# iW690

Zero Standby Power AC/DC Secondary-Side Regulation and Synchronous Rectification Controller

The iW690 is an AC/DC secondary-side controller designed to work with the iW9860/iW9870 primary-side controllers for zero standby power, high active mode efficiency flyback power supplies. The iW690 is designed for output power applications up to 140W+.

The iW690 measures the output voltage and load current and sends the results to a digital compensator for closed-loop control of flyback converter. The digital control signal generated by the compensator is converted to an analog signal and transferred to primary controller via an optocoupler.

The iW690 is also an advanced synchronous rectifier (SR) controller with an integrated MOSFET driver. The device works with an external power MOSFET to replace the main rectifying diode on the secondary of a flyback converter. The SR control block with proprietary technologies optimizes the SR on/off timing and driving voltage to achieve best efficiency.

The iW690 should be paired with Renesas' high power-density Flyback primary-side controllers such as the iW9860 to achieve high efficiency, accurate voltage/current control and fast dynamic load response. Furthermore, iW9860 and iW690 can enter an extremely low consumption state when the output is at no-load so that the power supply standby power is < 5mW (Zero standby power).

## Features

- Zero standby power secondary-side controller when paired with the iW9860/iW9870 (< 5mW at $230V_{AC}$ and no-load connected to the output)
- Configurable fixed output voltage and current
  - Supports up to 21V
  - Supports up to 7A current and both 5mΩ and 10mΩ sense resistors
- High resolution accuracy output voltage and current control
- Built-in digital loop compensation to minimize the external component count
- Built-in synchronous rectification controller with integrated driver
- Optimized $V_{DS}$-based SR timing and driving control with wide output range
- NFET driver for $V_{BUS}$ disconnect switch for off-mode
- Built-in single-point fault protections against output short-circuit, output over-load, output over-voltage, and optocoupler failure
- Dual over-temperature-protection (OTP): IC's internal junction temperature and external NTC
- Supports DCM and CCM operation
- 14-Lead TDFN package

## Applications

- Zero standby power consumption flyback converters for TVs/monitors/home appliances
- Motor control power supplies
- Power tools
- Table lamps

# Contents

# 1. Overview

## 1.1 Typical Application

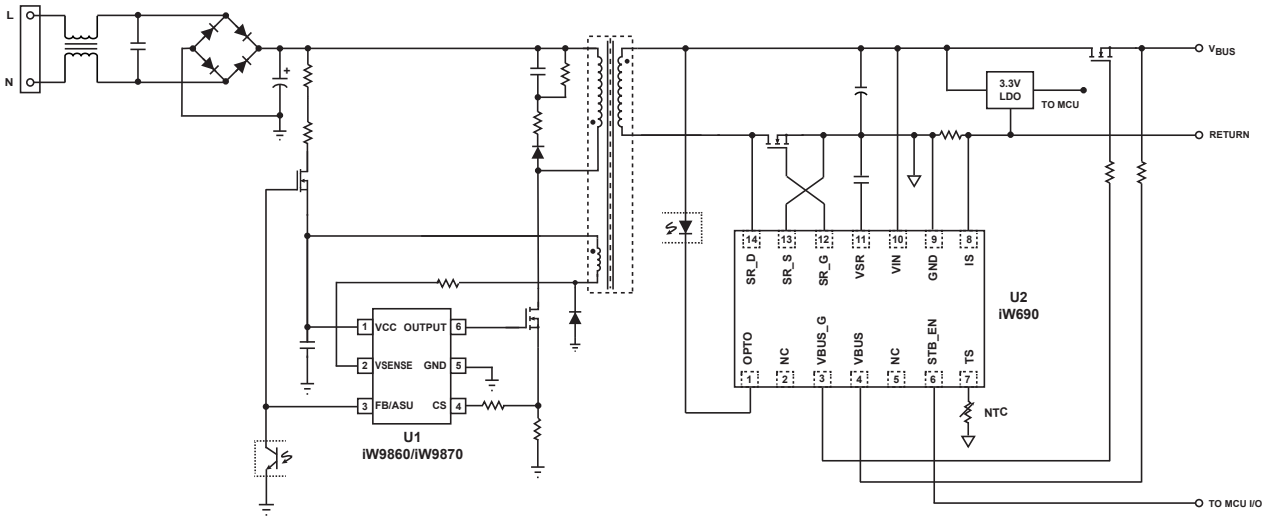


**Figure 1. iW690 Typical Application Circuit for Multi-Level Voltage and Current (Using iW9860/iW9870 as Primary-Side Controller, Achieving < 5mW No-Load Power Consumption).**

# 2. Pin Information

## 2.1 Pin Assignments

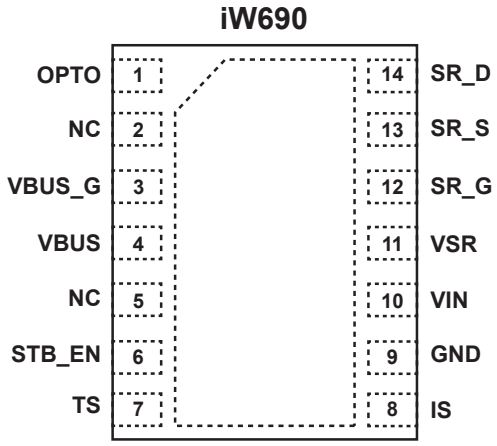


**Figure 2. Top View**

## 2.2 Pin Description

| Pin Number | Pin Name | Type | Description |
|---|---|---|---|
| 1 | OPTO | Analog Output | Optocoupler driver. |
| 2 | NC | Open | No Connection. |
| 3 | VBUS_G | Analog Input/Output | Gate drive for external VBUS switch. |
| 4 | VBUS | Analog Input/Output | Connect to VBUS switch source pin. |
| 5 | NC | Open | No Connection. |
| 6 | STB_EN | Analog Input | High to enter standby mode. Low to exit standby mode. |
| 7 | TS | Analog Input | Temperature sensing pin. Connect to an external NTC resistor to measure the power adapter temperature. |
| 8 | IS | Analog Input | Connect to current sensing resistor positive terminal. |
| 9 | GND | Ground | IC ground. |
| 10 | VIN | Power<br>Analog Input | Voltage supply for the IC. |
| 11 | VSR | Power | Voltage supply for SR drive. Connect to a capacitor. |
| 12 | SR_G | Analog Output | Synchronous rectifier MOSFET driver. |
| 13 | SR_S | Analog Input | Synchronous rectifier MOSFET source input. |
| 14 | SR_D | Analog Input | Synchronous rectifier MOSFET drain voltage sensing and the Pulse Linear Regulator (PLR) input. |

# 3. Specifications

[The spec data in the following tables is for example purposes only and will vary per device or technology.]

## 3.1 Absolute Maximum Ratings

**CAUTION:** Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions can adversely impact product reliability and result in failures not covered by warranty.

| Parameter | Symbol | Minimum | Maximum | Unit |
|---|---|---|---|---|
| $V_{VIN}$ DC supply voltage range ($I_{VIN}$ = 12mA max) | $V_{VIN}$ | -0.3 | 25 | V |
| Continuous DC supply current at VIN pin ($V_{VIN}$ = 12V) | $I_{VO}$ | | 12 | mA |
| SR_G peak output current | $I_{SR\_G}$ | | ±2 | A |
| SR_G voltage | $V_{SR\_G}$ | -0.6 | 6 | V |
| SR_D voltage (Note 1) | $V_{SR\_D}$ | -1.5 | 100 | V |
| SR_D peak current | $I_{DRAIN}$ | -40 | 300 | mA |
| SR_S voltage | $V_{SR\_S}$ | -0.5 | 6 | V |
| V_SR voltage | $V_{V\_SR}$ | | 6 | V |
| OPTO voltage | $V_{OPTO}$ | -0.6 | 25 | V |
| STB_EN voltage | $V_{STB\_EN}$ | -0.3 | 25 | V |
| IS voltage | $V_{IS+}$ | -0.3 | 7 | V |
| TS voltage | $V_{SD}$ | -0.3 | 7 | V |
| VBUS voltage (IBUS < 10mA) | $V_{VBUS}$ | -0.7 | 25 | V |
| VBUS_G voltage | $V_{VBUS\_G}$ | -0.7 | 30 | V |
| Maximum Junction Temperature | $T_{JMAX}$ | -40 | 150 | °C |
| Maximum Storage Temperature Range | $T_{STG}$ | -65 | 150 | °C |
| **ESD Rating** | | **Value** | | **Unit** |
| Human Body Model (Tested per JS-001-2017) | | ±2,000 | | V |
| Latch-Up (Tested per JESD78E; Class 2, Level A) | | ±100 | | mA |

1. The DRAIN pin voltage should not be below -0.6V for more than 500ns.

## 3.2 Thermal Specifications

| Thermal Resistance (Typical) | $\theta_{JA}$ (°C/W) [1] |
|---|---|
| 14-Lead TDFN Package | TBD |

# 4. Package Outline Drawings

The package outline drawings are located at the end of this document and are accessible from the Renesas website. The package information is the most current data available and is subject to change without revision of this document.

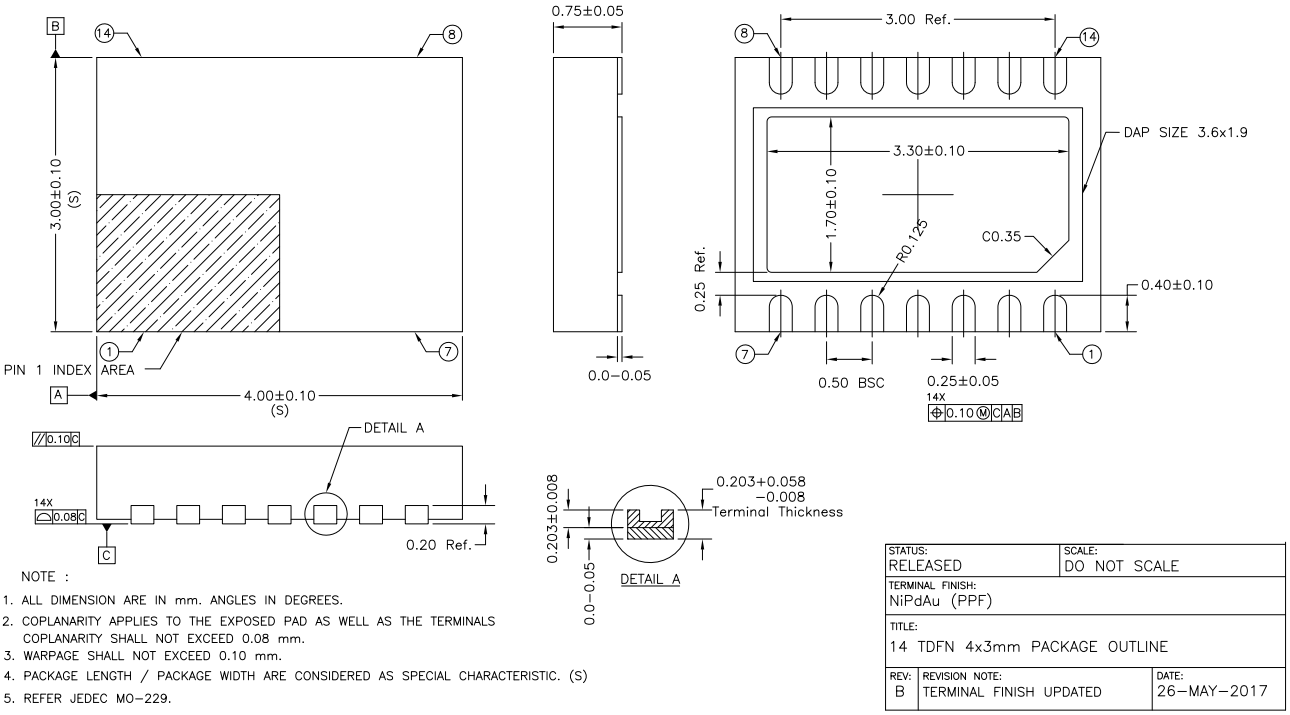


**Figure 3. 14-Lead TDFN Package**

# 5. Ordering Information

| Part no. | Options | | | Package | Description |
|---|---|---|---|---|---|
| | Output Voltage | Output Power | Primary-Side Controller | | |
| iW690-XX | TBD | TBD | iW9860<br>iW9870 | 14-Lead TDFN | Tape & Reel[1] |

1. Tape & Reel packing quantity is 3,000/reel. Minimum packing quantity is 3,000.

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