



➤➤ **DATA SHEET**  
( DOC No. HX5186-A-DS )

➤➤ **HX5186-A**

Charge Pump Controller

*Preliminary version 02 December, 2009*

**Himax Technologies, Inc.**  
<http://www.himax.com.tw>

For 幸福里 Only

➤ **HX5186-A**  
Charge Pump Controller



Himax Technologies, Inc.  
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**List of Contents**

December, 2009

1. General Description .....	4
2. Features .....	4
3. Block Diagram .....	5
4. Typical Operating Circuit.....	6
5. Pin Description .....	7
6. Pin Assignment .....	8
7. Package Information .....	9
8. Absolute Maximum Ratings .....	10
9. Thermal Information .....	10
10. ESD Rating .....	10
11. Electrical Specifications .....	11
12. Control Signals of HX5186-A .....	12
13. Ordering Information .....	13
14. Revision History .....	14

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**List of Figures**

December, 2009

Figure 4.1: Typical operating circuit .....	6
Figure 12.1: Control signals of HX5186-A.....	12
Figure 12.2: Control signal timing characteristics .....	12

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# ➤ HX5186-A

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**Preliminary Version 02**

December, 2009

## 1. General Description

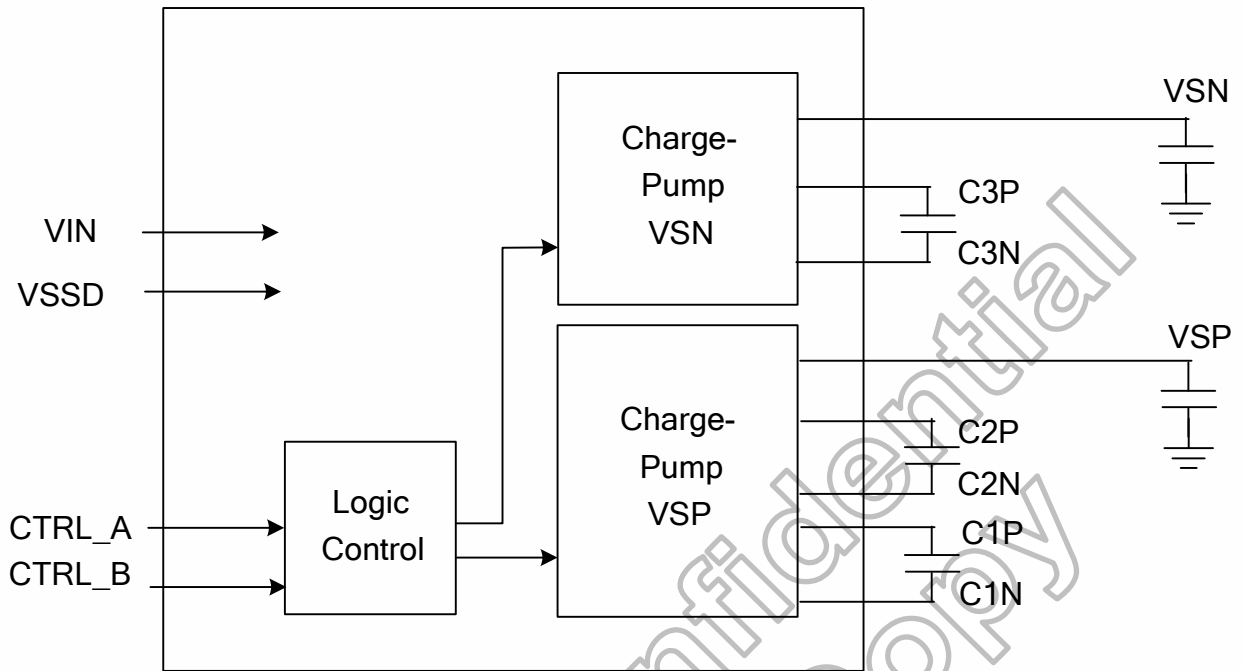
The HX5186-A is a dedicated high performance and low noise DC/DC pumping controller IC with a feature of low cost solution on specified power application. HX5186-A can be used charge pumping architecture with different pumping factor that is controlled by master driver.

## 2. Features

- Adjustable frequency operation of charge pumping on Master
- Adaptive x1.5/ x2/x3/ mode switchover for positive voltage and x-1 mode for negative voltage
- 2.3V to 3.8V Supply Voltage Range
- VSP output range 4.5V to 6.0V
- VSN output range -4.5V to -6.0V
- Control signals voltage 2.3V to 3.8V
- 12-pin 2.4mm x 2.4mm x 0.5mm TDFN12 package
- Applications for power conversion

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### 3. Block Diagram



## 4. Typical Operating Circuit

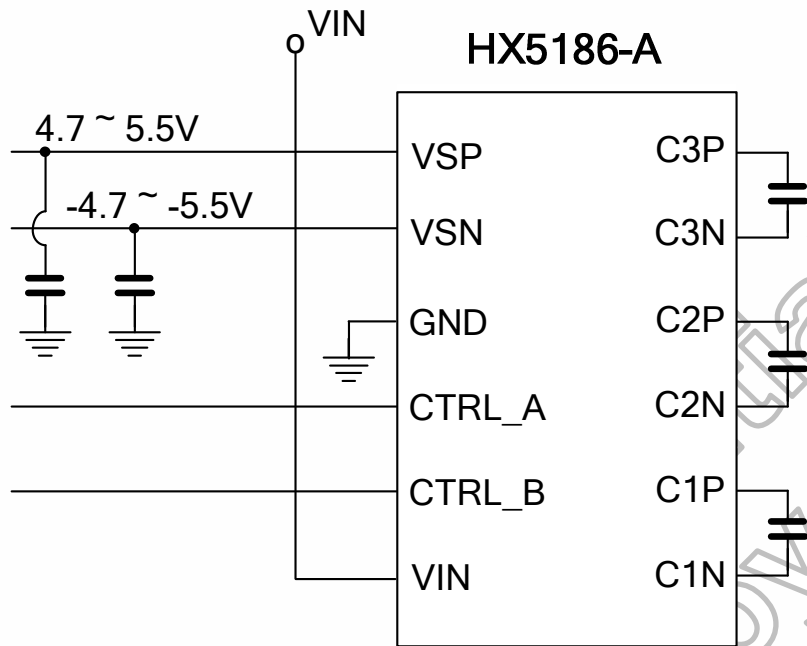


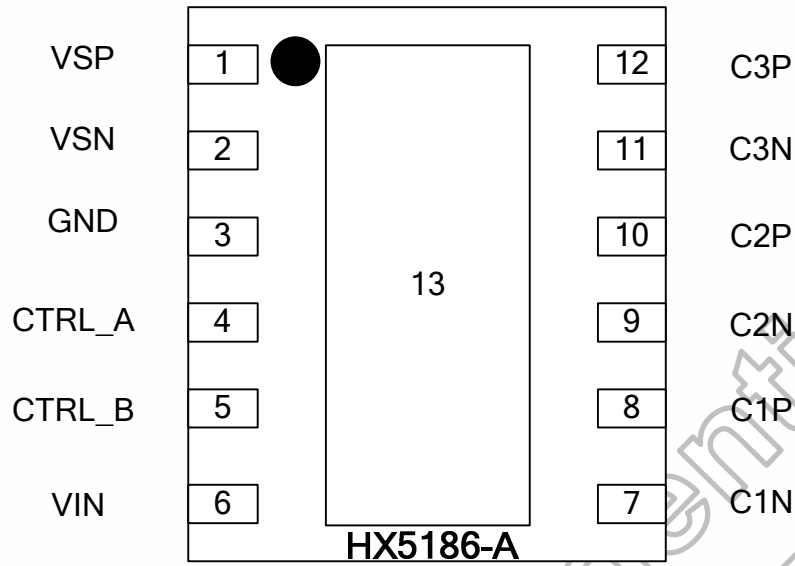
Figure 4.1: Typical operating circuit

## 5. Pin Description

Pin name	Pin no.	Description
VSP	1	Positive terminal of the output
VSN	2	Negative terminal of the output
GND	3	Ground
CTRL_A	4	Control signal 1, this signal should be low when no pump.
CTRL_B	5	Control signal 2, this signal should be low when no pump.
VIN	6	Power supply
C1N	7	Negative terminal of the charge-pump transfer capacitor 1(1.0uF/10V)
C1P	8	Positive terminal of the charge-pump transfer capacitor 1(1.0uF/10V)
C2N	9	Negative terminal of the charge-pump transfer capacitor 2(1.0uF/10V)
C2P	10	Positive terminal of the charge-pump transfer capacitor 2(1.0uF/10V)
C3N	11	Negative terminal of the charge-pump transfer capacitor 3(1.0uF/10V)
C3P	12	Positive terminal of the charge-pump transfer capacitor 3(1.0uF/10V)
Dummy	13	Dummy pad, please let it open.

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## 6. Pin Assignment

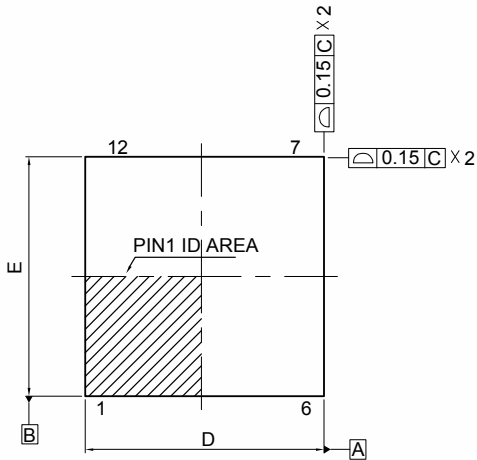


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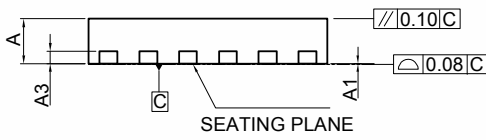
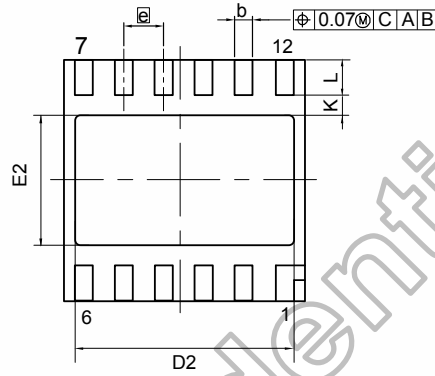


## 7. Package Information

TOP VIEW



BOTTOM VIEW



**NOTES:**

1. CONTROLLING DIMENSION : MILLIMETERS.

SYMBOL	DIMENSION(MM)			DIMENSION(MIL)		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.40	0.45	0.50	16	18	20
A1	0.00	0.02	0.05	0	0.8	2
A3	0.127 REF			5 REF		
b	0.13	0.18	0.25	5	7	10
D	2.35	2.40	2.45	93	95	97
D2	2.15	2.20	2.25	85	87	89
E	2.35	2.40	2.45	93	95	97
E2	1.25	1.30	1.35	49	51	53
ⓐ	0.40 BSC			16 BSC		
L	0.30	0.35	0.40	12	14	16
K	0.20			8		

## 8. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply voltage	VIN	-0.3 to 6	V
Control signals output current	Output current	60	mA
Control signals voltage range	Logic Input	-0.3 to 6	V
Output control driver	Output voltage VSP	0 to 6	V
	Output voltage VSN	0 to -6	

## 9. Thermal Information

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Operating junction temperature	T <sub>J</sub>	-40	-	125	°C
Operating temperature range (Ambient)	T <sub>OP</sub>	-40	-	85	°C
Storage temperature range	T <sub>STG</sub>	-55	-	150	°C
Lead soldering temperature, 10 seconds	-	-	-	260	°C

## 10. ESD Rating

Parameter	Symbol	Value	Unit
Human Body Model	HBM	2	KV
Machine Model	MM	200	V

## 11. Electrical Specifications

 (Testing is done under  $V_{IN}=2.3\sim 3.8V$ ,  $T_A=25^\circ C$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Input Power Supply						
Supply voltage	$V_{IN}$	-	2.3	-	3.8	V
Supply current	$I_{VIN}$	$V_{IN}=2.3V$ (x3 mode)	-	-	60	mA
		$V_{IN}=2.8V$ (x2 mode)	-	-	60	
		$V_{IN}=3.8V$ (x1.5 mode)	-	-	45	
Output Power Supply						
Positive output voltage	$V_{SP}$	-	4.5	-	6.0	V
Negative output voltage	$V_{SN}$	-	-6.0	-	-4.5	V
Positive output current	$I_{VSP}$	$V_{IN}=2.3V$ (x3 mode)	0	-	10	mA
		$V_{IN}=2.8V$ (x2 mode)	0	-	15	
		$V_{IN}=3.8V$ (x1.5 mode)	0	-	15	
Negative output current	$I_{VSN}$	$V_{IN}=2.3V$ (x3 mode)	0	-	10	mA
		$V_{IN}=2.8V$ (x2 mode)	0	-	15	
		$V_{IN}=3.8V$ (x1.5 mode)	0	-	15	
Control Signal Voltage Level						
Input high voltage	$V_{IH}(IN)$	-	0.8 $V_{IN}$	-	$V_{IN}$	V
Input low voltage	$V_{IL}(IN)$	-	0	-	0.2 $V_{IN}$	V
Output Power Supply						
Output / Input	Efficiency	$V_{IN}=2.3V$ $I_{VIN}=8mA$ (x3 mode)	67	75	-	%
		$V_{IN}=2.8V$ $I_{VIN}=8mA$ (x2 mode)	76	85	-	
		$V_{IN}=3.8V$ $I_{VIN}=8mA$ (x1.5 mode)	76	85	-	

## 12. Control Signals of HX5186-A

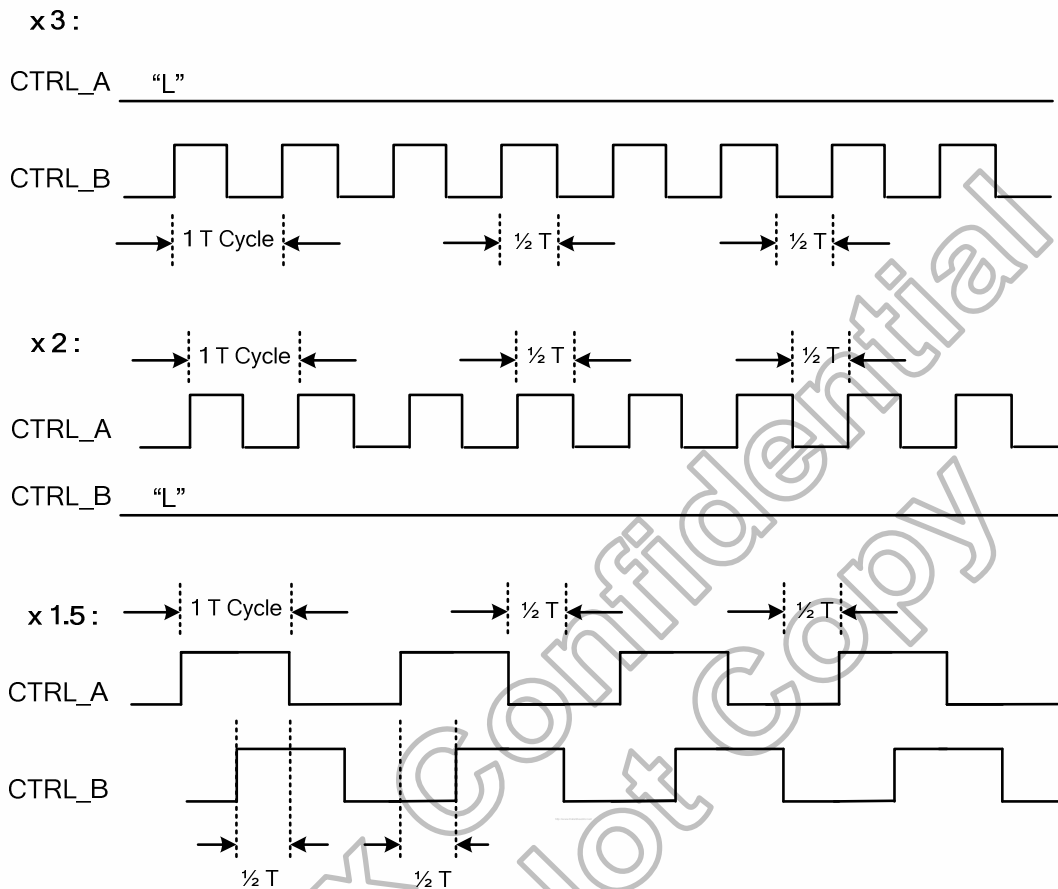


Figure 12.1: Control signals of HX5186-A

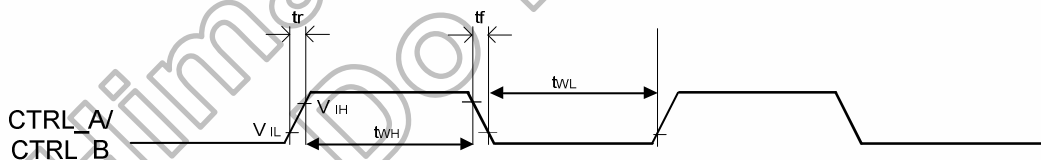


Figure 12.2: Control signal timing characteristics

(VIN=2.8V, TA =-30 to 70°C)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Rising time	$t_r$	1	-	100	ns
Falling time	$t_f$	1	-	100	ns
High pulse width	$t_{WH}$	0.4	-	-	μs
Low pulse width	$t_{WL}$	0.4	-	-	μs

### 13. Ordering Information

Part No.	Package
HX5186-A00 xxxx	xxxx: mean bonding drawing number.

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## 14. Revision History

Version	Date	Description of Changes
01	2008/12/10	1. New setup
	2008/12/22	1. Modify the description for 6. Package Information (page 7)
	2009/02/25	1. Modify the description for 4. Pin Description (page 5)
	2009/03/24	1. Modify the description for 2. Features (page 3) 2. Modify the description for 4. Pin Description (page 5) 3. Modify the description for 10. Electrical Specifications (page 9) 4. Modify the description for Figure 11.1 Control signals of HX5186-A (page 10)
	2009/08/04	1. Modify the description for 2. Features (page 3) 2. Modify the description for 8. Thermal Information (page 8) 3. Modify the description for 10. Electrical Specifications (page 9)
	2009/10/21	1. Modify the description for 2. Features (page 3) 2. Modify the description for Figure 11.1 Control signals of HX5186-A (page 10)
	2009/11/18	1. Modify the description for 4. Pin Description (page 5) 2. Modify the description for 5. Pin Assignment (page 6)
	2009/11/25	1. Modify the description for 3. Block Diagram Ratings (page 5) 2. Modify the description for 8. Absolute Maximum Ratings (page 10) 3. Modify the description for 11. Electrical Specifications (page 11) 4. Modify the description for 12. Control Signals of HX5186-A (page 12)
02	2009/12/09	1. Modify the description for 11. Electrical Specifications (page 11)