



ADVANCED  
LINEAR  
DEVICES, INC.

SHORT FORM CATALOG

# precision analog semiconductors

Nano-Power • Standard & Unique Functions • User-Specified Options

Small Signal MOSFET Arrays

Operational Amplifiers

EPAD<sup>®</sup> Voltage Comparators

Analog Switches

CMOS Analog Timers

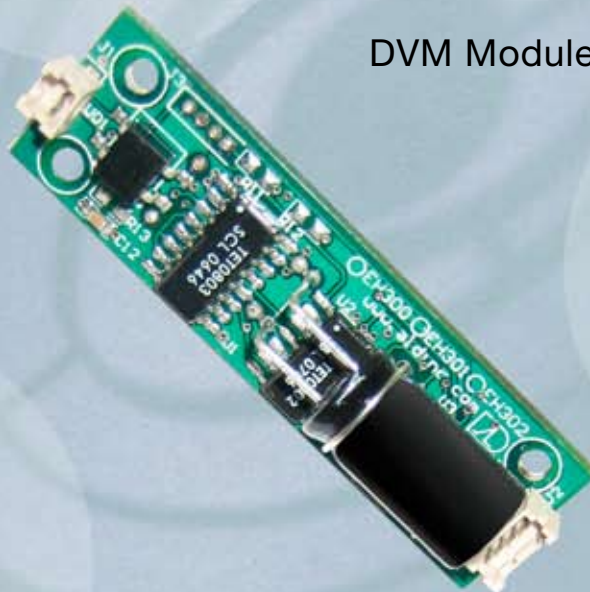
Integrating A/D Converters

Energy Harvesting Modules

DVM Modules & Chipsets



ALD 4201



ALD521DPD  
1331 0012



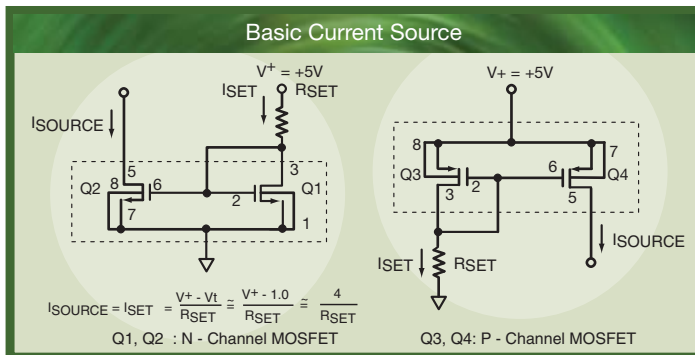
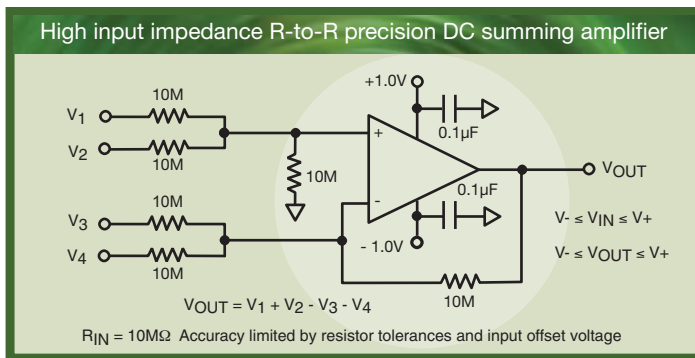
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# A Pioneer in the Field of Precision Analog Semiconductors

Founded in 1985, Advanced Linear Devices, Inc. is a leading Silicon Valley manufacturer of precision CMOS analog integrated circuits and specialty system circuit boards employing the company's proprietary EPAD<sup>®</sup> technology. Recognized over the years as an analog pioneer in precision ultra-low

power devices, ALD has introduced many industry first products including CMOS rail-to-rail operational amplifiers, function-specific ASIC program, EPAD MOSFET, 5-1/2 digit DVM chipset, zero threshold MOSFET array, and EPAD voltage comparator. The latest addition to this impressive list is the ALD Energy Harvesting (EH) Module featuring unparalleled high-efficiency energy storage.



the manufacture of precision and ultra low power operation featured in many ALD analog components. In recent years, EPAD has also been expanded into nano-power analog elements found in today's energy harvesting modules and precision digital voltmeter products. This technology is totally transparent to the user with no additional design knowledge or special handling required. Each product performs to full specifications as a standard, off-the-shelf precision analog component that is readily available direct from the factory or through a variety of domestic and international electronic distribution sources. Many EPAD products can also be supplied with optional, user specified threshold voltages as solutions for difficult design challenges.

## EPAD<sup>®</sup> Technology

EPAD<sup>®</sup> (Electrically Programmable Analog Device) is an ALD proprietary semiconductor device (Floating-Gate) trimming technology that contains MOSFET transistors with factory-trimmed precision threshold voltages. Specifically designed and developed over the past twenty years, EPAD has emerged as a unique design element integrated into



## Product Summary & Selection Guide

### **Precision Matched Small Signal MOSFET Arrays**

ALD MOSFET transistor arrays are available in both N-channel and P-channel types with precision matching characteristics.

### **Precision EPAD<sup>®</sup> Matched Small Signal MOSFET Arrays**

ALD EPAD MOSFET transistor arrays are offered with factory-trimmed, precision matching characteristics. This growing family of devices is available in enhancement, zero-threshold and depletion-mode versions with precise turn-on threshold voltages across a voltage range from +5.00V to -5.00V. The zero-threshold-mode features exactly 0.00V threshold voltage—a unique industry first.

### **Precision Operational Amplifiers**

ALD makes a broad line of precision rail-to-rail CMOS operational amplifiers. These devices offer a combination of ultra-low input offset voltages with ultra-low input bias currents. They are available in a variety of operating power ranges and bandwidths, offset voltages, temperature ranges, package types and configuration.

### **Precision Analog IC's**

#### **Ultra Low Input Offset Voltage EPAD<sup>®</sup> Dual CMOS Analog Voltage Comparators**

ALD precision voltage comparators are available as micropower devices with ultra low input offset voltages, ultra low input currents and high output current drivers. These devices offer extremely low input drive requirements and extremely high input-to-output current gains. They are available in a variety of package types and optional performance specifications.

#### **Ultra Low Charge Injection Low Voltage Analog Switches**

ALD CMOS analog switches feature extremely low charge injection and low voltage operation. Current device types available include break-before-make and make-before-break, quad normally-open, quad normally-closed and dual normally-open plus dual normally-closed.

#### **Precision Low Drift Low Power CMOS Analog Timers**

ALD analog low-drift CMOS timers are easy-to-use precision analog timers in single, dual and quad versions with low operating power and high discharge output characteristics.

### **Energy Harvesting Modules and DVM System Boards**

#### **High-Efficiency EPAD<sup>®</sup> Energy Harvesting Modules**

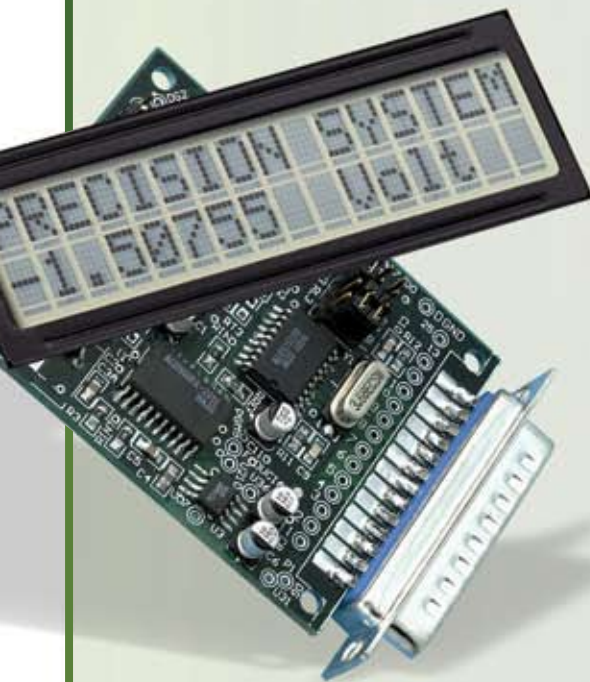
ALD EH300 and EH301 Series Energy Harvesting Modules are nano-power devices designed to power intermittent duty wireless sensor systems. They are used to either replace a battery or supplement a battery charging circuit that eliminates frequent battery replacements. Micropower energy is input to the module from a variety of energy generators including solar cells, piezoelectric, magnetic coil and various thermoelectric materials. Output energy is made available to power most conventional ICs and circuits within their required operating voltages and currents. Specific onboard functions include energy capture, accumulation, storage, power conditioning and management.

#### **± 5 1/2 Digit DVM (Digital Voltmeter) Boards**

ALD MB1, MB201 and MB203 series are low cost, high resolution and high precision measurement engines consisting of functional digital voltmeter (DVM) printed circuit board modules. These modules incorporate on-board ALD500/ALD500R and ALD521D/ALD523D DVM chipsets with associated support and microcontroller-interface circuitry designed for precision embedded DVM display applications.

#### **Dual Slope Integrating Analog Processors and Chipsets**

ALD500 series is a family of monolithic CMOS analog processor chips that implement precision, low power, low noise integrating dual slope A/D converters having a resolution of 16, 17 and 18 bits, plus sign bit and over-range bit. They are ideally suited for a variety of high accuracy line-powered and portable digital multimeter applications requiring 4 1/2 and 5 1/2 digit plus sign measurement resolution. Other members of the product family include precision on-chip voltage-referenced versions and DVM Chipset digital controllers



# Precision Matched Small Signal MOSFET Arrays

- Low threshold voltage<sup>1</sup>
- Patented EPAD<sup>®</sup>Technology
- Low voltage & nanopower circuits
- Near infinite current gain
- Drain source breakdown: 10V min.
- ROHS (leadfree) Compliant
- Temperature range: 0 to 70°C<sup>2</sup>
- Ideal current mirrors and current sources
- Drain source on resistance match: 0.5% typ.

## ALD N-CHANNEL ENHANCEMENT MODE (SO & MSOP packages are surface mount)

Part No.	Description	Package	Threshold Voltage Typ. (V)	Threshold Voltage Tol. (±) (V)	Offset Voltage Max. (±) (V)	On Drain Current Min. (mA)	Gate Input Leakage Current max. (pA)	Drain Source On Resistance Max. OHMS	Drain Source Leakage Currant Max. (nA)
ALD1101APAL	Dual N-Channel Matched Pair MOSFET	DIP-8	0.7	0.3	2	25	50	75	4
ALD1101ASAL	Dual N-Channel Matched Pair MOSFET	SO-8	0.7	0.3	2	25	50	75	4
ALD1101PAL	Dual N-Channel Matched Pair MOSFET	DIP-8	0.7	0.3	10	25	50	75	4
ALD1101SAL	Dual N-Channel Matched Pair MOSFET	SO-8	0.7	0.3	10	25	50	75	4
ALD1106PBL	Quad N-Channel Matched Pair MOSFET Array	DIP-14	0.7	0.3	10	3	10	500	0.4
ALD1106SBL	Quad N-Channel Matched Pair MOSFET Array	SO-14	0.7	0.3	10	3	10	500	0.4
ALD110802PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	0.20	0.02	10	3	30	500	0.1
ALD110802SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	0.20	0.02	10	3	30	500	0.1
ALD110804PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	0.40	0.02	10	3	100	500	0.4
ALD110804SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	0.40	0.02	10	3	100	500	0.4
ALD110808PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	0.80	0.02	10	3	30	500	0.1
ALD110808SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	0.80	0.02	10	3	30	500	0.1
ALD110808APCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	0.80	0.02	2	3	30	500	0.1
ALD110808ASCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	0.80	0.02	2	3	30	500	0.1
ALD110814PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	1.40	0.04	10	3	30	500	0.1
ALD110814SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	1.40	0.04	10	3	30	500	0.1
ALD110902PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	0.20	0.02	10	3	30	500	0.1
ALD110902SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	0.20	0.02	10	3	30	500	0.1
ALD110904PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	0.40	0.02	10	3	100	500	0.4
ALD110904SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	0.40	0.02	10	3	100	500	0.4
ALD110908PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	0.80	0.02	10	3	30	500	0.1
ALD110908SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	0.80	0.02	10	3	30	500	0.1
ALD110908APAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	0.80	0.02	2	3	30	500	0.1
ALD110908ASAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	0.80	0.02	2	3	30	500	0.1
ALD110914PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	1.40	0.04	10	3	30	500	0.1
ALD110914SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	1.40	0.04	10	3	30	500	0.1
ALD1116PAL	Dual N-Channel Matched Pair MOSFET	DIP-8	0.7	0.3	10	3	10	500	0.4
ALD1116SAL	Dual N-Channel Matched Pair MOSFET	SO-8	0.7	0.3	10	3	10	500	0.4
ALD111933MAL	Dual N-Channel EPAD Matched Pair MOSFET	MSOP-8	3.30	0.05	20	3	100	500	0.4
ALD111933PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	3.30	0.05	20	3	100	500	0.4
ALD111933SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	3.30	0.05	20	3	100	500	0.4
ALD1121EPAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	1.00	0.01	5	3	100	500	0.4
ALD1121ESAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	1.00	0.01	5	3	100	500	0.4
ALD1123EPCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	1.00	0.01	5	3	100	500	0.4
ALD1123ESCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	1.00	0.01	5	3	100	500	0.4

## ALD P-CHANNEL ENHANCEMENT MODE

ALD1102PAL	Dual P-Channel Matched Pair MOSFET	DIP-8	-0.8	0.4	10	-8	50	270	4
ALD1102SAL	Dual P-Channel Matched Pair MOSFET	SO-8	-0.8	0.4	10	-8	50	270	4
ALD1102APAL	Dual P-Channel Matched Pair MOSFET	DIP-8	-0.8	0.4	2	-8	50	270	4
ALD1102ASAL	Dual P-Channel Matched Pair MOSFET	SO-8	-0.8	0.4	2	-8	50	270	4
ALD1107PBL	Quad P-Channel Matched Pair MOSFET Array	DIP-14	-0.7	0.3	10	-1.3	10	1800	0.4
ALD1107SBL	Quad P-Channel Matched Pair MOSFET Array	SO-14	-0.7	0.3	10	-1.3	10	1800	0.4
ALD1117PAL	Dual P-Channel Matched Pair MOSFET	DIP-8	-0.7	0.3	10	-1.3	10	1800	0.4
ALD1117SAL	Dual P-Channel Matched Pair MOSFET	SO-8	-0.7	0.3	10	-1.3	10	1800	0.4

## ALD COMPLEMENTARY N-CHANNEL & P-CHANNEL ENHANCEMENT MODE MOSFET

ALD1103PBL	Dual N-Channel & Dual P-Channel Matched Pair	DIP-14	0.7/-0.7	0.3 / 0.3	10	25/-8	50	75/270	4
ALD1103SBL	Dual N-Channel & Dual P-Channel Matched Pair	SO-14	0.7/-0.7	0.3 / 0.3	10	25/-8	50	75/270	4
ALD1105PBL	Dual N-Channel & Dual P-Channel Matched Pair	DIP-14	0.7/-0.7	0.3 / 0.3	10	3/-1.3	50	500/1800	0.4
ALD1105SBL	Dual N-Channel & Dual P-Channel Matched Pair	SO-14	0.7/-0.7	0.3 / 0.3	10	3/-1.3	50	500/1800	0.4
ALD1115MAL	Complementary N-Channel & P-Channel	MSOP-8	0.7/-0.7	0.3	10	3/-1.3	50	500/1800	0.4
ALD1115PAL	Complementary N-Channel & P-Channel	DIP-8	0.7/-0.7	0.3	10	3/-1.3	50	500/1800	0.4
ALD1115SAL	Complementary N-Channel & P-Channel	SO-8	0.7/-0.7	0.3	10	3/-1.3	50	500/1800	0.4

## ALD N-CHANNEL ZERO THRESHOLD MODE

ALD110800PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	0.00	0.02	10	3	30	500	0.1
ALD110800SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	0.00	0.02	10	3	30	500	0.1
ALD110800APCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	0.00	0.01	2	3	30	500	0.1
ALD110800ASCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	0.00	0.01	2	3	30	500	0.1
ALD110900PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	0.00	0.02	10	3	30	500	0.1
ALD110900SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	0.00	0.02	10	3	30	500	0.1
ALD110900APAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	0.00	0.01	2	3	30	500	0.1
ALD110900ASAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	0.00	0.01	2	3	30	500	0.1

## ALD N-CHANNEL DEPLETION MODE

ALD114804PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	-0.40	0.04	20	3	30	75	0.1
ALD114804SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	-0.40	0.04	20	3	30	75	0.1
ALD114804APCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	-0.40	0.02	5	3	30	75	0.1
ALD114804ASCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	-0.40	0.02	5	3	30	75	0.1
ALD114813PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	-1.30	0.04	20	3	30	75	0.1
ALD114813SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	-1.30	0.04	20	3	30	75	0.1
ALD114835PCL	Quad N-Channel EPAD Matched Pair MOSFET Array	DIP-16	-3.50	0.05	20	3	30	75	0.1
ALD114835SCL	Quad N-Channel EPAD Matched Pair MOSFET Array	SO-16	-3.50	0.05	20	3	30	75	0.1
ALD114904PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	-0.40	0.04	20	3	30	75	0.1
ALD114904SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	-0.40	0.04	20	3	30	75	0.1
ALD114904APAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	-0.40	0.02	5	3	30	75	0.1
ALD114904ASAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	-0.40	0.02	5	3	30	75	0.1
ALD114913PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	-1.30	0.04	20	3	30	75	0.1
ALD114913SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	-1.30	0.04	20	3	30	75	0.1
ALD114935PAL	Dual N-Channel EPAD Matched Pair MOSFET	DIP-8	-3.50	0.05	20	3	30	75	0.1
ALD114935SAL	Dual N-Channel EPAD Matched Pair MOSFET	SO-8	-3.50	0.05	20	3	30	75	0.1

1. Optional user specified threshold voltages.

2. Optional industrial temperature range (-40°C to +85°C) or Military temperature range (-55°C to +125°C)

# Precision Operational Amplifiers

- Temp. Range: 0 to 70°C
- Patented EPAD® Technology
- Class AB output drivers
- Rail-to-rail input and output

- Voltage Supply Aux. max. 12(± 6)V
- Symmetrical complementary outputs
- Ultra-low input offset voltage
- Ultra-low input bias currents

- Unity gain stable
- High temperature stable
- Cable driver
- Ringing free

## ALD OPERATIONAL AMPLIFIERS - INSTRUMENT GRADE, OSCILLATION FREE

Part No.	Description	Package	Gain Bandwidth (MHz) Typ.	Slew Rate (V/μs) Typ.	Input Offset (Max)(mV)	Input Bias (Max)(pA)	Supply Voltage		Isup per Amp
							Min.	Max.	(mA) Max.
ALD1706SAL	Ultra-Micropower, Single	SO-8	0.4	0.17	4.5	30	2(±1)	12(± 6)	0.04
ALD1706PAL	Ultra-Micropower, Single	DIP-8	0.4	0.17	4.5	30	2(±1)	12(± 6)	0.04
ALD1701SAL	Micropower, Single	SO-8	0.7	0.7	4.5	30	2(±1)	12(± 6)	0.25
ALD1701PAL	Micropower, Single	DIP-8	0.7	0.7	4.5	30	2(±1)	12(± 6)	0.25
ALD2702SAL	5V Precision, Dual	SO-8	1.5	1.9	5	20	4(±2)	12(± 6)	1.5
ALD4702SBL	5V Precision, Quad	SO-14	1.5	1.9	5	30	4(±2)	12(± 6)	1.5
ALD2702PAL	5V Precision, Dual	DIP-8	1.5	1.9	5	20	4(±2)	12(± 6)	1.5
ALD4702PBL	5V Precision, Quad	DIP-14	1.5	1.9	5	30	4(± 2)	12(± 6)	1.5
ALD1702SAL	5V Precision, Single	SO-8	1.5	2.1	4.5	30	4(± 2)	12(± 6)	2
ALD1702PAL	5V Precision, Single	DIP-8	1.5	2.1	4.5	30	4(± 2)	12(± 6)	2
ALD1704SAL	High Slew Rate, Single	SO-8	2.1	5	4.5	20	6.5(± 3.25)	12(± 6)	4.5
ALD2704SAL	High Slew Rate, Dual	SO-8	2.1	5	5	20	6.5(± 3.25)	12(± 6)	3.25
ALD1704PAL	High Slew Rate, Single	DIP-8	2.1	5	4.5	20	6.5(± 3.25)	12(± 6)	4.5
ALD2704PAL	High Slew Rate, Dual	DIP-8	2.1	5	5	20	6.5(± 3.25)	12(± 6)	3.25

## ALD ULTRA LOW VOS @ ULTRA LOW BIAS CMOS OPERATIONAL AMPLIFIERS + ULTRA LOW INPUT SIGNAL POWER

Part No.	Description	Package	Gain Bandwidth (MHz) Typ.	Slew Rate (V/μs) Typ.	Input Offset (Max)(mV)	Input Bias (Max)(pA)	Supply Voltage		Isup per Amp
							Min.	Max.	(mA) Max.
ALD2706ASAL	Ultra-Micropower, Dual	SO-8	0.2	0.1	2	20	2(±1)	12(± 6)	0.04
ALD2706BSAL	Ultra-Micropower, Dual	SO-8	0.2	0.1	5	20	2(±1)	12(± 6)	0.04
ALD2736SAL	Ultra-Micropower High Precision, Dual	SO-8	0.2	0.1	2	10	2(±1)	10(± 5)	0.04
ALD2736ASAL	Ultra-Micropower High Precision, Dual	SO-8	0.2	0.1	0.6	10	2(±1)	10(± 5)	0.04
ALD2706APAL	Ultra-Micropower, Dual	DIP-8	0.2	0.1	2	20	2(±1)	12(± 6)	0.04
ALD2706BPAL	Ultra-Micropower, Dual	DIP-8	0.2	0.1	5	20	2(±1)	12(± 6)	0.04
ALD2736PAL	Ultra-Micropower High Precision, Dual	DIP-8	0.2	0.1	2	10	2(±1)	10(± 5)	0.04
ALD2736APAL	Ultra-Micropower High Precision, Dual	DIP-8	0.2	0.1	0.6	10	2(±1)	10(± 5)	0.04
ALD4706BSBL	Ultra-Micropower, Quad	SO-14	0.2	0.17	5	20	2(±1)	12(± 6)	0.05
ALD4706BPBL	Ultra-Micropower, Quad	DIP-14	0.2	0.17	5	20	2(±1)	12(± 6)	0.05
ALD1706ASAL	Ultra-Micropower, Single	SO-8	0.4	0.17	0.9	30	2(±1)	12(± 6)	0.04
ALD1736SAL	Ultra-Micropower High Precision, Single	SO-8	0.4	0.17	0.4	10	4(±2)	10(± 5)	0.04
ALD1736ASAL	Ultra-Micropower High Precision, Single	SO-8	0.4	0.17	0.1	10	4(±2)	10(± 5)	0.04
ALD1706APAL	Ultra-Micropower, Single	DIP-8	0.4	0.17	0.9	30	2(±1)	12(± 6)	0.04
ALD1736PAL	Ultra-Micropower High Precision, Single	DIP-8	0.4	0.17	0.4	10	4(±2)	10(± 5)	0.04
ALD1736APAL	Ultra-Micropower High Precision, Single	DIP-8	0.4	0.17	0.1	10	4(±2)	10(± 5)	0.04
ALD1701ASAL	Micropower, Single	SO-8	0.7	0.7	0.9	30	2(±1)	12(± 6)	0.25
ALD1731SAL	Micropower High Precision, Single	SO-8	0.7	0.7	0.4	10	2(±1)	10(± 5)	0.2
ALD1731ASAL	Micropower High Precision, Single	SO-8	0.7	0.7	0.1	10	2(±1)	10(± 5)	0.2
ALD2701ASAL	Micropower, Dual	SO-8	0.7	0.7	2	30	2(±1)	12(± 6)	0.25
ALD2711ASAL	Micropower High Precision, Dual	SO-8	0.7	0.7	0.6	10	2(±1)	12(± 6)	0.23
ALD2711SAL	Micropower High Precision, Dual	SO-8	0.7	0.7	1.5	10	2(±1)	12(± 6)	0.23
ALD4701ASBL	Micropower, Quad	SO-14	0.7	0.7	2	30	2(±1)	12(± 6)	0.25
ALD4701BSBL	Micropower, Quad	SO-14	0.7	0.7	5	30	2(±1)	12(± 6)	0.25
ALD1701APAL	Micropower, Single	DIP-8	0.7	0.7	0.9	30	2(±1)	12(± 6)	0.25
AL01731PAL	Micropower High Precision, Single	DIP-8	0.7	0.7	0.4	10	2(±1)	10(± 5)	0.2
AL01731APAL	Micropower High Precision, Single	DIP-8	0.7	0.7	0.1	10	2(±1)	10(± 5)	0.2
ALD2701APAL	Micropower, Dual	DIP-8	0.7	0.7	2	30	2(±1)	12(± 6)	0.25
ALD2711APAL	Micropower High Precision, Dual	DIP-8	0.7	0.7	0.6	10	2(±1)	12(± 6)	0.23
ALD2711PAL	Micropower High Precision, Dual	DIP-8	0.7	0.7	1.5	10	2(±1)	12(± 6)	0.23
ALD4701APBL	Micropower, Quad	DIP-14	0.7	0.7	2	30	2(±1)	12(± 6)	0.25
ALD4701BPBL	Micropower, Quad	DIP-14	0.7	0.7	5	30	2(±1)	12(± 6)	0.25
ALD2702ASAL	5V Precision, Dual	SO-8	1.5	1.9	1	20	4(±2)	12(± 6)	1.50
ALD2702BSAL	5V Precision, Dual	SO-8	1.5	1.9	2	20	4(±2)	12(± 6)	1.50
ALD2732SAL	5V High Precision, Dual	SO-8	1.5	1.9	2	10	4(±2)	10(± 5)	1.5
ALD2732ASAL	5V High Precision, Dual	SO-8	1.5	1.9	0.6	10	4(±2)	10(± 5)	1.5
ALD4702BSBL	5V Precision, Quad	SO-14	1.5	1.9	2	30	4(±2)	12(± 6)	1.50
ALD2702APAL	5V Precision, Dual	DIP-8	1.5	1.9	1	20	4(±2)	12(± 6)	1.50
ALD2702BPAL	5V Precision, Dual	DIP-8	1.5	1.9	2	20	4(±2)	12(± 6)	1.50
ALD2732PAL	5V High Precision, Dual	DIP-8	1.5	1.9	2	10	4(±2)	10(± 5)	1.5
ALD2732APAL	5V High Precision, Dual	DIP-8	1.5	1.9	0.6	10	4(±2)	10(± 5)	1.5
ALD4702BPBL	5V Precision, Quad	DIP-14	1.5	1.9	2	30	4(±2)	12(± 6)	1.50
ALD1702ASAL	5V Precision, Single	SO-8	1.5	2.1	0.9	30	4(±2)	12(± 6)	2.00
ALD1712SAL	Precision, Single	SO-8	1.5	2.1	0.5	10	4(±2)	12(± 6)	1.50
ALD1732SAL	5V High Precision, Single	SO-8	1.5	2.1	0.4	10	4(±2)	10(± 5)	1.5
ALD1732ASAL	5V High Precision, Single	SO-8	1.5	2.1	0.1	10	4(±2)	10(± 5)	1.5
ALD1702APAL	5V Precision, Single	DIP-8	1.5	2.1	0.9	30	4(±2)	12(± 6)	2.00
ALD1712PAL	Precision, Single	DIP-8	1.5	2.1	0.5	10	4(±2)	12(± 6)	1.50
ALD1732PAL	5V High Precision, Single	DIP-8	1.5	2.1	0.1	10	4(±2)	10(± 5)	1.5
ALD1732APAL	5V High Precision, Single	DIP-8	1.5	2.1	0.4	10	4(±2)	10(± 5)	1.5
ALD1704ASAL	High Slew Rate, Single	SO-8	2.1	5	0.9	20	6.5(-3.25)	12(± 6)	4.50
ALD2704BSAL	High Slew Rate, Dual	SO-8	2.1	5	2	20	6.5(±3.25)	12(± 6)	3.25
ALD1704APAL	High Slew Rate, Single	DIP-8	2.1	5	0.9	20	6.5(±3.25)	12(± 6)	4.50
ALD2704BPAL	High Slew Rate, Dual	DIP-8	2.1	5	2	20	6.5(±3.25)	12(± 6)	3.25

# Precision Analog ICs

## ULTRA LOW INPUT OFFSET VOLTAGE EPAD® DUAL CMOS ANALOG VOLTAGE COMPARATORS

• Instrument Grade • Ultra Low Input Signal Power • Ultra Low Input Offset Voltages • Temperature Range: 0 to 70°C

Part No.	Description	Package	Output Drive Current		Input Offset Voltage Max. (mV)	Input Bias Current Typ./Max (pA)	Response Time Typ. (ns)	Supply Voltage Min./Max. (V)	Supply Current Per Comp max. (µA)
			Min. (mA)	Typ. (mA)					
ALD2321APCL	Source Sink, Push-Pull	DIP-16	24 / -3.5	50 / -4.5	0.2	0.01/20	400	3/10	90
ALD2321ASCL	Source Sink, Push-Pull	SO-16	24 / -3.5	50 / -4.5	0.2	0.01/20	400	3/10	90
ALS2321BPCL	Source Sink, Push-Pull	DIP-16	24 / -3.5	50 / -4.5	0.5	0.01/20	400	3/10	90
ALD2321 BSCL	Source Sink, Push-Pull	SO-16	24 / -3.5	50 / -4.5	0.5	0.01/20	400	3/10	90
ALD2321PCL	Source Sink, Push-Pull	DIP-16	24 / -3.5	50 / -4.5	1	0.01/20	400	3/10	90
ALD2321 SCL	Source Sink, Push-Pull	SO-16	24 / -3.5	50 / -4.5	1	0.01/20	400	3/10	90
ALD2331PAL	Open Drain Driver	DIP-8	24 / -3.5	50 / -4.5	2.0	0.01/20	400	3/10	100
ALD2331APAL	Open Drain Driver	DIP-8	24 / -3.5	50 / -4.5	0.5	0.01/20	400	3/10	100
ALD2331BPAL	Open Drain Driver	DIP-8	24 / -3.5	50 / -4.5	1.0	0.01/20	400	3/10	100
ALD2331SAL	Open Drain Driver	SO-8	24 / -3.5	50 / -4.5	2.0	0.01/20	400	3/10	100
ALD2331ASAL	Open Drain Driver	SO-8	24 / -3.5	50 / -4.5	0.5	0.01/20	400	3/10	100
ALD2331BSAL	Open Drain Driver	SO-8	24 / -3.5	50 / -4.5	1.0	0.01/20	400	3/10	100
ALD2332PAL	Push-Pull Driver	DIP-8	24 / -3.5	50 / -4.5	2.0	0.01/20	400	3/10	100
ALD2332APAL	Push-Pull Driver	DIP-8	24 / -3.5	50 / -4.5	0.5	0.01/20	400	3/10	100
ALD2332BPAL	Push-Pull Driver	DIP-8	24 / -3.5	50 / -4.5	1.0	0.01/20	400	3/10	100
ALD2332SAL	Push-Pull Driver	SO-8	24 / -3.5	50 / -4.5	2.0	0.01/20	400	3/10	100
ALD2332ASAL	Push-Pull Driver	SO-8	24 / -3.5	50 / -4.5	0.5	0.01/20	400	3/10	100
ALD2332BSAL	Push-Pull Driver	SO-8	24 / -3.5	50 / -4.5	1.0	0.01/20	400	3/10	100

## PRECISION CMOS VOLTAGE COMPARATORS

• Instrument Grade • Low Power • Low Input Offset Voltage • Low Input Bias Currents  
• High Input Impedance • High Output Currents • Near Infinite Current Gain • Temperature Range: 0 to 70°C

Part No.	Description	Package	Input Offset Voltage Max. (mV)	Output Drive Current		Input Bias Current Typ./Max (pA)	Response Time Typ. (ns)	Supply Voltage Min./Max. (V)	Comp max. (µA)
				Min. (mA)	Typ. (mA)				
ALD2302APAL	Push-Pull, Dual	DIP-8	2	24/-2.0	60 /-4.5	10/200	180/400	4/12	250
ALD2302ASAL	Push-Pull, Dual	SO-8	2	24/-2.0	60 /-4.5	10/200	180/400	4/12	250
ALD2303APAL	Open Drain, Dual	DIP-8	2	24	60	10/200	5000/6500	3/12	20
ALD2303ASAL	Open Drain, Dual	SO-8	2	24	60	10/200	5000/6500	3/12	20
ALD2301APAL	Open Drain, Dual	DIP-8	2	24	60	10/200	300/650	3/12	90
ALD2301ASAL	Open Drain, Dual	SO-8	2	24	60	10/200	300/650	3/12	90
ALD2302PAL	Push-Pull, Dual	DIP-8	5	24/-2.0	60 /-4.5	10/200	180/400	4/12	250
ALD2302SAL	Push-Pull, Dual	SO-8	5	24/-2.0	60 /-4.5	10/200	180/400	4/12	250
ALD2303PAL	Open Drain, Dual	DIP-8	5	24	60	10/200	5000/6500	3/12	20
ALD2303SAL	Open Drain, Dual	SO-8	5	24	60	10/200	5000/6500	3/12	20
ALD2301BSAL	Open Drain, Dual	SO-8	5	24	60	10/200	300/650	3/12	90
ALD4301ASBL	Open Drain, Quad	SO-14	5	24	60	10/200	300/650	3/12	90
ALD4302APBL	Push-Pull, Quad	DIP-14	5	24/-2.0	60 /-4.5	10/200	120/400	3/12	250
ALD4302ASBL	Push-Pull, Quad	SO-14	5	24/-2.0	60 /-4.5	10/200	120/400	3/12	250
ALD4303APBL	Open Drain, Quad	DIP-14	5	24	60	10/200	5000/6500	3/12	20
ALD4303PBL	Open Drain, Quad	DIP-14	10	24	60	10/200	5000/6500	3/12	20
ALD4303SBL	Open Drain, Quad	SO-14	10	24	60	10/200	5000/6500	3/12	20
ALD2301PAL	Open Drain, Dual	DIP-8	10	24	60	10/200	300/650	3/12	90
ALD2301SAL	Open Drain, Dual	SO-8	10	24	60	10/200	300/650	3/12	90
ALD4302PBL	Push-Pull, Quad	DIP-14	10	24/-2.0	60 /-4.5	10/200	120/400	3/12	250
ALD4302SBL	Push-Pull, Quad	SO-14	10	24/-2.0	60 /-4.5	10/200	120/400	3/12	250
ALD4301SBL	Open Drain, Quad	SO-14	10	24	60	10/200	300/650	3/12	90
ALD2301CPAL	Open Drain, Dual	DIP-8	20	24	60	10/400	300/650	3/12	90
ALD2301CSAL	Open Drain, Dual	SO-8	20	24	60	10/400	300/650	3/12	90

## ULTRA LOW CHARGE INJECTION LOW VOLTAGE ANALOG SWITCHES

• Precision Switches • Low Voltage • Supply Voltage: Min. - 3±1.5V, Max. - 12±6V  
• High Fidelity Small Signal Switching • Temperature Range: 0 to 70°C • Supply Current: 1µA

Part No.	Description	Package	Switch Action	Charge Injection Typ./Max. (pC)	Source Off Leakage Max. (pA)	Ron (Ohm) Max.	Turn-On time (ns) Max.
ALD4201 PCL	Quad SPST NC	DIP-16	Break-before-Make	2.0 / 5.0	100	180	240
ALD4201SCL	Quad SPST NC	SO-16	Break-before-Make	1.0 / 2.5	100	180	240
ALD4202MPCL	Quad SPST NO	DIP-16	Make-before-Break	1.0 / 2.5	100	180	110
ALD4202MSCL	Quad SPST NO	SO-16	Make-before-Break	0.7 / 2.0	100	180	110
ALD4211PCL	Quad SPST NC	DIP-16	Break-before-Make	0.2 / 1.0	100	190	130
ALD4211SCL	Quad SPST NC	SO-16	Break-before-Make	0.2 / 1.0	100	190	130
ALD4212PCL	Quad SPST NO	DIP-16	Break-before-Make	0.2 / 1.0	100	190	130
ALD4212SCL	Quad SPST NO	SO-16	Break-before-Make	0.2 / 1.0	100	190	130
ALD4213PCL	Dual NO/Dual NC	DIP-16	Break-before-Make	0.2 / 1.0	100	190	130
ALD4213SCL	Dual NO/Dual NC	SO-16	Break-before-Make	0.2 / 1.0	100	190	130

## PRECISION LOW DRIFT, LOW POWER, ANALOG TIMERS WITH HIGH DISCHARGE OUTPUT

• Precision • High Input Impedance • Temperature Range: 0 to 70°C • Timer Accuracy: Typ. 1%  
• High Speed • Stable with Supply Voltage Changes • Temperature Drift: Typ. 10ppm /°C

Part No.	Description	Package	Type	Supply volt. Drift (Typ.)(%V)	Discharge Output Voltage/current (V)/(mA)	Supply Voltage		Supply Current Per Comp max. (µA)
						Min. (V)	Min. (V)	
ALD1502PAL	Micropower CMOS Timer	DIP-8	Single	0.2	1.0 @ 80	2	2	90
ALD1502SAL	Micropower CMOS Timer	SO-8	Single	0.2	1.0 @ 80	2	2	90
ALD2502PBL	Micropower CMOS Timer	DIP-14	Dual	0.2	1.0 @ 80	2	2	90
ALD2502SBL	Micropower CMOS Timer	SO-14	Dual	0.2	1.0 @ 80	2	2	90
ALD4501PEL	Micropower CMOS Timer	DIP-20	Quad	0.1	1.0 @ 40	2	2	67.5
ALD555PAL	CMOS Timer	DIP-8	Single	0.1	1.0 @ 80	2	2	180
ALD555SAL	CMOS Timer	SO-8	Single	0.1	1.0 @ 80	2	2	180

# Energy Harvesting Modules and DVM System Boards

## EPAD® ENERGY HARVESTING™ MODULES

Advanced Linear Devices' EPAD ENERGY HARVESTING™ Modules can accept energy from many types of electrical energy sources and store this energy to power conventional 3.3V and 5.0V electrical circuits and systems. They are completely self-powered, always in the active mode and intended for low power intermittent duty cycle sampled data or condition-based monitoring/extreme lifespan applications.

Part No.	Description
EH300	1.8V to 3.6V, 4.6mJ, 68msec@25mA
EH300A	1.8V to 3.6V, 30mJ, 75msec@150mA
EH301	3.1V to 5.2V, 8.3mJ, 80msec@25mA
EH301A	3.1V to 5.2V, 55mJ, 88msec@150mA
EHJ1C	Two wire, 6 inch Cable for EH300/EH301 w/connector
EHJ2C	Four wire, 6 inch Cable for EH300/EH301 w/connector
EH300KIT	Evaluation Kit (One each of EH300 and EH300A, Two each EHJ1C/EHJ2C cables)
EH301KIT	Evaluation Kit (One each of EH301 and EH301A, Two each EHJ1C/EHJ2C cables)

## ALD ± 5 1/2 DIGIT DVM (DIGITAL VOLTMETER) BOARDS FULLY ASSEMBLED, TESTED AND CALIBRATED

Part No.	Description	FS Input Range (DCV)	Input Impedance (min) (Ohm)	Conv./Sec (Min/Max)	Linearity (Max) (%)	Display Settings (Max)	Scale Factors (Max)
MB1S	±2.00000 DCV, with 0.01% Accuracy	±2.00000	1 G Ohm	0.01667 / 10	±0.005	---	---
MB201A2V	±2.00000 DCV, with 0.02% Accuracy	±2.00000	1 G Ohm	0.01667 / 10	±0.01	---	---
MB201A20V	±20.0000 DCV, with 0.02% Accuracy	±20.0000	10 M Ohm	0.01667 / 10	±0.01	---	---
MB203A2V	±2.00000 DCV with 0.02% Accuracy + LCD Display Interface	±2.00000	1 G Ohm	0.00833 / 10	±0.005	3 sets	3 sets
MB203A20V	±20.0000 DCV with 0.02% Accuracy + LCD Display Interface	±20.0000	10 M Ohm	0.00833 / 10	±0.005	3 sets	3 sets

## ALD DVM BOARD ACCESSORIES

Part No.	Description	Dimension (in.)
MBCDROM	Design Manual/Software Kit for MB Boards	Standard CD
MB203LCD	2x 16 Character LCD Module w/cable/connector for MB203 Board	3.15 x 1.42 x 0.43
MB203LCD-1	2x16 Character LCD Module (green LED) w/cable/connector for MB203 Board	3.15 x 1.42 x 0.43

## ALD 17/18 BIT, PLUS SIGN, DUAL SLOPE INTEGRATING ANALOG PROCESSORS

• System Integrating ND Processor • Max 1mA Supply Current • Typ. Input Current 2pA • Temp. Range, 0 to 70° C • Nom. Supply Voltage: +/-5V

Part No.	Description	Package	End Point Linearity (Max) (%)	Resolution (± Bits)	Zero-Scale Error (Max) (ppm)	Zero-Scale Tempco (Max) (ppm/°C)	Full-Scale Tempco (typ) (ppm/°C)	Full-Scale Rollover Error (typ) (%)
ALD500AUPCL	18 bit	DIP-16	0.005	±18	25	0.3	1.3	0.005
ALD500AUSCL	18 bit	SO-16	0.005	±18	25	0.3	1.3	0.005
ALD500RAU-10PEL	18 bit w/ 10 ppm V Ref	DIP-20	0.005	±18	25	0.3	1.3	0.005
ALD500RAU-10SEL	18 bit w/ 10 ppm V Ref	SO-20	0.005	±18	25	0.3	1.3	0.005
ALD500RAU-20PEL	18 bit w/ 20 ppm V Ref	DIP-20	0.005	±18	25	0.3	1.3	0.005
ALD500RAU-20SEL	18 bit w/ 20 ppm V Ref	SO-20	0.005	±18	25	0.3	1.3	0.005
ALD500APCL	17 bit	DIP-16	0.01	±17	30	0.35	1.3	0.008
ALD500ASCL	17 bit	SO-16	0.01	±17	30	0.35	1.3	0.008
ALD500ASWCL	17 bit	Wide SO-16	0.01	±17	30	0.35	1.3	0.008
ALD500AUSWCL	18 bit	Wide SO-16	0.005	±18	25	0.3	1.3	0.005

## ALD DIGITAL CONTROLLERS FOR DUAL SLOPE INTEGRATING ANALOG PROCESSORS (PC and uP Interface)

Part No.	Description	Package	No. of Digits (Max)	Resolution (Bits + Sign)	Conv./sec. (Min / Max)	Unit Conv.	LCD/VFD Display (characters)	Display Settings (Max)	Scale Factor	Supp. Curr. (Max) (mA)
ALD521DSDL	24 Bit	SO-18	---	23 + Sign	1 / 15	---	---	---	---	---
ALD521DPDL	24 Bit	DIP-18	---	23 + Sign	1 / 15	---	---	---	---	---

## PC AND μP INTERFACE OR STAND-ALONE OPERATION

• 22 Bit Serial to 7 digit decimal conversion • Direct Character Display Interface

Part No.	Description	Package	No. of Digits (Max)	Resolution (Bits + Sign)	Conv./sec. (Min/Max)	Unit Conv.	LCD/VFD Display (characters)	Display Settings (Max)	Scale Factor (Max)	Supp. Curr. (Max) (mA)
ALD523DSHL	24 Bit wA_CD Display Controller	SO-28	±9999999	23 + Sign	1 / 10	Built-in	1x16 or 2x16	3 sets	3 sets	8
ALD523DPHL	24 Bit w/LCD Display Controller	DIP-28	±9999999	23 + Sign	1 / 10	Built-in	1x16 or 2x16	3 sets	3 sets	8



## Markets & Applications

ALD's high quality linear components and board level products serve a broad spectrum of industries and feature many unique operating characteristics, such as precise voltage and current thresholds, ultra-low operating power and ultra-low input loading. Markets include Industrial Controls, Instrumentation, Computers, Portable Devices, Medical, Automotive, Telecom, Military, and Aerospace—many which demand high temperature and ruggedized operating environments.

Actual applications enabled by the company's technology and low-power products include integrated MEM-based pressure sensors, enhanced crystal radios, energy-harvesting power supplies, mixed-signal communications equipment, precision panel meters, high temperature engine controllers, precision machine controls (lathe and drilling platforms), remote barcode processors, telecommunication sub-systems, oil field instrumentation and navigation systems.

## Application Specific IC and User-specified Threshold Voltages

ALD's linear components are available as a standard-cell design kit for "Function-Specific" IC Integration where combined digital logic functions and passive parts, can be integrated onto a single custom IC chip. EPAD MOSFET transistors can also be supplied with individual (factory programmed) user-specified threshold voltages.

## Sales and Service

ALD markets its products globally through a network of manufactures representatives and traditional distribution networks as well as various on-line distribution sources. For the location of your nearest authorized sales office, visit our website at [www.aldinc.com](http://www.aldinc.com).

## Lead-Free, RoHS and "Green" Mold Compound Compatible

ALD Lead (Pb)-Free semiconductor products are suitable for use in specified lead-free processes and compatible with the current RoHS requirements for all six substances, including the requirements that lead not exceed 0.1% by weight in homogeneous material. ALD also supplies "Green" Mold Compound that is considered environmentally friendly.

## Legacy and Leaded Products

For legacy products, high-reliability products, or for customers who simply do not wish to convert to RoHS requirements, ALD is also committed to tap a vast network of legacy materials and processes to continue to support leaded products. These products feature solder-dipped/plated leads to work with SN60/PB40 solder.

## ISO-9001 Certified

ALD implements the Quality Systems and Management concepts of the ISO-9001 International Standards for quality, and has established a Corporate Quality Policy and Quality Objectives that is the basis of our commitment to maintain world class supplier status.

## Your Local Sales Rep



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