GENERAL DESCRIPTION

The ALD1101 is a monolithic dual N-channel matched transistor pair intended for a broad range of analog applications. These enhancement-mode transistors are manufactured with Advanced Linear Devices' enhanced ACMOS silicon gate CMOS process.

The ALD1101 offers high input impedance and negative current temperature coefficient. The transistor pair is matched for minimum offset voltage and differential thermal response, and it is designed for switching and amplifying applications in +2V to +12V systems where low input bias current, low input capacitance and fast switching speed are desired. Since these are MOSFET devices, they feature very large (almost infinite) current gain in a low frequency, or near DC, operating environment. When used with an ALD1102, a dual CMOS analog switch can be constructed. In addition, the ALD1101 is intended as a building block for differential amplifier input stages, transmission gates, and multiplexer applications.

The ALD1101 is suitable for use in 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 in extremely low current loss through the control gate. The DC current gain is limited by the gate input leakage current, which is specified at 50pA at room temperature. For example, DC beta of the device at a drain current of 5mA at 25°C is = 5mA/50pA = 100,000,000.

APPLICATIONS

• Precision current mirrors
• Precision current sources
• Analog switches
• Choppers
• Differential amplifier input stage
• Voltage comparator
• Data converters
• Sample and Hold
• Analog inverter

FEAT URES

• Low threshold voltage of 0.7V
• Low input capacitance
• Low Vos grades -- 2mV, 5mV, 10mV
• High input impedance -- 10^12Ω typical
• Negative current (I DS ) temperature coefficient
• Enhancement-mode (normally off)
• DC current gain 10^9

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Operating Temperature Range*</th>
<th>8-Pin</th>
<th>Plastic Dip</th>
<th>Package</th>
<th>ALD1101A PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>-55°C to +125°C</td>
<td>CERDIP</td>
<td>Package</td>
<td>ALD1101 DA</td>
<td></td>
</tr>
<tr>
<td>0°C to +70°C</td>
<td></td>
<td></td>
<td>ALD1101 B PA</td>
<td></td>
</tr>
<tr>
<td>0°C to +70°C</td>
<td></td>
<td></td>
<td>ALD1101 SA</td>
<td></td>
</tr>
</tbody>
</table>

* Contact factory for industrial temperature range.

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ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>ALD 1101A</th>
<th>ALD 1101B</th>
<th>ALD 11010</th>
<th>Unit</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-source voltage, $V_{DS}$</td>
<td>$V_{DS}$</td>
<td>13.2 V</td>
<td>13.2 V</td>
<td>13.2 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate-source voltage, $V_{GS}$</td>
<td>$V_{GS}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td></td>
<td>500 mW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>$T_A$ = 25°C</td>
<td>0°C to +70°C</td>
<td>0°C to +70°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td></td>
<td>-65°C to +150°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OPERATING ELECTRICAL CHARACTERISTICS

$T_A = 25°C$ unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>ALD 1101A</th>
<th>ALD 1101B</th>
<th>ALD 11010</th>
<th>Unit</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate Threshold Voltage</td>
<td>$V_T$</td>
<td>0.4</td>
<td>0.7</td>
<td>1.0</td>
<td>V</td>
<td>$I_{DS} = 10\mu A$, $V_{GS} = V_{DS}$</td>
</tr>
<tr>
<td>Offset Voltage</td>
<td>$V_{OS}$</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>mV</td>
<td>$I_{DS} = 100\mu A$, $V_{GS} = V_{DS}$</td>
</tr>
<tr>
<td>Gate Threshold Temperature Drift</td>
<td>$T_{CVT}$</td>
<td>-1.2</td>
<td>-1.2</td>
<td>-1.2</td>
<td>mV/°C</td>
<td></td>
</tr>
<tr>
<td>On Drain Current</td>
<td>$I_{DS(ON)}$</td>
<td>25</td>
<td>40</td>
<td>25</td>
<td>mA</td>
<td>$V_{GS} = V_{DS} = 5V$</td>
</tr>
<tr>
<td>Transconductance</td>
<td>$G_m$</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>10 mHmohm</td>
<td>$V_{DS} = 5V$, $I_{DS} = 10mA$</td>
</tr>
<tr>
<td>Mismatch</td>
<td>$\Delta G_m$</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Output Conductance</td>
<td>$G_O$</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>(\mu)mho</td>
<td>$V_{DS} = 5V$, $I_{DS} = 10mA$</td>
</tr>
<tr>
<td>Drain Source ON Resistance</td>
<td>$R_{DS(ON)}$</td>
<td>50</td>
<td>75</td>
<td>50</td>
<td>75 (\Omega)</td>
<td>$V_{DS} = 0.1V$, $V_{GS} = 5V$</td>
</tr>
<tr>
<td>Drain Source ON Resistance Mismatch</td>
<td>$\Delta R_{DS(ON)}$</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>%</td>
<td>$V_{DS} = 0.1V$, $V_{GS} = 5V$</td>
</tr>
<tr>
<td>Drain Source Breakdown Voltage</td>
<td>$B_{VDSS}$</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>V</td>
<td>$I_{DS} = 10\mu A$, $V_{GS} = 0V$</td>
</tr>
<tr>
<td>Off Drain Current</td>
<td>$I_{DS(OFF)}$</td>
<td>0.1</td>
<td>4</td>
<td>0.1</td>
<td>4 (nA)</td>
<td>$V_{DS} = 12V$, $V_{GS} = 0V$, $T_A = 125°C$</td>
</tr>
<tr>
<td>Gate Leakage Current</td>
<td>$I_{GSS}$</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>50 (pA)</td>
<td>$V_{DS} = 0V$, $V_{GS} = 12V$, $T_A = 125°C$</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>$C_{ISS}$</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td>10 pF</td>
<td></td>
</tr>
</tbody>
</table>
TYPICAL PERFORMANCE CHARACTERISTICS

OUTPUT CHARACTERISTICS

DRAIN-SOURCE CURRENT (mA)

VGS = 0V
VGS = 12V
VGS = 10V
VGS = 8V
VGS = 6V
VGS = 4V
VGS = 2V

DRAIN-SOURCE VOLTAGE (V)

LOW VOLTAGE OUTPUT CHARACTERISTICS

DRAIN-SOURCE CURRENT (mA)

VGS = 0V
VGS = 12V
VGS = 6V
VGS = 4V
VGS = 2V

DRAIN-SOURCE VOLTAGE (mV)

FORWARD TRANSCONDUCTANCE vs. DRAIN-SOURCE VOLTAGE

FORWARD TRANSCONDUCTANCE (µmho)

VGS = 0V
VGS = 12V
VGS = 10V
VGS = 8V
VGS = 6V
VGS = 4V
VGS = 2V

DRAIN-SOURCE VOLTAGE (V)

TRANSFER CHARACTERISTIC WITH SUBSTRATE BIAS

DRAIN-SOURCE CURRENT (µA)

VGS = VDS
VA = 25°C

GATE-SOURCE VOLTAGE (V)

RDS (ON) vs. GATE-SOURCE VOLTAGE

DRAIN-SOURCE ON RESISTANCE (Ω)

VDS = 0.2V
VBS = 0V
T_A = +125°C

GATE-SOURCE VOLTAGE (V)

OFF DRAIN-CURRENT vs. TEMPERATURE

OFF DRAIN CURRENT (A)

VDS = +12V
VGS = VBS = 0V

TEMPERATURE (°C)