

## Off-Line Digital Green-Mode Quasi-Resonant PWM Controller

### 1 Description

The iW1709 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 directly drives a power BJT and operates in quasi-resonant mode to provide high efficiency and key built-in protection features, while minimizing the external component count, simplifying EMI design, and lowering the total bill of material cost. The iW1709 features a distinctive soft-start scheme, which allows for fast and yet smooth start-up with both small and large capacitive loads. The iW1709 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. The pulse-by-pulse waveform analysis allows for fast dynamic load 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 iW1709 can achieve both the highest average efficiency and less than 50mW no-load power consumption; they also 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, set-top box, and home appliance power supply applications.

### 2 Features

- Optimized for 12V/1A AC/DC adapters with <50mW no-load power consumption at 230V<sub>AC</sub> and fast dynamic response
- Direct drive of low-cost BJT power switch
- Adaptively controlled soft start enables fast and smooth start-up for a wide range of capacitive loads (from 330 $\mu$ F to 6,000 $\mu$ F) with output voltage of 12V and above
- Very tight constant voltage and constant current regulation over entire operating range
- **PrimAccurate**<sup>™</sup> primary-side feedback eliminates opto-isolator and simplifies design
- **EZ-EMI**<sup>®</sup> design enhances manufacturability
- Intrinsically low common mode noise
- Optimized 72kHz maximum PWM switching frequency achieves best size and efficiency
- Adaptive multi-mode PWM/PFM control improves efficiency
- Quasi-resonant operation for highest overall efficiency
- Dynamic base current control
- No external loop compensation components required
- Complies with EPA 2.0/CoC Ver5/DoE energy-efficiency specifications with ample margin
- Built-in protections for output short-circuit, output low impedance, and output overvoltage
- Built-in over-temperature protection (OTP)
- No audible noise over entire operating range

### 3 Applications

- Network power adapters for ADSL, wireless access points and routers
- AC/DC adapter for set-top box
- AC/DC power supplies for home appliances

Off-Line Digital Green-Mode Quasi-Resonant PWM Controller

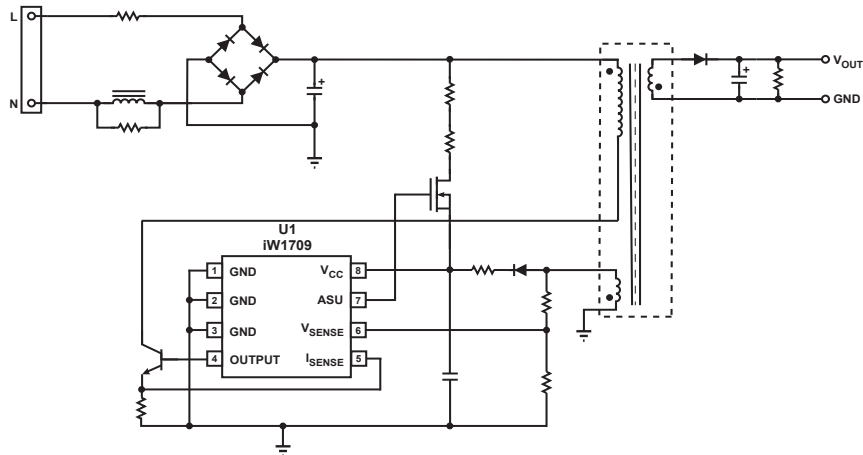


Figure 3.1 : iW1709 Typical Application Circuit (Achieving < 50mW No-load Power Consumption in 12V/1A Adapter Designs. Using Depletion Mode NFET as Active Start-up Device.)

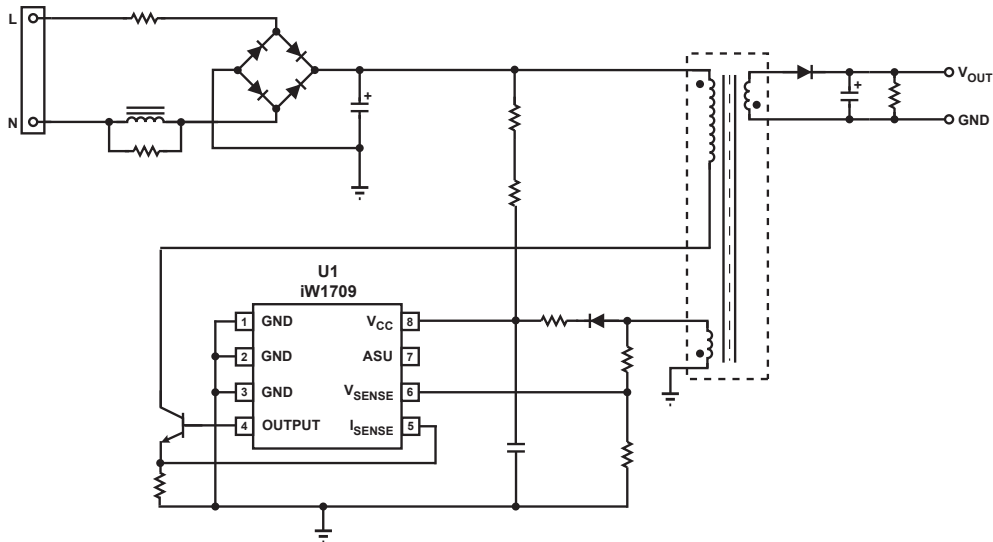


Figure 3.2 : iW1709 Typical Application Circuit (Achieving < 100mW No-load Power Consumption in 12V/1A Adapter Designs. Alternative Circuit without Using Active Start-up Device.)

## Off-Line Digital Green-Mode Quasi-Resonant PWM Controller

### 4 Pinout Description

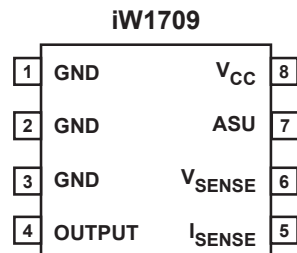


Figure 4.1 : 8-Lead SOIC-8 Package

Pin Number	Pin Name	Type	Pin Description
1	GND	Ground	Ground.
2	GND	Ground	Ground.
3	GND	Ground	Ground.
4	OUTPUT	Output	Base drive for BJT.
5	I <sub>SENSE</sub>	Analog Input	Primary current sense. It is used for cycle-by-cycle peak current control and limit.
6	V <sub>SENSE</sub>	Analog Input	Auxiliary voltage sense. It is used for primary regulation.
7	ASU	Output	Control signal for active start-up device (BJT or Depletion NFET).
8	V <sub>CC</sub>	Power Input	IC power supply.

## Off-Line Digital Green-Mode Quasi-Resonant PWM Controller

### 5 Absolute Maximum Ratings

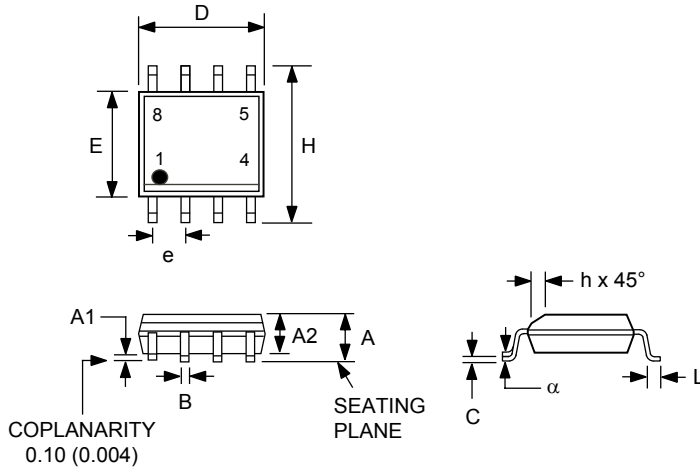
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Electrical Characteristics in Section 6.

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 ( $V_{CC} = 15\text{V}$ )	$I_{CC}$	25	mA
ASU output (pin 7)		-0.3 to 19.0	V
Output (pin 4)		-0.3 to 4.0	V
$V_{SENSE}$ input (pin 6, $I_{VSENSE} \leq 10\text{mA}$ )		-0.7 to 4.0	V
$I_{SENSE}$ input (pin 5)		-0.3 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	$\theta_{JA}$	155	°C/W
ESD rating per JEDEC JESD22-A114		$\pm 2,000$	V
Latch-up test per JESD78D		$\pm 100$	mA

Off-Line Digital Green-Mode Quasi-Resonant PWM Controller

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 Number	Options	Package	Description
iW1709-00	Cable Comp = 0mV, OTP recovery threshold = 100°C	SOIC-8	Tape & Reel <sup>1</sup>
iW1709-01	Cable Comp = 150mV, OTP recovery threshold = 100°C	SOIC-8	Tape & Reel <sup>1</sup>
iW1709-11	Cable Comp = 150mV, OTP recovery threshold = 120°C	SOIC-8	Tape & Reel <sup>1</sup>

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

## Off-Line Digital Green-Mode Quasi-Resonant PWM Controller

### Disclaimer

Information in this document is believed to be accurate and reliable. However, Dialog Semiconductor does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information. Dialog Semiconductor furthermore takes no responsibility whatsoever for the content in this document if provided by any information source outside of Dialog Semiconductor.

Dialog Semiconductor reserves the right to change without notice the information published in this document, including without limitation the specification and the design of the related semiconductor products, software and applications.

Applications, software, and semiconductor products described in this document are for illustrative purposes only. Dialog Semiconductor makes no representation or warranty that such applications, software and semiconductor products will be suitable for the specified use without further testing or modification. Unless otherwise agreed in writing, such testing or modification is the sole responsibility of the customer and Dialog Semiconductor excludes all liability in this respect.

Customer notes that nothing in this document may be construed as a license for customer to use the Dialog Semiconductor products, software and applications referred to in this document. Such license must be separately sought by customer with Dialog Semiconductor.

All use of Dialog Semiconductor products, software and applications referred to in this document are subject to [Dialog Semiconductor's Standard Terms and Conditions of Sale](#), available on the company website ([www.dialog-semiconductor.com](http://www.dialog-semiconductor.com)) unless otherwise stated.

Dialog and the Dialog logo are trademarks of Dialog Semiconductor plc or its subsidiaries. All other product or service names are the property of their respective owners.

© 2017 Dialog Semiconductor. All rights reserved.

### RoHS Compliance

Dialog Semiconductor's suppliers certify that its products are in compliance with the requirements of Directive 2011/65/EU of the European Parliament on the restriction of the use of certain hazardous substances in electrical and electronic equipment. RoHS certificates from our suppliers are available on request.

## Contacting Dialog Semiconductor

**United Kingdom (Headquarters)**  
Dialog Semiconductor (UK) LTD  
Phone: +44 1793 757700

**Germany**  
Dialog Semiconductor GmbH  
Phone: +49 7021 805-0

**The Netherlands**  
Dialog Semiconductor B.V.  
Phone: +31 73 640 8822

**Email**  
[info\\_pcbg@diasemi.com](mailto:info_pcbg@diasemi.com)

**North America**  
Dialog Semiconductor Inc.  
Phone: +1 408 845 8500

**Japan**  
Dialog Semiconductor K. K.  
Phone: +81 3 5425 4567

**Taiwan**  
Dialog Semiconductor Taiwan  
Phone: +886 281 786 222

**Web site:**  
[www.dialog-semiconductor.com](http://www.dialog-semiconductor.com)

**Singapore**  
Dialog Semiconductor Singapore  
Phone: +65 64 8499 29

**Hong Kong**  
Dialog Semiconductor Hong Kong  
Phone: +852 3769 5200

**Korea**  
Dialog Semiconductor Korea  
Phone: +82 2 3469 8200

**China (Shenzhen)**  
Dialog Semiconductor China  
Phone: +86 755 2981 3669

**China (Shanghai)**  
Dialog Semiconductor China  
Phone: +86 21 5424 9058