

LM199/LM299/LM399 Precision Reference

 Check for Samples: [LM199](#), [LM299](#), [LM399](#), [LM3999](#)

FEATURES

- **0.0001%/°C Temperature Coefficient**
- **Low Dynamic Impedance — 0.5**
- **Initial Tolerance on Breakdown Voltage — 2%**
- **Sharp Breakdown at 400 μ A**
- **Wide Operating Current — 500 μ A to 10 mA**
- **Wide Supply Range for Temperature Stabilizer**
- **Low Noise**
- **Low Power for Stabilization — 300 mW at 25°C**
- **Proven Reliability, Low-Stress Packaging in TO-46 Integrated-Circuit Hermetic Package, for Low Hysteresis after Thermal Cycling. 33 Million Hours MTBF at $T_A = +25^\circ\text{C}$ ($T_J = +86^\circ\text{C}$)**

DESCRIPTION

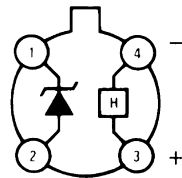
The LM199 series are precision, temperature-stabilized monolithic zeners offering temperature coefficients a factor of ten better than high quality reference zeners. Constructed on a single monolithic chip is a temperature stabilizer circuit and an active reference zener. The active circuitry reduces the dynamic impedance of the zener to about 0.5Ω and allows the zener to operate over 0.5 mA to 10 mA current range with essentially no change in voltage or temperature coefficient. Further, a new subsurface zener structure gives low noise and excellent long term stability compared to ordinary monolithic zeners. The package is supplied with a thermal shield to minimize heater power and improve temperature regulation.

The LM199 series references are exceptionally easy to use and free of the problems that are often experienced with ordinary zeners. There is virtually no hysteresis in reference voltage with temperature cycling. Also, the LM199 is free of voltage shifts due to stress on the leads. Finally, since the unit is temperature stabilized, warm up time is fast.

The LM199 can be used in almost any application in place of ordinary zeners with improved performance. Some ideal applications are analog to digital converters, calibration standards, precision voltage or current sources or precision power supplies. Further in many cases the LM199 can replace references in existing equipment with a minimum of wiring changes.

The LM199 series devices are packaged in a standard hermetic TO-46 package inside a thermal shield. The LM199 is rated for operation from -55°C to $+125^\circ\text{C}$ while the LM299 is rated for operation from -25°C to $+85^\circ\text{C}$ and the LM399 is rated from 0°C to $+70^\circ\text{C}$.

Connection Diagram

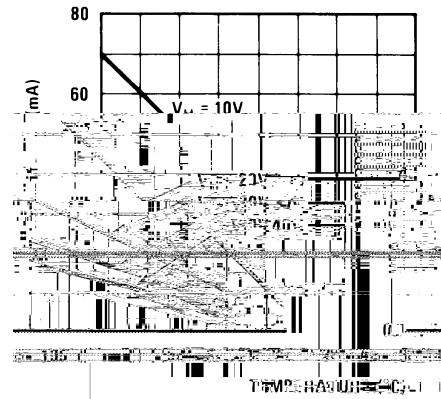
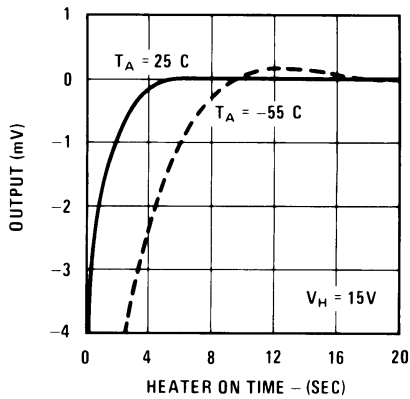
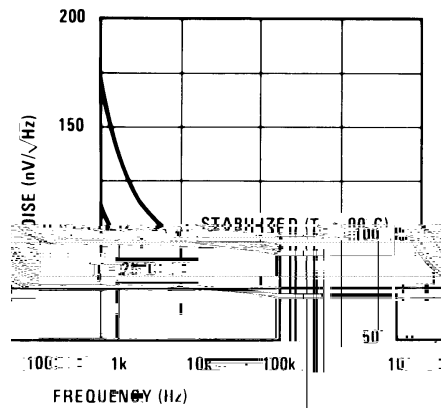
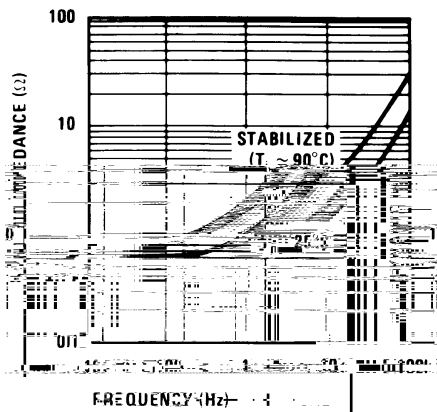
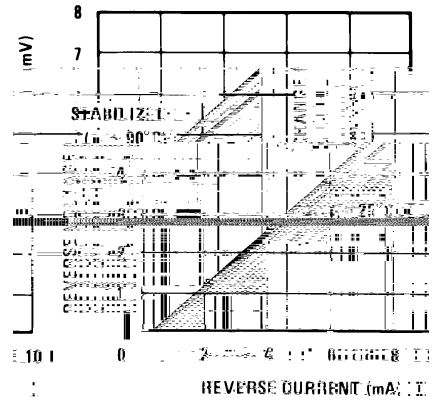
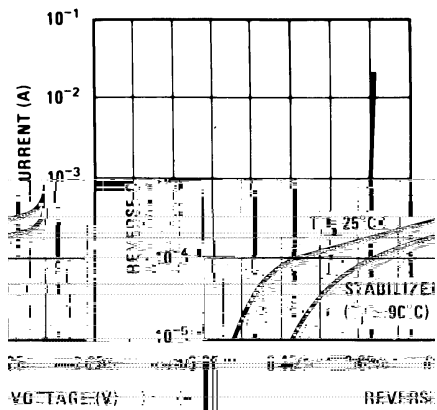


**Figure 1. Metal Can Package (TO-46) Top View
Package Number NER0004D**



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TYPICAL APPLICATIONS

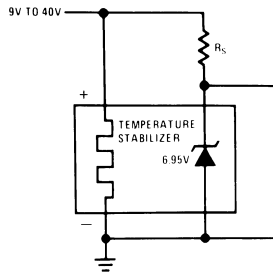


Figure 14. Single Supply Operation

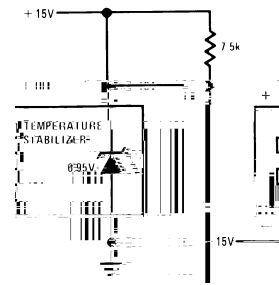


Figure 15. Split Supply Operation



Figure 16. Negative Heater Supply with Positive Reference

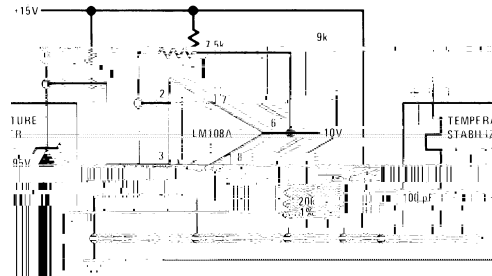


Figure 17. Buffered Reference With Single Supply

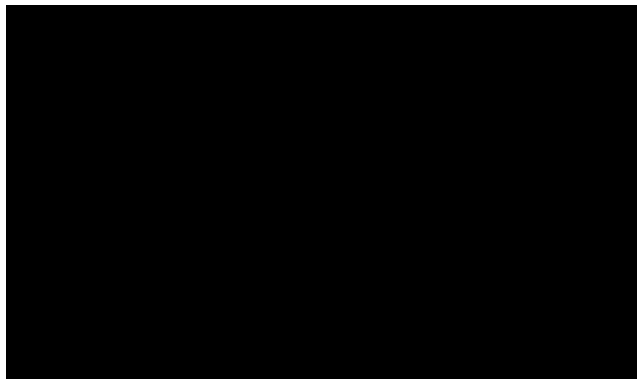


Figure 18. Positive Current Source

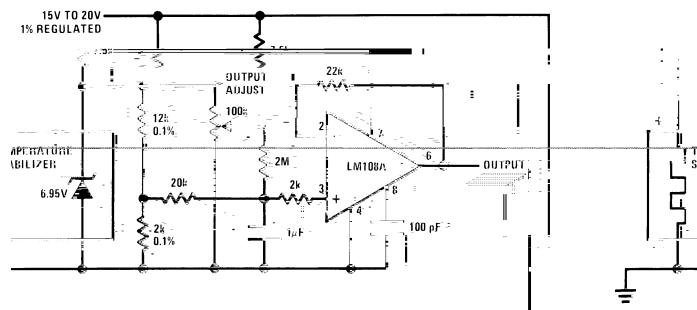
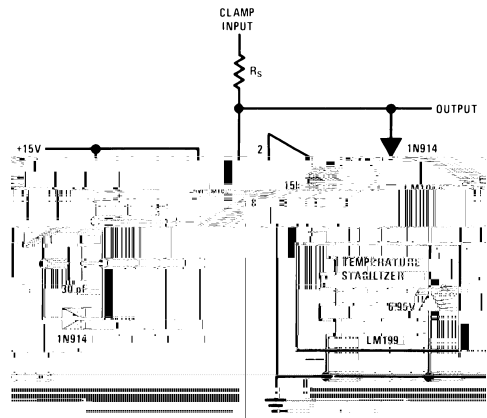


Figure 19. Standard Cell Replacement



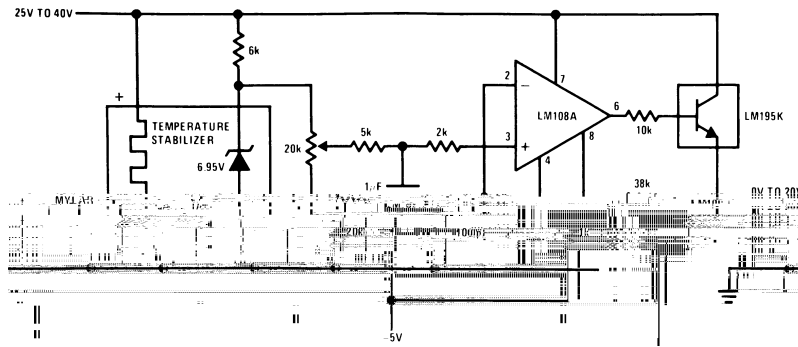


Figure 25. 0V to 20V Power Reference

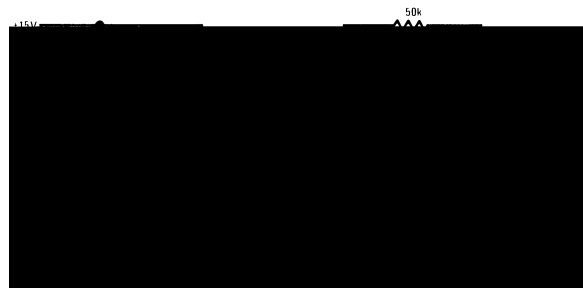


Figure 26. Bipolar Output Reference

Schematic Diagrams

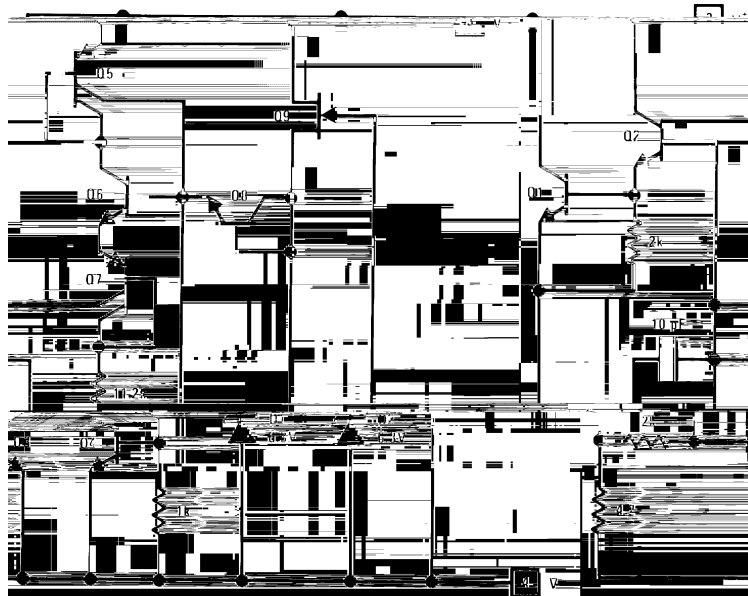


Figure 27. Temperature Stabilizer

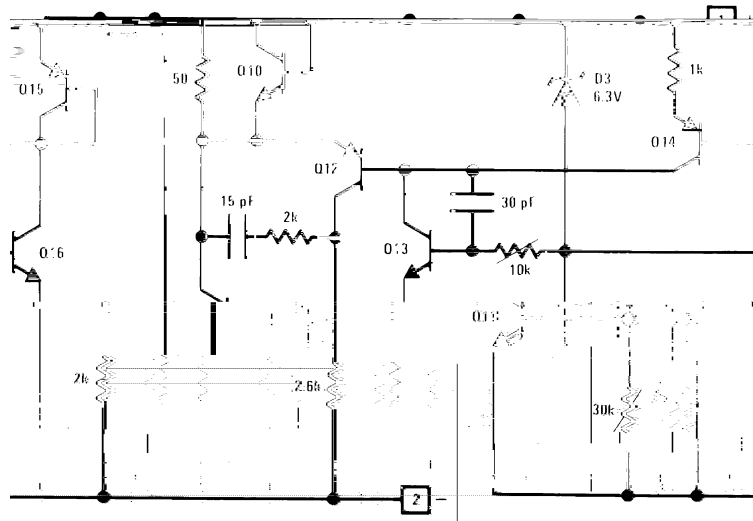


Figure 28. Reference

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