

UTCLM78XX LINEAR INTEGRATED CIRCUIT

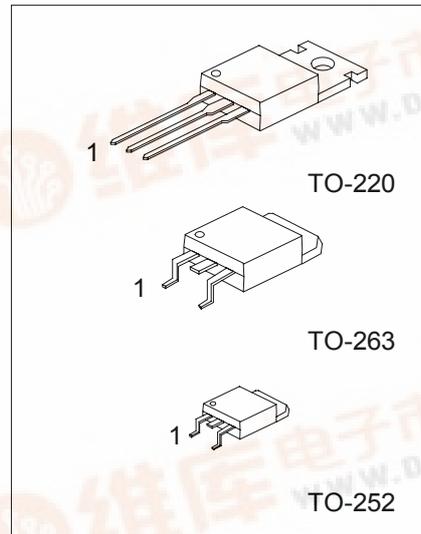
3-TERMINAL 1A POSITIVE VOLTAGE REGULATOR

DESCRIPTION

The UTC 78XX family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1 A.

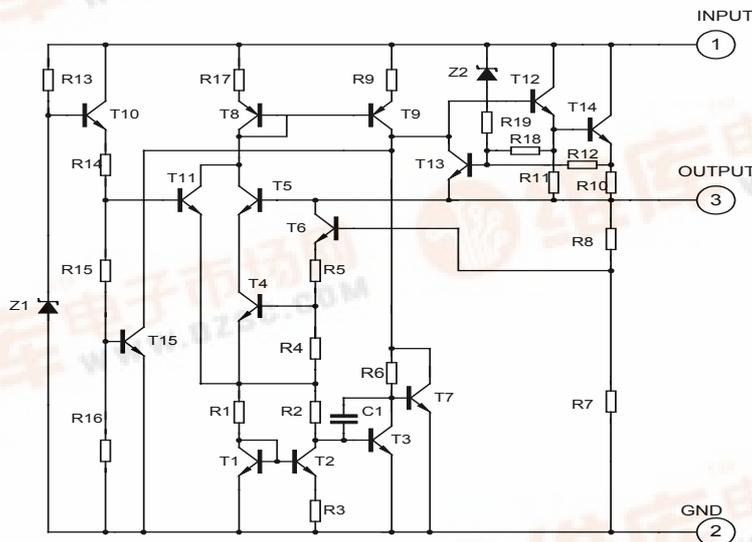
FEATURES

- *Output current up to 1.5 A
- *Fixed output voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V available
- *Thermal overload shutdown protection
- *Short circuit current limiting
- *Output transistor SOA protection



1: Input 2: GND 3: Output

TEST CIRCUIT



UTC LM78XX LINEAR INTEGRATED CIRCUIT

ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

| PARAMETER | SYMBOL | RATING | UNIT |
|---|--------|--------------------|------|
| Input voltage(for Vo=5~18V) (for Vo=24V) | Vi | 35 | V |
| | | 40 | V |
| Output Current | Io | 1 | A |
| Power Dissipation | PD | Internally Limited | W |
| Operating Junction Temperature Range | TOPR | -20 +150 | °C |
| Storage Temperature Range | TSTG | -55 +150 | °C |

UTC LM7805 ELECTRICAL CHARACTERISTICS

(Vi=10V, Io=0.5A, Tj= 0°C - 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------|---|------|------|------|-------|
| Output Voltage | Vo | Tj=25°C, Io=5mA - 1.0A | 4.80 | 5.0 | 5.20 | V |
| | | Vi =7.5V to 20V, Io=5mA - 1.0A, PD<15W | 4.75 | | 5.25 | V |
| Load Regulation | ΔVo | Tj=25°C, Io=5mA - 1.5A | | | 50 | mV |
| | | Tj=25°C, Io=0.25A - 0.75A | | | 25 | mV |
| Line regulation | ΔVo | Vi =7V to 25V, Tj=25°C | | | 50 | mV |
| | | Vi =7.5V to 20V, Tj=25°C, Io=1A | | | 50 | mV |
| Quiescent Current | Iq | Tj=25°C, Io=<1A | | | 8.0 | mA |
| Quiescent Current Change | ΔIq | Vi =7.5V to 20V | | | 1.0 | mA |
| | ΔIq | Io=5mA - 1.0A | | | 0.5 | mA |
| Output Noise Voltage | VN | 10Hz<=f<=100kHz | | 40 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | -0.6 | | mV/°C |
| Ripple Rejection | RR | Vi =8V - 18V, f=120Hz, Tj=25°C | 62 | 80 | | dB |
| Peak Output Current | IPK | Tj=25°C | | 1.8 | | A |
| Short-Circuit Current | Isc | Vi=35V, Tj=25°C | | 250 | | mA |
| Dropout Voltage | Vd | Tj=25°C | | 2.0 | | V |

UTC LM7806 ELECTRICAL CHARACTERISTICS

(Vi=11V, Io=0.5A, Tj= 0°C - 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------|---|------|------|------|-------|
| Output Voltage | Vo | Tj=25°C, Io=5mA - 1.0A | 5.76 | 6.0 | 6.24 | V |
| | | Vi =8.5V to 21V, Io=5mA - 1.0A, PD<15W | 5.70 | | 6.30 | V |
| Load Regulation | ΔVo | Tj=25°C, Io=5mA - 1.5A | | | 60 | mV |
| | | Tj=25°C, Io=0.25A - 0.75A | | | 30 | mV |
| Line regulation | ΔVo | Vi =8V to 25V, Tj=25°C | | | 60 | mV |
| | | Vi =8.5V to 21V, Tj=25°C, Io=1A | | | 60 | mV |
| Quiescent Current | Iq | Tj=25°C, Io=<1A | | | 8.0 | mA |
| Quiescent Current Change | ΔIq | Vi =8.5V to 21V | | | 1.0 | mA |
| | ΔIq | Io=5mA - 1.0A | | | 0.5 | mA |
| Output Noise Voltage | VN | 10Hz<=f<=100kHz | | 45 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | -0.7 | | mV/°C |
| Ripple Rejection | RR | Vi =9V - 19V, f=120Hz, Tj=25°C | 59 | 75 | | dB |

UTC LM78XX LINEAR INTEGRATED CIRCUIT

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------------------|----------|--|-----|-----|-----|------|
| Peak Output Current | I_{PK} | $T_j=25^\circ\text{C}$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35\text{V}, T_j=25^\circ\text{C}$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ\text{C}$ | | 2.0 | | V |

UTC LM7808 ELECTRICAL CHARACTERISTICS

($V_I=14\text{V}, I_o=0.5\text{A}, T_j=0^\circ\text{C} - 125^\circ\text{C}, C_1=0.33\mu\text{F}, C_o=0.1\mu\text{F}$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|--|------|------|------|----------------------------|
| Output Voltage | V_o | $T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.0\text{A}$ | 7.68 | 8.0 | 8.32 | V |
| | | $V_I=10.5\text{V to } 23\text{V},$ $I_o=5\text{mA} - 1.0\text{A}, \text{PD}<15\text{W}$ | 7.60 | | 8.40 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.5\text{A}$ | | | 80 | mV |
| | | $T_j=25^\circ\text{C}, I_o=0.25\text{A} - 0.75\text{A}$ | | | 40 | mV |
| Line regulation | ΔV_o | $V_I=10.5\text{V to } 25\text{V}, T_j=25^\circ\text{C}$ | | | 80 | mV |
| | | $V_I=10.5\text{V to } 23\text{V}, T_j=25^\circ\text{C}, I_o=1\text{A}$ | | | 80 | mV |
| Quiescent Current | I_q | $T_j=25^\circ\text{C}, I_o<1\text{A}$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_I=10.5\text{V to } 23\text{V}$ | | | 1.0 | mA |
| | ΔI_q | $I_o=5\text{mA} - 1.0\text{A}$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10\text{Hz}<f<=100\text{kHz}$ | | 58 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5\text{mA}$ | | -0.9 | | $\text{mV}/^\circ\text{C}$ |
| Ripple Rejection | RR | $V_I=11.5\text{V to } 21.5\text{V},$ $f=120\text{Hz}, T_j=25^\circ\text{C}$ | 56 | 72 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ\text{C}$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35\text{V}, T_j=25^\circ\text{C}$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ\text{C}$ | | 2.0 | | V |

UTC LM7809 ELECTRICAL CHARACTERISTICS

($V_I=15\text{V}, I_o=0.5\text{A}, T_j=0^\circ\text{C} - 125^\circ\text{C}, C_1=0.33\mu\text{F}, C_o=0.1\mu\text{F}$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|--|------|------|------|----------------------------|
| Output Voltage | V_o | $T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.0\text{A}$ | 8.64 | 9.0 | 9.36 | V |
| | | $V_I=11.5\text{V to } 24\text{V},$ $I_o=5\text{mA} - 1.0\text{A}, \text{PD}<15\text{W}$ | 8.55 | | 9.45 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.5\text{A}$ | | | 90 | mV |
| | | $T_j=25^\circ\text{C}, I_o=0.25\text{A} - 0.75\text{A}$ | | | 45 | mV |
| Line regulation | ΔV_o | $V_I=11.5\text{V to } 25\text{V},$ $T_j=25^\circ\text{C}, \text{PD}<15\text{W}$ | | | 90 | mV |
| | | $V_I=11.5\text{V to } 24\text{V}, T_j=25^\circ\text{C},$ $I_o<=1\text{A}$ | | | 90 | mV |
| Quiescent Current | I_q | $T_j=25^\circ\text{C}, I_o<1\text{A}$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_I=11.5\text{V to } 24\text{V}$ | | | 1.0 | mA |
| | ΔI_q | $I_o=5\text{mA} - 1.0\text{A}$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10\text{Hz}<f<=100\text{kHz}$ | | 58 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5\text{mA}$ | | -1.1 | | $\text{mV}/^\circ\text{C}$ |
| Ripple Rejection | RR | $V_I=12.5\text{V to } 22.5\text{V},$ $f=120\text{Hz}, T_j=25^\circ\text{C}$ | 56 | 72 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ\text{C}$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35\text{V}, T_j=25^\circ\text{C}$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ\text{C}$ | | 2.0 | | V |

UTC LM78XX LINEAR INTEGRATED CIRCUIT

UTC LM7810 ELECTRICAL CHARACTERISTICS

($V_I=16V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|--|------|------|-------|---------------|
| Output Voltage | V_o | $T_j=25^\circ C$, $I_o=5mA - 1.0A$ | 9.60 | 10.0 | 10.40 | V |
| | | $V_I=12.5V$ to $25V$, $I_o=5mA - 1.0A$, $PD \leq 15W$ | 9.50 | | 10.50 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ C$, $I_o=5mA - 1.5A$ | | | 100 | mV |
| | | $T_j=25^\circ C$, $I_o=0.25A - 0.75A$ | | | 50 | mV |
| Line regulation | ΔV_o | $V_I=13V$ to $25V$, $T_j=25^\circ C$ | | | 100 | mV |
| | | $V_I=13V$ to $25V$, $T_j=25^\circ C$, $I_o \leq 1A$ | | | 100 | mV |
| Quiescent Current | I_q | $T_j=25^\circ C$, $I_o < 1A$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_I=12.6V$ to $25V$ | | | 1.0 | mA |
| | ΔI_q | $I_o=5mA - 1.0A$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10Hz \leq f \leq 100kHz$ | | 58 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5mA$ | | -1.1 | | $mV/^\circ C$ |
| Ripple Rejection | RR | $V_I=13V - 23V$, $f=120Hz$, $T_j=25^\circ C$ | 56 | 72 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ C$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35V$, $T_j=25^\circ C$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ C$ | | 2.0 | | V |

UTC LM7812 ELECTRICAL CHARACTERISTICS

($V_I=19V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|---|-------|------|-------|---------------|
| Output Voltage | V_o | $T_j=25^\circ C$, $I_o=5mA - 1.0A$ | 11.52 | 12.0 | 12.48 | V |
| | | $V_I=14.5V$ to $27V$, $I_o=5mA - 1.0A$, $PD < 15W$ | 11.40 | | 12.60 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ C$, $I_o=5mA - 1.5A$ | | | 120 | mV |
| | | $T_j=25^\circ C$, $I_o=0.25A - 0.75A$ | | | 60 | mV |
| Line regulation | ΔV_o | $V_I=14.5V$ to $30V$, $T_j=25^\circ C$ | | | 120 | mV |
| | | $V_I=14.6V$ to $27V$, $T_j=25^\circ C$, $I_o=1A$ | | | 120 | mV |
| Quiescent Current | I_q | $T_j=25^\circ C$, $I_o < 1A$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_I=14.5V$ to $30V$ | | | 1.0 | mA |
| | ΔI_q | $I_o=5mA - 1.0A$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10Hz \leq f \leq 100kHz$ | | 75 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5mA$ | | -1.5 | | $mV/^\circ C$ |
| Ripple Rejection | RR | $V_I=15V - 25V$, $f=120Hz$, $T_j=25^\circ C$ | 55 | 72 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ C$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35V$, $T_j=25^\circ C$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ C$ | | 2.0 | | V |

UTCLM78XX LINEAR INTEGRATED CIRCUIT

UTC LM7815 ELECTRICAL CHARACTERISTICS

($V_I=23V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|--|-------|------|-------|---------------|
| Output Voltage | V_o | $T_j=25^\circ C$, $I_o=5mA - 1.0A$ | 14.40 | 15.0 | 15.60 | V |
| | | $V_I=17.5V$ to $30V$, $I_o=5mA - 1.0A$, $PD<15W$ | 14.25 | | 15.75 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ C$, $I_o=5mA - 1.5A$ | | | 150 | mV |
| | | $T_j=25^\circ C$, $I_o=0.25A - 0.75A$ | | | 75 | mV |
| Line regulation | ΔV_o | $V_I=18.5V$ to $30V$, $T_j=25^\circ C$ | | | 150 | mV |
| | | $V_I=17.7V$ to $30V$, $T_j=25^\circ C$, $I_o=1A$ | | | 150 | mV |
| Quiescent Current | I_q | $T_j=25^\circ C$, $I_o<1A$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_I=17.5V$ to $30V$ | | | 1.0 | mA |
| | ΔI_q | $I_o=5mA - 1.0A$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10Hz \leq f \leq 100kHz$ | | 90 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5mA$ | | -1.8 | | $mV/^\circ C$ |
| Ripple Rejection | RR | $V_I=18.5V$ to $28.5V$ $f=120Hz$, $T_j=25^\circ C$ | 54 | 70 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ C$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35V$, $T_j=25^\circ C$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ C$ | | 2.0 | | V |

UTC LM7818 ELECTRICAL CHARACTERISTICS

($V_I=27V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|---|-------|------|-------|---------------|
| Output Voltage | V_o | $T_j=25^\circ C$, $I_o=5mA - 1.0A$ | 17.28 | 18.0 | 18.72 | V |
| | | $V_I=21V$ to $33V$, $I_o=5mA - 1.0A$ | 17.10 | | 18.90 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ C$, $I_o=5mA - 1.5A$ | | | 180 | mV |
| | | $T_j=25^\circ C$, $I_o=0.25A - 0.75A$ | | | 90 | mV |
| Line regulation | ΔV_o | $V_I=21V$ to $33V$, $T_j=25^\circ C$ | | | 180 | mV |
| | | $V_I=21V$ to $33V$, $T_j=25^\circ C$, $I_o \leq 1A$, $PD<15W$ | | | 180 | mV |
| Quiescent Current | I_q | $T_j=25^\circ C$, $I_o \leq 1A$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_I=21.5V$ to $33V$ | | | 1.0 | mA |
| | ΔI_q | $I_o=5mA - 1.0A$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10Hz \leq f \leq 100kHz$ | | 110 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5mA$ | | -2.2 | | $mV/^\circ C$ |
| Ripple Rejection | RR | $V_I=22V - 32V$, $f=120Hz$, $T_j=25^\circ C$ | 53 | 69 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ C$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_I=35V$, $T_j=25^\circ C$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ C$ | | 2.0 | | V |

UTCLM78XX LINEAR INTEGRATED CIRCUIT

UTC LM7824 ELECTRICAL CHARACTERISTICS

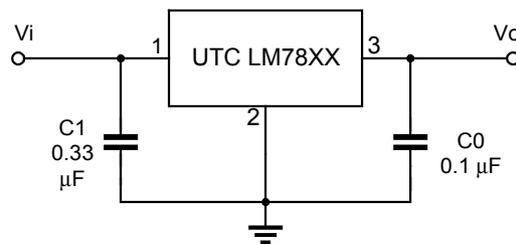
($V_i=33V$, $I_o=0.5A$, $T_j=0^\circ C - 12^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------------------|--|-------|------|-------|---------------|
| Output Voltage | V_o | $T_j=25^\circ C$, $I_o=5mA - 1.0A$ | 23.04 | 24.0 | 24.96 | V |
| | | $V_i=27V$ to $38V$, $I_o=5mA - 1.0A$ | 22.80 | | 25.20 | V |
| Load Regulation | ΔV_o | $T_j=25^\circ C$, $I_o=5mA - 1.5A$ | | | 240 | mV |
| | | $T_j=25^\circ C$, $I_o=0.25A - 0.75A$ | | | 120 | mV |
| Line regulation | ΔV_o | $V_i=27V$ to $38V$, $T_j=25^\circ C$ | | | 240 | mV |
| | | $V_i=27V$ to $38V$, $T_j=25^\circ C$, $I_o=1A$ | | | 240 | mV |
| Quiescent Current | I_q | $T_j=25^\circ C$, $I_o<1A$ | | | 8.0 | mA |
| Quiescent Current Change | ΔI_q | $V_i=28V$ to $38V$ | | | 1.0 | mA |
| | | $I_o=5mA - 1.0A$ | | | 0.5 | mA |
| Output Noise Voltage | V_N | $10Hz \leq f \leq 100kHz$ | | 170 | | μV |
| Temperature coefficient of V_o | $\Delta V_o/\Delta T$ | $I_o=5mA$ | | -2.8 | | $mV/^\circ C$ |
| Ripple Rejection | RR | $V_i=28V - 38V$, $f=120Hz$, $T_j=25^\circ C$ | 50 | 66 | | dB |
| Peak Output Current | I_{PK} | $T_j=25^\circ C$ | | 1.8 | | A |
| Short-Circuit Current | I_{SC} | $V_i=35V$, $T_j=25^\circ C$ | | 250 | | mA |
| Dropout Voltage | V_d | $T_j=25^\circ C$ | | 2.0 | | V |

Note 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 represents pulse test conditions with junction temperatures specified at the initiation of test.

Note 2: Power dissipation<0.5W

APPLICATION CIRCUIT



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

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