• **QuiCur™** technology provides outstanding output characteristics
  (QuiCur™ is a trademark name for ROHM’s original Quick Current circuit that achieves high-speed load response)
  Role-sharing using two error amps improves both output stability and response performance

• **Delivers low voltage output via** Nano Pulse Control™
  Low voltage output of less than 1V from 5V input is possible while maintaining a high switching frequency of 2.2MHz

• **Built-in gain selection function increases design flexibility**
  Gain settings can be optimized to meet set specifications

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### Details of QuiCur™ High-Speed Load Response Technology

**Feedback Circuit (DC-DC Converter IC)**

- **Conventional Circuit**
  - Two-stage error amp configuration utilized for shared signal processing

- **QuiCur™ Circuit**
  - Ultra-high-speed pulse control technology
  - Nano Pulse Control™ Buck operation from 5V to less than 1V in one step

### Frequency Response Graphs by Bode Plot

- **Stable Control Area**
  - Gain (dB) vs. Frequency Response Graphs
  - **COUT Adjustment** (Constant)
  - **fPC** (Zero Cross Frequency)
  - **f0** (Index of response performance)

- **Wide Stable Control Area**
  - **Unstable**

- **Unusable**
  - Difficult
  - Oscillation

---

### Response Performance Comparison

**Conventional DC-DC Converter IC**

- **Output Capacitance**: 44μF (22μF x 2)
- **Board Image**: [Image]
- **Zero Cross Frequency f0**: 100kHz
- **Load Response Waveforms**:
  - **VOUT = 50mV/div**
  - **IOUT = 1A/div**
  - **ΔV = 100mV**

**QuiCur™-Equipped BD9S402MUF-C**

- **Output Capacitance**: 44μF (22μF x 2)
- **Board Image**: [Image]
- **Zero Cross Frequency f0**: 300kHz
- **Load Response Waveforms**:
  - **VOUT = 50mV/div**
  - **IOUT = 1A/div**
  - **ΔV = 33mV**

**Good response performance with minimal voltage fluctuation**
**BD9S402MUFC (QuiCur™ + Nano Pulse Control™) Advantages**

- **Process Miniaturization and Core Voltage Reduction**
  - Nano Pulse Control™ technology supports lower CPU/DSP (load) voltage
  - ±50mV

- **Application Circuit (BD9S402MUFC-C)**
  - V_IN × 0.75
  - Load Response Waveforms
  - Good response performance with minimal voltage fluctuation

- **2.2MHz Automotive Secondary DC-DC Converter IC BD9S402MUFC Specifications**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Rated Voltage (V)</th>
<th>Output Current (Max) (A)</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Voltage Accuracy (%)</th>
<th>Switching Frequency (MHz)</th>
<th>ON Resistance (Typ) (mΩ)</th>
<th>Operating Temperature (℃)</th>
<th>ComfySIL™ Functional Safety Category</th>
<th>Package (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD9S402MUFC-C</td>
<td>7.0</td>
<td>4.0</td>
<td>2.7 to 5.5</td>
<td>Adj. (0.6 to V_IN × 0.75)</td>
<td>±1</td>
<td>2.2±10%</td>
<td>60</td>
<td>35</td>
<td>-40 to +125</td>
<td>VQFN16F3030 (3.0x3.0x1.0)</td>
</tr>
</tbody>
</table>

**Gain Setting Accommodates Various Set Specifications**

- **Mode selection function contributes to design optimization and reduced man-hours**
  - **Gain Terminal Setting**
    - High
    - Low
  - **Output Capacitance**
    - 44μF (22μF x 2)
    - 44μF (22μF x 2)
    - 22μF (22μF x 1)
  - **Board Image**
  - **Load Response Waveforms**
    - Phase Margin 45°
    - Phase Margin 60°
    - Phase Margin 45° (Ensures a large oscillation margin)

- **3-mode selection based on set specifications contributes to optimal design and reduced man-hours**

- **2.2MHz Automotive Secondary DC-DC Converter IC BD9S402MUFC Specifications**

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