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# ZN423

## PRECISION VOLTAGE REFERENCE SOURCE

The ZN423 is a monolithic integrated circuit using the energy bandgap voltage of a base-emitter junction to produce a precise, stable, reference source of 1.26V. This is derived via an external dropping resistor for supply voltages of 1.5V upwards. The temperature coefficient of the ZN423, unlike conventional Zener diodes, remains constant with reference current. The noise figure associated with breakdown mechanisms is also considerably reduced.

### FEATURES

- Low Voltage
- Low Temperature Coefficient
- Very Good Long Term Stability
- Low Slope Resistance
- Low RMS Noise
- Tight Tolerance
- High Power Supply Rejection Ratio
- 2-Lead TO-18 Metal Can Package

### ABSOLUTE MAXIMUM RATINGS

Reference current,  $I_{REF}$  20mA  
 Operating temperature range: -55°C to +125°C  
 Storage temperature range: -65°C to +165°C

### ORDERING INFORMATION

| Device Type | Operating Temperature | Package |
|-------------|-----------------------|---------|
| ZN423       | -55°C to +125°C       | CM2     |

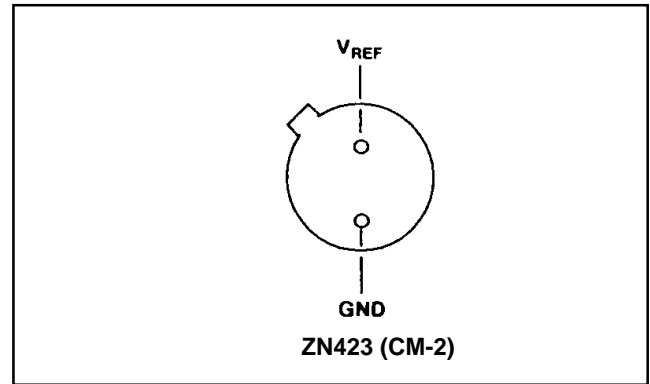


Fig.1 Pin connections (bottom view)

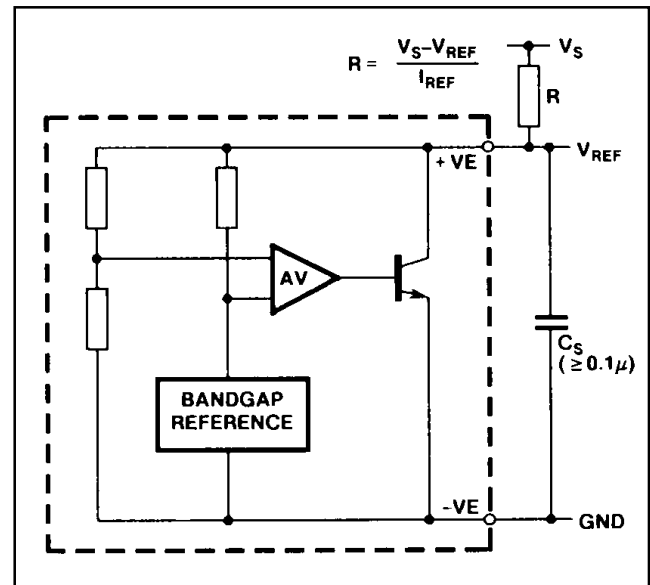


Fig.2 Circuit diagram

### ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated):  
 $T_{amb} = 25^\circ\text{C}$ , Shaping capacitor,  $C_S = 0.1\mu\text{F}$

| Characteristic          | Symbol    | Value |      |      | Unit          | Conditions  |
|-------------------------|-----------|-------|------|------|---------------|---|
|                         |           | Min.  | Typ. | Max. |               |   |
| Output voltage          | $V_{REF}$ | 1.2   | 1.26 | 1.32 | V             | $I_{REF} = 5\text{mA}$  |
| Slope resistance        | $R_{REF}$ |       | 0.5  | 1.5  | $\Omega$      |   |
| Reference current       | $I_{REF}$ | 1.5   |      | 12   | mA            |   |
| Temperature coefficient |           |       | 30   |      | ppm/°C        | $R_{EXT} = (V_{CC} - V_{REF}) / I_{REF}$<br>1Hz to 10kHz<br>$P_{SRR} = R_{EXT} / R_{REF}$ , $V_{REF} = 1.26\text{V}$ ,<br>$I_{REF} = 2.5\text{mA}$ , $V_{CC} = 5.0\text{V}$ |
| External resistor       | $R_{EXT}$ | 100   |      |      | $\Omega$      |   |
| RMS noise voltage       |           |       | 6    |      | $\mu\text{V}$ |   |
| Power supply ratio      | $P_{SRR}$ |       | 60   |      | dB            |   |

# ZN423

Reference current  $I_{REF}$  (max.) v operating temperature.

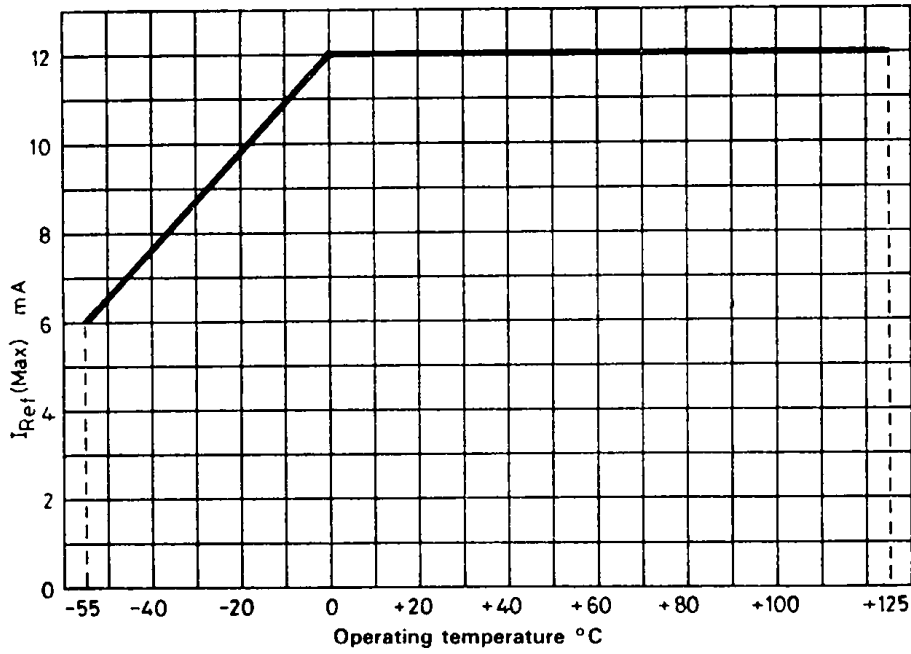


Fig.3 Derating curve

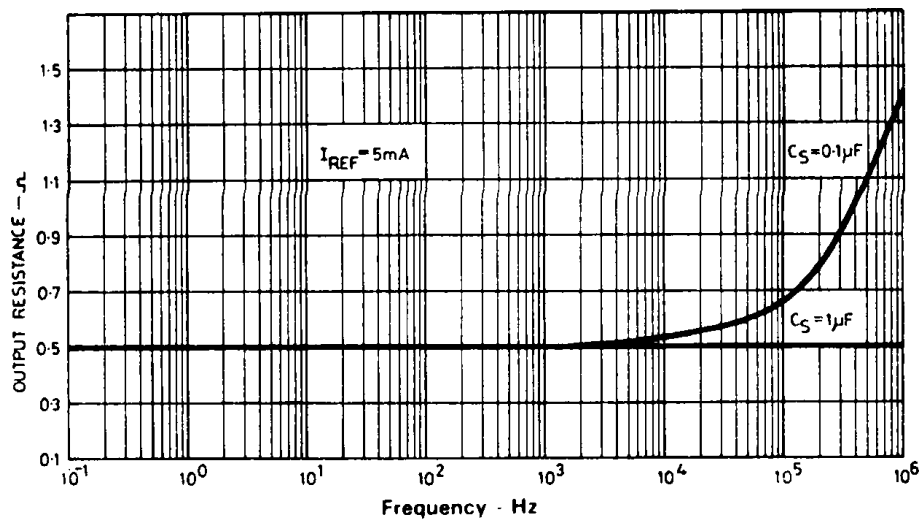


Fig.4 Slope resistance v frequency ( $I_{REF} = 5\text{mA}$ )



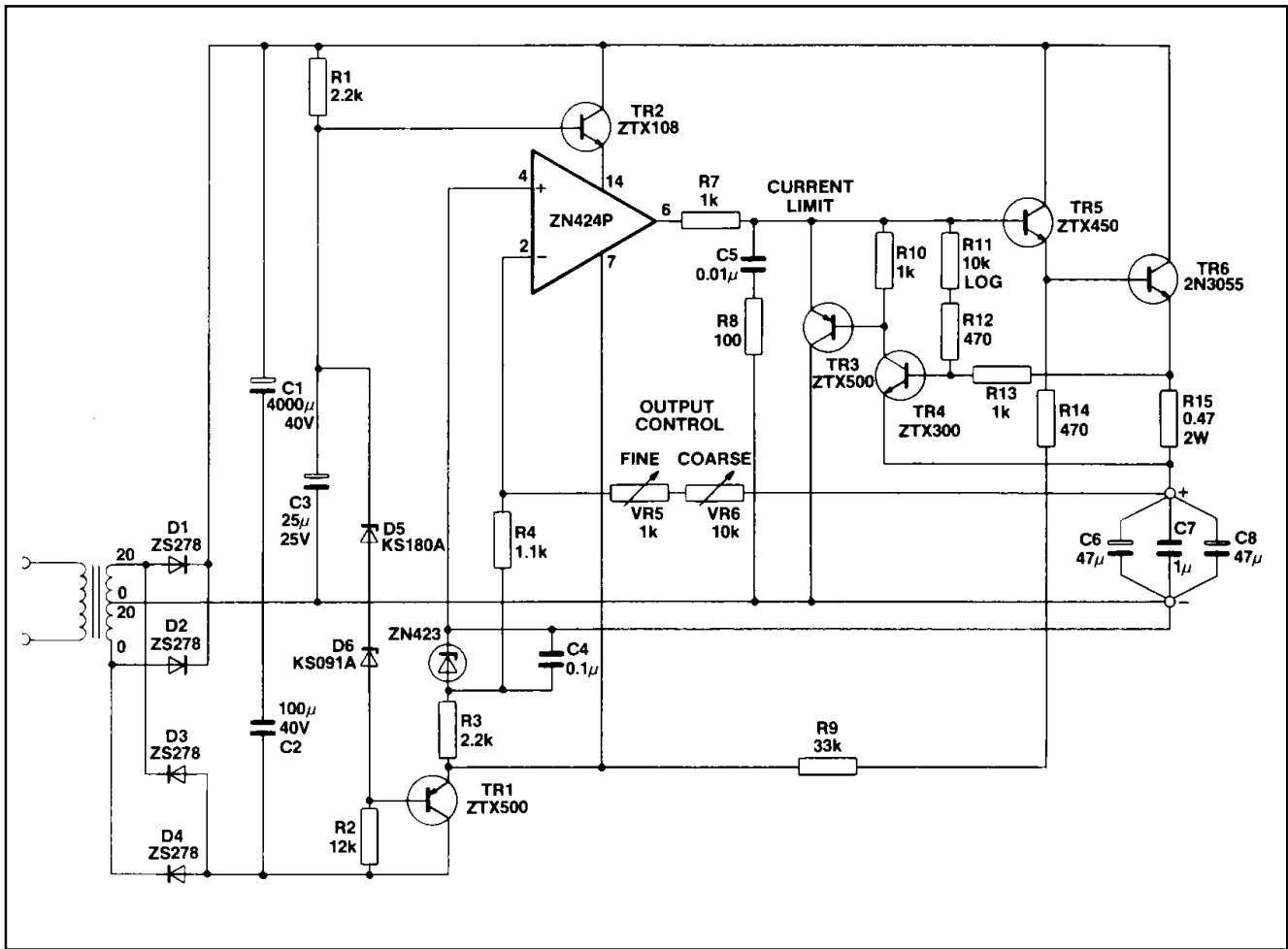


Fig.7 0V to 12V, 1A power supply

**0V to 12V, 1A Power Supply**

The circuit of Fig.7 provides a continuously variable, highly stable voltage for load currents up to 1A. The output voltage is given by:

$$V_o = \frac{(VR5 + VR6)}{R4} V_{REF}$$

and is controlled by VR5 and VR6 which should be high quality components (preferably wire wound).

The emitter follower stages TR1 and TR2 buffer the bias and reference from the output stages. The negative rail allows the output to operate down to 0V.

The current limit stage monitors output current through R15. As the potential across R15 increases due to load current, TR4 conducts and supplies base current for TR3, thus diverting part of the output from the ZN424P via TR3 to TR5.

Shaping is achieved by the network C5, R8 together with the output decoupling capacitors which also maintain

low output resistance at frequencies above 100kHz.

The power supply has the following performance characteristics:

- Output noise and ripple (full load) <100µV rms
- Output resistance (0 to 1A) 1MΩ
- Temperature coefficient ± 100ppm/°C

**Variable 100mA to 2A Current Source**

In the circuit of Fig.8 the output current is set by the resistor R in the collector of TR2, which may be switched to offer a range of output currents from 100mA to 2A with fine control by means of VR3 which varies the reference voltage to the non-inverting input of the ZN424P.

The feedback path from the output to the inverting input of the ZN424P maintains a constant voltage across R, equal to  $(V_{CC} - V_{IN})$  and hence a constant current to the load given by  $(V_{CC} - V_{IN})/R$ .

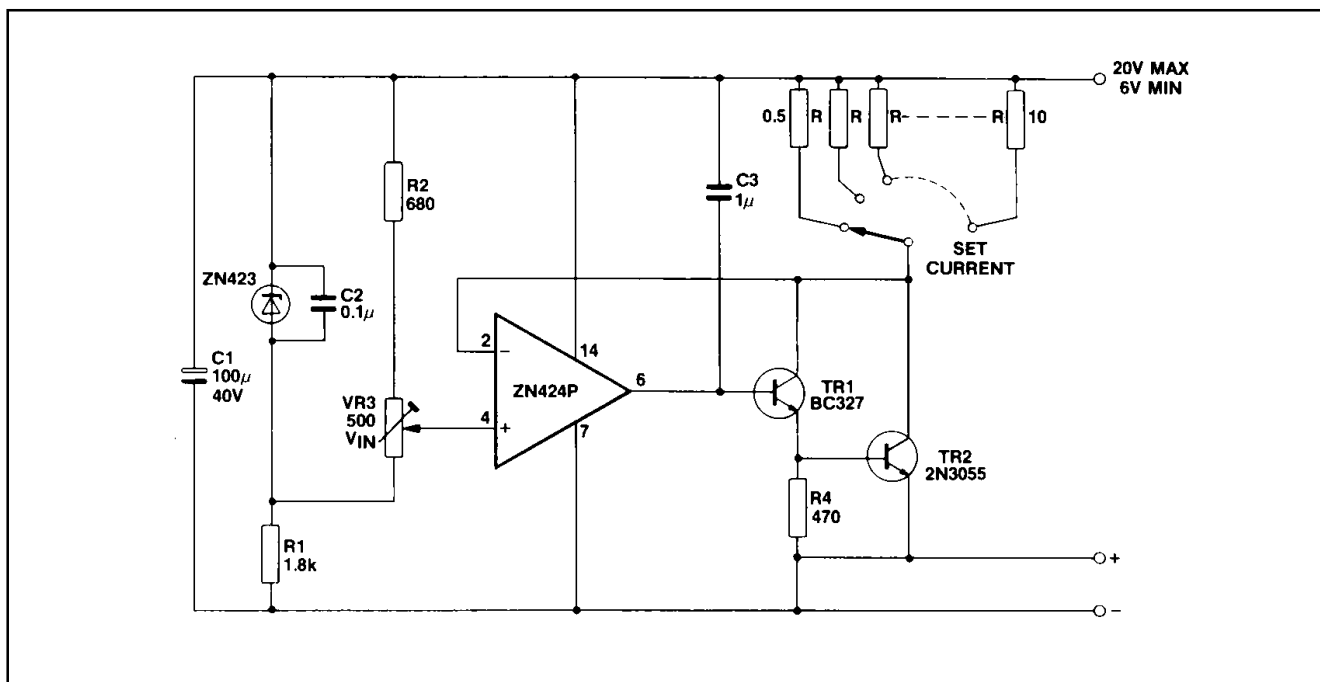


Fig.8 Variable current sources



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