PWM Current - mode Controller for Universal off-Line Supplies Featuring Standby and Short Circuit Protection

With an internal structure operating at a fixed 40 kHz, 60 kHz or 100 kHz switching frequency, the controller features, a high-voltage startup FET which ensures a clean and loss-less startup sequence. Its current—mode control naturally provides good audio-susceptibility and inherent pulse—by—pulse control.

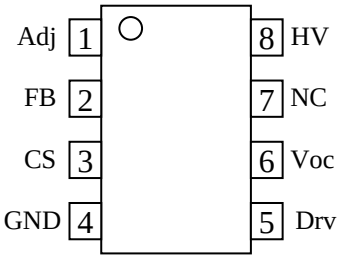
When the current set point falls below a given value, e.g. the output power demand diminishes, the IC automatic ally enters the so-called skip cycle mode and provides improved efficiency at light leads while offering excellent performance in standby conditions. Because this occurs at a user adjustable low peak current, no acoustic noise takes place.

The An1203 also includes an efficient protective circuitry which in presence of an output over load condition, disables the output pulses while the device enters a safe burst mode, trying to restart. Once the default has gone, the device auto—recovers. Finally, a temperature shutdown with hysteresis helps building safe and robust power supplies.

Features

- High-Voltage Startup Current Source
- Auto-Recovery Internal Output Short-Circuit Protection
- Extremely Low No-Load Standby Power
- Current— Mode with Adjustable Skip—Cycle Capability
- Internal Leading Edge Blanking
- 250 mA Peak Current Capability
- Internally Fixed Frequency at 40 kHz, 60 kHz and 100 kHz
- Direct Optocoupler Connection
- Under voltage Lockout at 7.8 V Typical

PIN CONNECTIONS



(Top View)

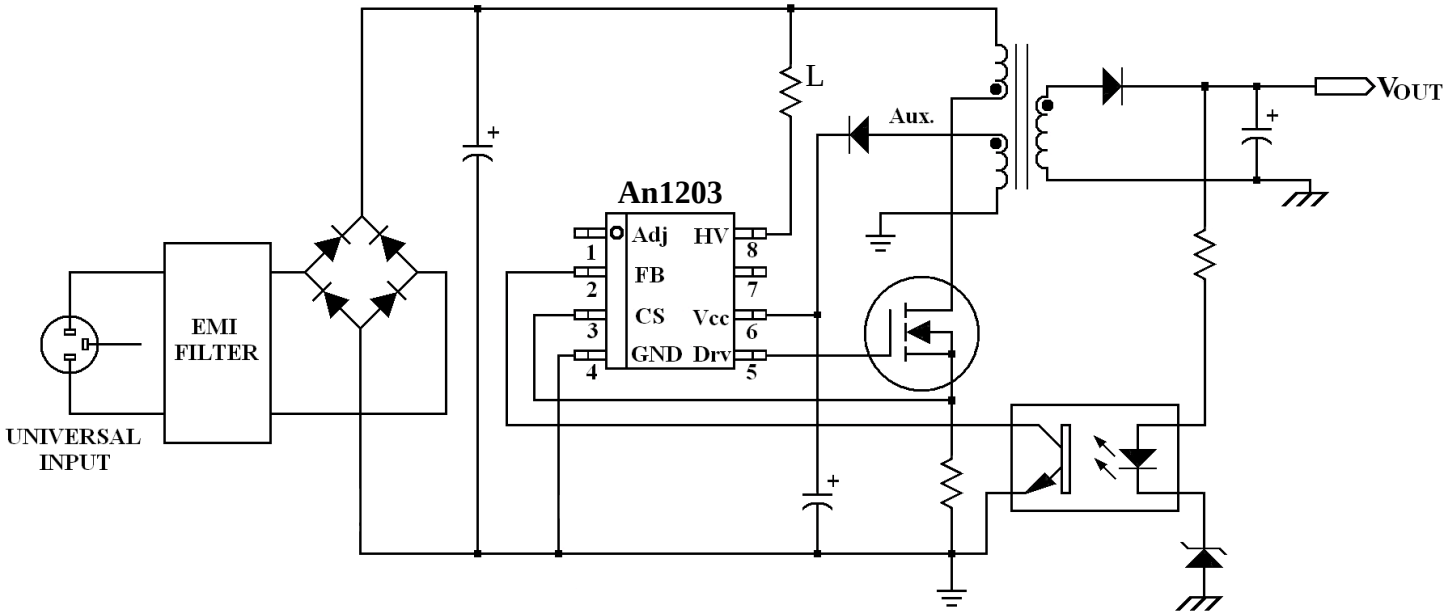


Figure 1. Typical Application Example

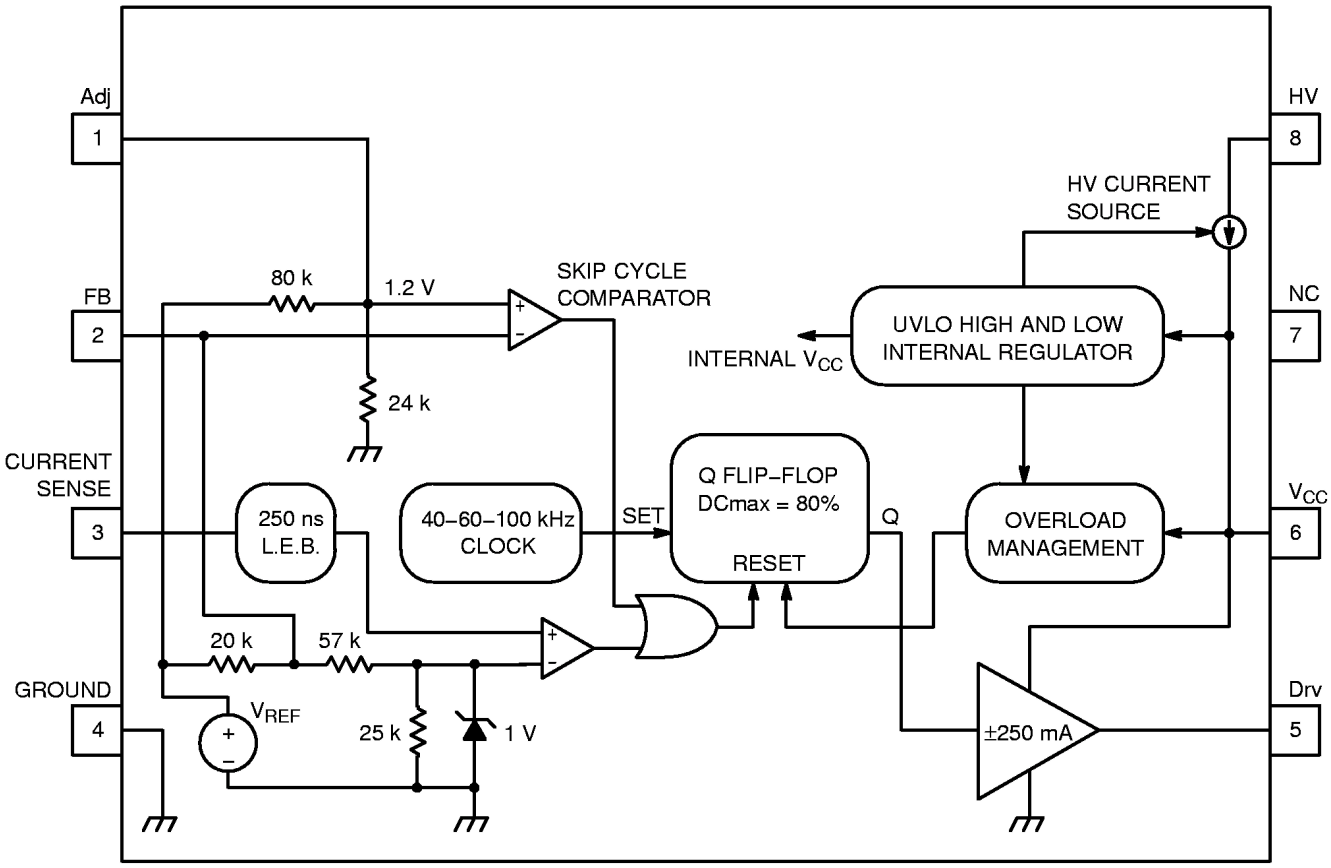


Figure 2. Internal Circuit Architecture

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}, Drv	16	V
Power Supply Voltage on all other pins except Pin 5 (Drv), Pin 6 (V_{CC}) and Pin 8 (HV)	-	-0.3 to 10	V
Maximum Current into all pins except Pin 6 (V_{CC}) and Pin 8 (HV) when 10 V ESD diodes are activated	-	5.0	mA
Thermal Resistance, Junction-to-Air, PDIP-8 Version Thermal Resistance, Junction-to-Air, SOIC Version Thermal Resistance, Junction-to-Case	$R_{\Theta JA}$ $R_{\Theta JA}$ $R_{\Theta JC}$	100 178 57	°C/W
Maximum Junction Temperature	TJ_{MAX}	150	°C
Temperature Shutdown	-	170	°C
Hysteresis in Shutdown	-	30	°C
Operating Temperature Range	T_J	-40 to +125	°C
Storage Temperature Range	T_{stg}	-60 to +150	°C
ESD Capability, HBM Model, All pins except Pin 6 (V_{CC}) and Pin 8 (HV)	-	2.0	kV
ESD Capability, Machine Model	-	200	V
Maximum Voltage on Pin 8 (HV) with Pin 6 (V_{CC}) Decoupled to Ground with 10 μF	-	500	V

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS (For typical values T_J = 25°C, for min/max values T_J = 0°C to +125°C, Max T_J = 150°C, V_{CC}= 11 V unless otherwise noted.)

Characteristic	Symbol	Pin	Min	Typ	Max	Unit
Supply Section (All frequency versions, otherwise noted)						
Turn-on Threshold Level, V_{CC} Going Up	V_{CC}(on)	6	12.2	12.8	14	V
Minimum Operating Voltage after Turn-on	V_{CC}(min)	6	7.2	7.8	8.4	V
V_{CC} Decreasing Level at which the Latch off Phase Ends	V_{CC}latch	6	-	4.9	-	V
Internal IC Consumption, No Output Load on Pin 5	I_{CC1}	6	-	750	880 (Note 1)	µA
Internal IC Consumption, 1.0 nF Output Load on Pin 5, F_{SW} = 40 kHz	I_{CC2}	6	-	1.2	1.4 (Note 2)	mA
Internal IC Consumption, 1.0 nF Output Load on Pin 5, F_{SW} = 60 kHz	I_{CC2}	6	-	1.4	1.6 (Note 2)	mA
Internal IC Consumption, 1.0 nF Output Load on Pin 5, F_{SW} = 100 kHz	I_{CC2}	6	-	2.0	2.2 (Note 2)	mA
Internal IC Consumption, Latch-off Phase, V_{CC} = 6.0 V	I_{CC3}	6	-	250	-	µA
Internal Startup Current Source (Pin 8 biased at 50 V)						
High-Voltage Current Source, V_{CC} = 10 V	IC1	8	3.5	6.0	9.0	mA
High-Voltage Current Source, V_{CC} = 0	IC2	8	-	11	-	mA
Drive Output						
Output Voltage Rise-Time @ CL = 1.0 nF, 10-90% of Output Signal	T_r	5	-	67	-	ns
Output Voltage Fall-Time @ CL = 1.0 nF, 10-90% of Output Signal	T_f	5	-	28	-	ns
Source Resistance	R_{OH}	5	27	40	61	Ω
Sink Resistance	R_{OL}	5	5.0	10	20	Ω
Current Comparator (Pin 5 loaded unless otherwise noted)						
Input Bias Current @ 1 .0 V Input Level on Pin 3	I_{IB}	3	-	0.02	-	µA
Maximum Internal Current Set point (Note 3)	I_{Limit}	3	0.85	0.92	1.0	V
Default Internal Current Set point for Skip Cycle Operation	I_{Lskip}	3	-	360	-	mV
Propagation Delay from Current Detection to Gate OFF State	T_{DEL}	3	-	90	160	ns
Leading Edge Blanking Duration (Note 3)	T_{LEB}	3	-	230	-	ns
Internal Oscillator (V_{CC} = 11 V, Pin 5 loaded by 1 nF)						
Oscillation Frequency, 40 kHz Version	fosc	-	37	42	47	kHz
Oscillation Frequency, 60 kHz Version	fosc	-	57	65	73	kHz
Oscillation Frequency, 100 kHz Version	fosc	-	90	103	115	kHz
Maximum Duty-Cycle	Dmax	-	74	80	87	%
Feedback Section (V_{CC} = 11 V, Pin 5 unloaded)						
Internal Pull-up Resistor	Rup	2	-	20	-	kΩ
Pin 3 to Current Set point Division Ratio	1 ratio	-	-	3.3	-	-

Skip Cycle Generation

Default Skip Mode Level	Vskip	1	1.0	1.2	1.4	V
Pin 1 Internal Output Impedance	Zout	1	-	22	-	kΩ

1. Max value at T_J = 0°C.
2. Maximum value @ T_J = 25°C.
3. Pin 5 loaded by 1 nF.

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