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

1 Description

The iW1601 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 along with 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 iW1601 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 optimizes 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 iW1601 and the secondary-side voltage positioning controller iW600 can achieve both the highest average active efficiency and less than 30mW no-load power consumption, and have fast dynamic load response in a compact form factor in typical 5V/2A 10W applications.

NOT RECOMMENDED FOR NEW DESIGNS

2 Features

- No-load power consumption < 30mW at 230V_{AC} in typical 5V/2A power supplies
- Fast dynamic response with secondary-side load transient detection without optocoupler
- Direct drive of low-cost BJT power switch achieving high efficiency
- Tight constant-voltage and constant-current regulation across line and load range with primary-side feedback and control
- Intelligent low power management achieves ultra-low operating current at no-load
- Proprietary optimized line/load adaptive maximum constant frequency PWM switching with quasi-resonant operation achieves best size, efficiency, and common mode noise
- User-configurable 4-level cable drop compensation provides design flexibility
- ***EZ-EMI***® design enhances manufacturability
- Adaptive multi-mode PWM/PFM control improves efficiency
- No external loop compensation components required
- 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
- ***SmartDefender***™ smart hiccup technology helps address issues of soft shorts in cables and connectors by effectively reducing the average output power at fault conditions without latch

3 Applications

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

© 2018 Dialog Semiconductor

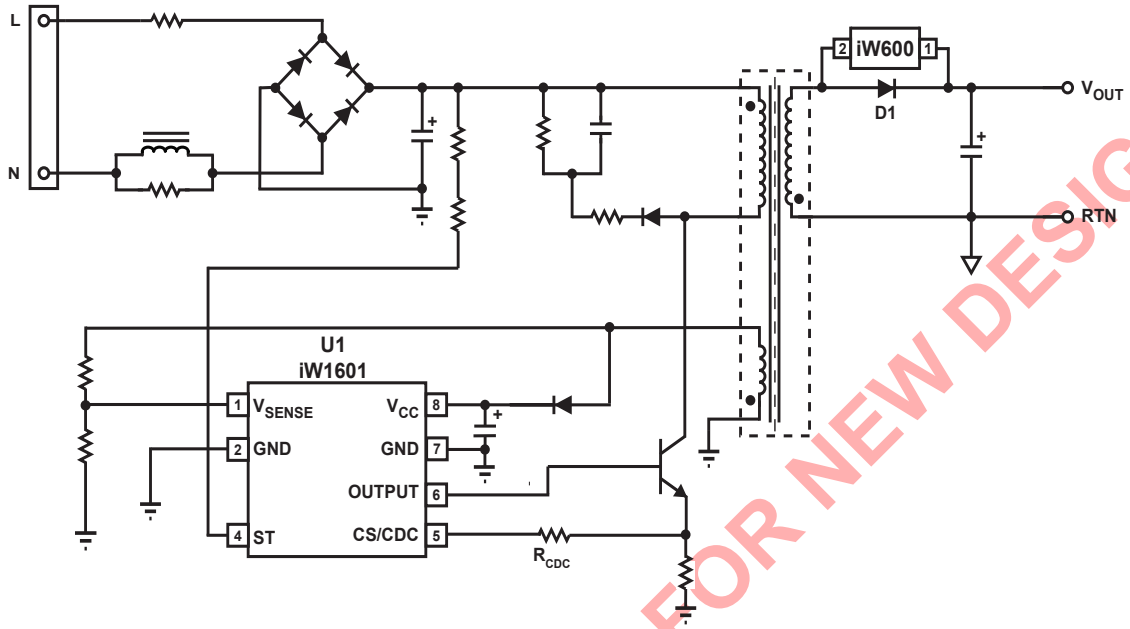


Figure 3.1: iW1601 Typical Application Circuit (Achieving < 30mW No-load Power Consumption in 5V/2A 10W Adapter Designs with iW600 Secondary Voltage Position IC)

NOT RECOMMENDED FOR NEW DESIGNS

© 2018 Dialog Semiconductor

4 Pinout Description

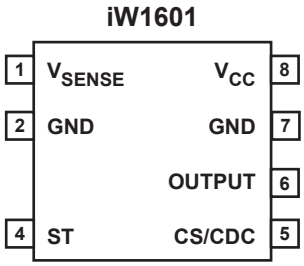


Figure 4.1 : 7 Lead SOIC-7 Package

Pin Number	Pin Name	Type	Pin Description
1	V_{SENSE}	Analog Input	Auxiliary voltage sense. Used for primary side regulation and detection of secondary-side load transient signal.
2	GND	Ground	Ground.
4	ST	Power	Startup voltage input.
5	CS/CDC	Analog Input	Primary current sense and external cable drop compensation (CDC). Used for cycle-by-cycle peak current control and limit in primary-side CV/CC regulation. Also used for CDC configuration.
6	OUTPUT	Output	Base drive for BJT.
7	GND	Ground	Ground.
8	V_{CC}	Power Input	IC power supply.

NOT RECOMMENDED FOR NEW DESIGNS

© 2018 Dialog Semiconductor

5 Absolute Maximum Ratings

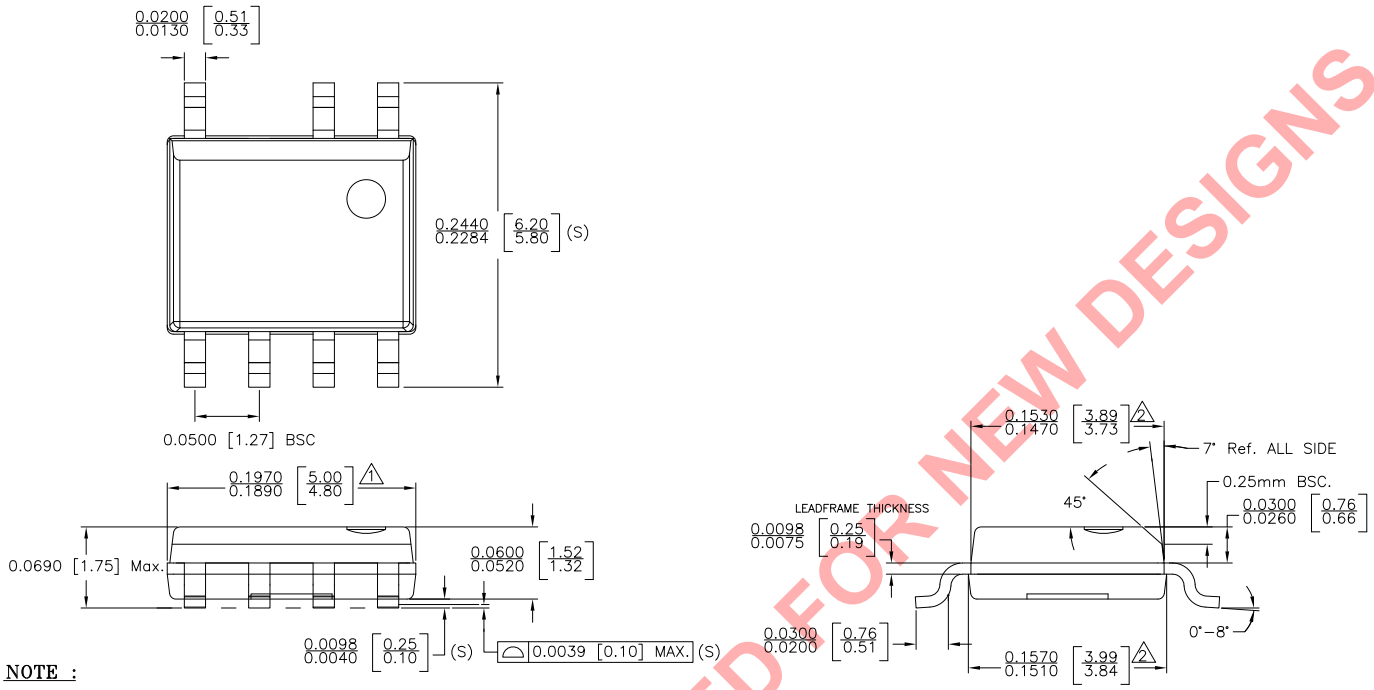
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 8, I_{CC} = 20mA max)	V_{CC}	-0.3 to 25.0	V
Continuous DC supply current at V_{CC} pin (V_{CC} = 15V)	I_{CC}	25	mA
ST output (pin 4)		-0.3 to 25	V
OUTPUT (pin 6)		-0.3 to 4.0	V
V_{SENSE} input (pin 1, I_{VSENSE} ≤ 10mA)		-0.7 to 4.0	V
CS/CDC 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}	100	°C/W
ESD rating per JEDEC JESD22-A114		±2,000	V
Latch-up test per JESD78D		±100	mA

NOT RECOMMENDED FOR NEW DESIGN

© 2018 Dialog Semiconductor

6 Physical Dimensions



NOTE :

1. DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 INCH PER SIDE.
2. DOES NOT INCLUDE INTER–LEAD FLASH OR PROTRUSIONS. INTER–LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .010 INCH PER SIDE.
3. PACKAGE DIMENSION CONFORM TO JEDEC SPECIFICATION MS–012
4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
5. CONTROLLING DIMENSIONS IN INCHES.[mm]

STATUS: RELEASED	SCALE: DO NOT SCALE
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)	
TITLE: 7 SOIC (NO PIN 3) PACKAGE OUTLINE	
REV: C	REVISION NOTE: ADD PACKAGE CHAMFER / DATE: 01–JUNE–2015

NOT RECOMMENDED FOR NEW DESIGNS

7 Ordering Information

Part Number	Options	Package	Description
iW1601-00	No latch, 2.8V CC shutdown voltage, smart hiccup with 2/8 duty cycle	SOIC-7	Tape & Reel[1]
iW1601-01	OVP latch, CC shutdown and latch, 3.5V CC shutdown voltage, no smart hiccup	SOIC-7	Tape & Reel[1]
iW1601-02	OVP latch, “no CC” operation and latch, no smart hiccup	SOIC-7	Tape & Reel[1]
iW1601-03	No latch, 3.0V CC shutdown voltage, no smart hiccup	SOIC-7	Tape & Reel[1]

Note 1: Tape and reel packing quantity is 2,500/reel. Minimum packing quantity is 2,500.

© 2018 Dialog Semiconductor

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) 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.

© 2018 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.

NOT RECOMMENDED FOR NEW DESIGNS

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

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

Japan
Dialog Semiconductor K. K.
Phone: +81 3 5769 5100

Taiwan
Dialog Semiconductor Taiwan
Phone: +886 281 786 222

Web site:
www.dialog-semiconductor.com

Hong Kong
Dialog Semiconductor Hong Kong
Phone: +852 2607 4271

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