Single Inverter

General Description

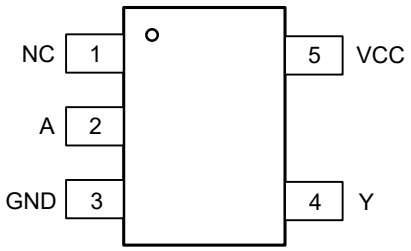
The ETQ74LVC1G04 is an inverter operating from a 1.65V to 5.5V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

Features

- Designed for 1.65V to 5.5V V_{CC} Operation
- ±32mA Balanced Sink and Source Output Capability
- Over-voltage Tolerant Inputs Accept Voltages to 5.5V
- These Devices are Pb-Free and 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
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ETQ74LVC1G04	SC70-5 (1.3mm × 2.1mm)	Tape and Reel, 3K/Reel	1

Pin Configuration



SC70-5

Figure1. Pin Configuration

Pin Function

SC70-5

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

Block Diagram

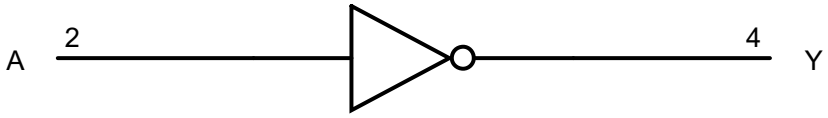


Figure2. Logic Symbol

Function Table

Input A	Output Y
L	H
H	L

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage (VCC Pin)		-0.5 to 6.5	V
V_I	DC Input Voltage (1)		$-0.5 \le V_I \le 6.5$	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 Latch Up Current Above V_{CC} and GND at 125°C (4)		±100	mA

Stresses exceeding those listed in this table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Note1: IO absolute maximum rating must be observed.

Note2: HBM tested per AEC-Q100-002(JEDEC JS-001);

Note3: CDM tested per AEC-Q100-011(JEDEC JS-002);

Note4: Latch Up Current Maximum Rating tested per AEC-Q100-004(JEDEC JESD78F).

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	300	°C/W

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		1.65	5.5	V
	Operating Date Retention		1.5	5.5	
V_I	DC Input Voltage		0	V_{CC}	V
V_O	DC Output Voltage (High or Low State)		0	V_{CC}	V
T_A	Operating Temperature Range		-40	125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2.5V ± 0.2V	0	20	ns/V
		V_{CC} = 3.0V ± 0.3V	0	10	
		V_{CC} = 5.0V ± 0.5V	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		1.65~1.95 2.3~5.5	0.75V_{CC} 0.7V_{CC}			0.75V_{CC} 0.7V_{CC}		V
V_{IL}	Low-Level Input Voltage		1.65~1.95 2.3~5.5			0.25V_{CC} 0.3V_{CC}		0.25V_{CC} 0.3V_{CC}	V
V_{OH}	High-Level Output Voltage	I_{OH} = -100μA	1.65~5.5	V_{CC} - 0.1	V_{CC}		V_{CC} - 0.1		V
		I_{OH} = -3mA	1.65	1.29	1.4		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	I_{OH} = 100μA	1.65~5.5		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_I = 5.5V or GND	0~5.5		±0.1			±1.0	μA
I_{OFF}	Power Off Leakage Current	V_I = 5.5V or V_O = 5.5V	0			1		10	μA
I_{CC}	Quiescent Supply Current	V_I = 5.5V or GND	5.5					10	μA

AC Electrical Characteristics

$t_r = t_f$ = 3ns; C_L = 50pF; R_L = 500Ω.

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	0.8	3.0	6.5	0.8	7.0	
		R_L = 1MΩ, C_L = 15pF	3.3 ± 0.3	0.5	2.4	4.5	0.5	4.7	
		R_L = 500Ω, C_L = 50pF		1.5	2.5	5.5	1.5	5.2	
		R_L = 1MΩ, C_L = 15pF	5.0 ± 0.5	0.5	2.0	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} = 5.5V, V_I = 0V or V_{CC}	2.5	pF
C_{PD}	Power Dissipation Capacitance (5)	10MHz, V_{CC} = 3.3V, V_I = 0V or V_{CC}	26	pF
		10MHz, V_{CC} = 5.5V, V_I = 0V or V_{CC}	30	

Note5: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

AC Test Circuit

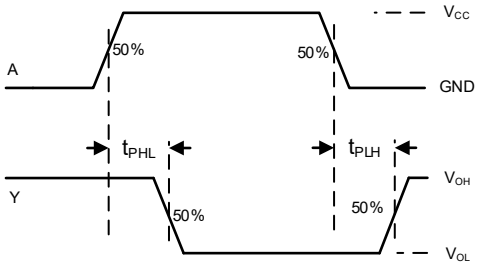


Figure 3. Switching Waveform

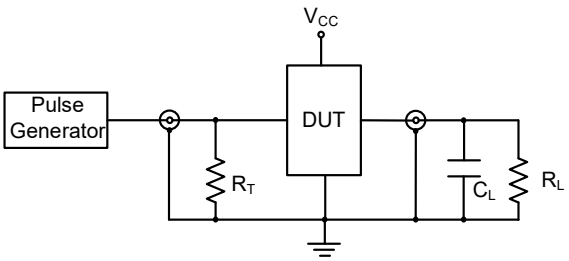
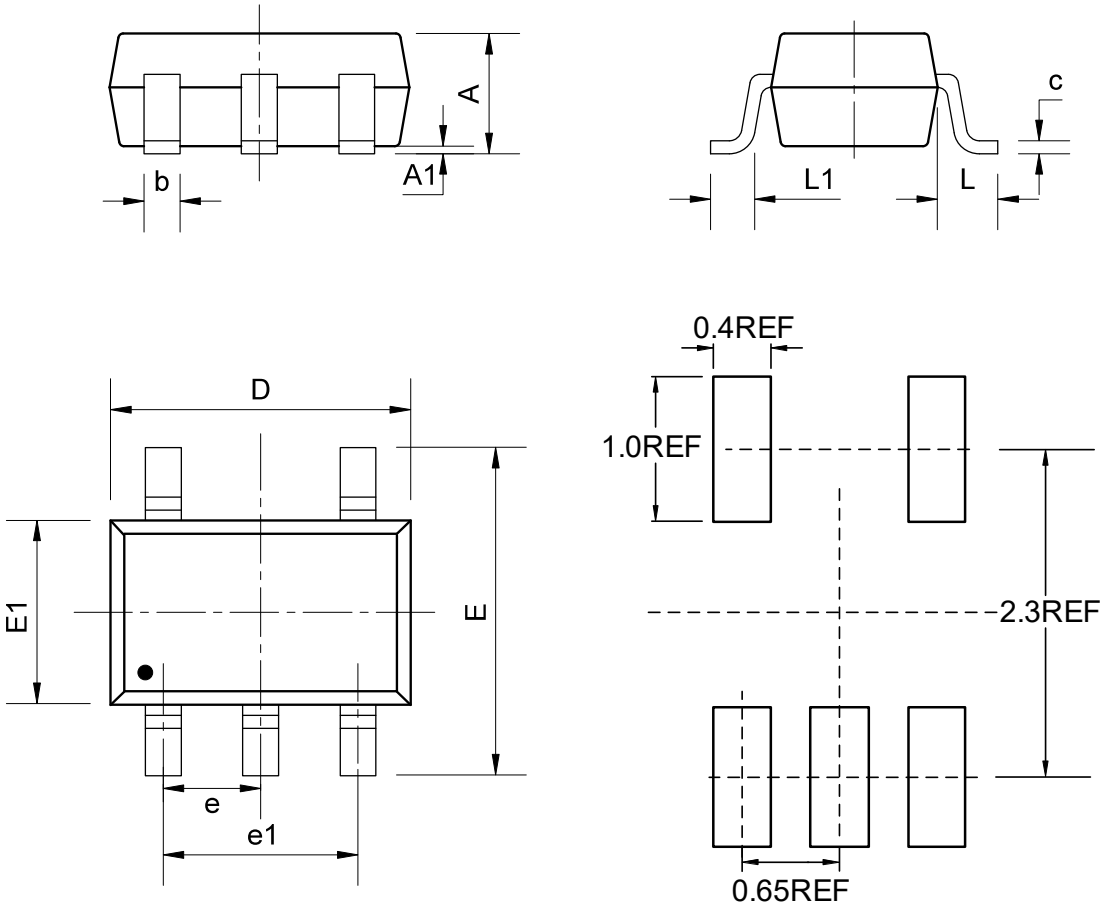


Figure4. Test Circuit

Package Dimension

SC70-5 (1.3mm × 2.1mm)



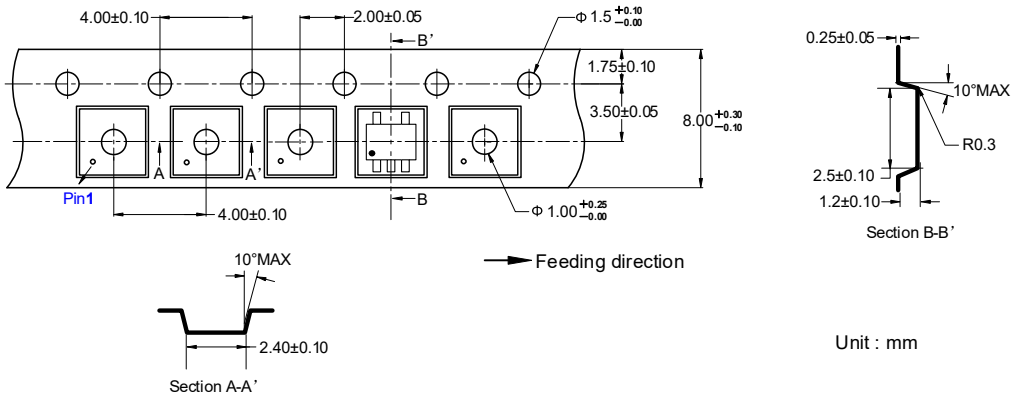
COMMON DIMENSIONS

(Unit: mm)

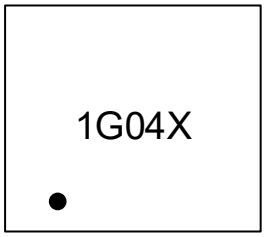
SYMBOL	MIN	NOM	MAX
A	-	-	1.10
A1	0.00	-	0.15
b	0.15	-	0.35
c	0.08	-	0.20
D	2.00	2.10	2.30
e	0.65BSC		
e1	1.30BSC		
E	2.15	2.30	2.50
E1	1.15	1.30	1.45
L	0.50REF		
L1	0.33REF		

Tape Information

SC70-5 (1.3mm × 2.1mm)



Marking Information



ETQ74LVC1G04
1G04 = Part Number
X = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-07-19	Original Version	Ma yongjian	Ma yongjian	Ma yongjian
1.1	2021-06-25	Update DC/AC Table	Ma yongjian	Ma yongjian	Ma yongjian
1.2	2022-05-18	Add DFN6(1X1)	Shi bo	Shi bo	Shi bo
1.3	2022-06-10	ESD Update	Shi bo	Shi bo	Shi bo
1.4	2022-08-03	Update DFN6(1X1)	Shi bo	Shi bo	Shi bo
1.5	2022-10-14	Update format and Thermal Characteristics	Wu han	Shi bo	Shi bo
1.6	2023-11-30	Update Pin table/ESD	Shi bo	Shi bo	Shi bo
1.7	2025-06-07	Add Packing Option	Yang xiaoxu	Yang xiaoxu	Liu jiaying
1.8	2025-10-15	Update Format	Wang anran	Yang xiaoxu	Liu jiaying
1.8.a	2026-04-22	Update Package	Xu tao	Yang xiaoxu	Liu jiaying