

MC7800, MC7800A, MC7800AE, NCV7800



ON Semiconductor®

1.0 A Positive Voltage Regulators

These voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation. With adequate heatsinking they can deliver output currents in excess of 1.0 A. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

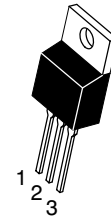
- Output Current in Excess of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage Offered in 1.5%, 2% and 4% Tolerance
- Available in Surface Mount D²PAK-3, DPAK-3 and Standard 3-Lead Transistor Packages
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes
- Pb-Free Packages are Available

MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

| Rating | Symbol | Value | | | Unit |
|--|------------------|--------------------|------|--------------|------|
| | | 369C | 221A | 936 | |
| Input Voltage (5.0 - 18 V) (24 V) | V _I | 35 40 | | | Vdc |
| Power Dissipation | P _D | Internally Limited | | | W |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} | 92 | 65 | Figure 15 | °C/W |
| Thermal Resistance, Junction-to-Case | R _{θJC} | 5.0 | 5.0 | 5.0 | °C/W |
| Storage Junction Temperature Range | T _{stg} | -65 to +150 | | | °C |
| Operating Junction Temperature | T _J | +150 | | | °C |

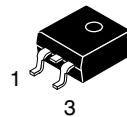
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015.
Machine Model Method 200 V.



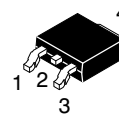
TO-220-3
T SUFFIX
CASE 221AB

Heatsink surface
connected to Pin 2.



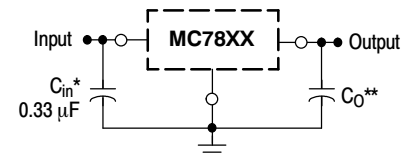
Pin 1. Input
2. Ground
3. Output
D²PAK-3
D2T SUFFIX
CASE 936

Heatsink surface (shown as terminal 4 in
case outline drawing) is connected to Pin 2.



DPAK-3
DT SUFFIX
CASE 369C

STANDARD APPLICATION



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

XX, These two digits of the type number indicate nominal voltage.

* C_{in} is required if regulator is located an appreciable distance from power supply filter.

** C_O is not needed for stability; however, it does improve transient response. Values of less than 0.1 µF could cause instability.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 23 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 30 of this data sheet.

MC7800, MC7800A, MC7800AE, NCV7800

ELECTRICAL CHARACTERISTICS ($V_{in} = 10\text{ V}$, $I_O = 1.0\text{ A}$, $T_J = T_{low}$ to 125°C (Note 3), unless otherwise noted)

| Characteristic | Symbol | MC7805AB/MC7805AC/NCV7805AB | | | Unit |
|---|--------------|-----------------------------|--------------------------|-----------------------|----------------------------|
| | | Min | Typ | Max | |
| Output Voltage ($T_J = 25^\circ\text{C}$) | V_O | 4.9 | 5.0 | 5.1 | Vdc |
| Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$ $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$) | V_O | 4.8 | 5.0 | 5.2 | Vdc |
| Line Regulation (Note 4) $7.5\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$, $I_O = 1.0\text{ A}$ $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$ $7.3\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$ | Reg_{line} | - | 0.5 0.8 1.3 4.5 | 10 12 4.0 10 | mV |
| Load Regulation (Note 4) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$ | Reg_{load} | - | 1.3 0.8 0.53 | 25 25 15 | mV |
| Quiescent Current | I_B | - | 3.2 | 6.0 | mA |
| Quiescent Current Change $8.0\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ | ΔI_B | - | 0.3 - 0.08 | 0.8 0.8 0.5 | mA |
| Ripple Rejection $8.0\text{ Vdc} \leq V_{in} \leq 18\text{ Vdc}$, $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$ | RR | 68 | 83 | - | dB |
| Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$) | $V_I - V_O$ | - | 2.0 | - | Vdc |
| Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$ | V_n | - | 10 | - | $\mu\text{V}/V_O$ |
| Output Resistance ($f = 1.0\text{ kHz}$) | r_O | - | 0.9 | - | $\text{m}\Omega$ |
| Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$ | I_{SC} | - | 0.2 | - | A |
| Peak Output Current ($T_J = 25^\circ\text{C}$) | I_{max} | - | 2.2 | - | A |
| Average Temperature Coefficient of Output Voltage | TCV_O | - | -0.3 | - | $\text{mV}/^\circ\text{C}$ |

3. $T_{low} = 0^\circ\text{C}$ for MC78XXC, MC78XXAC,

= -40°C for NCV78XX, MC78XXB, MC78XXAB, and MC78XXAEB

4. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

MC7800, MC7800A, MC7800AE, NCV7800

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.

Quiescent 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.

ORDERING INFORMATION

| Device | Nominal Voltage | Operating Temperature Range | Package | Shipping [†] |
|----------------|-----------------|----------------------------------|------------------------------|-----------------------|
| MC7805ABD2T | 5.0 V | T _J = -40°C to +125°C | D ² PAK | 50 Units /Rail |
| MC7805ABD2TG | | | D ² PAK (Pb-free) | 50 Units /Rail |
| MC7805ABD2TR4 | | | D ² PAK | 800 / Tape & Reel |
| MC7805ABD2TR4G | | | D ² PAK (Pb-free) | 800 / Tape & Reel |
| MC7805ABT | | | TO-220 | 50 Units /Rail |
| MC7805ABTG | | | TO-220 (Pb-free) | 50 Units /Rail |
| MC7805ACD2T | | T _J = 0°C to +125°C | D ² PAK | 50 Units /Rail |
| MC7805ACD2TG | | | D ² PAK (Pb-free) | 50 Units /Rail |
| MC7805ACD2TR4 | | | D ² PAK | 800 / Tape & Reel |
| MC7805ACD2TR4G | | | D ² PAK (Pb-free) | 800 / Tape & Reel |
| MC7805ACT | | | TO-220 | 50 Units /Rail |
| MC7805ACTG | | | TO-220 (Pb-free) | 50 Units /Rail |
| MC7805BD2T | | T _J = -40°C to +125°C | D ² PAK | 50 Units /Rail |
| MC7805BD2TG | | | D ² PAK (Pb-free) | 50 Units /Rail |
| MC7805BD2TR4 | | | D ² PAK | 800 / Tape & Reel |
| MC7805BD2TR4G | | | D ² PAK (Pb-free) | 800 / Tape & Reel |
| MC7805BDT | | | DPAK | 75 Units / Rail |
| MC7805BDTG | | | DPAK (Pb-free) | 75 Units / Rail |
| MC7805BDTRK | | | DPAK | 2500 / Tape & Reel |
| MC7805BDTRKG | | | DPAK (Pb-free) | 2500 / Tape & Reel |

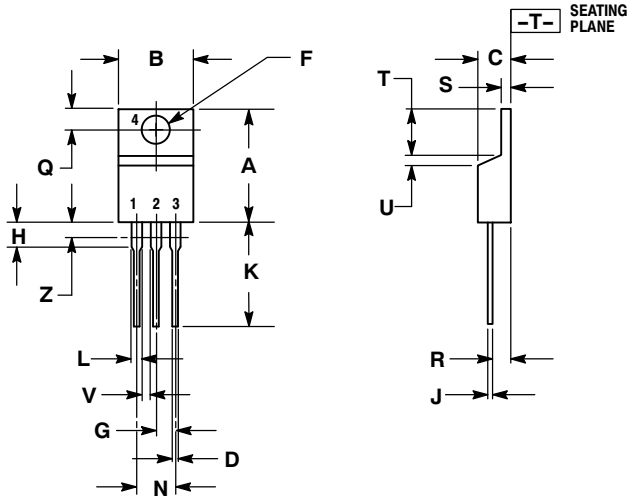
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = -40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

MC7800, MC7800A, MC7800AE, NCV7800

PACKAGE DIMENSIONS

TO-220, SINGLE GAUGE
T SUFFIX
CASE 221AB-01
ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.020 | 0.055 | 0.508 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | --- | 1.15 | --- |
| Z | --- | 0.080 | --- | 2.04 |