

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

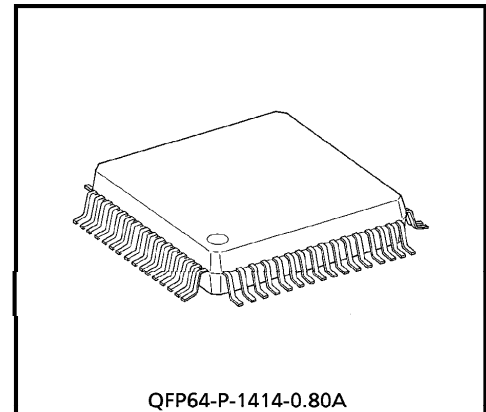
T M P N 3 1 5 0 B 1 A F

Neuron[®] Chip For Distributed Intelligent Control Networks (LONWORKS[®])

The TMPN3150B1AF is a Neuron Chip which configures LONWORKS nodes in combination with external memory. 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.

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. (Stored in external ROM)
- 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.
 - Highly reliable communication protocol is supplied as firmware.
 - Built-in twisted-pair wire transceiver with improved common mode and drive current capabilities.
 - 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.



QFP64-P-1414-0.80A

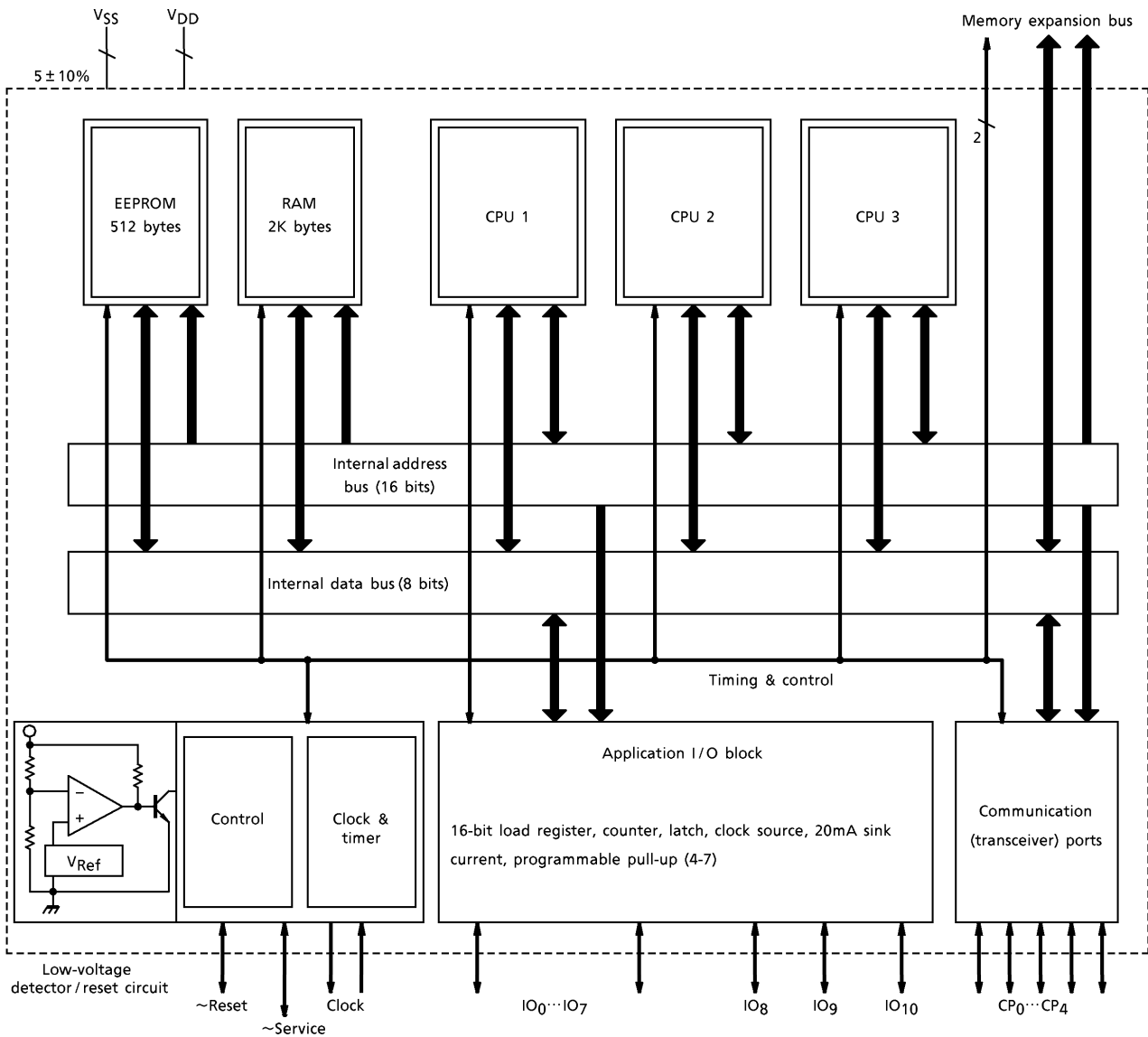
Weight : 1.0g (Typ.)

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- Other functions
 - Application programs are also stored within the EEPROM.
May be updated by downloading over the network. EEPROM can be externally added.
 - 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 QFP64-P-1414-0.80A.

BLOCK DIAGRAM



Reference clock input : 10MHz, 5MHz, 2.5MHz, 1.25MHz, 625kHz

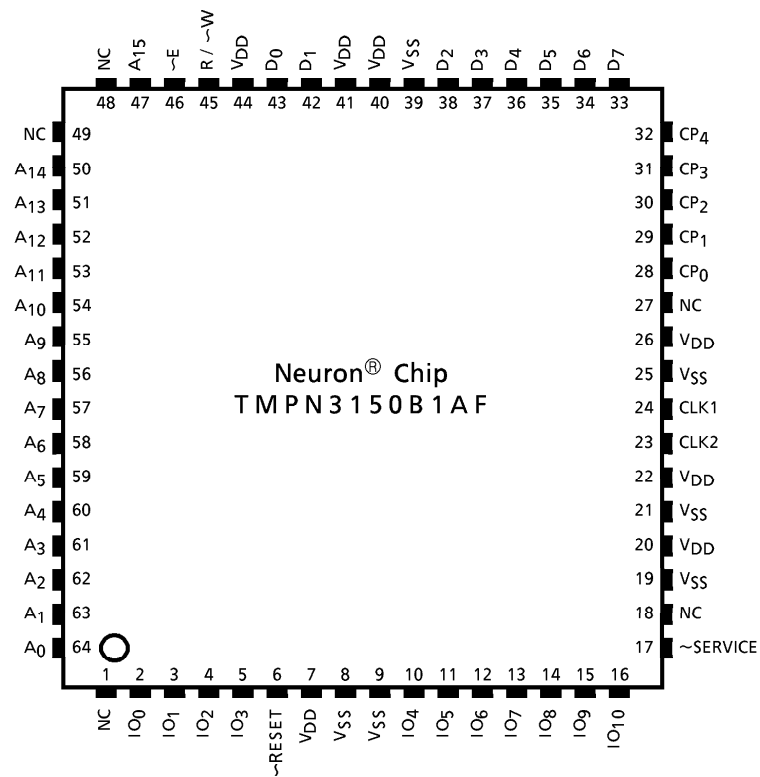
ITEM	TMPN3150B1AF
CPU	8-bit CPU × 3
RAM	2,048 bytes
ROM	—
EEPROM	512 bytes
16-bit Timer / Counter	2ch
External Memory Interface	あり
Package	64 pin QFP

PIN FUNCTION

PIN No.	PIN NAME	I/O	PIN FUNCTION
24	CLK1	Input	Oscillator connection, or external clock input.
23	CLK2	Output	Oscillator connection. Leave open when external clock is input to CLK1.
6	~RESET	I/O (built-in pull-up)	Reset pin. (Active low)
17	~SERVICE	I/O (built-in configurable pull-up)	Service pin. Indicator output during operation.
2~5	IO ₀ ~IO ₃	I/O	Large current sink capacity (20mA). General I/O port.
10~13	IO ₄ ~IO ₇	I/O (built-in configurable pull-up)	General I/O port. One of IO ₄ to IO ₇ can be specified as No.1 timer/counter input. Output signal can be output to IO ₀ . IO ₄ can be used as the No.2 timer/counter input with IO ₁ as output.
14~16	IO ₈ ~IO ₁₀	I/O	General I/O port. Can be used for serial communication with other device.
43, 42, 38~33	D ₀ , D ₁ , D ₂ ~D ₇	I/O	Data bus for memory expansion
45	R/~W	Output	Output port for controlling read/write for memory expansion
46	~E	Output	Output port for controlling memory expansion
47, 50~64	A ₁₅ , A ₁₄ ~A ₀	Output	Address output port for memory expansion
7, 20, 22, 26, 40, 41, 44	V _{DD}	Input	Power input (5.0V Typ.)
8, 9, 19, 21, 25, 39	V _{SS}	Input	Power input (0V GND)
1, 18, 27, 48, 49	NC	—	Do not connect anything. Leave pins open.
28~32	CP ₀ ~CP ₄	I/O	Bidirectional port for communications. Supports several communications protocols by specifying mode.

- (*)
- The ~SERVICE and IO₄~IO₇ terminals are programmable pull-ups.
 - All V_{DD} terminals must be externally connected.
 - All V_{SS} terminals must be externally connected.

PIN ASSIGNMENT



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

ITEM	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.)

ITEM	SYMBOL	PINS	TEST CONDITION	MIN	MAX	UNIT	
LOW Output Voltage (1)	V_{OL} (1)	IO ₀ ~IO ₃	$I_{OL} = 20mA$	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 ₂ , CP ₃	$I_{OL} = 40mA$	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 ₀ ~IO ₃	$I_{OH} = -1.4mA$	$V_{DD} - 0.4$	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 ₂ , CP ₃	$I_{OH} = -40mA$	$V_{DD} - 1.0$	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 ₄ ~IO ₇ ~SERVICE, ~RESET (Note 3)	$V_{IN} = 0V$	- 30	- 300	μA	
Current (operating)	I_{DD} (1)	V_{DD}	$V_{DD} = 5.5V$ (no load)	—	30	mA	
Current (SLEEP mode)	I_{DD} (2)	V_{DD}	$V_{DD} = 5.5V$ (no load)	—	0.1	mA	
Low-voltage Detection Level	V_{LVD}	V_{DD}	—	3.8	4.4	V	

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

(Note 2) Excludes pull-up input pins.

(Note 3) The IO₄ to IO₇ and ~SERVICE pins have programmable pull-ups. ~RESET has a fixed pull-up.

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"PORTABLE DEVICES"

(I) A portable device defined by ISO standard 7816 as having a width or length of ± 10 mm and a thickness of ± 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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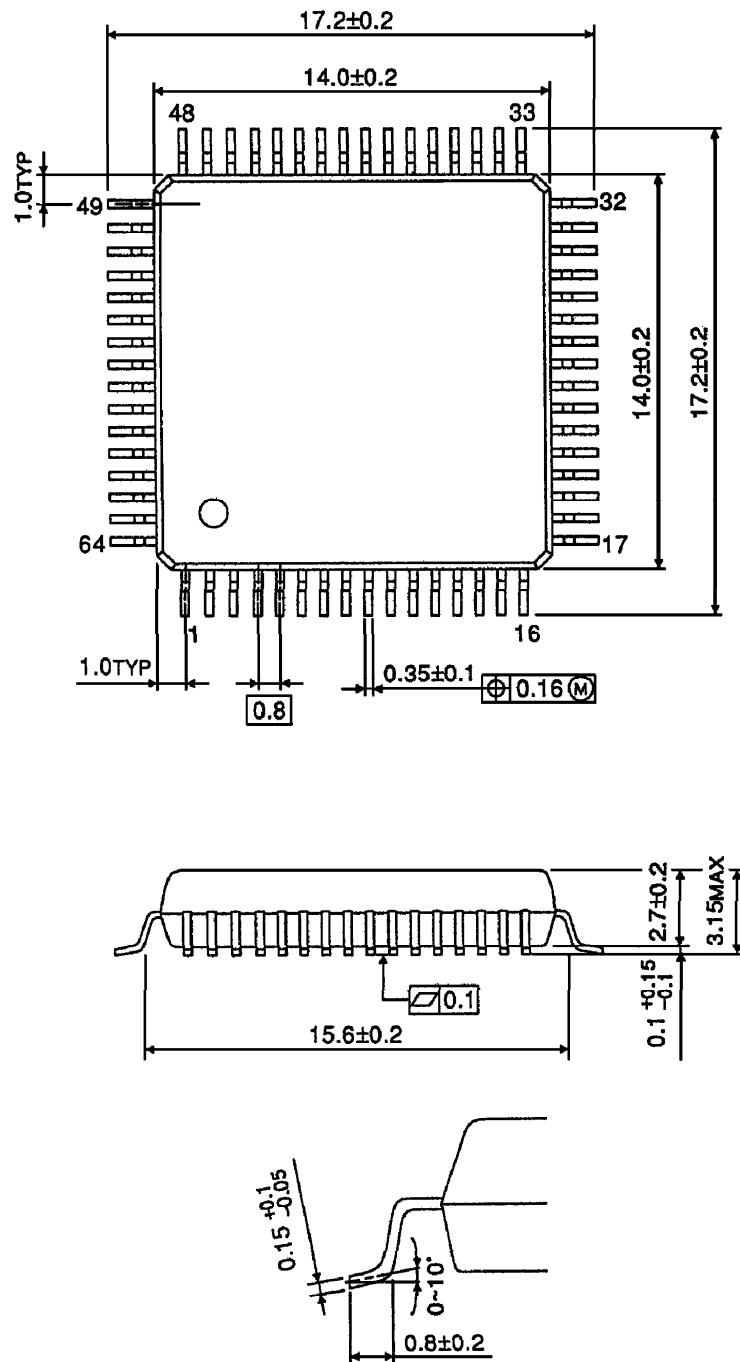
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OUTLINE DRAWING
QFP64-P-1414-0.80A

Unit : mm



Weight : 1.0g (Typ.)