

#### QUAD/DUAL P-CHANNEL MATCHED PAIR MOSFET ARRAY

#### **GENERAL DESCRIPTION**

The ALD1107/ALD1117 are monolithic quad/dual P-channel enhancement mode matched MOSFET transistor arrays intended for a broad range of precision analog applications. The ALD1107/ALD1117 offer high input impedance and negative current temperature coefficient. The transistor pairs are matched for minimum offset voltage and differential thermal response, and they are designed for precision analog switching and amplifying applications in +2V to +12V systems where low input bias current, low input capacitance and fast switching speed are desired. These MOSFET devices feature very large (almost infinite) current gain in a low frequency, or near DC, operating environment. The ALD1107/ALD1117 are building blocks for differential amplifier input stages, transmission gates, and multiplexer applications, current sources and many precision analog circuits.

#### **FEATURES**

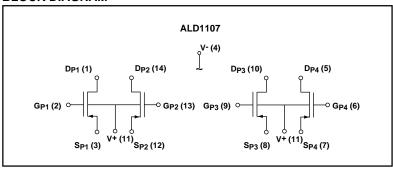
- Low threshold voltage of -0.7V
- Low input capacitance
- Low Vos 2mV typical
- High input impedance --  $10^{14}\Omega$  typical
- Negative current (IDS) temperature coefficient
- Enhancement-mode (normally off)
- DC current gain 109
- · Low input and output leakage currents
- RoHS compliant

#### ORDERING INFORMATION ("L" suffix denotes lead-free (RoHS))

Operating Temperature Range*					
0°C to +70°C	-55°C to +125°C				
8-Pin Plastic Dip Package	8-Pin CERDIP Package				
ALD1117PAL	ALD1117DA				
14-Pin Plastic Dip Package	14-Pin CERDIP Package				
ALD1107PBL	ALD1107DB				
	0°C to +70°C  8-Pin Plastic Dip Package  ALD1117PAL  14-Pin Plastic Dip Package				

<sup>\*</sup> Contact factory for leaded (non-RoHS) or high temperature versions.

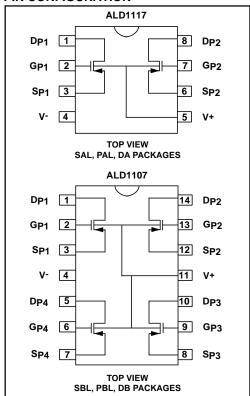
### **BLOCK DIAGRAM**



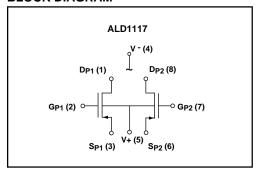
#### **APPLICATIONS**

- Precision current mirrors
- Precision current sources
- Voltage choppers
- · Differential amplifier input stage
- Voltage comparator
- Data converters
- Sample and Hold
- · Analog signal processing

#### **PIN CONFIGURATION**



### **BLOCK DIAGRAM**



### **ABSOLUTE MAXIMUM RATINGS**

Drain-source voltage, V <sub>DS</sub>		10.6\
Gate-source voltage, VGS		-10.6
Power dissipation		500mV
Operating temperature range	SAL, PAL, SBL, PBL packages	0°C to +70°C
	DA, DB packages	55°C to +125°C
Storage temperature range		-65°C to +150°C
Lead temperature, 10 seconds	} - <del></del>	+260°C
CAUTION: ESD Sensitive Dev	ice. Use static control procedures in ESD controlled environment.	

# **OPERATING ELECTRICAL CHARACTERISTICS**

### $T_A = 25^{\circ}C$ unless otherwise specified

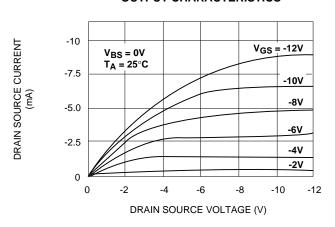
			ALD1107			ALD1117			Test
Parameter	Symbol	Min	Тур	Max	Min	Тур	Max	Unit	Conditions
Gate Threshold Voltage	V <sub>T</sub>	-0.4	-0.7	-1.0	-0.4	-0.7	-1.0	V	$I_{DS} = -1.0 \mu A V_{GS} = V_{DS}$
Offset Voltage V <sub>GS1</sub> -V <sub>GS2</sub>	Vos		2	10		2	10	mV	$I_{DS}$ = -10μA $V_{GS}$ = $V_{DS}$
Gate Threshold Temperature Drift <sup>2</sup>	TC <sub>VT</sub>		-1.3			-1.3		mV/°C	
On Drain Current	I <sub>DS</sub> (ON)	-1.3	-2		-1.3	-2		mA	$V_{GS} = V_{DS} = -5V$
Transconductance	G <sub>IS</sub>	0.25	0.67		0.25	0.67		mmho	V <sub>DS</sub> = -5V I <sub>DS</sub> = -10mA
Mismatch	$\Delta G_{fs}$		0.5			0.5		%	
Output Conductance	G <sub>OS</sub>		40			40		μmho	V <sub>DS</sub> = -5V I <sub>DS</sub> = -10mA
Drain Source On Resistance	R <sub>DS</sub> (ON)		1200	1800		1200	1800	Ω	V <sub>DS</sub> = -0.1V V <sub>GS</sub> = -5V
Drain Source On Resistance Mismatch	ΔR <sub>DS</sub> (ON)		0.5			0.5		%	V <sub>DS</sub> = -0.1V V <sub>GS</sub> = -5V
Drain Source Breakdown Voltage	BV <sub>DSS</sub>	-12			-12			V	I <sub>DS</sub> = -1.0μΑ V <sub>GS</sub> = 0V
Off Drain Current <sup>1</sup>	I <sub>DS (OFF)</sub>		10	400 4		10	400 4	pA nA	V <sub>DS</sub> = -12V V <sub>GS</sub> = 0V T <sub>A</sub> = 125°C
Gate Leakage Current	I <sub>GSS</sub>		0.1	10 1		0.1	10 1	pA nA	V <sub>DS</sub> = 0V V <sub>GS</sub> = -12V T <sub>A</sub> = 125°C
Input Capacitance <sup>2</sup>	C <sub>ISS</sub>		1	3		1	3	pF	

Notes: 1 Consists of junction leakage currents

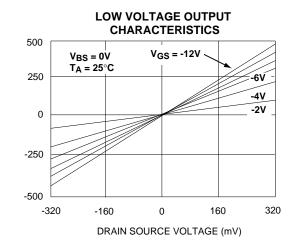
<sup>&</sup>lt;sup>2</sup> Sample tested parameters

### TYPICAL PERFORMANCE CHARACTERISITCS

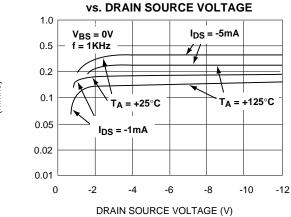
### **OUTPUT CHARACTERISTICS**







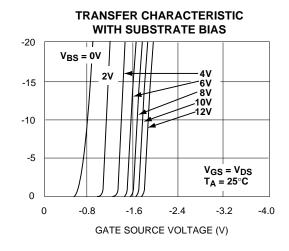
FORWARD TRANSCONDUCTANCE



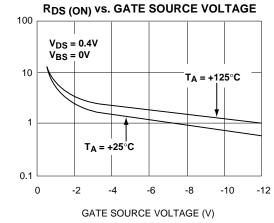
FORWARD TRANSCONDUCTANCE

DRAIN SOURCE ON RESISTANCE

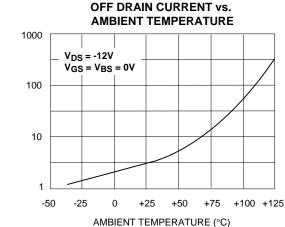




DRAIN SOURCE ON RESISTANCE





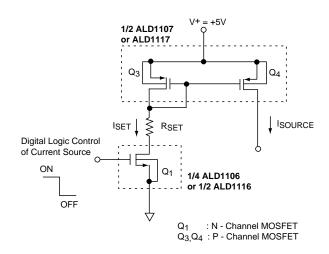


### **TYPICAL APPLICATIONS**

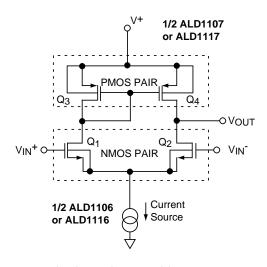
#### **CURRENT SOURCE MIRROR**

### $V^{+} = +5V$ 1/2 ALD1107 or ALD1117 $V^{+} = +5V$ Q<sub>3</sub> Q<sub>4</sub> RSET ISOURCE Q<sub>1</sub> I SOURCE = ISET = <u>V+ -Vt</u> 1/2 ALD1106 RSET or ALD1116 4 Q<sub>1</sub>, Q<sub>2</sub>: N - Channel MOSFET Q<sub>3</sub>, Q<sub>4</sub>: P - Channel MOSFET RSET

### **CURRENT SOURCE WITH GATE CONTROL**

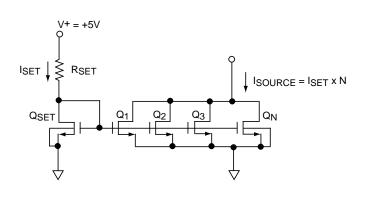


### **DIFFERENTIAL AMPLIFIER**



Q<sub>1</sub>, Q<sub>2</sub>: N - Channel MOSFET Q<sub>3</sub>, Q<sub>4</sub>: P - Channel MOSFET

#### **CURRENT SOURCE MULTIPLICATION**

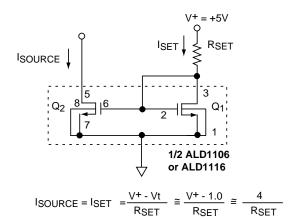


QSET, Q1..QN: ALD1106 or ALD1116 N - Channel MOSFET

# **TYPICAL APPLICATIONS (cont.)**

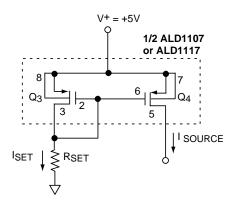
### **BASIC CURRENT SOURCES**

### N- CHANNEL CURRENT SOURCE



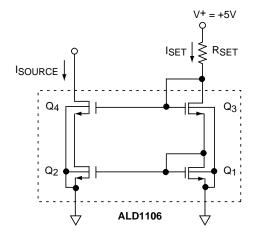
Q<sub>1</sub>, Q<sub>2</sub>: N - Channel MOSFET

#### P- CHANNEL CURRENT SOURCE

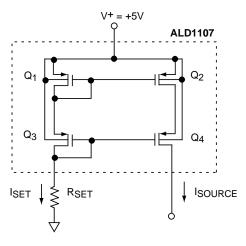


Q<sub>3</sub>, Q<sub>4</sub>: P - Channel MOSFET

### **CASCODE CURRENT SOURCES**



Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub>, Q<sub>4</sub>: N - Channel MOSFET (ALD1101 or ALD1103)

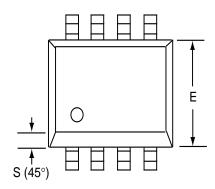


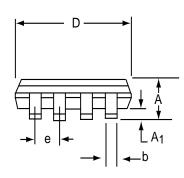
$$I_{SOURCE} = I_{SET} = \frac{V + - 2Vt}{R_{SET}} \cong \frac{3}{R_{SET}}$$

Q1, Q2, Q3, Q4: P - Channel MOSFET (ALD1102 or ALD1103)

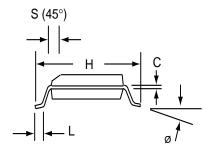
# **SOIC-8 PACKAGE DRAWING**

# 8 Pin Plastic SOIC Package



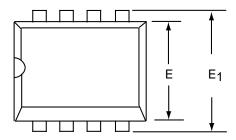


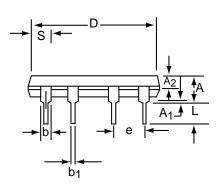
	Millin	neters	Inc	hes
Dim	Min	Max	Min	Max
Α	1.35	1.75	0.053	0.069
A <sub>1</sub>	0.10	0.25	0.004	0.010
b	0.35	0.45	0.014	0.018
С	0.18	0.25	0.007	0.010
D-8	4.69	5.00	0.185	0.196
E	3.50	4.05	0.140	0.160
е	1.27	BSC	0.050	BSC
н	5.70	6.30	0.224	0.248
L	0.60	0.937	0.024	0.037
Ø	0°	8°	0°	8°
s	0.25	0.50	0.010	0.020



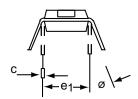
# **PDIP-8 PACKAGE DRAWING**

# 8 Pin Plastic DIP Package



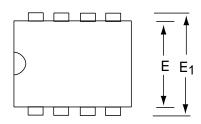


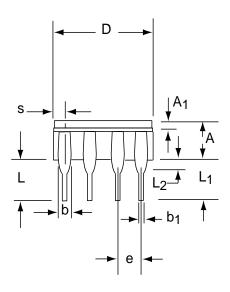
	Millim	eters	Inc	hes
Dim	Min	Max	Min	Max
Α	3.81	5.08	0.105	0.200
A <sub>1</sub>	0.38	1.27	0.015	0.050
A <sub>2</sub>	1.27	2.03	0.050	0.080
b	0.89	1.65	0.035	0.065
b <sub>1</sub>	0.38	0.51	0.015	0.020
С	0.20	0.30	0.008	0.012
D-8	9.40	11.68	0.370	0.460
E	5.59	7.11	0.220	0.280
E <sub>1</sub>	7.62	8.26	0.300	0.325
е	2.29	2.79	0.090	0.110
e <sub>1</sub>	7.37	7.87	0.290	0.310
L	2.79	3.81	0.110	0.150
S-8	1.02	2.03	0.040	0.080
Ø	0°	15°	0°	15°

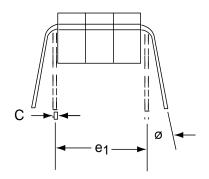


### **CERDIP-8 PACKAGE DRAWING**

# 8 Pin CERDIP Package



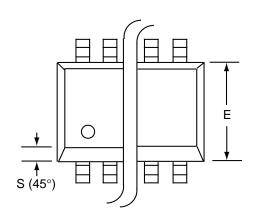


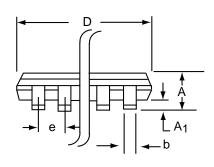


	Millim	neters	Inc	hes	
Dim	Min	Max	Min	Max	
Α	3.55	5.08	0.140	0.200	
A <sub>1</sub>	1.27	2.16	0.050	0.085	
b	0.97	1.65	0.038	0.065	
b <sub>1</sub>	0.36	0.58	0.014	0.023	
С	0.20	0.38	0.008	0.015	
D-8		10.29		0.405	
E	5.59	7.87	0.220	0.310	
E <sub>1</sub>	7.73	8.26	0.290	0.325	
е	2.54 E	BSC	0.100	BSC	
e <sub>1</sub>	7.62 BSC		0.300 BSC		
L	3.81	5.08	0.150	0.200	
L <sub>1</sub>	3.18		0.125	1	
L <sub>2</sub>	0.38	1.78	0.015	0.070	
S		2.49		0.098	
Ø	0°	15°	0°	15°	

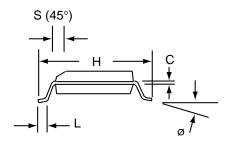
# **SOIC-14 PACKAGE DRAWING**

# 14 Pin Plastic SOIC Package



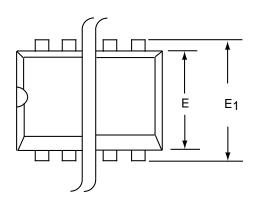


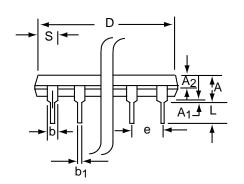
	Millim	neters	Inc	hes
Dim	Min	Max	Min	Max
Α	1.35	1.75	0.053	0.069
A <sub>1</sub>	0.10	0.25	0.004	0.010
b	0.35	0.45	0.014	0.018
С	0.18	0.25	0.007	0.010
D-14	8.55	8.75	0.336	0.345
E	3.50	4.05	0.140	0.160
е	1.27	BSC	0.050	BSC
Н	5.70	6.30	0.224	0.248
L	0.60	0.937	0.024	0.037
Ø	0°	8°	0°	8°
S	0.25	0.50	0.010	0.020



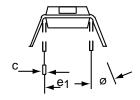
# **PDIP-14 PACKAGE DRAWING**

### 14 Pin Plastic DIP Package



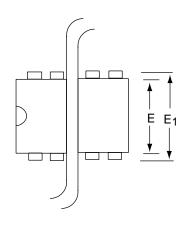


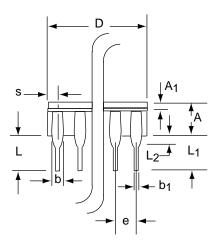
	Millimeters		Inc	hes
Dim	Min	Max	Min	Max
Α	3.81	5.08	0.105	0.200
A <sub>1</sub>	0.38	1.27	0.015	0.050
A <sub>2</sub>	1.27	2.03	0.050	0.080
b	0.89	1.65	0.035	0.065
b <sub>1</sub>	0.38	0.51	0.015	0.020
С	0.20	0.30	0.008	0.012
D-14	17.27	19.30	0.680	0.760
E	5.59	7.11	0.220	0.280
E <sub>1</sub>	7.62	8.26	0.300	0.325
е	2.29	2.79	0.090	0.110
e <sub>1</sub>	7.37	7.87	0.290	0.310
L	2.79	3.81	0.110	0.150
S-14	1.02	2.03	0.040	0.080
ø	0°	15°	0°	15°

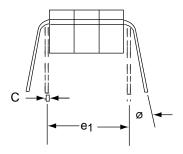


# **CERDIP-14 PACKAGE DRAWING**

### 14 Pin CERDIP Package







	Millim	neters	Inc	hes
Dim	Min	Max	Min	Max
Α	3.55	5.08	0.140	0.200
A <sub>1</sub>	1.27	2.16	0.050	0.085
b	0.97	1.65	0.038	0.065
b <sub>1</sub>	0.36	0.58	0.014	0.023
С	0.20	0.38	0.008	0.015
D-14		19.94		0.785
E	5.59	7.87	0.220	0.310
E <sub>1</sub>	7.73	8.26	0.290	0.325
е	2.54 E	BSC	0.100	BSC
e <sub>1</sub>	7.62 E	BSC	0.300	BSC
L	3.81	5.08	0.150	0.200
L <sub>1</sub>	3.18		0.125	
L <sub>2</sub>	0.38	1.78	0.015	0.070
S		2.49		0.098
Ø	0°	15°	0°	15°

# **Mouser Electronics**

**Authorized Distributor** 

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

**Advanced Linear Devices:** 

ALD1117PAL ALD1107SBL ALD1117SAL ALD1107PBL