POWER MANAGEMENT

Description

The SC4201 is a multi-phase link controller, ideal for isolated and non-isolated applications. Its frequency of operation can be programmed in excess of 1.5MHz and can be easily synchronized to an external faster frequency. The SC4201 output frequencies can be set to 2/4 or 3 phase operation. A single pin can either set a 4 phase operation (each phase is 90 degrees apart) or 3 phase operation (120 degrees apart).

Multi-phase operation of multiple primary or secondary controllers reduces input/output ripple, the number of components required for filtering, and noise due to frequency beating generated by multiple free running oscillators.

The SC4201 is available in the MSOP-8 surface mount package.

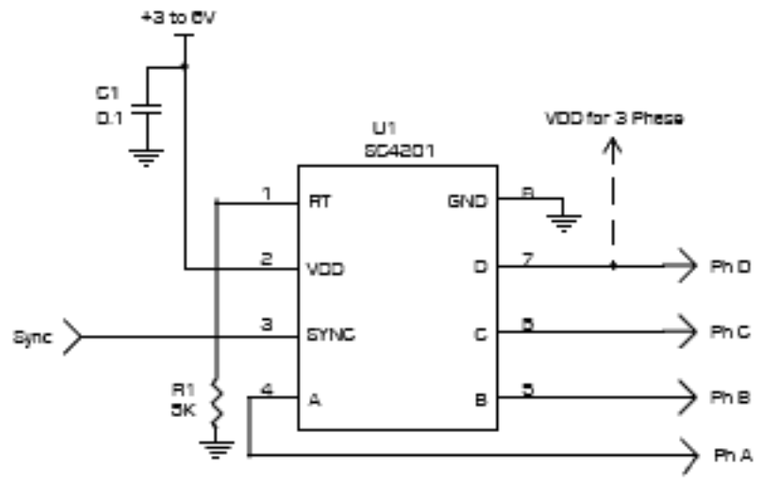
Features

- Low cost/small size
- Programmable frequency up to 2MHz, each phase
- Synchronized to faster frequency
- Programmable 2/4 or 3 phase operation

Applications

- Telecom distributed power architectures
- Multi-phase operation of power supplies
- Multi-phase operation of switching regulators

Typical Application Circuit



POWER MANAGEMENT

Absolute Maximum Ratings

Exceeding the specifications below may result in permanent damage to the device, or device malfunction. Operation outside of the parameters specified in the Electrical Characteristics section is not implied.

Parameter	Symbol	Limits	Units
Supply Voltage	V_{IN}	7	V
Operating Ambient Temperature Range	T_A	-40 to +105	°C
Operating Junction Temperature Range	T_J	-40 to 125	°C
Storage Temperature Range	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering) 10 sec	T_{LEAD}	+300	°C
Thermal Impedance Junction to Ambient	θ_{JA}	206	°C/W

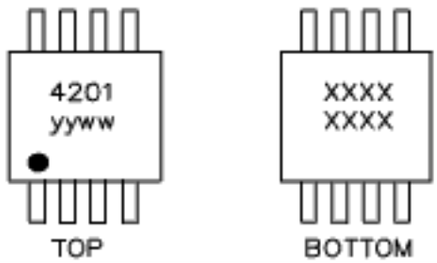
Electrical Characteristics

Unless specified: T_A = 25°C,

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}		3		6	V
Supply Current	I_{DD}	V_{DD} = 6V, R_T = 20K		2		mA
VDD Start Threshold			2.70		3.10	V
VDD UVLO Hysteresis				100		mV
Output Frequency	F_{OUT}	V_{DD} = 6V	0.1		2	MHz
Output Frequency Accuracy		V_{DD} = 6V			10	%
Sync Input Threshold	V_{SYNC}			VDD/3		V
Phase Accuracy		V_{DD} = 6V			1	%
O/P Rise Time	T_R	C_{OUT} = 20pF			20	nS
O/P Fall Time	T_F	C_{OUT} = 20pF			20	nS
Output	V_{OUT}				V_{DD}	V
Output Duration	T_P			(1)		nS

Notes: (1) $T_P = \frac{T_{OUT}}{N}$ where T_{OUT} = output signal period of individual phase.
N = 3 for 3 phase operation, N = 4 for 2/4 phase operation.
(2) This device is ESD sensitive. Use of standard ESD handling is required.

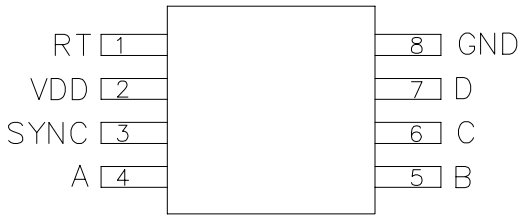
Marking Information



yyww = Datecode (Example: 0012)
xxxx = Semtech Lot # (Example: E901
xxxx = 01-1)

Pin Configuration

Top View



(MSOP-8)

Ordering Information

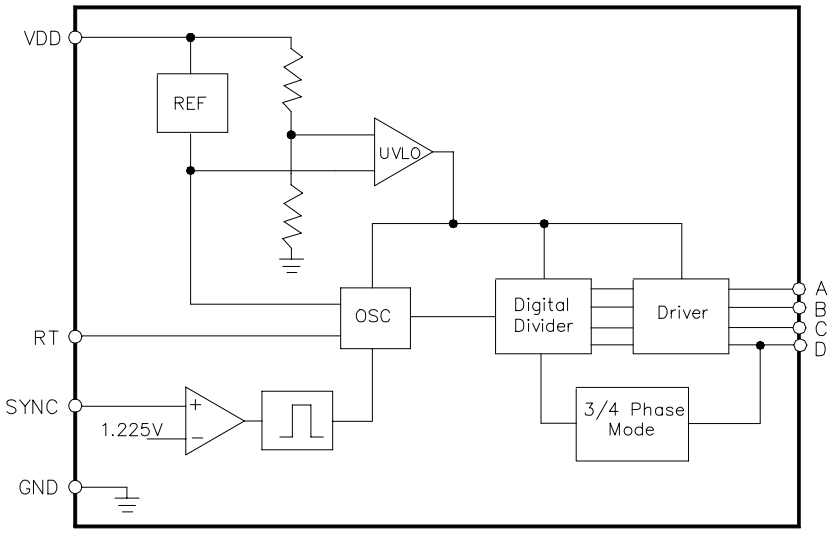
Part Number (1)	Package
SC4201IMSTR	MSOP-8
SC4201EVB	Evaluation Board

Note:
(1) Only available in tape and reel packaging. A reel contains 2500 devices.

Pin Descriptions

Pin	Pin Name	Pin Function
1	RT	Oscillator frequency is configured by connecting resistor R from RT to ground. Values for R can be selected to provide desired 3 phase or 4 phase output frequencies. $F_{OUT} \approx \{[1.25/(15pF \times Rt)]/phase\}$
2	VDD	The power input connection for the device.
3	SYNC	SYNC is a positive edge triggered input with a threshold of 1.5V. SYNC should be grounded when not required or connected to an external synchronization clock with frequency higher than the on board oscillator frequency (with respect to internal clock).
4	A	Logic level output clock. Phase "A".
5	B	Logic level output clock. Phase "B".
6	C	Logic level output clock. Phase "C".
7	D	Logic level output clock and phase selection pin. Default operation 4 phase/2 phase (90°/180°). Tie D to VDD to select 3 phase operation through A, B and C 120° out of phase.
8	GND	Reference ground and power ground for all functions.

Block Diagram



Application Information

Diagram in Figure 1 shows multi-phase operation of several power converters with fixed switching frequency FSW.

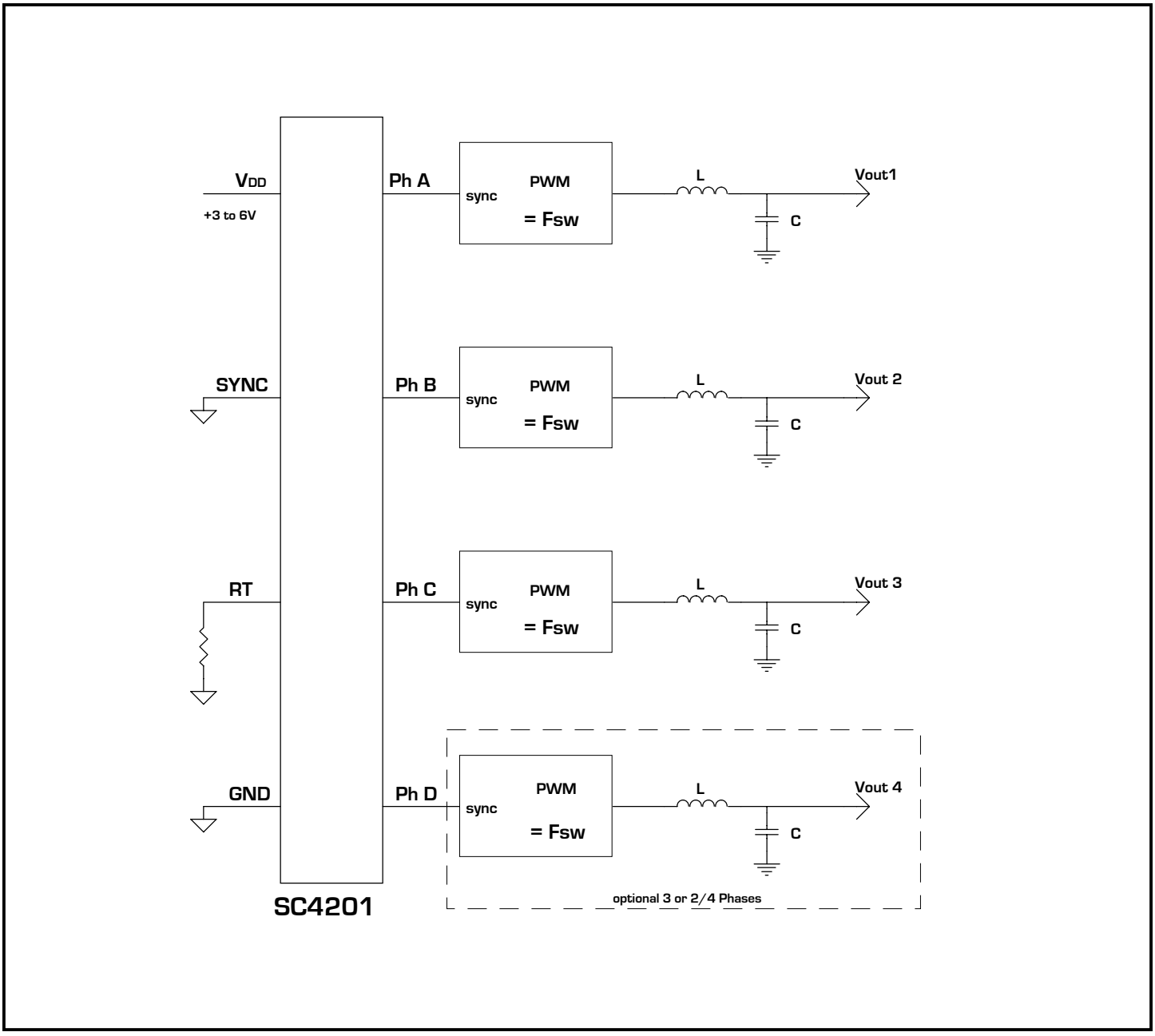


Figure 1

Application Information (Cont.)

Diagram in Figure 2 demonstrates a multi-phase operation of a single power supply with current sharing through the individual phases and with fixed switching frequency FSW.

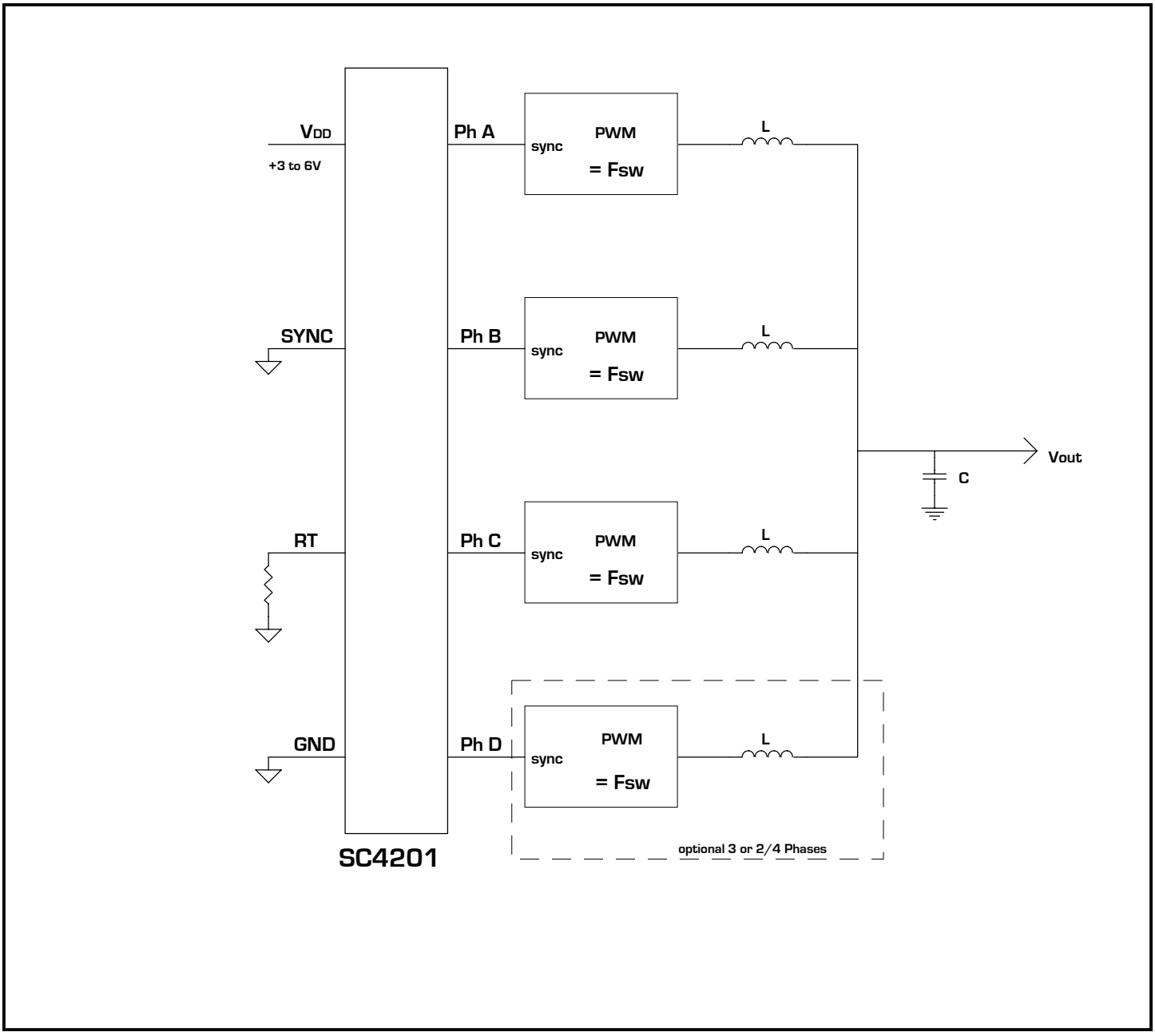


Figure 2

Application Information (Cont.)

Diagram in Figure 3 assumes variable switching frequency FSW, e.g. resonant power converters. This circuit will require additional "FSW Control" block, which is a task for a power designer.

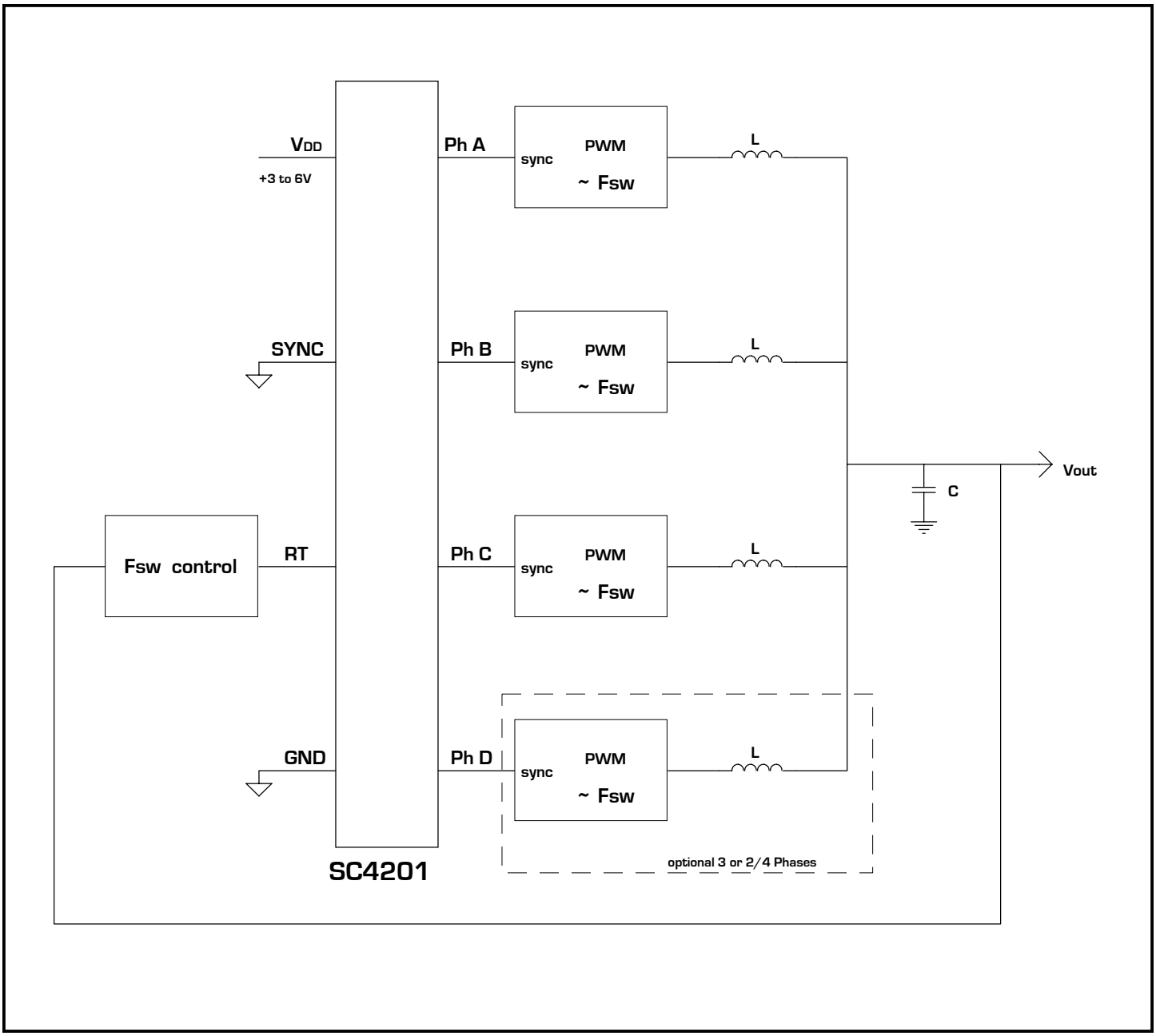


Figure 3

Application Information (Cont.)

Diagram in Figure 4 demonstrates a synchronous operation of two (or more) SC4201 controllers. If the "time delay" circuit is to be employed then 6-phase, 8-phase and other configurations become possible.

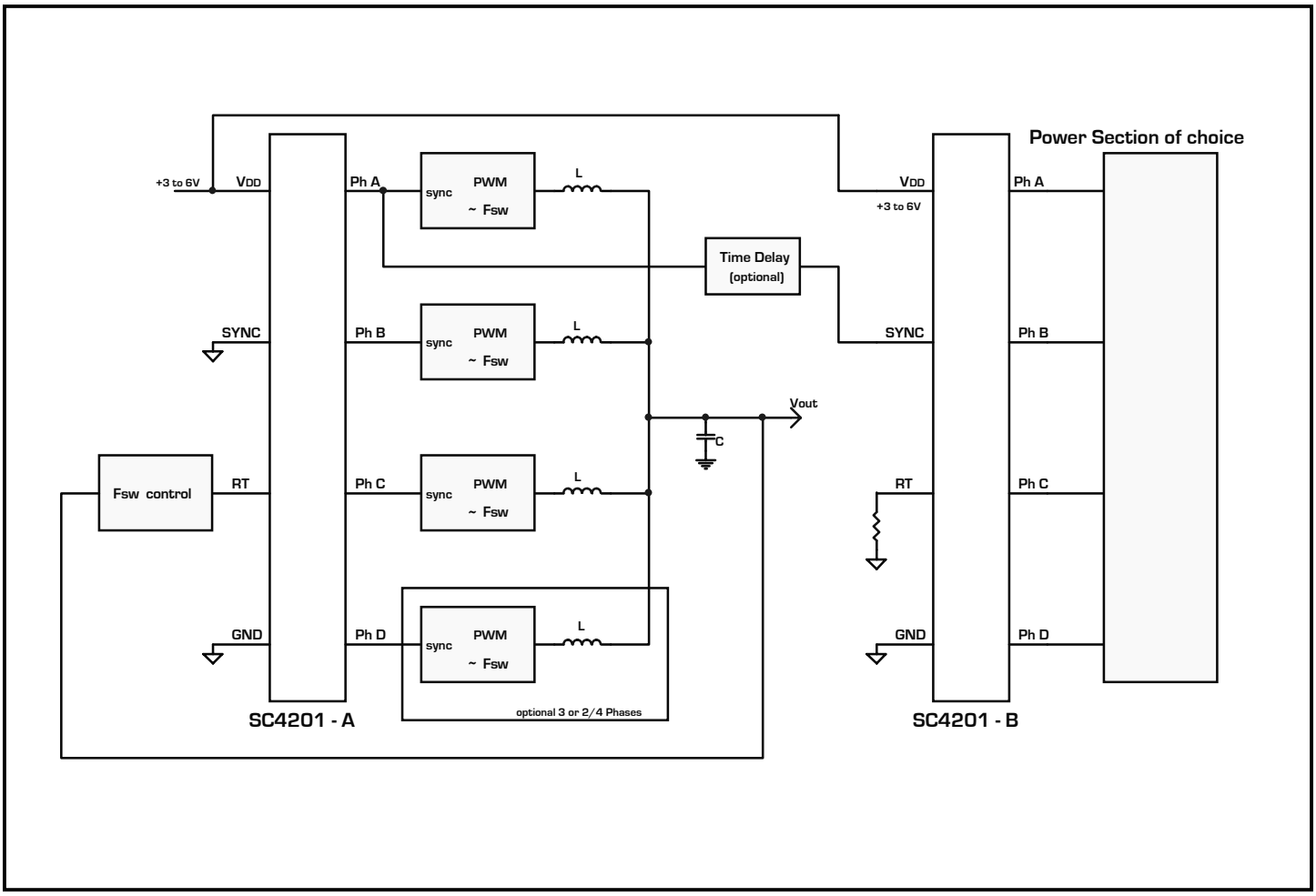
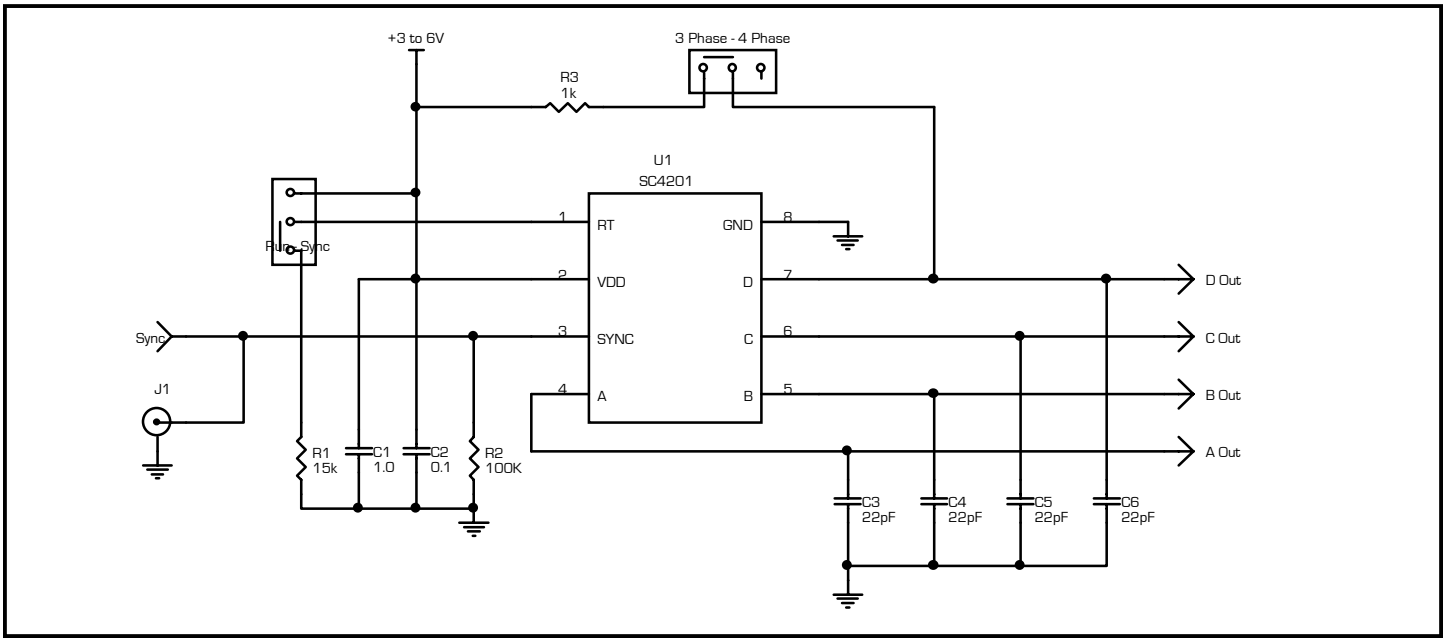
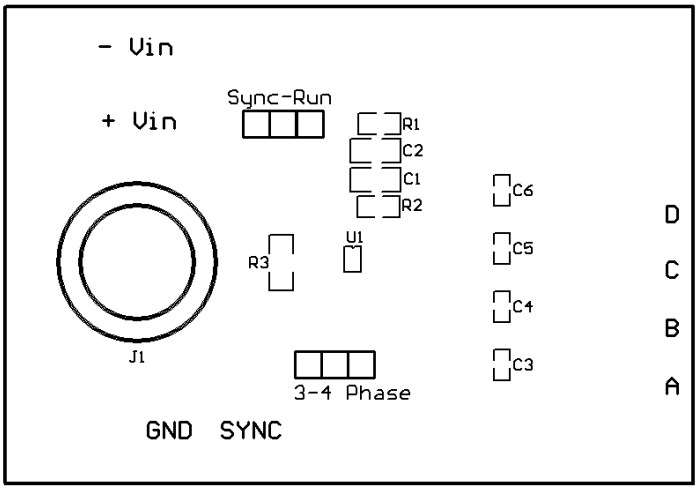


Figure 4

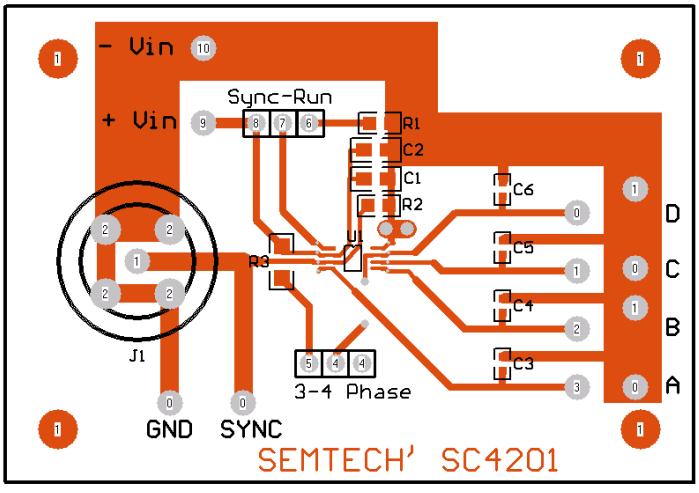
Evaluation Board Schematic



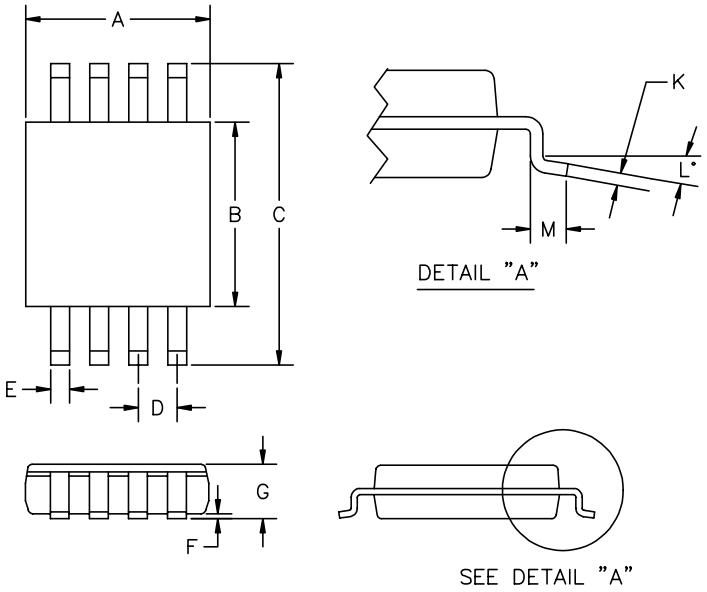
Top View



Layout



Outline Drawing - MSOP-8

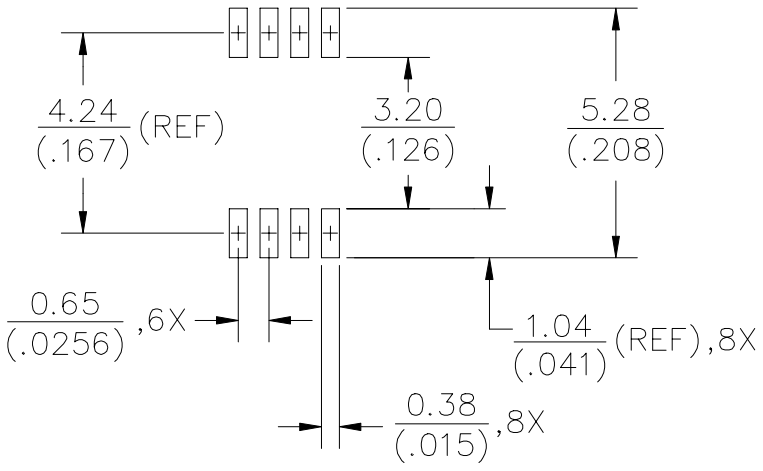


DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.114	.122	2.90	3.10	
B	.114	.122	2.90	3.10	
C	.187	.199	4.75	5.05	
D	.025 BSC		.65 BSC		
E	.010	.016	.25	.40	
F	.002	.006	.05	.15	
G	–	.043	–	1.10	
K	.005	.009	.13	.23	
L	0°	6°	0°	6°	
M	.016	.028	.40	.70	

2 PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH AND METAL BURR.

1 CONTROLLING DIMENSIONS: MILLIMETERS.

Land Pattern - MSOP-8



1 DIMENSIONS ARE IN MILLIMETERS (INCHES).

Contact Information

Semtech Corporation
Power Management Products Division
200 Flynn Road, Camarillo, CA 93012
Phone: (805)498-2111 FAX (805)498-3804