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The LM3478 and LM3488 are current mode, low side N-channel FET controllers. They can be utilized in numerous configurations including a Boost, Flyback or SEPIC. This evaluation board demonstrates the flexibility of the LM3478 in a boost topology.
1 Introduction
The LM3478 and LM3488 are current mode, low side N-channel FET controllers. They can be utilized in numerous configurations including a Boost, Flyback or SEPIC. This evaluation board demonstrates the flexibility of the LM3478 in a boost topology.

2 Features
- 5V Input Voltage Range
- 12V Output Voltage (default setting)
- Up to 1500 mA Output Current
- 1 MHz switching frequency
- PCB size: 43.18 mm x 52.07 mm

3 Adjusting the Output Voltage
The output voltage can be changed from 12V to another voltage by adjusting the feedback resistors using the following equation:

\[ V_{OUT} = V_{FB}(1+(R_{FB1}/R_{FB2})) \]  

Where \( V_{FB} \) is 1.26V.

For more information on components selection and features, see the LM3478 data sheet.

Figure 1. Top View
Adjusting the Output Voltage

Figure 2. LM3478 Evaluation Board

Figure 3. LM3478 Evaluation Board Schematic

Table 1. Bill of Materials (BOM) LM3478

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
<th>Size</th>
<th>Manufacturer Part #</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_IN1</td>
<td>CAP, 47µF, 20%, 25V, X5R</td>
<td>1206</td>
<td>C3216X5R1E476M</td>
<td>TDK</td>
</tr>
<tr>
<td>C_IN2</td>
<td>optional</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 1. Bill of Materials (BOM) LM3478 (continued)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
<th>Size</th>
<th>Manufacturer Part #</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_{IN3}</td>
<td>CAP, 150µF, 20%, 8V 15mΩ, Aluminum</td>
<td>7.3mm L x 4.3mm W x 4.2mm H</td>
<td>EEF-UE0K151R</td>
<td>Panasonic</td>
</tr>
<tr>
<td>C_{O1}, C_{O2}, C_{O3}</td>
<td>CAP, 47µF, 20%, 25V, X5R</td>
<td>1206</td>
<td>C3216X5R1E476M</td>
<td>TDK</td>
</tr>
<tr>
<td>C_{C}</td>
<td>CAP, 0.1µF, 10%, 16V, X7R</td>
<td>0603</td>
<td>GRM188R71C104KA01D</td>
<td>Murata</td>
</tr>
<tr>
<td>C_{C2}</td>
<td>CAP, 100pF, 5%, 50V, NP0</td>
<td>0603</td>
<td>GRM1885C1H101JA01D</td>
<td>Murata</td>
</tr>
<tr>
<td>C_{BYP}</td>
<td>CAP, 0.1µF, 10%, 16V, X7R</td>
<td>0603</td>
<td>GRM188R71C104KA01D</td>
<td>Murata</td>
</tr>
<tr>
<td>C_{FF}</td>
<td>optional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_{IN}</td>
<td>CAP, 0.01µF, 10%, 50V, X7R</td>
<td>0603</td>
<td>C0603C103KSRACTU</td>
<td>Kemet</td>
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<tr>
<td>R_{C}</td>
<td>RES, 1kΩ, 1%, 0.1W</td>
<td>0603</td>
<td>CRCW06031K00FKEA</td>
<td>Vishay</td>
</tr>
<tr>
<td>R_{BYP}</td>
<td>RES, 10.0 ohm, 1%, 0.1W</td>
<td>0603</td>
<td>CRCW060310R0FKEA</td>
<td>Vishay</td>
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<tr>
<td>R_{FBT}</td>
<td>RES, 86.6kΩ, 1%, 0.1W</td>
<td>0603</td>
<td>CRCW060386K6FKEA</td>
<td>Vishay</td>
</tr>
<tr>
<td>R_{FBB}</td>
<td>RES, 10.2kΩ, 1%, 0.1W</td>
<td>0603</td>
<td>CRCW060310K2FKEA</td>
<td>Vishay</td>
</tr>
<tr>
<td>R_{OR}</td>
<td>RES, 0Ω, 1%, 0.1W</td>
<td>0603</td>
<td>CRCW0603000Z0EA</td>
<td>Vishay</td>
</tr>
<tr>
<td>R_{SL}</td>
<td>RES, 0Ω, 1%, 0.1W</td>
<td>0603</td>
<td>CRCW0603000Z0EA</td>
<td>Vishay</td>
</tr>
<tr>
<td>R_{GN}</td>
<td>RES, 0.015Ω, 1%, 1W</td>
<td>1206</td>
<td>CSR1206FK15L0</td>
<td>Stackpole Electronics</td>
</tr>
<tr>
<td>Q_{1}</td>
<td>NexFET™ N-CH, 25V, 60A, R_{DS(on)}= 4.4mΩ</td>
<td>8-SON</td>
<td>CSD16323Q3</td>
<td>TI</td>
</tr>
<tr>
<td>D_{1}</td>
<td>Diode Schottky, 30V, 3A</td>
<td>SOD128</td>
<td>PMEG3030EP</td>
<td>Vishay</td>
</tr>
<tr>
<td>L_{1}</td>
<td>Shielded Inductor, 1.8µH, 10A</td>
<td>6.36mm L x 6.56mm W x 3.1mm H</td>
<td>XAL6030-182ME</td>
<td>Coilcraft</td>
</tr>
<tr>
<td>U_{1}</td>
<td>LM3478MM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EDGE CONNECTOR</td>
<td></td>
<td>307-020-500-202</td>
<td>EDAC</td>
</tr>
</tbody>
</table>

### 4 Optional components

- **C_{IN2}** is an additional input capacitor.
- **C_{FF}** increases the gain of the dynamic loop during load transients.

### 5 Test Setup

#### Table 2. Demonstration Board Quick Setup Procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect a power supply to V_{IN} and GND terminals</td>
<td>V_{IN} range: 4.5V to 5.5V</td>
</tr>
<tr>
<td>2</td>
<td>Turn on V_{IN} with 0A load applied, check V_{OUT}</td>
<td>V_{OUT} = 12V</td>
</tr>
<tr>
<td>3</td>
<td>Slowly increase the load from 0A to 1.5A, check V_{OUT}</td>
<td>V_{OUT} = 12V</td>
</tr>
</tbody>
</table>
Typical Performance Characteristics for LM3478 Evaluation Board

Efficiency vs. Load Current

Load Regulation

Load Transient Waveforms 500mA to 1500mA, 5V_{IN}

Switching Waveforms CCM, 1.5A, 5V_{IN}

Startup Waveforms V_{IN} = 5V
7 Layout

Figure 4. Top Layer

Figure 5. Top Silkscreen

Figure 6. Mid Layer 1
Figure 7. Mid Layer 2

Figure 8. Bottom Layer

Figure 9. Bottom Silkscreen
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- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
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