



**THE DATASHEET OF
MC33SB0400ES**



ABS motorcycle braking chip

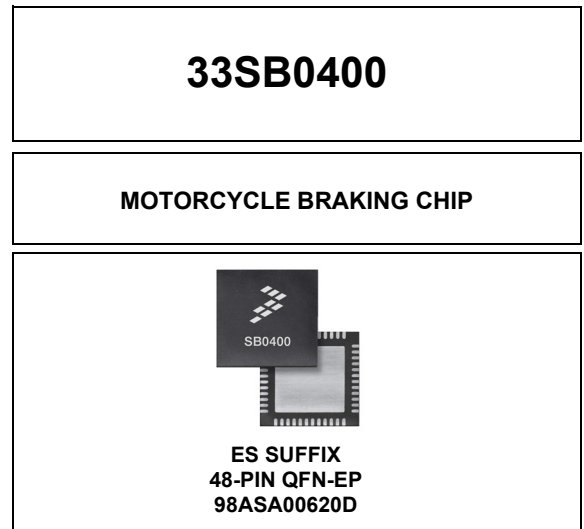
The SB0400 is an antilock brake controller designed for use in harsh motorcycle environments.

It has four high-current low-side drivers for use with solenoid valves, two configurable wheel speed sense inputs capable of handling active sensors, and high-side gate drivers for controlling two external N-channel MOSFETs for use with a pump motor and master relay for solenoid coils. Along with this main functionality, the SB0400 also has a warning lamp driver and a K-line transceiver. The SB0400 boosts an internal charge pump, allowing the high-side drivers to use inexpensive N-channel MOSFETs. The digital I/O pins can be configured for both 5.0 V and 3.3 V levels for easy connection to any microprocessor. The SB0400 uses standard SPI protocol for communication.

The SB0400 is a solution for ABS braking application, and powered by SMARTMOS technology.

Features

- Four PWMed valves driver
- High-side pre-driver for valves protection
- Two wheel speed sensor interfaces (active)
- Dual vehicle speed outputs
- Pump motor pre-driver
- 16-bit SPI interface with watchdog
- K-line interface
- Warning lamp driver
- Die temperature warning
- Supervision



Applications

- Motorcycle braking on two wheels

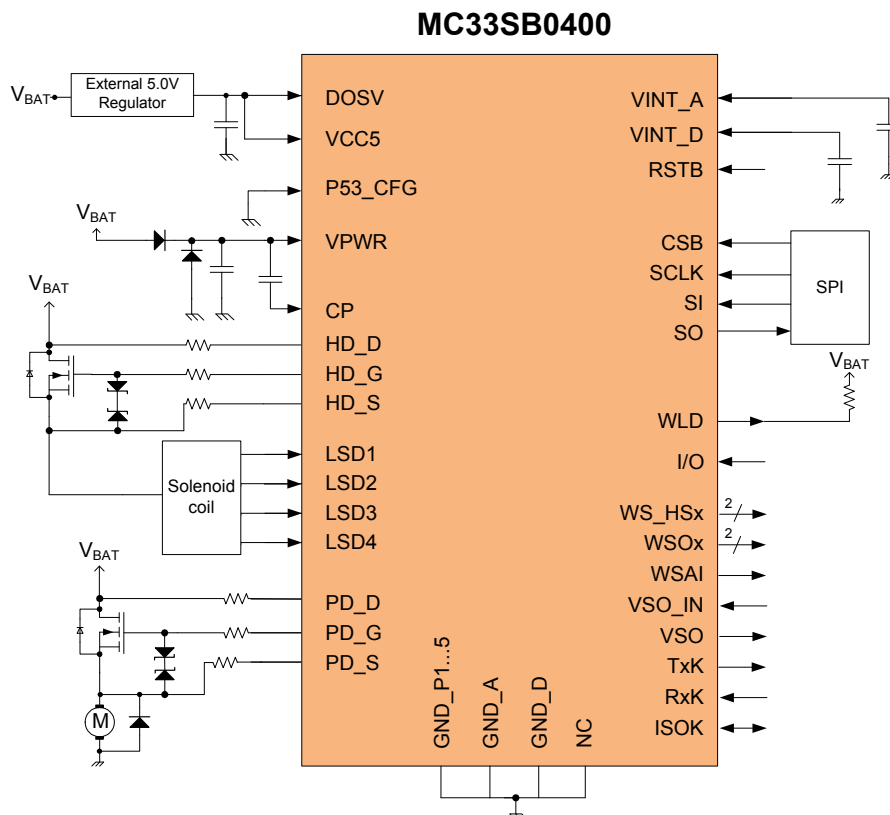


Figure 1. SB0400 simplified application diagram

* This document contains certain information on a new product. Specifications and information herein are subject to change without notice.

Table 1. Orderable part variations

| Part number | Notes | Temperature (T _A) | Package | Description |
|--------------|-------|-------------------------------|--|---|
| MC33SB0400ES | (1) | -40 °C to 125 °C | 7 x 7 x 0.9, 48-Pin QFN Exposed Pad, with 0.5 mm pitch, and a 5.6 x 5.6 exposed pad | <ul style="list-style-type: none"> • Four PWMed valves control • Safe switch control • Two wheel speed sensors • Pump motor control • ISO K-line interface • One warning lamp |

Notes

1. To order parts in Tape & Reel, add the R2 suffix to the part number.

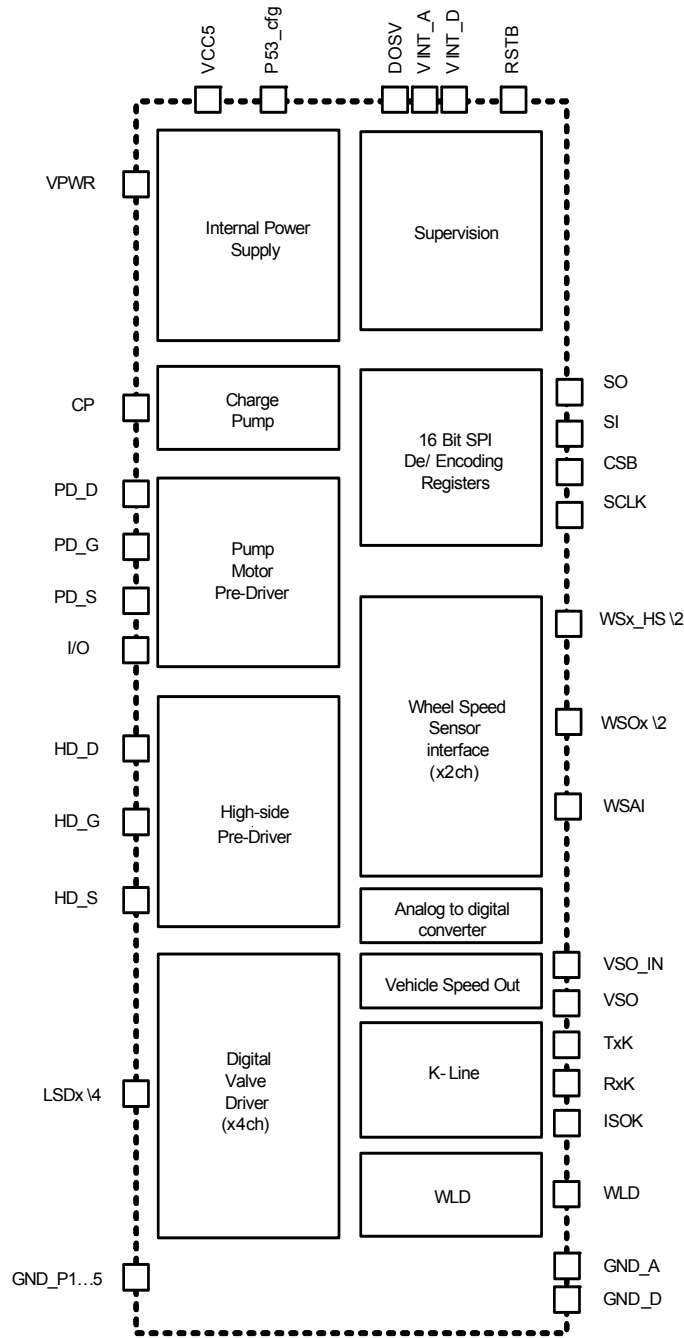


Figure 2. SB0400 simplified block diagram

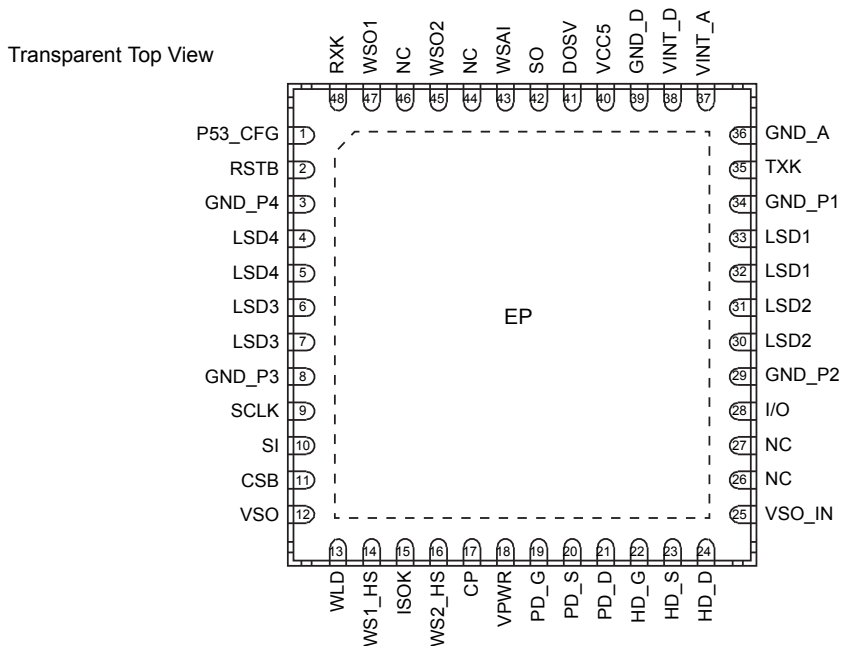


Figure 3. SB0400 48-pin QFN-EP pinout diagram

Table 2. SB0400 pin definitions

| Pin number | Pin name | Pin Function |
|------------|----------|--|
| 1 | P53_CFG | Supply |
| 2 | RSTB | Reset |
| 3 | GND_P4 | Supply |
| 4, 5 | LSD4 | Low-side Driver for Valves |
| 6, 7 | LSD3 | Low-side Driver for Valves |
| 8 | GND_P3 | Supply |
| 9 | SCLK | SPI |
| 10 | SI | SPI |
| 11 | CSB | SPI |
| 12 | VSO | Vehicle Speed Output |
| 13 | WLD | Warning Lamp Driver |
| 14 | WS1_HS | Wheel Speed Sensor Interface |
| 15 | ISOK | K-LINE |
| 16 | WS2_HS | Wheel Speed Sensor Interface |
| 17 | CP | Charge Pump |
| 18 | VPWR | Supply |
| 19 | PD_G | Motor Pump Driver |
| 20 | PD_S | Motor Pump Driver |
| 21 | PD_D | Motor Pump Driver |
| 22 | HD_G | High-side Driver for Valve's Fail Safe FET |
| 23 | HD_S | High-side Driver for Valve's Fail Safe FET |
| 24 | HD_D | High-side Driver for Valve's Fail Safe FET |
| 25 | VSO_IN | Digital Input of VSO |

| Pin Number | Pin Name | Pin Function |
|-------------|----------|------------------------------|
| 25 | VSO_IN | Digital Input of VSO |
| 28 | I/O | General I/O |
| 29 | GND_P2 | Supply |
| 30, 31 | LSD2 | Low-side Driver for Valves |
| 32, 33 | LSD1 | Low-side Driver for Valves |
| 34 | GND_P1 | Supply |
| 35 | TXK | K-LINE |
| 36 | GND_A | Supply |
| 37 | VINT_A | Internal Function |
| 38 | VINT_D | Internal Function |
| 39 | GND_D | Supply |
| 40 | VCC5 | Supply |
| 41 | DOSV | Supply |
| 42 | SO | SPI |
| 43 | WSAI | Wheel Speed Sensor Interface |
| 45 | WSO2 | Wheel Speed Sensor Interface |
| 47 | WSO1 | Wheel Speed Sensor Interface |
| 48 | RXK | K-LINE |
| 26, 27 | NC | Not connected |
| 44, 46 | NC | Not connected |
| Exposed pad | GND_P5 | Supply |

Table 3. Key parameters

Characteristics noted under conditions $6.0\text{ V} \leq V_{PWR} \leq 20\text{ V}$, $4.75\text{ V} \leq V_{CC5} \leq 5.25\text{ V}$, $3.13\text{ V} \leq V_{DOSV} \leq 5.25\text{ V}$, $-40\text{ }^\circ\text{C} \leq T_J \leq 150\text{ }^\circ\text{C}$, $GND = 0\text{ V}$, unless otherwise noted.

| Symbol | Characteristic | Typ. | Unit | Notes |
|--------|----------------|------|------|-------|
|--------|----------------|------|------|-------|

VPWR current consumptions

| | | | | |
|-------------|--|-----|---------------|--|
| I_{QVPWR} | Sleep Mode Measured at $V_{PWR} = 14\text{ V}$ | 3.0 | μA | |
| I_{VPWR} | Operating Mode | 10 | mA | |

VCC5 current consumptions

| | | | | |
|------------|----------------|----|----|--|
| I_{VCC5} | Operating Mode | 10 | mA | |
|------------|----------------|----|----|--|

Timings

| | | | | |
|---|---|--|-----|--|
| LF_PWM | Output PWM frequency <ul style="list-style-type: none"> • LF_PWM_14 = 111 • LF_PWM_14 = 110 • LF_PWM_14 = 101 • LF_PWM_14 = 100 • LF_PWM_14 = 000 (default) • LF_PWM_14 = 011 • LF_PWM_14 = 001 • LF_PWM_14 = 010 | 3.0 3.2 3.4 3.6 3.9 4.2 4.5 5.0 | kHz | |
| 0000 0000 0000 0001 ... 1111 1110 1111 1111 | PWM Duty cycle Programming (8bits) | OFF 0.39 ... 99.61 ON | % | |

| Revision | Date | Description of changes |
|----------|--------|---------------------------------|
| 2.0 | 8/2016 | • Added revision history table. |



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