GT74LVC3G04

Triple Inverter Gate

1 Features

- Low power consumption, 10-μA max I_{CC}
- Supports 5 V V_{CC} operation
- Inputs accept voltages to 5.5 V
- Max t_{pd} of 3.3 ns at 3.3 V
- ±24-mA output drive at 3.3 V
- I_{off} supports partial-power-down mode
- Typical V_{OHV} > 2 V at V_{CC} = 3.3 V, T_A = 25°C
- Typical V_{OLP} < 0.8 V at V_{CC} = 3.3 V, T_A = 25°C

2 Application

- AV receivers
- Audio docks: portable
- Blu-ray players and home theater
- Embedded PC
- MP3 player/recorder (portable audio)
- Personal digital assistant (PDA)
- Power: telecom/server AC/DC supply
- Solid state drive (SSD): client and enterprise
- TV: LCD/digital and high-definition (HDTV)
- Tablet: enterprise
- Video analytics: server
- Wireless headset, keyboard, and mouse

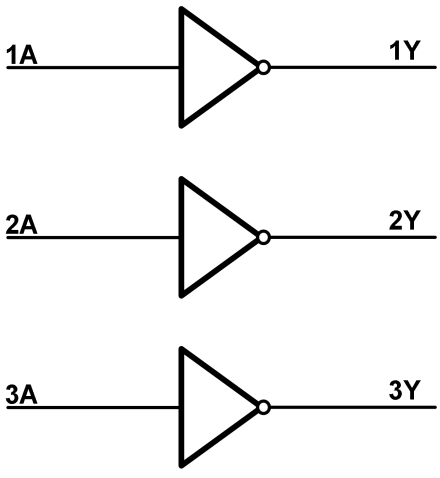
3 Description

The operating voltage range of the single inverter is 1.65 V to 5.5 V.

The GT74LVC3G04 device contains triple inverter and performs the Boolean function $Y=\overline{A}$. The CMOS device has high output drive while maintaining low static power dissipation over a broad VCC operating range.

This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

Circuit Diagram



4 Revision History

Revision	Date	Note
Rev. A1.0	2023. 08. 31	Original Version
Rev. A1.1	2023. 10. 24	1.Updated Package Qty 2.Added Tape and Reel Information 3. Added Application Note
Rev. A1.2	2023. 12. 26	1.Added Marking 2.Added MSL
Rev. A1.3	2024. 01. 26	Updated Part Name

The latest datasheet version should be checked on the GTIC official website, as the company does not actively inform customers about updates to the datasheet.

5 Device Summary, Pin and Packages

Table 5-1. Device Summary(1)

Serial Name	Part Name	Package	Body Size (Nom)	Marking(2)	MSL(3)	Package Qty
GT74LVC3G04	GT74LVC3G04V8	VSSOP-8	2.00mm×2.30mm×0.75mm	3G04 XXXX	3	Tape and Reel 3000

(1) For all available packages, please contact product sales.

(2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

(3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

(4) "XXXXX" in Marking will be appeared as the batch code.

5 Device Summary, Pin and Packages(Continued)

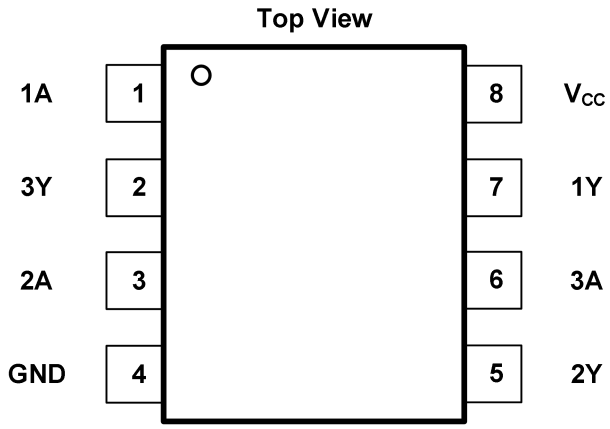


Fig.5-1. GT74LVC3G04:V8 (VSSOP8) Package

Table 5-2 Pin Definition

Pin		Type	Description
Name	V8		
1A	1	I	Input 1
3Y	2	O	Output 3
2A	3	I	Input 2
GND	4	—	Ground
2Y	5	O	Output 2
3A	6	I	Input 3
1Y	7	O	Output 1
V_{CC}	8	—	Positive Supply

6 Voltage, Temperature, ESD and Thermal Ratings

6.1 Absolute Maximum Ratings

Parameters			Min	Max.	Unit
V_{CC}	Supply voltage range		-0.5	6.5	V
V_I	Input voltage range		-0.5	6.5	V
V_O	Voltage range applied to any output in the high-impedance or power-off state		-0.5	6.5	V
V_O	Voltage range applied to any output in the high or low state		-0.5	V_{CC}+0.5	V
I_{IK}	Input clamp current	V_I<0		-50	mA
I_{OK}	Output clamp current	V_O<0		-50	mA
I_O	Continuous output current			±50	mA
Continuous current through V_{CC} or GND				±100	mA
T_J	Junction temperature under bias			150	˚C
T_{stg}	Storage temperature range		-55	150	˚C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

6.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic discharge	Human-body model (HBM)	4 K	V
		Charge device model (CDM)	2 K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6 Voltage, Temperature, ESD and Thermal Ratings(Continued)

6.3 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply voltage		1.65	5.5	V
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	V_{CC}=1.65V		-4	mA
		V_{CC}=2.3V		-8	
		V_{CC}=3V		-16	
				-24	
		V_{CC}=4.5V		-32	
I_{OL}	Low-level output current	V_{CC}=1.65V		4	mA
		V_{CC}=2.3V		8	
		V_{CC}=3V		16	
				24	
		V_{CC}=4.5V		32	
T_A	Operating free-air temperature		-40	125	℃

6.4 Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
VSSOP-8	227	84	°C/W

7 Electrical Specifications

Vcc=5.0V or 3.3V, FULL=–40°C to +125°C, Typical values are at T_A=+25°C. (unless otherwise noted)

Parameter	Test Conditions	V_{CC}	–40°C to 85°C			–40°C to 125°C			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{OH}	I_{OH}=–100 μA	1.65 V to 5.5 V	V_{CC}-0.1			V_{CC}-0.1			V
	I_{OH}=–4 mA	1.65 V	1.2			1.2			
	I_{OH}=–8 mA	2.3 V	1.9			1.9			
	I_{OH}=– 16 mA	3 V	2.4			2.4			
	I_{OH}=–24 mA		2.3			2.3			
	I_{OH}=–32 mA	4.5 V	3.8			3.8			
V_{OL}	I_{OL}=100 μA	1.65 V to 5.5 V			0.1			0.1	V
	I_{OL}=4 mA	1.65 V			0.45			0.45	
	I_{OL}=8 mA	2.3 V			0.3			0.3	
	I_{OL}=16 mA	3 V			0.4			0.4	
	I_{OL}=24 mA				0.55			0.55	
	I_{OL}=32 mA	4.5 V			0.55			0.55	
I_I A input	V_I=5.5 V or GND	0 to 5.5 V			±5			±5	μA
I_{off}	V_I or V_O=5.5 V	0			±10			±10	μA
I_{CC}	V_I=5.5 V or GND, I_O=0	1.65 V to 5.5 V			10			10	μA
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	3 V to 5.5 V			500			500	μA
C_i	V_I=V_{CC} or GND	3.3 V		5			5		pF

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation

7 Electrical Specifications (Continued)

Vcc=5.0V or 3.3V, FULL=–40°C to +125°C, Typical values are at T_A=+25°C. (unless otherwise noted)

Parameter	From (Input)	To (Output)	–40°C to 125°C								Unit
			V_{CC}=1.8 V ± 0.15 V		V_{CC}=2.5 V ± 0.2 V		V_{CC}=3.3 V ± 0.3 V		V_{CC}=5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	A	Y	3.9	8.0	1.4	3.5	1	3.3	1	3.0	ns

T_A=25°C

Parameter		Test Conditions	V_{CC}=1.8 V	V_{CC}=2.5 V	V_{CC}=3.3 V	V_{CC}=5 V	Unit
			Typ	Typ	Typ	Typ	
C_{pd}	Power dissipation capacitance	f=10 MHz	17	18	25	30	pF

8 Typical Characteristics

Over recommended operating free-air temperature range, C_L=30 pF or 50 pF (unless otherwise noted)

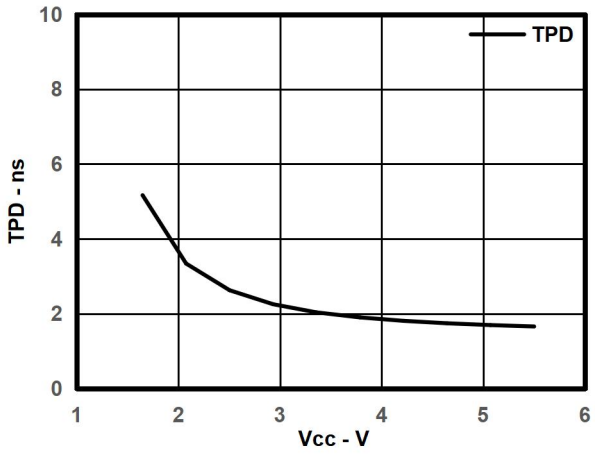


Fig.8-1. Typical Tpd vs Vcc

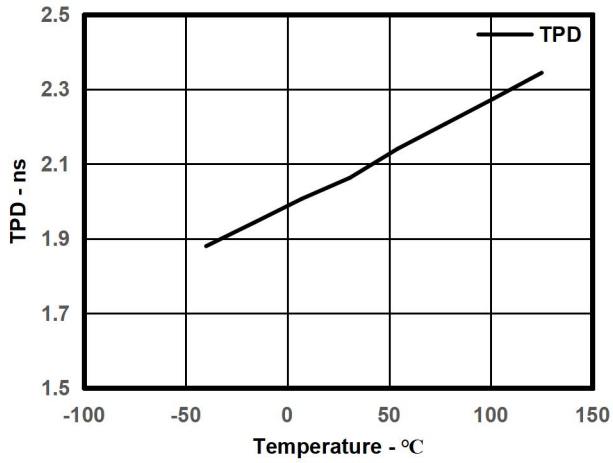
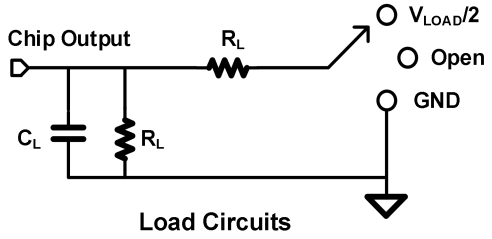


Fig.8-2. Typical Tpd vs Temp

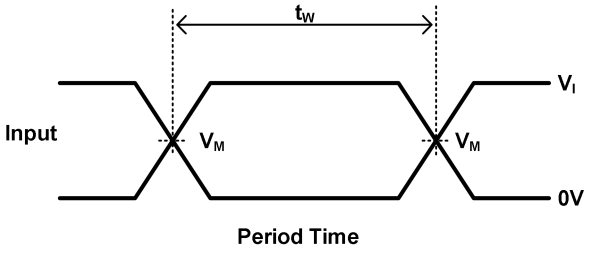
9 Parameter Measurement Information



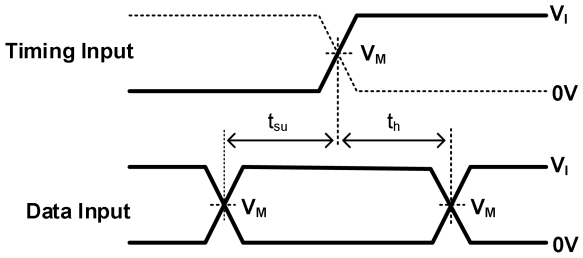
Load Circuits

TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

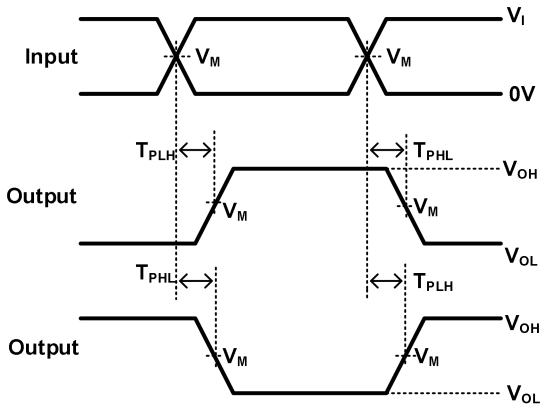
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	T_r/T_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2\times V_{CC}$	30pF	1kΩ	0.15V
2.5V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2\times V_{CC}$	30pF	500Ω	0.15V
3.3V±0.15V	3V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.15V	V_{CC}	≤2.5ns	$V_{CC}/2$	$2\times V_{CC}$	50pF	500Ω	0.3V



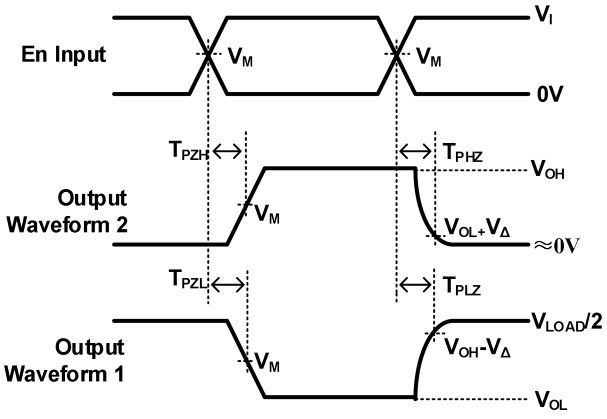
Period Time



Setup and Hold Times



Propagation Delay
for Output and Inverted Output



Enable and Disable Times
Low-And High-Level Enabling

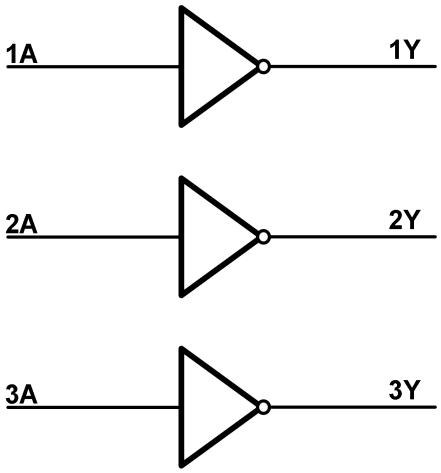
Notes: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, Z =50.
D. The outputs are measured one at a time, with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. t_{PLH} and t_{PHL} are the same as t_{pd}.
H. All parameters and waveforms are not applicable to all device.

10 Detailed Description

10.1 Overview

This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current back flow through the device when it is powered down.

10.2 Functional Block Diagram



10.3 Feature Description

The device is designed for 1.65V to 5.5V V_{CC} operation and it allows down voltage translation from 5V to 3.3V, or 3.3V to 1.8V. Input signals to this device can be driven above the supply voltage so long as they remain below the maximum input voltage value. Ioff feature allows voltages on the inputs and outputs, when V_{CC} is 0 V.

10.4 Device Functional Modes

Table 10-1 Function Table

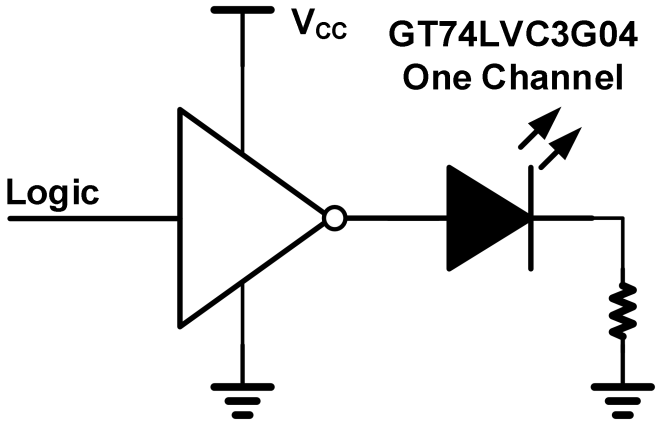
Input A	Output Y
H	L
L	H

11 Application Note

11.1 Application Information

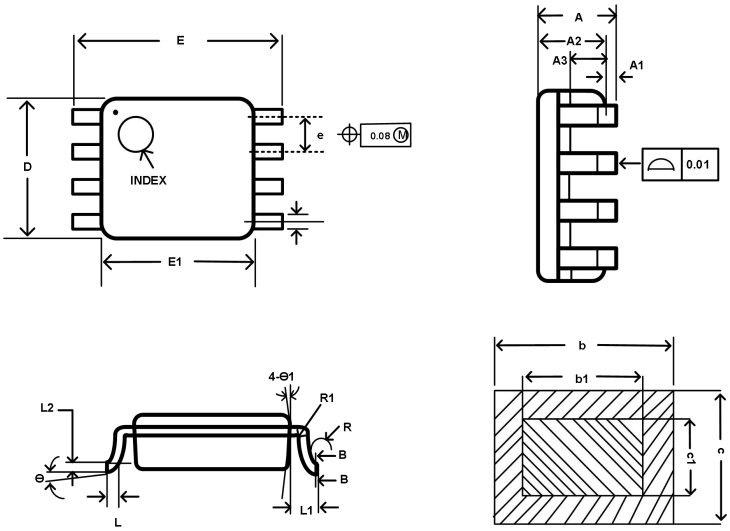
The GT74LVC3G04 is a high drive CMOS device that can be used for implementing inversion logic with a high output drive, such as an LED application. It can produce 24 mA of drive current at 3.3 V making it Ideal for driving multiple outputs and good for high-speed applications up to 100 Mhz. The inputs are 5.5 V tolerant allowing it to translate down to V_{CC}.

11.2 Typical Application



12 Package Outline Dimension

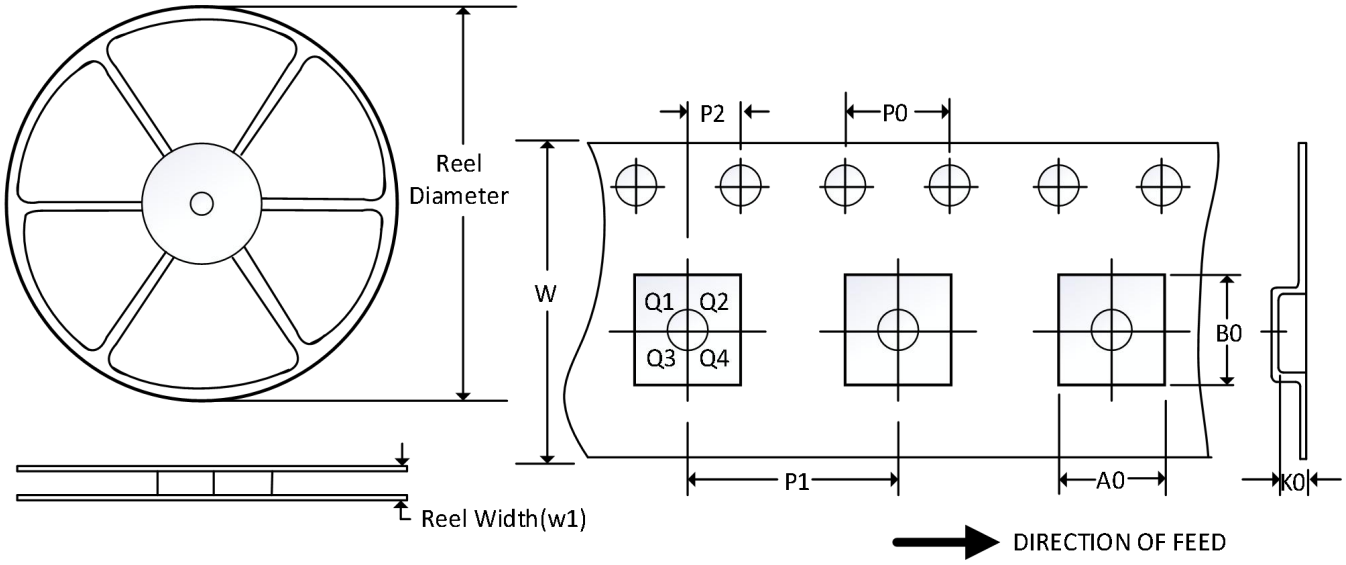
VSSOP-8



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min	Nom	Max	Min	Nom	Max
A	-	-	0.90	-	-	0.035
A1	0	0.05	0.10	0.000	0.002	0.004
A2	0.65	0.75	0.80	0.026	0.030	0.031
A3	0.32	0.37	0.42	0.013	0.015	0.017
b	0.17	-	0.27	0.007	-	0.011
b1	0.17	0.20	0.23	0.007	0.008	0.009
c	0.10	-	0.18	0.004	-	0.007
c1	0.10	0.13	0.14	0.004	0.005	0.006
E	3.00	3.10	3.20	0.118	0.122	0.126
D	1.90	2.00	2.10	0.075	0.079	0.083
E	3.00	3.10	3.20	0.118	0.122	0.126
E1	2.20	2.30	2.40	0.087	0.091	0.094
e	0.40	0.50	0.60	0.016	0.020	0.024
L	0.20	0.26	0.35	0.008	0.010	0.014
L1	0.40REF			0.016REF		
L2	0.12BSC			0.005BSC		
R	0.07	-	-	0.003	-	-
R1	0.07	-	-	0.003	-	-
θ	0°	-	6°	0°	-	6°
θ1	9°	12°	15°	9°	12°	15°

13 TAPE AND REEL INFORMATION

REEL DIMENSIONS **REEL DIMENSIONS**



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
VSSOP-8	7''	9.5	2.25	3.35	1.4	4	4	2	8	Q3

NOTE:
1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.