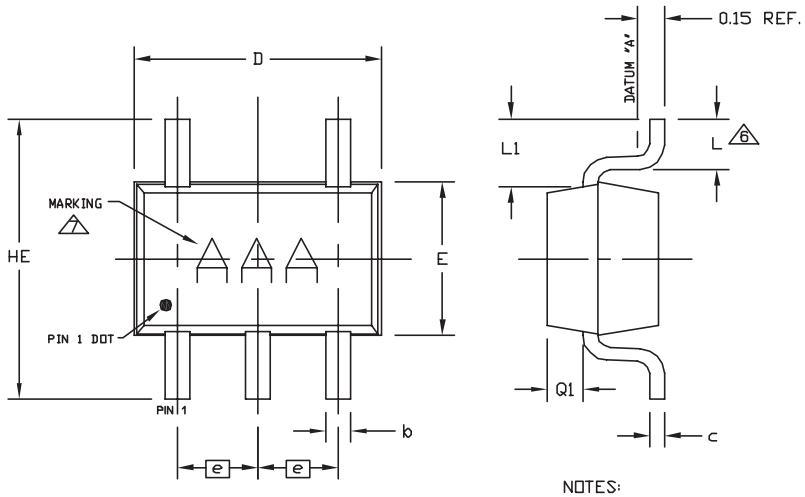
APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0057	F	1/1

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. 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.

SC70, 5L.EPS



COMMON DIMENSIONS			
SYMBOL	MIN	NOM	MAX
A	0.80	0.95	1.10
A1	0.00	0.07	0.10
A2	0.80	0.90	1.00
b	0.15	0.22	0.30
c	0.10	0.14	0.18
D	1.80	2.00	2.20
e	0.65 BSC.		
E	1.15	1.25	1.35
HE	1.80	2.20	2.40
L	0.26	0.34	0.46
L1	0.425 TYP.		
Q1	0.10	0.25	0.40
PKG. CODE	X5-1		

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH & METAL BURR.
4. COMPLY TO JEITA SC-88A EXCEPT FOR DIMENSION "L". ALL DIMENSIONS COMPLY TO JEDEC MO-203.
5. COPLANARITY 4 MILS. MAX.
6. FOOT LENGTH MEASURED AT INTERCEPT POINT BETWEEN DATUM "A" AND LEAD SURFACE.
7. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
8. LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.

-DRAWING NOT TO SCALE-

DALLAS SEMICONDUCTOR MAXIM

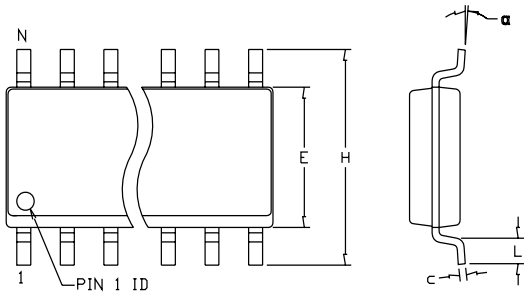
TITLE: PACKAGE OUTLINE, 5L SC70

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0076	E	1/1

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. 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.



COMMON DIMENSIONS				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	.053	.069	1.35	1.75
A1	.004	.010	0.10	0.25
b	.014	.019	0.35	0.49
c	.007	.010	0.19	0.25
E	.150	.157	3.80	4.00
e	.050 BSC		1.27 BSC	
H	.228	.244	5.80	6.20
L	.016	.050	0.40	1.27
α	0°	8°	0°	8°

VARIATION A				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
D	.189	.197	4.80	5.00
N	8			
MS012	AA			
PKG. CODE	S8-2, S8-4, S8-5, S8-6F, S8-7F, S8-8F, S8-10F, S8-11F, S8-16F			

VARIATION B				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
D	.337	.344	8.55	8.75
N	14			
MS012	AB			
PKG. CODE	S14-1, S14-4, S14-5, S14-6; S14M-4, S14M-5, S14M-6, S14M-7			

VARIATION C				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
D	.386	.394	9.80	10.00
N	16			
MS012	AC			
PKG. CODE	S16-1, S16-3, S16-5, S16-6, S16-8, S16-7F, S16-9F, S16-10F; S16M-3, S16M-6			

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. MATERIAL MUST COMPLY WITH BANNED AND RESTRICTED SUBSTANCES SPEC # 10-0131.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.15 MM (.006") PER SIDE.
4. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
5. MEETS JEDEC MS012
6. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PbFREE (+) PKG. CODES.

-DRAWING NOT TO SCALE-

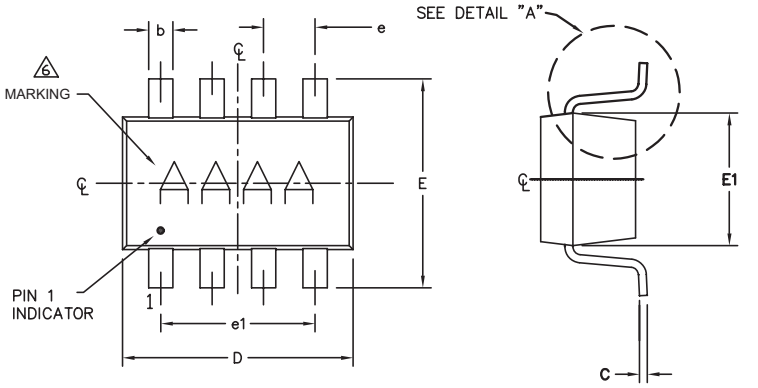
MAXIM

TITLE: PACKAGE OUTLINE, 8L, 14L, 16L SOIC .150 INCH			
APPROVAL	DOCUMENT CONTROL NO. 21-0041	REV. C	1/1

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

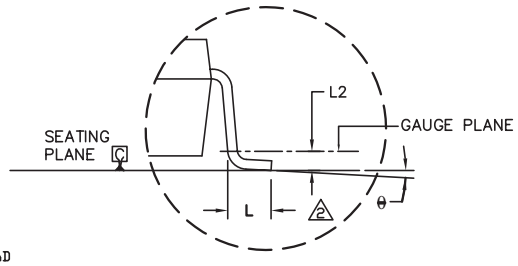
Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. 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.



SYMBOL	MIN	NOM	MAX
A	0.90	1.25	1.45
A1	0.00	0.06	0.15
A2	0.90	1.10	1.30
b	0.22	0.30	0.38
C	0.08	0.15	0.22
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.625	1.75
L	0.30	0.45	0.60
L2	0.25 BSC.		
e	0.65 BSC.		
e1	1.95 REF.		
θ	0°	3°	8°

PKG CODES:
K8-1, K8-2, K8F-4, K8FH-4, K8-5, K8SN-1; K8CN-2



DETAIL "A"

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. FOOT LENGTH MEASURED FROM LEAD TIP TO UPPER RADIUS OF HEEL OF THE LEAD PARALLEL TO SEATING PLANE C.
3. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & METAL BURR.
4. PACKAGE OUTLINE INCLUSIVE OF SOLDER PLATING.
5. COPLANARITY 4 MILS. MAX.
6. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
7. SOLDER THICKNESS MEASURED AT FLAT SECTION OF LEAD BETWEEN 0.08mm AND 0.15mm FROM LEAD TIP.
8. MEETS JEDEC MO178 VARIATION BA.
9. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND LEAD FREE (+) PACKAGE CODES.

-DRAWING NOT TO SCALE-

MAXIM

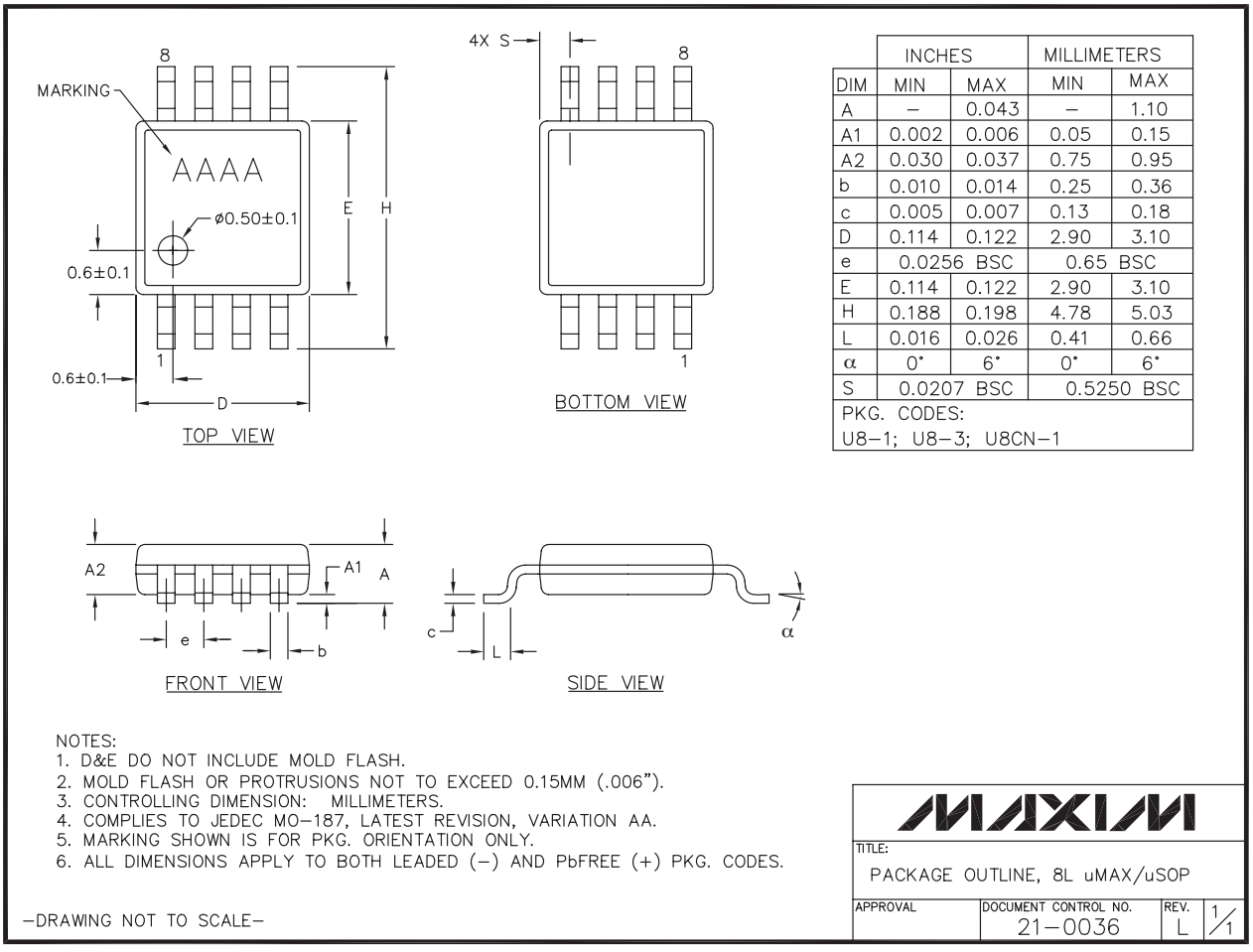
TITLE:
PACKAGE OUTLINE, SOT-23, 8L BODY

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0078	J	1/1

SC70, Low-Power, General-Purpose, Dual-Supply, Rail-to-Rail Op Amps

Package Information (continued)

For the latest package outline information and land patterns, go to **www.maxim-ic.com/packages**. 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.



DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	–	0.043	–	1.10
A1	0.002	0.006	0.05	0.15
A2	0.030	0.037	0.75	0.95
b	0.010	0.014	0.25	0.36
c	0.005	0.007	0.13	0.18
D	0.114	0.122	2.90	3.10
e	0.0256 BSC		0.65 BSC	
E	0.114	0.122	2.90	3.10
H	0.188	0.198	4.78	5.03
L	0.016	0.026	0.41	0.66
α	0°	6°	0°	6°
S	0.0207 BSC		0.5250 BSC	
PKG. CODES: U8-1; U8-3; U8CN-1				

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15MM (.006").
3. CONTROLLING DIMENSION: MILLIMETERS.
4. COMPLIES TO JEDEC MO-187, LATEST REVISION, VARIATION AA.
5. MARKING SHOWN IS FOR PKG. ORIENTATION ONLY.
6. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PbFREE (+) PKG. CODES.

-DRAWING NOT TO SCALE-

MAXIM

TITLE: PACKAGE OUTLINE, 8L uMAX/uSOP

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0036	L	1/1

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
2	10/08	Updated first paragraph of the *General Description* section	1
3	12/09	Added lead-free and automotive parts to *Ordering Information*	1

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