

## Dual RPM-Based PWM Fan Controller with Hardware Thermal Shutdown

### PRODUCT FEATURES

Data Brief

#### General Description

The EMC2104 is an SMBus compliant fan controller with up to five (up to 4 external and 1 internal) temperature channels. The fan drivers can be operated using two methods each with two modes. The methods include an RPM based Fan Speed Control Algorithm and a direct drive setting. The modes include manually programming the desired settings or using the internal programmable temperature look-up table to select the desired setting based on measured temperature.

The temperature monitors offer 1°C accuracy (for external diodes) with sophisticated features to reduce errors introduced by series resistance and beta variation of substrate thermal diode transistors commonly found in processors.

The EMC2104 also includes a hardware programmable temperature limits and dedicated system shutdown output for thermal protection of critical circuitry.

#### Applications

- Notebook Computers
- Embedded Applications
- Projectors
- Industrial and Networking Equipment

#### Features

- Two Programmable Fan Control circuits
  - 4-wire fan compatible
  - High speed PWM (26kHz)
  - Low speed PWM (9.5Hz - 2240Hz)
  - Optional detection of aging fans
- RPM based fan control algorithm
  - 2% accuracy from 500RPM to 16k RPM
- Temperature Look-Up Table
  - Allows programmed fan response to temperature
  - 1 to 4 thermal zones to control each fan driver
  - Controls fan speed or drive setting
  - Allows externally generated temperature data to control fan drivers including two DTS channels
- Up to Four External Temperature Channels
  - Designed to support 45nm, 60nm, and 90nm CPUs
  - Automatically detects and supports CPUs requiring the BJT or Transistor models
  - Resistance error correction
  - 1°C accurate (60°C to 100°C)
  - 0.125°C resolution
  - Detects fan aging and variation
- Up to three thermistor compatible voltage inputs
- Hardware Programmable Thermal Shutdown Temperature
  - Cannot be altered by software
  - 60°C to 122°C Range or 92°C to 154°C Range
- Programmable High and Low Limits for all channels
- 3.3V Supply Voltage
- SMBus 2.0 Compliant
  - SMBus Alert compatible
- Available in 20-pin QFN Package - Lead Free RoHS compliant (4mm x 4mm)

**ORDER NUMBER:**

| <b>ORDERING NUMBER</b> | <b>PACKAGE</b>                           | <b>FEATURES</b>   |
|------------------------|--|---|
| EMC2104-BP             | 20 pin QFN (Lead-Free<br>RoHS compliant) | Two PWM fan drivers, up to 4 external diode<br>measurement channels, one Critical /<br>Thermal Shutdown inputs. |

**REEL SIZE IS 4,000 PIECES**

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# Block Diagram

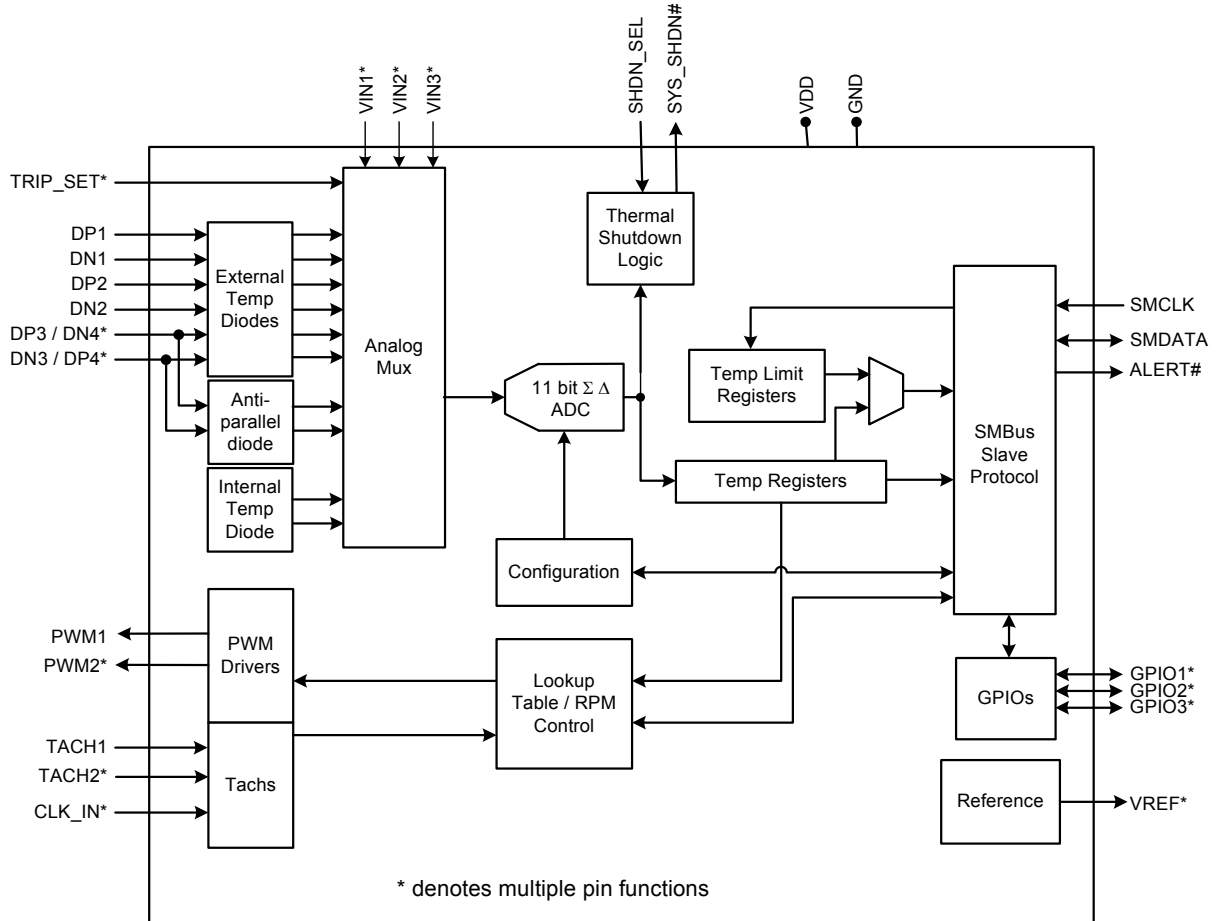
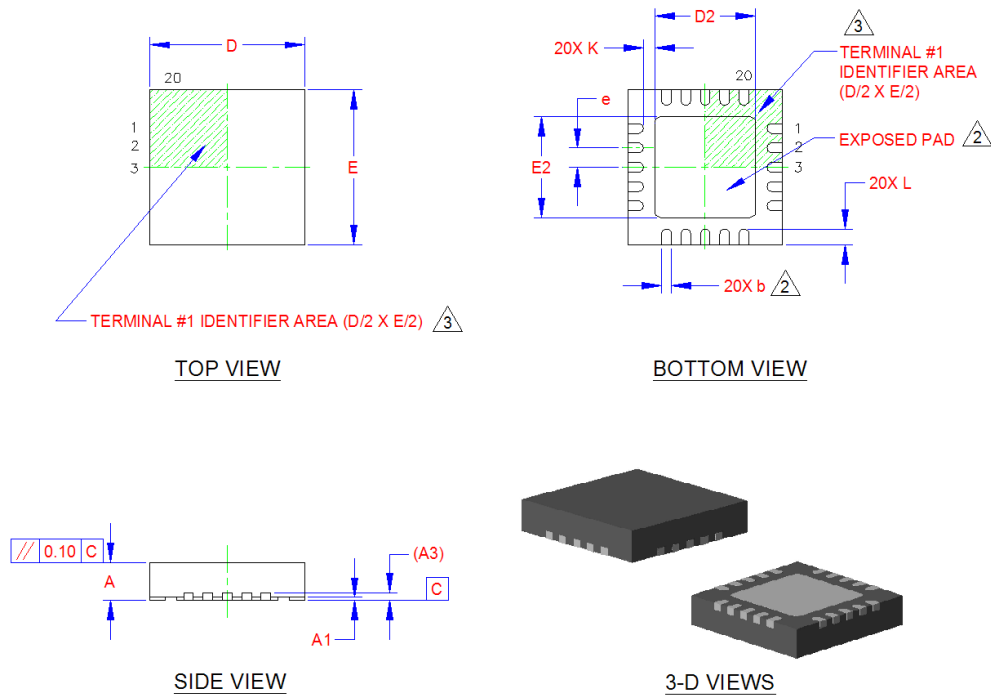


Figure 1 EMC2104 Block Diagram

# Package Outline

## QFN 20-Pin 4mm x 4mm



| COMMON DIMENSIONS |          |      |      |      |                          |
|-------------------|----------|------|------|------|--------------------------|
| SYMBOL            | MIN      | NOM  | MAX  | NOTE | REMARK                   |
| A                 | 0.80     | 0.85 | 0.90 | -    | OVERALL PACKAGE HEIGHT   |
| A1                | 0        | 0.02 | 0.05 | -    | STANDOFF                 |
| A3                | 0.20 REF |      |      | -    | LEAD-FRAME THICKNESS     |
| D/E               | 3.90     | 4.00 | 4.10 | -    | X/Y BODY SIZE            |
| D2/E2             | 2.50     | 2.60 | 2.70 | 2    | X/Y EXPOSED PAD SIZE     |
| L                 | 0.35     | 0.40 | 0.45 | -    | TERMINAL LENGTH          |
| b                 | 0.18     | 0.25 | 0.30 | 2    | TERMINAL WIDTH           |
| K                 | 0.20     | -    | -    | -    | TERMINAL TO PAD DISTANCE |
| e                 | 0.50 BSC |      |      | -    | TERMINAL PITCH           |

### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. POSITION TOLERANCE OF EACH TERMINAL AND EXPOSED PAD IS  $\pm 0.05\text{mm}$  AT MAXIMUM MATERIAL CONDITION. DIMENSIONS "b" APPLIES TO PLATED TERMINALS AND IT IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
3. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL BUT MUST BE LOCATED WITHIN THE AREA INDICATED.

Figure 2 EMC2104 20-Pin 4x4mm QFN Package Outline and Parameters