

# CMOS Logic ICs

## CD4000B Series

The Harris CMOS Product line covers a broad range of SSI, MSI-1 and MSI-2 functions from simple gates to complex counters, registers, and arithmetic circuits, and includes both standard circuits types for commercial and industrial applications and high-reliability slash (/) series types for aerospace, military, and critical industrial applications.

Specific design features for CMOS devices and the performance advantages of CMOS technology provide the logic system designer with the capability to achieve outstanding performance, excellent reliability, and simplified circuitry in a wide variety of equipment designs.

The CD4000B-series ICs incorporate the latest improvements in processing technology and plastic and ceramic packaging techniques. Product quality is real-time controlled using elevated-temperature group quality screening in which measured dc parameters are criticized against tight product limits.

Harris offers a comprehensive line of high-voltage ("B"-series) CMOS digital integrated circuits which meet, in all respect, the industry standard specifications established by JEDEC.

### Standardized Maximum Ratings and Recommended Operating Conditions for B-Series CMOS Integrated Circuits

#### Maximum Ratings, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE (V <sub>DD</sub> )	-0.5 to 20V
(Voltage referenced to V <sub>SS</sub> Terminal)	
INPUT VOLTAGE RANGE, ALL INPUTS	-0.5 to V <sub>DD</sub> +0.5V
DC INPUT CURRENT, ANY ONE INPUT	±10mA
* POWER DISSIPATION PER PACKAGE (P <sub>D</sub> ):	
For T <sub>A</sub> = -40 to +60°C (PACKAGE TYPE E)	500mW
For T <sub>A</sub> = +60 to +85°C (PACKAGE TYPE E)	Derate Linearly at 12mW/°C to 200mW
For T <sub>A</sub> = -55 to +100°C (PACKAGE TYPE D, F)	500mW
For T <sub>A</sub> = +100 to +125°C (PACKAGE TYPE D, F)	Derate Linearly at 12mW/°C to 200mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR:	
For T <sub>A</sub> = FULL PACKAGE-TEMPERATURE RANGE (All Package Types)	100mW
OPERATING -TEMPERATURE RANGE (T <sub>A</sub> ):	
PACKAGE TYPES D, F,	-55 to +125°C
PACKAGE TYPE E	-40 to +85°C
STORAGE TEMPERATURE RANGE (T <sub>STG</sub> )	-65 to +150°C
LEAD TEMPERATURE (DURING SOLDERING):	
At distance 1/16 ±1/32in. (1.59 ± 0.79mm) from case for 10s maximum	+265°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 <sub>A</sub> = Full Package Temperature Range)	3	18	V

### Product Classification Chart

Gates			Buffers & Inverters	Multi-Function /AOI	Decoders/ Encoders	Schmitt Trigger	Multivibrators	
NOR/NAND	OR/AND						Flip-Flop/Latches	
CD4001B CD4001UB CD4002B CD4011B CD4011UB CD4572UB	CD4012B CD4023B CD4025B CD4068B CD4078B CD40107B	CD4071B CD4072B CD4073B CD4075B CD4081B CD4082B	CD4007UB CD4009UB CD4010B CD4041UB CD4049UB CD4050B CD4069UB CD4502B CD4503B CD4572UB CD40107B	CD4019B CD4030B ■ CD4048B CD4070B ■ CD4077B ■ CD4085B CD4086B CD4519B	CD4028B CD4514B CD4515B CD4532B CD4555B* CD4556B CD40147B	CD4093B CD40106B	CD4013B CD4027B CD4042B CD4043B CD4044B CD4076B** CD4095B	CD4096B CD4099B** CD4508B CD4724B** CD40174B CD40175B Astable/ Monostable CD4047B Monostable CD4098B CD4538B CD14538B

■ See Comparators  
\* See Demultiplexers  
\*\* See Storage Registers

**CD4000B Series (Continued)**

**Product Classification Chart (Continued)**

Registers			Counters		Multiplexers/ Demulti- plexers	Phase Locked Loop	Quad Bilateral Switches	Interface Circuits
Shift	Storage	FIFO Buffer	Binary Ripple	Synchro- nous	Analog/ Digital Data Selectors			
CD4006B CD4014B CD4015B CD4021B CD4031B CD4034B CD4035B CD4094B CD4517B CD40100B CD40194B	CD4034B CD4076B † CD4099B CD4724B CD40174B CD40175B	CD40105B	CD4020B CD4024B CD4040B CD4060B CD4521B  <b>TIMERS</b> CD4045B CD4536B CD4541B CD4566B	CD4017B CD4018B CD4022B CD4029B CD4059A CD4510B CD4516B CD4518B CD4520B CD4522B CD4522B CD40102B CD40103B CD40160B CD40161B CD40162B CD40163B CD40192B CD40193B	CD4016B Δ CD4019B CD4051B CD4052B CD4053B CD4066B Δ CD4067B CD4097B CD4512B CD4519B CD4529B CD4555B φ CD4556B φ CD40257B  Δ See Quad Bilateral Switch	CD4046B	CD4016B □ CD4066B □	CD4009UB CD4010B CD4049UB CD4050B CD4054B CD4504B CD40107B CD40109B CD40115 CD40116 Δ CD40117B CD7211 Δ # CD7211A Δ # CD7211M Δ # CD7211AM Δ #
† See Flip/Flops						φ See Decoders/ Encoders	□ See Multiplexers	
Arithmetic Circuits				Display Drivers				
Adders/ Comparators		ALU/Rate Multipliers	With Counter	For LCD* Drive		For LED** Drive		
CD4008B CD4030B † See Multifunction /AOI	CD4063B CD4070B † CD4077B † CD4585B CD4560B	CD4089B CD4527B	CD4026B CD4033B CD40110B	CD4054B CD4055B CD4056B CD4543B *Liquid Crystal Display	CD7211M Δ # CD7211AM Δ # CD7211 Δ # CD7211A Δ #	CD4511B  **Light- Emitting Diode		

Δ Indicates types designed for special applications. Ratings and characteristics data for these types differ in some aspects from the standardized data for B-series types. # Interchangeable with Harris types ICM7211IPL, ICM7211AIPL, ICM7211MPL, ICM7211AMPL, respectively.

**Function Selection Chart**

Function	Type No.	No. of Pins
<b>Gates</b>		
<b>NOR/NAND</b>		
2-Input NOR, 2 Input NAND	CD4572UB	16
Dual 4-input NOR	CD4002B	14
Dual 4-input NAND	CD4012B	14
Triple 3-input NOR	CD4025B	14
Triple 3-input NAND	CD4023B	14
Quad 2-input NOR	CD4001B CD4001UB	14 14
Quad 2-input NAND	CD4011B CD4011UB	14 14
8-input NOR/OR	CD4078B	14
8-input NAND/AND	CD4068B	14
Dual 2-input NAND buffer/driver	CD40107B	8,14
<b>OR/AND</b>		
Dual 4-input OR	CD4072B	14
Dual 4-input AND	CD4082B	14
Triple 3-input OR	CD4075B	14
Triple 3-input AND	CD4073B	14
Quad 2-input OR	CD4071B	14
Quad 2-input AND	CD4081B	14

Function	Type No.	No. of Pins
<b>Buffers and Inverters</b>		
Dual complementary pair plus inverter	CD4007UB	14
Hex inverter	CD4069UB	14
Quad Inverter	CD4572UB	16
Hex inverter/buffer (3-state)	CD4502B	16
Hex buffer (3-state non-inverting)	CD4503B	16
Hex buffer/converter (inverting)	CD4009UB CD4049UB	16 16
Hex buffer/converter (non-inverting)	CD4010B CD4050B	16 16
Quad true/complement buffer	CD4041UB	14
Dual 2-input NAND buffer/driver	CD40107B	8,14
<b>Multifunction/AOI</b>		
Quad exclusive-OR	CD4030B CD4070B	14 14
Quad exclusive-NOR	CD4077B CD4519B	14 16
Quad AND/OR Select	CD4019B	16
4-Bit AND/OR Selector	CD4519B	16

## CMOS Logic ICs

## CD4000B Series (Continued)

## Function Selection Chart (Continued)

Function	Type	No. of Pins
<b>Multifunction/AOI</b>		
Dual 2-wide, 2-input AND/OR invert (AOI)	CD4085B	14
Expandable 4-wide, 2-input AND/OR invert (AOI)	CD4086B	14
Multifunctional expandable 8-input (3-state output)	CD4048B	16
<b>Decoders/Encoders</b>		
BCD-to-decimal decoder	CD4028B	16
8-input priority encoder	CD4532B	16
10-line to 4-line BCD priority encoder	CD40147B	16
4-bit latch/4-to-16 line decoder (outputs high)	CD4514B	24
4-bit latch/4-to-16 line decoder (outputs low)	CD4515B	24
Dual 1-of-4 decoder/demultiplexer (outputs high)	CD4555B	16
Dual 1-of-4 decoder/demultiplexer (outputs low)	CD4556B	16
<b>Schmitt Trigger</b>		
Quad 2-input NAND	CD4093B	14
Hex	CD40106B	14
<b>Interface</b>		
Quad low-to-high voltage	CD40109B	16
Hex high-to-low voltage (inverting)	CD4009UB	16
	CD4049UB	16
Hex high-to-low voltage (non-inverting)	CD4010B	16
	CD4050B	16
Hex voltage level shifter (TTL-CMOS, or CMOS-CMOS)	CD4504B	16
Dual 2-input NAND buffer/driver	CD40107B	8,14
8-bit bidirectional CMOS-to-TTL level converter	CD40116 $\Delta$ #	22
Programmable dual 4-bit terminator	CD40117B $\Delta$	14
<b>Multivibrators</b>		
Monostable/astable	CD4047B	14
Dual Monostable	CD4098B	16
Dual precision monostable	CD4538B	16
	CD14538B	16
<b>Flip-Flops</b>		
Dual "D" with set/reset capability	CD4013B	14
Dual "J-K" with set/reset capability	CD4027B	16
Gated "J-K" (non-inverting)	CD4095B	14
Gated "J-K" (inverting and non-inverting)	CD4096B	14
Hex "D"	CD40174B	16
4-bit "D" with 3-state outputs	CD4076B	14
Quad "D"	CD40175B	16
<b>Latches</b>		
Quad Clocked "D"	CD4042B	16
Quad NOR R/S (3-state outputs)	CD4043B	16
Quad NAND R/S (3-state outputs)	CD4044B	16
Dual 4-bit	CD4508B	24
8-bit addressable	CD4099B	16
	CD4724B	16

Function	Type	No. of Pins
<b>Registers</b>		
<b>Shift Registers-Static</b>		
Dual 4-stage with serial input/parallel output	CD4015B	16
18-stage	CD4006B	14
64-stage	CD4031B	16
Dual 64-bit	CD4517B	16
8-stage with synchronous parallel or serial input/serial output	CD4014B	16
8-stage with asynchronous parallel input or synchronous serial input/serial output	CD4021B	16
4-stage parallel-in/parallel-out with J-K input and true/complement output	CD4035B	16
4-bit universal bidirectional with asynchronous master reset	CD40194B	16
8-stage bidirectional parallel or serial input/parallel output	CD4034B	24
32-bit left/right	CD40100B	16
8-stage shift-and-store bus	CD4094B	16
<b>Storage Registers</b>		
8-bit addressable latch	CD4099B	16
	CD4724B	16
4-bit "D"-type with 3-state outputs	CD4076B	16
<b>FIFO Buffers Registers</b>		
4-bit x 16 word	CD40105B	16
<b>Counters</b>		
<b>Binary Ripple</b>		
7-stage	CD4024B	14
12-stage	CD4040B	16
14-stage	CD4020B	16
14-stage counter/divider and oscillator	CD4060B	16
24-stage frequency divider with oscillator section	CD4521B	16
<b>Timers</b>		
21-stage	CD4045B	14
Time base generator	CD4566B	16
Programmable	CD4536B	16
	CD4541B	14
<b>Synchronous</b>		
Decade counter/divider plus 10 decoded decimal outputs	CD4017B	16
Divide-by-8 counter/divider with 8 decimal outputs	CD4022B	16
Presetable divide-by-"N" counter, fixed or programmable	CD4018B	16
Programmable-divide-by-"N" counter	CD4059A	24
Programmable BCD divide-by-"N"	CD4522B	16
Presetable up/down counter, binary or BCD-decade	CD4029B	16
Presetable 4-bit BCD up/down counter	CD4510B	16
	CD40192B	16
Presetable 4-bit binary up/down counter	CD4516B	16
	CD40193B	16
Presetable 2-decade BCD down counter	CD40102B	16
Presetable 8-bit binary down counter	CD40103B	16

$\Delta$  Indicates types designed for special applications. Ratings and characteristics data for these types differ in some aspects from the standardized data for B-series types. # CMOS/SOS device.

## CMOS Logic ICs

## CD4000B Series (Continued)

## Function Selection Chart (Continued)

Function	Type	No. of Pins
<b>Counters (Continued)</b>		
Dual BCD up counter	CD4518B	16
Dual binary up counter	CD4520B	16
Decade counter/asynchronous clear	CD40160B	16
Binary counter/asynchronous clear	CD40161B	16
Decade counter/synchronous clear	CD40162B	16
Binary counter/synchronous clear	CD40163B	16
<b>Display Drivers With Counter</b>		
Decade counter/divider with 7-segment display outputs and display enable	CD4026B	16
Decade counter/divider with 7-segment display outputs and ripple blanking	CD4033B	16
Up/Down Counter-Latch-Decoder-Driver	CD40110B	16
<b>For Liquid-Crystal-Display Drive</b>		
4-segment display driver	CD4054B	16
BCD-to-7-segment decoder/driver with "display-frequency" output	CD4055B	16
BCD-to-7-segment decoder/driver with strobed-latch function	CD4056B	16
	CD4543B	16
4-digit decoder/driver with hexadecimal display	CD7211Δ	40
4-digit decoder/driver with decimal display	CD7211AΔ	40
4-digit decoder/driver with hexadecimal display	CD7211MΔ	40
4-digit decoder/driver with decimal display	CD7211AMΔ	40
<b>For Light-Emitting-Diode Drive</b>		
BCD-to-7-segment latch decoder/driver	CD4511B	16
<b>Multiplexers/Demultiplexers</b>		
<b>Digital</b>		
Triple 2-channel	CD4053B	16
Differential 4-channel	CD4052B	16
Single 8-channel	CD4051B	16
Differential 8-channel	CD4097B	24
Single 16-channel	CD4067B	24
Quad bilateral switch	CD4016B	14
Quad bilateral switch	CD4066B	14
Digital (Data Selectors)		
Quad AND/OR select	CD4019B	16
Dual 1-of-4 decoder/demultiplexer (outputs high)	CD4555B	16

Function	Type	No. of Pins
<b>Digital (Continued)</b>		
Dual 1-of-4 decoder/demultiplexer (outputs low)	CD4556B	16
Quad 2-line-to-line	CD40257B	16
8-channel	CD4512B	16
Quad 2-channel	CD4519B	16
<b>Analog (Data Selectors)</b>		
Dual 4-channel	CD4529B	16
<b>Phase-Locked Loop</b>		
Micropower	CD4046B	16
<b>Arithmetic Circuits</b>		
<b>Adders/Comparators</b>		
4-bit full adder with parallel Carry out	CD4008B	16
Triple serial adder, positive logic	CD4032B	16
Triple serial adder, negative logic	CD4038B	16
4-bit magnitude comparator	CD4063B	16
	CD4585B	16
Quad exclusive-OR gate	CD4030B	14
NBCD adder with 4 sum-outputs plus carry out	CD4560B	16
Quad exclusive-OR gate	CD4070B	14
Quad exclusive-NOR gate	CD4077B	14
<b>ALU/Rate Multipliers</b>		
BCD rate multiplier	CD4527B	16
Binary rate multiplier	CD4089B	16
<b>Quad Bilateral Switches</b>		
For transmission or multiplexing of analog or digital signals	CD4016B	14
	CD4066B	14
<b>Industrial Controller</b>		
16-channel precision timer/driver	CD22401Δ	40
<b>Sync Generator</b>		
TV Camera Sync Generator	CD22402	24
<b>Telecommunication Circuits</b>		
<b>Crosspoint Switches</b>		
4x4 crosspoint switch with control memory	CD22100Δ	16
4x4x2 crosspoint switch with control memory	CD22101Δ	24
4x4x2 crosspoint switch with control memory	CD22102Δ	24
<b>Timer/Driver</b>		
16-channel precision timer/driver	CD22401Δ	40

Δ Indicates types designed for special applications. Ratings and characteristics for these types differ in some aspects from the standardized data for the A- and B-series types.