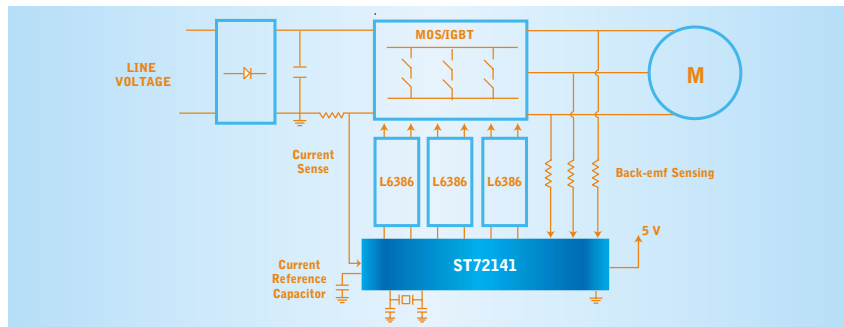# ST72141
# 8-Bit MCU with State Machine for Sensorless Control of BLDC Motors



The ST72141 is designed to control Brushless Permanent Magnet DC (BLDC) motors in six-step mode without using any sensors and with minimum external components. Built around an ST7 industry standard core, the motor control cell incorporates a state machine and coprocessor, and uses a sensorless STMicroelectronics-patented back-EMF monitoring method to determine rotor position. The ST72141 is well suited to cost-sensitive, Brushless DC motor control, in domestic appliances, HVAC, health, industrial and automotive applications.

## ST72141 Key Benefits
- Sensor/sensorless, star/delta operation
- Voltage or current mode, open or closed loop control
- 6 programmable PWM outputs with switching frequencies up to 25KHz
- Demagnetization time optimization
- End of demagnetization detection
- Simulated end of demagnetization back-up calculation
- B-EMF sensing through 3 resistors for sensorless motor positioning
- Current regulation/limitation with on-chip comparator
- Emergency input to force all outputs to high impedance
- Auto-commutation with hardware delay computation
- Automatic compensation for motor magnet disymetry



**ST72141 Application Typical Block Diagram**

# Device Summary

| ST72141K4 | |
|---|---|
| Program Memory | 8K bytes of ROM, OTP or EPROM |
| RAM (stack) | 256 (64) bytes |
| Operating Supply | 3.5V to 5.5V |
| Clock Source | 8 or 16 MHz crystal oscillator or ceramic resonator |
| Instruction Set | 63 basic instructions, 17 main addressing modes |
| Timers | 2 independent 16-bit free running timers each with the following capability (one used for motor control):<br>• 2 input captures (2 I/O pin alternate functions)<br>• 2 output compares (2 I/O pin alternate functions)<br>• PWM output and pulse generator mode<br>• External clock input<br>1 watchdog timer |
| Reset Management | Low voltage detector reset, power-on reset, watchdog reset |
| I/O Ports | 14 multifunctional I/O lines with:<br>• External interrupt capability<br>• 13 alternate function lines<br>• High sink outputs<br>• Clamping diodes on all I/Os |
| ADC | 8-bit resolution x 8 channels |
| Communication | Serial Peripheral Interface |
| Motor Control Peripheral | For sensor/sensorless brushless permanent magnet DC motor control |
| Low Power Modes | Run mode: core and peripherals all active<br>Wait: core halted, peripherals all active<br>Slow: core and peripherals running at reduced speed<br>Halt: core and peripherals halted |
| Power Consumption | Run (fosc = 8MHz) = 5/8mA typical/max |
| EMC | ESD sensitivity: 3500V |
| Temperature Range | $T_A$ =-40°C to 85°C or -40°C to 125°C (automotive) |
| Packages | SO34/SDIP32 |

# Tools and Third Party Support

- Emulator
  (Ref. ST7MDT5-EMU2B)
- Eprom Programming Board   (Ref. ST7MDT5-EPB/EU)
- Development Kit to configure and run your own motor. This kit includes a 24 V BLDC motor, control and power board, PC Windows interface, standard software, application builder and programming board.   Available from Kanda (www.kanda.com) or from your official ST distributor.
  (Ref. ST7MTC1/EU, ST7MTC1/US, ST7MTC1/UK). Manufacturer's suggested US resale Price : $ 695.

**For more information visit http://mcu.st.com**