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APPLICATION NOTE 6804

GUIDELINES FOR THE MAX77812 USER-SELECTABLE PHASE CONFIGURATIONS AND HOW TO SELECT THEM

Abstract: The MAX77812 is a quad-phase, high-current, step-down (buck) converter for high-end gaming consoles, VR/AR headsets, DSLR cameras, drones, network switches and routers, optical modules, and FPGA systems that use multi-core processors. The MAX77812's flexible architecture enables five user-selectable phase configurations such as 4, 3+1, 2+2, 2+1+1 and 1+1+1+1. This feature allows faster design/qualification cycles and easier inventory controls.

User-Selectable Phase Configurations

The MAX77812 supports user-programmable phase configuration by the PH_CFG0, PH_CFG1 and PH_CFG2 input logic state. The input logic state is latched at the POR event. All supported phase configurations are shown in **Table 1**.

Table 1. User-Programmable Phase Configurations

PHASE CONFIGURATION	PH_CFG2	PH_CFG1	PH_CFG0	MASTERS AND SLAVES
4	LOW	LOW	LOW	Master1 (PH1 & PH2 & PH3 & PH4)
3 + 1	LOW	LOW	HIGH	Master1 (PH1 & PH2 & PH3) + Master4 (PH4)
2 + 2	LOW	HIGH	LOW	Master1 (PH1 & PH2) + Master3 (PH3 & PH4)
2 + 1 + 1	LOW	HIGH	HIGH	Master1 (PH1 & PH2) + Master3

				(PH3) + Master4 (PH4)
1 + 1 + 1 + 1	HIGH	X	X	Master1 (PH1) + Master2 (PH2) + Master3 (PH3) + Master4 (PH4)

The input logic states are defined as follows:

- HIGH = V_{SYS}
- LOW = GND
- X = Don't Care condition (either V_{SYS} or GND)

Based on the selected phase configuration, the phase selector generates the TON signals to each power stage with different phase interleaving schemes, and the master phases are assigned, as shown in **Figure 1**. The slave phases are controlled by the corresponding master phases. Changes made on the registers of the slave phases are ignored.

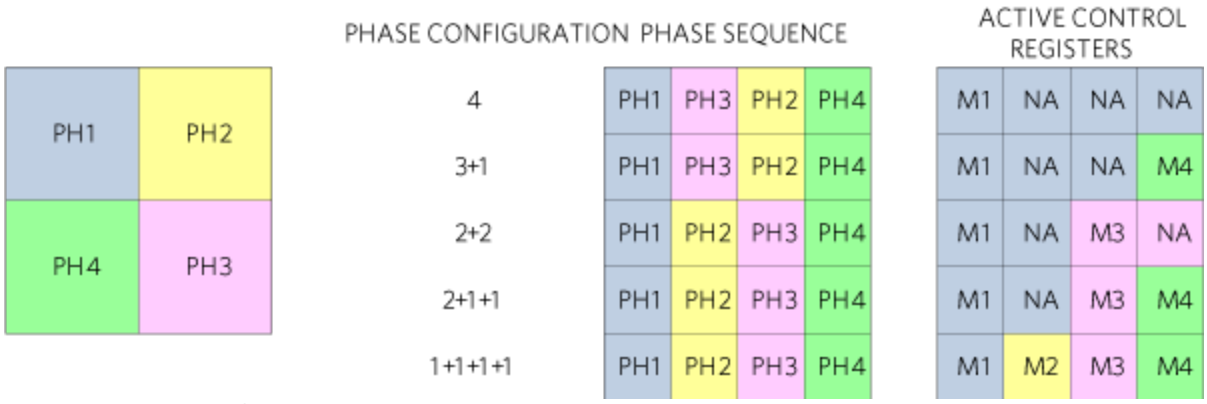

Figure 1. Phase configuration options

I²C Slave Address

For the I²C communication, the slave address of the MAX77812 is set by phase configuration as shown in **Table 2**. This supports more than one MAX77812 on the same I²C bus.

Table 2. I²C Slave Address

PH_CFG2	PH_CFG1	PH_CFG0	SLAVE ADDRESS (7-BIT)	SLAVE ADDRESS (WRITE)	SLAVE ADDRESS (READ)
LOW	LOW	LOW	011 0000	0x60 (0110 0000)	0x61 (0110 0001)
LOW	LOW	HIGH	011 0001	0x62 (0110 0010)	0x63 (0110 0011)
LOW	HIGH	LOW	011 0010	0x64 (0110 0100)	0x65 (0110 0101)
LOW	HIGH	HIGH	011 0011	0x66 (0110 0110)	0x67 (0110 0111)

HIGH	X	X	011 0100	0x68 (0110 1000)	0x69 (0110 1001)

Remote Sense Pin Connection

For accurate on-time generation, remote sense pins (SNSxP and SNSxN) must be connected to the output of the corresponding phase. If the multi-phase configuration is used, the remote sense signals of phases controlled by the same master can be tied together.

How to Select Phase Configurations

For example, if a MAX77812 with a 2+1+1 phase configuration is used, PH1, PH3 and PH4 are the master phases, and PH2 is the slave phase controlled by Master1. The phase configuration selection inputs are set as PH_CFG2 = LOW, PH_CFG1 = HIGH and PH_CFG0 = HIGH. The I^2C slave address is 7'h33 (011 0011). For the remote sense pin connection, SNS1P and SNS2P (SNS1N and SNS2N as well) are tied together to sense the output of PH1 and PH2. SNS3P and SNS3N sense the output of PH3. Similarly, SNS4P and SNS4N sense the output of PH4.

Summary

The MAX77812 supports five user-selectable phase configurations with the same device. This feature allows the users to scale up and down power solutions during development without having the hassle of qualifying new power solutions. It could also lower inventory concern in case more than one multi-phase buck converters in different phase configurations are needed in the systems.

Related Parts		
MAX77812	20A User-Configurable Quad-Phase Buck Converter	Samples

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