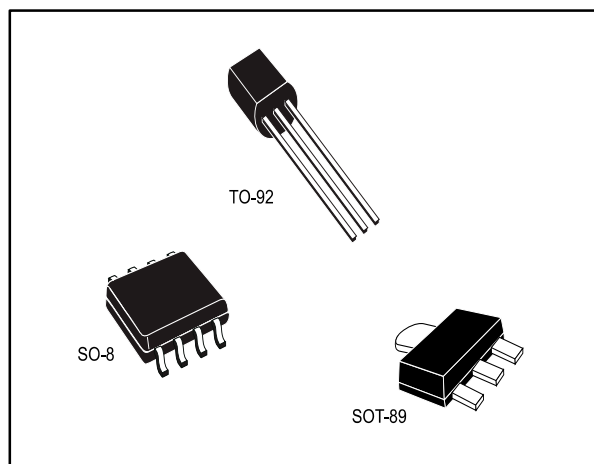


## Positive voltage regulators

Datasheet - production data



### Description

The L78L series of three-terminal positive regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heat-sink is provided, they can deliver up to 100 mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators. The L78L series used as Zener diode/resistor combination replacement, offers improvement along with lower quiescent current and lower noise.

### Features

- Output current up to 100 mA
- Output voltages of 3.3; 5; 6; 8; 9; 10; 12; 15; 18; 24 V thermal overload protection
- Short-circuit protection
- No external components are required
- Available in either  $\pm 4\%$  (A) or  $\pm 8\%$  (C) selection

**Contents**

**1 Diagram..... 3**

**2 Pin configuration ..... 4**

**3 Maximum ratings ..... 5**

**4 Electrical characteristics ..... 6**

**5 Typical performance ..... 25**

**6 Typical application ..... 27**

**7 Package information ..... 29**

    7.1 TO-92 package information..... 29

    7.2 TO-92 packing information ..... 30

    7.3 TO-92 Ammopak packing information ..... 32

    7.4 SO-8 package information ..... 34

    7.5 SO-8 packing information..... 36

    7.6 SOT-89 package information ..... 37

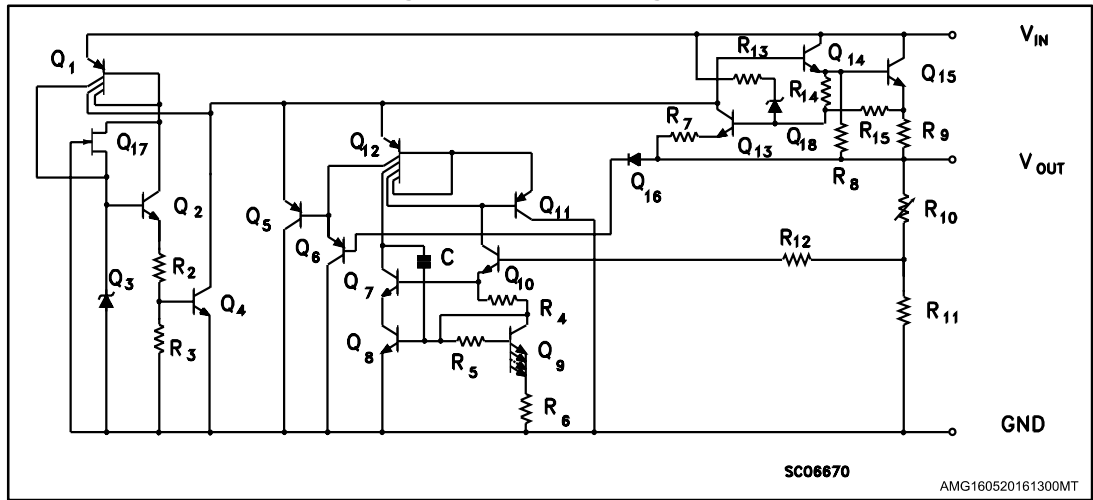
    7.7 SOT-89 packing information..... 40

**8 Ordering information..... 41**

**9 Revision history ..... 44**

# 1 Diagram

Figure 1: Schematic diagram



## 2 Pin configuration

Figure 2: Pin connection (top view, bottom view for TO-92)

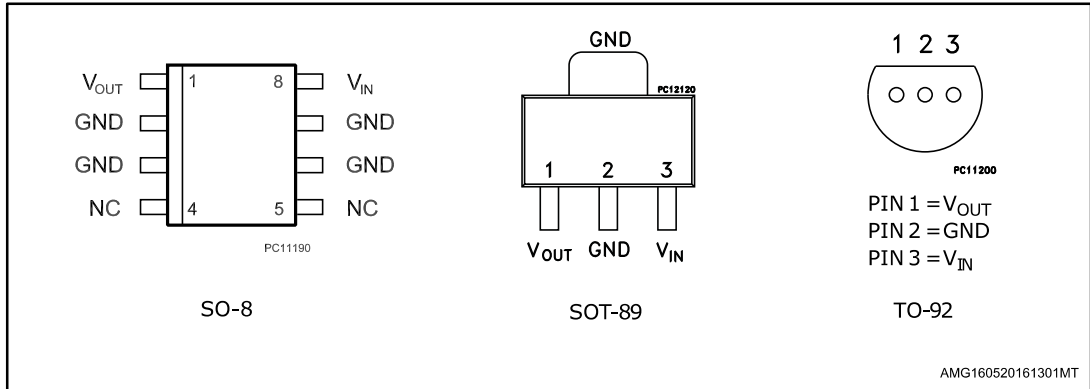
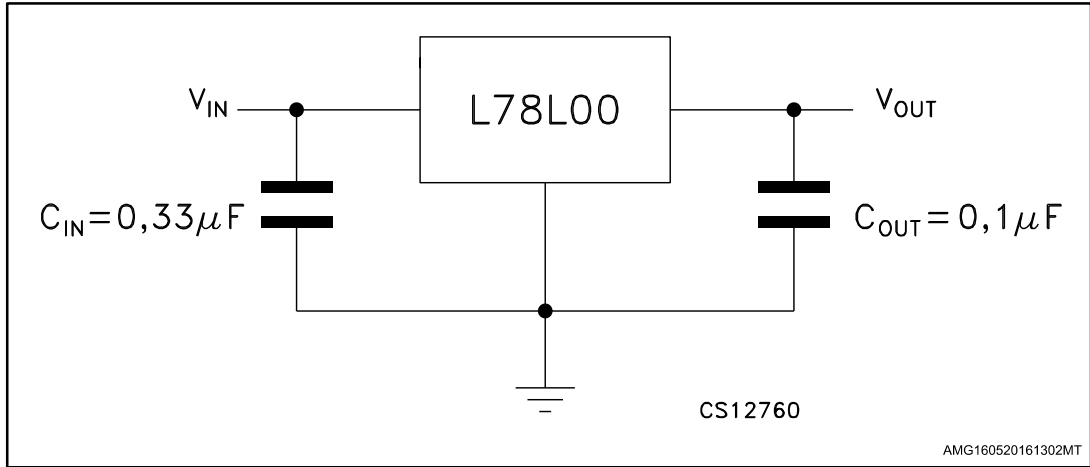


Figure 3: Test circuits



### 3 Maximum ratings

Table 1: Absolute maximum ratings

| Symbol           | Parameter                            | Value                             | Unit       |
|------------------|--------------------------------------|-----------------------------------|------------|
| V <sub>I</sub>   | DC Input voltage                     | V <sub>O</sub> = 3.3 to 9 V       | 30         |
|                  |                                      | V <sub>O</sub> = 12 to 15 V       | 35         |
|                  |                                      | V <sub>O</sub> = 18 to 24 V       | 40         |
| I <sub>O</sub>   | Output current                       | 100                               | mA         |
| P <sub>D</sub>   | Power dissipation                    | Internally limited <sup>(1)</sup> | mW         |
| T <sub>STG</sub> | Storage temperature range            | -65 to 150                        | °C         |
| T <sub>OP</sub>  | Operating junction temperature range | for L78LxxAC / L78LxxC            | 0 to 125   |
|                  |                                      | for L78LxxAB                      | -40 to 125 |

**Notes:**

<sup>(1)</sup>Our SO-8 package used for voltage regulators is modified internally to have pins 2, 3, 6 and 7 electrically communed to the die attach flag. This particular frame decreases the total thermal resistance of the package and increases its ability to dissipate power when an appropriate area of copper on the printed circuit board is available for heat-sinking. The external dimensions are the same as for the standard SO-8.

Table 2: Thermal data

| Symbol            | Parameter                                 | SO-8              | TO-92 | SOT-89            | Unit |
|-------------------|---|-------------------|-------|-------------------|------|
| R <sub>thJC</sub> | Thermal resistance junction-case (max)    | 20                |       | 15                | °C/W |
| R <sub>thJA</sub> | Thermal resistance junction-ambient (max) | 55 <sup>(1)</sup> | 200   | 55 <sup>(1)</sup> | °C/W |

**Notes:**

<sup>(1)</sup>Considering 6 cm<sup>2</sup> of copper Board heat-sink.

## 4 Electrical characteristics

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 8.3$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 3: Electrical characteristics of L78L33C**

| Symbol       | Parameter                | Test conditions   | Min.  | Typ. | Max.  | Unit    |
|--------------|--------------------------|---|-------|------|-------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C   | 3.036 | 3.3  | 3.564 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 5.3$ to $20$ V                           | 2.97  |      | 3.63  | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 8.3$ V                                   | 2.97  |      | 3.63  |         |
| $\Delta V_O$ | Line regulation          | $V_I = 5.4$ to $20$ V, $T_J = 25$ °C                                  |       |      | 150   | mV      |
|              |                          | $V_I = 6.3$ to $20$ V, $T_J = 25$ °C                                  |       |      | 100   |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                                  |       |      | 60    | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                   |       |      | 30    |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C   |       |      | 6     | mA      |
|              |                          | $T_J = 125$ °C  |       |      | 5.5   | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA  |       |      | 0.2   | mA      |
|              |                          | $V_I = 6.3$ to $20$ V   |       |      | 1.5   |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                               |       | 40   |       | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 6.3$ to $16.3$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 41    | 49   |       | dB      |
| $V_d$        | Dropout voltage          |   |       | 2    |       | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 10$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 4: Electrical characteristics of L78L05C**

| Symbol       | Parameter                | Test conditions   | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|---|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C   | 4.6  | 5    | 5.4  | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 7$ to $20$ V                         | 4.5  |      | 5.5  | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 10$ V                                | 4.5  |      | 5.5  |         |
| $\Delta V_O$ | Line regulation          | $V_I = 8.5$ to $20$ V, $T_J = 25$ °C                              |      |      | 200  | mV      |
|              |                          | $V_I = 9$ to $20$ V, $T_J = 25$ °C                                |      |      | 150  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                              |      |      | 60   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                               |      |      | 30   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C   |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C  |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA  |      |      | 0.2  | mA      |
|              |                          | $V_I = 8$ to $20$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                           |      | 40   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 9$ to $20$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 40   | 49   |      | dB      |
| $V_d$        | Dropout voltage          |   |      | 2    |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 14$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 5: Electrical characteristics of L78L08C

| Symbol       | Parameter                | Test conditions   | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|---|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C   | 7.36 | 8    | 8.64 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 8.5$ to $20$ V                       | 7.2  |      | 8.8  | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 12$ V                                | 7.2  |      | 8.8  |         |
| $\Delta V_O$ | Line regulation          | $V_I = 10.5$ to $20$ V, $T_J = 25$ °C                             |      |      | 200  | mV      |
|              |                          | $V_I = 11$ to $20$ V, $T_J = 25$ °C                               |      |      | 150  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                              |      |      | 80   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                               |      |      | 40   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C   |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C  |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA  |      |      | 0.2  | mA      |
|              |                          | $V_I = 8$ to $20$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                           |      | 60   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 9$ to $20$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 36   | 45   |      | dB      |
| $V_d$        | Dropout voltage          |   |      | 1.7  |      | V       |



Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 15$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 6: Electrical characteristics of L78L09C**

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 8.28 | 9    | 9.72 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 11.5$ to $23$ V                       | 8.1  |      | 9.9  | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 15$ V                                 | 8.1  |      | 9.9  |         |
| $\Delta V_O$ | Line regulation          | $V_I = 11.5$ to $23$ V, $T_J = 25$ °C                              |      |      | 250  | mV      |
|              |                          | $V_I = 12$ to $23$ V, $T_J = 25$ °C                                |      |      | 200  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 80   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 40   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.2  | mA      |
|              |                          | $V_I = 12$ to $23$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 70   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 12$ to $23$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 36   | 44   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 16$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 7: Electrical characteristics of L78L10C

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 9.2  | 10   | 10.8 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 12.5$ to $23$ V                       | 9    |      | 11   | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 16$ V                                 | 9    |      | 11   |         |
| $\Delta V_O$ | Line regulation          | $V_I = 12.5$ to $23$ V, $T_J = 25$ °C                              |      |      | 230  | mV      |
|              |                          | $V_I = 13$ to $23$ V, $T_J = 25$ °C                                |      |      | 170  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 80   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 40   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.1  | mA      |
|              |                          | $V_I = 13$ to $23$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 60   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 14$ to $23$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 37   | 45   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 19$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 8: Electrical characteristics of L78L12C**

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 11.1 | 12   | 12.9 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 14.5$ to $27$ V                       | 10.8 |      | 13.2 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 19$ V                                 | 10.8 |      | 13.2 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 14.5$ to $27$ V, $T_J = 25$ °C                              |      |      | 250  | mV      |
|              |                          | $V_I = 16$ to $27$ V, $T_J = 25$ °C                                |      |      | 200  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 100  | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 50   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.2  | mA      |
|              |                          | $V_I = 16$ to $27$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 80   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 15$ to $25$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 36   | 42   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 23$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified

Table 9: Electrical characteristics of L78L15C

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 13.8 | 15   | 16.2 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 17.5$ to $30$ V                           | 13.5 |      | 16.5 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 23$ V                                     | 13.5 |      | 16.5 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 17.5$ to $30$ V, $T_J = 25$ °C                                  |      |      | 300  | mV      |
|              |                          | $V_I = 20$ to $30$ V, $T_J = 25$ °C                                    |      |      | 250  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                                   |      |      | 150  | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                    |      |      | 75   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.2  | mA      |
|              |                          | $V_I = 20$ to $30$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                                |      | 90   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 18.5$ to $28.5$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 33   | 39   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 27$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 10: Electrical characteristics of L78L18C

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 16.6 | 18   | 19.4 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 22$ to $33$ V                         | 16.2 |      | 19.8 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 27$ V                                 | 16.2 |      | 19.8 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 22$ to $33$ V, $T_J = 25$ °C                                |      |      | 320  | mV      |
|              |                          | $V_I = 22$ to $33$ V, $T_J = 25$ °C                                |      |      | 270  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 170  | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 85   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.2  | mA      |
|              |                          | $V_I = 23$ to $33$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 120  |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 23$ to $33$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 32   | 38   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 33$  V,  $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 11: Electrical characteristics of L78L24C

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 22.1 | 24   | 25.9 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 27$ to $38$ V                         | 21.6 |      | 26.4 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 33$ V                                 | 21.6 |      | 26.4 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 27$ to $38$ V, $T_J = 25$ °C                                |      |      | 350  | mV      |
|              |                          | $V_I = 28$ to $38$ V, $T_J = 25$ °C                                |      |      | 300  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 200  | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 100  |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.2  | mA      |
|              |                          | $V_I = 28$ to $38$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 200  |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 29$ to $35$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 30   | 37   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 8.3$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 12: Electrical characteristics of L78L33AB and L78L33AC**

| Symbol       | Parameter                | Test conditions   | Min.  | Typ. | Max.  | Unit    |
|--------------|--------------------------|---|-------|------|-------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C   | 3.168 | 3.3  | 3.432 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 5.3$ to $20$ V                           | 3.135 |      | 3.465 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 8.3$ V                                   | 3.135 |      | 3.465 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 5.4$ to $20$ V, $T_J = 25$ °C                                  |       |      | 150   | mV      |
|              |                          | $V_I = 6.3$ to $20$ V, $T_J = 25$ °C                                  |       |      | 100   |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                                  |       |      | 60    | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                   |       |      | 30    |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C   |       |      | 6     | mA      |
|              |                          | $T_J = 125$ °C  |       |      | 5.5   | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA  |       |      | 0.1   | mA      |
|              |                          | $V_I = 6.3$ to $20$ V   |       |      | 1.5   |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                               |       | 40   |       | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 6.3$ to $16.3$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 41    | 49   |       | dB      |
| $V_d$        | Dropout voltage          |   |       | 2    |       | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 10$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 13: Electrical characteristics of L78L05AB and L78L05AC

| Symbol       | Parameter                | Test conditions   | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|---|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C   | 4.8  | 5    | 5.2  | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 7$ to $20$ V                         | 4.75 |      | 5.25 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 10$ V                                | 4.75 |      | 5.25 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 7.3$ to $20$ V, $T_J = 25$ °C                              |      |      | 150  | mV      |
|              |                          | $V_I = 8$ to $20$ V, $T_J = 25$ °C                                |      |      | 100  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                              |      |      | 60   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                               |      |      | 30   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C   |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C  |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA  |      |      | 0.1  | mA      |
|              |                          | $V_I = 8$ to $20$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                           |      | 40   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 8$ to $18$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 41   | 49   |      | dB      |
| $V_d$        | Dropout voltage          |   |      | 2    |      | V       |



Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 12$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 14: Electrical characteristics of L78L06AB and L78L06AC**

| Symbol       | Parameter                | Test conditions   | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|---|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C   | 5.76 | 6    | 6.24 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 8.5$ to $20$ V                       | 5.7  |      | 6.3  | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 12$ V                                | 5.7  |      | 6.3  |         |
| $\Delta V_O$ | Line regulation          | $V_I = 8.5$ to $20$ V, $T_J = 25$ °C                              |      |      | 150  | mV      |
|              |                          | $V_I = 9$ to $20$ V, $T_J = 25$ °C                                |      |      | 100  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                              |      |      | 60   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                               |      |      | 30   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C   |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C  |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA  |      |      | 0.1  | mA      |
|              |                          | $V_I = 9$ to $20$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                           |      | 50   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 9$ to $20$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 39   | 46   |      | dB      |
| $V_d$        | Dropout voltage          |   |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 14$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 15: Electrical characteristics of L78L08AB and L78L08AC

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 7.68 | 8    | 8.32 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 10.5$ to $23$ V                       | 7.6  |      | 8.4  | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 14$ V                                 | 7.6  |      | 8.4  |         |
| $\Delta V_O$ | Line regulation          | $V_I = 10.5$ to $23$ V, $T_J = 25$ °C                              |      |      | 175  | mV      |
|              |                          | $V_I = 11$ to $23$ V, $T_J = 25$ °C                                |      |      | 125  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 80   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 40   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.1  | mA      |
|              |                          | $V_I = 11$ to $23$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 60   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 12$ to $23$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 37   | 45   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 15$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 16: Electrical characteristics of L78L09AB and L78L09AC**

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 8.64 | 9    | 9.36 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 11.5$ to $23$ V                       | 8.55 |      | 9.45 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 15$ V                                 | 8.55 |      | 9.45 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 11.5$ to $23$ V, $T_J = 25$ °C                              |      |      | 225  | mV      |
|              |                          | $V_I = 12$ to $23$ V, $T_J = 25$ °C                                |      |      | 150  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 80   | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 40   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6    | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 5.5  | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.1  | mA      |
|              |                          | $V_I = 12$ to $23$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 70   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 12$ to $23$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 37   | 44   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ °C}$  (AC)  $T_J = -40$  to  $125\text{ °C}$  (AB),  $V_I = 16\text{ V}$ ,  
 $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

Table 17: Electrical characteristics of L78L10AC

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|--|------|------|------|---------------|
| $V_O$        | Output voltage           | $T_J = 25\text{ °C}$   | 9.6  | 10   | 10.4 | V             |
| $V_O$        | Output voltage           | $I_O = 1$ to $40\text{ mA}$ , $V_I = 12.5$ to $23\text{ V}$                                      | 9.5  |      | 10.5 | V             |
|              |                          | $I_O = 1$ to $70\text{ mA}$ , $V_I = 16\text{ V}$  | 9.5  |      | 10.5 |               |
| $\Delta V_O$ | Line regulation          | $V_I = 12.5$ to $23\text{ V}$ , $T_J = 25\text{ °C}$   |      |      | 230  | mV            |
|              |                          | $V_I = 13$ to $23\text{ V}$ , $T_J = 25\text{ °C}$   |      |      | 170  |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100\text{ mA}$ , $T_J = 25\text{ °C}$  |      |      | 80   | mV            |
|              |                          | $I_O = 1$ to $40\text{ mA}$ , $T_J = 25\text{ °C}$   |      |      | 40   |               |
| $I_d$        | Quiescent current        | $T_J = 25\text{ °C}$   |      |      | 6    | mA            |
|              |                          | $T_J = 125\text{ °C}$  |      |      | 5.5  | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40\text{ mA}$  |      |      | 0.1  | mA            |
|              |                          | $V_I = 13$ to $23\text{ V}$  |      |      | 1.5  |               |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25\text{ °C}$                                    |      | 60   |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = 14$ to $23\text{ V}$ , $f = 120\text{ Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25\text{ °C}$ | 37   | 45   |      | dB            |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V             |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 19$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 18: Electrical characteristics of L78L12AB and L78L12AC

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 11.5 | 12   | 12.5 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 14.5$ to $27$ V                       | 11.4 |      | 12.6 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 19$ V                                 | 11.4 |      | 12.6 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 14.5$ to $27$ V, $T_J = 25$ °C                              |      |      | 250  | mV      |
|              |                          | $V_I = 16$ to $27$ V, $T_J = 25$ °C                                |      |      | 200  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 100  | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 50   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.1  | mA      |
|              |                          | $V_I = 16$ to $27$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 80   |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 15$ to $25$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 37   | 42   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^\circ\text{C}$  (AC)  $T_J = -40$  to  $125\text{ }^\circ\text{C}$  (AB),  $V_I = 23\text{ V}$ ,  
 $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

Table 19: Electrical characteristics of L78L15AB and L78L15AC

| Symbol       | Parameter                | Test conditions  | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|--|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $T_J = 25\text{ }^\circ\text{C}$   | 14.4  | 15   | 15.6  | V             |
| $V_O$        | Output voltage           | $I_O = 1$ to $40\text{ mA}$ , $V_I = 17.5$ to $30\text{ V}$  | 14.25 |      | 15.75 | V             |
|              |                          | $I_O = 1$ to $70\text{ mA}$ , $V_I = 23\text{ V}$  | 14.25 |      | 15.75 |               |
| $\Delta V_O$ | Line regulation          | $V_I = 17.5$ to $30\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$   |       |      | 300   | mV            |
|              |                          | $V_I = 20$ to $30\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$   |       |      | 250   |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$  |       |      | 150   | mV            |
|              |                          | $I_O = 1$ to $40\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$   |       |      | 75    |               |
| $I_d$        | Quiescent current        | $T_J = 25\text{ }^\circ\text{C}$   |       |      | 6.5   | mA            |
|              |                          | $T_J = 125\text{ }^\circ\text{C}$  |       |      | 6     | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40\text{ mA}$  |       |      | 0.1   | mA            |
|              |                          | $V_I = 20$ to $30\text{ V}$  |       |      | 1.5   |               |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$  |       | 90   |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = 18.5$ to $28.5\text{ V}$ , $f = 120\text{ Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$ | 34    | 39   |       | dB            |
| $V_d$        | Dropout voltage          |  |       | 1.7  |       | V             |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 27$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 20: Electrical characteristics of L78L18AC

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 17.3 | 18   | 18.7 | V       |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 22$ to $33$ V                         | 17.1 |      | 18.9 | V       |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 27$ V                                 | 17.1 |      | 18.9 |         |
| $\Delta V_O$ | Line regulation          | $V_I = 22$ to $33$ V, $T_J = 25$ °C                                |      |      | 320  | mV      |
|              |                          | $V_I = 22$ to $33$ V, $T_J = 25$ °C                                |      |      | 270  |         |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 170  | mV      |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 85   |         |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA      |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA      |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.1  | mA      |
|              |                          | $V_I = 23$ to $33$ V   |      |      | 1.5  |         |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 120  |      | $\mu$ V |
| SVR          | Supply voltage rejection | $V_I = 23$ to $33$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 33   | 38   |      | dB      |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V       |

Refer to the test circuits,  $T_J = 0$  to  $125$  °C (AC)  $T_J = -40$  to  $125$  °C (AB),  $V_I = 33$  V,  
 $I_O = 40$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

Table 21: Electrical characteristics of L78L24AB and L78L24AC

| Symbol       | Parameter                | Test conditions  | Min. | Typ. | Max. | Unit      |
|--------------|--------------------------|--|------|------|------|-----------|
| $V_O$        | Output voltage           | $T_J = 25$ °C  | 23   | 24   | 25   | V         |
| $V_O$        | Output voltage           | $I_O = 1$ to $40$ mA, $V_I = 27$ to $38$ V                         | 22.8 |      | 25.2 | V         |
|              |                          | $I_O = 1$ to $70$ mA, $V_I = 33$ V                                 | 22.8 |      | 25.2 |           |
| $\Delta V_O$ | Line regulation          | $V_I = 27$ to $38$ V, $T_J = 25$ °C                                |      |      | 350  | mV        |
|              |                          | $V_I = 28$ to $38$ V, $T_J = 25$ °C                                |      |      | 300  |           |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100$ mA, $T_J = 25$ °C                               |      |      | 200  | mV        |
|              |                          | $I_O = 1$ to $40$ mA, $T_J = 25$ °C                                |      |      | 100  |           |
| $I_d$        | Quiescent current        | $T_J = 25$ °C  |      |      | 6.5  | mA        |
|              |                          | $T_J = 125$ °C   |      |      | 6    | mA        |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40$ mA   |      |      | 0.1  | mA        |
|              |                          | $V_I = 28$ to $38$ V   |      |      | 1.5  |           |
| eN           | Output noise voltage     | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                            |      | 200  |      | $\mu$ V5y |
| SVR          | Supply voltage rejection | $V_I = 29$ to $33$ V, $f = 120$ Hz<br>$I_O = 40$ mA, $T_J = 25$ °C | 31   | 37   |      | dB        |
| $V_d$        | Dropout voltage          |  |      | 1.7  |      | V         |



# 5 Typical performance

Figure 4: L78L05/12 output voltage vs. ambient temperature

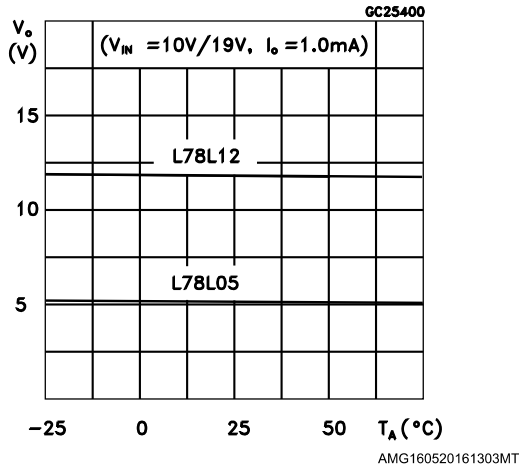


Figure 5: L78L05/12/24 load characteristics

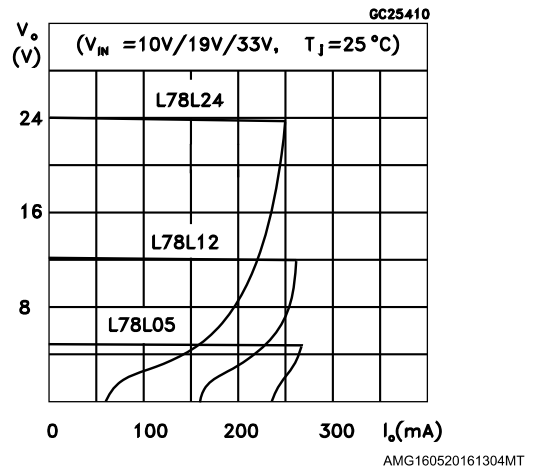


Figure 6: L78L05/12/24 thermal shutdown

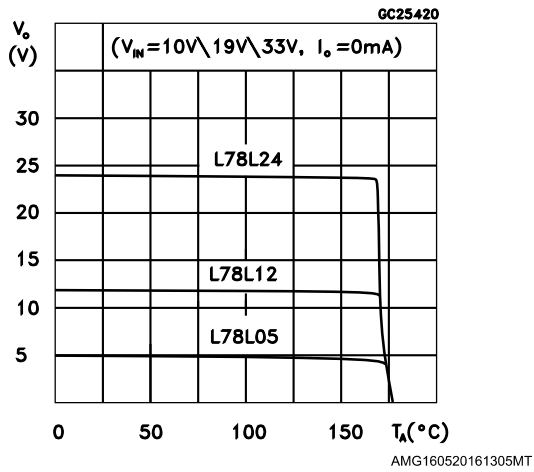


Figure 7: L78L05/12 quiescent current vs. output current

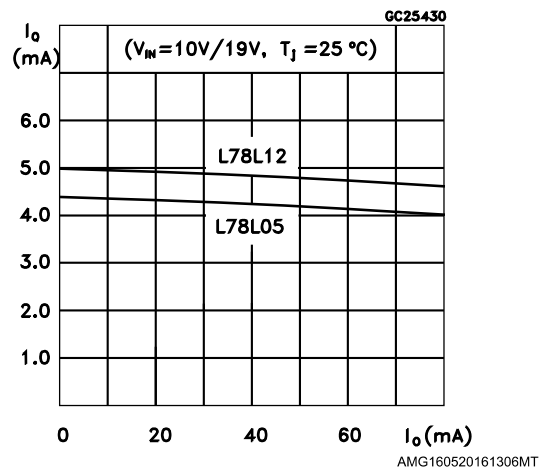


Figure 8: L78L05 quiescent current vs. input voltage

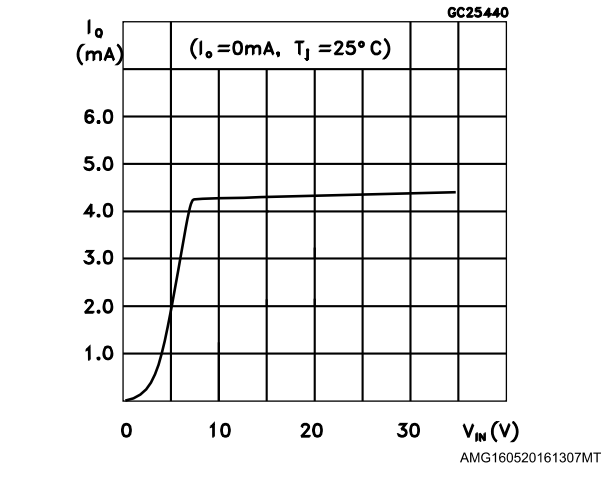


Figure 9: L78L05/12/24 output characteristics

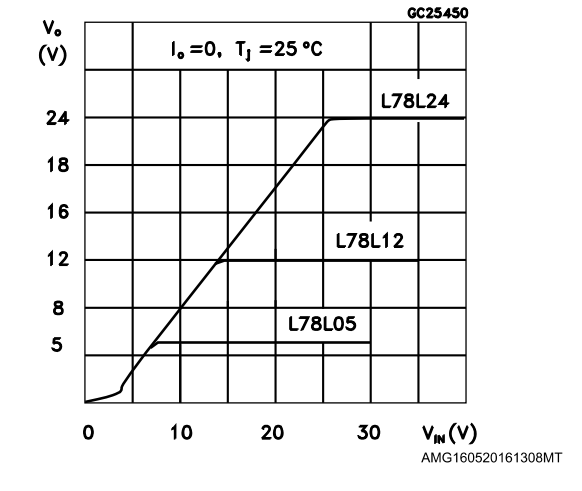


Figure 10: L78L05/12/24 ripple rejection

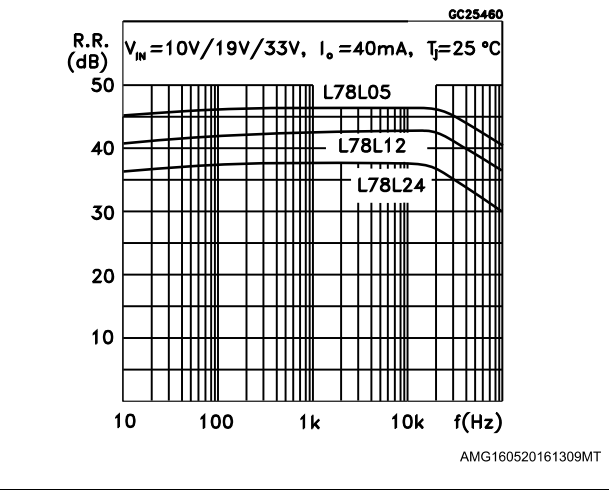


Figure 11: L78L05 dropout characteristics

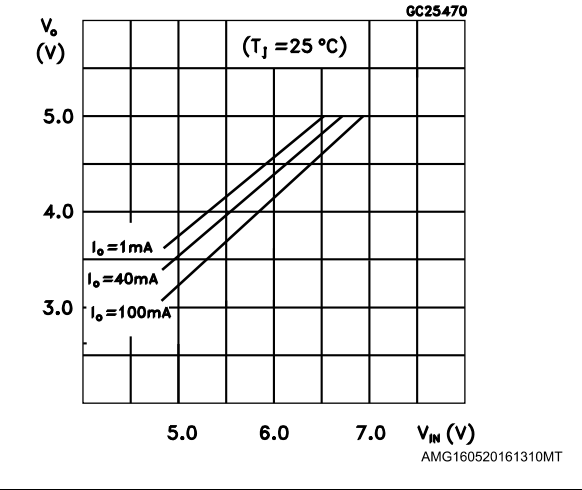
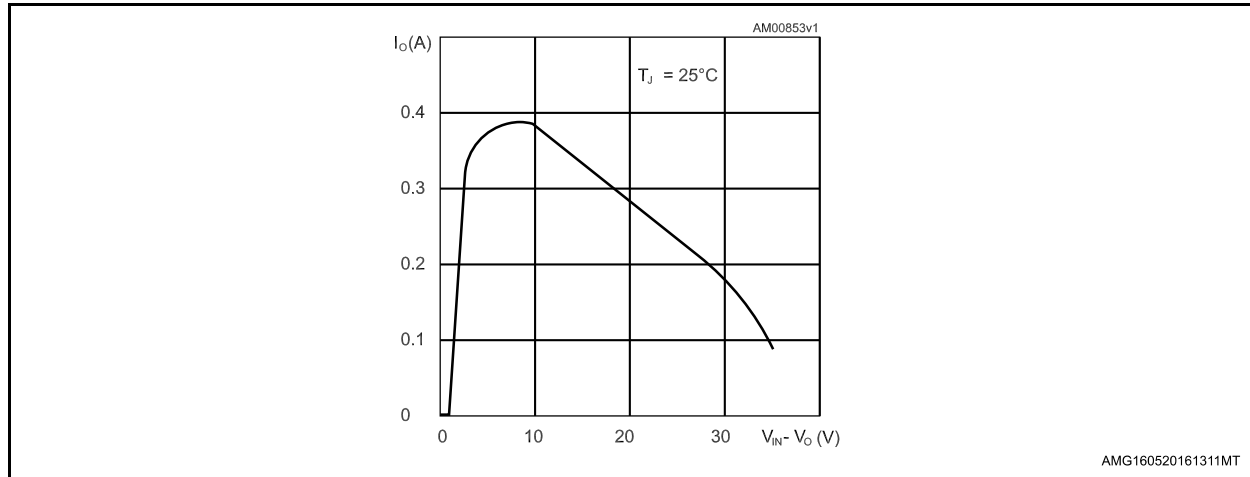


Figure 12: L78L short-circuit output current



## 6 Typical application

Figure 13: High output current short-circuit protected

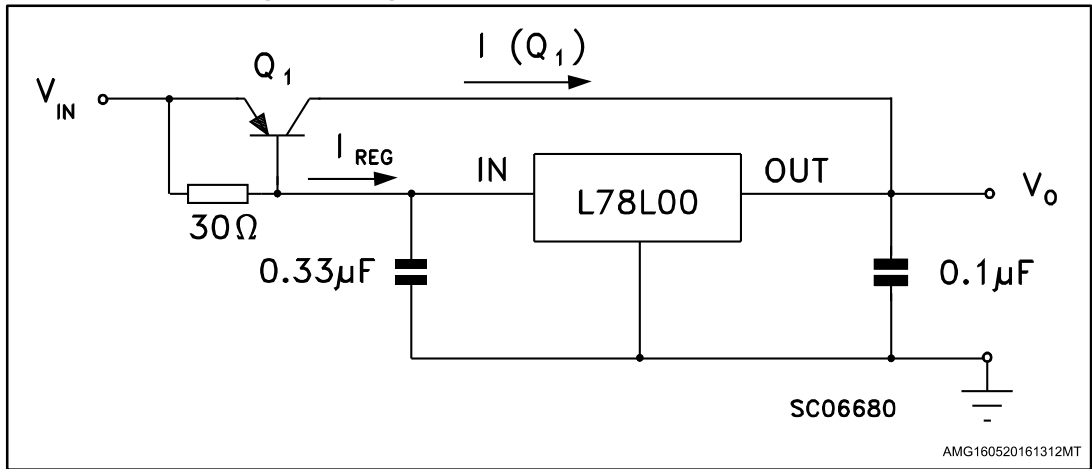


Figure 14: Output boost circuit

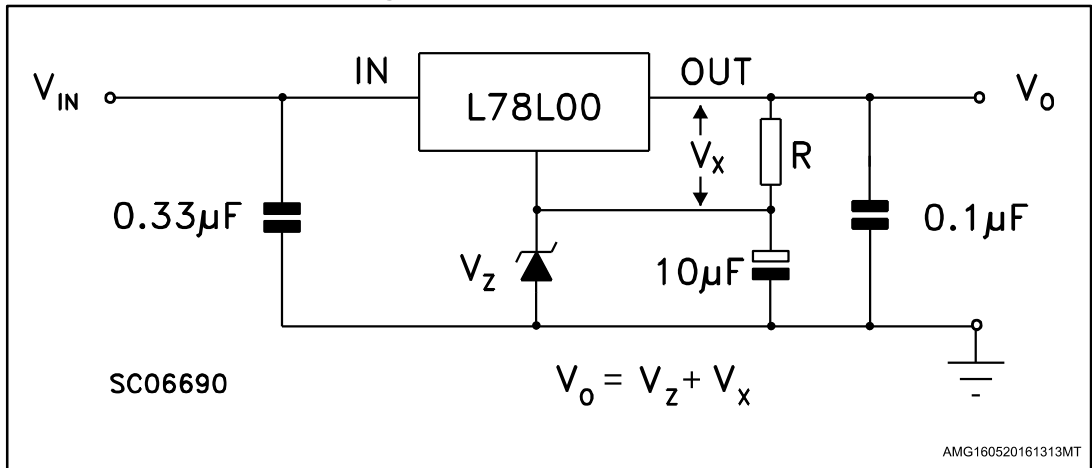


Figure 15: Current regulator

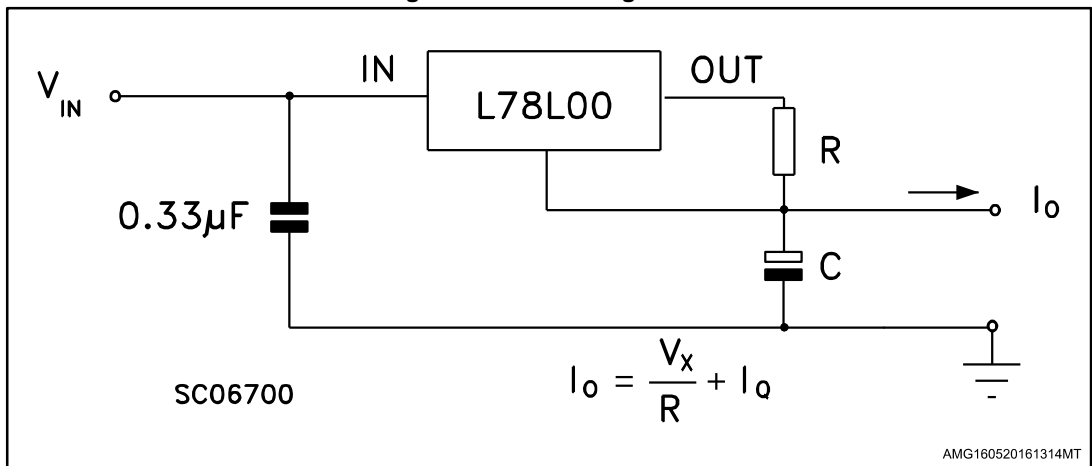
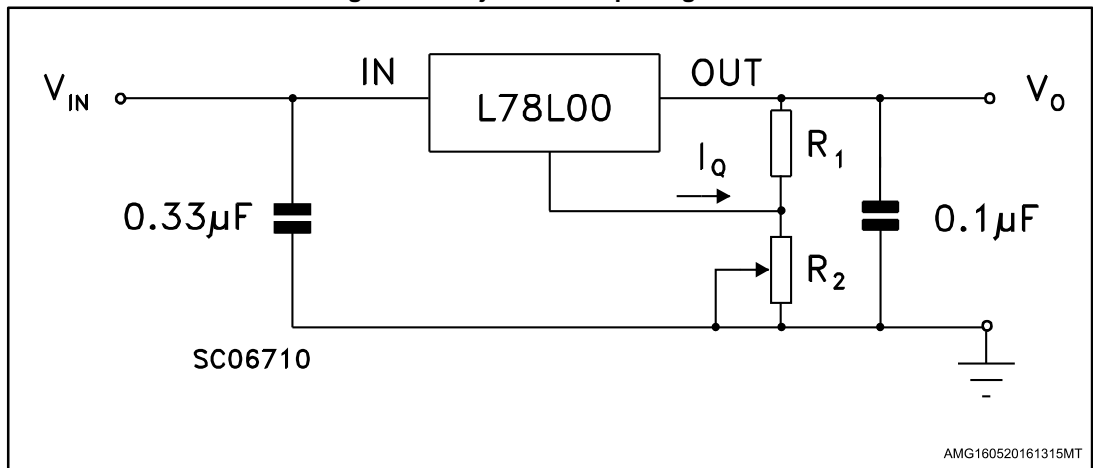


Figure 16: Adjustable output regulator

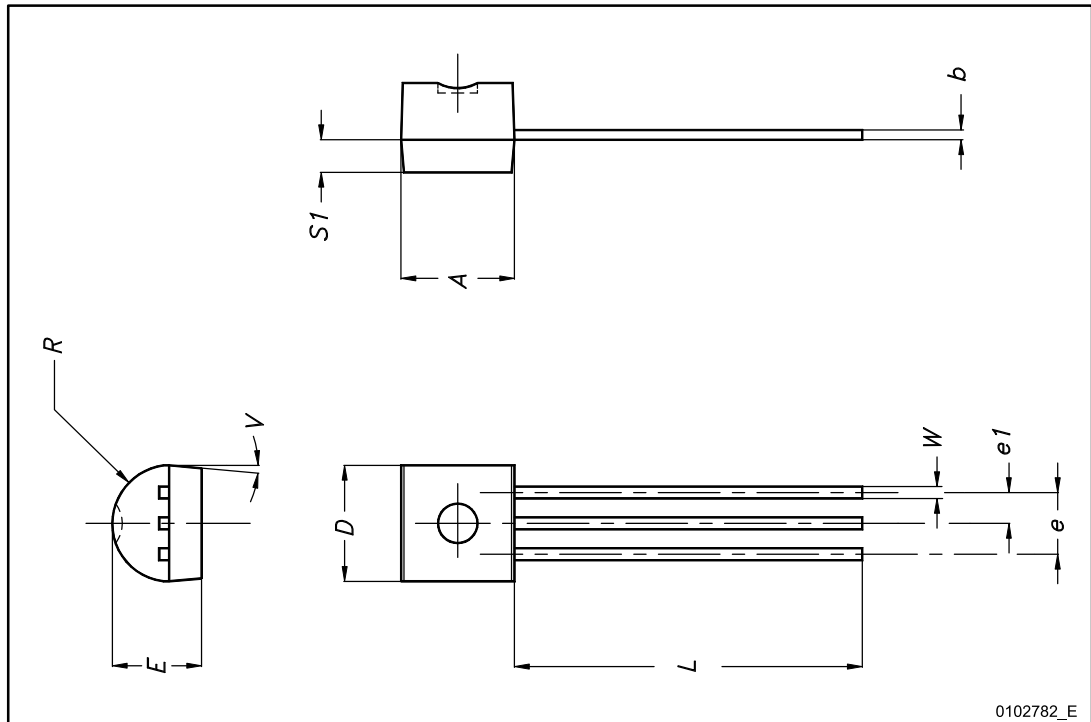


## 7 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

### 7.1 TO-92 package information

Figure 17: TO-92 package outline



0102782\_E

Table 22: TO-92 mechanical data

| Dim. | mm    |      |       |
|------|-------|------|-------|
|      | Min.  | Typ. | Max.  |
| A    | 4.32  |      | 4.95  |
| b    | 0.36  |      | 0.51  |
| D    | 4.45  |      | 4.95  |
| E    | 3.30  |      | 3.94  |
| e    | 2.41  |      | 2.67  |
| e1   | 1.14  |      | 1.40  |
| L    | 12.70 |      | 15.49 |
| R    | 2.16  |      | 2.41  |
| S1   | 0.92  |      | 1.52  |
| W    | 0.41  |      | 0.56  |
| V    |       | 5°   |       |

## 7.2 TO-92 packing information

Figure 18: TO-92 tape and reel outline

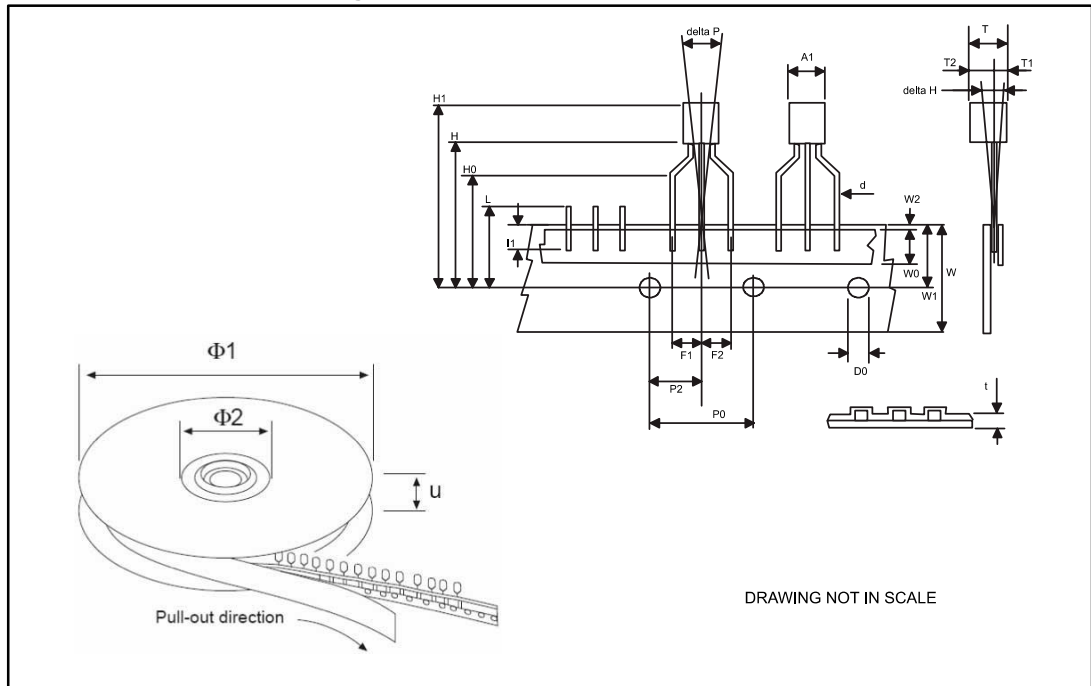


Table 23: TO-92 tape and reel mechanical data

| Dim.    | mm    |       |       |
|---------|-------|-------|-------|
|         | Min.  | Typ.  | Max.  |
| A1      |       |       | 4.80  |
| T       |       |       | 3.80  |
| T1      |       |       | 1.60  |
| T2      |       |       | 2.30  |
| d       | 0.45  | 0.47  | 0.48  |
| P0      | 12.50 | 12.70 | 12.90 |
| P2      | 5.65  | 6.35  | 7.05  |
| F1, F2  | 2.40  | 2.50  | 2.94  |
| F3      | 4.98  | 5.08  | 5.48  |
| delta H | -2.00 |       | 2.00  |
| W       | 17.50 | 18.00 | 19.00 |
| W0      | 5.5   | 6.00  | 6.5   |
| W1      | 8.50  | 9.00  | 9.25  |
| W2      |       |       | 0.50  |
| H       |       | 18.50 | 21    |
| H3      | 0.5   | 1     | 2     |
| H0      | 15.50 | 16.00 | 18.8  |
| H1      |       | 25.0  | 27.0  |
| D0      | 3.80  | 4.00  | 4.20  |
| t       |       |       | 0.90  |
| L       |       |       | 11.00 |
| l1      | 3.00  |       |       |
| delta P | -1.00 |       | 1.00  |
| Ø1      | 352   | 355   | 358   |
| Ø2      | 28    | 30    | 32    |
| u       | 44    | 47    | 50    |

### 7.3 TO-92 Ammopak packing information

Figure 19: TO-92 Ammopak tape and reel outline

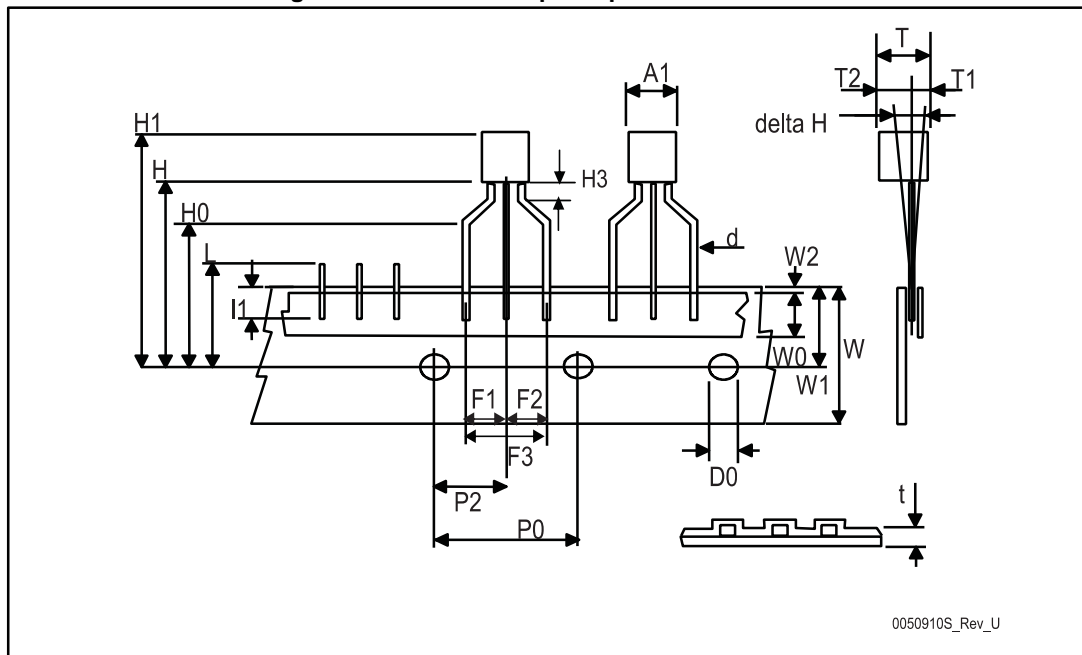




Table 24: TO-92 Ammopak tape and reel mechanical data

| Dim.    | mm    |       |       |
|---------|-------|-------|-------|
|         | Min.  | Typ.  | Max.  |
| A1      |       |       | 4.80  |
| T       |       |       | 3.80  |
| T1      |       |       | 1.60  |
| T2      |       |       | 2.30  |
| d       | 0.45  | 0.47  | 0.48  |
| P0      | 12.50 | 12.70 | 12.90 |
| P2      | 5.65  | 6.35  | 7.05  |
| F1, F2  | 2.40  | 2.50  | 2.94  |
| F3      | 4.98  | 5.08  | 5.48  |
| delta H | -2.00 |       | 2.00  |
| W       | 17.50 | 18.00 | 19.00 |
| W0      | 5.5   | 6.00  | 6.5   |
| W1      | 8.50  | 9.00  | 9.25  |
| W2      |       |       | 0.50  |
| H       |       | 18.50 | 21    |
| H3      | 0.5   | 1     | 2     |
| H0      | 15.50 | 16.00 | 18.8  |
| H1      |       | 25.0  | 27.0  |
| D0      | 3.80  | 4.00  | 4.20  |
| t       |       |       | 0.90  |
| L       |       |       | 11.00 |
| I1      | 3.00  |       |       |
| delta P | -1.00 |       | 1.00  |

### 7.4 SO-8 package information

Figure 20: SO-8 package outline

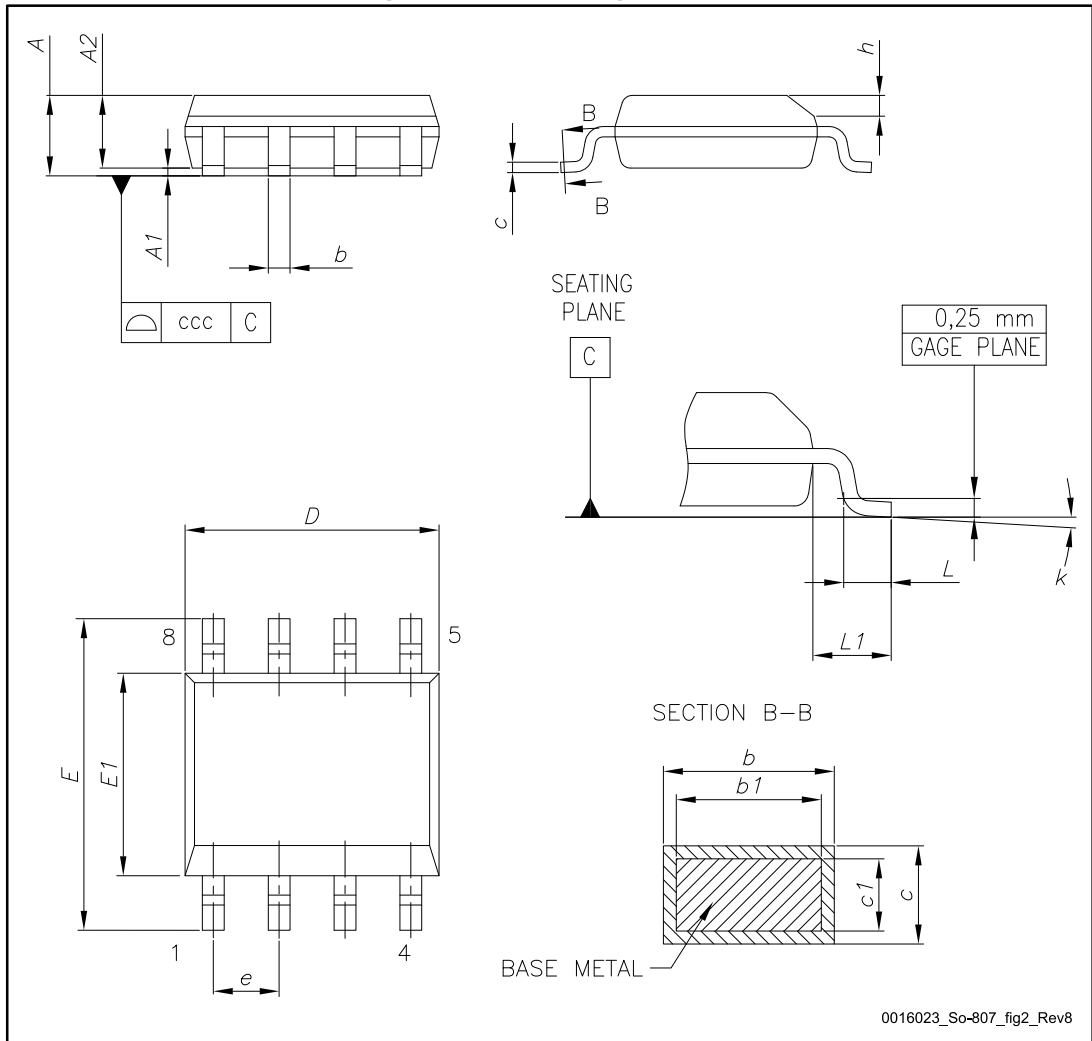
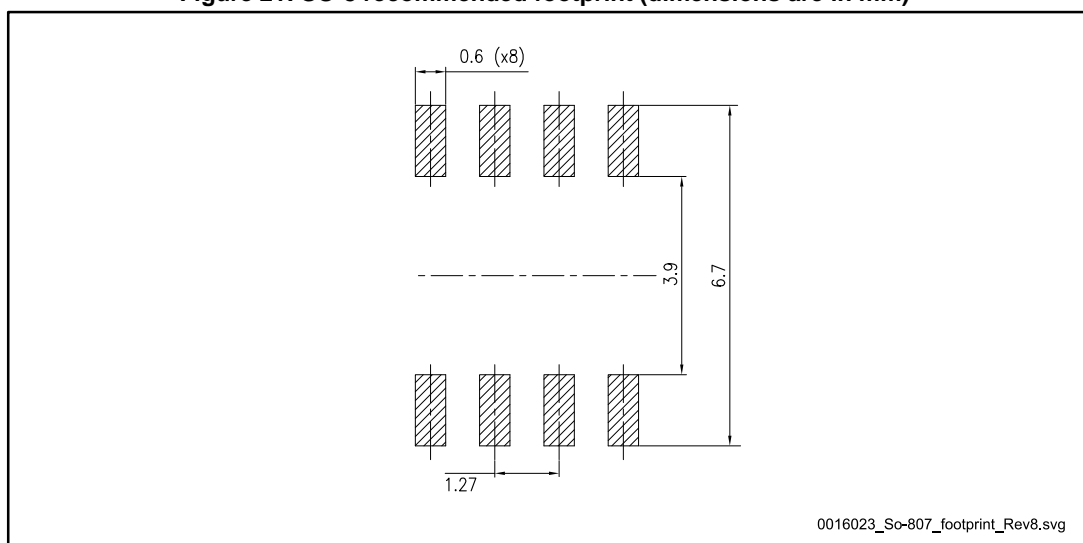


Table 25: SO-8 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 1.75 |
| A1   | 0.10 |      | 0.25 |
| A2   | 1.25 |      |      |
| b    | 0.31 |      | 0.51 |
| b1   | 0.28 |      | 0.48 |
| c    | 0.10 |      | 0.25 |
| c1   | 0.10 |      | 0.23 |
| D    | 4.80 | 4.90 | 5.00 |
| E    | 5.80 | 6.00 | 6.20 |
| E1   | 3.80 | 3.90 | 4.00 |
| e    |      | 1.27 |      |
| h    | 0.25 |      | 0.50 |
| L    | 0.40 |      | 1.27 |
| L1   |      | 1.04 |      |
| L2   |      | 0.25 |      |
| k    | 0°   |      | 8°   |
| ccc  |      |      | 0.10 |

Figure 21: SO-8 recommended footprint (dimensions are in mm)



## 7.5 SO-8 packing information

Figure 22: SO-8 tape and reel dimensions

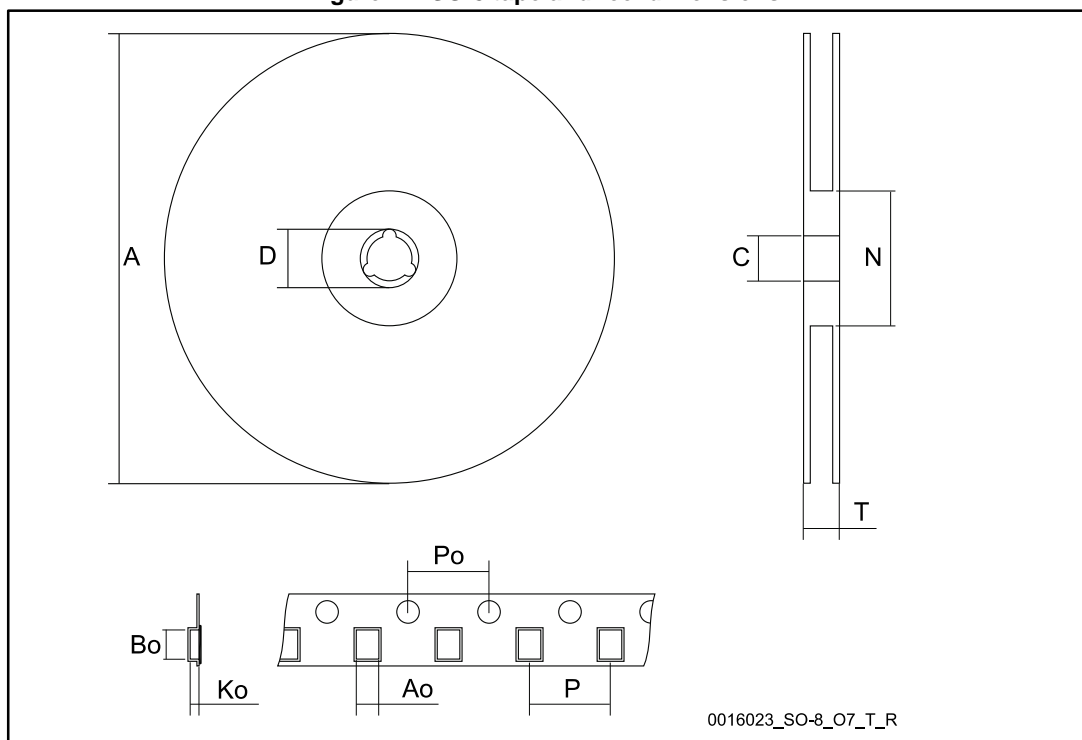


Table 26: SO-8 tape and reel mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 330  |
| C    | 12.8 |      | 13.2 |
| D    | 20.2 |      |      |
| N    | 60   |      |      |
| T    |      |      | 22.4 |
| Ao   | 8.1  |      | 8.5  |
| Bo   | 5.5  |      | 5.9  |
| Ko   | 2.1  |      | 2.3  |
| Po   | 3.9  |      | 4.1  |
| P    | 7.9  |      | 8.1  |

### 7.6 SOT-89 package information

Figure 23: SOT-89 package outline

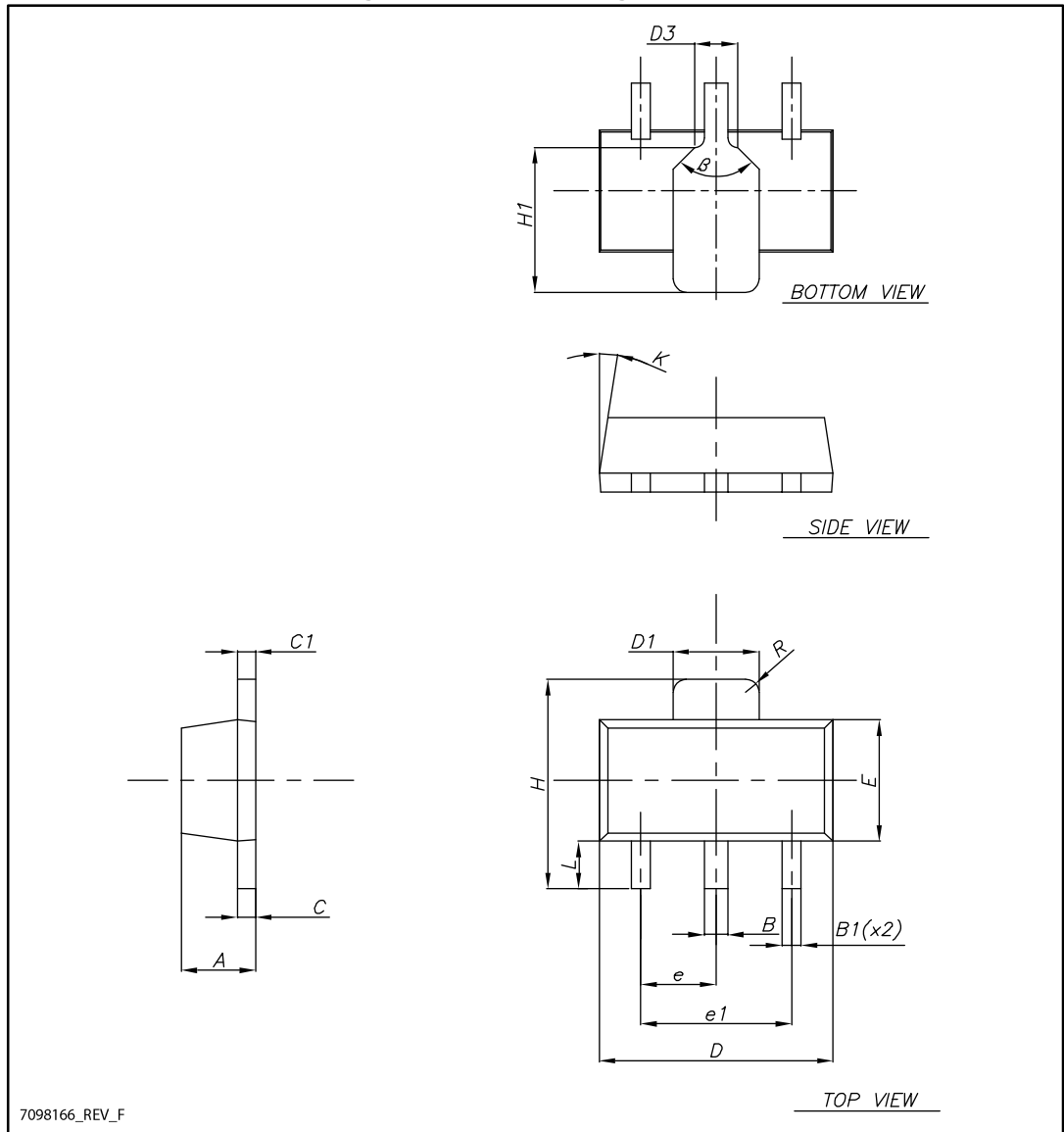
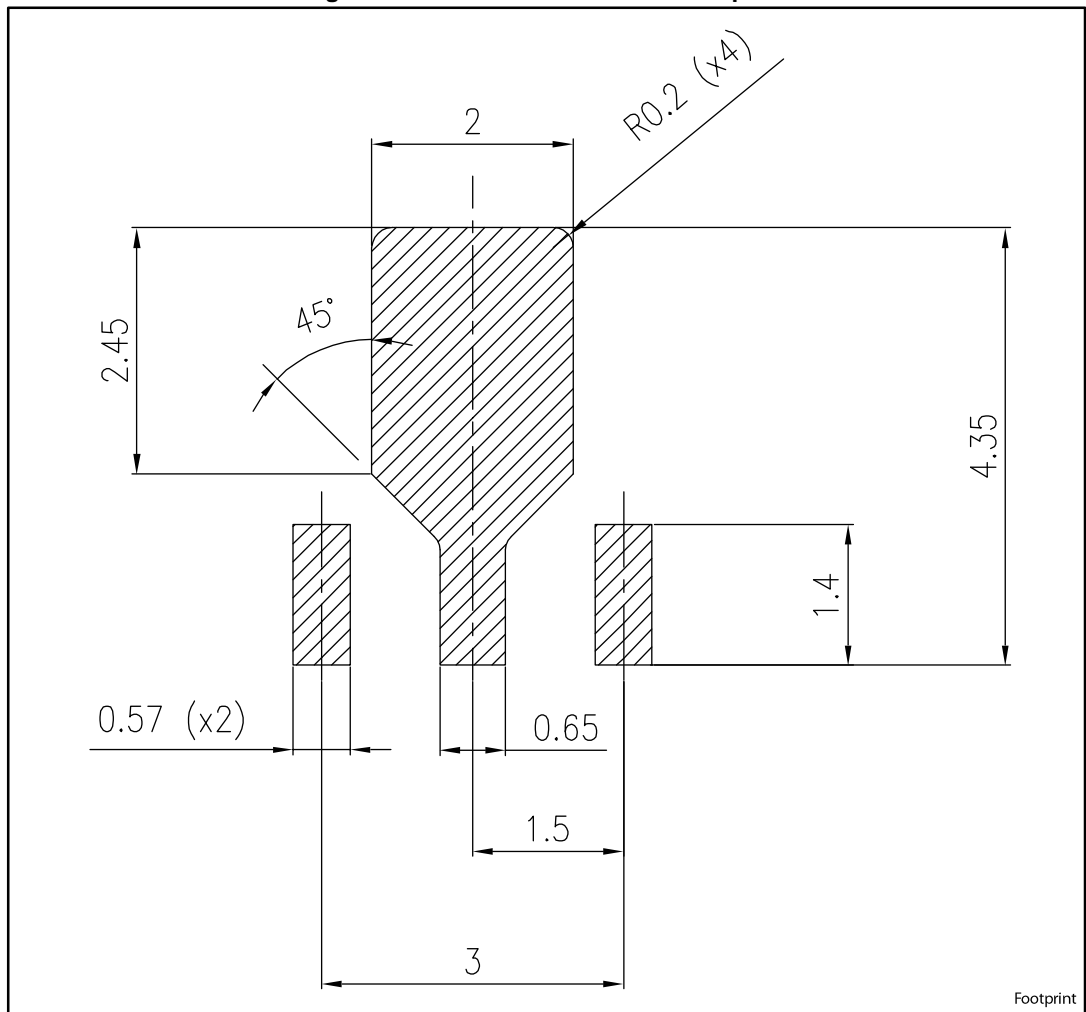


Table 27: SOT-89 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 1.40 |      | 1.60 |
| B    | 0.44 |      | 0.56 |
| B1   | 0.36 |      | 0.48 |
| C    | 0.35 |      | 0.44 |
| C1   | 0.35 |      | 0.44 |
| D    | 4.40 |      | 4.60 |
| D1   | 1.62 |      | 1.83 |
| D3   |      | 0.90 |      |
| E    | 2.29 |      | 2.60 |
| e    | 1.42 |      | 1.57 |
| e1   | 2.92 |      | 3.07 |
| H    | 3.94 |      | 4.25 |
| H1   | 2.70 |      | 3.10 |
| K    | 1°   |      | 8°   |
| L    | 0.89 |      | 120  |
| R    |      | 0.25 |      |
| β    |      | 90°  |      |

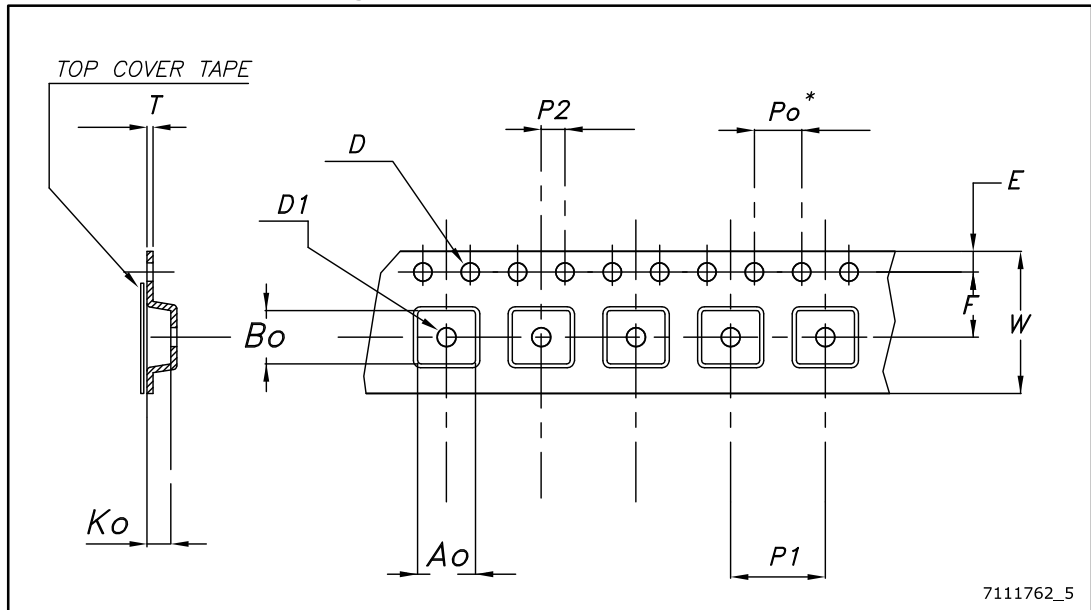
Figure 24: SOT-89 recommended footprint



Footprint

### 7.7 SOT-89 packing information

Figure 25: SOT-89 carrier tape outline



7111762\_5

Table 28: SOT-89 carrier tape mechanical data

| Dim. | mm     |           |
|------|--------|-----------|
|      | Value  | Tolerance |
| Ao   | 4.91   | ± 0.10    |
| Bo   | 4.52   | ± 0.10    |
| Ko   | 1.90   | ± 0.10    |
| F    | 5.50   | ± 0.10    |
| E    | 1.75   | ± 0.10    |
| W    | 12     | ± 0.30    |
| P2   | 2      | ± 0.10    |
| Po   | 4      | ± 0.10    |
| P1   | 8      | ± 0.10    |
| T    | 0.30   | ± 0.10    |
| D    | Ø 1.55 | ± 0.05    |
| D1   | Ø 1.60 | ± 0.10    |



## 8 Ordering information

Table 29: Order codes

| Part numbers  |                            |                  |                       |             | Output voltages (V) |
|---------------|----------------------------|------------------|-----------------------|-------------|---------------------|
| SO-8          | TO-92 (Bag) <sup>(1)</sup> | TO-92 (ammopack) | TO-92 (tape and reel) | SOT-89      |                     |
| L78L33ABD-TR  |                            | L78L33ABZ-AP     |                       | L78L33ABUTR | 3.3                 |
| L78L33ACD13TR | L78L33ACZ                  | L78L33ACZ-AP     | L78L33ACZTR           | L78L33ACUTR | 3.3                 |
| L78L33CD-TR   |                            |                  |                       |             | 3.3                 |
| L78L05ABD13TR | L78L05ABZ                  | L78L05ABZ-AP     | L78L05ABZ-TR          | L78L05ABUTR | 5                   |
| L78L05ACD13TR | L78L05ACZ                  | L78L05ACZ-AP     | L78L05ACZTR           | L78L05ACUTR | 5                   |
| L78L05CD13TR  | L78L05CZ                   |                  |                       |             | 5                   |
|               | L78L06ABZ                  |                  |                       | L78L06ABUTR | 6                   |
| L78L06ACD13TR |                            |                  |                       | L78L06ACUTR | 6                   |
| L78L08ABD13TR |                            | L78L08ABZ-AP     | L78L08ABZTR           | L78L08ABUTR | 8                   |
| L78L08ACD13TR | L78L08ACZ                  | L78L08ACZ-AP     | L78L08ACZTR           | L78L08ACUTR | 8                   |
| L78L08CD13TR  |                            |                  |                       |             | 8                   |
| L78L09ABD13TR | L78L09ABZ                  |                  |                       | L78L09ABUTR | 9                   |
| L78L09ACD13TR |                            | L78L09ACZ-AP     | L78L09ACZ-TR          | L78L09ACUTR | 9                   |
| L78L09CD13TR  |                            |                  |                       |             | 9                   |
|               |                            |                  |                       | L78L10ACUTR | 10                  |
| L78L12ABD-TR  | L78L12ABZ                  | L78L12ABZ-AP     |                       | L78L12ABUTR | 12                  |
| L78L12ACD13TR | L78L12ACZ                  | L78L12ACZ-AP     | L78L12ACZ-TR          | L78L12ACUTR | 12                  |
| L78L12CD13TR  |                            |                  |                       |             | 12                  |
|               |                            | L78L15ABZ-AP     |                       | L78L15ABUTR | 15                  |
| L78L15ACD13TR | L78L15ACZ                  |                  |                       | L78L15ACUTR | 15                  |
| L78L15CD-TR   |                            |                  |                       |             | 15                  |
|               |                            |                  |                       | L78L18ACUTR | 18                  |
| L78L18CD13TR  |                            |                  |                       |             | 18                  |
|               | L78L24ABZ-TR               |                  |                       |             | 24                  |
|               |                            |                  | L78L24ACZ-AP          | L78L24ACUTR | 24                  |
| L78L24CD-TR   |                            |                  |                       |             | 24                  |

### Notes:

<sup>(1)</sup>Available in Ammopak with the suffix "-AP" or in tape and reel with the suffix "TR". Please note that in these cases pins are shaped according to tape and reel specifications.

Table 30: Marking information

| Part numbers  | Marking | Packages | Output voltages |
|---------------|---------|----------|-----------------|
| L78L05ABD13TR | 78L05B  | SO-8     | 5 V             |
| L78L05ABUTR   | 8C      | SOT-89   | 5 V             |
| L78L05ABZ     | L78L05A | TO-92    | 5 V             |
| L78L05ABZ-AP  | L78L05A | TO-92    | 5 V             |
| L78L05ABZ-TR  | L78L05A | TO-92    | 5 V             |
| L78L05ACD13TR | 78L05A  | SO-8     | 5 V             |
| L78L05ACUTR   | 8C      | SOT-89   | 5 V             |
| L78L05ACZ     | L78L05A | TO-92    | 5 V             |
| L78L05ACZ-AP  | L78L05A | TO-92    | 5 V             |
| L78L05ACZTR   | L78L05A | TO-92    | 5 V             |
| L78L05CD13TR  | 78L05   | SO-8     | 5 V             |
| L78L05CZ      | L78L05A | TO-92    | 5 V             |
| L78L06ABUTR   | 8E      | SOT-89   | 6 V             |
| L78L06ABZ     | L78L06A | TO-92    | 6 V             |
| L78L06ACD13TR | L78L06A | SO-8     | 6 V             |
| L78L06ACUTR   | 8E      | SOT-89   | 6 V             |
| L78L08ABD13TR | 78L08B  | SO-8     | 8 V             |
| L78L08ABUTR   | 8G      | SOT-89   | 8 V             |
| L78L08ABZ-AP  | L78L08A | TO-92    | 8 V             |
| L78L08ABZTR   | L78L08A | TO-92    | 8 V             |
| L78L08ACD13TR | 78L08A  | SO-8     | 8 V             |
| L78L08ACUTR   | 8G      | SOT-89   | 8 V             |
| L78L08ACZ     | L78L08A | TO-92    | 8 V             |
| L78L08ACZ-AP  | L78L08A | TO-92    | 8 V             |
| L78L08ACZTR   | L78L08A | TO-92    | 8 V             |
| L78L08CD13TR  | 78L08   | SO-8     | 8 V             |
| L78L09ABD13TR | 78L09B  | SO-8     | 8 V             |
| L78L09ABZ     | L78L09A | TO-92    | 9 V             |
| L78L09ABUTR   | 8H      | SOT-89   | 9 V             |
| L78L09ACD13TR | 78L09A  | SO8      | 9 V             |
| L78L09ACUTR   | 8H      | SOT-89   | 9 V             |
| L78L09ACZ-AP  | L78L09A | TO-92    | 9 V             |
| L78L09ACZ-TR  | L78L09A | TO-92    | 9 V             |
| L78L09CD13TR  | L78L09A | SO-8     | 9 V             |
| L78L10ACUTR   | 8I      | SOT-89   | 10 V            |
| L78L12ABD-TR  | 78L12B  | SO-8     | 12 V            |
| L78L12ABUTR   | 8K      | SOT-89   | 12 V            |
| L78L12ABZ     | L78L12A | TO-92    | 12 V            |
| L78L12ABZ-AP  | L78L12A | TO 92    | 12 V            |

## L78L

## Ordering information

| Part numbers  | Marking | Packages | Output voltages |
|---------------|---------|----------|-----------------|
| L78L12ACD13TR | 78L12A  | SO-8     | 12 V            |
| L78L12ACUTR   | 8K      | SOT-89   | 12 V            |
| L78L12ACZ     | L78L12A | TO-92    | 12 V            |
| L78L12ACZ-AP  | L78L12A | TO-92    | 12 V            |
| L78L12ACZ-TR  | L78L12A | TO-92    | 12 V            |
| L78L12CD13TR  | 78L12   | SO-8     | 12 V            |
| L78L15ABUTR   | 8L      | SOT-89   | 15 V            |
| L78L15ABZ-AP  | L78L15A | TO-92    | 15 V            |
| L78L15ACD13TR | 78L15A  | SO-8     | 15 V            |
| L78L15ACUTR   | 8L      | SOT-89   | 15 V            |
| L78L15ACZ     | L78L15A | TO-92    | 15 V            |
| L78L15CD-TR   | 78L15   | SO-8     | 15 V            |
| L78L18ACUTR   | 8B      | SOT-89   | 18 V            |
| L78L18CD13TR  | L78L18  | SO-8     | 18 V            |
| L78L24ABZ-TR  | L78L24A | TO-92    | 24 V            |
| L78L24ACUTR   | 8P      | SOT-89   | 24 V            |
| L78L24ACZ-AP  | L78L24A | TO-92    | 24 V            |
| L78L24CD-TR   | 78L24   | SO-8     | 24 V            |
| L78L33ABD-TR  | 78L33B  | SO-8     | 3.3 V           |
| L78L33ABUTR   | 8A      | SOT-89   | 3.3 V           |
| L78L33ABZ-AP  | L78L33A | TO-92    | 3.3 V           |
| L78L33ACD13TR | 78L33A  | SO-8     | 3.3 V           |
| L78L33ACUTR   | 8A      | SOT-89   | 3.3 V           |
| L78L33ACZ     | L78L33A | TO-92    | 3.3 V           |
| L78L33ACZ-AP  | L78L33A | TO-92    | 3.3 V           |
| L78L33ACZTR   | L78L33A | TO-92    | 3.3 V           |

## 9 Revision history

**Table 31: Document revision history**

| Date        | Revision | Changes   |
|-------------|----------|---|
| 14-Mar-2005 | 9        | Add tape and reel for TO-92.  |
| 15-Mar-2005 | 10       | Add note on Table 3.  |
| 23-Dec-2005 | 11       | Mistake on ordering Table in header.  |
| 12-Sep-2006 | 12       | Order codes updated.  |
| 07-Jun-2007 | 13       | Order codes updated.  |
| 18-Sep-2007 | 14       | Added Table 1 in cover page.  |
| 15-Jul-2008 | 15       | Modified: Table 1 and Table 28: Order codes.  |
| 18-Aug-2008 | 16       | Modified Figure 12 on page 26.  |
| 03-Apr-2009 | 17       | Added: RthJA value for SOT-89 Table 2 on page 5.  |
| 08-Feb-2011 | 18       | Added note Table 26 on page 39  |
| 21-Feb-2012 | 19       | Modified: SOT-89 Figure 2 on page 4.  |
| 14-Aug-2012 | 20       | Updated TOP value for L78L00AC in Table 1 on page 5.<br>Minor text changes.   |
| 07-Sep-2012 | 21       | Added: Table 29: Marking information.   |
| 14-Apr-2014 | 22       | Part numbers L78LxxAB, L78LxxAC, L78LxxC changed to L78L.<br>Removed Table1: Device summary.<br>Updated features and description in cover page, Table 28: Order codes, Table 29: Marking information and Section 7: Package information.<br>Added Section: Packing mechanical data.<br>Minor text changes.  |
| 06-Oct-2014 | 23       | Updated Table 28: Order codes and Table 29: Marking information.<br>Minor text changes.   |
| 10-Feb-2015 | 24       | Updated Table 29: Marking information.<br>Minor text changes.   |
| 10-Feb-2016 | 25       | Updated Table 29: Marking information and Section 7.7: SOT-89 packing information.<br>Minor text changes.   |
| 21-Jun-2016 | 26       | Changed test condition values for the parameter "Line regulation" and the typical value for the parameter "Dropout voltage" in : <a href="#">Table 3: "Electrical characteristics of L78L33C"</a> , <a href="#">Table 4: "Electrical characteristics of L78L05C"</a> , <a href="#">Table 12: "Electrical characteristics of L78L33AB and L78L33AC"</a> and <a href="#">Table 13: "Electrical characteristics of L78L05AB and L78L05AC"</a> .<br>Minor text changes. |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2016 STMicroelectronics – All rights reserved