

## QUAD/DUAL N-CHANNEL DEPLETION MODE EPAD® MATCHED PAIR MOSFET ARRAYS

## **GENERAL DESCRIPTION**

## **APPLICATIONS**

- · Functional replacement of Form B (NC) relay
- · Zero power fail safe circuits
- · Backup battery circuits
- Power failure detector
- Fail safe signal detector
- Source followers and buffers
- Precision current mirrors
- Precision current sources
- Capacitives probes
- Sensor interfaces
- Charge detectors
- Charge integrators
- · Differential amplifier input stage
- High side switches
- Peak detectors
- · Sample and Hold
- Alarm systems
- Current multipliers
- Analog switches
- Analog multiplexers
- Voltage comparators
- Level shifters

## **PIN CONFIGURATION**

#### ALD114813 N/C\* N/C\* 1 16 G<sub>N2</sub> 15 2 G<sub>N1</sub> M 1 м D<sub>N1</sub> D<sub>N2</sub> 3 14 V+ 13 S12 4 5 12 S34 V-6 11 D<sub>N3</sub> D<sub>N4</sub> M 4 M 3 7 10 G<sub>N4</sub> G<sub>N3</sub> ŧ 8 9 N/C\* N/C\* ν PC, SC PACKAGES ALD114913 N/C\* N/C\* 1 8 G<sub>N1</sub> 2 G<sub>N2</sub> M 2 D<sub>N1</sub> 3 6 D<sub>N2</sub> 5 v-S<sub>12</sub> 4 v PA, SA PACKAGES \*N/C pins are internally connected. Connect to V- to reduce noise

ALD114813/ALD114913 are monolithic quad/dual N-Channel MOSFETS matched at the factory using ALD's proven EPAD CMOS technology. These devices are intended for low voltage, small signal applications. They are excellent functional replacements for normally-closed relay applications, as they are normally on (conducting) without any power applied, but could be turned off or modulated when system power supply is turned on. These MOSFETS have the unique characteristics of, when the gate is grounded, operating in the resistance mode for low drain voltage levels and in the current source mode for higher voltage levels and providing a constant drain current.

These MOSFETS are designed for exceptional device electrical characteristics matching. As these devices are on the same monolithic chip, they also exhibit excellent temperature tracking characteristics. They are versatile as design components for a broad range of analog applications, and they are basic building blocks for current sources, differential amplifier input stages, transmission gates, and multiplexer applications. Besides matched pair electrical characteristics, each individual MOSFET also exhibits well controlled parameters, enabling the user to depend on tight design limits. Even units from different batches and different date of manufacture have correspondingly well matched characteristics.

These depletion mode devices are built for minimum offset voltage and differential thermal response, and they are designed for switching and amplifying applications in single 1.5V to +/-5V systems where low input bias current, low input capacitance and fast switching speed are desired. These devices exhibit well controlled turn-off and sub-threshold characteristics and therefore can be used in designs that depend on sub-threshold characteristics.

The ALD114813/ALD114913 are suitable for use in precision applications which require very high current gain, beta, such as current mirrors and current sources. A sample calculation of the DC current gain at a drain current of 3mA and gate input leakage current of 30pA = 100,000,000. It is recommended that the user, for most applications, connect V+ pin to the most positive voltage potential (or left open unused) and V- and N/C pins to the most negative voltage potential in the system. All other pins must have voltages within these voltage limits.

## FEATURES

- Depletion mode (normally ON) without power
- Precision Gate Threshold Voltages: -1.30V +/- 0.04V
- Nominal R<sub>DS(ON)</sub> @V<sub>GS</sub>=0.0V of 1.3KΩ
- Matched MOSFET to MOSFET characteristics
- Tight lot to lot parametric control
- · Low input capacitance
- V<sub>GS(th)</sub> match (V<sub>OS</sub>) 20mV
- High input impedance  $-10^{12}\Omega$  typical
- Positive, zero, and negative V<sub>GS(th)</sub> temperature coefficient
- DC current gain >10<sup>8</sup>
- · Low input and output leakage currents

## ORDERING INFORMATION

0°C to -		nperature Range* 0°C to +70°C		
16-Pin Plastic Dip Package	16-Pin SOIC Package	8-Pin Plastic Dip Package	8-Pin SOIC Package	
	ALD114813SC	ALD114913PA	ALD114913SA	

\* Contact factory for industrial temp. range or user-specified threshold voltage values

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 $V_{GS(th)} = -1.3V$ 

# www.DataSheet40.com

Drain-Source voltage, V <sub>DS</sub>	10.6V
Gate-Source voltage, V <sub>GS</sub>	10.6V
Power dissipation	500 mW
Operating temperature range PA, SA, PC, SC package	0°C to +70°C
Storage temperature range	65°C to +150°C
Lead temperature, 10 seconds	+260°C

## **OPERATING ELECTRICAL CHARACTERISTICS**

V+ = +5V (or open) V- = -5V T<sub>A</sub> = 25°C unless otherwise specified CAUTION: ESD Sensitive Device. Use static control procedures in ESD controlled environment.

Parameter		ALD114813/ALD114913				
	Symbol	Min	Тур	Max	Unit	Test Conditions
Gate Threshold Voltage	VGS(th)	-1.34	-1.30	-1.26	V	I <sub>DS</sub> =1μA V <sub>DS</sub> = 0.1V
Offset Voltage VGS(th)1-VGS(th)2	VOS		7	20	mV	I <sub>DS</sub> =1μA
Offset Voltage Tempco	TCVOS		5		μV/ °C	V <sub>DS1</sub> = V <sub>DS2</sub>
GateThreshold Voltage Tempco	TCVGS(th)		-1.7 0.0 +1.6		mV/ °C	I <sub>D</sub> = 1μA I <sub>D</sub> = 20μA, V <sub>DS</sub> = 0.1V I <sub>D</sub> = 40μA
On Drain Current	IDS (ON)		12.0 3.0		mA	VGS = +8.2 V VGS = +2.7V VDS = +5V
Forward Transconductance	GFS		1.4		mmho	VGS = +2.7V V <sub>DS</sub> = +7.7V
Transconductance Mismatch	∆GFS		1.8		%	
Output Conductance	GOS		68		μmho	V <sub>GS</sub> =+2.7V V <sub>DS</sub> = +7.7V
Drain Source On Resistance	R <sub>DS</sub> (ON)		500		Ω	V <sub>DS</sub> = 0.1V V <sub>GS</sub> = +2.7V
Drain Source On Resistance	RDS (ON)		1.3		KΩ	VDS = 0.1V VGS = +0.0V
Drain Source On Resistance Tolerance	∆RDS (ON)		7		%	
Drain Source On Resistance Mismatch	∆RDS (ON)		0.5		%	
Drain Source Breakdown Voltage	BVDSX	10			V	I <sub>DS</sub> = 1.0μA V <sub>GS</sub> = -2.3V
Drain Source Leakage Current <sup>1</sup>	IDS (OFF)		10	100 4	pA nA	V <sub>GS</sub> =-2.3V, V <sub>DS</sub> =+5V T <sub>A</sub> = 125°C
Gate Leakage Current <sup>1</sup>	IGSS		3	30 1	pA nA	V <sub>DS</sub> = 0V V <sub>GS</sub> = +10V T <sub>A</sub> =125°C
Input Capacitance	CISS		2.5		pF	
Transfer Reverse Capacitance	C <sub>RSS</sub>		0.1		pF	
Turn-on Delay Time	ton		10		ns	$V$ + = 5 $V$ RL= 5 $K\Omega$
Turn-off Delay Time	<sup>t</sup> off		10		ns	$V$ + = 5 $V$ RL= 5 $K\Omega$
Crosstalk			60		dB	f = 100KHz

Notes: 1 Consists of junction leakage currents

ALD114813/ALD114913