

Advanced CMOS Logic ICs

CD54/74AC/ACT Series

The Advanced High-Speed CMOS Logic product line represents the second generation of high-speed CMOS logic. Designated the CD54/74AC and CD54/74ACT families, these devices match Fairchild's bipolar FAST™ devices in speed, performance and logic/type output drive, but at CMOS power levels.

Featuring < 3ns gate propagation delays, Advanced CMOS Logic is the fastest CMOS logic yet available. (By contrast, the standard propagation delay for CMOS logic is 90ns, and for high-speed CMOS logic, 9ns.) ACL can operate at more than 150MHz. Output drive capability is 24mA, compared with 6mA for HC/HCT. This capability enables AC/ACT types to drive 50Ω transmission lines, yet still generate the voltages necessary to operate the receiving logic devices safely.

Benefits of the Advanced CMOS Logic family compared to other logic families include:

- Lower Power Dissipation
- Balanced Propagation Delay
- Superior Input Characteristics: Larger Noise Immunity and Noise Margin Input Switching Voltage Stability with Temperature Variation
- Lower Input Current
- Improved Output Source Current with Better Balance
- Wider Operating Supply Voltage Range
- Wider Commercial-Product Operating-Temperature Range
- Lower 3-State Output Leakage (High-Z-Mode)
- Improved Reliability in General, and Particular in Surface-Mount (Small-Outline) Packages
- Rail-To-Rail Output Voltage Swing

Maximum Ratings, Absolute-Maximum Values:

| | |
|--|------------|
| DC Supply-Voltage (V _{CC}) | -0.5 to 6V |
| DC Input Diode Current, I _{IK} (for V _I < -0.5V or V _I > V _{CC} + 0.5V) | ±20mA |
| DC Output Diode Current, I _{OK} (for V _O < -0.5V or V _O > V _{CC} + 0.5V) | ±50mA |
| DC Output Source Or Sink Current per Output Pin, I _O (for V _O > -0.5 or V _O < V _{CC} - 0.5V) | ±50mA |
| DC V _{CC} or Ground Current (I _{CC} or I _{GND}) | ±100mA* |

**Power Dissipation Per Package (P_D):

| | |
|--|------------------------------------|
| For T _A = -55°C to +100°C (Package Type E) | 500mW |
| For T _A = +100°C to +125°C (Package Type E) | Derate Linearly at 8mW/°C to 300mW |
| For T _A = -55°C to +70°C (Package Type M) | 400mW |
| For T _A = +70°C to +125°C (Package Type M) | Derate Linearly at 6mW/°C to 70mW |

Operating-Temperature Range (T_A) -55°C to +125°C

Storage Temperature (T_{STG}) -65°C to +150°C

Lead Temperature (During Soldering):

At distance 1/16 ± 1/32 in. (1.59 ± 0.79mm) from case for 10s maximum +265°C

Unit inserted into PC board min. thickness 1/16 in.

(1.59mm) with solder contacting lead tips only +300°C

* For up to 4 outputs per device; add ±25mA for each additional output.

** See interpretation guide and packaging section

Recommended Operating Conditions:

For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

| Characteristics | Limits | | Units |
|---|--------|-----------------|-------|
| | Min | Max | |
| Supply-Voltage Range, (For T _A = Full Package-Temperature Range) V _{CC} * | | | |
| AC Types | 1.5 | 5.5 | V |
| ACT Types | 4.5 | 5.5 | V |
| DC Input or Output Voltage, V _I , V _O | 0 | V _{CC} | V |
| Operating Temperature, T _A | -55°C | +125°C | °C |
| Input Rise and Fall Slew Rate, dt/dv | | | |
| at 1.5V to 3V (AC Types) | 0 | 50 | ns/V |
| at 3.6V to 5.5V (AC Types) | 0 | 20 | ns/V |
| at 4.5V to 5.5V (ACT Types) | 0 | 10 | ns/V |

* Unless otherwise specified, all voltages are referenced to ground.

Advanced CMOS Logic ICs

CD54/74AC/ACT Series (Continued)

Product Classification Chart

| Gates | | | Buffers Line-Drivers | Bus Drivers | Decoders/ Encoders | Schmitt Trigger | Multivibrators | |
|--|--------------------------|--|---|---|--|---------------------------------|---|--|
| NOR/NAND | Inverters | OR/AND/ Exclusive-OR | | | | | Flip-Flops/Latches | |
| CD/54/74AC/ACT | | | CD54/74AC/ACT | | | CD54/74AC/ACT | | |
| AC/ACT00 AC/ACT02 AC/ACT10 AC/ACT20 | AC/ACT04 AC/ACT05** | AC/ACT08 AC/ACT32 AC/ACT86 | AC/ACT240 AC/ACT241 AC/ACT244 AC/ACT540 AC/ACT541 | AC/ACT240 AC/ACT241 AC/ACT244 AC/ACT540 AC/ACT541 | AC/ACT138 AC/ACT139 AC/ACT238 | AC/ACT14 | AC/ACT74 AC/ACT109 AC/ACT112 AC/ACT174 AC/ACT175 AC/ACT273 AC/ACT374 AC/ACT534 AC/ACT564 AC/ACT574 | AC/ACT373 AC/ACT533 AC/ACT563 AC/ACT573 |
| Registers | | Counters | | Multiplexers/ Demultiplexers | Interface Circuits | Arithmetic Circuits | Phase-Locked Loop | |
| Shift | FIFO Buffer | Synchronous | | | | | | |
| CD54/74AC/ACT | | CD54/74AC/ACT | | CD54/74AC/ACT | CD54/74AC/ACT | CD54/74AC/ACT | | |
| AC/ACT164 AC/ACT299 AC/ACT323 | AC/ACT7201 AC/ACT7202 | AC/ACT161 AC/ACT163 AC/ACT191 AC/ACT193 AC/ACT7060 AC/ACT7061 | AC/ACT138 AC/ACT139 AC/ACT151 AC/ACT153 AC/ACT157 AC/ACT158 AC/ACT238 AC/ACT251 AC/ACT253 AC/ACT257 AC/ACT258 | Bus Transceivers | AC/ACT245 AC/ACT623 AC/ACT646 AC/ACT647 † AC/ACT648 AC/ACT649 † AC/ACT651 AC/ACT652 AC/ACT653** AC/ACT654** AC/ACT7623** AC/ACT7651 | Adders/ Comparators | AC/ACT283 | AC/ACT297 |
| | | | | | | Parity Generator/ Checker | AC/ACT280 | |

† Open Drain **Open Drain (one side)

Function Selection Chart

| Type CD54/74 | Function/Description | Classification | Number of Pins |
|---|---|---|--|
| AC/ACT00 AC/ACT02 AC/ACT10 AC/ACT20 | NAND/NOR Gates Quad 2-Input NAND Gate Quad 2-Input NOR Gate Triple 3-Input NAND Gate Dual 4-Input NAND Gate | SSI SSI SSI SSI | 14 14 14 14 |
| AC/ACT08 AC/ACT32 AC/ACT86 | AND/OR/Exclusive-OR Gates Quad 2-Input AND Gate Quad 2-Input OR Gate Quad 2-Input Exclusive-OR Gate | SSI SSI SSI | 14 14 14 |
| AC/ACT04 AC/ACT05 AC/ACT240 AC/ACT241 AC/ACT244 AC/ACT540 AC/ACT541 | Inverters/Buffers/Bus Drivers Hex Inverter/Buffer Hex Inverter/Buffer with Open-Drain Outputs Octal Buffer/Line Driver; 3-State; Inverting Octal Buffer/Line Driver; 3-State Octal Buffer/Line Driver; 3-State Octal Buffer/Line Driver; 3-State; Inverting Octal Buffer/Line Driver; 3-State | SSI SSI MSI MSI MSI MSI MSI | 14 14 20 20 20 20 20 |

Advanced CMOS Logic ICs

CD54/74AC/ACT Series (Continued)

Function Selection Chart (Continued)

| Type CD54/74 | Function/Description | Classification | No. of Pins |
|--------------|--|----------------|-------------|
| | Flip-Flops/Latches | | |
| AC/ACT74 | Dual D-Type Flip-Flop with SET and RESET; Positive-Edge Trigger | FF | 14 |
| AC/ACT109 | Dual JK Flip-Flop with SET and RESET; Positive-Edge Trigger | FF | 16 |
| AC/ACT112 | Dual JK Flip-Flop with SET and RESET | FF | 16 |
| AC/ACT174 | Hex D-Type Flip-Flop with RESET | MSI | 16 |
| AC/ACT175 | Quad D-Type Flip-Flop with RESET | MSI | 16 |
| AC/ACT273 | Octal D-Type Flip-Flop with RESET | FF | 20 |
| AC/ACT374 | Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State; Non-Inverting | FF | 20 |
| AC/ACT534 | Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State; Inverting | FF | 20 |
| AC/ACT564 | Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State; Inverting | FF | 20 |
| AC/ACT574 | Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State | FF | 20 |
| | Shift/FIFO Buffer/Multiport Registers | | |
| AC/ACT164 | 8-Bit Serial-In Parallel-Out Shift Register | MSI | 14 |
| AC/ACT299 | 8-Bit Universal Shift Register; 3-State | MSI | 20 |
| AC/ACT323 | 8-Bit Universal Shift Register; 3-State (w/Synchronous RESET) | MSI | 20 |
| AC/ACT7202 | 1024 x 9 Bit Parallel In-Out FIFO | MSI | 28 |
| AC/ACT7201 | 512 x 9 Bit Parallel FIFO | MSI | 28 |
| | Arithmetic Circuits | | |
| AC/ACT280 | 8-Bit Odd/Even Parity Generator/Checker | MSI | 14 |
| AC/ACT283 | 4-Bit Full Adder with Fast Carry | MSI | 16 |
| | Counters | | |
| AC/ACT161 | Presettable Synchronous 4-Bit Binary Counter; Asynchronous RESET | MSI | 16 |
| AC/ACT163 | Presettable Synchronous 4-Bit Counter; Synchronous RESET | MSI | 16 |
| AC/ACT191 | Presettable Synchronous 4-Bit Binary Up/Down Counter | MSI | 16 |
| AC/ACT193 | Presettable Synchronous 4-Bit Binary Up/Down Counter | MSI | 16 |
| AC/ACT7060 | 14-Stage Binary Ripple Counter with Oscillator | MSI | 20 |
| AC/ACT7061 | 14-Stage Binary Ripple Counter with Oscillator | MSI | 20 |
| | Analog and Digital Multiplexers/Demultiplexers | | |
| AC/ACT138 | 3-to-8-Line Decoder/Demultiplexer, Inverting | MSI | 16 |
| AC/ACT139 | Dual 2-of-4-Line Decoder/Demultiplexer | MSI | 16 |
| AC/ACT151 | 8-Input Multiplexer | MSI | 16 |
| AC/ACT153 | Dual 4-Input Multiplexer | MSI | 16 |
| AC/ACT157 | Quad 2-Input Multiplexer | MSI | 16 |
| AC/ACT158 | Quad 2-Input Multiplexer, Inverting | MSI | 16 |
| AC/ACT238 | 3-to-8-Line Decoder/Demultiplexer | MSI | 16 |
| AC/ACT251 | 8-Input Multiplexer; 3-State | MSI | 16 |
| AC/ACT253 | Dual 4-Input Multiplexer; 3-State | MSI | 16 |
| AC/ACT257 | Quad 2-Input Multiplexer; 3-State; Non-Inverting Outputs | MSI | 16 |
| AC/ACT258 | Quad 2-Input Multiplexer; 3-State; Inverting Outputs | MSI | 16 |
| | Decoders/Encoders | | |
| AC/ACT138 | 3-to-8-Line Decoder/Demultiplexer Inverting | MSI | 16 |
| AC/ACT139 | Dual 2-of-4-Line Decoder/Demultiplexer | MSI | 16 |
| AC/ACT238 | 3-to-8-Line Decoder/Demultiplexer | MSI | 16 |
| | Bus Transceivers | | |
| AC/ACT245 | Octal Bus Transceiver; 3-State | MSI | 20 |
| AC/ACT623 | Octal Bus Transceiver; 3-State; Non-Inverting | MSI | 20 |
| AC/ACT646 | Octal Bus Transceiver/Register; 3-State | MSI | 24 |
| AC/ACT647 | Octal Bus Transceiver/Register with Open Drain, Non-Inverting | MSI | 24 |
| AC/ACT648 | Octal Bus Transceiver/Register; 3-State; Inverting | MSI | 24 |
| AC/ACT649 | Octal Bus Transceiver/Register with Open Drain, Inverting | MSI | 24 |
| AC/ACT651 | Octal Bus Transceiver/Register with Open Drain, Inverting | MSI | 24 |
| AC/ACT652 | Octal Bus Transceiver/Register; 3-State; Non-Inverting | MSI | 24 |
| AC/ACT653 | Octal Bus Transceiver/Register; 3-State (B Side), Open-Drain (A Side); Inverting | MSI | 24 |
| AC/ACT654 | Octal Bus Transceiver/Register; 3-State (B-Side), Open-Drain (A-Side); Non-Inverting | MSI | 24 |
| AC/ACT7623 | Octal Bus Transceiver; 3-State (B-Side), Open-Drain (A-Side); Non-Inverting | MSI | 20 |
| AC/ACT7651 | Octal Bus Transceiver/Register; 3-State; Inverting | MSI | 24 |

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CD54/74AC/ACT Series (Continued)

Function Selection Chart (Continued)

| Type CD54/74 | Function/Description | Classification | No. of Pins |
|--------------|---|----------------|-------------|
| AC/ACT373 | Latches Octal Transparent Latch; 3-State | MSI | 20 |
| AC/ACT533 | Octal Transparent Latch; 3-State; Inverting | MSI | 20 |
| AC/ACT563 | Octal Transparent Latch; 3-State | MSI | 20 |
| AC/ACT573 | Octal Transparent Latch; 3-State | MSI | 20 |
| AC/ACT14 | Schmitt Trigger Hex Inverting Schmitt Trigger | SSI | 14 |
| AC/ACT297 | Phase-Locked Loop Digital Phase-Locked Loop | MSI | 16 |

BIMOS FCT Interface Logic ICs

CD54/74FCT Series

FCT Products for Backplane-Interface Applications

Harris FCT products are developed to provide a reliable interface with modern high-speed backplanes. The FCT types vastly reduce power consumption, avoid bus contention, minimize switching noise, and provide outputs that are specifically tailored to interface with VME buses or their equivalents.

The speed of the FCT family is comparable to that of bipolar FAST types. Sink current ranges from 48 milliamperes to 64 milliamperes depending on product type.

FCT Features

| | |
|---|---|
| Speed | Competitive with similar bipolar F/AS TTL functions. Typical delay is 3.5 nanoseconds. |
| Sink/Source Current | All types have sink and source currents meeting VME, multibus, etc., standards. Output edges are monotonic through the TTL switch point with fully populated backplanes. A BiMOS output driver stage is used. |
| Simultaneous Switching Transient | (Ground bounce) Competitive with similar bipolar TTL and CMOS products. Output swing is 3.5 volts. Controlled output-edge rate. |
| Operating and Standby Power | Ultra-low pure CMOS operating power and standby power of almost zero. |
| Pinout | Standard |

Fully populated buses, such as the 21-slot VME can be reliably interfaced. Products are most economically packaged in plastic DIP and gull-wing surface-mount pinouts. As with the Harris AC/ACT family of logic devices, simultaneous switching transients are controlled to levels comparable to similar bipolar logic functions (1 volt peak area for octal ground bounce).

The two competitive bipolar families (FAST™ and BCT), compared with FCT products, are 150 times higher in quiescent power consumption and 10 times higher in operating power consumption at a continuous five megahertz operation.

FCT Benefits

- Swift delay requirements dictated by modern control-system backplane-interface logic present no problems.
- Optimized output drives minimize backplane reflections in worst-case situations.
- EMI and RFI emissions minimized. Good signal-pulse integrity.
- Meets low-power needs of down-sized computers without fans, etc. Low battery drain.
- Provided in minimum and most economically sized DIP and SOP.
- Minimum CAD/CAM, burn-in board, and PC-board real estate costs with no performance sacrifice.