

# VRE204 Reference

## FEATURES

- ◆ Very High Accuracy: +4.5 V Output,  $\pm 0.4$  mV
- ◆ Extremely Low Drift: 0.6 ppm/ $^{\circ}$ C (-55 $^{\circ}$ C to +125 $^{\circ}$ C)
- ◆ Excellent Stability: 6 ppm/1000 Hrs. Typical
- ◆ Excellent Line Regulation: 6 ppm/V Typical
- ◆ Wide Supply Range:  $\pm 13.5$  V to  $\pm 22.0$  V
- ◆ Hermetic 20-terminal Ceramic LCC
- ◆ Military Processing Available

## APPLICATIONS

- ◆ Precision A/D and D/A Converters
- ◆ Transducer Excitation
- ◆ Accurate Comparator Threshold Reference
- ◆ High Resolution Servo Systems
- ◆ Digital Voltmeters
- ◆ High Precision Test and Measurement Instruments

## DESCRIPTION

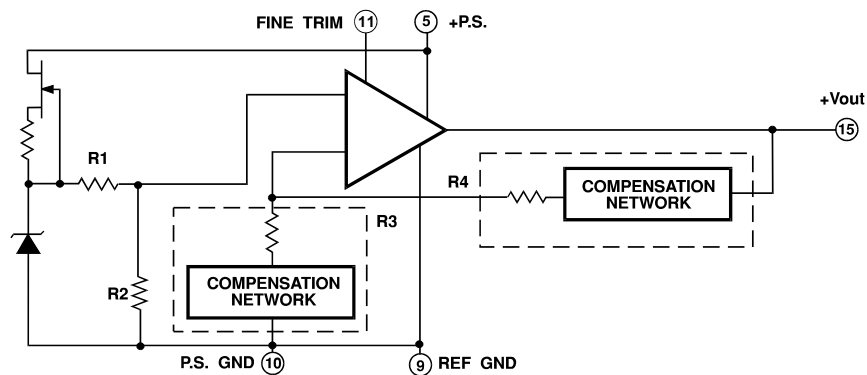
The VRE204 is a precision 4.5V reference with accuracy and temperature coefficient as low as 0.6 ppm/ $^{\circ}$ C.

These references are specifically designed to be used in precision instrumentation applications. The VRE204 is available in a 20-terminal ceramic LCC package.

The VRE204 is available in two versions: VRE204M (0.4mV accuracy) and VRE204 (0.3mV accuracy).

Other applications which can benefit from the VRE204 include precision instrumentation, test and measurement equipment, and digital voltmeters.

## BLOCK DIAGRAM



## OPERATION GUIDE

Model	Output (V)	Temp. Coeff. (ppm/ $^{\circ}$ C)	Accuracy (mV)
VRE204M	4.5	0.6	$\pm 0.6$
VRE204	4.5	0.3	$\pm 0.3$



20-terminal LCC package



# 1. ELECTRICAL CHARACTERISTICS

## ELECTRICAL CHARACTERISTICS

V<sub>PS</sub> = 2.5V, T<sub>amb</sub> = 25°C, R<sub>L</sub> = 10K Ω UNLESS OTHERWISE NOTED.

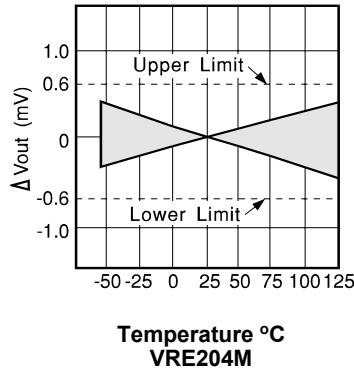
Parameter	MIN			MAX			Units
	Mn	Tp	Ma	Mn	Tp	Ma	
<b>OUTPUT VOLTAGE</b>							
Output Voltage	+13.5		22	*		*	V
Operating Temperature	5		25	*		*	°C
Storage Temperature	-65		0	*		*	°C
Output Voltage Error	0			*			
<b>OUTPUT VOLTAGE</b>							
VRE204		45			*		V
<b>OUTPUT VOLTAGE ERRORS</b>							
Initial Error			80			400	μV
Warmup Drift		2			1		ppm
T <sub>MIN</sub> - T <sub>amb</sub> (Note1)			600			300	μV
Temperature Drift		6			*		ppm/°C
Noise (0.1 - 10Hz)		3			*		mVp
<b>OUTPUT CURRENT</b>							
R <sub>g</sub>	0			*			A
<b>REGULATION</b>							
Line Regulation		6	0		*	*	ppm
Load Regulation		3			*		ppm
<b>OUTPUT RESISTANCE</b>							
R <sub>g</sub>		0			*		mΩ
Temperature Coefficient		4			*		ppm/°C
<b>QUICK START CURRENT (Note 2)</b>							
VRE204 PS		5	7		*	*	A

**NOTES:**

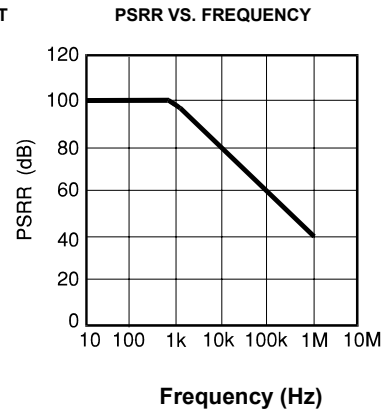
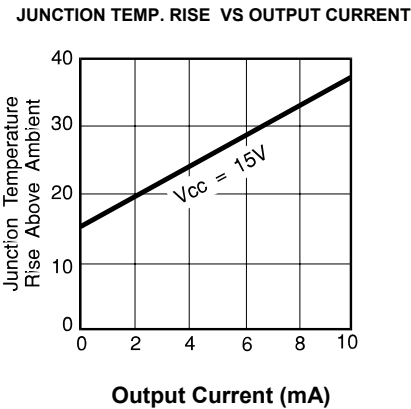
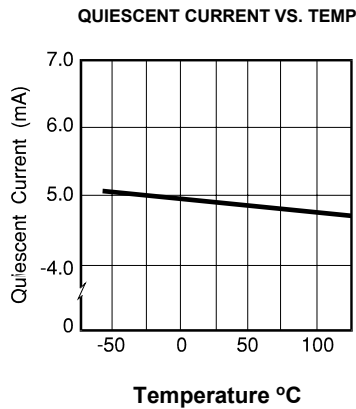
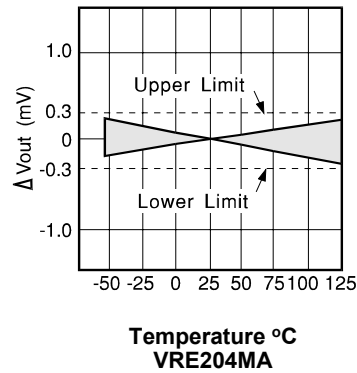
- \* **MIN**
- 1. Using the box method, the specified value is the maximum deviation from the output voltage at 25°C over the specified operating temperature range.
- 2. The specified values are unloaded.

## 2. PERFORMANCE

V<sub>OUT</sub> vs. TEMPERATURE



V<sub>OUT</sub> vs. TEMPERATURE



## 3. THEORY OF OPERATION

The following discussion refers to the block diagram in Figure 1. A FET current source is used to bias a 6.3 zener diode. The zener voltage is divided by the resistor network R1 and R2. This voltage is then applied to the noninverting input of the operational amplifier which amplifies the voltage to produce a 4.5 V output. The gain is determined by the resistor networks R3 and R4:  $G=1 + R4/R3$ . The 6.3 zener diode is used because it is the most stable diode

The current source provides a closely regulated zener current, which determines the slope of the references' voltage vs. temperature function. By trimming the zener current a lower drift over temperature can be achieved. But

Application Note  
VRE204  
VRE204  
VRE204  
VRE204



## 4. CONNECTION INFORMATION

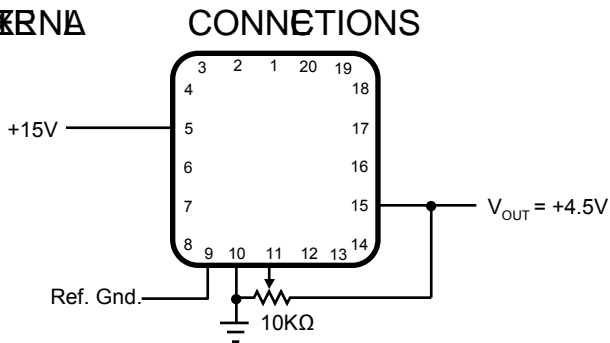
The VRE204 is a precision voltage reference device. It is designed to provide a stable, accurate output voltage over a wide range of operating conditions.

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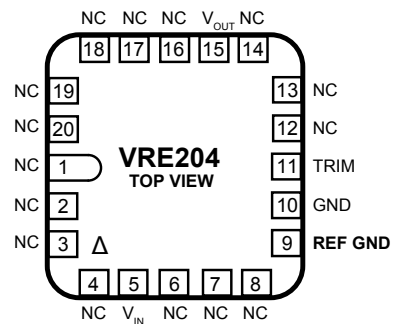
references have a voltage drop across their power supply ground pin due to quiescent current flowing through the contact resistance. If the contact resistance was constant with time and temperature, this voltage drop could be trimmed out. When the reference is plugged into a socket, this source of error can be as high as 20 ppm. By connecting the reference to a printed circuit board (PCB),

the error due to the contact resistance can be eliminated. If the unit is soldered into place, the contact resistance is sufficiently small that it does not effect performance.

### WIRE CONNECTIONS



### PIN CONFIGURATION



## CONTACTING CIRRUS LOGIC SUPPORT

For all Apex Precision Power product questions and inquiries, call toll free 800-546-2739 in North America.

For more information, visit our website at [www.cirrus.com](http://www.cirrus.com).

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