



# 78NXX

## LINEAR INTEGRATED CIRCUIT

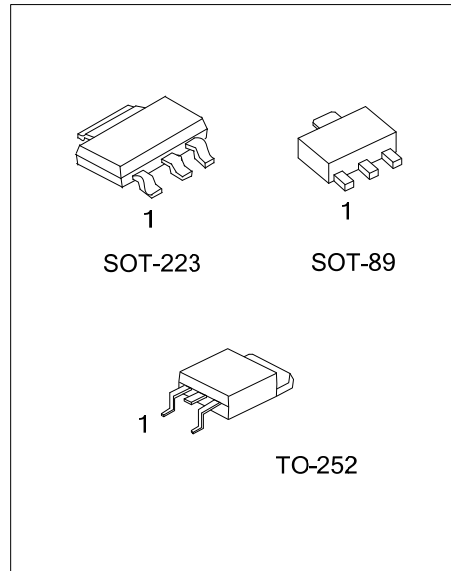
### 3-TERMINAL 300mA POSITIVE VOLTAGE REGULATOR

#### DESCRIPTION

The UTC 78NXX family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications requiring supply current up to 300mA.

#### FEATURES

- \* Output Current up to 300mA
- \* Fixed Output Voltage of 5V, 6V, 8V
- \* Thermal Overload Shutdown Protection
- \* Short Circuit Current Limiting



#### ORDERING INFORMATION

| Ordering Number |              | Package | Pin Assignment |   |   | Packing   |
|-----------------|--------------|---------|----------------|---|---|-----------|
| Lead Free       | Halogen Free |         | 1              | 2 | 3 |           |
| 78NXXL-AB3-R    | 78NXXG-AB3-R | SOT-89  | O              | G | I | Tape Reel |
| 78NXXL-AA3-R    | 78NXXG-AA3-R | SOT-223 | O              | G | I | Tape Reel |
| 78NXXL-TN3-R    | 78NXXG-TN3-R | TO-252  | I              | G | O | Tape Reel |
| 78NXXL-TN3-T    | 78NXXG-TN3-T | TO-252  | I              | G | O | Tube      |

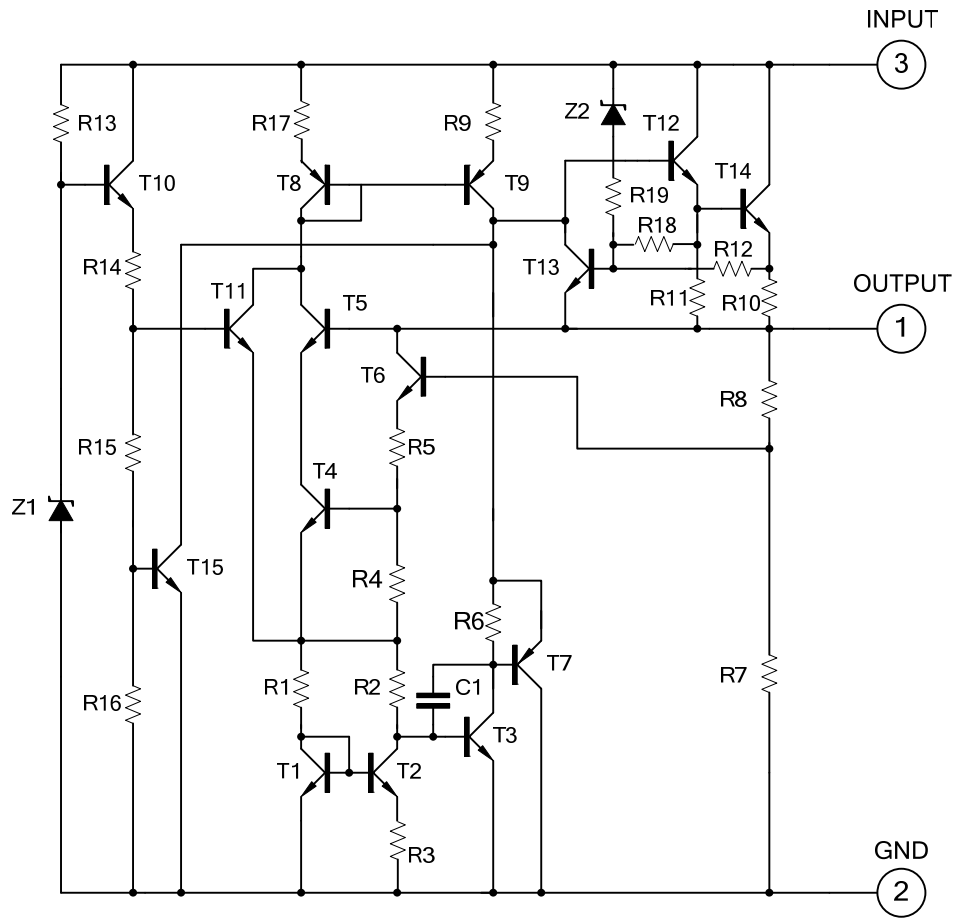
Note: XX: Output Voltage, refer to Marking Information

|                     |  |   |
|---------------------|--|---|
| <p>78NXXL-AB3-R</p> | <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Halogen Free</p> <p>(4) Output Voltage Code</p> | <p>(1) T: Tube, R: Tape Reel</p> <p>(2) AB3: SOT-89, AA3: SOT-223, TN3: TO-252</p> <p>(3) G: Halogen Free, L: Lead Free</p> <p>(4) xx: Refer to Marking Information</p> |
|---------------------|--|---|

### MARKING INFORMATION

| PACKAGE | VOLTAGE CODE                     | MARKING   |
|---------|----------------------------------|---|
| SOT-89  | 05: 5.0V<br>06: 6.0V<br>08: 8.0V | <p>Date Code ←<br/>Voltage Code ←</p> <p>78N□□□</p> <p>→ L: Lead Free<br/>→ G: Halogen Free</p> <p>1 2 3</p>                            |
| SOT-223 |                                  | <p>Voltage Code ←</p> <p>78NXX□</p> <p>→ L: Lead Free<br/>→ G: Halogen Free</p> <p>→ Date Code</p> <p>1 2 3</p>                         |
| TO-252  |                                  | <p>UTC</p> <p>Voltage Code ←</p> <p>78NXX□</p> <p>→ L: Lead Free<br/>→ G: Halogen Free</p> <p>← Lot Code ← → Date Code</p> <p>1 2 3</p> |

## ■ BLOCK CIRCUIT



■ **ABSOLUTE MAXIMUM RATING** (Operating temperature range applies, unless otherwise specified.)

| PARAMETER                      | SYMBOL    | RATINGS  | UNIT |
|--------------------------------|-----------|----------|------|
| Input Voltage                  | $V_{IN}$  | 30       | V    |
| Output Current                 | $I_{OUT}$ | 300      | mA   |
| Power Dissipation              | SOT-89    | 550      | mW   |
|                                | SOT-223   | 750      |      |
|                                | TO-252    | 1000     |      |
| Operating Temperature (Note 2) | $T_{OPR}$ | -40~+150 | °C   |
| Storage Temperature            | $T_{STG}$ | -55~+150 | °C   |

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

1. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. It is guarantee by design, not 100% be tested.

■ **ELECTRICAL CHARACTERISTICS**

(0°C <  $T_J$  < 125°C,  $C_1=0.33\mu\text{F}$ ,  $C_O=0.1\mu\text{F}$ , unless otherwise specified) (Note 1)

**For 78N05 ( $V_{IN}=10\text{V}$ ,  $I_{OUT}=40\text{mA}$ )**

| PARAMETER                            | SYMBOL                | TEST CONDITIONS   | MIN  | TYP   | MAX  | UNIT  |
|--------------------------------------|-----------------------|---|------|-------|------|-------|
| Output Voltage                       | $V_{OUT}$             | $T_J=25^\circ\text{C}$  | 4.80 | 5.0   | 5.20 | V     |
|                                      |                       | $7\text{V} \leq V_{IN} \leq V_{MAX}$<br>$I_{OUT}=1\text{mA} \sim 300\text{mA}$ (Note 2) | 4.75 |       | 5.25 | V     |
| Load Regulation                      | $\Delta V_{OUT}$      | $T_J=25^\circ\text{C}$ , $I_{OUT}=1\text{mA} \sim 300\text{mA}$                         |      | 11    | 60   | mV    |
|                                      |                       | $T_J=25^\circ\text{C}$ , $I_{OUT}=1\text{mA} \sim 40\text{mA}$                          |      | 5.0   | 30   | mV    |
| Line Regulation                      | $\Delta V_{OUT}$      | $7\text{V} \leq V_{IN} \leq 20\text{V}$ , $T_J=25^\circ\text{C}$                        |      | 8     | 150  | mV    |
|                                      |                       | $8\text{V} \leq V_{IN} \leq 20\text{V}$ , $T_J=25^\circ\text{C}$                        |      | 6     | 100  | mV    |
| Quiescent Current                    | $I_Q$                 |   |      | 2.0   | 5.5  | mA    |
| Quiescent Current Change             | $\Delta I_Q$          | $8\text{V} \leq V_{IN} \leq 20\text{V}$   |      |       | 1.5  | mA    |
|                                      |                       | $1\text{mA} \leq V_{IN} \leq 40\text{mA}$   |      |       | 0.1  | mA    |
| Output Noise Voltage                 | $e_N$                 | $10\text{Hz} \leq f \leq 100\text{kHz}$   |      | 40    |      | uV    |
| Temperature Coefficient of $V_{OUT}$ | $\Delta V_O/\Delta T$ | $I_{OUT}=5\text{mA}$  |      | -0.65 |      | mV/°C |
| Ripple Rejection                     | RR                    | $8\text{V} \leq V_{IN} \leq 20\text{V}$ , $f=120\text{Hz}$ , $T_J=25^\circ\text{C}$     | 41   | 80    |      | dB    |
| Dropout Voltage                      | $V_D$                 | $T_J=25^\circ\text{C}$  |      | 1.7   |      | V     |

**For 78N06 ( $V_{IN}=12\text{V}$ ,  $I_{OUT}=40\text{mA}$ )**

| PARAMETER                            | SYMBOL                | TEST CONDITIONS   | MIN  | TYP  | MAX  | UNIT  |
|--------------------------------------|-----------------------|---|------|------|------|-------|
| Output Voltage                       | $V_{OUT}$             | $T_J=25^\circ\text{C}$  | 5.76 | 6.0  | 6.24 | V     |
|                                      |                       | $8.5\text{V} \leq V_{IN} \leq V_{MAX}$ ,<br>$I_{OUT}=1\text{mA} \sim 300\text{mA}$ (Note 2) | 5.7  |      | 6.3  | V     |
| Load Regulation                      | $\Delta V_{OUT}$      | $T_J=25^\circ\text{C}$ , $I_{OUT}=1\text{mA} \sim 300\text{mA}$                             |      | 12.8 | 80   | mV    |
|                                      |                       | $T_J=25^\circ\text{C}$ , $I_{OUT}=1\text{mA} \sim 40\text{mA}$                              |      | 5.8  | 40   | mV    |
| Line Regulation                      | $\Delta V_{OUT}$      | $8.5\text{V} \leq V_{IN} \leq 20\text{V}$ , $T_J=25^\circ\text{C}$                          |      | 64   | 175  | mV    |
|                                      |                       | $9\text{V} \leq V_{IN} \leq 20\text{V}$ , $T_J=25^\circ\text{C}$                            |      | 54   | 125  | mV    |
| Quiescent Current                    | $I_Q$                 |   |      | 2.0  | 5.5  | mA    |
| Quiescent Current Change             | $\Delta I_Q$          | $9\text{V} \leq V_{IN} \leq 20\text{V}$   |      |      | 1.5  | mA    |
|                                      |                       | $1\text{mA} \leq V_{IN} \leq 40\text{mA}$   |      |      | 0.1  | mA    |
| Output Noise Voltage                 | $e_N$                 | $10\text{Hz} \leq f \leq 100\text{kHz}$   |      | 49   |      | uV    |
| Temperature Coefficient of $V_{OUT}$ | $\Delta V_O/\Delta T$ | $I_{OUT}=5\text{mA}$  |      | 0.75 |      | mV/°C |
| Ripple Rejection                     | RR                    | $10\text{V} \leq V_{IN} \leq 20\text{V}$ , $f=120\text{Hz}$ , $T_J=25^\circ\text{C}$        | 40   | 46   |      | dB    |
| Dropout Voltage                      | $V_D$                 | $T_J=25^\circ\text{C}$  |      | 1.7  |      | V     |

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

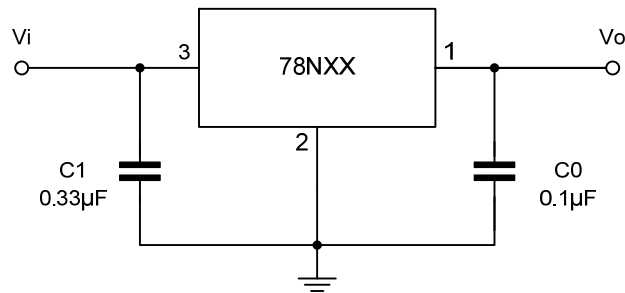
For 78N08 ( $V_{IN}=14V$ ,  $I_{OUT}=40mA$ )

| PARAMETER                            | SYMBOL                | TEST CONDITIONS   | MIN  | TYP  | MAX  | UNIT           |
|--------------------------------------|-----------------------|---|------|------|------|----------------|
| Output Voltage                       | $V_{OUT}$             | $T_J=25^{\circ}C$   | 7.68 | 8.0  | 8.32 | V              |
|                                      |                       | $10.5V \leq V_{IN} \leq V_{MAX}$ ,<br>$I_{OUT}=1mA \sim 300mA$ (Note 2) | 7.60 |      | 8.40 | V              |
| Load Regulation                      | $\Delta V_{OUT}$      | $T_J=25^{\circ}C, I_{OUT}=1mA \sim 300mA$                               |      | 15   | 80   | mV             |
|                                      |                       | $T_J=25^{\circ}C, I_{OUT}=1mA \sim 40mA$                                |      | 8.0  | 40   | mV             |
| Line Regulation                      | $\Delta V_{OUT}$      | $10.5V \leq V_{IN} \leq 23V, T_J=25^{\circ}C$                           |      | 10   | 175  | mV             |
|                                      |                       | $11V \leq V_{IN} \leq 23V, T_J=25^{\circ}C$                             |      | 8    | 125  | mV             |
| Quiescent Current                    | $I_Q$                 |   |      | 2.0  | 5.5  | mA             |
| Quiescent Current Change             | $\Delta I_Q$          | $11V \leq V_{IN} \leq 23V$  |      |      | 1.5  | mA             |
|                                      |                       | $1mA \leq V_{IN} \leq 40mA$   |      |      | 0.1  | mA             |
| Output Noise Voltage                 | $e_N$                 | $10Hz \leq f \leq 100kHz$   |      | 49   |      | $\mu V$        |
| Temperature Coefficient of $V_{OUT}$ | $\Delta V_O/\Delta T$ | $I_{OUT}=5mA$   |      | 0.75 |      | $mV/^{\circ}C$ |
| Ripple Rejection                     | RR                    | $11V \leq V_{IN} \leq 23V, f=120Hz, T_J=25^{\circ}C$                    | 39   | 70   |      | dB             |
| Dropout Voltage                      | $V_D$                 | $T_J=25^{\circ}C$   |      | 1.7  |      | V              |

Notes: 1. The Maximum steady state usable output current are dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data above represent pulse test conditions with junction temperatures specified at the initiation of test.

2. Power dissipation < 0.5W

### ■ TYPICAL APPLICATION CIRCUIT



Note 1. To specify an output voltage, substitute voltage value for "XX".

2. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

## TYPICAL CHARACTERISTICS

Fig.1 Ambient Temperature vs. Power Dissipation

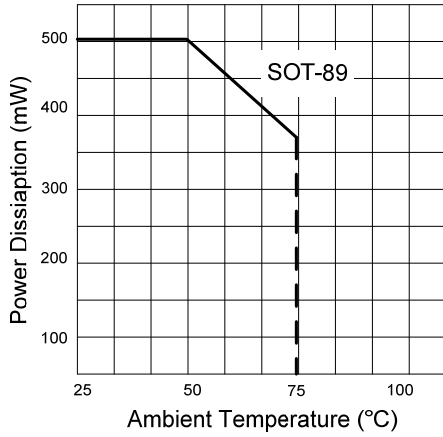


Fig.2 78N05 Output Voltage vs. Ambient Temperature

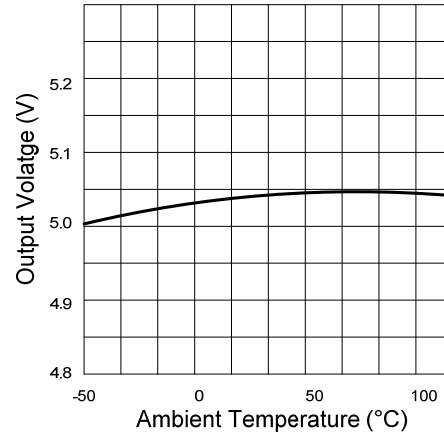


Fig.3 78N08 Output Voltage vs. Ambient Temperature

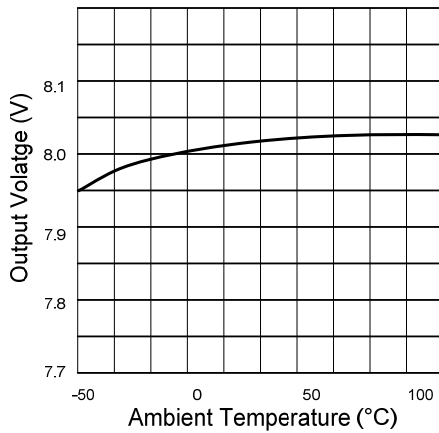


Fig.4 Output Characteristics (I<sub>OUT</sub>=0mA, T<sub>J</sub>=25°C)

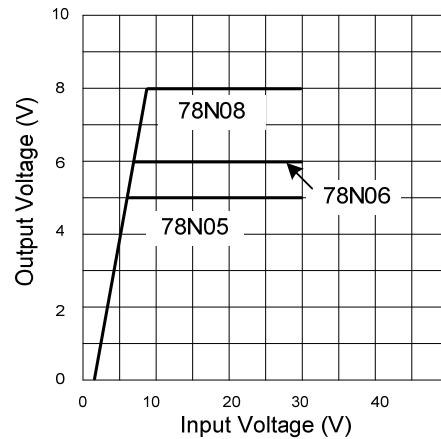


Fig.5 78N05 Dropout Characteristics (T<sub>J</sub>=25°C)

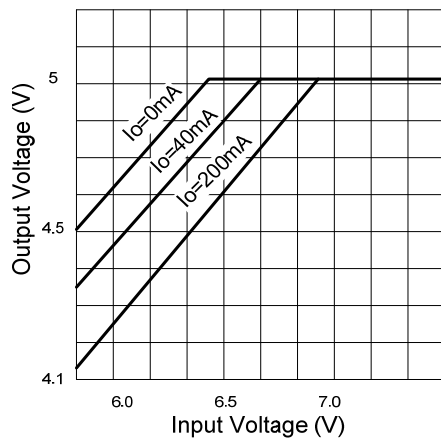
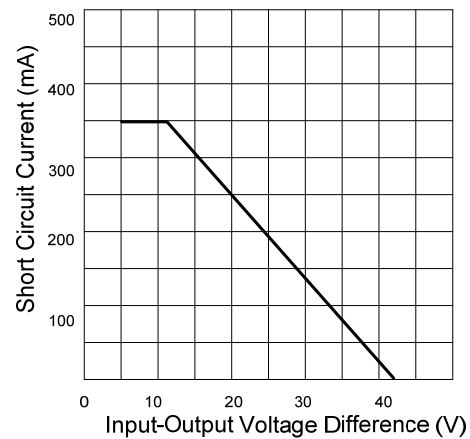


Fig.6 Short Circuit Output Current (T<sub>J</sub>=25°C)



## ■ TYPICAL CHARACTERISTICS(Cont.)

Fig.7 78N05 Quiescent Current vs. Input Voltage ( $I_{out}=0mA, T_J=25^{\circ}C$ )

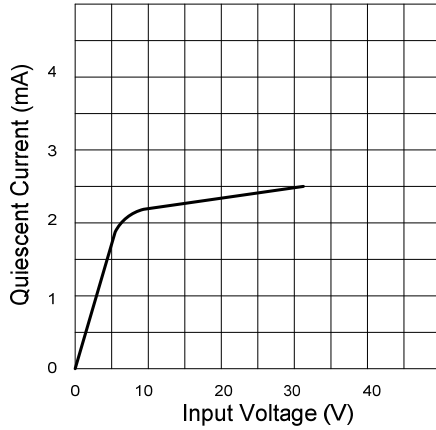
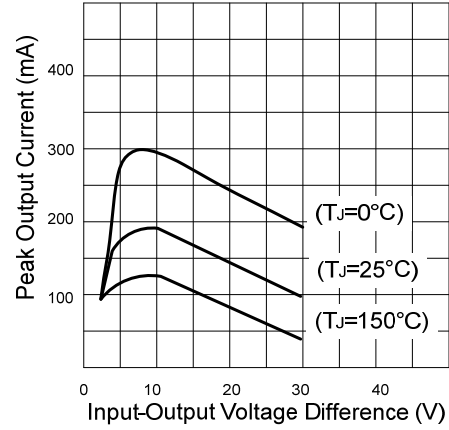


Fig.8 Peak Output Current vs Dropout Voltage Difference



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