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 Particulary 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 t 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) form 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.

CD54/74AC/ACT Series (Continued)

Product Classification Chart

Gates			Buffers Line-Drivers	Bus Drivers	Decoders/ Encoders	Schmitt Trigger	Multivibrators	
							Flip-Flops/Latches	
NOR/NAND	Inverters	OR/AND/ Exclusive-OR					Flip/Flops	Latches
CD/54/74AC/ACT			CD54/74/AC/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 **Parity Generator/ Checker** AC/ACT280	AC/ACT297

†Open Drain **Open Drain (one side)

Function Selection Chart

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

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	Presetable 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

Advanced CMOS Logic ICs

CD54/74AC/ACT Series (Continued)

Function Selection Chart (Continued)

Type CD54/74	Function/Description	Classification	No. of Pins
	Latches		
AC/ACT373	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
	Schmitt Trigger		
AC/ACT14	Hex Inverting Schmitt Trigger	SSI	14
	Phase-Locked Loop		
AC/ACT297	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.