

# AS8410 - A Novel PWM DC Motor Regulator Solution for Automotive and Industrial Applications

## 1. Key Features

- Field proven DC motor regulator in Automotive industry
- Simultaneously achieving excellent EMC performance and better than 95 % power efficiency (Euro-norm EN 61000-4-x, Automotive qualification Fig.1 below)
- Single supply voltage from 6 V up to 34 V ( $V_{ddmax} = 50$  V)
- Operating temperature range  $-40$  °C ...  $125$  °C
- PWM frequency 20 kHz
- Complete PWM controlled DC Motor current regulation loop
- Comprehensive set of failure modes:
  - motor failures
  - over temperature
  - over current
  - under and over voltage
- Simple to program using one or two external devices
- Wide power range supporting a number of different DC motors
- Automatic sleep mode
- Available in standard SOIC16 package

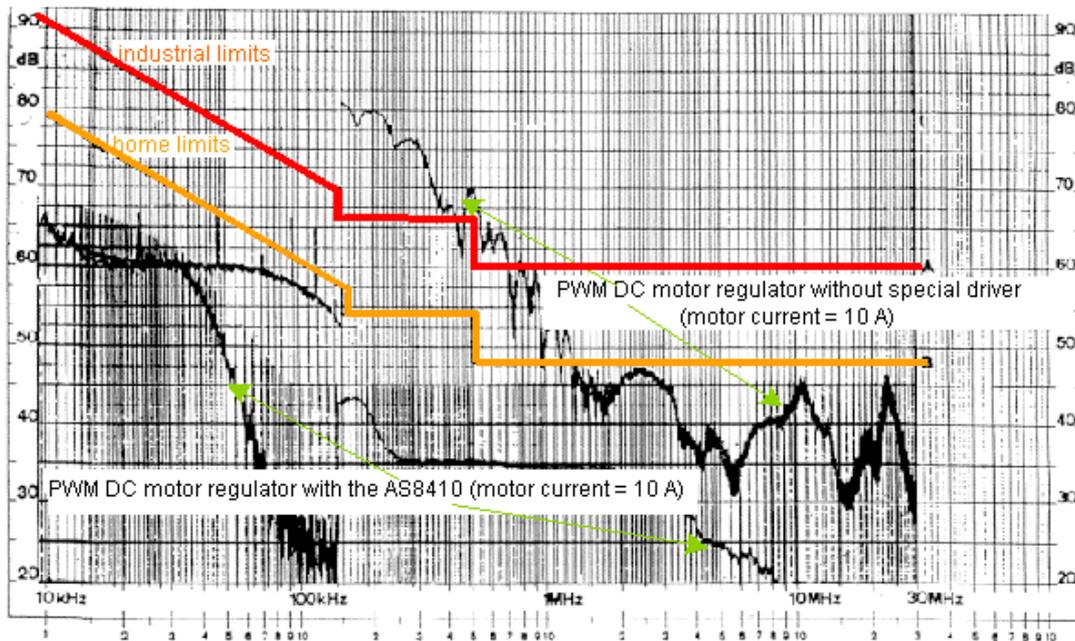


Fig.1 AS8410 comparison with a commercially available solution, showing much lower RF Emission using a motor current of 10 A

## 2. Applications

Connecting directly to the car battery, the AS8410 is able to drive an external power FET using a patented slew rate controlled PWM algorithm. In this configuration the DC motor control is regulated by an active current loop measurement. The RF emission is kept very low (45 dB at 50 kHz) without compromising the power efficiency of the regulator module. Efficiency of better than 95 % is achieved with FET switching rise and fall times less than 150 ns.

The AS8410 can be used in two modes:

Mode 1:  $\mu$ P based system (the set value is the duty ratio of a low frequency PWM input signal)

Mode 2: analogue input or stand alone DC motor regulator (the set value is an analogue voltage in the range 0 ... 5 V)

A complete protection against different motor failures and power FET failures, over temperature and over / under voltages with build in failure handling procedures enables a very high level of security in all automotive or industrial applications.

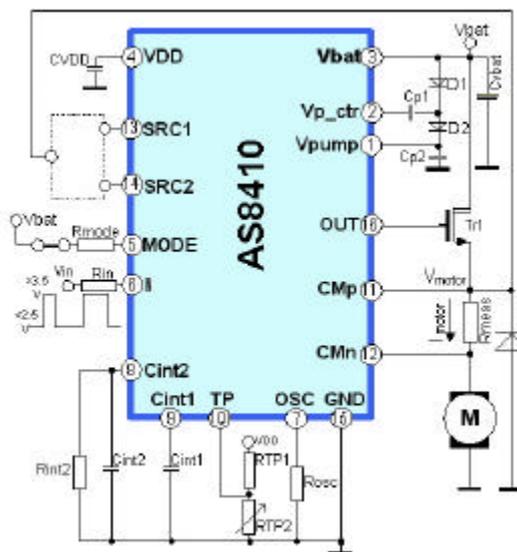


Fig. 2 Application mode 1 of the motor regulator (e.g. Automotive)

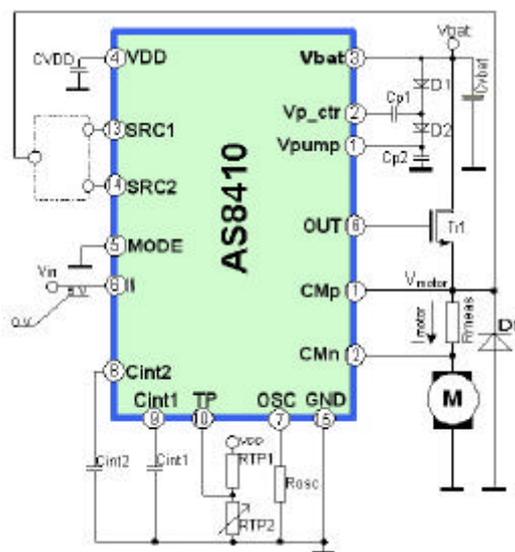


Fig. 3 Application mode 2 of the motor regulator

### 3. Description

The AS8410 was realized in a high voltage CMOS mixed signal technology. All functional blocks to build an analogue DC motor current regulation loop with analogue / digital failure detection and failure handling procedures are integrated (see Figure 4):

1. Slew rate regulated Power FET driver
2. Charge pump (generation of the power FET control voltage)
3. PWM generator (20 kHz)
4. Motor current measurement unit
5. Analogue / Digital Interface, Signal conditioning
6. Regulation characteristic generator
7. Failure detection and protection procedures
  - 7.1 Over Current detection and protection
  - 7.2 Open Wire detection (motor or power FET)
  - 7.3 No-load detection of the motor
  - 7.4 Shorted Motor Segments detection / protection
  - 7.5 Blocked Motor detection / protection
  - 7.6 Short circuit of the power FET detection
  - 7.7 Protection of the power FET in generator mode of the motor
  - 7.8 Over Temperature protection in two modes
  - 7.9 Over / Under voltage detection / protection
8. Analogue / digital state machine (failure handling procedures)
9. Generation of the failure feedback signal
10. Oscillator
11. 5 V regulator (bandgap)
12. Sleep mode / Wake up system

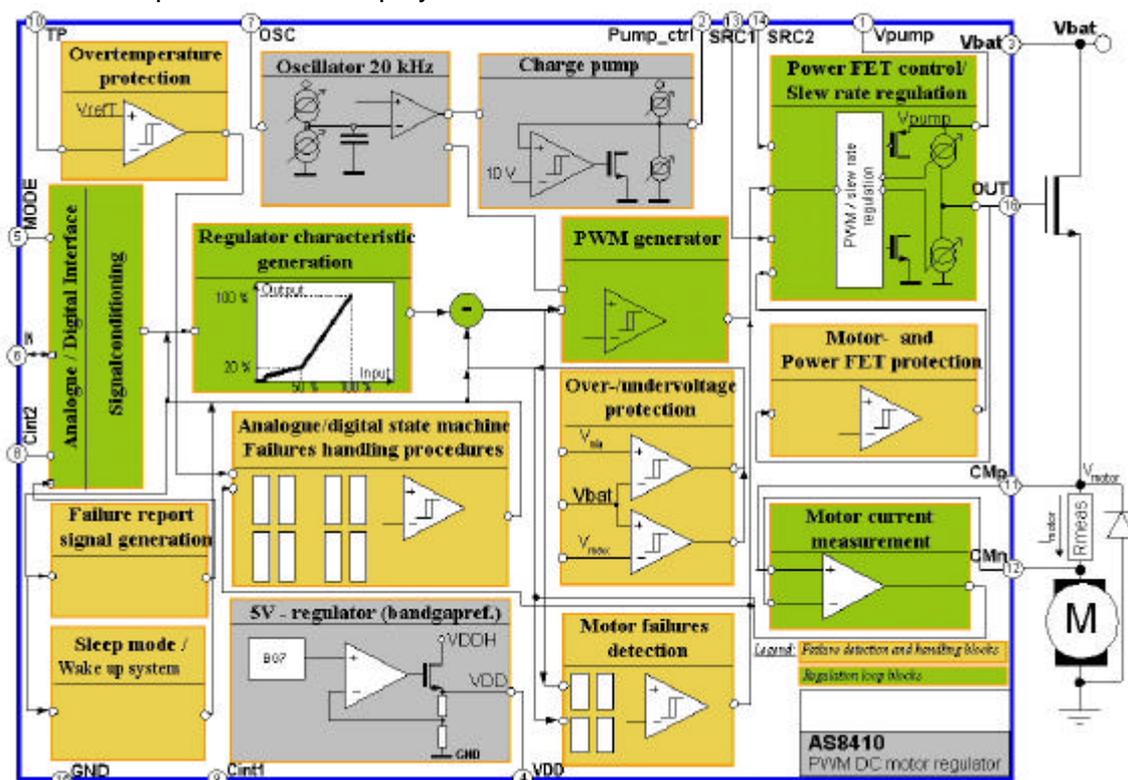


Fig. 4 Block diagram of the AS8410

## 4. Documentation and Application Support

Technical application documents, evaluation boards and application support are available.

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