



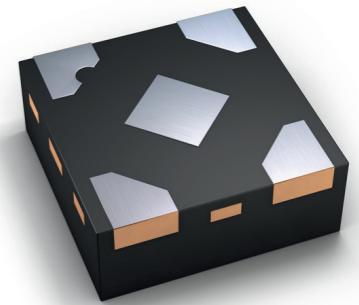
# General-purpose logic solutions

Commitment and innovation

**NXP**

# Commitment and Innovation

Over the last 50 years, the NXP logic business – starting as Philips Semiconductors and then incorporating the experience of Signetics – has supported growing global demand for logic. Today, as the No. 1 volume logic supplier in the world, NXP offers a broad variety of industry-leading solutions – at the exceptionally high quality levels demanded by the automotive and military industries. We continually invest in new process and package technologies, as well as new packaging facilities, to extend our leading-edge portfolio and support high volume mobile requirements.



## Performance, size and flexibility

We focus on increasing speed without degrading signal-integrity, lowering power consumption, and reducing size. Our advanced CMOS processes deliver robust performance and drive the expansion of our low-power logic families. NXP logic families are characterized and specified from -40 to +85 °C or -40 to +125 °C. Our combination and configurable logic devices allow a single device to perform many different operations, enabling greater design flexibility and simpler inventory management.

## Low-voltage solutions (3.3 V and below)

We offer several product families optimized for low-voltage applications. Our AUP family, which operates at just 1.8 V, offers ultra-low power consumption, while the AVC family saves energy in systems operating at 2.5 V. For applications in the 3.3 V range, our state of the art LVC, LVT, ALVC, and ALVT families deliver exceptional performance and are ideally suited for use in high-end workstations, consumer products, and telecommunications equipment.

## High-voltage solutions (5 to 15 V)

For improved performance in PCs, consumer applications and portable systems operating at 5 V, we offer the HEF4000, HC/T and AHC/T families which are available in industry standard SO and TSSOP packages. Additionally smaller, innovative DQFN and PicoGate packages are also available for these families.

## From DIP to Diamonds

Our leadless DQFN package is the industry's smallest package for gates, octals, and MSI functions. It combines key functionality with package miniaturization and offers a 74% space savings over TSSOP equivalents.

NXP's PicoGate and MicroPak packages simplify PCB routing, so you only use what you need and it is easier to make last-minute changes. MicroPak packaging contains the world's smallest packages for single-, dual-, and triple-gate logic, including the new NXP Diamond package, which has a footprint of just 0.64 mm<sup>2</sup>. The Diamond package also has larger bond pads, resulting in better contact between the device and the PCB compared to similar WLCSP offerings.

For designs that need larger pin counts, our VFBGA and LFBGA packages are ideally suited for 16- and 32-bit applications, and save space in a range of systems, including computers and telecommunications infrastructure.

# Product portfolio matrix

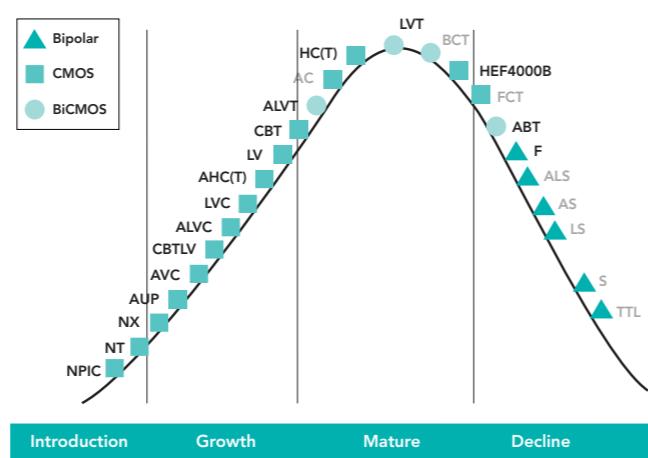
Families	Functions																Special features			Process					
	Buffers/line drivers	Configurable logic	Flip-flops	Combination logic	Counters	Shift registers	Encoders/multiplexers	Decoders/demultiplexers	Comparators/parity gen.	Gates	Schmitt triggers	Analog switches	Transceivers	Level shifters/translators	Phase lock loops	Bus switches	Bus hold	Series damping resistors	Live insertion	Overtoltage-tolerant inputs	Power-off output disable	Power-up reset	Bipolar	CMOS	BiCMOS
<b>1.8-volt logic</b>																									
AUP	•	•	•	•				•	•	•									•	•					
<b>2.5-volt logic</b>																									
AVC(M)	•		•															•	•	•	•		•		
<b>3.3-volt logic</b>																									
LV	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•							•		
LVC	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
ALVC	•		•							•	•					•	•	•	•	•	•	•	•		
LVT	•		•							•						•	•	•	•	•	•	•	•		
ALVT	•		•													•	•	•	•	•	•	•	•		
CBTLV(D)																		•	•				•		
NX3																		•	•				•		
NT																		•	•				•		
<b>5-volt logic</b>																									
HEF4000B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
HC(T)	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
AHC(T)	•		•															•					•		
FAST	•		•	•														•					•		
ABT	•		•															•	•	•	•	•	•		
VHC(T)	•																	•	•	•	•	•	•		
XC7	•																	•	•	•	•	•	•		
CBT(D)																		•	•				•		
NPIC																		•					•		
NX5																		•	•				•		

Notes: 1, inputs without bus hold 2, control inputs only

## Definitions of special features

- Bus hold supports floating inputs
- Series damping resistor eliminates the need for external termination resistors, thereby improving impedance matching and reducing over/undershoot
- Live insertion lets a board be inserted into a powered-up system without causing an interruption
- Overvoltage-tolerant inputs and I/O can withstand voltages greater than the supply voltage
- Power-off disable brings inputs and outputs to a high-impedance state when the supply voltage is 0 V
- Power-up reset ensures outputs float during power-up, allows control signals to be defined before voltages are forced onto a bus

## Logic family lifecycle



NXP logic products in **bold**

# NXP logic families

Typical features and performance for 5-volt products								
Family	HEF4000B	HC(T)	AHC(T)	VHC(T) / XC7	FAST	ABT	NPIC	CBT(D)
Supply Voltage	3 to 15 V	2 to 6 V	2 to 5.5 V	2 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V
Typ Prop delay	60 ns	9 ns	5 ns	5 ns	4 ns	3 ns	5 ns	0.25 ns
Output drive	+/- 3 mA	+/- 8 mA	+/- 8 mA	+/- 8 mA	-15/24 mA	-32/64 mA	100 mA	n.a.
Standby Current	600 µA	80 µA	40 µA	40 µA	10 mA	50 µA	200 µA	3 µA
T <sub>amb</sub>	-40 °C to 85 °C	-40 °C to 125 °C	-40 °C to 125 °C	-40 °C to 125 °C	0 °C to 70 °C	-40 °C to 85 °C	-40 °C to 125 °C	-40 °C to 85 °C
-Q100 option	yes	yes	yes	yes	yes	yes	yes	yes
Functions	Gates, MSI, buffer functions Analog switch functions	Gates, MSI, 8-bit bus interface functions Analog switch functions	Gates, MSI, 8-bit bus interface functions	Gates, MSI, 8-bit bus interface functions	Gates, 8 and 16-bit bus interface functions	LED drivers	Bus switches Level shifting functions	
Features	Input clamp diodes	Input clamp diodes TTL input option	5 V tolerant inputs TTL input option	5 V tolerant inputs TTL input option	Series damping resistor options	5 V tolerant inputs Bus hold and series damping resistor options Power off disable	33 V open drain outputs	Low delay isolation

## Typical features and performance for low-voltage products

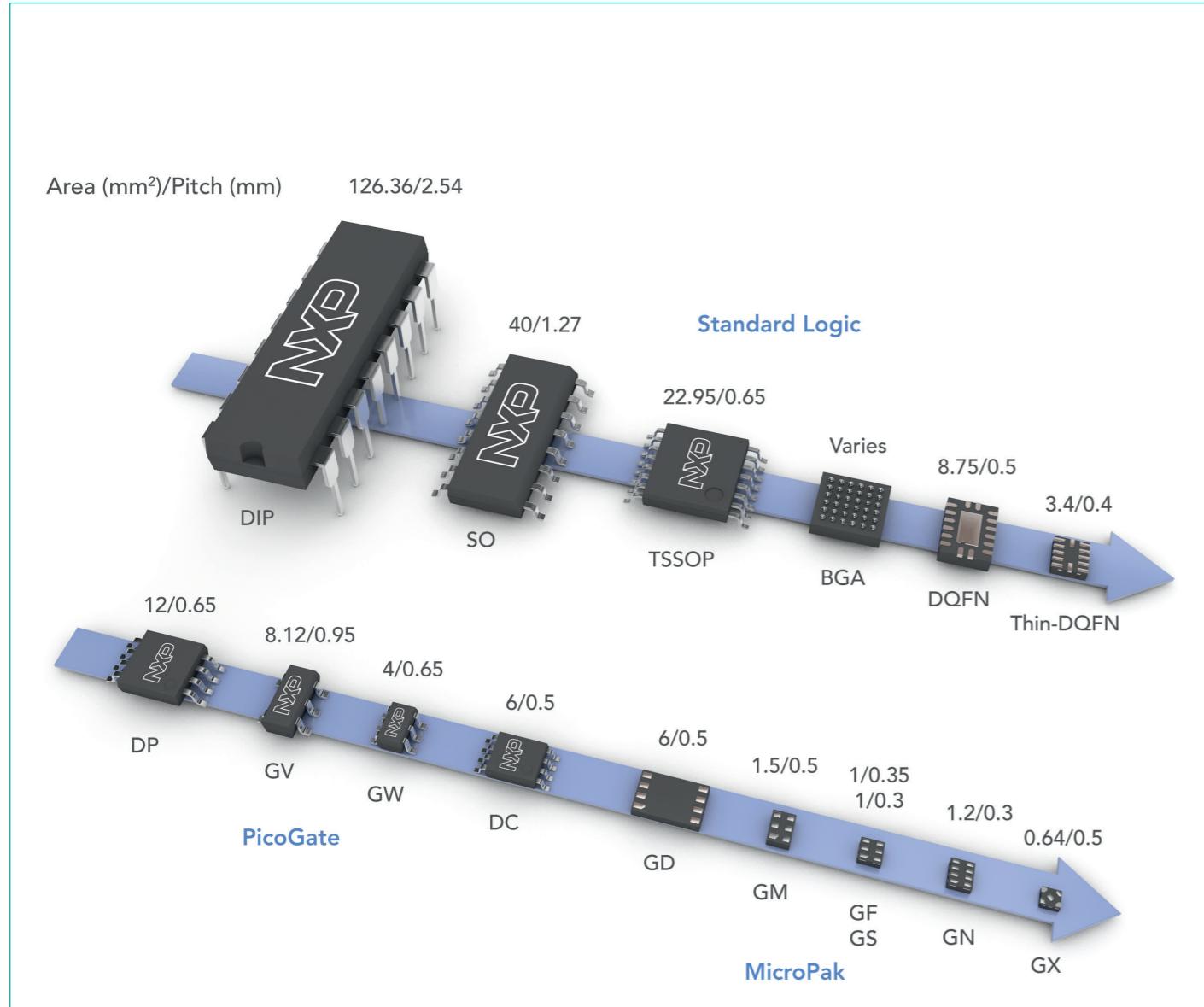
	LV	LVC	ALVC	LVT	ALVT	AVC(M)	AUP	CBTLV(D)
Supply Voltage	1 to 3.6 V*	1.2 to 3.6 V**	1.2 to 3.6 V	2.7 to 3.6 V	2.3 to 3.6 V	1.2 to 3.6 V	0.8 to 3.6 V	2.3 to 3.6 V
Typ. Prop. Delay	9 ns	2 ns	2 ns	2 ns	1.5 ns	2 ns	4 ns	0.15 ns
Output drive	+/- 8 mA	+/-24 mA	+/-24 mA	-32/64 mA	-32/64 mA	+/- 8 mA	+/- 4 mA	n.a.
Standby Current	20 µA	20 µA	40 µA	120 µA	90 µA	20 µA	0.9 µA	10 µA
T <sub>amb</sub>	-40 °C to 125 °C	-40 °C to 125 °C	-40 °C to 85 °C	-40 °C to 85 °C	-40 °C to 125 °C	-40 °C to 85 °C	-40 °C to 125 °C	-40 °C to 125 °C
-Q100 option	yes	yes	no	yes	no	yes	yes	yes
Functions	Gates, MSI, buffer functions Analog switch functions	Gates, MSI, 8, 16 and 32-bit bus interface functions Level translator functions	Gates, 8, 16 and 32-bit bus interface functions Level translator functions	8 and 16-bit bus interface functions	16 and 32-bit bus interface functions	Gates, Configurable and combination logic Level translator functions	Bus switches Level shifting functions	
Features	Input clamp diodes	5 V tolerant inputs Bus hold and series damping resistor options Power off disable#	3.6 V tolerant inputs Bus hold and series damping resistor options	5 V tolerant inputs Bus hold Series damping resistor option Power off disable	3.6 V tolerant inputs Bus hold Series damping resistor option Power off disable	3.6 V tolerant inputs Bus hold and series damping resistor options Power off disable	3.6 V tolerant inputs Low threshold input options Power off disable	Low delay isolation Rail to rail switching

\* Some functions operate up to 5.5 V

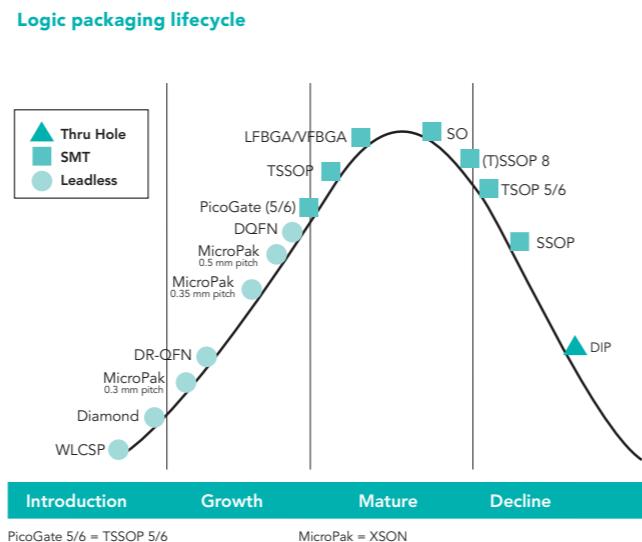
\*\* PicoGate functions operate up to 5.5 V

# PicoGate functions

# Package evolution



NXP's dedication to the Logic market over the last 50 years has brought about innovations in package. These innovations are driven by designers who are focused on creating smaller, more efficient systems. Logic products play an important role to do so as they increase design flexibility and system performance while minimizing power consumption and the PCB footprint. When selecting the correct logic package for a design, the maturity of the package also needs to be considered in order to achieve the optimal balance of performance, lifetime and cost. Choosing a package for a design, which is in the declining lifecycle stage, may not coincide with the system lifetime, while choosing the newest, smallest package may not allow a designer to meet the necessary system cost. NXP's goal is to help designers find the ideal logic device and package for each design.



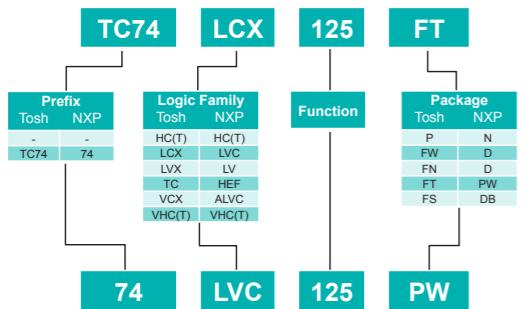
# Surface-mount packaging

	Width (mm)	Pitch (mm)	5	6	8	10	12	14	16	20	24	28	48	56	60	96/114	Suffix
SOIC	3.9	1.27							SOT108-1	SOT109-1							D
	7.5	1.27															DS
SSOP	3.9	0.635							SOT519-1	SOT724-1	SOT556-1						DS / DK
	5.3	0.65							SOT337-1	SOT338-1	SOT339-1	SOT340-1	SOT341-1				DB
TSOP	2.8	0.95	SOT753	SOT457													GV
	2.1	0.65	SOT353	SOT363													GW
TSSOP	4.4	0.65							SOT402-1	SOT403-1	SOT360-1	SOT355-1	SOT361-1				PW
	6.1	0.5												SOT362-1	SOT364-1	DGG	
DQFN	2.5	0.5							SOT762-1	SOT763-1	SOT764-1						BQ/BX
	3.5	0.5										SOT815-1					BQ
HUQFN	4	0.5												SOT1025-1		BX	
														SOT480-1	SOT481-1	DGV	
LFBGA	4.4	0.4														SOT536	EC
	5.5	0.8														SOT702-1	EV
VFBGA	4.5	0.65															GX
	0.8	0.5	SOT1226														GM/GT
XSON	1.0	0.5		SOT886	SOT833												GS
	1.0	0.35		SOT1202	SOT1203												GN
XQFN	1.0	0.3		SOT1115	SOT1116												GM
	1.6	0.5		SOT902	SOT1049	SOT1174								SOT1161		GU	
	1.7	0.5															

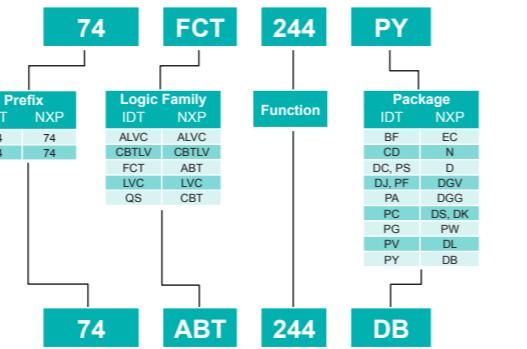


## Notes

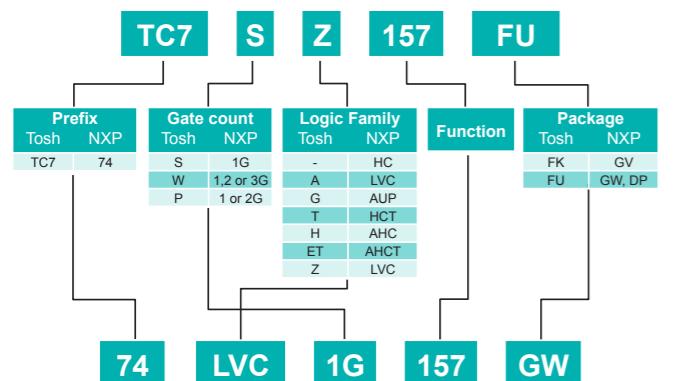
### Toshiba standard logic



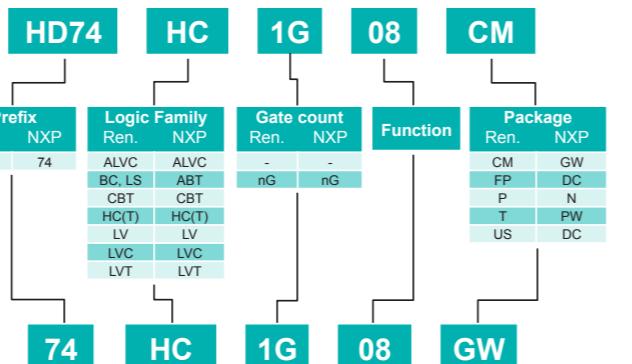
### IDT logic



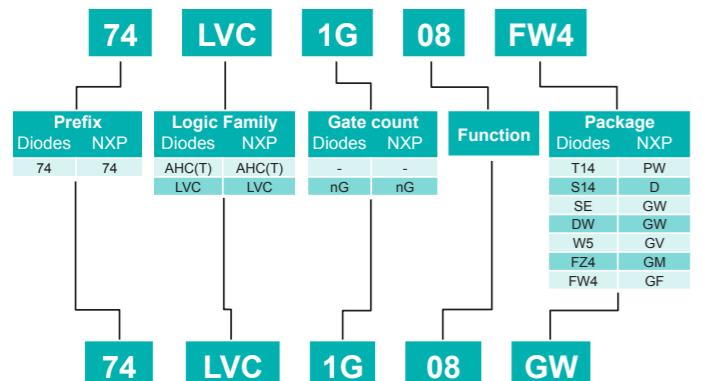
### Toshiba one gate



### Renesas logic



### Diodes Inc. logic





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