

Off-Line Digital Quasi-Resonant PWM Controller with Peak Power Operation

1 Description

The iW1770 is a high performance AC/DC power supply controller that uses digital control technology to build peak current mode PWM flyback power supplies. The device operates in quasi-resonant mode to provide high efficiency and includes a number of key built-in protection features while minimizing the external component count, simplifying EMI design and lowering the total bill of material cost. The iW1770 can operate at peak power mode with momentary peak power higher than the maximum continuous output power without design cost and size increase. The iW1770 removes the need for a secondary feedback circuit while achieving excellent line and load regulation. It also eliminates the need for loop compensation components while maintaining stability over all operating conditions. Pulse-by-pulse waveform analysis allows for a fast dynamic load transient response. The built-in power limit function enables optimized transformer design for a wide input voltage range.



Dialog's innovative proprietary technology ensures that power supplies built with the iW1770 can achieve both the highest average active efficiency and less than 50mW no-load power consumption in 20W output power range, and have fast yet smooth start-up with a wide range of capacitive loads with output voltage of 12V and above, and are ideal for network and ultrabook adapter applications.

2 Features

- No-load power consumption < 50mW at 230V_{AC} along with fast dynamic load response and short turn-on delay in typical 20W and above adapter applications
- **PrimAccurate**[™] primary-side feedback eliminates opto-isolators and simplifies design
- Peak power mode provides momentary peak power higher than the maximum continuous output power without design cost and size increase
- Adaptively controlled soft-start enables fast and smooth start-up for a wide range of capacitive loads (from 330μF to 6,000μF) with output voltage of 12V and above
- Tight constant-voltage (CV) regulation across line and load range
- Proprietary optimized 79kHz maximum PWM switching frequency with quasi-resonant operation achieves best size, efficiency and common mode noise
- User-configurable 5-level cable drop compensation
- **EZ-EMI**[®] design enhances manufacturability
- Adaptive multi-mode PWM/PFM control improves efficiency and eliminates audible noise
- Built-in single-point fault protections against output short-circuit, output over-voltage, output over-current, and current-sense-resistor-short fault
- On-chip internal over-temperature protection
- Dedicated pins for user-configurable external shutdown control

3 Applications

- Power supplies requiring peak power capability such as network devices, ultrabooks and home electronics
- Universal input AC/DC adapters (15W - 40W)

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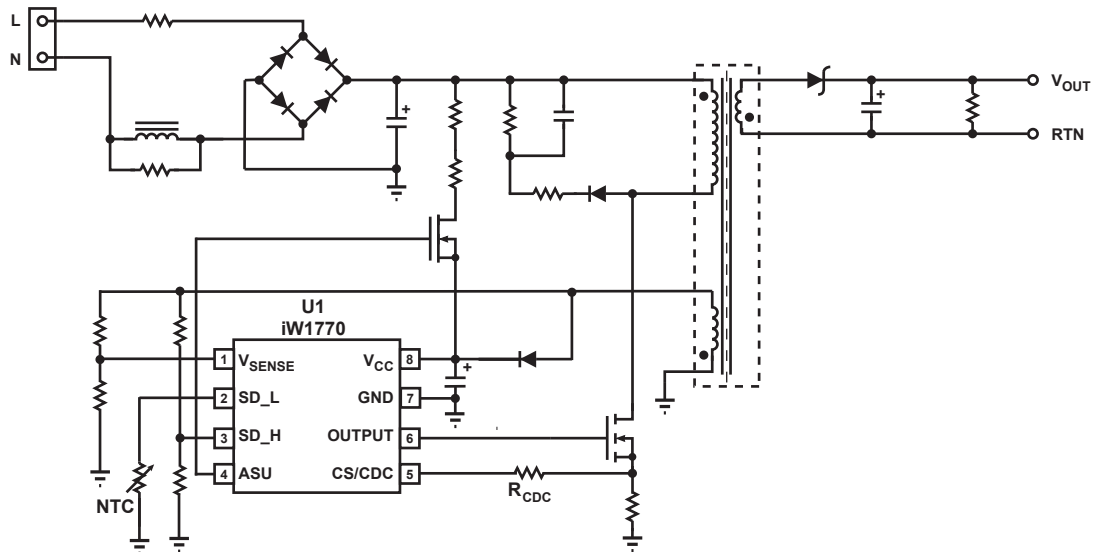


Figure 3.1 : iW1770 Typical Application Circuit
(Using Depletion Mode N-FET as Active Start-up Device)
(Achieving < 50mW No-load Power Consumption in 20W Adapter Designs)

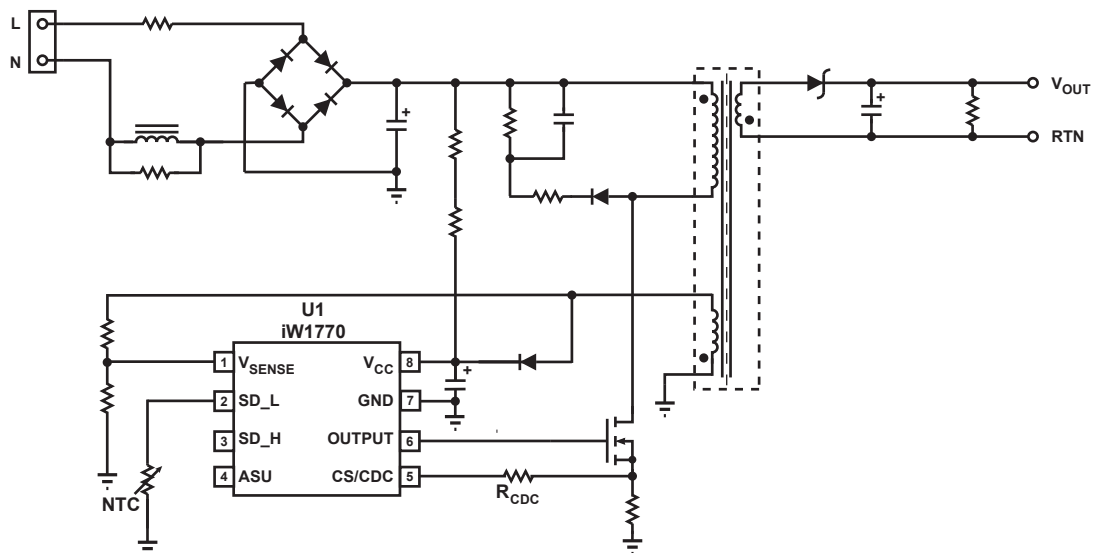


Figure 3.2 : iW1770 Typical Application Circuit
(Alternative Circuit without Using Active Start-Up Device and without Using External Shutdown Control at Pin 3)

Note: Pin 3 (SD_H) can be left unconnected if high-level-triggered external shutdown control is not needed.
Pin 4 (ASU) can be left unconnected if an active start-up device is not needed.

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4 Pinout Description

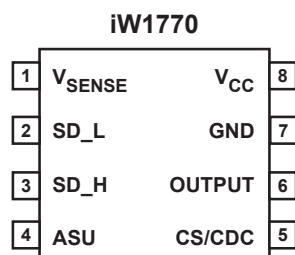


Figure 4.1 : 8 Lead SOIC-8 Package

Pin Number	Pin Name	Type	Pin Description
1	V _{SENSE}	Analog Input	Auxiliary voltage sense. Used for primary-side regulation.
2	SD_L	Analog Input	External shutdown control when input goes low. Can be configured for external over-temperature protection (OTP) by connecting an NTC resistor from this pin to Ground.
3	SD_H	Analog Input	External shutdown control when input goes high. Can be configured for supplemental over-voltage protection (OVP).
4	ASU	Output	Control signal. Used for active start-up device (BJT or depletion mode N-FET).
5	CS/CDC	Analog Input	Primary-side current sense and external cable drop compensation (CDC). Used for cycle-by-cycle peak-current control and limit in primary-side CV regulation. Also used for CDC configuration.
6	OUTPUT	Output	Gate drive for external MOSFET switch.
7	GND	Ground	Ground.
8	V _{CC}	Power Input	IC power supply.

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5 Absolute Maximum Ratings

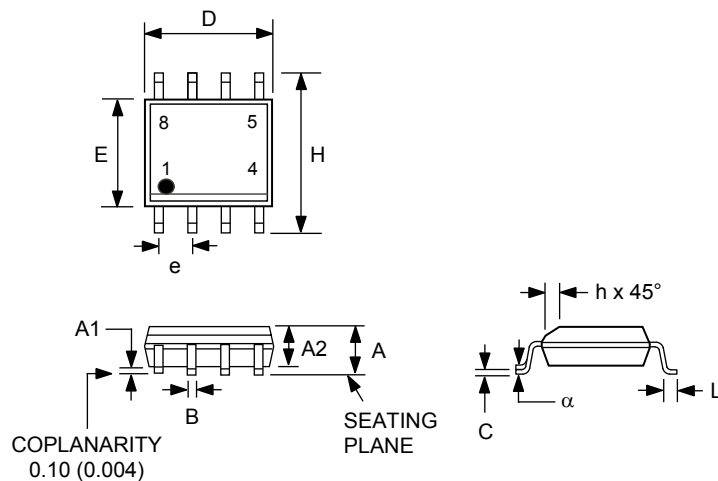
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 8, $I_{CC} = 20\text{mA max}$)	V_{CC}	-0.3 to 25.0	V
Continuous DC supply current at V_{CC} pin ($V_{CC} = 15\text{V}$)	I_{CC}	20	mA
ASU output (pin 4)		-0.3 to 19.0	V
OUTPUT (pin 6)		-0.3 to 20.0	V
V_{SENSE} input (pin 1, $I_{V_{sense}} \leq 10\text{mA}$)		-0.7 to 4.0	V
CS/CDC input (pin 5)		-0.3 to 4.0	V
SD (pin 2)		-0.3 to 4.0	V
SD_H (pin 3, $I_{SD_H} \leq 20\text{mA}$)		-0.8 to 4.0	V
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STG}	-65 to 150	°C
Thermal resistance junction-to-ambient	θ_{JA}	160	°C/W
ESD rating per JEDEC JESD22-A114		$\pm 2,000$	V
Latch-up test per JESD78A		± 100	mA

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6 Physical Dimensions

8-Lead Small Outline (SOIC) Package



Symbol	Inches		Millimeters	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.0040	0.010	0.10	0.25
A2	0.049	0.059	1.25	1.50
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
D	0.189	0.197	4.80	5.00
E	0.150	0.157	3.80	4.00
e	0.050 BSC		1.27 BSC	
H	0.228	0.244	5.80	6.20
h	0.10	0.020	0.25	0.50
L	0.016	0.049	0.4	1.25
α	0°	8°		

Compliant to JEDEC Standard MS12F

Controlling dimensions are in inches; millimeter dimensions are for reference only

This product is RoHS compliant and Halide free.

Soldering Temperature Resistance:

[a] Package is IPC/JEDEC Std 020D moisture sensitivity level 1

[b] Package exceeds JEDEC Std No. 22-A111 for solder immersion resistance; package can withstand 10 s immersion < 260°C

Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15 mm per end. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25 mm per side.

The package top may be smaller than the package bottom. Dimensions D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.

7 Ordering Information

Part No.	Options	Package	Description
iW1770-00-B	No OVP/OTP latch; Peak power mode timer = 40ms	SOIC-8	Tape & Reel ¹
iW1770-03	No OVP/OTP latch; Peak power mode timer = 160ms	SOIC-8	Tape & Reel ¹
iW1770-23	OVP/External OTP latch; Peak power mode timer = 160ms	SOIC-8	Tape & Reel ¹

Note 1: Tape & Reel packing quantity is 2,500/reel. Minimum ordering quantity is 2,500.

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(Rev.1.0 Mar 2020)

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