

Adaptive Digital DC-DC Controller with Current Sharing

Description

The ZL2004-01 is specialized version of the ZL2004 DC-DC controller that has been optimized for high output accuracy within a given set of operating conditions. The ZL2004-01 is otherwise identical to the ZL2004 in features and functionality. The ZL2004-01 has been optimized for use with the ZL1505 MOSFET driver and discrete MOSFETs.

The ZL2004-01 integrates a proprietary Digital-DC communication bus for current sharing and inter device communication. Adaptive algorithms improve light load efficiency. All operating features can be configured by simple pin-strap selection, resistor selection or through the on-board serial port. The PMBus™-compliant ZL2004-01 uses the SMBus™ serial interface for communication with other Digital-DC products or a host controller.

Features

Power Conversion

- Efficient synchronous buck controller
- $\pm 0.2\%$ V_{OUT} set-point accuracy
- 8.0 V to 10.0 V input range
- 0.9 V to 1.1 V output range
- Adaptive performance optimization algorithms
- Fast load transient response
- Active current sharing
- DCR current sensing with digitally adjustable current sense range
- RoHS compliant (5 x 5 mm) QFN package

Power Management

- Digital soft start/stop
- Precision delay and ramp-up
- Power good/enable
- Voltage tracking, sequencing and margining
- Voltage/current/temperature monitoring
- SMBus communication (PMBus compliant)
- Output voltage and current protection
- Internal non-volatile memory (NVM)

Applications

- Servers / storage equipment
- Telecom / datacom equipment
- Power supplies (memory, DSP, ASIC, FPGA)

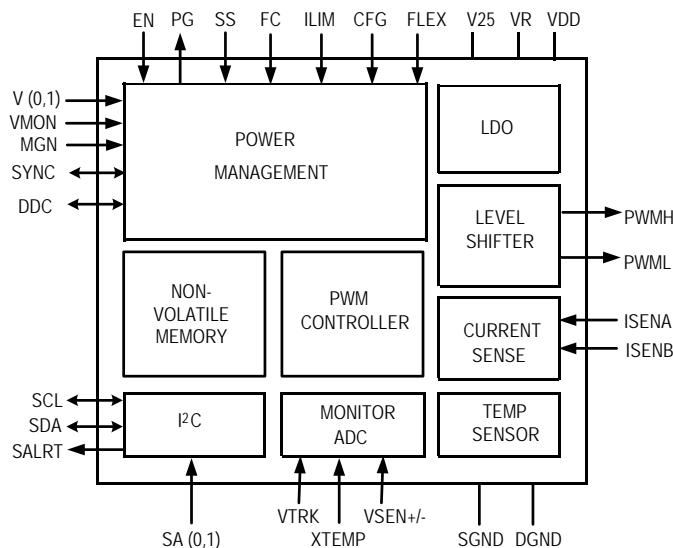


Figure 1. Block Diagram

1. Electrical Characteristics

Table 1. Absolute Maximum Ratings

Operating beyond these limits may cause permanent damage to the device. Functional operation beyond the Recommended Operating Conditions is not implied. Voltage measured with respect to SGND.

Parameter	Pin(s)	Value	Unit
DC supply voltage	VDD	-0.3 to 17	V
Logic I/O voltage	CFG, DDC, EN, FC, FLEX, ILIM, MGN, PG, SA(0,1), SALRT, SCL, SDA, SS, SYNC, VMON, V(0,1)	-0.3 to 6.5	V
Analog input voltages	VSEN+, VSEN-, VTRK, XTEMP	-0.3 to 6.5	V
	ISENA, ISENB	-1.5 to 6.5	V
MOSFET drive reference	VR	-0.3 to 6.5	V
Logic reference	V25	-0.3 to 3	V
Ground voltage differential ($V_{DGND} - V_{SGND}$)	DGND, SGND	-0.3 to +0.3	V
Junction temperature	–	-55 to 150	°C
Storage temperature range	–	-55 to 150	°C
Lead temperature (soldering, 10 s)	–	300	°C

Table 2. Recommended Operating Conditions and Thermal Information

Parameter	Symbol	Min	Typ	Max	Unit
Input Supply Voltage Range	V_{DD}	8.0	–	10.0	V
Output Voltage Range	V_{OUT}	0.9	1.0	1.1	V
Operating Frequency	F_{SW}	–	400	–	kHz
Operating Ambient Temperature Range	T_A	0	–	65	°C
Junction to Ambient Thermal Impedance ¹	Θ_{JA}	–	35	–	°C/W
Junction to Case Thermal Impedance ²	Θ_{JC}	–	5	–	°C/W

Notes:

- Θ_{JA} is measured in free air with the device mounted on a multi-layer FR4 test board and the exposed metal pad soldered to a low impedance ground plane using multiple vias.
- For Θ_{JC} , the “case” temperature is measured at the center of the exposed metal pad

Table 3. Electrical Specifications

$V_{DD} = 8.6\text{ V}$, $V_{OUT} = 1.0\text{ V}$, $T_A = 0^\circ\text{C}$ to 65°C unless otherwise noted. Typical values are at $T_A = 25^\circ\text{C}$.

The following specifications describe the ZL2004-01 electrical specifications that differ from the ZL2004. Please refer to the ZL2004 data sheet for the full operating specification limits for the remaining functions not described herein.

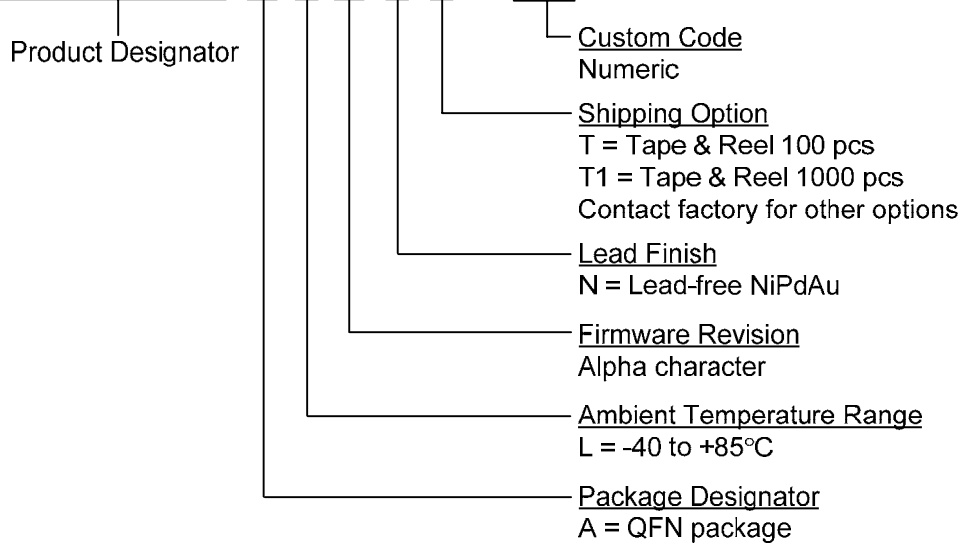
Parameter	Conditions	Min	Typ	Max	Unit
Input and Supply Characteristics					
I_{DD} supply current at $f_{sw} = 400\text{ kHz}$	GH no load, GL no load, MISC_CONFIG[7] = 1	–	16	30	mA
I_{DDS} shutdown current	EN = 0 V No I ² C/SMBus activity	–	2	5	mA
VR reference output voltage	$V_{DD} > 6\text{ V}$, $I_{VR} < 50\text{ mA}$	4.5	5.2	5.5	V
V25 reference output voltage	$V_R > 3\text{ V}$, $I_{V25} < 50\text{ mA}$	2.25	2.5	2.75	V
Output Characteristics					
Output voltage adjustment range	$V_{IN} > V_{OUT}$	0.9	–	1.1	V
Output voltage setpoint accuracy ¹	$V_{IN} = 8.6\text{ V}$, $V_{OUT} = 1\text{ V}$ $T_A = 0^\circ\text{C}$ to $+65^\circ\text{C}$, $I_{LOAD} = 0\text{-}40\text{ A}$	- 0.2	–	0.2	%
Oscillator and Switching Characteristics					
Switching frequency ²	SYNC pin floating or NVM configured for 400kHz	–	400	–	kHz
Switching frequency set-point accuracy		- 5	–	5	%
Fault Protection Characteristics					
UVLO threshold range	Configurable via I ² C/SMBus	2.85	–	16	V

Notes:

1. V_{OUT} set-point measured at the termination of the VSEN+ and VSEN- sense points.
2. The ZL2004-01 has been optimized for operation at 400 kHz only. Please consult the factory for requirements at other operating frequencies.

2. Ordering Information

Z L 2 0 0 4 A L N N T - 0 1



3. Revision History

Rev. #	Description	Date
1.0	Data sheet initial release	March 2008
1.1	Updated Ordering Information	May 2008
FN6847.0	Assigned file number FN6847 to datasheet as this will be the first release with an Intersil file number. Replaced header and footer with Intersil header and footer. Updated disclaimer information to read "Intersil and it's subsidiaries including Zilker Labs, Inc." No changes to datasheet content	February 2009



Zilker Labs, Inc.
4301 Westbank Drive
Building A-100
Austin, TX 78746

Tel: 512-382-8300

Fax: 512-382-8329

© 2008, Zilker Labs, Inc. All rights reserved. Zilker Labs, Digital-DC, and the Zilker Labs Logo are trademarks of Zilker Labs, Inc. All other products or brand names mentioned herein are trademarks of their respective holders.

This document contains information on a product under development. Specifications are subject to change without notice. Pricing, specifications and availability are subject to change without notice. Please see www.zilker-labs.com for updated information. This product is not intended for use in connection with any high-risk activity, including without limitation, air travel, life critical medical operations, nuclear facilities or equipment, or the like.

The reference designs contained in this document are for reference and example purposes only. THE REFERENCE DESIGNS ARE PROVIDED "AS IS" AND "WITH ALL FAULTS" AND INTERSIL CORPORATION AND IT'S SUBSIDIARIES INCLUDING ZILKER LABS, INC. DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED. ZILKER LABS SHALL NOT BE LIABLE FOR ANY DAMAGES, WHETHER DIRECT, INDIRECT, CONSEQUENTIAL (INCLUDING LOSS OF PROFITS), OR OTHERWISE, RESULTING FROM THE REFERENCE DESIGNS OR ANY USE THEREOF. Any use of such reference designs is at your own risk and you agree to indemnify Intersil Corporation and it's subsidiaries including Zilker Labs, Inc. for any damages resulting from such use.