

## GENERAL DESCRIPTION

The TLV2711IDBVR are general purpose, low offset, high frequency response and low power operational amplifiers. With an excellent bandwidth of 1MHz, a slew rate of 1V/ $\mu$ s, and a quiescent current of 28  $\mu$ A per amplifier at 5V, the TLV2711IDBVR family can be designed into a wide range of applications. The TLV2711IDBVR op-amps are designed to provide optimal performance in low voltage and low power systems. The input common-mode voltage range includes ground, and the maximum input offset voltage are 3mV. These parts provide rail-to-rail output swing into heavy loads. The TLV2711IDBVR families of operational amplifiers are specified at the full temperature range of -40°C to +85°C under single or dual power supplies of 1.8V to 5.5V.


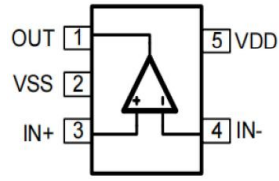

## FEATURES

- VDD range: 1.8V to 5.5V
- Low Offset Voltage: 0.5mV (Typical)
- Low Drift: 0.65 $\mu$ V/C (Typical)
- Low Noise
- Quiescent Current: 28 $\mu$ A
- Rail to Rail Input/Output
- MicroSize Packages: SOT23-5

## Applications

- Transducers
- Temperature Measurement
- Electronic Scales
- Medical instrumentation
- Handheld Test Equipment

## Reference News

PACKAGE OUTLINE	PIN CONFIGURATION	Marking
		
SOT-23-5	SOT-23-5	SOT-23-5

## PIN DESCRIPTION

Pin Name	Pin Number	Description
OUT	1	Output
VSS	2	Negative (lowest) power supply
IN+	3	Noninverting input
IN-	4	Inverting input
VDD	5	Positive (highest) power supply

**SIMPLIFIED SCHEMATIC**

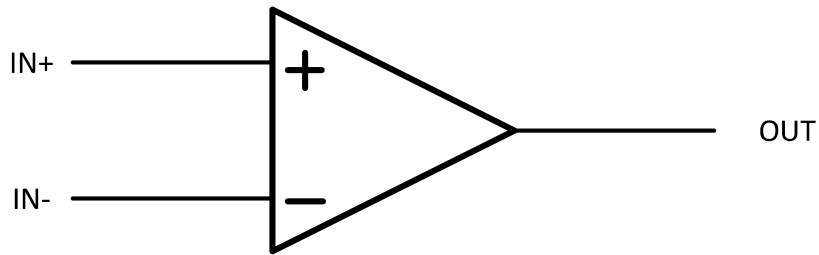


Figure 1.Simpliied Schematic

**ABSOLUTE MAXIMUM RATINGS**

Thermal Resistance 0 Jc.....130°C/W  
 Supply Voltage.....1.8 to 5.5V  
 Signal Input Terminals Voltage.....-0.1 to (V+)+0.1V  
 Operating Junction Temperature.....150°C  
 Operating Temperature Range..... -40°C to 125°C  
 Storage Temperature ..... -65°C to 150°C

**REEL SPECIFICATION**

P/N	PKG	QTY
TLV2711IDBVR	SOT-23-5	3000

**ELECTRICAL CHARACTERISTICS**

(At TA=25° C, RL=10k connected to Vs/2, and Vour=Vs/2, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage		-3	0.5	3	mV
Input Offset Voltage Drift	TA=-40° C to 125° C		1.8		μV/°C
Power Supply Rejection Ratio	Vs =1.8V to 5.5V TA=-40°C to 125°C	80	90		dB
Input Bias Current	TA=25°C		2.0		pA
Input Offset Current			1.0		pA
Common-mode Voltage Range		(V-)-0.1		(V+)+0.1	V
Common-mode Rejection Ratio	V-)-0.1 < Vcm < (V+)+0.1 TA=-40°C to 125°C	80	95		dB
Open Loop Voltage Gain	(V-)+100mV < Vo < (V+)-100mV, RL=10k TA=-40° C to 125°C	80	100		dB
Gain-bandwidth product	CL=120pF		1.5		MHz
Slew Rate	G=+1		1.2		V/μs
Specified Voltage Range		1.8		5.5	V
Quiescent Current			28	40	μA
Operating Temperature Range		-40		125	°C
Storage Temperature Range		-65		150	°C

## TYPICAL PERFORMANCE CHARACTERISTICS

(At  $T_A = 25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $C_L = 20\text{pF}$ , unless otherwise noted.)

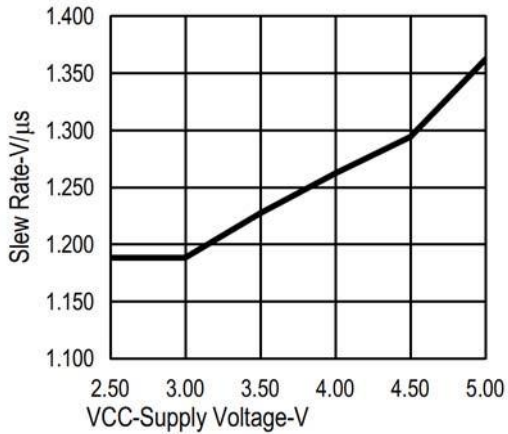


Figure 2. Slew Rate vs Supply Voltage

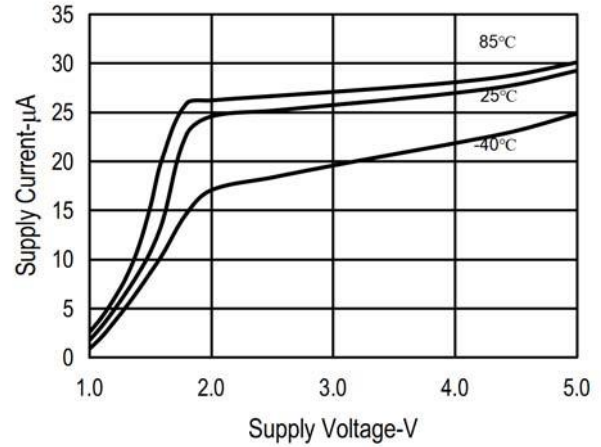


Figure 3. Supply Current vs Supply Voltage

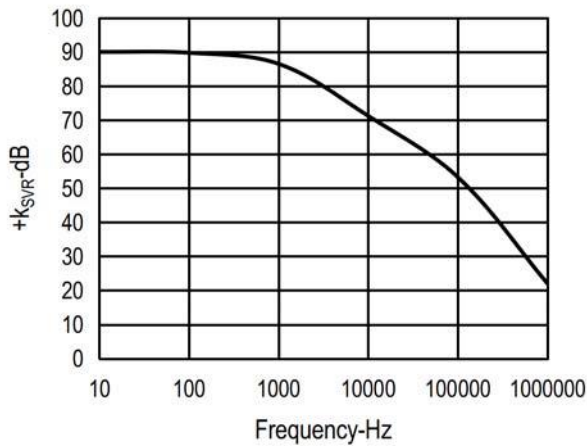


Figure 4. +kSVR vs Frequency

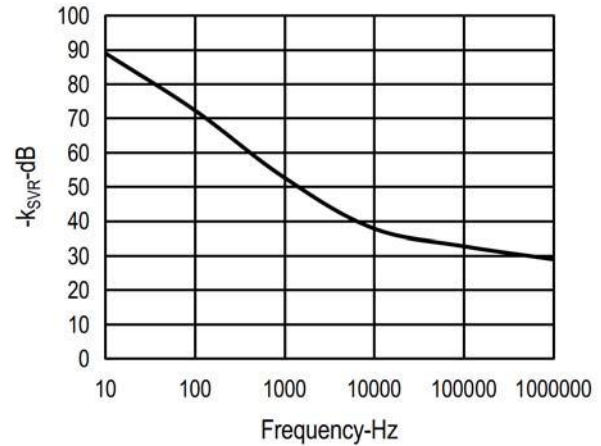


Figure 5. -kSVR vs Frequency

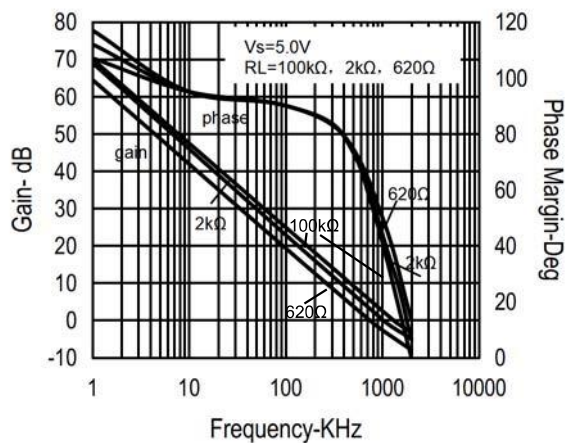


Figure 6. Frequency Response vs Resistive Load

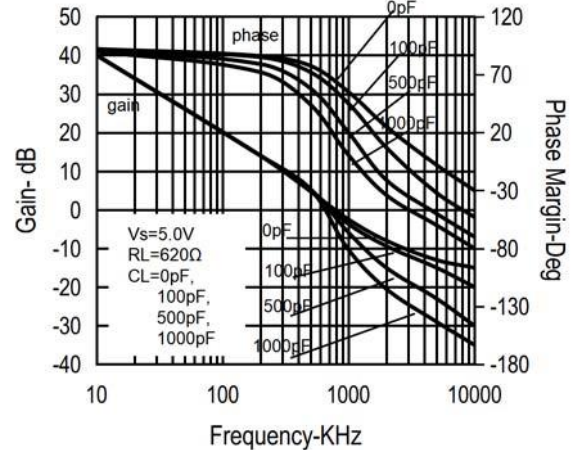


Figure 7. Frequency Response vs Capacitive Load

## TYPICAL PERFORMANCE CHARACTERISTICS

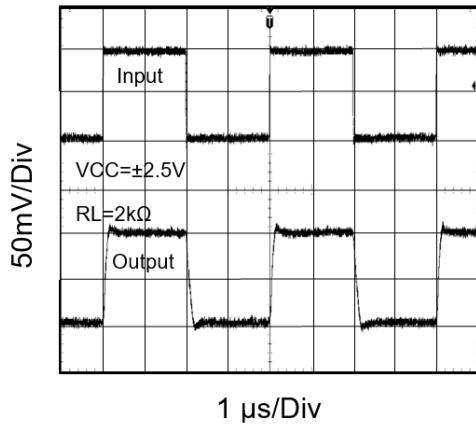


Figure 8. Noninverting Small-Signal Pulse Response

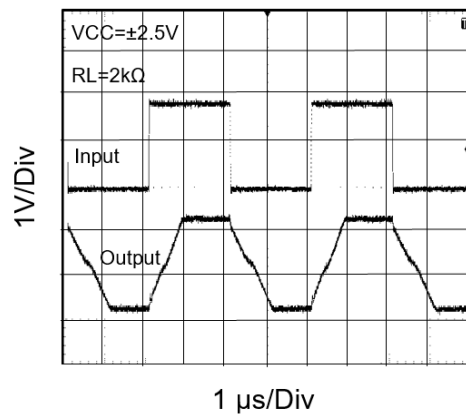


Figure 9. Noninverting Large-Signal Pulse Response

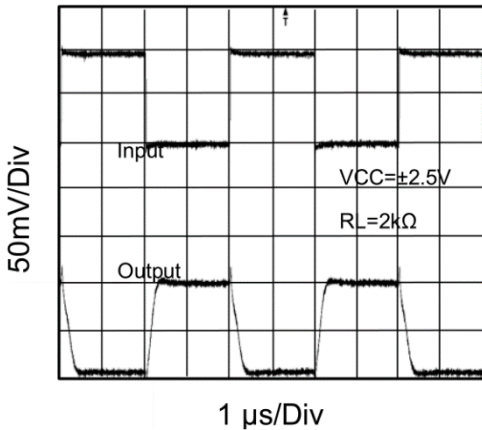


Figure 10. Inverting Small-Signal Pulse Response

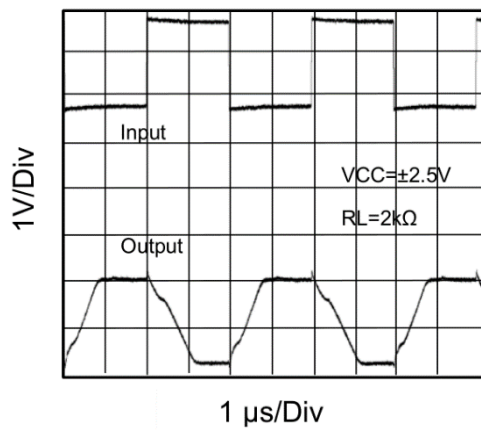


Figure 11. Inverting Large-Signal Pulse Response

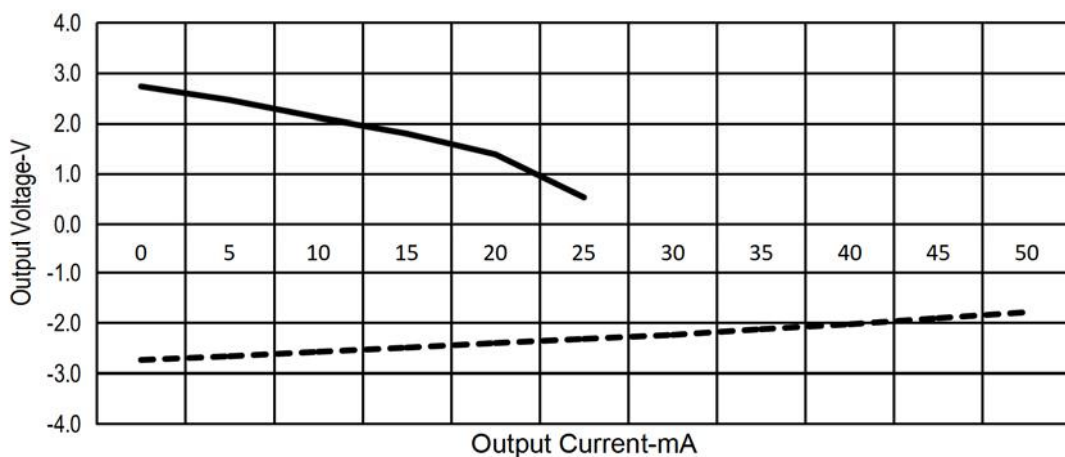


Figure 12. Output Voltage vs Output Current

## FUNCTIONAL DESCRIPTION

### Operating Voltage

The TLV2711IDBVR devices are fully specified and ensured for operation from 1.8V to 5.5V. In addition, many specifications apply from -40°C to 85°C. Parameters that vary significantly with operating voltages or temperature are shown in the Typical Characteristics graphs.

### Unity-Gain Bandwidth

The unity-gain bandwidth is the frequency up to which an amplifier with a unity gain may be operated without greatly distorting the signal. The TLV2711IDBVR device has a 1.5-MHz unity-gain bandwidth.

## APPLICATIONS INFORMATION

The TLV2711IDBVR is a unity-gain stable, precision operational amplifier with very low offset voltage drift; these devices are also free from output phase reversal. Applications with noisy or high-impedance power supplies require decoupling capacitors close to the device power-supply pins. In most cases, 0.1µF capacitors are adequate.

### Typical Application

Figure 13 shows a simple circuit to convert a single-ended input into differential output. The TLV2711IDBVR could be used to build this circuit. The circuit is composed of two amplifiers. One amplifier acts as a buffer and creates a voltage,  $V_{out+}$ . The second amplifier inverts the input and adds a reference voltage to generate  $V_{out-}$ . Both  $V_{out+}$  and  $V_{out-}$  range from 0.5 to 2V. The difference,  $V_{DIFF}$ , is the difference between  $V_{out+}$  and  $V_{out-}$ .

### Slew Rate

The slew rate is the rate at which an operational amplifier can change its output when there is a change on the input. The TLV2711IDBVR devices have a 1.2-V/µs slew rate. The TLV2711IDBVR is characterized to perform with this technique the recommended resistor value is approximately 20 k.

### Device Functional Modes

The TLV2711IDBVR device has a single functional mode. The device is powered on as long as the power supply voltage is between 1.8V(±0.9V) and 5.5V(±2.75V).

### Detailed Design Procedure

Linearity over the input range is key for good dc accuracy. The common mode input range and the output swing limitations determine the linearity. In general, an amplifier with rail-to-rail input and output swing is required. Bandwidth is a key concern for this design.

Because TLV2711IDBVR has a bandwidth of 1MHz, this circuit will only be able to process signals with frequencies of less than 1MHz.

Because the transfer function of  $V_{out}$  is heavily reliant on resistors ( $R_1, R_2, R_3,$  and  $R_4$ ), use resistors with low tolerances to maximize performance and minimize error. This design used resistors with resistance values of 36 k with tolerances measured to be within 2%. If the noise of the system is a key parameter, the user can select smaller resistance values (6k or lower) to keep the overall system noise low. This ensures that the noise from the resistors is lower than the amplifier noise.

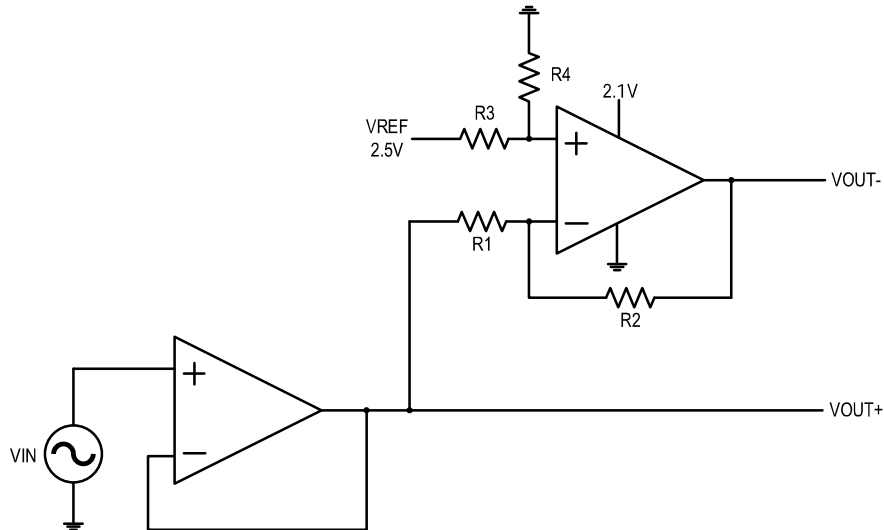
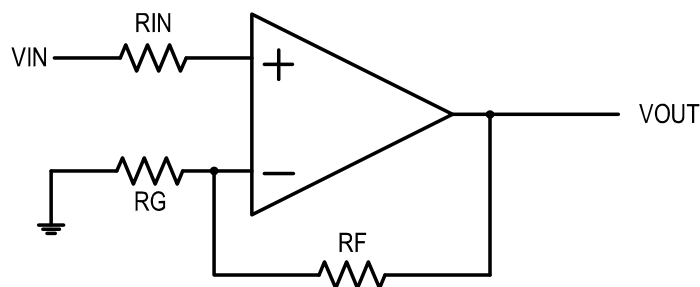


Figure 13. Schematic for Single-Ended Input to Differential Output Conversion

## LAYOUT

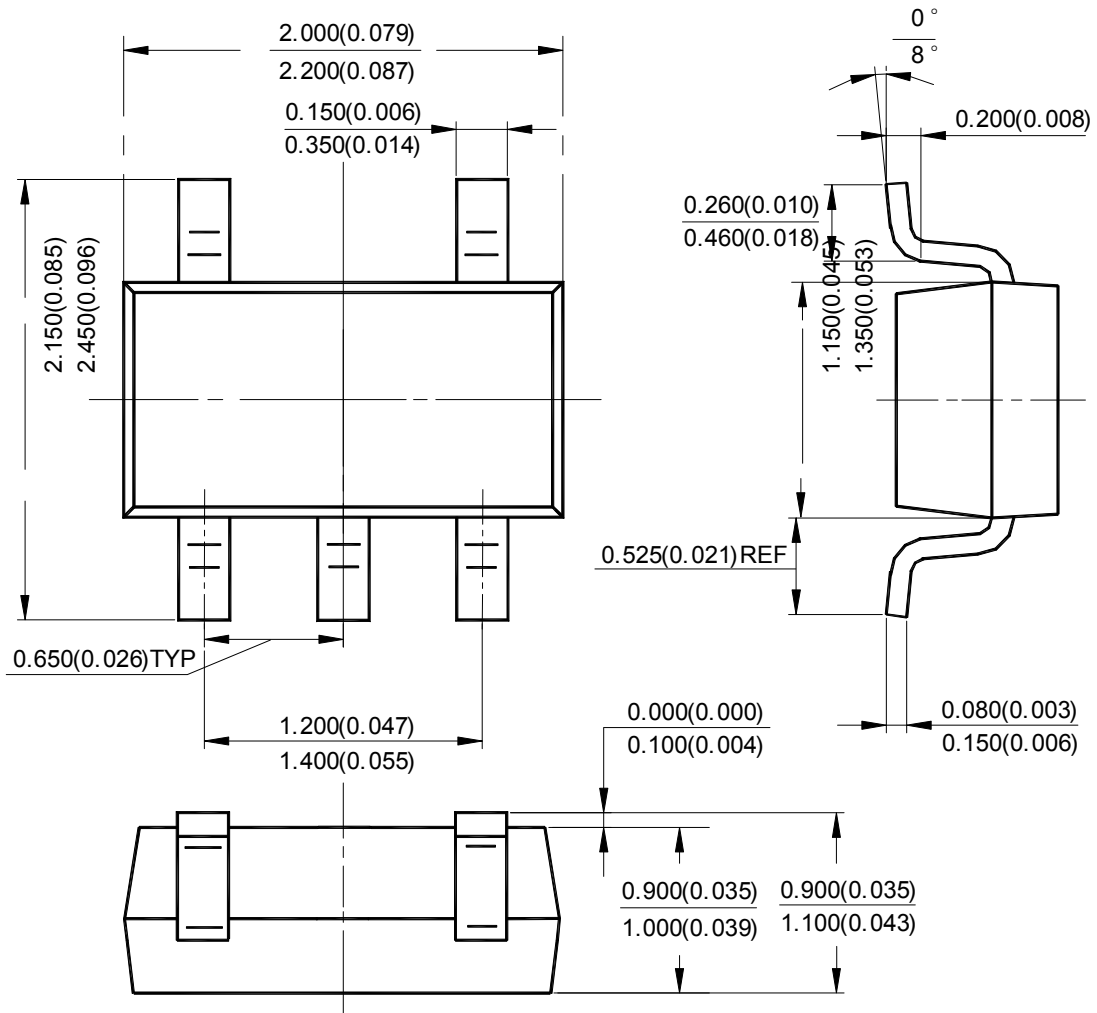
Use good PCB layout practices for best operational performance of the device, including:

- Keep the length of input traces as short as possible.
- Run the input traces as far away from the supply lines as possible to reduce parasitic coupling.
- Place components close to device and to each other to reduce parasitic capacitance and parasitic errors.
- Use low-ESR, ceramic bypass capacitors to reduce the coupled noise by providing low impedance power sources local to the analog circuitry.
- Grounding for analog and digital portions of circuitry separately to suppress the noise.



## Package Outline Dimensions (All dimensions in mm(inch).)

### SC-70-5



## Package Outline Dimensions (Cont. All dimensions in mm(inch).)

### SOT-23-5

