25W AccuSwitch™ AC/DC Controller with Integrated 700V Power FET with Option for Input OVP

1 Description

The iW1825 is an ***AccuSwitch™*** product that integrates a 700V power MOSFET with a high-performance digital AC/DC controller. The product offers a unique light load mode that can be configured with an external resistor to allow the design to be optimized for ultra-low no-load power consumption or fast transient response. It operates in quasi-resonant mode to provide high efficiency at heavy loads and minimizes the external component count while simplifying EMI design and lowering the total bill of material cost.

Renesas' ***PrimAccurate™*** primary-side sensing technology allows the iW1825 to eliminate the need for secondary-side feedback while achieving excellent line and load regulation. This proprietary digital control technology also eliminates the need for loop compensation components while maintaining stability over all operations. 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.

Renesas' innovative proprietary technology ensures that power supplies built with the iW1825 can achieve both the highest average active efficiency and less than 75mW no-load power consumption. Active start-up circuitry enables fast, yet smooth start-up into large capacitive loads at any output voltage, making it ideal for networking and monitor adaptor applications.

The iW1825 offers a full range of fault protection circuits including internal and external over-voltage protection (OVP). The external OVP feature can monitor either the input voltage or output voltage. The -01 and -31 options offer a supplemental output OVP, while the -10 option can monitor the input voltage, even during start-up, to protect from an over-voltage event on the input.

2 Features

- ***AccuSwitch™*** technology - integrated 700V power MOSFET
- 25W output power capable
- iW1825-01 and iW1825-31 options: external supplemental output over-voltage protection
- iW1825-10 options: external input over-voltage protection
- Adaptively controlled soft-start enables fast and smooth start-up into large capacitive loads (from 330µF to 6,000µF)
- Internal single-point fault protections against output short-circuit, output over-voltage and output over-current
- User-configurable light-load operation mode for optimized dynamic load response and no-load power consumption
- < 75mW no-load power consumption at $230V_{AC}$ with fast dynamic load response in typical 12V, 2A 24W compact adapter/charger
- ***PrimAccurate™*** Primary-side feedback eliminates optocouplers and simplifies design
- Proprietary optimized 79kHz maximum PWM switching frequency with quasi-resonant operation achieves best size, efficiency and common mode noise
- ***EZ-EMI™*** design enhances manufacturability
- Adaptive multi-mode PWM/PFM control improves efficiency
- User-configurable 5-level cable drop compensation provides design flexibility in iW1825-01 and iW1825-31 options
- Tight constant-voltage and constant current regulation across line and load range
- ***SmartDefender™*** smart hiccup technology helps to address issues of soft shorts in cables and connectors by effectively reducing the average output power at fault conditions without latch
- Optional on-chip internal over-temperature protection
- No audible noise over entire operating range
- 10-lead SOIC batwing package

3 Applications

- Power adapters for network devices and monitors
- Universal AC/DC adapters (5 – 25W)

© 2022 Renesas Electronics

25W AccuSwitch™ AC/DC Controller with Integrated 700V Power FET with Option for Input OVP

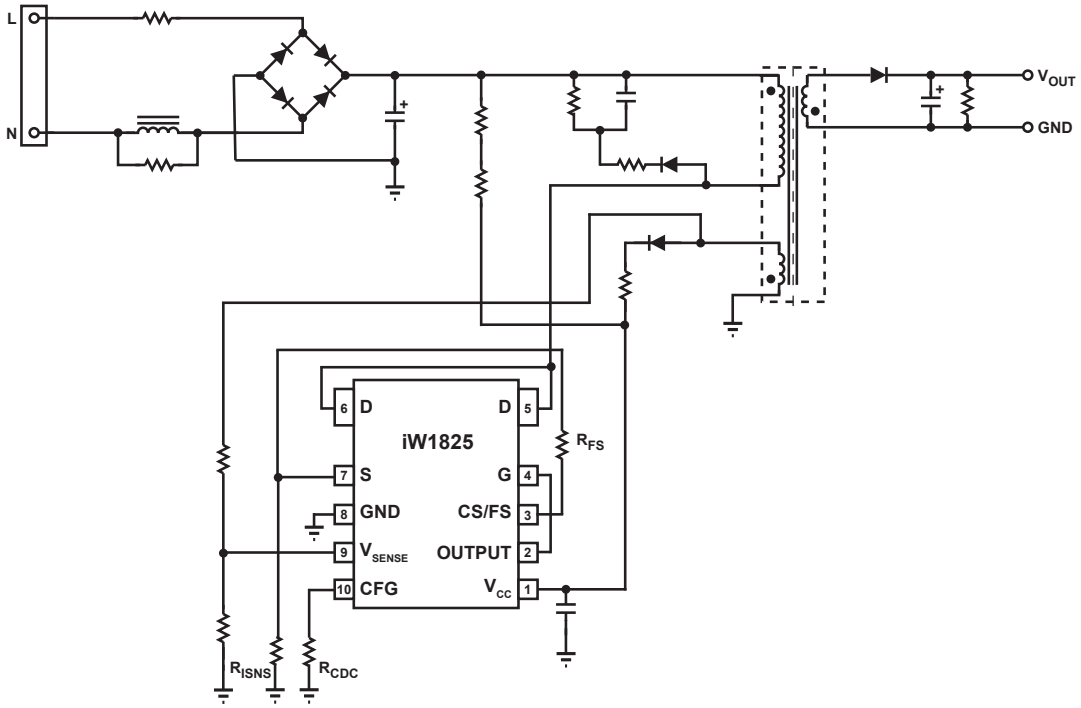


Figure 3.1 : iW1825 Typical Application Circuit
(Achieving < 75mW No-Load Power Consumption in 12V, 2A 24W Adapter Design).

© 2022 Renesas Electronics

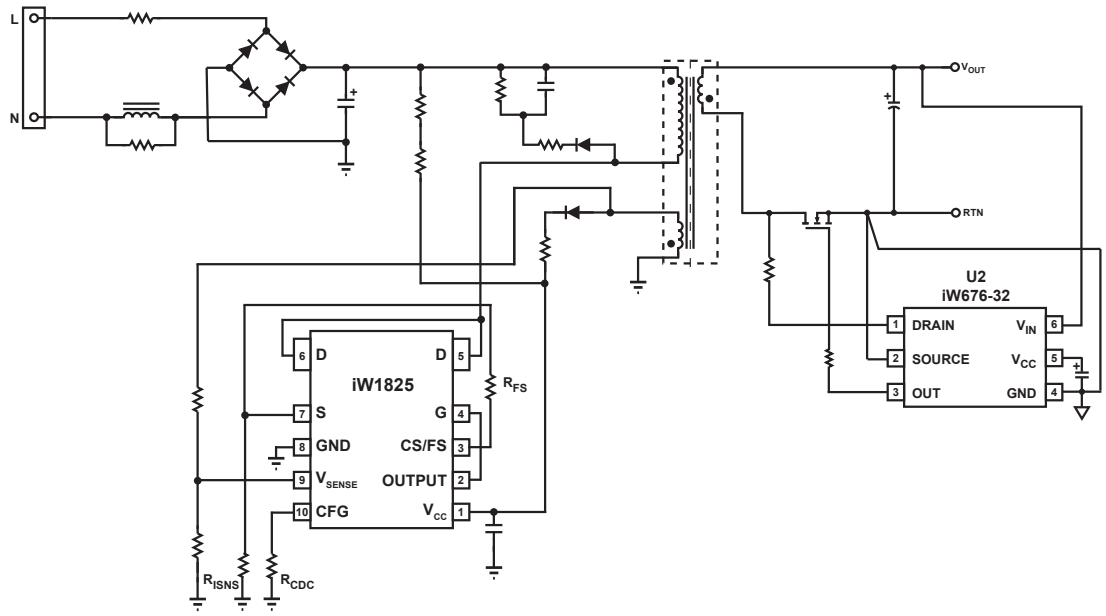


Figure 3.2 : iW1825 Typical Application Circuit with the iW676-32 Synchronous Rectifier Controller with Active Voltage Positioning Technology

WARNING:
The iW1825 is intended for high voltage AC/DC offline applications. Contact with live high voltage offline circuits or improper use of components may cause lethal or life threatening injuries or property damage. Only qualified professionals with safety training and proper precaution should operate with high voltage offline circuits.

iW1825 Output Power Table at Universal Input ($85V_{AC}$–$264V_{AC}$)

Condition	Open Frame[1]
Output Power (W)[2]	25

Notes:

Note 1. Maximum practical continuous output power measured at open frame ambient temperature of 50°C while minimum bulk capacitor voltage is kept above 90V (test unit is placed in a non-ventilated environment).

Note 2. The output power can vary depending on the power supply system designs and operating conditions.

© 2022 Renesas Electronics

4 Pinout Description

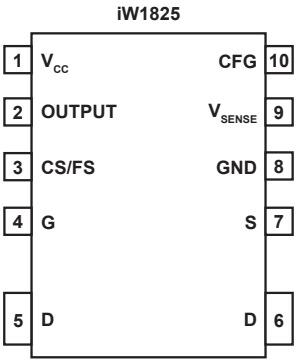


Figure 4.1 : 10-Lead SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	V_{CC}	Power Input	IC power supply.
2	OUTPUT	Output	Gate drive for the MOSFET switch.
3	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.
4	G	Analog Input	Gate of internal MOSFET. Connect to OUTPUT pin for proper operation.
5	D	Analog Input	Drain of internal MOSFET.
6	D	Analog Input	Drain of internal MOSFET.
7	S	Analog Input	Source of internal MOSFET.
8	GND	Ground	Ground.
9	V_{SENSE}	Analog Input	Auxiliary voltage sense. It is used for primary-side regulation and detection of secondary-side load transient signal.
10	CFG	Analog Input	In iW1825-01 and iW1825-31 options, it is used for external cable drop compensation (CDC) configuration and supplemental output over-voltage protection (OVP). In the iW1825-10 option, it is dedicated to input OVP.

© 2022 Renesas Electronics

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 2)		-0.3 to 20.0	V
V_{SENSE} input (pin 9, I_{VSENSE} ≤ 10mA)		-0.7 to 4.0	V
CS/FS input (pin 3)		-0.3 to 4.0	V
CFG (pin 10, I_{CFG} ≤ 20mA)		-0.8 to 4.0	V
Drain-source voltage	V_{DSS}	700	V
Single Pulse Avalanche Energy (starting T_J = 25°C)	E_{AS}	60	mJ
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STG}	-65 to 150	°C
ESD rating per JEDEC JS-001-2017		±2,000	V
Latch-up test per JESD78E		±100	mA

Notes:

Note 1. Repetitive rating; pulse width limited by maximum junction temperature.

6 Thermal Characteristics

Parameter	Symbol	Value	Units
Thermal Resistance Junction-to-Ambient[1]	θ_{JA}	55.6	°C/W
Thermal Resistance Junction-to-Drain pin (pin 5 and pin 6)[2]	ψ_{JB}	31.1	°C/W

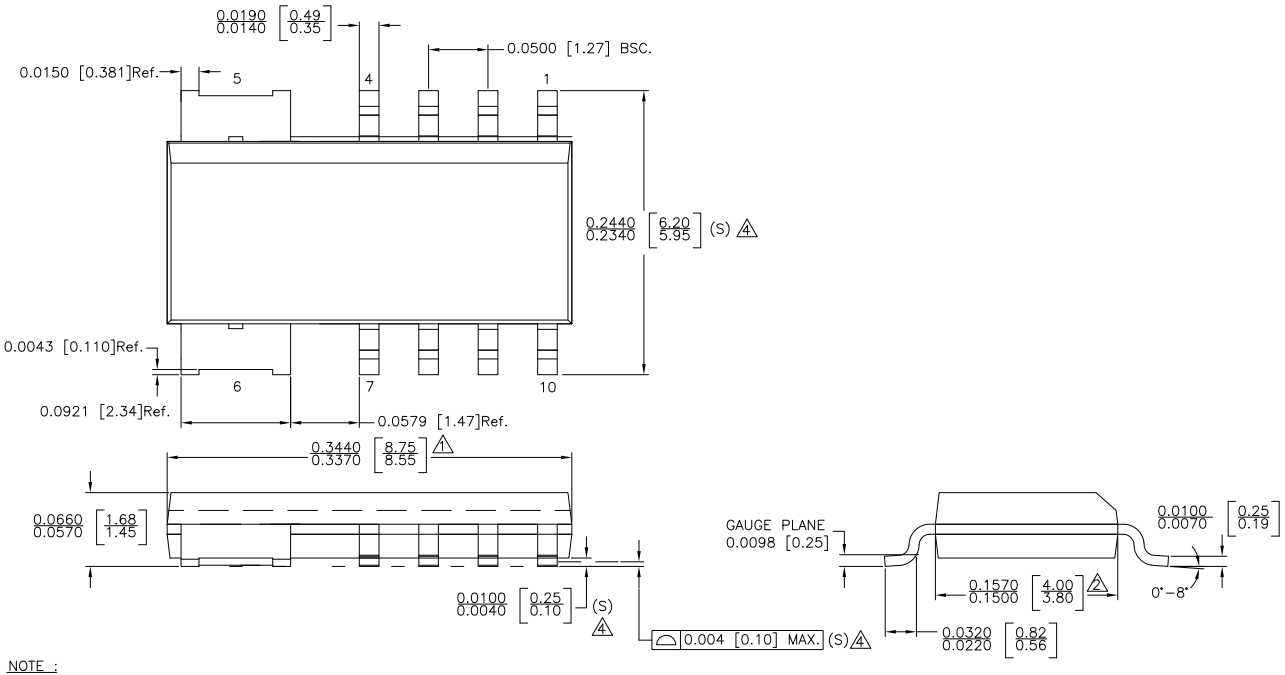
Notes:

Note 1. Device is mounted on a JEDEC single-sided board with 83mm^2 of 70µm thick copper, in a one-cubic-foot natural convection chamber with 1W dissipated power.

Note 2. ψ_{JB} [Psi Junction to Board] provides an estimation of the die junction temperature relative to the PCB [Board] surface temperature. ψ_{JB} is measured at the ground pin (pin 8) without using any thermal adhesives. See Section 10.14 for more information.

© 2022 Renesas Electronics

7 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. THIS PART IS COMPLIANT WITH JEDEC SPECIFICATION MS–012 AB.
4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
5. CONTROL DIMENSIONS IN INECHES.[mm]

STATUS: RELEASED	SCALE: DO NOT SCALE
TERMINAL FINISH: NiPdAu (PPF)	
TITLE: 10 SOIC BATWING PACKAGE OUTLINE	
REV: A / REVISION NOTE: NEW DRAWING	DATE: 29–SEP–2015

8 Ordering Information

Part Number	Options[1]					Package	Description
	External CFG Over-Voltage Protection Option	CC Shutdown Voltage at 5V Output[2]	Latch Conditions	CDC	Smart Defender		
iW1825-01	Output	No CC Operation	Latch	Yes	No	SO-10 Batwing	Tape & Reel[3]
iW1825-31	Output	0.75V	No Latch	Yes	Yes	SO-10 Batwing	Tape & Reel[3]
iW1825-10	Input	4V	No Latch	No	Yes	SO-10 Batwing	Tape & Reel[3]

Note 1: For availability of additional options, please contact Marketing.

Note 2: Please refer to section 10.5 for CC shutdown voltage at different nominal output voltages.

Note 3: Tape and reel packing quantity is 2,500/reel. Minimum packing quantity is 2,500.

© 2022 Renesas Electronics

25W AccuSwitch™ AC/DC Controller with Integrated 700V Power FET with Option for Input OVP

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas’ products are provided only subject to Renesas’ Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

© 2022 Renesas Electronics Corporation. 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.

(Rev.1.0 Mar 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.