

High-Speed CMOS Logic ICs

CD54/74HC/HCT Series

The Harris HC/HCT series of high-speed CMOS logic integrated circuits includes an extensive line of products that are pin compatible with many existing bipolar 54/74 LSTTL and CMOS 4000 series of digital logic types. The new HC/HCT series ICs provide high-speed CMOS replacements for the most popular LSTTL devices in existing designs and also offer low-power all-CMOS designs for the new digital systems. Key family features of the Harris HC/HCT types include:

- Speeds equivalent to LSTTL types with typical gate delays of 8ns.
- Fanout to 10 74LSTTL loads; 15 loads using Bus Driver 54/74 types.
- Operating frequencies equivalent to LSTTL types, typically 50MHz.

- Full Operating Temperature Ranges:
F Package: -55 to +125°C
E & M Packages: -40 to +125°C
- The high voltage noise immunity characteristic of CMOS, typically 45 percent of V_{CC} , a two to three times improvement over LSTTL (HC-series types.)
- Wide range of power supply operating voltages, 2 to 6 volts.
- CMOS low static power consumption, typically less than 1 microwatt.

The product line consists of CD54/74HC-series types, which feature CMOS input voltage level compatibility, and CD54/74HCT-series types, which are input voltage level compatible with LSTTL devices. The line also includes a limited number of single-stage, unbuffered inverter types (CD54/74HCU-series) for added versatility in oscillator and amplifier applications.

Standardized Maximum Ratings and Recommended Operating Conditions for CD54/74HC, CD54/74HCT, and CD54/74HCU Integrated Circuits

Maximum Ratings, Absolute-Maximum Values:

DC Supply-Voltage (V_{CC})

(Voltages referenced to ground) -0.5 to +7V

DC Input Diode Current, I_{IK} (for $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$) $\pm 20mA$

DC Output Diode Current, I_{OK} (for $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$) $\pm 20mA$

DC Drain Current, Per Output (I_O) (for $-0.5V < V_O < V_{CC} + 0.5V$):

Standard Output $\pm 25mA$

Bus Driver Output $\pm 35mA$

DC V_{CC} or Ground Current (I_{CC}):

Standard Output $\pm 50mA$

Bus Driver Output $\pm 70mA$

* Power Dissipation Per Package (P_D):

For $T_A = -40$ to $+100^\circ C$ (Package Type E) 500mW

For $T_A = +100$ to $+125^\circ C$ (Package Type E) Derate Linearly at 8mW/°C to 300mW

For $T_A = -55$ to $+100^\circ C$ (Package Type F,) 500mW

For $T_A = +100$ to $+125^\circ C$ (Package Type F,) Derate Linearly at 8mW/°C to 300mW

For $T_A = -40$ to $+70^\circ C$ (Package Type M) 400mW

For $T_A = +70$ to $+125^\circ C$ (Package Type M) Derate Linearly at 6mW/°C to 70mW

Operating-Temperature Range (T_A):

Package Types F, H -55 to +125°C

Package Type E, M -40 to +125°C

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

Lead Temperature (During Soldering):

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

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

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

* 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} .* CD54/74HC Types (and CD54/74HCU04) CD54/74HCT Types	2	6	V
	4.5	5.5	V
DC Input or Output Voltage, V_I, V_O	0	V_{CC}	V
Operating Temperature, T_A : CD74 Types CD54 Types	-40	+125	°C
	-55	+125	
Input Rise and Fall Times t_r, t_f at 2V at 4.5V at 6V	0	1000	ns
	0	500	ns
	0	400	ns

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

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Product Classification Chart

Gates			Buffers Line- Drivers	Bus Drivers	Multi- Function AOI	Decoders/ Encoders/	Schmitt Trigger	Multivibrators	
NOR/NAND	OR/AND	Flip-Flops/Latches							
		Flip-Flops						Latches	
CD54/74HC/HCT				CD54/74/HC/HCT				CD54/74HC/HCT	
HC/HCT02 HC/HCT03* HC/HCT27 HC/HCT4002	HC/HCT00 HC/HCT10 HC/HCT20 HC/HCT30	HC/HCT08 HC/HCT11 HC/HCT21 HC/HCT32 HC/HCT4075	HC/HCT240 • HC/HCT241 • HC/HCT244 • HC/HCT355 • HC/HCT366 • HC/HCT367 • HC/HCT368 • HC/HCT540 • HC/HCT541 •	HC/HCT125 HC/HCT126 HC/HCT241 • HC/HCT244 • HC/HCT365 • HC/HCT366 • HC/HCT367 • HC/HCT368 • HC/HCT540 • HC/HCT541 •	HC/HCT86 HC/HCT266	HC/HCT42 HC/HCT137 HC/HCT138 HC/HCT139 HC/HCT147 HC/HCT154 HC/HCT237 HC/HCT238 HC/HCT4511 HC/HCT4514 HC/HCT4515 HC/HCT4543	HC/HCT14 HC/HCT132	HC/HCT73 HC/HCT74 HC/HCT107 HC/HCT109 HC/HCT122 HC/HCT173 • HC/HCT174 HC/HCT175 HC/HCT273 HC/HCT374 • HC/HCT377 HC/HCT534 • HC/HCT564 • HC/HCT574 •	HC/HCT75 HC/HCT259 HC/HCT373 • HC/HCT533 • HC/HCT563 • HC/HCT573 • Monostable HC/HCT123 HC/HCT221 HC/HCT423 HC/HCT4538†
Exclusive- NOR	Inverters	Exclusive OR	High-to-Low Level Shifters						
HC7268	HC/HCT04 HCU04	HC/HCT86							
			HC4049 HC4050						
Registers			Counters		Digital Multi- plexers	Phase Locked Loops	Bilateral Switches	Interface Circuits	
Shift	FIFO Buffer	Multiport	Binary Ripple	Synchro- nous					
CD54/74HC/HCT			CD54/74HC/HCT		CD54/74HC/HCT				
HC/HCT164 HC/HCT165 HC/HCT166 HC/HCT194 HC/HCT195 HC/HCT299 • HC/HCT597 HC/HCT4015 HC/HCT4094 HC/HCT40104 •	HC/HCT40105 HC/HCT7030 •	HC/HCT670	HC/HCT93 HC/HCT390 HC/HCT393 HC/HCT4020 HC/HCT4024 HC/HCT4040 HC/HCT4060 HC/HCT40103	HC/HCT160 HC/HCT161 HC/HCT162 HC/HCT163 HC/HCT190 HC/HCT191 HC/HCT192 HC/HCT193 HC/HCT4017 HC/HCT4510 HC/HCT4516 HC/HCT4518 HC/HCT4520 HC/HCT40102	HC/HCT151 HC/HCT153 HC/HCT157 HC/HCT158 HC/HCT251 HC/HCT253 • HC/HCT257 • HC/HCT258 HC/HCT354 • HC/HCT356 •	HC/HCT297 HC/HCT4046A HC/HCT7046A	HC/HCT4016Δ HC/HCT4066Δ HC/HCT4316Δ	BUS Transceivers	HC/HCT242 • HC/HCT243 • HC/HCT245 • HC/HCT640 • HC/HCT643 • HC/HCT646 • HC/HCT647 • HC/HCT648 • HC/HCT649 • HC/HCT651 • HC/HCT652 • HC/HCT653 • HC/HCT654 • HC/HCT7038 •
Arithmetic Circuits						Display Drivers			
Adders/ Comparators	ALU/Rate Multipliers		Parity Generator/Checker			For LCD Drive		For LED Drive	
CD54/74HC/HCT						CD54/74HC/HCT			
HC/HCT85 HC/HCT283 HC/HCT583 HC/HCT688		HC/HCT181 HC/HCT182		HC/HCT280		HC/HCT4543 See Decoders/ Encoders		HC/HCT4511	

* Open Collector

Δ Quad type

• With Bus Driver output stage

† Precision type

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Function Selection Chart

Type CD54/74	Function/Description	Classification	No. of Pins
NAND/NOR Gates			
HC/HCT00	Quad 2-Input NAND Gate	SSI	14
HC/HCT02	Quad 2-Input NOR Gate	SSI	14
HC/HCT03	Quad 2-Input NAND Gate with Open Drain	SSI	14
HC/HCT10	Triple 3-Input NAND Gate	SSI	14
HC/HCT20	Dual 4-Input NAND Gate	SSI	14
HC/HCT27	Triple 3-Input NOR Gate	SSI	14
HC/HCT30	8-Input NAND Gate	SSI	14
HC/HCT4002	Dual 4-Input NOR Gate	SSI	14
AND/OR/EXCLUSIVE-OR Gates			
HC/HCT08	Quad 2-Input AND Gate	SSI	14
HC/HCT11	Triple 3-Input AND Gate	SSI	14
HC/HCT21	Dual 4-Input AND Gate	SSI	14
HC/HCT32	Quad 2-Input OR Gate	SSI	14
HC/HCT86	Quad 2-Input EXCLUSIVE-OR Gate	SSI	14
HC/HCT4075	Triple 3-Input OR Gate	SSI	14
HC7266	Quad Exclusive NOR Gate	SSI	14
Inverters/Buffers/Bus Drivers			
HC/HCT04	Hex Inverter/Buffer	SSI	14
HCU04	Hex Inverter (Unbuffered)	SSI	14
HC/HCT125*	Quad 3-State Buffer	MSI	14
HC/HCT126*	Quad 3-State Buffer	MSI	14
HC/HCT240*	Octal Buffer/Line Driver; 3-State; Inverting	MSI	20
HC/HCT241*	Octal Buffer/Line Driver; 3-State	MSI	20
HC/HCT244*	Octal Buffer/Line Driver; 3-State	MSI	16
HC/HCT365*	Hex Buffer/Line Driver; 3-State	MSI	16
HC/HCT366*	Hex Buffer/Line Driver; 3-State; Inverting	MSI	16
HC/HCT367*	Hex Buffer/Line Driver; 3-State	MSI	16
HC/HCT368*	Hex Buffer/Line Driver; 3-State; Inverting	MSI	16
HC/HCT540*	Octal Buffer/Line Driver; 3-State; Inverting	MSI	20
HC/HCT541*	Octal Buffer/Line Driver; 3-State	MSI	20
HC4049	Hex Inverting HIGH-to-LOW Level Shifter	SSI	16
HC4050	Hex HIGH-to-LOW Level Shifter	SSI	16
Flip-Flops			
HC/HCT73	Dual JK Flip-Flop with Reset; Negative-Edge Trigger	FF	14
HC/HCT74	Dual D-Type Flip-Flop with Set and Reset; Positive-Edge Trigger	FF	14
HC/HCT107	Dual JK Flip-Flop with Reset; Negative-Edge Trigger	FF	14
HC/HCT109	Dual JK Flip-Flop with Set and Reset; Positive-Edge Trigger	FF	16
HC/HCT112	Dual JK Flip-Flop with Set and Reset; Negative-Edge Trigger; 3-State	FF	16
HC/HCT173*	Quad D-Type Flip-Flop with Set and Reset; Positive-Edge Trigger; 3-State	MSI	16
HC/HCT174	Hex D-Type Flip-Flop with Reset; Positive-Edge Trigger	MSI	16
HC/HCT175	Quad D-Type Flip-Flop with Reset; Positive-Edge Trigger	MSI	16
HC/HCT273	Octal D-Type Flip-Flop with Reset; Positive-Edge Trigger	MSI	20
HC/HCT374*	Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State	MSI	20
HC/HCT377	Octal D-Type Flip-Flop with Data Enable; Positive-Edge Trigger	MSI	20
HC/HCT534*	Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State; Inverting	MSI	20
HC/HCT564*	Octal D-Type Flip-Flop; Positive-Edge Trigger; 3-State; Inverting	MSI	20
HC/HCT574*	Octal D-Type Flip-Flop; Positive-Edge; 3-State	MSI	20
Shift/FIFO Buffer/Multiport Registers			
HC/HCT164	8-Bit Serial-In/Parallel-Out Shift Register	MSI	14
HC/HCT165	8-Bit Parallel-In/Serial-Out Shift Register	MSI	16
HC/HCT166	8-Bit Parallel/Serial-In Serial Out Shift Register	MSI	16
HC/HCT194	4-Bit Bidirectional Universal Shift Register	MSI	16
HC/HCT195	4-Bit Parallel Access Shift Register	MSI	16
HC/HCT299*	8-Bit Universal Shift Register; 3-State	MSI	20

* Types with a bus driver output stage.

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Function Selection Chart (Continued)

Type CD54/74	Function/Description	Classification	No. of Pins
	Shift/FIFO Buffer/Multiport Registers (Continued)		
HC/HCT597	8-Bit Shift Register With Input Latch	MSI	16
HC/HCT670*	4 x 4 Register File; 3-State	MSI	16
HC/HCT4015	Dual 4-Stage Static Shift Register	MSI	16
HC/HCT4094	8-Stage Shift-and-Store Bus Register; 3-State	MSI	16
HC/HCT7030*	9-Bit x 64 Word FIFO Register; 3-State	MSI	28
HC/HCT40104*	4-Bit Bidirectional Universal Shift Register; 3-State	MSI	16
HC/HCT40105	4 Bits x 16 Words FIFO Register	MSI	16
	Arithmetic Circuits		
HC/HCT85	4-Bit Magnitude Comparator	MSI	16
HC/HCT181	4-Bit Arithmetic Logic Unit	MSI	24
HC/HCT182	Look-Ahead Carry Generator	MSI	16
HC/HCT280	9-Bit Odd/Even Parity Generator/Checker	MSI	14
HC/HCT283	4-Bit Binary Full Adder With Fast Carry	MSI	16
HC/HCT583	4-Bit BCD Full Adder with Fast Carry	MSI	16
HC/HCT688	8-Bit Magnitude Comparator	MSI	20
	Counters		
HC/HCT93	4-Binary Ripple Counter	MSI	14
HC/HCT160	Presetable Synchronous BCD Decade Counter; Asynchronous Reset	MSI	16
HC/HCT161	Presetable Synchronous 4-Bit Binary Counter; Asynchronous Reset	MSI	16
HC/HCT162	Presetable Synchronous BCD Decade Counter; Synchronous Reset	MSI	16
HC/HCT163	Presetable Synchronous 4-Bit Binary Counter; Synchronous Reset	MSI	16
HC/HCT190	Presetable Synchronous BCD Decade Up/Down Counter	MSI	16
HC/HCT191	Presetable Synchronous 4-Bit Binary Up/Down Counter	MSI	16
HC/HCT192	Presetable Synchronous BCD Decade Up/Down Counter	MSI	16
HC/HCT193	Presetable Synchronous 4-Bit Binary Up/Down Counter	MSI	16
HC/HCT390	Dual Decade Ripple Counter	MSI	16
HC/HCT393	Dual 4-Bit Binary Ripple Counter	MSI	14
HC/HCT4017	Decade Counter/Divider with 10 Decoded Outputs	MSI	16
HC/HCT4020	14-Stage Binary Ripple Counter	MSI	16
HC/HCT4024	7-Stage Binary Ripple Counter	MSI	16
HC/HCT4040	12-Stage Binary Ripple Counter	MSI	16
HC/HCT4059	Programmable Divide by "N" Counter	MSI	24
HC/HCT4060	14-Stage Binary Ripple Counter with Oscillator	MSI	16
HC/HCT4510	Presetable BCD Up/Down Counter	MSI	16
HC/HCT4516	Presetable Binary Up/Down Counter	MSI	16
HC/HCT4518	Dual Synchronous BCD Counter	MSI	16
HC/HCT4520	Dual 4-Bit Synchronous Binary Counter	MSI	16
HC/HCT40102	Synchronous 2-Decade BCD Down Counter	MSI	16
HC/HCT40103	8-Bit Synchronous Binary Down Counter	MSI	16
	One-Shot Multivibrators		
HC/HCT123	Dual Retriggerable Monostable Multivibrator with Reset	MSI	16
HC/HCT221	Dual Monostable Multivibrator with Reset	MSI	16
HC/HCT423	Dual Retriggerable Monostable Multivibrator with Reset	MSI	16
HC/HCT4538	Dual Retriggerable Precision Monostable Multivibrator	MSI	16
	Analog and Digital Multiplexers/Demultiplexers		
HC/HCT151	8-Input Multiplexer	MSI	16
HC/HCT153	Dual 4-Input Multiplexer	MSI	16
HC/HCT157	Quad 2-Input Multiplexer	MSI	16
HC/HCT158	Quad 2-Input Multiplexer; Inverting	MSI	16
HC/HCT251	8-Input Multiplexer; 3-State	MSI	16
HC/HCT253*	Dual 4-Input Multiplexer; 3-State	MSI	16
HC/HCT257*	Quad 2-Input Multiplexer; 3-State; Non-Inverting Outputs	MSI	16
HC/HCT258	Quad 2-Input Multiplexer; 3-State; Inverting Outputs	MSI	16
HC/HCT354*	8-Input Multiplexer/Register; 3-State	MSI	20
HC/HCT356*	8-Input Multiplexer/Register; 3-State	MSI	20

* Type with a bus-driver output stage.

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CD54/74HC/HCT Series (Continued)

Function Selection Chart (Continued)

Type CD54/74	Function/Description	Classification	No. of Pins
Analog and Digital Multiplexers/Demultiplexers (Continued)			
HC/HCT4051	8-Channel Analog Multiplexer/Demultiplexer	MSI	16
HC/HCT4052	Dual 4-Channel Analog Multiplexer/Demultiplexer	MSI	16
HC/HCT4053	Triple 2-Channel Analog Multiplexer/Demultiplexer	MSI	16
HC/HCT4067	16-Channel Analog Multiplexer/Demultiplexer	MSI	24
HC/HCT4351	Dual 4-Channel Analog Multiplexer/Demultiplexer with Latch	MSI	20
HC/HCT4352	Triple 2-Channel Analog Multiplexer/Demultiplexer with Latch	MSI	20
HC/HCT4353	16-Channel Analog Multiplexer/Demultiplexer with Latch	MSI	20
Decoders/Encoders			
HC/HCT42	BCD to Decimal Decoder (1-of-10)	MSI	16
HC/HCT137	3-to-8-Line Decoder with Latch; Inverting	MSI	16
HC/HCT138	3-to-8-Line Decoder/Demultiplexer; Inverting	MSI	16
HC/HCT139	Dual 2-to-4-Line Decoder/Demultiplexer	MSI	16
HC/HCT147	10-to-4-Line Priority Encoder	MSI	16
HC/HCT154	4-to-16-Line Decoder/Demultiplexer	MSI	24
HC/HCT237	3-to-8-Line Decoder/Demultiplexer with Address Latches	MSI	16
HC/HCT238	3-to-8-Line Decoder/Demultiplexer Non-Inverting	MSI	16
HC/HCT4511	BCD-to-7-Segment Latch/Decoder/Driver	MSI	16
HC/HCT4514	4-to-16-Line Decoder/Demultiplexer with Input Latches	MSI	24
HC/HCT4515	4-to-16-Line Decoder/Demultiplexer with Input Latches	MSI	24
HC/HCT4543	BCD-to-7-Segment Latch/Decoder/Driver for LCDs	MSI	16
Analog Switches			
HC/HCT4016	Quad Bilateral Switch	SSI	14
HC/HCT4066	Quad Bilateral Switch	SSI	14
HC/HCT4316	Quad Analog Switch	MSI	16
Bus Transceivers			
HC/HCT242*	Quad Bus Transceiver; 3-State; Inverting	MSI	14
HC/HCT243*	Quad Bus Transceiver; 3-State	MSI	14
HC/HCT245*	Octal Bus Transceiver; 3-State	MSI	20
HC/HCT640*	Octal Bus Transceiver; 3-State; Inverting	MSI	20
HC/HCT643*	Octal Bus Transceiver; 3-State; True/Inverting	MSI	20
HC/HCT646*	Octal Bus Transceiver; 3-State	MSI	24
HC/HCT648*	Octal Bus Transceiver; 3-State; Inverting	MSI	24
HC/HCT7038*	9-Bit Bus Transceiver with Latch	MSI	24
Schmitt Triggers			
HC/HCT14	Hex Inverting Schmitt Trigger	SSI	14
HC/HCT132	Quad 2-Input NAND Schmitt Trigger	SSI	14
Latches			
HC/HCT75	Dual 2-Input Bistable Transparent Latch	FF	16
HC/HCT259	8-Bit Addressable Latch	MSI	16
HC/HCT373*	Octal Transparent Latch; 3-State	MSI	20
HC/HCT533*	Octal Transparent Latch; 3-State; Inverting	MSI	20
HC/HCT563*	Octal Transparent Latch; 3-State; Inverting	MSI	20
HC/HCT573*	Octal Transparent Latch; 3-State	MSI	20
Phase-Locked Loops (PLL)			
HC/HCT297	Digital Phase-Locked Loop Filter	MSI	16
HC/HCT4046A	Phase-Locked Loop with VCO	MSI	16
HC/HCT7046A	Phase-Locked Loop with In-Lock Detection	MSI	16

* Type with a bus-driver output stage.