## GENERAL DESCRIPTION

The CM8685/G is a single channel monolithic Class D Plus™ Audio Amplifier IC that using Champion's unique close loop and feed forward compensation techniques to achieve better THD+N. The CM8685/G integrated four power MOSFETs to drive bridge tight load output. They are guaranteed no shot through, adaptively control break before make. The CM8685/G can deliver peak output power of up to 5 watts at 2Ω load in the high fidelity range (20 Hz to 20kHz). The CM8685/G incorporated a green mode function to ensure high efficiency at light load and full load. The CM8685/G has the optimal high efficiency of up to 90% and no heat sink required. The efficient Class D Plus™ enables the CM8685/G to operate at full power into 4Ω loads at an ambient temperature of 40 ℃.

Low supply current of 3mA makes the device ideal for battery-powered applications.

CM8685/G is packaged in a 8-pin PSOP and PDIP package saves the system space.

## FEATURES

- Patent Filed #6,452,366
- Wide input range of 2.0V to 5.0V
- 8 pin PSOP & PDIP package
- Integrated power MOSFETs
- Reduce system cost with no heat sink
- Close Loop and Feed Forward compensation
- Efficiency of up to 90%
- Dramatically improves efficiency versus Class-AB
- Excellent bass frequency without big bypass DC blocking capacitor
- Ultra low shut down current (1uA)
- Ultra low operation current without load (3mA)
- Internal Thermal Protection

## 24 Hours Technical Support---WebSIM

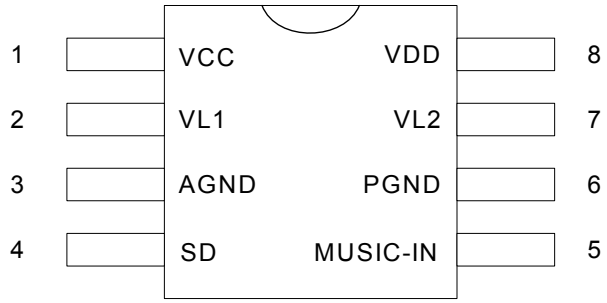
Champion provides customers an online circuit simulation tool called WebSIM. You could simply logon our website at www.champion-micro.com for details.

## APPLICATIONS

- Desktop & Laptop Computers
- PDAs
- Speakers (Multimedia speakers, USB speakers,..)
- Multi-media Monitors (CRT monitors, LCD monitors,..)
- Telephony Accessories (Feature phones, Web phones, & cell phones,..)
- MP3 Players
- DVD Players
- TVs (HDTV, LCD TV, Plasma TV,…)
- Portable Radio Cassettes

## PIN CONFIGURATION

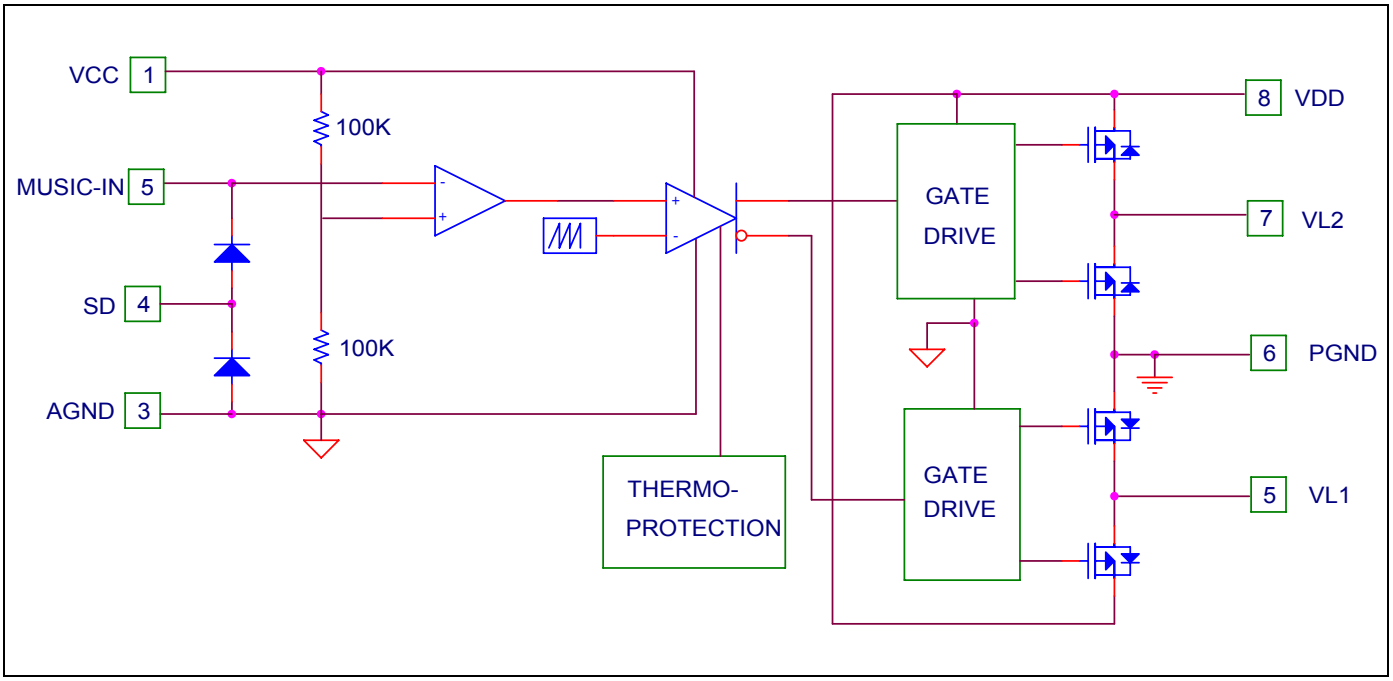
PSOP-8 (PS08)/PDIP (P08)
Top View



## PIN DESCRIPTION

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VCC | Voltage supply for internal circuits |
| 2,7 | VL1, VL2 | Output / Inductor connection (IDD1, IDD2) |
| 3 | AGND | Analog ground |
| 4 | SD | Shutdown active HIGH. CMOS input level |
| 5 | MUSIC-IN | Audio input |
| 6 | PGND | Power ground for output power switcher |
| 8 | VDD | Power supply for output power switcher |

## BLOCK DIAGRAM




## ORDERING INFORMATION

| Part Number | Temperature Range | Package |
|---|---|---|
| CM8685EP | -40℃ to +85℃ | 8-Pin PDIP (P08) |
| CM8685ES | -40℃ to +85℃ | 8-Pin PSOP (PS08) |
| CM8685GEP | -40℃ to +85℃ | 8-Pin PDIP (P08) |
| CM8685GES | -40℃ to +85℃ | 8-Pin PSOP (PS08) |

## ABSOLUTE MAXIMUM RATINGS

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

| | | | |
|---|---|---|---|
| Supply Voltage | -0.3 to 5.5V | Junction Temperature (Note 3) | 150 ℃ |
| Input Voltage | -0.3V to $V_{CC}$+0.3V | Storage Temperature | -65℃ ≦$T_A$≦150℃ |
| Power Dissipation (Note 1) | Internally Limited | Lead Temperature | |
| ESD Susceptibility (Note 2) | 2KV | (soldering 10 sec) | 260℃ |

## RECOMMENDED OPERATING CONDITIONS

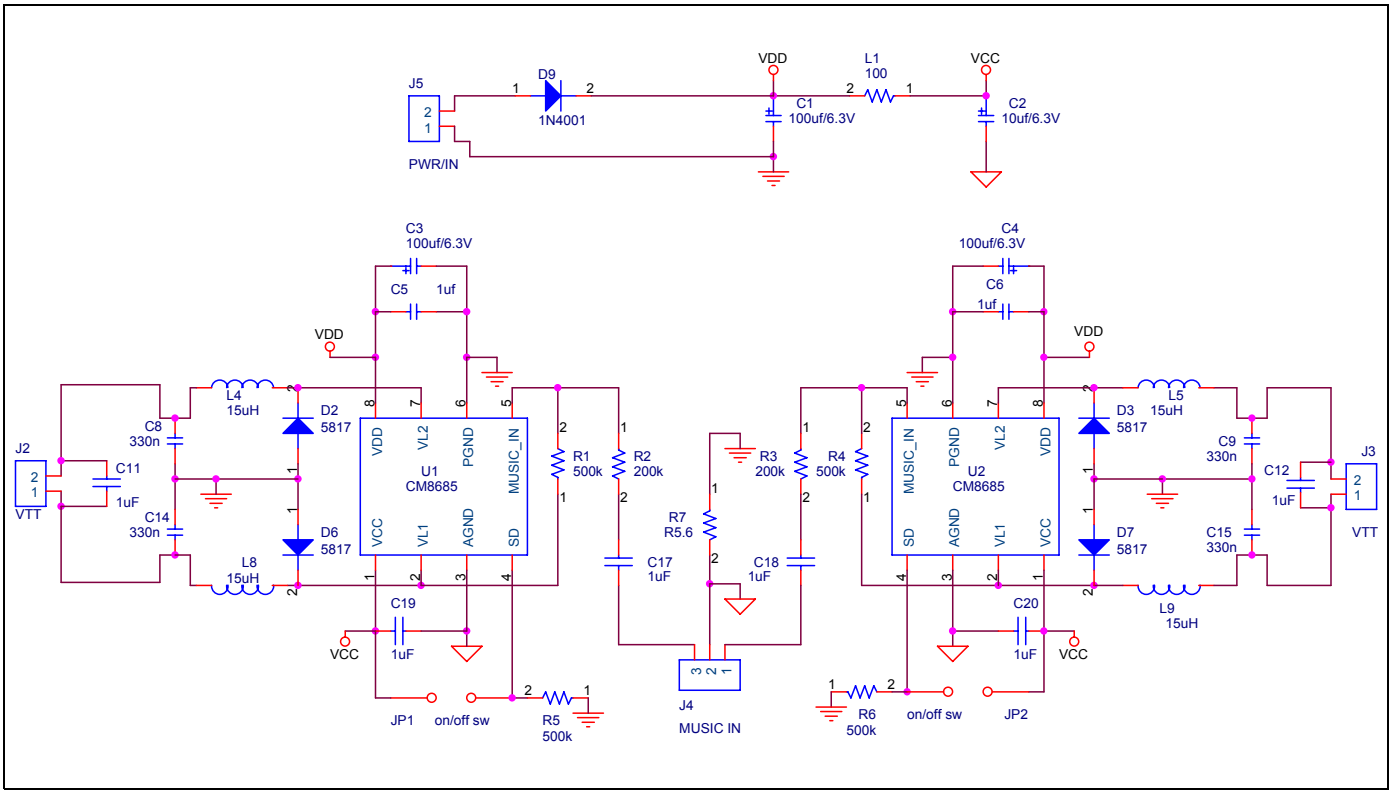
| | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Operating Free-air Temperature, $T_A$ | | -40 | | 85 | ℃ |
| Supply Voltage, VCC, VDD | | 3 | 4.5 | 5.5 | V |
| High-level Input Voltage, $V_{IH}$ | SD | 2 | | | V |
| Low-level Input Voltage, $V_{IL}$ | SD | | | 0.8 | V |

## ELECTRICAL CHARACTERISTICS **(Unless otherwise stated, these specifications apply $T_A$=25°C; Vcc=+5V and VDD=+5V)** maximum ratings are stress ratings only and functional device operation is not implied.

| Symbol | Parameter | Test Conditions | CM8685/G | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| **REFERENCE SECTION** | | | | | | |
| ISD | Supply Current, Shutdown Mode | VSD=5V | | 1 | 5 | μA |
| IDD | Supply Current | Without load | | 3 | 10 | mA |
| f | Switching Frequency | | 510 | 600 | 690 | KHz |
| $V_{OS}$ | Output Offset Voltage Between VL1 and VL2 with 8 ohm Load | | | | 50 | mV |
| PSRR | Power Supply Rejection Ratio | VCC=VDD=3.3V to 5.5V | | 55 | | dB |
| THD+N | Total Harmonic Distortion plus Noise | Po=1W, 4 ohm load, f=1kHz , | | <0.6 | | % |
| $Rds_{(ON)}$ | Drain to Source on-State Resistance | IDD=0.5A, VDD=5V | | 200 | 220 | mΩ |
| D | Duty Cycle | | 5 | | | % |

Note 1: For operating at case temperatures above 25℃, the device must be derated based on a 150℃ maximum junction temperature and a thermal resistance of $\theta_{JA}$=80℃/W (junction to ambient).
Note 2: Human body model, 100pF discharged through a 1.5KΩ resistor.
Note 3: The operating junction temperature maximum is 150℃.

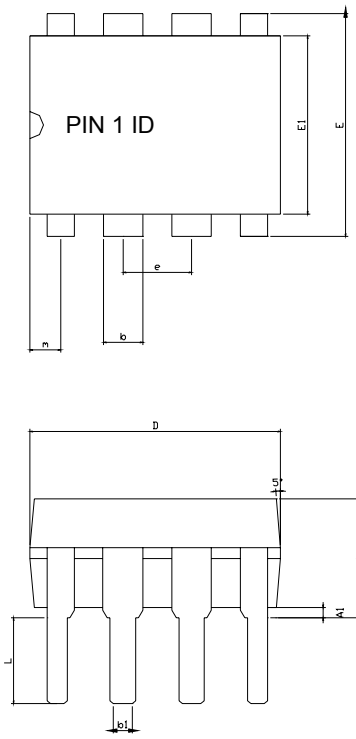
## APPLICATION CIRCUIT




**Typical Application Circuits**

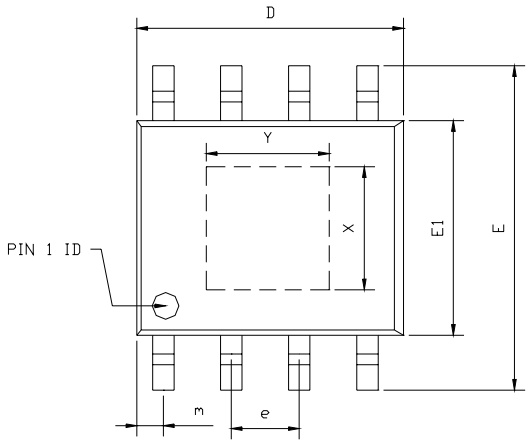
## PACKAGE DIMENSION

### 8-PIN PDIP (P08)




| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | --- | --- | 4.32 | --- | --- | 0.170 |
| A1 | 0.38 | --- | --- | 0.015 | --- | --- |
| b | 1.40 | --- | 1.65 | 0.055 | --- | 0.065 |
| b1 | 0.40 | --- | 0.56 | 0.016 | --- | 0.022 |
| C | 0.20 | --- | 0.31 | 0.008 | --- | 0.012 |
| D | 9.27 | --- | 9.77 | 0.365 | --- | 0.385 |
| E | 7.49 | --- | 8.26 | 0.295 | --- | 0.325 |
| E1 | 6.09 | --- | 6.61 | 0.240 | --- | 0.260 |
| e | --- | 2.54 | --- | --- | 0.100 | --- |
| L | 3.18 | --- | --- | 0.125 | --- | --- |
| m | 0.50 | --- | --- | 0.02 | --- | --- |
| θ | 0 | --- | 15 | 0 | --- | 15 |

### 8-PIN PSOP (PS08)




| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A1 | 0.10 | --- | 0.25 | 0.004 | --- | 0.010 |
| 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 | 4.60 | --- | 5.06 | 0.169 | --- | 0.199 |
| 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=2.3

## IMPORTANT NOTICE

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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.

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