

# 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 <sub>CC</sub> )	-0.5 to 6V
DC Input Diode Current, I <sub>IK</sub> (for V <sub>I</sub> < -0.5V or V <sub>I</sub> > V <sub>CC</sub> + 0.5V)	±20mA
DC Output Diode Current, I <sub>OK</sub> (for V <sub>O</sub> < -0.5V or V <sub>O</sub> > V <sub>CC</sub> + 0.5V)	±50mA
DC Output Source Or Sink Current per Output Pin, I <sub>O</sub> (for V <sub>O</sub> > -0.5 or V <sub>O</sub> < V <sub>CC</sub> -0.5V)	±50mA
DC V <sub>CC</sub> or Ground Current (I <sub>CC</sub> or I <sub>GND</sub> )	±100mA*

### \*\*Power Dissipation Per Package (P<sub>D</sub>):

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

Operating-Temperature Range (T<sub>A</sub>) ..... -55°C to +125°C

Storage Temperature (T<sub>STG</sub>) ..... -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 <sub>A</sub> = Full Package-Temperature Range) V <sub>CC</sub> *			
AC Types	1.5	5.5	V
ACT Types	4.5	5.5	V
DC Input or Output Voltage, V <sub>I</sub> , V <sub>O</sub>	0	V <sub>CC</sub>	V
Operating Temperature, T <sub>A</sub>	-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	<b>NAND/NOR Gates</b> 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	<b>AND/OR/Exclusive-OR Gates</b> 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	<b>Inverters/Buffers/Bus Drivers</b> 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
	<b>Flip-Flops/Latches</b>		
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
	<b>Shift/FIFO Buffer/Multiport Registers</b>		
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
	<b>Arithmetic Circuits</b>		
AC/ACT280	8-Bit Odd/Even Parity Generator/Checker	MSI	14
AC/ACT283	4-Bit Full Adder with Fast Carry	MSI	16
	<b>Counters</b>		
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
	<b>Analog and Digital Multiplexers/Demultiplexers</b>		
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
	<b>Decoders/Encoders</b>		
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
	<b>Bus Transceivers</b>		
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

## Advanced CMOS Logic ICs

### CD54/74AC/ACT Series (Continued)

#### Function Selection Chart (Continued)

Type CD54/74	Function/Description	Classification	No. of Pins
AC/ACT373	<b>Latches</b> 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	<b>Schmitt Trigger</b> Hex Inverting Schmitt Trigger	SSI	14
AC/ACT297	<b>Phase-Locked Loop</b> 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

<b>Speed</b>	Competitive with similar bipolar F/AS TTL functions. Typical delay is 3.5 nanoseconds.
<b>Sink/Source Current</b>	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.
<b>Simultaneous Switching Transient</b>	(Ground bounce) Competitive with similar bipolar TTL and CMOS products. Output swing is 3.5 volts. Controlled output-edge rate.
<b>Operating and Standby Power</b>	Ultra-low pure CMOS operating power and standby power of almost zero.
<b>Pinout</b>	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.