

## 1. General Description

---

The 74LVC2G14 is a dual inverter with Schmitt-trigger inputs. 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.

This device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

## 2. Features and Benefits

---

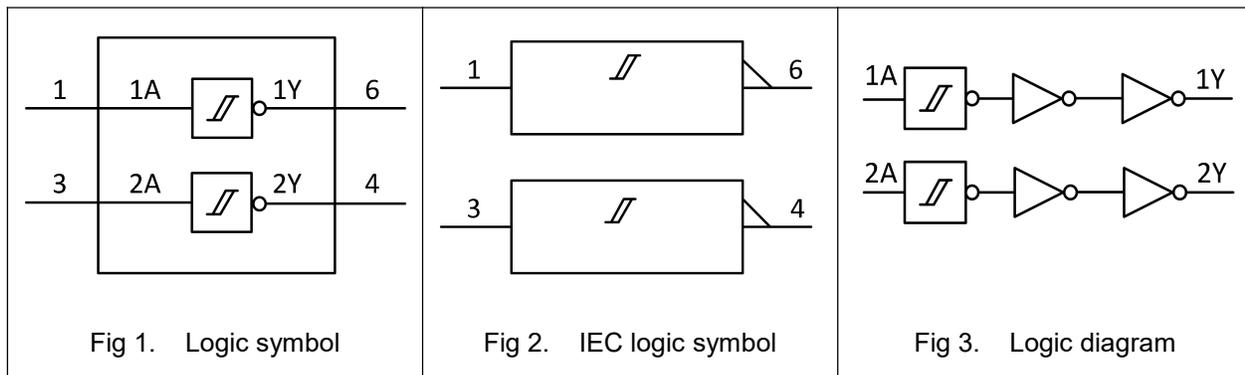
- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- $\pm 24$  mA output drive (VCC = 3.0 V)
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA
- Direct interface with TTL levels
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Unlimited rise and fall times
- 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		Quantity
	Name	Description	
74LVC2G14GV	SOT23-6L	SOT23 package, 6 pins 2.92 mm × 1.6 mm; 1.25 mm (Max) height	3000
74LVC2G14GW	SOT363	SOT363 package, 6 pins 2.1 mm × 1.25 mm; 1.1 mm (Max) height	3000
74LVC2G14GS	DFN1x1-6L	DFN1×1 package, 6 pins 1 mm × 1 mm; 0.42 mm (Max) height	3000
74LVC2G14GM	DFN1x1.45-6L	DFN1.45×1 package, 6 pins 1.45 mm × 1 mm; 0.6 mm (Max) height	3000

### 4. Function Diagram



## 5. Pinning Information

### 5.1. Pin map

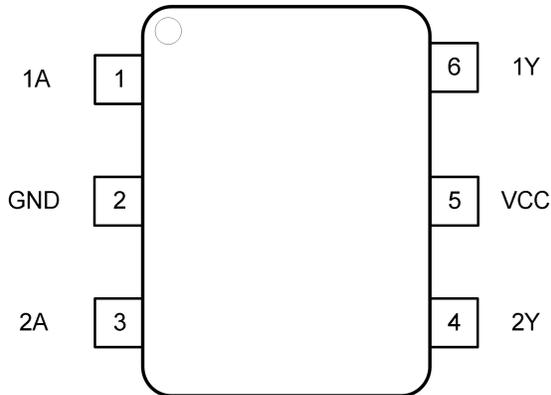


Fig 4. Top view pin configuration SOT23-6 and SOT363

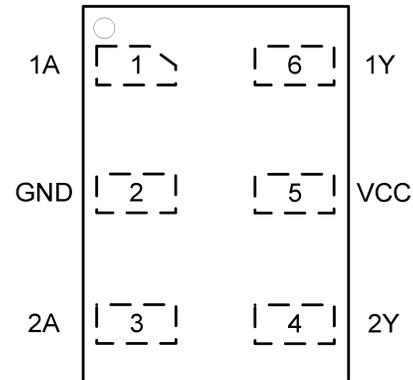


Fig 5. Top view pin configuration DFN6L

### 5.2. Pin description

**Table 2. Pin description**

Symbol	Pin	Description
1A	1	Data input
GND	2	Ground (0V)
2A	3	Data input
2Y	4	Data output
VCC	5	Supply voltage
1Y	6	Data output

## 6. Functional Description

**Table 3. Function table**

H = HIGH voltage level; L = LOW voltage level.

Input	Output
nA	nY
L	H
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	$V_O > V_{CC}$ or $V_O < 0$ V		$\pm 50$	mA
$V_O$	output voltage	Active mode [1]	-0.5	$V_{CC} + 0.5$	V
		Power-down mode; [1] $V_{CC} = 0$ V	-0.5	6.5	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$		$\pm 50$	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 <sub>CC</sub>	supply voltage		1.65		5.5	V
V <sub>I</sub>	input voltage		0		5.5	V
V <sub>O</sub>	output voltage	Active mode	0		V <sub>CC</sub>	V
		Power-down mode; V <sub>CC</sub> = 0 V	0		5.5	V
T <sub>amb</sub>	ambient temperature		-40		125	°C

## 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>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>						
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	V <sub>CC</sub> - 0.1			V <sub>CC</sub> - 0.1		V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2			0.95		V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.9			1.7		V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2			1.9		V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.3			2.0		V
		I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.8			3.4		V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</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> = 5.5 V		±0.1	±1		±1	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> = 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<sub>CC</sub> = 3.3V and T<sub>amb</sub> = 25°C.

## 10. Dynamic Characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
$t_{pd}$	propagation delay	nA to nY; see Fig. 6 [2]						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	4.0	10.6	19.5	4.0	19.8	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.5	5.9	10.6	2.5	10.9	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.0	4.3	7	2.0	7.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.5	2.9	4.8	1.5	5.0	ns
$C_{PD}$	power dissipation capacitance	per buffer ; $V_I = \text{GND to } V_{CC}$ ; $V_{CC} = 3.3\text{V}$ [3]		24				pF

[1] Typical values are measured at  $T_{amb} = 25 \text{ °C}$  and  $V_{CC} = 1.8 \text{ V}, 2.5 \text{ V}, 3.3 \text{ V}$  and  $5.0 \text{ V}$  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  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

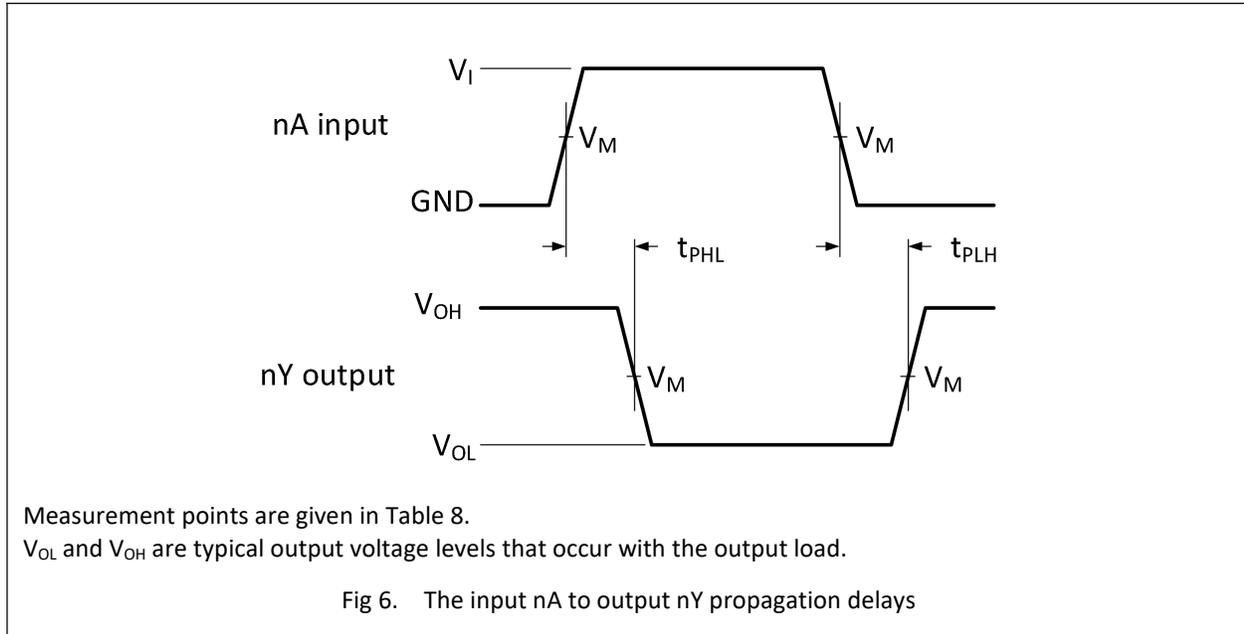
$C_L$  = output load capacitance in pF;

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

$N$  = number of inputs switching;

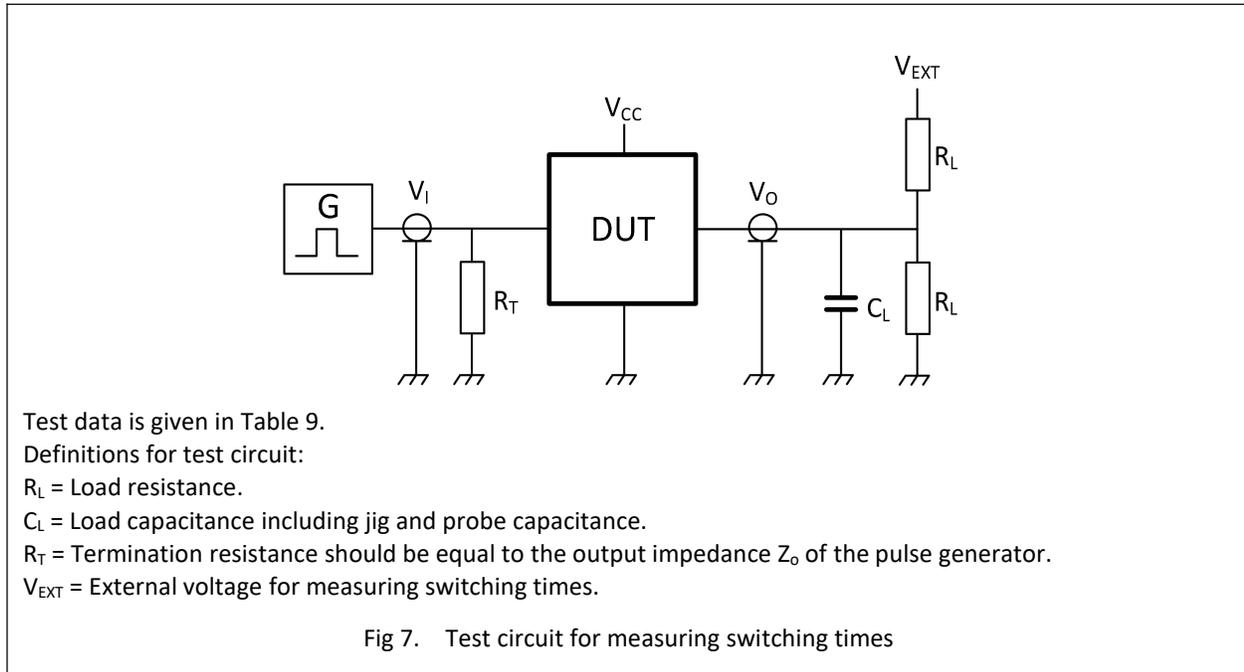
$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

### 10.1. Waveforms and test circuit



**Table 8. Measurement points**

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


**Table 9. Test data**

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

# 11. Transfer Characteristics

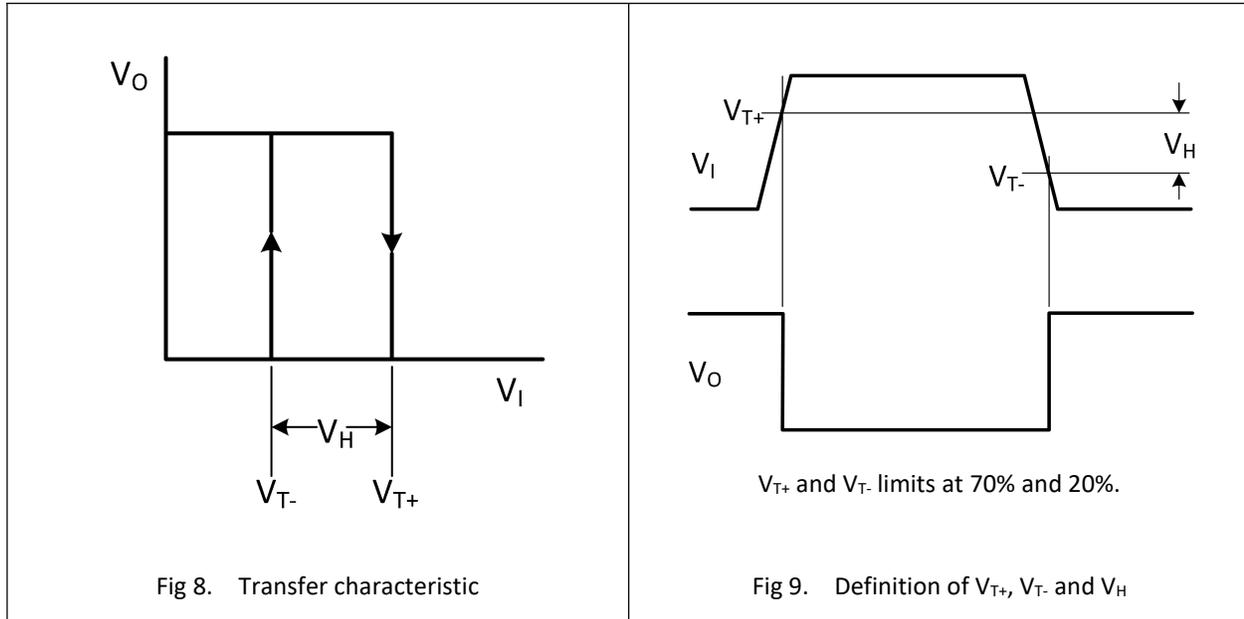
**Table 10. Transfer characteristics**

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>T+</sub>	positive-going threshold voltage	see Fig. 8 and Fig. 9						
		V <sub>CC</sub> = 1.8 V	0.82	1.0	1.14	0.79	1.14	V
		V <sub>CC</sub> = 2.3 V	1.03	1.2	1.40	1.00	1.40	V
		V <sub>CC</sub> = 3.0 V	1.29	1.5	1.71	1.26	1.71	V
		V <sub>CC</sub> = 4.5 V	1.84	2.2	2.36	1.81	2.36	V
		V <sub>CC</sub> = 5.5 V	2.19	2.6	2.79	2.16	2.79	V
V <sub>T-</sub>	negative-going threshold voltage	see Fig. 8 and Fig. 9						
		V <sub>CC</sub> = 1.8 V	0.46	0.6	0.75	0.46	0.78	V
		V <sub>CC</sub> = 2.3 V	0.65	0.7	0.96	0.65	0.99	V
		V <sub>CC</sub> = 3.0 V	0.88	1.0	1.24	0.88	1.27	V
		V <sub>CC</sub> = 4.5 V	1.32	1.6	1.84	1.32	1.87	V
		V <sub>CC</sub> = 5.5 V	1.58	1.9	2.24	1.58	2.27	V
V <sub>H</sub>	hysteresis voltage	see Fig. 8 and Fig. 9						
		V <sub>CC</sub> = 1.8 V	0.26	0.5	0.62	0.19	0.62	V
		V <sub>CC</sub> = 2.3 V	0.28	0.5	0.65	0.22	0.65	V
		V <sub>CC</sub> = 3.0 V	0.31	0.6	0.7	0.25	0.7	V
		V <sub>CC</sub> = 4.5 V	0.40	0.6	0.77	0.34	0.77	V
		V <sub>CC</sub> = 5.5 V	0.47	0.6	0.88	0.41	0.88	V

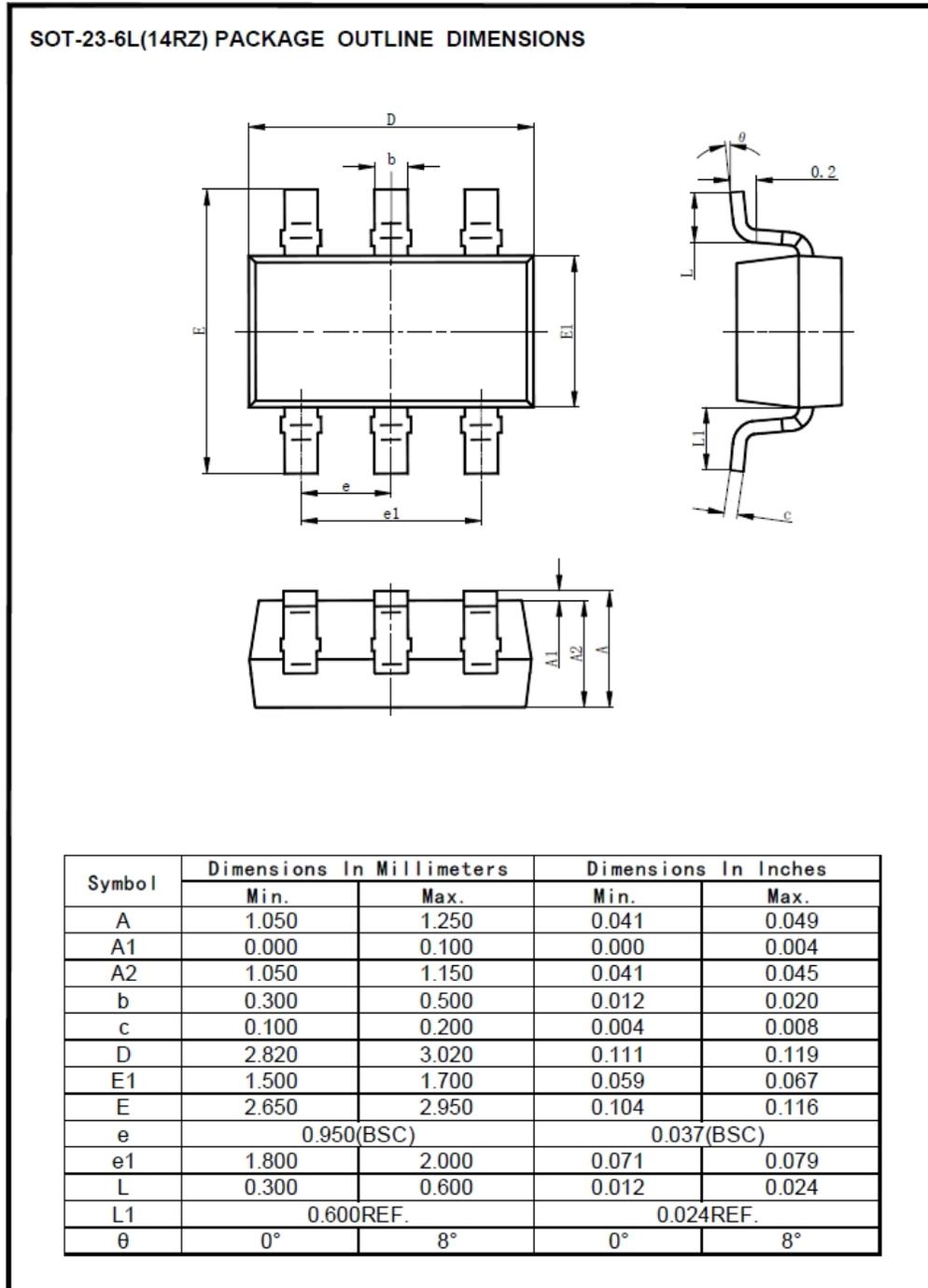
 [1] Typical values are measured at T<sub>amb</sub> = 25 °C.

### 11.1. Waveforms transfer characteristics



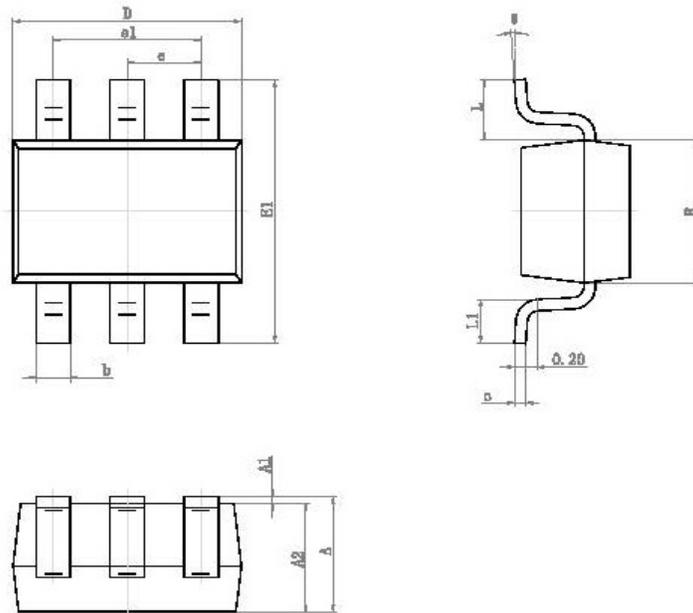
## 12. Package Outline

SOT23-6L



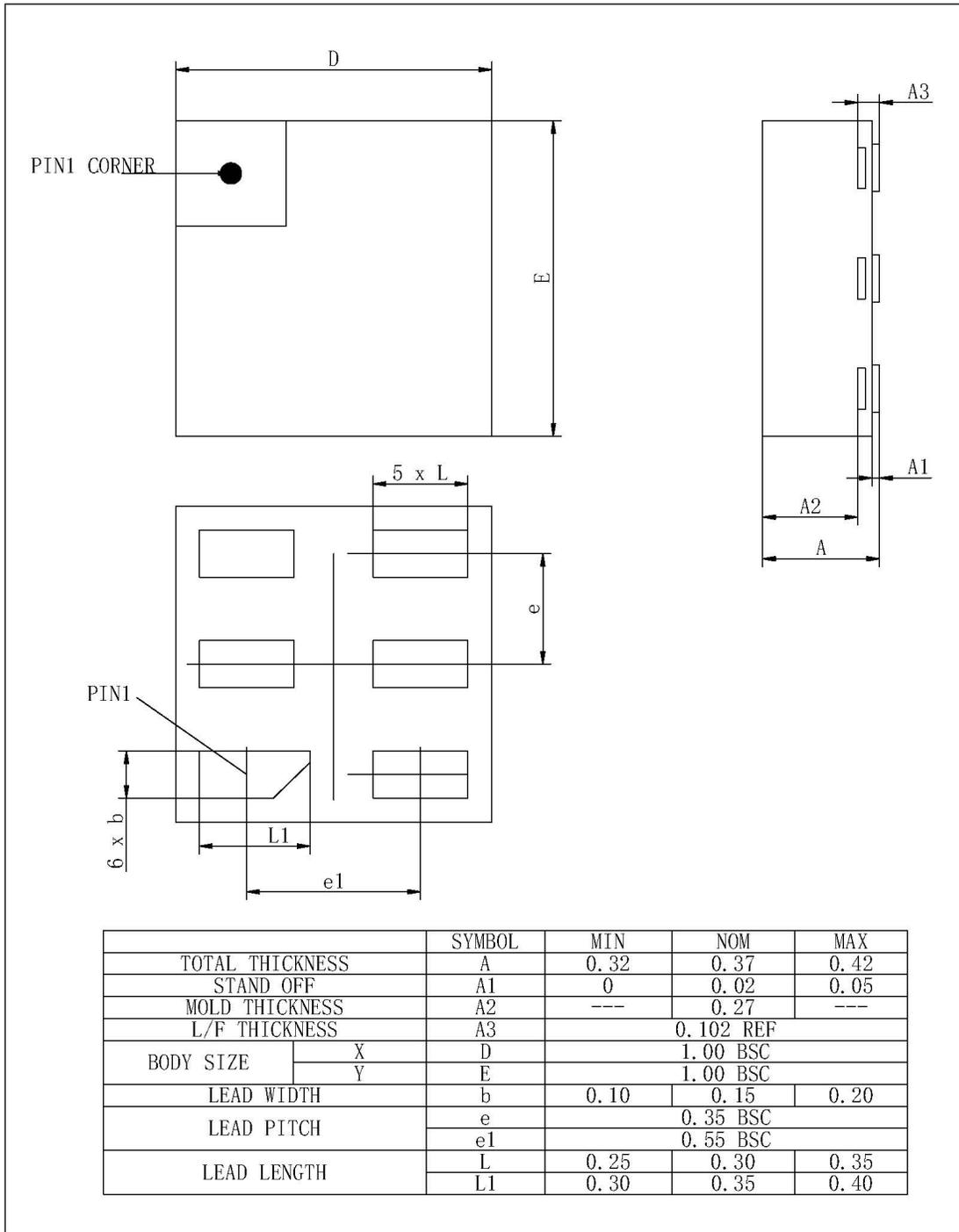
SOT363

**SOT-363 (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	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP.		0.026 TYP.	
e1	1.200	1.400	0.047	0.055
L	0.525 REF.		0.021 REF.	
L1	0.260	0.460	0.010	0.018
$\theta$	0°	8°	0°	8°

DFN1x1-6L





## 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
74LVC2G14 Rev. 1.0	Aug 08, 2024	Product datasheet		