

Technical Note: Ferrofluid in Optical Disc Pickup Actuators

Introduction: Today's optical pickup actuator design has been in use since the early 1980's and is found in a variety of devices including CD players, Laser Disc players, CD-ROM drives and, DVD-ROM drives. The actuator provides focus (axial motion) and tracking (radial motion) to the objective lens, which reads the data from the optical disk.

Actuator: The actuator is an electro-mechanical device comprised of two magnetic circuits and two discrete coils, oriented perpendicular to each other. The coils and objective lens are mounted on an integral bobbin/carrier assembly which, in turn, is suspended in the magnetic air gaps by four strands of BeCu wire. The suspension is damped by the presence of silicone rubber at its termination.

Problem: In spite of the presence of the silicone rubber "damper bond", the actuator still exhibits a strong mechanical resonance which affects its settling time (Figure 1A) and vibrational characteristics (). This resonance can cause errors in reading information from the disk, particularly in high speed CD-ROM and DVD-ROM drives.

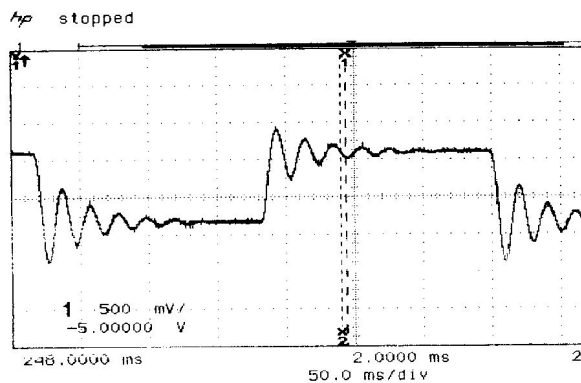


Figure 2

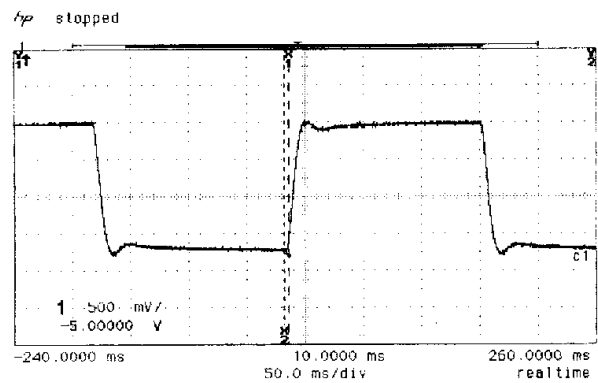


Figure 1

Ferrofluid Solution: Ferrofluids are ultra-stable colloidal suspensions of sub-micron sized magnetic particles in a carrier liquid. The presence of these particles (Fe_3O_4) in the carrier allows the ferrofluid to be precisely positioned and controlled by a magnetic field. In the actuator design, ferrofluid is applied to the surface of the magnets until the quantity is sufficient to maintain intimate contact with the bobbin/carrier assembly. The fluid is retained in the magnetic field and its viscosity provides the desired mechanical resistance (damping) to the moving assembly, improving the actuator's settling time (Figure 1) and vibrational characteristics (Figure 3). Access time is also improved, particularly on warped or eccentric discs.

Developed specifically for optical pickup actuators, the **CF Series** of ferrofluids possess the necessary wide temperature range, colloid stability and low volatility required for guaranteed long term performance in these applications. Specifications for the **CF Series** of fluids and samples are available upon request to qualified individuals and Companies.

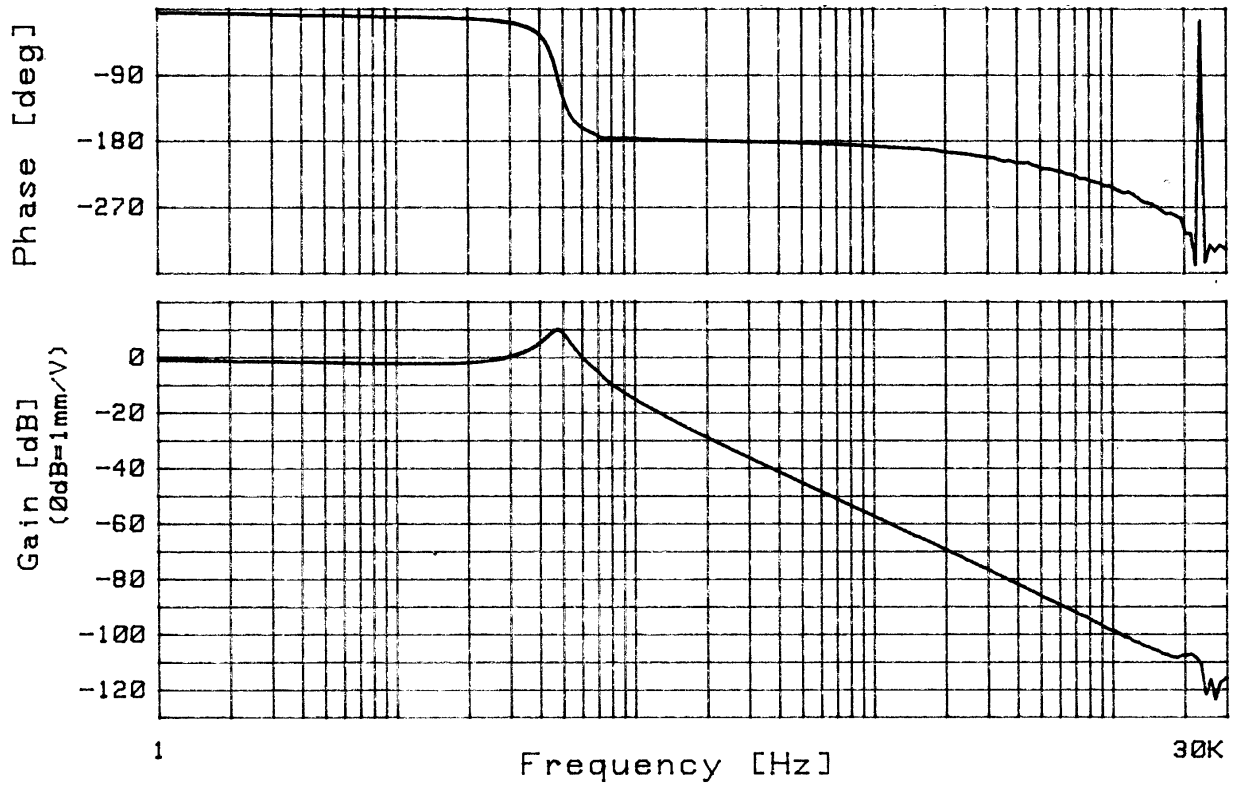


Figure 3

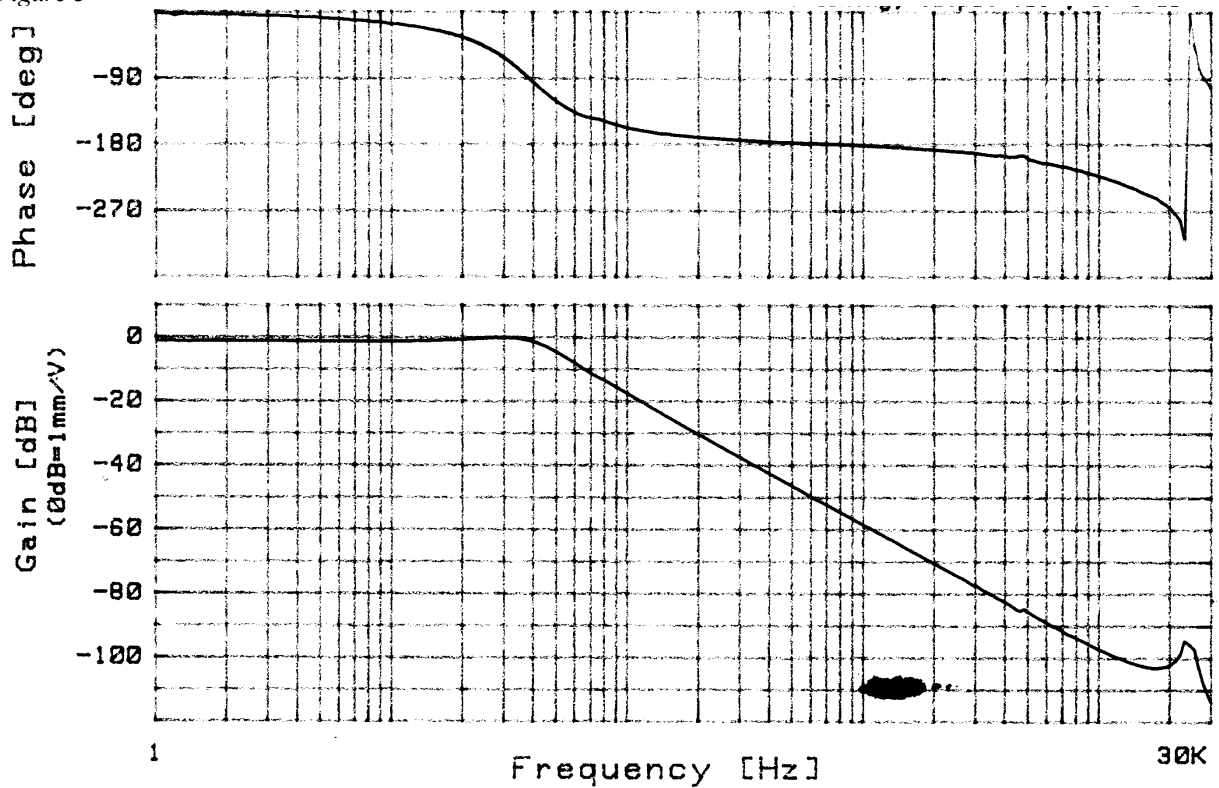


Figure 4

performance graphs courtesy of Samsung Electronics Co.; Suwon City, Korea