Z86D99

LOW-VOLTAGE Z8 OTP MICROCONTROLLER WITH ADC

Product Block Diagram

32K Bytes OTP EPROM	
233 Bytes General-Purpose RAM	256 Bytes Executable RAM
Z8 Core	
8-Bit Sigma Delta ADC with External Reference	
8-Bit C/T (T8) · 16-Bit C/T (T16) · 8-Bit GP C/T (T1)	
Port 2 · Port 4 · Port 5 · Port 6	
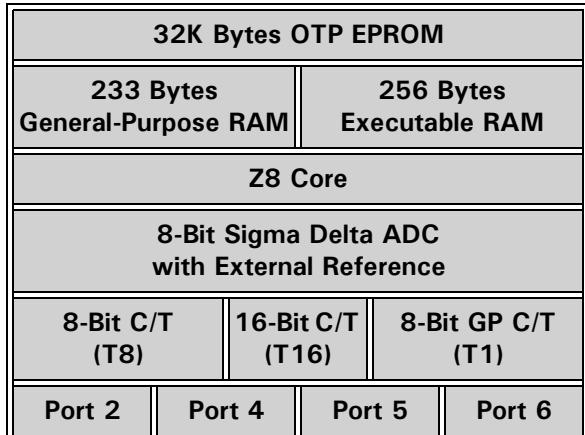
General Description

The Z86D99 is a low-voltage general-purpose one-time programmable Z8® microcontroller with an integrated four-channel 8-bit sigma delta analog-to-digital converter.

The Z86D99 is designed to be used in a wide variety of embedded control applications, such as appliances, battery chargers, IR remotes, keyboards, and security systems.

Operating Characteristics

- 8-MHz operation
- 3.0 V to 5.5 V operating voltage
- Low power consumption (40 mW typical) with three standby modes:
    - Stop (2 μA typical)
    - Halt (0.8 mA typical)
    - Low voltage standby
- Low-battery detection flag
- Low-voltage protection circuit (VBO)
- Watchdog timer and power-on reset circuits

Key Features

- 32K bytes of OTP EPROM
- 256 bytes of executable RAM
- 8-bit sigma delta A/D converter with external voltage references (not available in the 28-pin configuration)
- Two independent analog comparators
- VDD power filter (40/44-pin configuration only)
- Constant current source (100 mA)

Counter/Timer Structure

- Programmable 8-bit counter/timer (T8) with two 8-bit capture registers and two 8-bit load registers
- Programmable 16-bit counter/timer (T16) with one 16-bit capture register pair and one 16-bit load register pair
- General-purpose 8-bit counter/timer (T1) with 6-bit prescaler

Input/Output and Interrupts

- Twenty-nine bidirectional I/Os with programmable resistive pull-up transistors (Twenty-one I/Os are available in the 28-pin configuration.)
- Sixteen I/Os are selectable as stop-mode recovery sources.
- Six interrupt vectors with nine interrupt sources
    - Three external sources
    - Two comparator interrupts
    - Three timer interrupts
    - One low-voltage detector

Block Diagram of Z86D99

Register File 256 x 8-bit	Expanded Register File

Port 2 — 7 ... 0

Port 4 — 7 ... 0

Port 5 — 7 ... 0

Port 6 — 7 ... 0

Program Memory 32 KB OTP

256 Bytes EXE RAM

Z8 Core

Power — VDD, AV_{DD} / VSS, AV_{SS}

Machine Timing and Instruction Control — XTAL 1 / XTAL2

Two Analog Comparators

8-Bit C/T (Carrier)

16-Bit C/T (Modulation)

8-Bit C/T (General)

8-Bit A/D — V_{Ref+} V_{Ref-}

MUX — ADC0/P44, ADC1/P45, ADC2/P46, ADC3/P47
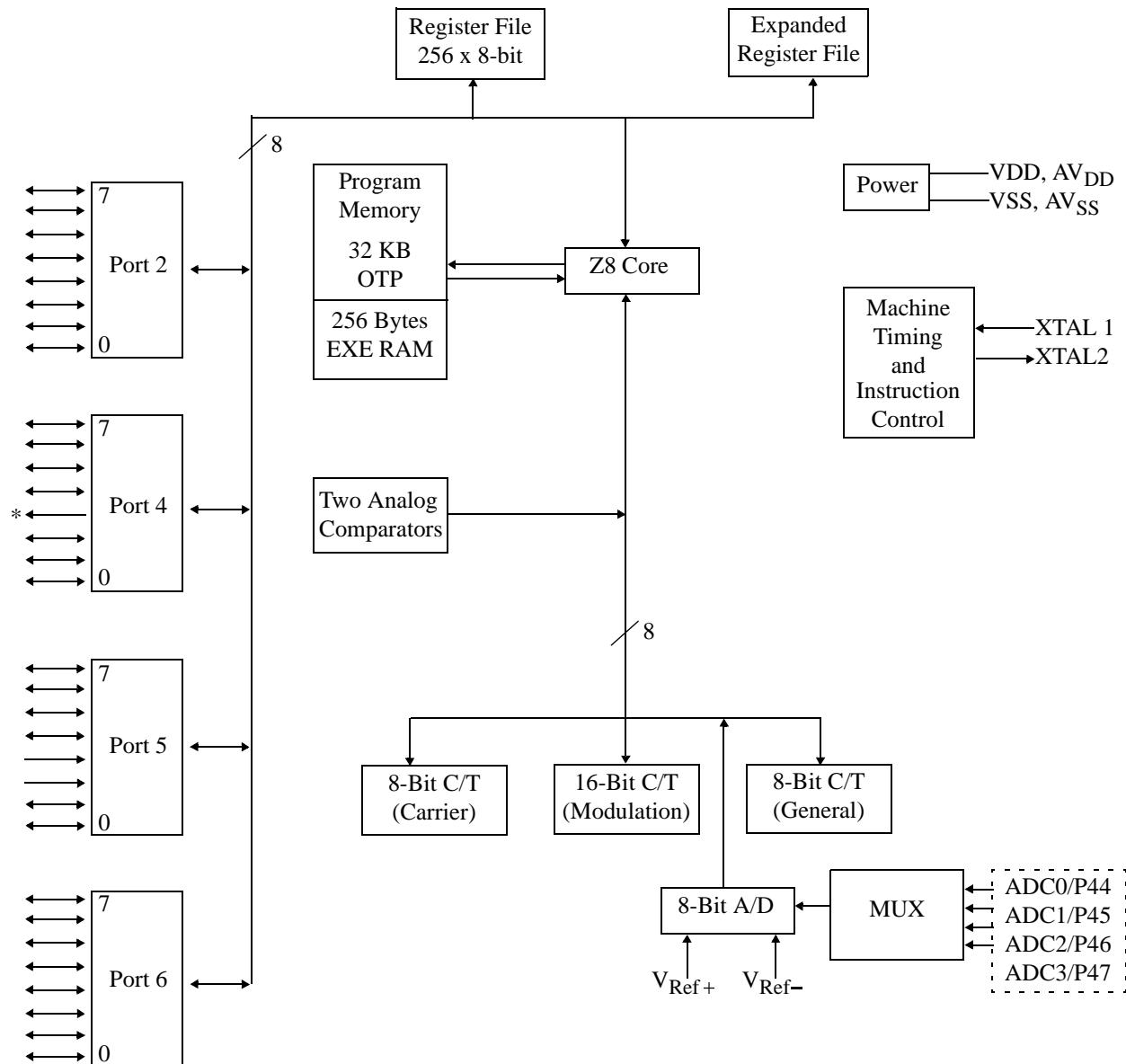
*Constant Current Source (100 mA)

Pin-Outs and Pin Direction
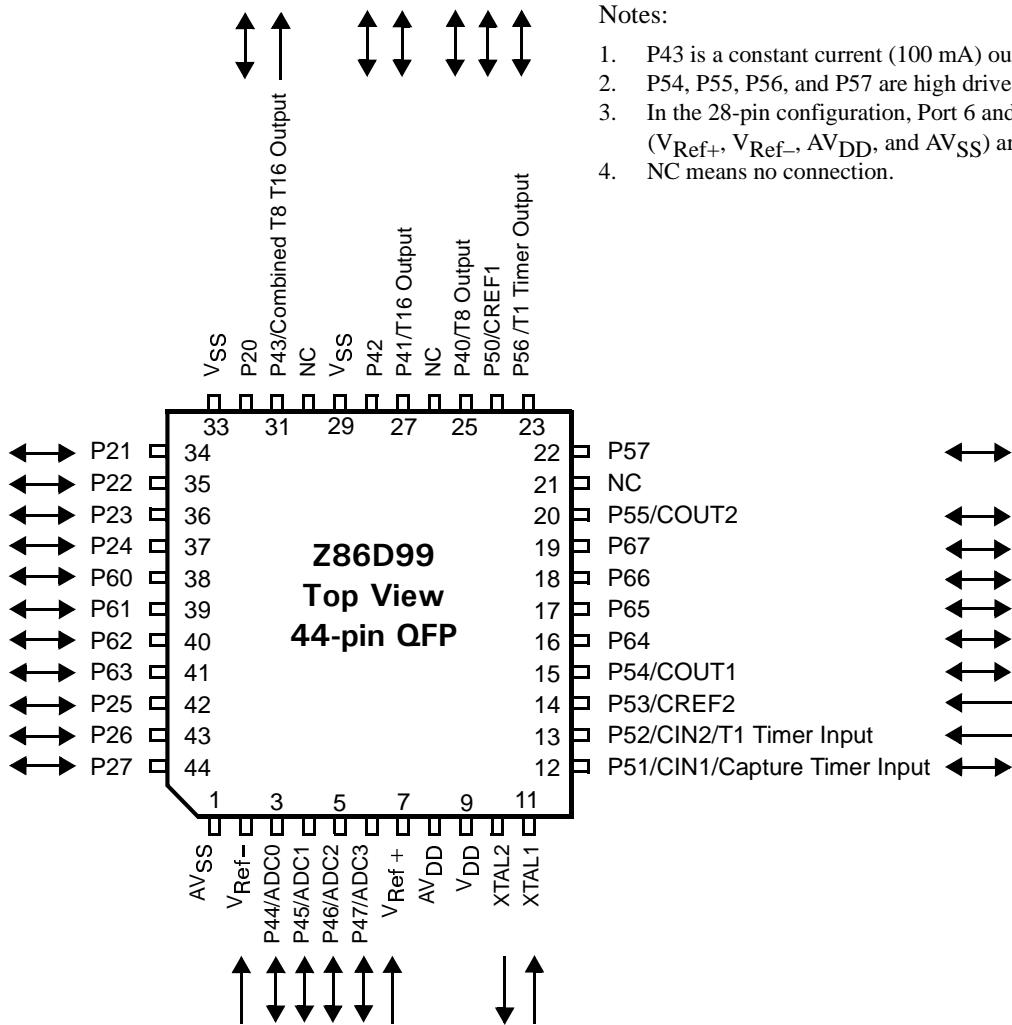
Notes:

1. P43 is a constant current (100 mA) output source.
2. P54, P55, P56, and P57 are high drive outputs.
3. In the 28-pin configuration, Port 6 and the ADC (V_{Ref+}, V_{Ref-}, AV_{DD}, and AV_{SS}) are not available.
4. NC means no connection.

Top pins (left to right): V_{SS}, P20, P43/Combined T8 T16 Output, NC, V_{SS}, P42, P41/T16 Output, NC, P40/T8 Output, P50/CREF1, P56/T1 Timer Output

Pin numbers top (left to right): 33, 31, 29, 27, 25, 23

Z86D99 Top View 44-pin QFP

Left side pins:
- P21 — 34
- P22 — 35
- P23 — 36
- P24 — 37
- P60 — 38
- P61 — 39
- P62 — 40
- P63 — 41
- P25 — 42
- P26 — 43
- P27 — 44

Right side pins:
- 22 — P57
- 21 — NC
- 20 — P55/COUT2
- 19 — P67
- 18 — P66
- 17 — P65
- 16 — P64
- 15 — P54/COUT1
- 14 — P53/CREF2
- 13 — P52/CIN2/T1 Timer Input
- 12 — P51/CIN1/Capture Timer Input

Pin numbers bottom (left to right): 1, 3, 5, 7, 9, 11

Bottom pins (left to right): AV_{SS}, V_{Ref-}, P44/ADC0, P45/ADC1, P46/ADC2, P47/ADC3, V_{Ref+}, AV_{DD}, V_{DD}, XTAL2, XTAL1

User Selectable Option Bits

- RC/other (LC, resonator, or crystal)
- Watchdog timer default state
- 32-kHz crystal
- Port 6 enable
- Ports 20-27 pull-up transistor
- Ports 40-42 pull-up transistor
- Ports 44-47 pull-up transistor
- Ports 50-51 pull-up transistor
- Ports 54-57 pull-up transistor
- Ports 60-63 pull-up transistor
- Ports 64-67 pull-up transistor

Development Suite

The following development tools are available for the programming and debugging of this device:

- Z86L9900ZEM Emulator/Programmer
- ZiLOG Developer Studio (ZDS)
- ZiLOG C-Compiler

Related Products

Z8 microcontrollers of interest are as follows:

Z86L99	ROM equivalent of Z86D99 (16K ROM, 2 V to 3.6 V operation)
Z86L88	Low-voltage IR Controller (16K ROM, 28 pin)
Z86L87	Low-voltage IR Keyboard Controller (16K ROM, 40 pin)

Electrical Features Summary

- 50 µA Maximum Supply Current
- 3.0 V to 5.5 V Operating Range

Ordering Information

Part	PSI	Description
Z86D990	Z86D99008PSC	40-pin PDIP
Z86D990	Z86D99008FSC	44-pin QFP
Z86D991	Z86D99108SSC	28-pin SOIC (ADC not available)
Emulator	Z86L9900ZEM	Emulator/Programmer

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