## AC/DC Secondary-Side Synchronous Rectification and Rapid Charge™ Interface Controller for Qualcomm® Quick Charge™ 3.0

## 1 Description

The iW662 is an AC/DC secondary-side combo controller for Qualcomm® Quick Charge™ 3.0 (QC3.0) which includes USB interface, secondary-to-primary communication and synchronous rectification functions in a single IC.

The iW662 resides on the secondary side of an AC/DC power supply and allows the adapter to be configured for multi-level output voltages from 3.6V to 12V in 200mV increments, depending on the voltage requested by the mobile device (MD). It can be used in Dialog's primary-side controlled AC/ DC systems to achieve fast voltage transition, low no-load power consumption, and fast dynamic load response.

The iW662 uses Dialog's proprietary XM-Comm secondary-to-primary digital communication technology. When paired with one of Dialog's primary-side controllers, the iW1790 or iW1796, the optocoupler can be completely eliminated in the system. The iW662 transmits all necessary information for rapid charge through the power transformer, including output voltage requests, output current limits, output voltage undershoot, output over-voltage, and fault and reset signals.

The iW662 is also an advanced synchronous rectifier (SR) controller with an integrated MOSFET driver, enabling discontinuous mode flyback converters with high efficiency operation. The device works with an external power MOSFET to replace the main rectifying diode on the secondary of a flyback converter, improving efficiency by reducing secondaryside conduction losses. Dialog's digital adaptive turn-off control technology minimizes turn-off deadtime, eliminating the need for an additional Schottky diode that is typically needed in parallel with the synchronous MOSFET in conventional synchronous rectifiers.

The iW662 and iW1790/iW1796 provide double-layer cable protection. On the secondary side, the iW662 incorporates Dialog's proprietary D+/D- over-voltage protection to address $V_{BUS}$ D+/D- soft shorts. On the primary side, the iW1790/ iW1796 uses Dialog's advanced fault control technology to reduce the average output power during soft shorts without latch.

Qualcomm® Quick Charge™ 3.0 is a product of Qualcomm Technologies, Inc.

## 2 Features

- XM-Comm proprietary secondary-to-primary digital communication transmits all information for rapid charge without an optocoupler: output voltage requests, output current limits, output voltage undershoot, over-voltage protection, and other fault and reset signals

- Lossless MOSFET $V_{DS}$ sensing for SR timing control with digital adaptive turn-off control

- Optimized 5V MOSFET gate driver

- High-voltage drain sensing up to 100V with no additional external clamping circuits required

- Supports Qualcomm® Quick Charge™ 3.0 technology High Voltage Dedicated Charging Port (HVDCP) to provide $V_{BUS}$ from 3.6V to 12V in 200mV increments

- Double-layer cable protection:

  » Secondary side (iW662): Proprietary D+/D- over-voltage protection (OVP) addresses $V_{BUS}$ D+/D-soft shorts

  » Primary side (iW1790/iW1796): advanced fault control technology reduces average output power at fault conditions without latch

- Adaptive OVP/UV detection for most $V_{BUS}$ levels

- Backward compatible with QC2.0 and USB Battery Charging Specification Revision 1.2 (USB BC1.2)

- Wide operating voltage range from 3V to 16V

- Programmable active fast discharge from a high voltage to 5V at MD unplug or from a high voltage level to a lower level upon request with built-in switch or external switch

- Intelligent low power mode enables < 20mW no-load power consumption

- 8-Lead SOIC package

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**AC/DC Secondary-Side Synchronous Rectification and Rapid Charge™**
**Interface Controller for Qualcomm® Quick Charge™ 3.0**

## 3 Applications

- 18W/24W QC AC/DC adapters for smart phones,
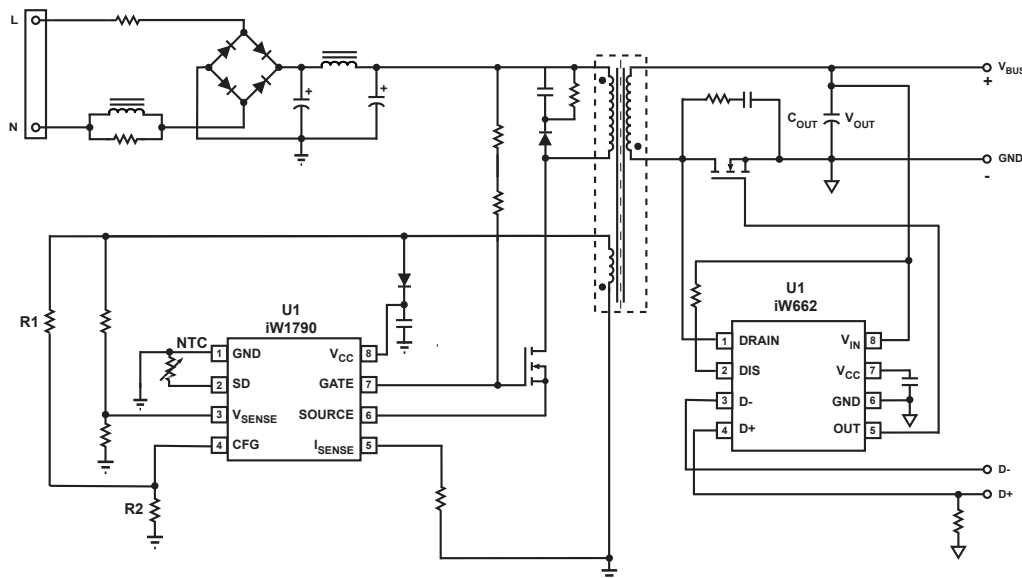  tablets, and other portable devices



**Figure 3.1 : iW662 18W/24W Typical Application Circuit for Multi-Level Output Voltage and Current (Using iW1790 as Primary-Side Controller. Achieving < 20mW No-Load Power Consumption.)**
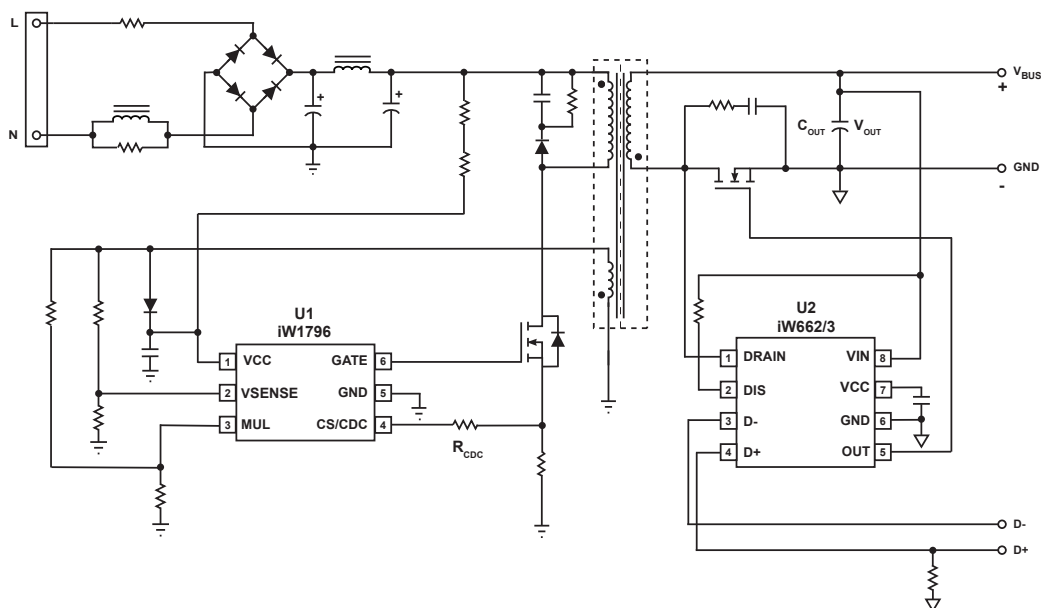


**Figure 3.2 : iW1796 Typical Application Circuit for Multi-Level Output Voltage and Current**
**(Using iW662/3 as Secondary-Side Controller for Rapid Charge Protocols. Achieving < 75mW No-Load Power Consumption (with ample margin) in Typical 15W Design.)**

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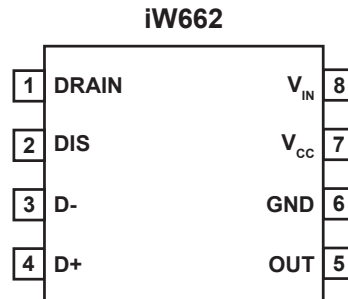
## 4 Pinout Description

**iW662**



**Figure 4.1 : 8-Lead SOIC Package**

| Pin No. | Pin Name | Type | Pin Description |
|---------|----------|------|-----------------|
| 1 | DRAIN | Analog Input | Synchronous rectifier MOSFET drain voltage sensing and the Pulse Linear Regulator (PLR) input. |
| 2 | DIS | Analog Output | Discharging circuit. Used for fast discharging of output capacitor. |
| 3 | D- | Analog Input | USB D- signal. |
| 4 | D+ | Analog Input | USB D+ signal. |
| 5 | OUT | Output | Synchronous rectifier MOSFET driver. |
| 6 | GND | Ground | Ground. |
| 7 | $V_{CC}$ | Power Input | LDO and PLR output. Connect this pin to a capacitor. |
| 8 | $V_{IN}$ | Analog Input | Input of the internal LDO and output voltage sensing circuit. Connect to adapter/charger output for bias voltage. The internal LDO clamps the $V_{CC}$ voltage at 5V when $V_{IN}$ > 5V. |

**iW662**

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## 5 Absolute Maximum Ratings

Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Electrical Characteristics in Section 6.

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| $V_{IN}$ DC supply voltage range ($I_{CC}$ = 15mA max) | $V_{IN}$ | -0.3 to 33 | V |
| Continuous DC supply current at $V_{IN}$ pin ($V_{IN}$ = 25V) | $I_{VO}$ | 15 | mA |
| Continuous DC supply current at $V_{CC}$ pin ($V_{CC}$ = 5.5V) | $I_{VCC}$ | 15 | mA |
| Gate peak output current | $I_G$ | ±3 | A |
| DRAIN pin voltage (Note 1) | $V_D$ | -1.5 to 100 | V |
| DRAIN pin peak current | $I_{DRAIN}$ | -40 to 350 | mA |
| OUT pin voltage | $V_{OUT}$ | -0.6 to $V_{CC}$ +0.6 | V |
| $V_{CC}$ pin voltage | $V_{CC}$ | -0.6 to 6 | V |
| DIS pin voltage | $V_{DIS}$ | 30 | V |
| D+ pin voltage | $V_{D+}$ | -0.3 to 7 | V |
| D- pin voltage | $V_{D-}$ | -0.3 to 7 | V |
| Junction temperature | $T_J$ | -40 to 150 | °C |
| Storage temperature | | -65 to 150 | °C |
| ESD rating per JEDEC JESD22-A114 (D+ and D- pins) | | ± 6,000 | V |
| ESD rating per JEDEC JESD22-A114 (all other pins) | | ± 2,000 | V |

**Notes:**

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

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## 6 Physical Dimensions
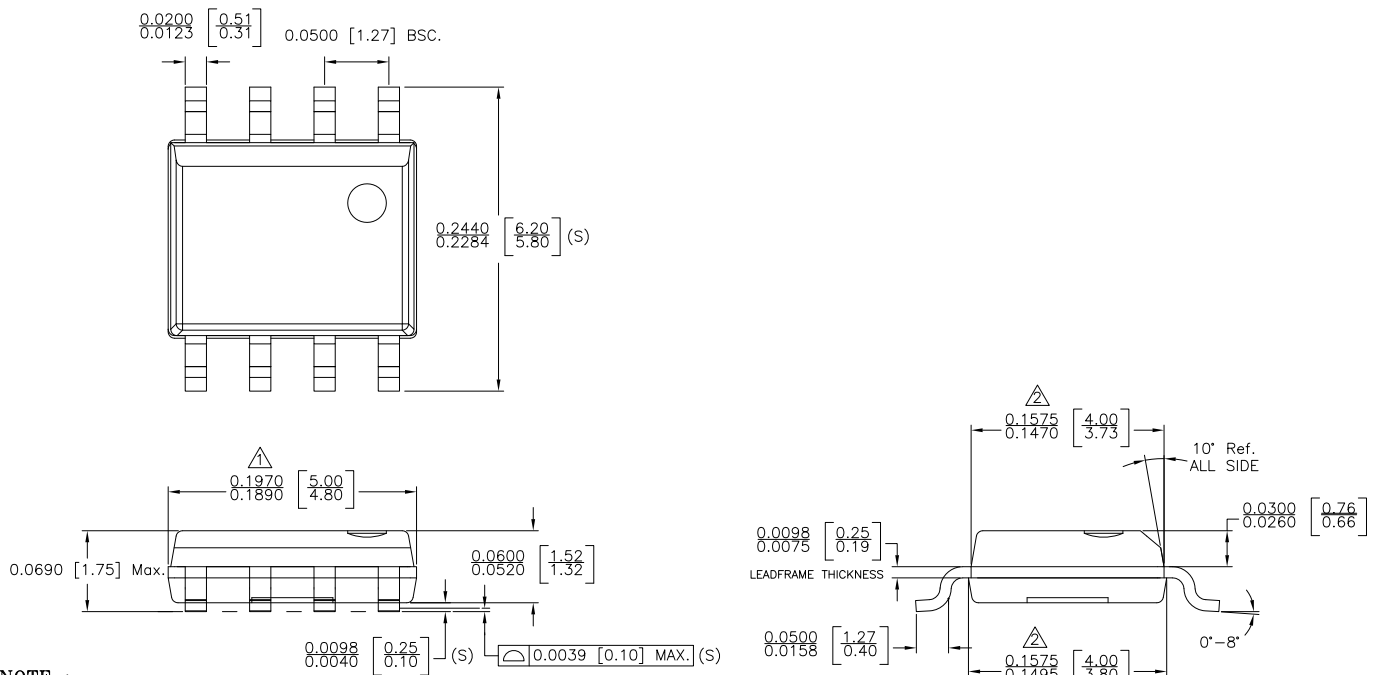


NOTE :

⚠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.

4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED
   AS SPECIAL CHARACTERISTIC.(S)

5. CONTROLLING DIMENSIONS IN INCHES. [mm]

| STATUS: | SCALE: |
|---|---|
| RELEASED | DO NOT SCALE |

TERMINAL FINISH:
100% Sn or NiPdAu (PPF)

TITLE:
8 SOIC PACKAGE OUTLINE

| REV: | REVISION NOTE: | DATE: |
|---|---|---|
| A | NEW DRAWING | 02−MAR−2015 |

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## 7 Ordering Information

| Part no. | Options | | | | Package | Description |
|---|---|---|---|---|---|---|
| | $V_{BUS}$ Range | $k_{CC}$ | Primary-Side Controller | OVP Level | | |
| iW662-00-SO8 | 3.6V to 12V | 0.422 for $V_{BUS}$ = 3.6V to 8V Determined by constant max power for 8.2V to 12V | iW1790-08/ iW1796-08 | Note 1 | SOIC-8 | Tape & Reel[2] |
| iW662-01-SO8 | 3.6V to 12V | 0.5 for $V_{BUS}$ = 3.6V to 6V Determined by constant max power for 6.2V to 12V | iW1790-09/ iW1796-09 | Note 1 | SOIC-8 | Tape & Reel[2] |
| iW662-02-SO8 | 3.6V to 12V | 0.5 for $V_{BUS}$ = 3.6V to 8V Determined by constant max power for 8.2V to 12V | iW1790-09/ iW1796-09 | Note 1 | SOIC-8 | Tape & Reel[2] |
| iW662-03-SO8 | 3.6V to 12V | 0.5 for $V_{BUS}$ = 3.6V to 6V Determined by constant max power for 6.2V to 12V | iW1790-19/ iW1796-19 | 14.76V | SOIC-8 | Tape & Reel[2] |
| iW662-05-SO8[3] | 3.6V to 9V | 0.422 for $V_{BUS}$ = 3.6V to 9V | iW1790-08 | Note 1 | SOIC-8 | Tape & Reel[2] |
| iW662-08-SO8[3] | 3.6V to 9V | 0.422 for $V_{BUS}$ = 3.6V to 9V | iW1796-08 | Note 1 | SOIC-8 | Tape & Reel[2] |
| iW662-18-SO8[3] | 3.6V to 9V | 0.422 for $V_{BUS}$ = 3.6V to 9V | iW1790-18 | 11.07V | SOIC-8 | Tape & Reel[2] |

Note 1: The OVP threshold is adjusted according to the nominal output voltage. For details, see the Discharge/UV/OV section of the electrical characteristics table in section 6.

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

Note 3: This option is a customized product option with 12V disabled. Adapters designed with this product option may not pass QC2.0 HVDCP compliancy test.

# AC/DC Secondary-Side Synchronous Rectification and Rapid Charge™ Interface Controller for Qualcomm® Quick Charge™ 3.0

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