15W AccuSwitch™ Quasi-Resonant PWM Controller with Integrated Power BJT for 5V Applications

1 Description

The iW1820 integrates a high performance digital AC/DC power supply controller and a power BJT switch in a power package to enable compact peak current mode PWM flyback power supplies. The device operates in quasi-resonant mode and features multiple key protection features, enabling designs with improved efficiency and lower EMI which lowering the bill of material cost.

The iW1820 features a distinctive soft-start scheme, which allows for fast and yet smooth start-up. 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 overall 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 iW1820 can achieve both the highest average efficiency and maintain less than 30mW no-load power consumption while achieving fast dynamic load response and the shortest possible start-up time for the 30mW no-load power in typical 5V adapter applications.

2 Features

- No-load power consumption < 30mW at $230V_{AC}$ with typical application circuit (5-star rating)
- ***AccuSwitch***™ technology − integrated 800V bipolar junction transistor (BJT)
- Optimized for 5V/2A AC/DC adapters/chargers with < 30mW no-load power consumption at $230V_{AC}$ and fast dynamic load response for both one-time and repetitive load transients
- 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
- Complies with EPA 2.0/CoC Ver5/DoE energy efficiency specifications with ample margin
- 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

- Compact AC/DC adapters/chargers for media tablets and smart phones
- AC/DC adaptor for consumer electronics
- AC/DC power supplies for home appliances and industrial applications

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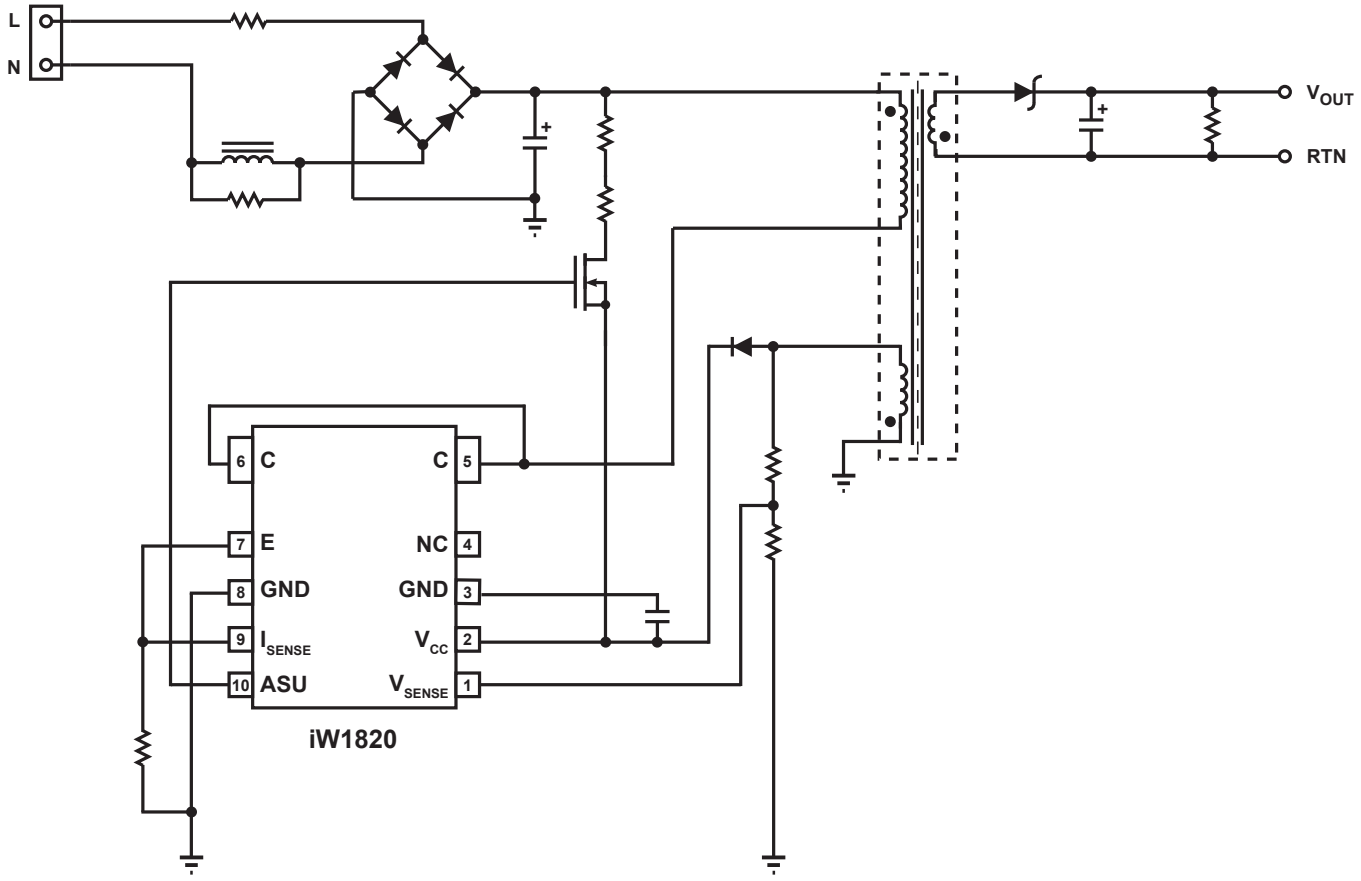


Figure 3.1 : iW1820 Typical Application Circuit
(Achieving < 30mW No-load Power Consumption. Using Depletion Mode NFET as Active Start-up Device)

WARNING:

The iW1820 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.

iW1820 Output Power Table at Universal Input ($85V_{AC}$–$264V_{AC}$)

Condition	Open Frame[1]
Output Power (W)[2]	15

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

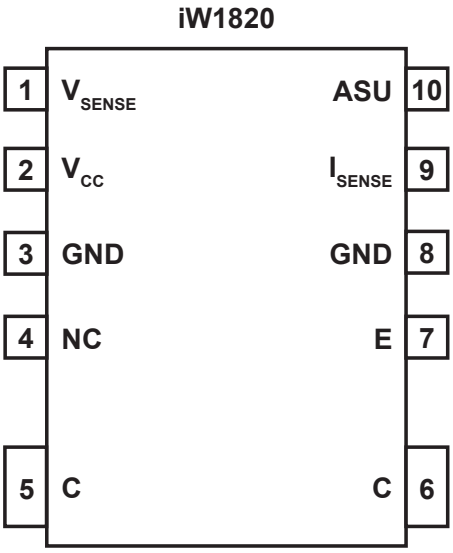


Figure 4.1 : 10-Lead SOIC Batwing Package

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		
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-Emitter breakdown voltage (Emitter and base shorted together; I_C = 1mA, R_{EB} = 0Ω)	V_{CES}	800	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-001-2012	$ESD_{(HBM)}$	±2000	V
Electrostatic Discharge Capability (Charged Device Model), JESD22-C101	$ESD_{(CDM)}$	±1000	V
Latch-up test per JESD78D		±100	mA

Notes:

Note 1. Limited by maximum junction temperature.

6 Thermal Characteristics

Parameter	Symbol	Value	Units
Thermal Resistance Junction-to-Ambient (Note 1)	θ_{JA}	TBD	°C/W
Thermal Resistance Junction-to-GND pin (pin 8) (Note 2)	ψ_{JB}	TBD	°C/W
Thermal Resistance Junction-to-Collector pin (Note 2)	$\psi_{J\text{-}BJT}$	TBD	°C/W
Thermal Shutdown Threshold (Note 3)	T_{SD}	150	°C
Thermal Shutdown Recovery (Note 3)	$T_{SD\text{-}R}$	100	°C

Notes:

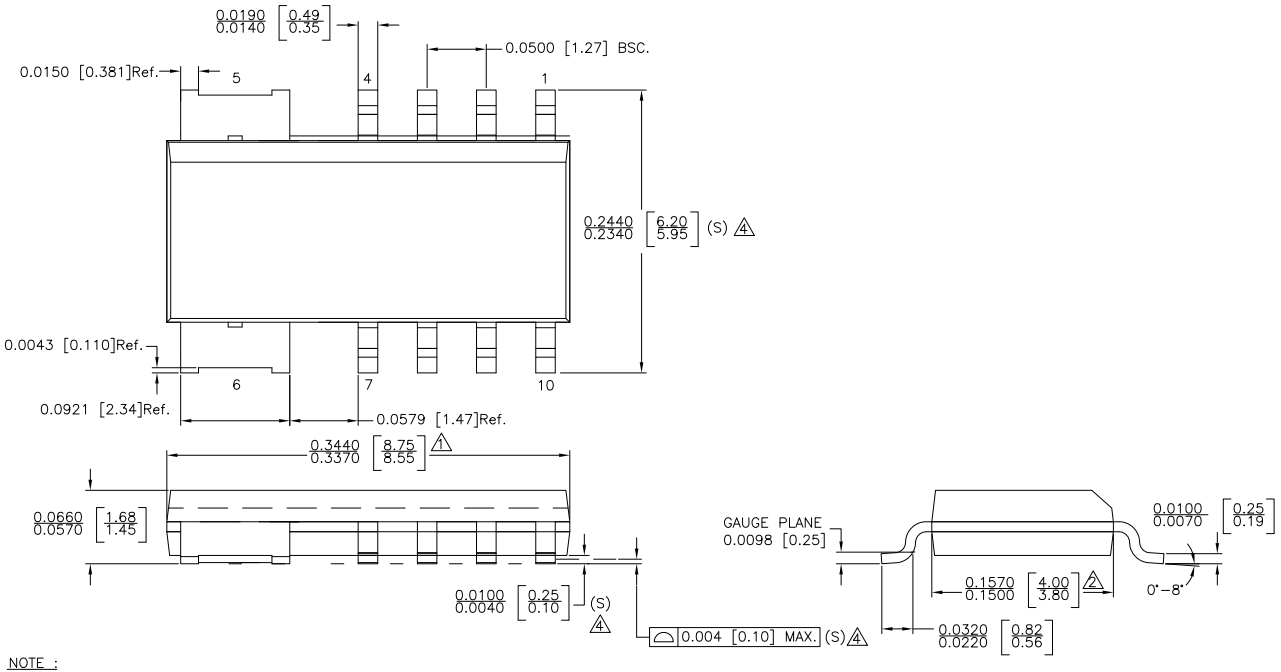
Note 1. Device is mounted on a JEDEC single-sided board with 100mm² of 35µm thick copper, in a one-cubic-foot natural convection chamber with 1W dissipated power.

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 3) without using any thermal adhesives. See Section 10.14 for more information.

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
iW1820-30	Cable Comp = 0mV, OTP recovery threshold = 100°C	SO-10 Batwing	Tape & Reel[1]
iW1820-31	Cable Comp = 300mV, OTP recovery threshold = 100°C	SO-10 Batwing	Tape & Reel[1]
iW1820-33	Cable Comp = 450mV, OTP recovery threshold = 100°C	SO-10 Batwing	Tape & Reel[1]
iW1820-35	Cable Comp = 150mV, OTP recovery threshold = 100°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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