

## GENERAL DESCRIPTION

The CM8501/A is a low cost switching regulator designed to provide a desired output voltage or termination voltage for various applications by converting voltage supplies ranging from 2.0V to 4.0V. The CM8501 can be implemented to produce regulated output voltages in two different modes. In the default mode, when the VIN/2 pin is open, the output voltage is 50% of the VCCQ. The CM8501 can also be used to produce various user-defined voltages by forcing a voltage on the VIN/2 pin. In this case, the output voltage follows the VIN/2 pin input voltage. The regulated output voltage of CM8501A is internally set to be 50% of the applied VCCQ. The switching regulator is capable of sourcing or sinking up to 1.5A of current while regulating an output  $V_{TT}$  voltage to within 3% or less.

**The CM8501A could guarantee to provide continuous sinking or sourcing up to 2A current while enlarging the layout GND pad dimension as layout suggestion in page 6.**

The CM8501/A provides low profile 8-pin PSOP package to save system space as well as 16-pin PSOP and PTSSOP packages that are pin-to-pin compatible to the previous CM8500.

## APPLICATIONS

- ◆ Mother Board
- ◆ PCI/AGP Graphics
- ◆ Game/ Play Station
- ◆ Set Top Box

## FEATURES

- ◆ Patent Filed #6,452,366
- ◆ 8-pin PSOP, 16 pin PTSSOP and 16 pin PSOP power packages
- ◆ Source and sink up to 1.5A, no heat sink required
- ◆ Peak Current to 3A
- ◆ Integrated Power MOSFETs
- ◆ Output voltage can be programmed by external resistors (CM8501)
- ◆ Separate voltages for VCCQ and PVDD
- ◆  $V_{OUT}$  of  $\pm 3\%$  or less at 1.5A
- ◆ Minimum external components
- ◆ Shutdown for standby or suspend mode operation
- ◆ Thermal shutdown protection
- ◆ Soft start

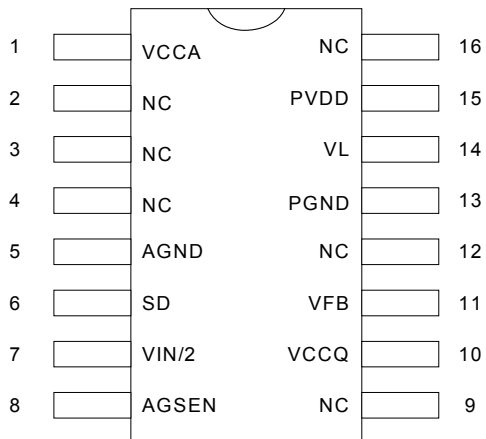
## 24 Hours Technical Support---WebSIM

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.

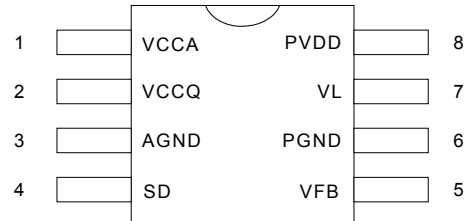
- ◆ IPC
- ◆ SCSI-III Bus terminator
- ◆ Buck Converter

### PIN CONFIGURATION

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



PSOP-8 (PS08)  
Top View



### PIN DESCRIPTION

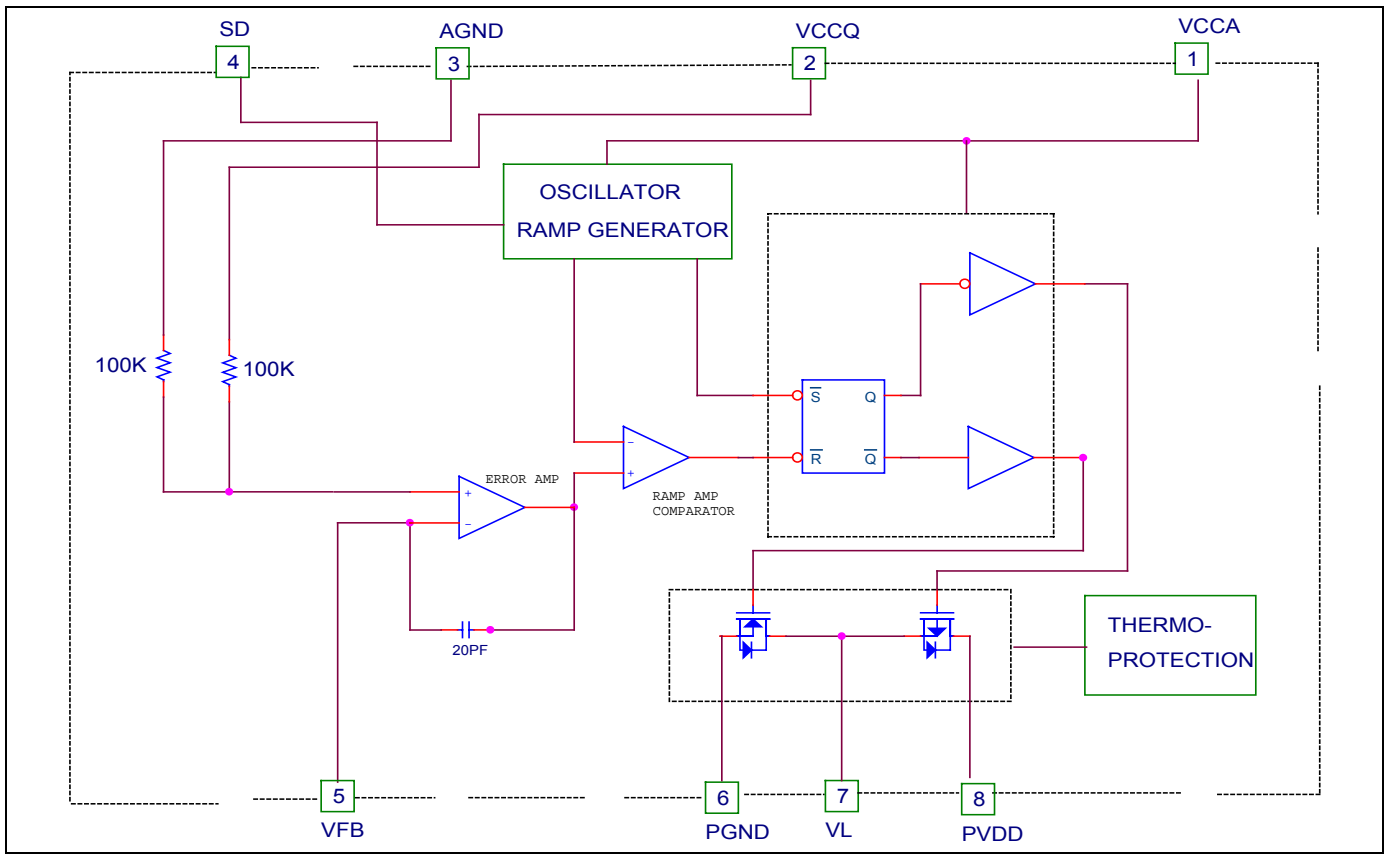
Pin No.		Symbol	Description	Operating Rating				
8501	8501A			Min.	Typ.	Max.	Unit	
1	1	VCCA	Voltage supply for internal circuits		2	2.5	5.5	V
2,3,4,9,12,16	--	NC	No Connection					
5	3	AGND	Ground for internal reference voltage divider					
6	4	SD	CMOS input level	Shutdown level	0.75 x VCCA		VCCA+0.3	V
				Enable level	0		2.0	
7	--	VIN/2	Input for external reference voltage			VCCQ/2		V
8	--	AGSEN	Ground for remote sensing					
10	2	VCCQ	Voltage reference for external voltage divider			2.5		V
11	5	VFB	Feedback node for the V <sub>TT</sub>			VCCQ/2		V
13	6	PGND	Ground for output power transistors					
14	7	VL	Output voltage/inductor connection (IDD1+IDD2, Output RMS current)		-2.0		+2.0	A
15	8	PVDD	Voltage supply for output power transistors		2	2.5	5.5	V

### ORDERING INFORMATION

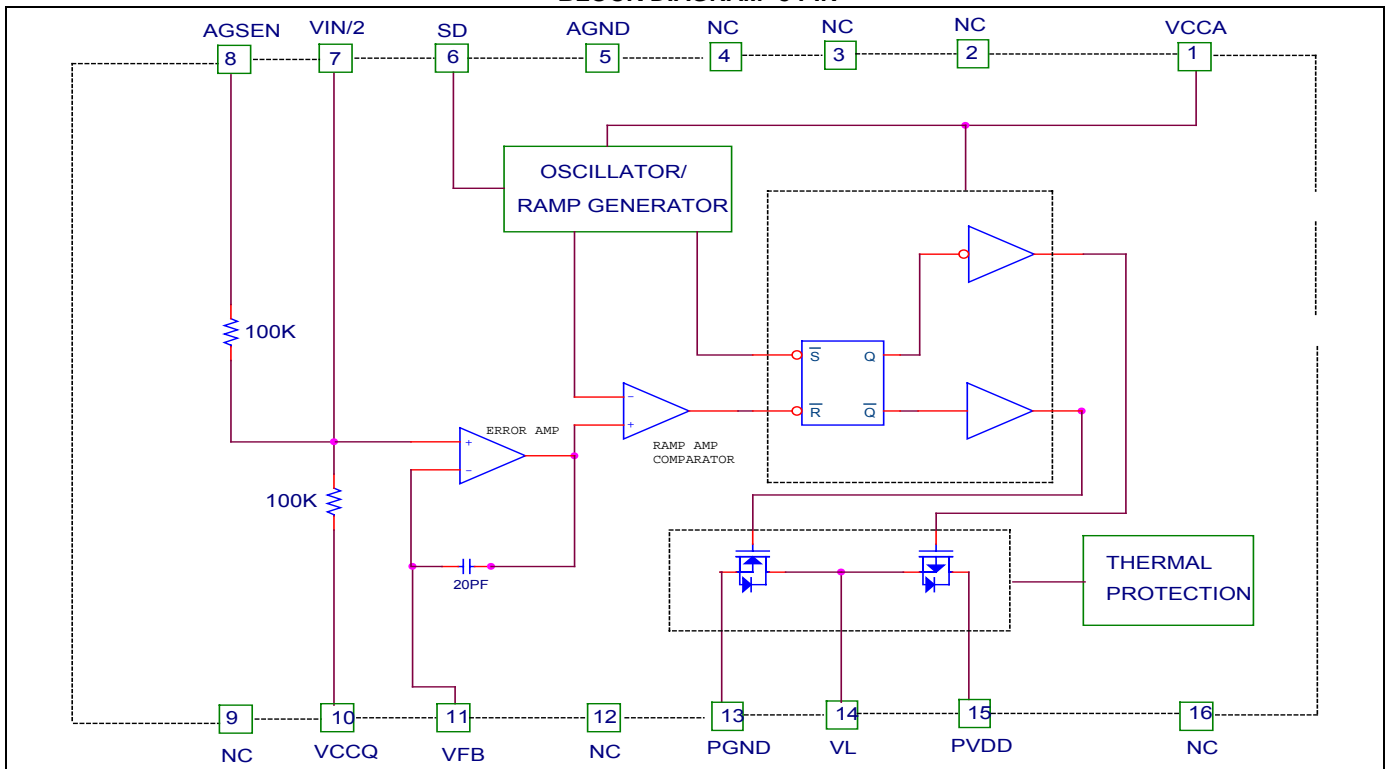
Part Number	Temperature Range	Package
CM8501IT	-40°C to 85°C	16-Pin PTSSOP (PT16)
CM8501IS	-40°C to 85°C	16-Pin PSOP (PS16)
CM8501AIS	-40°C to 85°C	8-Pin PSOP (PS08)
CM8501GIT*	-40°C to 85°C	16-Pin PTSSOP (PT16)
CM8501GIS*	-40°C to 85°C	16-Pin PSOP (PS16)
CM8501AGIS*	-40°C to 85°C	8-Pin PSOP (PS08)

\*Note: G : Suffix for Pb Free Product

### BLOCK DIAGRAM



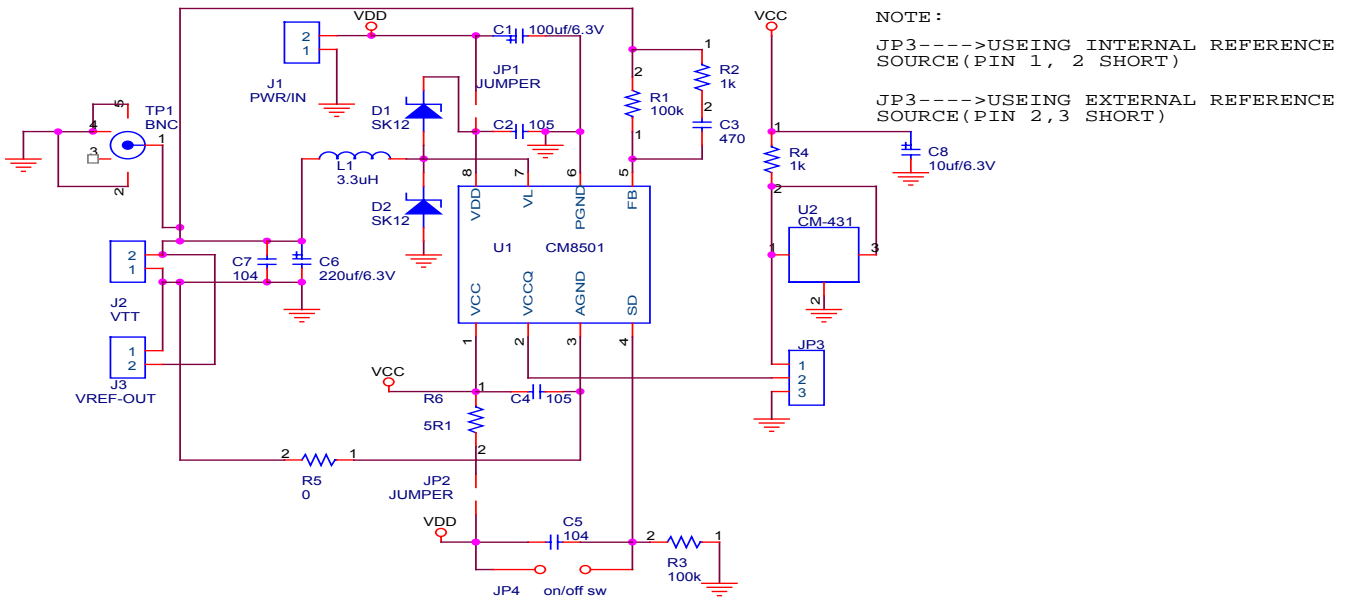
### BLOCK DIAGRAM- 8 PIN



### BLOCK DIAGRAM- 16 PIN

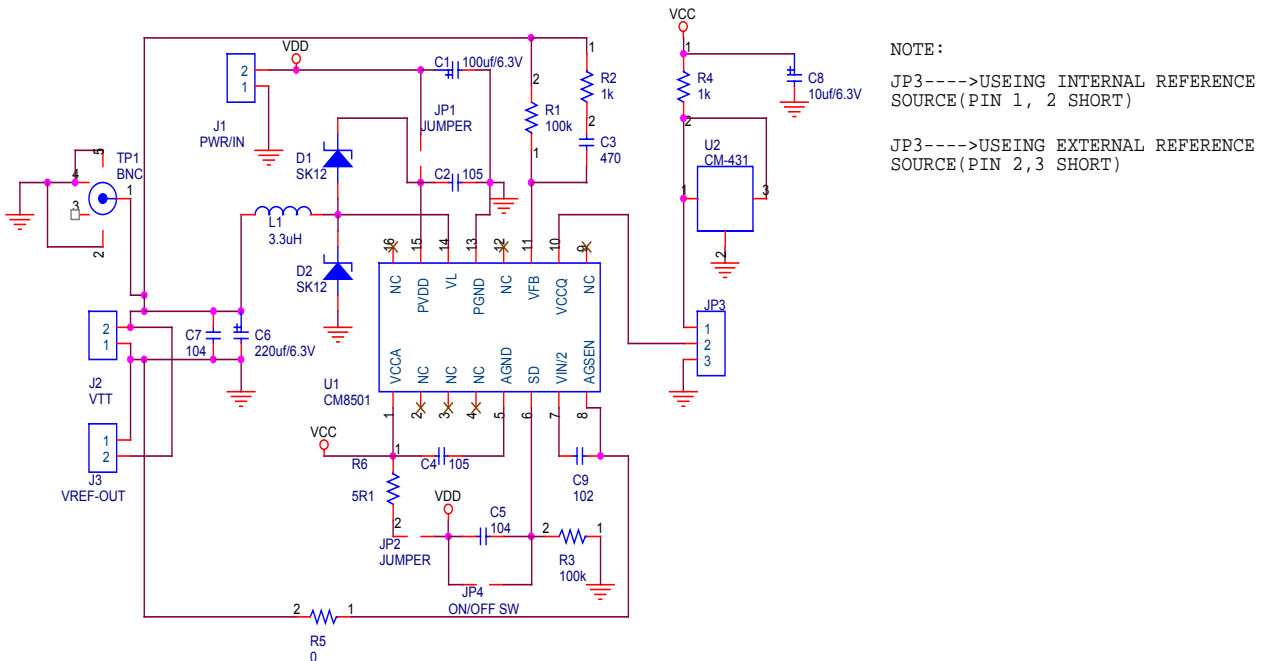
### APPLICATION CIRCUITS

#### 1.5A DDR BUS TERMINATOR DEMO BOARD CIRCUIT



8-Pin Schematic

#### 1.5A DDR BUS TERMINATOR DEMO BOARD CIRCUIT



16-Pin Schematic

### ABSOLUTE MAXIMUM RATINGS

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

PVDD/VCCA/VCCQ .....-0.3V to 4.0V  
 Voltage on Any Other Pin ..... GND – 0.3V to VCC + 0.3V  
 Output RMS Current, Source or Sink .....1.5A

Junction Temperature .....150°C  
 Storage Temperature ..... -65°C to 125°C  
 Lead Temperature (Soldering, 5 sec)..... 300°C  
 16-Pin Package Thermal Resistance( $\theta_{JA}$ )..... 40°C/W  
 8-Pin Package Thermal Resistance( $\theta_{JA}$ )..... .50°C/W

### OPERATING CONDITIONS

Temperature Range ..... -40°C to 85°C  
 PVDD Operating Range .....2.0V to 4.0V

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

(Note 1)

Symbol	Parameter	Test Conditions	CM8501/A			Unit	
			Min.	Typ.	Max.		
<b>SWITCHING REGULATOR</b>							
VL	Output Voltage, SSTL_2	IOUT = 0,	VCCQ = 2.3V	1.12	1.15	1.18	V
			VCCQ = 2.5V	1.22	1.25	1.28	V
		Note 2	VCCQ = 2.7V	1.32	1.35	1.38	V
			IOUT =	VCCQ = 2.3V	1.09	1.15	1.21
		$\pm 1.5\text{A}$ ,	VCCQ = 2.5V	1.19	1.25	1.31	V
			Note 2	VCCQ = 2.7V	1.28	1.35	1.42
VIN/2	Internal Resistor Divider	IOUT = 0 Note 2	VCCQ = 2.3V	1.139	1.15	1.162	V
			VCCQ = 2.5V	1.238	1.25	1.263	V
			VCCQ = 2.7V	1.337	1.35	1.364	V
ZIN	VIN/2 Reference Pin Input Impedance	Note 2	VCCQ = 0		50	K $\Omega$	
fsw	Switching Frequency	CM8501/A	0.9	1.2	1.5	MHz	
IOUT(RMS)	Minimum Output RMS Current	CM8501/A	1.5	2.0		A	
IOUT(PEAK)	Maximum Output Peak Current	CM8501/A			3	A	
OTS	Over Temperature Shutdown	CM8501/A	135	150		°C	
<b>MOSFETs</b>							
RDS(ON)	Drain to Source on-State Resistance	PVDD=5V		250		m $\Omega$	
<b>SUPPLY</b>							
IVCCA	Quiescent Current	VFB = 1.4V LC unconnected		220		$\mu\text{A}$	
IPVDD		VFB = 1.4V LC unconnected		500		$\mu\text{A}$	

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

**Note 2:** VCCA, PVDD = 3.3V  $\pm 10\%$ , VIN/2=open for CM8501

**Note 3:** Guaranteed by design, not 100% test

### FUNCTIONAL DESCRIPTION

The CM8501/A is a switching regulator that is capable of sinking and sourcing 1.5A of current without an external heat sink. CM8501/A uses a standard surface mount PTSSOP and PSOP package with bottom metal exposed and the heat can be piped through the bottom of the device and onto the PCB.

The CM8501/A integrates power MOSFETs that are capable of source and sink 1.5A of current while maintaining excellent voltage regulation. The output voltage can be regulated within 3% or less by using the external feedback. Separate voltage supply inputs have been added to fit applications with various power supplies for the databus and power buses.

#### OUTPUTS

The output voltage pins (VL) are tied to the databus, address, or clock lines via an external inductor. Output voltage is determined by the VCCQ or VIN/2 inputs for CM8501 and is determined by the VCCQ only for CM8501A.

#### INPUTS

The input voltage pins (VCCQ & VIN/2 of CM8501 or VCCQ of CM8501A) determine the output voltages (VL). At CM8501, when the VIN/2 pin is open, the output voltage is 50% of the VCCQ input. If a specific voltage is forced at the VIN/2 pin, the output voltage follows the voltage at the VIN/2 pin. At CM8501A, the output voltage is always 50% of the VCCQ input.

VCCQ is suggested to connect to VCCQ of memory module for better tracking with memory VCCQ.

#### OTHER SUPPLY VOLTAGES

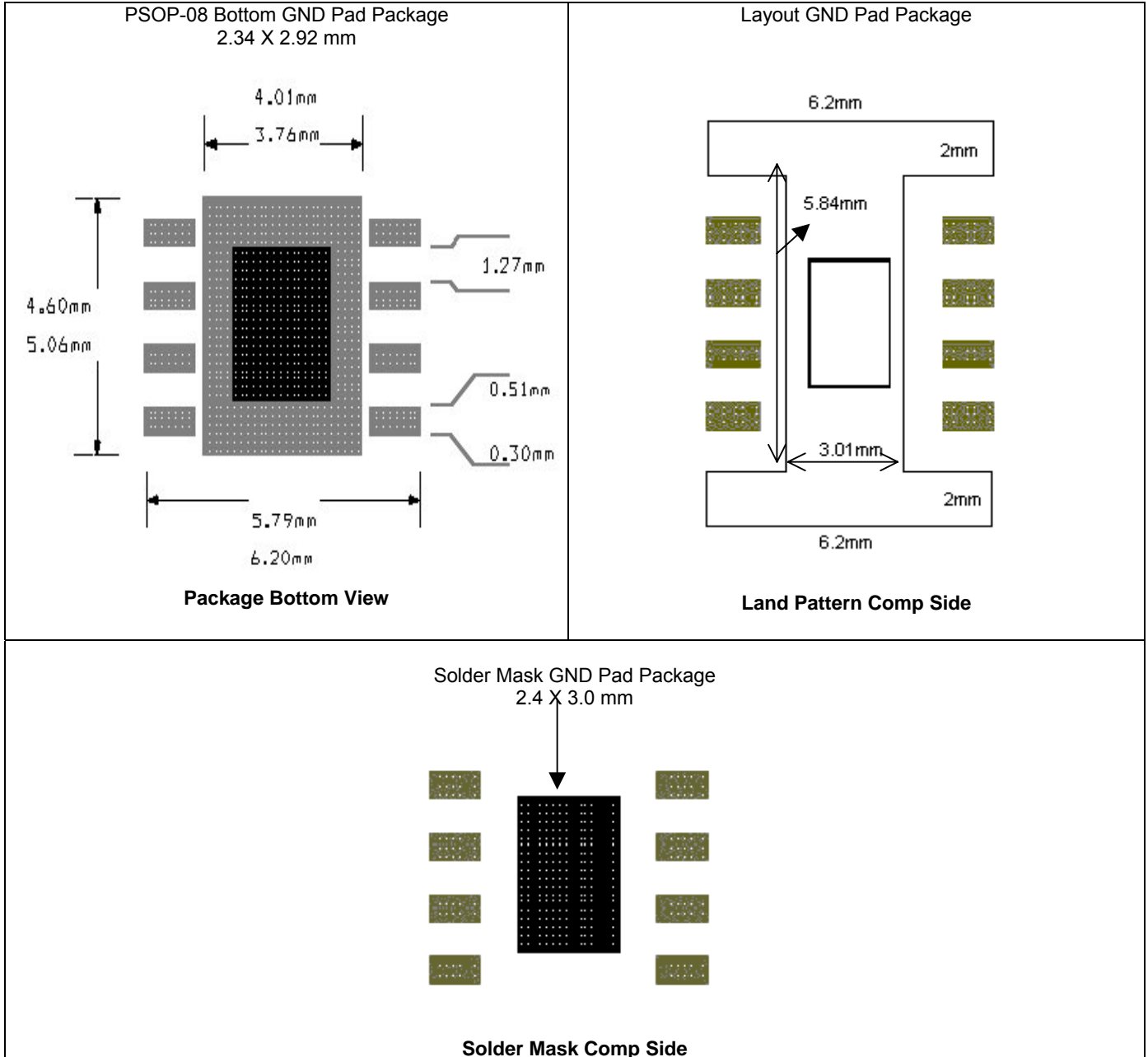
Several inputs are provided for the supply voltages: PVDD and VCCA

The PVDD provide the power supply to the power MOSFETs. VCCA provide the voltage supply to the logic section and internal error amplifiers of CM8501/A.

#### FEEDBACK

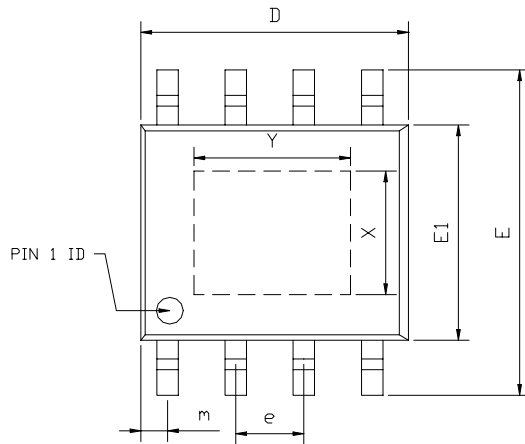
The VFB pin is an input that can be used for closed loop compensation. This input is derived from the voltage output. AGSEN pin is a contact node of internal resistor divider for remote sense (CM8501).

**Suggested Layout GND Pad Dimension:** to guarantee providing continuous sinking or sourcing current up to 2A.



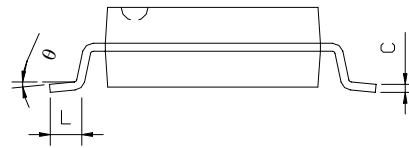
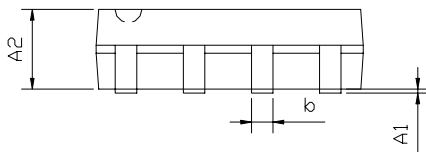
### PACKAGE DIMENSION

#### 8-PIN PSOP (PS08)



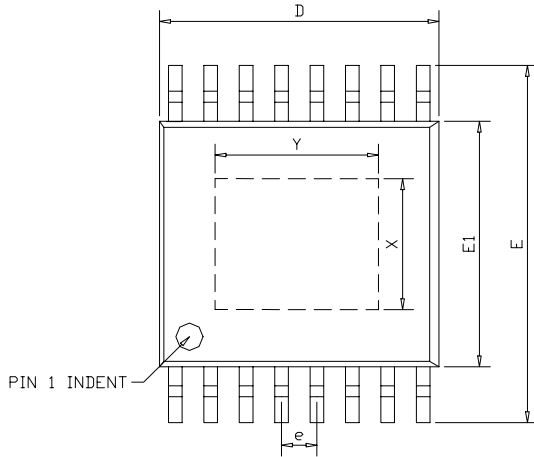
SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	0.10	---	0.25	0.004	---	0.010
A2	1.40	---	1.55	0.055	---	0.061
b	0.30	---	0.51	0.012	---	0.020
c	0.15	---	0.26	0.006	---	0.010
D	4.60	---	5.06	0.169	---	0.199
E	5.79	---	6.20	0.228	---	0.244
E1	3.76	---	4.01	0.148	---	0.156
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=2.34 ; Y=2.92



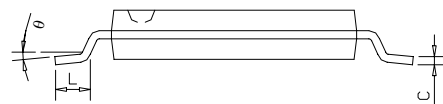
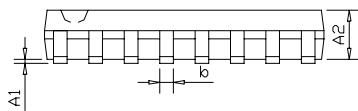
### PACKAGE DIMENSION

#### 16-PIN PTSSOP (PT16)

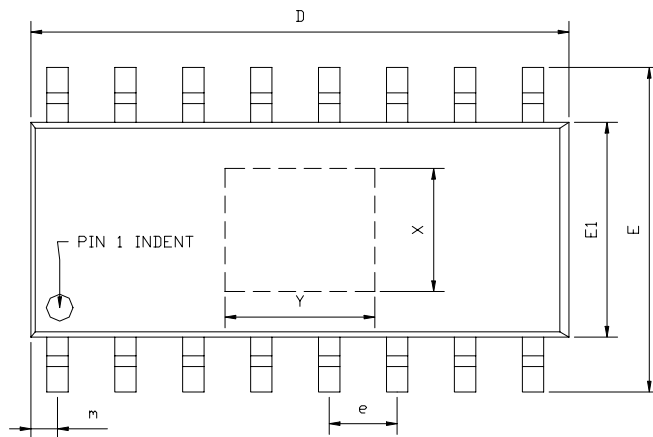


SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	0.05	---	0.15	0.002	---	0.006
A2	0.84	---	0.94	0.033	---	0.037
b	0.20	---	0.30	0.008	---	0.012
c	0.10	---	0.20	0.004	---	0.008
D	4.88	---	5.13	0.192	---	0.202
E	6.25	---	6.55	0.246	---	0.258
E1	4.29	---	4.50	0.169	---	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

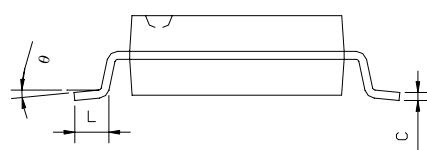
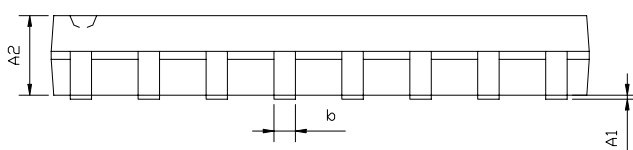


#### 16-PIN PSOP (PS16)



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



### IMPORTANT NOTICE

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