



## LD1117/A

### LINEAR INTEGRATED CIRCUIT

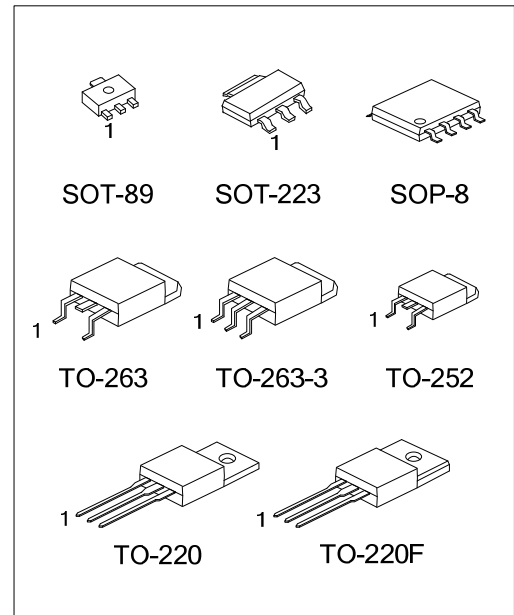
## LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS

### DESCRIPTION

The UTC **LD1117/A** is a low dropout, 3-terminal positive voltage regulator designed to provide output current up to 800mA/1A. There are adjustable version ( $V_{REF}=1.25V$ ) and various fixed versions.

### FEATURES

- \* Low dropout voltage
- \* Suitable for SCSI-2 active termination if  $V_{OUT}$  set to 2.85V
- \* Output current up to 0.8A for 1117 and 1.0A for 1117A
- \* Built-in current limit and over temperature protection
- \* Available in  $\pm 1\%$  (at 25°C) and 2% in all temperature range
- \* Low current consumption
- \* Support MLCC



### ORDERING INFORMATION

| Ordering Number     |                     | Package  | ②<br>Pin Assignment                                                                                                                                                                                                                                                         |  |  |  | ③<br>Packing |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
|---------------------|---------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------------------|
| Lead Free           | Halogen Free        |          |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-AA3-②-③ | LD1117①G-xx-AA3-②-③ | SOT-223  | <table><tr><td>Pin Code</td><td>1</td><td>2</td><td>3</td></tr><tr><td>A</td><td>G</td><td>O</td><td>I</td></tr><tr><td>B</td><td>O</td><td>G</td><td>I</td></tr><tr><td>C</td><td>G</td><td>I</td><td>O</td></tr><tr><td>D</td><td>I</td><td>G</td><td>O</td></tr></table> |  |  |  | Pin Code     | 1 | 2 | 3 | A | G | O | I | B | O | G | I | C | G | I | O | D | I | G | O | R: Tape Reel<br>T: Tube |
| Pin Code            | 1                   | 2        |                                                                                                                                                                                                                                                                             |  |  |  | 3            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| A                   | G                   | O        |                                                                                                                                                                                                                                                                             |  |  |  | I            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| B                   | O                   | G        |                                                                                                                                                                                                                                                                             |  |  |  | I            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| C                   | G                   | I        |                                                                                                                                                                                                                                                                             |  |  |  | O            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| D                   | I                   | G        |                                                                                                                                                                                                                                                                             |  |  |  | O            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-AB3-②-③ | LD1117①G-xx-AB3-②-③ | SOT-89   |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-TA3-②-③ | LD1117①G-xx-TA3-②-③ | TO-220   |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-TF3-②-③ | LD1117①G-xx-TF3-②-③ | TO-220F  |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-TN3-②-③ | LD1117①G-xx-TN3-②-③ | TO-252   |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-TQ2-②-③ | LD1117①G-xx-TQ2-②-③ | TO-263   |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-TQ3-②-③ | LD1117①G-xx-TQ3-②-③ | TO-263-3 |                                                                                                                                                                                                                                                                             |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |
| LD1117①L-xx-S08-②-③ | LD1117①G-xx-S08-②-③ | SOP-8    | GOOIxOOx                                                                                                                                                                                                                                                                    |  |  |  |              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                         |

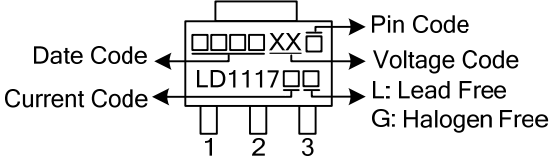
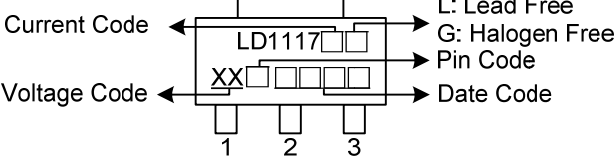
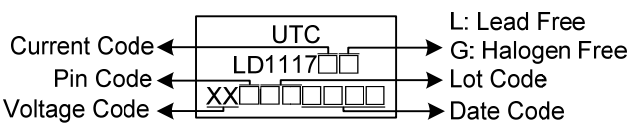
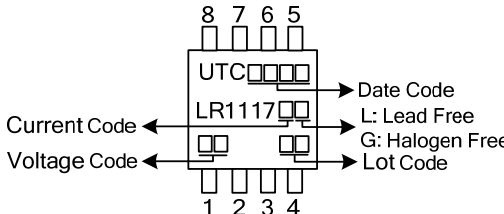
Notes: 1. ① : Current code: Blank: 800mA A: 1A

2. Pin Assignment: I:  $V_{IN}$  O:  $V_{OUT}$  G: GND/ADJ

3. xx: Output Voltage, Refer to Marking Information.

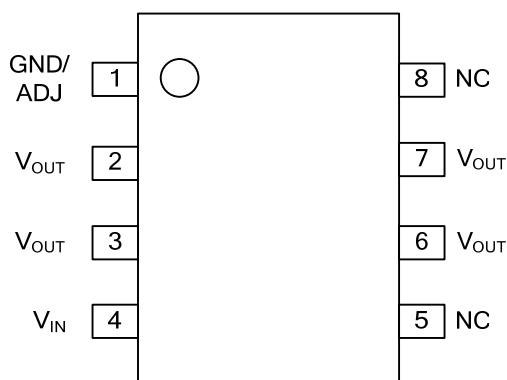
|                                                                                                                                                                      |                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>LD1117①L-xx-AA3-②-③</p> <p>(1) Packing Type<br/>(2) Pin Assignment<br/>(3) Package Type<br/>(4) Output Voltage Code<br/>(5) Lead Plating<br/>(6) Current Code</p> | <p>(1) R: Tape Reel, T: Tube<br/>(2) refer to Pin Assignment<br/>(3) AA3: SOT-223, AB3: SOT-89, TA3: TO-220, TF3: TO-220F, TN3: TO-252, TQ2: TO-263, TQ3: TO-263-3, S08: SOP-8<br/>(4) xx: refer to Marking Information<br/>(5) L: Lead Free, G: Halogen Free<br/>(6) Blank: 800mA, A: 1A</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### MARKING INFORMATION

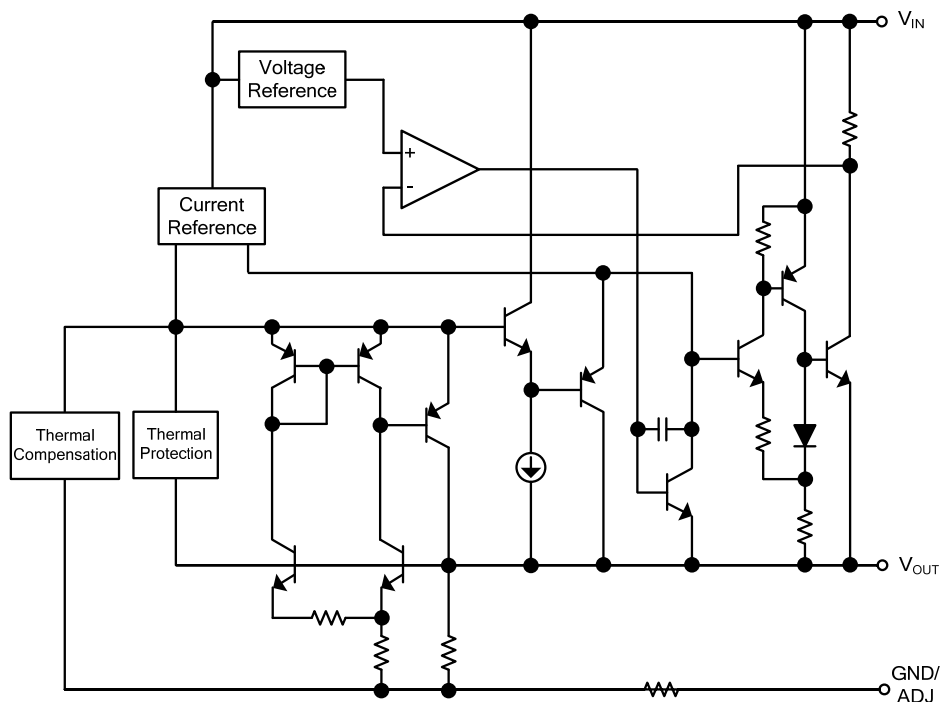
| PACKAGE                                           | VOLTAGE CODE                                                                                                         | MARKING                                                                             |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| SOT-89                                            | 12 :1.2V<br>15 :1.5V<br>18 :1.8V<br>25 :2.5V<br>2J :2.85V<br>30 :3.0V<br>33 :3.3V<br>36 :3.6V<br>50 :5.0V<br>AD :ADJ |   |
| SOT-223                                           |                                                                                                                      |   |
| TO-220<br>TO-220F<br>TO-252<br>TO-263<br>TO-263-3 |                                                                                                                      |   |
| SOP-8                                             |                                                                                                                      |  |

Note: Current code: Blank: 0.8A A: 1A

### PIN CONFIGURATION of SOP-8



## ■ BLOCK DIAGRAM



# ■ ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

| PARAMETER                      | SYMBOL           | RATINGS            | UNIT |
|--------------------------------|------------------|--------------------|------|
| DC Input Voltage               | V <sub>IN</sub>  | 18                 | V    |
| Power Dissipation              | P <sub>D</sub>   | Internally limited |      |
| Junction Temperature           | T <sub>J</sub>   | +150               | °C   |
| Operating Temperature (Note 2) | T <sub>OPR</sub> | -20 ~ +125         | °C   |
| Storage temperature            | T <sub>STG</sub> | -65 ~ +150         | °C   |

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

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

2. This condition is only determined from design. It can't be 100% tested in mass production.

# ■ RECOMMENDED OPERATING RATINGS

| PARAMETER                      | SYMBOL          | RATINGS  | UNIT |
|--------------------------------|-----------------|----------|------|
| Input Voltage                  | V <sub>IN</sub> | 15       | V    |
| Operating Junction Temperature | T <sub>J</sub>  | 0 ~ +125 | °C   |

# ■ THERMAL DATA

| PARAMETER           |         | SYMBOL        | RATINGS | UNIT |
|---------------------|---------|---------------|---------|------|
| Junction to Ambient | SOT-223 | $\theta_{JA}$ | 165     | °C/W |
|                     | SOT-89  |               | 180     | °C/W |
|                     | SOP-8   |               | 150     | °C/W |
|                     | TO-252  |               | 112     | °C/W |
|                     | TO-220  |               | 54      | °C/W |
|                     | TO-263  |               | 64      | °C/W |
| Junction to Case    | SOT-223 | $\theta_{JC}$ | 15      | °C/W |
|                     | SOT-89  |               | 50      | °C/W |
|                     | SOP-8   |               | 20      | °C/W |
|                     | TO-252  |               | 12      | °C/W |
|                     | TO-220  |               | 4       | °C/W |
|                     | TO-263  |               | 4       | °C/W |

## ■ ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}\text{C}$ , refer to the test circuits,  $T_J=0 \sim 125^{\circ}\text{C}$ ,  $C_O=10\mu\text{F}$  unless otherwise specified)

### For LD1117/A-1.2

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                                                             | MIN.              | TYP.        | MAX.  | UNIT          |
|--------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|-------|---------------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=3.2\text{V}$ , $I_{OUT}=10\text{mA}$ , $T_J=25^{\circ}\text{C}$                                                     | 1.176             | 1.200       | 1.224 | V             |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=2.7$ to $8\text{V}$<br>LD1117 : $I_{OUT}=10\sim 800\text{mA}$<br>LD1117A : $I_{OUT}=10\sim 1000\text{mA}$           | 1.176             | 1.200       | 1.224 | V             |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=2.7$ to $8\text{V}$ , $I_{OUT}=10\text{mA}$                                                                         |                   | 1           | 6     | mV            |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=2.7\text{V}$<br>LD1117 : $I_{OUT}=10\sim 800\text{mA}$<br>LD1117A : $I_{OUT}=10\sim 1000\text{mA}$                  |                   | 1           | 10    | mV            |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                                                             |                   | 0.5         |       | %             |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}\text{C}$                                                                                         |                   | 0.3         |       | %             |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100\text{mA}$                                                                                                      |                   |             | 15    | V             |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 10\text{V}$                                                                                                     |                   | 5           | 10    | mA            |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=6.2\text{V}$ , $T_J=25^{\circ}\text{C}$                                                                             | LD1117<br>LD1117A | 800<br>1000 |       | mA            |
| Minimum Load Current     | $I_{O(MIN)}$     | $V_{IN}=15\text{V}$                                                                                                         |                   | 2           | 5     | mA            |
| Output Noise Voltage     | $e_N$            | $B=10\text{Hz}$ to $10\text{KHz}$ , $T_J=25^{\circ}\text{C}$                                                                |                   | 100         |       | $\mu\text{V}$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40\text{mA}$ , $f=120\text{Hz}$ , $T_J=25^{\circ}\text{C}$ ,<br>$V_{IN}=4.2\text{V}$ , $V_{RIPPLE}=1\text{V}_{PP}$ | 60                | 75          |       | dB            |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100\text{mA}$                                                                                                      |                   | 1.00        | 1.10  | V             |
|                          |                  | $I_{OUT}=500\text{mA}$                                                                                                      |                   | 1.15        | 1.25  |               |
|                          |                  | $I_{OUT}=800\text{mA}$                                                                                                      |                   | 1.20        | 1.30  |               |
|                          |                  | $I_{OUT}=1\text{A}$                                                                                                         |                   | 1.20        | 1.30  |               |
| Thermal Regulation       |                  | $T_A=25^{\circ}\text{C}$ , 30ms Pulse                                                                                       |                   | 0.01        | 0.10  | %/W           |

### For LD1117/A-1.5

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                                                             | MIN               | TYP         | MAX   | UNIT          |
|--------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|-------|---------------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=3.5\text{V}$ , $I_{OUT}=10\text{mA}$ , $T_J=25^{\circ}\text{C}$                                                     | 1.470             | 1.500       | 1.530 | V             |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=3$ to $8\text{V}$<br>LD1117 : $I_{OUT}=0\sim 800\text{mA}$<br>LD1117A : $I_{OUT}=0\sim 1000\text{mA}$               | 1.470             | 1.500       | 1.530 | V             |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=3$ to $8\text{V}$ , $I_{OUT}=0\text{mA}$                                                                            |                   | 1           | 6     | mV            |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=3\text{V}$<br>LD1117 : $I_{OUT}=0\sim 800\text{mA}$<br>LD1117A : $I_{OUT}=0\sim 1000\text{mA}$                      |                   | 1           | 10    | mV            |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                                                             |                   | 0.5         |       | %             |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}\text{C}$                                                                                         |                   | 0.3         |       | %             |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100\text{mA}$                                                                                                      |                   |             | 15    | V             |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 10\text{V}$                                                                                                     |                   | 5           | 10    | mA            |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=6.5\text{V}$ , $T_J=25^{\circ}\text{C}$                                                                             | LD1117<br>LD1117A | 800<br>1000 |       | mA            |
| Output Noise Voltage     | $e_N$            | $B=10\text{Hz}$ to $10\text{KHz}$ , $T_J=25^{\circ}\text{C}$                                                                |                   | 100         |       | $\mu\text{V}$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40\text{mA}$ , $f=120\text{Hz}$ , $T_J=25^{\circ}\text{C}$ ,<br>$V_{IN}=4.5\text{V}$ , $V_{RIPPLE}=1\text{V}_{PP}$ | 60                | 75          |       | dB            |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100\text{mA}$                                                                                                      |                   | 1.00        | 1.10  | V             |
|                          |                  | $I_{OUT}=500\text{mA}$                                                                                                      |                   | 1.15        | 1.25  |               |
|                          |                  | $I_{OUT}=800\text{mA}$                                                                                                      |                   | 1.20        | 1.30  |               |
|                          |                  | $I_{OUT}=1\text{A}$                                                                                                         |                   | 1.20        | 1.30  |               |
| Thermal Regulation       |                  | $T_A=25^{\circ}\text{C}$ , 30ms Pulse                                                                                       |                   | 0.01        | 0.10  | %/W           |

## ■ ELECTRICAL CHARACTERISTICS(Cont.)

## For LD1117/A-1.8

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                            | MIN.                             | TYP.  | MAX.  | UNIT    |
|--------------------------|------------------|--------------------------------------------------------------------------------------------|----------------------------------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=3.8V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                         | 1.764                            | 1.800 | 1.836 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=3.3$ to $8V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$ | 1.764                            | 1.800 | 1.836 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=3.3$ to $8V$ , $I_{OUT}=0mA$                                                       |                                  | 1     | 6     | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=3.3V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$        |                                  | 1     | 10    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                            |                                  | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                               |                                  | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                            |                                  |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 10V$                                                                           |                                  | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=6.8V$ , $T_J=25^{\circ}C$                                                          | LD1117<br>800<br>LD1117A<br>1000 |       |       | mA      |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                    |                                  | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=5.5V$ , $V_{RIPPLE}=1V_{PP}$   | 60                               | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                            |                                  | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                            |                                  | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                            |                                  | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                               |                                  | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                             |                                  | 0.01  | 0.10  | %/W     |

## For LD1117/A-2.5

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                             | MIN.                             | TYP.  | MAX.  | UNIT    |
|--------------------------|------------------|---------------------------------------------------------------------------------------------|----------------------------------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=4.5V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                          | 2.450                            | 2.500 | 2.550 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=3.9$ to $10V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$ | 2.450                            | 2.500 | 2.550 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=3.9$ to $10V$ , $I_{OUT}=0mA$                                                       |                                  | 1     | 6     | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=3.9V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$         |                                  | 1     | 10    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                             |                                  | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                                |                                  | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                             |                                  |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 10V$                                                                            |                                  | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=7.5V$ , $T_J=25^{\circ}C$                                                           | LD1117<br>800<br>LD1117A<br>1000 |       |       | mA      |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                     |                                  | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=5.5V$ , $V_{RIPPLE}=1V_{PP}$    | 60                               | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                             |                                  | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                             |                                  | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                             |                                  | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                                |                                  | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                              |                                  | 0.01  | 0.10  | %/W     |

## ■ ELECTRICAL CHARACTERISTICS(Cont.)

## For LD1117/A-2.85

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                              | MIN                              | TYP   | MAX   | UNIT    |
|--------------------------|------------------|----------------------------------------------------------------------------------------------|----------------------------------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=4.85V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                          | 2.793                            | 2.850 | 2.907 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=4.25$ to $10V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$ | 2.793                            | 2.850 | 2.907 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=4.25$ to $10V$ , $I_{OUT}=0mA$                                                       |                                  | 1     | 6     | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=4.25V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$         |                                  | 1     | 10    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                              |                                  | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                                 |                                  | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                              |                                  |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 10V$                                                                             |                                  | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=7.85V$ , $T_J=25^{\circ}C$                                                           | LD1117<br>800<br>LD1117A<br>1000 |       |       | mA      |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                      |                                  | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=5.85V$ , $V_{RIPPLE}=1V_{PP}$    | 60                               | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                              |                                  | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                              |                                  | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                              |                                  | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                                 |                                  | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                               |                                  | 0.01  | 0.10  | %/W     |

## For LD1117/A-3.0

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                             | MIN.                             | TYP.  | MAX.  | UNIT    |
|--------------------------|------------------|---------------------------------------------------------------------------------------------|----------------------------------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=5V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                            | 2.940                            | 3.000 | 3.060 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=4.5$ to $10V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$ | 2.940                            | 3.000 | 3.060 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=4.5$ to $12V$ , $I_{OUT}=0mA$                                                       |                                  | 1     | 6     | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=4.5V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$         |                                  | 1     | 10    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                             |                                  | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                                |                                  | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                             |                                  |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 15V$                                                                            |                                  | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=8V$ , $T_J=25^{\circ}C$                                                             | LD1117<br>800<br>LD1117A<br>1000 |       |       | mA      |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                     |                                  | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=6V$ , $V_{RIPPLE}=1V_{PP}$      | 60                               | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                             |                                  | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                             |                                  | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                             |                                  | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                                |                                  | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                              |                                  | 0.01  | 0.10  | %/W     |

## ■ ELECTRICAL CHARACTERISTICS(Cont.)

## For LD1117/A-3.3

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                              | MIN.  | TYP.  | MAX.  | UNIT    |
|--------------------------|------------------|----------------------------------------------------------------------------------------------|-------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=5.3V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                           | 3.234 | 3.300 | 3.366 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=4.75$ to $10V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$ | 3.234 | 3.300 | 3.366 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=4.75$ to $15V$ , $I_{OUT}=0mA$                                                       |       | 1     | 6     | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=4.75V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$         |       | 1     | 10    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                              |       | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                                 |       | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                              |       |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 15V$                                                                             |       | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=8.3V$ , $T_J=25^{\circ}C$                                                            |       |       |       | mA      |
|                          |                  | LD1117 : 800<br>LD1117A : 1000                                                               |       |       |       |         |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                      |       | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=6.3V$ , $V_{RIPPLE}=1V_{PP}$     | 60    | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                              |       | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                              |       | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                              |       | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                                 |       | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                               |       | 0.01  | 0.10  | %/W     |

## For LD1117/A-3.6

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                           | MIN.  | TYP.  | MAX.  | UNIT    |
|--------------------------|------------------|-------------------------------------------------------------------------------------------|-------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=5.6V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                        | 3.528 | 3.600 | 3.672 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=5$ to $10V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$ | 3.528 | 3.600 | 3.672 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=5$ to $15V$ , $I_{OUT}=0mA$                                                       |       | 1     | 6     | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=5V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$         |       | 1     | 10    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                           |       | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                              |       | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                           |       |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 15V$                                                                          |       | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=8.6V$ , $T_J=25^{\circ}C$                                                         |       |       |       | mA      |
|                          |                  | LD1117 : 800<br>LD1117A : 1000                                                            |       |       |       |         |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                   |       | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=6.6V$ , $V_{RIPPLE}=1V_{PP}$  | 60    | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                           |       | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                           |       | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                           |       | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                              |       | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                            |       | 0.01  | 0.10  | %/W     |

## ■ ELECTRICAL CHARACTERISTICS(Cont.)

## For LD1117/A-5.0

| PARAMETER                | SYMBOL           | TEST CONDITIONS                                                                           | MIN.                             | TYP.  | MAX.  | UNIT    |
|--------------------------|------------------|-------------------------------------------------------------------------------------------|----------------------------------|-------|-------|---------|
| Output Voltage           | $V_{OUT}$        | $V_{IN}=7V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                          | 4.900                            | 5.000 | 5.100 | V       |
| Output Voltage           | $V_{OUT}$        | $V_{IN}=6.5$ to $15V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1.0A$ | 4.900                            | 5.000 | 5.100 | V       |
| Line Regulation          | $\Delta V_{OUT}$ | $V_{IN}=6.5$ to $15V$ , $I_{OUT}=0mA$                                                     |                                  | 1     | 10    | mV      |
| Load Regulation          | $\Delta V_{OUT}$ | $V_{IN}=6.5V$<br>LD1117 : $I_{OUT}=0\sim 800mA$<br>LD1117A : $I_{OUT}=0\sim 1000mA$       |                                  | 1     | 15    | mV      |
| Temperature stability    | $\Delta V_{OUT}$ |                                                                                           |                                  | 0.5   |       | %       |
| Long Term Stability      | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                              |                                  | 0.3   |       | %       |
| Operating Input Voltage  | $V_{IN}$         | $I_{OUT}=100mA$                                                                           |                                  |       | 15    | V       |
| Quiescent Current        | $I_Q$            | $V_{IN}\leq 15V$                                                                          |                                  | 5     | 10    | mA      |
| Current Limit            | $I_{LIMIT}$      | $V_{IN}=10V$ , $T_J=25^{\circ}C$                                                          | LD1117<br>800<br>LD1117A<br>1000 |       |       | mA      |
| Output Noise Voltage     | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                   |                                  | 100   |       | $\mu V$ |
| Supply Voltage Rejection | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}=8V$ , $V_{RIPPLE}=1V_{PP}$    | 60                               | 75    |       | dB      |
| Dropout Voltage          | $V_D$            | $I_{OUT}=100mA$                                                                           |                                  | 1.00  | 1.10  | V       |
|                          |                  | $I_{OUT}=500mA$                                                                           |                                  | 1.15  | 1.25  |         |
|                          |                  | $I_{OUT}=800mA$                                                                           |                                  | 1.20  | 1.30  |         |
|                          |                  | $I_{OUT}=1A$                                                                              |                                  | 1.20  | 1.30  |         |
| Thermal Regulation       |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                            |                                  | 0.01  | 0.10  | %/W     |

## For LD1117/A-ADJ

| PARAMETER                     | SYMBOL           | TEST CONDITIONS                                                                                         | MIN.                             | TYP.  | MAX.  | UNIT    |
|-------------------------------|------------------|---------------------------------------------------------------------------------------------------------|----------------------------------|-------|-------|---------|
| Reference Voltage             | $V_{REF}$        | $V_{IN}-V_{OUT}=2V$ , $I_{OUT}=10mA$ , $T_J=25^{\circ}C$                                                | 1.225                            | 1.25  | 1.275 | V       |
| Reference Voltage             | $V_{REF}$        | $V_{IN}-V_{OUT}=1.4$ to $10V$<br>LD1117 : $I_{OUT}=10\sim 800mA$<br>LD1117A : $I_{OUT}=10\sim 1000mA$   | 1.225                            | 1.25  | 1.275 | V       |
| Line Regulation               | $\Delta V_{OUT}$ | $V_{IN}-V_{OUT}=1.5$ to $13.75V$ , $I_{OUT}=10mA$                                                       |                                  | 0.035 | 0.2   | %       |
| Load Regulation               | $\Delta V_{OUT}$ | $V_{IN}-V_{OUT}=3V$<br>LD1117 : $I_{OUT}=10\sim 800mA$<br>LD1117A : $I_{OUT}=10\sim 1000mA$             |                                  | 0.1   | 0.4   | %       |
| Temperature stability         | $\Delta V_{OUT}$ |                                                                                                         |                                  | 0.50  |       | %       |
| Long Term Stability           | $\Delta V_{OUT}$ | 1000 hrs, $T_J=125^{\circ}C$                                                                            |                                  | 0.3   |       | %       |
| Operating Input Voltage       | $V_{IN}$         |                                                                                                         |                                  |       | 15    | V       |
| Adjustment Pin Current        | $I_{ADJ}$        | $V_{IN}\leq 15V$                                                                                        |                                  | 60    | 120   | $\mu A$ |
| Adjustment Pin Current Change | $\Delta I_{ADJ}$ | $V_{IN}-V_{OUT}=1.4$ to $10V$ ,<br>LD1117 : $I_{OUT}=10\sim 800mA$<br>LD1117A : $I_{OUT}=10\sim 1000mA$ |                                  | 1     | 5     | $\mu A$ |
| Minimum Load Current          | $I_{O(MIN)}$     | $V_{IN}=15V$                                                                                            |                                  | 2     | 5     | mA      |
| Current Limit                 | $I_{LIMIT}$      | $V_{IN}-V_{OUT}=5V$ , $T_J=25^{\circ}C$                                                                 | LD1117<br>800<br>LD1117A<br>1000 |       |       | mA      |
| Output Noise (% $V_O$ )       | $e_N$            | $B=10Hz$ to $10KHz$ , $T_J=25^{\circ}C$                                                                 |                                  | 0.003 |       | %       |
| Supply Voltage Rejection      | SVR              | $I_{OUT}=40mA$ , $f=120Hz$ , $T_J=25^{\circ}C$ ,<br>$V_{IN}-V_{OUT}=3V$ , $V_{RIPPLE}=1V_{PP}$          | 60                               | 75    |       | dB      |
| Dropout Voltage               | $V_D$            | $I_{OUT}=100mA$                                                                                         |                                  | 1.00  | 1.10  | V       |
|                               |                  | $I_{OUT}=500mA$                                                                                         |                                  | 1.15  | 1.25  |         |
|                               |                  | $I_{OUT}=800mA$                                                                                         |                                  | 1.20  | 1.30  |         |
|                               |                  | $I_{OUT}=1A$                                                                                            |                                  | 1.20  | 1.30  |         |
| Thermal Regulation            |                  | $T_A=25^{\circ}C$ , 30ms Pulse                                                                          |                                  | 0.01  | 0.10  | %/W     |

### ■ TYPICAL APPLICATIONS

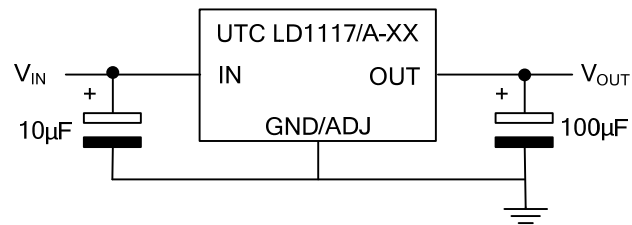


Fig.1 Typical Application Circuit

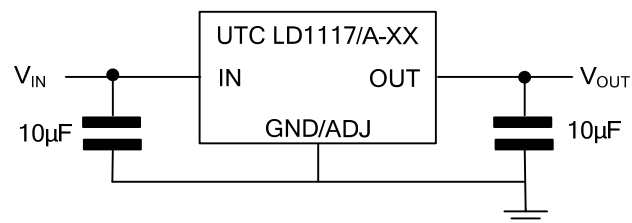


Fig.2 Typical Application Circuit (FOR MLCC)

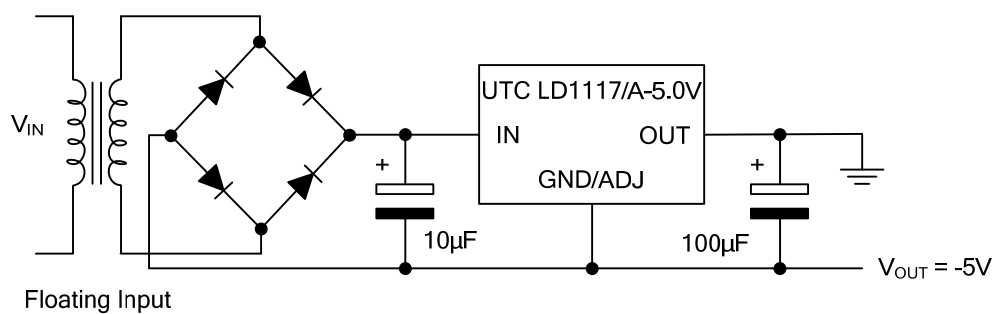


Fig.3 Negative Supply

■ TYPICAL APPLICATIONS(Cont.)

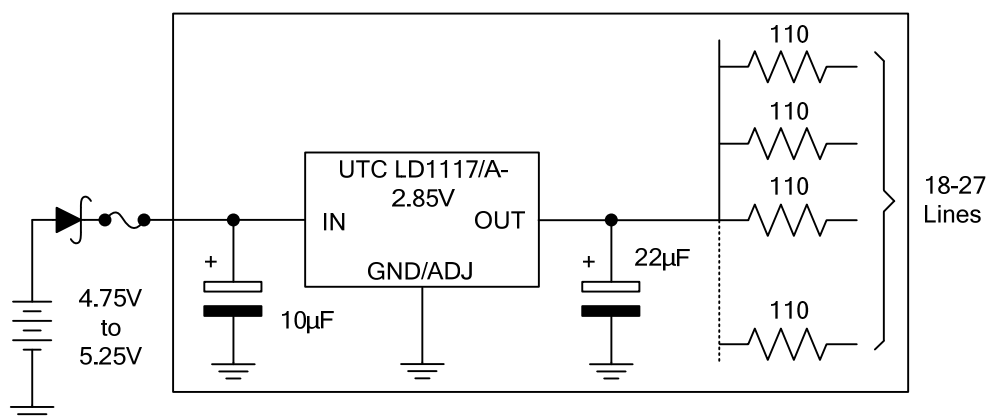


Fig.4 Active Terminator for SCSI-2 BUS

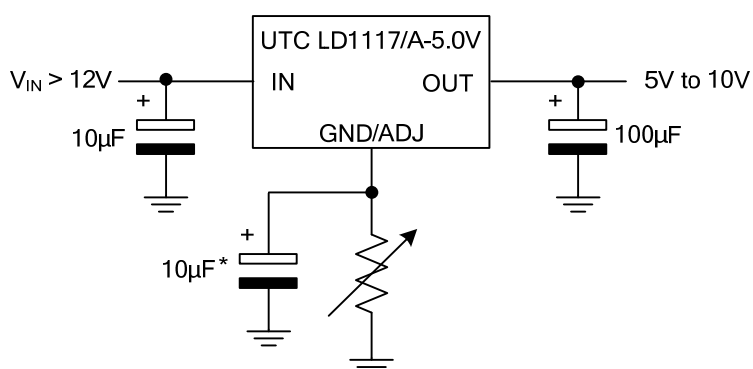


Fig.5 Circuit for Increasing Output Voltage

# APPLICATION NOTE of LD1117/A ADJUSTABLE

The **LD1117/A** adjustable has a reference voltage of between the OUT and ADJ/GND pins.  $I_{ADJ}$  is 60 $\mu$ A typ. (120 $\mu$ A max.) and  $\Delta I_{ADJ}$  is 1 $\mu$ A typ. (5 $\mu$ A max.).

$R_1$  is normally fixed to 120 $\Omega$ .

From figure 6 we obtain:

$$V_{OUT} = V_{REF} + R_2(I_{ADJ} + I_{R1}) = V_{REF} + R_2(I_{ADJ} + V_{REF}/R_1) = V_{REF}(1 + R_2/R_1) + R_2 \times I_{ADJ}.$$

Usually  $R_2$  value is in the range of few K $\Omega$ , so the  $R_2 \times I_{ADJ}$  product could be neglected; then the above expression becomes:  $V_{OUT} = V_{REF}(1 + R_2/R_1)$

For better load regulation, realize a good Kelvin connection of  $R_1$  and  $R_2$  is important. Particularly  $R_1$  connection must be realized very close to OUT and ADJ/GND pin, while  $R_2$  ground connection must be placed as near as possible to the negative Load pin. Ripple rejection can be improved by introducing a 10 $\mu$ F electrolytic capacitor placed in parallel to the  $R_2$  resistor (See Fig. 8)

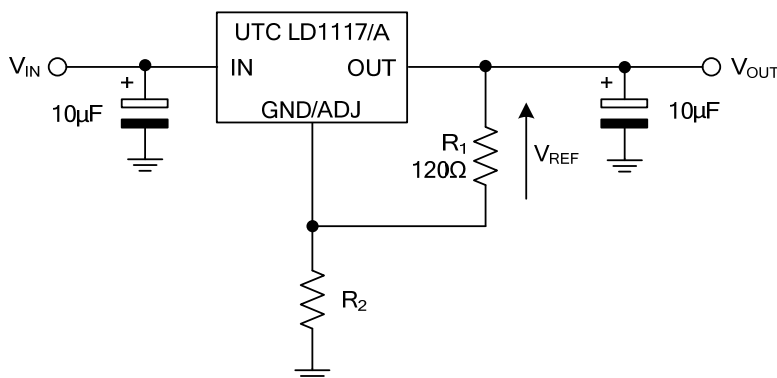


Fig.6 Adjustable Output Voltage Application Circuit

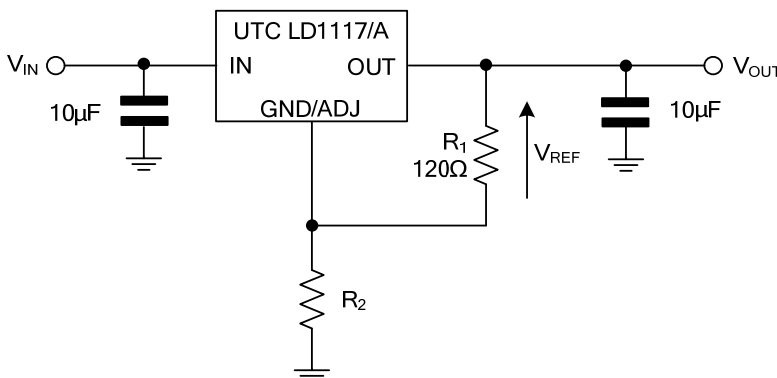


Fig.7 Adjustable Output Voltage Application Circuit (FOR MLCC)

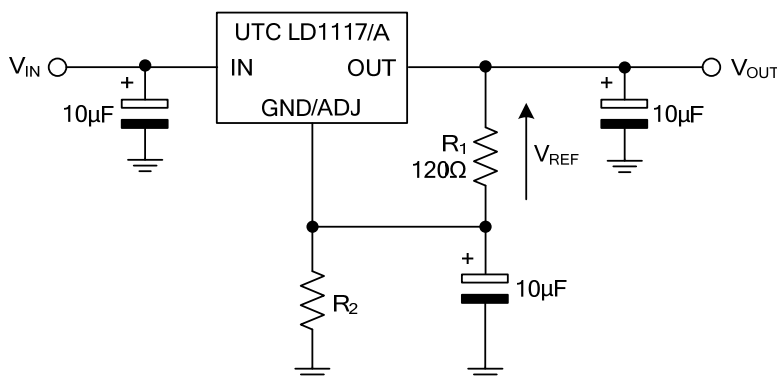
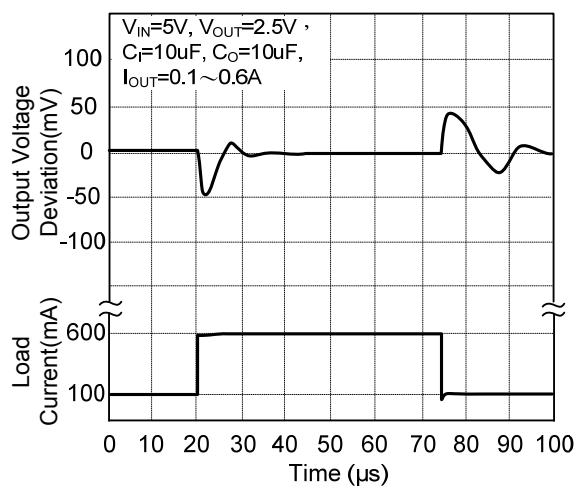


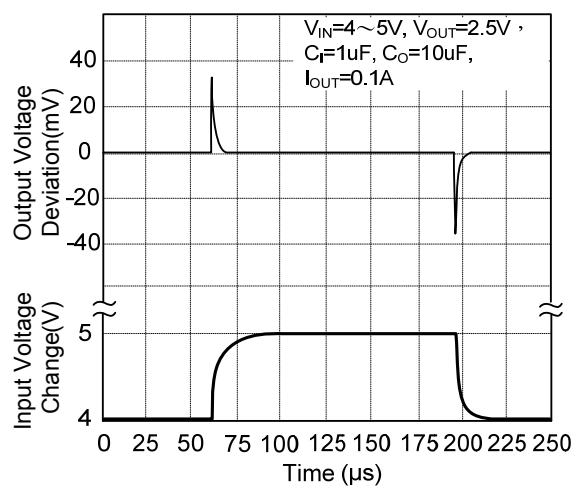
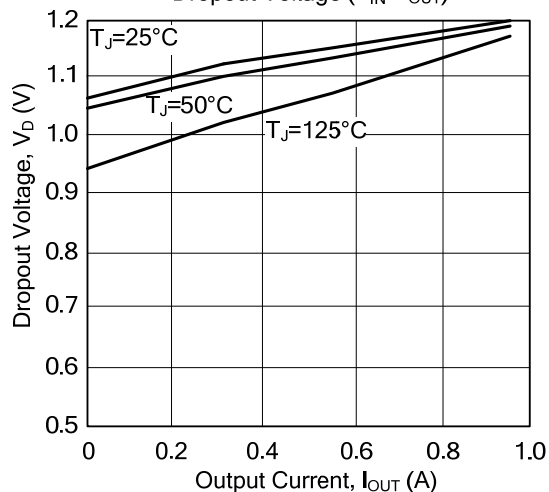
Fig.8 Adjustable Output Voltage Application with improved Ripple Rejection.

## ■ TYPICAL CHARACTERISTICS

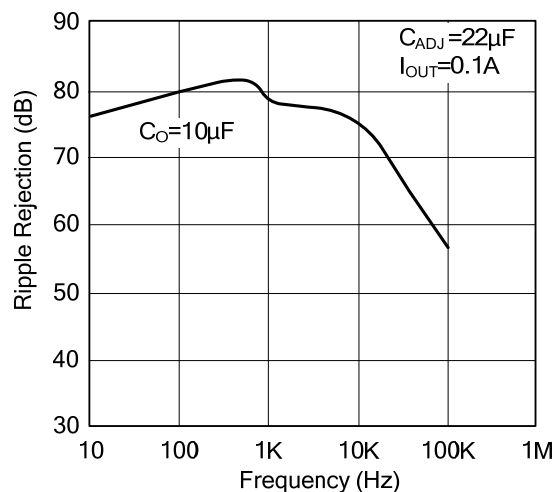
Load Transient Response



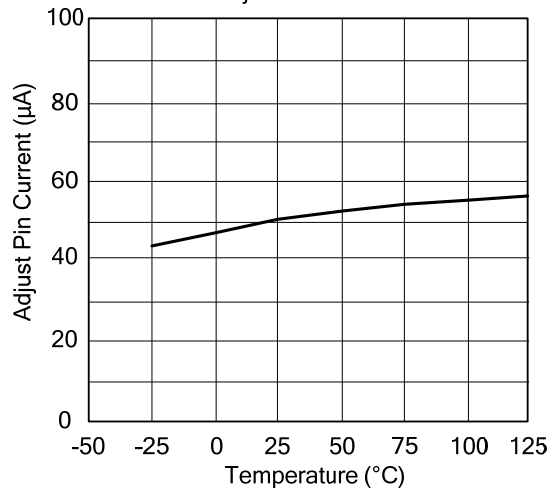
Line Transient Response

Dropout Voltage ( $V_{IN}-V_{OUT}$ )

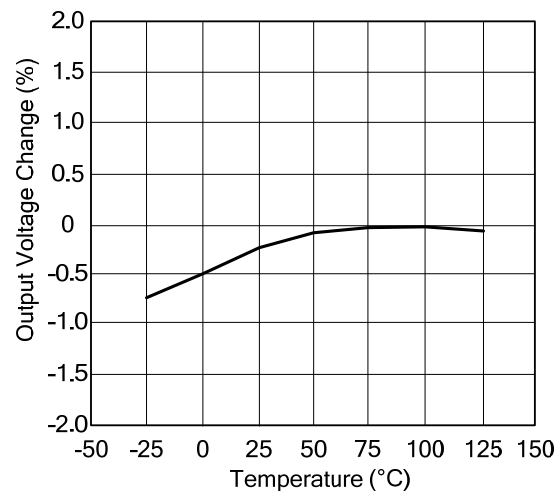
Ripple Rejection



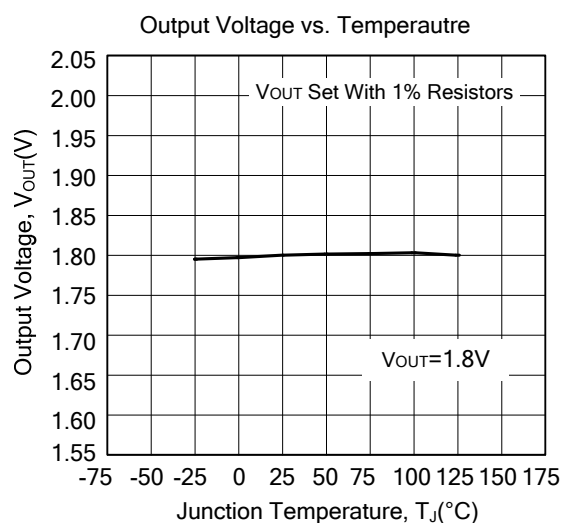
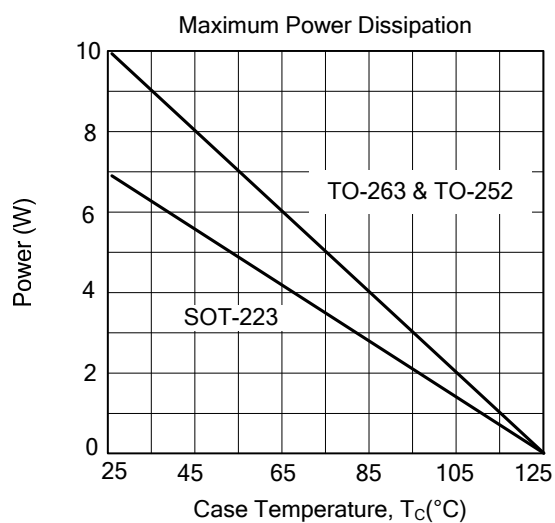
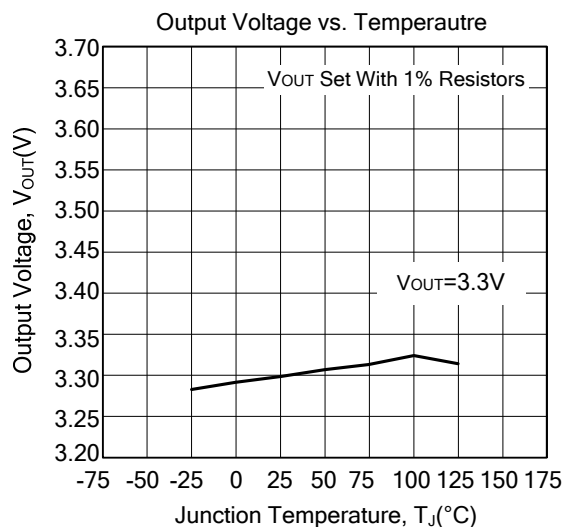
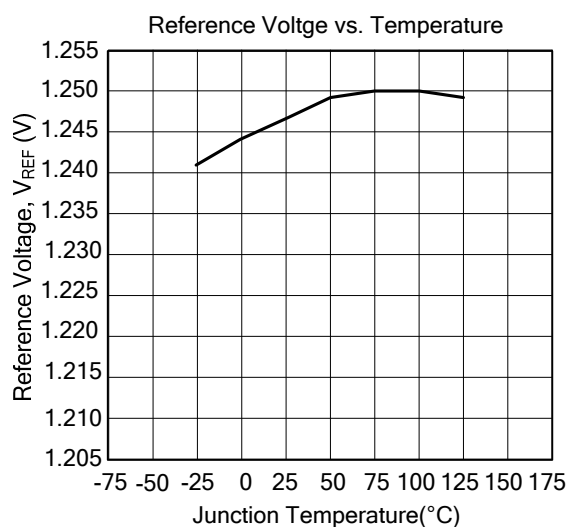
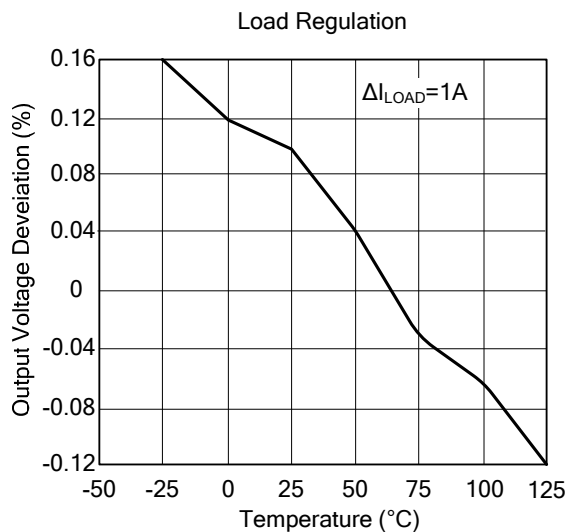
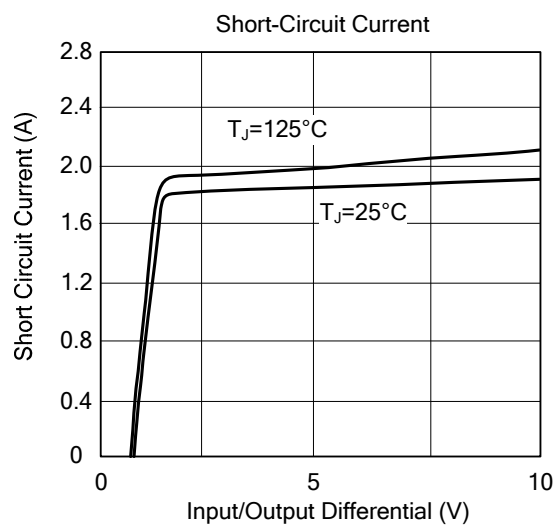
Adjust Pin Current



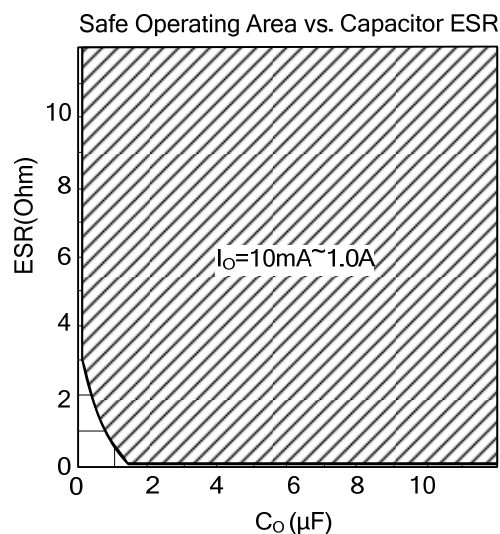
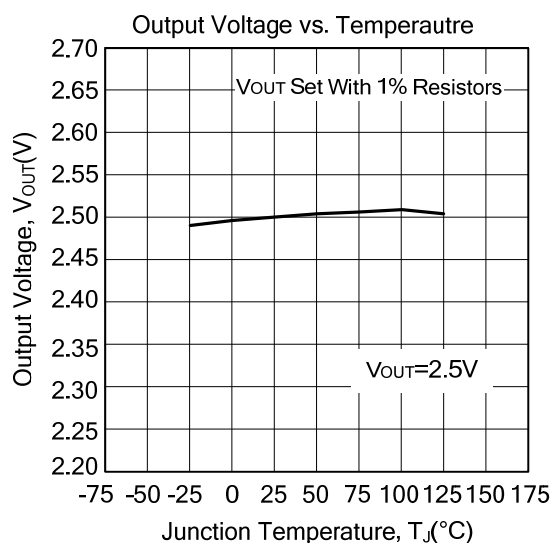
Temperature Stability



## ■ TYPICAL CHARACTERISTICS(Cont.)



# ■ TYPICAL CHARACTERISTICS(Cont.)



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