

2A SWITCH STEP DOWN SWITCHING REGULATOR**Features**

- 2A Internal Switch
- Operating Input Voltage from 4.8V to 22V
- 3.3V $\pm 2\%$ Reference Voltage
- Output Voltage:
APW1173 - adjustable from 1.235V to 20V
- Low Dropout Operation: 100% Duty Cycle
- 500KHz Internally Fixed Frequency
- Voltage Feed-Forward
- Zero Load Current Operation
- Internal Current Limit
- Inhibit for Zero Current Consumption
- Synchronization
- Protection **against** Feedback Disconnection
- Thermal Protection
- External Soft-Start
- Over-Voltage Protection
- Lead **Free** Available (RoHS Compliant)

Applications

- Consumer: STB, DVD, TV, VCR, Car Radio, LCD monitors
- **Networking**: XDSL, Modems, DC-DC Modules
- Computer: Printers, Audio/Graphic Cards, Optical Storage, Hard Disk Drive
- Industrial: Chargers, Car Battery DC-DC Converters

General Description

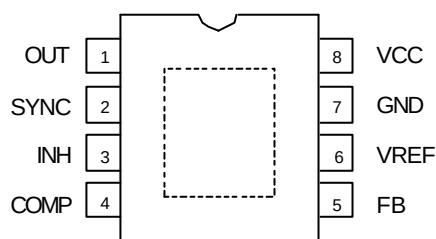
The APW1173 is a step down monolithic power switching regulator with a switching current limit of 3.8A so it is able to deliver more than 2A DC current to the load depending on the application conditions.

The output voltage can be set from 1.235V to 22V. The high current level is also achieved utilize an SOP-8 package with exposed pad frame. The type of package allows to re-duce the $R_{th(j-amb)}$ down to approximately 45 C/W.

An internal oscillator fixes the switching frequency at 500KHz.

Having a minimum input voltage of 4.8V only, it is particularly suitable for 5V bus, available in all computer related applications.

Pulse by pulse current limit with the internal frequency modulation offers an effective constant current short-circuit protection.

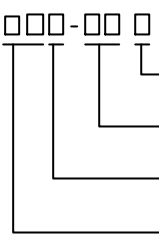
Pin Description

SOP-8-P (Top View)

 = Thermal Pad
(connected to GND plane for better heat dissipation)

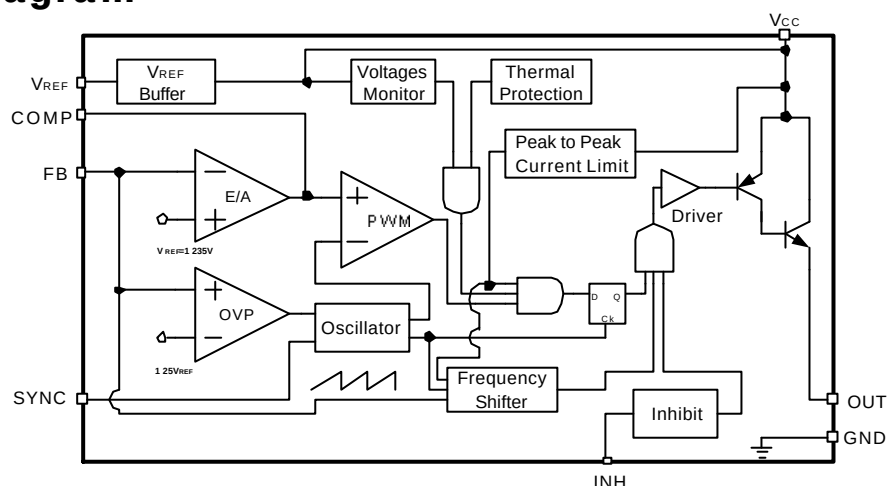
ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Ordering and Marking Information

APW1173	 Lead Free Code Handling Code Temp. Range Package Code	Package Code KA : SOP-8-P Operating Ambient Temp. Range C : 0 to 70 °C I : -40 to 85 °C Handling Code TU : Tube TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device
APW1173 KA :	APW1173 XXXXX	XXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldering operations. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J STD-020C for MSL classification at lead-free peak reflow temperature.

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CC}	Input voltage (VCC to GND)	25	V
V_{OUT}	Output DC voltage	-1 to 25	V
V_{INH}	INH to GND	-0.7 ~ V_{CC}	V
V_{IO}	COMP and FB to GND	-0.7 ~ V_{CC}	V
I_{OUT}	Output current	0 to current limit	A
V_{REF}	VREF to GND	3.3	V
P_D	Average Power Dissipation, $T_A < 50^\circ$	2.2	W
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	-65 ~ 150	°C
T_{SDR}	Soldering Temperature, 10 seconds	300	°C
V_{ESD}	Minimum ESD rating (Human body mode)	±3	KV

Pin Function Description

No.	PIN	Description
1	OUT	Regulator Output.
2	SYNC	Master/Slave synchronization.
3	INH	A logical signal (active high) disables the device. If INH not used the pin must be connected to GND. When it is open an internal pull-up disable the device.
4	COMP	E/A output for frequency compensation.
5	FB	Feedback input. Connecting directly to this pin results in an output voltage of 1.235V(APW1173). An external resistive divider is required for higher output voltages.
6	VREF	3.3V reference voltage output, no Capacitor Is requested for stability.
7	GND	Ground.
8	VCC	Unregulated DC input voltage.

Thermal Characteristics

Symbol	Parameter	Value	Unit
θ_{JA}	Junction to ambient thermal resistance in free air	45.7	°C/W

* The area of the thermal pad is 4.5mm X 2mm and the GND plane is 60mm X 60mm. Connect the thermal pad and the GND plane by 8 vias. $T_A = 25^\circ\text{C}$.

Electrical Characteristics

The * denotes the specifications that apply over $T_A = -40 \sim 85^\circ\text{C}$. Typical values are at $T_A = 25^\circ\text{C}$.

$V_{CC} = 12\text{V}$ unless otherwise specified.

Symbol	Parameter	Test condition		APW1173			Unit
				Min	Typ	Max	
V_{CC}	Operating input voltage range	$V_O = 1.235\text{V}; I_O = 2\text{A}$	*	4.7		22	V
V_{UVLO}	UVLO threshold voltage	V_{CC} rising	*	3.8	4.2	4.6	V
	Hysteresis				0.3		V
V_d	Dropout voltage	$V_{CC} = 4.8\text{V}; I_O = 2\text{A}$	*		1.0	1.2	V
I_{LM}	Maximum limiting current	$V_{CC} = 4.8\text{V}$ to 22V	*	3.3	3.8	4.3	A
f_s	Switching frequency	Main design	*	400	500	600	KHz
				410	500	590	
	Duty cycle			0		100	%

Electrical Characteristics (Cont.)

The * denotes the specifications that apply over $T_A = -40 \sim 85^\circ\text{C}$. Typical values are at $T_A = 25^\circ\text{C}$.

$V_{CC} = 12\text{V}$ unless otherwise specified.

Symbol	Parameter	Test condition	APW1173			Unit	
			Min	Typ	Max		
Dynamic Characteristics							
V _{FB}	Voltage feedback APW1173	4.8V < V _{CC} < 22V, 20mA < I _O <2A		1.22	1.235	1.25	V
			*	1.198	1.235	1.272	
η	Efficiency	V _O = 5V, V _{CC} = 12V, I _{OUT} = 1A			82		%
DC Characteristics							
I _{qop}	Total Operating Quiescent		*			12	mA
I _q	Quiescent Current	Duty Cycle = 0; V _{FB} = 1.5V				10	mA
I _{qst-by}	Total Stand-by Quiescent Current	V _{INH} > 2.2V	*		50	100	μA
		V _{CC} = 22V; V _{INH} > 2.2V	*		80	150	μA
Inhibit							
V _{INH}	INH Threshold Voltage	Device ON		1.1	1.3	1.5	V
		Device OFF		1.2	1.4	1.6	V
	INH Pull-Up Current	V _{INH} < 3V			1		μA
	Maximum INH Voltage	I _{INH} = 0A			4.3		V
Error Amplifier							
V _{OH}	High Level Output Voltage	V _{FB} = 1V		3.5	3.8		V
V _{OL}	Low Level Output Voltage	V _{FB} = 1.5V				0.4	V
I _{O source}	Source Output Current	V _{COMP} = 1.9V; V _{FB} = 1V		200	300		μA
I _{O sink}	Sink Output Current	V _{COMP} = 1.9V; V _{FB} = 1.5V		1	1.5		mA
I _{FB}	Source Bias Current	V _{FB} = 1.5V			2.5	4	μA
	Maximum FB Voltage	I _{FB} = 0μA			2.1		V
gm	Trans-conductance	V _{FB} = 1.255V to 1.215V, I _{COMP} = -0.1mA to 0.1mA V _{COMP} = 1.9V			2.3		mAV
SYNC Function							
	High Input Voltage	V _{CC} = 4.8 to 22V		2.5		V _{REF}	V
	Low Input Voltage	V _{CC} = 4.8V to 22V				0.74	V
	Slave Sink Current	V _{SYNC} = 0.74V		0.11		0.25	mA
		V _{SYNC} = 2.33V		0.21		0.45	
	Master Output Amplitude	I _{SOURCE} = 3mA		2.75	3		V
	Output Pulse Width	No load, V _{SYNC} =1.65V		0.2	0.35		μs

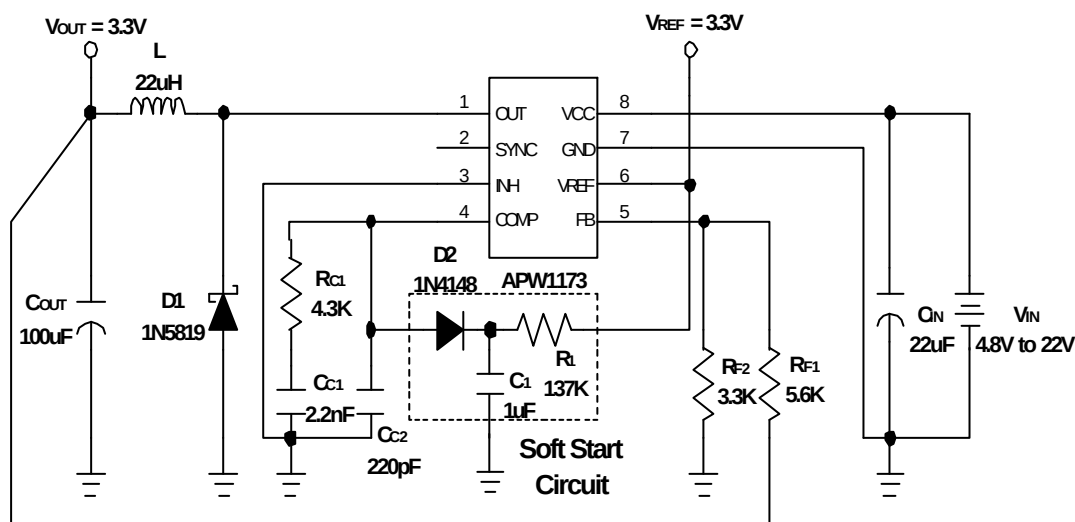
Electrical Characteristics (Cont.)

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$V_{CC} = 12\text{V}$ unless otherwise specified.

Symbol	Parameter	Test condition	APW1173			Unit	
			Min	Typ	Max		
Reference Section							
V _{REF}	VREF Output Voltage	I _{REF} = 0mA		3.234	3.3	3.366	V
		I _{REF} = 0mA to 5mA, V _{CC} = 4.4A to 22V	*	3.2	3.3	3.399	V
	Line Regulation	I _{REF} = 0mA,V _{CC} = 4.4A to 22V			5	10	mV
	Load Regulation	I _{REF} = 0mA to 5mA			8	15	mV
	Short Circuit Current			10	18	30	mA
Other							
	Thermal Limiting Protection				160		°C
	Hysteresis				30		°C
	Over-Voltage Protection Threshold Voltage	V _{COMP} = 0.8V	*	120	125	130	%

Typical Application Circuit



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