Off-Line Digital Green-Mode Quasi-Resonant PWM Controller with Output Current Limit Configuration

1 Description

The iW1608 is a high performance AC/DC power supply controller with output current limit configuration capability 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 iW1608 removes the need for 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 loop response that is much faster than traditional solutions, resulting in improved dynamic load response. The built-in power limit function enables optimized transformer design in universal off-line applications and allows for a wide input voltage range.

Dialog's innovative proprietary technology ensures that power supplies built with the iW1608 can achieve both the highest average active efficiency and low no-load power consumption, and have fast dynamic load response in a compact form factor in typical 10W applications. The iW1608 has unique user-configurable light-load operation modes to allow optimization of the system cost and performance according to the application requirements of dynamic load response and no-load power consumption.

The iW1608 allows configuration of output current limit on-the-fly through CFG Pin. For example, CFG pin can be used to detect the input voltage and adjust the output current limit accordingly.

2 Features

- User-configurable output current limit
- User-configurable light-load operation modes for optimized dynamic load response and no-load power consumption
- No-load power consumption < 30mW at $230V_{AC}$ with fast dynamic load response in typical 10W compact adapter/charger when a secondary-side controller with Active Voltage Positioning (AVP) function is used (iW676-30)
- No-load power consumption < 75mW at $230V_{AC}$ along with fast dynamic load response in typical 5V, 2A 10W compact adapter/charger applications without a secondary-side AVP controller
- Tight constant-voltage and constant current regulation across line and load range
- Primary-side feedback eliminates optoisolators and simplifies design
- Intelligent low power management achieves ultra-low operating current (~250µA) at no-load
- Proprietary optimized 89kHz maximum PWM switching frequency with quasi-resonant operation achieves best size, efficiency and common mode noise
- 150mV cable drop compensation
- ***EZ-EMI***® design enhances manufacturability
- Adaptive multi-mode PWM/PFM control improves efficiency
- Complies with CoC Version 5 Tier 2 and DOE level VI energy-efficiency specifications with ample margin
- Built-in single-point fault protections against output short-circuit, output over-voltage and output over-current
- On-chip internal over-temperature protection
- No audible noise over entire operating range
- Space-saving SOT-23 package

3 Applications

- Compact AC/DC adapters/chargers for media tablets and smart phones
- AC/DC adapters for consumer electronics

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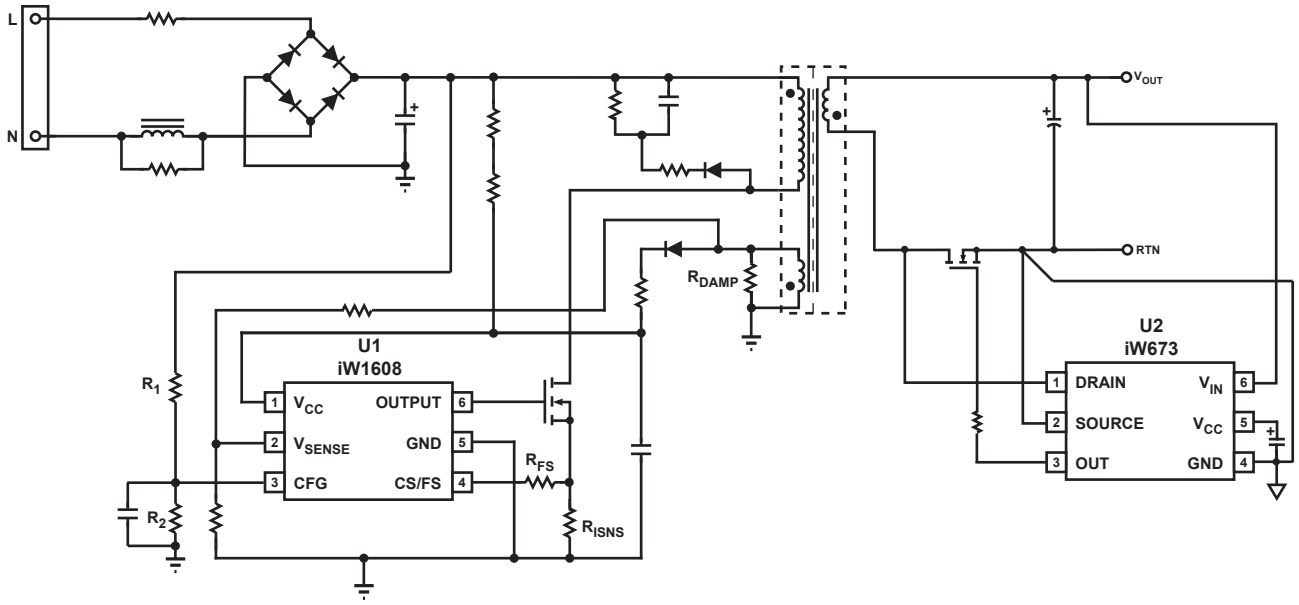


Figure 3.1 : iW1608 Typical Application Circuit Using iW673 as the Secondary-Side Synchronous Rectifier

4 Pinout Description

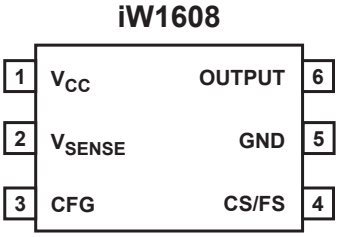


Figure 4.1 : 6-Lead SOT23 Package

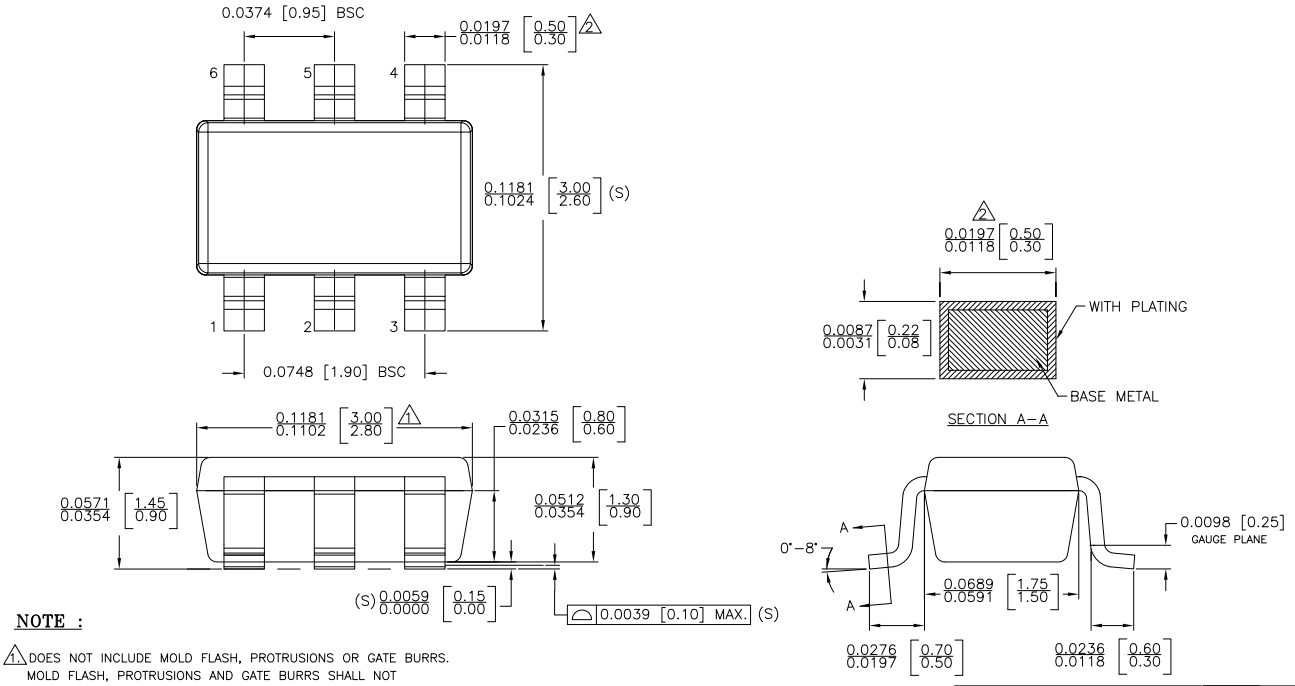
Pin Number	Pin Name	Type	Pin Description
1	V_{CC}	Power Input	IC power supply.
2	V_{SENSE}	Analog Input	Auxiliary voltage sense. It is used for primary-side regulation and detection of secondary-side load transient signal.
3	CFG	Analog Input	It is used for real-time output current limit configuration.
4	CS/FS	Analog Input	Primary-side current sense and minimum switching frequency configuration. It is used for cycle-by-cycle peak-current control and limit in primary-side CV/CC regulation. It is also used for minimum switching frequency configuration.
5	GND	Ground	Ground.
6	OUTPUT	Output	Gate drive for the external MOSFET switch.

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 1, I_{CC} = 20mA max)	V_{CC}	-0.3 to 25.0	V
Continuous DC supply current at V_{CC} pin (V_{CC} = 15V)	I_{CC}	20	mA
OUTPUT (pin 6)		-0.3 to 20.0	V
V_{SENSE} input (pin 2, I_{VSENSE} ≤ 10mA)		-0.7 to 4.0	V
CS/FS input (pin 4)		-0.3 to 4.0	V
CFG (pin 3, I_{CFG} ≤ 20mA)		-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}	208	°C/W
ESD rating per JEDEC JS-001-2017		±2,000	V
Latch-up test per JESD78E		±100	mA

6 Physical Dimensions



NOTE :

1. DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.127 MM PER SIDE.
2. DOES NOT INCLUDE INTER–LEAD FLASH OR PROTRUSIONS. INTER–LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.127 MM PER SIDE.
3. DIE IS FACING UP FOR MOLD.DIE IS FACING DOWN FOR TRIM/FORM.
4. THIS PART IS COMPLIANT WITH EIAJ SPECIFICATION SC74A AND JEDEC SPECIFICATION MO–178AB.
5. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
6. CONTROLLING DIMENSIONS IN INCHES. [mm]

dialog SEMICONDUCTOR

STATUS: RELEASED	SCALE: DO NOT SCALE
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)	
TITLE: 6 SOT23 PACKAGE OUTLINE	
REV: A	REVISION NOTE: NEW DRAWING — DATE: 02–MAR–2015

7 Ordering Information

Part Number	Options	Package	Description
iW1608-00B	2.8V CC shutdown voltage, 150mV CDC, configurable CC limit	SOT-23	Tape & Reel[1]

Note 1: Tape and reel packing quantity is 3,000/reel. Minimum packing quantity is 3,000.

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