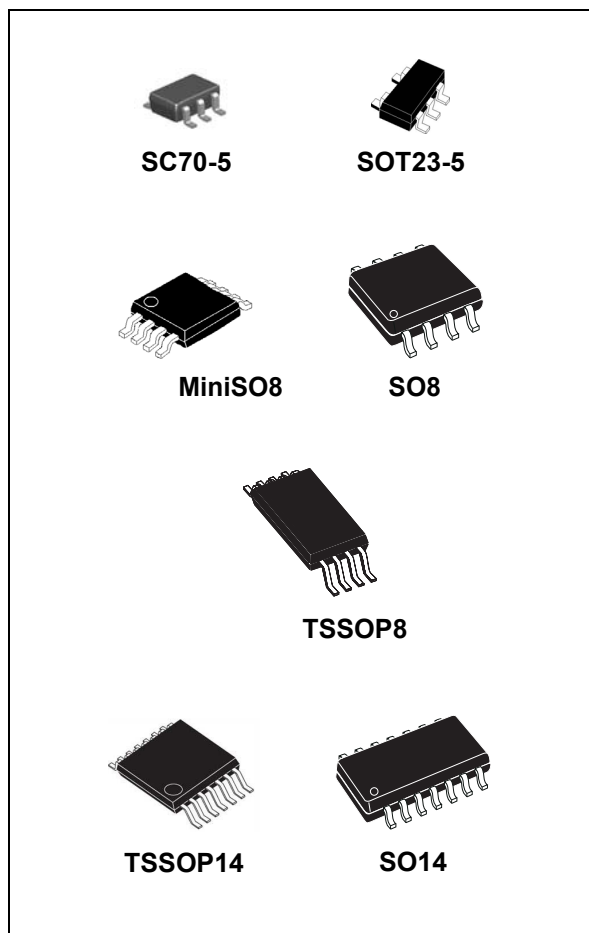




### Applications

- Battery-powered applications
- Portable devices
- Signal conditioning
- Active filtering
- Medical instrumentation

### Description

The LMV321L, LMV358L, and LMV324L are single, dual, and quad operational amplifiers with rail-to-rail output capabilities. They are specifically designed to operate at low voltages (2.7 V to 5 V) with enhanced performances compared to the industry standard LM3xx series.

The LMV321L, LMV358L, and LMV324L are offered in tiny packages, allowing the devices to be used in small portable electronic applications and to be placed closer to the actual signal.

The LMV321L, LMV358L, and LMV324L are complete cost-effective solutions for application designs where cost is of primary importance.

### Features

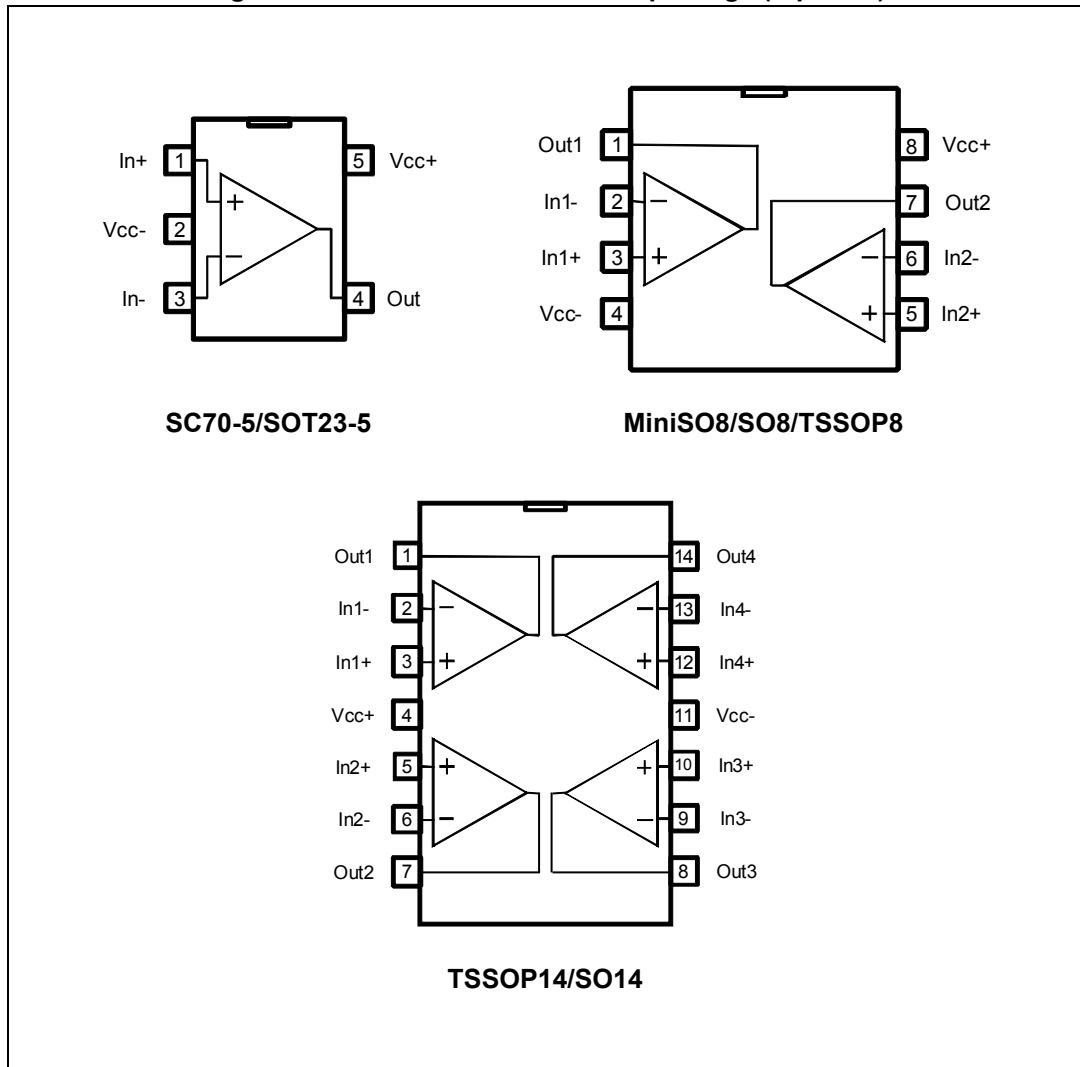
- Low-power consumption: 250  $\mu$ A max at 5 V
- Low offset voltage: 7 mV max at 25 °C
- Industrial temperature range: -40 °C to +125 °C
- Low supply voltage: 2.7 V - 5.5 V
- Gain bandwidth product: 1.3 MHz
- Tiny packages

# Contents

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# 1 Package pin connections

Figure 1. Pin connections for each package (top view)



## 2 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings (AMR)

| Symbol     | Parameter                                                | Value                              | Unit |
|------------|----------------------------------------------------------|------------------------------------|------|
| $V_{CC}$   | Supply voltage <sup>(1)</sup>                            | 6                                  | V    |
| $V_{id}$   | Differential input voltage <sup>(2)</sup>                | $\pm V_{CC}$                       |      |
| $V_{in}$   | Input pins (IN+ and IN- pins) voltage <sup>(3)</sup>     | $V_{CC-} - 0.3$ to $V_{CC+} + 0.2$ |      |
| $I_{in}$   | Input current <sup>(4)</sup>                             | 10                                 | mA   |
| $T_{stg}$  | Storage temperature                                      | -65 to +150                        | °C   |
| $R_{thja}$ | Thermal resistance junction to ambient <sup>(5)(6)</sup> |                                    | °C/W |
|            | SC70-5                                                   | 205                                |      |
|            | SOT23-5                                                  | 250                                |      |
|            | MiniSO8                                                  | 190                                |      |
|            | SO8                                                      | 125                                |      |
|            | TSSOP8                                                   | 120                                |      |
|            | TSSOP14                                                  | 100                                |      |
|            | SO14                                                     | 105                                |      |
| $T_j$      | Maximum junction temperature                             | 150                                | °C   |
| ESD        | HBM: human body model <sup>(7)</sup>                     | 4000                               | V    |
|            | MM: machine model <sup>(8)</sup>                         | 250                                |      |
|            | CDM: charged device model <sup>(9)</sup>                 | 1300                               |      |
|            | Latch-up immunity                                        | 200                                | mA   |

1. All voltage values, except differential voltage, are with respect to network ground terminal
2. Differential voltage is the non-inverting input terminal with respect to the inverting input terminal
3.  $V_{CC-} - V_{in}$  must not exceed 6 V,  $V_{in}$  must not exceed 6 V
4. Input current must be limited by a resistor in series with the inputs
5. Short-circuits can cause excessive heating and destructive dissipation
6.  $R_{th}$  are typical values
7. Human body model: 100 pF discharged through a 1.5 k $\Omega$  resistor between two pins of the device, done for all couples of pin combinations with other pins floating.
8. Machine model: a 200 pF cap is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5  $\Omega$ ), done for all couples of pin combinations with other pins floating.
9. Charged device model: all pins plus package are charged together to the specified voltage and then discharged directly to the ground.

Table 2. Operating conditions

| Symbol     | Parameter                            | Value                                | Unit |
|------------|--------------------------------------|--------------------------------------|------|
| $V_{CC}$   | Supply voltage                       | 2.7 to 5.5                           | V    |
| $V_{icm}$  | Common mode input voltage range      | $(V_{CC-}) - 0.2$ to $(V_{CC+}) - 1$ |      |
| $T_{oper}$ | Operating free-air temperature range | -40 to +125                          | °C   |

### 3 Electrical characteristics

**Table 3. Electrical characteristics at  $V_{CC+} = 2.7\text{ V}$  with  $V_{CC-} = 0\text{ V}$ ,  $V_{icm} = V_{CC}/2$ ,  $T_{amb} = 25\text{ }^{\circ}\text{C}$ , and  $R_L$  connected to  $V_{CC}/2$  (unless otherwise specified)**

| Symbol                   | Parameter                                  | Conditions                                                                                             | Min. | Typ.     | Max. | Unit                                 |
|--------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------|------|----------|------|--------------------------------------|
| <b>DC performance</b>    |                                            |                                                                                                        |      |          |      |                                      |
| $V_{io}$                 | Input offset voltage                       |                                                                                                        |      | 1        | 7    | mV                                   |
| $\Delta V_{io}/\Delta T$ | Input offset voltage drift <sup>(1)</sup>  | $-40\text{ }^{\circ}\text{C} < T < 125\text{ }^{\circ}\text{C}$                                        |      | 5        |      | $\mu\text{V}/^{\circ}\text{C}$       |
| $I_{io}$                 | Input offset current                       | $V_{out} = V_{CC}/2$                                                                                   |      | 0.5      | 30   | nA                                   |
| $I_{ib}$                 | Input bias current                         |                                                                                                        |      | 27       | 60   |                                      |
| CMRR                     | Common mode rejection ratio <sup>(1)</sup> | $V_{ic} = 0\text{ V to } V_{CC}-1\text{ V}$ , $V_{out} = V_{CC}/2$                                     | 70   | 75       |      | dB                                   |
| $V_O$                    | Output swing                               | $R_L = 10\text{ k}\Omega$ , high level                                                                 | 2.6  | 2.69     |      | V                                    |
|                          |                                            | $R_L = 10\text{ k}\Omega$ , low level                                                                  |      | 65       | 180  | mV                                   |
| $I_{CC}$                 | Supply current (per channel)               | No load, $V_{out} = V_{CC}/2$                                                                          |      | 120      | 180  | $\mu\text{A}$                        |
| <b>AC performance</b>    |                                            |                                                                                                        |      |          |      |                                      |
| GBP                      | Gain bandwidth product                     | $R_L > 1\text{ M}\Omega$ , $C_L = 200\text{ pF}$                                                       |      | 1.3      |      | MHz                                  |
| $\Phi_m$                 | Phase margin                               |                                                                                                        |      | 60       |      | degrees                              |
| $G_m$                    | Gain margin                                |                                                                                                        |      | 10       |      | dB                                   |
| SR                       | Slew rate                                  | $R_L > 1\text{ M}\Omega$ , $C_L = 200\text{ pF}$<br>$V_{out} = 0.5\text{ V to } V_{CC} - 0.5\text{ V}$ |      | 0.6      |      | V/ $\mu\text{s}$                     |
| $e_n$                    | Equivalent input noise voltage             | $f = 1\text{ kHz}$<br>$f = 10\text{ kHz}$                                                              |      | 31<br>20 |      | $\frac{\text{nV}}{\sqrt{\text{Hz}}}$ |
| $i_n$                    | Equivalent input noise current             | $f = 1\text{ kHz}$                                                                                     |      | 0.30     |      | $\frac{\text{pA}}{\sqrt{\text{Hz}}}$ |

1.  $\text{CMRR (dB)} = 20 \log (\Delta V_{icm}/\Delta V_{io})$

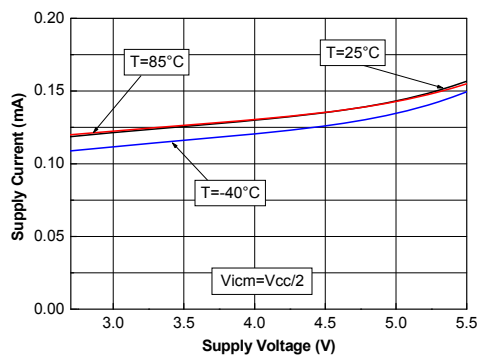
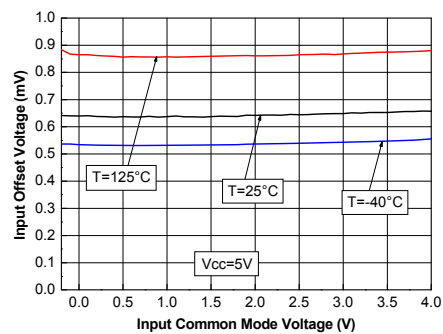
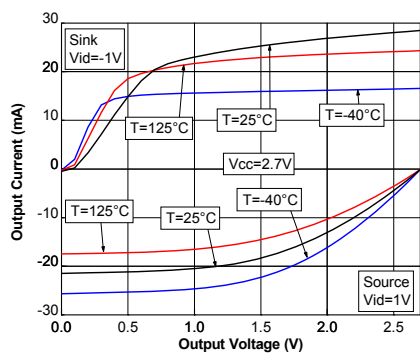
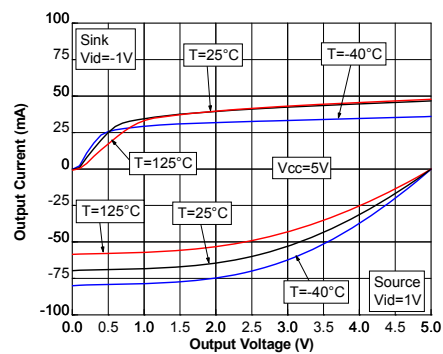
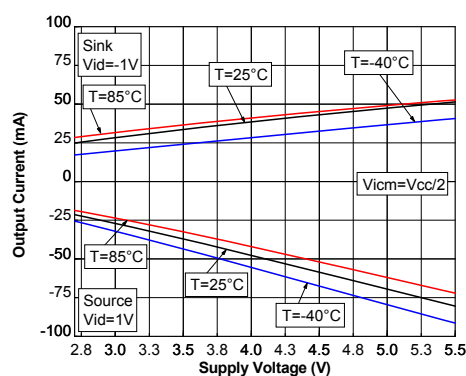
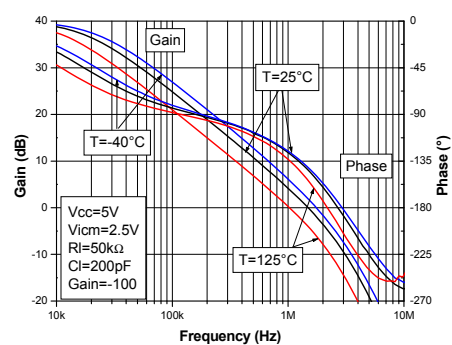
**Table 4. Electrical characteristics at  $V_{CC+} = 5\text{ V}$  with  $V_{CC-} = 0\text{ V}$ ,  $V_{icm} = V_{CC}/2$ ,  $T_{amb} = 25\text{ }^{\circ}\text{C}$ , and  $R_L$  connected to  $V_{CC}/2$  (unless otherwise specified)**

| Symbol               | Parameter                                  | Conditions                                                                                           | Min. | Typ. | Max. | Unit    |
|----------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------|------|------|------|---------|
| DC performance       |                                            |                                                                                                      |      |      |      |         |
| V <sub>io</sub>      | Input offset voltage                       |                                                                                                      |      | 1    | 7    | mV      |
|                      |                                            | -40 °C < T< 125 °C                                                                                   |      |      | 9    |         |
| ΔV <sub>io</sub> /ΔT | Input offset voltage drift <sup>(1)</sup>  | -40 °C < T< 125 °C                                                                                   |      | 5    |      | μV/°C   |
| I <sub>io</sub>      | Input offset current                       | V <sub>out</sub> = V <sub>cc</sub> /2                                                                |      | 0.5  | 30   | nA      |
|                      |                                            | -40 °C < T< 125 °C                                                                                   |      |      | 50   |         |
| I <sub>ib</sub>      | Input bias current                         | V <sub>out</sub> = V <sub>cc</sub> /2                                                                |      | 27   | 60   |         |
|                      |                                            | -40 °C < T< 125 °C                                                                                   |      |      | 110  |         |
| CMRR                 | Common mode rejection ratio <sup>(2)</sup> | V <sub>ic</sub> = 0 V to V <sub>cc</sub> -1 V,V <sub>out</sub> = V <sub>cc</sub> /2                  | 72   | 75   |      | dB      |
| SVRR                 | Supply voltage rejection ratio             | V <sub>cc</sub> = 2.7 to 5 V                                                                         | 72   | 79   |      |         |
| A <sub>vd</sub>      | Large signal voltage gain                  | R <sub>L</sub> = 2 kΩ<br>V <sub>out</sub> = 0.5 V to (V <sub>CC</sub> -0.5 V)                        | 90   | 100  |      | dB      |
|                      |                                            | -40 °C < T< 125 °C                                                                                   | 80   |      |      |         |
| V <sub>OH</sub>      | Output swing high level                    | R <sub>L</sub> = 10 kΩ                                                                               | 4.90 | 4.99 |      | V       |
|                      |                                            | R <sub>L</sub> = 10 kΩ, -40 °C < T< 125 °C                                                           | 4.80 |      |      |         |
|                      |                                            | R <sub>L</sub> = 2 kΩ                                                                                | 4.70 | 4.96 |      |         |
|                      |                                            | R <sub>L</sub> = 2 kΩ, -40 °C < T< 125 °C                                                            | 4.60 |      |      |         |
| V <sub>OL</sub>      | Output swing low level                     | R <sub>L</sub> = 10 kΩ                                                                               |      | 65   | 180  | mV      |
|                      |                                            | R <sub>L</sub> = 10 kΩ, -40 °C < T< 125 °C                                                           |      |      | 280  |         |
|                      |                                            | R <sub>L</sub> = 2 kΩ                                                                                |      | 120  | 300  |         |
|                      |                                            | R <sub>L</sub> = 2 kΩ, -40 °C < T< 125 °C                                                            |      |      | 400  |         |
| I <sub>out</sub>     | Output short circuit current               | Sinking, V <sub>out</sub> = V <sub>CC</sub>                                                          | 35   | 43   |      | mA      |
|                      |                                            | Sourcing, V <sub>out</sub> = 0 V                                                                     | 60   | 70   |      |         |
| I <sub>CC</sub>      | Supply current (per channel)               | No load, V <sub>out</sub> = V <sub>CC</sub> /2                                                       |      | 130  | 250  | μA      |
|                      |                                            | -40 °C < T< 125 °C                                                                                   |      |      | 350  |         |
| AC performance       |                                            |                                                                                                      |      |      |      |         |
| GBP                  | Gain bandwidth product                     | R <sub>L</sub> > 1 MΩ, C <sub>L</sub> = 200 pF                                                       |      | 1.3  |      | MHz     |
| F <sub>u</sub>       | Unity gain frequency                       |                                                                                                      |      | 1    |      |         |
| Φ <sub>m</sub>       | Phase margin                               |                                                                                                      |      | 60   |      | degrees |
| G <sub>m</sub>       | Gain margin                                |                                                                                                      |      | 10   |      | dB      |
| SR                   | Slew rate                                  | R <sub>L</sub> > 1 MΩ, C <sub>L</sub> = 200 pF<br>V <sub>out</sub> = 0.5 V to V <sub>CC</sub> - 0.5V |      | 0.7  |      | V/μs    |

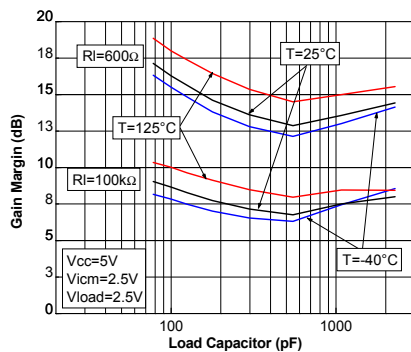
**Table 4. Electrical characteristics at  $V_{CC+} = 5\text{ V}$  with  $V_{CC-} = 0\text{ V}$ ,  $V_{icm} = V_{CC}/2$ ,  $T_{amb} = 25\text{ °C}$ , and  $R_L$  connected to  $V_{CC}/2$  (unless otherwise specified) (continued)**

| Symbol | Parameter                      | Conditions                                | Min. | Typ.     | Max. | Unit                                 |
|--------|--------------------------------|-------------------------------------------|------|----------|------|--------------------------------------|
| $e_n$  | Equivalent input noise voltage | $f = 1\text{ kHz}$<br>$f = 10\text{ kHz}$ |      | 30<br>20 |      | $\frac{\text{nV}}{\sqrt{\text{Hz}}}$ |
| $i_n$  | Equivalent input noise current | $f = 1\text{ kHz}$                        |      | 0.30     |      | $\frac{\text{pA}}{\sqrt{\text{Hz}}}$ |

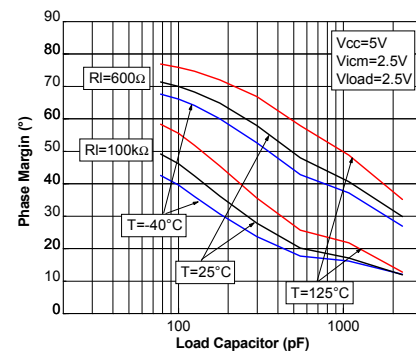
1. See [Section 4.4: Input offset voltage drift over temperature](#)
2.  $\text{CMRR (dB)} = 20 \log (\Delta V_{icm} / \Delta V_{io})$

**Figure 2. Supply current vs. supply voltage at  $V_{icm} = V_{CC}/2$** **Figure 3. Input offset voltage vs. input common mode voltage at  $V_{CC} = 5\text{ V}$** **Figure 4. Output current vs. output voltage at  $V_{CC} = 2.7\text{ V}$** **Figure 5. Output current vs. output voltage at  $V_{CC} = 5\text{ V}$** **Figure 6. Output current vs. supply voltage at  $V_{icm} = V_{CC}/2$** **Figure 7. Voltage gain and phase with  $C_I = 200\text{ pF}$** 

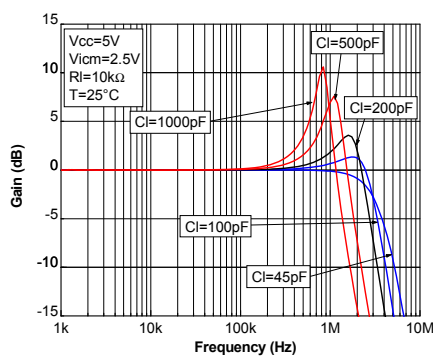
**Figure 8. Gain margin vs. load capacitor at  $V_{CC} = 5\text{ V}$**



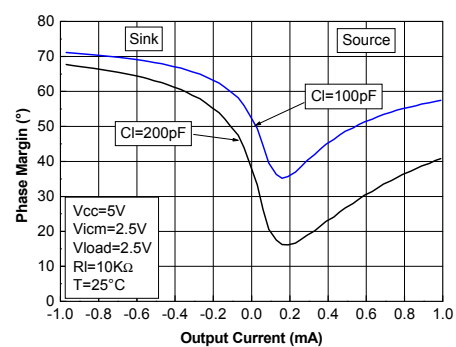
**Figure 9. Phase margin vs. load capacitor at  $V_{CC} = 5\text{ V}$**



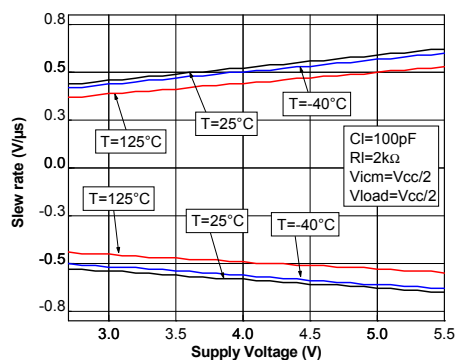
**Figure 10. Closed-loop gain in voltage follower configuration for different capacitive loads**



**Figure 11. Phase margin vs. output current at  $V_{CC} = 5\text{ V}$**



**Figure 12. Positive and negative slew rate vs. supply voltage**



**Figure 13. Positive slew rate at  $V_{CC} = 5\text{ V}$  with  $Cl = 100\text{ pF}$**

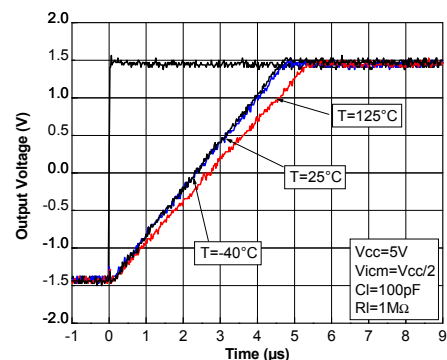


Figure 14. Negative slew rate at  $V_{CC} = 5\text{ V}$  with  $C_I = 100\text{ pF}$

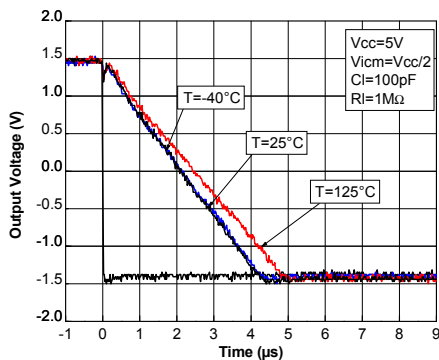


Figure 15. Noise vs. frequency

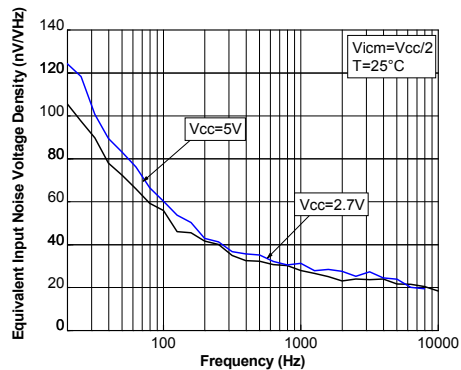


Figure 16. Distortion + noise vs. frequency

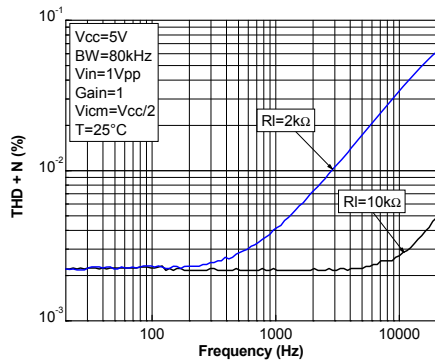
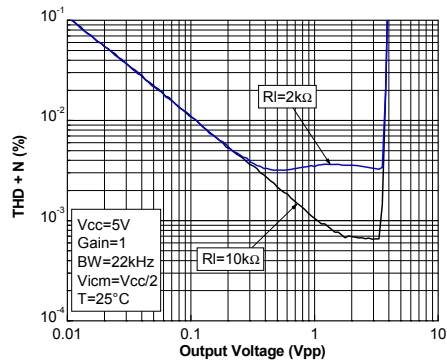


Figure 17. Distortion + noise vs. output voltage



## 4 Application information

### 4.1 Operating voltages

The LMV321L, LMV358L, and LMV324L can operate from 2.7 to 5.5 V. The devices' parameters are fully specified for 2.7 V and 5 V power supplies. Additionally, the main specifications are guaranteed in extended temperature ranges from -40 °C to 125 °C.

### 4.2 Input common-mode range

The LMV321L, LMV358L, and LMV324L have an input common-mode range that includes ground. The input common-mode range is extended from  $(V_{CC-}) - 0.2 \text{ V}$  to  $(V_{CC+}) - 1 \text{ V}$ , with no output phase reversal.

### 4.3 Rail-to-rail output

The operational amplifiers' output levels can go close to the rails: 180 mV maximum above and below the rail when connected to a 10 k $\Omega$  resistive load to  $V_{CC}/2$ .

### 4.4 Input offset voltage drift over temperature

The maximum input voltage drift over the temperature variation is defined as follows.

$$\frac{\Delta V_{io}}{\Delta T} = \max \left| \frac{V_{io}(T) - V_{io}(25^\circ \text{C})}{T - 25^\circ \text{C}} \right|$$

for  $T_{\min} < T < T_{\max}$ .

### 4.5 PCB layouts

For correct operation, it is advised to add 10 nF decoupling capacitors as close as possible to the power supply pins.

### 4.6 Macromodel

Accurate macromodels of the LMV321L, LMV358L, and LMV324L are available on STMicroelectronics' web site at [www.st.com](http://www.st.com). These models are a trade-off between accuracy and complexity (that is, time simulation) of the LMV321L, LMV358L, and LMV324L operational amplifiers. They emulate the nominal performances of a typical device within the specified operating conditions mentioned in the datasheet. They also help to validate a design approach and to select the right operational amplifier, *but they do not replace on-board measurements*.

## 5 Package information

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.

## 5.1 SC70-5 (SOT323-5) package information

Figure 18. SC70-5 (SOT323-5) package mechanical drawing

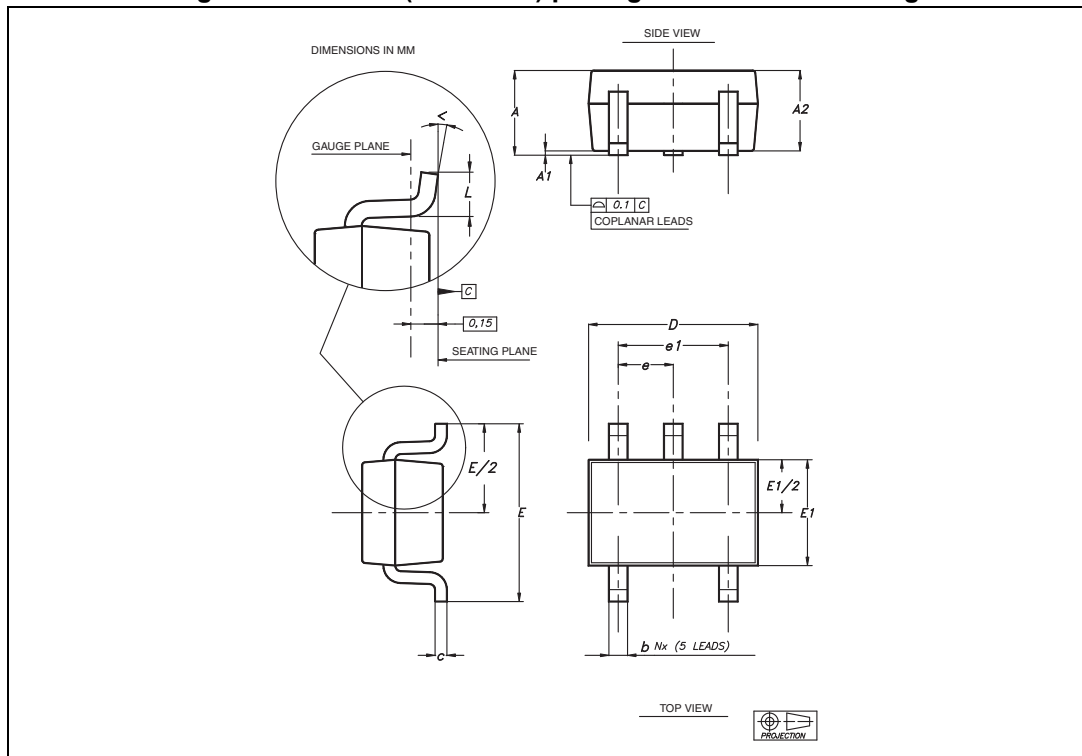


Table 5. SC70-5 (or SOT323-5) package mechanical data

| Ref | Dimensions  |      |      |        |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | Millimeters |      |      | Inches |       |       |
|     | Min         | Typ  | Max  | Min    | Typ   | Max   |
| A   | 0.80        |      | 1.10 | 0.315  |       | 0.043 |
| A1  |             |      | 0.10 |        |       | 0.004 |
| A2  | 0.80        | 0.90 | 1.00 | 0.315  | 0.035 | 0.039 |
| b   | 0.15        |      | 0.30 | 0.006  |       | 0.012 |
| c   | 0.10        |      | 0.22 | 0.004  |       | 0.009 |
| D   | 1.80        | 2.00 | 2.20 | 0.071  | 0.079 | 0.087 |
| E   | 1.80        | 2.10 | 2.40 | 0.071  | 0.083 | 0.094 |
| E1  | 1.15        | 1.25 | 1.35 | 0.045  | 0.049 | 0.053 |
| e   |             | 0.65 |      |        | 0.025 |       |
| e1  |             | 1.30 |      |        | 0.051 |       |
| L   | 0.26        | 0.36 | 0.46 | 0.010  | 0.014 | 0.018 |
| <   | 0 °         |      | 8 °  | 0 °    |       | 8 °   |

## 5.2 SOT23-5 package information

Figure 19. SOT23-5 package mechanical drawing

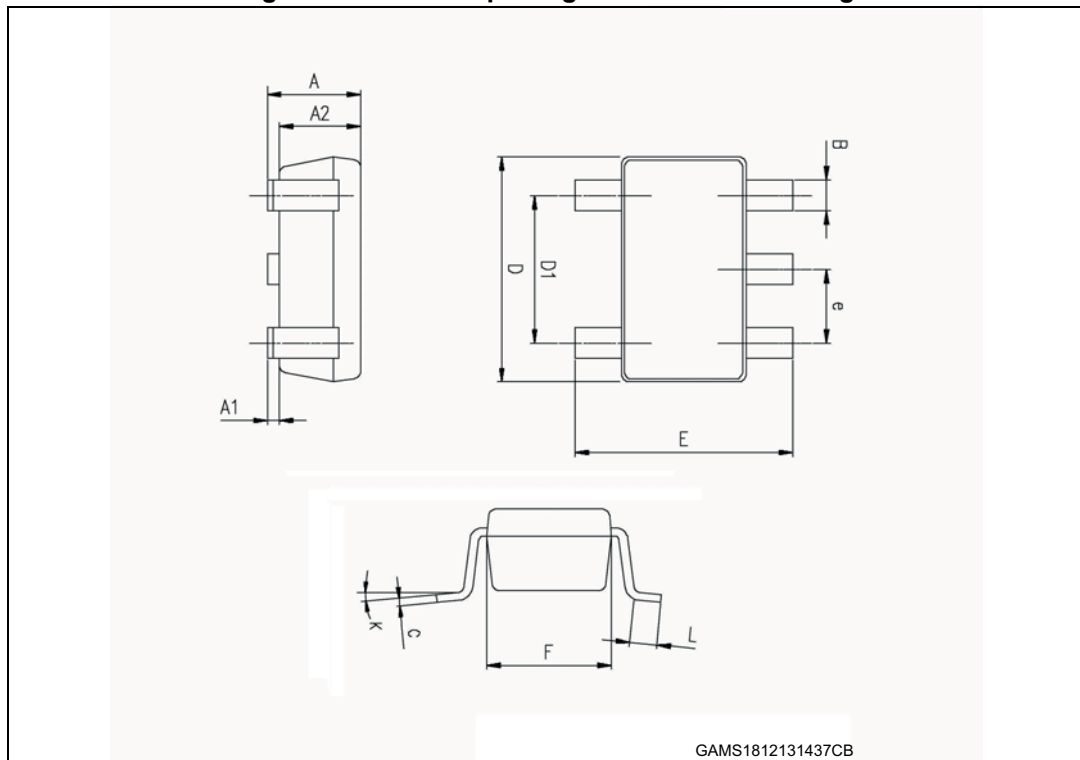


Table 6. SOT23-5 package mechanical data

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.90        | 1.20 | 1.45 | 0.035  | 0.047 | 0.057 |
| A1   |             |      | 0.15 |        |       | 0.006 |
| A2   | 0.90        | 1.05 | 1.30 | 0.035  | 0.041 | 0.051 |
| B    | 0.35        | 0.40 | 0.50 | 0.014  | 0.016 | 0.020 |
| C    | 0.09        | 0.15 | 0.20 | 0.004  | 0.006 | 0.008 |
| D    | 2.80        | 2.90 | 3.00 | 0.110  | 0.114 | 0.118 |
| D1   |             | 1.90 |      |        | 0.075 |       |
| e    |             | 0.95 |      |        | 0.037 |       |
| E    | 2.60        | 2.80 | 3.00 | 0.102  | 0.110 | 0.118 |
| F    | 1.50        | 1.60 | 1.75 | 0.059  | 0.063 | 0.069 |
| L    | 0.10        | 0.35 | 0.60 | 0.004  | 0.014 | 0.024 |
| K    | 0 °         |      | 10 ° | 0 °    |       | 10 °  |

### 5.3 MiniSO8 package information

Figure 20. MiniSO8 package mechanical drawing

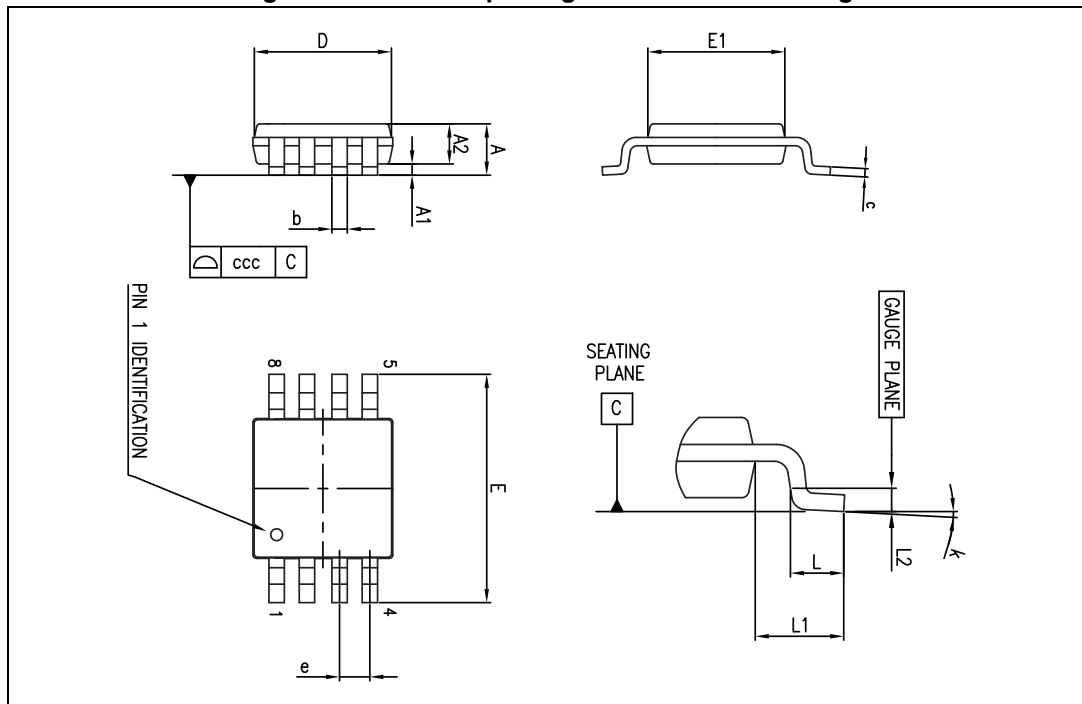


Table 7. MiniSO8 package mechanical data

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.1  |        |       | 0.043 |
| A1   | 0           |      | 0.15 | 0      |       | 0.006 |
| A2   | 0.75        | 0.85 | 0.95 | 0.030  | 0.033 | 0.037 |
| b    | 0.22        |      | 0.40 | 0.009  |       | 0.016 |
| c    | 0.08        |      | 0.23 | 0.003  |       | 0.009 |
| D    | 2.80        | 3.00 | 3.20 | 0.11   | 0.118 | 0.126 |
| E    | 4.65        | 4.90 | 5.15 | 0.183  | 0.193 | 0.203 |
| E1   | 2.80        | 3.00 | 3.10 | 0.11   | 0.118 | 0.122 |
| e    |             | 0.65 |      |        | 0.026 |       |
| L    | 0.40        | 0.60 | 0.80 | 0.016  | 0.024 | 0.031 |
| L1   |             | 0.95 |      |        | 0.037 |       |
| L2   |             | 0.25 |      |        | 0.010 |       |
| k    | 0 °         |      | 8 °  | 0 °    |       | 8 °   |
| ccc  |             |      | 0.10 |        |       | 0.004 |

## 5.4 SO8 package information

Figure 21. SO8 package mechanical drawing

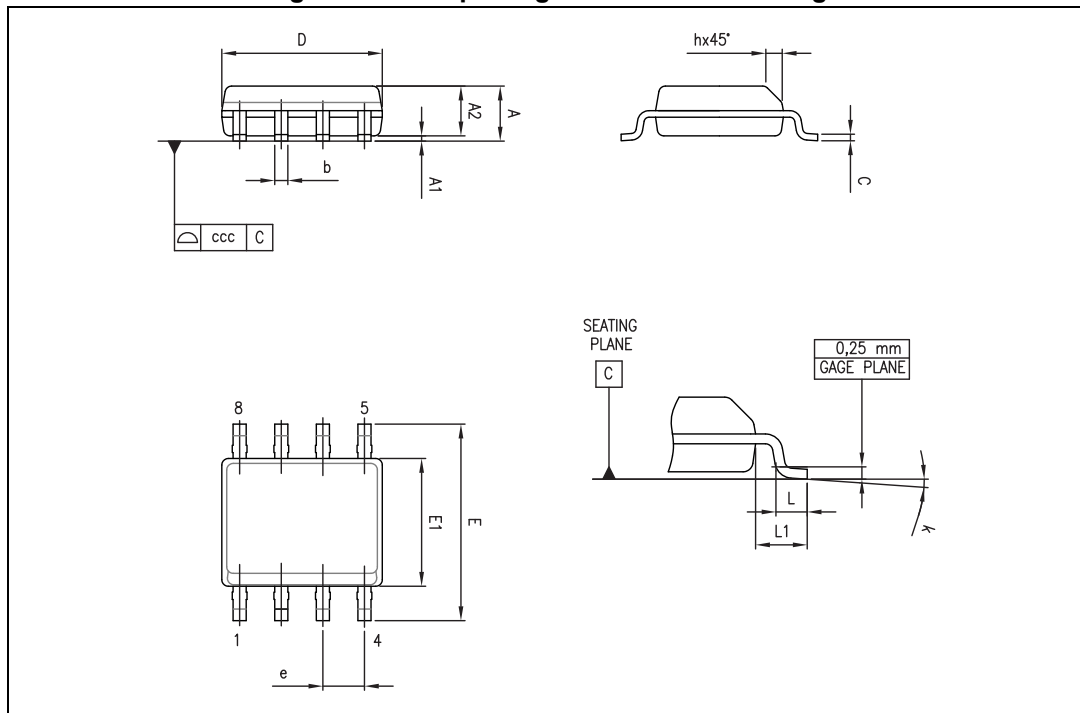


Table 8. SO8 package mechanical data

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.75 |        |       | 0.069 |
| A1   | 0.10        |      | 0.25 | 0.004  |       | 0.010 |
| A2   | 1.25        |      |      | 0.049  |       |       |
| b    | 0.28        |      | 0.48 | 0.011  |       | 0.019 |
| c    | 0.17        |      | 0.23 | 0.007  |       | 0.010 |
| D    | 4.80        | 4.90 | 5.00 | 0.189  | 0.193 | 0.197 |
| E    | 5.80        | 6.00 | 6.20 | 0.228  | 0.236 | 0.244 |
| E1   | 3.80        | 3.90 | 4.00 | 0.150  | 0.154 | 0.157 |
| e    |             | 1.27 |      |        | 0.050 |       |
| h    | 0.25        |      | 0.50 | 0.010  |       | 0.020 |
| L    | 0.40        |      | 1.27 | 0.016  |       | 0.050 |
| L1   |             | 1.04 |      |        | 0.040 |       |
| k    | 0 °         |      | 8 °  | 1 °    |       | 8 °   |
| ccc  |             |      | 0.10 |        |       | 0.004 |

## 5.5 TSSOP8 package information

Figure 22. TSSOP8 package mechanical drawing

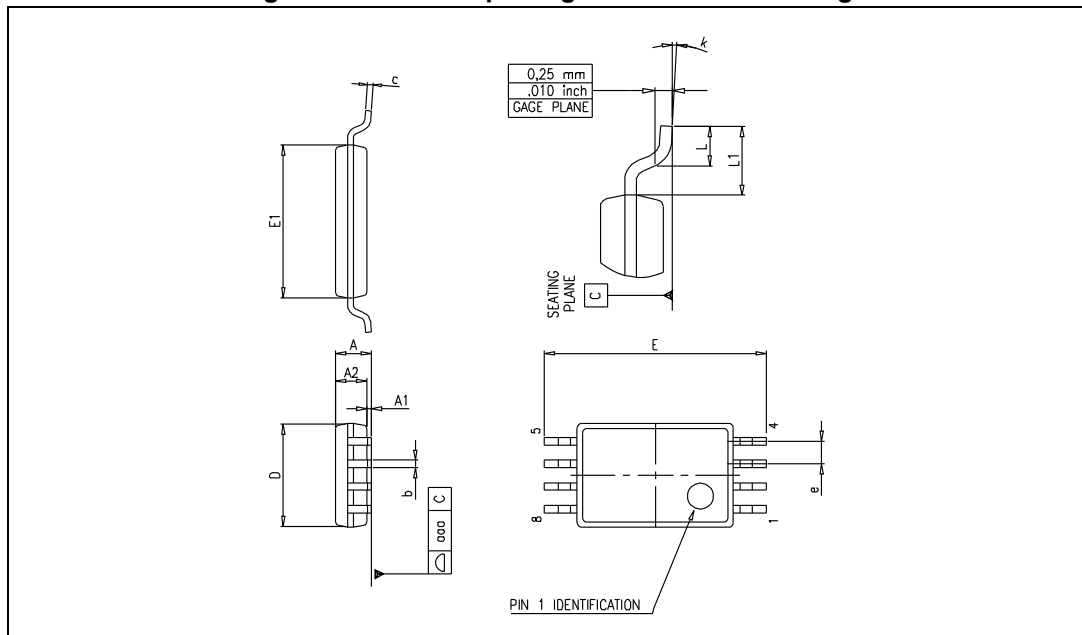


Table 9. TSSOP8 package mechanical data

| Ref. | Dimensions  |      |      |        |        |       |
|------|-------------|------|------|--------|--------|-------|
|      | Millimeters |      |      | Inches |        |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.   | Max.  |
| A    |             |      | 1.2  |        |        | 0.047 |
| A1   | 0.05        |      | 0.15 | 0.002  |        | 0.006 |
| A2   | 0.80        | 1.00 | 1.05 | 0.031  | 0.039  | 0.041 |
| b    | 0.19        |      | 0.30 | 0.007  |        | 0.012 |
| c    | 0.09        |      | 0.20 | 0.004  |        | 0.008 |
| D    | 2.90        | 3.00 | 3.10 | 0.114  | 0.118  | 0.122 |
| E    | 6.20        | 6.40 | 6.60 | 0.244  | 0.252  | 0.260 |
| E1   | 4.30        | 4.40 | 4.50 | 0.169  | 0.173  | 0.177 |
| e    |             | 0.65 |      |        | 0.0256 |       |
| k    | 0°          |      | 8°   | 0°     |        | 8°    |
| L    | 0.45        | 0.60 | 0.75 | 0.018  | 0.024  | 0.030 |
| L1   |             | 1    |      |        | 0.039  |       |
| aaa  |             | 0.1  |      |        | 0.004  |       |

## 5.6 TSSOP14 package information

Figure 23. TSSOP14 package mechanical drawing

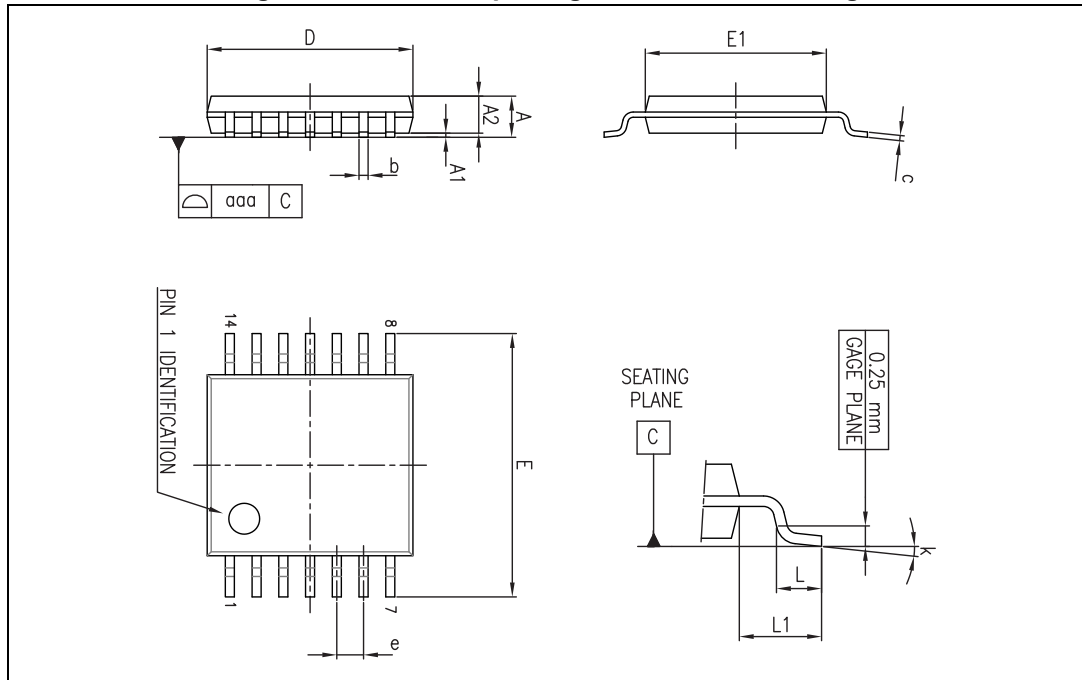


Table 10. TSSOP14 package mechanical data

| Ref. | Dimensions  |      |      |        |        |        |
|------|-------------|------|------|--------|--------|--------|
|      | Millimeters |      |      | Inches |        |        |
|      | Min.        | Typ. | Max. | Min.   | Typ.   | Max.   |
| A    |             |      | 1.20 |        |        | 0.047  |
| A1   | 0.05        |      | 0.15 | 0.002  | 0.004  | 0.006  |
| A2   | 0.80        | 1.00 | 1.05 | 0.031  | 0.039  | 0.041  |
| b    | 0.19        |      | 0.30 | 0.007  |        | 0.012  |
| c    | 0.09        |      | 0.20 | 0.004  |        | 0.0089 |
| D    | 4.90        | 5.00 | 5.10 | 0.193  | 0.197  | 0.201  |
| E    | 6.20        | 6.40 | 6.60 | 0.244  | 0.252  | 0.260  |
| E1   | 4.30        | 4.40 | 4.50 | 0.169  | 0.173  | 0.176  |
| e    |             | 0.65 |      |        | 0.0256 |        |
| L    | 0.45        | 0.60 | 0.75 | 0.018  | 0.024  | 0.030  |
| L1   |             | 1.00 |      |        | 0.039  |        |
| k    | 0 °         |      | 8 °  | 0 °    |        | 8 °    |
| aaa  |             |      | 0.10 |        |        | 0.004  |

## 5.7 SO14 package information

Figure 24. SO14 package mechanical drawing

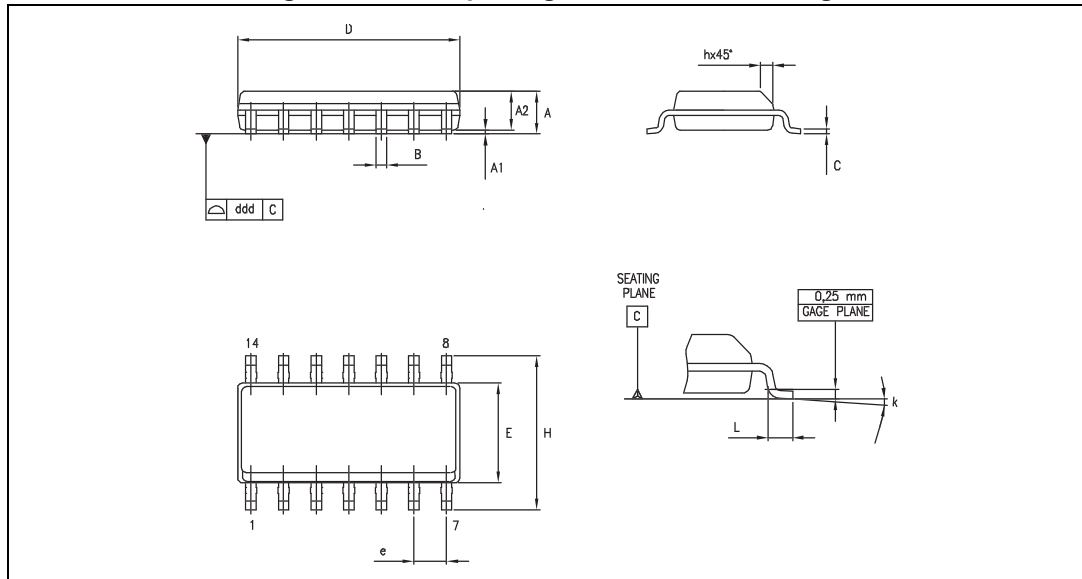


Table 11. SO14 package mechanical data

| Dimensions |             |      |      |        |      |       |
|------------|-------------|------|------|--------|------|-------|
| Ref.       | Millimeters |      |      | Inches |      |       |
|            | Min.        | Typ. | Max. | Min.   | Typ. | Max.  |
| A          | 1.35        |      | 1.75 | 0.05   |      | 0.068 |
| A1         | 0.10        |      | 0.25 | 0.004  |      | 0.009 |
| A2         | 1.10        |      | 1.65 | 0.04   |      | 0.06  |
| B          | 0.33        |      | 0.51 | 0.01   |      | 0.02  |
| C          | 0.19        |      | 0.25 | 0.007  |      | 0.009 |
| D          | 8.55        |      | 8.75 | 0.33   |      | 0.34  |
| E          | 3.80        |      | 4.0  | 0.15   |      | 0.15  |
| e          |             | 1.27 |      |        | 0.05 |       |
| H          | 5.80        |      | 6.20 | 0.22   |      | 0.24  |
| h          | 0.25        |      | 0.50 | 0.009  |      | 0.02  |
| L          | 0.40        |      | 1.27 | 0.015  |      | 0.05  |
| k          | 8 ° (max.)  |      |      |        |      |       |
| ddd        |             |      | 0.10 |        |      | 0.004 |

## 6 Ordering information

**Table 12. Order codes for devices without shutdown feature**

| Order code | Temperature range | Package | Packing       | Marking |
|------------|-------------------|---------|---------------|---------|
| LMV321LICT | -40 °C to +125 °C | SC70-5  | Tape and reel | K25     |
| LMV321LILT |                   | SOT23-5 |               | K170    |
| LMV358LIST |                   | MiniSO8 |               | K170    |
| LMV358LIPT |                   | TSSOP8  |               | V358L   |
| LMV358LIDT |                   | SO8     |               | LMV358L |
| LMV324LIPT |                   | TSSOP14 |               | LMV324L |
| LMV324LIDT |                   | SO14    |               | LMV324L |

## 7 Revision history

**Table 13. Document revision history**

| Date        | Revision | Changes                                                                                                                                                 |
|-------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 04-May-2012 | 1        | Initial release.                                                                                                                                        |
| 19-Dec-2013 | 2        | New template                                                                                                                                            |
| 09-Dec-2014 | 3        | Added TSSOP8 package<br><a href="#">Table 6</a> : updated some of the “inches” dimensions<br><a href="#">Table 12</a> : added new order code LMV358LIPT |

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