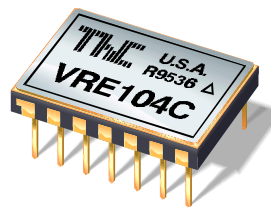




# VRE104

## Precision Reference Supplies



THALER CORPORATION • 2015 N. FORBES BOULEVARD • TUCSON, AZ. 85745 • (520) 882-4000

### FEATURES

- **VERY HIGH ACCURACY:** 4.5000 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. Typ.
- **EXCELLENT LINE REGULATION:** 6 ppm/V Typ.
- **WIDE SUPPLY RANGE:** +13.5 to +22.0 V
- **HERMETIC 14-PIN CERAMIC DIP**
- **MILITARY PROCESSING OPTIONS**

### 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

VRE104 Series Precision Voltage References provide ultrastable +4.500 V outputs with up to  $\pm 0.4$  mV initial accuracy and temperature coefficient as low as 0.6 ppm/ $^{\circ}$ C over the full military temperature range.

These references are specifically designed to be used with the Crystal Semiconductor line of successive-approximation type Analog to Digital Converters (ADCs). This line of ADCs sets new standards for temperature drift, which can only be as good as the external reference used. The Thaler VRE104 combined with a Crystal ADC will provide the lowest drift data conversion obtainable.

VRE104 series devices are available in two operating temperature ranges, -25 $^{\circ}$ C to +85 $^{\circ}$ C and -55 $^{\circ}$ C to +125 $^{\circ}$ C, and two performance 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 the VRE104 ideal for all precision applications which may require a 4.5V reference. High-accuracy test and measurement instrumentation, and transducer excitation are some other applications which can benefit from the high accuracy of the VRE104.

### SELECTION GUIDE

Type	Output	Temperature Operating Range	Max. Volt Deviation
VRE104C	+4.5V	-25 $^{\circ}$ C to +85 $^{\circ}$ C	0.4mV
VRE104CA	+4.5V	-25 $^{\circ}$ C to +85 $^{\circ}$ C	0.2mV
VRE104M	+4.5V	-55 $^{\circ}$ C to +125 $^{\circ}$ C	0.6mV
VRE104MA	+4.5V	-55 $^{\circ}$ C to +125 $^{\circ}$ C	0.3mV

# ELECTRICAL SPECIFICATIONS

# VRE104

Vps =+15V, T = 25°C, RL = 10KΩ unless otherwise noted.

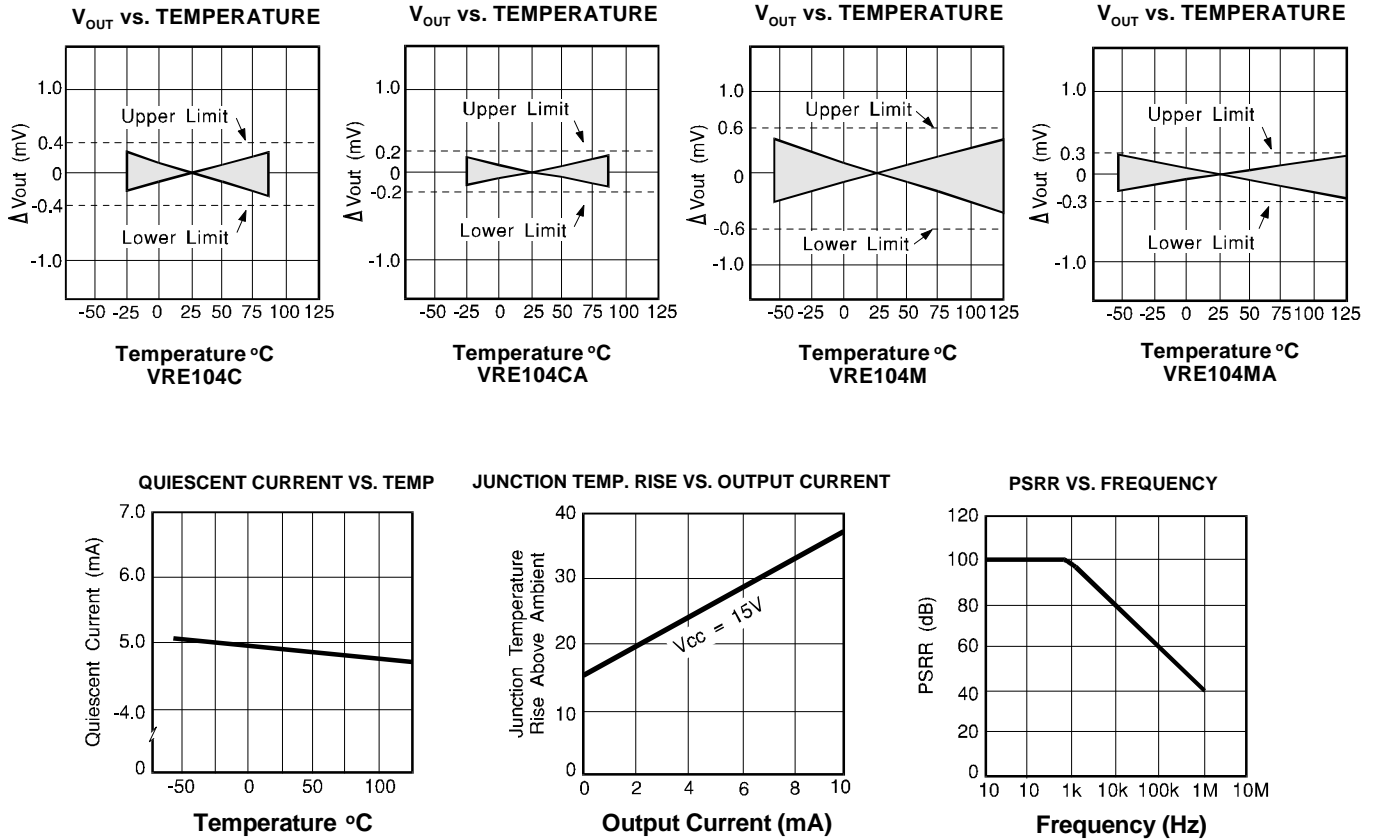
MODEL	C			CA			M			MA			
PARAMETERS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
<b>ABSOLUTE MAXIMUM RATINGS</b>													
Power Supply	+13.5		+22	*		*	*		*	*		*	V
Operating Temperature	-25		85	*		*	-55		125	-55		125	°C
Storage Temperature	-65		150	*		*	*		*	*		*	°C
Short Circuit Protection	Continuous				*			*			*		
<b>OUTPUT VOLTAGE</b>													
VRE104		+4.5			*			*			*		V
<b>OUTPUT VOLTAGE ERRORS</b>													
Initial Error			800			400			800			400	μV
Warmup Drift		2			1			2			1		ppm
T <sub>min</sub> - T <sub>max</sub> <sup>(1)</sup>			400			200			600			300	μV
Long-Term Stability		6			*			*			*		ppm/1000hrs
Noise (.1-10Hz)		3			*			*			*		μVpp
<b>OUTPUT CURRENT</b>													
Range	±10			*			*			*			mA
<b>REGULATION</b>													
Line		6	10		*	*		*	*		*	*	ppm/V
Load		3			*			*			*		ppm/mA
<b>OUTPUT ADJUSTMENT</b>													
Range		10			*			*			*		mV
Temperature Coeff.		4			*			*			*		μV/°C/mV
<b>POWER SUPPLY CURRENTS</b> <sup>(2)</sup>													
VRE104 +PS		5	7		*	*		*	*		*	*	mA

NOTES: \*Same as C Models.

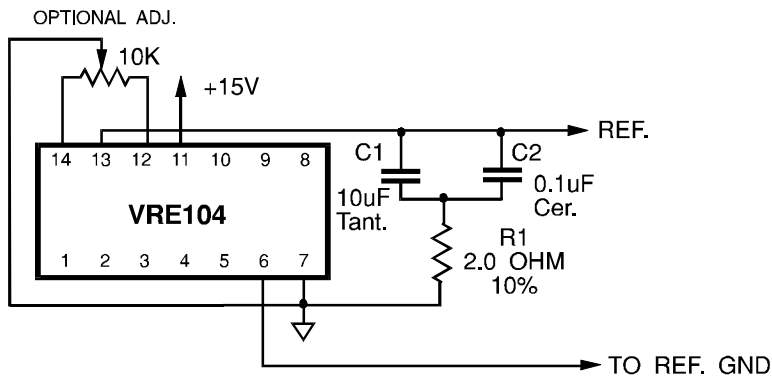
1. Using the box method, the specified value is the maximum deviation from the output voltage at 25°C over the specified operating temperature range.

2. The specified values are unloaded.

# TYPICAL PERFORMANCE CURVES



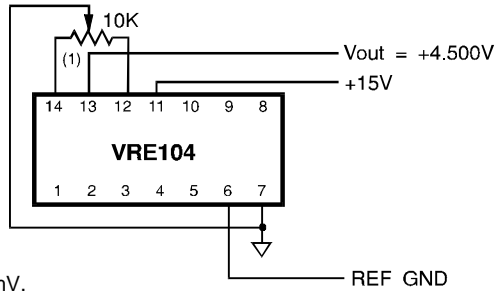
## VRE104 Used With Crystal Semiconductor ADC



Suggested Reading: Crystal Semiconductor Application Note: "Voltage References for the CS501X/CS251IX Series of A/D Converters"



## EXTERNAL CONNECTIONS

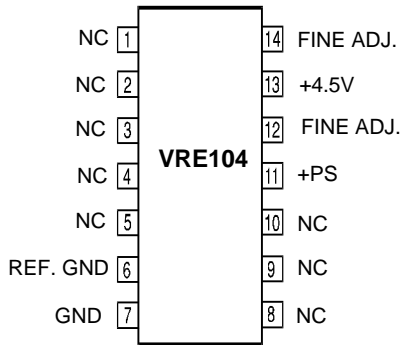


**FIGURE 2**

1. Optional Fine Adjust for approximately  $\pm 10\text{mV}$ .

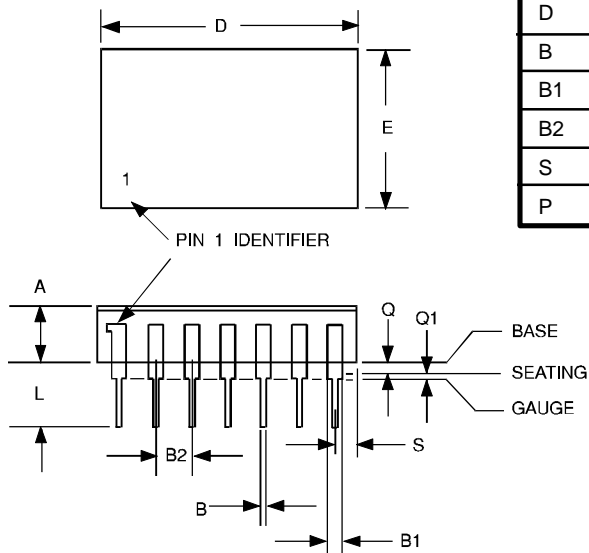
## PIN CONFIGURATION

### TOP VIEW



## MECHANICAL

### 14-PIN HYBRID PACKAGE



DIM	INCHES		MILLIMETER		DIM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
E	.480	.500	12.1	12.7	A	.120	.155	3.0	4.0
L	.195	.215	4.9	5.4	Q	.015	.035	0.4	0.9
D	.775	.805	19.7	20.4	Q1	N/A	.030	N/A	0.7
B	.016	.020	0.4	0.5	C	.009	.012	0.2	0.3
B1	.038	.042	0.9	1.0	G1	.290	.310	7.3	7.8
B2	.095	.105	2.4	2.6					
S	.085	.105	2.1	2.6					
P	.004	.006	0.10	0.15					