ANALOG DEVICES

MultiPort Internet Gateway Processor

Preliminary Technical Data — ADSP-21mod980N-210

ADSP-21MOD980N-210 FEATURES
High Density
  16 Integrated Modem Channels in a Single Device
    (includes datapump and controller functions)
  35mm Plastic Ball Grid Array Package
  On-device DS0/DS1 Interface
  Full Function DMA Port
  No External Memory Required
  Over 8 Modem Channels per Square Inch
Low Power
  480 mW Typical Active (30 mW per channel)
  1.9 Volts nominal (internally)
DATA Modulations
  ITU-T V.90: 56,000 bps – 28,000 bps
  K56Flex™: 56,000 bps – 32,000 bps
  ITU-T V.34: 33,600 bps – 2,400 bps
  ITU-T V.32bis: 14,400 bps – 7,200 bps
  ITU-T V.32: 9,600 bps, 4,800 bps
  ITU-T V.23: 75 bps/ 1,200 – 600 bps
  ITU-T V.22/V.22bis: 2400, 1200, 600 bps
  ITU-T V.21: 300 bps
  Bell 212A: 1200 bps
  Bell 103: 300 bps
Error Correction
  ITU-T V.42, LAPM & MNP 2 - 4

Start-Up Procedures
  ITU-T V.8
  ITU-T V.8bis
Data Compression
  ITU-T V.42bis & MNP Class 5
FAX Modem
  ITU-T V.17: 14,400, 12,000, 9,600 and 7,200 bps
  ITU-T V.29: 9,600 bps, 7,200 bps & 4,800 bps
  ITU-T V.27ter: 4,800 bps, 2,400 bps
  ITU-T V.21 Channel 2: 300 bps
Fax Modem Protocols
  ITU-T T.30
  Group 3, Class 2.0
ISDN B-Channel HDLC
  ITU-T V.120
  ITU-T V.110
  PPP Asynchronous Framing Support (RFC 1662)
  Fully Upgradeable RAM-Based Architecture
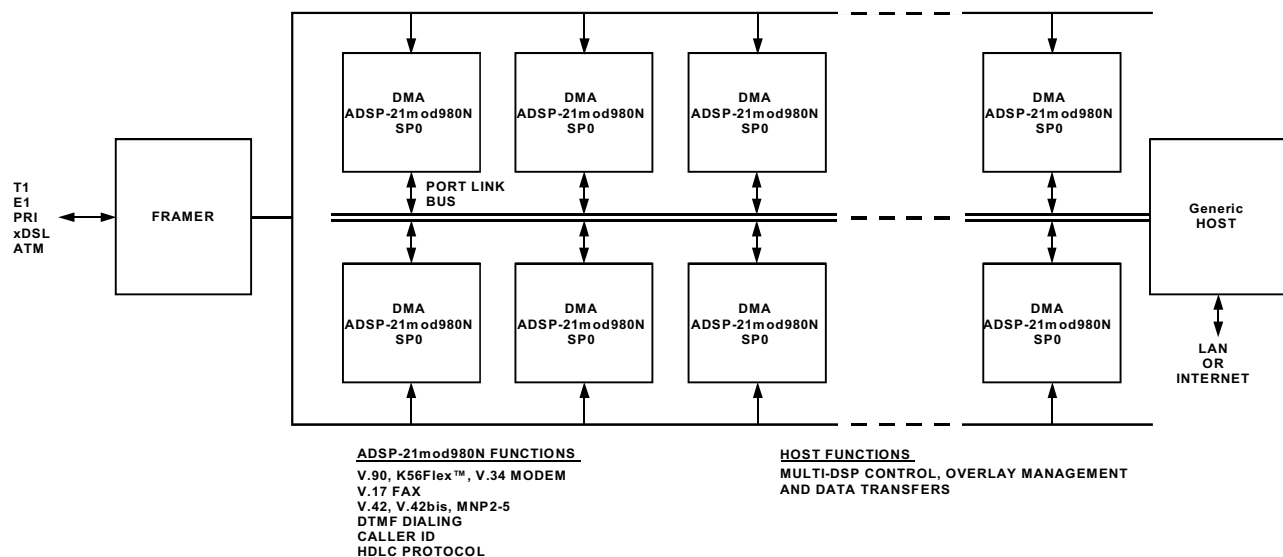 **Fast Download**
  Full Image in 5 ms
High Speed 16-Bit Port Link Bus Provides Simple
Interface Between Host and Modem Pool
Instruction Executes at 80 MHz
Optional Capability and Extensions Available

Functional Block Diagram

ADSP-21mod980N FUNCTIONS
V.90, K56Flex™, V.34 MODEM
V.17 FAX
V.42, V.42bis, MNP2-5
DTMF DIALING
CALLER ID
HDLC PROTOCOL

HOST FUNCTIONS
MULTI-DSP CONTROL, OVERLAY MANAGEMENT
AND DATA TRANSFERS

REV. PrB

ADSP-21mod980N-210

For current information contact Analog Devices at (781) 461-3881

September 2001

GENERAL NOTE
This data sheet provides preliminary information for the ADSP-21mod980N-210 Multiport Internet Gateway Processor Solution.

GENERAL DESCRIPTION
The ADSP-21MOD980N-210 is a sixteen-channel solution intended for remote access server and remote access concentrator applications. It combines a highly integrated DSP processor with downloadable software. All data pump and controller functions are implemented on a single 1.9-square-inch device. This modem package allows the highest modem port density while achieving the lowest power consumption in a software upgradeable platform.

The ADSP-21MOD980N-210 is designed for high-density systems such as remote access servers, see the functional block diagram on page 1. Its high performance DSP core, large on-device SRAM, TDM serial port and 16-bit DMA port provide efficient control and data communication with minimal device count. The modem software provides a number of data modulations, such as V.90, K56 flex™, V.34, and ISDN with a software upgrade path to future standards and new applications, such as voice over network. The host interface allows system access to modem statistics such as call progress, connect speed and modulation parameters such as retrain count and symbol rate.

On-device RAM
The ADSP-21MOD980N-210 processor integrates 16 M bits of on-device memory. The modem datapump and controller software, as well as data storage, are contained in the on-device RAM. The RAM cells are designed by Analog Devices. These cells are optimized for high speed digital signal processing and low power consumption.

You can dynamically configure the ADSP-21MOD980N-210 with software through the 16-bit DMA interface.

DMA Interface
The 16-bit internal DMA port (DMA Port) provides transparent, direct access to the on-device RAM of the ADSP-21MOD980N-210 processor. This high speed access to on-device memory simplifies control and data communication and system debug. Use the 16-bit DMA interface to dynamically configure the ADSP-21MOD980N-210 with software.

Serial Ports
The ADSP-21MOD980N-210 processor incorporates two complete synchronous, double-buffered serial ports for serial communications. The serial ports interface directly to a time-division multiplexed (TDM) 1544 kbps (T1) or 2048 kbps (E1) serial stream, to an 8K sample/s data stream, or to an 8-bit companded (64 kb/s) data stream (DS0). The serial ports operate under modem software control.

Supported System Architectures
The ADSP-21MOD980N-210 Multiport Internet Gateway Processor supports two system architectures: serial Telco PCM TDM data stream and parallel Telco PCM data stream. The two architectures are differentiated by the method of proving Telco PCM data to the DSP Modem.

Serial Telco PCM TDM Data Stream Architecture
The serial Telco PCM TDM data stream architecture, shown in Figure 1 on page 3, is the most common architecture. In this architecture, the modem pool may have a local Telco interface that provides a serial TDM data stream of Telco PCM data to the DSP through the DSP's Serial Port. You can connect up to 24/32 DSPs, through the Serial Port, to a 24-/32-channel serial TDM data stream.

Parallel Telco PCM Data Stream Architecture
The parallel Telco PCM data stream architecture, shown in Figure 2 on page 3, provides a single bus interface for all data and control. In this architecture, the modem pool may have a remote Telco interface that provides a parallel data stream of Telco PCM data to the DSP through the DSP's DMA Port. An arbitrary number of DSPs can be connected, through the DMA Port, to a Host that provides the parallel data stream.

Note: The number of parallel DSPs is limited only by the software loading constraints on the Host.

Software Interface
Analog Devices provides sample C code for the software inter-face to the ADSP-21MOD980N-210. The software interface includes the following four areas—download, control interface, data interface and modem statistics.

Download
The DMA Port on the ADSP-21MOD980N-210 contains an auto-incrementing address generator. The host writes the starting address of the transfer and then writes the first word of data.

After the first write, the DMA address generator automatically increments; the host writes the next data word and the DMA transfers that word to the next location in ADSP-21MOD980N-210 memory.

The executable image contains code and data that must be loaded into program and data memory. Program memory on the ADSP-21MOD980N-210 is 24 bits wide, therefore two transfers are used to load each word of program memory.

The host begins the download by asserting the RESET pin of the ADSP-21MOD980N-210. The host then transfers all code and data. All internal memory can be loaded in 5 ms.
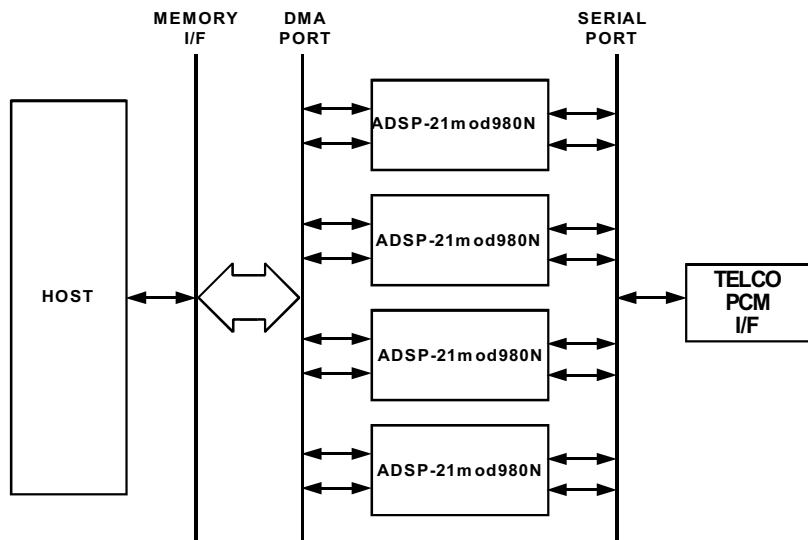
REV. PrB

Figure 1. Serial Telco PCM TDM Data Stream Architecture for Dual Channel (-210) Software
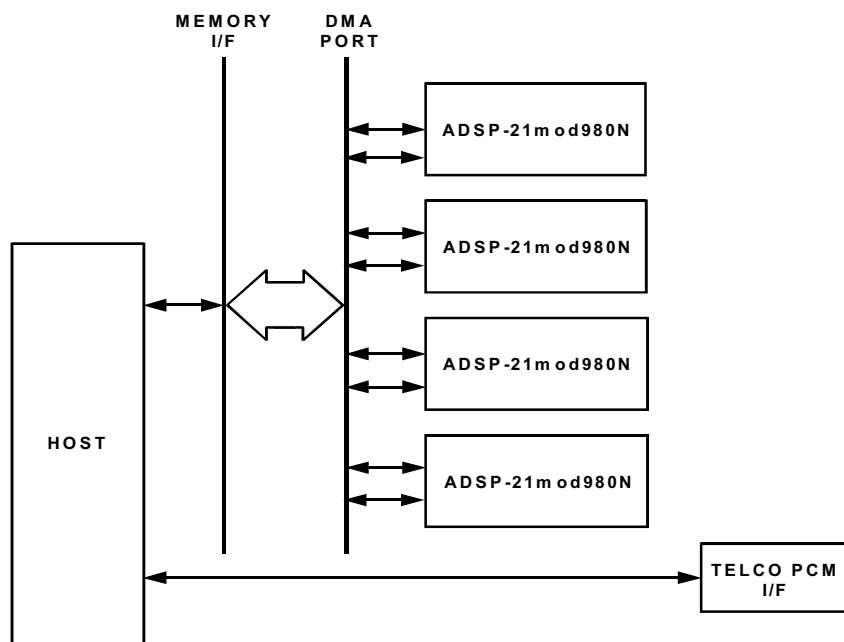

Figure 2. Parallel Telco PCM Data Stream Architecture for Dual Channel (-210) Software

Control Interface

The ADSP-21MOD980N-210 is controlled through two FIFOs in DSP memory. The host sends a control event by writing to the host-to-modem FIFO. The ADSP-21MOD980N-210 posts events to the host by writing into the modem-to-host FIFO.

Data Interface

All data transferred to and from the ADSP 21mod970-110 passes through word FIFOs located in internal memory on the ADSP-21MOD980N-210. The FIFOs are accessed through a control structure that contains a pointer to the start of the FIFO in memory, the length of the FIFO in

16-bit words, a pointer to the next address to be read, and a pointer to the next address to be written. The transmit and receive FIFOs are 1024 bytes deep.

Example code providing primitives for accessing the byte-FIFOs is available from Analog Devices. shows an example of a data FIFO.
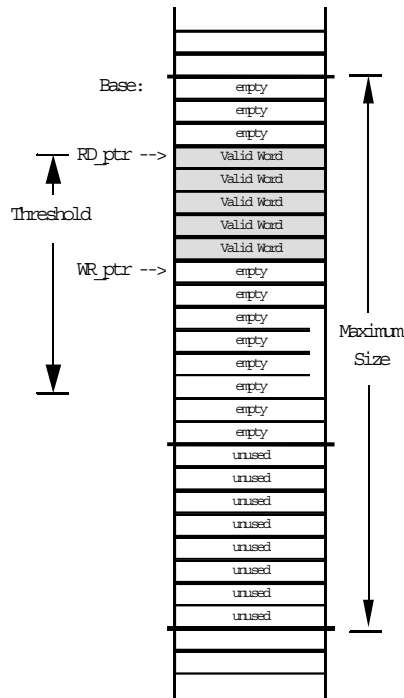

Figure 3. FIFO Example

Modem Statistics

Several modem statistics can be gathered through the DMA Port. These statistics include call status, modulation in use, connect rate, transmit and receive data rate, symbol rate, retrain count, rate renegotiation count and others. through contain a complete listing of available modem statistics.

Table 1. Shell Status

Reference #	Function
SHS. 0	Product Number
SHS. 1	Application Version
SHS. 2	Application Type
SHS. 3	Programmable Flag Data
SHS. 4	Sport Port Control

Table 1. Shell Status (Continued)

Reference #	Function
SHS. 5	Sport Port Tx Time Slot Mask Low
SHS. 6	Sport Port Tx Time Slot Mask High
SHS. 7	Sport Port Rx Time Slot Mask Low
SHS. 8	Sport Port Rx Time Slot Mask High

Table 2. Data Modem Status

Reference #	Function
DMS. 0	Data Modulation State
DMS. 1	SNR MSE Measure
DMS. 2	Rx Level dBm
DMS. 3	Tx Level dBm
DMS. 4	Tx V.34 Symbol Rate
DMS. 5	Rx V.34 Symbol Rate
DMS. 6	Round Trip Delay
DMS. 7	Telemetry Data Update
DMS. 8	Constellation X
DMS. 9	Constellation Y
DMS. 10	Variable 2 X Pointer
DMS. 11	Variable 2 Y Pointer
DMS. 12	Variable 3 X Pointer
DMS. 13	Variable 3 Y Pointer
DMS. 14	Variable 4 X Pointer
DMS. 15	Variable 4 Y Pointer
DMS. 16	Data Modulation Monitor Retrain Local Count
DMS. 17	Data Modulation Monitor Retrain Remote Count
DMS. 18	Data Modulation Monitor Retrain Auto Count
DMS. 19	Data Modulation Monitor Renegotiate Local Count
DMS. 20	Data Modulation Monitor Renegotiate Remote Count

REV. PrB

| September | For current information contact Analog Devices at (781) 461-3881 | ADSP-21mod980N-210 |

Table 2. Data Modem Status (Continued)

Reference #	Function
DMS. 21	Data Modulation Monitor Renegotiate Auto Count
DMS. 22	Omc Carrier Family
DMS. 23	Omc Disconnect Reason
DMS. 24	Omc State
DMS. 25	Omc Time
DMS. 26	Omc Idle Time Start
DMS. 27	Omc Data Protocol Time Start
DMS. 28	Omc Initial Rx Data Rate
DMS. 29	Omc Current Rx Data Rate
DMS. 30	Omc Initial Tx Data Rate
DMS. 31	Omc Current Tx Data Rate
DMS. 32	Data Protocol
DMS. 33	Data Protocol Compression
DMS. 34	Data Protocol Rx HDLC Error Frame Count
DMS. 35	Data Protocol Rx HDLC Frame Count
DMS. 36	Data Protocol Tx HDLC Frame Count
DMS. 37	Data Protocol Tx Data Frame Count
DMS. 38	Data Protocol Tx Data Frame Retransmit Count
DMS. 39	Data Protocol Rx Data Frame Count
DMS. 40	Data Protocol Rx Data Frame Missing Count
DMS. 41	Data Protocol Rx Data Frame Retransmit Count
DMS. 42	Data Protocol Call Tx Data Compressibility Metric
DMS. 43	Data Protocol Call Rx Data Compressibility Metric
DMS. 44	Data Protocol Call Tx Data Metric
DMS. 45	Data Protocol Call Rx Data Metric
DMS. 46	V.PCM Digital Attenuation

Table 2. Data Modem Status (Continued)

Reference #	Function
DMS. 47	V.PCM Robbed Bit Mask
DMS. 48	V.PCM Coding Law
DMS. 49	V.110 Rate Mask

Table 3. Fax Modem Status

Reference #	Function
FMS. 0	Remote Image Resolution Code
FMS. 1	Remote Data Rate Signaling Mask
FMS. 2	Remote Page Width Code
FMS. 3	Remote Page Length Code
FMS. 4	Remote Data Compression Code
FMS. 5	Remote ECM Capability
FMS. 6	Remote ECM Frame Size
FMS. 7	Remote Binary File Tx Capability
FMS. 8	Remote Scan Line Duration Code
FMS. 9	Remote Receive Capability
FMS. 10	Remote Request for Poll
FMS. 11	Remote ID Array
FMS. 12	Remote ID Received Indication
FMS. 13	Negotiated Image Resolution Code
FMS. 14	Negotiated Data Rate Mask
FMS. 15	Negotiated Page Width Code
FMS. 16	Negotiated Page Length Code
FMS. 17	Reserved
FMS. 18	Negotiated ECM Mode
FMS. 19	Negotiate ECM Frame Size
FMS. 20	Reserved
FMS. 21	Negotiated Scan Line Duration
FMS. 22	Session Disconnect Reason
FMS. 23	Rx PPM
FMS. 24	Page Tx Status

September	For current information contact Analog Devices at (781) 461-3881	ADSP-21mod980N-210

Table 3. Fax Modem Status (Continued)

Reference #	Function
FMS. 25	Reserved
FMS. 26	Rx Image Line Count
FMS. 27	Reserved
FMS. 28	Reserved
FMS. 29	Overflow Lost Byte Count
FMS. 30	Reserved
FMS. 31	Reserved
FMS. 32	Reserved
FMS. 33	Reserved

Table 4. Telephony Signaling Status

Reference #	Function
TSS. 0	Called Party Received Indicator
TSS. 1	Calling Party Received Indicator
TSS. 2	Current Receive Tone
TSS. 3	Current Send Tone
TSS. 4	Call Control Termination Reason
TSS. 5	Called Party Digit Count
TSS. 6	Called Party Digit Array
TSS. 7	Calling Party Digit Count
TSS. 8	Calling Party Digit Array
TSS. 9	Calling Category
TSS. 10	Language Digit
TSS. 11	Country Code
TSS. 12	R2 Completion Code
TSS. 13	ANSI Information Digit
TSS. 14	DTMF Detector Status
TSS. 15	MF Detector Status

Modem Configuration

The modem is configured by programming various parameters through the DMA Port. through contain complete lists of modem configuration parameters.

Table 5. Shell Parameters

Reference	Function
SHP. 0	Serial Port Tx Time Slot
SHP. 1	Serial Port Rx Time Slot
SHP. 2	Serial Port Configuration
SHP. 3	Programmable Flag Control
SHP. 4	Programmable Flag Data
SHP. 5	Host Interrupt Count
SHP. 6	DTE Data FIFO Rx Timeout
SHP. 7	DTE Big Endian Enable

Table 6. Data Modem Parameters

Reference	Function
DMP. 0	Originate Enable
DMP. 1	Billing Delay Timer
DMP. 2	Connect Timer
DMP. 3	Data Protocol Start Timer
DMP. 4	Data Protocol Allowed Mask
DMP. 5	Protocol Preferred Mask
DMP. 6	Data Protocol Auto-Select Mask
DMP. 7	Data Protocol Compression Mask
DMP. 8	Binary Data Mode
DMP. 9	HDLC Operation Mode
DMP. 10	Sync Mode
DMP. 11	MNP Block Mode
DMP. 12	MNP Compression Mode
DMP. 13	MNP Header Optimization
DMP. 14	MNP Maximum Block Size
DMP. 15	MNP Service Class
DMP. 16	Disconnect Management Mode

Table 6.   Data Modem Parameters (Continued)

Reference	Function
DMP. 17	Disconnect Management Timer
DMP. 18	Digital Data Modes
DMP. 19	Analog Modulation Modes
DMP. 20	Pump Tone Tx Level
DMP. 21	Pump Tx Level
DMP. 22	Pump V.34 Tx Level
DMP. 23	Carrier Detect Duration
DMP. 24	Carrier Loss Duration
DMP. 25	Line Quality Monitor
DMP. 26	Modulation Options Mask
DMP. 27	Data Modulation V.32 Rate Enable Mask
DMP. 28	Data Modulation V.34 Rate Mask
DMP. 29	V.PCM Maximum Tx Power
DMP. 30	V.PCM Tx Power Reference Point
DMP. 31	Modulation K56Flex™ Server Limit
DMP. 32	K56Flex™ Modulation Tx Rate Maximum
DMP. 33	K56Flex™ Modulation Tx Rate Minimum
DMP. 34	Reserved
DMP. 35	PPP Rx Mode Enable
DMP. 36	PPP Tx Mode Enable
DMP. 37	PPP Rx Detect Mode Enable
DMP. 38	PPP Rx Async-Control-Character-Mask
DMP. 39	PPP Tx Async-Control-Character-Mask
DMP. 40	Event Code Filtering
DMP. 41	Status Code Filtering
DMP. 42	Answer tone Length
DMP. 43	V.90 Data Rate Mask
DMP. 44	V.110 Rate Mask
DMP. 45	V.120 Operating Mode

Table 6.   Data Modem Parameters (Continued)

Reference	Function
DMP. 46	V.120 Asynchronous Mode
DMP. 47	Nominal V.8bis Tx Level
DMP. 48	Cre V.8bis Tx level

Table 7. Facsimile Modem Parameters

Reference	Function
FMP. 0	Image Resolution Code
FMP. 1	Data Signaling Rate mask
FMP. 2	Page Width Code
FMP. 3	Page Length Code
FMP. 4	Reserved
FMP. 5	ECM Enable Control
FMP. 6	ECM Frame Size
FMP. 7	Reserved
FMP. 8	Scan Line Duration
FMP. 9	Rx Image Enable
FMP. 10	Remote Poll Enable
FMP. 11	Automatic Acknowledge Enable
FMP. 12	Post Page Message
FMP. 13	Page Transfer Status
FMP. 14	ECM Maximum Attempt Count
FMP. 15	Local Identification Array
FMP. 16	Local ID Enable
FMP. 17	Polling Local ID Array
FMP. 18	Polling Local ID Enable
FMP. 19	Local Non-Specific Frame Array
FMP. 20	Local NSF Length
FMP. 21	Reserved
FMP. 22	High Speed Data Mode
FMP. 23	Ignore Bad Frame Enable
FMP. 24	CRP Frame Enable

Table 7. Facsimile Modem Parameters (Continued)

Reference	Function
FMP. 25	Tx Phase C Timeout Duration
FMP. 26	Tx ECM Phase C Timeout Duration
FMP. 27	Rx Phase C Timeout Duration
FMP. 28	Rx ECM Phase C Timeout Duration
FMP. 29	Tx ECM RR/RNR Timeout Duration
FMP. 30	Rx ECM RR/RNR Timeout Duration
FMP. 31	High Speed Timeout Duration
FMP. 32	Delete Adjacent EOL Enable
FMP. 33	Ignore Until First EOL
FMP. 34	Strip Leading Eol
FMP. 35	Ensure Leading Eol
FMP. 36	Ensure Final EOL
FMP. 37	Append Final RTC
FMP. 38	Align EOL Code Enable
FMP. 39	Strip Fill Enable

Table 8. Telephony Signaling Parameters

Reference	Function
TSP. 0	DTMF Dial Digit
TSP. 1	DTMF Tone on Duration
TSP. 2	DTMF Tone off Duration
TSP. 3	DTMF Low Tone Level
TSP. 4	DTMF High Tone Level
TSP. 5	Call Control Signaling Type
TSP. 6	Call Control Flags
TSP. 7	Pre-Dialing Call Progress Wait Mask
TSP. 8	Post-Dialing Call Progress Wait Mask
TSP. 9	Address Timeout Duration
TSP. 10	Digit Timeout Duration
TSP. 11	MF High Tone Power level
TSP. 12	MF Low Tone Power level

Table 8. Telephony Signaling Parameters (Continued)

Reference	Function
TSP. 13	MF Digit Duration
TSP. 14	MF Tone off Duration
TSP. 15	MF Non-digit Duration
TSP. 16	Calling Party Send Enable
TSP. 17	Called Party Maximum Digit Count
TSP. 18	Calling Party Maximum Digit Count
TSP. 19	Backward MF Generation Translation Table
TSP. 20	Backward MF Group B Generation Translation Table
TSP. 21	Backward MF Interpretation Translation Table
TSP. 22	Backward MF Group B Interpretation Translation Table
TSP. 23	Forward MF Generation Translation Table
TSP. 24	Forward MF Group II Generation Translation Table
TSP. 25	Forward MF Interpretation Translation Table
TSP. 26	Forward MF Group II Interpretation Translation Table
TSP. 27	MF Digit
TSP. 28	MF Low Tone Level
TSP. 29	MF High Tone Level
TSP. 30	MF Tone On Time
TSP. 31	MF Tone Off Time
TSP. 32	Called Party Digit Count
TSP. 33	Called Party Digit Array
TSP. 34	Calling Party Digit Count
TSP. 35	Calling Party digit Array
TSP. 36	Calling Category
TSP. 37	Language Digit
TSP. 38	Country Code
TSP. 39	ANSI Information Digit

OUTLINE DIMENSIONS – 352 PLASTIC BALL GRID ARRAY

All dimensions shown in millimeters.

352 PBGA 35 x 35 mm Body, 1.27 Pitch Package Outline

NOTES:
1. THE ACTUAL POSITION OF THE BALL GRID IS WITHIN 0.30 OF THE IDEAL POSITION RELATIVE TO THE PACKAGE EDGES.
2. THE ACTUAL POSITION OF EACH BALL IS WITHIN 0.15 OF ITS IDEAL POSITION RELATIVE TO THE BALL GRID.
3. CENTER FIGURES ARE NOMINAL, UNLESS OTHERWISE NOTED.
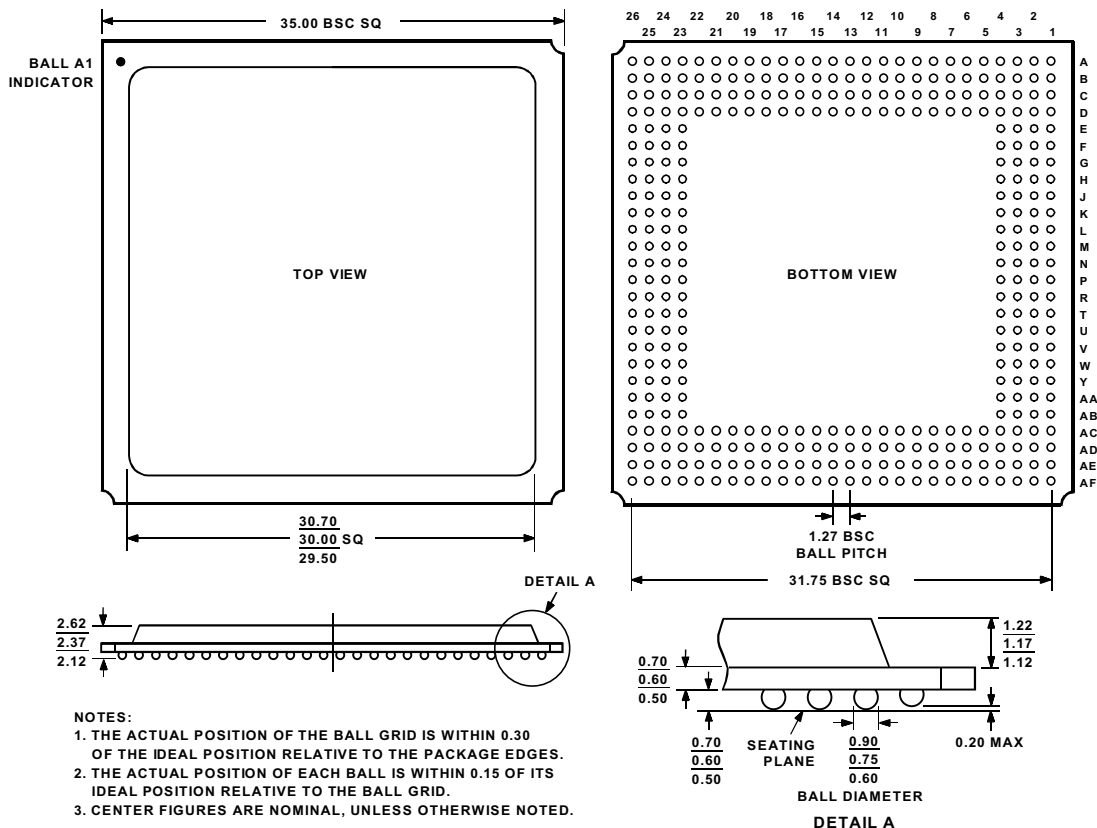
ORDERING GUIDE

Package Part Number	Description	Package Description	Package Option
ADSP-21mod980N-210	640 MIPS DSP with Modem Software License	352 Plastic Ball Grid Array	352-Ball PBGA

RELATED DOCUMENTS

For further information see the ADSP-21mod980N Multiport Internet Gateway Processor data sheet and ADSP-21mod8xx-110/210 Universal Digital Port Application Programming Interface (API) document Revision 2.02.