MC145650

Product Preview

CopperGold™ Asymmetric Digital Subscriber Line (ADSL) Transceiver

144 PIN CQFP

The MC145650 is a single integrated circuit transceiver device for ANSI (American National Standard Institute) T1.413 category 2 ADSL modems[1], based on the Discrete Multi-tone (DMT) line code. The category 2 specification requires payload rates of (6.144 Mbps + 640 kbps) downstream and 640 kbps upstream, with crosstalk, over carrier serving area (CSA) range loops, and to achieve (1.544 Mbps + 176 kbps) downstream and 176 kbps upstream with crosstalk, over selected ANSI integrated services digital network (ISDN) loops. The payload makeup is flexible thereby allowing multiple data streams to be multiplexed and demultiplexed.

The MC145650 is capable of data rates up to 8 Mbps downstream and 1 Mbps bi-directionally, however actual rates obtained in any system are dependent on loop length, impairments, and transmitted power. The ADSL and DMT techniques are adaptive, changing system parameters based on loop characteristics in order to optimize the data rate.

This device combined with a microcontroller and a line interface may be configured as either a central office ADSL transceiver unit (ATU-C) or as a remote terminal ADSL transceiver unit (ATU-R).

An ADSL system could be configured to provide the user with high speed Internet access with POTS, or two 3 Mbps MPEG2 (or four 1.5 Mbps MPEG1) video channels, a 640 Kbps bi-directional data channel, along with POTS (Plain Old Telephone Service), all over existing copper telephone wire.

- Designed for ANSI Standard ANS T1.413 Category 2 modems (ETR-328)
- Single Chip Integrated Transceiver for Reduced System Cost
- Single 3.3V ±5% Power Supply
- Estimated 2 Watt Power Dissipation
- Flexible Channel Multiplexing and Demultiplexing
- Framing and Deframing
- Central Office or Remote Configurable
- Maintenance Facilities
- Initialization Control
- CRC and Scrambling
- Interleaving
- Reed-Solomon Forward Error Correction
- Wei 4D Trellis Encoding and Decoding
- DMT Modulation and Demodulation
- DMT Echo Cancellation for ADSL
- A/D Conversion and Receive Path Filtering
- D/A Conversion and Transmit Path Filtering
- Adaptive Rate Mode (N x 32 kbps Channel Programmability)

[1]Without 26 dBm transmit power boost
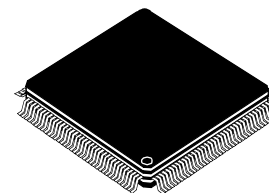
MOTOROLA

FUNCTIONAL DESCRIPTION

All of the basic functions required to perform both the transmit and the receive operations in a category 2 ADSL modem are contained within the MC145650. These functions include those that make up the transmit and receive data processing as well as the control, timing and test functions that are outside the data path. A detailed functional block diagram of the MC145650 is shown in Figure 1.
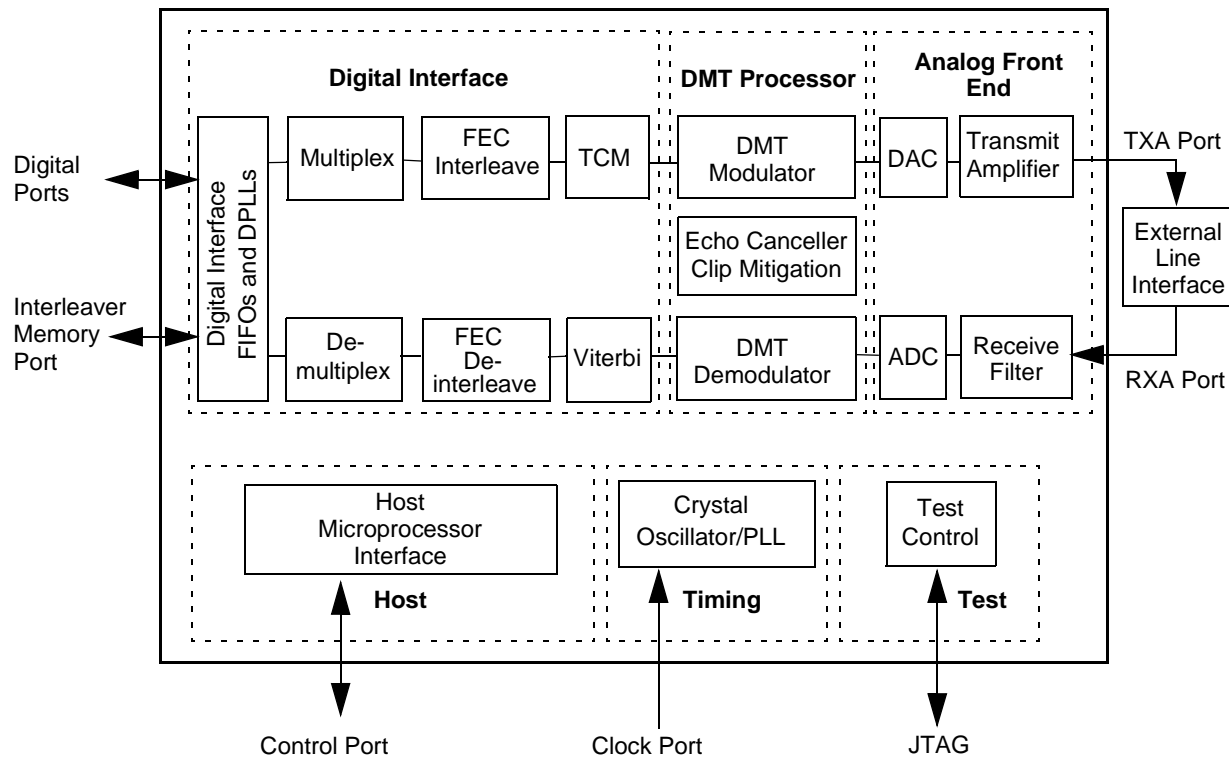

Figure 1. MC145650 Block Diagram

Digital Interface

Input and output data is transferred through the MC145650 digital interface. The MC145650 can support up to seven independent data streams, or bearer services, on its digital ports. The digital ports include four simplex ports for transmitting data downstream (as from an ADSL unit in a Central office (CO) to an ADSL remote terminal or subscriber box), and three duplex ports for bidirectional data transfers. All three duplex ports may be reconfigured to provide upstream simplex channels. The digital interface also provides framing, deframing, trellis encoding/decoding, and data interleaving functions.

Table 1. Supported Port Rates.

Port	Type	Min.	Max.
A	Simplex	32 kbps	10.752 Mbps
B	Simplex	32 kbps	4.608 Mbps
C	Simplex	32 kbps	3.072 Mbps
D	Simplex	32 kbps	2.048 Mbps
E	Duplex/Simplex	16 kbps	1.024 Mbps
F	Duplex/Simplex	32 kbps	1.024 Mbps
G	Duplex/Simplex	32 kbps	1.024 Mbps

Interleaver Memory Port

The interleaver memory port provides address, data, and control lines for interfacing to a fast static RAM used for interleave storage.

DMT Processor

The DMT processor consists of an embedded DSP and peripherals that perform the modulation, demodulation, and echo cancellation for the system. Both transmit and receive data processing is handled by the DMT processor, via the Analog Front End (AFE) and the digital interface.

Analog Front End (AFE)

The AFE performs the digital-to-analog conversions on the data samples received from the DMT processor and then provides the necessary filtering and signal conditioning for transmission on the line interface. During the receive operation, the AFE filters the analog input and then performs the analog-to-digital conversion, sending the digital samples on to the DMT processor.

Host Processor Interface (HPI)

The host processor interface allows communication with the MC145650 by an external microprocessor. This interface is compatible with the 8-bit parallel data and address interface available on popular Motorola microcontrollers and allows the host processor to be connected directly to the MC145650. The HPI parallel interface contains an 8-bit data bus, a 5-bit address bus, a chip select and a read/write signal. The interface also provides a single interrupt line to allow the MC145650 to request interrupt service from the host processor. Depending on the application, this processor could be from the Motorola MC68302, MC68360, or MPC860 families.

Timing Block

System clocks for the MC145650 are generated by the timing block. Depending on the operating mode and the type of transceiver operating at the far end, the timing block will generate the high rate system clock from an externally supplied clock, or from the recovered timing from the received DMT pilot tone. The externally supplied clock may be provided directly or a crystal may be used to generate a local oscillator reference.

Test Block

The test block provides the control circuitry necessary to perform JTAG and special debug features.

PIN ASSIGNMENTS

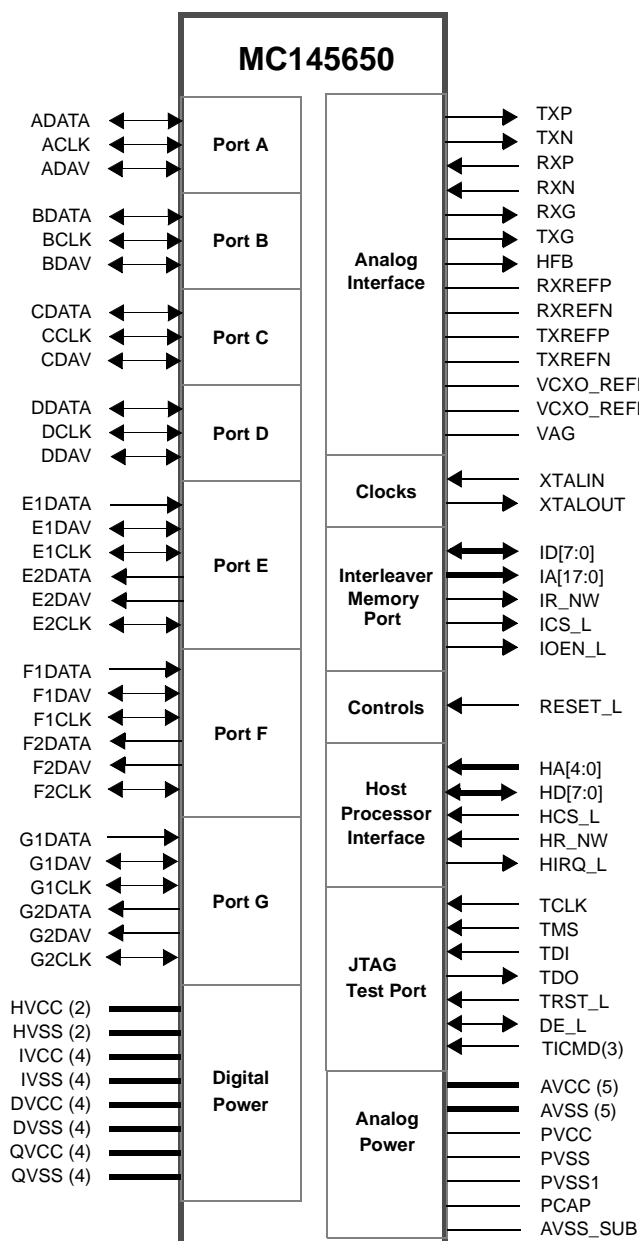Pinout for the MC145650 is shown in Figure 2 below.

Figure 2. MC145650 Pin Assignments

Table 1. Recommended Operating Conditions

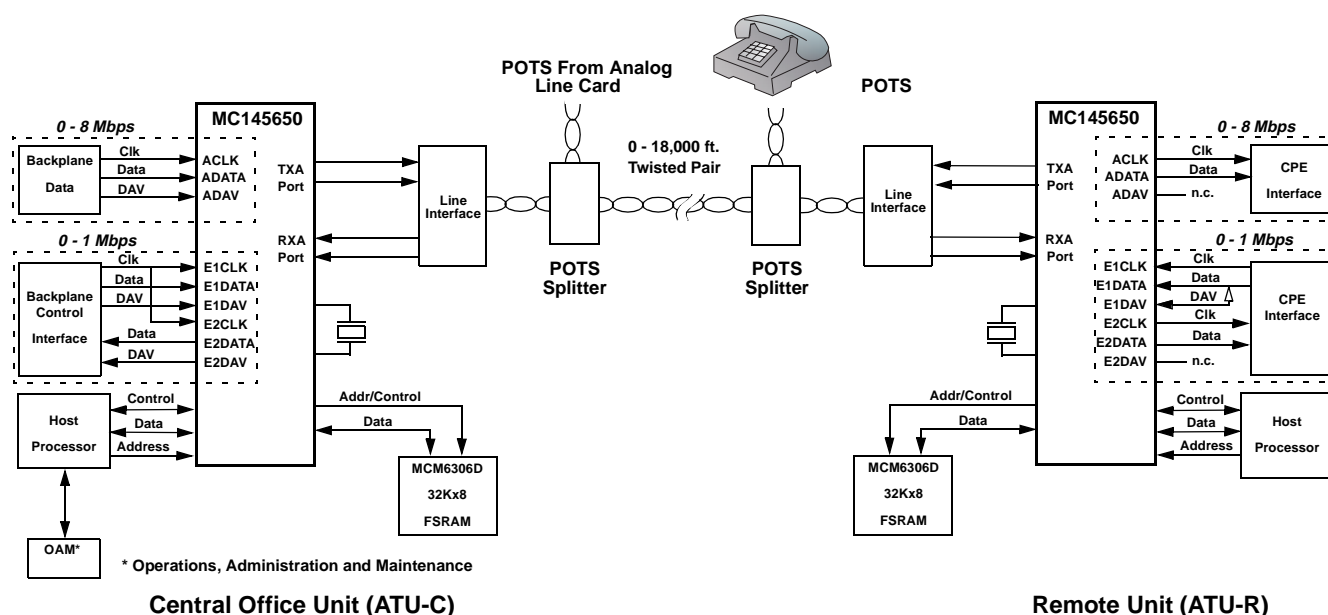| Parameter	Min	Typ	Max	Unit
DC Supply Voltage	3.135	3.3	3.465	V
Operating Temperature	-40	–	+85	°C

Figure 3. Typical Application

TYPICAL APPLICATION

The MC145650 can be configured to act as the master or slave as in the typical application shown in Figure 3. Along with a minimal amount of support electronics, it forms a complete central office or remote unit. Four different data streams can be multiplexed together on chip to make up the simplex downstream.

The host processor is used for initialization of and maintenance operation in the MC145650, while the optional SRAM provides interleaver storage.

ATM over ADSL

The MC145650 can transport an ATM data stream by channeling all data through one simplex port upstream and one simplex port downstream. Typically Port A is utilized for the downstream simplex port because it has the highest supported data rate. The TC (transport convergence) layer functionality must be implemented externally.

Adaptive Rate Modem

The MC145650 can be configured through the host processor interface during initialization as an adaptive rate modem. An adaptive rate modem can adjust the data rate to within 32 kbps of the maximum throughput the line is capable of supporting in the current noise environment (within a predeter-

mined margin). In this mode of operation, much like an analog modem but at higher data rates, a user can be assured they are achieving the highest data throughput possible.

DETAIL A

DETAIL A

DETAIL C

DETAIL B

DETAIL C

-C- SEATING PLANE

-H- DATUM PLANE

-H- DATUM PLANE

BASE METAL

| ⊕ | 0.20 (0.008) Ⓜ | H | A–B Ⓢ | D Ⓢ |

| ⊕ | 0.20 (0.008) Ⓜ | C | A–B Ⓢ | D Ⓢ |

| ⌒ | 0.10 (0.004) |

| ⊕ | 0.13 (0.005) Ⓜ | C | A–B Ⓢ | D Ⓢ |
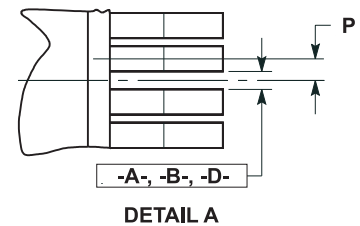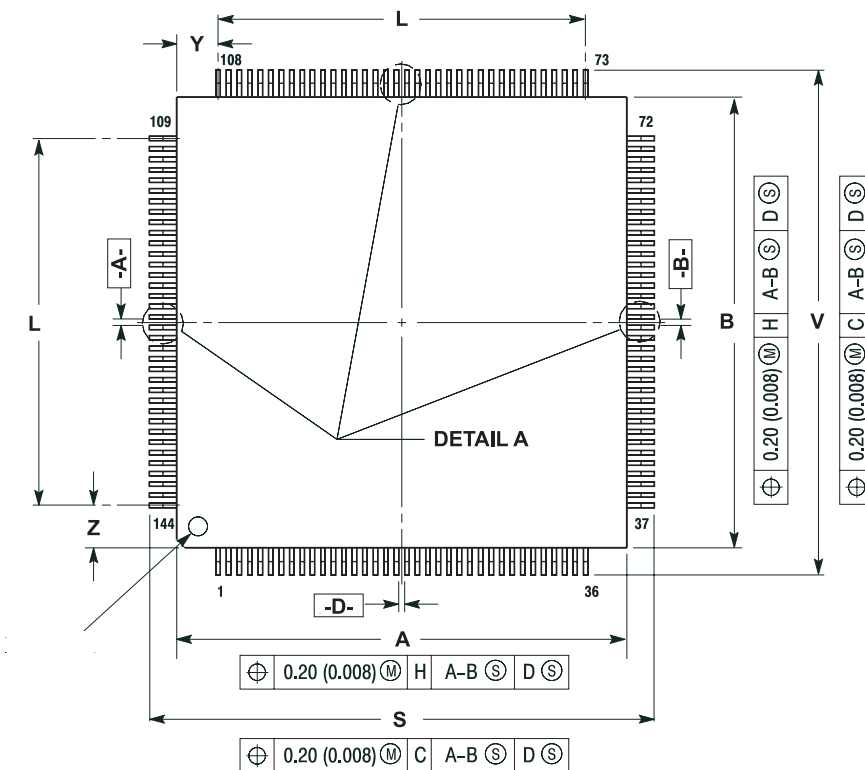
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DATUM PLANE –H– IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE CERAMIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUMS A–B AND –D– TO BE DETERMINED AT DATUM PLANE –H–.
5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE –C–.
6. DIMENSIONS A AND B DEFINE MAXIMUM CERAMIC BODY DIMENSIONS INCLUDING GLASS PROTRUSION AND MISMATCH CERAMIC BODY TOP AND BOTTOM.
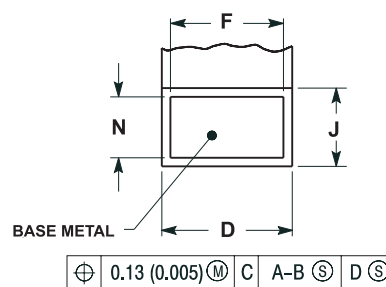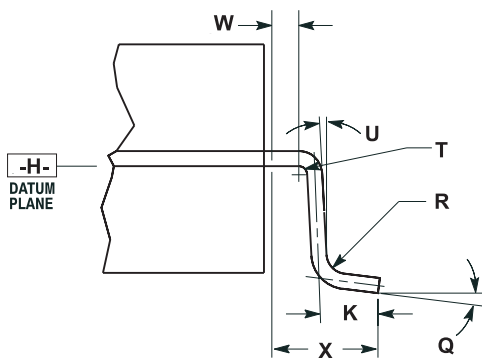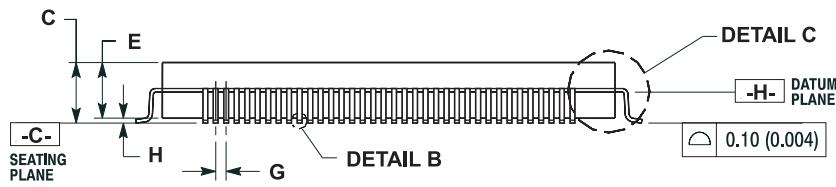
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	25.84	27.70	1.017	1.091
B	25.84	27.70	1.017	1.091
C	3.55	4.31	0.140	0.170
D	0.22	0.41	0.009	0.016
E	2.95	3.70	0.116	0.146
F	0.20	0.36	0.008	0.014
G	0.65 BSC		0.026 BSC	
H	0.25	0.88	0.010	0.035
J	0.13	0.25	0.005	0.010
K	0.65	0.95	0.026	0.037
L	22.75 REF		0.896 REF	
N	0.10	0.16	0.004	0.006
P	0.33 REF		0.013 BSC	
Q	0°	8°	0°	8°
R	0.20 REF		0.008 REF	
S	30.95	31.45	1.219	1.238
T	0.20 REF		0.008 REF	
U	0°	8°	0°	8°
V	30.95	31.45	1.219	1.238
W	1.50 REF		0.059 REF	
X	2.50 REF		0.098 REF	
Y	1.60 REF		0.063 REF	
Z	1.60 REF		0.063 REF	

CASE 863A-01
ISSUE A

*Note: For the most current information regarding this device, contact Motorola
on the World Wide Web at* http://www.mot.com/adsl.

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