

# 74ALVC164245

16-bit dual supply translating transceiver; 3-state

Rev. 05 — 13 April 2010

Product data sheet

## 1. General description

The 74ALVC164245 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

The 74ALVC164245 is a 16-bit (dual octal) dual supply translating transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. It is designed to interface between a 3 V and 5 V bus in a mixed 3 V and 5 V supply environment.

This device can be used as two 8-bit transceivers or one 16-bit transceiver.

The direction control inputs (1DIR and 2DIR) determine the direction of the data flow. nDIR (active HIGH) enables data from nAn ports to nBn ports. nDIR (active LOW) enables data from nBn ports to nAn ports. The output enable inputs ( $1\overline{OE}$  and  $2\overline{OE}$ ), when HIGH, disable both nAn and nBn ports by placing them in a high-impedance OFF-state. Pins nAn,  $n\overline{OE}$  and nDIR are referenced to  $V_{CC(A)}$  and pins nBn are referenced to  $V_{CC(B)}$ .

In suspend mode, when one of the supply voltages is zero, there will be no current flow from the non-zero supply towards the zero supply. The nAn-outputs must be set 3-state and the voltage on the A-bus must be smaller than  $V_{diode}$  (typical 0.7 V).  $V_{CC(B)} \geq V_{CC(A)}$  (except in suspend mode).

## 2. Features and benefits

- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Wide supply voltage range:
  - ◆ 3 V port ( $V_{CC(A)}$ ): 1.5 V to 3.6 V
  - ◆ 5 V port ( $V_{CC(B)}$ ): 1.5 V to 5.5 V
- CMOS low power consumption
- Direct interface with TTL levels
- Control inputs voltage range from 2.7 V to 5.5 V
- Inputs accept voltages up to 5.5 V
- High-impedance outputs when  $V_{CC(A)}$  or  $V_{CC(B)} = 0$  V
- Complies with JEDEC standard JESD8-B/JESD36
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Specified from  $-40$  °C to  $+85$  °C and  $-40$  °C to  $+125$  °C



### 3. Ordering information

Table 1. Ordering information

Type number	Temperature range	Package		
		Name	Description	Version
74ALVC164245DL	-40 °C to +125 °C	SSOP48	plastic shrink small outline package; 48 leads; body width 7.5 mm	SOT370-1
74ALVC164245DGG	-40 °C to +125 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1
74ALVC164245BQ	-40 °C to +125 °C	HXQFN60U	plastic thermal enhanced extremely thin quad flat package; no leads; 60 terminals; UTLP based; body 4 × 6 × 0.5 mm	SOT1134-1

### 4. Functional diagram

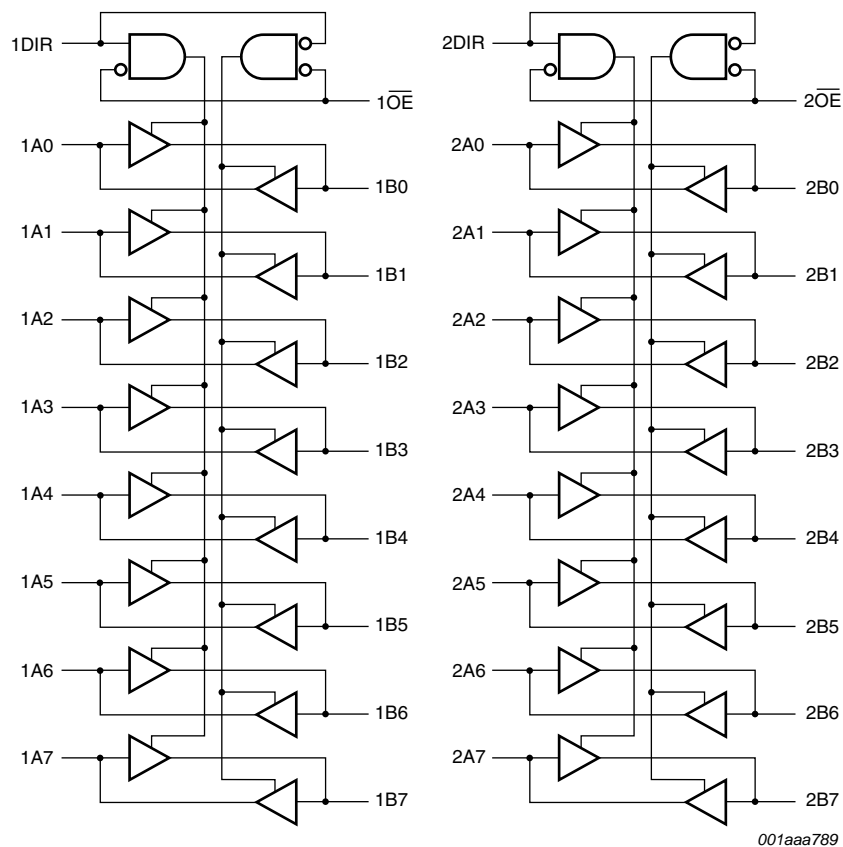


Fig 1. Logic symbol

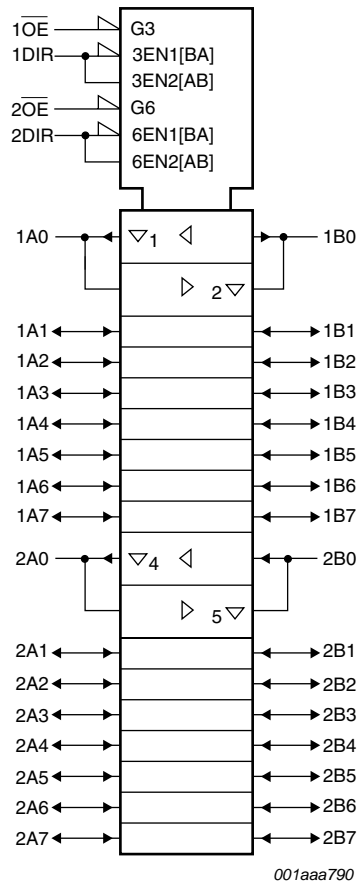


Fig 2. IEC logic symbol

5. Pinning information

5.1 Pinning

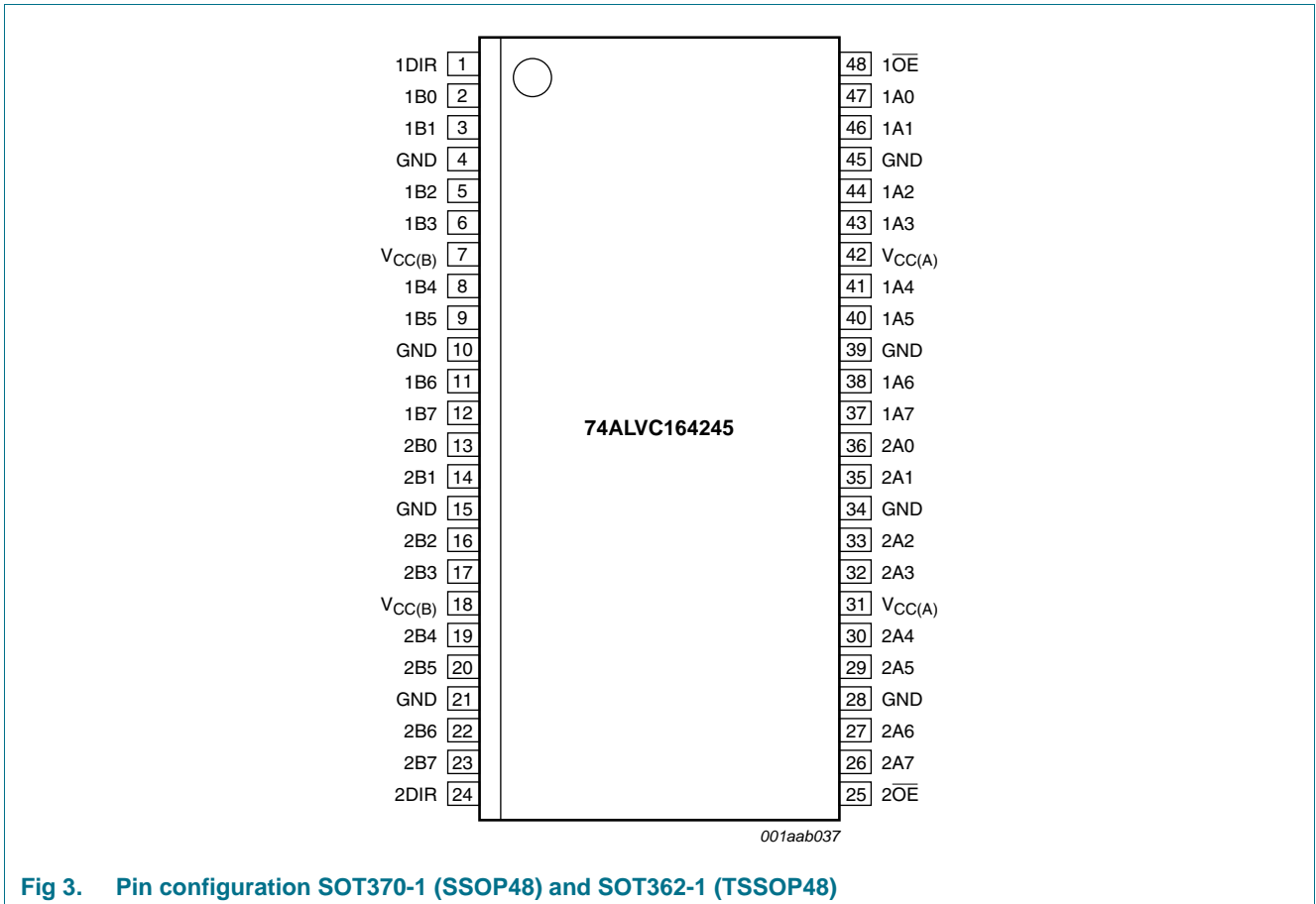
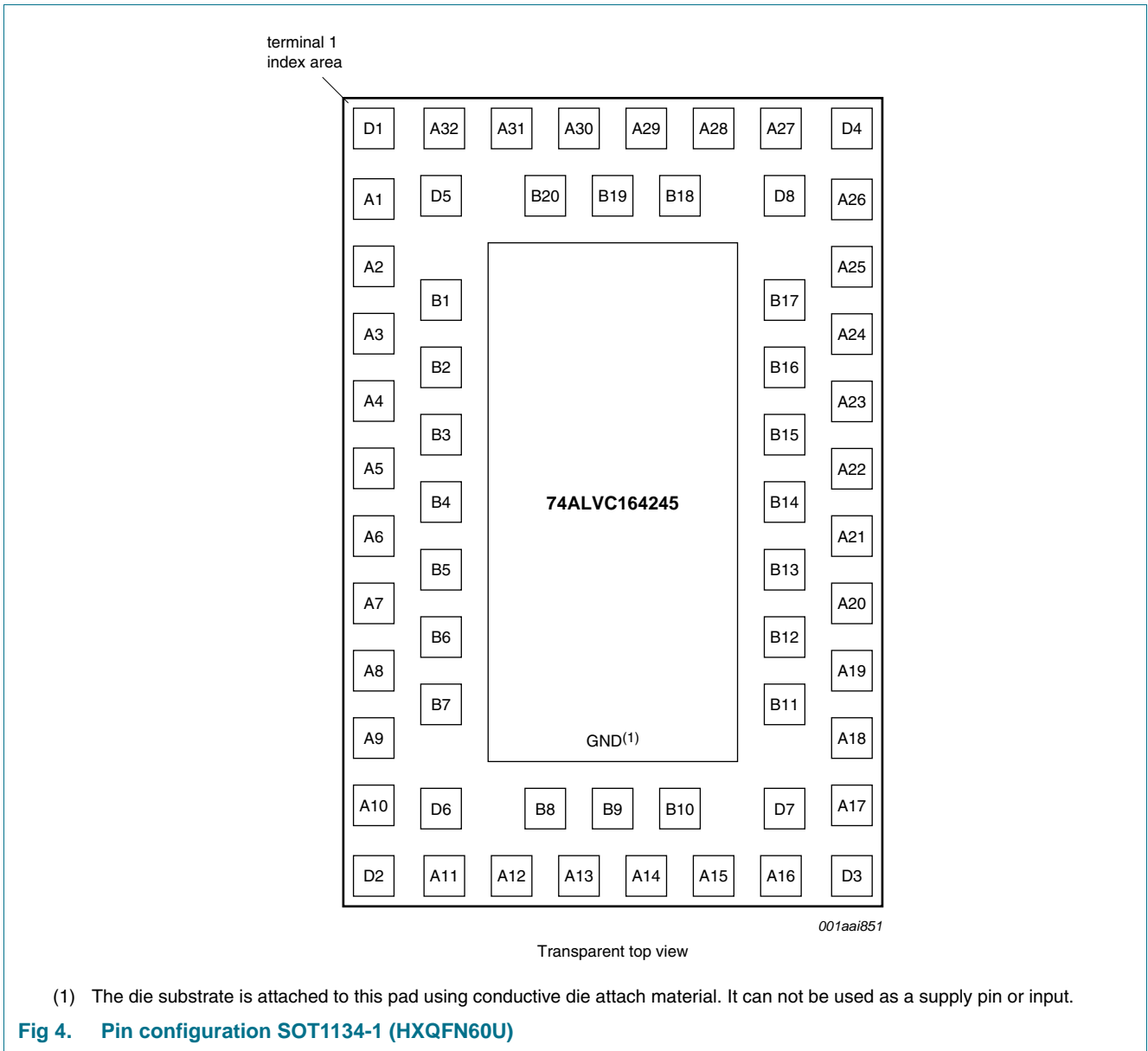


Fig 3. Pin configuration SOT370-1 (SSOP48) and SOT362-1 (TSSOP48)



## 5.2 Pin description

Table 2. Pin description

Symbol	Pin		Description
	SOT370-1 and SOT362-1	SOT1134-1	
1DIR, 2DIR	1, 24	A30, A13	direction control input
1B0 to 1B7	2, 3, 5, 6, 8, 9, 11, 12	B20, A31, D5, D1, A2, B2, B3, A5	data input/output
2B0 to 2B7	13, 14, 16, 17, 19, 20, 22, 23	A6, B5, B6, A9, D2, D6, A12, B8	data input/output
GND	4, 10, 15, 21, 28, 34, 39, 45	A32, A3, A8, A11, A16, A19, A24, A27	ground (0 V)
V <sub>CC(B)</sub>	7, 18	A1, A10,	supply voltage B (5 V bus)
1 $\overline{\text{OE}}$ , 2 $\overline{\text{OE}}$	48, 25	A29, A14	output enable input (active LOW)
1A0 to 1A7	47, 46, 44, 43, 41, 40, 38, 37	B18, A28, D8, D4, A25, B16, B15, A22	data input/output
2A0 to 2A7	36, 35, 33, 32, 30, 29, 27, 26	A21, B13, B12, A18, D3, D7, A15, B10	data input/output
V <sub>CC(A)</sub>	31, 42	A17, A26	supply voltage A (3 V bus)
n.c.	-	A4, A7, A20, A23, B1, B4, B7, B9, B11, B14, B17, B19	not connected

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

Inputs		Outputs	
nOE	nDIR	nAn	nBn
L	L	nAn = nBn	inputs
L	H	inputs	nBn = nAn
H	X	Z	Z

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V). See [1].

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC(B)</sub>	supply voltage B	V <sub>CC(B)</sub> ≥ V <sub>CC(A)</sub>	-0.5	+6.0	V
V <sub>CC(A)</sub>	supply voltage A	V <sub>CC(B)</sub> ≥ V <sub>CC(A)</sub>	-0.5	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
V <sub>I</sub>	input voltage		[2] -0.5	+6.0	V
V <sub>I/O</sub>	input/output voltage		-0.5	V <sub>CC</sub> + 0.5	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V	-	±50	mA
V <sub>O</sub>	output voltage	output HIGH or LOW	[2] -0.5	V <sub>CC</sub> + 0.5	V
		output 3-state	[2] -0.5	+6.0	V
I <sub>O(sink/source)</sub>	output sink or source current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA

**Table 4. Limiting values ...continued**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V). See [1].

Symbol	Parameter	Conditions	Min	Max	Unit
$I_{GND}$	ground current		-100	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C to }+125\text{ °C}$			
		(T)SSOP48 package	[3] -	500	mW
		HXQFN60U package	[4] -	1000	mW

- [1] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.
- [2] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- [3] Above 60 °C the value of  $P_{tot}$  derates linearly with 5.5 mW/K.
- [4] Above 70 °C the value of  $P_{tot}$  derates linearly with 1.8 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC(B)}$	supply voltage B	$V_{CC(B)} \geq V_{CC(A)}$				
		maximum speed performance	2.7	-	5.5	V
		low-voltage applications	1.5	-	5.5	V
$V_{CC(A)}$	supply voltage A	$V_{CC(B)} \geq V_{CC(A)}$				
		maximum speed performance	2.7	-	3.6	V
		low-voltage applications	1.5	-	3.6	V
$V_I$	input voltage	control inputs: $\overline{nOE}$ and $nDIR$	0	-	5.5	V
$V_{I/O}$	input/output voltage	nAn port	0	-	$V_{CC(A)}$	V
		nBn port	0	-	$V_{CC(B)}$	V
$V_O$	output voltage	nAn port	0	-	$V_{CC(A)}$	V
		nBn port	0	-	$V_{CC(B)}$	V
$T_{amb}$	ambient temperature		-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC(A)} = 2.7\text{ V to }3.0\text{ V}$	0	-	20	ns/V
		$V_{CC(A)} = 3.0\text{ V to }3.6\text{ V}$	0	-	10	ns/V
		$V_{CC(B)} = 3.0\text{ V to }4.5\text{ V}$	0	-	20	ns/V
		$V_{CC(B)} = 4.5\text{ V to }5.5\text{ V}$	0	-	10	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Typ <sup>[1]</sup>	Max	
V <sub>IH</sub>	HIGH-level input voltage	nBn port							
		V <sub>CC(B)</sub> = 3.0 V to 5.5 V <sup>[2]</sup>	2.0	-	-	2.0	-	-	V
		nAn port, n $\overline{\text{OE}}$ and nDIR							
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V	2.0	-	-	2.0	-	-	V
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V <sup>[2]</sup>	1.7	-	-	1.7	-	-	V
V <sub>IL</sub>	LOW-level input voltage	nBn port							
		V <sub>CC(B)</sub> = 4.5 V to 5.5 V <sup>[2]</sup>	-	-	0.8	-	-	0.8	V
		V <sub>CC(B)</sub> = 3.0 V to 3.6 V <sup>[2]</sup>	-	-	0.7	-	-	0.7	V
		nAn port, n $\overline{\text{OE}}$ and nDIR							
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V	-	-	0.8	-	-	0.8	V
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V <sup>[2]</sup>	-	-	0.7	-	-	0.7	V
V <sub>OH</sub>	HIGH-level output voltage	nBn port; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>							
		I <sub>O</sub> = -24 mA; V <sub>CC(B)</sub> = 4.5 V	V <sub>CC(B)</sub> - 0.8	-	-	V <sub>CC(B)</sub> - 1.2	-	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC(B)</sub> = 4.5 V	V <sub>CC(B)</sub> - 0.5	-	-	V <sub>CC(B)</sub> - 0.8	-	-	V
		I <sub>O</sub> = -18 mA; V <sub>CC(B)</sub> = 3.0 V	V <sub>CC(B)</sub> - 0.8	-	-	V <sub>CC(B)</sub> - 1.0	-	-	V
		I <sub>O</sub> = -100 μA; V <sub>CC(B)</sub> = 3.0 V	V <sub>CC(B)</sub> - 0.2	V <sub>CC(B)</sub>	-	V <sub>CC(B)</sub> - 0.3	V <sub>CC(B)</sub>	-	V
		nAn port; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>							
		I <sub>O</sub> = -24 mA; V <sub>CC(A)</sub> = 3.0 V	V <sub>CC(A)</sub> - 0.7	-	-	V <sub>CC(A)</sub> - 1.0	-	-	V
		I <sub>O</sub> = -100 μA; V <sub>CC(A)</sub> = 3.0 V	V <sub>CC(A)</sub> - 0.2	-	-	V <sub>CC(A)</sub> - 0.3	-	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC(A)</sub> = 2.7 V	V <sub>CC(A)</sub> - 0.5	-	-	V <sub>CC(A)</sub> - 0.8	-	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC(A)</sub> = 2.3 V	V <sub>CC(A)</sub> - 0.6	-	-	V <sub>CC(A)</sub> - 0.6	-	-	V
		I <sub>O</sub> = -100 μA; V <sub>CC(A)</sub> = 2.3 V	V <sub>CC(A)</sub> - 0.2	V <sub>CC(A)</sub>	-	V <sub>CC(A)</sub> - 0.3	V <sub>CC(A)</sub>	-	V
V <sub>OL</sub>	LOW-level output voltage	nBn port; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>							
		I <sub>O</sub> = 24 mA; V <sub>CC(B)</sub> = 4.5 V	-	-	0.55	-	-	0.60	V
		I <sub>O</sub> = 12 mA; V <sub>CC(B)</sub> = 4.5 V	-	-	0.40	-	-	0.80	V
		I <sub>O</sub> = 100 μA; V <sub>CC(B)</sub> = 4.5 V	-	-	0.20	-	-	0.30	V
		I <sub>O</sub> = 18 mA; V <sub>CC(B)</sub> = 3.0 V	-	-	0.55	-	-	0.80	V
		I <sub>O</sub> = 100 μA; V <sub>CC(B)</sub> = 3.0 V	-	-	0.20	-	-	0.30	V
		nAn port; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>							
		I <sub>O</sub> = 24 mA; V <sub>CC(A)</sub> = 3.0 V	-	-	0.55	-	-	0.80	V
		I <sub>O</sub> = 100 μA; V <sub>CC(A)</sub> = 3.0 V	-	-	0.20	-	-	0.30	V
		I <sub>O</sub> = 12 mA; V <sub>CC(A)</sub> = 2.7 V	-	-	0.40	-	-	0.60	V
I <sub>O</sub> = 12 mA; V <sub>CC(A)</sub> = 2.3 V	-	-	0.60	-	-	0.60	V		
		I <sub>O</sub> = 100 μA; V <sub>CC(A)</sub> = 2.3 V	-	-	0.20	-	-	0.20	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND	-	±0.1	±5	-	±0.1	±10	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND <sup>[3]</sup>	-	±0.1	±10	-	±0.1	±20	μA



**Table 6. Static characteristics ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Typ <sup>[1]</sup>	Max	
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	0.1	40	-	0.1	80	μA
ΔI <sub>CC</sub>	additional supply current	per control pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A	-	5	500	-	5	5000	μA
C <sub>I</sub>	input capacitance		-	4.0	-	-	-	-	pF
C <sub>I/O</sub>	input/output capacitance	nAn and nBn port	-	5.0	-	-	-	-	pF

[1] All typical values are measured at V<sub>CC(B)</sub> = 5.0 V, V<sub>CC(A)</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

[2] If V<sub>CC(A)</sub> < 2.7 V, the switching levels at all inputs are not TTL compatible.

[3] For transceivers, the parameter I<sub>OZ</sub> includes the input leakage current.

[4] V<sub>CC(A)</sub> = 2.7 V to 3.6 V: other inputs at V<sub>CC(A)</sub> or GND; V<sub>CC(B)</sub> = 4.5 V to 5.5 V: other inputs at V<sub>CC(B)</sub> or GND.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

GND = 0 V; t<sub>r</sub> = t<sub>f</sub> ≤ 2.5 ns; C<sub>L</sub> = 50 pF; for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nAn to nBn; see <a href="#">Figure 5</a>						
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V; V <sub>CC(B)</sub> = 3.0 V to 3.6 V	1.5	3.3	7.6	1.5	9.5	ns
		V <sub>CC(A)</sub> = 2.7 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.0	3.0	5.9	1.0	7.5	ns
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.0	2.9	5.8	1.0	7.5	ns
		nBn to nAn; see <a href="#">Figure 5</a>						
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V; V <sub>CC(B)</sub> = 3.0 V to 3.6 V	1.0	3.0	7.6	1.0	9.5	ns
		V <sub>CC(A)</sub> = 2.7 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.0	4.3	6.7	1.0	8.5	ns
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.2	2.5	5.8	1.2	7.5	ns

**Table 7. Dynamic characteristics ...continued**GND = 0 V;  $t_r = t_f \leq 2.5$  ns;  $C_L = 50$  pF; for test circuit see [Figure 7](#).

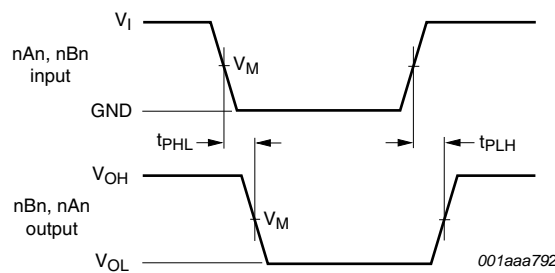
Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>en</sub>	enable time	nOE to nBn; see <a href="#">Figure 6</a> <sup>[2]</sup>						
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V; V <sub>CC(B)</sub> = 3.0 V to 3.6 V	1.5	4.1	11.5	1.5	14.5	ns
		V <sub>CC(A)</sub> = 2.7 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.5	3.6	9.2	1.5	11.5	ns
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.0	3.2	8.9	1.0	12.0	ns
		nOE to nAn; see <a href="#">Figure 6</a> <sup>[2]</sup>						
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V; V <sub>CC(B)</sub> = 3.0 V to 3.6 V	1.5	4.6	12.3	1.5	15.5	ns
		V <sub>CC(A)</sub> = 2.7 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.5	4.3	9.3	1.5	12.0	ns
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.0	3.2	8.9	1.0	11.5	ns
		t <sub>dis</sub>	disable time	nOE to nBn; see <a href="#">Figure 6</a> <sup>[2]</sup>				
V <sub>CC(A)</sub> = 2.3 V to 2.7 V; V <sub>CC(B)</sub> = 3.0 V to 3.6 V	2.0			2.7	10.5	2.0	13.5	ns
V <sub>CC(A)</sub> = 2.7 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	2.5			4.6	9.0	2.5	11.5	ns
V <sub>CC(A)</sub> = 3.0 V to 3.6 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	2.1			4.9	8.6	2.1	11.0	ns
nOE to nAn; see <a href="#">Figure 6</a> <sup>[2]</sup>								
V <sub>CC(A)</sub> = 2.3 V to 2.7 V; V <sub>CC(B)</sub> = 3.0 V to 3.6 V	1.0			2.7	9.3	1.0	12.0	ns
V <sub>CC(A)</sub> = 2.7 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	1.5			3.5	9.0	1.5	11.5	ns
V <sub>CC(A)</sub> = 3.0 V to 3.6 V; V <sub>CC(B)</sub> = 4.5 V to 5.5 V	2.0			3.2	8.6	2.0	11.0	ns

**Table 7. Dynamic characteristics ...continued**  
*GND = 0 V;  $t_r = t_f \leq 2.5$  ns;  $C_L = 50$  pF; for test circuit see [Figure 7](#).*

Symbol	Parameter	Conditions	$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$			$T_{amb} = -40\text{ }^{\circ}\text{C to } +125\text{ }^{\circ}\text{C}$		Unit	
			Min	Typ <sup>[1]</sup>	Max	Min	Max		
$C_{PD}$	power dissipation capacitance	5 V port: nAn to nBn; <a href="#">[3][4]</a> $V_{CC(B)} = 5$ V; $V_{CC(A)} = 3.3$ V	outputs enabled	-	30	-	-	-	pF
			outputs disabled	-	15	-	-	-	pF
		3 V port: nBn to nAn; <a href="#">[3][4]</a> $V_{CC(B)} = 5$ V; $V_{CC(A)} = 3.3$ V	outputs enabled	-	40	-	-	-	pF
			outputs disabled	-	5	-	-	-	pF

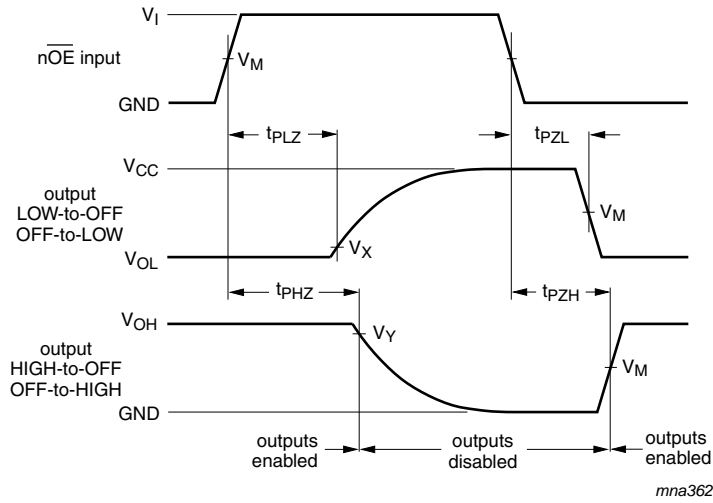
- [1] All typical values are measured at nominal voltage for  $V_{CC(B)}$  and  $V_{CC(A)}$  and at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .
- [2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .  
 $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .  
 $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .
- [3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $V_{CC}$  = supply voltage in V;  
 $N$  = number of inputs switching;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.
- [4] The condition is  $V_I = \text{GND to } V_{CC}$ .

## 11. AC waveforms



Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 5. Input (nAn, nBn) to output (nBn, nAn) propagation delays**

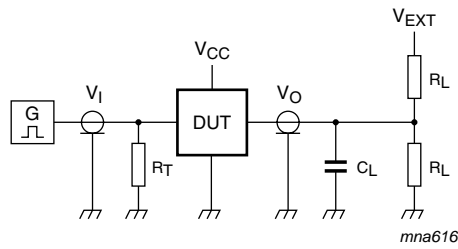


Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with output load.

**Fig 6. 3-state enable and disable times**

**Table 8. Measurement points**

Direction	Supply voltage		Input		Output		
	$V_{CC(A)}$	$V_{CC(B)}$	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
nAn port to nBn port	2.3 V to 2.7 V	2.7 V to 3.6 V	$V_{CC(A)}$	$0.5 \times V_{CC(A)}$	1.5 V	$V_{OL(B)} + 0.3 V$	$V_{OH(B)} - 0.3 V$
nBn port to nAn port	2.3 V to 2.7 V	2.7 V to 3.6 V	2.7 V	1.5 V	$0.5 \times V_{CC(A)}$	$V_{OL(A)} + 0.15 V$	$V_{OH(A)} - 0.15 V$
nAn port to nBn port	2.7 V to 3.6 V	4.5 V to 5.5 V	2.7 V	1.5 V	$0.5 \times V_{CC(B)}$	$0.2 \times V_{CC(B)}$	$0.8 \times V_{CC(B)}$
nBn port to nAn port	2.7 V to 3.6 V	4.5 V to 5.5 V	3.0 V	1.5 V	1.5 V	$V_{OL(A)} + 0.3 V$	$V_{OH(A)} - 0.3 V$



Test data is given in [Table 9](#).

Definitions for test circuit:

$R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

$C_L$  = Load capacitance including jig and probe capacitance.

$R_L$  = Load resistance.

**Fig 7. Load circuitry for switching times**

**Table 9. Test data**

Direction	Supply voltage		Load		$V_{EXT}$		
	$V_{CC(A)}$	$V_{CC(B)}$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
nAn port to nBn port	2.3 V to 2.7 V	2.7 V to 3.6 V	50 pF	500 $\Omega$	open	GND	$2 \times V_{CC}$
nBn port to nAn port	2.3 V to 2.7 V	2.7 V to 3.6 V	50 pF	500 $\Omega$	open	GND	6.0 V
nAn port to nBn port	2.7 V to 3.6 V	4.5 V to 5.5 V	50 pF	500 $\Omega$	open	GND	$2 \times V_{CC}$
nBn port to nAn port	2.7 V to 3.6 V	4.5 V to 5.5 V	50 pF	500 $\Omega$	open	GND	6.0 V

12. Package outline

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1

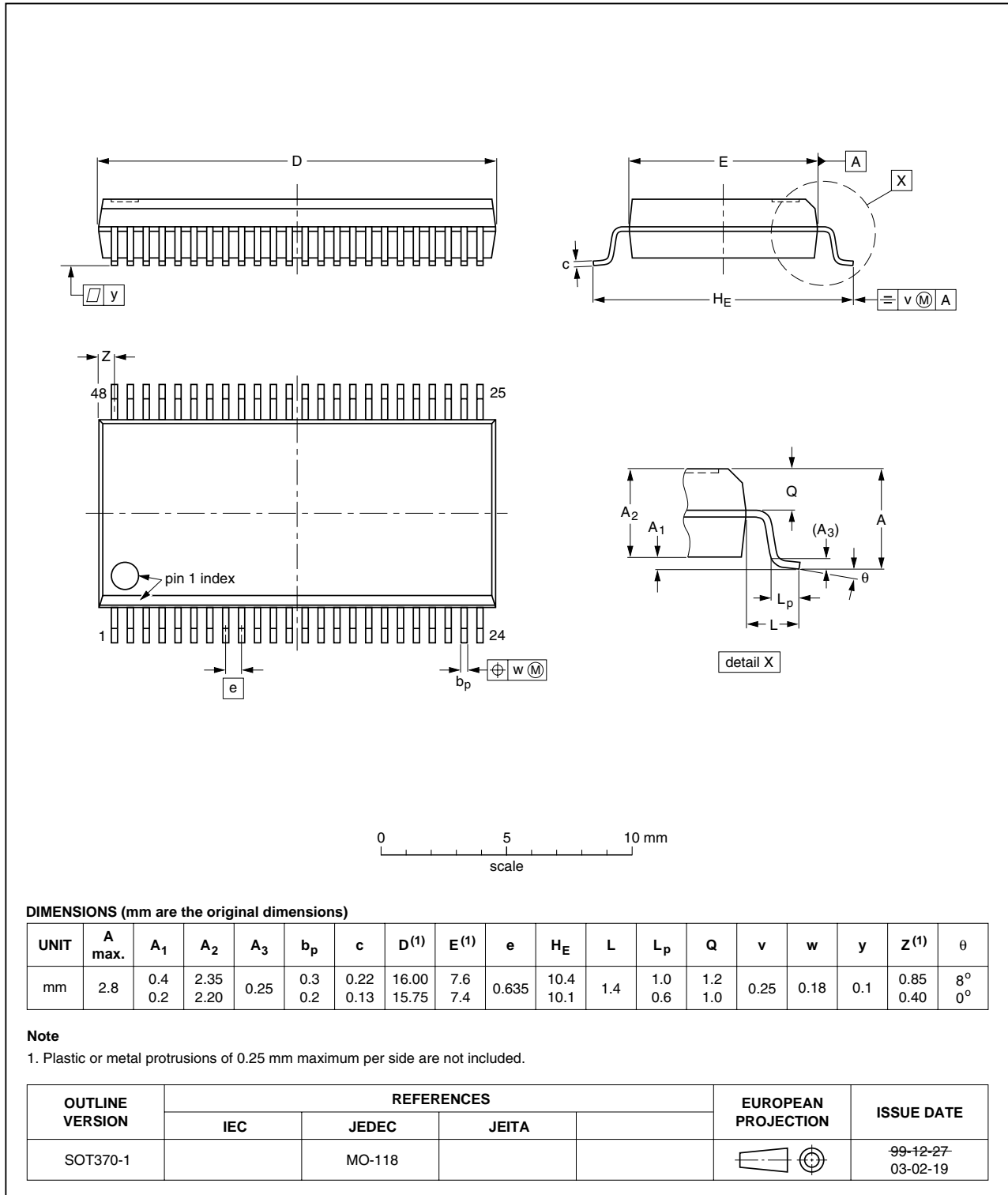


Fig 8. Package outline SOT370-1 (SSOP48)

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1

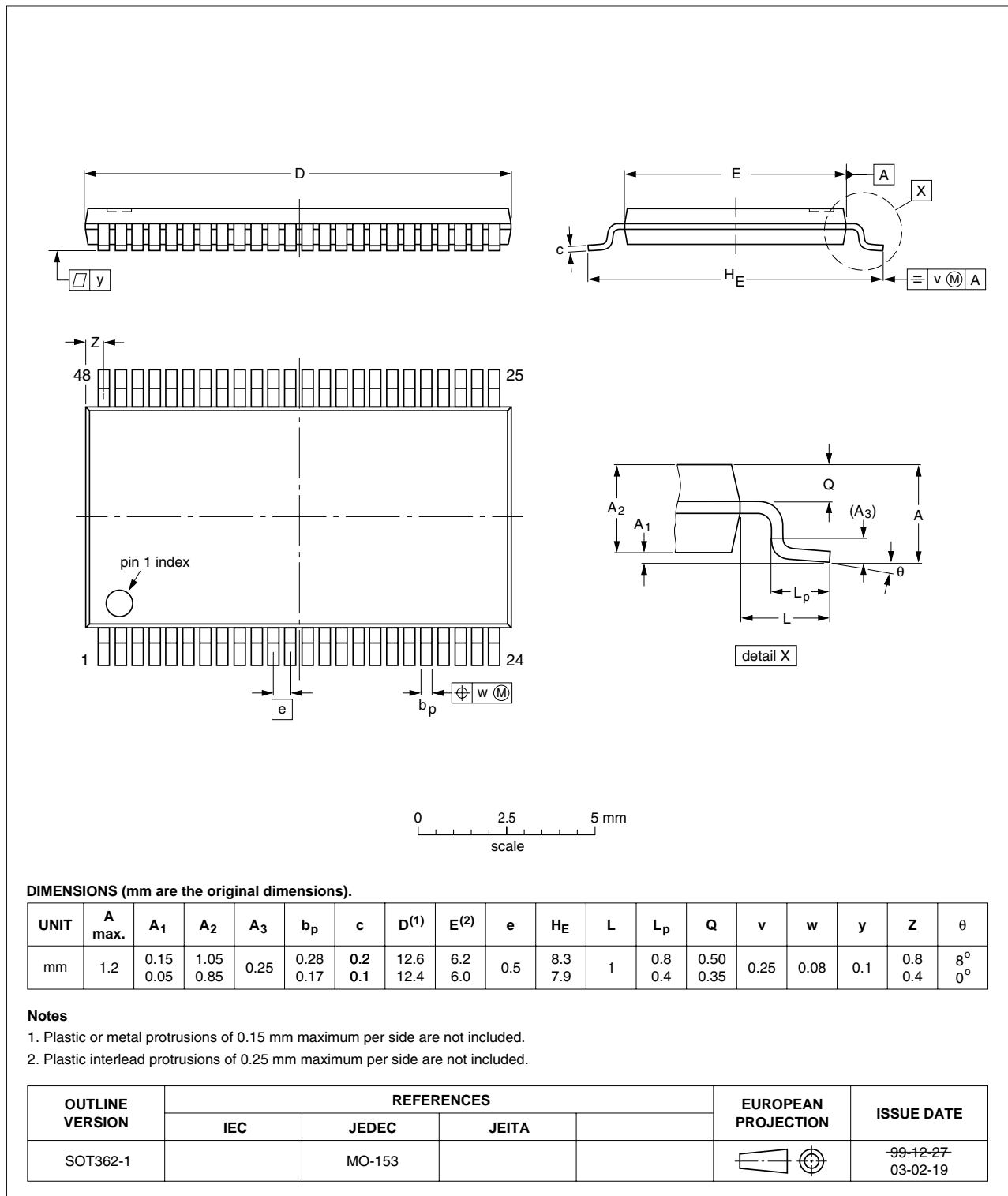


Fig 9. Package outline SOT362-1 (TSSOP48)

HXQFN60U: plastic thermal enhanced extremely thin quad flat package; no leads;  
60 terminals; UTLP based; body 4 x 6 x 0.5 mm

SOT1134-1

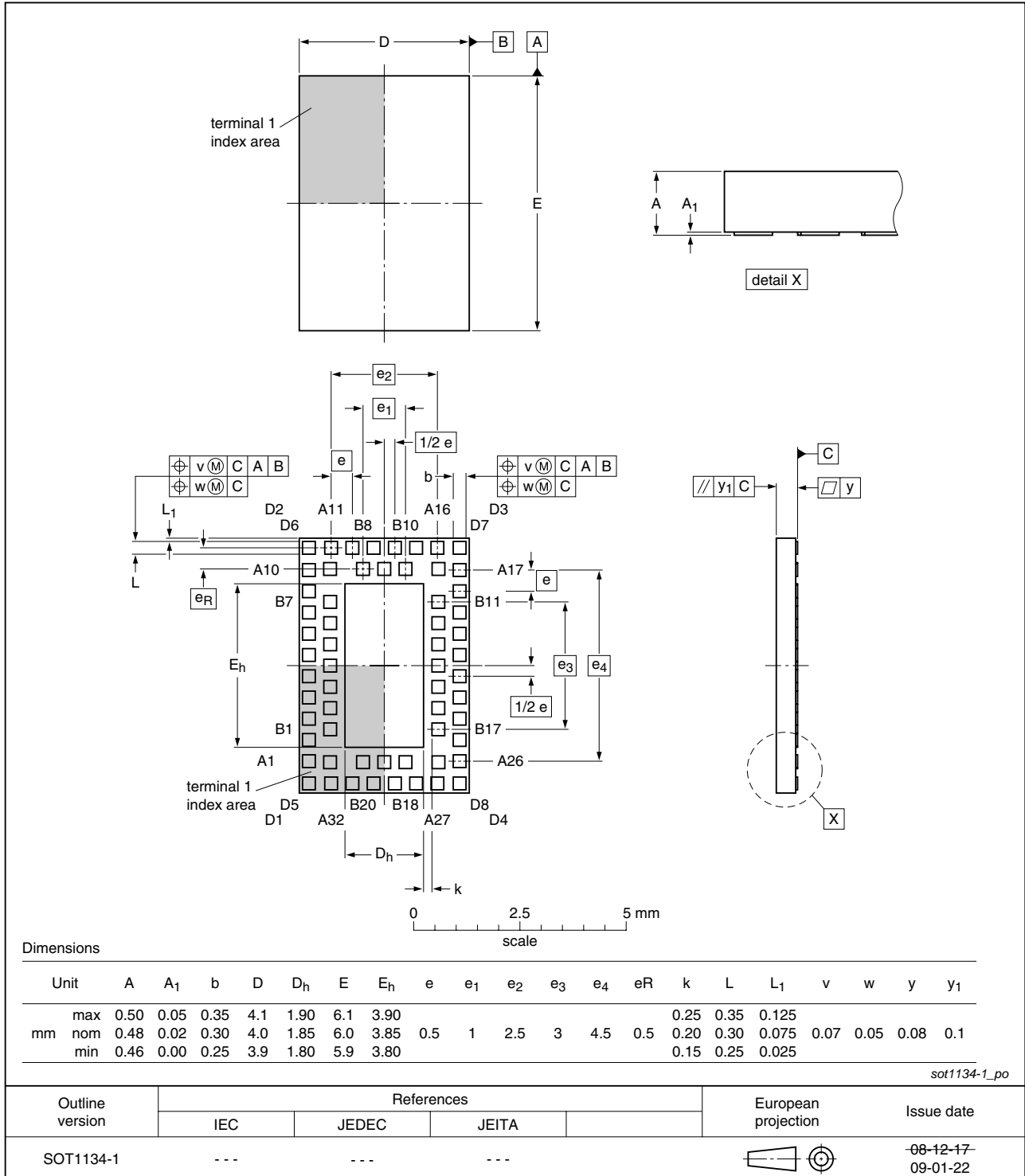


Fig 10. Package outline SOT1134-1 (HXQFN60U)



## 13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVC164245_5	20100413	Product data sheet	-	74ALVC164245_4
Modifications:	<ul style="list-style-type: none"> <li>74ALVC164245BQ changed from HUQFN60U (SOT1025-1) to HXQFN60U (SOT1134-1) package.</li> </ul>			
74ALVC164245_4	20081111	Product data sheet	-	74ALVC164245_3
Modifications:	<ul style="list-style-type: none"> <li>Added type number 74ALVC164245 (HUQFN60U package)</li> </ul>			
74ALVC164245_3	20040914	Product data sheet	-	74ALVC164245_2
74ALVC164245_2	20040601	Product data sheet	-	74ALVC164245_1
74ALVC164245_1	19980826	Product specification	-	-

## 15. Legal information

### 15.1 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>.

### 15.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 15.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use in automotive applications** — This NXP Semiconductors product has been qualified for use in automotive applications. The product is not designed, authorized or warranted to be

suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on a weakness or default in the customer application/use or the application/use of customer's third party customer(s) (hereinafter both referred to as "Application"). It is customer's sole responsibility to check whether the NXP Semiconductors product is suitable and fit for the Application planned. Customer has to do all necessary testing for the Application in order to avoid a default of the Application and the product. NXP Semiconductors does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

### 15.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 16. Contact information

---

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

**17. Contents**

**1 General description . . . . . 1**

**2 Features and benefits . . . . . 1**

**3 Ordering information . . . . . 2**

**4 Functional diagram . . . . . 2**

**5 Pinning information . . . . . 4**

5.1 Pinning . . . . . 4

5.2 Pin description . . . . . 6

**6 Functional description . . . . . 6**

**7 Limiting values . . . . . 6**

**8 Recommended operating conditions . . . . . 7**

**9 Static characteristics . . . . . 8**

**10 Dynamic characteristics . . . . . 9**

**11 AC waveforms . . . . . 11**

**12 Package outline . . . . . 14**

**13 Abbreviations . . . . . 17**

**14 Revision history . . . . . 17**

**15 Legal information . . . . . 18**

15.1 Data sheet status . . . . . 18

15.2 Definitions . . . . . 18

15.3 Disclaimers . . . . . 18

15.4 Trademarks . . . . . 18

**16 Contact information . . . . . 19**

**17 Contents . . . . . 20**

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2010. All rights reserved.

For more information, please visit: <http://www.nxp.com>  
 For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 13 April 2010  
 Document identifier: 74ALVC164245\_5