



虹冠電子工業股份有限公司  
Champion Microelectronic Corporation

*Specialized in Integrated High Efficient Switching Power Management Solutions*  
高整合高效率交換型電源管理方案之專業 I C 設計



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## GENERAL DESCRIPTION

The CM8685 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 integrated four power MOSFETs to drive bridge tight load output. They are guaranteed no shot through, adaptively control break before make. The CM8685 can deliver peak output power of up to 5 watts at 4Ω load from a single 5V power supply in the high fidelity range (20 Hz to 20kHz). The CM8685 incorporated a green mode function to ensure high efficiency at light load and full load. The CM8685 has the optimal high efficiency of up to 90% and no heat sink required. The efficient Class D Plus™ enables the CM8685 to operate at full power into 4Ω loads at an ambient temperature of 40 °C.

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

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

## FEATURES

- ◆ 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

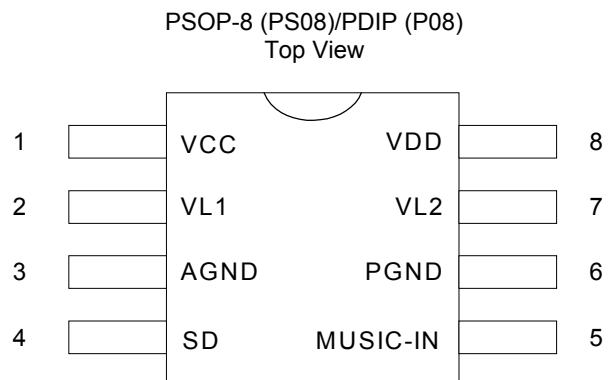
## 24 Hours Technical Support---WebSIM

Champion provides customers an online circuit simulation tool called WebSIM. You could simply logon our website at [www.champion-micro.com](http://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

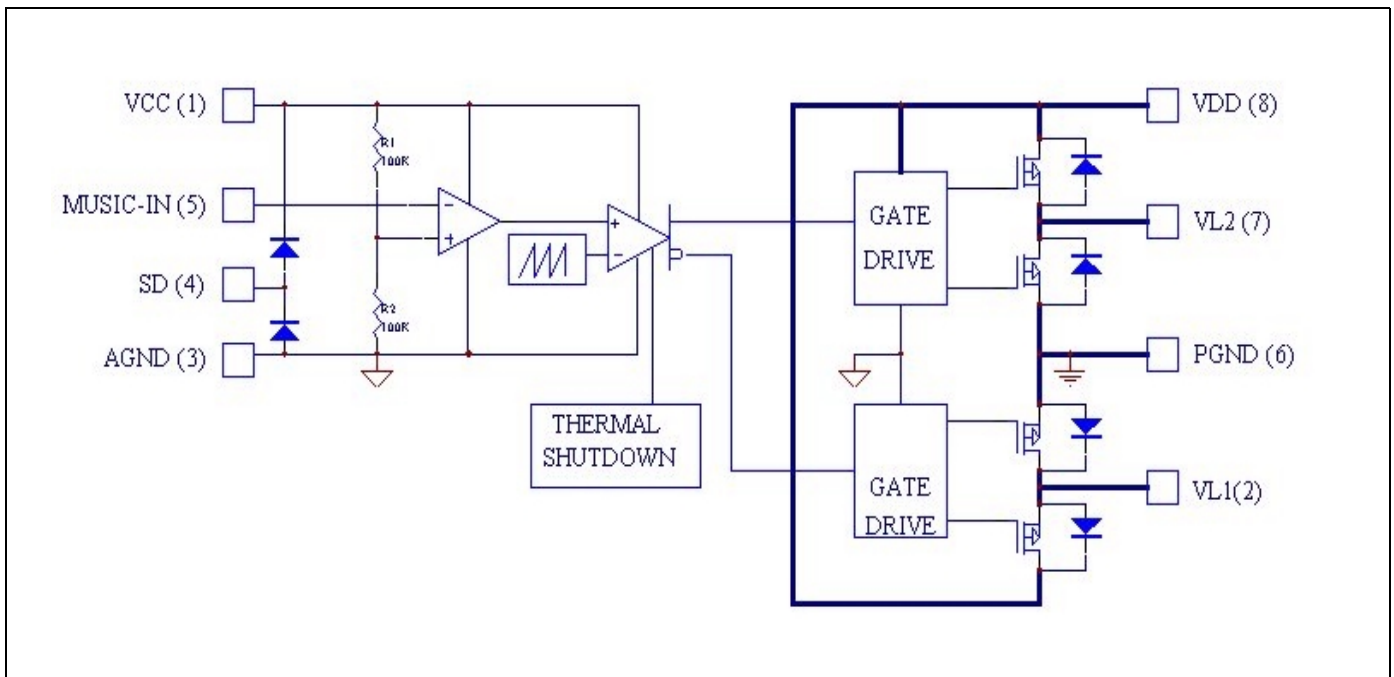
## PIN CONFIGURATION



### 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	-20°C to 70°C	8-Pin PDIP (P08)
CM8685ES	-20°C to 70°C	8-Pin PSOP (PS08)



# Patent

## 5W MONO CLASS D PLUS™ AUDIO AMPLIFIER

**CM8685**

### 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 °C
Input Voltage	-0.3V to V <sub>CC</sub> +0.3V	Storage Temperature	-65°C ≤ T <sub>A</sub> ≤ 150°C
Power Dissipation (Note 1)	Internally Limited	Lead Temperature	
ESD Susceptibility (Note 2)	2KV	(soldering 10 sec)	260°C

### RECOMMENDED OPERATING CONDITIONS

		MIN	TYP	MAX	UNIT
Operating Free-air Temperature, T <sub>A</sub>		-20		70	°C
Supply Voltage, V <sub>CC</sub> , V <sub>DD</sub>		3	4.5	5.5	V
High-level Input Voltage, V <sub>IH</sub>	SD	2			V
Low-level Input Voltage, V <sub>IL</sub>	SD			0.8	V

**ELECTRICAL CHARACTERISTICS** (Unless otherwise stated, these specifications apply T<sub>A</sub>=25°C; V<sub>CC</sub>=+5V and V<sub>DD</sub>=+5V) maximum ratings are stress ratings only and functional device operation is not implied.

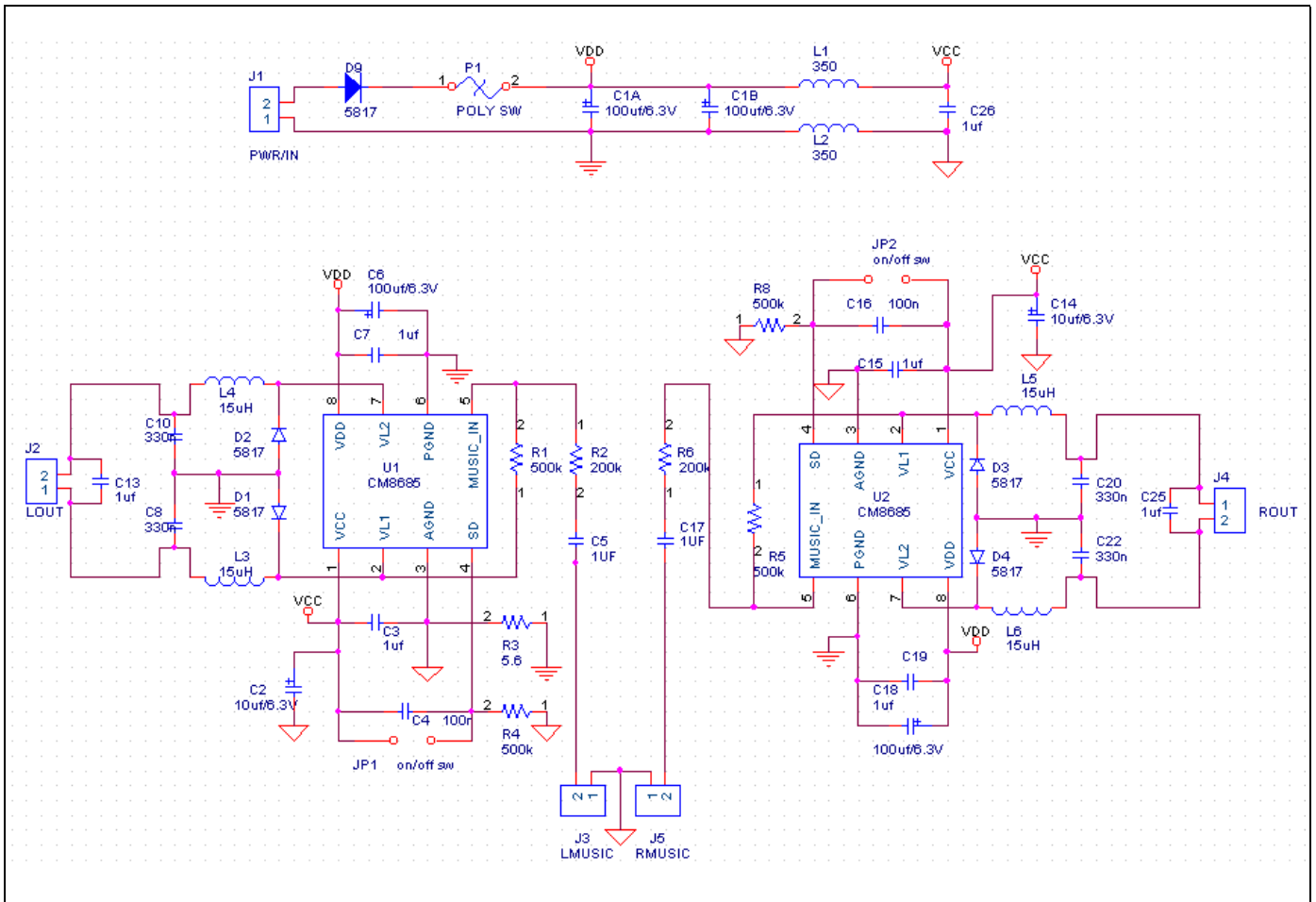
Symbol	Parameter	Test Conditions	CM8685			Unit
			Min.	Typ.	Max.	
<b>REFERENCE SECTION</b>						
ISD	Supply Current, Shutdown Mode	VSD=5V		1	5	μA
IDD	Supply Current	Without load		3	10	mA
f	Switching Frequency		510	600	690	KHz
V <sub>OS</sub>	Output Offset Voltage Between VL1 and VL2 with 8 ohm Load				50	mV
PSRR	Power Supply Rejection Ratio	V <sub>CC</sub> =V <sub>DD</sub> =3.3V to 5.5V		55		dB
THD+N	Total Harmonic Distortion plus Noise	Po=1W, 4 ohm load, f=1kHz ,		<0.6		%
R <sub>ds(ON)</sub>	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°C, the device must be derated based on a 150°C maximum junction temperature and a thermal resistance of  $\theta_{JA}=80^{\circ}\text{C}/\text{W}$  (junction to ambient).

Note 2: Human body model, 100pF discharged through a 1.5KΩ resistor.

Note 3: The operating junction temperature maximum is 150°C.

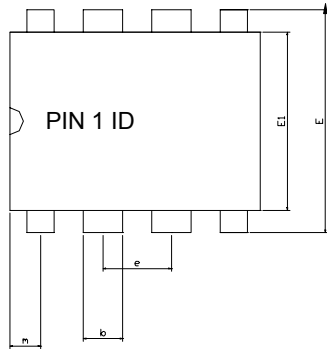
### APPLICATION CIRCUIT



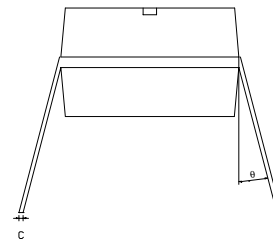
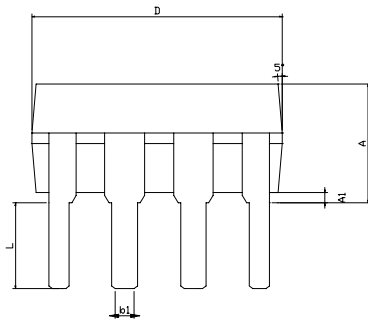
Typical Application Circuits

### PACKAGE DIMENSION

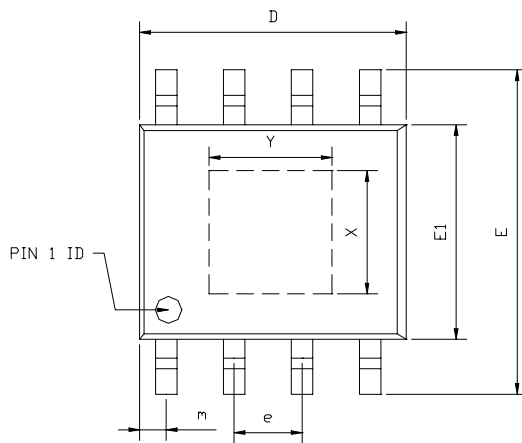
#### 8-PIN PDIP (P08)



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

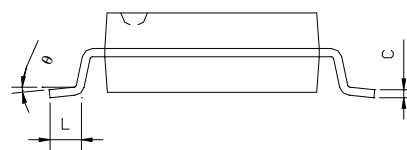
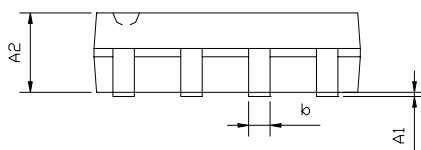


#### 8-PIN PSOP (PS08)



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





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