QUAD/DUAL N-CHANNEL ENHANCEMENT MODE EPAD® MATCHED PAIR MOSFET ARRAY

$V_{GS(th)}$= +0.4V

GENERAL DESCRIPTION

ALD110804/ALD110904 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. The ALD110804/ALD110904 MOSFETs are designed and built for exceptional device electrical characteristics matching. Since these devices are on the same monolithic chip, they also exhibit excellent tempco tracking characteristics. They are versatile circuit elements useful as design components for a broad range of analog applications, such as basic building blocks for current sources, differential amplifier input stages, transmission gates, and multiplexer applications. For most applications, connect V^- and N/C pins to the most negative voltage potential in the system and V^+ pin to the most positive voltage potential (or left open unused). All other pins must have voltages within these voltage limits.

The ALD110804/ALD110904 devices are built for minimum offset voltage and differential thermal response, and they are suited for switching and amplifying applications in <+0.1V to +10V systems where low input bias current, low input capacitance and fast switching speed are desired, as these devices exhibit well controlled turn-off and sub-threshold characteristics and can be biased and operated in the sub-threshold region. Since these are MOSFET devices, they feature very large (almost infinite) current gain in a low frequency, or near DC, operating environment.

The ALD110804/ALD110904 are suitable for use in very low operating voltage or very low power (nanowatt), precision applications which require very high current gain, beta, such as current mirrors and current sources. The high input impedance and the high DC current gain of the Field Effect Transistors result from extremely low current loss through the control gate. The DC current gain is limited by the gate input leakage current, which is specified at 30pA at room temperature. For example, DC beta of the device at a drain current of 3mA and input leakage current of 30pA at 25°C is = 3mA/30pA = 100,000,000.

FEATURES

- Enhancement-mode (normally off)
- Precision Gate Threshold Voltage of +0.40V
- Matched MOSFET to MOSFET characteristics
- Tight lot to lot parametric control
- Low input capacitance
- $V_{GS(th)}$ match (V_{OS}) to 10mV
- High input impedance — $10^{12}\Omega$ typical
- Positive, zero, and negative $V_{GS(th)}$ temperature coefficient
- DC current gain $>10^8$
- Low input and output leakage currents

ORDERING INFORMATION

Operating Temperature Range*			
0°C to +70°C		0°C to +70°C	
16-Pin Plastic Dip Package	16-Pin SOIC Package	8-Pin Plastic Dip Package	8Pin SOIC Package
ALD110804PCL	ALD110804SCL	ALD110904PAL	ALD110904SAL

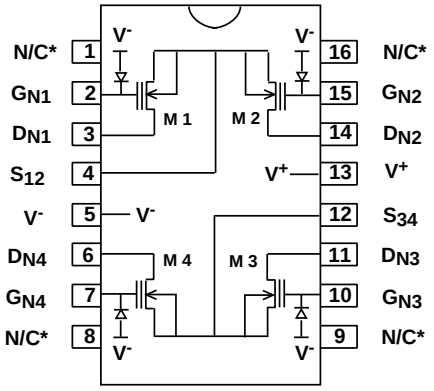
* Contact factory for industrial or military temp. ranges or user-specified threshold voltage values.

APPLICATIONS

- Ultra low power (nanowatt) analog and digital circuits
- Ultra low operating voltage(<0.4V) circuits
- Sub-threshold biased and operated circuits
- Precision current mirrors and current sources
- Nano-Amp current sources
- High impedance resistor simulators
- Capacitive probes and sensor interfaces
- Differential amplifier input stages
- Discrete Voltage comparators and level shifters
- Voltage bias circuits
- Sample and Hold circuits
- Analog and digital inverters
- Charge detectors and charge integrators
- Source followers and High Impedance buffers
- Current multipliers
- Discrete Analog switches / multiplexers

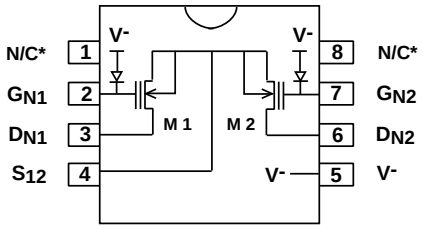
PIN CONFIGURATION

ALD110804



PCL, SCL PACKAGES

ALD110904



PAL, SAL PACKAGES

*N/C pins are internally connected.
Connect to V- to reduce noise

ABSOLUTE MAXIMUM RATINGS

Drain-Source voltage, V_{DS} ____ 10.6V
Gate-Source voltage, V_{GS} ____ 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- = GND T_A = 25°C unless otherwise specified

CAUTION: ESD Sensitive Device. Use static control procedures in ESD controlled environment.

Parameter	Symbol	ALD110804 / ALD110904 Min	Typ	Max	Unit	Test Conditions
Gate Threshold Voltage	$V_{GS(th)}$	0.38	0.40	0.42	V	I_{DS} =1µA V_{DS} = 0.1V
Offset Voltage $V_{GS(th)1}$-$V_{GS(th)2}$	V_{OS}		2	10	mV	
Offset VoltageTempco	TC ΔV_{OS}		5		µV/ °C	V_{DS1} = V_{DS2}
GateThreshold Voltage Tempco	TC$\Delta V_{GS(th)}$		-1.7 0.0 +1.6		mV/ °C	I_D = 1µA I_D = 20µA, V_{DS} = 0.1V I_D = 40µA
On Drain Current	$I_{DS\ (ON)}$		12.0 3.0		mA	V_{GS} = + 9.9V V_{GS} = + 4.2V V_{DS} = +5V
Forward Transconductance	G_{FS}		1.4		mmho	V_{GS} = + 4.4V V_{DS} = + 9.4V
Transconductance Mismatch	ΔG_{FS}		1.8		%	
Output Conductance	G_{OS}		68		µmho	V_{GS} =+4.4V V_{DS} = +9.4V
Drain Source On Resistance	$R_{DS\ (ON)}$		500		Ω	V_{DS} = 0.1V V_{GS} = +4.4V
Drain Source On Resistance Mismatch	$\Delta R_{DS\ (ON)}$		0.5		%	
Drain Source Breakdown Voltage	BV_{DSX}		10		V	I_{DS} = 1.0µA V_{GS} = -0.6V
Drain Source Leakage Current[1]	$I_{DS\ (OFF)}$		10	100 4	pA nA	V_{GS} = -0.6V V_{DS} =10V, T_A = 125°C
Gate Leakage Current[1]	I_{GSS}		3	30 1	pA nA	V_{DS} = 0V V_{GS} = 10V T_A =125°C
Input Capacitance	C_{ISS}		2.5		pF	
Transfer Reverse Capacitance	C_{RSS}		0.1		pF	
Turn-on Delay Time	t_{on}		10		ns	V^+ = 5V R_L= 5KΩ
Turn-off Delay Time	t_{off}		10		ns	V^+ = 5V R_L= 5KΩ
Crosstalk			60		dB	f = 100KHz

Notes: [1] Consists of junction leakage currents