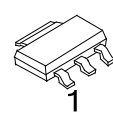
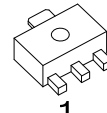
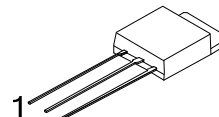
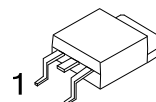
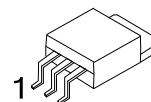


**78DXXL****LINEAR INTEGRATED CIRCUIT****3-TERMINALS 0.5A POSITIVE VOLTAGE REGULATOR****■ DESCRIPTION**

The UTC **78DXXL** family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 0.5 A.

**■ FEATURE**

- \* Output Current Up To 0.5 A
- \* Fixed Output Voltage Of 5V, 6V, 8V, 9V, 12V, 15V and 18V Available
- \* Thermal Overload Shutdown Protection
- \* Short Circuit Current Limiting
- \* Output Transistor SOA Protection

**SOT-223****SOT-89****TO-251****TO-252****TO-252-3****■ ORDERING INFORMATION**

| Ordering Number |                 | Package  | Pin Assignment |   |   | Packing   |
|-----------------|-----------------|----------|----------------|---|---|-----------|
| Lead Free       | Halogen Free    |          | 1              | 2 | 3 |           |
| -               | 78DXXLG-AA3-R   | SOT-223  | I              | G | O | Tape Reel |
| -               | 78DXXLG-AB3-B-R | SOT-89   | O              | G | I | Tape Reel |
| 78DXXLL-TM3-T   | 78DXXLG-TM3-T   | TO-251   | I              | G | O | Tube      |
| 78DXXLL-TN3-R   | 78DXXLG-TN3-R   | TO-252   | I              | G | O | Tape Reel |
| 78DXXLL-TNA-R   | 78DXXLG-TNA-R   | TO-252-3 | I              | G | O | Tape Reel |

Note: 1. XX: Output Voltage, refer to Marking Information

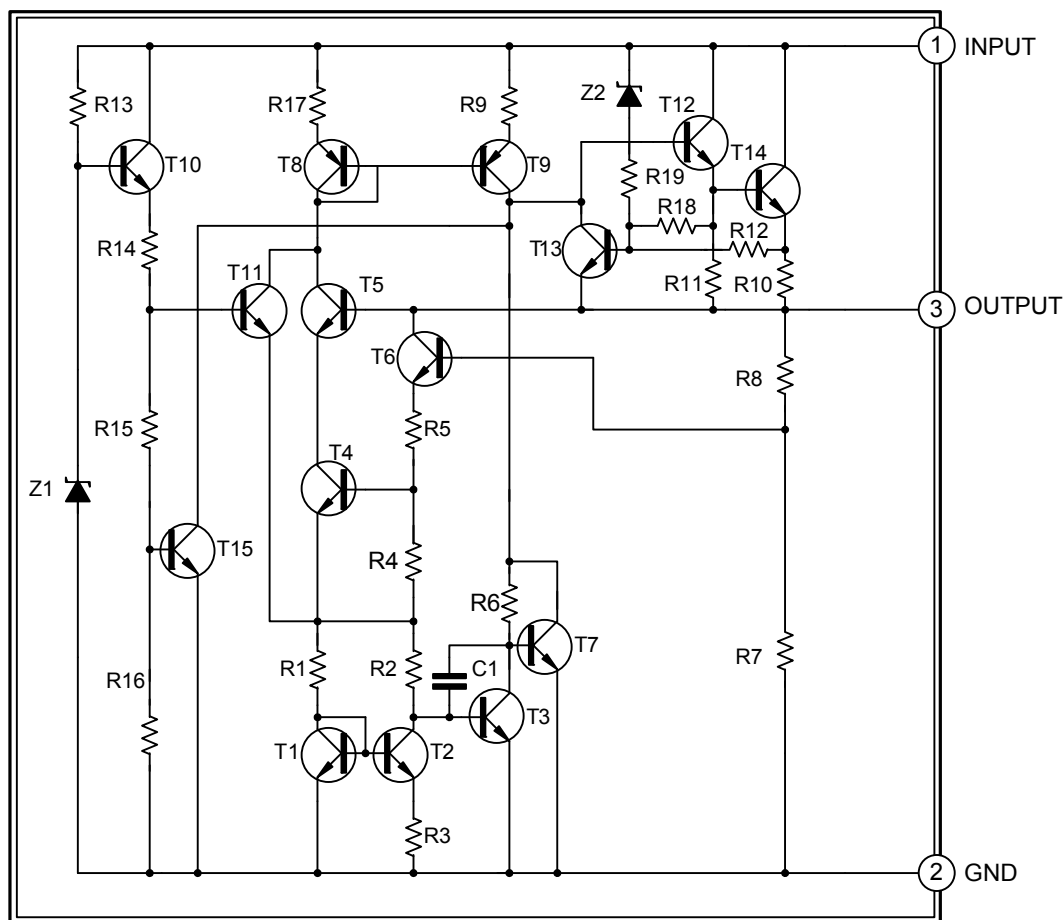
2. Pin Code: I: Input G: GND O: Output

|  |                         |                                                                        |
|--|-------------------------|------------------------------------------------------------------------|
|  | (1) Packing Type        | (1) R: Tape Reel, T: Tube                                              |
|  | (2) Package Type        | (2) AA3: SOT-223, AB3: SOT-89, TM3: TO-251, TN3: TO-252, TNA: TO-252-3 |
|  | (3) Green Package       | (3) G: Halogen Free and Lead Free, L: Lead Free                        |
|  | (4) Output Voltage Code | (4) XX: refer to Marking Information                                   |

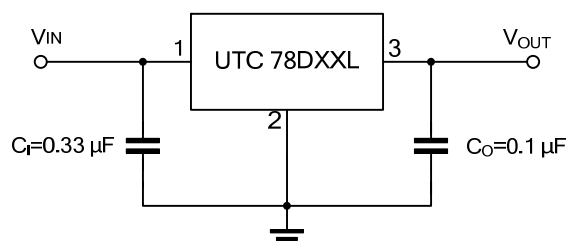
# MARKING INFORMATION

| PACKAGE                      | VOLTAGE CODE                                                          | MARKING |
|------------------------------|-----------------------------------------------------------------------|---------|
| SOT-223                      | 05: 5V<br>06: 6V<br>08: 8V<br>09: 9V<br>12: 12V<br>15: 15V<br>18: 18V |         |
| SOT-89                       |                                                                       |         |
| TO-251<br>TO-252<br>TO-252-3 |                                                                       |         |

### ■ BLOCK DIAGRAM



### ■ TYPICAL APPLICATION CIRCUIT



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

### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>J</sub>=25°C, unless otherwise specified)

| PARAMETER                                |                 | SYMBOL           | RATINGS    | UNIT |
|------------------------------------------|-----------------|------------------|------------|------|
| Input Voltage                            |                 | V <sub>IN</sub>  | 35         | V    |
| Output Current                           |                 | I <sub>OUT</sub> | 0.5        | A    |
| Power Dissipation (T <sub>C</sub> =25°C) | SOT-223         | P <sub>D</sub>   | 8.5        | W    |
|                                          | SOT-89          |                  | 2.3        |      |
|                                          | TO-251 / TO-252 |                  | 10         |      |
| Junction Temperature                     |                 | T <sub>J</sub>   | -20~ +150  | °C   |
| Storage Temperature                      |                 | T <sub>STG</sub> | -65 ~ +150 | °C   |

Notes: 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.

### ■ THERMAL DATA

| PARAMETER        |                 | SYMBOL          | RATINGS | UNIT |
|------------------|-----------------|-----------------|---------|------|
| Junction to Case | SOT-223         | θ <sub>JC</sub> | 15      | °C/W |
|                  | SOT-89          |                 | 5.5     |      |
|                  | TO-251 / TO-252 |                 | 12.5    |      |

### ■ ELECTRICAL CHARACTERISTICS

(T<sub>J</sub>=25°C, C<sub>I</sub>=0.33μF, C<sub>O</sub>=0.1μF, P<sub>D</sub>≤7W, unless otherwise specified)

For 78D05L (V<sub>IN</sub>=10V, I<sub>OUT</sub>=0.5A)

| PARAMETER                                   | SYMBOL                | TEST CONDITIONS                                      | MIN  | TYP  | MAX  | UNIT  |
|---------------------------------------------|-----------------------|------------------------------------------------------|------|------|------|-------|
| Output Voltage                              | V <sub>OUT</sub>      | I <sub>OUT</sub> =5mA~0.5A                           | 4.8  | 5    | 5.2  | V     |
|                                             |                       | V <sub>IN</sub> =7.5~20V, I <sub>OUT</sub> =5mA~0.5A | 4.75 |      | 5.25 | V     |
| Load Regulation                             | ΔV <sub>OUT</sub>     | I <sub>OUT</sub> =5mA~0.5A                           |      |      | 100  | mV    |
|                                             |                       | I <sub>OUT</sub> =5mA~200mA                          |      |      | 50   | mV    |
| Line Regulation                             | ΔV <sub>OUT</sub>     | V <sub>IN</sub> =7V~25V                              |      |      | 100  | mV    |
|                                             |                       | V <sub>IN</sub> =7.5~20V, I <sub>OUT</sub> =0.5A     |      |      | 100  | mV    |
| Quiescent Current                           | I <sub>Q</sub>        | I <sub>OUT</sub> =0.5A                               |      |      | 8    | mA    |
| Quiescent Current Change                    | ΔI <sub>Q</sub>       | V <sub>UT</sub> =7.5~20V                             |      |      | 1    | mA    |
|                                             |                       | I <sub>OUT</sub> =5mA~0.5A                           |      |      | 0.5  | mA    |
| Output Noise Voltage                        | e <sub>N</sub>        | 10Hz≤f≤100kHz                                        |      | 40   |      | μV    |
| Temperature coefficient of V <sub>OUT</sub> | ΔV <sub>OUT</sub> /ΔT | I <sub>OUT</sub> =5mA                                |      | -0.6 |      | mV/°C |
| Ripple Rejection                            | RR                    | V <sub>IN</sub> =8~18V, f=120Hz                      | 62   | 80   |      | dB    |
| Peak Output Current                         | I <sub>PEAK</sub>     |                                                      |      | 1.2  |      | A     |
| Short-Circuit Current                       | I <sub>SC</sub>       | V <sub>IN</sub> =V <sub>OUT</sub> +19V               |      | 250  |      | mA    |
| Dropout Voltage                             | V <sub>D</sub>        |                                                      |      | 2    |      | V     |

## ■ ELECTRICAL CHARACTERISTICS (Cont.)

For 78D06L ( $V_{IN}=11V$ ,  $I_{OUT}=0.5A$ )

| PARAMETER                            | SYMBOL                    | TEST CONDITIONS                             | MIN  | TYP  | MAX  | UNIT            |
|--------------------------------------|---------------------------|---------------------------------------------|------|------|------|-----------------|
| Output Voltage                       | $V_{OUT}$                 | $I_{OUT}=5mA\sim0.5A$                       | 5.76 | 6    | 6.24 | V               |
|                                      |                           | $V_{IN}=8.5\sim21V$ , $I_{OUT}=5mA\sim0.5A$ | 5.7  |      | 6.3  | V               |
| Load Regulation                      | $\Delta V_{OUT}$          | $I_{OUT}=5mA\sim0.5A$                       |      |      | 120  | mV              |
|                                      |                           | $I_{OUT}=5mA\sim200mA$                      |      |      | 60   | mV              |
| Line Regulation                      | $\Delta V_{OUT}$          | $V_{IN}=8\sim25V$                           |      |      | 120  | mV              |
|                                      |                           | $V_{IN}=8.5\sim21V$ , $I_{OUT}=0.5A$        |      |      | 120  | mV              |
| Quiescent Current                    | $I_Q$                     | $I_{OUT}=0.5A$                              |      |      | 8    | mA              |
| Quiescent Current Change             | $\Delta I_Q$              | $V_{IN}=8.5\sim21V$                         |      |      | 1    | mA              |
|                                      |                           | $I_{OUT}=5mA\sim0.5A$                       |      |      | 0.5  | mA              |
| Output Noise Voltage                 | $e_N$                     | $10Hz\leq f\leq 100kHz$                     |      | 45   |      | $\mu V$         |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$                               |      | -0.7 |      | mV/ $^{\circ}C$ |
| Ripple Rejection                     | RR                        | $V_{IN}=9\sim19V$ , $f=120Hz$               | 59   | 75   |      | dB              |
| Peak Output Current                  | $I_{PEAK}$                |                                             |      | 1.2  |      | A               |
| Short-Circuit Current                | $I_{SC}$                  | $V_{IN}=V_{OUT}+19V$                        |      | 250  |      | mA              |
| Dropout Voltage                      | $V_D$                     |                                             |      | 2    |      | V               |

For 78D08L ( $V_{IN}=14V$ ,  $I_{OUT}=0.5A$ )

| PARAMETER                            | SYMBOL                    | TEST CONDITIONS                              | MIN  | TYP  | MAX  | UNIT            |
|--------------------------------------|---------------------------|----------------------------------------------|------|------|------|-----------------|
| Output Voltage                       | $V_{OUT}$                 | $I_{OUT}=5mA\sim0.5A$                        | 7.68 | 8    | 8.32 | V               |
|                                      |                           | $V_{IN}=10.5\sim23V$ , $I_{OUT}=5mA\sim0.5A$ | 7.6  |      | 8.4  | V               |
| Load Regulation                      | $\Delta V_{OUT}$          | $I_{OUT}=5mA\sim0.5A$                        |      |      | 160  | mV              |
|                                      |                           | $I_{OUT}=5mA\sim200mA$                       |      |      | 80   | mV              |
| Line Regulation                      | $\Delta V_{OUT}$          | $V_{IN}=10.5\sim25V$                         |      |      | 160  | mV              |
|                                      |                           | $V_{IN}=10.5\sim23V$ , $I_{OUT}=0.5A$        |      |      | 160  | mV              |
| Quiescent Current                    | $I_Q$                     | $I_{OUT}=0.5A$                               |      |      | 8    | mA              |
| Quiescent Current Change             | $\Delta I_Q$              | $V_{IN}=10.5\sim23V$                         |      |      | 1    | mA              |
|                                      |                           | $I_{OUT}=5mA\sim0.5A$                        |      |      | 0.5  | mA              |
| Output Noise Voltage                 | $e_N$                     | $10Hz\leq f\leq 100kHz$                      |      | 58   |      | $\mu V$         |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$                                |      | -0.9 |      | mV/ $^{\circ}C$ |
| Ripple Rejection                     | RR                        | $V_{IN}=11.5\sim21.5V$ , $f=120Hz$           | 56   | 72   |      | dB              |
| Peak Output Current                  | $I_{PEAK}$                |                                              |      | 1.2  |      | A               |
| Short-Circuit Current                | $I_{SC}$                  | $V_{IN}=V_{OUT}+19V$                         |      | 250  |      | mA              |
| Dropout Voltage                      | $V_D$                     |                                              |      | 2    |      | V               |

For 78D09L ( $V_{IN}=15V$ ,  $I_{OUT}=0.5A$ )

| PARAMETER                            | SYMBOL                    | TEST CONDITIONS                              | MIN  | TYP  | MAX  | UNIT            |
|--------------------------------------|---------------------------|----------------------------------------------|------|------|------|-----------------|
| Output Voltage                       | $V_{OUT}$                 | $I_{OUT}=5mA\sim0.5A$                        | 8.64 | 9    | 9.36 | V               |
|                                      |                           | $V_{IN}=11.5\sim24V$ , $I_{OUT}=5mA\sim0.5A$ | 8.55 |      | 9.45 | V               |
| Load Regulation                      | $\Delta V_{OUT}$          | $I_{OUT}=5mA\sim0.5A$                        |      |      | 180  | mV              |
|                                      |                           | $I_{OUT}=5mA\sim200mA$                       |      |      | 90   | mV              |
| Line Regulation                      | $\Delta V_{OUT}$          | $V_{IN}=11.5\sim25V$                         |      |      | 180  | mV              |
|                                      |                           | $V_{IN}=11.5\sim24V$ , $I_{OUT}=0.5A$        |      |      | 180  | mV              |
| Quiescent Current                    | $I_Q$                     | $I_{OUT}=0.5A$                               |      |      | 8    | mA              |
| Quiescent Current Change             | $\Delta I_Q$              | $V_{IN}=11.5\sim24V$                         |      |      | 1    | mA              |
|                                      |                           | $I_{OUT}=5mA\sim0.5A$                        |      |      | 0.5  | mA              |
| Output Noise Voltage                 | $e_N$                     | $10Hz\leq f\leq 100kHz$                      |      | 58   |      | $\mu V$         |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$                                |      | -1.1 |      | mV/ $^{\circ}C$ |
| Ripple Rejection                     | RR                        | $V_{IN}=12.5\sim22.5V$ , $f=120Hz$           | 56   | 72   |      | dB              |
| Peak Output Current                  | $I_{PEAK}$                |                                              |      | 1.2  |      | A               |
| Short-Circuit Current                | $I_{SC}$                  | $V_{IN}=V_{OUT}+19V$                         |      | 250  |      | mA              |
| Dropout Voltage                      | $V_D$                     |                                              |      | 2    |      | V               |

## ■ ELECTRICAL CHARACTERISTICS (Cont.)

For 78D12L ( $V_{IN}=19V$ ,  $I_{OUT}=0.5A$ )

| PARAMETER                            | SYMBOL                    | TEST CONDITIONS                           | MIN   | TYP  | MAX   | UNIT            |
|--------------------------------------|---------------------------|-------------------------------------------|-------|------|-------|-----------------|
| Output Voltage                       | $V_{OUT}$                 | $I_{OUT}=5mA\sim0.5A$                     | 11.52 | 12   | 12.48 | V               |
|                                      |                           | $V_{IN}=14.5\sim27V, I_{OUT}=5mA\sim0.5A$ | 11.4  |      | 12.6  | V               |
| Load Regulation                      | $\Delta V_{OUT}$          | $I_{OUT}=5mA\sim0.5A$                     |       |      | 240   | mV              |
|                                      |                           | $I_{OUT}=5mA\sim200mA$                    |       |      | 120   | mV              |
| Line Regulation                      | $\Delta V_{OUT}$          | $V_{IN}=14.5\sim30V$                      |       |      | 240   | mV              |
|                                      |                           | $V_{IN}=14.6\sim27V, I_{OUT}=0.5A$        |       |      | 240   | mV              |
| Quiescent Current                    | $I_Q$                     | $I_{OUT}=0.5A$                            |       |      | 8     | mA              |
| Quiescent Current Change             | $\Delta I_Q$              | $V_{IN}=14.5\sim30V$                      |       |      | 1     | mA              |
|                                      |                           | $I_{OUT}=5mA\sim0.5A$                     |       |      | 0.5   | mA              |
| Output Noise Voltage                 | $e_N$                     | $10Hz\leq f\leq 100kHz$                   |       | 75   |       | $\mu V$         |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$                             |       | -1.5 |       | mV/ $^{\circ}C$ |
| Ripple Rejection                     | RR                        | $V_{IN}=15\sim25V, f=120Hz$               | 55    | 72   |       | dB              |
| Peak Output Current                  | $I_{PEAK}$                |                                           |       | 1.2  |       | A               |
| Short-Circuit Current                | $I_{SC}$                  | $V_{IN}=V_{OUT}+19V$                      |       | 250  |       | mA              |
| Dropout Voltage                      | $V_D$                     |                                           |       | 2    |       | V               |

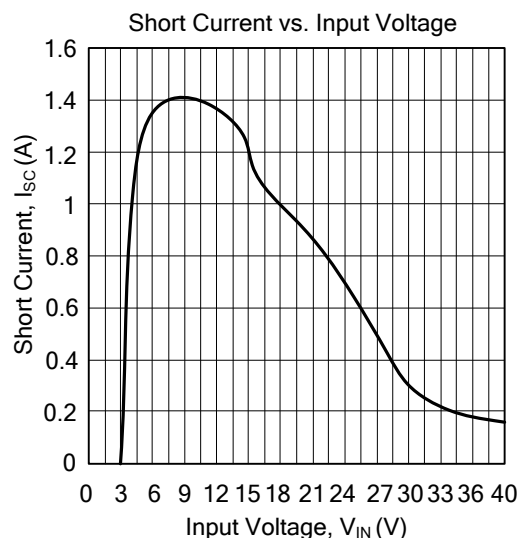
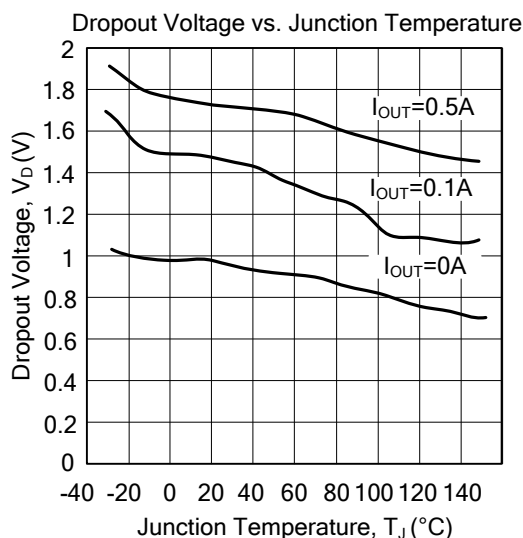
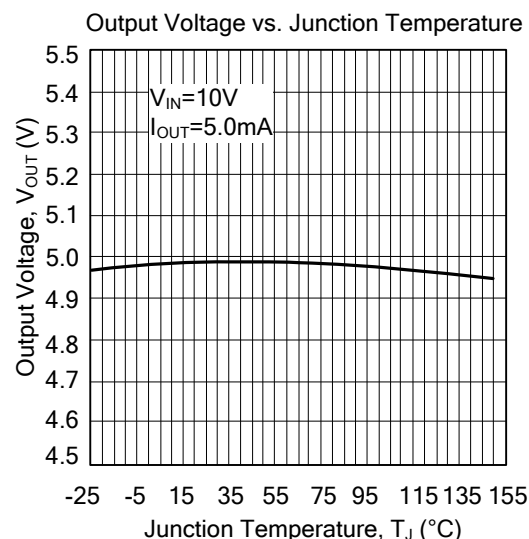
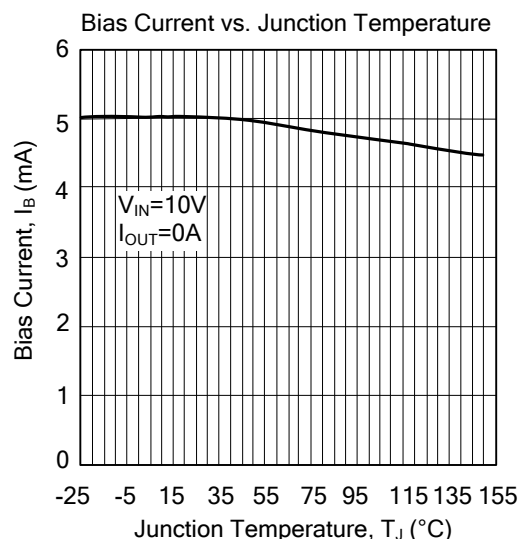
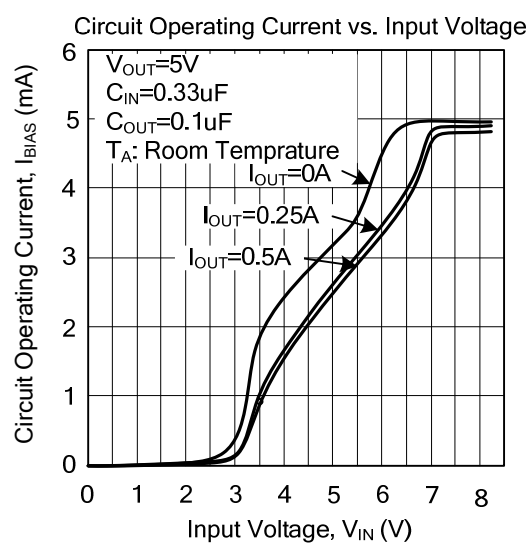
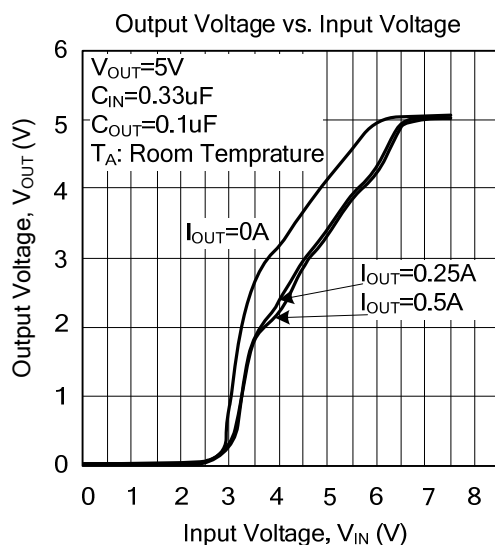
For 78D15L ( $V_{IN}=23V$ ,  $I_{OUT}=0.5A$ ,  $C_I=0.33\mu F$ ,  $C_O=0.1\mu F$ )

| PARAMETER                            | SYMBOL                    | TEST CONDITIONS                           | MIN   | TYP  | MAX   | UNIT            |
|--------------------------------------|---------------------------|-------------------------------------------|-------|------|-------|-----------------|
| Output Voltage                       | $V_{OUT}$                 | $I_{OUT}=5mA\sim0.5A$                     | 14.4  | 15   | 15.6  | V               |
|                                      |                           | $V_{IN}=17.5\sim30V, I_{OUT}=5mA\sim0.5A$ | 14.25 |      | 15.75 | V               |
| Load Regulation                      | $\Delta V_{OUT}$          | $I_{OUT}=5mA\sim0.5A$                     |       |      | 300   | mV              |
|                                      |                           | $I_{OUT}=5mA\sim200mA$                    |       |      | 150   | mV              |
| Line Regulation                      | $\Delta V_{OUT}$          | $V_{IN}=18.5\sim30V$                      |       |      | 300   | mV              |
|                                      |                           | $V_{IN}=17.5\sim30V, I_{OUT}=0.5A$        |       |      | 300   | mV              |
| Quiescent Current                    | $I_Q$                     | $I_{OUT}=0.5A$                            |       |      | 8     | mA              |
| Quiescent Current Change             | $\Delta I_Q$              | $V_{IN}=17.5\sim30V$                      |       |      | 1     | mA              |
|                                      |                           | $I_{OUT}=5mA\sim0.5A$                     |       |      | 0.5   | mA              |
| Output Noise Voltage                 | $e_N$                     | $10Hz\leq f\leq 100kHz$                   |       | 90   |       | $\mu V$         |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$                             |       | -1.8 |       | mV/ $^{\circ}C$ |
| Ripple Rejection                     | RR                        | $V_{IN}=18.5\sim28.5V, f=120Hz$           | 54    | 70   |       | dB              |
| Peak Output Current                  | $I_{PEAK}$                |                                           |       | 1.2  |       | A               |
| Short-Circuit Current                | $I_{SC}$                  | $V_{IN}=V_{OUT}+19V$                      |       | 250  |       | mA              |
| Dropout Voltage                      | $V_D$                     |                                           |       | 2    |       | V               |

For 78D18L ( $V_{IN}=27V$ ,  $I_{OUT}=0.5A$ )

| PARAMETER                            | SYMBOL                    | TEST CONDITIONS                         | MIN   | TYP  | MAX   | UNIT            |
|--------------------------------------|---------------------------|-----------------------------------------|-------|------|-------|-----------------|
| Output Voltage                       | $V_{OUT}$                 | $I_{OUT}=5mA\sim0.5A$                   | 17.28 | 18   | 18.72 | V               |
|                                      |                           | $V_{IN}=21\sim33V, I_{OUT}=5mA\sim0.5A$ | 17.1  |      | 18.9  | V               |
| Load Regulation                      | $\Delta V_{OUT}$          | $I_{OUT}=5mA\sim0.5A$                   |       |      | 360   | mV              |
|                                      |                           | $I_{OUT}=5mA\sim200mA$                  |       |      | 180   | mV              |
| Line Regulation                      | $\Delta V_{OUT}$          | $V_{IN}=21\sim33V$                      |       |      | 360   | mV              |
|                                      |                           | $V_{IN}=21\sim33V, I_{OUT}=0.5A$        |       |      | 360   | mV              |
| Quiescent Current                    | $I_Q$                     | $I_{OUT}=0.5A$                          |       |      | 8     | mA              |
| Quiescent Current Change             | $\Delta I_Q$              | $V_{IN}=21.5\sim33V$                    |       |      | 1     | mA              |
|                                      |                           | $I_{OUT}=5mA\sim0.5A$                   |       |      | 0.5   | mA              |
| Output Noise Voltage                 | $e_N$                     | $10Hz\leq f\leq 100kHz$                 |       | 110  |       | $\mu V$         |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$                           |       | -2.2 |       | mV/ $^{\circ}C$ |
| Ripple Rejection                     | RR                        | $V_{IN}=22\sim32V, f=120Hz$             | 53    | 69   |       | dB              |
| Peak Output Current                  | $I_{PEAK}$                |                                         |       | 1.2  |       | A               |
| Short-Circuit Current                | $I_{SC}$                  | $V_{IN}=35V$                            |       | 250  |       | mA              |
| Dropout Voltage                      | $V_D$                     |                                         |       | 2    |       | V               |

## ■ TYPICAL CHARACTERISTICS



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