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# NX5DV330

## Quad 1-of-2 video multiplexer/demultiplexer

Rev. 03 — 5 August 2009

Product data sheet

## 1. General description

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The NX5DV330 is a quad 1-of-2 high-speed TTL-compatible video multiplexer/demultiplexer. The low ON resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

It has a digital select input (S), four independent inputs/outputs (nY0, nY1), a common input/output (nZ) and an active LOW enable input (E). When pin E is HIGH, the switch is turned off.

Schmitt-trigger action at the enable input ( $\bar{E}$ ) and select input (S) makes the circuit tolerant to slower input rise and fall times across the entire  $V_{CC}$  range from 4.0 V to 5.5 V.

The NX5DV330 is characterized for operation from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

## 2. Features

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- $5\ \Omega$  switch connection between two ports
- TTL-compatible input levels
- Minimal propagation delay through the switch
- ESD protection:
  - ◆ HBM JESD22-A114E Class 2A exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101C exceeds 1000 V
- Latch-up testing is done to JEDEC standard JESD78 which exceeds 100 mA

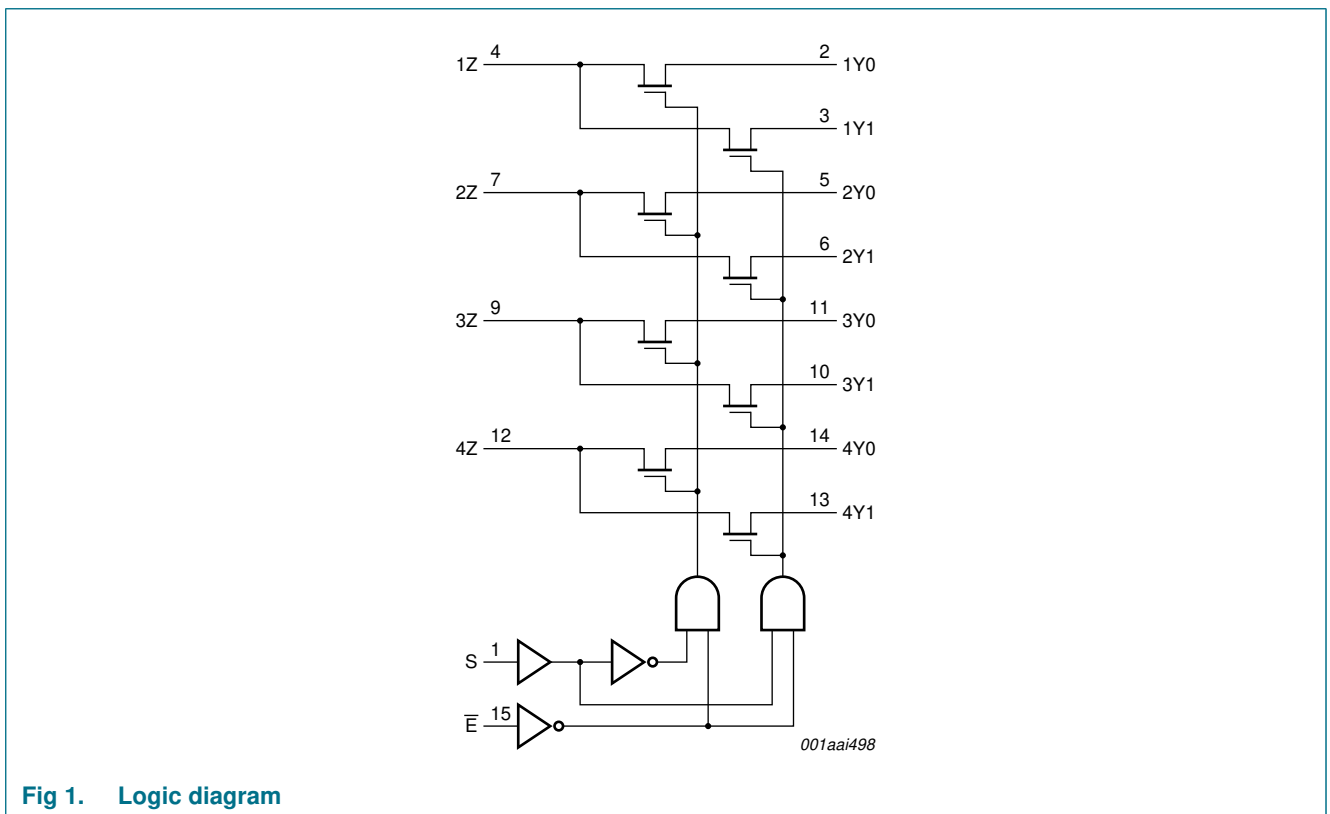
### 3. Ordering information

**Table 1. Ordering information**

Type number	Package			Version
	Temperature range	Name	Description	
NX5DV330D	-40 °C to +85 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
NX5DV330DS	-40 °C to +85 °C	SSOP16 <sup>[1]</sup>	plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm	SOT519-1
NX5DV330PW	-40 °C to +85 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
NX5DV330BQ	-40 °C to +85 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1

[1] Also known as QSOP16.

### 4. Functional diagram



**Fig 1. Logic diagram**

## 5. Pinning information

### 5.1 Pinning

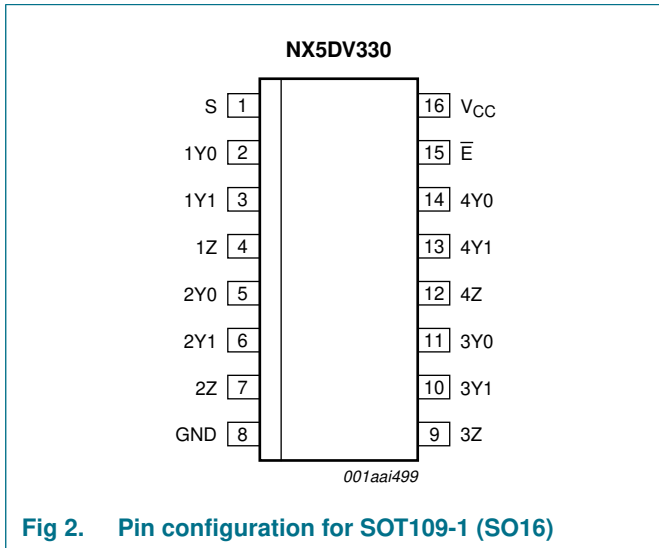


Fig 2. Pin configuration for SOT109-1 (SO16)

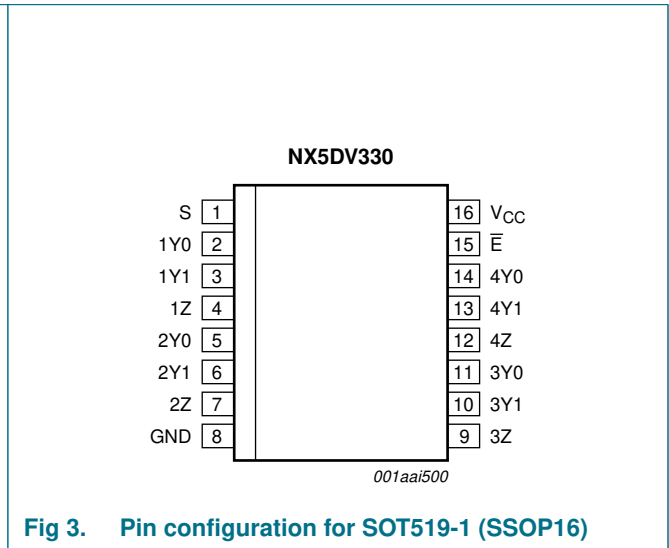


Fig 3. Pin configuration for SOT519-1 (SSOP16)

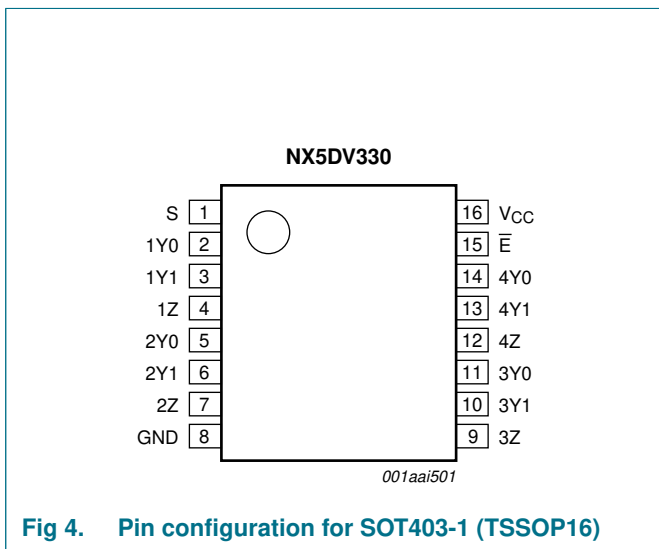


Fig 4. Pin configuration for SOT403-1 (TSSOP16)

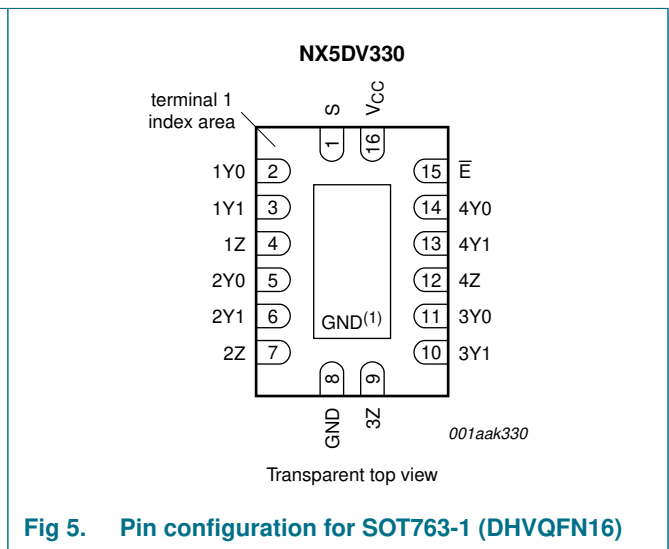


Fig 5. Pin configuration for SOT763-1 (DHWQFN16)

### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
S	1	select control input
1Y0, 1Y1, 2Y0, 2Y1, 3Y1, 3Y0, 4Y1, 4Y0	2, 3, 5, 6, 10, 11, 13, 14	independent input or output
1Z, 2Z, 3Z, 4Z	4, 7, 9, 12	independent input or output
GND	8	ground (0 V)
$\bar{E}$	15	enable input (active LOW)
V <sub>CC</sub>	16	positive supply voltage



## 6. Functional description

**Table 3. Function selection**

H = HIGH voltage level; L = LOW voltage level; X = Don't care.

Input		Switch
$\bar{E}$	S	
L	L	Y0 to Z or Z to Y0
L	H	Y1 to Z or Z to Y1
H	X	switch off

## 7. Limiting values

**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7.0	V
$V_I$	input voltage		[1] -0.5	+7.0	V
$I_{SW}$	switch current	continuous current through each switch	-	128	mA
$I_{IK}$	input clamping current	$V_I < 0$ V	-	-50	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation		[2][3][4] -	500	mW

[1] The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

[2] For SO16 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

[3] For SSOP16 (QSOP16) and TSSOP16 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

[4] For DHVQFN16 packages: above 60 °C derate linearly with 4.5 mW/K.

## 8. Recommended operating conditions

**Table 5. Operating conditions**

All unused control inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		4.0	5.0	5.5	V
$V_{IH}$	HIGH-level input voltage		2.0	-	-	V
$V_{IL}$	LOW-level input voltage		-	-	0.8	V
$V_H$	hysteresis voltage	pin S, $\bar{E}$	-	45	-	mV
$T_{amb}$	ambient temperature	operating in free-air	-40	+25	+85	°C

## 9. Static characteristics

**Table 6. Static characteristics**

$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$V_{IK}$	input clamping voltage	$V_{CC} = 4.5\text{ V}$ ; $I_I = -18\text{ mA}$	-	-	-1.2	V
$I_I$	input leakage current	pin S, $\bar{E}$ ; $V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ or $5.5\text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ ; $V_O = 0\text{ V}$ to $5.5\text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0\text{ V}$ ; $V_I = V_O = 0\text{ V}$ to $5.5\text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
$I_{CC}$	supply current	$V_{CC} = 5.5\text{ V}$ ; $I_O = 0\text{ mA}$ ; $V_I = V_{CC}$ or $\text{GND}$	-	-	3	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	pin S, $\bar{E}$ ; $V_{CC} = 5.5\text{ V}$ ; one input at $3.4\text{ V}$ , other inputs at $V_{CC}$ or $\text{GND}$	<sup>[2]</sup> -	-	2.5	mA
$C_I$	input capacitance	pin S, $\bar{E}$ ; $V_I = 5\text{ V}$ or $0\text{ V}$	-	3.5	-	pF
$C_{io(off)}$	off-state input/output capacitance	Z port; $V_{CC} = 5\text{ V}$ ; $V_O = 5\text{ V}$ or $0\text{ V}$ ; $\bar{E} = V_{CC}$	-	6.0	-	pF
		Y port; $V_{CC} = 5\text{ V}$ ; $V_O = 5\text{ V}$ or $0\text{ V}$ ; $\bar{E} = V_{CC}$	-	4.0	-	pF
$C_{io(on)}$	on-state input/output capacitance	Z port; $V_{CC} = 5\text{ V}$ ; $V_O = 5\text{ V}$ or $0\text{ V}$ ; $\bar{E} = \text{GND}$	-	14	-	pF
$R_{ON}$	ON resistance	$V_{CC} = 4.5\text{ V}$	<sup>[3]</sup>			
		$V_I = 1.0\text{ V}$ ; $I_I = 13\text{ mA}$	-	3	7	$\Omega$
		$V_I = 2.0\text{ V}$ ; $I_I = 26\text{ mA}$	-	7	10	$\Omega$

[1] All typical values are measured at  $V_{CC} = 5\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

[2] This is the increase in supply current for each input that is at the specified TTL voltage level rather than  $V_{CC}$  or  $\text{GND}$ .

[3] Measured by the voltage drop between the Z and the Y terminals at the indicated current through the switch. ON-state resistance is determined by the lowest voltage of the two (Z or Y) terminals.

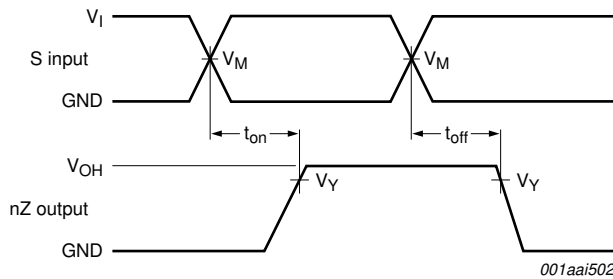
## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ ; for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{on}$	turn-on time	S to nZ; see <a href="#">Figure 6</a>				
		$V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	4.0	6.0	ns
$t_{off}$	turn-off time	S to nZ; see <a href="#">Figure 6</a>				
		$V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	2.3	6.0	ns

### 11. Waveforms

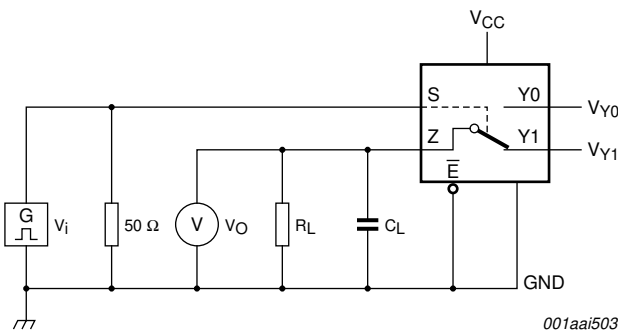


Measurement points are given in [Table 8](#).  
 $V_{OH}$  is the typical voltage output level that occurs with the output load.

**Fig 6. Input (S) to output (nZ) turn-on and turn-off time**

**Table 8. Measurement points**

Supply voltage	Input		Output
$V_{CC}$	$V_I$	$V_M$	$V_Y$
4.5 V to 5.5 V	GND to 3.0 V	1.5 V	$0.9V_{OH}$



Test data is given in [Table 9](#).  
 Definitions test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.

**Fig 7. Test circuit for measuring turn-on and turn-off times**

**Table 9. Test data**

Input			Load			
$V_I$	$f_i$	$t_r, t_f$	$V_{Y0}$	$V_{Y1}$	$R_L$	$C_L$
GND to 3.0 V	$\leq 10$ MHz	$\leq 2.5$ ns	GND to 3.0 V	3.0 V to GND	$75 \Omega$	20 pF

## 12. Additional dynamic characteristics

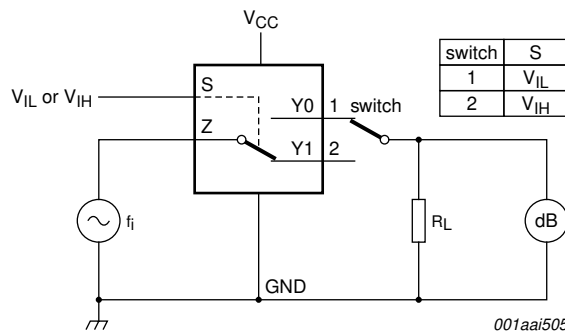
**Table 10. Additional dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $V_I = GND$  or  $V_{CC}$  (unless otherwise specified);  $T_{amb} = 25\text{ }^\circ\text{C}$ ;  $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_{dif}$	differential gain	$f_i = 3.58\text{ MHz}$ ; $R_L = 150\ \Omega$	-	0.64	-	%
$\varphi_{dif}$	differential phase	$f_i = 3.58\text{ MHz}$ ; $R_L = 150\ \Omega$	-	0.1	-	deg
$f_{(-3dB)}$	-3 dB frequency response	$R_L = 150\ \Omega$ ; see <a href="#">Figure 8</a>	300	-	-	MHz
$\alpha_{iso}$	isolation (OFF-state)	$f_i = 10\text{ MHz}$ ; $R_L = 150\ \Omega$ ; see <a href="#">Figure 9</a>	-	-60	-	dB
Xtalk	crosstalk	between switches; see <a href="#">Figure 10</a> ; $f_i = 10\text{ MHz}$ ; $R_L = 150\ \Omega$ ; $R_i = 10\ \Omega$	[1]	-63	-	dB

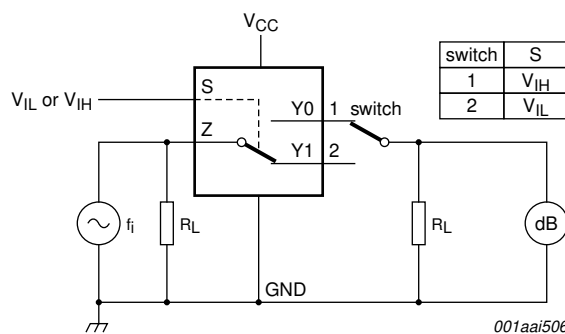
[1] All unused analog input pins (nZ) and outputs pins (nYn) are connected through 10  $\Omega$  and 50  $\Omega$  pull-down resistors, respectively.

## 13. Test circuits



Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads -3 dB.

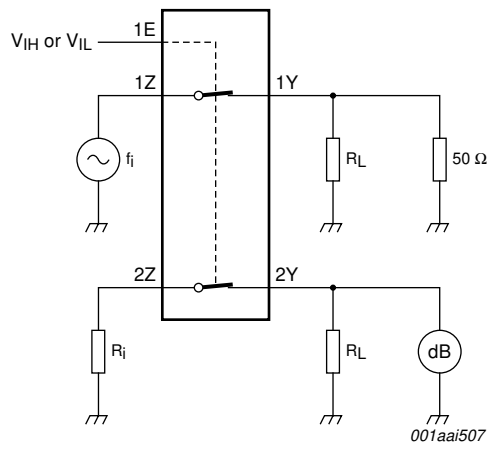
**Fig 8. Test circuit for measuring the frequency response when channel is in ON-state**



Adjust  $f_i$  voltage to obtain 0 dBm level at input.

**Fig 9. Test circuit for measuring isolation (OFF-state)**





Adjust  $f_i$  voltage to obtain 0 dBm level at input.

**Fig 10. Test circuit for measuring crosstalk voltage between digital inputs and switch**

14. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

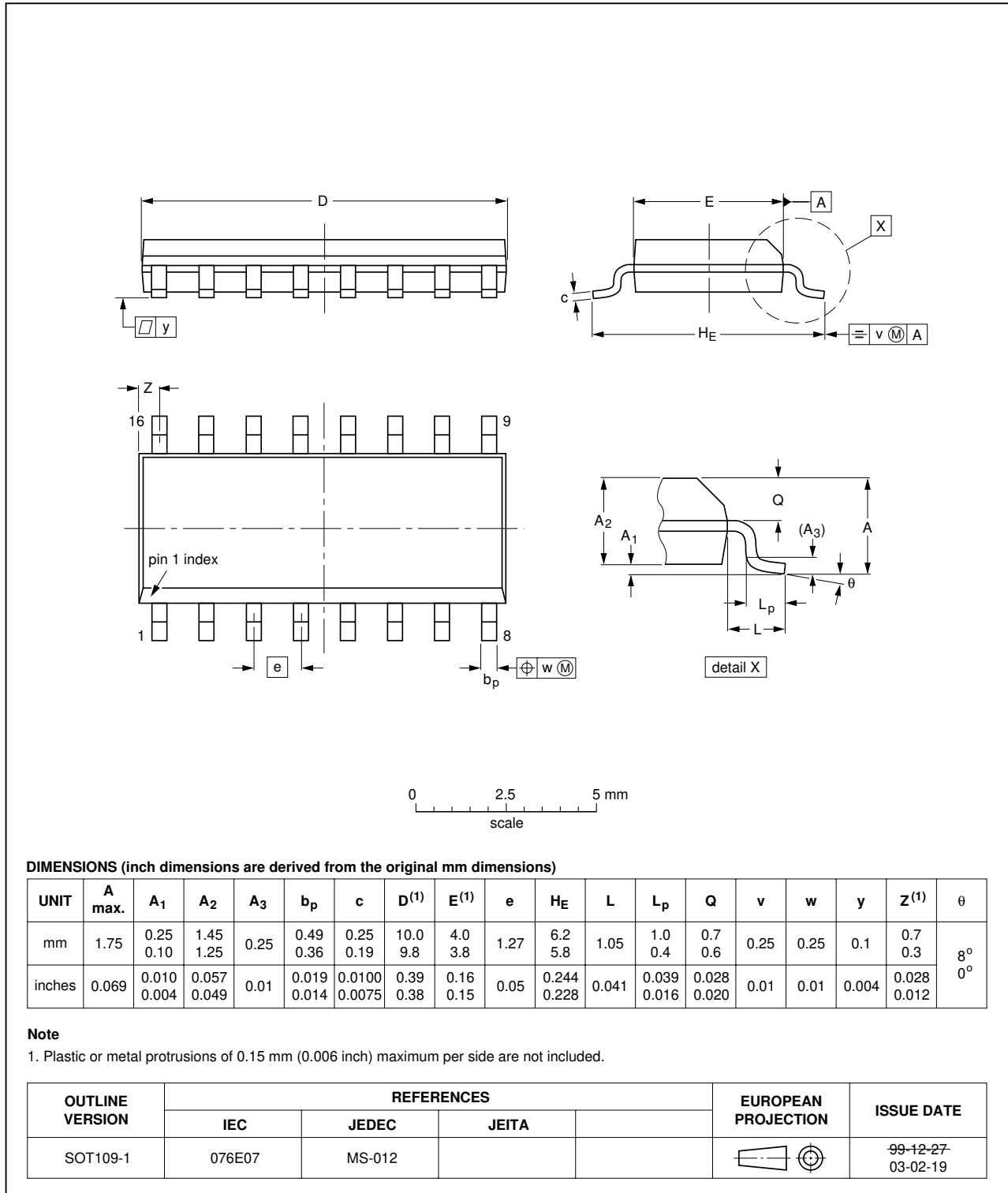


Fig 11. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm SOT519-1

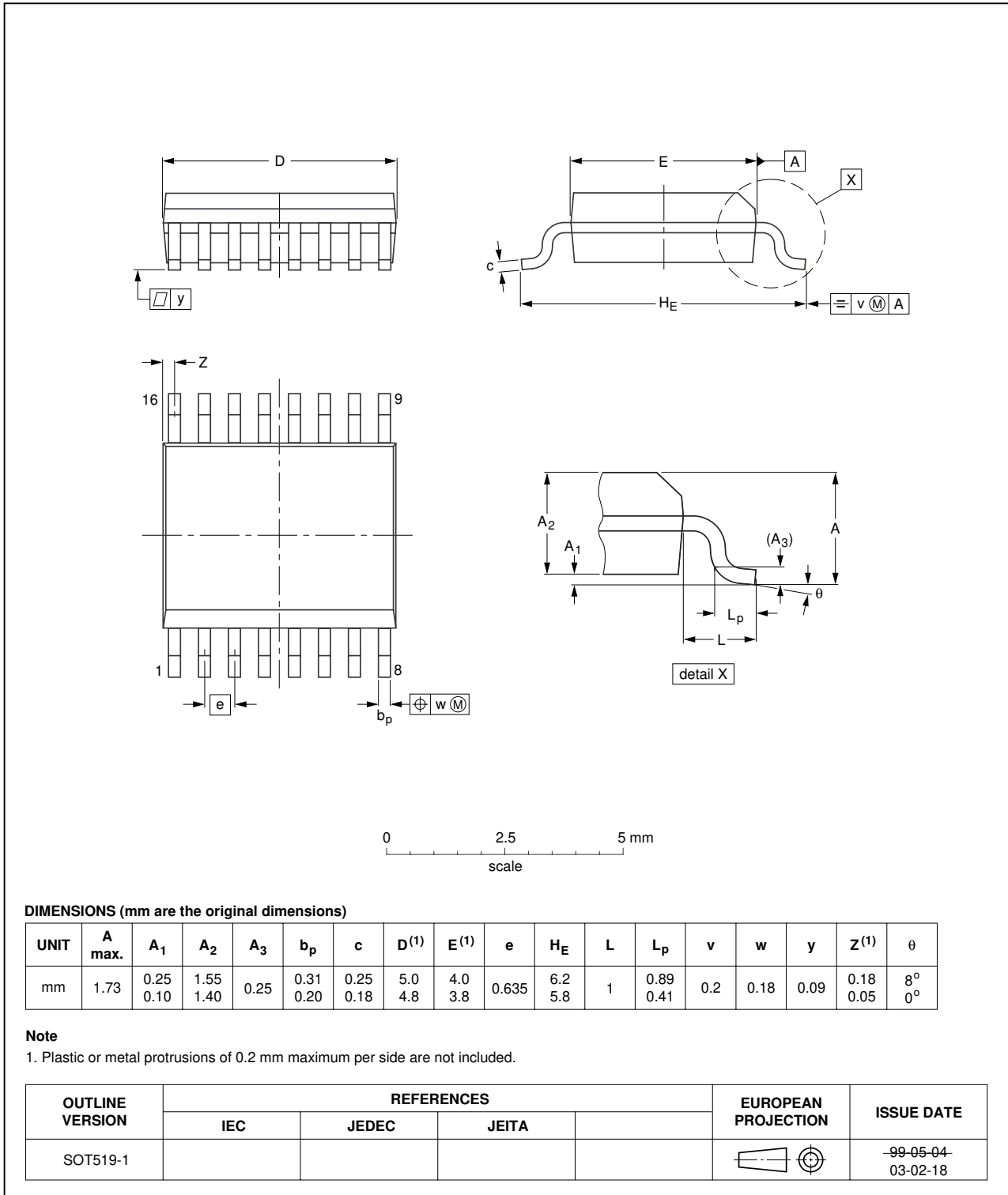


Fig 12. Package outline SOT519-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

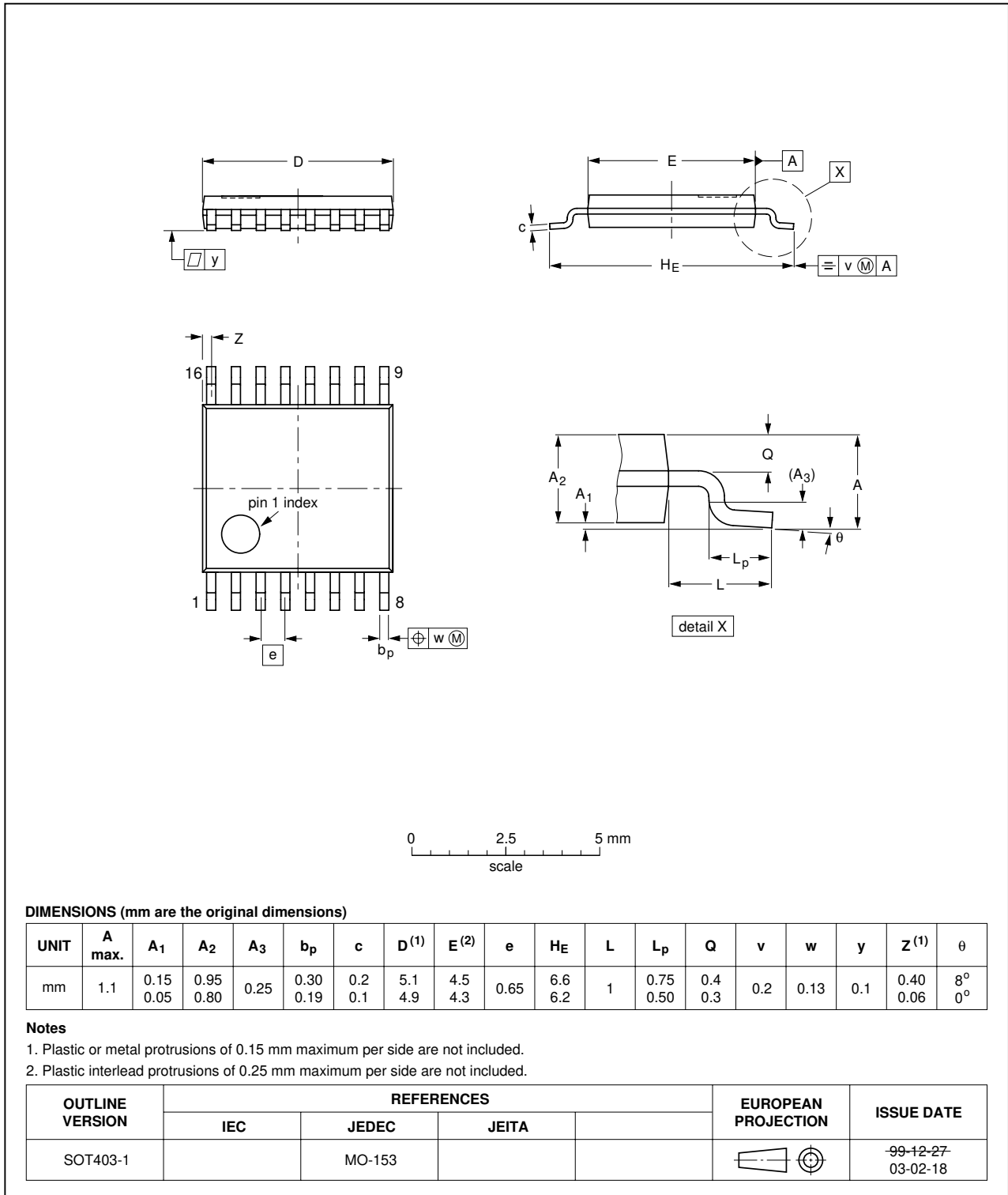


Fig 13. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

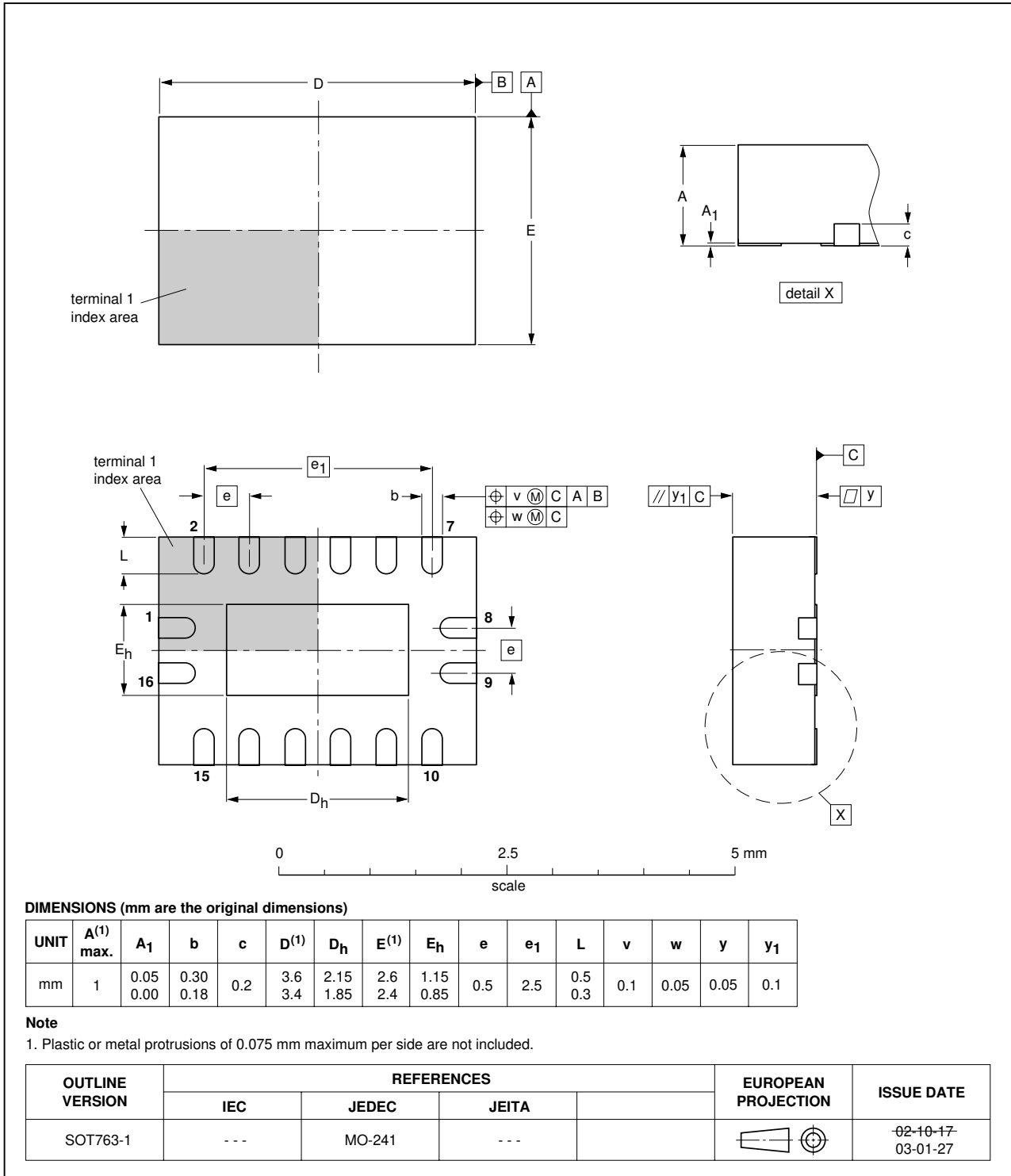


Fig 14. Package outline SOT763-1 (DHVQFN16)

## 15. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 16. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NX5DV330_3	20090805	Product data sheet	-	NX5DV330_2
Modifications:	• Added type number NX5DV330BQ (DHVQFN16 package)			
NX5DV330_2	20080825	Product data sheet	-	NX5DV330_1
NX5DV330_1	20080815	Product data sheet	-	-



## 17. Legal information

### 17.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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