A PRACTICAL SOLUTION to CUSTOM LINEAR I.C.'s — ALD's "FUNCTION-SPECIFIC" ASIC PROGRAM

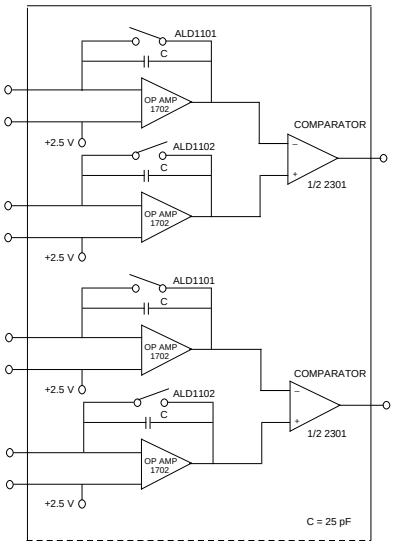
"**FUNCTION-SPECIFIC**" is ALD's standard cell approach to custom linear circuits with the standard cells being ALD standard products. It allows you to design with completely specified standard linear I.C.'s and implement your custom I.C. - or - go into production with standard I.C.'s and transition into your custom I.C. - with no redesigns - as your production volume increases.

Standard Part = Standard Cell = Kit Part
Easy to implement.

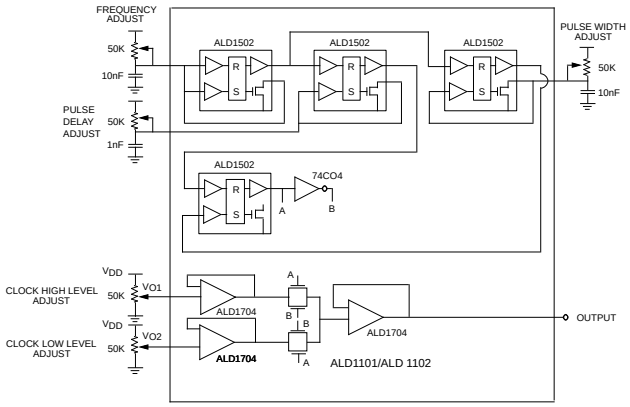
Step I. Order your "Function-Specific" Design Kit.
Step II. Design your circuit with ALD standard products.
Step III. Breadboard and prove your design.
Step IV. Decide on the package and pin-out.
Step V. Send your circuit to ALD for a quotation.
Step VI. Place order, wait 12 -16 weeks, and receive your "Function-Specific" Circuit.

No I.C. design techniques or software to learn. A full custom, high performance ASIC Program. There is a nonrecurring engineering charge. All standard packages, including SOIC's and dice, are available. Hi Rel processing available.

Examples of "FUNCTION-SPECIFIC" Linear I.C.'s



EXAMPLE 1. 1/2 of OCTAL INTEGRATOR
(Consists of 8 Op Amps, 4 Comparators, 8 MOSFETS and 8 Capacitors)



EXAMPLE 2. RAIL TO RAIL PULSE GENERATOR
(Consists of 3 Op Amps, 4 Timers, 4 MOSFETS and 74C04 Inverter)

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What is ALD's "FUNCTION-SPECIFIC" Approach?

- No I.C. design techniques or software to learn. Optional simulation models, macromodels and subcircuits are available.
- Design and breadboard with completely specified, off the shelf, standard I.C.'s as you normally do.
- Minimizes risk - proves your design works before committing to a custom chip.
- If you're not sure your volume justifies a custom chip just yet, go into production with standard ALD linear I.C.'s and transition to a custom I.C. when it suits you -AND- without a major redesign.
- Optimizes your surface mount program - use an SOIC package and combine your linear I.C.'s onto one chip.
- FAST: 12-16 weeks is the normal lead time once your "Function-Specific" order is placed -AND- you don't have to spend weeks or months becoming an I.C. designer in order to develop your circuit.
- Low power, low voltage, precision Silicon Gate CMOS - using ALD's precision ACMOS process - provides 5V linear I.C.'s that match-up with the 5V digital circuits you're using in today's low voltage, low power systems.

How Does ALD's "Function-Specific" Design Approach Compare?

COMPARISON OF VARIOUS DESIGN APPROACHES

Relative Comparison Scale of 0 to 10

	Full Customl	"Function-Specific" ASIC	Cell Library ASIC	Linear Array ASIC	Standard Product
Circuit Performance	10	10	7	5	10
I.C. Design Cost	10	2	2	2	0
Design & Prototype Ease	1	10	3	3	10
Prototype Development Time	10	5	5	3	0
Die Size Optimization	10	7	7	5	NA
Project Cost	10	2	3	2	0
First Time Prototype Success Rate	4	10	7	5	NA
Redesign Flexibility	4	10	7	5	10
Test Engineering Cost	10	2	5	8	0
Production Unit Cost	3	3	7	10	2
Per Function Reliability	10	10	5	5	2
P C Board Cost	1	1	2	2	5
Production Cost	1	2	2	2	5
Design Security	10	8	8	8	1
Ease of Field Testing	1	10	2	2	10
Production Quantity Time	10	4	4	4	2

Packaging, Hi Rel, and Non-Standard Cells

- Your packaging requirements are met with industry standard PDIP, CDIP, SOIC, PLCC, and DICE. Standard pin counts are 8, 14, 16, 18, 20, 22, 24, 28, 40, 48, 54, 68 and 84. Special packages are available.
- High reliability military processing is available, as is ALD's industrial enhanced reliability "A+" program.
- New products (=standard cells) are continually being announced by ALD. Should your design require cells not currently announced, check with us to see if what we have coming fits in with your plans. In the event ALD's "Function-Specific" approach doesn't meet your needs, ALD will work with you on your "full-custom I.C."

Products

The heart of a standard cell program is having high performance, completely specified, leading edge, useful linear cells designed with integration in mind. ALD's product line provides this:

Op amps with:
- Rail to Rail inputs and outputs
- $10^{12}\,\Omega$ input impedance
- Dual or single supply
- Low power, low voltage

Timers/Oscillators with:
- 99% accuracy
- Up to 1.4 to 2.5 MHz frequency
- 1V to 12V supply voltage
- Low power

Comparators with:
- Response times of 120ns to 650ns
- Output current of 24mA to 60mA
- Low power: 55µA to 250µA
- $10^{12}\,\Omega$ input impedance
- Low voltage, dual or single supply

MOSFET Pairs with:
- N channel and P channel
- Low voltage, low power

Next page shows a summary. See individual data sheets for complete specifications.

Frequently Asked Questions Regarding "Function-Specific" Circuits

Q: Is this like a linear array?
A: No. An array is a chip filled with fixed transistors, diodes and passives - which you must design with and interconnect - following I.C. design rules and sometimes using specialized software and hardware. "Function-Specific" is a standard cell approach with defined I.C.'s (standard parts) you configure using your standard design practices, resulting in a completely custom chip. In "Function-Specific" you have completely characterized higher level building blocks (such as various operational amplifiers) that were carefully developed to be integrated.

Q: What about critical nodes? Will my circuit work in chip form?
A: ALD has already solved this problem. The critical nodes are within the devices themselves - inside the op amps, timers, comparators, etc. All the normal input, output, and power supply nodes are noncritical and designed to withstand parasitic stray capacitances. As a result, integrating a variety of devices on a single chip presents no particular problem - as long as the breadboard works.

Q: Is "SPICE" available for simulation?
A: ALD supports simulation models, subcircuits and macromodels. PSPICE with this simulation can be conducted by either a customer or by ALD personnel, as a supplement to the breadboard.

Q: Why does it take 12-16 weeks?
A: Because each I.C. is different and must have a unique, complete custom mask set generated, wafers fabricated and tested, units packaged, final tested, and shipped.

Q: Can resistors and capacitors be integrated in a "Function-Specific" I.C.?
A: Yes, resistors and capacitors can be integrated on your custom linear I.C.

Q: Can I put in 1% precision resistors and different types of capacitors?
A: No, but you can bring out the leads where you want them and place your precision passives off the chip.

Q: Can digital circuits be put on a "Function-Specific" chip?
A: Yes, contact ALD for a list of digital SSI and MSI level gates that are currently available in the ALD "Function Specific" digital library.

Q: Are diodes available on chip?
A: You can use the MOSFETS in a diode-connected configuration.

Q: Can I have isolated circuits on one chip?
A: There are typically 120dB isolation between circuits.

Q: How much does it cost?
A: Since it is a full custom program, it depends on the complexity of the circuitry involved. There are two cost components. The first is a one time, nonrecurring engineering cost for setting up and implementing the project. The second component is a unit cost, which depends on the complexity, packaging, testing, and volume of the ASIC chip. An I.C. chip usually costs much less than buying the individual parts and assembling them onto a circuit board.

FSK11 DESIGN KIT

Part No.	Description	Maximum Vos	Quantity	Part No.	Description	Quantity
ALD2701	Op Amp, dual micropower	10.0	4	ALD2301	Dual comparator, 60mA	2
ALD2701A	Op Amp, dual micropower	2.0	4	ALD4302	Quad comparator, fast	2
ALD1701	Op Amp, micropower	4.5	8			
ALD1701G	Op Amp, micropower	10.0	4	ALD555	Precision timer	4
ALD1701A	Op Amp, micropower	0.9	2	ALD1502	High frequency timer	4
ALD1702	Op Amp, oscillation resistant	4.5	8	ALD2502	Dual, high frequency timer	4
ALD1702A	Op Amp, oscillation resistant	0.9	2			
ALD1703	Op Amp, general purpose	10.0	10	ALD1101	N-channel dual MOSFET	4
ALD1704	Op Amp, JFET replacement	4.5	8	ALD1102	P-channel dual MOSFET	4
ALD1704A	Op Amp, JFET replacement	0.9	2			
ALD1706	Op Amp, ultra micropower	4.5	8		"Function-Specific" Design Manual	1
ALD1706A	Op Amp, ultramicropower	0.9	2		Data Sheets	All

"FUNCTION-SPECIFIC" PARTS LIST

OPERATIONAL AMPLIFIERS

Part No.	Description	Bandwidth	Slew Rate	Maximum Input Bias Current	Input Voltage Range	Maximum Power	Supply Voltage Range	Maximum Input Offset Voltage	Maximum Input Offset Current	Packages
ALD1701	CMOS, Rail to Rail, Micropower	0.7MHz	0.7V/µsec	30pA	Vss to Vdd	1.25mW	±1V to ±6V 2V to 12V	0.9mV, 2mV 4.5mV, 10mV	25pA	8L SOIC, PDIP, CDIP, DICE
ALD1702	CMOS, Rail to Rail, Oscillation resistant	1.5MHz	2.1V/µsec	30pA	Vss to Vdd	10mW	±2V to ±6V 4V to 12V	0.9mV, 2mV 4.5mV	25pA	8L SOIC, PDIP, CDIP, DICE
ALD1703	CMOS, Low Cost	1.5MHz	2.1V/µsec	50pA	within 150mV of Vss or Vdd	12.5mW	±2V to ±6V 4V to 12V	10mW	30pA	8L SOIC, PDIP, CDIP, DICE
ALD1704	CMOS, Low cost, JFET replacement	2.1MHz	5V/µsec	20pA	Vss to Vdd	45mW	±3.25V to ±6V 6.5V to 12V	0.9mV, 2mV 4.5mV, 10mV	15pA	8L SOIC, PDIP, CDIP, DICE
ALD1706	CMOS, Rail to Rail, Very low power	0.3MHz	0.17V/µsec	30pA	Vss to Vdd	0.2mW	±1V to ±6V 2V to 12V	0.9mV, 2mV 4.5mV, 10mV	25pA	8L SOIC, PDIP, CDIP, DICE
ALD2701	Dual CMOS, Rail to Rail, micropower	0.7MHz	0.7V/µsec	30pA	Vss to Vdd	2.5mW	±1V to ±6V 2V to 12V	2mV, 5mV, 10mV	25pA	14 L SOIC, 8L PDIP, CDIP, DICE

VOLTAGE COMPARATORS

Part No.	Description	LS TTL Fanout	Minimum Output Current	5mV Overdrive Response Time	Supply Voltage	Maximum Supply Current	Maximum Input Bias Current	Maximum Input Offset Current	Maximum Input Offset Voltage	Packages
ALD2301	Dual CMOS Open Collector Outputs	30	24mA	650 ns	+3V to +12V ±1.5V to ±6V	90µA	200 pA	200 pA	2- 20 mV	8L SOIC, PDIP, CDIP, DICE
ALD4302	Quad CMOS Push-Pull Outputs	30	24mA	400 ns	+3V to +12V ±1.5V to ±6V	250µA	200 pA	200 pA	5-15mV	14L SOIC, PDIP, CDIP, DICE

TIMERS/OSCILLATORS

Part No.	Configuration	Supply Voltage	Power Dissipation µW/Timer		Accuracy %		Maximum Operating Frequency, MHz		Trigger/Threshold Current, nA		Packages
			Typ	Max	Typ	Min	Typ	Guaranteed	Typ	Max	
ALD555	Single	2-12V	500 @ 5V	900	99	98	2.0	1.4	0.001	0.2	8L SOIC, PDIP, CDIP, DICE
ALD1502	Single	2-12V	250 @ 5V	450	99	97	2.5	1.5	0.01	0.4	
ALD2502	Dual	2-12V	250 @ 5V	450	99	97	2.5	1.5	0.01	0.4	14L SOIC, PDIP, CDIP, DICE

MOSFET TRANSISTORS

Part No.	Channel	V T V		IDS (on) mA		Gm umho	Packages
		Typ	Max	Min	Typ		
ALD 1101	Dual N	0.70	1.00	30	40	10,000	8L PDIP, CDIP, T0-99, DICE
ALD 1102	Dual P	-0.70	-1.00	-11	-16	4,000	

ON-CHIP PASSIVE COMPONENTS

Passive Component	Type	Value Range		Tolerance	Matching		Temperature Coefficient
		Min	Max		Min	Max	
Resistor	Ion Implanted	1kΩ 1kΩ	25kΩ 10MΩ	±10% ±25%	±0.2% -	±1% ±2%	2000ppm/°C
	Polysilicon	10Ω	1kΩ	±20%	±0.5%	±2%	1200ppm/°C
Capacitor	MOS	0.25pF	1000pF	±10%	±0.1%	±1%	30ppm/°C