MOTOROLA

Microprocessor and Memory Technologies Group

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MC68DP356

Product Brief

V.34 Modem Chip Set

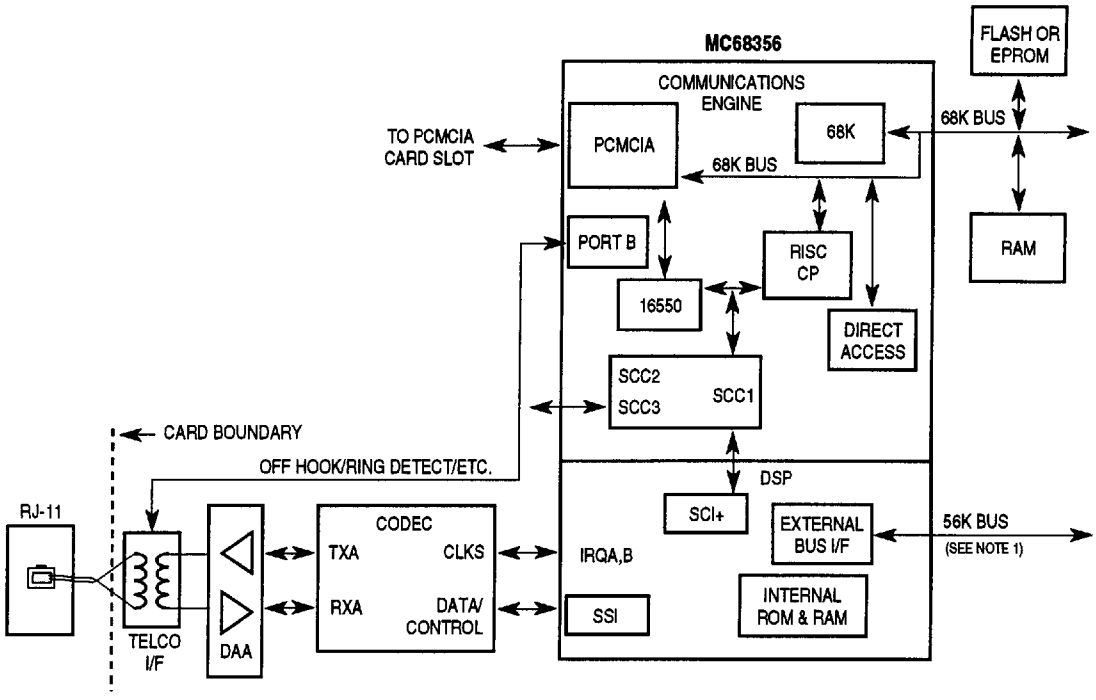
INTRODUCTION

The MC68DP356 is a two-chip set that includes the principal components of a V.34 modem, including fall back options to lower fax and data rates. V.34 allows data transfers at up to 28.8 Kbps, and when combined with 4:1 data compression as specified in V.42bis, allows full duplex data transfers at approximately 115 Kbps.

The first device in the chip set is a special version of the MC68356. The MC68356 is a single CMOS device that contains an integrated multiprotocol communications processor (IMP) whose features form a superset of the popular MC68302, a static DSP56002 based 24-bit digital signal processor with greatly expanded on-board ROM and RAM memory spaces, a PCMCIA slave interface with a UART block that emulates the UART 16550, and a fully programmable low-power management system. The DSP portion of the MC68DP356 has internal ROM and RAM that provide a complete V.34 data pump with popular data and fax fallback options or can function as a general purpose DSP. This leaves the MC68302 portion of the device free to run the modem controller code, and handle the interface to a terminal port, ISA, or PCMCIA connections. The second device in the V.34 chip set is the ST7544 modem analog front end (MAFE) device from SGS Thompson Microelectronics. This device is controlled automatically by the datapump code in the DSP56002, and provides the A-D and D-A functions as well as data filtering and PLL functions. Both devices are provided when ordering the MC68DP356 from Motorola.

For additional information on the V.34 chip set, consult the *MC68DP356UM/AD V.34 Chip Set Users Manual.* For additional information about the MC68356, consult the *MC68356UM/AD Users Manual.*

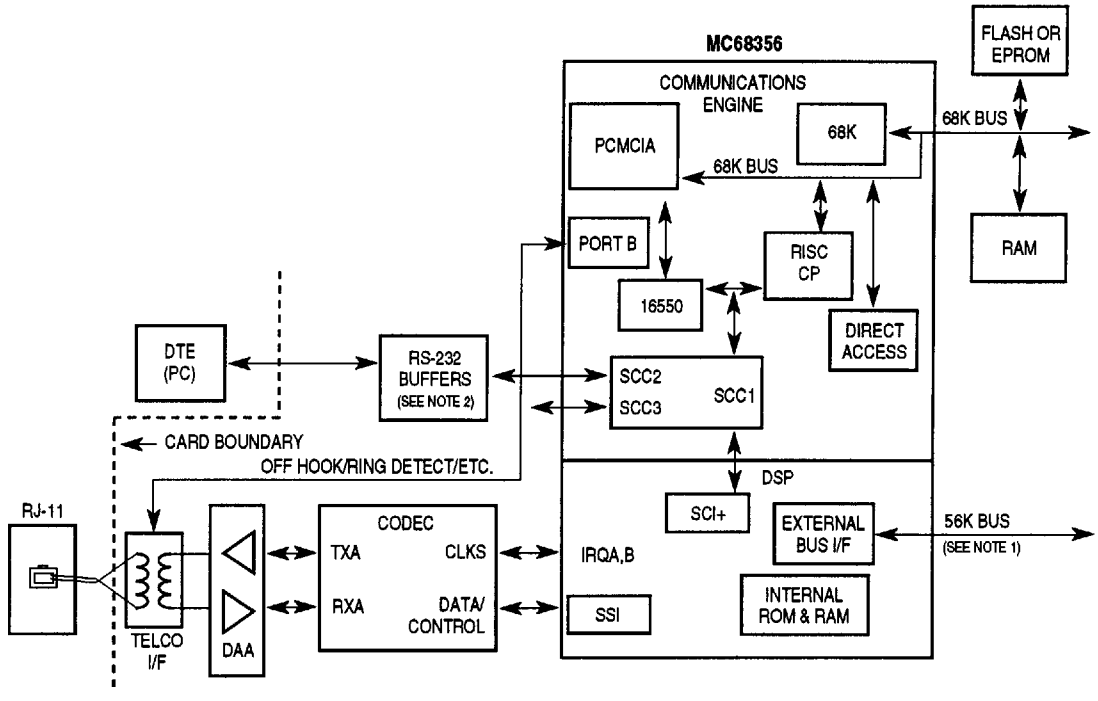
Because of the integration of the chip-set, a V.34 modem may be implemented in a minimum amount of board space. In a PCMCIA card application, the chip set requires only controller memory and data access arrangement (DAA) as shown in Figure 1.



NOTE : NO EXTERNAL DSP MEMORY NEEDED

Figure 1. PCMCIA Modem Application

In stand-alone modem applications, the only basic difference is the inclusion of an external RS232 transceiver as shown inFigure 2.



NOTES:
1. NO EXTERNAL DSP MEMORY NEEDED
2. STAND ALONE MODEMS

Figure 2. Stand-Alone Modem Application

DATAPUMP OVERVIEW

The following list summarizes the key features of the data pump contained in the MC68DP356.

Modulations

- V.34
  - —2400 - 28800 bps (in 2400 step increments) QAM
  - —All carriers supported, shaping, warping, pre-coding, transmit level control, pre-emphasis, V.8 and V.32 automode, asymmetric bit rates, 16 state receive trellis, secondary channel, half duplex, fax mode and automatic bit rate selection with controller override
- V.33
  - —12000 and 14400 bps QAM
  - —Control of rate words
- V.32bis
  - —4800, 7200, 9600, 12000 and 14400 bps QAM
  - —Control of rate words, rate renegotiation and retrain
- V.32
  - —4800, 9600 (unencoded and trellis encoded) bps QAM
  - —Control of rate words and retrain
- V.29
  - —4800, 7200 and 9600 bps QAM.
  - —Leased line, duplex and half duplex mode, dial line for Fax mode and invalid carrier detection for Fax mode
- V.27ter
  - —2400 and 4800 bps PSK
- V.23
  - —1200 bps PSK
  - —Transmit or receive at 75bps
- V.22bis
  - —2400 bps QAM
  - —Guard tone supported, retrain and remote data loopback
- V.22
  - —1200 bps PSK
  - —Carrier drop causes retrain and guard tone supported
- V.21
  - —300 bps FSK
  - —Synchronous Fax mode
- V.17
  - —9600, 12000 and 14400 bps QAM
  - —Fax mode
- Bell 212A
  - —1200 bps PSK
- Bell 103
  - —300 bps FSK
  - —Asynchronous (16x clock) allowing for 0-300 bps

General

- No external DSP memory required
- Maximum and minimum bit rates are selectable
- All modulations can be used on 2/4 wire or dial line
- Caller ID support
- Echo cancellation up to 1.2 seconds (2 satellite hops)

Programmable Signal Levels

- Carrier detect on/off threshold level
- Transmit level
- Both DTMF tone transmit levels
- DFT threshold detection
- DTMF threshold detection

DTMF

- Generation
  - — 0-9, A-D, * and #
  - — 1300Hz Call Tone, 1100Hz FAX call tone, 2100 and 2225 answer tone, 1800Hz echo protect and 2100+15Hz AM V.34 answer ID generation
  - — 2 programmable tones
- Detection
  - — 0-9, A-D, * and #

Frequency Detection

- 21 common frequencies
  - — 150, 325, 350, 420, 440, 480, 510, 575, 600, 620, 1004, 1100, 1200, 1300, 1650, 1800, 2100, 2125, 2225, 2400 and 3000 Hz
- 2 programmable frequencies
- Specification of the number of DFT passes for control of frequency resolution, allowing for adjustments for specific country requirements

Status Information

- Receive bit rate
- Receive baud rate
- Receive power level
- Rate words
- Error count
- Round trip delay
- Eye quality monitor
- Jitter tracking
- Carrier and timing frequency offset
- Echo levels, delays and offset

Loopback and Testing

- 511
  - — Pattern generation
  - — Pattern detection and error count
- V.54
  - — Pattern generation
  - — Pattern detection
- V.22RDL
- X-Y Display
  - — Diagnostic output for connection to X-Y oscilloscope

— Constellation and informative display

Data Pump Command Interface

- Memory mapped parallel interface
- Sample software available from Motorola

Data Pump Data Interface

- SCC to SCI+ connection
  - — HDLC framing
  - — Transparent mode
  - — Asynchronous uart mode

DTE Interface

- PCMCIA
  - — Supports PCMCIA 2.1
  - — 5 configuration registers
  - — Common memory mapped to 68302 memory
  - — UART 16450/16550 emulation
  - — ExCA compatible
- Serial
  - — Uart with Autobaud capability up to 230.4Kbps
  - — Pass through from SCC to data pump without 68302 intervention
  - — ISDN interface while data pump is in use

Ring Detection

- Performed in the 68302 allowing for greater adjustment of specific country requirements
- Sample software available from Motorola

V.14

- Performed in the 68302
- Sample software available from Motorola

Controller Code

- Controller fax / modem source code available from third parties
  - — R. Scott Associates, Inc. (919) 846-7171
  - — TRISIGNAL Communications (514) 340-1334

Example Software

- Free software available on the Motorola BBS at (512) 891-3733
- Drivers for interfacing to the data pump
  - — Dial and train
  - — Ring detect, answer and train
  - — Test modes

Physical

- Packaging
  - — 68356: 357-pin Ball Grid Array - 645^2mm
  - — ST7544: 44-pin TQFP - 264^2mm
- Power consumption
  - — Chip set low power mode down to 800ua (200ua 68356, 600ua ST7544)
  - — V.34: 900mW for the 68356 and 260mW for the ST7544 operating with a 36.864MHz crystal
  - — DSP automatic power savings during fallback operation
- ST7544 Codec

— Available from Motorola
— 16 bit oversampling A/D and D/A
— 92dB dynamic range with a 9600Hz sampling frequency
— Total harmonic distortion of –89dB
— Single +5V power supply

Modem Design Example

- Schematic available from Motorola for a full modem and U.S. DAA design

PACKAGE AND FREQUENCY AVAILABILITY

Table 1. Package and Frequency Availability

Part Number	Parts	Frequency	Temperature	Availability
XKIT68356C34 (5 Volt)	XC68DP356ZP25 ST7544CQFP	0-25 Mhz	0 - 70ºC 0 - 70ºC	1Q95
XKIT68356LV34 (3.3 Volt)	XC68DP356ZP25V ST7544CQFP	0-20 Mhz	0 - 70ºC 0 - 70ºC	*TBD*

ADDITIONAL DOCUMENTATION

The documents listed in the following table contain detailed information on the MC68356. These documents may be obtained from the Literature Distribution Centers at the addresses listed at the end of this document.

Table 2. Documentation

Document Title	Order Number	Contents
MC68DP356 User's Manual	MC68DP356UM/AD	Detailed information on V.34 Chip Set
MC68356 User's Manual	MC68356UM/AD	Detailed information on the MC68356
MC68356 Product Brief	MC68356/D	Product Brief of the MC68356 Device
M68000 Family Programmer's Reference Manual	M68000PM/AD	M68000 Family Instruction Set
The 68K Source	BR729/D	Independent vendor listing supporting software and development tools

Literature Distribution Centers:
USA/EUROPE: Motorola Literature Distribution; P.O. Box 20912, Arizona 85036.
JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141 Japan.
ASIA-PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate,

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