**FEATURES**
- Generates + and – from Single Input
- Up to ±18V Output
- Only Needs Four 1µF Capacitors
- No Inductors
- 10mA Output Current Minimum
- Operates Down to 4V
- No Latchup
- 8-Pin Minidip

**APPLICATIONS**
- Line Drivers
- Op Amp Suppliers
- Battery Splitters
- RS232 Power

**DESCRIPTION**

The LT®1026 is a switched capacitor voltage doubler and inverter on a single monolithic die. Capable of operating from a 4V to 10V input, it provides ±7V to ±18V output. Output currents of over 10mA are available. Two charge pumps first double the input voltage then invert the doubled voltage. Manufactured in bipolar technology, the LT1026 is not susceptible to latchup and generates up to 36V.

The LT1026 offers a convenient way of generating additional system voltages without using inductors. Powering interface circuits, op amps or data acquisition circuitry off logic supplies is simplified.

LTC and LT are registered trademarks of Linear Technology Corporation.
LT1026

**ABSOLUTE MAXIMUM RATINGS** *(Note 1)*

Supply Voltage .................................................... 10V
V+ ........................................................................ 20V
V– ..........................................................................–20V
Short-Circuit Duration ............................... 10 sec

<table>
<thead>
<tr>
<th>OPERATING TEMPERATURE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT1026C ......................... 0°C to 70°C</td>
</tr>
<tr>
<td>LT1026I ......................... –40°C to 85°C</td>
</tr>
<tr>
<td>LT1026M (OBSOLETE) ........ –55°C to 125°C</td>
</tr>
</tbody>
</table>

**Lead Temperature (Soldering, 10 sec)........... 300°C**

**PACKAGE/ORDER INFORMATION**

**PARAMETERS**

**CONDITIONS**

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage</td>
<td>V(_{IN}) = 4V</td>
<td>IL = 0mA</td>
<td>Positive</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>(Note 2)</td>
<td>IL = 0mA</td>
<td>Negative</td>
<td>–6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = 10mA</td>
<td>Positive</td>
<td>5.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = –10mA</td>
<td>Negative</td>
<td>–4.5</td>
</tr>
<tr>
<td></td>
<td>V(_{IN}) = 5V</td>
<td>IL = 15mA</td>
<td>Positive</td>
<td>6.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = –15mA</td>
<td>Negative</td>
<td>–5.5</td>
</tr>
<tr>
<td></td>
<td>V(_{IN}) = 10V</td>
<td>IL = 0mA</td>
<td>Positive</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = 0mA</td>
<td>Negative</td>
<td>–17.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = 10mA</td>
<td>Positive</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = –10mA</td>
<td>Negative</td>
<td>–15.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = 15mA</td>
<td>Positive</td>
<td>15.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL = –15mA</td>
<td>Negative</td>
<td>–14.5</td>
</tr>
<tr>
<td></td>
<td>V(_{IN}) = 5V</td>
<td>IL = 10mA, –10mA</td>
<td>Positive</td>
<td>6.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative</td>
<td>–5.5</td>
<td>–6.5</td>
</tr>
<tr>
<td></td>
<td>V(_{IN}) = 10V</td>
<td>IL = 10mA, –10mA</td>
<td>Positive</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative</td>
<td>–14.25</td>
<td>–15.75</td>
</tr>
</tbody>
</table>

Consult LTC Marketing for parts specified with wider operating temperature ranges.

**ELECTRICAL CHARACTERISTICS**

The • denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T\(_{A}\) = 25°C.

**ORDER PART NUMBER**

<table>
<thead>
<tr>
<th>N8 PACKAGE</th>
<th>8-LEAD TO-5 METAL CAN</th>
<th>T(<em>{JMAX}) = 150°C, q(</em>{JA}) = 150°C/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT1026CH</td>
<td>LT1026MJ8</td>
<td></td>
</tr>
<tr>
<td>LT1026MH</td>
<td>LT1026CJ8</td>
<td></td>
</tr>
</tbody>
</table>

**ORDER PART NUMBER**

<table>
<thead>
<tr>
<th>S8 PACKAGE</th>
<th>8-LEAD PLASTIC SO</th>
<th>T(<em>{JMAX}) = 150°C, q(</em>{JA}) = 150°C/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT1026CN8</td>
<td>LT1026IS8</td>
<td></td>
</tr>
<tr>
<td>LT1026CS8</td>
<td>1026</td>
<td></td>
</tr>
</tbody>
</table>

**Consult LTC Marketing for parts specified with wider operating temperature ranges.**
### Electrical Characteristics

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^\circ C$.

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current</td>
<td>$V_{IN} = 4V$ $I_L = 0mA$</td>
<td>●</td>
<td>7</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = 10V$ $I_L = 0mA$</td>
<td>●</td>
<td>15</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Note 2:** $V_{IN}$ min = −4.5 for $T_A \leq 40^\circ C$

### Typical Performance Characteristics

#### Load Regulation (Both Outputs Loaded)

- $C = 1\mu F$
- $V_{IN} = 5V$
- $T_A = 25^\circ C$

#### Load Regulation for Positive Loading

- $C = 1\mu F$
- $V_{IN} = 5V$
- $T_A = 25^\circ C$

#### Load Regulation for Negative Loading

- $C = 1\mu F$
- $V_{IN} = 5V$
- $T_A = 25^\circ C$

#### Supply Current

- $C = 22\mu F$
- $V_{IN} = 5V$
- $T_A = 25^\circ C$
- BOTH OUTPUTS LOADED
The LT1026 is a nonregulating voltage converter that converts a single input voltage into both a positive and negative output at up to 15mA. A positive input voltage is first doubled and then the doubled voltage is inverted. The voltage output level is dependent on both the input voltage and the output loading. The total output current available depends on the individual loading of the outputs since loading on one output affects the load and the voltage of the other.

Only four external components are needed for operation. Two charge pump capacitors and two output storage capacitors. Nominal value for these capacitors is 1μF, but the LT1026 will operate (with reduced performance) down to 0.1μF. Higher value capacitors (22μF) will reduce ripple and slightly lower output impedance. For higher output currents the outputs of several converters may be paralleled with common output capacitors.

The substrate diodes are an inherent part of the IC, and must always be reversed biased to isolate the individual transistors. In the LT1026 the substrate is tied to the negative output. If the negative output is not used, such as when only the voltage doubler output is needed, –VOUT must be tied to ground so the substrate diodes are properly biased. The substrate diodes must never become forward biased even during overload conditions. For example, pulling –VOUT positive with respect to ground can forward bias the substrate diodes. Clamping the substrate to ground with an external diode would be needed to ensure proper operation and prevent the substrate from carrying any current.

No overload protection is included on the LT1026. Neither output is damaged by momentary shorts, but during sustained shorts the resulting high current flow will overheat the IC.
TYPICAL APPLICATIONS

Positive to Negative Converter

Voltage Doubler

Standard Configuration Voltage Doubler and Inverter

Voltage Quadrupler

Parallel Converters for Higher Output Current and Lower Output Impedance
LT1026

TYPICAL APPLICATIONS

5V Powered RS232 Line Driver

PACKAGE DESCRIPTION

H Package
8-Lead TO-5 Metal Can (.230 Inch PCD)
(Reference LTC DWG # 05-08-1321)

LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND THE SEATING PLANE
**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS

INSULATING STANDOFF

110 – 160
(2.794 – 4.064)

INSULATING STANDOFF

45° TYP

.028 – .034
(0.711 – 0.864)

.027 – .045
(0.686 – 1.143)

PIN 1

.230
(5.842) TYP

.028 – .034
(0.711 – 0.864)

INSULATING STANDOFF

45° TYP

.028 – .034
(0.711 – 0.864)

INSULATING STANDOFF

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INSULATING STANDOFF

45° TYP

.028 – .034
(0.711 – 0.864)

INSULATING STANDOFF
PACKAGE DESCRIPTION

J8 Package
8-Lead CERDIP (Narrow .300 Inch, Hermetic)
(Reference LTC DWG # 05-08-1110)

N8 Package
8-Lead PDIP (Narrow .300 Inch)
(Reference LTC DWG # 05-08-1510)

S8 Package
8-Lead Plastic Small Outline (Narrow 0.150)
(LTC DWG # 05-08-1610)

NOTE:
1. DIMENSIONS ARE IN INCHES
2. DRAWING NOT TO SCALE
3. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

RECOMMENDED SOLDER PAD LAYOUT

Information furnished by Linear Technology Corporation is believed to be accurate and reliable. However, no responsibility is assumed for its use. Linear Technology Corporation makes no representation that the interconnection of its circuits as described herein will not infringe on existing patent rights.
**TYPICAL APPLICATION**

Regulated Converter

**RELATED PARTS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT1044</td>
<td>Switched Capacitor Voltage Converter</td>
<td>Can be Used as Inverter/Doubler/Divider or a Multiplier, ( V_{IN} = 1.5\text{V} ) to 9\text{V}, ( I_O = 60\text{\mu A} ), SO-8</td>
</tr>
<tr>
<td>LT1054/LT1054L</td>
<td>Switched Capacitors Voltage Converters with Regulator</td>
<td>( I_{OUT} ) to 100\text{mA}/125\text{mA}, ( V_{IN} = 3.5\text{V} ) to 15\text{V}, Inverter, Neg/Pos Doubler</td>
</tr>
<tr>
<td>LTC1517-5</td>
<td>Micropower, Regulated 5V In SOT-23</td>
<td>Ultralow Power: ( I_{CC} = 6\text{\mu A} ) Typical, Small 5-Pin SOT-23</td>
</tr>
<tr>
<td>LTC1550/LTC1551</td>
<td>Low Noise, Switched Capacitor Regulator Voltage Inverter</td>
<td>(&lt; 1\text{mVp-p} ) Typical Output Ripple, 900kHz, ( I_{OUT} = 10\text{mA} )</td>
</tr>
<tr>
<td>LTC1555/LTC1556</td>
<td>SIM Power Supply and Level Translator</td>
<td>Step-Up/Step-Down Generates 5V, Input Voltage Range: 2.7V to 10V, ( &gt; 10\text{kV ESD, Short-Circuit and Overtemp Protection}</td>
</tr>
</tbody>
</table>