

# 0.5 $\mu$ m CMOS Gate Array **CMOS-N5 Family**

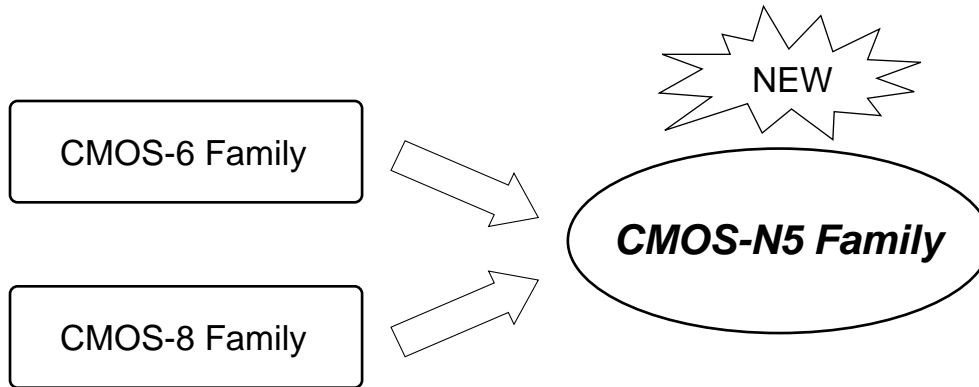


*High-speed operation with a 5-V power supply voltage  
Drastic cost reduction*

**New  
Products**

# Features

The CMOS-N5 family is a channel-less type gate array that provides high speed operation with a 5-V power supply voltage. Drastic cost reductions have been achieved compared with the conventional CMOS-6 and CMOS-8 families thanks to higher integration by the adoption of 0.5  $\mu\text{m}$  technology (2-layer wiring), and lowering the package assembly cost. Moreover, the 3-V power supply voltage is supported for the CMOS-N5 family.



## [Integration]

- 3K to 120K gates (number of integrated gates)
- 2K to 86K gates (number of usable gates)

## [Package]

- QFP (Fine pitch) 160 to 304 pins
- TQFP 48 to 80 pins
- LQFP 44 to 160 pins

## [High-speed operation] (preliminary)

- $t_{PD} = 0.26$  ns (2-input NAND (power gate), fanout = 2, standard wiring length)
- Operating frequency: 60 MHz max.

## [Function blocks]

- CPU peripheral block
- RAM block (1 port/2 ports)
- Oscillation block
- CTS block

## [Test design]

- Scan path test

# Product Overview

## Product type list

Product name	$\mu$ PD65880	$\mu$ PD65881	$\mu$ PD65882	$\mu$ PD65883	$\mu$ PD65884
Number of integrated gates <sup>Note 1</sup>	3456	5880	13952	25344	33864
Number of usable gates <sup>Note 2</sup>	2764	4704	11161	20275	27091
Number of pads <sup>Note 3</sup>	72	88	120	160	184
Internal gate	0.46 ns (fanout = 2, wiring length=2mm)				
Power gate	0.30 ns (fanout = 2, wiring length=2mm)				
Input buffer	0.33 ns (fanout = 2, wiring length=2mm)				
Output buffer	1.30 ns ( $C_L = 15$ pF)				
Output drive capability	$I_{OL} = 3, 6, 9, 12, 18, 24$ mA				
Power supply voltage	5 V $\pm$ 10 % (CMOS level)				

Product name	$\mu$ PD65885	$\mu$ PD65887	$\mu$ PD65889	$\mu$ PD65890	$\mu$ PD65893
Number of integrated gates <sup>Note 1</sup>	40768	56496	76000	99528	123384
Number of usable gates <sup>Note 4</sup>	28537	39547	53200	69669	86368
Number of pads <sup>Note 3</sup>	244	284	324	372	412
Internal gate	0.46 ns (fanout = 2, wiring length=2mm)				
Power gate	0.30 ns (fanout = 2, wiring length=2mm)				
Input buffer	0.33 ns (fanout = 2, wiring length=2mm)				
Output buffer	1.30 ns ( $C_L = 15$ pF)				
Output drive capability	$I_{OL} = 3, 6, 9, 12, 18, 24$ mA				
Power supply voltage	5 V $\pm$ 10 % (CMOS level)				

**Notes 1.** 2-input NAND conversion

2. Cell utilization rate 80 %
3. Including power supply and GND pins. The number of pins that can actually be used differs depending on the type of package.
4. Cell utilization rate 70 %

## Package list (1)

Package	Number of pins	Lead pitch (mm)	Body height (mm)	Body size (mm)
QFP (FP)	160	0.5	2.7	24 × 24
	208	0.5	3.2	28 × 28
	240	0.5	3.2	32 × 32
	304	0.5	3.7	40 × 40
TQFP	48	0.5	1.0	7 × 7
	64	0.65	1.0	12 × 12
	80	0.5	1.0	12 × 12
LQFP	44	0.8	1.4	10 × 10
	100	0.5	1.4	14 × 14
	160	0.5	1.4	24 × 24

**Remark** FP : Fine pitch

## Package list (2)

Master name	$\mu$ PD65880	$\mu$ PD65881	$\mu$ PD65882	$\mu$ PD65883	$\mu$ PD65884
160-pin QFP (FP)	–	–	–	–	–
208-pin QFP (FP)	–	–	–	–	–
240-pin QFP (FP)	–	–	–	–	–
304-pin QFP (FP)	–	–	–	–	–
48-pin TQFP	○	○	○		–
64-pin TQFP	–	○	○	○	
80-pin TQFP	–	–	○	○	
44-pin LQFP	○	○			–
100-pin LQFP	–	–	○	○	○
160-pin LQFP	–	–	–	–	○

Master name	$\mu$ PD65885	$\mu$ PD65887	$\mu$ PD65889	$\mu$ PD65890	$\mu$ PD65893
160-pin QFP (FP)	○	○	–	–	–
208-pin QFP (FP)	○	○	○	○	○
240-pin QFP (FP)	–	○	○	○	○
304-pin QFP (FP)	–	–	–	○	○
48-pin TQFP	–	–	–	–	–
64-pin TQFP			–	–	–
80-pin TQFP			–	–	–
44-pin LQFP	–	–	–	–	–
100-pin LQFP	○	○		–	–
160-pin LQFP	–	–	○	○	

**Remark** ○ : Released    – : Not to be supported    Blank : Under consideration    FP : Fine pitch

# Development Tools

## Easy interface with your EWS or PC

Users can choose the following tools to their environment.

**Caution** Some functions may not be supported. Make it sure before use.

### OPENCAD™ V5.4 Configuration Tool

Function	NEC Tool	Interface Data	Commercially Available Tool Interface
Function simulator	–	• Netlist PWC/EDIF(2.0.0)/	ModelSim™/Verilog-XL™/ NC-Verilog™/VCS™
Schematic editor	Vdraw™	Verilog™ HDL	–
Logic synthesis	–		Design Compiler®
Gate level simulator <sup>Note 1</sup>	V.sim™	• Test pattern ALBA	ModelSim/Verilog-XL/NC-Verilog/ VCS
Formal verifier	–		Formality®/Tuxedo™-LEC
STA <sup>Note 1</sup>	Tiara	• Delay information file	PrimeTime®
Fault simulator <sup>Note 2</sup>	C.FGRADE™		–
Design for test	TESTACT/NEC_SCAN/ NEC_BSCAN/NEC_BIST/ TESTBUS	• Constraints file	TestCompiler™/Testgen™ FastScan™/TetraMax™
Floor planner <sup>Note 3</sup>	ace_floorplan galet_floorplan		–
Placement and Routing <sup>Note 3</sup>	Galet		Gate Ensemble™ Silicon Ensemble™

**Notes 1.** Sign-off tool

2. Tool not supported in the HP™ version

3. Stand-alone tool

**Remark** Platform: SUN™(Solaris™)/HP(HP-UX™)

GUI : X11R5/Motif™ 1.2

C.FGRADE, OPENCAD, Vdraw and V.sim are trademarks of NEC Corporation.

Design Compiler is a registered trademark of Synopsys, Inc. in Japan.

PrimeTime and Formality are registered trademarks of Synopsys, Inc. in the USA.

Testgen, TetraMAX, TestCompiler and VCS are trademarks of Synopsys, Inc.

Gate Ensemble, Silicon Ensemble, NC-Verilog, Verilog, and Verilog-XL are trademarks of Cadence Design Systems, Inc.

ModelSim is a trademark of Model Technology, Inc.

Tuxedo is a trademark of Verplex System, Inc.

FastScan is a trademark of Mentor Graphics, Inc.

SUN and Solaris are trademarks of SUN Microsystems, Inc.

HP and HP-UX are trademarks of Hewlett-Packard Co.

Motif is a trademark of Open Software Foundation, Inc. (OSF).

The export of this product from Japan is regulated by the Japanese government. To export this product may be prohibited without governmental license, the need for which must be judged by the customer. The export or re-export of this product from a country other than Japan may also be prohibited without a license from that country. Please call an NEC sales representative.

• **The information in this document is current as of February, 2001. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**

• No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.

• NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.

• Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.

• While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.

• NEC semiconductor products are classified into the following three quality grades: "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

(Note)

(1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.

(2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4

*For further information, please contact:*

**NEC Corporation**

NEC Building  
7-1, Shiba 5-chome, Minato-ku  
Tokyo 108-8001, Japan  
Tel: 03-3454-1111  
<http://www.ic.nec.co.jp/>

**[North & South America]**

**NEC Electronics Inc.**

2880 Scott Blvd.  
Santa Clara, CA 95050-2554, U.S.A.  
Tel: 408-588-6000  
800-366-9782  
Fax: 408-588-6130  
800-729-9288  
<http://www.necel.com/>

**NEC do Brasil S.A.**

Electron Devices Division  
Rodovia Presidente Dutra, Km 214  
07210-902-Guarulhos-SP Brasil  
Tel: 011-6462-6810  
Fax: 011-6462-6829

**[Europe]**

**NEC Electronics (Germany) GmbH**

Kanzlerstr. 2,  
40472 Düsseldorf, Germany  
Tel: 0211-650302  
Fax: 0211-6503490  
<http://www.nec.de/>

**Munich Office**

Arabellastr. 17  
81925 München, Germany  
Tel: 089-921003-0  
Fax: 089-92100315

**Stuttgart Office**

Industriestr. 3  
D-70565 Stuttgart, Germany  
Tel: 0711-99010-0  
Fax: 0711-99010-19

**Hannover Office**

Podbielskistr. 164  
D-30177 Hannover, Germany  
Tel: 0511-33402-0  
Fax: 0511-33402-34

**Benelux Office**

Boschdijk 187a  
5612 HB Eindhoven,  
The Netherlands  
Tel: 040-2445845  
Fax: 040-2444580

**Scandinavia Office**

P.O. Box 134  
18322 Taeby, Sweden  
Tel: 08-6380820  
Fax: 08-6380388

**NEC Electronics (UK) Limited**

Cygnus House, Sunrise Parkway,  
Linford Wood, Milton Keynes,  
MK14 6NP, U.K.  
Tel: 01908-691-133  
Fax: 01908-670-290

**NEC Electronics (France) S.A.**

9, rue Paul Dautier-B.P. 52  
78142 Velizy-Villacoublay Cédex  
France  
Tel: 01-3067-5800  
Fax: 01-3067-5899

**Madrid Office**

Juan Esplandiu, 15  
28007 Madrid, Spain  
Tel: 091-504-2787  
Fax: 091-504-2860

**NEC Electronics Italiana s.r.l.**

Via Fabio Filzi, 25/A,  
20124 Milano, Italy  
Tel: 02-667541  
Fax: 02-66754299

**[Asia & Oceania]**

**NEC Electronics Hong Kong Limited**

12/F., Cityplaza 4,  
12 Taikoo Wan Road, Hong Kong  
Tel: 2886-9318  
Fax: 2886-9022/9044

**Seoul Branch**

10F, ILSONG Bldg., 157-37,  
Samsung-Dong, Kangnam-Ku  
Seoul, the Republic of Korea  
Tel: 02-528-0303  
Fax: 02-528-4411

**NEC Electronics Taiwan Ltd.**

7F, No. 363 Fu Shing North Road  
Taipei, Taiwan, R. O. C.  
Tel: 02-2719-2377  
Fax: 02-2719-5951

**NEC Electronics Singapore Pte. Ltd.**

238A Thomson Road  
#12-01/10 Novena Square  
Singapore 307684  
Tel: 253-8311  
Fax: 250-3583