XDPE19284C Digital Multi-phase Controller

8-phase Dual Loop Voltage Regulator

Features

- Digital controller assisted with high performance analog front ends with a fully programmable ARM® Cortex™ –M0 Processor
- Compliant with Intel™ VR13, VR13HC, and VR14 Server VR Vendor PWM Enabling Specification Rev 1.88 (October 2021)
- Compliant with Intel™ SVID Protocol Spec Rev 1.94 (April 2021)
- Compliant with Intel™ IMVP9.1 Rev 0.9 (September 2020) and IMVP9.2 Rev 0.7 (March 2021)
- Compliant with PMBus Rev 1.3.1 (March 2015) serial interface
  - Query voltage, current, temperature faults
  - Fault Response
  - Maximum supported bus speed 1 MHz
  - Support 1.8/3.3 V operation
- Output voltage regulation range
  - 0.25 V to 1.52 V (5 mV/step)
  - 0.5 V to 3.04 V (10 mV/step)
- Digitally controlled phasing for full flexibility in both loop configuration and phase firing order
- Digital current emulation for TLVR inductor support
- Configurable autonomous phase add/drop
- Automatic phase detection at start-up
- Supports start-up into pre-bias voltage
- Integrated power stage current sense
- Differential output voltage sense
- Fast current balancing with current-mode control
- Digitally programmable PID (Proportional, Integral, Differential) loop compensation
- Digitally programmable loadline slope
- Digital temperature compensation
- Direct input (+12 V) voltage and current sense
- Extensive fault detection and protection capability
  - IUVP, OUVP & OOVP (fixed and tracking)
  - OCP instantaneous (total current)
  - Multiple OTP thresholds
  - Peak phase current pulse limiting
  - Negative current limit protection
  - TLVR secondary Open/Short detection
- Internal non-volatile memory (NVM) to store multiple custom configurations
- RoHS compliant and Halogen free 40-lead QFN plastic package

Potential applications

- Vcore power regulation for Intel™ VR13, VR13HC, VR14 based Microprocessors
  - Servers
  - Workstations
  - High-end desktops
- High Current ASIC, PMBus POLs

Product validation

Qualified for industrial applications according to the relevant tests of JEDEC47/20/22/78

Description

The XDPE19284 digital dual loop 8 phase controller provides power for Intel™ VR13, VR13HC, VR14 server, workstation, and high-end desktop applications. Core voltage is provided by a multi-phase buck converter with up to 8 synchronous-rectified channels in parallel while a second loop provides voltage for the I/O. The XDPE19284 phase configuration is flexible in how the phases are allocated to the 2 loops. Any phase can be assigned to either loop and the phase firing order is fully programmable to offer the ultimate in phase configuration flexibility. Typically, configurations of 8+0, 7+1, 6+2, 5+3 or 4+4 phases are supported.

Command and monitoring functions are controlled through the PMBus and SVID interfaces which supports dynamic voltage identification with 5 mV/step or 10 mV/step in Intel mode, output range up to 3.04 V, offset and trim resolution of 625 uV and accuracy better than 0.5%.

The XDPE19284 controller utilizes digital technology to implement all control functions, providing the ultimate system solution in terms of flexibility and stability. Advanced control loop features, such as current mode control, variable frequency operation, Active Transient Response (ATR/FATR), fast DVID response, automatic phase shedding and Pulse Frequency Modulation (PFM) enable optimal response to a highly dynamic load with fast di/dt load transients across a wide range of load current.

The XDPE19284 controller supports multi-vendor pin compatible integrated power stages with trivalent PWM interfaces, fast response, integrated current sense, integrated temperature sense, and advanced fault detection capability, interface and signaling.

In addition to supporting power stage fault protection features, the XDPE19284 controller also includes a set of sophisticated over-voltage, under-voltage, over-temperature, over-current, and phase fault protections. These attributes provide a complete and advanced protection feature set for microprocessor and power systems.

Infineon strongly recommends pairing Infineon's powerstages with our Digital XDP™ family of controllers to ensure correct interoperability. Interoperability when pairing with other vendor power stages/ discrete power components cannot be guaranteed by Infineon and requires thorough evaluation and characterization by the power stage/ discrete power component vendor.

Table 1 Part number and package summary

Base Part Number	Package
XDPE19284C	40-lead 5 mm x 5 mm QFN PG-VQFN-40

Table of contents

1 Ordering information

Table 2 Ordering information

Base Part Number	Package Type	Standard Pack Form and Quantity		Orderable Part Number
XDPE19284C	QFN 5 mm x 5 mm	Tape and Reel	4000	XDPE19284C0000XUMA1 Note **1**
				XDPE19284CxyzzXUMA1 Note **2**

Note:

1. *Standard Part Number with default configuration*
2. *Customer Specific Part Number, where x = Firmware ID, and yzz = Custom Config File ID (Codes assigned by Product Marketing).*

Sample Programming

The customer can program the parts to their specific system requirements using software/hardware available from Infineon or through other controller programming 3rd Parties (contact Infineon for recommendations). Infineon Field Application Engineers are available to assist with system and configuration file optimization and programming of the controllers. Alternatively, samples can be ordered with a customer specific configuration pre-programmed at the factory, but lead times for these types of samples are significantly longer than for standard default configuration samples. The generic part numbering format is shown below:

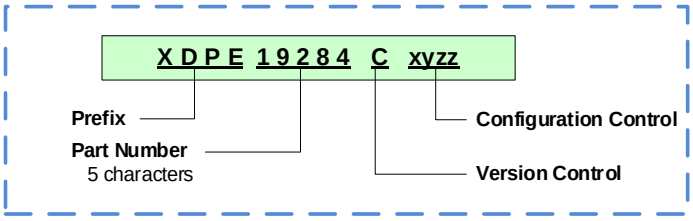

Figure 1 Part number decoding

2 Package marking

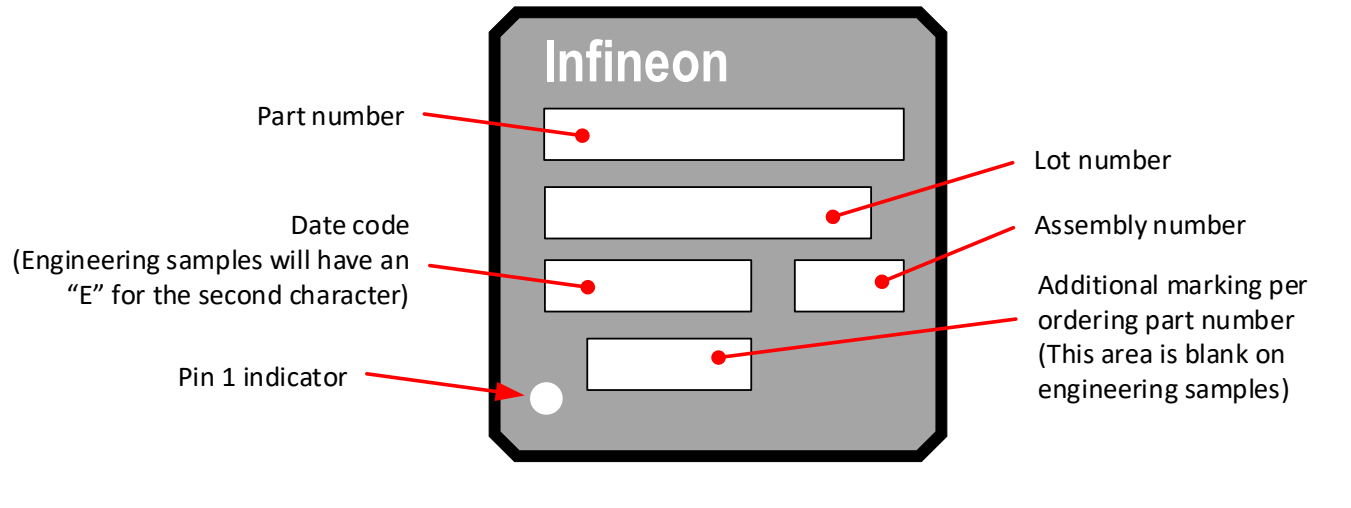

Figure 2 Package marking

Note:

3. All dimensions refer to JEDEC TO-281 and do not include mold flash, protrusions or gate burrs. Gate burrs are less than 0.5 mm

3 Environmental qualifications

Table 3

Qualification Level		Industrial	
Moisture Sensitivity		QFN Package	MSL1
ESD	Human Body Model	JS-001, Class 2	
	Charged Device Model	JS-002, Class C3	
	Latch-up	JESD78, Class 2	
RoHS Compliant		Yes	

Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

Edition 2024-04-02

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about this document?

Email: erratum@infineon.com

Document reference

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (**www.infineon.com**).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

Revision History

XDPE19284C short

Revision 2024-04-08, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2023-12-19	Release of final version
2.1	2024-03-18	Based on revision 2.1
2.2	2024-04-08	Removed 'Restricted' from the header.

Published by Infineon Technologies AG
81726 München, Germany