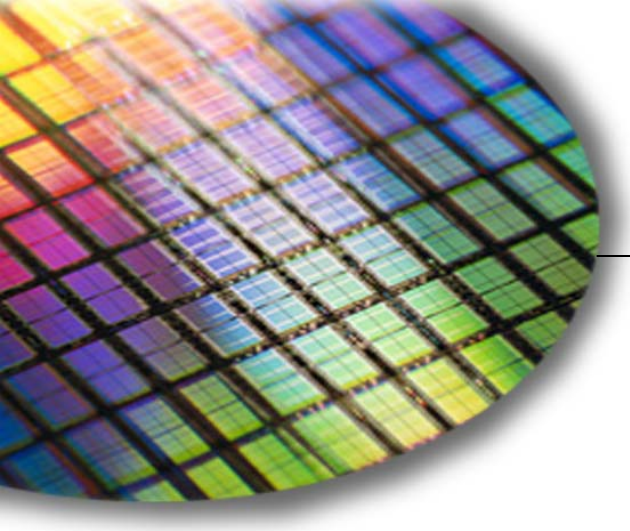


iCoupler®

The World Leader in High-Performance Signal Processing Solutions

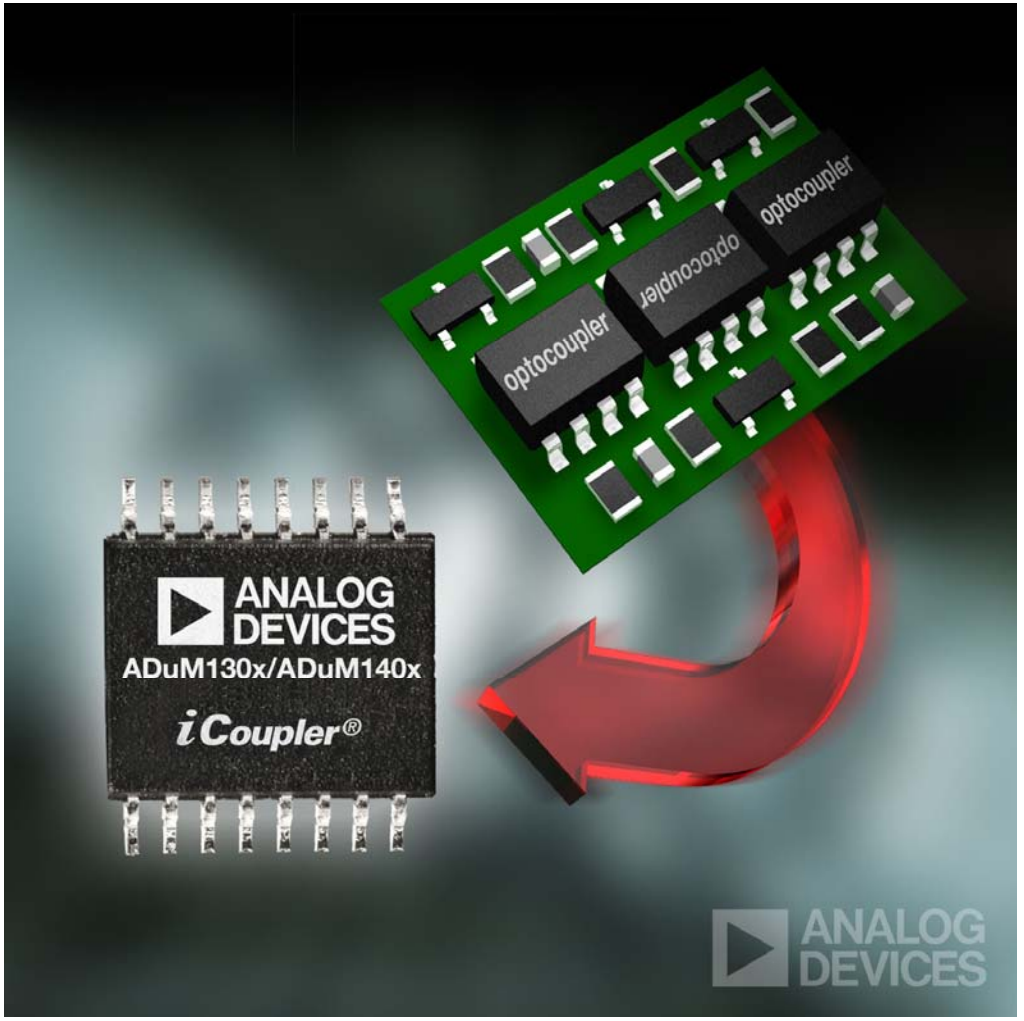
Analog Devices *i*Coupler® Technology

May 2005

ANALOG DEVICES

*i*Coupler Technology Removes the Limitations of Optocoupler Solutions

- *Integration*
- *Performance*
- *Power Consumption*
- *Ease-of-Use*
- *Reliability*

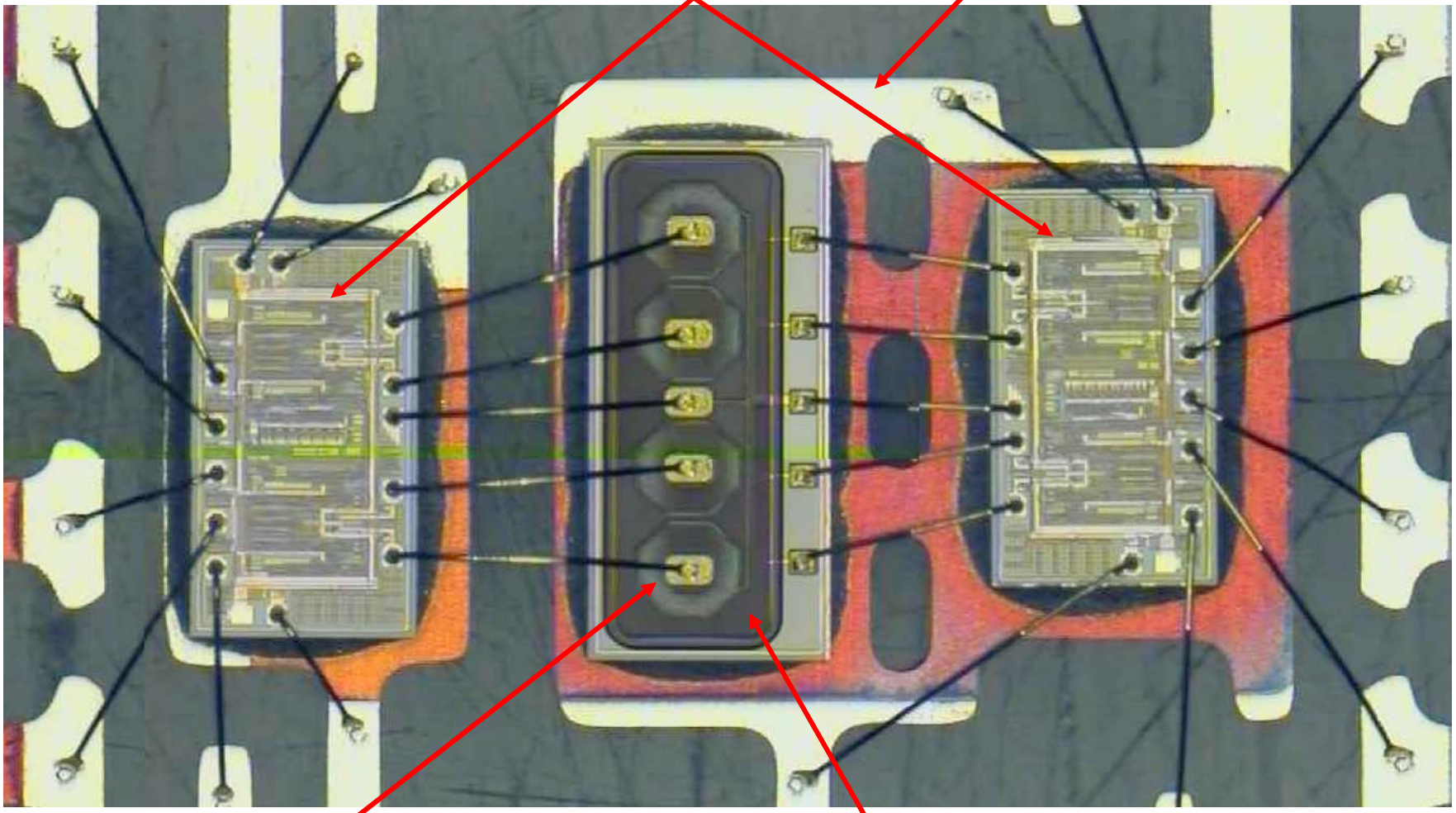


ANALOG DEVICES

ADuM140x Quad-Channel Isolator

CMOS interface chips contain drive and receive circuits

split-paddle lead frame supports high input-output isolation

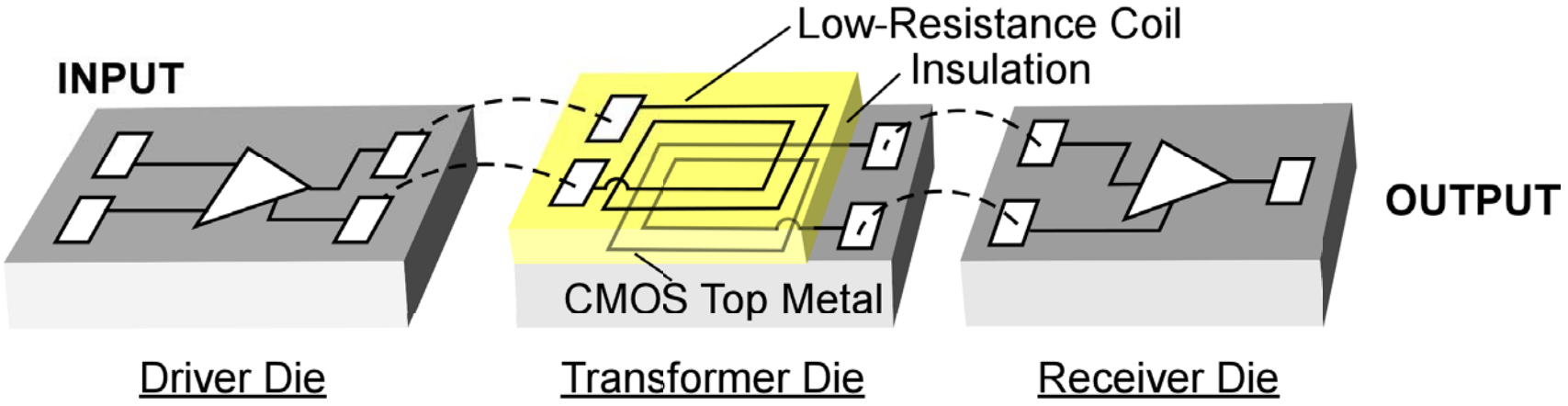


iCoupler transformers support communication in either direction

polyimide insulation layers enable 2.5KV isolation rating

ANALOG DEVICES

*i*Coupler Technology:
Chip-Scale, Transformer Isolation

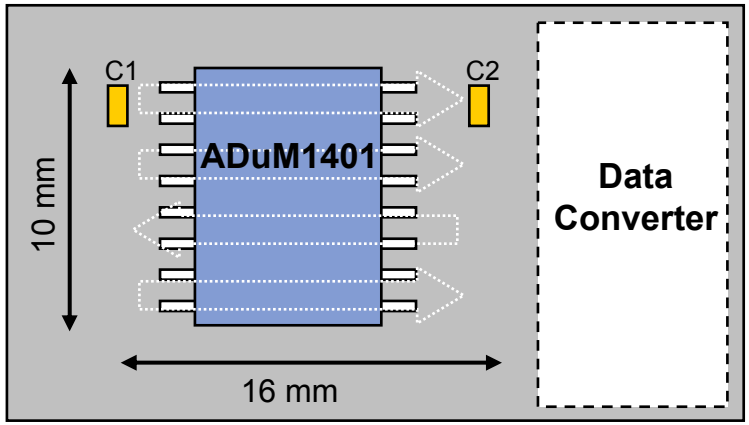


***i*Coupler Devices Eliminate Optocoupler Limitations:**

- ***Integration***
- ***Performance***
- ***Power Consumption***
- ***Ease-of-Use***
- ***Reliability***

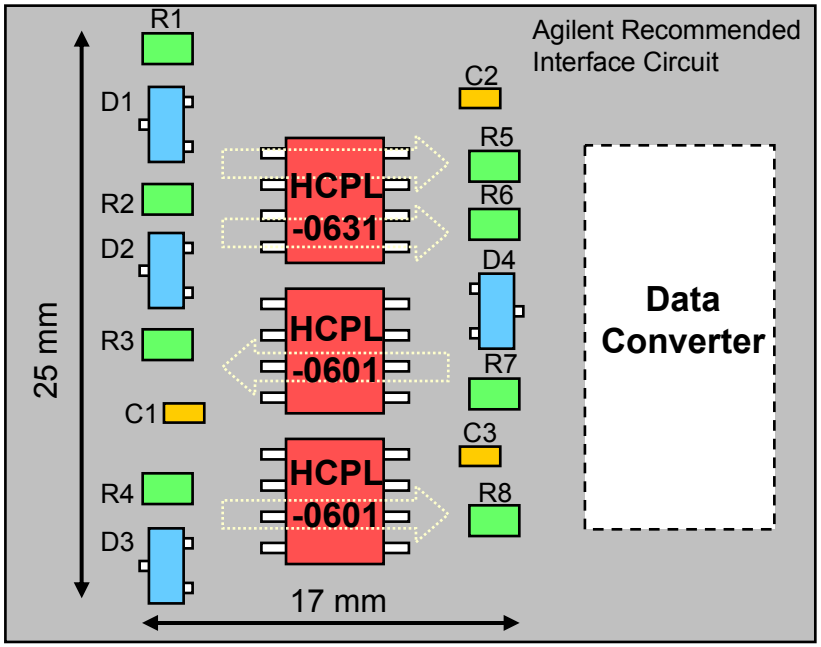
Integration Benefits – 30-60% Cost/Size Reduction

*i*Coupler Solution



Component Count:	**3**
Board Area:	**160 sq mm**
Total Cost:	**$2.55**
ADuM1401B:	$2.40
Discretes (2):	$0.03
Placement Costs:	$0.12

Optocoupler Solution



Component Count:	**18**
Board Area:	**425 sq mm**
Total Cost:	**$3.55**
HCPL-0601 (2):	$1.40
HCPL-0631:	$1.40
Discretes (15):	$0.21
Placement Costs:	$0.54

(10K OEM pricing)

ANALOG DEVICES

Performance Benefits – Data Rate & Timing

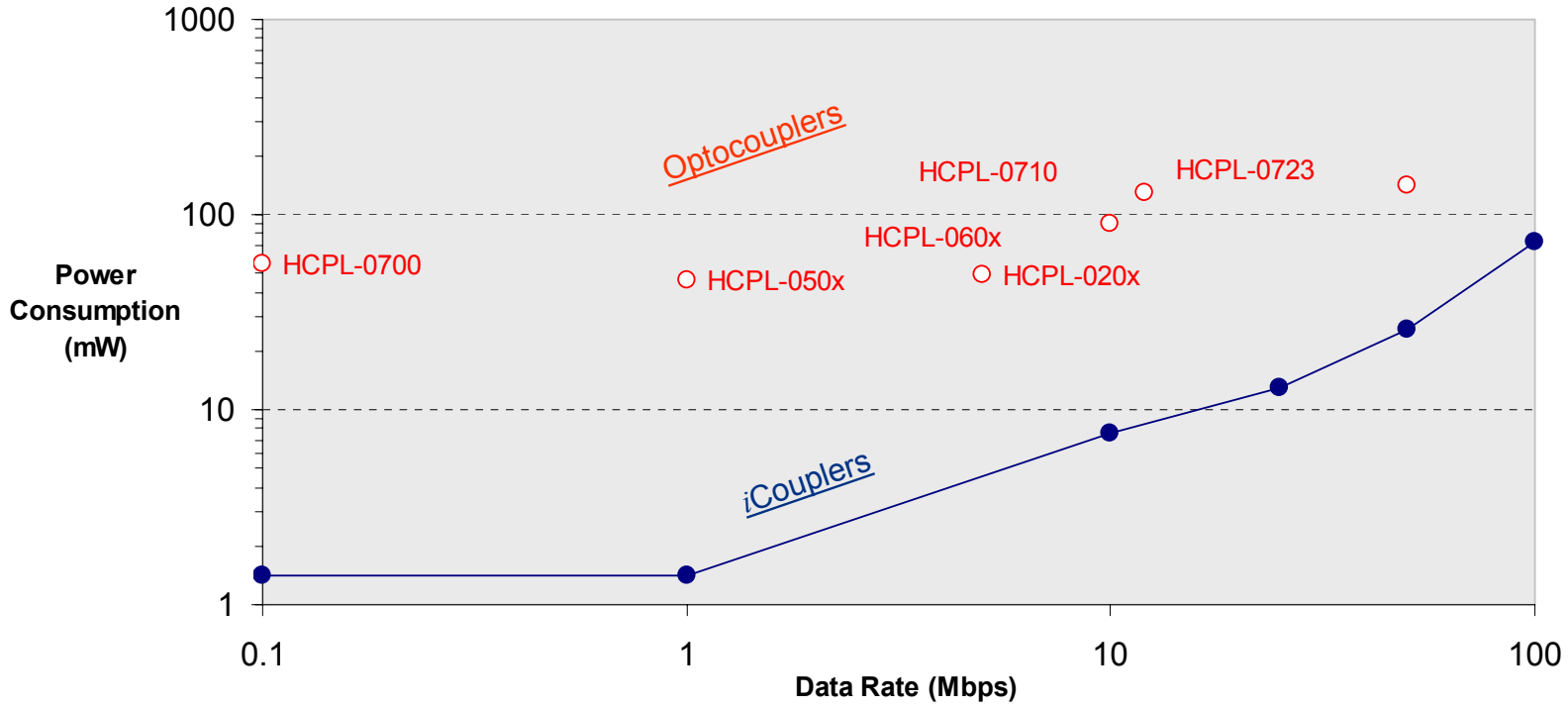
High-Speed

Parameter	Agilent HCPL-0710 Optocoupler	Agilent HCPL-0723 Optocoupler	Analog Devices ADuM1100BR *i*Coupler
Max. Data Rate (Mbps)	12.5	50	100
Prop. Delay (ns)	40	22	18
Part-to-Part Match (ns)	20	16	8
Pulse Width Distortion (ns)	8	2	2

Medium-Speed

Parameter	Agilent HCPL-063x Dual Optocoupler	Analog Devices ADuM1200BR Dual *i*Coupler
Max. Data Rate (Mbps)	10	10
Prop. Delay (ns)	100	50
Part-to-Part Match (ns)	40	15
Channel-to-Channel Match (ns)	unspecified	3
Pulse Width Distortion (ns)	35	3

Power Consumption Benefits – Up to 98% Reduction!



Reduced Power Consumption Results in:

- *Reduced Heat Dissipation*
- *Improved Reliability*
- *Reduced Performance Variation*
- *Reduced Cost*

ANALOG DEVICES

Ease-of-Use Benefits

<u>*i*Couplers Operate as Standard Digital CMOS Components</u>

- **Low Temperature Sensitivity**
- **High Reliability**
- **Standard CMOS/TTL Interfaces**
- **No Derating, Variation Over Time**

Parameter	Optocouplers	Analog Devices *i*Coupler
Interfaces	Analog	Digital
External Components	Pull-up resistors + caps	Bypass caps only
Current Transfer Ratio	• Wide range of values • Varies over time and temp	(not applicable)
Max. Operating Temperature	85 °C (usually)	100 °C and 125 °C
Prop. Delay vs. Temperature	0.1 - >1 ns/°C	0.003 ns/°C
Voltage Translation	--	2.7V to 5.5V
Common-Mode Transient Immunity	Unspecified to 10 kV/μs	25 kV/μs

Reliability Benefits

Parameter	Optocouplers	Analog Devices *i*Couplers	
Active Devices	LEDs, Photodiodes, (Silicon Transistors)	0.6 micron CMOS	• No LED Wearout • Reduced Temp. Acceleration • FIT Rate <10
Insulation	Discrete, inserted at Assembly	Polyimide, Wafer-Level Processed	• Semiconductor clean-room environment, control, and consistency
Thermal Dissipation	50 - 200 mW per channel	1 - 10 mW per channel (data rates < 10 Mbps)	• Increased lifetime • Negligible heating of adjacent components

- ***i*Coupler Products Have the Same Safety Approvals as High-Quality Optocouplers**
  - UL 1577: 2.5 KV Dielectric Withstand Voltage
  - CSA Component Acceptance Notice #5
  - VDE 0884 (EN 60747-5-2): 400 VRMS Max. Working Voltage
- **100% Production Testing is Performed at 3.0KV$_{RMS}$**

Product Overview

Product	Description	Status	Cost/ Channel*
ADuM1100	Single Channel	Production	$1.20 -$2.05
ADuM120x	Dual Channel	Production	$0.45 -$0.90
ADuM130x	Triple Channel	Production	$0.40 -$0.90
ADuM140x	Quad Channel	Production	$0.40 -$0.80
ADuM240x	Quad Channel, 5KV	Samples: Now Production: Sept. 2005	$0.60 - $1.10

* 10K OEM Pricing, May 2005

ADuM1100 Digital Isolators

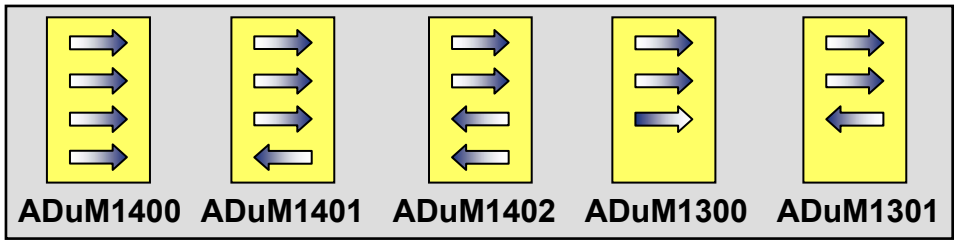
- **Features:**
  - Supports Data Rates up to 100 Mbps
  - Low Power Consumption
    (5 mW at 1 Mbps, 22 mW at 25 Mbps)
  - 3.0– 5.5V, 125°C Operation
  - 8-Lead SOIC Package
- **Three Performance Grades:**
  - A Grade: 25 Mbps Data Rate, 105°C, $1.20
  - B Grade: 100 Mbps Data Rate, 105°C, $1.35
  - U Grade: 100 Mbps Data Rate, 125°C, $2.05
- **Customer Benefits**
  - 5x Improvement in Data Rate, Timing Accuracy
  - 10x Reduction in Power Consumption
  - 10x Cost Reduction for 125°C Isolation

(10K qty)

ANALOG DEVICES

ADuM130x/140x Triple/Quad Isolators

- **Five Configurations Each With Three Performance Grades**
  - "A" (<1 Mbps): $0.40/Channel
  - "B" (<10 Mbps): $0.60/Channel
  - "C" (<90 Mbps): $0.80-$0.90/Channel (10K OEM pricing)

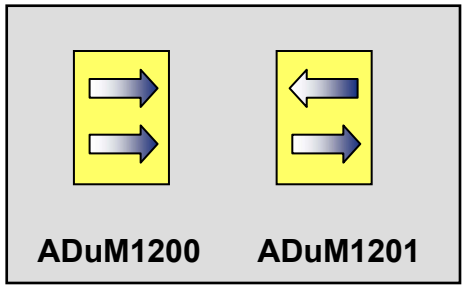


- **Features:**
  - 2.7V – 5.5V, 105°C Operation
  - Low Power Consumption (8.4 mA: Total Four Channels @10 Mbps)
  - 16-Lead Wide Body SOIC Package

- **Customer Benefits**
  - Single-Component Solution
  - Reduced Cost, Size, and Power
  - Superior Data Rate, Timing Accuracy

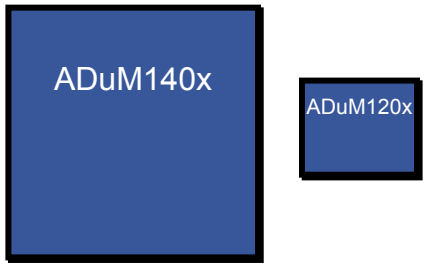
ADuM1200/1201 Dual-Channel Isolators

- **Two Configurations Each With Three Performance Grades**
  - "A" (<1 Mbps): $0.45/Channel (10K qty)
  - "B" (<10 Mbps): $0.65/Channel
  - "C" (<25 Mbps): $0.90/Channel



- **Features:**
  - 2.7 – 5.5V, 105°C Operation
  - Low Power Consumption (8.4 mA: Total Four Channels @10 Mbps)
  - 8-Lead Narrow Body SOIC Package
- **Targeted Applications**
  - RS-232/485/422 Isolation
  - General-Purpose Multi-Channel Isolation
  - Supplement to ADuM130x/140x Triple/Quad Isolators
- **Customer Benefits (Relative to Optocouplers)**
  - Single-Component Solution
  - Reduced Cost, Size, and Power
  - Superior Data Rate, Timing Accuracy

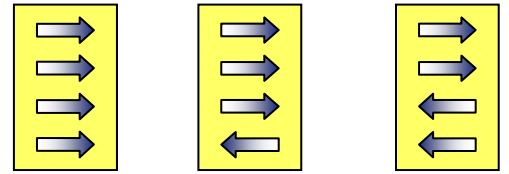
***i*Coupler Relative Sizes**



ANALOG DEVICES

5KV Isolators

- **Three Configurations Each With Three Performance Grades**



- **Features**
  - 5KV Insulation Rating
  - 2.7 – 5.5V, 105°C Operation
  - 16-Lead Wide Body SOIC Package
  - UL, CSA, VDE Approvals
  - IEC 60601-1 Approval (Medical)

- **Availability**
  - Samples: Now
  - Production: Sept. 2005

*i*Coupler Resources

- **New *i*Coupler Catalog!**
  (www.analog.com/icoupler/brochure)

- **Product Web Pages**
  - ADuM1100 – www.analog.com/ADuM1100
  - ADuM120x – www.analog.com/ADuM120x
  - ADuM130x – www.analog.com/ADuM130x
  - ADuM140x – www.analog.com/ADuM140x
  - ADuM240x – www.analog.com/ADuM240x

- **Other Web Resources**
  - *i*Coupler vs. GMR Isolation Technologies
  - Frequently Asked Questions
  - Product Briefs
  - Technical Articles
  - Datasheets
  - Evaluation Boards

*i*Coupler® Digital Isolation Products

Table of Contents

Introduction to Analog Devices' iCoupler Isolation Products

In a wide variety of systems, designers are faced with the challenge of signaling data between two points while preventing the flow of electrical current. This is typically needed for safety or grounding considerations. The solution to this problem is to employ a galvanic isolation device. Such a device allows signals to travel between the two points but prevents the flow of electrical current.

Common isolation solutions use either optocoupler, transformer, or capacitor techniques. None of these approaches has kept up with the relentless drive to improve the cost, size, power, performance, and reliability characteristics of electrical systems. As a result, the isolation function has become a limiting factor in many designs in regards to these characteristics.

Analog Devices' iCoupler technology eliminates this bottleneck. Based on chip scale transformer technology, iCoupler products bring the isolation function into the fold with other semiconductor functions with improvements in all these areas. As a result, designers can implement isolation in their designs without the cost, size, power, performance, and reliability constraints found with traditional isolation solutions.

ANALOG DEVICES