

Re: Variable reluctance motor drive?

## Re: Variable reluctance motor drive?

---

*Source:* <http://coding.derkeiler.com/Archive/General/comp.arch.embedded/2008-08/msg00022.html>

---

- *From:* "John Speth" <[johnspeth@xxxxxxxx](mailto:johnspeth@xxxxxxxx)>
  - *Date:* Fri, 1 Aug 2008 08:22:02 -0700
- 

"Paul Carpenter" <[paul@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:paul@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx)> wrote in message [news:MPG.22fc4bea9f75346b98969f@xxxxxxxxxxxxxxxx](mailto:news:MPG.22fc4bea9f75346b98969f@xxxxxxxxxxxxxxxx)

On 31 Jul., 17:57, "John Speth" <[johnsp...@xxxxxxxx](mailto:johnsp...@xxxxxxxx)> wrote:

<[dkel...@xxxxxxxx](mailto:dkel...@xxxxxxxx)> wrote in message

[news:74a922b3-8485-4569-a99b-81517d94de63@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:74a922b3-8485-4569-a99b-81517d94de63@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx)

On Jul 30, 8:36 am, "John Speth" <[johnsp...@xxxxxxxx](mailto:johnsp...@xxxxxxxx)> wrote:

Hi group-

I've been experimenting with various stepper motor samples for personal education. One of my motor samples is what I'm pretty sure is a variable reluctance motor (VRM) salvaged from an old PC tape drive. It has three windings each connected at one end with a common high side connection.

Sounds like it could be a Brushless DC Motor (BLDC) and the common is the

Re: Variable reluctance motor drive?

star common point of a 3 phase BLDC, number of poles would have to be determined from the analysis of steps and steps required for one revolution.

BLDC are quite common in disk and tape drives, this could be a sensorless motor that relies on driving two coils and measuring the third in various ways to determine position/speed/torque/load.

.....

(I'm the OP)

I'm now having my doubts I am using a VRM. The motor has definite cog stops which I believe would indicate it's \*not\* a VRM.

Still sounds like a BLDC.

The motor is clearly an OEM model. It has 36 cog stops. It has three windings with a common point verified with an ohm-meter. I can see nine winding "lobes" through holes in the rotor. The windings are stationary and are mounted on a PCB. Each lobe's winding axis is radially oriented from the rotation axle and distributed evenly ( $360/9 = 40$  deg separation).

The rotor is cup shaped hiding a clear view of the internal parts. It appears to have some sort of black material ringing the inside periphery of the cup sides. I assume that is a permanent (or a group of permanent) magnets.

Sounds like a BLDC, look at Maxxon motors data sheets for a comparison.

This layout is typical, the nine lobes are the three windings split to give an 'interleaved' windings on a PCB so the motive force is generated at three points around the axis, possibly giving smoother and drive and less vibration.

Have you checked the impedance of each winding and compared impedances?

## Re: Variable reluctance motor drive?

If the impedance is doubled when measuring across two windings, this MIGHT confirm the star configuration.

I think you're right about it being a BLDC motor. An ohm-meter does confirm the star configuration (1.9 ohms at DC across one winding and double that across two, very easy to confirm).

Unit is likely to be 12V drive (could be 5V), and can be driven with 3 phase sinusoid or trapezoid waveforms, varying frequency changes speed of rotation, changing voltage drive gives changes in torque. By using PWM it is possible to simulate the average drive voltage level to give varying torque.

Basically you drive one winding to VCC (or PWM modulated) and another winding to GND (or -ve rail), then step through a sequence to get rotation. The star point is often used to measure the effects of third winding being undriven becoming a generator.

I think that can be described as bipolar drive for a three phase Y motor.

Reversing the sequence gives you the reverse rotation.

This is documented in lots of places and lots of website tutorials exist.

I wonder if this motor is a special type of three winding stepper motor that would require microstepping of some kind to spin it up and down smoothly. Its former function (IIRC) was a direct drive capstan motor for a PC tape drive. Without microstepping, there's only two ways to drive it: turn on one winding at a time in succession or or two windings at a time in succession.

Capstan motors are/were often BLDC motors for simplicity of driving, cheap to make, efficiency and controllability.

If you are getting any rotation currently by only driving one winding

Re: Variable reluctance motor drive?

at a time it is inefficient.

I have driven BLDC from a simple controller and FET drives from 0–1000's RPM. Get it working in open-loop mode first then start adding feedback to get closed loop control.

Paul (and others who responded via usenet and email), thanks for the excellent advice and pointers!

In summary: It's most likely a BLDC and certainly not a VRM as I originally thought. My homemade stepper driver is built for one way current switching (unipolar) so major changes would be needed to achieve bipolar current switching (IOW, some sort of H bridge driver).

JJS

.