



# L79LxxAB L79LxxAC - L79LxxC

## Negative voltage regulators

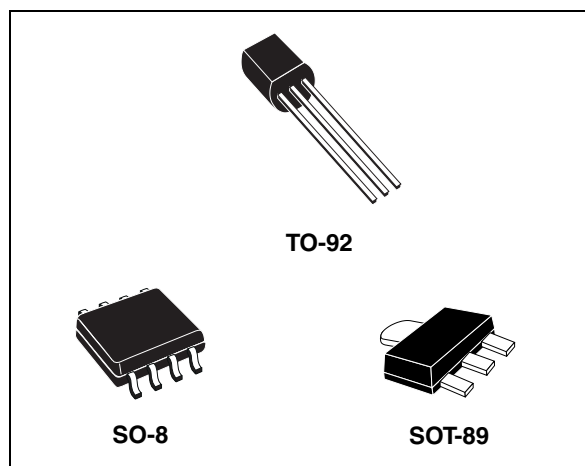
### Features

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

### Description

The L79Lxx series of three-terminal negative 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 L79Lxx series used as Zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two orders of magnitude, along with lower quiescent current and lower noise.

**Table 1. Device summary**

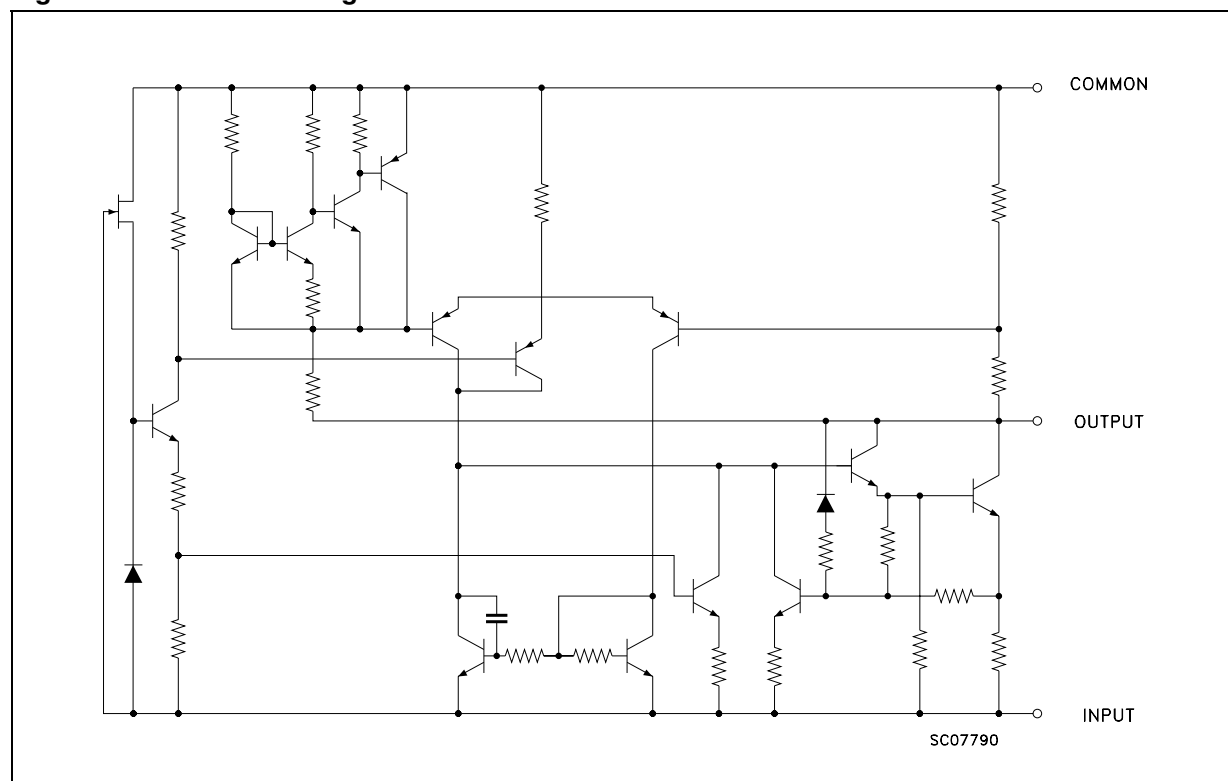
| Part numbers |          |
|--------------|----------|
| L79L05AC     | L79L09AC |
| L79L05AB     | L79L09AB |
| L79L06C      | L79L12C  |
| L79L06AC     | L79L12AC |
| L79L06AB     | L79L12AB |
| L79L08C      | L79L15C  |
| L79L08AC     | L79L15AC |
| L79L08AB     | L79L15AB |
| L79L09C      |          |

# Contents

|   |                                  |    |
|---|----------------------------------|----|
| 1 | Diagram .....                    | 3  |
| 2 | Pin configuration .....          | 4  |
| 3 | Maximum ratings .....            | 5  |
| 4 | Electrical characteristics ..... | 6  |
| 5 | Package mechanical data .....    | 18 |
| 6 | Order codes .....                | 25 |
| 7 | Revision history .....           | 26 |

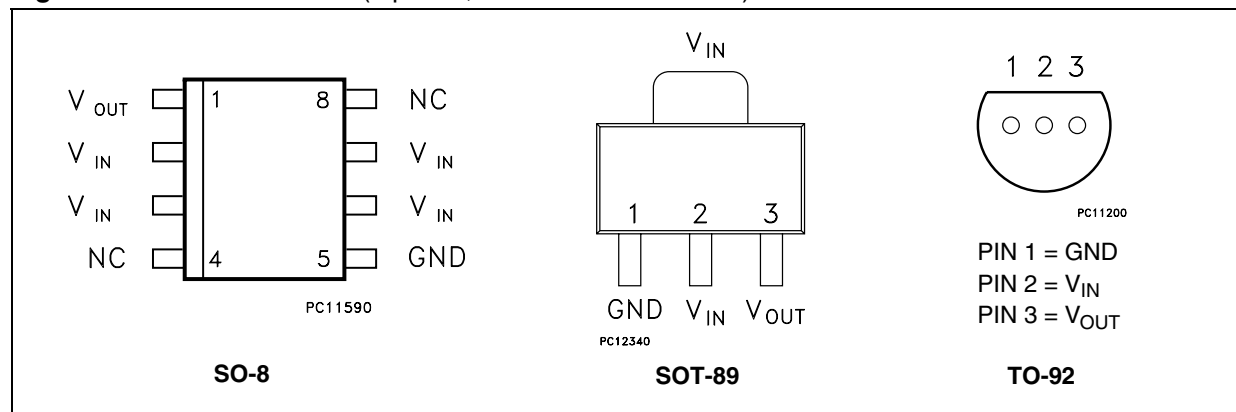
# 1 Diagram

Figure 1. Schematic diagram

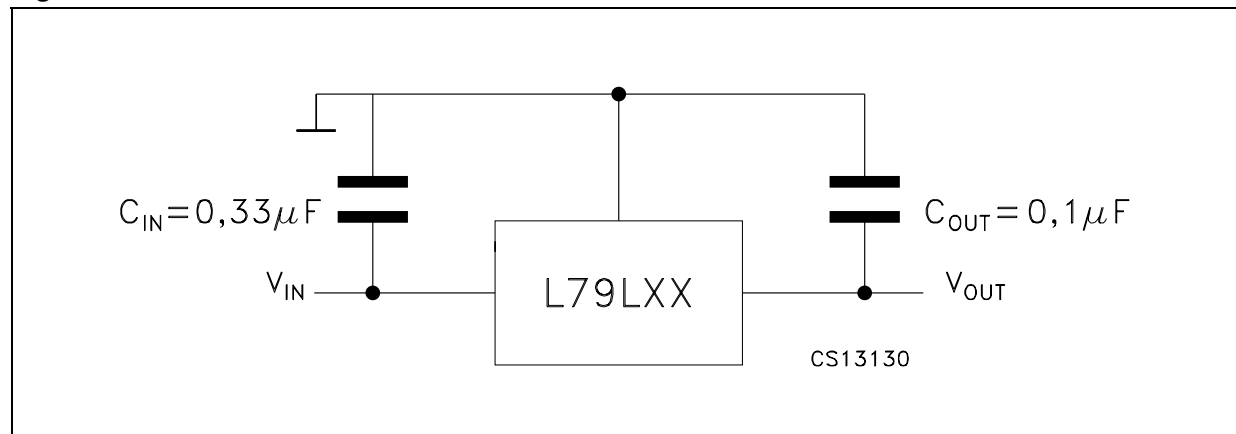


## 2 Pin configuration

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



**Figure 3. Test circuit**



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                            |                        | Value                             | Unit |
|-----------|--------------------------------------|------------------------|-----------------------------------|------|
| $V_I$     | DC input voltage                     | $V_O = -5$ to $-9$ V   | -30                               | V    |
|           |                                      | $V_O = -12$ to $-15$ V | -35                               |      |
| $I_O$     | Output current                       |                        | 100                               | mA   |
| $P_D$     | Power dissipation                    |                        | Internally limited <sup>(1)</sup> | mW   |
| $T_{STG}$ | Storage temperature range            |                        | -40 to 150                        | °C   |
| $T_{OP}$  | Operating junction temperature range | For L79L00C, L79L00AC  | 0 to 125                          | °C   |
|           |                                      | For L79L00AB           | -40 to 125                        |      |

1. 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 3. Thermal data**

| Symbol     | Parameter                                  | SO-8              | TO-92 | SOT-89 | Unit |
|------------|--------------------------------------------|-------------------|-------|--------|------|
| $R_{thJC}$ | Thermal resistance junction-case. (Max)    | 20                |       | 15     | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient. (Max) | 55 <sup>(1)</sup> | 200   |        | °C/W |

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

## 4 Electrical characteristics

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

**Table 4. Electrical characteristics of L79L05**

| Symbol       | Parameter                | Test conditions                                                                                       | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|-------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $T_J = 25^\circ\text{C}$                                                                              | -4.6 | -5   | -5.4 | V             |
| $V_O$        | Output voltage           | $I_O = 1$ to $40\text{ mA}$ , $V_I = -7$ to $-20\text{ V}$                                            | -4.5 |      | -5.5 | V             |
|              |                          | $I_O = 1$ to $70\text{ mA}$ , $V_I = -10\text{ V}$                                                    | -4.5 |      | -5.5 |               |
| $\Delta V_O$ | Line regulation          | $V_I = -7$ to $-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                               |      |      | 200  | mV            |
|              |                          | $V_I = -8$ to $-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                               |      |      | 150  |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100\text{ mA}$ , $T_J = 25^\circ\text{C}$                                               |      |      | 60   | mV            |
|              |                          | $I_O = 1$ to $40\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                |      |      | 30   |               |
| $I_d$        | Quiescent current        | $T_J = 25^\circ\text{C}$                                                                              |      |      | 6    | mA            |
|              |                          | $T_J = 125^\circ\text{C}$                                                                             |      |      | 5.5  | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40\text{ mA}$                                                                           |      |      | 0.2  | mA            |
|              |                          | $V_I = -8$ to $-20\text{ V}$                                                                          |      |      | 1.5  |               |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                     |      | 40   |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = -8$ to $-18\text{ V}$ , $f = 120\text{ Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 40   | 49   |      | dB            |
| $V_d$        | Dropout voltage          |                                                                                                       |      | 1.7  |      | V             |

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = -12\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 5. Electrical characteristics of L79L06**

| Symbol       | Parameter                | Test conditions                                                                                       | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|-------------------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $T_J = 25^\circ\text{C}$                                                                              | -5.52 | -6   | -6.48 | V             |
| $V_O$        | Output voltage           | $I_O = 1$ to $40\text{ mA}$ , $V_I = -8.5$ to $-20\text{ V}$                                          | -5.4  |      | -6.6  | V             |
|              |                          | $I_O = 1$ to $70\text{ mA}$ , $V_I = -12\text{ V}$                                                    | -5.4  |      | -6.6  |               |
| $\Delta V_O$ | Line regulation          | $V_I = -8.5$ to $-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                             |       |      | 200   | mV            |
|              |                          | $V_I = -9$ to $-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                               |       |      | 150   |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100\text{ mA}$ , $T_J = 25^\circ\text{C}$                                               |       |      | 60    | mV            |
|              |                          | $I_O = 1$ to $40\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                |       |      | 30    |               |
| $I_d$        | Quiescent current        | $T_J = 25^\circ\text{C}$                                                                              |       |      | 6     | mA            |
|              |                          | $T_J = 125^\circ\text{C}$                                                                             |       |      | 5.5   | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40\text{ mA}$                                                                           |       |      | 0.2   | mA            |
|              |                          | $V_I = -8$ to $-20\text{ V}$                                                                          |       |      | 1.5   |               |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                     |       | 50   |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = -9$ to $-20\text{ V}$ , $f = 120\text{ Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 38    | 46   |       | dB            |
| $V_d$        | Dropout voltage          |                                                                                                       |       | 1.7  |       | V             |

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

**Table 6. Electrical characteristics of L79L08**

| Symbol       | Parameter                | Test conditions                                                                                          | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|----------------------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $T_J = 25^{\circ}\text{C}$                                                                               | -7.36 | -8   | -8.64 | V             |
| $V_O$        | Output voltage           | $I_O = 1$ to $40\text{ mA}$ , $V_I = -10.5$ to $-23\text{ V}$                                            | -7.2  |      | -8.8  | V             |
|              |                          | $I_O = 1$ to $70\text{ mA}$ , $V_I = -14\text{ V}$                                                       | -7.2  |      | -8.8  |               |
| $\Delta V_O$ | Line regulation          | $V_I = -10.5$ to $-23\text{ V}$ , $T_J = 25^{\circ}\text{C}$                                             |       |      | 200   | mV            |
|              |                          | $V_I = -11$ to $-23\text{ V}$ , $T_J = 25^{\circ}\text{C}$                                               |       |      | 150   |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1$ to $100\text{ mA}$ , $T_J = 25^{\circ}\text{C}$                                                |       |      | 80    | mV            |
|              |                          | $I_O = 1$ to $40\text{ mA}$ , $T_J = 25^{\circ}\text{C}$                                                 |       |      | 40    |               |
| $I_d$        | Quiescent current        | $T_J = 25^{\circ}\text{C}$                                                                               |       |      | 6     | mA            |
|              |                          | $T_J = 125^{\circ}\text{C}$                                                                              |       |      | 5.5   | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1$ to $40\text{ mA}$                                                                              |       |      | 0.2   | mA            |
|              |                          | $V_I = -11$ to $-23\text{ V}$                                                                            |       |      | 1.5   |               |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^{\circ}\text{C}$                                      |       | 60   |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = -12$ to $-23\text{ V}$ , $f = 120\text{ Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25^{\circ}\text{C}$ | 36    | 45   |       | dB            |
| $V_d$        | Dropout voltage          |                                                                                                          |       | 1.7  |       | V             |



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

**Table 7. Electrical characteristics of L79L09**

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

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

**Table 8. Electrical characteristics of L79L12**

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

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

**Table 9. Electrical characteristics of L79L15**

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

Refer to the test circuits,  $V_I = -10\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  for L79L05AC,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  for L79L05AB, unless otherwise specified.

**Table 10. Electrical characteristics of L79L05AB and L79L05AC**

| Symbol       | Parameter                | Test conditions                                                                                          | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|----------------------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $T_J = 25^\circ\text{C}$                                                                                 | -4.8  | -5   | -5.2  | V             |
| $V_O$        | Output voltage           | $I_O = 1\text{ to }40\text{ mA}$ , $V_I = -7\text{ to }-20\text{ V}$                                     | -4.75 |      | -5.25 | V             |
|              |                          | $I_O = 1\text{ to }70\text{ mA}$ , $V_I = -10\text{ V}$                                                  | -4.75 |      | -5.25 |               |
| $\Delta V_O$ | Line regulation          | $V_I = -7\text{ to }-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                             |       |      | 150   | mV            |
|              |                          | $V_I = -8\text{ to }-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                             |       |      | 100   |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1\text{ to }100\text{ mA}$ , $T_J = 25^\circ\text{C}$                                             |       |      | 60    | mV            |
|              |                          | $I_O = 1\text{ to }40\text{ mA}$ , $T_J = 25^\circ\text{C}$                                              |       |      | 30    |               |
| $I_d$        | Quiescent current        | $T_J = 25^\circ\text{C}$                                                                                 |       |      | 6     | mA            |
|              |                          | $T_J = 125^\circ\text{C}$                                                                                |       |      | 5.5   | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1\text{ to }40\text{ mA}$                                                                         |       |      | 0.1   | mA            |
|              |                          | $V_I = -8\text{ to }-20\text{ V}$                                                                        |       |      | 1.5   |               |
| eN           | Output noise voltage     | $B = 10\text{Hz to }100\text{kHz}$ , $T_J = 25^\circ\text{C}$                                            |       | 40   |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = -8\text{ to }-18\text{V}$ , $f = 120\text{Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 41    | 49   |       | dB            |
| $V_d$        | Dropout voltage          |                                                                                                          |       | 1.7  |       | V             |

Refer to the test circuits,  $V_I = -12\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  for L79L05AC,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  for L79L05AB, unless otherwise specified.

**Table 11. Electrical characteristics of L79L06AB and L79L06AC**

| Symbol       | Parameter                | Test conditions                                                                                          | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|----------------------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $T_J = 25^\circ\text{C}$                                                                                 | -5.76 | -6   | -6.24 | V             |
| $V_O$        | Output voltage           | $I_O = 1\text{ to }40\text{ mA}$ , $V_I = -8.5\text{ to }-20\text{ V}$                                   | -5.7  |      | -6.3  | V             |
|              |                          | $I_O = 1\text{ to }70\text{ mA}$ , $V_I = -12\text{ V}$                                                  | -5.7  |      | -6.3  |               |
| $\Delta V_O$ | Line regulation          | $V_I = -8.5\text{ to }-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                           |       |      | 150   | mV            |
|              |                          | $V_I = -9\text{ to }-20\text{ V}$ , $T_J = 25^\circ\text{C}$                                             |       |      | 100   |               |
| $\Delta V_O$ | Load regulation          | $I_O = 1\text{ to }100\text{ mA}$ , $T_J = 25^\circ\text{C}$                                             |       |      | 60    | mV            |
|              |                          | $I_O = 1\text{ to }40\text{ mA}$ , $T_J = 25^\circ\text{C}$                                              |       |      | 30    |               |
| $I_d$        | Quiescent current        | $T_J = 25^\circ\text{C}$                                                                                 |       |      | 6     | mA            |
|              |                          | $T_J = 125^\circ\text{C}$                                                                                |       |      | 5.5   | mA            |
| $\Delta I_d$ | Quiescent current change | $I_O = 1\text{ to }40\text{ mA}$                                                                         |       |      | 0.1   | mA            |
|              |                          | $V_I = -8\text{ to }-20\text{ V}$                                                                        |       |      | 1.5   |               |
| eN           | Output noise voltage     | $B = 10\text{Hz to }100\text{kHz}$ , $T_J = 25^\circ\text{C}$                                            |       | 50   |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $V_I = -9\text{ to }-20\text{V}$ , $f = 120\text{Hz}$<br>$I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 39    | 46   |       | dB            |
| $V_d$        | Dropout voltage          |                                                                                                          |       | 1.7  |       | V             |

Refer to the test circuits,  $V_I = -14\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  for L79L05AC,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  for L79L05AB, unless otherwise specified.

**Table 12. Electrical characteristics of L79L08AB and L79L08AC**

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

Refer to the test circuits,  $V_I = -15\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  for L79L05AC,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  for L79L05AB, unless otherwise specified.

**Table 13. Electrical characteristics of L79L09AB and L79L09AC**

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

Refer to the test circuits,  $V_I = -19\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  for L79L05AC,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  for L79L05AB, unless otherwise specified.

**Table 14. Electrical characteristics of L79L12AB and L79L12AC**

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



Refer to the test circuits,  $V_I = -23\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  for L79L05AC,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  for L79L05AB, unless otherwise specified.

**Table 15. Electrical characteristics of L79L15AB and L79L15AC**

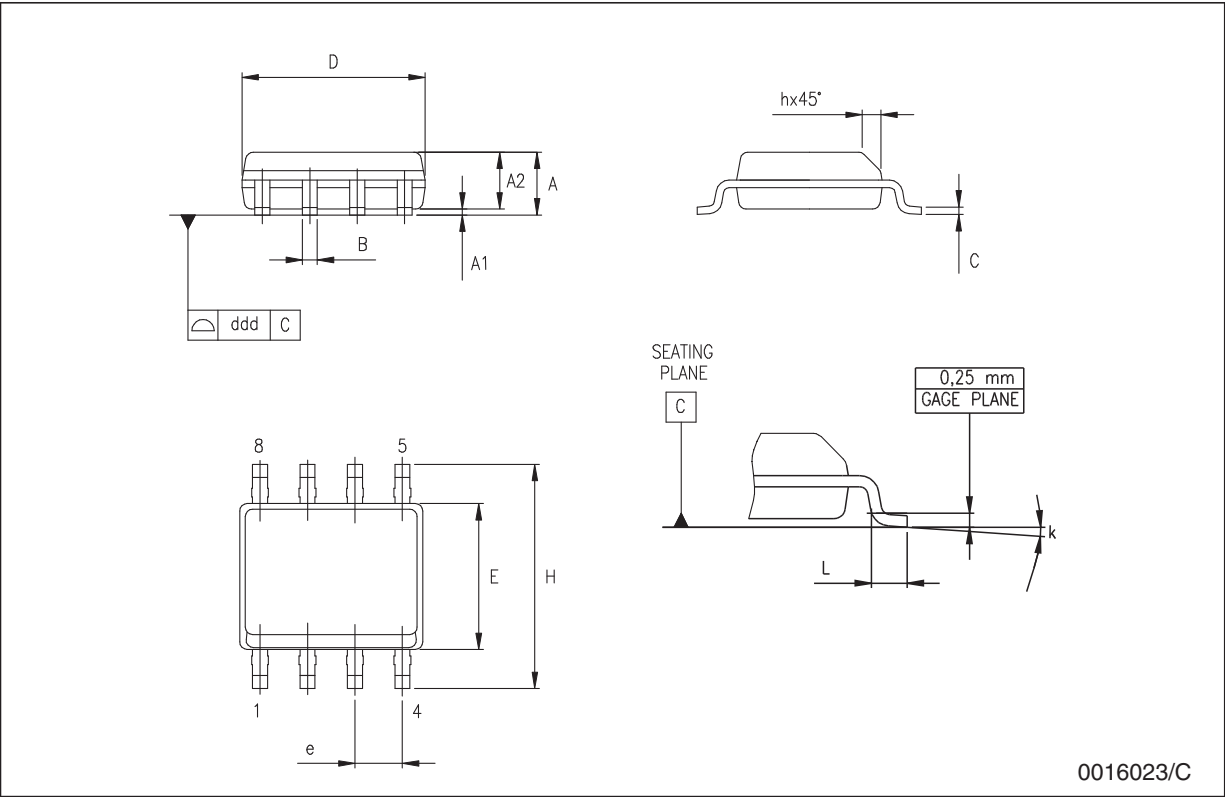
| Symbol       | Parameter                | Test conditions                                                                                                | Min.   | Typ. | Max.   | Unit          |
|--------------|--------------------------|----------------------------------------------------------------------------------------------------------------|--------|-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

## 5 Package mechanical data

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

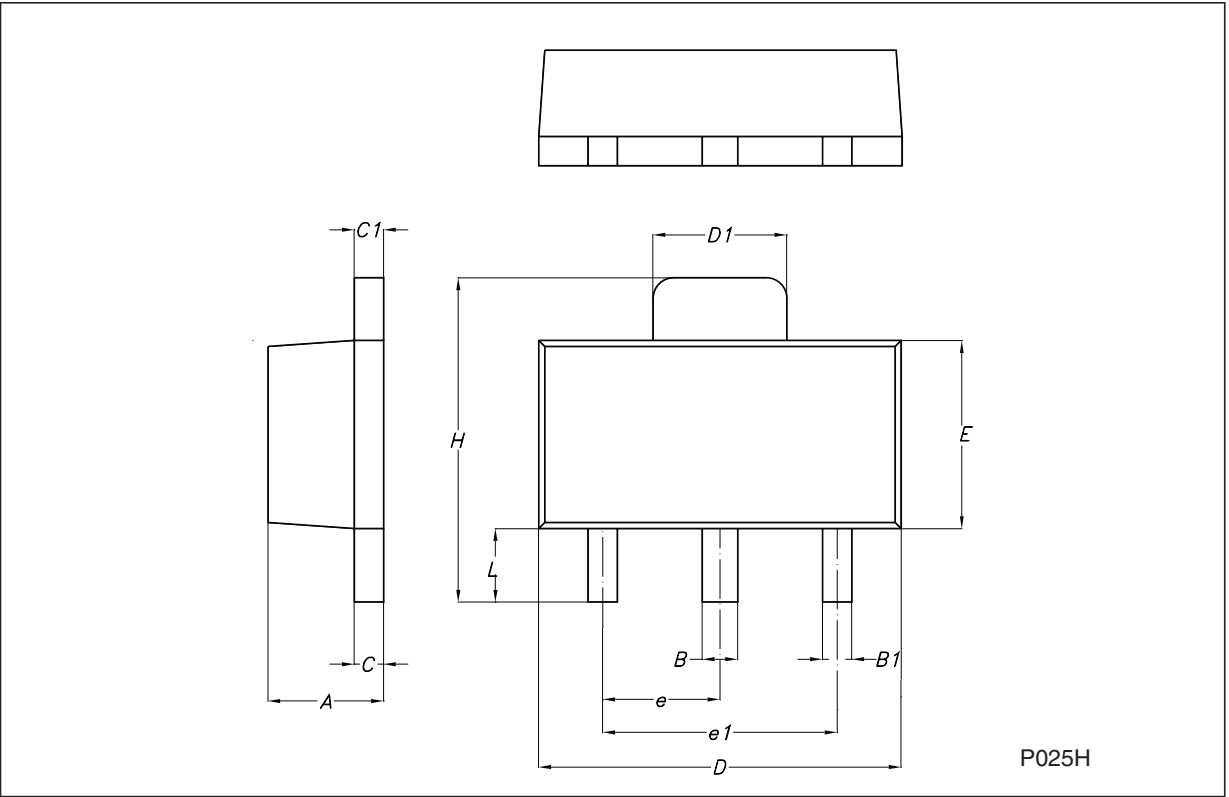
SO-8 mechanical data

| Dim. | mm.       |      |      | inch. |       |       |
|------|-----------|------|------|-------|-------|-------|
|      | Min.      | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    | 1.35      |      | 1.75 | 0.053 |       | 0.069 |
| A1   | 0.10      |      | 0.25 | 0.04  |       | 0.010 |
| A2   | 1.10      |      | 1.65 | 0.043 |       | 0.065 |
| B    | 0.33      |      | 0.51 | 0.013 |       | 0.020 |
| C    | 0.19      |      | 0.25 | 0.007 |       | 0.010 |
| D    | 4.80      |      | 5.00 | 0.189 |       | 0.197 |
| E    | 3.80      |      | 4.00 | 0.150 |       | 0.157 |
| e    |           | 1.27 |      |       | 0.050 |       |
| H    | 5.80      |      | 6.20 | 0.228 |       | 0.244 |
| h    | 0.25      |      | 0.50 | 0.010 |       | 0.020 |
| L    | 0.40      |      | 1.27 | 0.016 |       | 0.050 |
| k    | 8° (max.) |      |      |       |       |       |
| ddd  |           |      | 0.1  |       |       | 0.04  |



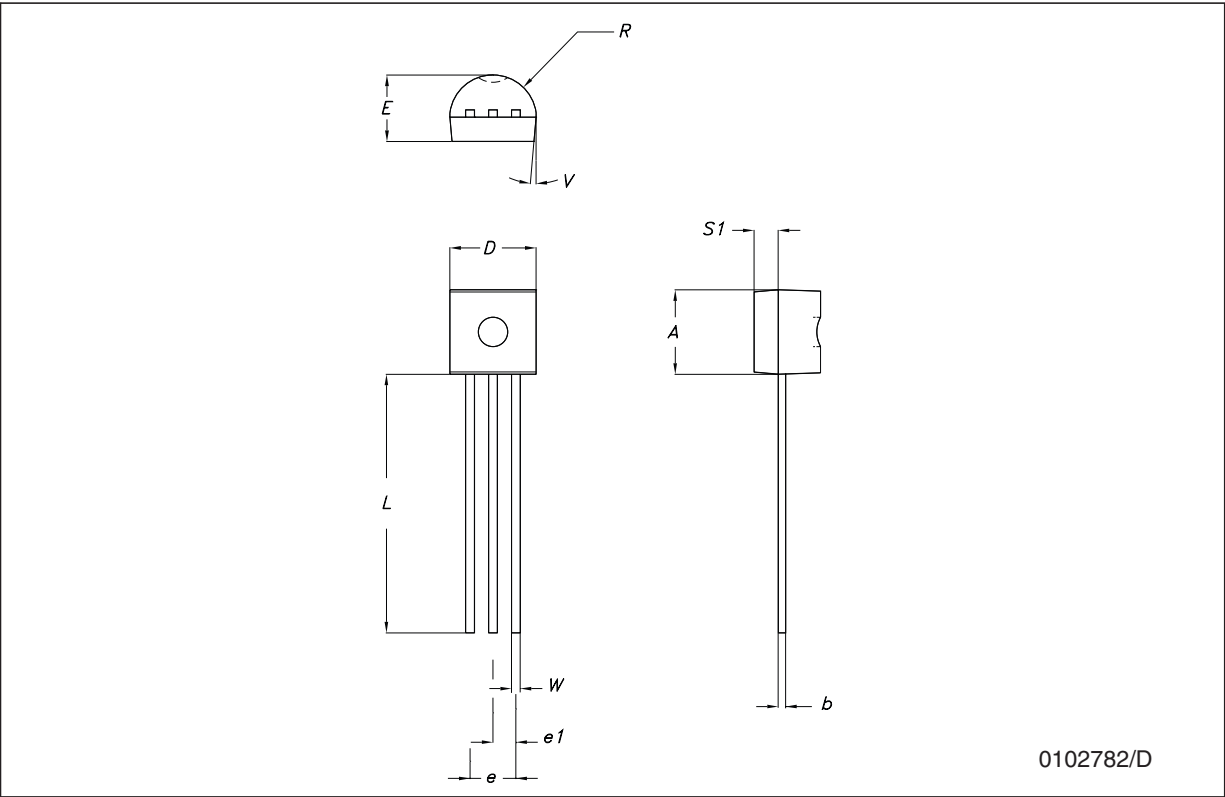
SOT-89 mechanical data

| Dim. | mm.  |      |      | mils. |      |       |
|------|------|------|------|-------|------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ. | Max.  |
| A    | 1.4  |      | 1.6  | 55.1  |      | 63.0  |
| B    | 0.44 |      | 0.56 | 17.3  |      | 22.0  |
| B1   | 0.36 |      | 0.48 | 14.2  |      | 18.9  |
| C    | 0.35 |      | 0.44 | 13.8  |      | 17.3  |
| C1   | 0.35 |      | 0.44 | 13.8  |      | 17.3  |
| D    | 4.4  |      | 4.6  | 173.2 |      | 181.1 |
| D1   | 1.62 |      | 1.83 | 63.8  |      | 72.0  |
| E    | 2.29 |      | 2.6  | 90.2  |      | 102.4 |
| e    | 1.42 |      | 1.57 | 55.9  |      | 61.8  |
| e1   | 2.92 |      | 3.07 | 115.0 |      | 120.9 |
| H    | 3.94 |      | 4.25 | 155.1 |      | 167.3 |
| L    | 0.89 |      | 1.2  | 35.0  |      | 47.2  |



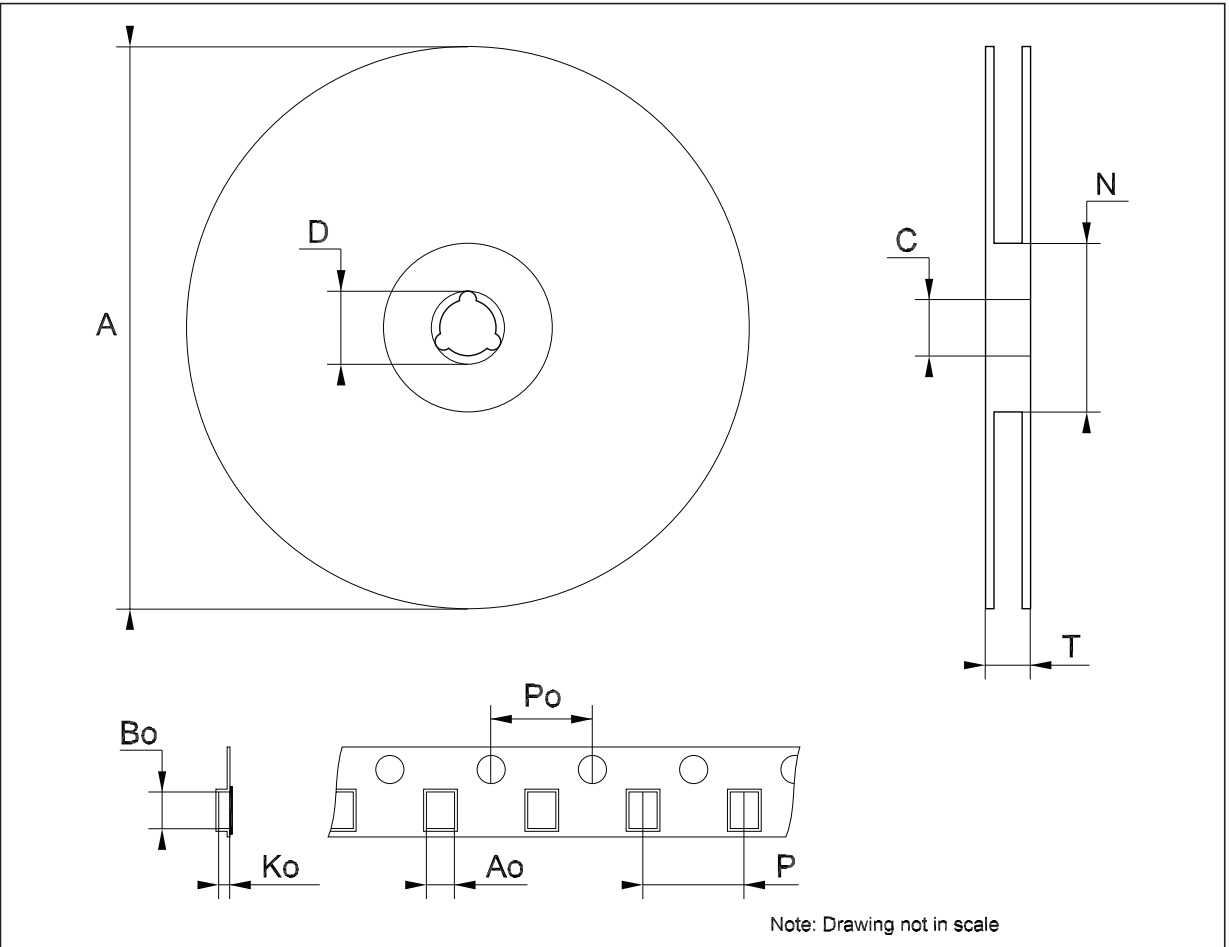
TO-92 mechanical data

| Dim. | mm.  |      |       | mils. |      |       |
|------|------|------|-------|-------|------|-------|
|      | Min. | Typ. | Max.  | Min.  | Typ. | Max.  |
| A    | 4.32 |      | 4.95  | 170.1 |      | 194.9 |
| b    | 0.36 |      | 0.51  | 14.2  |      | 20.1  |
| D    | 4.45 |      | 4.95  | 175.2 |      | 194.9 |
| E    | 3.30 |      | 3.94  | 129.9 |      | 155.1 |
| e    | 2.41 |      | 2.67  | 94.9  |      | 105.1 |
| e1   | 1.14 |      | 1.40  | 44.9  |      | 55.1  |
| L    | 12.7 |      | 15.49 | 500.0 |      | 609.8 |
| R    | 2.16 |      | 2.41  | 85.0  |      | 94.9  |
| S1   | 0.92 |      | 1.52  | 36.2  |      | 59.8  |
| W    | 0.41 |      | 0.56  | 16.1  |      | 22.0  |
| α    |      | 5°   |       |       | 5°   |       |



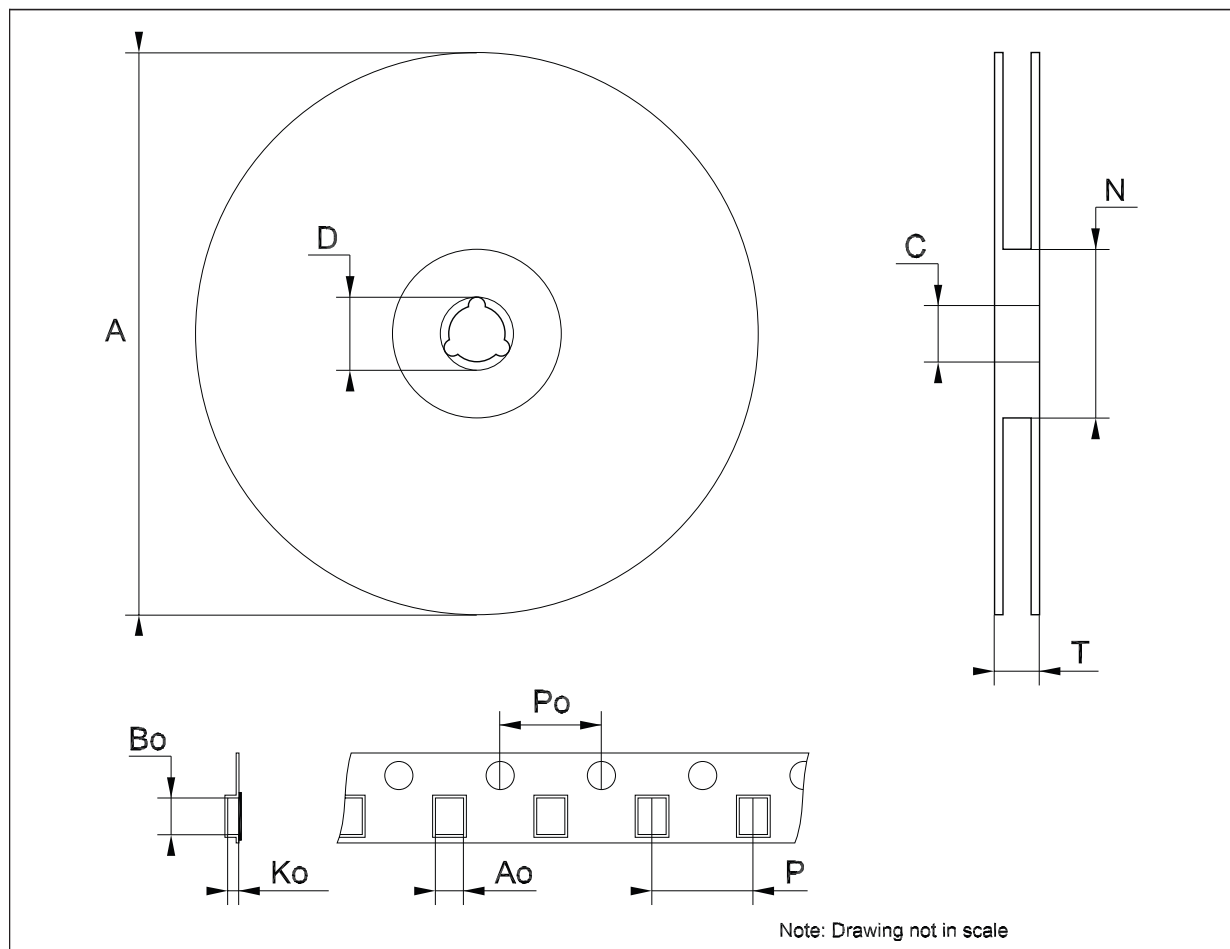
Tape & reel SO-8 mechanical data

| Dim. | mm.  |      |      | inch. |      |        |
|------|------|------|------|-------|------|--------|
|      | Min. | Typ. | Max. | Min.  | Typ. | Max.   |
| A    |      |      | 330  |       |      | 12.992 |
| C    | 12.8 |      | 13.2 | 0.504 |      | 0.519  |
| D    | 20.2 |      |      | 0.795 |      |        |
| N    | 60   |      |      | 2.362 |      |        |
| T    |      |      | 22.4 |       |      | 0.882  |
| Ao   | 8.1  |      | 8.5  | 0.319 |      | 0.335  |
| Bo   | 5.5  |      | 5.9  | 0.216 |      | 0.232  |
| Ko   | 2.1  |      | 2.3  | 0.082 |      | 0.090  |
| Po   | 3.9  |      | 4.1  | 0.153 |      | 0.161  |
| P    | 7.9  |      | 8.1  | 0.311 |      | 0.319  |



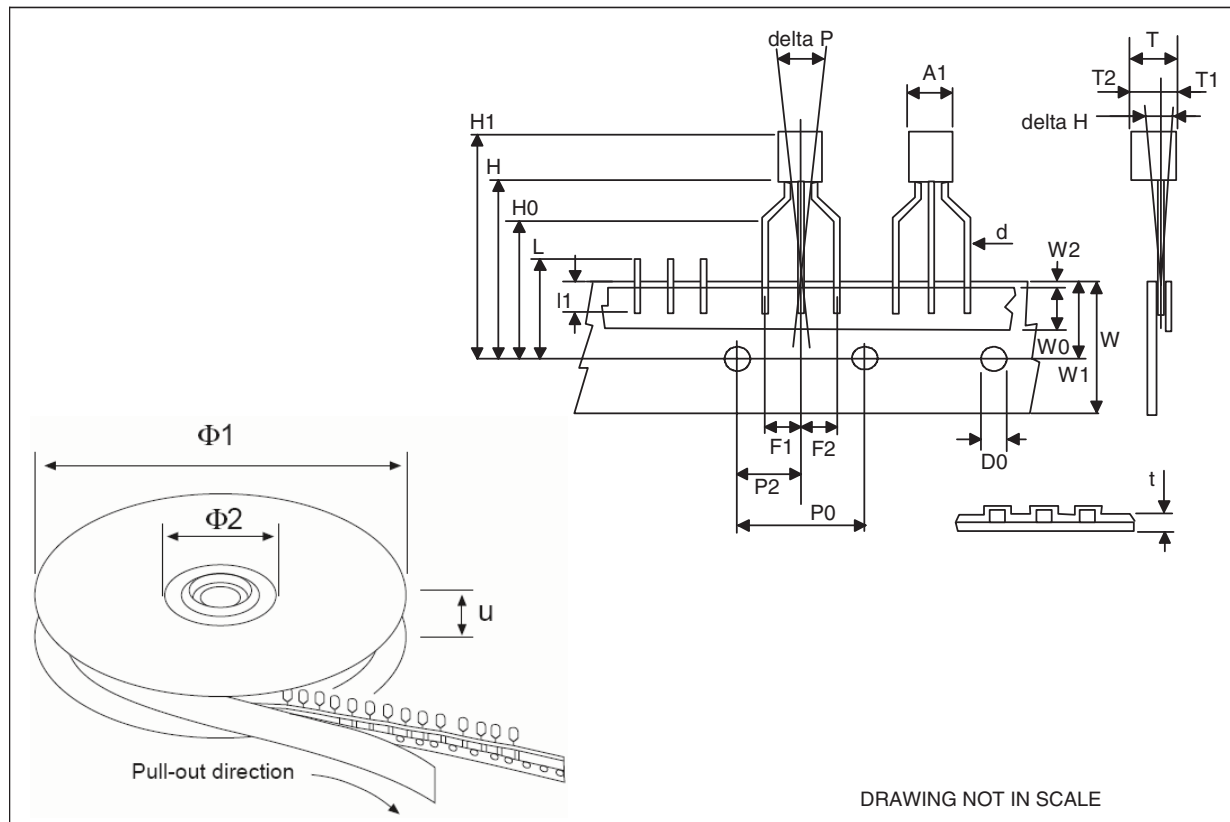
## Tape &amp; reel SOT-89 mechanical data

| Dim. | mm.  |      |      | inch. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    |      |      | 180  |       |       | 7.086 |
| C    | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519 |
| D    | 20.2 |      |      | 0.795 |       |       |
| N    | 60   |      |      | 2.362 |       |       |
| T    |      |      | 14.4 |       |       | 0.567 |
| Ao   | 4.70 | 4.80 | 4.90 | 0.185 | 0.189 | 0.193 |
| Bo   | 4.30 | 4.40 | 4.50 | 0.169 | 0.173 | 0.177 |
| Ko   | 1.70 | 1.80 | 1.90 | 0.067 | 0.071 | 0.075 |
| Po   | 3.9  | 4.0  | 4.1  | 0.153 | 0.157 | 0.161 |
| P    | 7.9  | 8.0  | 8.1  | 0.311 | 0.315 | 0.319 |



## Tape &amp; reel for TO-92 mechanical data

| Dim.    | mm.   |       |       | inch. |        |       |
|---------|-------|-------|-------|-------|--------|-------|
|         | Min.  | Typ.  | Max.  | Min.  | Typ.   | Max.  |
| A1      |       | 4.80  |       |       | 0.189  |       |
| T       |       | 3.80  |       |       | 0.150  |       |
| T1      |       | 1.60  |       |       | 0.063  |       |
| T2      |       | 2.30  |       |       | 0.091  |       |
| d       |       | 0.48  |       |       | 0.019  |       |
| P0      | 12.5  |       | 12.9  | 0.492 |        | 0.508 |
| P2      | 5.65  |       | 7.05  | 0.222 |        | 0.278 |
| F1, F2  | 2.44  | 2.54  | 2.94  | 0.096 | 0.100  | 0.116 |
| delta H |       | ±2    |       |       | 0.079  |       |
| W       | 17.5  | 18.00 | 19.0  | 0.689 | 0.709  | 0.748 |
| W0      | 5.7   |       | 6.3   | 0.224 |        | 0.248 |
| W1      | 8.5   |       | 9.25  | 0.335 |        | 0.364 |
| W2      |       | 0.50  |       |       | 0.20   |       |
| H       |       | 18.50 | 18.70 |       | 0.728  | 0.726 |
| H0      | 15.50 |       | 16.50 | 0.610 |        | 0.650 |
| H1      |       | 25.00 |       |       | 0.984  |       |
| D0      | 3.8   |       | 4.2   | 0.150 |        | 0.165 |
| t       |       | 0.90  |       |       | 0.035  |       |
| L1      |       | 3     |       |       | 0.118  |       |
| delta P |       | ±1    |       |       | 0.039  |       |
| u       |       | 50    |       |       | 1.968  |       |
| Φ1      |       | 360   |       |       | 14.173 |       |
| Φ2      |       | 30    |       |       | 1.181  |       |





## 6 Order codes

Table 16. Order codes

| Packaging                    |                           |                            | Output voltage |
|------------------------------|---------------------------|----------------------------|----------------|
| SO-8                         | TO92 (BAG) <sup>(1)</sup> | SOT-89                     |                |
| L79L05ACD13TR                | L79L05ACZ                 | L79L05ACUTR                | -5 V           |
| L79L05ABD13TR                | L79L05ABZ                 | L79L05ABUTR                | -5 V           |
| L79L06CD13TR <sup>(2)</sup>  |                           |                            | -6 V           |
| L79L06ACD13TR                | L79L06ACZ                 |                            | -6 V           |
| L79L06ABD13TR <sup>(2)</sup> | L79L06ABZ                 | L79L06ABUTR                | -6 V           |
| L79L08CD13TR <sup>(2)</sup>  |                           |                            | -8 V           |
| L79L08ACD13TR                | L79L08ACZ                 | L79L08ACUTR <sup>(2)</sup> | -8 V           |
| L79L08ABD13TR <sup>(2)</sup> | L79L08ABZ <sup>(2)</sup>  | L79L08ABUTR <sup>(2)</sup> | -8 V           |
| L79L09CD13TR <sup>(2)</sup>  |                           |                            | -9 V           |
| L79L09ACD13TR <sup>(2)</sup> | L79L09ACZ                 | L79L09ACUTR                | -9 V           |
| L79L09ABD13TR <sup>(2)</sup> | L79L09ABZ <sup>(2)</sup>  | L79L09ABUTR <sup>(2)</sup> | -9 V           |
| L79L12CD13TR <sup>(2)</sup>  |                           |                            | -12 V          |
| L79L12ACD13TR                | L79L12ACZ                 | L79L12ACUTR                | -12 V          |
| L79L12ABD13TR <sup>(2)</sup> | L79L12ABZ <sup>(2)</sup>  | L79L12ABUTR <sup>(2)</sup> | -12 V          |
| L79L15CD13TR <sup>(2)</sup>  |                           |                            | -15 V          |
| L79L15ACD13TR                |                           | L79L15ACUTR                | -15 V          |
| L79L15ABD13TR                | L79L15ABZ <sup>(2)</sup>  |                            | -15 V          |

1. Available in Ammopak with the suffix "-AP" or in Tape & Reel with the suffix "TR". Please note that in these cases pins are shaped according to Tape & Reel specifications.

2. Available on request.

## 7 Revision history

**Table 17. Document revision history**

| Date        | Revision | Changes                                                                                                    |
|-------------|----------|------------------------------------------------------------------------------------------------------------|
| 14-Mar-2005 | 9        | Add Tape & 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.                                                                                       |
| 25-Jul-2007 | 13       | Pin connection for SOT-89 updated on <a href="#">Figure 2</a> , add <a href="#">Table 1</a> in cover page. |
| 04-Dec-2007 | 14       | Modified: <a href="#">Table 16</a> .                                                                       |
| 14-Jul-2008 | 15       | Modified: <a href="#">Table 16 on page 25</a> .                                                            |
| 29-Jul-2009 | 16       | Modified: <a href="#">Table 16 on page 25</a> .                                                            |

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2009 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)