

## 1. General Description

---

The 74LVC1G06 is a single inverter with open-drain output. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments. Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times. This device is fully specified for partial power down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

## 2. Features and Benefits

---

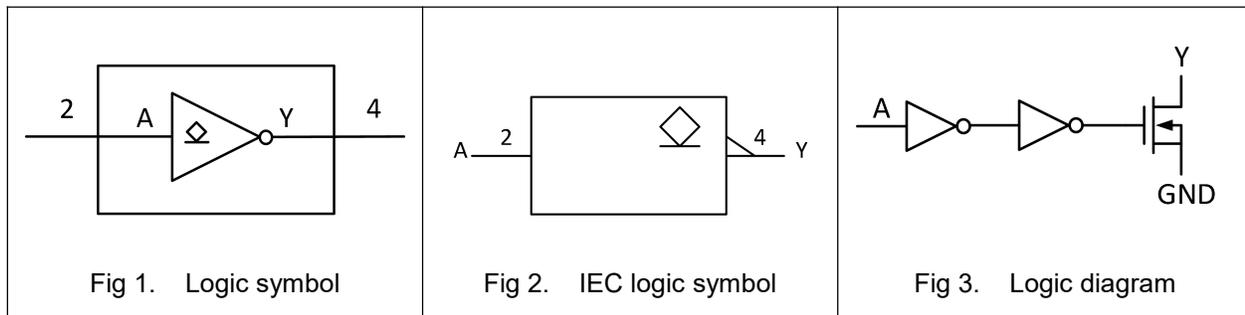
- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- CMOS low power dissipation
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- $\pm 24$  mA output drive ( $V_{CC} = 3.0$  V)
- Latch-up performance exceeds 100 mA
- Direct interface with TTL levels
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD36 (4.5 V to 5.5 V)
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 Class 3B exceeds 8000 V
  - MM JESD22-A115C Class C exceeds 550 V
  - CDM ANSI/ESDA/JEDEC JS-002 Class C3 exceeds 2000 V
- Multiple package options

### 3. Ordering Information

**Table 1. Ordering information**

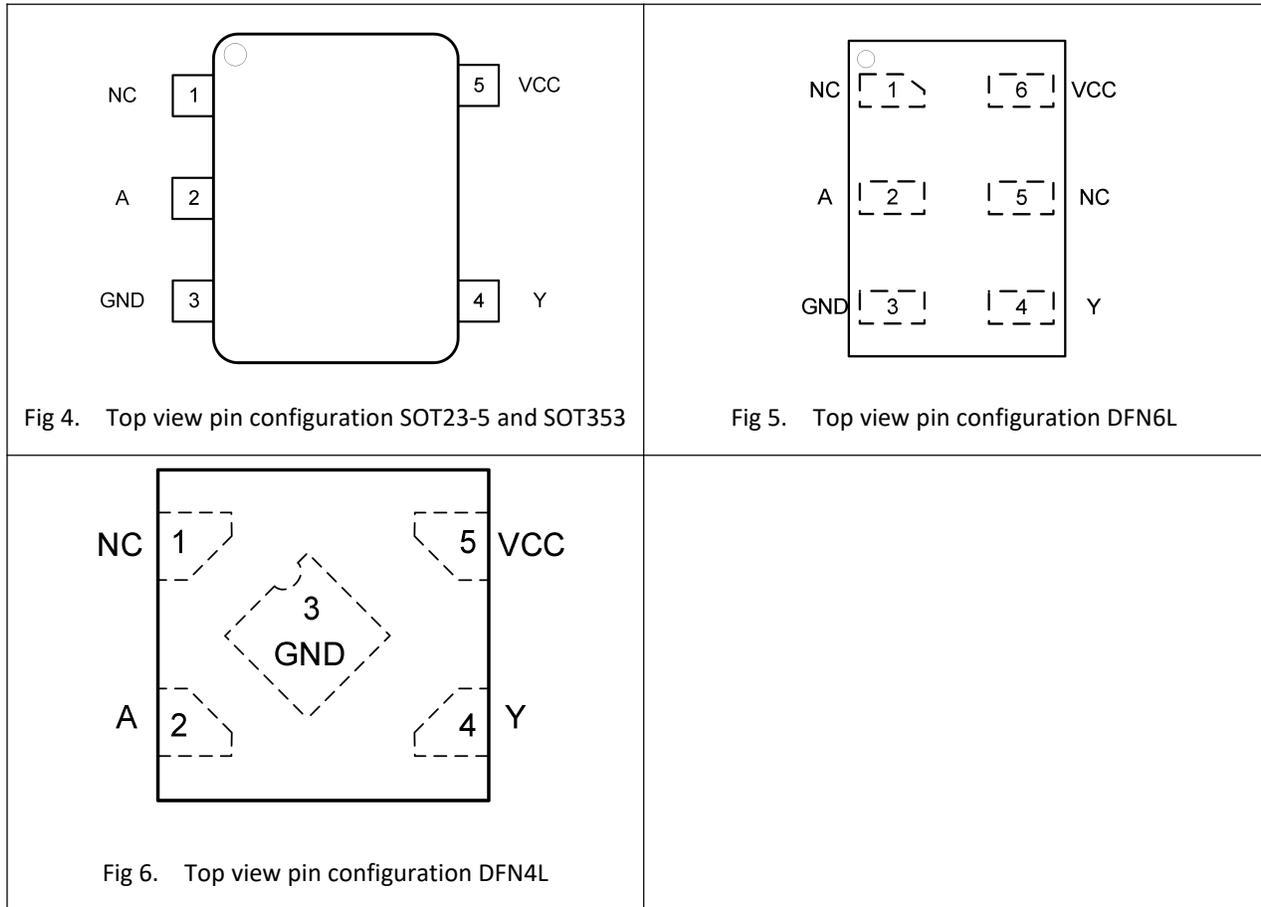
Type number	Package		
	Name	Description	Quantity
74LVC1G06GV	SOT23-5L	SOT23 package, 5 pins 2.92 mm × 1.6 mm; 1.25 mm (Max) height	3000
74LVC1G06GW	SOT353	SOT353 package, 5 pins 2.1 mm × 1.25 mm; 1.1 mm (Max) height	3000
74LVC1G06GS	DFN1x1-6L	DFN1×1 package, 6 pins 1 mm × 1 mm; 0.42 mm (Max) height	3000
74LVC1G06GM	DFN1x1.45-6L	DFN1.45×1 package, 6 pins 1.45 mm × 1 mm; 0.6 mm (Max) height	3000
74LVC1G06GX	DFN0.8x0.8-4L	DFN0.8×0.8 package, 5 pins 0.8 mm × 0.8 mm; 0.4 mm (Max) height	3000

### 4. Function Diagram



## 5. Pinning Information

### 5.1. Pin map



### 5.2. Pin description

Table 2. Pin description

Symbol	Pin		Description
	SOT23-5, SOT353 and DFN4L	DFN6L	
NC	1	1, 5	Not connected
A	2	2	Data input
GND	3	3	Ground (0V)
Y	4	4	Data output
VCC	5	6	Supply voltage

## 6. Functional Description

**Table 3. Function table**

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

Input	Output
A	Y
L	Z
H	L

## 7. Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

**Table 4. Absolute Maximum Ratings**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	6.5	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50		mA
$V_I$	input voltage	[1]	-0.5	6.5	V
$I_{OK}$	output clamping current	$V_O < 0$ V	-50		mA
$V_O$	output voltage	Active mode [1]	-0.5	6.5	V
		Power-down mode; $V_{CC} = 0$ V [1]	-0.5	6.5	V
$I_O$	output current	$V_O = 0$ V to 6.5V		50	mA
$I_{CC}$	supply current			100	mA
$I_{GND}$	ground current		-100		mA
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to + 125 °C		250	mW
$T_{stg}$	storage temperature		-65	150	°C

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

## 8. Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. EnergyMath does not recommend exceeding them or designing to Absolute Maximum Ratings.

**Table 5. Recommended Operating Conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		1.65		5.5	V
$V_I$	input voltage		0		5.5	V
$V_O$	output voltage	Active mode	0		5.5	V
		Power-down mode; $V_{CC} = 0\text{ V}$	0		5.5	V
$T_{amb}$	ambient temperature		-40		125	°C
$\Delta t/\Delta V$	Input transition rise and fall rate	$V_{CC} = 1.65\text{ V to }2.7\text{ V}$			20	ns/V
		$V_{CC} = 2.7\text{ V to }5.5\text{ V}$			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	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65V <sub>CC</sub>			0.65V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7			1.7		V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0			2.0		V
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7V <sub>CC</sub>			0.7V <sub>CC</sub>		V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V			0.35V <sub>CC</sub>		0.35V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V			0.7		0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V			0.8		0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V			0.3V <sub>CC</sub>		0.3V <sub>CC</sub>	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V			0.10		0.10	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V			0.45		0.70	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V			0.30		0.45	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V			0.40		0.60	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V			0.55		0.80	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V			0.55		0.80	V
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = 5.5 V or GND ; V <sub>CC</sub> = 0 V to 5.5 V		±0.1	±1		±1	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; V <sub>CC</sub> = 5.5 V		±0.1	±2		±2	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0V ; V <sub>I</sub> or V <sub>O</sub> = 5.5 V		±0.1	±2		±2	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5V or GND ; I <sub>O</sub> = 0A ; V <sub>CC</sub> = 1.65V to 5.5V		0.1	4		4	μA
ΔI <sub>CC</sub>	additional supply current	per pin ; V <sub>CC</sub> = 2.3V to 5.5V ; V <sub>I</sub> = V <sub>CC</sub> - 0.6V ; I <sub>O</sub> = 0A		5	500		500	μA
C <sub>I</sub>	input capacitance	V <sub>CC</sub> = 3.3V ; V <sub>I</sub> = GND to V <sub>CC</sub>		5				pF

[1] All typical values are measured at  $V_{CC} = 3.3V$  and  $T_{amb} = 25^{\circ}C$ .

## 10. Dynamic Characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 8.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
$t_{pd}$	propagation delay	A to Y; see Fig. 7 [2]						
		$V_{CC} = 1.65 V$ to $1.95 V$	2.6	7.4	12.6	2.6	12.9	ns
		$V_{CC} = 2.3 V$ to $2.7 V$	1.7	3.9	6.6	1.7	7.0	ns
		$V_{CC} = 3.0 V$ to $3.6 V$	1.4	2.5	4.0	1.4	4.2	ns
		$V_{CC} = 4.5 V$ to $5.5 V$	1.2	2.0	2.9	1.2	3.0	ns
$C_{PD}$	power dissipation capacitance	$V_I = GND$ to $V_{CC}$ ; $V_{CC} = 3.3V$ [3]		3.5				pF

[1] Typical values are measured at  $T_{amb} = 25^{\circ}C$  and  $V_{CC} = 1.8 V, 2.5 V, 3.3 V$  and  $5.0 V$  respectively.

[2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

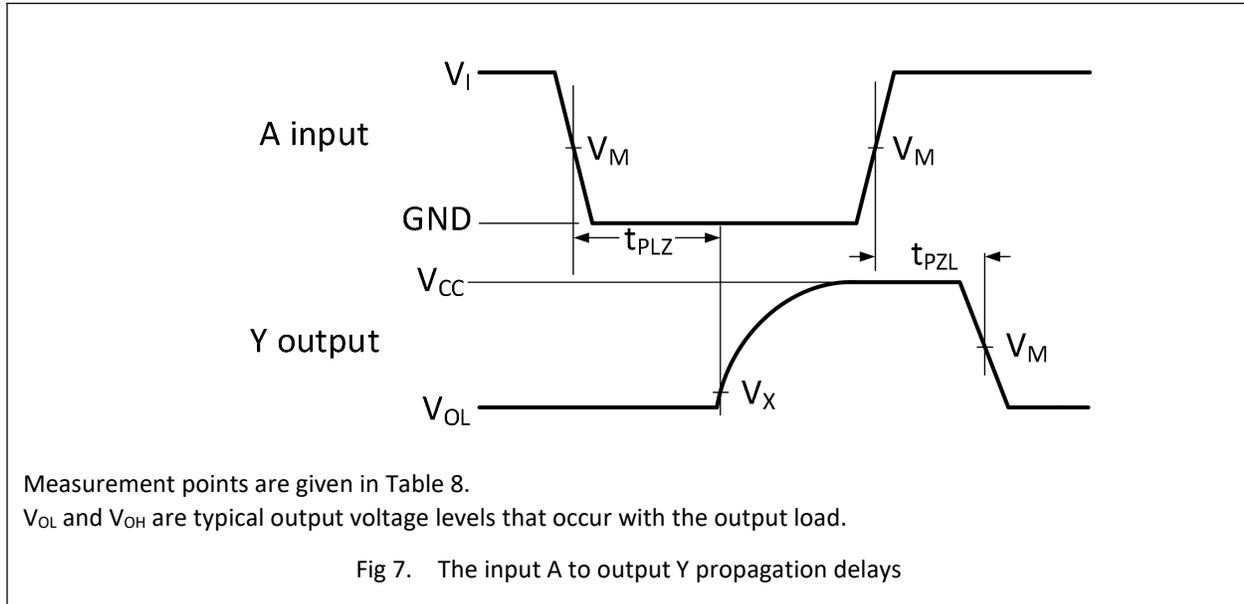
$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

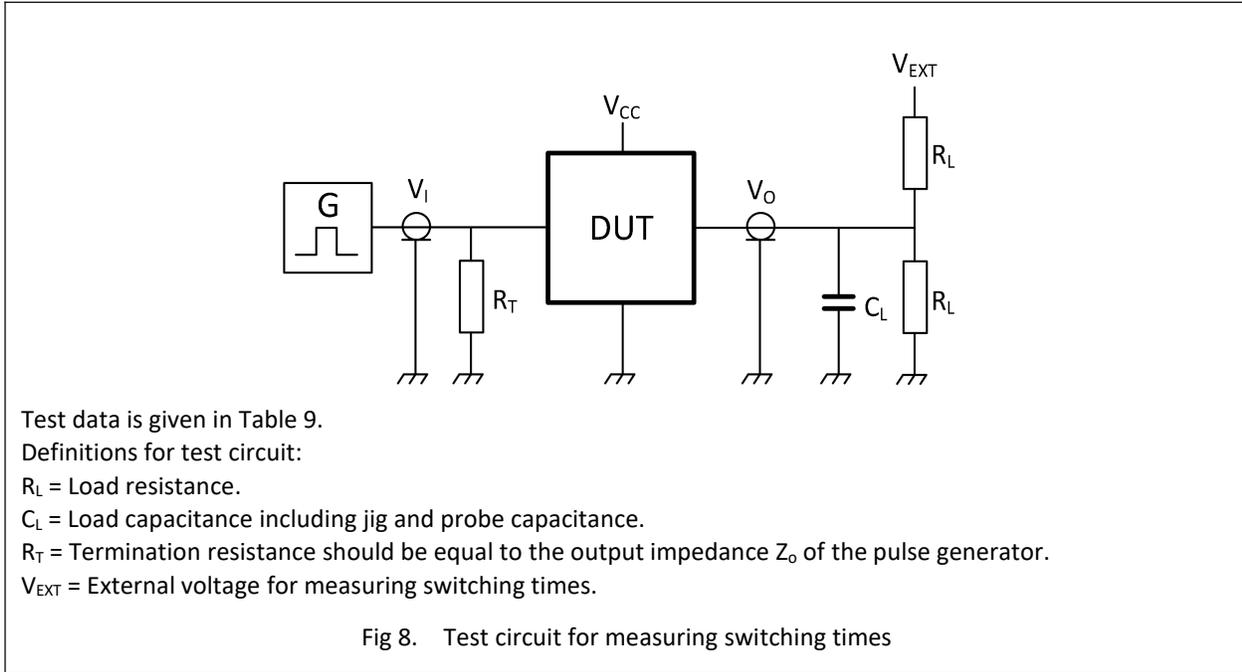
$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

### 10.1. Waveforms and test circuit



**Table 8. Measurement points**

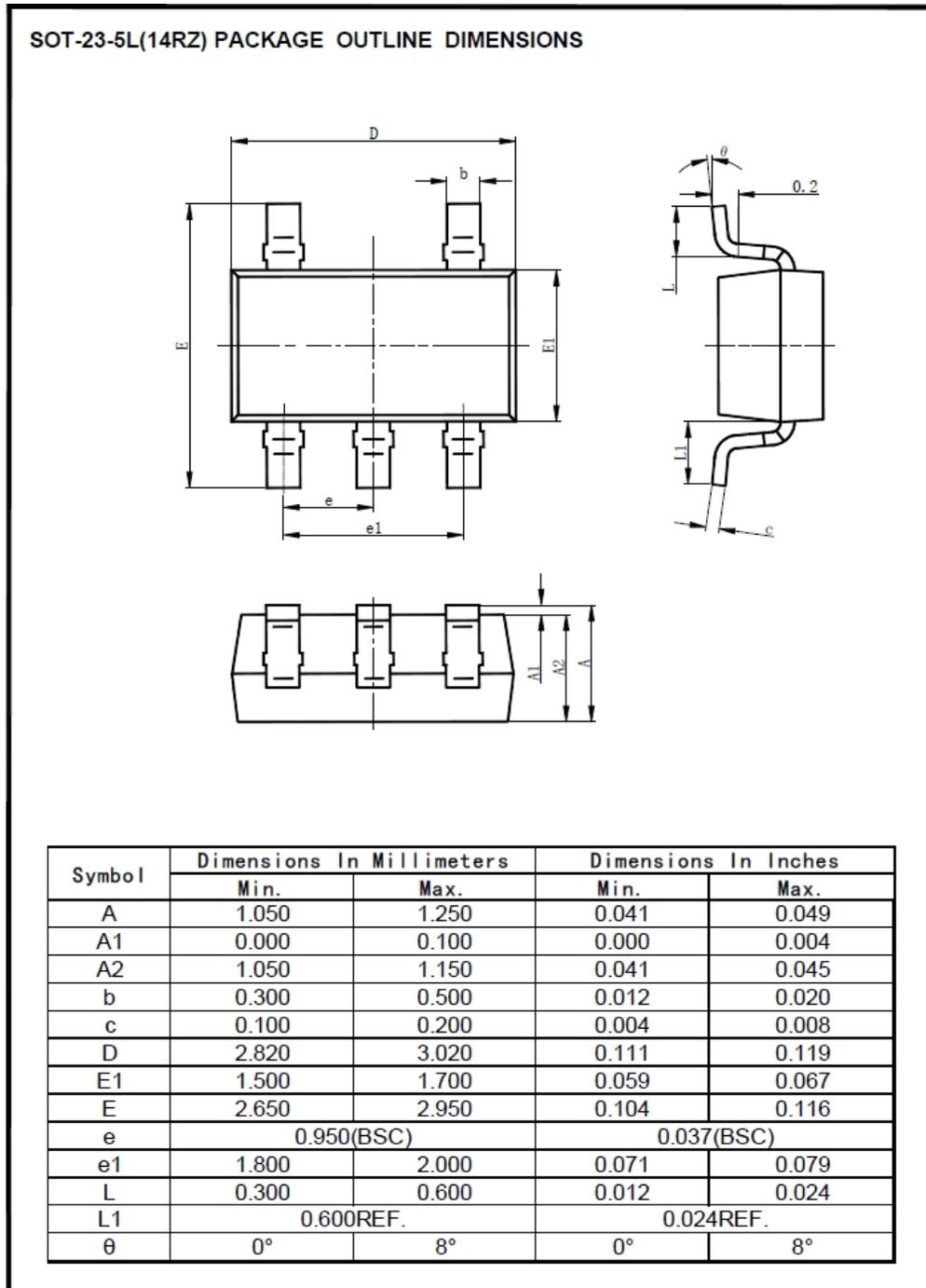
Supply voltage	Input	Output	
$V_{CC}$	$V_M$	$V_M$	$V_X$
1.65 V to 1.95 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15V$
2.3 V to 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15V$
3.0 V to 3.6 V	1.5 V	1.5 V	$V_{OL} + 0.3V$
4.5 V to 5.5 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.3V$


**Table 9. Test data**

Supply voltage	Input		Load		$V_{EXT}$
$V_{CC}$	$V_I$	$t_r = t_f$	$C_L$	$R_L$	$t_{PZL}, t_{PLZ}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	$2 \times V_{CC}$
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	$2 \times V_{CC}$
3.0 V to 3.6 V	3 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	6V
4.5 V to 5.5 V	$V_{CC}$	$\leq 2.5$ ns	50 pF	500 $\Omega$	$2 \times V_{CC}$

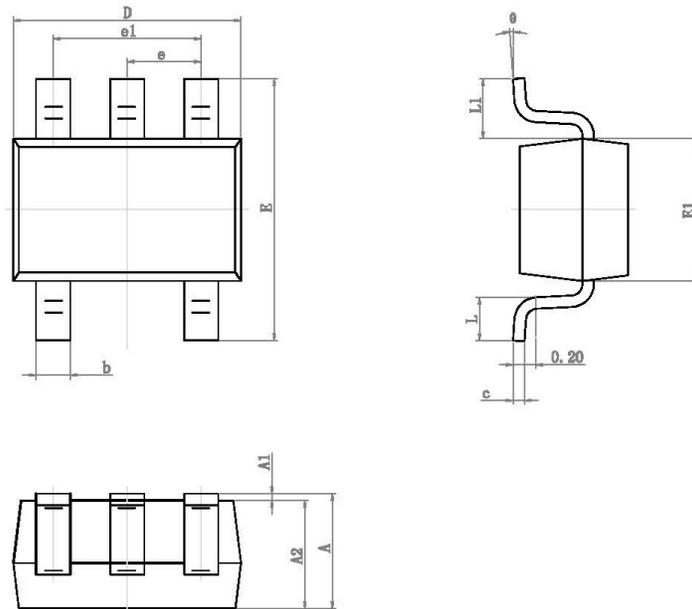
# 11. Package Outline

SOT23-5L



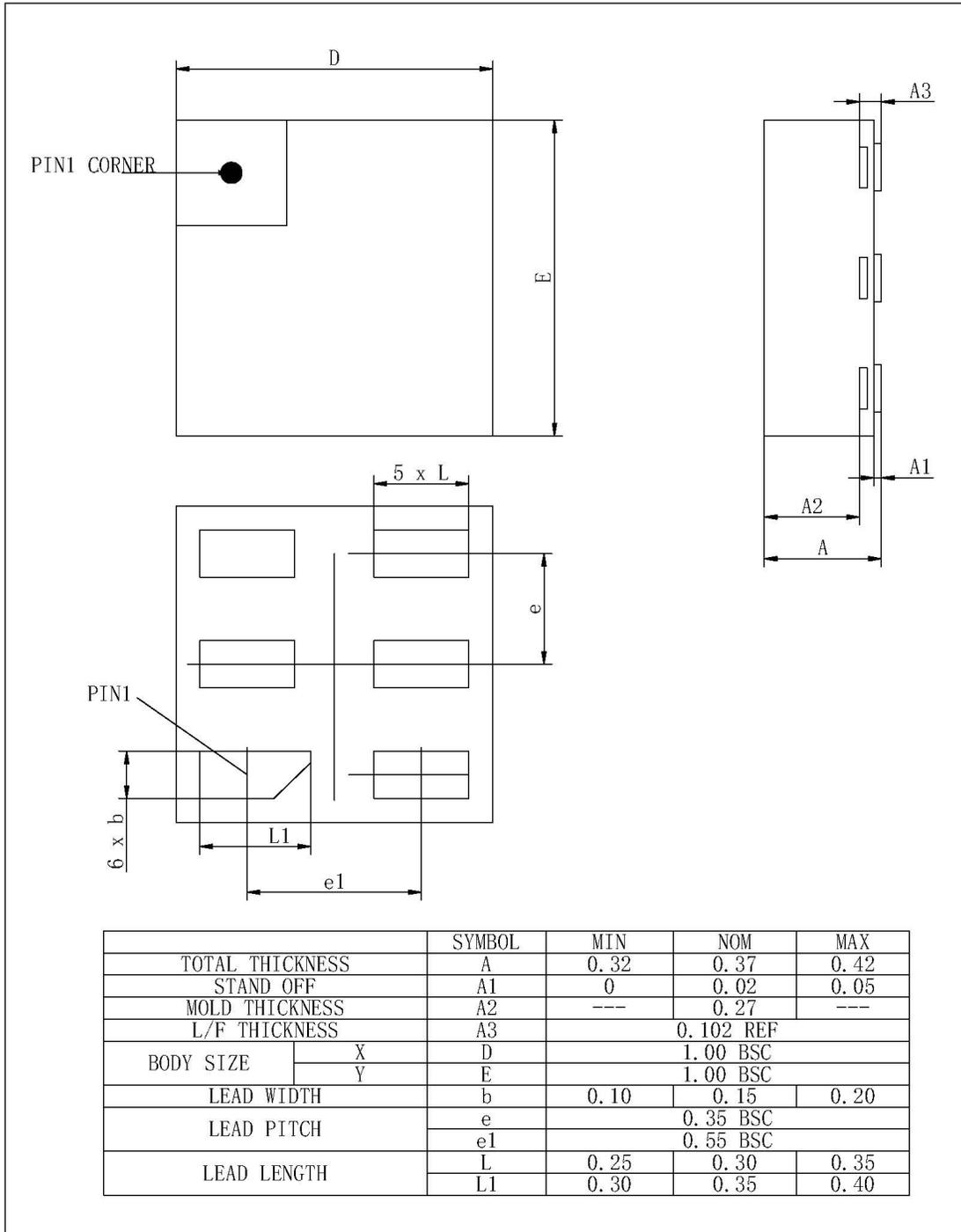
SOT353

**SOT-353 (16R) PACKAGE OUTLINE DIMENSIONS**



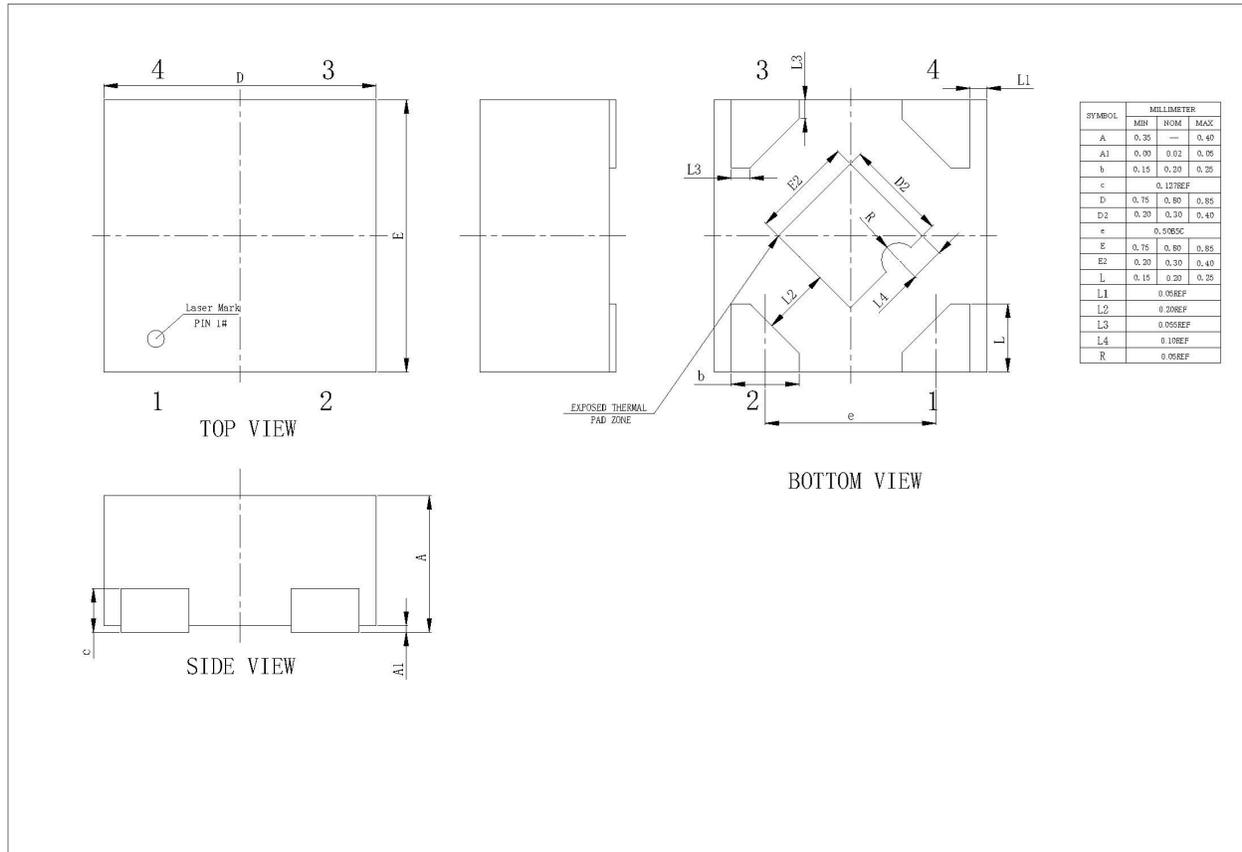
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650 TYP.		0.026 TYP.	
e1	1.200	1.400	0.047	0.055
L	0.260	0.460	0.010	0.018
L1	0.525 REF.		0.021 REF.	
θ	0°	8°	0°	8°

DFN1x1-6L





DFN0.8x0.8-4L



## 12. 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

## 13. Revision History

Table 11. Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
74LVC1G06 Rev. 1.0	Aug 08, 2024	Product datasheet		