

GENERAL DESCRIPTION

The CM3708A is a low-noise, pulse-width-modulated (PWM), DC-DC step-down converter. It powers logic and transmitters in small wireless systems such as cellular phones, communicating PDAs, and handy-terminals. The device features an internal synchronous rectifier for high efficiency; it requires no external Schottky diode. Excellent noise characteristics and fixed-frequency operation provide easy post-filtering. The CM3708A is ideally suited for Li-Ion battery applications. It is also useful for +3V or +5V fixed input applications.

The device operates in one of four modes. Forced PWM mode operates at a fixed frequency regardless of the load. Shutdown mode places the device in standby, reducing quiescent supply current to under 0.1µA.

The CM3708A can deliver over 3.0A. The output voltage can be adjusted from VREF to VIN. The input range is from 2.0V to 5.0V. Other features of the CM3708A include high efficiency, low dropout voltage. It is available in a space-saving 16-pin SOP & TSSOP package.

FEATURES

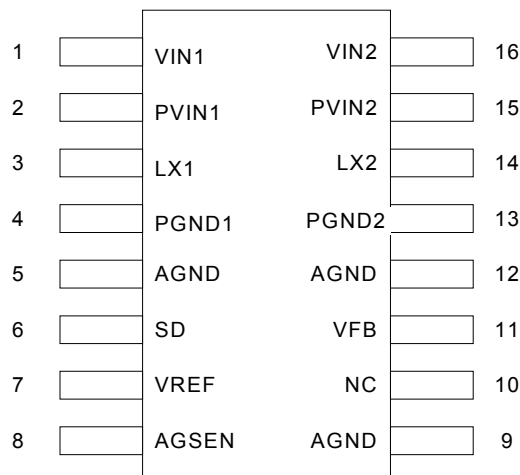
- ◆ Patent Filed #6,452,366
- ◆ 600KHz switching and synchronization
- ◆ Dynamic output-voltage adjustment from VREF to VIN
- ◆ 3A Guaranteed Output Current
- ◆ 95% Efficiency
- ◆ No Schottky Diode Required
- ◆ 16-pin PSOP/PTSSOP power packages
- ◆ 6A Low Noise Current Limit Protection
- ◆ External Soft Start
- ◆ Rail to Rail output Buck Converter

APPLICATIONS

- ◆ Cellular Phone
- ◆ Cordless Phone
- ◆ PDAs and Handy-Terminals
- ◆ AGP Chipset Supplies
- ◆ CPU I/O Supplies
- ◆ Notebook Chipset Supplies
- ◆ Battery Operated Devices

PIN CONFIGURATION

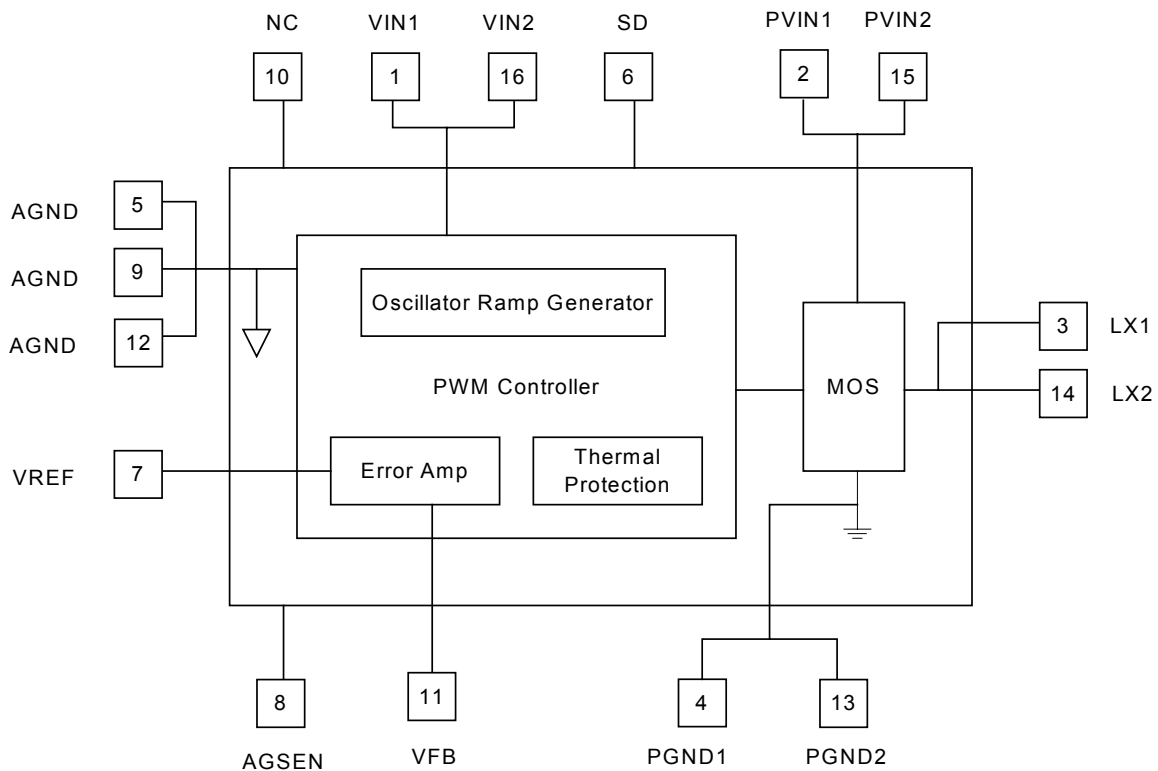
PSOP-16 (PS16) / PTSSOP-16 (PT16)
Top View



PIN DESCRIPTION

| Pin No. | Symbol | Description | Operating Rating | | | |
|---------|--------------|---|------------------|------|------------|------|
| | | | Min. | Typ. | Max. | Unit |
| 1,16 | VIN1, VIN2 | Voltage supply for internal circuits | 2 | 2.5 | 5 | V |
| 2,15 | PVIN1, PVIN2 | Voltage supply for output power transistors | 2 | 2.5 | 5 | V |
| 3,14 | LX1, LX2 | Inductor connection to the Drains of the internal power MOSFETs | | | 5 | V |
| 4,13 | PGND1, PGND2 | Ground for output power transistors | | | | |
| 5,9,12 | AGND | Ground for internal reference voltage divider | | | | |
| 8 | AGSEN | Ground for remote sensing | | | | |
| 6 | SD | Shutdown active high. CMOS input level | 0.75 x VIN | | VIN + 0.3V | V |
| 7 | VREF | V _{OUT} Set Voltage | 0 | | VIN | V |
| 10 | NC | No Connection | | | | |
| 11 | VFB | Feedback node for the V _{OUT} | | | 5 | V |

BLOCK DIAGRAM





Patent

3A LOW-NOISE PWM STEP-DOWN REGULATOR

CM3708A

ORDERING INFORMATION

| Part Number | Temperature Range | Package |
|-------------|-------------------|----------------------|
| CM3708AIT | -40°C to 85°C | 16-Pin PTSSOP (PT16) |
| CM3708AGIT* | -40°C to 85°C | 16-Pin PTSSOP (PT16) |
| CM3708AIS | -40°C to 85°C | 16-Pin PSOP (PS16) |
| CM3708AGIS* | -40°C to 85°C | 16-Pin PSOP (PS16) |

*Note: G : Suffix for Pb Free Product

ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings are those values beyond which the device could be permanently damaged.

PVIN/VIN-0.3V to 6.0V
 Voltage on Any Other Pin GND – 0.3V to VIN + 0.3V
 Output Current, Source or Sink3.0A

Junction Temperature150°C
 Storage Temperature -65°C to 125°C
 Lead Temperature (Soldering, 5 sec)..... 260°C
 Thermal Dissipation(θ_{JC})..... .50°C/W

OPERATING CONDITIONS

Temperature Range -40°C to 85°C
 PVIN Operating Range2.0V to 5.0V

ELECTRICAL CHARACTERISTICS (Unless otherwise stated, these specifications apply $T_A=25^\circ\text{C}$;
VIN=+3.3V and PVIN=+3.3V) maximum ratings are stress ratings only and functional device operation is not implied.
 (Note 1)

| Symbol | Parameter | Test Conditions | CM3708A | | | Unit |
|----------------------------|-------------------------------------|------------------------------|---------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| SWITCHING REGULATOR | | | | | | |
| V_{REF} | Adjustable Output Voltage | | 0 | | VIN | V |
| fsw | Switching Frequency | CM3708A | 480 | | 660 | KHz |
| $I_{OUT(RMS)}$ | Maximum Output RMS Current | CM3708A | | | 3.0 | A |
| $I_{OUT(PEAK)}$ | Maximum Output Peak Current | CM3708A | | | 6.0 | A |
| I_{limit} | Current limit | CM3708A | | 6 | | A |
| MOSFETs | | | | | | |
| $R_{DS(ON)}$ | Drain to Source on-State Resistance | PVIN=5V | | 150 | 180 | m Ω |
| SUPPLY | | | | | | |
| I_{VIN} | Quiescent Current | VFB = 1.4V LC unconnected | | 200 | | μA |
| I_{PVIN} | Quiescent Current | VFB = 1.4V LC unconnected | | 500 | | μA |

Note 1: Limits are guaranteed by 100% testing, sampling, or correlation with worst case test conditions

Note 2: VIN, PVIN = 3.3V \pm 10%

Note 3: It's not 100% test

FUNCTIONAL DESCRIPTION

The CM3708A step-down, pulse-width-modulated (PWM), DC-DC converter has an adjustable output range from VREF to the input voltage (VIN). An internal synchronous rectifier improves efficiency and eliminates an external Schottky diode. Fixed-frequency operation enables easy post-filtering, thereby providing excellent noise characteristics. As a result, the CM3708A is an ideal choice for many small wireless systems.

VREF

The reference voltage could be ranged from 0V to VIN.

OUTPUTS

The output voltage pins (LX1, LX2) are tied to the RF power amp, via an external inductor. Output voltage is determined by the VREF inputs so it can be from 0V to VIN.

Internal Power Switches:

CM3708A has been integrated 2 Power MOSFETs whose $R_{DS(ON)}$ is around 100m Ohm each.

Low Noise Current Limit:

CM3708A's current limit is a low noise current limit. It increase the system loop noise immunity while it is doing the current limit protection for the system. The current limit is around 6A for the normal 3A operation.

INPUTS

The input voltage reference pin, VREF determine the output voltages (LX1, LX2). If a specific voltage is forced at the VREF pin, the output voltage follows the voltage at the VREF pin.

OTHER SUPPLY VOLTAGES

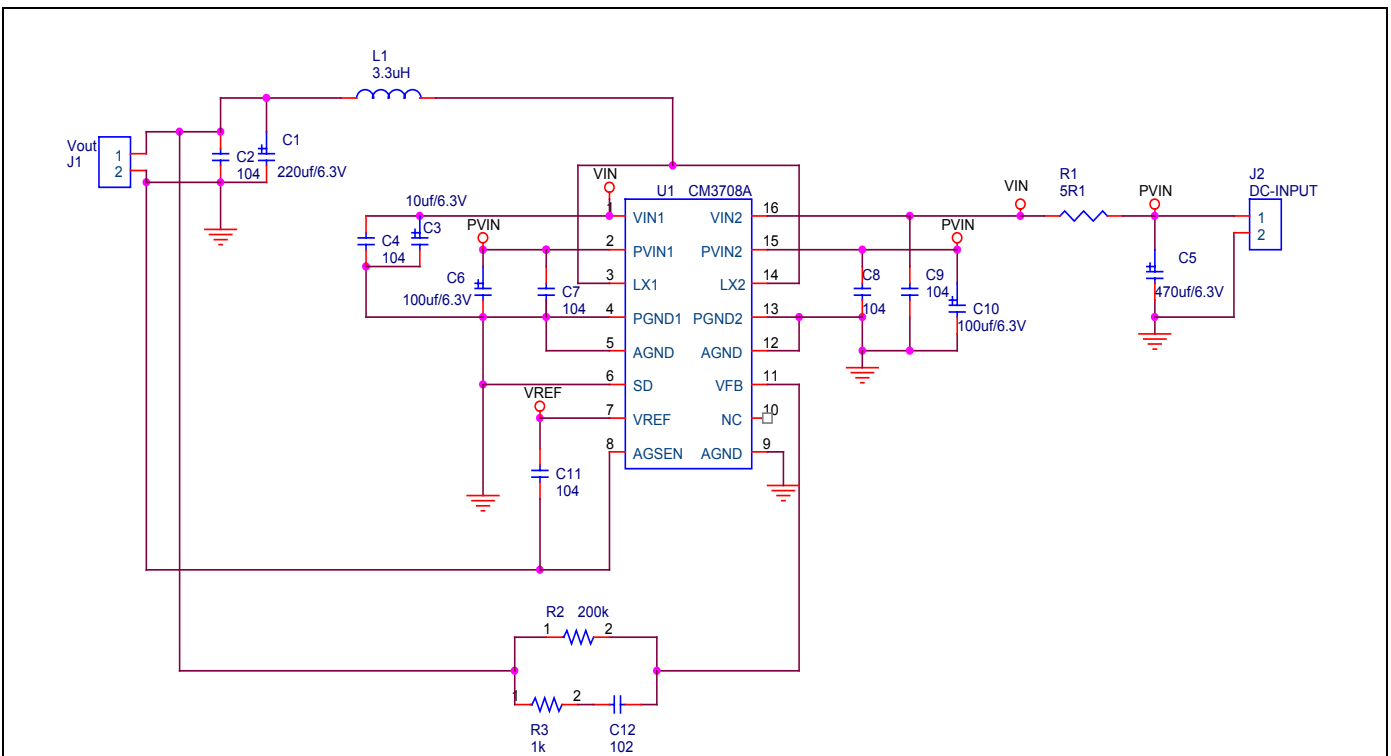
Several inputs are provided for the supply voltages: PVIN and VIN.

The PVIN provide the power supply to the power MOSFETs. VIN provides the voltage supply to the logic section and internal error amplifiers.

FEEDBACK

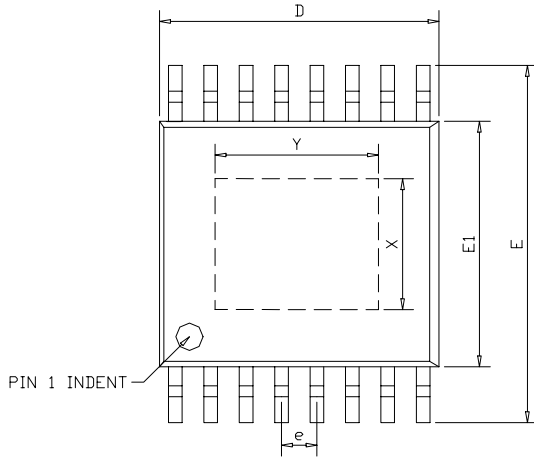
The VFB pin is an input that can be used for closed loop compensation. This input is derived from the voltage output. AGND pin is a contact node of internal resistor divider for remote sense.

APPLICATION CIRCUIT



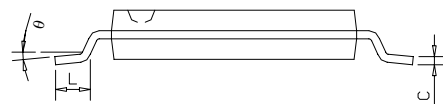
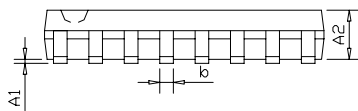
PACKAGE DIMENSION

16-PIN PTSSOP (PT16)

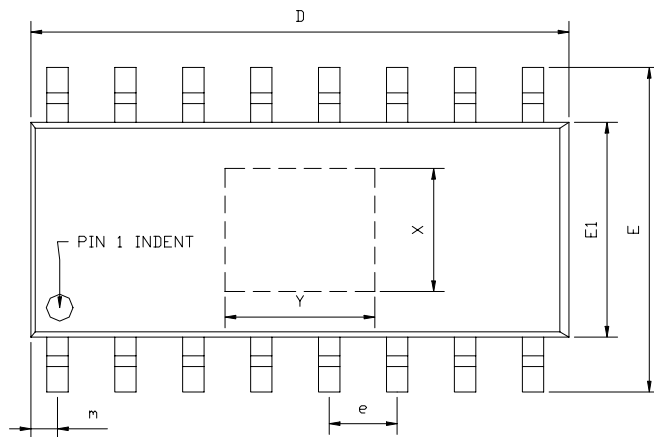


| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---------|---------------------------|------|------|---------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A1 | 0.05 | --- | 0.15 | 0.002 | --- | 0.006 |
| A2 | 0.84 | --- | 0.94 | 0.033 | --- | 0.037 |
| b | 0.20 | --- | 0.30 | 0.008 | --- | 0.012 |
| c | 0.10 | --- | 0.20 | 0.004 | --- | 0.008 |
| D | 4.88 | --- | 5.13 | 0.192 | --- | 0.202 |
| E | 6.25 | --- | 6.55 | 0.246 | --- | 0.258 |
| E1 | 4.29 | --- | 4.50 | 0.169 | --- | 0.177 |
| e | --- | 0.65 | --- | --- | 0.026 | --- |
| L | 0.51 | --- | 0.71 | 0.020 | --- | 0.028 |
| θ | 0° | --- | 8° | 0° | --- | 8° |

EXPOSED PAD DIMENSION : (mm)
PAD SIZE: X=2.4; Y=3.0

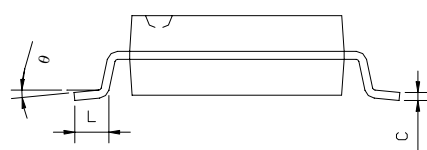
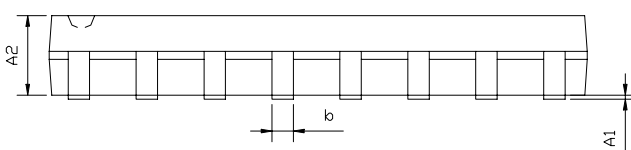


16-PIN PSOP (PS16)



| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---------|---------------------------|------|-------|---------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A1 | 0.05 | --- | 0.15 | 0.002 | --- | 0.006 |
| A2 | 1.40 | --- | 1.55 | 0.055 | --- | 0.061 |
| b | 0.30 | --- | 0.51 | 0.012 | --- | 0.020 |
| C | 0.15 | --- | 0.26 | 0.006 | --- | 0.010 |
| D | 9.80 | --- | 10.06 | 0.386 | --- | 0.396 |
| E | 5.79 | --- | 6.20 | 0.228 | --- | 0.244 |
| E1 | 3.76 | --- | 4.01 | 0.148 | --- | 0.158 |
| e | --- | 1.27 | --- | --- | 0.050 | --- |
| L | 0.38 | --- | 0.69 | 0.015 | --- | 0.035 |
| m | 0.43 | --- | 0.69 | 0.017 | --- | 0.027 |
| θ | 0° | --- | 8° | 0° | --- | 8° |

EXPOSED PAD DIMENSION : (mm)
PAD SIZE: X=2.3 ; Y=2.8





Patent

3A LOW-NOISE PWM STEP-DOWN REGULATOR

CM3708A

IMPORTANT NOTICE

Champion Microelectronic Corporation (CMC) reserves the right to make changes to its products or to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

A few applications using integrated circuit products may involve potential risks of death, personal injury, or severe property or environmental damage. CMC integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life-support applications, devices or systems or other critical applications. Use of CMC products in such applications is understood to be fully at the risk of the customer. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

HsinChu Headquarter

5F, No. 11, Park Avenue II,
Science-Based Industrial Park,
HsinChu City, Taiwan 300

TEL: +886-3-567 9979

FAX: +886-3-567 9909

<http://www.champion-micro.com>

Sales & Marketing

11F, No. 306-3, Sec. 1, Ta Tung Rd.,
Hsichih, Taipei Hsien
Taiwan 221

TEL: +886-2-8692 1591

FAX: +886-2-8692 1596