Custom Devices, Inc.

FOR NEGATIVE REFERENCE APPLICATIONS

— 6.4 Volt REFERENCE

DRVM 6.4B 10N
DRVM 6.4B 25N
DRVM 6.4B 50N
DRVM 6.4B 100N

FEATURES

- EXTREMELY STABLE VOLTAGE OVER A WIDE TEMPERATURE RANGE
- ELIMINATES NEED FOR CURRENT REGULATING CIRCUITRY
- REFERENCE REMAINS STABLE WITH WIDE INPUT VARIATION.
- FAST RECOVERY FROM SHORT CIRCUIT CONDITIONS
- LOW POWER CONSUMPTION

DESCRIPTION

Reference Voltage devices in Hybrid IC form provide stable negative output voltages in applications where input voltages may vary from −12V to −40V.

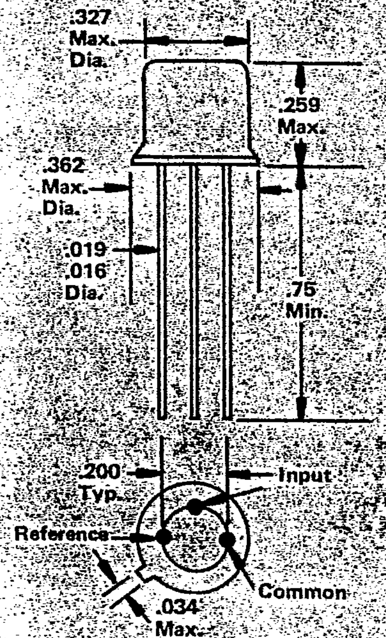
Each device incorporates a selected FET and temperature compensated reference diode which combine to provide a stable negative reference voltage with varying temperature.

MAXIMUM RATINGS

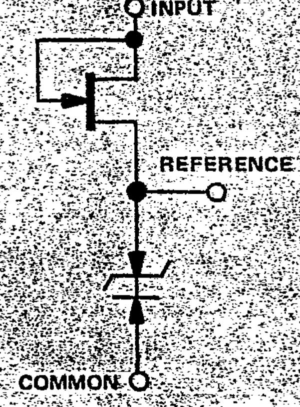
V_{IN} . . . . Input Voltage . . . .−40 Volts
T_s . . . . . Storage Temperature . . . .−55 to +150 °C
T_j . . . . . Junction Temperature . . . . . .−55 to +150 °C

ELECTRICAL CHARACTERISTICS @ 25°C unless noted

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNIT	TEST CONDITION
V_{REF}	Reference Voltage	− 6.08	− 6.72	Volts	V_{IN} = -28V
V_{IN}	Input Voltage	−12	−40	Volts	
I_{IN}	Input Current	− .8	− 1.2	mA	V_{IN} = -28V
Z_{IN}	Input Impedance	.2		MΩ	See Test Ckt.
Z_{REF}	Zener Impedance		100	Ω	I_{IN} = −1mA
P	Power Consumed		48	mW	V_{IN} = −40V
T.C.	DRVM 6.4B 10 N DRVM 6.4B 25 N DRVM 6.4B 50 N DRVM 6.4B 100 N		0.0010 0.0025 0.0050 0.0100	%/°C %/°C %/°C %/°C	−55°C, +25°C +100°C V_{IN} = −28V (No Load)



(All dimensions in inches)
CASE OUTLINE
TO-5



ELECTRICAL SCHEMATIC

DRVM- 0006 4B-1X

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1.0. INTRODUCTION:

There are a large number of applications where a stable TC voltage reference is of vital importance. Digital to analog and analog to digital converters, fixed and variable power supplies, missile guidance and control systems comprise a few where stability of the reference voltage is critical.

2.0. OPERATION:

Previously, design engineers using a TC diode were forced to provide ovens for temperature control and peripheral circuitry to maintain the operating point of the diode at the TC test current. Depending upon the degree of accuracy required, the current controlling circuitry can range from as simple a circuit as a large power supply with a stable series resistor to more sophisticated circuits employing bipolar transistors and zener diodes.

The Reference Voltage (DRVM) device eliminates the need for the current controlling circuitry. Internal in the construction of the DRVM is an N-Channel Field-Effect Transistor whose I_{DSS} is the same as the I_{ZT} of the TC Reference Diode. The Temperature Coefficient of the TC Reference Diode is compensated by the current TC of the FET. This compensation enables the device to provide a stable reference voltage at temperatures ranging from −55° to 100°C.

3.0. DEFINITION OF TEMPERATURE COEFFICIENT:

The temperature coefficient of V_{REF} is given in %/°C and described by the following:

$$T.C. = \frac{V_{REF}(T_1) - V_{REF}(25°C)}{(V_{REF}(25°C))\,(T_1 - 25)} \times 100\%$$

where $V_{REF}(T_1)$ is the value of V_{REF} at temperature T_1, $V_{REF}(25°C)$ is the value of V_{REF} at 25°C and T_1 is the temperature expressed in °C. Reference Voltage devices are measured at −55, +25, and +100°C.

4.0. TYPICAL OPERATING CHARACTERISTICS:

V_{REF} vs V_{IN}

The DRVM requires an input voltage from −12 to −40 volts. As can be seen in Figure 1, this is in the region of high dynamic impedance of the FET. Above −40 volts the FET will break down and conduct freely. Figure 2 shows the change in V_{REF} for an input voltage change. The curve is normalized at V_{IN} = −28 V. Figure 3 shows the change in TC as the input voltage (V_{IN}) changes.

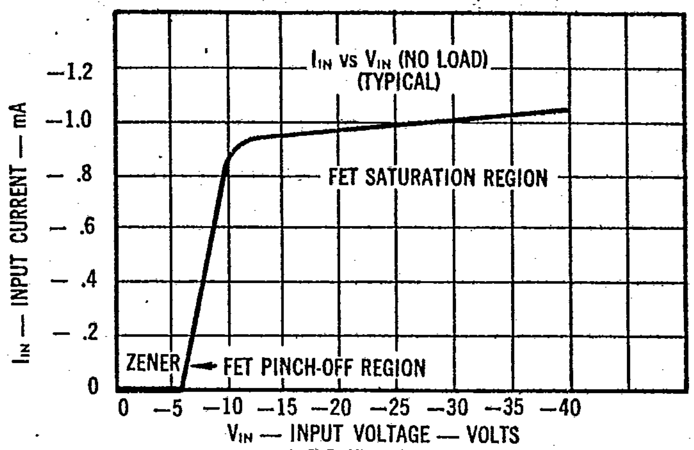

FIGURE 1

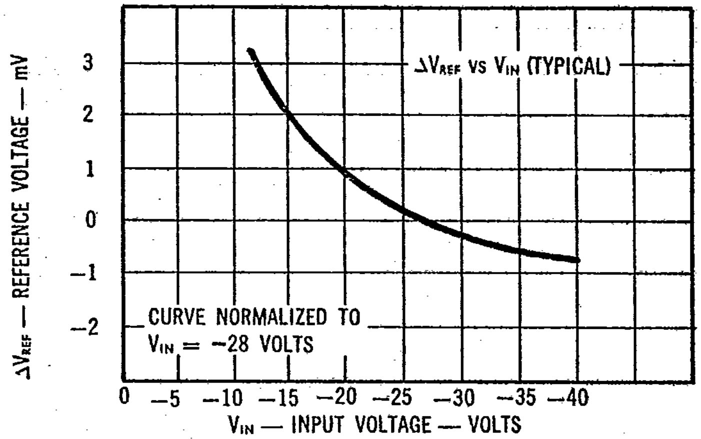

FIGURE 2

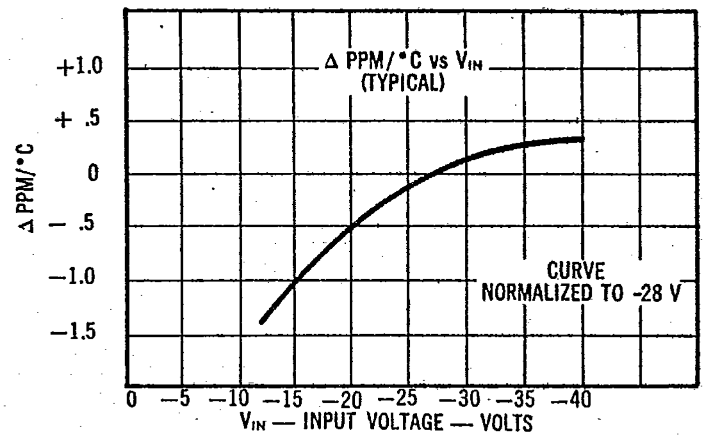

FIGURE 3

V_{REF} vs I_L

As current is drawn from the DRVM to the load, the reference diode current drops proportionately because of the constant current supplied by the FET. The decrease in zener current causes an increase in V_{REF} as shown in Figure 4. The temperature coefficient also is affected by the load as shown in Figure 5. Note that the coefficient becomes more negative with greater load currents. Above −0.25mA the negative coefficient increases rapidly and operation under these conditions is not recommended.

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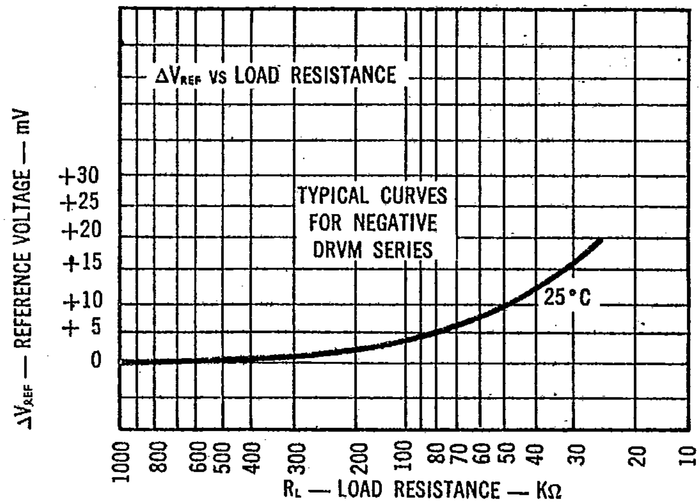


FIGURE 4

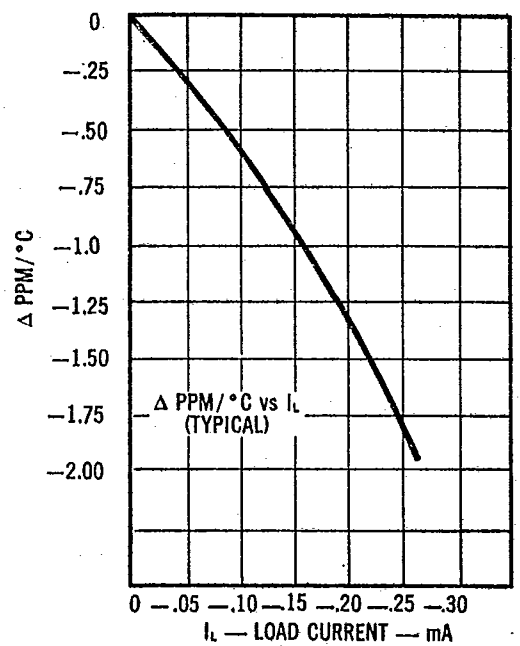
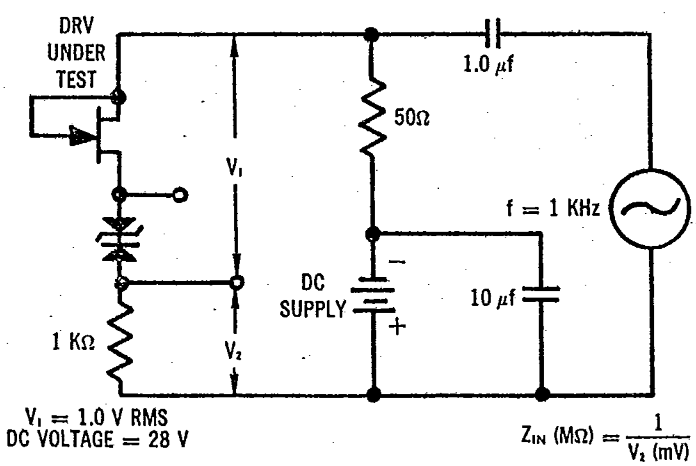


FIGURE 5



Z_{IN} TEST CIRCUIT

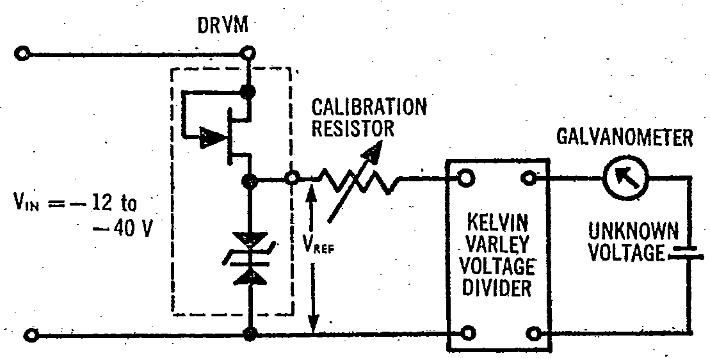
5.0. STABILITY:

In order for any voltage reference to be useful it must maintain a stable output voltage under steady state conditions over long periods of time. Testing results on the DRVM show that stability equal to or greater than standard cells is obtainable.

6.0. APPLICATIONS:

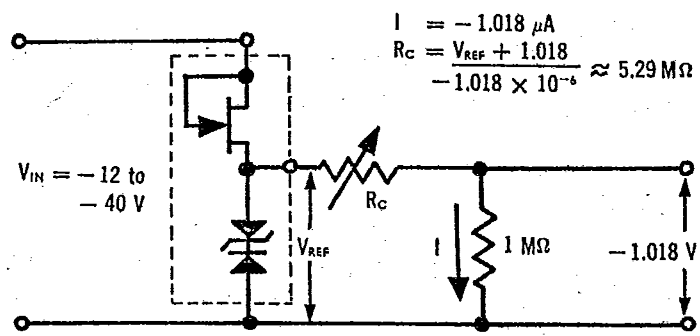
WORKING SOURCE FOR POTENTIOMETERS

Since the reference voltage remains nearly constant when the load current is less than 5.0 μA, the DRVM provides an excellent working source for potentiometers.



REPLACEMENT FOR STANDARD CELLS

In order for a standard cell to provide its reference voltage it must be maintained in a carefully controlled atmosphere (both temperature and humidity). It cannot be tilted over 60° or exposed to light for a long period of time. Permanent damage is also experienced when a current greater than 100 μA is drawn from the cell. None of these conditions will damage the DRVM. The only precautions which need to be taken with the DRVM are exceeding the maximum input voltage and operation or storage beyond specified temperature limits.



GENERAL PURPOSE REFERENCE

As stated in paragraph 1.0 there exists today a large number of circuits and systems where a stable reference voltage is required. The small size, ease of mounting and ruggedness of the DRVM make it ideal for incorporation in most circuits.

DRVM–00064B–3X