18W AccuSwitch™ Quasi-Resonant PWM Controller with Integrated 900V Power BJT

1 Description

The iW1822 integrates a high performance AC/DC power supply controller using digital control technology and a power BJT switch in one package to enable compact peak current mode PWM flyback power supplies. The device operates in quasi-resonant mode and features multiple key protection features, allowing designs with improved efficiency and lower EMI, while lowering the bill of material cost.

The iW1822 features a distinctive soft-start scheme, which allows for fast and yet smooth start-up with both small and large capacitive loads. It 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 across 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.

Renesas' innovative, proprietary technology ensures that power supplies built with the iW1822 can achieve both the highest average efficiency and less than 30mW no-load power consumption. And, the iW1822 can start-up into a wide range of capacitive loads at 5V to 12V or higher output voltages, making it ideal for networking, set-top box and home appliance power supply applications.

2 Features

- Optimized for 12V/1.5A AC/DC adapters with < 30mW no-load power consumption at 230V_{AC} and fast dynamic response
- ***AccuSwitch***™ technology − integrated 900V bipolar junction transistor (BJT)
- Adaptively controlled soft-start enables fast and smooth start-up for a wide range of capacitive loads (from 330µF to 6,000µF)
- Very tight constant voltage and constant current regulation over entire operating range
- ***PrimAccurate***™ primary-side feedback eliminates optocoupler 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
- Built-in single-point protections against 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
- AC/DC adaptor for set top box
- AC/DC power supplies for home appliances and industrial applications

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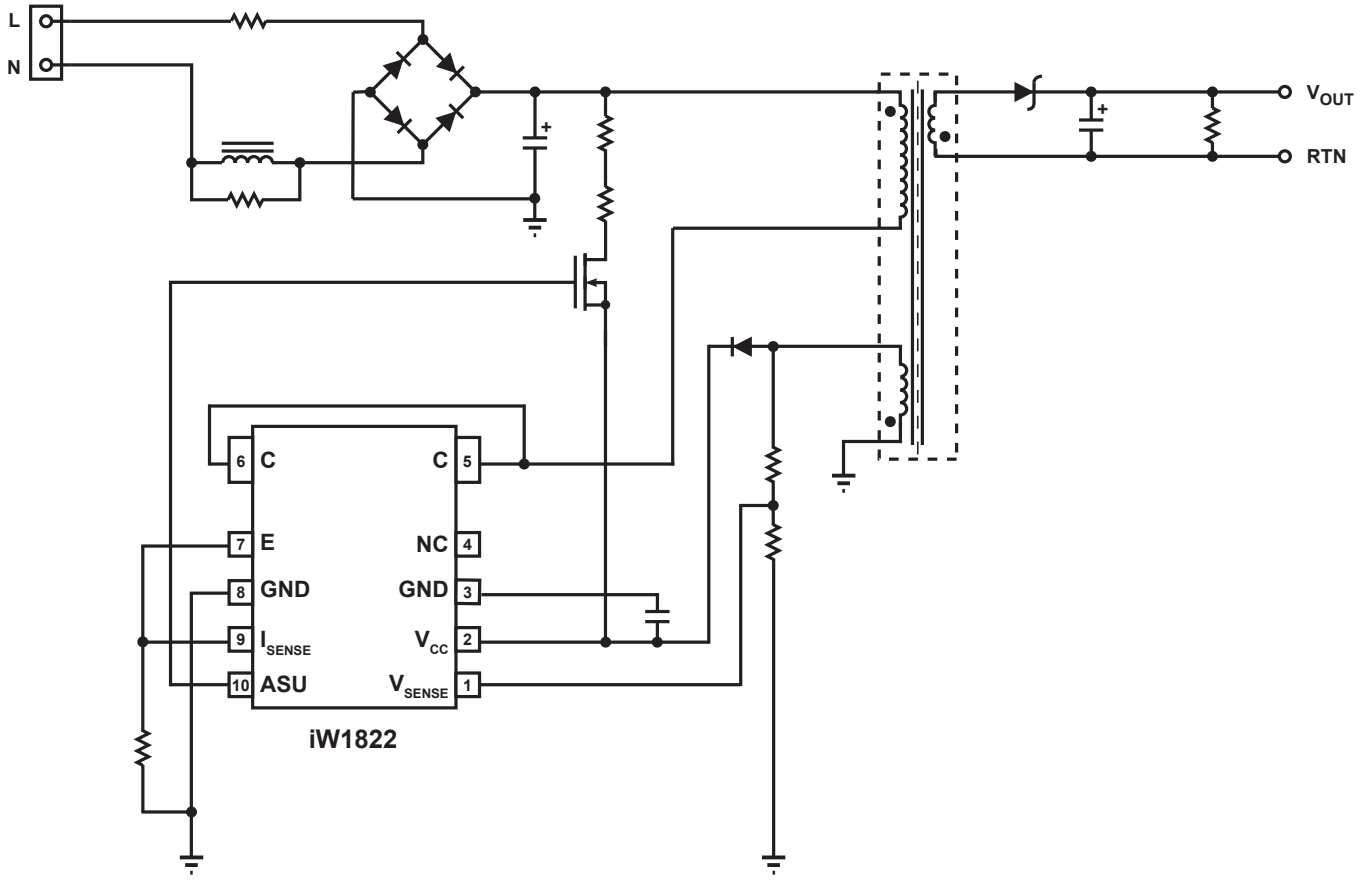


Figure 3.1 : iW1822 Typical Application Circuit

WARNING:

The iW1822 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.

iW1822 Output Power Table at Universal Input ($85V_{AC}$–$264V_{AC}$)

Condition	Open Frame[1]
Output Power (W)[2]	18

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.

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4 Pinout Description

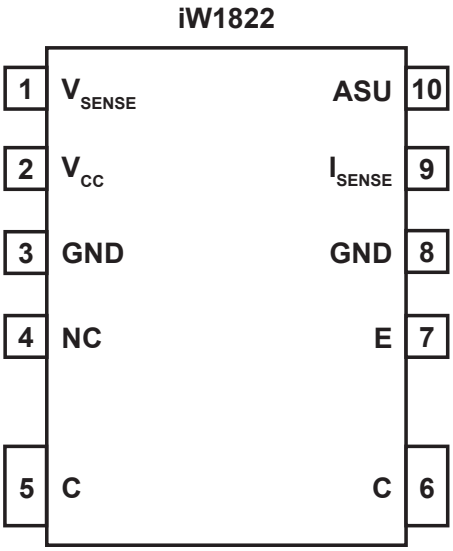


Figure 4.1 : 10-Lead SOIC Batwing Package

Pin Number	Pin Name	Type	Pin Description
1	V_{SENSE}	Analog Input	Auxiliary voltage sense (used for primary-side regulation).
2	V_{CC}	Power Input	Power supply for control logic.
3	GND	Ground	Ground.
4	NC		This pin must be left floating.
5	C	BJT Collector	Collector of internal BJT.
6	C	BJT Collector	Collector of internal BJT.
7	E	BJT Emitter	Emitter of internal BJT.
8	GND	Ground	Ground.
9	I_{SENSE}	Analog Input	Primary current sense. Used for cycle-by-cycle peak current control and current limit.
10	ASU	Output	Control signal. Used for active start-up device.

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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 2, 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
ASU output (pin 10)		-0.3 to 19.0	V
V_{SENSE} input (pin 1, I_{VSENSE} ≤ 10mA)		-0.7 to 4.0	V
I_{SENSE} input (pin 9)		-0.3 to 4.0	V
Collector-Base breakdown voltage	V_{CBO}	900	V
Collector-Emitter breakdown voltage	V_{CES}	900	V
Collector current (Note 1)	I_C	4	A
Collector peak current (Note 1) (t_p < 1ms)	I_{CM}	8	A
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STG}	-55 to 150	°C
Electrostatic Discharge Capability (Human Body Model), JEDEC JS-001-2017	$ESD_{(HBM)}$	±2000	V
Electrostatic Discharge Capability (Charged Device Model), JS-002-2014	$ESD_{(CDM)}$	±1000	V
Latch-up test per JESD78E		±100	mA

Notes:

Note 1. Limited by maximum junction temperature.

6 Thermal Characteristics

Parameter	Symbol	Value	Units
Thermal Resistance Junction-to-Ambient[1]	θ_{JA}	55.2	°C/W
Characterization Parameter Junction-to-Collector pin (pin 5 and pin 6)[2]	$\Psi_{J\text{-}COLLECTOR}$	5.8	°C/W
Thermal Shutdown Threshold[3]	T_{SD}	150	°C
Thermal Shutdown Recovery[3]	$T_{SD\text{-}R}$	100	°C
Thermal Shutdown Recovery[3] (iW1822-11)	$T_{SD\text{-}R}$	120	°C

Notes:

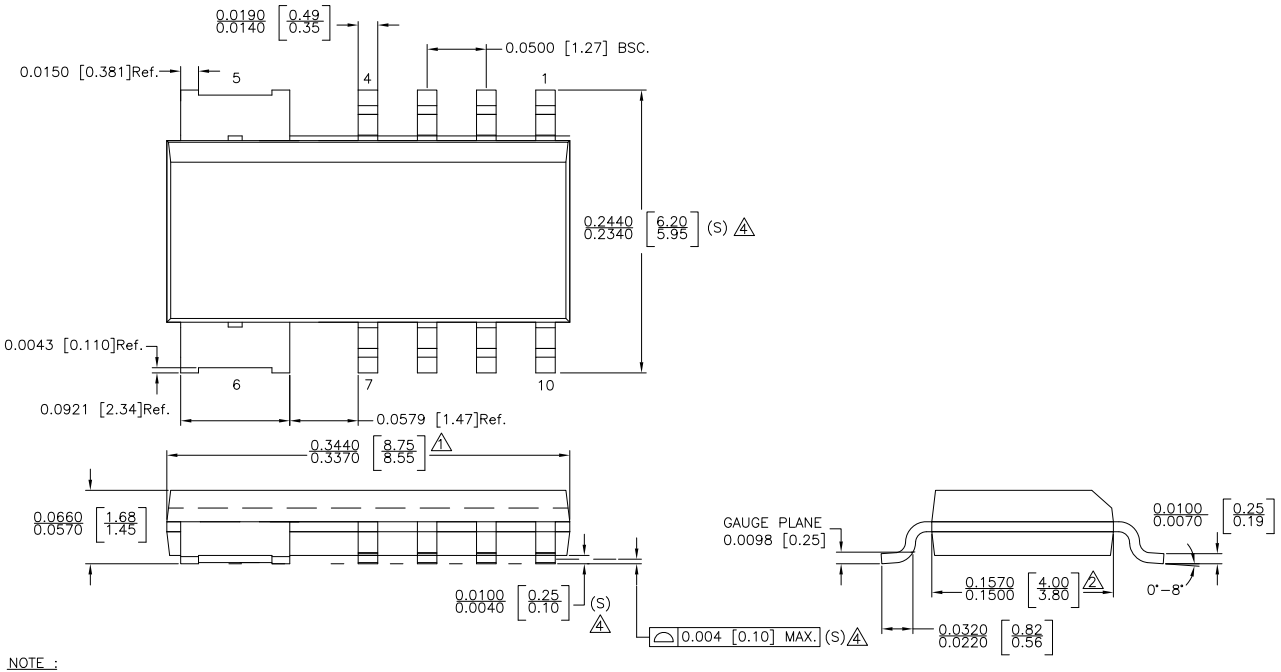
Note 1. Device is mounted on a 4-layer JEDEC board with 100mm^2 of 70µm thick copper, in a one-cubic-foot natural convection chamber.

Note 2. $\Psi_{J\text{-}COLLECTOR}$ [Psi Junction to Collector pin] provides an estimation of the die junction temperature relative to the Collector pin [internal BJT Collector] surface temperature.

Note 3. These parameters are typical and they are guaranteed by design.

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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 no.	Options	Package	Description
iW1822-00	Cable Comp = 0mV, OTP recovery threshold = 100°C	SO-10 Batwing	Tape & Reel[1]
iW1822-01	Cable Comp = 150mV, OTP recovery threshold = 100°C	SO-10 Batwing	Tape & Reel[1]
iW1822-11	Cable Comp = 150mV, OTP recovery threshold = 120°C	SO-10 Batwing	Tape & Reel[1]

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

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(Rev.1.0 Mar 2020)

Corporate Headquarters

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

Contact Information

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