



# Z89462

## 16-BIT, FIXED-POINT DIGITAL SIGNAL PROCESSOR

### FEATURES

Part	Prog. RAM (K Words)	Prog./Data (K Words)	Data RAM (Words)	Speed (MHz)
Z89462	1	64	512	20, 40

- 100-Pin QFP and 124-Pin PGA Packages
- 0°C to +70°C Temperature Range
- 3.3- to 5.0-Volt Operating Range  
40 MHz Operation @ 5.0V  
20 MHz Operation @ 3.3V
- Six RAM Pointers for 4K-Word RAM Banks
- Three Maskable Vectored Interrupts, Edge or Level Trigger Selectable

- Enhanced Instruction Set
- Single-Cycle Instruction Execution
- Four-Stage Pipeline

### On-Board Peripherals

- Dual 8/16-Bit CODEC Interface
- Wait-State Generator
- Two 16-Bit Timer/Counters
- Dynamic Program Bus Sizing

### GENERAL DESCRIPTION

The Z89462 is a high-performance Digital Signal Processor (DSP) optimized for processing and transferring data. This enhanced processor provides an upward migration path for its Z89C00/Z89321 predecessors.

The DSP provides three 12-bit Register Pointers for each RAM bank. These pointers may be incremented or decremented automatically to implement circular buffers without software overhead.

Three prioritized and individually maskable interrupts are provided for use by external peripherals requiring service from the DSP. The interrupt inputs can be individually conditioned for edge or level trigger. Acknowledgement of an activated interrupt occurs at the end of an instruction execution.

Two banks of 512 x 16-bit data RAM are available. Expansion of the on-chip data RAM is provided through future upgrades.

External interfaces include Address Bus and Data Bus for external Program Memory, Address Bus and Data Bus for external Data Memory, three vectored interrupt ports, and two input/two output user ports.

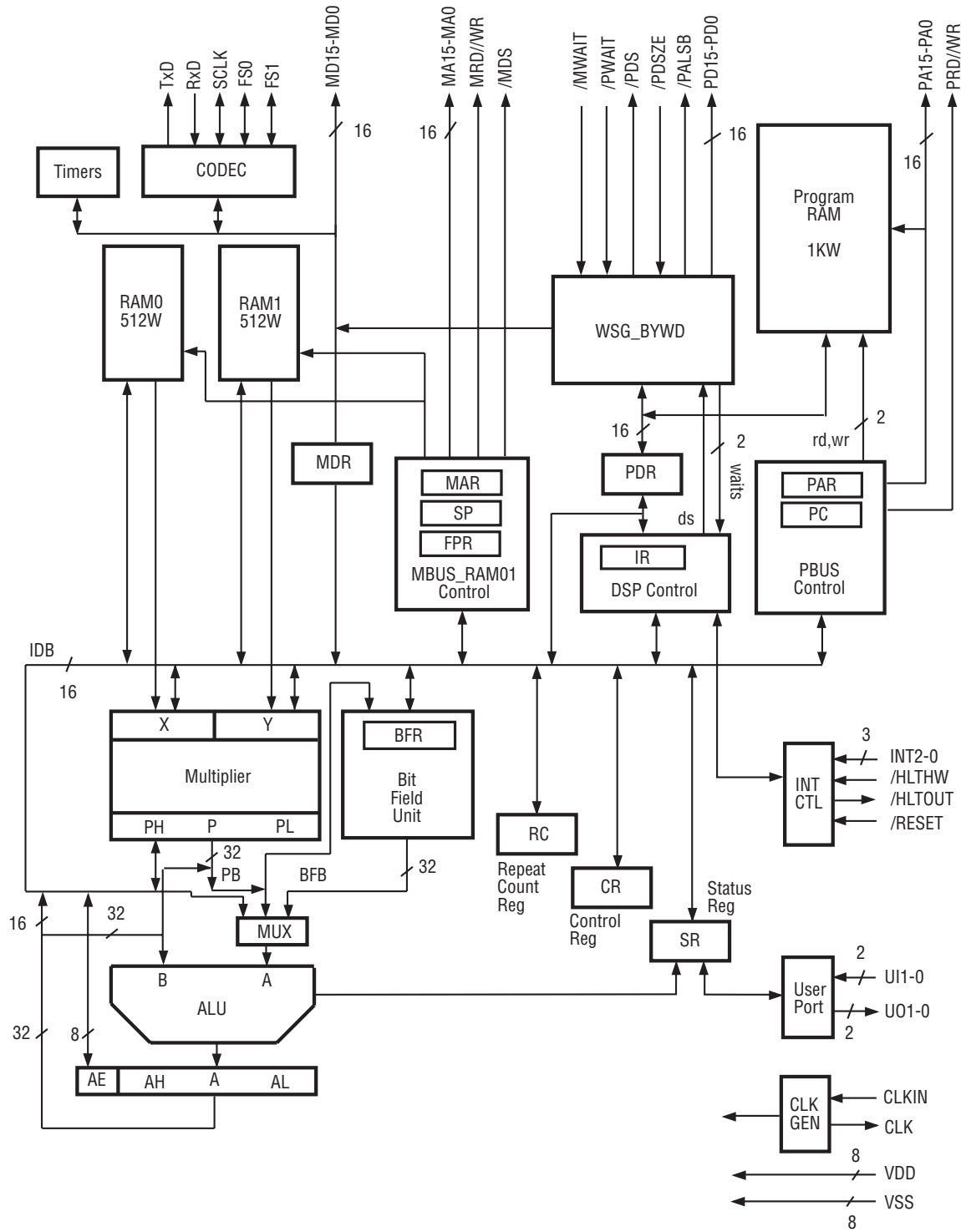
#### Notes:

All Signals with a preceding front slash, "/", are active Low, e.g., B//W (WORD is active Low); /B/W (BYTE is active Low, only).

Power connections follow conventional descriptions below:

Connection	Circuit	Device
Power	$V_{CC}$	$V_{DD}$
Ground	GND	$V_{SS}$

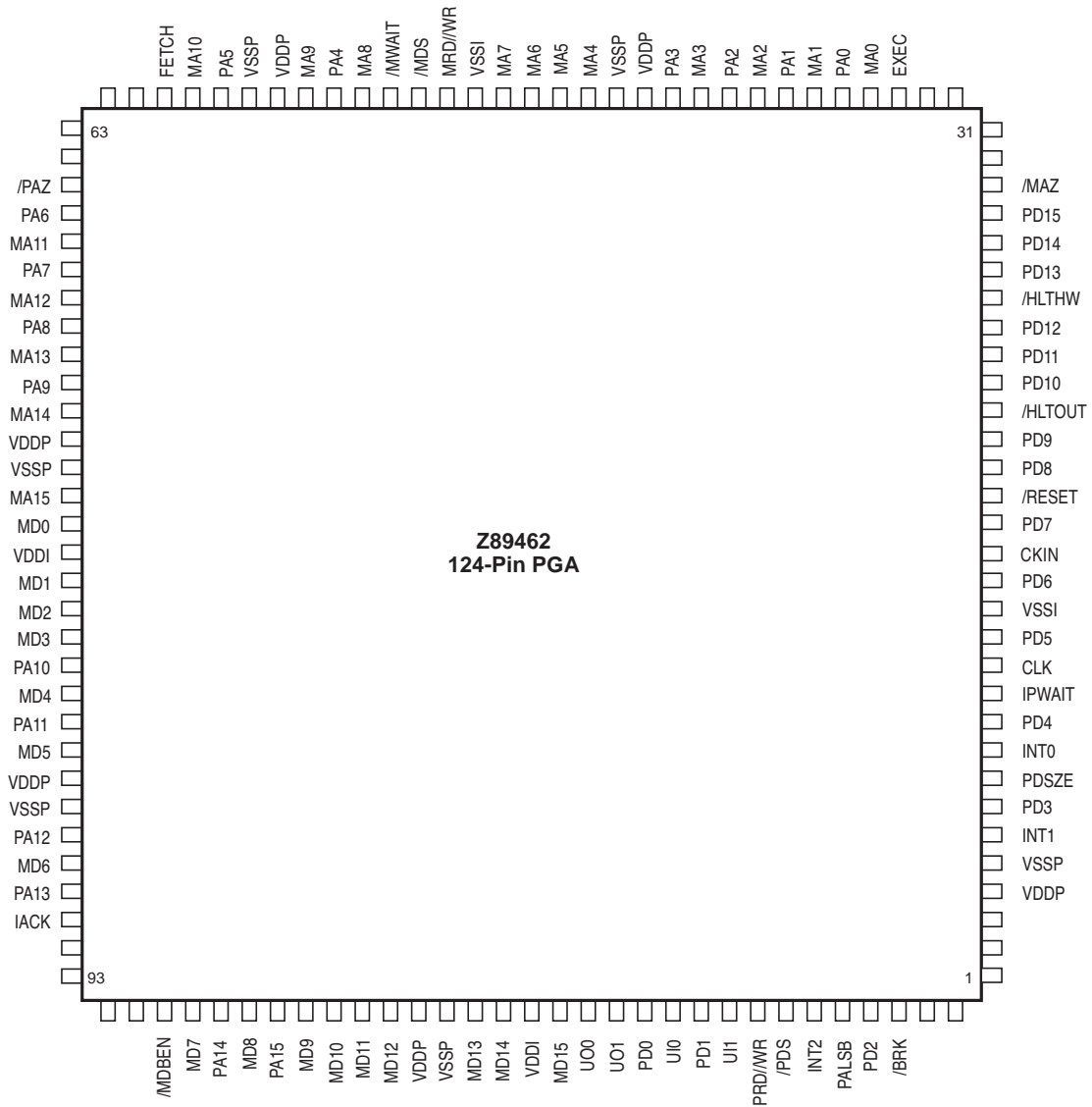
GENERAL DESCRIPTION (Continued)



Functional Block Diagram



PIN DESCRIPTION (Continued)



124-Pin PGA Pin Assignments

## ABSOLUTE MAXIMUM RATINGS

Description	Min.	Max.	Units
Voltages on $V_{DD}$ with Respect to $V_{SS}$	-0.5	+5.5	V
Voltages on All Pins with Respect to $V_{SS}$	-0.5	( $V_{DD}+0.5$ )	V
$T_{STG}$ Storage Temp	-85°	+150°	°C
$T_A$ Oper Ambient Temp	0°	+70°	°C

Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; operation of the device at any condition above those indicated in the operational sections of these specifications is not implied. Exposure to absolute maximum rating conditions for extended period may affect device reliability.

## STANDARD TEST CONDITIONS

The AC and DC Characteristics listed below apply for standard test conditions, unless otherwise noted. All voltages are referenced to  $V_{SS}$  (= Ground = 0V). Positive current flows into the referenced pin. Standard conditions are as follows:

3.0V < VDD < 3.6V  
VSS = 0V  
Ambient Temperature = 0°C to +70°C  
Standard Test Load on All Outputs

## DC ELECTRICAL CHARACTERISTICS

(5.0V Operation)

Sym.	Parameter	Min.	Max.	Unit	Note
$V_{IH}$	Input High Voltage	2.0	$V_{DD}+0.5$	V	
$V_{IL}$	Input Low Voltage	-0.5	0.8	V	
$V_{OH1}$	Output High Voltage (-4 mA $I_{OH}$ )	2.4		V	
$V_{OH2}$	Output High Voltage (-250 $\mu$ A $I_{OH}$ )	$V_{DD}-0.8$		V	
$V_{OL}$	Output Low Voltage (4 mA $I_{OL}$ )		0.5	V	
$I_{IL}$	Input Leakage Current	-10	+10	$\mu$ A	[1]
$I_{TL}$	Tri-State Leakage Current	-10	+10	$\mu$ A	[2]
$I_{DD}$	Power Supply Current (@ 40 Mhz)		TBD	mA	[3]
$I_{DD2}$	Stopped Clock Power Supply Current		20	$\mu$ A	[4]
$C_{IN}$	Input Capacitance (f = 1 MHz)		15	pF	[5]
$C_{OUT}$	Output Capacitance (f = 1 Mhz)		15	pF	[5]
$C_{IO}$	I/O Capacitance (f = 1 MHz)		15	pF	[5]
$C_L$	Output Load Capacitance		30	pF	

### Notes:

- [1]  $V_{IN} = 0.4V$
- [2]  $0.4V < V_{OUT} < 2.4V$
- [3]  $V_{DD} = 5.0V, V_{IH} = 4.8V, V_{IL} = 0.2V$
- [4]  $V_{DD} = 5.0V, V_{IH} = 4.8V, V_{IL} = 0.2V$
- [5] Unmeasured pins returned to  $V_{SS}$ .

## AC ELECTRICAL CHARACTERISTICS

(5.0V Operation)

Symbol	Parameter	Min.	Max.	Unit	Note
TcCl	CLKIN Cycle Time	25		ns	
TwClh	CLKIN Width High	10		ns	
TwClL	CLKIN Width Low	10		ns	
TrCl	CLKIN Rise Time		2	ns	
TfCl	CLKIN Fall Time		2	ns	
TdClr(Cr)	CLKIN Rise to CLK Rise Delay		8	ns	
TdClf(Cf)	CLKIN Fall to CLK Fall Delay		8	ns	
TrC	CLK Rise Time		2	ns	
TfC	CLK Fall Time		2	ns	
TdCr(PA)	CLK Rise to PA Valid Delay		5	ns	
TdCr(PALSB)	CLK Rise to PALSb Valid Delay		5	ns	
TdCr(PDSr)	CLK Rise to /PDS Rise Delay		4	ns	
TdCf(PDSf)	CLK Fall to /PDS Fall Delay		4	ns	
TsPW(Cr)	/PWAIT to CLK Rise Setup Time	5		ns	
ThPW(Cr)	/PWAIT to CLK Rise Hold Time	0		ns	
TsPSZ(Cr)	PDSZE to CLK Rise Setup Time	5		ns	
ThPSZ(Cr)	PDSZE to CLK Rise Hold Time	0		ns	
TdCr(PRDWR)	CLK Rise to PRD//WR Delay		5	ns	
TsPD(Cr)	PD to CLK Rise Setup Time	5		ns	
ThPD(Cr)	PD to CLK Rise Hold Time	0		ns	
TdCR(PD)	CLK Rise to PD Valid Delay		5	ns	
TdCr(PDt)	CLK Rise to PD Tri-State Delay		5	ns	
TdCr(MA)	CLK Rise to MA Valid Delay		5	ns	
TdCr(MDSr)	CLK Rise to /MDS Rise Delay		4	ns	
TdCf(MDSf)	CLK Rise to /MDS Fall Delay		4	ns	
TsMW(Cr)	/MWAIT to CLK Rise Setup Time	5		ns	
ThMW(Cr)	/MWAIT to CLK Rise Hold Time	0		ns	
TdCr(MRDWR)	CLK Rise to MRD//WR Delay		5	ns	
TsMD(Cr)	MD to CLK Rise Setup Time	5		ns	
ThMD(Cr)	MD to CLK Rise Hold Time	0		ns	
TdCr(MD)	CLK Rise to MD Valid Delay		5	ns	
TdCr(MDt)	CLK Rise to MD Tri-State Delay		5	ns	
TsINT(Cr)	INT2-0 to CLK Rise Setup Time	5		ns	[1]
TwINTh	INT2-0 Width High	10		ns	
TwHLTHWI	/HLTHW Width Low	10		TcCl	[2]
TwHLTHWh	/HLTHW Width High	2		TcCl	[2]
TdCr(HLTOUT)	CLK Rise to HLTOUT Delay		5	ns	
TwRESETI	/RESET Width Low	3		TcCl	[2]

**Notes:**

- [1] INT2-0 can also be asserted/deasserted asynchronously.
- [2] These signals are asserted/deasserted asynchronously.

## DC ELECTRICAL CHARACTERISTICS

(3.0V Operation)

Sym.	Parameter	Min.	Max.	Unit	Note
$V_{IH}$	Input High Voltage	2.0	$V_{DD} + 0.5$	V	
$V_{IL}$	Input Low Voltage	-0.5	0.6	V	
$V_{OH}$	Output High Voltage ( $-200 \mu A I_{OH}$ )	2.15		V	
$V_{OL}$	Output Low Voltage (4 mA $I_{OL}$ )		0.4	V	
$I_{IL}$	Input Leakage Current	-10	+10	$\mu A$	[1]
$I_{TL}$	Tri-State Leakage Current	-10	+10	$\mu A$	[2]
$I_{DD}$	Power Supply Current (@ 40 Mhz)		TBD	mA	[3]
$I_{DD2}$	Stopped Clock Power Supply Current		20	$\mu A$	[4]
$C_{IN}$	Input Capacitance (f = 1 MHz)		15	pF	[5]
$C_{OUT}$	Output Capacitance (f = 1 Mhz)		15	pF	[5]
$C_{IO}$	I/O Capacitance (f = 1 MHz)		15	pF	[5]
$C_L$	Output Load Capacitance		30	pF	

### Notes:

[1]  $V_{IN} = 0.4V$

[2]  $0.4V < V_{OUT} < 2.15V$

[3]  $V_{DD} = 3.3V, V_{IH} = 3.0V, V_{IL} = 0.2V$

[4]  $V_{DD} = 3.3V, V_{IH} = 3.0V, V_{IL} = 0.2V$

[5] Unmeasured pins returned to  $V_{SS}$ .

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**Pre-Characterization Product:**

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