1 Features

- Schmitt-Trigger Inputs
- Hysteresis Voltage (Typical):
  - 0.9 V at $V_{DD} = 5$ V
  - 2.3 V at $V_{DD} = 10$ V
  - 3.5 V at $V_{DD} = 15$ V
- Noise Immunity Greater Than 50%
- No Limit On Input Rise and Fall Times
- Standardized, Symmetrical Output Characteristics
- For Quiescent Current at 20 V
- Maximum Input Current Of 1 µA at 18 V Over Full Package Temperature Range:
  - 100 nA at 18 V and 25°C
- Low $V_{DD}$ and $V_{SS}$ Current During Slow Input Ramp
- 5-V, 10-V, and 15-V Parametric Ratings

2 Applications

- Wave and Pulse Shapers
- High-Noise-Environment Systems
- Monostable Multivibrators
- Astable Multivibrators

3 Description

The CD40106B device consists of six Schmitt-Trigger inputs. Each circuit functions as an inverter with Schmitt-Trigger input. The trigger switches at different points for positive- and negative-going signals. The difference between the positive-going voltage ($V_p$) and the negative-going voltages ($V_n$) is defined as hysteresis voltage ($V_H$).

The CD40106B device is supplied in ceramic packaging (J) as well as standard packaging (D, N, NS, PW). All CD40106B devices are rated for –55°C to +125°C ambient temperature operation.

Device Information

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PACKAGE</th>
<th>BODY SIZE (NOM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD40106BF</td>
<td>CDIP (14)</td>
<td>6.92 mm x 19.94 mm</td>
</tr>
<tr>
<td>CD40106BE</td>
<td>PDIP (14)</td>
<td>6.30 mm x 19.31 mm</td>
</tr>
<tr>
<td>CD40106BM</td>
<td>SOIC (14)</td>
<td>3.90 mm x 8.65 mm</td>
</tr>
<tr>
<td>CD40106BNSR</td>
<td>SO (14)</td>
<td>5.30 mm x 10.20 mm</td>
</tr>
<tr>
<td>CD40106BPWR</td>
<td>TSSOP (14)</td>
<td>4.40 mm x 5.00 mm</td>
</tr>
</tbody>
</table>

(1) For all available packages, see the orderable addendum at the end of the data sheet.

All inputs protected by the protection network shown to the right.

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.
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2 Applications .......................................................... 1
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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision E (September 2016) to Revision F

Page

• Changed incorrect pin descriptions to match package drawing ............................................................ 3

Changes from Revision D (August 2003) to Revision E

Page

• Added ESD Ratings table, Feature Description section, Device Functional Modes, Application and Implementation section, Power Supply Recommendations section, Layout section, Device and Documentation Support section, and Mechanical, Packaging, and Orderable Information section .......................................................... 1

• Added Thermal Information table ........................................................................................................ 4
5 Pin Configuration and Functions

D, J, N, NS, PW Packages
14-Pin SOIC, CDIP, PDIP, SO, TSSOP
Top View

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>NAME</th>
<th>I/O</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>I</td>
<td>Channel A input</td>
</tr>
<tr>
<td>2</td>
<td>G = A</td>
<td>O</td>
<td>Channel A inverted output</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>I</td>
<td>Channel B input</td>
</tr>
<tr>
<td>4</td>
<td>H = B</td>
<td>O</td>
<td>Channel B inverted output</td>
</tr>
<tr>
<td>5</td>
<td>C</td>
<td>I</td>
<td>Channel C input</td>
</tr>
<tr>
<td>6</td>
<td>I = C</td>
<td>O</td>
<td>Channel C inverted output</td>
</tr>
<tr>
<td>7</td>
<td>VSS</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>8</td>
<td>J = D</td>
<td>O</td>
<td>Channel D inverted output</td>
</tr>
<tr>
<td>9</td>
<td>D</td>
<td>I</td>
<td>Channel D input</td>
</tr>
<tr>
<td>10</td>
<td>K = E</td>
<td>O</td>
<td>Channel E inverted output</td>
</tr>
<tr>
<td>11</td>
<td>E</td>
<td>I</td>
<td>Channel E input</td>
</tr>
<tr>
<td>12</td>
<td>L = F</td>
<td>O</td>
<td>Channel F inverted output</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>I</td>
<td>Channel F input</td>
</tr>
<tr>
<td>14</td>
<td>VDD</td>
<td>—</td>
<td>Power supply</td>
</tr>
</tbody>
</table>

Not to scale
6 Specifications

6.1 Absolute Maximum Ratings
over operating free-air temperature range (unless otherwise noted)\(^\text{(1)}\)

<table>
<thead>
<tr>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC supply voltage, (V_{DD})(^\text{(2)})</td>
<td>–0.5</td>
<td>20</td>
</tr>
<tr>
<td>Input voltage, all inputs</td>
<td>–0.5</td>
<td>(V_{DD} + 0.5)</td>
</tr>
<tr>
<td>DC input current, any one input</td>
<td>±10</td>
<td>mA</td>
</tr>
<tr>
<td>Power dissipation, (P_D) (T_A = -55^\circ\text{C to } +100^\circ\text{C})</td>
<td>500</td>
<td>mW</td>
</tr>
<tr>
<td>(T_A = 100^\circ\text{C to } 125^\circ\text{C})(^\text{(3)})</td>
<td>200</td>
<td>mW</td>
</tr>
<tr>
<td>Device dissipation per output transistor</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Maximum junction temperature, (T_J)</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature, (T_{stg})</td>
<td>–65</td>
<td>150</td>
</tr>
</tbody>
</table>

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) Voltages referenced to \(V_{SS}\) terminal

(3) Derate linearity at 12 mW/°C

6.2 ESD Ratings

<table>
<thead>
<tr>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_{ESD}) Electrostatic discharge Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(^\text{(1)})</td>
<td>2000</td>
</tr>
<tr>
<td>Charged-device model (CDM), per JEDEC specification JESD22-C101(^\text{(2)})</td>
<td>1000</td>
</tr>
</tbody>
</table>

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions
over operating free-air temperature range (unless otherwise noted)

<table>
<thead>
<tr>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Operating temperature, (T_A)</td>
<td>–55</td>
<td>125</td>
</tr>
</tbody>
</table>

6.4 Thermal Information

<table>
<thead>
<tr>
<th>THERMAL METRIC(^\text{(1)})</th>
<th>(\text{CD40106B})</th>
</tr>
</thead>
<tbody>
<tr>
<td>D (SOIC) 14 PINS</td>
<td>N (PDIP) 14 PINS</td>
</tr>
<tr>
<td>(R_{JA}) Junction-to-ambient thermal resistance</td>
<td>86.1</td>
</tr>
<tr>
<td>(R_{JC(top)}) Junction-to-case (top) thermal resistance</td>
<td>44.3</td>
</tr>
<tr>
<td>(R_{JB}) Junction-to-board thermal resistance</td>
<td>40.6</td>
</tr>
<tr>
<td>(\psi_{JT}) Junction-to-top characterization parameter</td>
<td>11.6</td>
</tr>
<tr>
<td>(\psi_{JB}) Junction-to-board characterization parameter</td>
<td>40.3</td>
</tr>
</tbody>
</table>

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.
### 6.5 Electrical Characteristics: Static

over operating free-air temperature range (unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I_{DD\text{max}}) Quiescent device current</td>
<td>(V_{IN} = 0) or 5, (V_{DD} = 5)</td>
<td>(T_A = –55\degree C)</td>
<td>1</td>
<td>(T_A = –40\degree C) (\text{MIN} = 1)</td>
<td>(T_A = 25\degree C) (\text{TYP} = 0.02)</td>
</tr>
<tr>
<td>(\text{MIN} = 2)</td>
<td>(T_A = 25\degree C) (\text{TYP} = 0.02)</td>
<td>(T_A = 85\degree C) (\text{MAX} = 60)</td>
<td>(T_A = 125\degree C) (\text{UNIT} = 60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(V_{DD} = 10)</td>
<td>(T_A = –55\degree C) (\text{MIN} = 4)</td>
<td>(T_A = –40\degree C) (\text{TYP} = 4)</td>
<td>(T_A = 25\degree C) (\text{MAX} = 120)</td>
<td>(T_A = 85\degree C) (\text{UNIT} = 120)</td>
<td></td>
</tr>
<tr>
<td>(V_{DD} = 15)</td>
<td>(T_A = –55\degree C) (\text{MIN} = 20)</td>
<td>(T_A = –40\degree C) (\text{TYP} = 20)</td>
<td>(T_A = 25\degree C) (\text{MAX} = 600)</td>
<td>(T_A = 85\degree C) (\text{UNIT} = 600)</td>
<td></td>
</tr>
<tr>
<td>(V_{DD} = 5)</td>
<td>(T_A = –55\degree C) (\text{MIN} = 2.2)</td>
<td>(T_A = –40\degree C) (\text{TYP} = 2.2)</td>
<td>(T_A = 25\degree C) (\text{MAX} = 2.9)</td>
<td>(T_A = 85\degree C) (\text{UNIT} = 2.2)</td>
<td></td>
</tr>
<tr>
<td>(V_{DD} = 10)</td>
<td>(T_A = –55\degree C) (\text{MIN} = 4.6)</td>
<td>(T_A = –40\degree C) (\text{TYP} = 4.6)</td>
<td>(T_A = 25\degree C) (\text{MAX} = 5.9)</td>
<td>(T_A = 85\degree C) (\text{UNIT} = 4.6)</td>
<td></td>
</tr>
<tr>
<td>(V_{DD} = 15)</td>
<td>(T_A = –55\degree C) (\text{MIN} = 6.8)</td>
<td>(T_A = –40\degree C) (\text{TYP} = 6.8)</td>
<td>(T_A = 25\degree C) (\text{MAX} = 8.8)</td>
<td>(T_A = 85\degree C) (\text{UNIT} = 6.8)</td>
<td></td>
</tr>
</tbody>
</table>

\(V_{P\text{min}}\) Positive trigger threshold voltage

| \(V_{DD} = 5\) | \(T_A = –55\degree C\) \(\text{MIN} = 2.2\) | \(T_A = –40\degree C\) \(\text{TYP} = 2.2\) | \(T_A = 25\degree C\) \(\text{MAX} = 2.9\) | \(T_A = 85\degree C\) \(\text{UNIT} = 2.2\) |
| \(V_{DD} = 10\) | \(T_A = –55\degree C\) \(\text{MIN} = 4.6\) | \(T_A = –40\degree C\) \(\text{TYP} = 4.6\) | \(T_A = 25\degree C\) \(\text{MAX} = 5.9\) | \(T_A = 85\degree C\) \(\text{UNIT} = 4.6\) |
| \(V_{DD} = 15\) | \(T_A = –55\degree C\) \(\text{MIN} = 6.8\) | \(T_A = –40\degree C\) \(\text{TYP} = 6.8\) | \(T_A = 25\degree C\) \(\text{MAX} = 8.8\) | \(T_A = 85\degree C\) \(\text{UNIT} = 6.8\) |
## Electrical Characteristics: Static (continued)

Over operating free-air temperature range (unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{\text{pmax}} )</td>
<td>( V_{\text{DD}} = 5 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>3.6</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>3.6</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>2.9</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>3.6</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>3.6</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{\text{DD}} = 10 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>5.9</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{\text{DD}} = 15 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>10.8</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>10.8</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>8.8</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>10.8</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>10.8</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td>( V_{\text{Nmin}} )</td>
<td>( V_{\text{DD}} = 5 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>0.9</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>0.9</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>0.9</td>
<td>0.9</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>0.9</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>0.9</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{\text{DD}} = 10 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>2.5</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{\text{DD}} = 15 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>4</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>4</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>4</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>4</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>( V_{\text{Nmax}} )</td>
<td>( V_{\text{DD}} = 5 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>2.8</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>2.8</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>1.9</td>
<td>2.8</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>2.8</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>2.8</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{\text{DD}} = 10 )</td>
<td>( T_A = -55^\circ \text{C} )</td>
<td>5.2</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = -40^\circ \text{C} )</td>
<td>5.2</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>3.9</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 85^\circ \text{C} )</td>
<td>5.2</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_A = 125^\circ \text{C} )</td>
<td>5.2</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{\text{DD}} = 15 )</td>
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## Electrical Characteristics: Static (continued)

over operating free-air temperature range (unless otherwise noted)

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<td>mA</td>
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### Electrical Characteristics: Static (continued)

Over operating free-air temperature range (unless otherwise noted)

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<th>MAX</th>
<th>UNIT</th>
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<td>$–1.3$</td>
<td>$–2.6$</td>
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<td>$T_A = 85^\circ C$</td>
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<td>$T_A = 125^\circ C$</td>
<td>$–2.4$</td>
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</table>

| $V_{OL\max}$ | Low-level output voltage | $V_{IN} = 5, V_{DD} = 5$ | $T_A = –55^\circ C, –40^\circ C, 25^\circ C, 85^\circ C,$ and $125^\circ C$ | $0$ | $0.05$ | V |
| | | $V_{IN} = 10, V_{DD} = 10$ | $T_A = –55^\circ C, –40^\circ C, 25^\circ C, 85^\circ C,$ and $125^\circ C$ | $0$ | $0.05$ | |
| | | $V_{IN} = 15, V_{DD} = 15$ | $T_A = –55^\circ C, –40^\circ C, 25^\circ C, 85^\circ C,$ and $125^\circ C$ | $0$ | $0.05$ | |

| $V_{OH\min}$ | High-level output voltage | $V_{IN} = 0, V_{DD} = 5$ | $T_A = –55^\circ C, –40^\circ C, 25^\circ C, 85^\circ C,$ and $125^\circ C$ | $4.95$ | $5$ | V |
| | | $V_{IN} = 0, V_{DD} = 10$ | $T_A = –55^\circ C, –40^\circ C, 25^\circ C, 85^\circ C,$ and $125^\circ C$ | $9.95$ | $10$ | |
| | | $V_{IN} = 0, V_{DD} = 15$ | $T_A = –55^\circ C, –40^\circ C, 25^\circ C, 85^\circ C,$ and $125^\circ C$ | $14.95$ | $15$ | |

| $I_{IN\max}$ | Input current | $V_{IN} = 0$ or $18, V_{DD} = 18$ | $T_A = –55^\circ C$ | $±0.1$ | | µA |
| | | | $T_A = –40^\circ C$ | $±0.1$ | | |
| | | | $T_A = 25^\circ C$ | $±0.00001$ | $±0.1$ | |
| | | | $T_A = 85^\circ C$ | | $±1$ | |
| | | | $T_A = 125^\circ C$ | | $±1$ | |

### 6.6 Electrical Characteristics: Dynamic

At $T_A = 25^\circ C$, input $t_r, t_f = 20$ ns, $C_L = 50$ pF, and $R_L = 200$ kΩ (unless otherwise noted)

<table>
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<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
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<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
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<td>ns</td>
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<td>$100$</td>
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<td>7.5</td>
<td>pF</td>
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6.7 Typical Characteristics

Figure 1. Typical Output Low (Sink) Current Characteristics

Figure 2. Minimum Output Low (Sink) Current Characteristics

Figure 3. Typical Output High (Source) Current Characteristics

Figure 4. Minimum Output High (Source) Current Characteristics

Figure 5. Typical Current and Voltage Transfer Characteristics

Figure 6. Typical Voltage Transfer Characteristics as a Function of Temperature
Typical Characteristics (continued)

Figure 7. Typical Propagation Delay Time as a Function of Load Capacitance

Figure 8. Typical Transition Time as a Function of Load Capacitance

Figure 9. Typical Power Dissipation Per Trigger as a Function of Input Frequency

Figure 10. Typical Trigger Threshold Voltage as a Function of Supply Voltage

Figure 11. Typical Percent Hysteresis as a Function of Supply Voltage
7 Parameter Measurement Information

Figure 12. Input and Output Characteristics

Figure 13. Hysteresis Definition, Characteristics, and Test Set-Up

Figure 14. Quiescent Device Current Test Circuit
Parameter Measurement Information (continued)

Figure 15. Input Current Test Circuit

Figure 16. Dynamic Power Dissipation Test Circuit
8 Detailed Description

8.1 Overview
The CD40106B device contains six independent inverters with schmitt trigger inputs. They perform the Boolean function $Y = \overline{A}$ in positive logic.

Schmitt-Trigger inputs are designed to provide a minimum separation between positive and negative switching thresholds. This allows for noisy or slow inputs that would cause problems such as oscillation or excessive current consumption.

8.2 Functional Block Diagram

![Functional Block Diagram](image)

8.3 Feature Description
The CD40106B has standardized symmetrical output characteristics and a wide operating voltage from 3 V to 18 V with quiescent current of 20 µA tested at 20 V. These devices have transition times of $t_{\text{TLH}} = t_{\text{THL}} = 50 \text{ ns}$ (typical) at 10 V. The operating temperature is from $-55^\circ C$ to $+125^\circ C$. Schmitt trigger inputs on this device support slow or noisy input signals.

8.4 Device Functional Modes
Table 1 lists the functional modes of the CD40106B.

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

Table 1. Function Table
9 Application and Implementation

NOTE
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI’s customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information
The CD40106B device is a Schmitt-Trigger input device that can be used for a multitude of inverting buffer type functions. The application shown here takes advantage of the Schmitt-Trigger inputs to produce a square wave output from a sine wave input.

9.2 Typical Applications
9.2.1 Wave Shaper

![Wave Shaper Schematic](1/6 CD40106B)

Frequency Range of Wave Shape
is from DC to 1 MHz.

Figure 17. Wave Shaper Schematic

9.2.1.1 Design Requirements
Take care to avoid bus contention, because it can drive currents that would exceed maximum limits. Parallel output drive can create fast edges into light loads so consider routing and load conditions to prevent ringing.

9.2.1.2 Detailed Design Procedure
The recommended input conditions for Figure 17 includes specified high and low levels (see \( V_P \) and \( V_N \) in Electrical Characteristics: Static). Inputs are not overvoltage tolerant and must be below \( V_{CC} \) level because of the presence of input clamp diodes to VCC.

The recommended output condition for the CD40106B application includes specific load currents. Load currents must be limited so as to not exceed the total power (continuous current through VCC or GND) for the device. These limits are in the Absolute Maximum Ratings. Outputs must not be pulled above \( V_{CC} \).

9.2.1.3 Application Curve

![Power Dissipation vs Rise and Fall Time](1/6 CD40106B)

Figure 18. Typical Power Dissipation as a Function of Rise and Fall Times
Typical Applications (continued)

9.2.2 Monostable Multivibrator

The timing of the monostable multivibrator circuit can be set by following the equations shown in Figure 19.

![Monostable Multivibrator Schematic and Equations](image)

\[ t_M = RC \ln \left( \frac{V_{DD} - V_P}{V_{DD} - V_N} \right) \]

50 kΩ \( \leq R \leq \) 1 MΩ
100 pF \( \leq C \leq \) 1 µF

For the Range of R and C
Given 5 µs \( \leq t_M \leq \) 1 s

Figure 19. Monostable Multivibrator Schematic and Equations

9.2.3 Astable Multivibrator

The timing of the astable multivibrator circuit can be set by following the equations shown in Figure 20.

![Astable Multivibrator Schematic and Equations](image)

\[ t_A = RC \ln \left( \frac{V_P}{V_N} \right) \left( \frac{V_{DD} - V_N}{V_{DD} - V_P} \right) \]

50 kΩ \( \leq R \leq \) 1 MΩ
100 pF \( \leq C \leq \) 1 µF

For the Range of R and C
Given 2 µs \( \leq t_A \leq \) 0.4 s

Figure 20. Astable Multivibrator Schematic and Equations
10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the Recommended Operating Conditions. The V\textsubscript{CC} terminal must have a good bypass capacitor to prevent power disturbance. A 0.1-µF capacitor is recommended to be used on the V\textsubscript{CC} terminal, and it must be placed as close as possible to the pin for best results.

11 Layout

11.1 Layout Guidelines

When using multiple bit logic devices, inputs must never float. In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input AND gate are used or only three of the four buffer gates are used. Such inputs must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally they are tied to GND or V\textsubscript{CC}, whichever makes more sense or is more convenient. Floating outputs are generally acceptable, unless the part is a transceiver.

11.2 Layout Example

![Layout Diagram](Figure 21. Layout Diagram)
Figure 22. Dimensions and Pad Layout for CD40106BH
12 Device and Documentation Support

12.1 Receiving Notification of Documentation Updates
To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on Alert me to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.2 Community Resources
The following links connect to TI community resources. Linked contents are provided “AS IS” by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI’s views; see TI’s Terms of Use.

TI E2E™ Online Community TI’s Engineer-to-Engineer (E2E) Community. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support TI’s Design Support Quickly find helpful E2E forums along with design support tools and contact information for technical support.

12.3 Trademarks
E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

12.4 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

12.5 Glossary
SLYZ022 — TI Glossary.
This glossary lists and explains terms, acronyms, and definitions.

13 Mechanical, Packaging, and Orderable Information
The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.
### PACKAGING INFORMATION

<table>
<thead>
<tr>
<th>Orderable Device</th>
<th>Status (1)</th>
<th>Package Type</th>
<th>Package Drawing</th>
<th>Pins</th>
<th>Package Qty</th>
<th>Eco Plan (2)</th>
<th>Lead finish/ Ball material (6)</th>
<th>MSL Peak Temp (3)</th>
<th>Op Temp (°C)</th>
<th>Device Marking (4/5)</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD40106BE</td>
<td>ACTIVE</td>
<td>PDIP</td>
<td>N</td>
<td>14</td>
<td>25</td>
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<td>NIPDAU</td>
<td>N / A for Pkg Type</td>
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<td>Samples</td>
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<td>-55 to 125</td>
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<td>PW</td>
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<td>CM0106B</td>
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</tr>
</tbody>
</table>

(1) The marketing status values are defined as follows:
- **ACTIVE:** Product device recommended for new designs.
- **LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
- **NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
- **PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
- **OBSOLETE:** TI has discontinued the production of the device.

(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

- **RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
- **Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF CD40106B, CD40106B-MIL:**
- Catalog: CD40106B
- Military: CD40106B-MIL

**NOTE:** Qualified Version Definitions:
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
TAPE AND REEL INFORMATION

**REEL DIMENSIONS**
- Reel Diameter
- Reel Width (W1)

**TAPE DIMENSIONS**
- A0: Dimension designed to accommodate the component width
- B0: Dimension designed to accommodate the component length
- K0: Dimension designed to accommodate the component thickness
- W: Overall width of the carrier tape
- P1: Pitch between successive cavity centers

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**
- Pocket Quadrants
- Sprocket Holes
- User Direction of Feed

*All dimensions are nominal*

<table>
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<th>Package Type</th>
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<th>SPQ</th>
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<th>A0 (mm)</th>
<th>B0 (mm)</th>
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<th>P1 (mm)</th>
<th>W (mm)</th>
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## TAPE AND REEL BOX DIMENSIONS

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*All dimensions are nominal*
### TUBE

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<th>T (µm)</th>
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</tbody>
</table>

*All dimensions are nominal*
MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0.15.

DIM | PINS ** | 14 | 16 | 20 | 24
---|--------|----|----|----|----
A MAX | 10.50 | 10.50 | 12.90 | 15.30
A MIN | 9.90 | 9.90 | 12.30 | 14.70

4040062/C 03/03
Images above are just a representation of the package family, actual package may vary. Refer to the product data sheet for package details.
NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermatically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
NOTES:

A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

⚠️ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0.15) each side.

⚠️ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0.43) each side.

E. Reference JEDEC MS-012 variation AB.
NOTES:  
A. All linear dimensions are in millimeters.  
B. This drawing is subject to change without notice.  
C. Publication IPC-7351 is recommended for alternate designs.  
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.  
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.
NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
B. This drawing is subject to change without notice.

⚠️ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 each side.

⚠️ Body width does not include interlead flash. Interlead flash shall not exceed 0.25 each side.

E. Falls within JEDEC MO-153
N (R–PDIP–T**)  
16 PINS SHOWN

PLASTIC DUAL–IN–LINE PACKAGE

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| MS–001 VARIATION | AA | BB | AC | AD |

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<tr>
<th>DIM</th>
<th>0.045 (1.14)</th>
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<th>0.020 (0.51) MIN</th>
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<th>0.015 (0.38)</th>
<th>0.010 (0.25) NOM</th>
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NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002