MC78M00, MC78M00A, NCV78M00 Series

500 mA Positive Voltage Regulators

The MC78M00/MC78M00A Series positive voltage regulators are identical to the popular MC7800 Series devices, except that they are specified for only half the output current. Like the MC7800 devices, the MC78M00 three-terminal regulators are intended for local, on-card voltage regulation.

Internal current limiting, thermal shutdown circuitry and safe-area compensation for the internal pass transistor combine to make these devices remarkably rugged under most operating conditions. Maximum output current, with adequate heatsinking is 500 mA.

Features
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- MC78M00A High Accuracy (±2%)
  Available for 5.0 V, 8.0 V, 12 V and 15 V
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These are Pb-Free Devices

Figure 1. Representative Schematic Diagram

This device contains 28 active transistors.
MC78M00, MC78M00A, NCV78M00 Series

MAXIMUM RATINGS (TA = 25°C, unless otherwise noted) (Note 1)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage (5.0 V–18 V)</td>
<td>VI</td>
<td>35</td>
<td>Vdc</td>
</tr>
<tr>
<td>(20 V–24 V)</td>
<td></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Dissipation (Package Limitation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic Package, T Suffix</td>
<td>PD</td>
<td>Internally Limited</td>
<td></td>
</tr>
<tr>
<td>TA = 25°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal Resistance, Junction-to-Air</td>
<td>θJA</td>
<td>70</td>
<td>°C/W</td>
</tr>
<tr>
<td>Thermal Resistance, Junction-to-Case</td>
<td>θJC</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Plastic Package, DT Suffix</td>
<td>PD</td>
<td>Internally Limited</td>
<td></td>
</tr>
<tr>
<td>TA = 25°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal Resistance, Junction-to-Air</td>
<td>θJA</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Thermal Resistance, Junction-to-Case</td>
<td>θJC</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Operating Junction Temperature Range</td>
<td>TJ</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Tstg</td>
<td>−65 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. This device series contains ESD protection and exceeds the following tests:
   Machine Model Method 200 V.

MC78M05C/AC/B/AB, NCV78M05AB/B ELECTRICAL CHARACTERISTICS
(VI = 10 V, IO = 350 mA, TJ = Tlow to Thigh, PD ≤ 5 W, unless otherwise noted) (Note 2)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (TJ = 25°C)</td>
<td>VO</td>
<td>4.8</td>
<td>5.0</td>
<td>5.2</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M05B/MC78M05C/NCV78M05B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC78M05AB/MC78M05AC/NCV78M05AB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Voltage Variation (7.0 Vdc ≤ VI ≤ 20 Vdc, 5.0 mA ≤ IO ≤ 350 mA)</td>
<td>VO</td>
<td>4.75</td>
<td>–</td>
<td>5.25</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M05B/MC78M05C/NCV78M05B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC78M05AB/MC78M05AC/NCV78M05AB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line Regulation (TJ = 25°C, 7.0 Vdc ≤ VI ≤ 25 Vdc, IO = 200 mA)</td>
<td>Regline</td>
<td>–</td>
<td>3.0</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>Regload</td>
<td>–</td>
<td>20</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td>(TJ = 25°C, 5.0 mA ≤ IO ≤ 500 mA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(TJ = 25°C, 5.0 mA ≤ IO ≤ 200 mA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (TJ = 25°C)</td>
<td>IIB</td>
<td>–</td>
<td>3.2</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (8.0 Vdc ≤ VI ≤ 25 Vdc, IO = 200 mA)</td>
<td>ΔIIB</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≤ IO ≤ 350 mA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (TA = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>VN</td>
<td>–</td>
<td>40</td>
<td>–</td>
<td>µV</td>
</tr>
<tr>
<td>Ripple Rejection (IO = 100 mA, f = 120 Hz, 8.0 V ≤ VI ≤ 18 V)</td>
<td>RR</td>
<td>–</td>
<td>62</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(IO = 300 mA, f = 120 Hz, 8.0 V ≤ VI ≤ 18 V, TJ = 25°C)</td>
<td></td>
<td></td>
<td>62</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (TJ = 25°C)</td>
<td>VI–VO</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (TJ = 25°C, VI = 35 V)</td>
<td>IOS</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (IO = 5.0 mA)</td>
<td>ΔVO/ΔT</td>
<td>–</td>
<td>±0.2</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (TJ = 25°C)</td>
<td>IO</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

2. Tlow = 0°C for MC78MxxAC, C
   = −40°C for MC78MxxAB, B, NCV78MxxAB, B
   Thigh = +125°C for MC78MxxAB, AC, B, C, NCV78MxxAB, B

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### MC78M06C/B ELECTRICAL CHARACTERISTICS

(V<sub>I</sub> = 11 V, I<sub>O</sub> = 350 mA, T<sub>J</sub> = T<sub>low</sub> to T<sub>hight</sub>, P<sub>D</sub> ≦ 5.0 W, unless otherwise noted) (Note 3)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>5.75</td>
<td>6.0</td>
<td>6.25</td>
<td>Vdc</td>
</tr>
<tr>
<td>Output Voltage Variation (8.0 Vdc ≦ V&lt;sub&gt;I&lt;/sub&gt; ≦ 21 Vdc, 5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 350 mA)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>5.7</td>
<td>–</td>
<td>6.3</td>
<td>Vdc</td>
</tr>
<tr>
<td>Line Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 8.0 Vdc ≦ V&lt;sub&gt;I&lt;/sub&gt; ≦ 25 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>Reg&lt;sub&gt;line&lt;/sub&gt;</td>
<td>–</td>
<td>5.0</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 500 mA)</td>
<td>Reg&lt;sub&gt;load&lt;/sub&gt;</td>
<td>–</td>
<td>20</td>
<td>120</td>
<td>mV</td>
</tr>
<tr>
<td>(T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 200 mA)</td>
<td></td>
<td></td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>3.2</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (9.0 Vdc ≦ V&lt;sub&gt;I&lt;/sub&gt; ≦ 25 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>ΔI&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 350 mA)</td>
<td></td>
<td></td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T&lt;sub&gt;A&lt;/sub&gt; = 25°C, 10 Hz ≦ f ≦ 100 kHz)</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>–</td>
<td>45</td>
<td>–</td>
<td>µV</td>
</tr>
<tr>
<td>Ripple Rejection (I&lt;sub&gt;O&lt;/sub&gt; = 100 mA, f = 120 Hz, 9.0 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 19 V)</td>
<td>RR</td>
<td>59</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 300 mA, f = 120 Hz, 9.0 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 19 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td></td>
<td>59</td>
<td>80</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; - V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, V&lt;sub&gt;I&lt;/sub&gt; = 35 V)</td>
<td>I&lt;sub&gt;OS&lt;/sub&gt;</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I&lt;sub&gt;O&lt;/sub&gt; = 5.0 mA)</td>
<td>ΔV&lt;sub&gt;O&lt;/sub&gt;/ΔT</td>
<td>–</td>
<td>±0.2</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

### MC78M08C/AC/AB, NCV78M08B ELECTRICAL CHARACTERISTICS

(V<sub>I</sub> = 14 V, I<sub>O</sub> = 350 mA, T<sub>J</sub> = T<sub>low</sub> to T<sub>hight</sub>, P<sub>D</sub> ≦ 5.0 W, unless otherwise noted) (Note 3)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>7.70</td>
<td>7.84</td>
<td>8.0</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M08B/MC78M08C/NCV78M08B</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MC78M08AB/MC78M08AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Voltage Variation (10.5 Vdc ≦ V&lt;sub&gt;I&lt;/sub&gt; ≦ 23 Vdc, 5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 350 mA)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>7.6</td>
<td>–</td>
<td>8.4</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M08B/MC78M08C/NCV78M08B</td>
<td></td>
<td>7.7</td>
<td>–</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>MC78M08AB/MC78M08AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 10.5 Vdc ≦ V&lt;sub&gt;I&lt;/sub&gt; ≦ 25 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>Reg&lt;sub&gt;line&lt;/sub&gt;</td>
<td>–</td>
<td>6.0</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 500 mA)</td>
<td>Reg&lt;sub&gt;load&lt;/sub&gt;</td>
<td>–</td>
<td>25</td>
<td>160</td>
<td>mV</td>
</tr>
<tr>
<td>(T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 200 mA)</td>
<td></td>
<td></td>
<td>10</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>3.2</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (10.5 Vdc ≦ V&lt;sub&gt;I&lt;/sub&gt; ≦ 25 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>ΔI&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≦ I&lt;sub&gt;O&lt;/sub&gt; ≦ 350 mA)</td>
<td></td>
<td>–</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T&lt;sub&gt;A&lt;/sub&gt; = 25°C, 10 Hz ≦ f ≦ 100 kHz)</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>–</td>
<td>52</td>
<td>–</td>
<td>µV</td>
</tr>
<tr>
<td>Ripple Rejection (I&lt;sub&gt;O&lt;/sub&gt; = 100 mA, f = 120 Hz, 11.5 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 21.5 V)</td>
<td>RR</td>
<td>56</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 300 mA, f = 120 Hz, 11.5 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 21.5 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td></td>
<td>56</td>
<td>80</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; - V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, V&lt;sub&gt;I&lt;/sub&gt; = 35 V)</td>
<td>I&lt;sub&gt;OS&lt;/sub&gt;</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I&lt;sub&gt;O&lt;/sub&gt; = 5.0 mA)</td>
<td>ΔV&lt;sub&gt;O&lt;/sub&gt;/ΔT</td>
<td>–</td>
<td>±0.2</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

3. T<sub>low</sub> = 0°C for MC78MxxAC, C = –40°C for MC78MxxAB, B, NCV78MxxAB, B
   T<sub>hight</sub> = +125°C for MC78MxxAB, AC, B, C, NCV78MxxAB, B

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### MC78M00, MC78M00A, NCV78M00 Series

#### MC78M00C/B ELECTRICAL CHARACTERISTICS
(V<sub>I</sub> = 15 V, I<sub>O</sub> = 350 mA, T<sub>J</sub> = T<sub>low</sub> to T<sub>high</sub>, P<sub>D</sub> ≤ 5.0 W, unless otherwise noted) (Note 4)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;D&lt;/sub&gt;</td>
<td>8.64</td>
<td>9.0</td>
<td>9.45</td>
<td>Vdc</td>
</tr>
<tr>
<td>Output Voltage Variation (11.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 23 Vdc, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>8.55</td>
<td>–</td>
<td>9.45</td>
<td>Vdc</td>
</tr>
<tr>
<td>Line Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 11.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 25 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>Reg&lt;sub&gt;line&lt;/sub&gt;</td>
<td>–</td>
<td>6.0</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 500 mA)</td>
<td>Reg&lt;sub&gt;load&lt;/sub&gt;</td>
<td>–</td>
<td>25</td>
<td>180</td>
<td>mV</td>
</tr>
<tr>
<td>(T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 200 mA)</td>
<td></td>
<td></td>
<td>10</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>3.2</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (11.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 25 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>ΔI&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td></td>
<td></td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T&lt;sub&gt;A&lt;/sub&gt; = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>–</td>
<td>52</td>
<td>–</td>
<td>μV</td>
</tr>
<tr>
<td>Ripple Rejection (I&lt;sub&gt;O&lt;/sub&gt; = 100 mA, f = 120 Hz, 12.5 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 22.5 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>RR</td>
<td>56</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 300 mA, f = 120 Hz, 12.5 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 22.5 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td></td>
<td>56</td>
<td>80</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; – V&lt;sub&gt;D&lt;/sub&gt;</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, V&lt;sub&gt;I&lt;/sub&gt; = 35 V)</td>
<td>I&lt;sub&gt;OS&lt;/sub&gt;</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I&lt;sub&gt;O&lt;/sub&gt; = 5.0 mA)</td>
<td>ΔV&lt;sub&gt;O&lt;/sub&gt;/ΔT</td>
<td>–</td>
<td>±0.2</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

### MC78M12C/AC/B/AB, NCV78M12B ELECTRICAL CHARACTERISTICS
(V<sub>I</sub> = 19 V, I<sub>O</sub> = 350 mA, T<sub>J</sub> = T<sub>low</sub> to T<sub>high</sub>, P<sub>D</sub> ≤ 5.0 W, unless otherwise noted) (Note 4)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;D&lt;/sub&gt;</td>
<td>11.50</td>
<td>12</td>
<td>12.50</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M12B/MC78M12C/NCV78M12B</td>
<td></td>
<td>11.76</td>
<td>12</td>
<td>12.24</td>
<td></td>
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<tr>
<td>Output Voltage Variation (14.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 27 Vdc, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>11.4</td>
<td>–</td>
<td>12.6</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M12B/MC78M12C/NCV78M12B</td>
<td></td>
<td>11.5</td>
<td>–</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Line Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 14.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 30 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>Reg&lt;sub&gt;line&lt;/sub&gt;</td>
<td>–</td>
<td>8.0</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 500 mA)</td>
<td>Reg&lt;sub&gt;load&lt;/sub&gt;</td>
<td>–</td>
<td>25</td>
<td>240</td>
<td>mV</td>
</tr>
<tr>
<td>(T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 200 mA)</td>
<td></td>
<td>–</td>
<td>10</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>3.2</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (14.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 30 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>ΔI&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T&lt;sub&gt;A&lt;/sub&gt; = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>–</td>
<td>75</td>
<td>–</td>
<td>μV</td>
</tr>
<tr>
<td>Ripple Rejection (I&lt;sub&gt;O&lt;/sub&gt; = 100 mA, f = 120 Hz, 15 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 25 V)</td>
<td>RR</td>
<td>55</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 300 mA, f = 120 Hz, 15 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 25 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td></td>
<td>55</td>
<td>80</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; – V&lt;sub&gt;D&lt;/sub&gt;</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, V&lt;sub&gt;I&lt;/sub&gt; = 35 V)</td>
<td>I&lt;sub&gt;OS&lt;/sub&gt;</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I&lt;sub&gt;O&lt;/sub&gt; = 5.0 mA)</td>
<td>ΔV&lt;sub&gt;O&lt;/sub&gt;/ΔT</td>
<td>–</td>
<td>±0.3</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

4. T<sub>low</sub> = 0°C for MC78MxxAC, C
   = −40°C for MC78MxxAB, B, NCV78MxxAB, B
   T<sub>high</sub> = +125°C for MC78MxxAB, AC, B, C, NCV78MxxAB, B
### MC78M15C/AC/B/AB, NCV78M15B ELECTRICAL CHARACTERISTICS

(V<sub>I</sub> = 23 V, I<sub>O</sub> = 350 mA, T<sub>J</sub> = T<sub>low</sub> to T<sub>high</sub>, P<sub>D</sub> ≤ 5 W, unless otherwise noted) (Note 5)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>14.4</td>
<td>15</td>
<td>15.6</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M15B/MC78M15C/NCV78M15B</td>
<td></td>
<td>14.7</td>
<td>15</td>
<td>15.3</td>
<td></td>
</tr>
<tr>
<td>Output Voltage Variation (17.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 30 Vdc, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>14.25</td>
<td>–</td>
<td>15.75</td>
<td>Vdc</td>
</tr>
<tr>
<td>MC78M15B/MC78M15C/NCV78M15B</td>
<td></td>
<td>14.40</td>
<td>–</td>
<td>15.60</td>
<td></td>
</tr>
<tr>
<td>Input Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 17.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 30 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>Reg&lt;sub&gt;line&lt;/sub&gt;</td>
<td>–</td>
<td>10</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>Reg&lt;sub&gt;load&lt;/sub&gt;</td>
<td>–</td>
<td>25</td>
<td>300</td>
<td>mV</td>
</tr>
<tr>
<td>Input Bias Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>3.2</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change</td>
<td>ΔI&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(17.5 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 30 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>(5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T&lt;sub&gt;A&lt;/sub&gt; = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>–</td>
<td>90</td>
<td>–</td>
<td>μV</td>
</tr>
<tr>
<td>Ripple Rejection</td>
<td>RR</td>
<td>54</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 100 mA, f = 120 Hz, 18.5 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 28.5 V)</td>
<td></td>
<td>54</td>
<td>70</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 300 mA, f = 120 Hz, 18.5 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 28.5 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td></td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt;–V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, V&lt;sub&gt;I&lt;/sub&gt; = 35 V)</td>
<td>I&lt;sub&gt;OS&lt;/sub&gt;</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I&lt;sub&gt;O&lt;/sub&gt; = 5.0 mA)</td>
<td>ΔV&lt;sub&gt;O&lt;/sub&gt;/ΔT</td>
<td>–</td>
<td>±0.3</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

### MC78M18C/B ELECTRICAL CHARACTERISTICS

(V<sub>I</sub> = 27 V, I<sub>O</sub> = 350 mA, T<sub>J</sub> = T<sub>low</sub> to T<sub>high</sub>, P<sub>D</sub> ≤ 5 W, unless otherwise noted) (Note 5)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>17.3</td>
<td>18</td>
<td>18.7</td>
<td>Vdc</td>
</tr>
<tr>
<td>Output Voltage Variation (21 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 33 Vdc, 5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>17.1</td>
<td>–</td>
<td>18.9</td>
<td>Vdc</td>
</tr>
<tr>
<td>Line Regulation (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, 21 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 33 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td>Reg&lt;sub&gt;line&lt;/sub&gt;</td>
<td>–</td>
<td>10</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>Reg&lt;sub&gt;load&lt;/sub&gt;</td>
<td>–</td>
<td>30</td>
<td>360</td>
<td>mV</td>
</tr>
<tr>
<td>Input Bias Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>3.2</td>
<td>6.5</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change</td>
<td>ΔI&lt;sub&gt;IB&lt;/sub&gt;</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(21 Vdc ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 33 Vdc, I&lt;sub&gt;O&lt;/sub&gt; = 200 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>(5.0 mA ≤ I&lt;sub&gt;O&lt;/sub&gt; ≤ 350 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T&lt;sub&gt;A&lt;/sub&gt; = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>–</td>
<td>100</td>
<td>–</td>
<td>μV</td>
</tr>
<tr>
<td>Ripple Rejection</td>
<td>RR</td>
<td>53</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 100 mA, f = 120 Hz, 22 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 32 V)</td>
<td></td>
<td>53</td>
<td>70</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>(I&lt;sub&gt;O&lt;/sub&gt; = 300 mA, f = 120 Hz, 22 V ≤ V&lt;sub&gt;I&lt;/sub&gt; ≤ 32 V, T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td></td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt;–V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T&lt;sub&gt;J&lt;/sub&gt; = 25°C, V&lt;sub&gt;I&lt;/sub&gt; = 35 V)</td>
<td>I&lt;sub&gt;OS&lt;/sub&gt;</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I&lt;sub&gt;O&lt;/sub&gt; = 5.0 mA)</td>
<td>ΔV&lt;sub&gt;O&lt;/sub&gt;/ΔT</td>
<td>–</td>
<td>±0.3</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T&lt;sub&gt;J&lt;/sub&gt; = 25°C)</td>
<td>I&lt;sub&gt;O&lt;/sub&gt;</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

5. T<sub>low</sub> = 0°C for MC78MxxAC, C
    = −40°C for MC78MxxAB, B, NCV78MxxAB, B
    T<sub>high</sub> = +125°C for MC78MxxAB, AC, C, NCV78MxxAB, B
### MC78M00, MC78M00A, NCV78M00 Series

#### MC78M20C/B ELECTRICAL CHARACTERISTICS

(V_I = 29 V, I_O = 350 mA, T_J = T_{low} to T_{high}, P_D ≤ 5.0 W, unless otherwise noted) (Note 6)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T_J = 25°C)</td>
<td>V_O</td>
<td>19.2</td>
<td>20</td>
<td>20.8</td>
<td>Vdc</td>
</tr>
<tr>
<td>Output Voltage Variation (23 Vdc ≤ V_I ≤ 35 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)</td>
<td>V_O</td>
<td>19</td>
<td>–</td>
<td>21</td>
<td>Vdc</td>
</tr>
<tr>
<td>Line Regulation (T_J = 25°C, 23 Vdc ≤ V_I ≤ 35 Vdc, I_O = 200 mA)</td>
<td>Regline</td>
<td>–</td>
<td>10</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation (T_J = 25°C, 5.0 mA ≤ I_O ≤ 500 mA)</td>
<td>Regload</td>
<td>–</td>
<td>30</td>
<td>400</td>
<td>mV</td>
</tr>
<tr>
<td>(T_J = 25°C, 5.0 mA ≤ I_O ≤ 200 mA)</td>
<td></td>
<td>–</td>
<td>10</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (T_J = 25°C)</td>
<td>I_IB</td>
<td>–</td>
<td>3.2</td>
<td>6.5</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (23 Vdc ≤ V_I ≤ 35 Vdc, I_O = 200 mA)</td>
<td>ΔI_IB</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≤ I_O ≤ 350 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>V_n</td>
<td>–</td>
<td>110</td>
<td>–</td>
<td>μV</td>
</tr>
<tr>
<td>Ripple Rejection (I_O = 100 mA, f = 120 Hz, 24 V ≤ V_I ≤ 34 V)</td>
<td>RR</td>
<td>52</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I_O = 300 mA, f = 120 Hz, 24 V ≤ V_I ≤ 34 V, T_J = 25°C)</td>
<td></td>
<td>52</td>
<td>70</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T_J = 25°C)</td>
<td>V_I−V_O</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T_J = 25°C, V_I = 35 V)</td>
<td>I_O</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)</td>
<td>ΔV_O/ΔT</td>
<td>–</td>
<td>±0.5</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T_J = 25°C)</td>
<td>I_O</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

### MC78M24C/B ELECTRICAL CHARACTERISTICS

(V_I = 33 V, I_O = 350 mA, T_J = T_{low} to T_{high}, P_D ≤ 5.0 W, unless otherwise noted) (Note 6)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (T_J = 25°C)</td>
<td>V_O</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>Vdc</td>
</tr>
<tr>
<td>Output Voltage Variation (27 Vdc ≤ V_I ≤ 38 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)</td>
<td>V_O</td>
<td>22.8</td>
<td>–</td>
<td>25.2</td>
<td>Vdc</td>
</tr>
<tr>
<td>Line Regulation (T_J = 25°C, 27 Vdc ≤ V_I ≤ 38 Vdc, I_O = 200 mA)</td>
<td>Regline</td>
<td>–</td>
<td>10</td>
<td>50</td>
<td>mV</td>
</tr>
<tr>
<td>Load Regulation (T_J = 25°C, 5.0 mA ≤ I_O ≤ 500 mA)</td>
<td>Regload</td>
<td>–</td>
<td>30</td>
<td>480</td>
<td>mV</td>
</tr>
<tr>
<td>(T_J = 25°C, 5.0 mA ≤ I_O ≤ 200 mA)</td>
<td></td>
<td>–</td>
<td>10</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>Input Bias Current (T_J = 25°C)</td>
<td>I_IB</td>
<td>–</td>
<td>3.2</td>
<td>7.0</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current Change (27 Vdc ≤ V_I ≤ 38 Vdc, I_O = 200 mA)</td>
<td>ΔI_IB</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td>(5.0 mA ≤ I_O ≤ 350 mA)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage (T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz)</td>
<td>V_n</td>
<td>–</td>
<td>170</td>
<td>–</td>
<td>μV</td>
</tr>
<tr>
<td>Ripple Rejection (I_O = 100 mA, f = 120 Hz, 28 V ≤ V_I ≤ 38 V)</td>
<td>RR</td>
<td>50</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>(I_O = 300 mA, f = 120 Hz, 28 V ≤ V_I ≤ 38 V, T_J = 25°C)</td>
<td></td>
<td>50</td>
<td>70</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (T_J = 25°C)</td>
<td>V_I−V_O</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>Vdc</td>
</tr>
<tr>
<td>Short Circuit Current Limit (T_J = 25°C)</td>
<td>I_O</td>
<td>–</td>
<td>350</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)</td>
<td>ΔV_O/ΔT</td>
<td>–</td>
<td>±0.5</td>
<td>–</td>
<td>mV/°C</td>
</tr>
<tr>
<td>Peak Output Current (T_J = 25°C)</td>
<td>I_O</td>
<td>–</td>
<td>700</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

6. \( T_{low} = 0°C \) for MC78MxxAC, C  
\( = -40°C \) for MC78MxxAB, B  
\( T_{high} = +125°C \) for MC78MxxAB, AC, B, C
DEFINITIONS

Line Regulation – The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

Load Regulation – The change in output voltage for a change in load current at constant chip temperature.

Maximum Power Dissipation – The maximum total device dissipation for which the regulator will operate within specifications.

Input Bias Current – That part of the input current that is not delivered to the load.

Output Noise Voltage – The rms AC voltage at the output, with constant load and no input ripple, measured over a specified frequency range.

Long Term Stability – Output voltage stability under accelerated life test conditions with the maximum rated voltage listed in the devices’ electrical characteristics and maximum power dissipation.

Figure 2. DPAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

Figure 3. Worst Case Power Dissipation versus Ambient Temperature (TO–220)
Figure 4. Peak Output Current versus Dropout Voltage

Figure 5. Dropout Voltage versus Junction Temperature

Figure 6. Ripple Rejection versus Frequency

Figure 7. Ripple Rejection versus Output Current

Figure 8. Bias Current versus Input Voltage

Figure 9. Bias Current versus Output Current
Design Considerations

The MC78M00/MC78M00A Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that limits the maximum current the circuit will pass, and Output Transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33 μF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulator’s input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

The MC78M00 regulators can also be used as a current source when connected as above. In order to minimize dissipation the MC78M05C is chosen in this application. Resistor R determines the current as follows:

\[ I_O = \frac{5.0\, V}{R} + I_B \]

\[ I_B = 1.5\, mA \] over line and load changes.

For example, a 500 mA current source would require R to be a 10 Ω, 10 W resistor and the output voltage compliance would be the input voltage less 7.0 V.

The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtainable with this arrangement is 2.0 V greater than the regulator voltage.

The circuit of Figure 12 can be modified to provide supply protection against short circuits by adding a short circuit sense resistor, R_SC, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three-terminal regulator. Therefore, a 4.0 A plastic power transistor is specified.

The MC78M00 series can be current boosted with a PNP transistor. The MJ2955 provides current to 5.0 A. Resistor R in conjunction with the V_BE of the PNP determines when the pass transistor begins conducting; this circuit is not short circuit proof. Input-output differential voltage minimum is increased by V_BE of the pass transistor.

The circuit of Figure 12 can be modified to provide supply protection against short circuits by adding a short circuit sense resistor, R_SC, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three-terminal regulator. Therefore, a 4.0 A plastic power transistor is specified.

The MC78M00 series can be current boosted with a PNP transistor. The MJ2955 provides current to 5.0 A. Resistor R in conjunction with the V_BE of the PNP determines when the pass transistor begins conducting; this circuit is not short circuit proof. Input-output differential voltage minimum is increased by V_BE of the pass transistor.
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<tr>
<th>Device</th>
<th>Output Voltage</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Marking</th>
<th>Shipping¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC78M05CDTG</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M05</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M05CDTT5G</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M05</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M05CDTRKG</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M05</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M05ACDTG</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>8M05D</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M05ACDTRKG</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>8M05D</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M05ACDTG</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M05CT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M05ACTG</td>
<td>5.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M05ACT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M05ABDTG</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05A</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M05ABDTRKG</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05A</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>NCV78M05ABDTRKG*</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05A</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M05ABTG</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>TO–220</td>
<td>78M05ABT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M05BDTG</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05B</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M05BDTT5G</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05B</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M05BDTRKG</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05B</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>NCV78M05BDTRKG*</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
<td>8M05B</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M05BTG</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>TO–220</td>
<td>78M05BT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>NCV78M05BTG*</td>
<td>5.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>TO–220</td>
<td>78M05BT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M06CDTG</td>
<td>6.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M06</td>
<td>75 Units / Rail</td>
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<tr>
<td>MC78M06CDTRKG</td>
<td>6.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M06</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M06CTG</td>
<td>6.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>TO–220</td>
<td>78M06CT</td>
<td>50 Units / Rail</td>
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<td>6.0 V</td>
<td>T_J = -40° to +125°C</td>
<td>TO–220</td>
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<tr>
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<td>T_J = -40° to +125°C</td>
<td>DPAK-3</td>
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<td>2500 / Tape &amp; Reel</td>
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<tr>
<td>MC78M08CDTG</td>
<td>8.0 V</td>
<td>T_J = 0° to +125°C</td>
<td>DPAK-3</td>
<td>78M08</td>
<td>75 Units / Rail</td>
</tr>
</tbody>
</table>

¹For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NVC devices: T_{low} = -40°C, T_{high} = +125°C. Guaranteed by design. NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable.
## ORDERING INFORMATION (continued)

<table>
<thead>
<tr>
<th>Device</th>
<th>Output Voltage</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Marking</th>
<th>Shipping†</th>
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<tbody>
<tr>
<td>MC78M08CDTRKG</td>
<td>8.0 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>78M08</td>
<td>2500 Units / Tape &amp; Reel</td>
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<tr>
<td>MC78M08ACDTG</td>
<td>8.0 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08D</td>
<td>75 Units / Rail</td>
</tr>
<tr>
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<td>8.0 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08D</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M08CTG</td>
<td>8.0 V</td>
<td>TJ = 0° to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M08CT</td>
<td>50 Units / Rail</td>
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<tr>
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<td>8.0 V</td>
<td>TJ = 0° to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M08ACT</td>
<td>50 Units / Rail</td>
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<tr>
<td>MC78M08ABDTG</td>
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<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08A</td>
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<tr>
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<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08A</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M08ABTG</td>
<td>8.0 V</td>
<td>TJ = −40° to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M08ABT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M08BDTG</td>
<td>8.0 V</td>
<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08B</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M08BDTRKG</td>
<td>8.0 V</td>
<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08B</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>NCV78M08BDTRKG*</td>
<td>8.0 V</td>
<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M08B</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M08BGT</td>
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<td>TJ = −40° to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M08B</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M09CDTG</td>
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<td>DPAK-3 (Pb–Free)</td>
<td>78M09</td>
<td>75 Units / Rail</td>
</tr>
<tr>
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<td>9.0 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
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<td>2500 Units / Tape &amp; Reel</td>
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<tr>
<td>MC78M09CTG</td>
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<td>TJ = 0° to +125°C</td>
<td>TO–220 (Pb–Free)</td>
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</tr>
<tr>
<td>MC78M09BDTG</td>
<td>9.0 V</td>
<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M09B</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M09BDTRKG</td>
<td>9.0 V</td>
<td>TJ = −40° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M09B</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M12CDTG</td>
<td>12 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>78M12</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M12CDTT5G</td>
<td>12 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>78M12</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M12CDTRKG</td>
<td>12 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>78M12</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M12ACDTG</td>
<td>12 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
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<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M12ACDTRKG</td>
<td>12 V</td>
<td>TJ = 0° to +125°C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>8M12D</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M12CTG</td>
<td>12 V</td>
<td>TJ = 0° to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M12CT</td>
<td>50 Units / Rail</td>
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</tbody>
</table>

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## ORDERING INFORMATION (continued)

<table>
<thead>
<tr>
<th>Device</th>
<th>Output Voltage</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Marking</th>
<th>Shipping†</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC78M12ACTG</td>
<td>12 V</td>
<td>$T_J = 0^\circ$ to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M12ACT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M12ABDTG</td>
<td>12 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>8M12A</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M12ABDTRKG</td>
<td>12 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>8M12A</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M12ABTG</td>
<td>12 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M12ABT</td>
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</tr>
<tr>
<td>MC78M12BDTG</td>
<td>12 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
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</tr>
<tr>
<td>MC78M12BDTRKG</td>
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<td>DPAK–3 (Pb–Free)</td>
<td>8M12B</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>NCV78M12BDTRKG*</td>
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<td>DPAK–3 (Pb–Free)</td>
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<tr>
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<td>$T_J = -40^\circ$ to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M12BT</td>
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<td>MC78M15CDTG</td>
<td>15 V</td>
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<td>DPAK–3 (Pb–Free)</td>
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<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M15CDTRKG</td>
<td>15 V</td>
<td>$T_J = 0^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>78M15</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M15ACDTG</td>
<td>15 V</td>
<td>$T_J = 0^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
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</tr>
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<td>$T_J = 0^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>8M15D</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M15CTG</td>
<td>15 V</td>
<td>$T_J = 0^\circ$ to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M15CT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M15ACTG</td>
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<td>TO–220 (Pb–Free)</td>
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<td>50 Units / Rail</td>
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<tr>
<td>MC78M15ABDTG</td>
<td>15 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
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<td>75 Units / Rail</td>
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<td>DPAK–3 (Pb–Free)</td>
<td>8M15A</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M15ABTG</td>
<td>15 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M15ABT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M15BDTG</td>
<td>15 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>8M15B</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>NCV78M15BDTG*</td>
<td>15 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>8M15B</td>
<td>75 Units / Rail</td>
</tr>
<tr>
<td>MC78M15BDTRKG</td>
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<td>$T_J = -40^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>8M15B</td>
<td>2500 Units / Tape &amp; Reel</td>
</tr>
<tr>
<td>MC78M15BTG</td>
<td>15 V</td>
<td>$T_J = -40^\circ$ to +125°C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M15BT</td>
<td>50 Units / Rail</td>
</tr>
<tr>
<td>MC78M18CDTG</td>
<td>18 V</td>
<td>$T_J = 0^\circ$ to +125°C</td>
<td>DPAK–3 (Pb–Free)</td>
<td>78M18</td>
<td>75 Units / Rail</td>
</tr>
</tbody>
</table>

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### ORDERING INFORMATION (continued)

<table>
<thead>
<tr>
<th>Device</th>
<th>Output Voltage</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Marking</th>
<th>Shipping†</th>
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</thead>
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<tr>
<td>MC78M18CDTRKG</td>
<td>18 V</td>
<td>$T_J = 0^\circ$ to $+125^\circ$C</td>
<td>DPAK-3 (Pb–Free)</td>
<td>78M18</td>
<td>2500 Units / Tape &amp; Reel</td>
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<tr>
<td>MC78M18CTG</td>
<td>18 V</td>
<td>$T_J = 0^\circ$ to $+125^\circ$C</td>
<td>TO–220 (Pb–Free)</td>
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<td>50 Units / Rail</td>
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<tr>
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<td>18 V</td>
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<td>TO–220 (Pb–Free)</td>
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<td>MC78M20CTG</td>
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<td>MC78M24CTG</td>
<td>24 V</td>
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<td>TO–220 (Pb–Free)</td>
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<td>50 Units / Rail</td>
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<tr>
<td>MC78M24BTG</td>
<td>24 V</td>
<td>$T_J = -40^\circ$ to $+125^\circ$C</td>
<td>TO–220 (Pb–Free)</td>
<td>78M24BT</td>
<td>50 Units / Rail</td>
</tr>
</tbody>
</table>

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MC78M00, MC78M00A, NCV78M00 Series

PACKAGE DIMENSIONS

DPAK−3
DT SUFFIX
CASE 369C
ISSUE D

NOTES:
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

<table>
<thead>
<tr>
<th>INCHES</th>
<th>MILLIMETERS</th>
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<tbody>
<tr>
<td>A</td>
<td>0.095 0.094</td>
</tr>
<tr>
<td>b</td>
<td>0.025 0.020</td>
</tr>
<tr>
<td>b2</td>
<td>0.030 0.025</td>
</tr>
<tr>
<td>b3</td>
<td>0.180 0.175</td>
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<tr>
<td>e</td>
<td>0.018 0.024</td>
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<tr>
<td>c2</td>
<td>0.018 0.024</td>
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<tr>
<td>D</td>
<td>0.235 0.245</td>
</tr>
<tr>
<td>E</td>
<td>0.250 0.265</td>
</tr>
<tr>
<td>a</td>
<td>0.000 BSC</td>
</tr>
<tr>
<td>b</td>
<td>0.020 BSC</td>
</tr>
<tr>
<td>L1</td>
<td>0.108 REF</td>
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<tr>
<td>L2</td>
<td>0.020 BSC</td>
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<tr>
<td>L3</td>
<td>0.035 0.050</td>
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<tr>
<td>L4</td>
<td>0.040</td>
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<tr>
<td>Z</td>
<td>0.105</td>
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</table>

SOLDERING FOOTPRINT*

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.
## PACKAGE DIMENSIONS

### TO-220, SINGLE GAUGE

**CASE 221AB**

**ISSUE A**

**NOTES:**
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. PRODUCT SHIPPED PRIOR TO 2008 HAD DIMENSIONS

<table>
<thead>
<tr>
<th>DIM</th>
<th>MIN</th>
<th>MAX</th>
<th>MIN</th>
<th>MAX</th>
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</thead>
<tbody>
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<td>A</td>
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<td>0.620</td>
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<td>B</td>
<td>0.380</td>
<td>0.405</td>
<td>9.66</td>
<td>10.28</td>
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<tr>
<td>C</td>
<td>0.160</td>
<td>0.190</td>
<td>4.07</td>
<td>4.82</td>
</tr>
<tr>
<td>D</td>
<td>0.025</td>
<td>0.035</td>
<td>0.64</td>
<td>0.88</td>
</tr>
<tr>
<td>F</td>
<td>0.142</td>
<td>0.147</td>
<td>3.61</td>
<td>3.73</td>
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<tr>
<td>G</td>
<td>0.095</td>
<td>0.105</td>
<td>2.42</td>
<td>2.66</td>
</tr>
<tr>
<td>H</td>
<td>0.110</td>
<td>0.135</td>
<td>2.80</td>
<td>3.35</td>
</tr>
<tr>
<td>J</td>
<td>0.018</td>
<td>0.025</td>
<td>0.46</td>
<td>0.64</td>
</tr>
<tr>
<td>K</td>
<td>0.500</td>
<td>0.562</td>
<td>12.70</td>
<td>14.27</td>
</tr>
<tr>
<td>L</td>
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<td>0.060</td>
<td>1.15</td>
<td>1.52</td>
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<tr>
<td>N</td>
<td>0.190</td>
<td>0.210</td>
<td>4.83</td>
<td>5.33</td>
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<tr>
<td>Q</td>
<td>0.100</td>
<td>0.120</td>
<td>2.54</td>
<td>3.06</td>
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<tr>
<td>S</td>
<td>0.020</td>
<td>0.024</td>
<td>0.508</td>
<td>0.61</td>
</tr>
<tr>
<td>T</td>
<td>0.236</td>
<td>0.256</td>
<td>5.97</td>
<td>6.47</td>
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<tr>
<td>U</td>
<td>0.000</td>
<td>0.050</td>
<td>0.00</td>
<td>1.37</td>
</tr>
<tr>
<td>V</td>
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<td>---</td>
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</tr>
<tr>
<td>Z</td>
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<td>0.080</td>
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<td>2.04</td>
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**DIMENSIONS S** - 0.045 - 0.055 INCHES (1.143 - 1.397 MM)

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**MC78M00/D**