HN624416N Series

1048576-word × 16-bit/2097152-word × 8-bit CMOS Mask Programmable ROM

HITACHI

ADE-203-465(Z)
Preliminary
Rev. 0.0
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Description

The HN624416N is a 16-Mbit CMOS mask-Programmable ROM organized either as 1048576 words by 16 bits or 2097152 words by 8 bits. Realizing low power consumption, this memory is allowed for battery operation. And a high speed access of 100/120 ns (max) is the most suitable to the system using a high speed micro-computer by 16 bits.

Feature

- Single 5 V supply
- High speed
  Normal access time: 100/120 ns (max)
  Page access time: 40/50 ns (max)
- Low power
  Active: 770 mW (max)
  Standby: 165 µW (max)
- Byte-wide or word-wide data organization (Switched by BHE terminal)
- 4 word page access on word-wide mode
- 8 byte page access on byte-wide mode
- Three-state data output for or-tying
- Directly TTL compatible
  All inputs and outputs
- Pin compatible with 8 Mbit Mask ROM (HN62448)

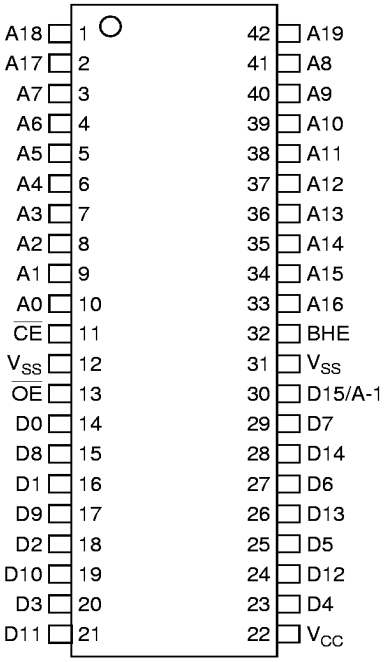
Note: The specifications of this device are subject to change without notice. Please contact your nearest Hitachi's Sales Dept. regarding specifications.

Ordering Information

Type No.	Access time	Package
HN624416NP-10 HN624416NP-12	100 ns 120 ns	600 mil 42-pin plastic DIP (DP-42)
HN624416NFB-10 HN624416NFB-12	100 ns 120 ns	600 mil 44-pin plastic SOP (FP-44D)
HN624416NTT-10 HN624416NTT-12	100 ns 120 ns	400 mil 44-pin plastic TSOP II (TTP-44D)

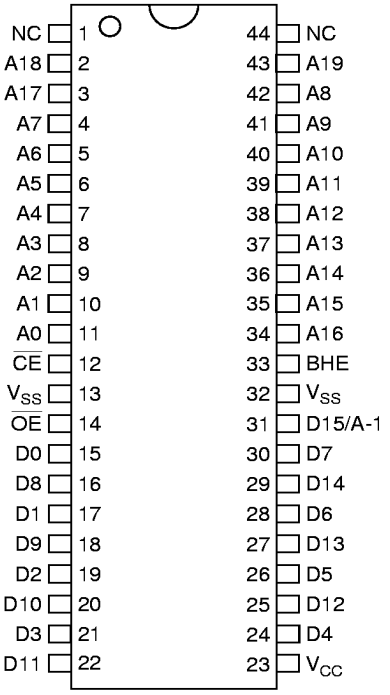
Pin Arrangement

HN624416NP Series



(Top View)

HN624416NFB Series
HN624416NTT Series

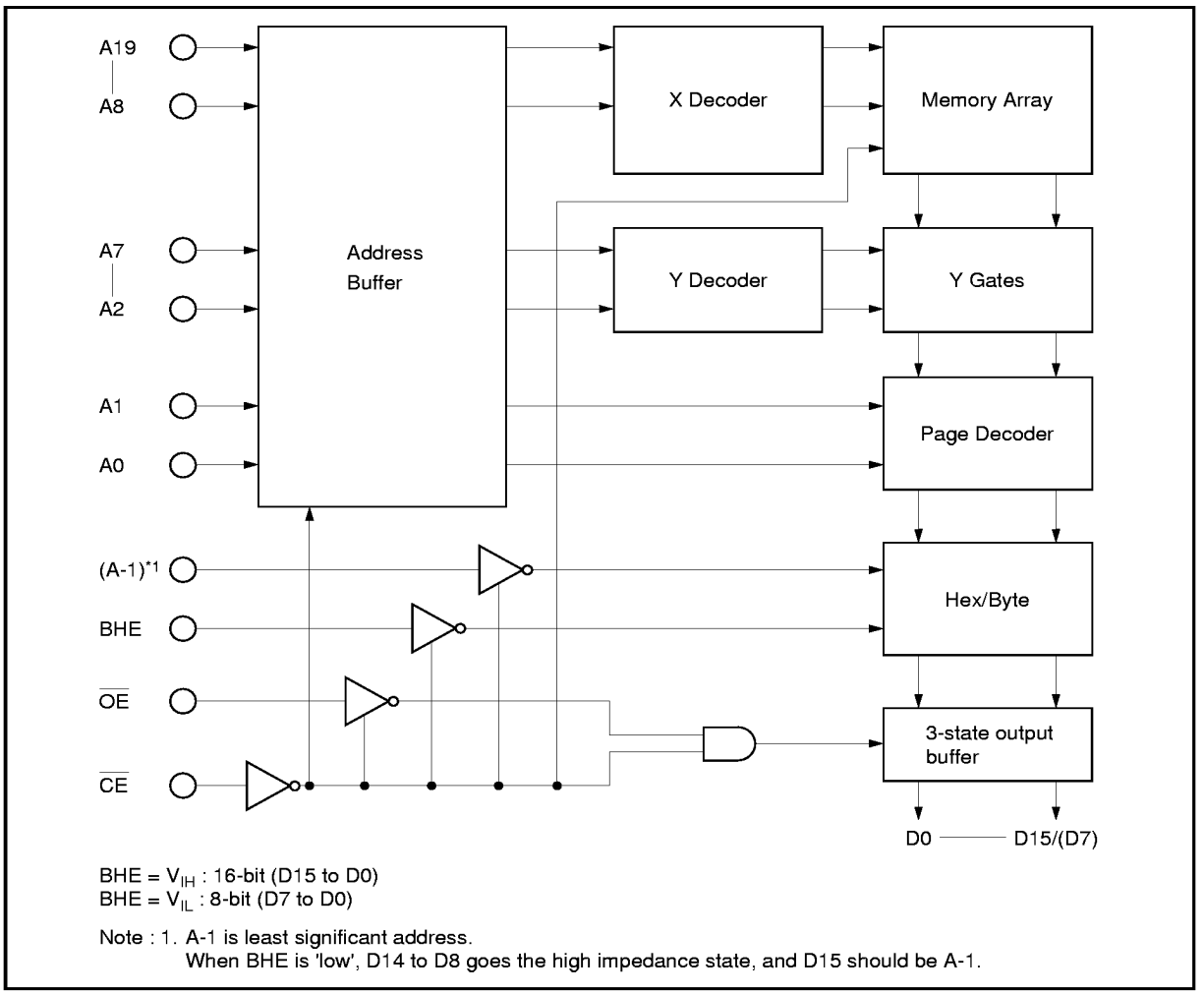


(Top View)

Pin Description

Pin name	Function
A2 to A19	Address inputs
D0 to D15	Data outputs
A-1, A0, A1	Page address inputs
BHE	8/16 bit (byte/word) mode switch
$\overline{CE}$	Chip enable
$\overline{OE}$	Output enable
NC	No connection
V_{CC}	Power supply
V_{SS}	Ground

Block Diagram



BHE = V_{IH} : 16-bit (D15 to D0)
BHE = V_{IL} : 8-bit (D7 to D0)

Note : 1. A-1 is least significant address.
When BHE is 'low', D14 to D8 goes the high impedance state, and D15 should be A-1.

Mode Selection

	Pin							
					Data output		Address input	
Mode	$\overline{CE}$	$\overline{OE}$	BHE	D15/A-1	D0-D7	D8-D15	LSB	MSB
Standby	H	×[*1]	×	×	High-Z[*2]	High-Z	—	—
Output disable	L	H	×	×	High-Z	High-Z	—	—
Read (16-bit)	L	L	H	Dout	D0 to D7	D8 to D15	A0	A19
Read (8-bit)	L	L	L	L	D0 to D7	High-Z	A-1	A19
Read (8-bit)	L	L	L	H	D8 to D15	High-Z	A-1	A19

Notes: 1. ×: Don't care.
2. High-Z: High impedance

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply voltage[*1]	V_{CC}	–0.3 to +7.0	V
All input and output voltage[*1]	Vin, Vout	–0.3 to V_{CC} + 0.3	V
Operating temperature range	Topr	0 to +70	°C
Storage temperature range	Tstg	–55 to +125	°C
Temperature under bias	Tbias	–20 to +85	°C

Note: 1. With respect to V_{SS}.

Recommended DC Operating Conditions (Ta = 0 to + 70°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.5	5.0	5.5	V
	V_{SS}	0	0	0	V
Input Voltage	V_{IH}	2.2	—	V_{CC} + 0.3	V
	V_{IL}	–0.3	—	0.8	V

DC Characteristics (V_{CC} = 5.0 V ± 10%, V_{SS} = 0 V, Ta = 0 to + 70°C)

Parameter		Symbol	Min	Max	Unit	Test conditions
Supply current	Active	I_{CC}	—	140/120	mA	V_{CC} = 5.5 V, I_{DOUT} = 0 mA, t_{RC} = 100/120 ns
	Standby	I_{SB1}	—	30	µA	V_{CC} = 5.5 V, $\overline{CE} \geq V_{CC} - 0.2$ V
	Standby	I_{SB2}	—	3	mA	V_{CC} = 5.5 V, $\overline{CE} \geq 2.2$ V
Input leakage current		$\|I_{IL}\|$	—	10	µA	Vin = 0 to V_{CC}
Output leakage current		$\|I_{OL}\|$	—	10	µA	$\overline{CE}$ = 2.2 V, Vout = 0 to V_{CC}
Output voltage		V_{OH}	2.4	—	V	I_{OH} = –205 µA
		V_{OL}	—	0.4	V	I_{OL} = 1.6 mA

Capacitance (V_{CC} = 5.0 V ± 10%, V_{SS} = 0 V, Ta = 25°C, Vin = 0 V, f = 1MHz)

Parameter	Symbol	Min	Max	Unit
Input capacitance*1	Cin	—	10	pF
Output capacitance*1	Cout	—	15	pF

Note: 1. This parameter is sampled and not 100% tested. D15/A-1 pin is output.

AC Characteristics (V_{CC} = 5.0 V ± 10%, V_{SS} = 0 V, Ta = 0 to + 70°C)

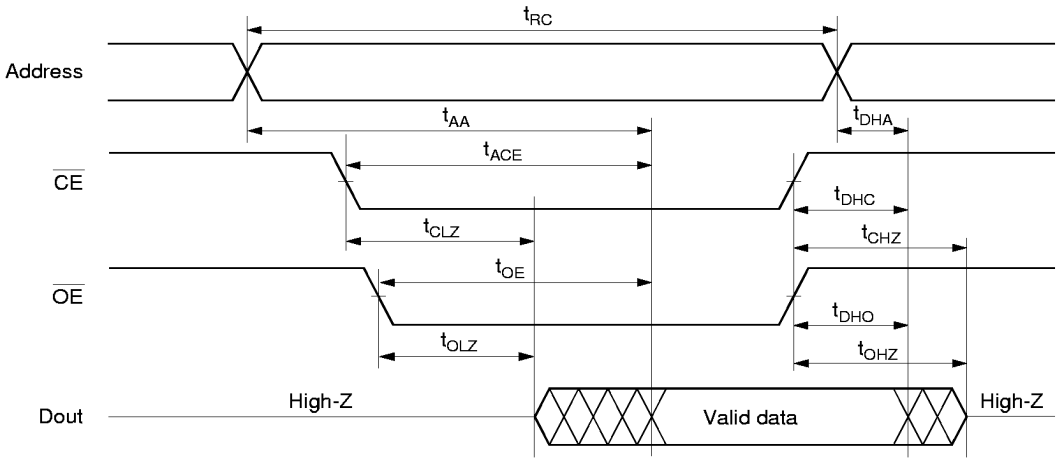
- Output load: 1TTL + C_L = 100 pF (including jig)
- Input pulse level: 0.45 to 2.4 V
- Input and output timing reference level: 1.5 V
- Input rise and fall time: 5 ns

		HN624416N-10		HN624416N-12			
Parameter	**Symbol**	**Min**	**Max**	**Min**	**Max**	**Unit**	**Note**
Read cycle time	t_{RC}	100	—	120	—	ns	
Page read cycle time	t_{PC}	40	—	50	—	ns	
Address access time	t_{AA}	—	100	—	120	ns	
Page address access time	t_{PA}	—	40	—	50	ns	
$\overline{CE}$ access time	t_{ACE}	—	100	—	120	ns	
$\overline{OE}$ access time	t_{OE}	—	40	—	50	ns	
BHE access time	t_{BHE}	—	100	—	120	ns	
Output hold time from address change	t_{DHA}	5	—	5	—	ns	
Output hold time from $\overline{CE}$	t_{DHC}	0	—	0	—	ns	
Output hold time from $\overline{OE}$	t_{DHO}	0	—	0	—	ns	
Output hold time from BHE	t_{DHB}	0	—	0	—	ns	
$\overline{CE}$ to output in high-Z	t_{CHZ}	—	30	—	30	ns	1
$\overline{OE}$ to output in high-Z	t_{OHZ}	—	30	—	30	ns	1
BHE to output in high-Z	t_{BHZ}	—	30	—	30	ns	1
$\overline{CE}$ to output in low-Z	t_{CLZ}	5	—	5	—	ns	
$\overline{OE}$ to output in low-Z	t_{OLZ}	5	—	5	—	ns	
BHE to output in low-Z	t_{BLZ}	5	—	5	—	ns	

Note: 1. t_{CHZ}, t_{OHZ} and t_{BHZ} are defined as the time at which the output achieves the open circuit conditions and are not referred to output voltage levels.

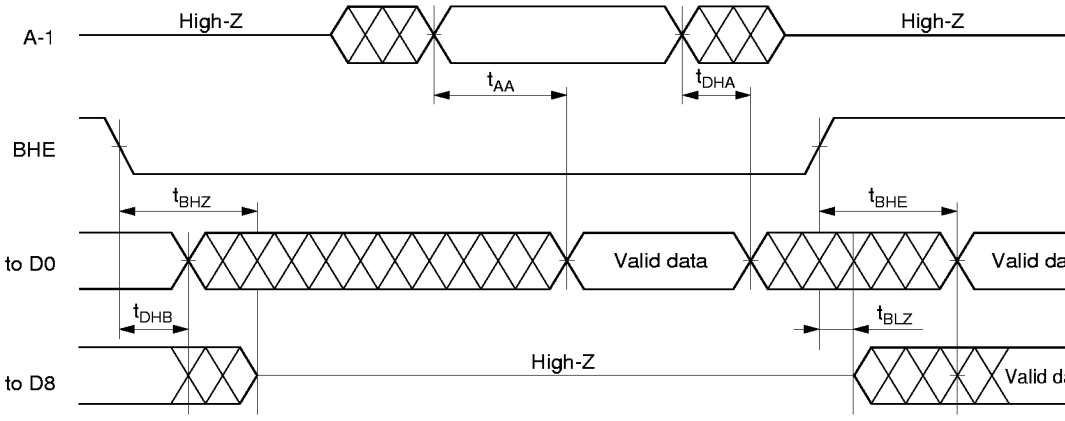
Timing Waveforms

Word mode (BHE = 'V_{IH}') or Byte Mode (BHE = 'V_{IL}')



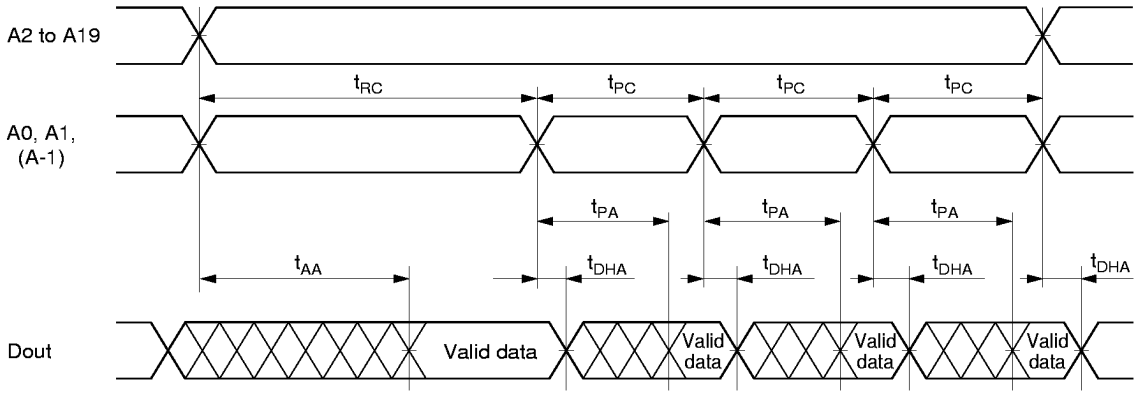
Notes : 1. t_{DHA}, t_{DHC}, t_{DHO} : Determined by faster.
2. t_{AA}, t_{ACE}, t_{OE} : Determined by slower.
3. t_{CLZ}, t_{OLZ} : Determined by slower.

Word Mode, Byte Mode Switch



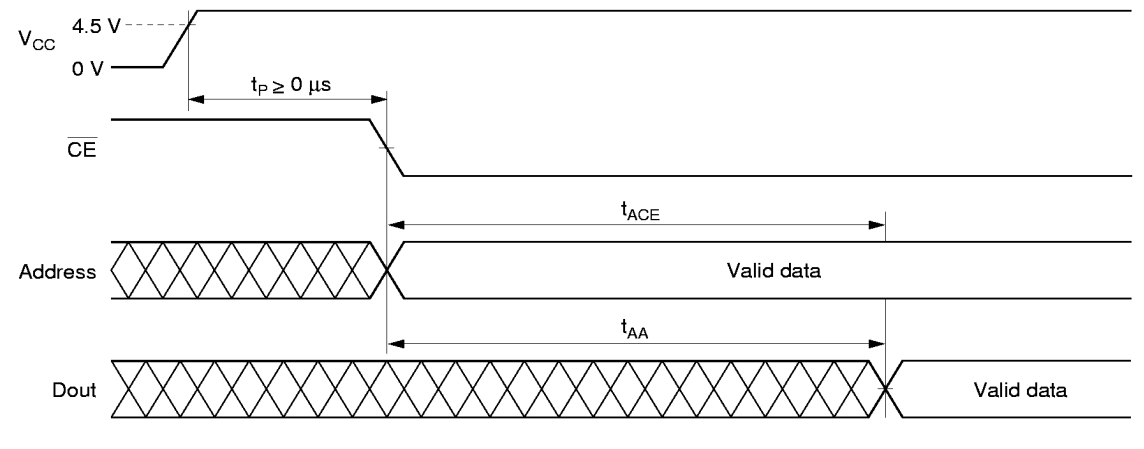
Notes : 1. $\overline{CE}$ and $\overline{OE}$ are enable, A19 to A0 are valid.
2. D15/A-1 pin is in the output state when BHE is high, $\overline{CE}$ and $\overline{OE}$ are enable.
Therefore, the input signals of opposite phase to the output must not be applied to them.

Page Mode



Notes : 1. Page address is determined as below.
Word mode (BHE = 'High') : A0, A1.
Byte mode (BHE = 'Low') : A-1, A0, A1
2. $\overline{CE}$ and $\overline{OE}$ are eneble.

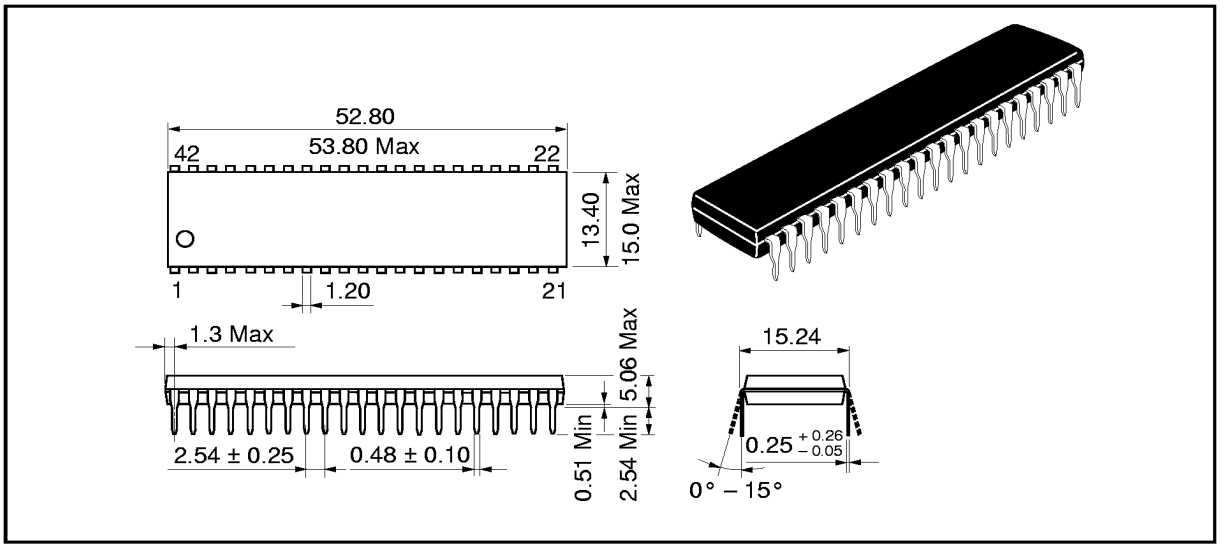
Power Up Sequence



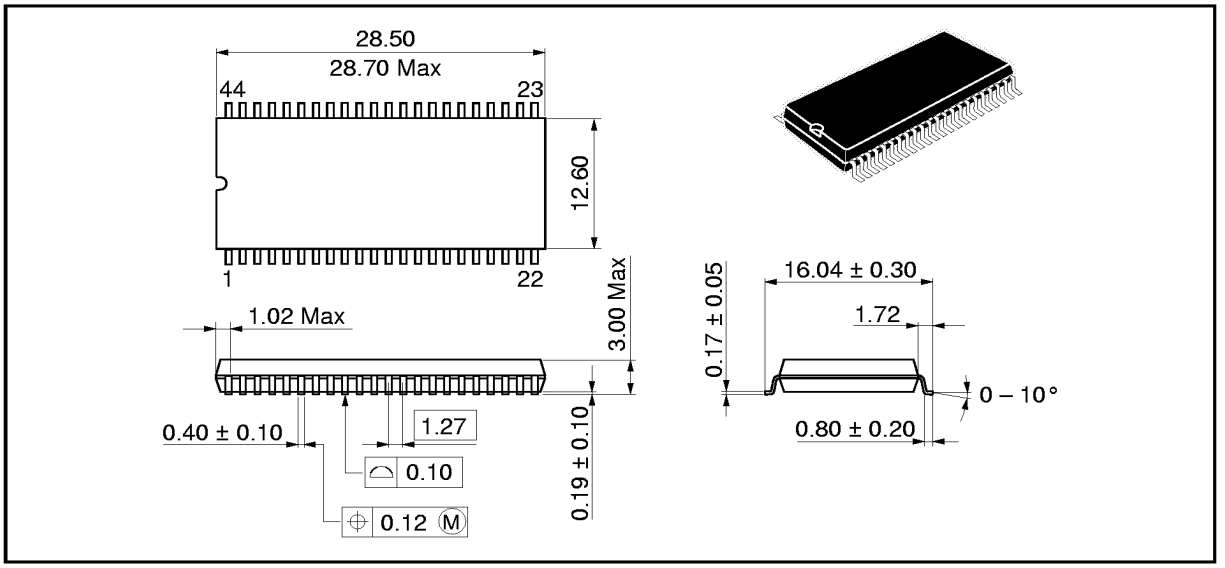
Note : 1. This device is used ATD (Address Transition Detecter). Therefore, transfer either $\overline{CE}$ or address (A19 to A2) after power up to 4.5 V.

Package Dimensions

HN624416NP Series (DP-42) Unit: mm



HN624416NFB Series (FP-44D) Unit: mm



Package Dimensions (cont)

HN624416NTT Series (TTP-44D) Unit: mm