

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_{AC} 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 μ F to 6,000 μ F) with output voltage of 12V and above
- Very tight constant voltage and constant current regulation over entire operating range
- **PrimAccurate**[™] primary-side feedback eliminates opto-isolator and simplifies design
- **EZ-EMI**[®] 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

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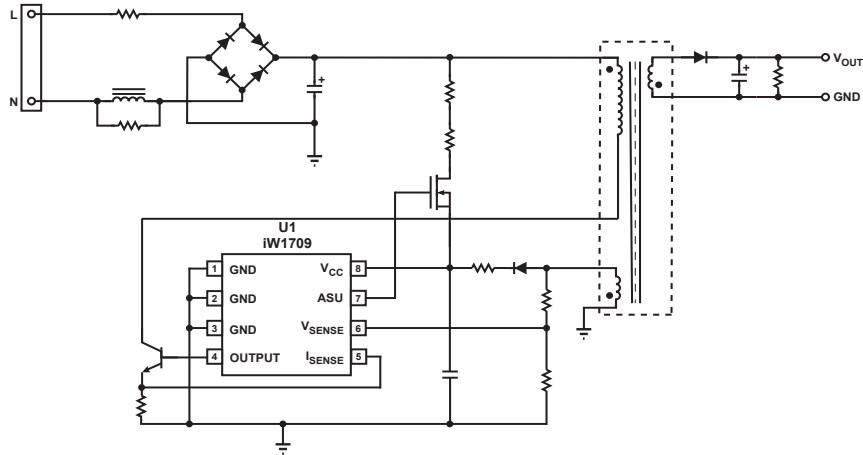


Figure 3.1 : iW1709 Typical Application Circuit (Achieving < 50mW No-load Power Consumption in 12V/1A Adapter Designs. Using Depletion Mode NFET as Active Start-up Device.)

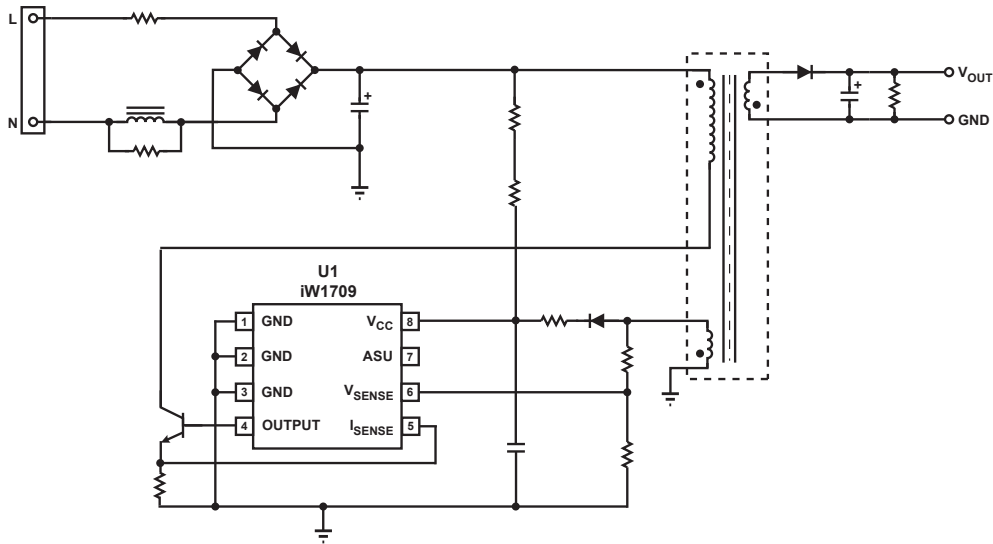


Figure 3.2 : iW1709 Typical Application Circuit (Achieving < 100mW No-load Power Consumption in 12V/1A Adapter Designs. Alternative Circuit without Using Active Start-up Device.)

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4 Pinout Description

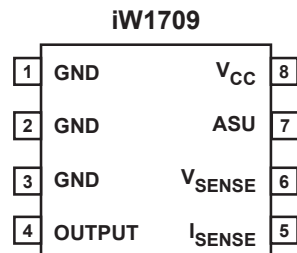


Figure 4.1 : 8-Lead SOIC-8 Package

| 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 _{SENSE} | Analog Input | Primary current sense. It is used for cycle-by-cycle peak current control and limit. |
| 6 | V _{SENSE} | 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 _{CC} | Power Input | IC power supply. |

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5 Absolute Maximum Ratings

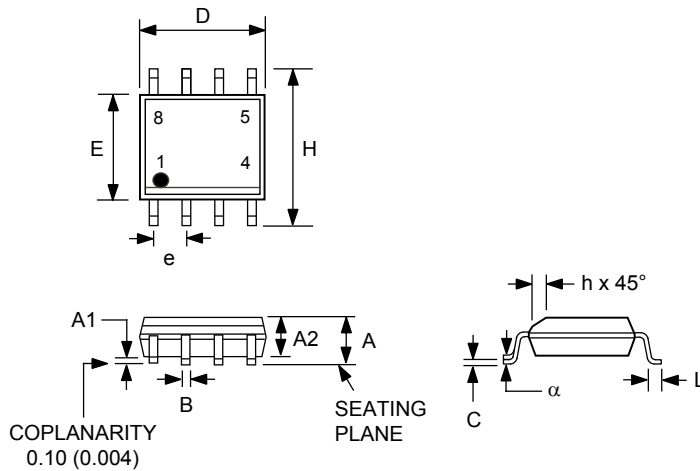
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Electrical Characteristics in Section 6.

| 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 | θ_{JA} | 155 | °C/W |
| ESD rating per JEDEC JESD22-A114 | | $\pm 2,000$ | V |
| Latch-up test per JESD78D | | ± 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 Number | Options | Package | Description |
|-------------|--|---------|--------------------------|
| iW1709-00 | Cable Comp = 0mV, OTP recovery threshold = 100°C | SOIC-8 | Tape & Reel ¹ |
| iW1709-01 | Cable Comp = 150mV, OTP recovery threshold = 100°C | SOIC-8 | Tape & Reel ¹ |
| iW1709-11 | Cable Comp = 150mV, OTP recovery threshold = 120°C | 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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