Breakthrough InstaSPIN™-FOC motor control technology is here!

Texas Instruments

InstaSPIN-FOC technology enables designers to identify, tune and fully control any type of three-phase, variable-speed, synchronous or asynchronous motor in just minutes. This new technology removes the need for a mechanical rotor sensor by using TI's new software encoder (sensorless observer) algorithm, FAST™ (flux, angle, speed and torque), embedded in the read-only-memory (ROM) of Piccolo™ microcontrollers. This enables premium solutions that improve motor efficiency, performance and reliability in all variable-speed and variable-load applications.

www.ti.com/instaspin-foc

Field Control
- Weakening allows for the rotor to obtain higher speeds than designed
- Boosting allows for higher torque than designed

Motor ID
- No datasheet required!
- One time parameter identification
- Optional on-line feature can track changes and provide compensation during operation

System Flexibility
- Supports all main 3-ph motor types
- Control torque, speed+torque, angle, and flux
- Full FOC in ROM for simplicity
- Full customization for expert users
- All source besides FAST provided in MotorWare™ software projects and new motor control library

FAST™ Software Encoder
- Universal 3-phase motor sensorless observer
- Encoder-like performance

Control Loop Tuning
- Current PI gains set from motor parameters
  - user may adjust if using ROM
  - or use own controllers
  - MTPA for most motors
- Speed PI gains chosen for evaluation
  - user tuned to meet performance goals
  - or use own controller
- PowerWarp™ Technology
  - optional mode for induction motors
  - minimum current use at all times

PowerWarp™ Technology
14-Month Field Trial

- 80%+ savings vs. Triac
- 45%+ savings vs. standard FOC

www.ti.com/powerwarp

F

Rotor Flux
- High integrity signal for stable field control

A

Rotor Angle
- Locks within one electrical cycle of rotation
- Stable through zero
- Robust under dynamics
- Recovery after stall events

S

Rotor Speed
- Mechanical and electrical speed estimations
- Near zero phase lag

T

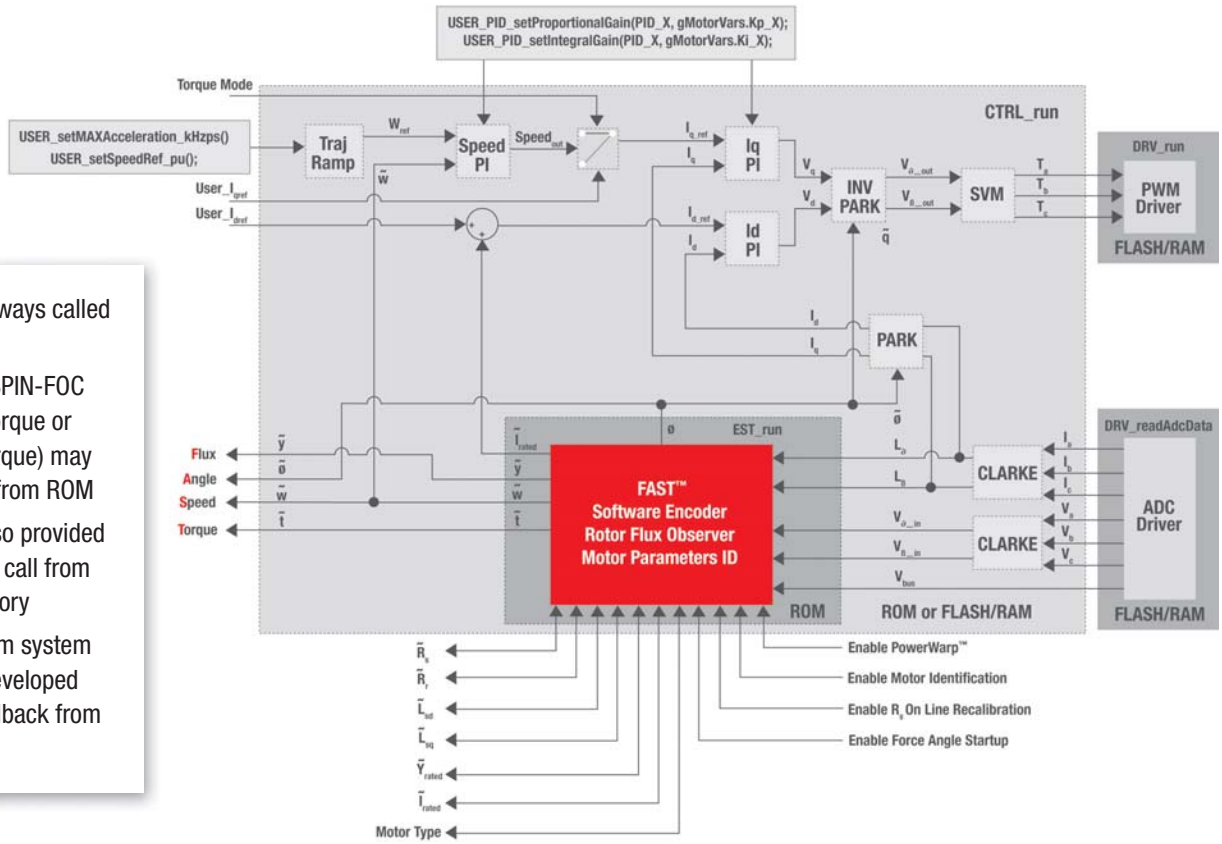
Rotor Torque
- Accurate for load monitoring, flow rate, unbalanced load, motor diagnostics

FAST™ Software Encoder (Sensorless Observer)

- Universal 3-phase motor software encoder supports
  - Synchronous (BLDC, SPM, IPM)
  - Asynchronous (ACI) motors
  - Unique, high-quality feedback signals for use in control systems
- Performance
  - Tracks below 1 Hz
  - Tracks through zero on speed reversals
  - Stable feedback to control system when rotor is at zero speed
- Motor parameters
  - Relies on fewer parameters than other observers
  - Off-line commissioning learns the needed electrical motor parameters
  - Optional on-line observer tracks parameter changes to ensure estimation accuracy over time and temperature
- Tuning
  - No tuning of the observer required

Included in ROM on select Piccolo™ MCUs, with software API

InstaSPIN FOC



- FAST is always called from ROM
- Full InstaSPIN-FOC system (torque or speed+torque) may be called from ROM
- Source also provided for FOC to call from user memory
- Any custom system may be developed using feedback from FAST

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