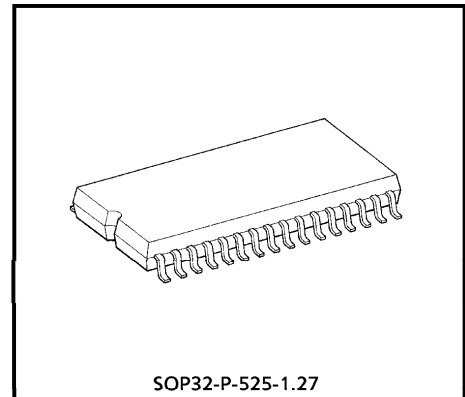


TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TMPN3120B1AM

## Neuron<sup>®</sup> Chip For Distributed Intelligent Control Networks (LONWORKS<sup>®</sup>)

The TMPN3120B1AM is a Neuron Chip which configures LONWORKS nodes on a single chip. Neuron Chips have all the built-in communications and control functions required to implement LONWORKS nodes. These nodes may then be easily integrated into highly-reliable distributed intelligent control networks. The typical functions for this chip are explained below.



Weight : 1.0g (Typ.)

### FEATURES

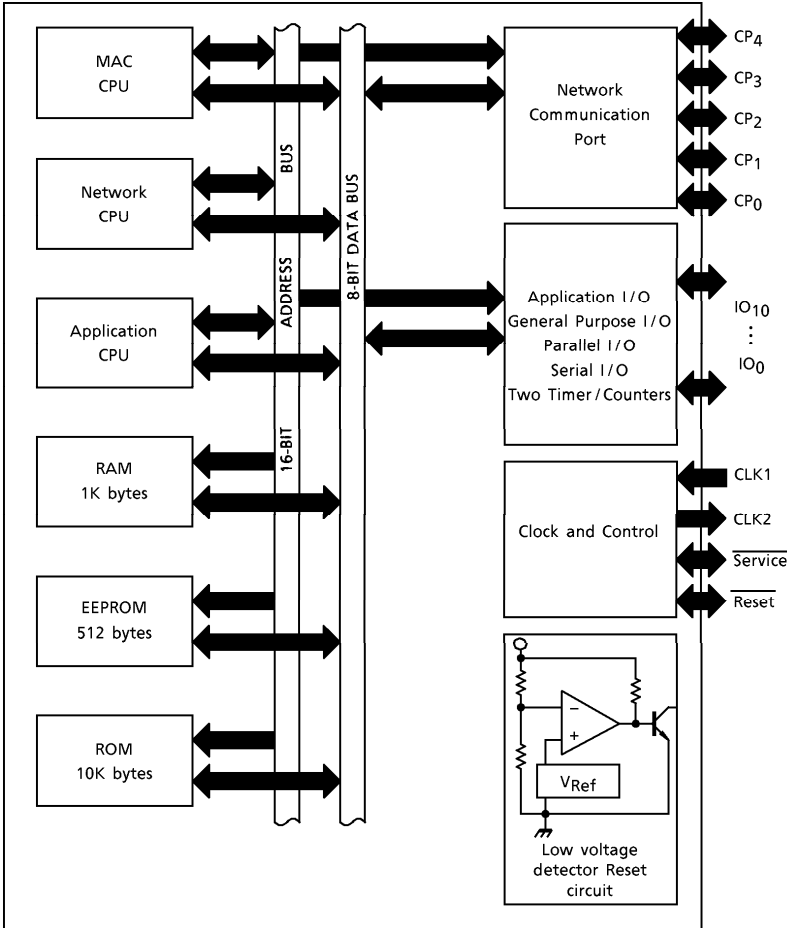
- I/O Functions
  - Eleven programmable I/O pins.
  - Two programmable 16-bit timers and counters built in.
  - 34 different types of I/O functions to handle a wide range of input and output.
  - ROM firmware image containing pre-programmed I/O drivers, greatly simplifying application programs.
- Network functions
  - Two CPUs for communication protocol processing built in.  
The communications and application CPUs execute in parallel.
  - Equipped with a built-in LonTalk protocol which supports all seven levels of the OSI reference model with ISO.
  - The ROM firmware image contains a complete network operating system, greatly simplifying application programs.
  - Built-in twisted-pair wire transceiver
  - Equipped with communications modes and communication speeds which support various types of external transceivers.  
Supports twisted-pair wire, power line, radio (RF), infrared, coaxial cables, and fiber optics.
  - Communication port transceiver modes and logical addresses stored within the EEPROM.  
Can be amended via the network.

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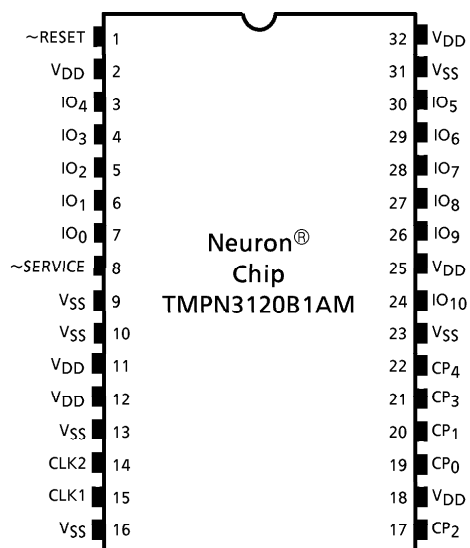
- Other functions
  - Application programs are also stored within the EEPROM.  
May be updated by downloading over the network. Up to 400-byte applications can be stored.
  - Built-in watch-dog timer.
  - Each chip has a unique ID number.  
Effective during the logical installation of networks.
  - Low electrical consumption mode supported with a sleep mode.
  - Built-in low-voltage detection circuit.  
Prevents incorrect operations and writing errors in the EEPROM during drops in power voltage.
  - The package is SOP32-P-525-1.27.

BLOCK DIAGRAM



ITEM	TMPN3120B1AM
CPU	8-bit CPU × 3
RAM	1,024 bytes
ROM	10,240 bytes
EEPROM	512 bytes
16-bit Timer / Counter	2 channels
External Memory Interface	Not available
Package	32-pin SOP

PIN ASSIGNMENT



PIN FUNCTION

PIN No.	PIN NAME	I / O	PIN FUNCTION
15	CLK1	Input	Oscillator connection, or external clock input.
14	CLK2	Output	Oscillator connection. Leave open when external clock is input to CLK1.
1	~RESET	I / O (built-in configurable pull-up)	Reset pin. (Active low)
8	~SERVICE	I / O (built-in configurable pull-up)	Service pin. Indicator output during operation.
7~4	IO0~IO3	I / O	Large current sink capacity (20mA). General I / O port.
3, 30~28	IO4~IO7	I / O (built-in configurable pull-up)	General I / O port. One of IO4 to IO7 can be specified as No.1 timer / counter input. Output signal can be output to IO0. IO4 can be used as the No.2 timer / counter input with IO1 as output.
27, 26, 24	IO8~IO10	I / O	General I / O port. Can be used for serial communication with other device.
2, 11, 12, 18, 25, 32	VDD	Input	Power input (5.0V Typ.)
9, 10, 13, 16, 23, 31	VSS	Input	Power input (0V GND)
19, 20, 17, 21, 22	CP0~CP4	I / O	Bidirectional port for communications. Supports several communications protocols by specifying mode.

- (\*) ● The ~SERVICE and IO4~IO7 terminals are programmable pull-ups.
- All VDD terminals must be externally connected.
- All VSS terminals must be externally connected.

MAXIMUM RATINGS ( $V_{SS} = 0V$ ,  $V_{SS}$  typ.)

CHARACTERISTICS	SYMBOL	RATING	UNIT
Power Supply Voltage	$V_{DD}$	-0.3~7.0	V
Input Voltage	$V_{IN}$	-0.3~ $V_{DD} + 0.3$	V
Power Dissipation	$P_D$	800	mW
Storage Temperature	$T_{stg}$	-65~150	°C

## OPERATING CONDITIONS

ITEM	SYMBOL	MIN	TYP.	MAX	UNIT
Operating Voltage	$V_{DD}$	4.5	5.0	5.5	V
Input Voltage (TTL)	$V_{IH}$	2.0	—	$V_{DD}$	V
	$V_{IL}$	$V_{SS}$	—	0.8	V
Input Voltage (CMOS)	$V_{IH}$	$V_{DD} - 0.8$	—	$V_{DD}$	V
	$V_{IL}$	$V_{SS}$	—	0.8	V
Operating Frequency	$f_{osc}$	0.625	—	10	MHz
Operating Temperature	$T_{opr}$	-40	—	85	°C

## ELECTRICAL CHARACTERISTICS

DC characteristic ( $V_{DD} = 5.0V \pm 10\%$ ,  $V_{SS} = 0V$ ,  $T_a = -40 \sim 85^\circ C$ )

(Above operating conditions apply unless otherwise states.)

CHARACTERISTICS	SYMBOL	PINS	TEST CONDITION	MIN	MAX	UNIT	
LOW Output Voltage (1)	$V_{OL}$ (1)	IO <sub>0</sub> ~IO <sub>3</sub>	$I_{OL} = 20mA$	0	0.8	V	
			$I_{OL} = 10mA$	0	0.4	V	
LOW Output Voltage (2)	$V_{OL}$ (2)	~SERVICE	Duty cycle = 50%	$I_{OL} = 20mA$	0	0.8	V
				$I_{OL} = 10mA$	0	0.4	V
LOW Output Voltage (3)	$V_{OL}$ (3)	CP <sub>2</sub> , CP <sub>3</sub>	$I_{OL} = 40mA$	0	1.0	V	
LOW Output Voltage (4)	$V_{OL}$ (4)	Others (Note 1)	$I_{OL} = 1.4mA$	0	0.4	V	
HIGH Output Voltage (1)	$V_{OH}$ (1)	IO <sub>0</sub> ~IO <sub>3</sub>	$I_{OH} = -1.4mA$	$V_{DD} - 0.4$	$V_{DD}$	V	
HIGH Output Voltage (2)	$V_{OH}$ (2)	~SERVICE	$I_{OH} = -1.4mA$	$V_{DD} - 0.4$	$V_{DD}$	V	
HIGH Output Voltage (3)	$V_{OH}$ (3)	CP <sub>2</sub> , CP <sub>3</sub>	$I_{OH} = -40mA$	$V_{DD} - 1.0$	$V_{DD}$	V	
HIGH Output Voltage (4)	$V_{OH}$ (4)	Others (Note 1)	$I_{OH} = -1.4mA$	$V_{DD} - 0.4$	$V_{DD}$	V	
Input Current	$I_{IN}$	(Note 2)	$V_{IN} = V_{SS} \sim V_{DD}$	-10	+10	μA	
Pull-up Current	$I_{PU}$	IO <sub>4</sub> ~IO <sub>7</sub> ~SERVICE, ~RESET (Note 3)	$V_{IN} = 0V$	-30	-300	μA	
Low-voltage Detection Level	$V_{LVD}$	$V_{DD}$	—	3.8	4.5	V	

(Note 1) Output voltage characteristics exclude the ~RESET pin and CLK2 pin.

(Note 2) Excludes pull-up input pins.

(Note 3) The IO<sub>4</sub> to IO<sub>7</sub> and ~SERVICE pins have programmable pull-ups. ~RESET has a fixed pull-up.

ITEM		SYMBOL	TYP.	MAX	UNIT
Operating Mode Current Consumption	10MHz Clock	I <sub>DD(OP)</sub>	17	30	mA
	5MHz Clock		9	15	
	2.5MHz Clock		6	8	
	1.25MHz Clock		4	5	
	0.625MHz Clock		2	3	
Sleep Mode Current Consumption		I <sub>DD(SLP)</sub>	16	100	μA

(Note) Test conditions for current dissipation

V<sub>DD</sub> = 5V, all output = with no load, all input = 0.2V or below or V<sub>DD</sub> - 0.2V, programmable pull-up = off, crystal oscillator clock input, differential receiver disabled.

The current value (typ.) is a typical value when Ta = 25°C.

The current value (max) applies to the rated temperature range of V<sub>DD</sub> = 5.5V.

200μA (typ.) to 600μA (max) is added to the current of the differential receiver when the receiver is enabled.

The differential receiver is enabled by either of the following conditions :

- When the Neuron chip is in Run mode and the communication ports are in Differential mode.
- When the Neuron chip is in Sleep mode, the communication ports are in Differential mode, and the Wakeup pins are masked.

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**"PORTABLE DEVICES"**

(I) A portable device defined by ISO standard 7816 as having a width or length of  $\pm 10$ mm and a thickness of  $\pm 3$ mm.

(II) A portable device that conforms to the electrical connection placement and shape stipulated by ISO standard 7816 Part 2.

(III) A pocket-sized portable device in which the ID or history of the holder or the ID or history of the device can be stored as information.

[ BULL CP8 patent: America patent number 4,382,279 ]

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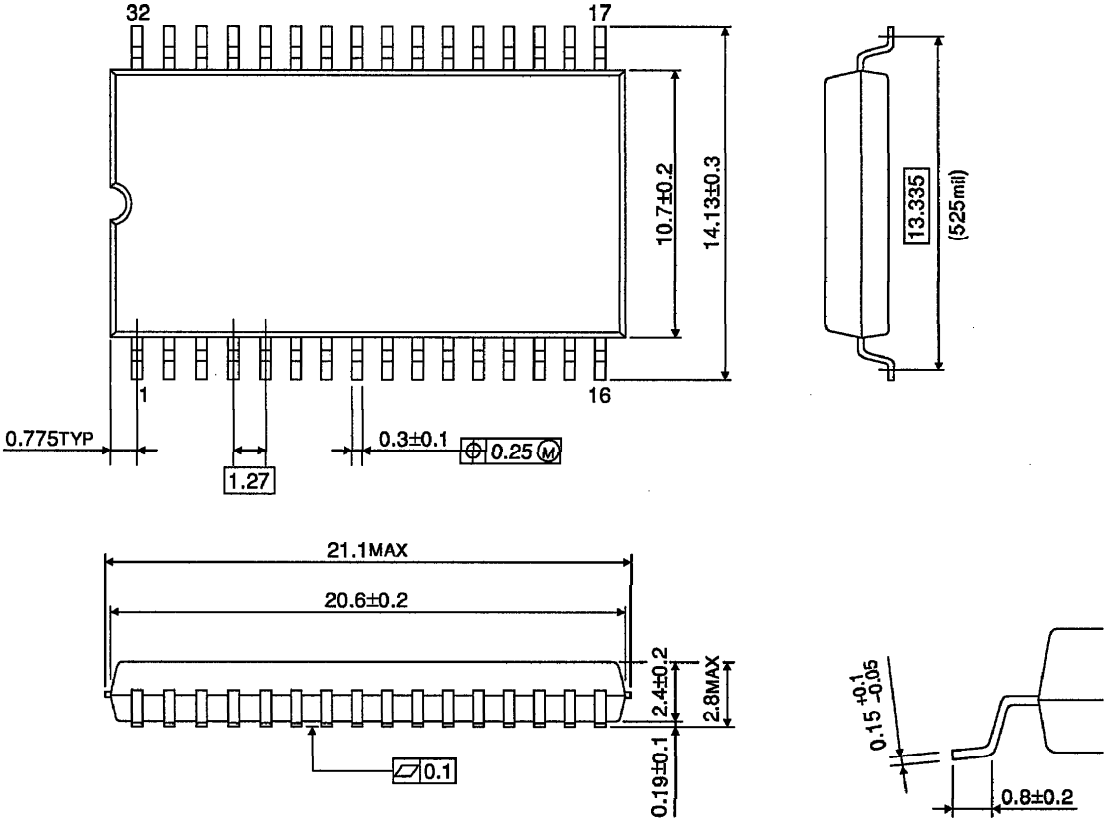
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PACKAGE DIMENSIONS  
SOP32-P-525-1.27

Unit : mm



Weight : 1.0g (Typ.)