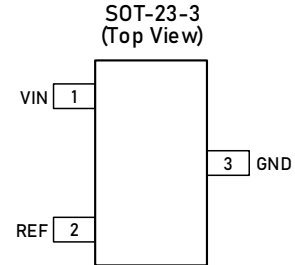


## Low-Drift, Low-Power, Small-Footprint Series Voltage Reference

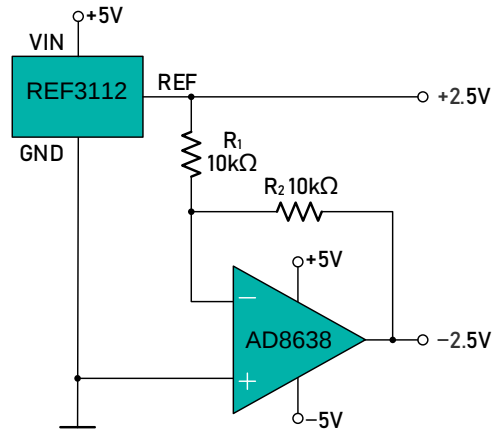
### Features and Benefits

- Voltage options: 1.25 V, 2.048 V, 2.5 V, 3.0 V, 3.3 V, 4.096 V
- Initial accuracy:  $\pm 0.1\%$  (maximum)
- Low temperature coefficient: 20 ppm/°C (maximum)
- Output 1/f noise at 0.1 to 10 Hz: 15  $\mu\text{V}_{\text{pp}}/\text{V}$
- Supply voltage: 2.7 to 5.5 V
- Power consumption: < 500  $\mu\text{A}$
- Start-up time: < 400  $\mu\text{s}$
- Operating temperature:  $-40$  to  $125^\circ\text{C}$
- Output Current:  $\pm 5$  mA



### Applications

- Data acquisition (DAQ)
- PLC analog I/O modules
- Field transmitters
- Motor drive control module
- Battery test equipment
- LCR meters



## Pin Description

| Pin. Name | Pin Description                                                |
|-----------|----------------------------------------------------------------|
| VIN       | Power supply voltage                                           |
| GND       | Ground.                                                        |
| REF       | Reference voltage outputs , an external capacitor is required. |

## Ordering Information <sup>(1)</sup>

| Type Number    | Output Voltage | Quantity | Operating Temperature | Package Name | Marking Code |
|----------------|----------------|----------|-----------------------|--------------|--------------|
| REF3112AIDBZR  | 1.25 V         | 3000     | –40 to 125°C          | SOT-23-3     | 3AXXX        |
| REF3320ARJZ-R7 | 2.048 V        | 3000     | –40 to 125°C          | SOT-23-3     | 3BXXX        |
| REF3325ARJZ-R7 | 2.5 V          | 3000     | –40 to 125°C          | SOT-23-3     | 3CXXX        |
| REF3330ARJZ-R7 | 3.0 V          | 3000     | –40 to 125°C          | SOT-23-3     | 3DXXX        |
| REF3333ARJZ-R7 | 3.3 V          | 3000     | –40 to 125°C          | SOT-23-3     | 3EXXX        |
| REF3340ARJZ-R7 | 4.096 V        | 3000     | –40 to 125°C          | SOT-23-3     | 3FXXX        |

(1) Please contact to your Linearin representative for the latest availability information and product details.

## Limiting Value – In accordance with the Absolute Maximum Rating System (IEC 60134).

|                                     |                 |
|-------------------------------------|-----------------|
| Operating Ambient Temperature Range | –40 to 125°C    |
| Storage Temperature Range           | –50 to 125°C    |
| Input Voltage Range                 | –0.3 V to 5.5 V |
| ESD protection                      | > 3000 V        |

*Note: Stresses exceeding those listed in the Maximum Rating table may damage the device. Operation beyond the maximum Rating conditions or under harsh conditions may affect product reliability and function.*

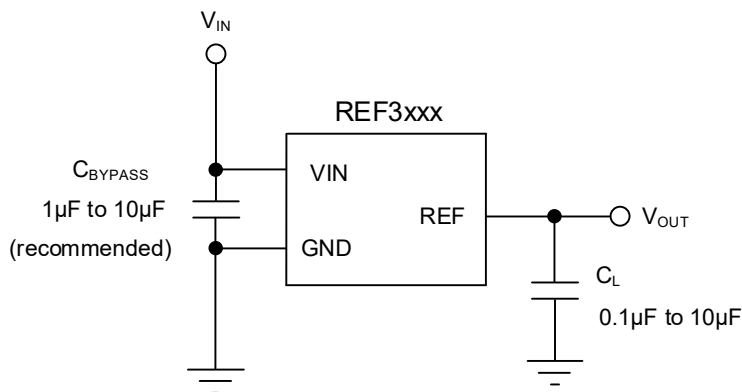
## Recommended Operating Conditions

| Parameter            | Symbol   | Min.          | Typ. | Max. | Unit |
|----------------------|----------|---------------|------|------|------|
| Supply input voltage | $V_{IN}$ | $V_{OUT}+0.2$ |      | 5.5  | V    |
| Output current range | $I_{CC}$ | –5            |      | 5    | mA   |

## Electrical Characteristics

| Parameter               | Symbol                         | Description                | Min. | Typ.  | Max. | Unit        |
|-------------------------|--------------------------------|----------------------------|------|-------|------|-------------|
| Power supply voltage    | $V_{IN}$                       |                            | 2.7  | 5     | 5.5  | V           |
| Power consumption       | $I_{CC}$                       | $V_{CC} = 5.0$ V, no load. |      | 300   | 500  | $\mu$ A     |
| Output voltage          | $V_{OUT}$                      | REF3312                    |      | 1.25  |      | V           |
|                         |                                | REF3320                    |      | 2.048 |      | V           |
|                         |                                | REF3325                    |      | 2.5   |      | V           |
|                         |                                | AEF333R                    |      | 3.0   |      | V           |
|                         |                                | REF3333                    |      | 3.3   |      | V           |
|                         |                                | REF3340                    |      | 4.096 |      | V           |
| Output voltage accuracy | $\Delta V_{OUT}$               |                            | -0.1 |       | 0.1  | %           |
| Output Noise            | $V_{noise}$                    | 0.1 to 10 Hz               |      | 15    |      | $\mu$ Vpp/V |
| Temperature coefficient | $T_C$                          | -40 to 125°C               |      |       | 20   | ppm/°C      |
| Dropout Voltage         | $V_{IN}-V_{OUT}$               |                            |      | 200   |      | mV          |
| Line Regulation         | $\Delta V_{OUT}/\Delta V_{IN}$ |                            |      |       | 100  | ppm/V       |
| Load Regulation         | $\Delta V_{OUT}/\Delta I_L$    |                            |      |       | 50   | ppm/mA      |
| Thermal hysteresis      | dT                             |                            |      | 80    |      | ppm         |
| Long-term stability     |                                | 0h to 1000h at 25°C        |      | 200   |      | ppm         |
| Short-circuit current   | $I_{SC}$                       | Sourcing and sinking       |      | 50    |      | mA          |
| Capacitive load         |                                |                            | 0.1  |       | 10   | $\mu$ F     |
| Turn-on setting time    |                                |                            |      |       | 400  | $\mu$ s     |

## Typical Application



## Layout

### Layout Guidelines

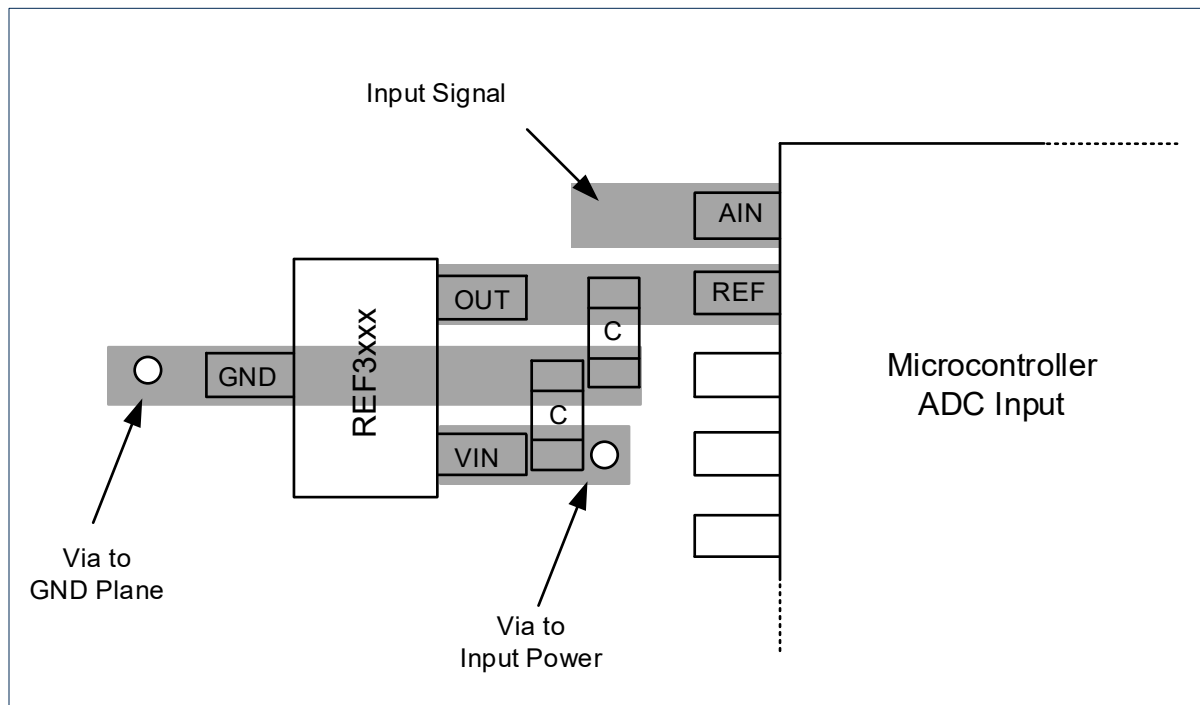
For optimal performance of this design, please follow standard printed circuit board (PCB) layout guidelines, including proper decoupling close to all integrated circuits and adequate power and ground connections with large copper pours.

As shown below an example of a PCB layout for a data acquisition system using the REF3xxx

Some key considerations are:

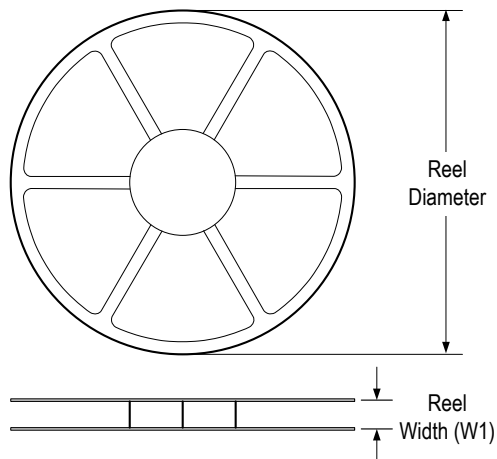
- Connect a low-ESR, 1  $\mu$ F ceramic capacitor at the IN pin for bypass, and a 0.1  $\mu$ F to 10  $\mu$ F ceramic capacitor at the OUT pin for stability of the REF3xxx.
- Decouple other active devices in the system per the device specifications.
- Use a solid ground plane helps distribute heat and reduces EMI noise pickup.
- Place the external components as close to the device as possible. This configuration prevents parasitic errors (such as the Seebeck effect) from occurring.
- Minimize trace length between the reference and bias connections to the ADC to reduce noise pickup.
- Do not run sensitive analog traces in parallel with digital traces. Avoid crossing digital and analog traces if possible, and only make perpendicular crossings when absolutely necessary.

### Layout Example

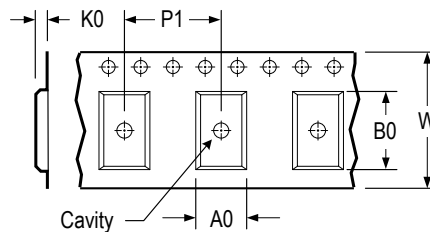


## Tape and Reel Information

### REEL DIMENSIONS

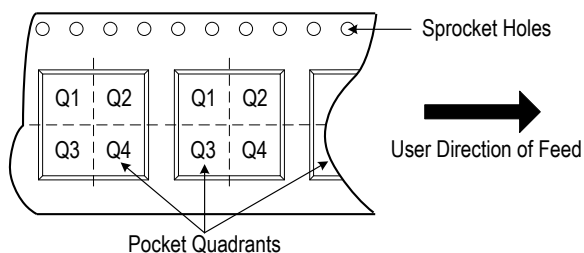


### TAPE DIMENSIONS



|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

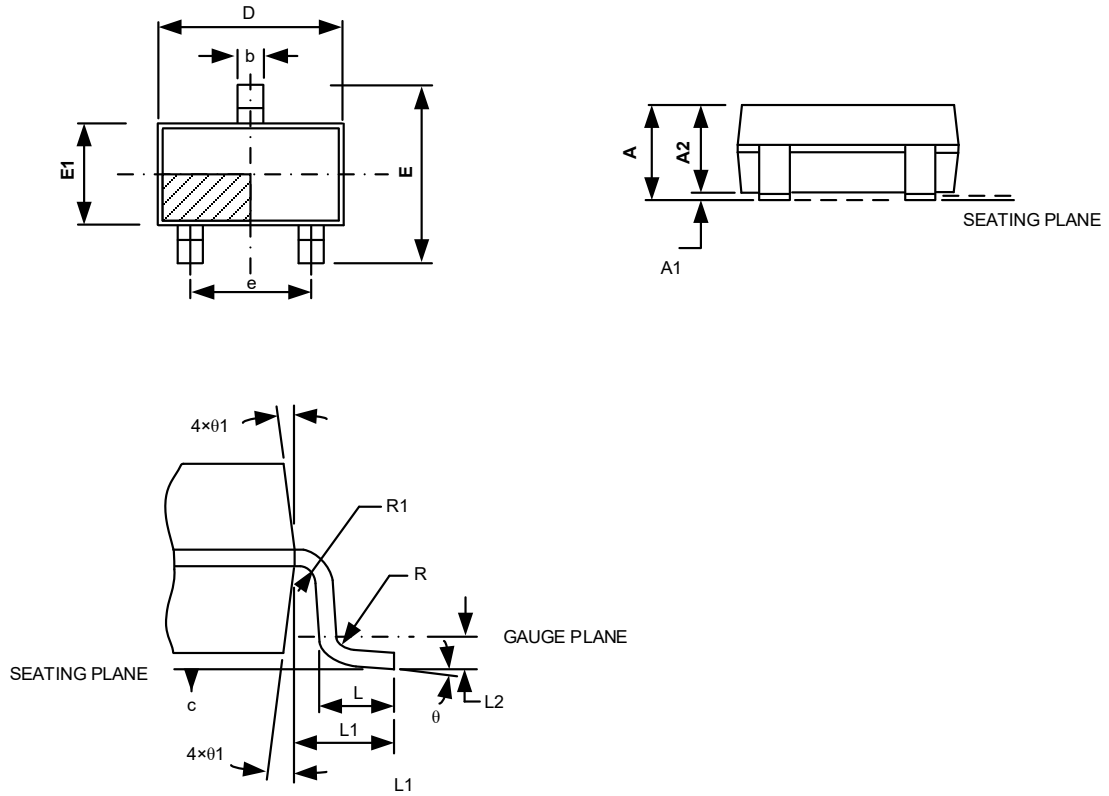


\* All dimensions are nominal

| Device        | Package Type | Pins | SPQ   | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin 1 Quadrant |
|---------------|--------------|------|-------|--------------------|--------------------|---------|---------|---------|---------|--------|----------------|
| REF3112AIDBZR | SOT23        | 3    | 3 000 | 178                | 9.0                | 3.3     | 3.2     | 1.5     | 4.0     | 8.0    | Q3             |

## Package Outlines

### DIMENSIONS, SOT-23-3



| Symbol | Min.    | Typ.  | Max.  |
|--------|---------|-------|-------|
| A      | –       | –     | 1.35  |
| A1     | 0       | –     | 0.15  |
| A2     | 1.0     | 1.1   | 1.2   |
| b      | 0.35    | –     | 0.45  |
| C      | 0.14    | –     | 0.20  |
| D      | 2.82    | 2.92  | 3.02  |
| E      | 2.60    | 2.80  | 3.00  |
| E1     | 1.526   | 1.626 | 1.726 |
| e      | 1.8     | 1.9   | 2.0   |
| L      | 0.35    | 0.45  | 0.6   |
| L1     | 0.6REF  |       |       |
| L2     | 0.25REF |       |       |
| R      | 0.1     | –     | –     |
| R1     | 0.1     | –     | 0.25  |
| θ      | 0°      | 4°    | 8°    |
| θ1     | 5°      | 10°   | 15°   |

(Unit: mm)