High Performance AC/DC Primary-Side Rapid Charge™ PWM Controller Supporting XM-Comm Technology

1 Description

The iW1798 is a high performance AC/DC power supply controller for Rapid Charge applications that uses transformer communication (XM-Comm) technology to minimize external component count and simplify system design. The iW1798 can support high power applications with power ratings of 45W or up and it can support voltage step requests up to 21V. The device operates in quasi-resonant mode to provide high efficiency and it also provides a number of key built-in protection features. The iW1798 can achieve tight multi-level constant voltage and multi-level constant current regulation without a traditional secondary feedback circuit. It also eliminates the need for loop compensation components while maintaining stability over all operating conditions.

The iW1798 is optimized to work with Dialog's secondary-side controller supporting XM-Comm technology for various rapid charge protocols, such as Qualcomm® Quick Charge™ 2.0 and 3.0 technologies, Huawei Fast Charger Protocol (FCP), and USB Power Delivery (PD), to achieve fast and smooth voltage transitions upon request by mobile devices (MD). When paired with the iW662/3, the iW1798 completely eliminates the optocoupler between primary and secondary side. Using Dialog's proprietary transformer communication technology, XM-Comm, the iW662/3 can communicate with the iW1798 to send output voltage requests, output current limits, output voltage undershoot and over voltage information without any additional external components. The iW1798 paired with the iW662/3 can provide fast dynamic load response in typical AC/DC rapid charge adapter designs.

The iW1798 can provide no-load power consumption for a typical 5V output setting of less than 75mW with ample margin. The no-load power consumption can be reduced to less than 20mW with an optional, external active start-up DFET.

Dialog's innovative proprietary technology ensures that power supplies designed with the iW1798 and iW662/3 can provide various output voltage configurations for QC2.0/QC3.0/FCP/USB PD and other proprietary protocols, with various user-selected output current limit combinations.

Qualcomm® Quick Charge™ 2.0 and 3.0 are products of Qualcomm Technologies, Inc.

2 Features

- Supports 45W or up application circuit designs
- Supports 10mV voltage step request up to 21V required by USB PD programmable power supply (PPS) or other proprietary rapid charge protocols
- Integrated XM-Comm technology eliminates secondary-to-primary optocoupler
  - » Transformer communication for all the rapid charge information: output voltage request, output current limit, output voltage undershoot, and over-voltage protection
- RC charging VCC technology enables ultra-low no-load power of < 75mW with ample margin at $230V_{AC}$ and 5V output voltage setting
  - » < 20mW achievable (at $230V_{AC}/5V_{OUT}$) with an external active startup circuit
- High VCC pin voltage rating eliminates external V_{VCC} LDO
- Tight multi-level constant-voltage and multi-level constant-current regulation with primary-side feedback and control
- Fast dynamic load response (DLR)
- Proprietary optimized load adaptive maximum constant frequency PWM switching with quasi-resonant operation achieves best size, efficiency, and common mode noise
- Multi-mode PWM/PFM control improves efficiency at various load conditions
- User-configurable 4-level cable drop compensation independent of output voltage
- ***EZ-EMI™*** design enhances manufacturability
- Built-in single-point fault protections against output short-circuit including soft short and half short, output over-voltage, and output over-current
- Advance fault control technology addresses issues of soft shorts in cables and connectors by effectively reducing the average output power at fault conditions without latch
- Dual over-temperature protection with both internal OTP and external shutdown control
- No audible noise over entire operating range
- Supports rapid charge technologies, such as QC 2.0 and 3.0 technologies, FCP and USB PD

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3 Applications

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

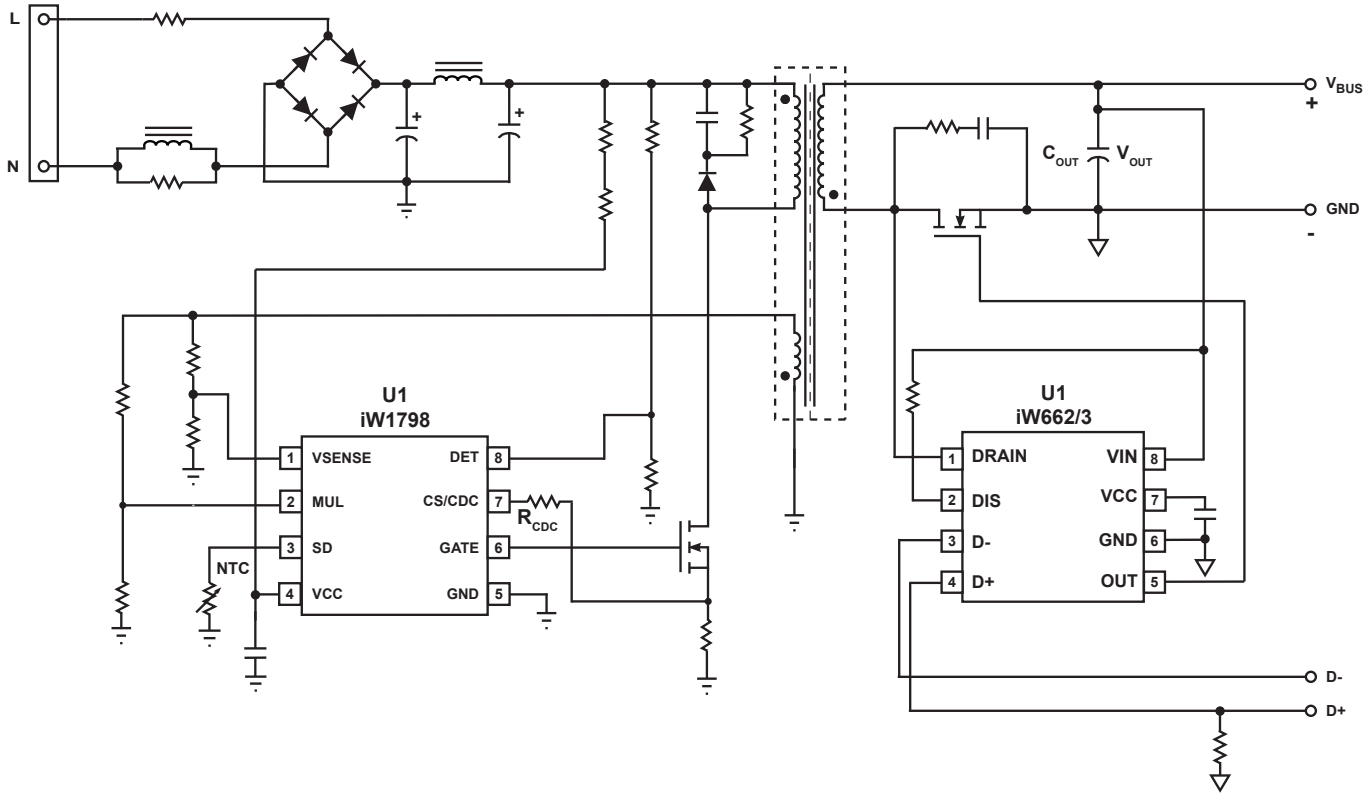


Figure 3.1 : iW1798 Typical Application Circuit for Multi-Level Output Voltage and Current (Using iW662/3 as Secondary-Side Controller for Rapid Charge Protocols. Achieving < 75mW No-Load Power Consumption in Typical 15W Design.)

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4 Pinout Description

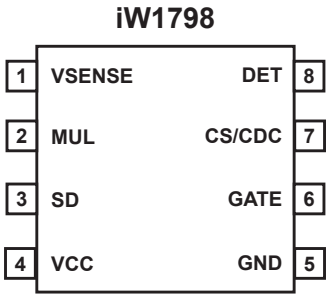


Figure 4.1 : 8-Lead 8SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	VSENSE	Analog Input	Auxiliary voltage sense. Used for primary-side regulation and secondary-to-primary communication through main transformer
2	MUL	Analog Output	Used for auxiliary winding open detection and/or ASU control.
3	SD	Analog input	Used for external shutdown control. Can be configured for external over-temperature protection (OTP) by connecting an NTC resistor from this pin to Ground.
4	VCC	Power Input	IC power supply.
5	GND	GND	Ground
6	GATE	Output	Gate drive for external MOSFET switch.
7	CS/CDC	Analog Input	Primary-side current sense. Used for cycle-by-cycle peak-current control and limit in primary-side CV/CC regulation. During configuration stage, used for config CDC compensation level.
8	DET	Analog Input	Used for external V_{VIN} OVP protection or X-cap discharge. Note: for external V_{VIN} OVP protection or X-cap discharge, additional components are required on the DET pin.

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5 Absolute Maximum Ratings

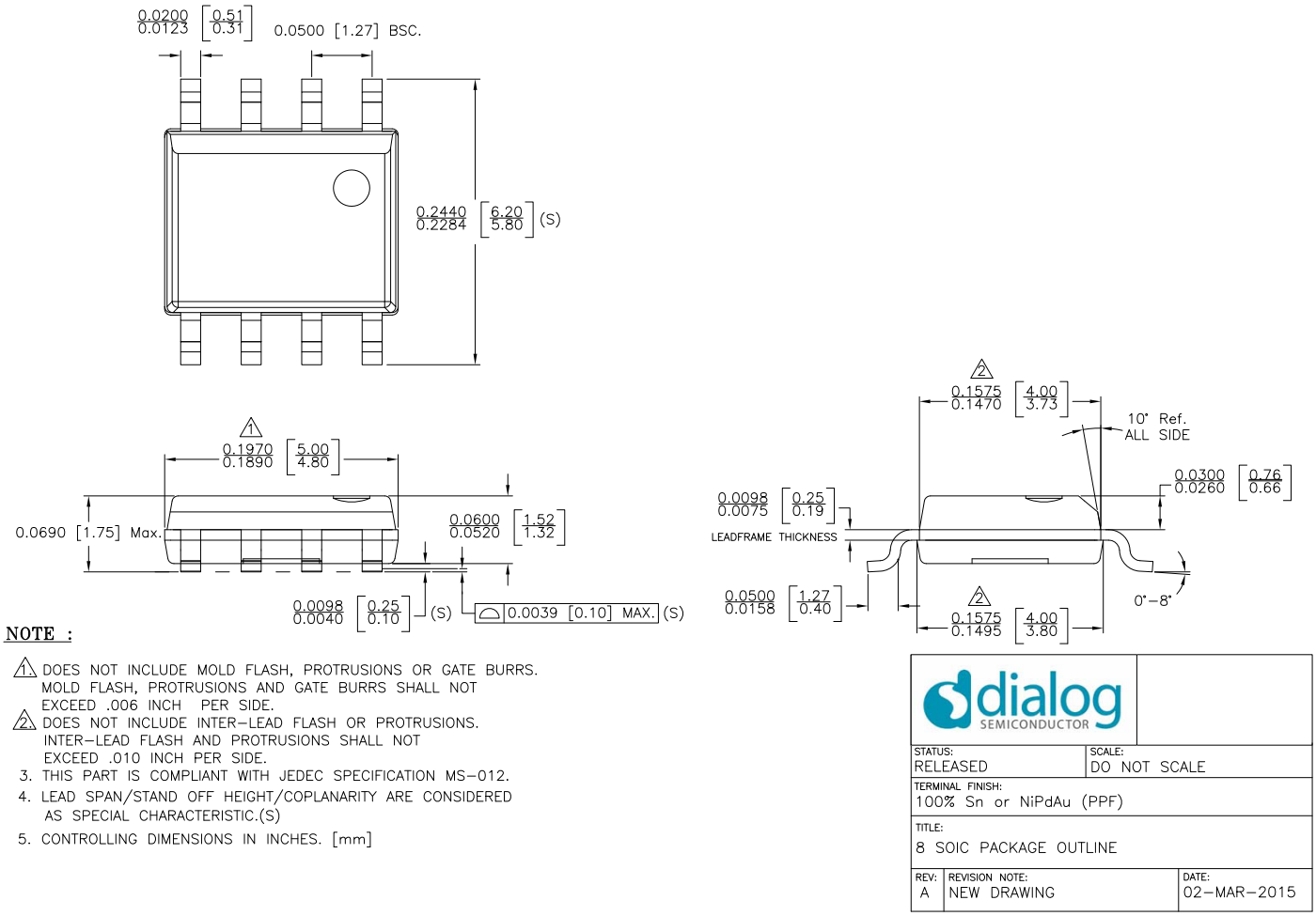
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to the Electrical Characteristics section.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 1, I_{VCC} = 20mA max)	V_{VCC}	-0.3 to 45.0	V
Continuous DC supply current at VCC pin (V_{VCC} = 15V)	I_{VCC}	20	mA
VSENSE input (pin 2, I_{VSENSE} ≤ 10mA)		-0.7 to 10.0	V
MUL (pin 2)		-0.7 to 5.0	V
CS/CDC (pin 7)		-0.7 to 5.0	V
GATE (pin 6)		-0.3 to 30	V
SD (pin 3)		-0.7 to 5.5	V
DET (pin 8)		-0.7 to 5.0	V
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STG}	-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

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.

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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]

dialog SEMICONDUCTOR

STATUS: RELEASED	SCALE: DO NOT SCALE
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)	
TITLE: 8 SOIC PACKAGE OUTLINE	
REV: A / REVISION NOTE: NEW DRAWING	DATE: 02–MAR–2015

Figure 6.1 : SOIC-8 package outline drawing

7 Ordering Information

Part Number	Options						V_{VIN} OVP or X-cap discharge	Package	Description
	Protocol Supported	Default k_{CC} at Start-up	CC Shutdown Voltage	OVP/ OTP Latch	CC Shut-down Latch	Supported DLNK Voltage Information Resolution			
iW1798-38	USB PD/QC	0.5	3.0V	No	No	10mV/Step up to 21V	V_{VIN} OVP	SOIC-8	Tape & Reel[1]

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

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Corporate Headquarters

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

Contact Information

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