VRE117/118/119 Precision Reference Supplies



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FEATURES

- VERY HIGH ACCURACY: 3.000 V OUTPUT ±200 μV
- EXTREMELY LOW DRIFT: 0.6 ppm/°C 55°C to +125°C
- LOW WARM-UP DRIFT: 1 ppm Typ.
- EXCELLENT STABILITY: 6 ppm/1000 Hrs. Typ.
- EXCELLENT LINE REGULATION: 3 ppm/V Typ.
- HERMETIC 14-PIN CERAMIC DIP
- MILITARY PROCESSING OPTION

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

VRE117 Series Precision Voltage References provide ultrastable +3.000V (VRE117), -3.000V (VRE118) and ±3.000V (VRE119) outputs with ±0.200 mV initial accuracy and temperature coefficient as low as 0.6 ppm/°C over the full military temperature range. This improvement in accuracy is made possible by a unique, multipoint laser compensation proprietary technique developed by Thaler Corporation. Significant improvements have been made in other performance parameters as well, including initial accuracy, warm-up drift, line regulation, and long-term stability, making the VRE117 series the most accurate and stable 3.0V reference available.

VRE117/118/119 devices are available in two operating temperature ranges, -25°C to +85°C and -55°C to +125°C, and two performance

SELECTION GUIDE

Туре	Output	Temperature Operating Range	Max. Volt Deviation		
VRE117C	+3.0V	-25°C to +85°C	200 μV		
VRE117CA	+3.0V	-25°C to +85°C	100 μV		
VRE117M	+3.0V	-55°C to +125°C	400 μV		
VRE117MA	+3.0V	-55°C to +125°C	200 μV		
VRE118C	-3.0V	-25°C to +85°C	200 μV		
VRE118CA	-3.0V	-25°C to +85°C	100 μV		
VRE118M	-3.0V	-55°C to +125°C	400 μV		
VRE118MA	-3.0V	-55°C to +125°C	200 μV		
VRE119C	±3.0V	-25°C to +85°C	200 μV		
VRE119CA	±3.0V	-25°C to +85°C	100 μV		
VRE119M	±3.0V	-55°C to +125°C	400 μV		
VRE119MA	±3.0V	-55°C to +125°C	200 μV		

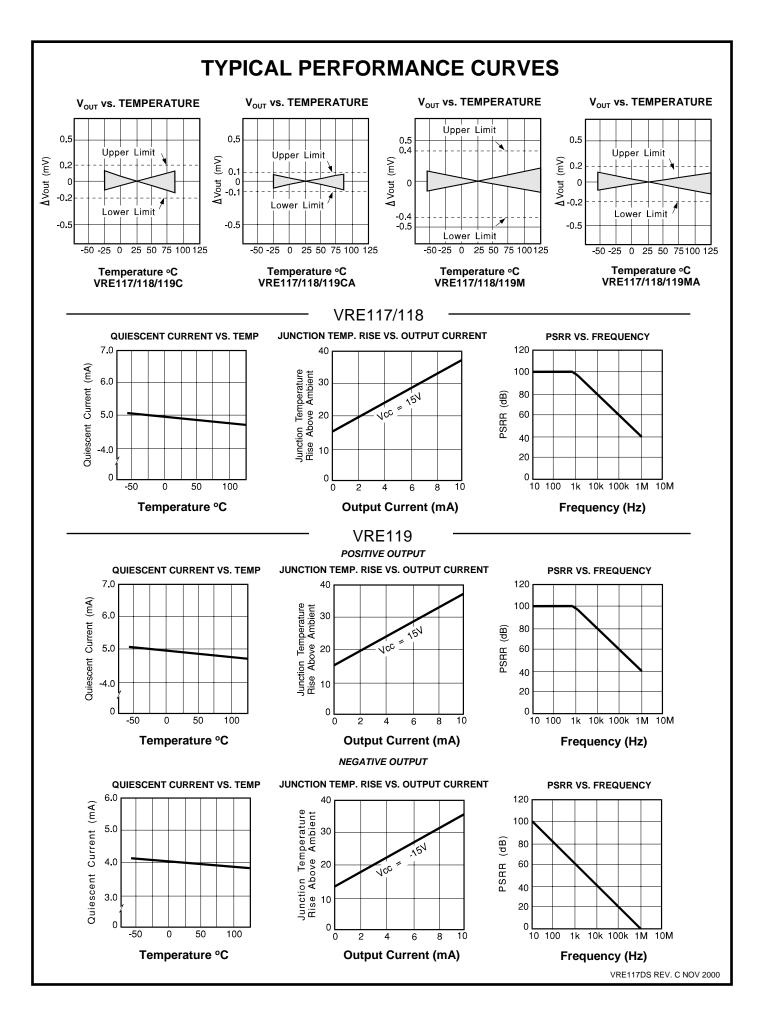
grades. All devices are packaged in 14-pin hermetic ceramic packages for maximum long-term stability. "M" versions are screened for high reliability and quality.

Superior stability, accuracy, and quality make these references ideal for precision applications such as A/D and D/A converters, high-accuracy test and measurement instrumentation, and transducer excitation.

ELECTRICAL SPECIFICATIONS Vps =±15V, T = 25°C, RL = 10kΩ unless otherwise noted.VRE117/118/119													
MODEL	С		CA		м		МА						
PARAMETERS	MIN	ТҮР	MAX	MIN	ТҮР	МАХ	MIN	ТҮР	MAX	MIN	ТҮР	МАХ	UNITS
ABSOLUTE MAXIMUM RATINGS													
Power Supply Operating Temperature Storage Temperature Short Circuit Protection	-65	ntinuc	+22 85 150 ous	* *	*	* * *	* -55 *	*	* 125 *	* -55 *	*	* 125 *	V °C °C
OUTPUT VOLTAGE													
VRE117 VRE118 VRE119		+3.0 -3.0 ±3.0			* * *			* *			* * *		V V V
OUTPUT VOLTAGE ERRORS													
Initial Error Warmup Drift Tmin - Tmax ⁽¹⁾ Long-Term Stability Noise (.1-10Hz)		2 6 1.5	300 200		1	200 100		2	300 400		1	200 200	μV ppm μV ppm/1000hr. μVpp
OUTPUT CURRENT									•				
Range	±10			*			*			*			mA
REGULATION													
Line Load		3 3	10		*	*		*	*		*	*	ppm/V ppm/mA
OUTPUT ADJUSTMENT													
Range Temperature Coefficient		5 1			*			*			*		mV μV/°C/mV
POWER SUPPLY CURRE		2)				•			r				
VRE117 +PS/ -PS VRE119 +PS VRE118/119 -PS		5 7 4	7 9 6		* * *	* * *		* * *	* *		* * *	* *	mA mA mA
NOTES: *Same as C M 1.Using the box method, maximum deviation fror	the sp	ecified											

over the specified operating temperature range.

2. The specified values are unloaded.



DISCUSSION OF PERFORMANCE

THEORY OF OPERATION

The following discussion refers to the schematic below. A FET current source is used to bias a 6.3V 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 3.000V output. The gain is determined by the resistor networks R3 and R4: G=1 + R4/R3. The 6.3V zener diode is used because it is the most stable diode over time and temperature.

The current source provides a closely regulated zener current, which determines the slope of the reference's voltage vs. temperature function. By trimming the zener current, a lower drift over temperature can be achieved. But since the voltage vs. temperature function is nonlinear, this method leaves a residual error over wide temperature ranges.

To remove this residual error, Thaler Corporation has developed a nonlinear compensation network of thermistors and resistors that is used in the VRE117 series references. This proprietary network eliminates most of the nonlinearity in the voltage vs. temperature function. By then adjusting the slope, Thaler Corporation produces a very stable voltage over wide temperature ranges. This network is less than 2% of the overall network resistance so it has a negligible effect on long term stability.

APPLICATION INFORMATION

Figure 1 shows the proper connection of the VRE117 series voltage reference with the optional trim resistors. When trimming the VRE119, the positive voltage should be trimmed first since the negative voltage tracks the positive side. Pay careful attention to the circuit layout to avoid noise pickup and voltage drops in the lines.

The VRE117 series voltage references have the ground terminal brought out on two pins (pin 6 and pin 7) which are connected together internally. This allows the user to achieve greater accuracy when using a socket. Voltage 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 20ppm. By connecting pin 7 to the power supply ground and pin 6 to a high impedance ground point in the measurement circuit, 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 doesn't effect performance.

