

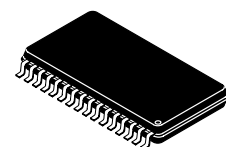
## MC143120B1

# Neuron<sup>®</sup> Chip Distributed Communications and Control Processor

The MC143120 is a communications and control processor which enables the development of interoperable products. It provides systems designers with many features to accelerate product development for distributed sense and control applications. Services at every layer of the OSI networking model are implemented in the included LonTalk<sup>®</sup> firmware-based protocol and are easily and optionally invoked. In addition, 34 I/O models are integrated with hardware to provide simplified sense and control device interfacing.

The MC143120 is designed for maximum clock operation of 10 MHz over a temperature range of - 40 to + 85°C including EEPROM writes.

- Three 8-Bit Pipelined Processors for Concurrent Processing of Application Code and Network Packets
- 11-Pin I/O Port Programmable in 34 Modes for Fast Application Program Development
- Two 16-Bit Timer/Counters for Measuring and Generating I/O Device Waveforms
- 5-Pin Communications Port That Supports Direct Connect and Network Transceiver Interface
- 1024 Bytes of Static RAM for Buffering Network and Application Data
- 512 bytes of EEPROM with On-Chip Charge Pump for Address, Binding Data, and Application Code
- Programmable Pull-Ups on IO4 – IO7 and 20 mA Sink Current on IO0 – IO3
- Unique 48-Bit ID Number Redundantly Stored in Every Device
- 10 Kbyte ROM
- 32-Pin SOG Package
- Low Operating Current      15 mA (typical) at 10 MHz Frequency  
   3 mA (typical) at 625 kHz Frequency
- Sleep Mode Operation Reduced Current Consumption (15  $\mu$ A Typical)
- 0.8 $\mu$  Manufacturing Process
- Redundant 48-Bit ID for Longer Reliability



**DW SUFFIX**  
SOG PACKAGE  
**CASE 1116-0**

**ORDERING INFORMATION**  
MC143120B1DW      SOG Package

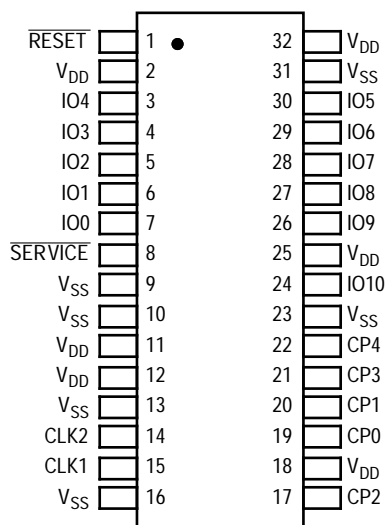
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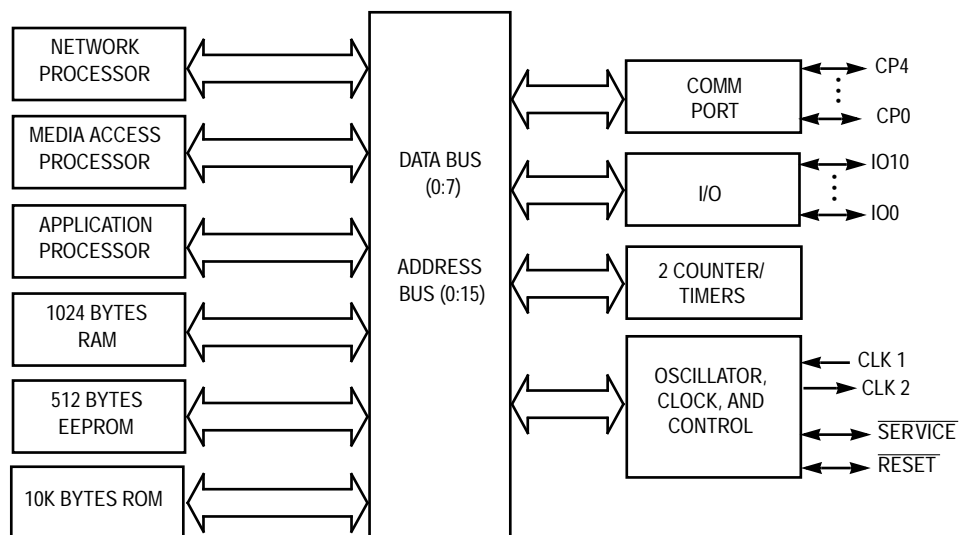


## PIN ASSIGNMENT

### 32-LEAD SOG



### BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Parameter                                      | Symbol    | Value                   | Unit |
|--|-----------|-------------------------|------|
| Supply Voltage Range (Referenced to $V_{SS}$ ) | $V_{DD}$  | – 0.3 to 7.0 V          | V    |
| Input Voltage Range (Referenced to $V_{SS}$ )  | $V_{in}$  | – 0.3 to $V_{DD} + 0.3$ | V    |
| Maximum Drain Current                          | $I_{DD}$  | 200                     | mA   |
| Maximum Source Current                         | $I_{SS}$  | 300                     | mA   |
| Maximum Power Dissipation                      | $P_D$     | 800                     | mW   |
| Operating Temperature                          | $T_A$     | – 40 to + 85            | °C   |
| Storage Temperature Range                      | $T_{stg}$ | – 65 to + 150           | °C   |

## RECOMMENDED OPERATING CONDITIONS (Voltages referenced to $V_{SS}$ , $T_A = -40$ to + 85°C)

| Parameter                      | Symbol   | Min            | Max      | Unit |
|--------------------------------|----------|----------------|----------|------|
| Supply Voltage                 | $V_{DD}$ | 4.5            | 5.5      | V    |
| TTL Low-Level Input Voltage    | $V_{IL}$ | $V_{SS}$       | 0.8      | V    |
| TTL High-Level Input Voltage   | $V_{IH}$ | 2.0            | $V_{DD}$ | V    |
| CMOS Low-Level Input Voltage   | $V_{IL}$ | $V_{SS}$       | 0.8      | V    |
| CMOS High-Level Input Voltage  | $V_{IH}$ | $V_{DD} - 0.8$ | $V_{DD}$ | V    |
| Operating Free-Air Temperature | $T_A$    | –40*           | + 85     | °C   |

\* Writes to EEPROM are guaranteed down to –40°C for all Neuron Chip devices.

## ELECTRICAL CHARACTERISTICS ( $V_{DD} = 4.5$ to 5.5 V)

| Parameter  | Symbol    | Min  | Typ                   | Max                                 | Unit |
|--|-----------|--|-----------------------|-------------------------------------|------|
| Input Low Voltage<br>IO0 – IO10, D0 – D7, CP0, CP3, CP4, SERVICE<br>CP0, CP1 (Differential)<br>Reset   | $V_{IL}$  | —<br>—   | —<br>—                | 0.8<br>Programmable<br>0.3 $V_{DD}$ | V    |
| Input High Voltage<br>IO0 – IO10, D0 – D7, CP0, CP3, CP4, service pin<br>CP0, CP1 (Differential)<br>Reset  | $V_{IH}$  | 2.0<br>Programmable  | —<br>—                | —<br>—<br>$V_{DD} - 0.7$            | V    |
| Low-Level Output Voltage<br>Standard Outputs ( $I_{OL} = 1.4$ mA) (Note 1)<br>High Sink (IO0 – IO3), SERVICE, RESET ( $I_{OL} = 20$ mA)<br>High Sink (IO0 – IO3), SERVICE, RESET ( $I_{OL} = 10$ mA)<br>Maximum Sink (CP2, CP3) ( $I_{OL} = 40$ mA)<br>Maximum Sink (CP2, CP3) ( $I_{OL} = 15$ mA) | $V_{OL}$  | —<br>—<br>—<br>—<br>—  | —<br>—<br>—<br>—<br>— | 0.4<br>0.8<br>0.4<br>1.0<br>0.4     | V    |
| High-Level Output Voltage<br>Standard Outputs ( $I_{OH} = -1.4$ mA) (Note 1)<br>High Sink (IO0 – IO3), SERVICE ( $I_{OH} = -1.4$ mA)<br>Maximum Source (CP2, CP3) ( $I_{OH} = -40$ mA)<br>Maximum Source (CP2, CP3) ( $I_{OH} = -15$ mA)   | $V_{OH}$  | $V_{DD} - 0.4$<br>$V_{DD} - 0.4$<br>$V_{DD} - 1.0$<br>$V_{DD} - 0.4$ | —<br>—<br>—<br>—      | —<br>—<br>—<br>—                    | V    |
| Hysteresis (Excluding CLK1, RESET)   | $V_{hys}$ | 175  | —                     | —                                   | mV   |
| Input Current (Excluding pullups) ( $V_{SS}$ to $V_{DD}$ ) (Note 2)  | $I_{in}$  | – 10   | —                     | 10                                  | μA   |
| Pullup Source Current ( $V_{out} = 0$ V, Output = High-Z) (Note 2)   | $I_{pu}$  | 60   | —                     | 260                                 | μA   |
| Operating Mode Supply Current (Notes 3, 4, and 5)  |           |  |                       |                                     | mA   |
| 10 MHz Clock   |           | —  | 14                    | 25                                  |      |
| 5 MHz Clock  |           | —  | 7.5                   | 13                                  |      |
| 2.5 MHz Clock  |           | —  | 4.5                   | 7                                   |      |
| 1.25 MHz Clock   |           | —  | 3.2                   | 4.2                                 |      |
| 0.625 MHz Clock  |           | —  | 1.6                   | 2.5                                 |      |
| Sleep Mode Supply Current (Note 3,4)   |           | —  | 9                     | 100                                 | μA   |

### NOTES:

- Standard outputs are A0 – A15, D0 – D7, IO4 – IO10, CP0, CP1, CP4,  $\bar{E}$ , and R/ $\bar{W}$ . ( $\overline{\text{RESET}}$  is a CMOS open drain input/output. CLK2 must have  $\leq 15$  pF.)
- IO4 – IO7 and SERVICE have configurable pullups.  $\overline{\text{RESET}}$  has a permanent pullup.
- Supply current measurement conditions: all outputs under no-load conditions, all inputs  $\leq 0.2$  V or  $\geq (V_{DD} - 0.2)$  V, configurable pullups off, crystal oscillator clock input, differential receiver disabled. The differential receiver adds approximately 200 μA typical and 600 μA maximum when enabled. It is enabled on either of the following conditions:
  - Neuron Chip in Operating mode **and** Comm Port in Differential mode.
  - Neuron Chip in Sleep mode **and** Comm Port in Differential mode **and** Comm Port Wakeup not masked.
- Typical values are at midpoint of voltage range and 25°C only.

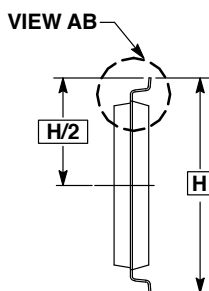
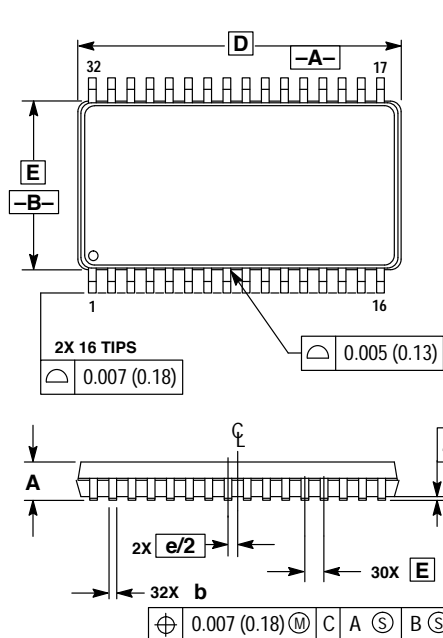
**RESET TRIP POINT ( $V_{DD}$ )**

| Part Number | Min | Typ | Max | Unit |
|-------------|-----|-----|-----|------|
| MC143120B1  | 2.1 | 3.3 | 4.4 | V    |

**Table 1. Pin Descriptions**

| Pin Name   | I/O                                | Pin Function   | DW Suffix<br>Pin Number |
|------------|------------------------------------|--|-------------------------|
| CLK1       | Input                              | Oscillator connection or external clock input.   | 15                      |
| CLK2       | Output                             | Oscillator connection. Leave open when external clock is input to CLK1. One Load.  | 14                      |
| RESET      | I/O (Built-In Configurable Pullup) | Reset pin (active low).  | 1                       |
| SERVICE    | I/O (Built-In Configurable Pullup) | Service pin. Indicator output during operation.  | 8                       |
| IO0 – IO3  | I/O                                | Large current-sink capacity (20 mA). General I/O port.   | 7, 6, 5, 4              |
| IO4 – IO7  | I/O (Built-In Configurable Pullup) | General I/O port. One of IO4 to IO7 can be specified as No. 1 timer/counter input with IO0 as output. IO4 can be used as the No. 2 timer/counter input with IO1 as output. | 3, 30, 29, 28           |
| IO8 – IO10 | I/O                                | General I/O port. Can be used for serial communication with other devices.   | 27, 26, 24              |
| D0 – D7    | I/O                                | Memory data bus.   | N/A                     |
| R/W        | Output                             | Read/write control output port for external memory.  | N/A                     |
| E          | Output                             | Control output port for external memory.   | N/A                     |
| A15 – A0   | Output                             | Address output port.   | N/A                     |
| $V_{DD}$   | Input                              | Power input (5 V nom). All $V_{DD}$ pins must be connected together externally.  | 2, 11, 12, 18, 25, 32   |
| $V_{SS}$   | Input                              | Power input (0 V, GND). All $V_{SS}$ pins must be connected together externally.   | 9, 10, 13, 16, 23, 31   |
| CP0 – CP4  | Communication Network Interface    | Bidirectional port that supports communications protocols by specifying mode.  | 19, 20, 17, 21, 22      |
| NC         | N/A                                | No internal connection. Leave open.  | N/A                     |

DW SUFFIX  
SOG PACKAGE  
CASE 1116-01



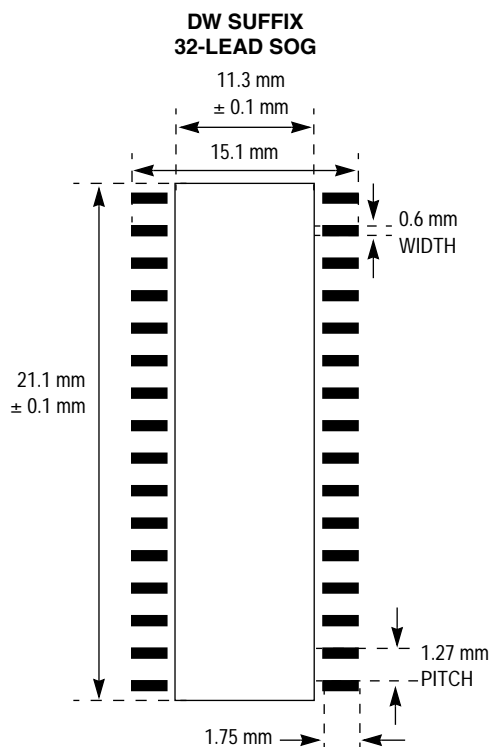
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION. MAXIMUM MOLD PROTRUSIONS SHALL NOT EXCEED 0.006 (0.15) PER SIDE.
4. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED 0.026 (0.65).

|     | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
| DIM | MIN       | MAX   | MIN         | MAX  |
| A   | 0.090     | 0.100 | 2.29        | 2.54 |
| A1  | 0.004     | 0.010 | 0.10        | 0.25 |
| A2  | 0.086     | 0.090 | 2.18        | 2.29 |
| b   | 0.014     | 0.020 | 0.35        | 0.51 |
| C   | 0.004     | 0.009 | 0.10        | 0.22 |
| D   | 0.825 BSC |       | 20.96 BSC   |      |
| E   | 0.430 BSC |       | 10.92 BSC   |      |
| e   | 0.050 BSC |       | 1.27 BSC    |      |
| H   | 0.560 BSC |       | 14.22 BSC   |      |
| L   | 0.021     | 0.041 | 0.33        | 1.04 |
| L1  | 0.120 REF |       | 3.048 REF   |      |
| θ   | 0°        | 8°    | 0°          | 8°   |


VIEW AB

MC143120 PAD LAYOUT



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