

RapidCharge™ AC/DC Primary-Side Digital ZVS Flyback Controller

1 Description

The iW9802 is a high-performance AC/DC primary-side digital flyback controller with advanced zero voltage switching (ZVS) and adaptive multi-mode-control (MMC) working with secondary-side regulation (SSR) for applications requiring high power density and high resolution in output voltage/current setting. The device can support rapid charge applications such as travel adapters (TA) of 40W and above. It operates under multi-mode control (MMC) including PWM, PFM and burst mode with main switch ZVS turn-on at high line voltage to achieve less switching loss and low EMI. It also provides a number of key built-in protection features. The iW9802 is optimized to work with Dialog's secondary-side controller, the iW72x, for SSR, synchronous rectifier (SR) control and D+/D- based protocols support. The iW9802/iW72x chipset can achieve tight multi-level constant voltage (CV) and multi-level constant current (CC) regulation in very fine steps for rapid charge applications. With SSR digital compensation, the chipset eliminates the need for external loop compensation components while maintaining stability under all operating conditions. The iW9802 is also compatible with TL431 or third party secondary-side ICs with SSR and rapid charge protocols.

The iW9802 and iW72x chipset can support D+/D- based protocols to achieve fast and smooth CV/CC transitions upon request by mobile devices (MD). The iW9802 and iW72x chipset can meet no-load power consumption of less than 60mW for typical 40W to 66W designs at 5V output setting.

Dialog's innovative proprietary technology ensures that power supplies designed with the iW9802 and iW72x chipset can achieve high efficiency, high accuracy voltage/current control and fast dynamic load response.

2 Features

- Supports Rapid Charge adapters applications of around 40W and above
- Supports constant-voltage (CV) and constant-current (CC) regulation in fine steps by secondary-side regulation (SSR)
- Dialog's patented adaptive ZVS control minimizes switching loss to enable high efficiency and low EMI
- User configurable ZVS timing to optimize performance for different power MOSFETs
- Adaptive multi-mode control (MMC) using PWM/PFM/Burst modes based on input voltage and output voltage/current improves efficiency across any load and eliminates audible noise
- Adaptive quasi-resonant (QR) mode and continuous conduction mode (CCM) operation at low line voltage
- Built-in single-point fault protections
 - » AC line voltage brown-out
 - » Output short-circuit
 - » Output over-voltage
 - » Optocoupler failure
- User programable internal over-temperature protection (OTP) threshold for various thermal requirements
- 10-lead SOIC package

3 Applications

- Rapid-charging AC/DC adapters for smart phones, tablets, notebook and other portable devices

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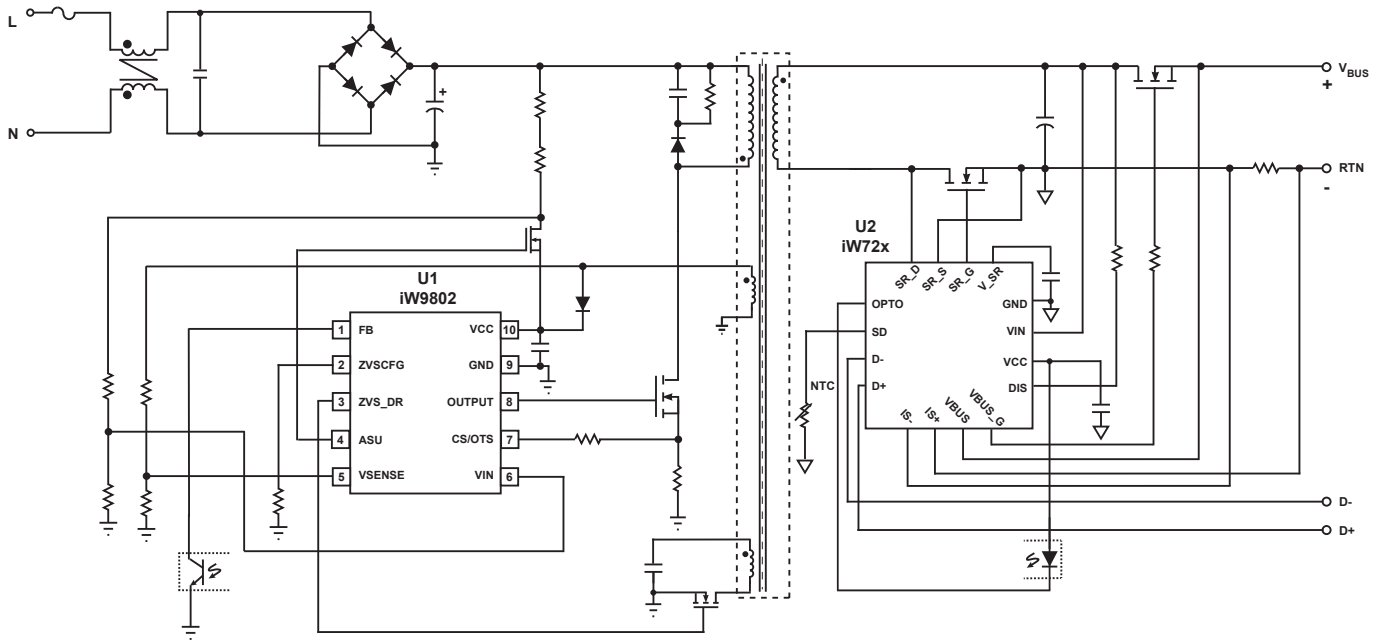


Figure 3.1 : iW9802 Typical Application Circuit with Active Start-up Circuit (Using iW72x as Secondary-Side Controller. Achieving Multi-Level CV/CC Regulation)

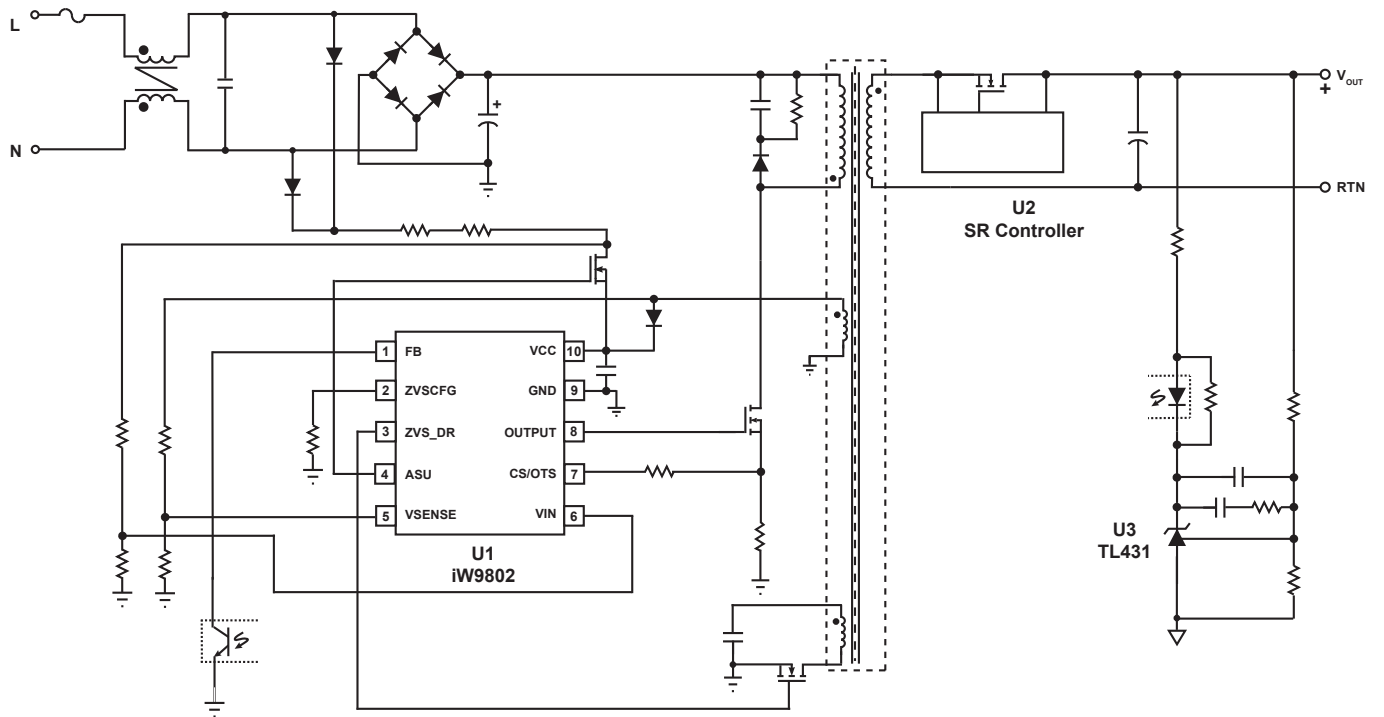
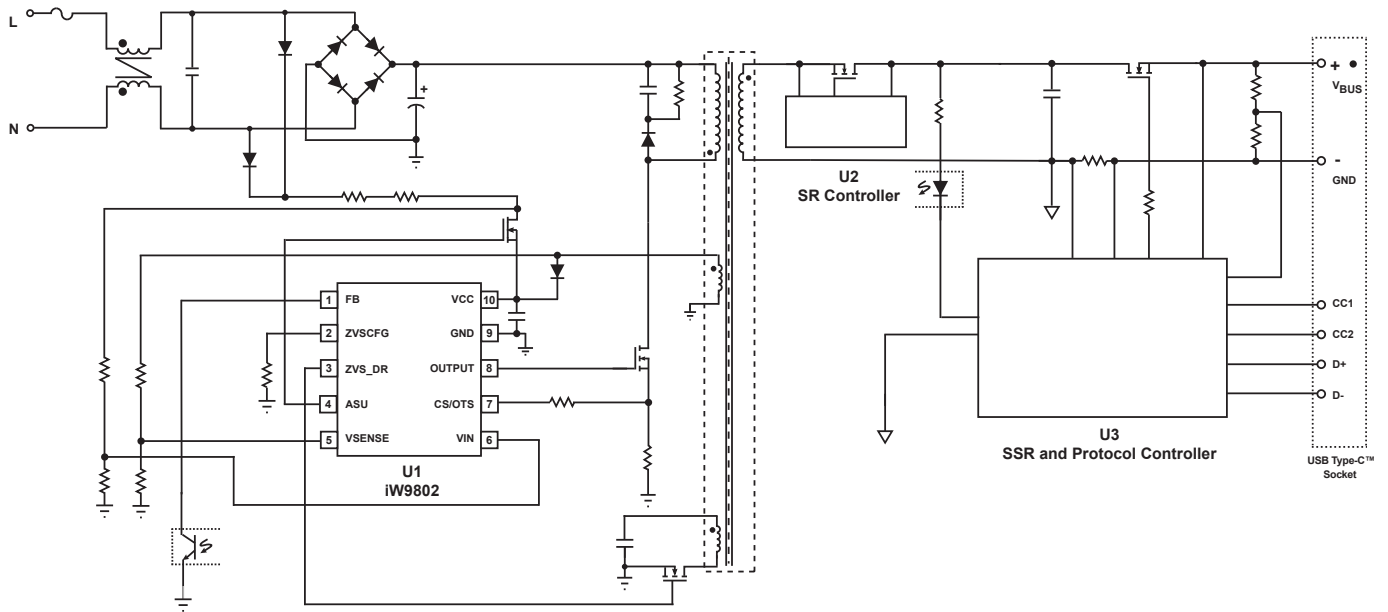


Figure 3.2 : iW9802 Typical Application Circuit with Active Start-up Circuit (Pairing with TL431. Achieving Fixed Voltage CV Regulation)

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**Figure 3.3 : iW9802 Typical Application Circuit with Active Start-up Circuit
(Using Third Party Controllers for SSR, USB PD and SR. Achieving Multi-Level CV/CC Regulation)**

Note: A PFC stage is normally required for the applications of 75W and above.

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4 Pinout Description

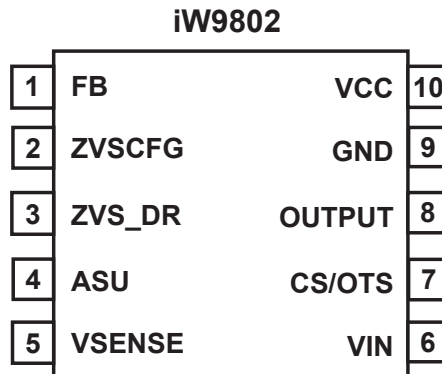


Figure 4.1 : 10-Lead SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	FB	Analog Input	Feedback signal. Used for determining multi-mode control and cycle-by-cycle peak current control.
2	ZVSCFG	Analog Input	ZVS timing configuraton. Used for fine-tuning of ZVS switching turn-on time.
3	ZVS_DR	Analog Output	Gate drive for auxiliary MOSFET for ZVS purpose.
4	ASU	Analog Output	Control Signal. Used for active start-up device (BJT or depletion mode N-FET)
5	VSENSE	Analog Input	Voltage sensing. Used for output voltage sensing and auxiliary winding ringing voltage sensing.
6	VIN	Analog Input	Input AC line voltage detection. Used for AC line voltage detection and optional AC unplug detection for X-capacitor discharge.
7	CS/OTS	Analog Input	Current sensing and over temperature setting. Used for cycle-by-cycle peak-current control and limit. During configuration stage, it can be used to configure certain parameters, such as internal over-temperature protection setting.
8	OUTPUT	Analog Output	Gate drive for power MOSFET.
9	GND	Ground	Ground.
10	VCC	Power Input	IC power supply.

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5 Absolute Maximum Ratings

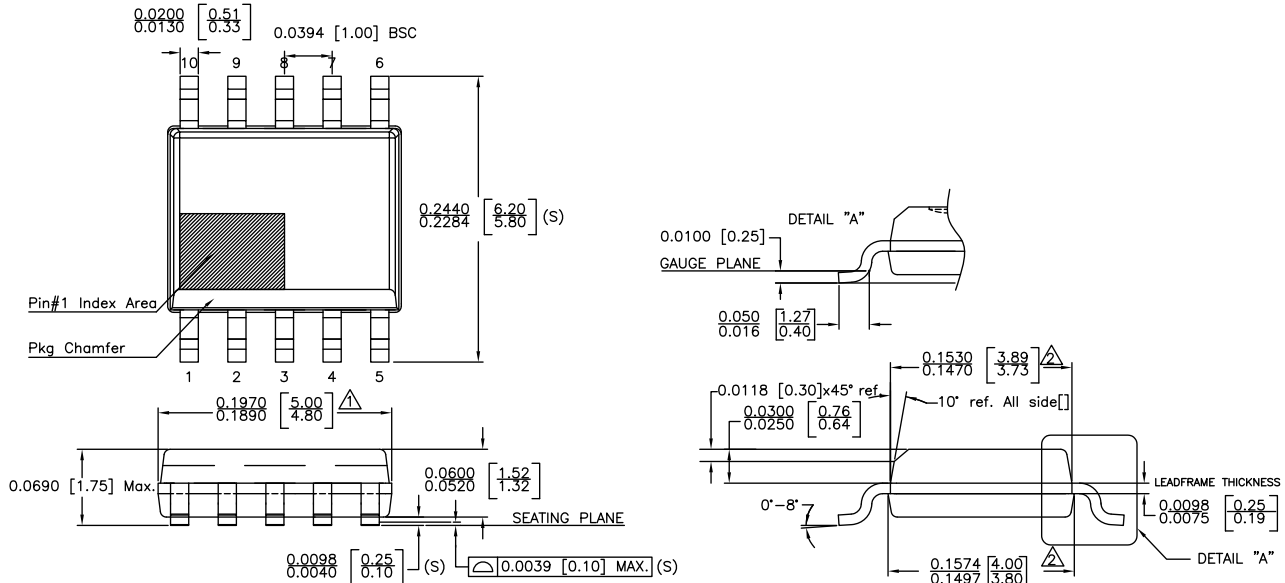
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range	V_{VCC}	-0.3 to 45	V
Continuous DC supply current at VCC pin ($V_{VCC} = 15V$)	I_{VCC}	20	mA
VSENSE input ($I_{VSENSE} \leq 10mA$)		-0.7 to 10	V
FB voltage		-0.3 to 5.0	V
ZVSCFG voltage		-0.3 to 5.5	V
ZVS_DR voltage		-0.3 to 20	V
VIN voltage		-0.3 to 5	V
ASU voltage		-0.3 to 45	V
CS/OTS voltage		-0.3 to 5.5	V
OUTPUT voltage		-0.3 to 20	V
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STO}	-65 to 150	°C
Thermal Resistance Junction-to-Ambient	θ_{JA}	160	°C/W
ESD rating per JEDEC JS-001-2017		±2,000	V
Latch-up test per JESD78E		±100	mA

Notes:

- Note 1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

6 Physical Dimensions



NOTE :

- △ DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 INCH PER SIDE.
- △ 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 EXCEPT LEAD PITCH.
- 4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
- 5. CONTROLLING DIMENSIONS IN INCHES.[mm]
- 6. PHYSICAL APPEARANCE OF PACKAGE (E-PIN, DIMPLE, CHAMFER) MAY VARY DUE TO ASSEMBLY TOOLINGS

STATUS:	
RELEASED	
TERMINAL FINISH:	
PPF or 100% Sn	
TITLE:	
SOP 10L 150MIL PACKAGE OUTLINE	
REV:	REVISION NOTE:
C	STANDARDIZED PCD

Figure 6.1 : 10-Lead SOIC Package Outline Drawing
(For pin 1 identifier and top marking information, please see section 8)

7 Ordering Information

Part no.	Options								Package	Description
	V _{BUS} range	CCM	ZVS	F _{SW(MAX)} at low line	F _{SW(MAX)} at high line	V _{BUS} /V _{SENSE}	X-cap discharge	Pairs with		
iW9802-04	3.3V to 12V	Yes	Yes at high line	80kHz	75kHz	5:1	No	iW72x	SOIC-10	Tape & Reel ¹
iW9802-07	Fixed output	Yes	Yes at high line	100kHz	95kHz	5:0.7	Yes	TL431	SOIC-10	Tape & Reel ¹
iW9802-16	3.3V to 21V	Yes	Yes at high line	90kHz	95kHz	5:0.7	No	iW72x	SOIC-10	Tape & Reel ¹
iW9802-21	3.3V to 21V	No	Yes	140kHz	150kHz	5:0.7	Yes	3 rd party IC	SOIC-10	Tape & Reel ¹
iW9802-23	3.3V to 21V	No	Yes	80kHz	75kHz	5:0.7	Yes	3 rd party IC	SOIC-10	Tape & Reel ¹

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

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8 Top Marking

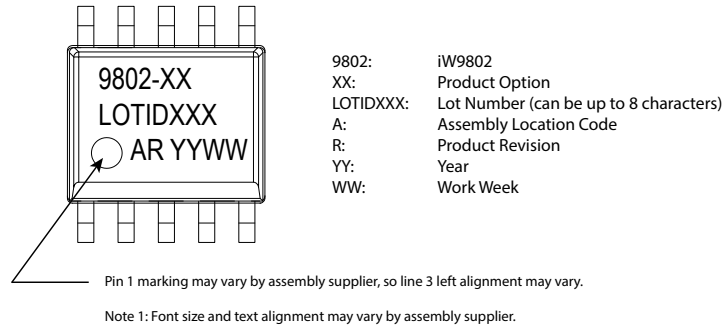


Figure 8.1 : Top Marking for the iW9802

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