Single Inverter with Schmitt Trigger

General Description

The ETQ74LVC1G14 is an inverter in three tiny footprint packages. The device performs much as LCX multi-gate products in speed and drive.

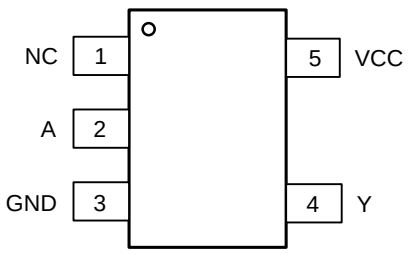
Features

- 24mA Sink and Source Output Capability
- Over−Voltage Tolerant Inputs and Outputs
- Chip Complexity: FETs = 20
- Designed for 1.65V to 5.5V VCC Operation
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant.
- Multiple Package Options Automotive AEC-Q100 Grade 1 Qualified
  - -- Ambient temperature range of -40°C to +125°C
  - -- ESD HBM 4KV PASS
  - -- ESD CDM 1KV PASS
  - -- Latch Up Current to 100mA PASS

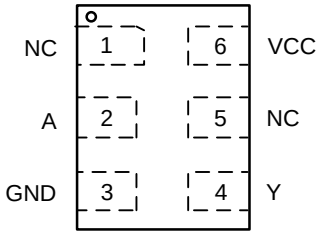
Device Information

Part No.	Package	MSL
ETQ74LVC1G14	SC70-5 (1.3mm×2.1mm)	3
ETQ74LVC1G14T	SOT23-5 (1.6mm×2.9mm)	3
ETQ74LVC1G14Y	DFN6 (1.0mm×1.5mm)	1

Pin Configuration



SC70-5/SOT23-5



DFN6(1×1.5)

Figure1. Top View

Pin Function

(SC70-5/ SOT23-5)

Pin No.	Pin Name	Function
1	NC	No connect
2	A	Input
3	GND	Ground
4	Y	Output
5	VCC	Supply Voltage

DFN6

Pin No.	Pin Name	Function
1	NC	No connect
2	A	Input
3	GND	Ground
4	Y	Output
5	NC	No connect
6	VCC	Supply Voltage

Block Diagram

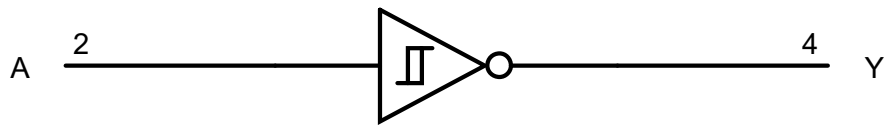


Figure2. Logic Symbol

Functional Description

Function Table

Input A	Output Y
L	H
H	L

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_I	DC Input Voltage (1)		−0.5 ≤ V_I ≤ +7.0	V
V_O	DC Output Voltage Output in Higher or Low State		−0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current V_I < GND		−50	mA
I_{OK}	DC Output Diode Current V_O < GND, V_O > V_{CC}		±50	mA
I_O	DC Output Sink Current		±50	mA
I_{CC}	DC Supply Current per Supply Pin		±100	mA
I_{GND}	DC Ground Current per Supply Pin		±100	mA
T_{STG}	Storage Temperature Range		−65 to 150	°C
T_L	Lead Temperature, Soldering 10 Seconds		260	°C
T_J	Max Junction Temperature		150	°C
V_{ESD}	ESD Classification	Human Body Model (2)	±4000	V
		Charged Device Model (3)	±1000	
I_{LU}	Max Latchup Current Above V_{CC} and GND at 125°C (4)		±100	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Note1： IO absolute maximum rating must be observed.

Note2： HBM tested per AEC-Q100-002(EIA/JESD22-A114).

Note3： CDM tested per AEC-Q100-011(EIA/JESD22-C101).

Note4： Latch up Current Maximum Rating tested per AEC-Q100-004(EIA/JESD78E).

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	300	°C/W
	SOT23-5		250	
	DFN6(1×1.5)		440	

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage Operating		1.65	5.5	V
	Date Retention		1.5	5.5	
V_{IN}	DC Input Voltage		0	5.5	V
V_{OUT}	DC Output Voltage (High or Low State)		0	5.5	V
T_A	Operating Temperature Range		-40	125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2.5 V ± 0.2 V	0	20	ns/V
		V_{CC} = 3.0 V ± 0.3 V	0	10	
		V_{CC} = 5.0 V ± 0.5 V	0	5	

Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Condition	V_{CC}(V)	T_A = 25 °C			−40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	High−Level Input Voltage		1.65to1.95 2.3 to 5.5	0.75Vcc 0.7Vcc			0.75Vcc 0.7Vcc		V
V_{IL}	Low−Level Input Voltage		1.65to1.95 2.3 to 5.5			0.25Vcc 0.3Vcc		0.25Vcc 0.3Vcc	V
V_{OH}	High−Level Output Voltage V_{IN} = V_{IL}	I_{OH}=−100μA	1.65 to 5.5	Vcc−0.1	Vcc		Vcc−0.1		V
		I_{OH}=−3mA	1.65	1.29	1.52		1.29		
		I_{OH}=−8mA	2.3	1.9	2.1		1.9		
		I_{OH}=−12mA	2.7	2.2	2.4		2.2		
		I_{OH}=−16mA	3.0	2.4	2.7		2.4		
		I_{OH}=−24mA	3.0	2.3	2..5		2.3		
		I_{OH}=-32mA	4.5	3.8	4.0		3.8		
V_{OL}	Low−Level Output Voltage V_{IN} = V_{IH}	I_{OL}=100μA	1.65 to 5.5		0.0	0.1		0.1	V
		I_{OL}=3mA	1.65		0.08	0.24		0.24	
		I_{OL}=8mA	2.3		0.20	0.3		0.3	
		I_{OL}=12mA	2.7		0.22	0.4		0.4	
		I_{OL}=16mA	3.0		0.28	0.4		0.4	
		I_{OL}=24mA	3.0		0.38	0.55		0.55	
		I_{OL}=32mA	4.5		0.42	0.55		0.55	
I_{IN}	Input Leakage Current	V_{IN} = 5.5 V or GND	0 to 5.5		±0.1			±1.0	μA
I_{OFF}	Power Off Leakage Current	V_{IN} = 5.5 V or V_{OUT} = 5.5 V	0			1		10	μA
I_{CC}	Quiescent Supply Current	V_{IN} = 5.5 V or GND	5.5					10	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

AC Electrical Characteristics

$t_r = t_f = 2.5ns$; $C_L = 50pF$; $R_L = 500\ \Omega$.

Symbol	Parameter	Condition	V_{CC}(V)	T_A = 25 °C			−40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay (Figure3 and 4)	R_L= 1MΩ C_L= 15pF	1.65	2.0	5.3	11.4	2.0	12.0	ns
			1.8	2.0	4.4	9.5	2.0	10.0	
		R_L= 1MΩ C_L= 15pF	2.5±0.2	0.2	3.5	6.5	0.8	7.0	
		R_L= 1MΩ C_L= 15pF	3.3±0.3	0.8	2.1	4.5	0.5	4.7	
		R_L= 500Ω C_L= 50pF		1.2	2.9	5.5	1.5	5.2	
		R_L= 1MΩ C_L= 15pF	5.0±0.5	0.5	1.8	3.9	0.5	4.1	
		R_L= 500Ω C_L= 50pF		0.8	2.4	4.3	0.8	4.5	

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C_{IN}	Input Capacitance	V_{CC}= 5.5 V, V_I = 0 V or V_{CC}	>2.5	pF
C_{PD}	Power Dissipation Capacitance [(5)]	10 MHz,V_{CC}= 3.3 V, V_I = 0 V or V_{CC}	9	pF
		10 MHz,V_{CC}= 5.5 V, V_I = 0 V or V_{CC}	11	

Note5: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)}=C_{PD}\times V_{CC}\times fin+I_{CC}\times C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D=C_{PD}\times V_{CC}^2\times fin+I_{CC}\times V_{CC}\times Fig$.

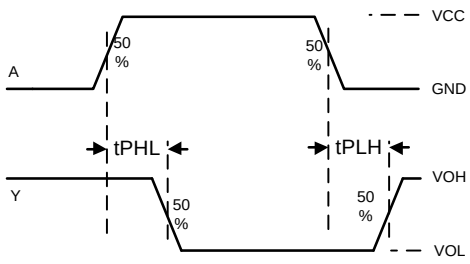


Figure3. Switching Waveform

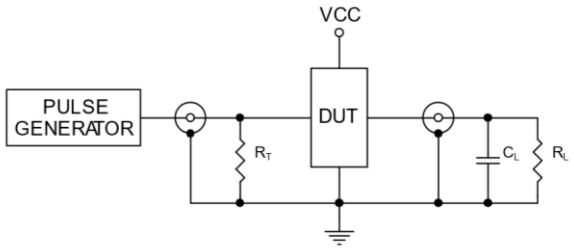
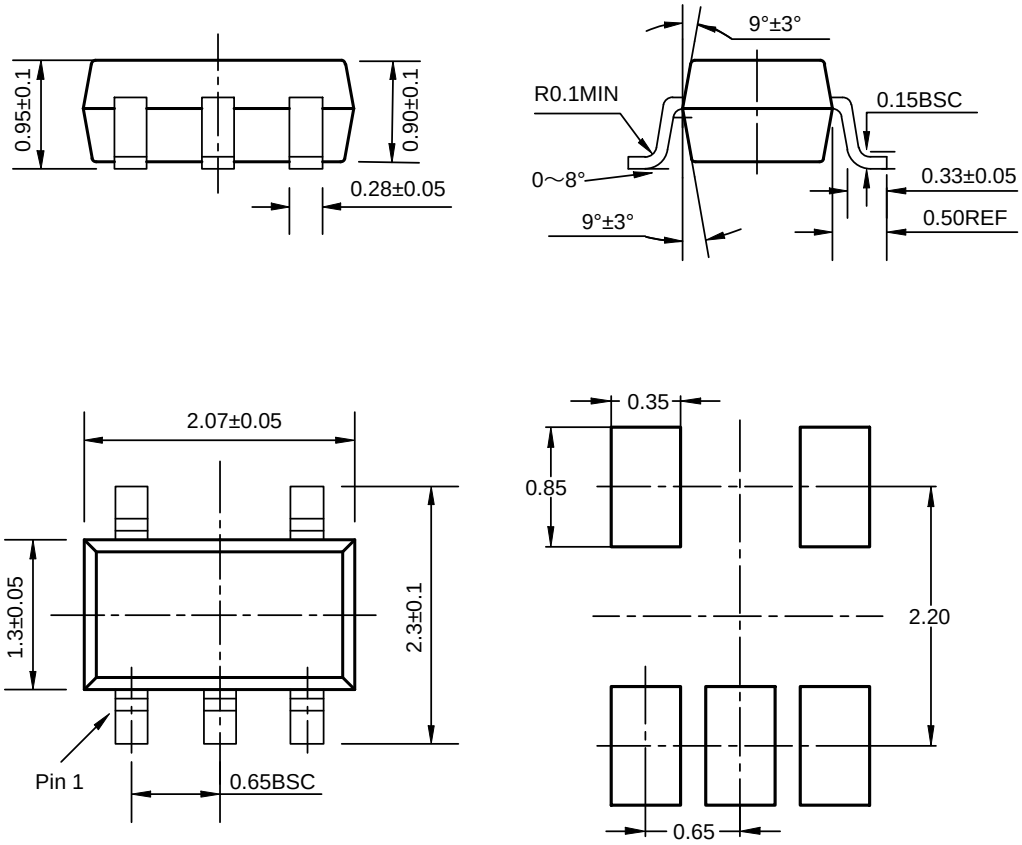


Figure4. Test Circuit

Package Dimension

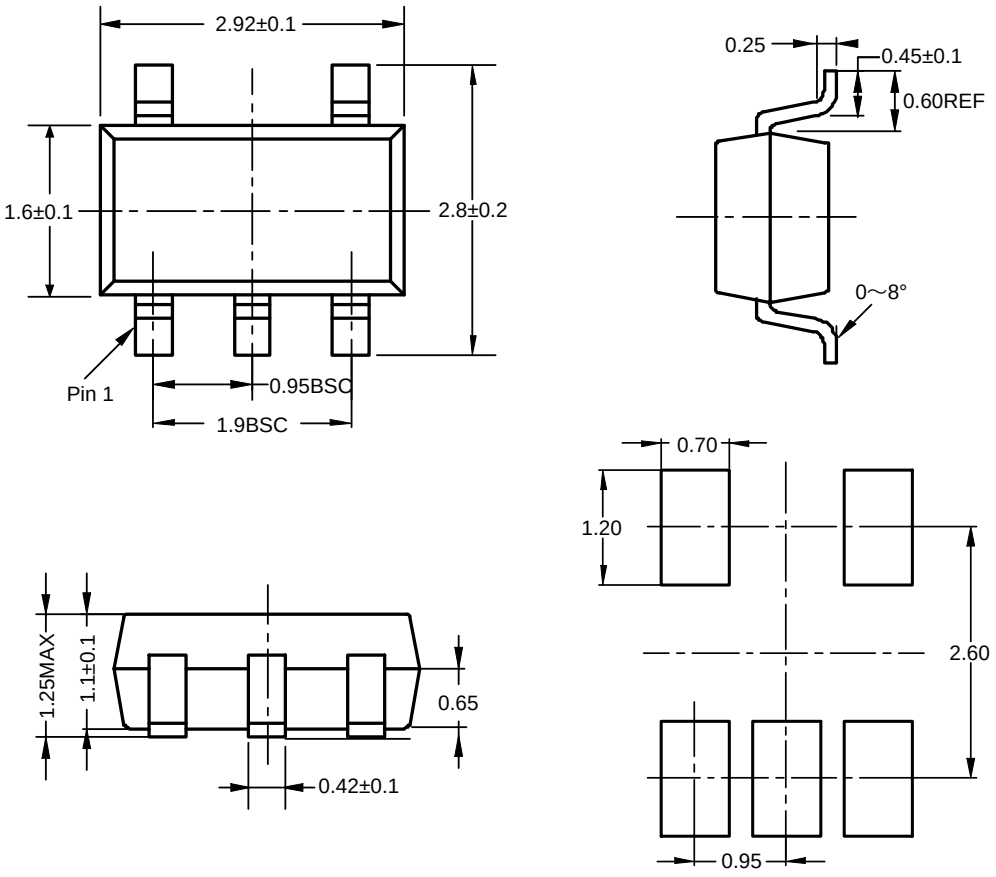
SC70-5



Recommended Land Pattern

Unit: mm

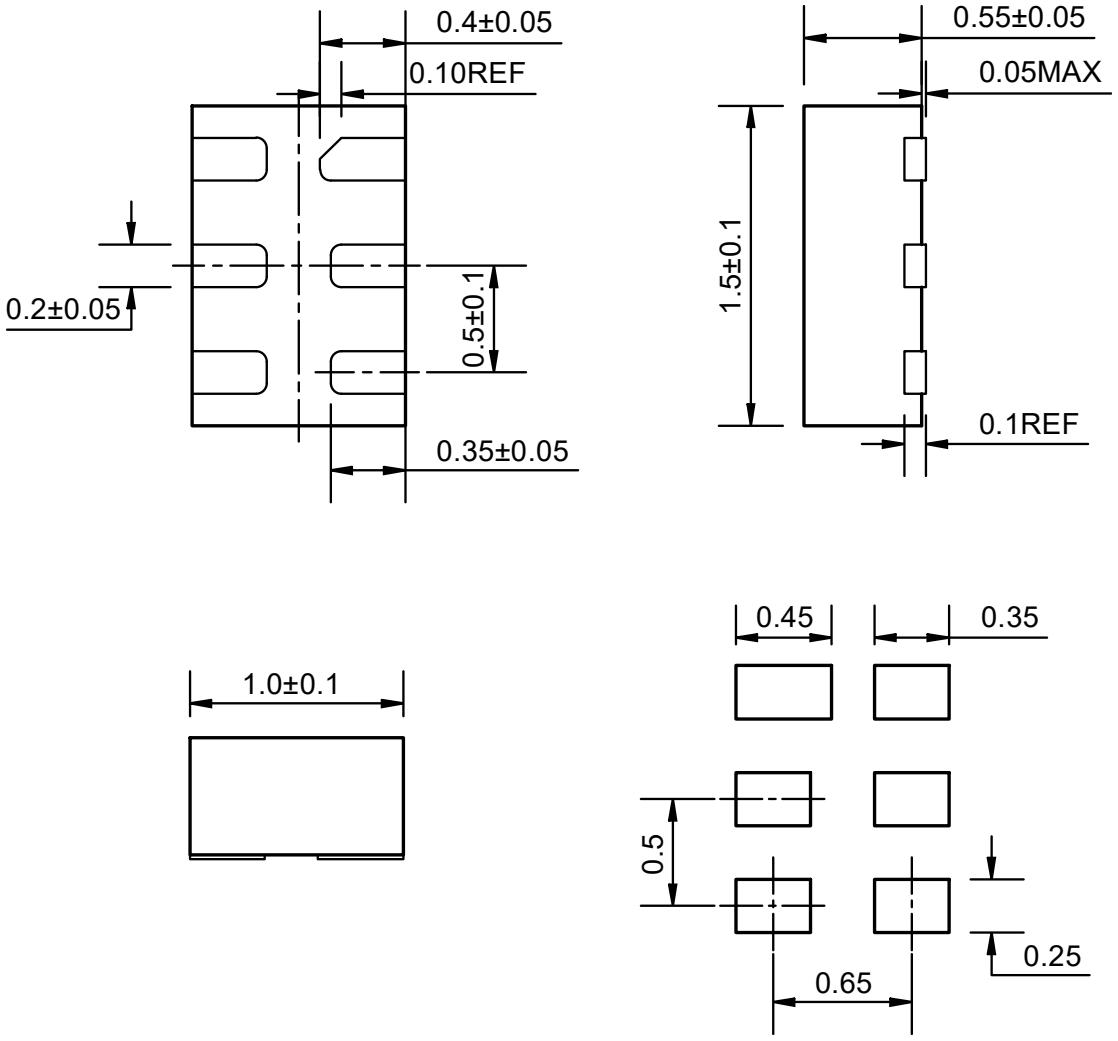
SOT23-5



Recommended Land Pattern

Unit: mm

DFN6 (1.0×1.5)



Recommended Land Pattern

Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-07-19	Original Version	Ma Yong jian	Ma Yong jian	Liu Jia Ying
1.1	2019-07-18	Update AC Table and Device Information	Ma Yong jian	Ma Yong jian	Liu Jia Ying
1.2	2021-06-25	Update Cpd in AC Table and Lin/Loff/Lcc in Dc Table	Ma Yong jian	Ma Yong jian	Liu Jia Ying
1.3	2022-01-18	Add SC70-5 Recommended Pad Layout	Shibo	Shibo	Zhujl
1.4	2022-06-10	ESD Update	Shibo	Shibo	Zhujl
1.5	2022-10-14	Update format and Thermal Characteristics	Wuhan	Shibo	Zhujl
1.6	2023-11-29	Update Typeset /ESD	Shibo	Shibo	Shibo