

SBOS347D-NOVEMBER 2005-REVISED MAY 2008

1.8V, 2.9µA, 90kHz, Rail-to-Rail I/O OPERATIONAL AMPLIFIERS

FEATURES

• LOW NOISE: 2.8μV_{PP} (0.1Hz - 10Hz)

UMENTS

microPower: 5.5μA (max)

LOW OFFSET VOLTAGE: 1.5mV (max)

DC PRECISION:
- CMRR: 100dB
- PSRR: 2μV/V
- A_{OL}: 120dB

• WIDE SUPPLY VOLTAGE RANGE: 1.8V to 5.5V

microSize PACKAGES:

SC70-5, SOT23-5, SOT23-8, SO-8, TSSOP-14

APPLICATIONS

- BATTERY-POWERED INSTRUMENTS
- PORTABLE DEVICES
- MEDICAL INSTRUMENTS
- HANDHELD TEST EQUIPMENT

DESCRIPTION

The OPA379 family of micropower, low-voltage operational amplifiers is designed for battery-powered applications. These amplifiers operate on a supply voltage as low as 1.8V (± 0.9 V). High-performance, single-supply operation with rail-to-rail capability ($10\mu V$ max) makes the OPA379 family useful for a wide range of applications.

In addition to *micro*Size packages, the OPA379 family of op amps features impressive bandwidth (90kHz), low bias current (5pA), and low noise (80nV/ $\sqrt{\text{Hz}}$) relative to the very low quiescent current (5.5 μ A max).

The OPA379 (single) is available in SC70-5, SOT23-5, and SO-8 packages. The OPA2379 (dual) comes in SOT23-8 and SO-8 packages. The OPA4379 (quad) is offered in a TSSOP-14 package. All versions are specified from -40°C to +125°C.

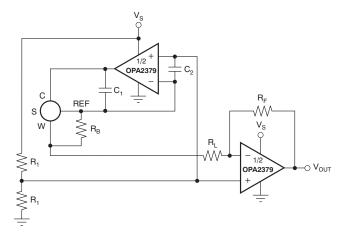


Figure 1. OPA2379 in Portable Gas Meter Application

Table 1. OPAx379 RELATED PRODUCTS

FEATURES	PRODUCT
1μA, 70kHz, 2mV V _{OS} , 1.8V to 5.5V Supply	OPAx349
1μA, 5.5kHz, 390μV V_{OS} , 2.5V to 16V Supply	TLV240x
1μA, 5.5kHz, 0.6mV V _{OS} , 2.5V to 12V Supply	TLV224x
7μA, 160kHz, 0.5mV V _{OS} , 2.7V to 16V Supply	TLV27Lx
7μA, 160kHz, 0.5mV V _{OS} , 2.7V to 16V Supply	TLV238x
20μA, 350kHz, 2mV V _{OS} , 2.3V to 5.5V Supply	OPAx347
20μA, 500kHz, 550μV V _{OS} , 1.8V to 3.6V Supply	TLV276x
45μA, 1MHz, 1mV V _{OS} , 2.1V to 5.5V Supply	OPAx348

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Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.





This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ABSOLUTE MAXIMUM RATINGS(1)

Over operating free-air temperature range (unless otherwise noted).

			OPA379, OPA2379, OPA4379	UNIT		
Supply Voltag	e	V _S = (V+) - (V-)	+7	V		
Signal Input T	erminals, Voltage ⁽²⁾		(V-) - 0.5 to (V+) + 0.5	V		
Signal Input Terminals, Current ⁽²⁾			±10			
Output Short-Circuit (3)			Continuous			
Operating Temperature		T _A	-40 to +125	°C		
Storage Temperature		T _A	-65 to +150	°C		
Junction Temperature		T _J	T _J +150			
CCD Dating	Human Body Model	(HBM)	2000	V		
ESD Rating	Charged Device Model	(CDM)	1000	V		

⁽¹⁾ Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not supported.

PACKAGE/ORDERING INFORMATION(1)

PRODUCT	PACKAGE-LEAD	PACKAGE DESIGNATOR	PACKAGE MARKING		
	SC70-5	DCK	AYR		
OPA379	SOT23-5	DBV	B53		
	SO-8	D	OPA379A		
OD40070	SOT23-8	DCN	B61		
OPA2379	SO-8	D	OPA2379A		
OPA4379	TSSOP-14	PW	OPA4379A		

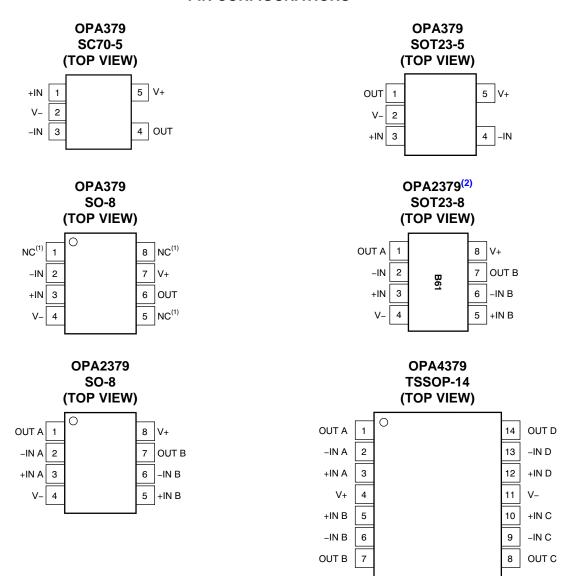
⁽¹⁾ For the most current package and ordering information see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

⁽²⁾ Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

⁽³⁾ Short-circuit to ground, one amplifier per package.



PIN CONFIGURATIONS



- (1) NC denotes no internal connection.
- (2) Pin 1 of the SOT23-8 package is determined by orienting the package marking as shown.



ELECTRICAL CHARACTERISTICS: V_S = +1.8V to +5.5V

Boldface limits apply over the specified temperature range indicated. At $T_A = +25^{\circ}C$, $R_L = 25k\Omega$ connected to $V_S/2$, and $V_{CM} < (V+) - 1V$, unless otherwise noted.

				OPA379, OPA2379, OPA4379				
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT		
OFFSET VOLTAGE								
Initial Offset Voltage	Vos	$V_S = 5V$		0.4	1.5	mV		
Over -40°C to +125°C					2	mV		
Drift, -40°C to +85°C	dV _{os} /dT			1.5		μ ۷/ °C		
Drift, -40°C to +125°C				2.7		μ ۷/ °C		
vs Power Supply	PSRR			2	10	$\mu V/V$		
Over -40°C to +125°C					20	μ V/V		
INPUT VOLTAGE RANGE								
Common-Mode Voltage Range	V_{CM}		(V-)	– 0.1 to (V+)	+ 0.1	V		
Common-Mode Rejection Ratio (1)	CMRR	$(V-) < V_{CM} < (V+) - 1V$	90	100		dB		
Over -40°C to +85°C		$(V-) < V_{CM} < (V+) - 1V$	80			dB		
Over -40°C to +125°C		$(V-) < V_{CM} < (V+) - 1V$	62			dB		
INPUT BIAS CURRENT								
Input Bias Current	I_{B}	$V_S = 5V$, $V_{CM} \le V_S/2$		±5	±50	pA		
Input Offset Current	Ios	$V_S = 5V$		±5	±50	pA		
INPUT IMPEDANCE								
Differential				10 ¹³ 3		Ω pF		
Common-Mode				10 ¹³ 6		Ω pF		
NOISE								
Input Voltage Noise		f = 0.1Hz to 10Hz		2.8		μV_{PP}		
Input Voltage Noise Density	e _n	f = 1kHz		80		nV/√ Hz		
Input Current Noise Density	in	f = 1kHz		1		fA/√ Hz		
OPEN-LOOP GAIN								
Open-Loop Voltage Gain	A _{OL}	$V_S = 5V, R_L = 25k\Omega, 100mV < V_O < (V+) - 100mV$	100	120		dB		
Over -40°C to +125°C	-	$V_S = 5V$, $R_L = 25k\Omega$, $100mV < V_O < (V+) - 100mV$	80			dB		
		$V_S = 5V, R_L = 5k\Omega, 500mV < V_O < (V+) - 500mV$	100	120		dB		
Over -40°C to +125°C		$V_S = 5V$, $R_L = 5k\Omega$, $500mV < V_O < (V+) - 500mV$	80			dB		
ОИТРИТ		· · · · · · · · · · · · · · · · · · ·						
Voltage Output Swing from Rail		$R_L = 25k\Omega$		5	10	mV		
Over –40°C to +125°C		$R_L = 25k\Omega$			15	mV		
		$R_L = 5k\Omega$		25	50	mV		
Over –40°C to +125°C		$R_L = 5k\Omega$			75	mV		
Short-Circuit Current	I _{SC}			±5		mA		
Capacitive Load Drive	C _{LOAD}		See Ty	rpical Charac	teristics			
Closed-Loop Output Impedance	R _{OUT}	$G = 1, f = 1kHz, I_O = 0$		10		Ω		
Open-Loop Output Impedance	Ro	$f = 100kHz, I_0 = 0$		28		kΩ		
FREQUENCY RESPONSE		C _{LOAD} = 30pF						
Gain Bandwidth Product	GBW	1		90		kHz		
Slew Rate	SR	G = +1		0.03		V/μs		
Overload Recovery Time		V _{IN} × GAIN > V _S		25		μs		
Turn-On Time	t _{ON}	0		1		ms		

⁽¹⁾ See Typical Characteristic gragh, Common-Mode Rejection Ratio vs Frequency (Figure 3).



ELECTRICAL CHARACTERISTICS: $V_s = +1.8V$ to +5.5V (continued)

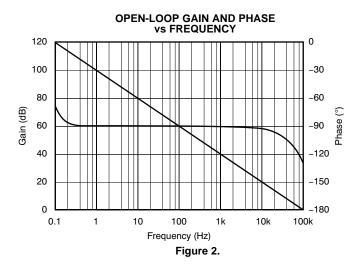
Boldface limits apply over the specified temperature range indicated. At $T_A = +25^{\circ}C$, $R_L = 25k\Omega$ connected to $V_S/2$, and $V_{CM} < (V+) - 1V$, unless otherwise noted.

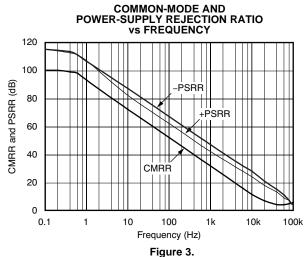
			OPA379,	OPA2379,	OPA4379	
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Specified/Operating Voltage Range	Vs		1.8		5.5	V
Quiescent Current per Amplifier	ΙQ	$V_S = 5.5V, I_O = 0$		2.9	5.5	μΑ
Over -40°C to +125°C					10	μ Α
TEMPERATURE						
Specified/Operating Range	T _A		-40		+125	°C
Storage Range	TJ		-65		+150	°C
Thermal Resistance	θ_{JA}					
SC70-5				250		°C/W
SOT23-5				200		°C/W
SOT23-8, TSSOP-14, SO-8				150		°C/W

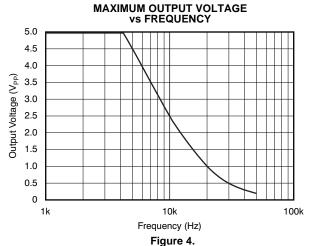


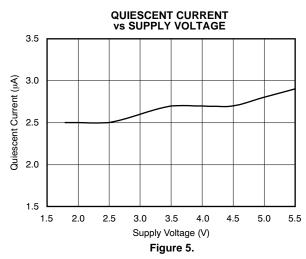
TYPICAL CHARACTERISTICS

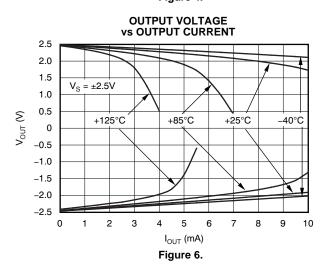
At $T_A = +25^{\circ}C$, $V_S = 5V$, and $R_L = 25k\Omega$ connected to $V_S/2$, unless otherwise noted.

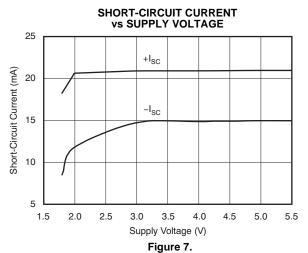














TYPICAL CHARACTERISTICS (continued)

At $T_A = +25$ °C, $V_S = 5$ V, and $R_L = 25$ k Ω connected to $V_S/2$, unless otherwise noted.

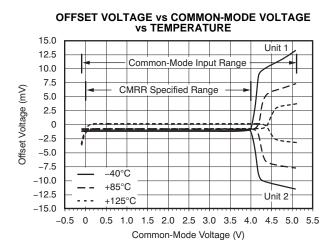
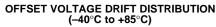
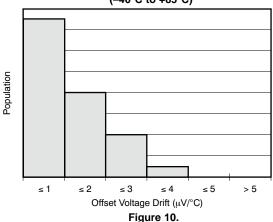


Figure 8.





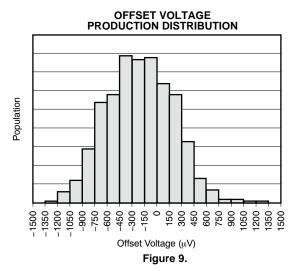
vs TEMPERATURE 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 -50 -25 0 25 50 100 125

Temperature (°C)

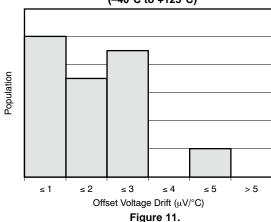
Figure 12.

QUIESCENT CURRENT

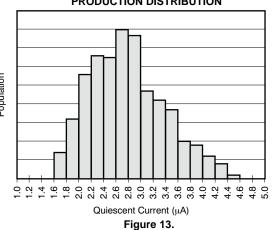
Population



OFFSET VOLTAGE DRIFT DISTRIBUTION (-40°C to +125°C)



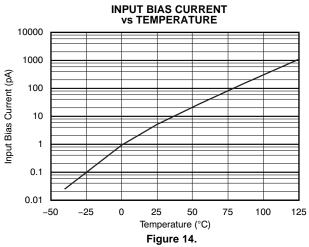
QUIESCENT CURRENT PRODUCTION DISTRIBUTION





TYPICAL CHARACTERISTICS (continued)

At $T_A = +25$ °C, $V_S = 5V$, and $R_L = 25k\Omega$ connected to $V_S/2$, unless otherwise noted.



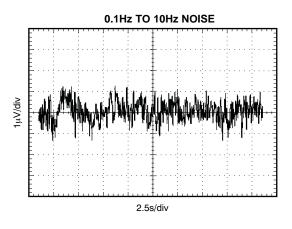
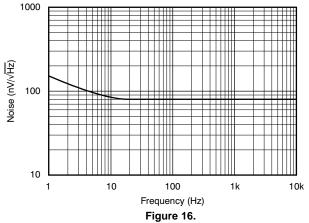
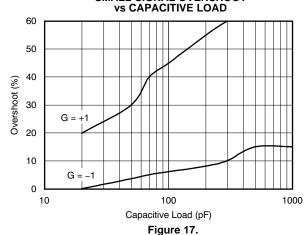
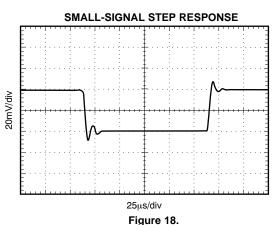


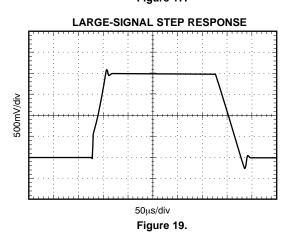
Figure 15.













APPLICATION INFORMATION

The OPA379 family of operational amplifiers minimizes power consumption without compromising bandwidth or noise. Power-supply rejection ratio (PSRR), common-mode rejection ratio (CMRR), and open-loop gain (A_{OL}) typical values are 100dB or better.

When designing for ultra-low power, choose system components carefully. To minimize current consumption, select large-value resistors. Any resistors will react with stray capacitance in the circuit and the input capacitance of the operational amplifier. These parasitic RC combinations can affect the stability of the overall system. A feedback capacitor may be required to assure stability and limit overshoot or gain peaking.

Good layout practice mandates the use of a $0.1\mu F$ bypass capacitor placed closely across the supply pins.

OPERATING VOLTAGE

OPA379 series op amps are fully specified and tested from +1.8V to +5.5V (±0.9V to ±2.75V). Parameters that will vary with supply voltage are shown in the Typical Characteristics curves.

INPUT COMMON-MODE VOLTAGE RANGE

The input common-mode voltage range of the OPA379 family typically extends 100mV beyond each supply rail. This rail-to-rail input is achieved using a complementary input stage. CMRR is specified from the negative rail to 1V below the positive rail. Between (V+) – 1V and (V+) + 0.1V, the amplifier operates with higher offset voltage because of the transition region of the input stage. See the typical characteristic, Offset Voltage vs Common-Mode Voltage vs Temperature (Figure 8).

PROTECTING INPUTS FROM OVER-VOLTAGE

Normally, input currents are 5pA. However, a large voltage input (greater than 500mV beyond the supply rails) can cause excessive current to flow in or out of the input pins. Therefore, as well as keeping the input voltage below the maximum rating, it is also important to limit the input current to less than 10mA. This limiting is easily accomplished with an input voltage resistor, as shown in Figure 20.

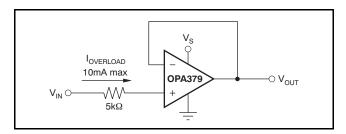


Figure 20. Input Current Protection for Voltages
Exceeding the Supply Voltage

NOISE

Although micropower amplifiers frequently have high wideband noise, the OPA379 series offer excellent noise performance. Resistors should be chosen carefully because the OPA379 has only $2.8\mu V_{PP}$ of 0.1Hz to 10Hz noise, and $80nV/\sqrt{Hz}$ of wideband noise; otherwise, they can become the dominant source of noise.

CAPACITIVE LOAD AND STABILITY

Follower configurations with load capacitance in excess of 30pF can produce extra overshoot (see typical characteristic Small-Signal Overshoot vs Capacitive Load, Figure 17) and ringing in the output signal. Increasing the gain enhances the ability of the amplifier to drive greater capacitive loads. In unity-gain configurations, capacitive load drive can be improved by inserting a small (10Ω to 20Ω) resistor, R_S, in series with the output, as shown in Figure 21. This resistor significantly reduces ringing while maintaining direct current (dc) performance for purely capacitive loads. However, if there is a resistive load in parallel with the capacitive load, a voltage divider is created, introducing a dc error at the output and slightly reducing the output swing. The error introduced is proportional to the ratio R_S/R_I, and is generally negligible.

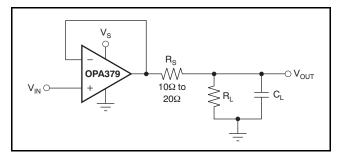


Figure 21. Series Resistor in Unity-Gain Buffer Configuration Improves Capacitive Load Drive

In unity-gain inverter configuration, phase margin can be reduced by the reaction between the capacitance at the op amp input and the gain setting resistors. Best performance is achieved by using smaller valued resistors. However, when large valued resistors cannot be avoided, a small (4pF to 6pF) capacitor, C_{FB} , can be inserted in the feedback, as shown in Figure 22. This configuration significantly reduces overshoot by compensating the effect of capacitance, C_{IN} , which includes the amplifier input capacitance (3pf) and printed circuit board (PC) parasitic capacitance.

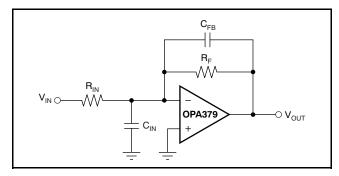


Figure 22. Improving Stability for Large R_F and R_{IN}

BATTERY MONITORING

The low operating voltage and quiescent current of the OPA379 series make it an excellent choice for battery monitoring applications, as shown in Figure 23. In this circuit, V_{STATUS} is high as long as the battery voltage remains above 2V. A low-power reference is used to set the trip point. Resistor values are selected as follows:

1. R_F Selecting: Select R_F such that the current through R_F is approximately 1000x larger than the maximum bias current over temperature:

$$R_{F} = \frac{V_{REF}}{1000(I_{BMAX})}$$

$$= \frac{1.2V}{1000(100pA)}$$

$$= 12M\Omega \approx 10M\Omega \tag{1}$$

- 2. Choose the hysteresis voltage, V_{HYST}. For battery monitoring applications, 50mV is adequate.
- Calculate R₁ as follows:

$$R_{1} = R_{F} \left(\frac{V_{HYST}}{V_{BATT}} \right) = 10M\Omega \left(\frac{50mW}{2.4V} \right) = 210k\Omega$$
 (2)

- 4. Select a threshold voltage for V_{IN} rising $(V_{THRS}) = 2.0V$
- 5. Calculate R₂ as follows:

$$R_{2} = \frac{1}{\left[\left(\frac{V_{THRS}}{V_{REF} \times R_{1}}\right) - \frac{1}{R_{1}} - \frac{1}{R_{F}}\right]}$$

$$= \frac{1}{\left[\left(\frac{2V}{1.2V \times 210k\Omega}\right) - \frac{1}{210k\Omega} - \frac{1}{10M\Omega}\right]}$$

$$= 325k\Omega \tag{3}$$

6. Calculate R_{BIAS} : The minimum supply voltage for this circuit is 1.8V. The REF1112 has a current requirement of 1.2 μ A (max). Providing 2 μ A of supply current assures proper operation. Therefore:

$$R_{BIAS} = \frac{(V_{BATTMIN} - V_{REF})}{I_{BIAS}} = \frac{(1.8V - 1.2V)}{2\mu A} = 0.3M\Omega$$
 (4)

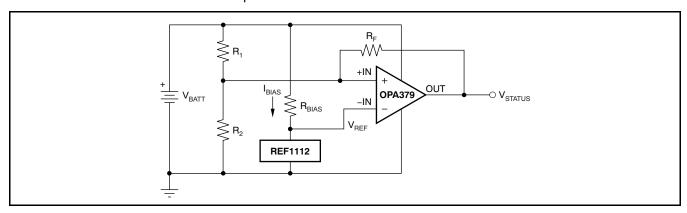


Figure 23. Battery Monitor



WINDOW COMPARATOR

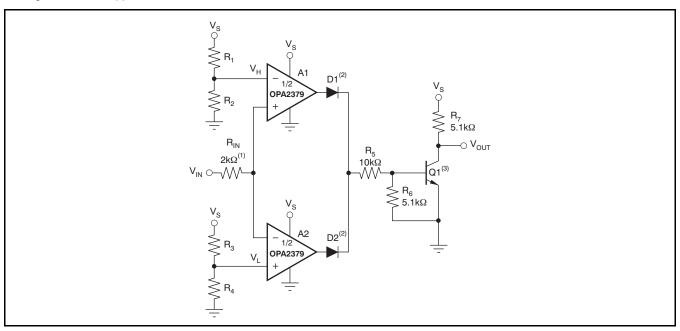
Figure 24 shows the OPA2379 used as a window comparator. The threshold limits are set by V_H and V_L , with $V_H > V_L$. When $V_{IN} < V_H$, the output of A1 is low. When $V_{IN} > V_L$, the output of A2 is low. Therefore, both op amp outputs are at 0V as long as V_{IN} is between V_H and V_L . This architecture results in no current flowing through either diode, Q1 in cutoff, with the base voltage at 0V, and V_{OUT} forced high.

If V_{IN} falls below V_L , the output of A2 is high, current flows through D2, and V_{OUT} is low. Likewise, if V_{IN} rises above V_H , the output of A1 is high, current flows through D1, and V_{OUT} is low.

The window comparator threshold voltages are set as follows:

$$V_{H} = \frac{R_{2}}{R_{1} + R_{2}} \times V_{S}$$
 (5)

$$V_{L} = \frac{R_4}{R_3 + R_4} \times V_{S} \tag{6}$$



- (1) R_{IN} protects A1 and A2 from possible excess current flow.
- (2) IN4446 or equivalent diodes.
- (3) 2N2222 or equivalent NPN transistor.

Figure 24. OPA2379 as a Window Comparator

ADDITIONAL APPLICATION EXAMPLES

Figure 25 through Figure 29 illustrate additional application examples.

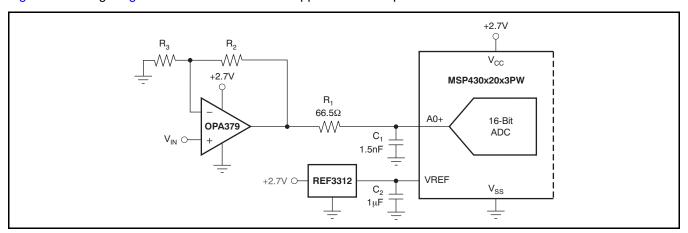


Figure 25. Unipolar Signal Chain Configuration

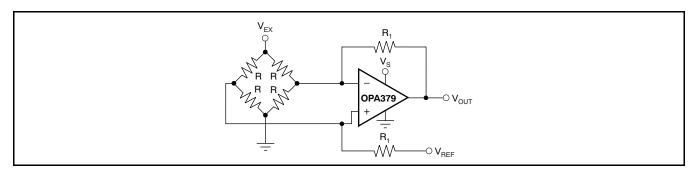
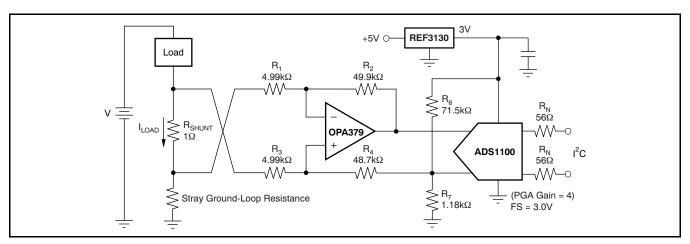


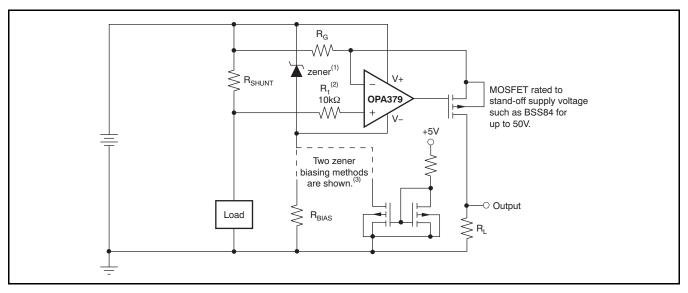
Figure 26. Single Op Amp Bridge Amplifier



NOTE: 1% resistors provide adequate common-mode rejection at small ground-loop errors.

Figure 27. Low-Side Current Monitor





- (1) Zener rated for op amp supply capability (that is, 5.1V for OPA379).
- (2) Current-limiting resistor.
- (3) Choose zener biasing resistor or dual NMOSMETs (FDG6301N, NTJD4001N, or Si1034).

Figure 28. High-Side Current Monitor

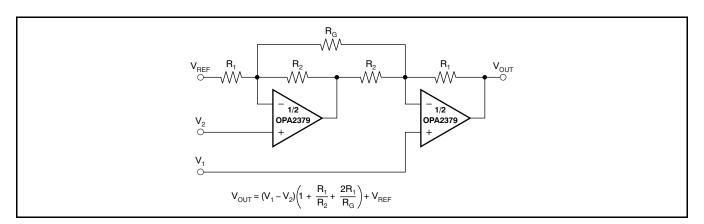


Figure 29. Two Op Amp Instrumentation Amplifier







PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
OPA2379AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDCNR	ACTIVE	SOT-23	DCN	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDCNRG4	ACTIVE	SOT-23	DCN	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDCNT	ACTIVE	SOT-23	DCN	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDCNTG4	ACTIVE	SOT-23	DCN	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA2379AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDCKTG4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA379AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA4379AIPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA4379AIPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
OPA4379AIPWT	PREVIEW	TSSOP	PW	14	250	TBD	Call TI	Call TI

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in



PACKAGE OPTION ADDENDUM

11-Jul-2008

a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

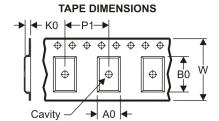
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TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
OPA2379AIDCNR	SOT-23	DCN	8	3000	180.0	8.4	3.2	3.1	1.39	4.0	8.0	Q3
OPA2379AIDCNT	SOT-23	DCN	8	250	180.0	8.4	3.2	3.1	1.39	4.0	8.0	Q3
OPA2379AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
OPA379AIDBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.1	1.39	4.0	8.0	Q3
OPA379AIDBVT	SOT-23	DBV	5	250	180.0	8.4	3.2	3.1	1.39	4.0	8.0	Q3
OPA379AIDCKR	SC70	DCK	5	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
OPA379AIDCKT	SC70	DCK	5	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
OPA379AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
OPA4379AIPWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1





*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
OPA2379AIDCNR	SOT-23	DCN	8	3000	190.5	212.7	31.8
OPA2379AIDCNT	SOT-23	DCN	8	250	190.5	212.7	31.8
OPA2379AIDR	SOIC	D	8	2500	346.0	346.0	29.0
OPA379AIDBVR	SOT-23	DBV	5	3000	190.5	212.7	31.8
OPA379AIDBVT	SOT-23	DBV	5	250	190.5	212.7	31.8
OPA379AIDCKR	SC70	DCK	5	3000	195.0	200.0	45.0
OPA379AIDCKT	SC70	DCK	5	250	195.0	200.0	45.0
OPA379AIDR	SOIC	D	8	2500	346.0	346.0	29.0
OPA4379AIPWR	TSSOP	PW	14	2000	346.0	346.0	29.0

DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-178 Variation AA.



DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
- D. Falls within JEDEC MO-203 variation AA.



PW (R-PDSO-G**)

14 PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-153

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



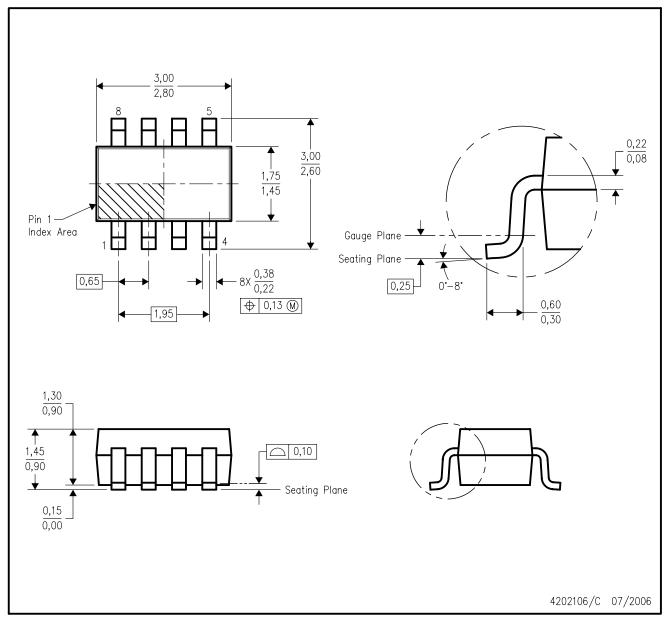
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AA.



DCN (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



NOTES:

- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Package outline exclusive of mold flash, metal burr & dambar protrusion/intrusion.
- D. Package outline inclusive of solder plating.
- E. A visual index feature must be located within the Pin 1 index area.
- F. Falls within JEDEC MO-178 Variation BA.



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