

REF1004

1.2V and 2.5V Micropower VOLTAGE REFERENCE

FEATURES

- **INITIAL ACCURACY:**
REF1004-1.2 $\pm 4\text{mV}$
REF1004-2.5 $\pm 20\text{mV}$
- **MINIMUM OPERATING CURRENT:**
REF1004-1.2 $10\mu\text{A}$
REF1004-2.5 $20\mu\text{A}$
- **EXCELLENT LONG TERM TEMPERATURE STABILITY**
- **VERY LOW DYNAMIC IMPEDANCE**
- **OPERATES UP TO 20mA**
- **PACKAGE: 8-Lead SOIC**

APPLICATIONS

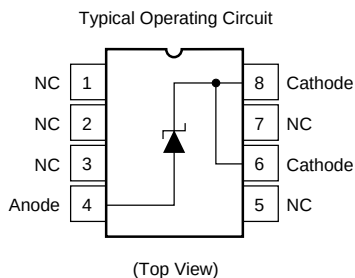
- **BATTERY POWERED TEST EQUIPMENT**
- **PORTABLE MEDICAL INSTRUMENTATION**
- **PORTABLE COMMUNICATIONS DEVICES**
- **A/D AND D/A CONVERTERS**
- **NOTEBOOK AND PALMTOP COMPUTERS**

DESCRIPTION

The REF1004-1.2 and REF1004-2.5 are two terminal bandgap reference diodes designed for high accuracy with outstanding temperature characteristics at low operating currents. Prior to the introduction of the REF1004 Micropower Voltage References, accuracy and stability specifications could only be attained by expensive screening of standard devices. The REF1004 is a cost effective solution when reference voltage accuracy, low power, and long term temperature stability are required.

REF1004 is a drop-in replacement for the LT1004 as well as an upgraded replacement of the LM185/385 series references. The REF1004C is characterized for operation from 0°C to 70°C and the REF1004I is characterized for operation from -40°C to $+85^{\circ}\text{C}$.

The REF1004 is offered in an 8-lead Plastic SOIC package and shipped in anti-static rails or tape and reel.



SPECIFICATIONS

ELECTRICAL

$T_A = +25^{\circ}\text{C}$ unless otherwise noted.

PARAMETER	CONDITIONS	REF1004-1.2			REF1004-2.5			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
REFERENCE VOLTAGE REF1004C ⁽¹⁾ REF1004I ⁽²⁾	$I_R = 100\mu\text{A}$	1.231 1.229 1.225	1.235 1.235 1.235	1.239 1.239 1.239	2.490 2.487 2.480	2.500 2.500 2.500	2.511 2.511 2.511	V
AVERAGE TEMPERATURE COEFFICIENT	$I_{\text{MIN}} \leq I_R \leq 20\text{mA}$		20			20		ppm/ $^{\circ}\text{C}$
MINIMUM OPERATION CURRENT ⁽³⁾			8	10		12	20	μA
REVERSE BREAKDOWN VOLTAGE CHANGE WITH CURRENT	$I_{\text{MIN}} \leq I_R \leq 1\text{mA}$ $1\text{mA} \leq I_R \leq 20\text{mA}$			1 1.5 ⁽³⁾ 10 20 ⁽³⁾			1 1.5 ⁽³⁾ 10 20 ⁽³⁾	mV
REVERSE DYNAMIC IMPEDANCE ⁽³⁾	$I_R = 100\mu\text{A}$		0.2	0.6		0.2	0.6	Ω
WIDE BAND NOISE (RMS) 10Hz $\leq I_R \leq 10\text{kHz}$	$I_R = 100\mu\text{A}$		60			120		μV
LONG TERM STABILITY $T_A = 25^{\circ}\text{C} \pm 0.1^{\circ}\text{C}$	$I_R = 100\mu\text{A}$		20			20		ppm/KHr
NOTES: (1) This specification applies over the full operating temperature range of $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$. (2) This specification applies over the full operating temperature range of $40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$. (3) Denotes the specifications which apply over the full operating temperature range.								

ORDERING INFORMATION

MODEL	T_A	V_Z	PACKAGE
REF1004C-1.2	0°C to $+70^{\circ}\text{C}$	1.2V	8-Lead SOIC
REF1004C-2.5	0°C to $+70^{\circ}\text{C}$	2.5V	8-Lead SOIC
REF1004I-1.2	-40°C to $+85^{\circ}\text{C}$	1.2V	8-Lead SOIC
REF1004I-2.5	-40°C to $+85^{\circ}\text{C}$	2.5V	8-Lead SOIC

NOTE: Available in Tape and Reel, Add -TR to Model Number.

ABSOLUTE MAXIMUM RATINGS

Reverse Breakdown Current	30mA
Forward Current	10mA
Operating Temperature Range	
REF1004C	0°C to $+70^{\circ}\text{C}$
REF1004I	-40°C to $+85^{\circ}\text{C}$
Storage Temperature	
REF1004C	-65°C to $+150^{\circ}\text{C}$
REF1004I	-65°C to $+150^{\circ}\text{C}$
Lead Temperature (soldering, 10s)	$+300^{\circ}\text{C}$

ORDERING INFORMATION

MODEL	PART MARKING
REF1004C-1.2	BBREF0412
REF1004C-2.5	BBREF0425
REF1004I-1.2	BBREF0412
REF1004I-2.5	BBREF0425

PACKAGE INFORMATION

MODEL	PACKAGE	PACKAGE DRAWING NUMBER ⁽¹⁾
REF1004C-1.2	8-Pin SOIC	182
REF1004C-2.5	8-Pin SOIC	182
REF1004I-1.2	8-Pin SOIC	182
REF1004I-2.5	8-Pin SOIC	182

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

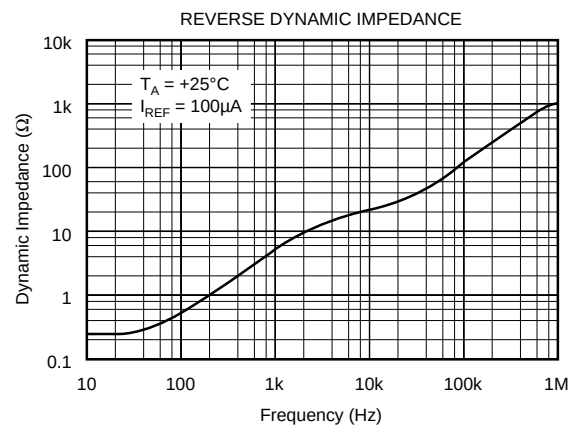
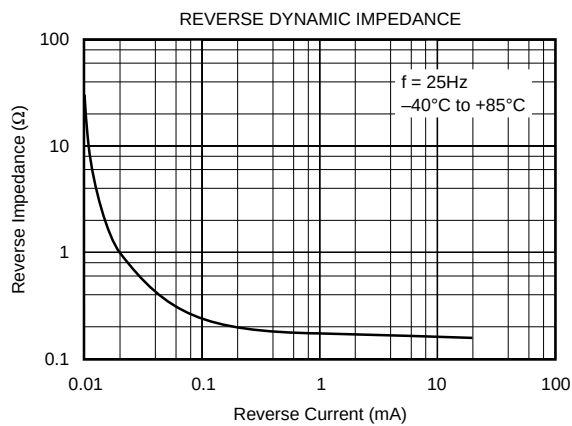
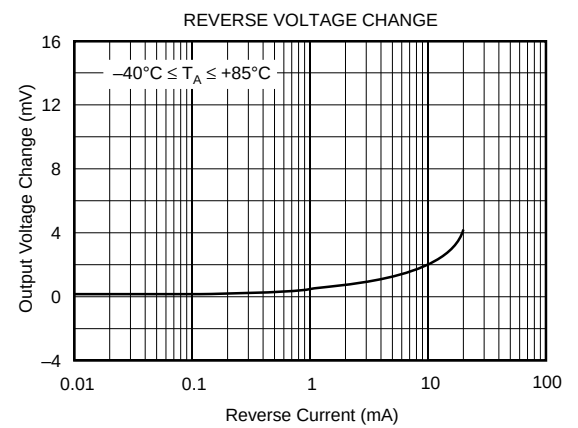
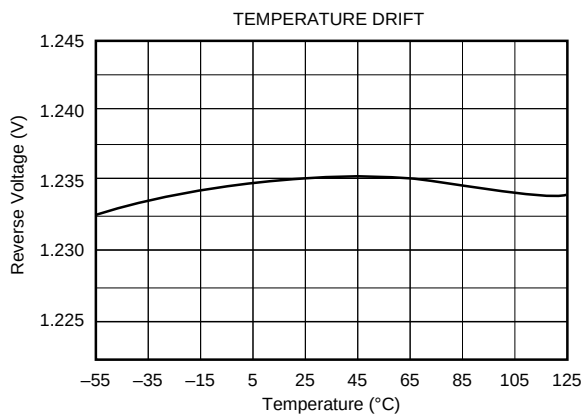
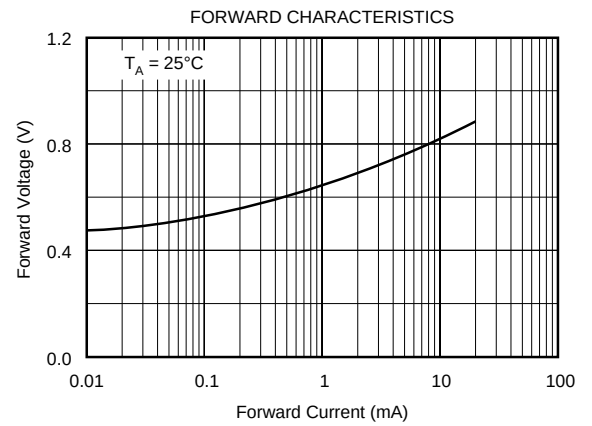
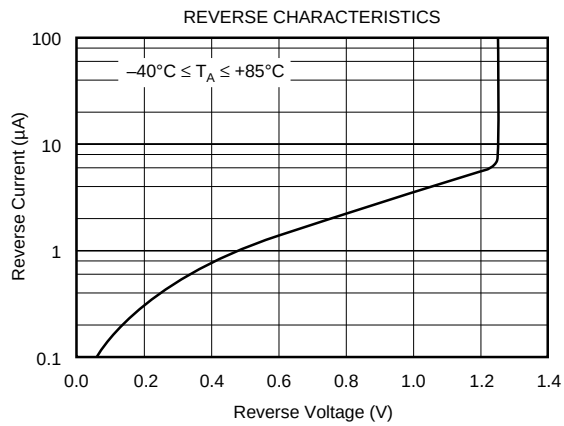
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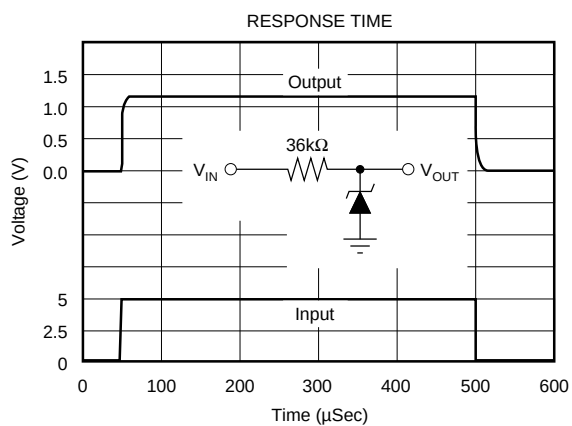
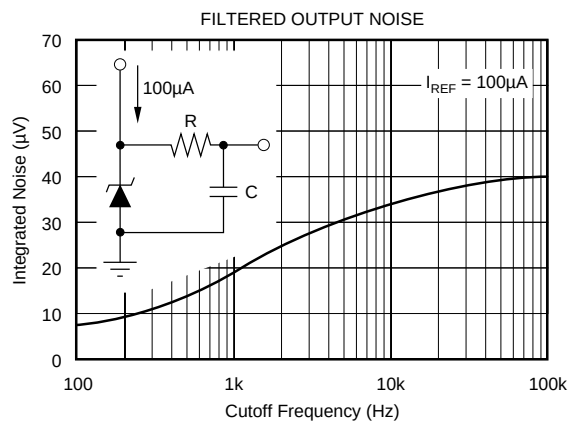
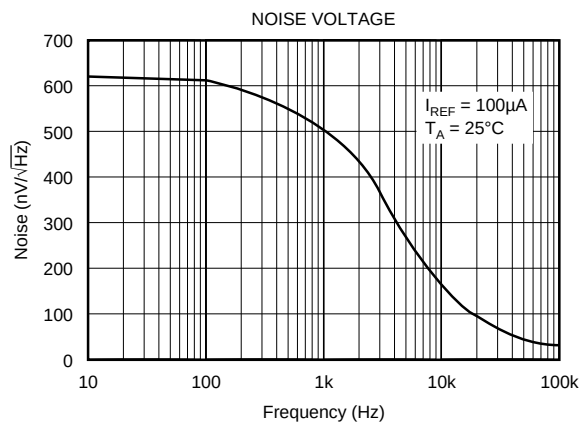
TYPICAL PERFORMANCE CURVES 1.2V

$T_A = +25^\circ\text{C}$ unless otherwise noted.



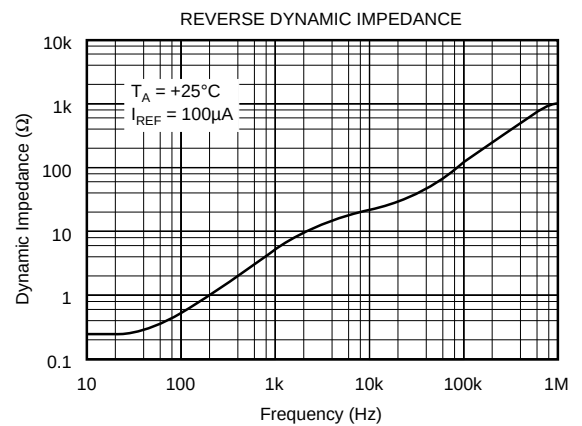
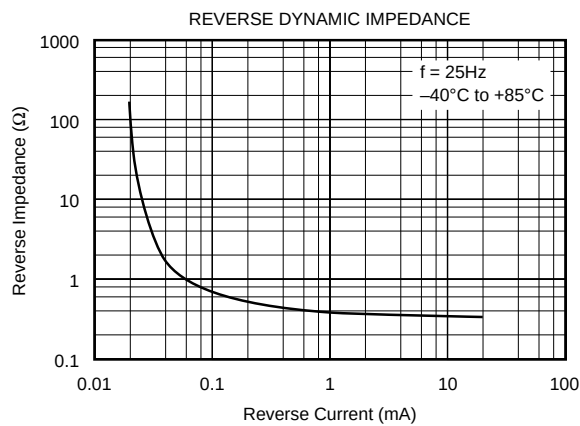
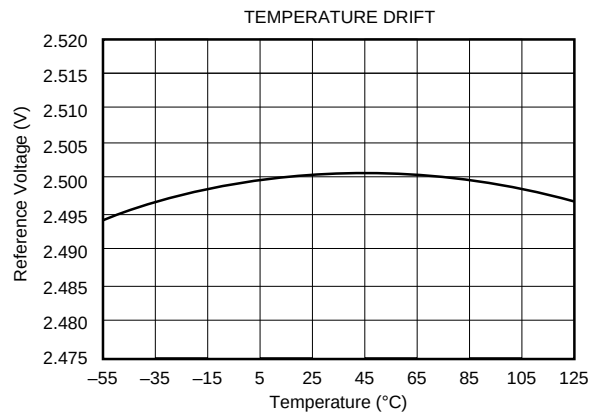
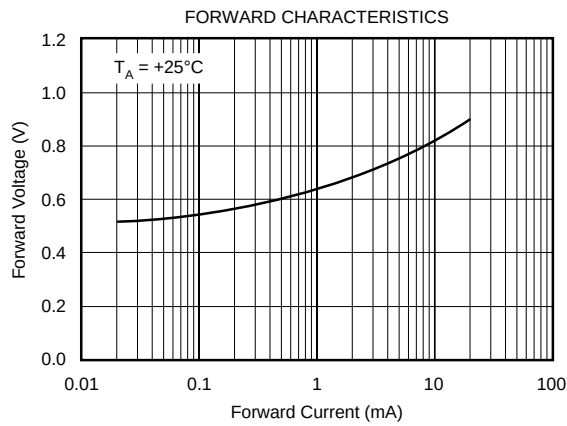
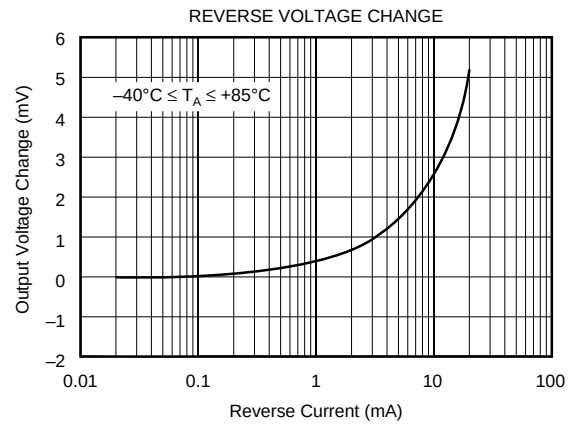
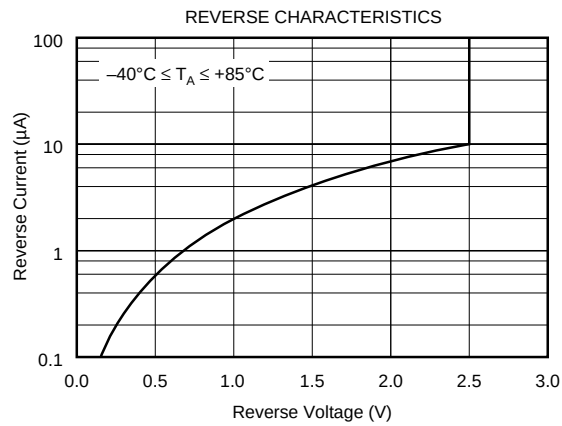
TYPICAL PERFORMANCE CURVES 1.2V (CONT)

$T_A = +25^\circ\text{C}$ unless otherwise noted.



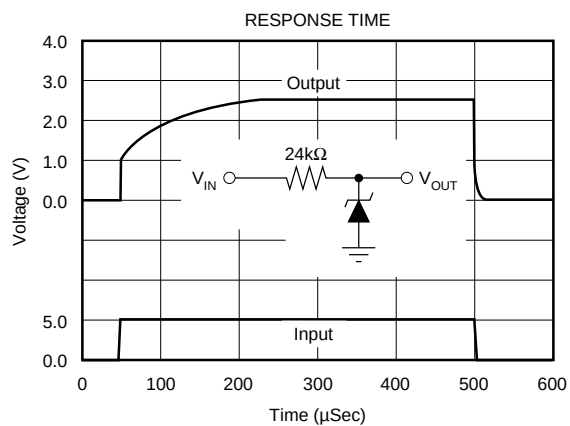
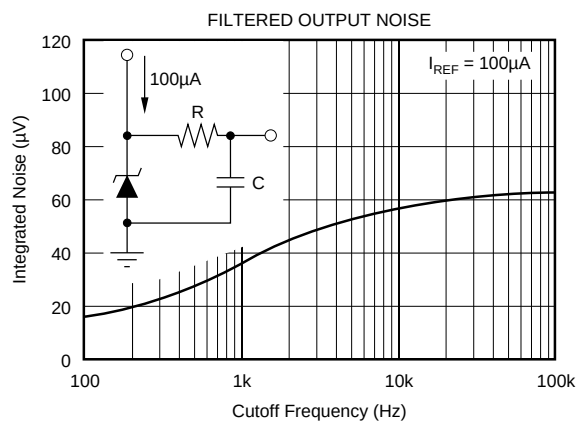
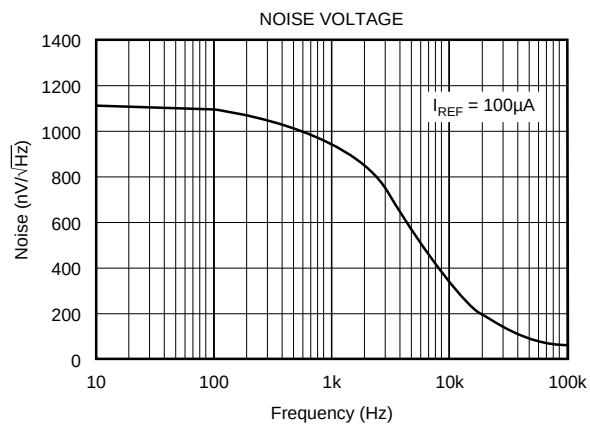
TYPICAL PERFORMANCE CURVES 2.5V

$T_A = +25^\circ\text{C}$ unless otherwise noted.



TYPICAL PERFORMANCE CURVES 2.5V (CONT)

$T_A = +25^\circ\text{C}$ unless otherwise noted.



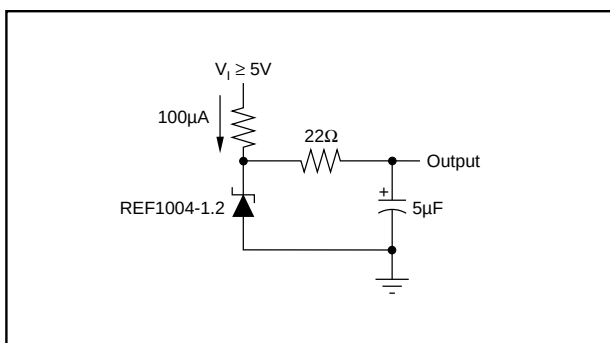


FIGURE 1. Low-Noise Reference.

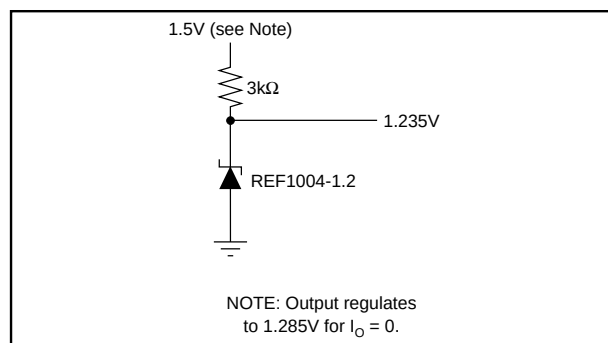


FIGURE 3. 1.2V Reference from 1.5V Battery.

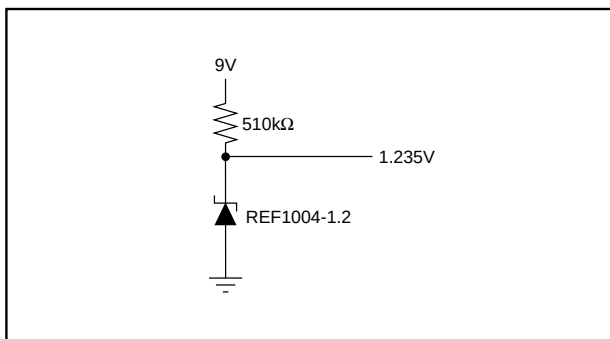


FIGURE 2. Micropower Reference from 9V Battery.

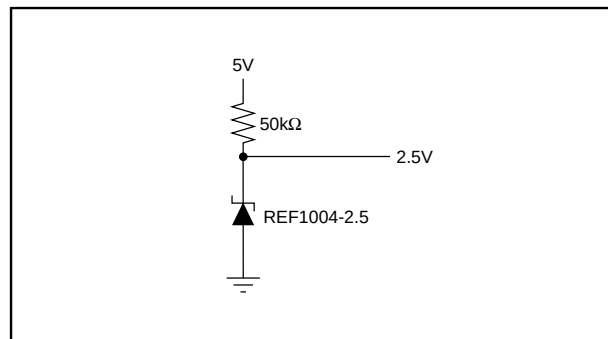


FIGURE 4. 2.5V Reference.

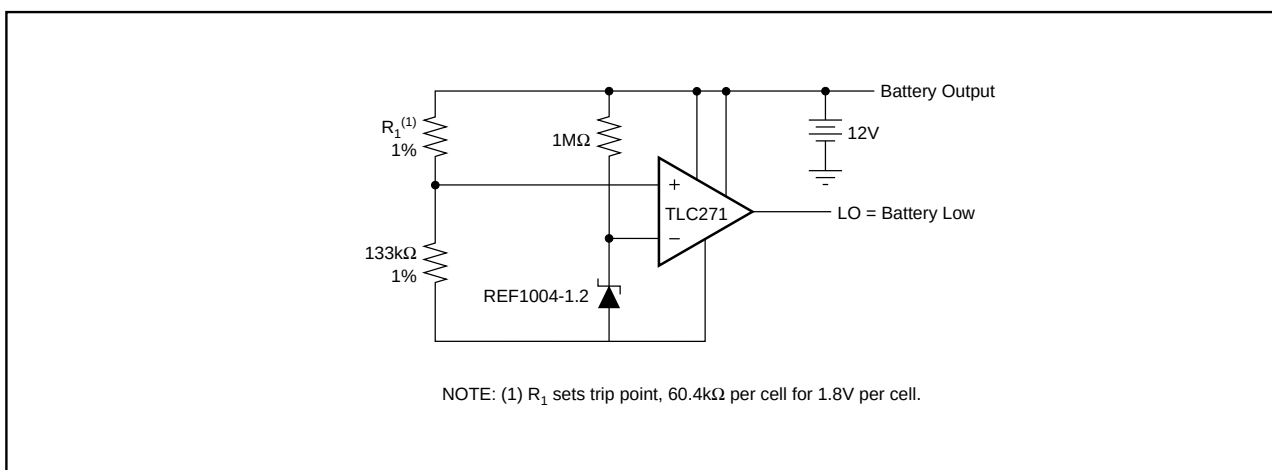


FIGURE 5. Lead-Acid Low-Battery-Voltage Detector.