



Analog, Mixed-Signal and Power Management

# MC33813

## Applications

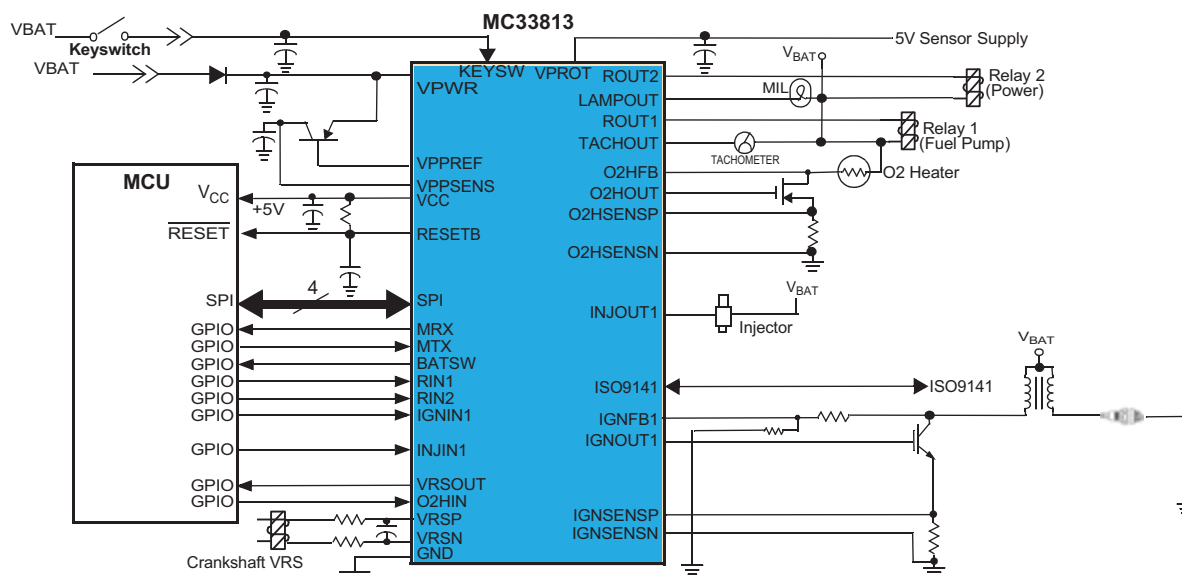
- Motorscooter Engine Control Unit (ECU)
- Motorcycle Engine Control Unit (ECU)
- Small Engine Control for:
  - Three-wheelers
  - Lawn mowers
  - Lawn trimmers
  - Snow blowers
  - Chain saws
  - Gas-driven electrical generators
  - Outboard motors
  - Marine engines and personal watercraft

## One Cylinder Small Engine Control IC

### Overview

The 33813 is an engine control analog power IC intended for one cylinder motorcycle and other small engine control applications. The IC consists of five integrated low side drivers, two pre-drivers, a Variable Reluctance Sensor (VRS) input circuit, a voltage pre-regulator using an external pass transistor and two 5 volt internal regulators, one for the MCU VCC supply and the other for use as a protected sensor supply. Also included is an MCU reset control circuit with watchdog, an ISO 9141 K-Line interface for diagnostic communication and a Serial Peripheral Interface (SPI). The five low side drivers are intended for driving a fuel injector, a lamp, two relays or other loads and a tachometer. The pre-driver is intended to drive IGBT or MOSFET transistors to control ignition coils, and/or a HEGO heater. The device is packaged in a 48 pin LQFP with an exposed pad.

### Motorcycle and Small Engine Control



## Features

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- Designed to operate over supply voltage range of  $4.5\text{ V} \leq \text{VPWR} \leq 36\text{ V}$
- Logic stability guaranteed down to  $2.5\text{ V}$
- One Fuel Injector driver - Typically  $1.3\text{ A}$
- One Ignition IGBT or General Purpose Gate Pre-driver
- One O2 Sensor (HEGO) Heater General Purpose Gate Pre-driver
- Relay 1 driver Typically  $2.0\text{ A}$ , can be used for fuel pump control
- Relay 2 driver Typically  $1.0\text{ A}$ , can be used as power relay control
- Lamp Driver Typically  $1.0\text{ A}$  can also be used to drive a LED
- VPROT Protected sensor supply tracks VCC +5 V regulator
- MCU Reset generator -System Integrity Monitor (Watchdog)
- VPP pre-regulator provides power for VCC and VPROT regulators
- Independent fault protection with all faults reported via SPI
- Interfaces directly to microcomputer (MCU) using  $5.0\text{ V}$  SPI and logic I/O
- ISO-9141 K-Line interface for communicating diagnostic messages
- Start-Up/ shut-down control and power sequence logic for power control
- Differential/single-ended VRS conditioning circuit with auto/manual selected thresholds and filter times with digital and tachometer outputs
- Keyswitch logic with provision for power relay and MCU controlled shutdown.
- ISO-9141 K-Line interface for communicating diagnostic messages

## Benefits

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- Product will eliminate many discrete devices on a PCB with improved reliability over current discrete designs
- Integrated single cylinder control IC
- Multifunctional ignition and injector driver
- Ready to use evaluation kit available
- Cost-effective solution with 16-bit MCU or 32-bit MCU
- Automotive grade quality
- Protection against short-circuit, over-current and over-temperature
- Robust solution for harsh environments in compact, easy-to-use package
- Freescale's Product Longevity Program assures supply for 15 years after launch

## Performance

| Parametric                                      | Typical Values                                                                             |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| Output Type                                     | 5 Low-side drivers, 2 Pre-drivers,<br>ISO9141 K-Line Bi-directional                        |
| Operating Voltage (fully operational)           | 4.5 V to 36 V                                                                              |
| Continuous Current (minimum)                    | 1.3 A for Injector Driver, 1.0 A for Lamp and Relay 2 drivers,<br>2.0 A for Relay 1 Driver |
| Control                                         | SPI and Parallel                                                                           |
| ESD, Human Body Model                           | ±2000 V                                                                                    |
| Ambient Operating Temperature (T <sub>A</sub> ) | -40 °C to 125 °C                                                                           |

## Protection

| Protection       | Detect | Limiting | Shut Down | Auto Retry | Status Reporting |
|------------------|--------|----------|-----------|------------|------------------|
| Over-voltage     | •      |          | •         | •          |                  |
| Over-current/SC  | •      | •        | •         |            | •                |
| Over-temperature | •      |          | •         | •          | •                |
| Open Load        | •      |          |           |            | •                |

## Questions

- Are you designing a control application for a small engine?
- Is your local government planning to issue environmental regulations for small engines?
- Are you planning to move from a mechanical to an electrical engine control system?
- Do you need a reference design for a transition from mechanical to an electrical engine control system?
- Is the space limited in your current electronically controlled small engine?
- Do you want to consolidate/integrate multiple functions into a single IC?



48 pin LQFP-EP  
98ASA00173D

## Orderable Part Numbers

| Part Number | Temp Range (Ambient) | Package        |
|-------------|----------------------|----------------|
| PC33813AE   | -40 to 125 °C        | 48 pin LQFP-EP |

Note: Add R2 Suffix for Tape and Reel

## Documentation

| Document Number | Title                                | Description |
|-----------------|--------------------------------------|-------------|
| MC33813         | One Cylinder Small Engine Control IC | Data Sheet  |

## Development Tools

| Part Number    | Description                                             |
|----------------|---------------------------------------------------------|
| KIT33813AEEVBE | 33813 Evaluation Board (Contact Sales for Availability) |
| KIT33813ECUEVM | 33813 Reference Design (Contact Sales for Availability) |

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