



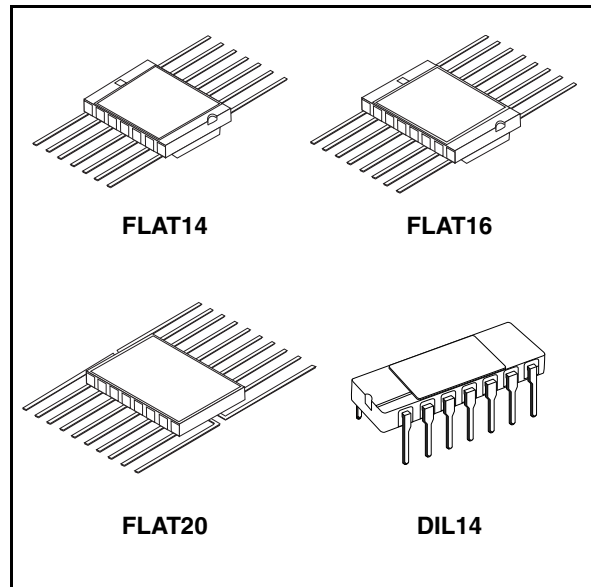
## HCC4000B series

### RadHardened high voltage complementary MOS logic series

Data Brief

#### Features

- 20V max operating voltage
- Bufferized inputs and outputs
- Standardized symmetrical outputs characteristic
- 50ns typical propagation delays
- 100nA max 25°C input current
- 20V quiescent current, 100% tested
- 5-10-15V parametric testing
- Available in hermetic Flat packages
- Also available in DIL and DIE form upon request
- RadHard 100kRad TID at 11rad/sec dose rate
- SEL-SEU immune to 72MeV/cm<sup>2</sup>/mg LET ions
- Designed for space use: ESCC qualified
- FM parts are delivered in accordance with ESCC detail specifications, with ESCC marking and ST + ESA logos
- Engineering model parts meet same electrical specifications as FM parts
- Detailed Contractual ESCC detailed specification for each Type shall be downloaded from European Space Agency web.site



#### Description

The HCC4000B series is composed of close to 80 monolithic types built with Metal Oxide Complementary technology. It provides Designers with high voltage noise tolerant complete Logic series. Its radiation hardness and immunity to Heavy Ions make this series to be usable in the most difficult environmental conditions.

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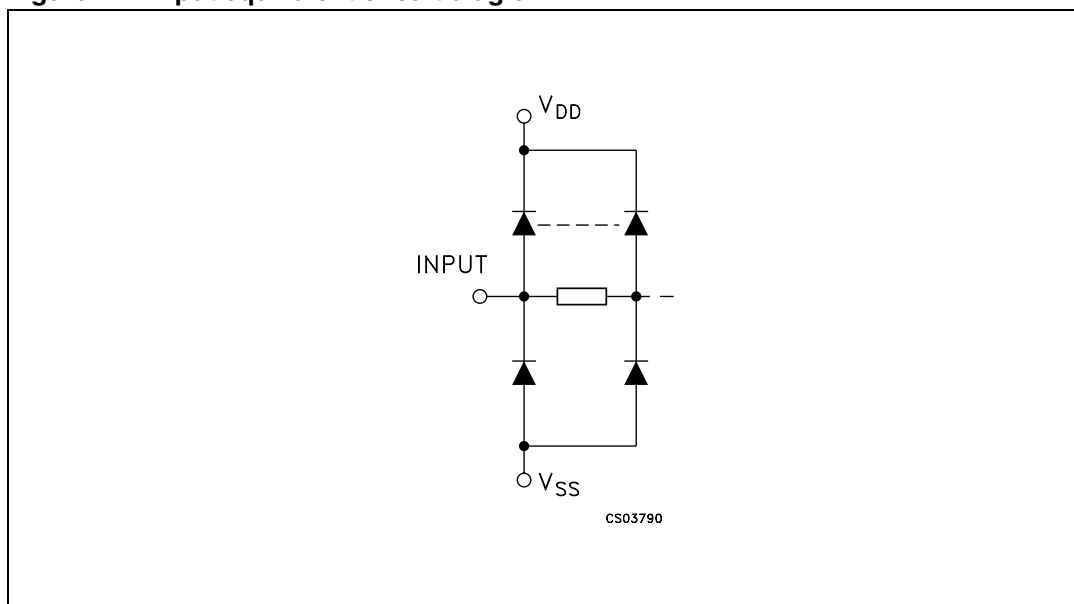
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# 1 Input equivalent circuit diagram

Figure 1. Input equivalent circuit diagram



## 2 Maximum rating

Stressing the device above the rating listed in the “absolute maximum ratings” table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the Operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics sure program and other relevant quality documents.

**Table 1. Absolute maximum ratings**

| Symbol    | Parameter                     | Value                  | Unit |
|-----------|-------------------------------|------------------------|------|
| $V_{DD}$  | Supply voltage                | -0.5 to 22             | V    |
| $V_I$     | DC input voltage              | -0.5 to $V_{DD} + 0.5$ | V    |
| $I_I$     | DC input current              | $\pm 10$               | mA   |
| $P_D$     | Power dissipation per package | 100                    | mW   |
| $T_{OP}$  | Operating temperature         | -55 to +125            | °C   |
| $T_{STG}$ | Storage temperature           | -65 to +150            | °C   |

*Note:* All voltage values are referred to  $V_{SS}$  pin voltage.

### 2.1 Recommended operating conditions

**Table 2. Recommended operating conditions**

| Symbols  | Parameter             | Value         | Unit |
|----------|-----------------------|---------------|------|
| $V_{DD}$ | Supply voltage        | 20            | V    |
| $V_I$    | Input voltage         | 0 to $V_{DD}$ | V    |
| $T_{OP}$ | Operating temperature | -55 to +125   | °C   |

### 3 Package mechanical data

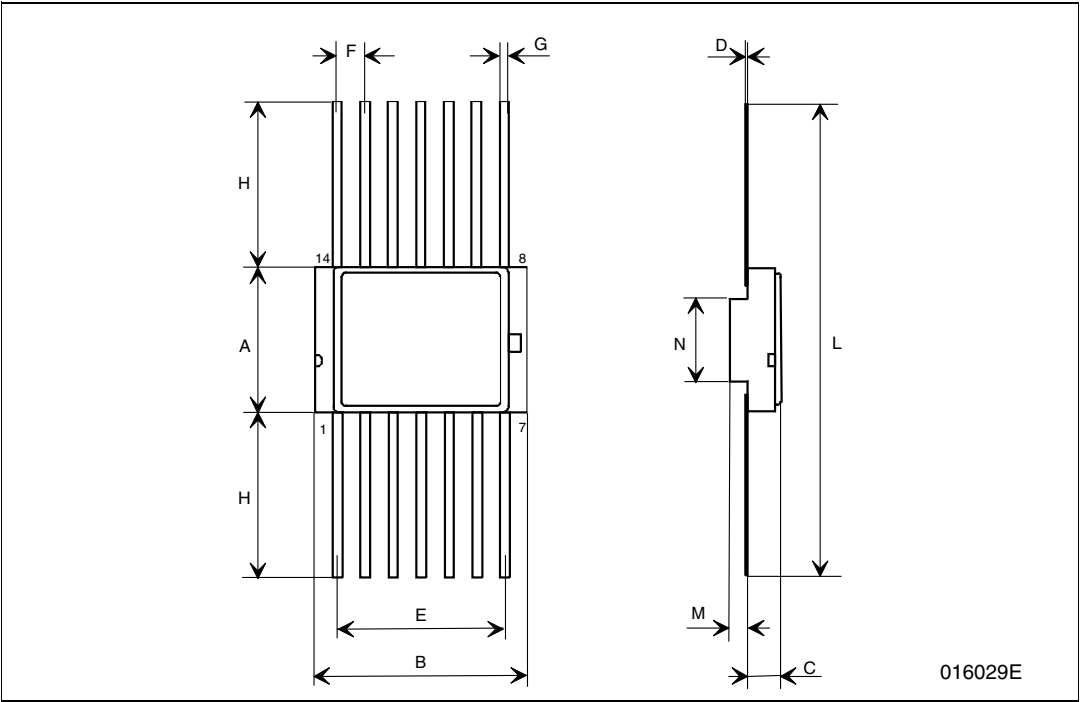
| DILC-14 MECHANICAL DATA |       |       |       |       |       |       |
|-------------------------|-------|-------|-------|-------|-------|-------|
| DIM.                    | mm.   |       |       | inch  |       |       |
|                         | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A                       | 2.1   |       | 2.54  | 0.083 |       | 0.100 |
| a1                      | 3.00  |       | 3.70  | 0.118 |       | 0.146 |
| a2                      | 0.63  | 0.88  | 1.14  | 0.025 | 0.035 | 0.045 |
| B                       | 1.82  | 2.03  | 2.39  | 0.072 | 0.080 | 0.094 |
| b                       | 0.40  | 0.45  | 0.50  | 0.016 | 0.018 | 0.020 |
| b1                      | 0.20  | 0.254 | 0.30  | 0.008 | 0.010 | 0.012 |
| D                       | 18.79 | 19.00 | 19.20 | 0.740 | 0.748 | 0.756 |
| E                       | 7.36  | 7.62  | 7.87  | 0.290 | 0.300 | 0.310 |
| e                       |       | 2.54  |       |       | 0.100 |       |
| e1                      | 15.11 | 15.24 | 15.37 | 0.595 | 0.600 | 0.605 |
| e2                      | 7.62  | 7.87  | 8.12  | 0.300 | 0.310 | 0.320 |
| F                       | 7.11  |       | 7.75  | 0.280 |       | 0.305 |
| I                       |       |       | 3.70  |       |       | 0.146 |
| K                       | 10.90 |       | 12.1  | 0.429 |       | 0.476 |
| L                       | 1.14  | 1.27  | 1.5   | 0.045 | 0.050 | 0.059 |

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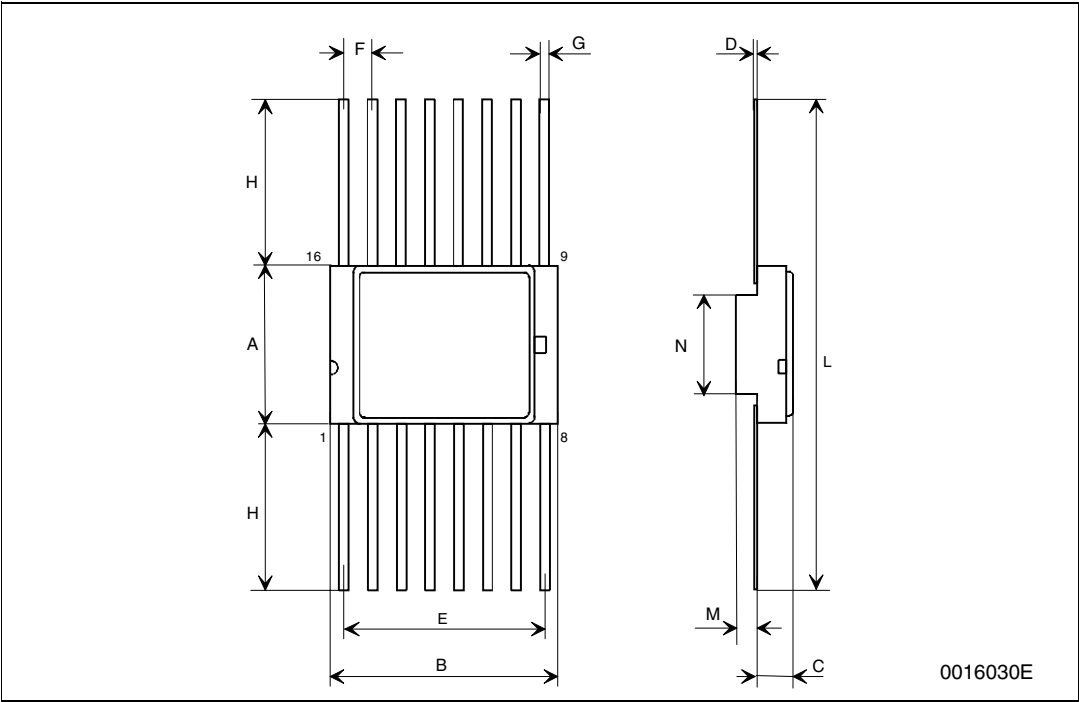
FPC-14 MECHANICAL DATA

| DIM. | mm.   |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 6.75  | 6.91  | 7.06  | 0.266 | 0.272 | 0.278 |
| B    | 9.76  | 9.95  | 10.14 | 0.384 | 0.392 | 0.399 |
| C    | 1.49  |       | 1.95  | 0.059 |       | 0.077 |
| D    | 0.10  | 0.127 | 0.15  | 0.004 | 0.005 | 0.006 |
| E    | 7.50  | 7.62  | 7.75  | 0.295 | 0.300 | 0.305 |
| F    |       | 1.27  |       |       | 0.050 |       |
| G    | 0.38  | 0.43  | 0.48  | 0.015 | 0.017 | 0.019 |
| H    |       | 6.0   |       |       | 0.236 |       |
| L    | 18.75 |       | 22.0  | 0.738 |       | 0.866 |
| M    |       | 0.38  |       |       | 0.015 |       |
| N    |       | 4.31  |       |       | 0.170 |       |



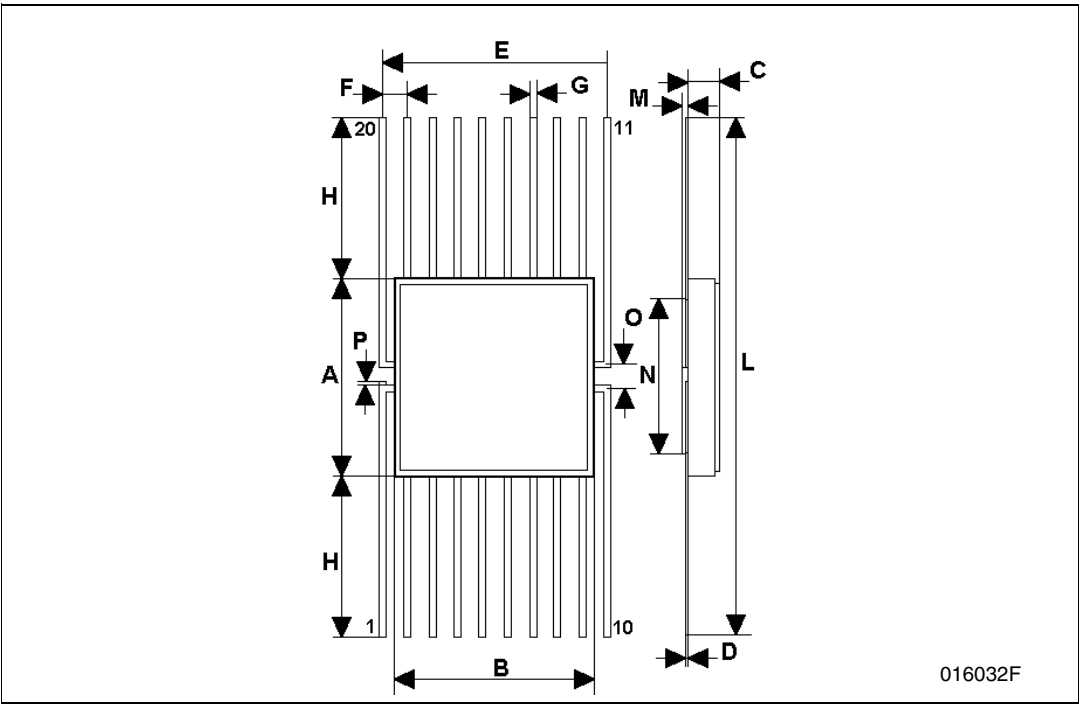
FPC-16 MECHANICAL DATA

| DIM. | mm.   |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 6.75  | 6.91  | 7.06  | 0.266 | 0.272 | 0.278 |
| B    | 9.76  | 9.94  | 10.14 | 0.384 | 0.392 | 0.399 |
| C    | 1.49  |       | 1.95  | 0.059 |       | 0.077 |
| D    | 0.102 | 0.127 | 0.152 | 0.004 | 0.005 | 0.006 |
| E    | 8.76  | 8.89  | 9.01  | 0.345 | 0.350 | 0.355 |
| F    |       | 1.27  |       |       | 0.050 |       |
| G    | 0.38  | 0.43  | 0.48  | 0.015 | 0.017 | 0.019 |
| H    | 6.0   |       |       | 0.237 |       |       |
| L    | 18.75 |       | 22.0  | 0.738 |       | 0.867 |
| M    | 0.33  | 0.38  | 0.43  | 0.013 | 0.015 | 0.017 |
| N    |       | 4.31  |       |       | 0.170 |       |



FPC-20 MECHANICAL DATA

| DIM. | mm.   |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 9.98  | 10.16 | 10.34 | 0.393 | 0.400 | 0.407 |
| B    | 9.98  | 10.16 | 10.34 | 0.393 | 0.400 | 0.407 |
| C    | 1.45  | 1.61  | 1.78  | 0.57  | 0.63  | 0.070 |
| D    | 0.10  | 0.127 | 0.18  | 0.004 | 0.005 | 0.007 |
| E    | 11.30 | 11.43 | 11.56 | 0.445 | 0.450 | 0.455 |
| F    |       | 1.27  |       |       | 0.050 |       |
| G    | 0.38  | 0.43  | 0.48  | 0.015 | 0.017 | 0.019 |
| H    | 7.24  |       | 8.16  | 0.285 |       | 0.320 |
| L    | 24.46 |       | 26.67 | 0.960 |       | 1.050 |
| M    | 0.45  | 0.50  | 0.55  | 0.018 | 0.020 | 0.022 |
| N    |       | 7.87  |       |       | 0.310 |       |
| O    | 1.14  | 1.27  | 1.40  | 0.045 | 0.050 | 0.055 |
| P    | 0.10  | 0.18  | 0.25  | 0.004 | 0.007 | 0.010 |



## 4 Type list

Table 3. Type list

| Types     | ESCC detail spec | Functionality                             | EM part number |
|-----------|------------------|-------------------------------------------|----------------|
| HCC4001B  | 9201-041         | Quad 2-Input Nor gates                    | HCC4001BK1     |
| HCC4002B  | 9201-042         | Dual 4-Input NOR Gate                     | HCC4002BK1     |
| HCC4008B  | 9202-039         | 4-bit Full Adder                          | HCC4008BK1     |
| HCC4011B  | 9201-043         | Quad 2-Input NAND Gate                    | HCC4011BK1     |
| HCC4012B  | 9201-044         | Dual 4-Input NAND Gate                    | HCC4012BK1     |
| HCC4013B  | 9203-023         | Dual D-Flip Flop                          | HCC4013BK1     |
| HCC4014B  | 9306-014         | 8-stage Static synchronous Shift register | HCC4014BK1     |
| HCC4015B  | 9306-015         | Dual 4-stage Static Shift Register        | HCC4015BK1     |
| HCC4016B  | 9202-050         | Quad Bilateral Switch                     | HCC4016BK1     |
| HCC4017B  | 9204-020         | Decade Counter - Divider                  | HCC4017BK1     |
| HCC4018B  | 9204-021         | Presettable Divide-by N Counter           | HCC4018BK1     |
| HCC4019B  | 9202-051         | Quad AND/OR select Gates                  | HCC4019BK1     |
| HCC4020B  | 9204-022         | 14-stage Binary - Ripple Counter          | HCC4020BK1     |
| HCC4021B  | 9306-016         | 8-stage Static Shift Register             | HCC4021BK1     |
| HCC4022B  | 9204-023         | Divide-by-8 Counter - Divider             | HCC4022BK1     |
| HCC4023B  | 9201-045         | Triple 3-Input NAND Gate                  | HCC4023BK1     |
| HCC4024B  | 9204-024         | 7-stage Binary - Ripple Counter           | HCC4024BK1     |
| HCC4025B  | 9201-046         | Triple 3-Input NOR Gate                   | HCC4025BK1     |
| HCC4026B  | 9406-001         | Decade Counter-Div. 7-seg. Display driver | HCC4026BK1     |
| HCC4027B  | 9203-022         | Dual J-K Master-Slave Flip-Flop           | HCC4027BK1     |
| HCC4028B  | 9205-010         | BCD-to-Decimal Decoder                    | HCC4028BK1     |
| HCC4029B  | 9204-025         | Presettable Up-Down Counter               | HCC4029BK1     |
| HCC4030B  | 9201-047         | Quad Exclusive-OR Gate                    | HCC4030BK1     |
| HCC4031B  | 9306-017         | 64-stage Static Shift Register            | HCC4031BK1     |
| HCC4034B  | 9306-025         | 8-stage Static bidirectional Bus Register | HCC4034BK1     |
| HCC4035B  | 9306-018         | 4-stage Parallel I/O Shift Register       | HCC4035BK1     |
| HCC4040B  | 9204-026         | 12-stage Binary - Ripple Counter          | HCC4040BK1     |
| HCC4040B  | 9204-026         | 12-stage Binary - Ripple Counter          | HCC4040BK1     |
| HCC4041UB | 9202-040         | Quad True -Complement Buffer              | HCC4041UBK1    |
| HCC4042B  | 9202-041         | Quad Clocked D Latch                      | HCC4042BK1     |
| HCC4043B  | 9202-042         | Quad 3-state NOR R/S Latch                | HCC4043BK1     |
| HCC4044B  | 9202-043         | Quad 3-state NAND R/S Latch               | HCC4044BK1     |

Table 3. Type list

| Types     | ESCC detail spec | Functionality                             | EM part number |
|-----------|------------------|-------------------------------------------|----------------|
| HCC4046B  | 9202-044         | Micropower Phase Locker Loop              | HCC4046BK1     |
| HCC4047B  | 9207-003         | Monostable - Astable Multivibrator        | HCC4047BK1     |
| HCC4049UB | 9202-045         | Hex Inverting Buffer - Converter          | HCC4049UBK1    |
| HCC4050B  | 9202-046         | Hex Non-Inverting Buffer - Converter      | HCC4050BK1     |
| HCC4051B  | 9202-047         | Single 8-channel Analog Mux - DeMux       | HCC4051BK1     |
| HCC4052B  | 9202-048         | Different 4-channel Analog Mux - DeMux    | HCC4052BK1     |
| HCC4053B  | 9202-049         | Triple 3-channel Analog Mux - Demux       | HCC4053BK1     |
| HCC4060B  | 9204-052         | 14-stage Counter - Divider AND Oscillator | HCC4060BK1     |
| HCC4063B  | 9209-001         | 4-bit Magnitude Comparator                | HCC4063BK1     |
| HCC4066B  | 9408-005         | Quad Bi-lateral Switch                    | HCC4066BK1     |
| HCC4067B  | 9408-009         | Single 16-channel Analog Mux - DeMux      | HCC4067BK1     |
| HCC4068B  | 9201-061         | 8-Input NAND / AND Gate                   | HCC4068BK1     |
| HCC4069UB | 9401-010         | Hex Inverter                              | HCC4069UBK1    |
| HCC4070B  | 9201-048         | Quad Exclusive-OR Gate                    | HCC4070BK1     |
| HCC4071B  | 9201-063         | Quad 2-Input OR Gate                      | HCC4071BK1     |
| HCC4072B  | 9201-082         | Dual 4-Input OR Gate                      | HCC4072BK1     |
| HCC4073B  | 9201-064         | Triple 3-Input AND Gate                   | HCC4073BK1     |
| HCC4075B  | 9201-065         | Triple 3-Input OR Gate                    | HCC4075BK1     |
| HCC4076B  | 9306-022         | 4-bit D-type Register                     | HCC4076BK1     |
| HCC4077B  | 9201-055         | Quad Ex-NOR Gate                          | HCC4077BK1     |
| HCC4078B  | 9201-062         | 8-Input NOR / OR Gate                     | HCC4078BK1     |
| HCC4081B  | 9201-052         | Quad 2-Input AND Gate                     | HCC4081BK1     |
| HCC4082B  | 9201-066         | Dual 4-Input AND Gate                     | HCC4082BK1     |
| HCC4085B  | 9201-067         | Dual 2-wide 2-Input AND-OR Inverter Gate  | HCC4085BK1     |
| HCC4093B  | 9409-002         | Quad 2-Input NAND Schmitt Trigger         | HCC4093BK1     |
| HCC4094B  | 9306-026         | 8-stage Shift AND Store Bus Register      | HCC4094BK1     |
| HCC4098B  | 9206-003         | Dual Monostable Multivibrator             | HCC4098BK1     |
| HCC4099B  | 9202-058         | 8-bit Addressable Latch                   | HCC4099BK1     |
| HCC40103B | 9204-036         | Presettable 8-bit Binary Down Counter     | HCC40103BK1    |
| HCC40105B | 9306-033         | 4-bit by 16 words                         | HCC40105BK1    |
| HCC40106B | 9409-005         | Hex Schmitt Trigger                       | HCC40106BK1    |
| HCC40107B | 9401-013         | Dual 2-Input NAND Buffer - Driver         | HCC40107BK1    |
| HCC40109B | 9407-003         | Dual Low-to-High Voltage Level Shifter    | HCC40109BK1    |
| HCC40161B | 9204-054         | Binary Counter with Asynchronous Clear    | HCC40161BK1    |
| HCC40163B | 9204-046         | Binary Counter with Synchronous Clear     | HCC40163BK1    |

Table 3. Type list

| Types     | ESCC detail spec | Functionality                                   | EM part number |
|-----------|------------------|-------------------------------------------------|----------------|
| HCC40174B | 9203-038         | Hex - D Flip Flop                               | HCC40174BK1    |
| HCC40193B | 9204-041         | Presettable 4-bit Binary Up-Down Counter        | HCC40193BK1    |
| HCC40257B | 9408-017         | Quad 2-line-to-1 Line Data Multiplexer          | HCC40257BK1    |
| HCC4502B  | 9401-006         | Strobed Hex Inverter - Buffer                   | HCC4502BK1     |
| HCC4503B  | 9401-030         | Hex Buffer (3-state Non-Inverter)               | HCC4503BK1     |
| HCC4508B  | 9202-063         | Dual 4-bit Latch (3-state Outputs)              | HCC4508BK1     |
| HCC4512B  | 9408-006         | 8-channel Data Selector (3-state Output)        | HCC4512BK1     |
| HCC4514B  | 9408-012         | 4-bit Latch / 4-to-16 Line Decoder, output high | HCC4514BK1     |
| HCC4515B  | 9205-011         | 4-bit Latch / 4-to-16 Line Decoder, output low  | HCC4515BK1     |
| HCC4516B  | 9204-045         | Presettable 4-bit Binary Up-Down Counter        | HCC4516BK1     |
| HCC4520B  | 9204-028         | Dual Binary Up-Down Counter                     | HCC4520BK1     |
| HCC4532B  | 9202-065         | 8-Input Priority Encoder                        | HCC4532BK1     |
| HCC4538B  | 9207-007         | Dual Precision Monostable Multivibrator         | HCC4538BK1     |
| HCC4555B  | 9408-011         | Dual 1-of-4 Decoder - Demux, output high        | HCC4555BK1     |
| HCC4556B  | 9408-025         | Dual 1-of-4 Decoder - Demux, output low         | HCC4556BK1     |

## 5 Revision history

**Table 4. Revision history**

| Date        | Revision | Changes       |
|-------------|----------|---------------|
| 18-Oct-2006 | 1        | First release |

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