description

The SN754410 is a quadruple high-current half-H driver designed to provide bidirectional drive currents up to 1 A at voltages from 4.5 V to 36 V. The device is designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are compatible with TTL- and low-level CMOS logic. Each output (Y) is a complete totem-pole driver with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs become active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in a high-impedance state. With the proper data inputs, each pair of drivers form a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

A separate supply voltage (V CC1 ) is provided for the logic input circuits to minimize device power dissipation. Supply voltage V CC2 is used for the output circuits.

The SN754410 is designed for operation from –40°C to 85°C.
logic symbol†

![Logic symbol](image)

† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

schematics of inputs and outputs

![Schematics](image)
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output supply voltage, $V_{CC1}$ (see Note 1)</td>
<td>4.5</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Output supply voltage, $V_{CC2}$</td>
<td>4.5</td>
<td>36</td>
<td>V</td>
</tr>
<tr>
<td>High-level input voltage, $V_{IH}$</td>
<td>2</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Low-level input voltage, $V_{IL}$</td>
<td>−0.3†</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>Operating virtual junction temperature, $T_J$</td>
<td>−40</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>Operating free-air temperature, $T_A$</td>
<td>−40</td>
<td>85</td>
<td>°C</td>
</tr>
</tbody>
</table>

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values are with respect to network GND.
2. For operation above 25°C free-air temperature, derate linearly at the rate of 16.6 mW/°C. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection can be activated at power levels slightly above or below the rated dissipation.

The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet for logic voltage levels.
### Electrical Characteristics

#### Input Clamp Voltage
- **Parameter:** \( V_{IK} \)
- **Test Conditions:** \( I_I = -12 \, mA \)
- **Values:**
  - \( \text{MIN} = -0.9 \, V \)
  - \( \text{TYP} = -1.5 \, V \)
  - \( \text{MAX} = -1.1 \, V \)

#### High-Level Output Voltage
- **Parameter:** \( V_{OH} \)
- **Test Conditions:** \( I_OH = -0.5 \, A \);
  - \( \text{MIN} = V_{CC2} - 1.5 \, V \)
  - \( \text{TYP} = V_{CC2} - 1.1 \, V \)
  - \( \text{MAX} = V_{CC2} - 2 \, V \)

#### Low-Level Output Voltage
- **Parameter:** \( V_{OL} \)
- **Test Conditions:** \( I_OH = -1 \, A, \, T_J = 25^\circ C \)
- **Values:**
  - \( \text{MIN} = V_{CC2} - 1.8 \, V \)
  - \( \text{TYP} = V_{CC2} - 1.4 \, V \)

#### High-Level Output Clamp Voltage
- **Parameter:** \( V_{OKH} \)
- **Test Conditions:** \( I_OH = -0.5 \, A \);
  - \( \text{MIN} = V_{CC2} + 1.4 \, V \)
  - \( \text{TYP} = V_{CC2} + 1.9 \, V \)
  - \( \text{MAX} = V_{CC2} + 2.5 \, V \)

#### Low-Level Output Clamp Voltage
- **Parameter:** \( V_{OKL} \)
- **Test Conditions:** \( I_OH = -1 \, A \);
  - \( \text{MIN} = V_{CC2} + 1.2 \, V \)
  - \( \text{TYP} = V_{CC2} + 1.8 \, V \)

#### Off-State High-Impedance-State Output Current
- **Parameter:** \( I_{OZ(\text{off})} \)
- **Test Conditions:** \( V_O = V_{CC2} \)
  - \( \text{MIN} = 500 \, \mu A \)
  - \( \text{TYP} = 500 \, \mu A \)

#### High-Level Input Current
- **Parameter:** \( I_{IH} \)
- **Test Conditions:** \( V_I = 5.5 \, V \)
  - \( \text{MIN} = 10 \, \mu A \)

#### Low-Level Input Current
- **Parameter:** \( I_{IL} \)
- **Test Conditions:** \( V_I = 0 \)
  - \( \text{MIN} = -10 \, \mu A \)

#### Output Supply Current
- **Parameter:** \( I_{CC1} \)
- **Test Conditions:** \( I_O = 0 \)
  - \( \text{MIN} = 25 \, mA \)
  - \( \text{TYP} = 10 \, mA \)
  - \( \text{MAX} = 38 \, mA \)

#### Output Supply Current
- **Parameter:** \( I_{CC2} \)
- **Test Conditions:** \( I_O = 0 \)
  - \( \text{MIN} = 5 \, mA \)
  - \( \text{TYP} = 20 \, mA \)
  - \( \text{MAX} = 33 \, mA \)

#### Switching Characteristics

#### Delay Times
- **Parameter:** \( t_{d1}, t_{d2} \)
  - **Test Conditions:** See Figure 1
  - **Values:**
    - \( \text{MIN} = 400 \, ns \)
    - \( \text{TYP} = 800 \, ns \)
    - \( \text{MAX} = 300 \, ns \)

#### Transition Times
- **Parameter:** \( t_{THL}, t_{TLH} \)
  - **Values:**
    - \( \text{MIN} = 300 \, ns \)
    - \( \text{TYP} = 300 \, ns \)
    - \( \text{MAX} = 300 \, ns \)

#### Rise Time
- **Parameter:** \( t_r \)
  - **Values:**
    - \( \text{MIN} = 300 \, ns \)
    - \( \text{TYP} = 300 \, ns \)
    - \( \text{MAX} = 300 \, ns \)

#### Fall Time
- **Parameter:** \( t_f \)
  - **Values:**
    - \( \text{MIN} = 300 \, ns \)
    - \( \text{TYP} = 300 \, ns \)
    - \( \text{MAX} = 300 \, ns \)

#### Pulse Duration
- **Parameter:** \( t_w \)
  - **Values:**
    - \( \text{MIN} = 300 \, ns \)
    - \( \text{TYP} = 300 \, ns \)
    - \( \text{MAX} = 300 \, ns \)

#### Enable Times
- **Parameter:** \( t_{en1}, t_{en2} \)
  - **Test Conditions:** See Figure 2
  - **Values:**
    - \( \text{MIN} = 700 \, ns \)
    - \( \text{TYP} = 400 \, ns \)
    - \( \text{MAX} = 900 \, ns \)

#### Disable Times
- **Parameter:** \( t_{dis1}, t_{dis2} \)
  - **Test Conditions:** See Figure 2
  - **Values:**
    - \( \text{MIN} = 600 \, ns \)

\( ^\dagger \) All typical values are at \( V_{CC1} = 5 \, V, \, V_{CC2} = 24 \, V, \, T_A = 25^\circ C. \)
PARAMETER MEASUREMENT INFORMATION

Figure 1. Test Circuit and Switching Times From Data Inputs

Figure 2. Test Circuit and Switching Times From Enable Inputs

NOTES:  
A. The pulse generator has the following characteristics: \( t_r \leq 10 \) ns, \( t_f \leq 10 \) ns, \( t_w = 10 \) μs, \( PRR = 5 \) kHz, \( Z_O = 50 \) Ω.  
B. \( C_L \) includes probe and jig capacitance.
APPLICATION INFORMATION

Figure 3. Two-Phase Motor Driver
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