AS2208

Primary Side PWM Controller

Preliminary Specification

Features

- Low Startup Current
- Single-start or auto-restart modes
- Oscillator trimmed for precision duty cycle clamp
- Standard temperature range extended to 105°C
- Remote on / off control
- Self limiting supply Voltage
- Standard current mode control

Description

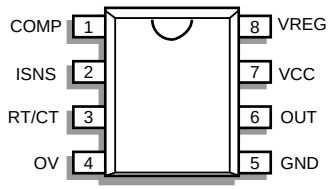
The AS2208 is a simplified pulse width modulation controller, offering similar functionality as that of the AS3842. Based on the AS2214, the AS2208 provides the additional features of low startup current and overvoltage latching, making it a good solution for adapter applications.

The PWM function is controlled by the current sense comparator for normal current mode control. The COMP pin, which serves as an input to the current sense comparator, provides a 1 mA current source which can be tied directly to the control loop optocoupler. The output stage is a high current totem pole output that sees only 85 ns delay from the PWM comparator.

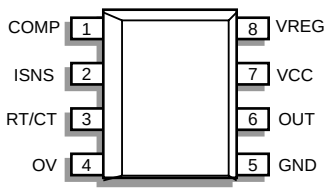
The AS2208 requires only 100 µA of startup current. The undervoltage lockout (UVLO) thresholds are nominally 14V for turn on and 8 V for turn off. The VREG pin, based on a trimmed bandgap reference, provides a temperature compensated 5 V to loads of up to 50 mA. The oscillator discharge current is trimmed to provide guaranteed duty cycle clamping.

Pin Configuration — Top view

PDIP (N)



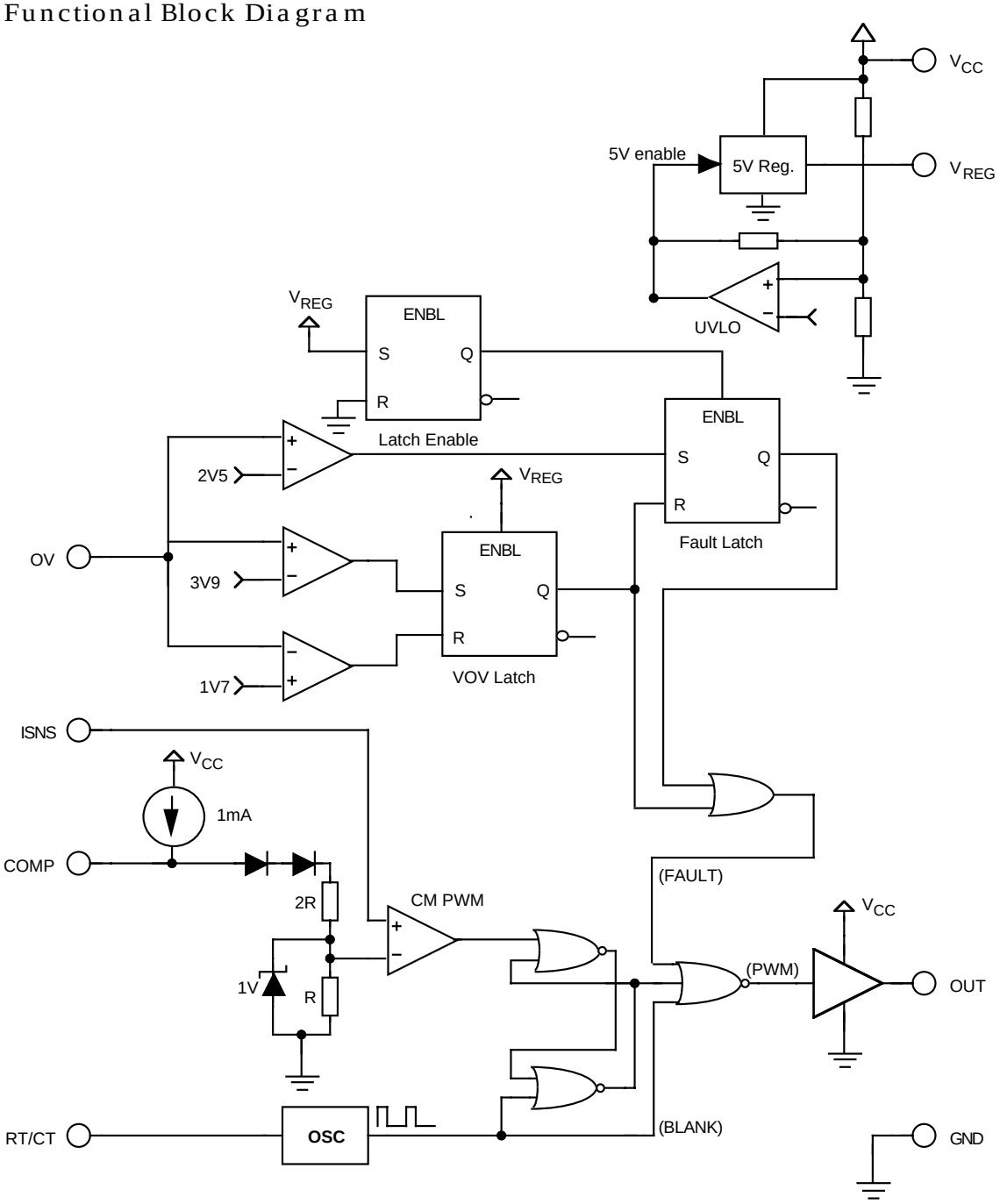
8L SOIC (D)



Ordering Information

Package	Temperature Range	Order Code
8-Pin Plastic DIP	0 to 105° C	AS2208N
8-Pin Plastic SOIC	0 to 105° C	AS2208D

Functional Block Diagram



Pin Function Description

Pin Number	Function	Description
1	COMP	This is the inverting input to the PWM comparator. A divided and level shifted representation of this voltage is compared to the ISNS input to determine OUT duty cycle. A 1 mA current source is provided as a pull-up for an optocoupler.
2	ISNS	A voltage proportional to inductor current is connected to this pin. The PWM uses this information to terminate the gate drive of the output.
3	RT/CT	Oscillator frequency and maximum duty cycle are set by connecting a resistor (R_T) to VREG and a capacitor (C_T) to ground.
4	OV	This pin latches OUT low when pulled above 2.5 V. The latch can be reset by pulling OV above 4 V then back to ground.
5	GND	Circuit common ground.
6	OUT	This totem pole output is designed to directly drive a power MOSFET switch capable of sourcing and sinking peak currents up to 1 A.
7	V_{CC}	Positive supply voltage for the IC.
8	V_{REG}	Output of 5V series regulator.

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply Voltage (I_{CC} < 30 mA)	V_{CC}	Self-Limiting	V
Supply Voltage (Low Impedance Source)	V_{CC}	20	V
Reference Current	I_{REF}	200	mA
Output Current	I_{OUT}	1	A
Output Voltage	V_{OUT}	20	V
Continuous Power Dissipation at 25° C	P_D	500	mW
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	–65 to 150	°C
Lead Temperature, Soldering 10 Seconds	T_L	300	°C

Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Conditions

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC}	10 - 15	V
Oscillator	F_{OSC}	50 - 250	kHz

Typical Thermal Resistance

Package	θ_{JA}	θ_{JC}	Typical Derating
8L PDIP	95° C/W	50° C/W	10.5 mW/°C
8L SOIC	175° C/W	45° C/W	5.7 mW/°C

Electrical Characteristics

Electrical Characteristics are guaranteed over full junction temperature range (0 to 105° C). Ambient temperature must be derated based on power dissipation and package thermal characteristics. Unless otherwise specified, the conditions of test are V_{CC} = 15 V; BOK = 3 V; OV = 0V; R_T = 680 Ω; C_T = 10 nF. To override UVLO, V_{CC} should be raised above 18 V prior to test.

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
5 V Regulator						
Output Voltage	V_{REG}	I_{REG} = 1 mA, T_J= 25° C	4.90	5.00	5.10	V
Line Regulation	PSRR	9 ≤ V_{CC} ≤ 18 V		5	15	mV
Load Regulation		1≤ I_{REG} ≤ 20mA		5	15	mV
Temperature Stability	TC_{REG}			0.2	0.4	mV/°C
Total Output Variation		Line, Load,Temperature	4.85		5.15	V
Long-Term Stability		Over 1,000 hrs at 25°C		5	25	mV
Output Noise Voltage	V_{NOISE}	10 ≤ f ≤ 100kHz, T_J = 25°C		50		µV
Maximum Source Current	I_{MAX}	V_{REG} = 4.8 V	30	120	180	mA
Oscillator						
Initial Accuracy	F_{OSC}	T_J =25°C	108	120	132	kHz
Voltage Stability		9 ≤ V_{CC} ≤ 18 V		0.2	1	%
Temperature Stability	TC_F	T_{MIN} ≤ T_J ≤ T_{MAX}		5		%
Amplitude	V_{OSC}	$V_{RT/CT}$ peak-to-peak		1.55		V
Upper Trip Point	V_H			2.80		V
Lower Trip Point	V_L			1.25		V
Discharge Current	I_{DSC}		7.50	8.70	9.50	mA
Duty cycle Limit		R_T =680 Ω, C_T =10nF, T_J =25°C	46	50	55	%
Over-Temperature Shutdown	T_{OT}			140		°C
Current Sense Comparator						
Transfer Gain	AV $_{ISNS}$	-0.2 ≤ V_{ISNS} ≤ 0.8 V	2.85	3.00	3.15	V/V
ISNS Level Shift	V_{LS}	V_{ISNS} = 0 V		1.50		V
Maximum Input Signal	$V_{ISNS\ MAX}$	V_{COMP} =+5 V	1.00	1.08	1.20	V
Input Bias Current	$I_{BIAS\ ISNS}$	V_{COMP} =+5 V		-1	-10	µA
COMP Source Current	I_{COMPH}	V_{COMP} =+5 V	0.6	1.0		mA
COMP Swing High	V_{COMPH}		5.2	5.6		V
Power Supply Rejection Ratio	PSRR	9 ≤ V_{CC} ≤ 18 V		70		dB
Propagation Delay to Output	t_{PB}			85	150	ns

Electrical Characteristics (cont'd)

Electrical Characteristics are guaranteed over full junction temperature range (0 to 105° C). Ambient temperature must be derated based on power dissipation and package thermal characteristics. Unless otherwise specified, the conditions of test are V_{CC} = 15 V; BOK = 3 V; OV = 0V; R_T = 680 Ω; C_T = 10 nF. To override UVLO, V_{CC} should be raised above 18 V prior to test.

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output						
Output Low Level	V_{OL}	I_{SINK} = 20 mA		0.1	0.4	V
Output Low Level	V_{OL}	I_{SINK} = 150 mA		1.5	2.2	V
Output High Level	V_{OH}	I_{SOURCE} = 20 mA	13	13.5		V
Output High Level	V_{OH}	I_{SOURCE} = 150 mA	12	13		V
Rise Time	t_R	C_L = 1 nF		50	150	ns
Fall Time	t_F	C_L = 1 nF		50	150	ns
Maximum Duty Cycle	D_{MAX}		94	97	100	%
Minimum Duty Cycle	D_{MIN}		0			%
Over-Voltage Input						
OV Threshold	V_{OV}		2.50	2.80	3.10	V
OV Reset Threshold	V_{VOVH}		3.80	4.00	4.50	V
OV Clear Threshold	V_{VOVL}		1.10	1.75	2.20	V
OV Bias Current	$I_{BIAS\ OV}$	V_{REG} = 5 V, $V_{OV} \leq$ OV Threshold	-1	-0.2	1	µA
Under Voltage Lockout						
Startup Threshold	V_{CC} (ON)		12.5	14.0	15.8	V
Minimum Operating Voltage after Turn-on	V_{CC} (OFF)		7.3	8.0	8.5	AV
Startup Current	I_{CC}	V_{CC} = 13 V		105	150	µA
Operating Supply Current	I_{CC}			12	20	mA
Supply Voltage Clamp	V_{CC} Zener	I_{CC} = 30 mA		18		V
Output Impedance to GND in UVLO State	Z_{OUT}	V_{CC} = 6 V		22.0		kΩ

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ASTEC SEMICONDUCTOR

255 Sinclair Frontage Road • Milpitas, California 95035 • Tel. (408) 263-8300 • FAX (408) 263-8340

Notes