

Low-power Configurable Multiple Function Gate

General Description

The ET74LVC1G57 is a configurable multiple function gate with Schmitt-trigger inputs. The device can be configured as any of the following logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer; using the 3-bit input. All inputs can be connected directly to V_{CC} or GND. 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_{OFF} . The I_{OFF} circuitry disables the output, preventing the potentially damaging back-flow current through the device when it is powered down.

Features

- Wide Supply Voltage Range from 1.65 V to 5.5 V
- Over-voltage Tolerant Inputs to 5.5 V
- High Noise Immunity
- ± 24 mA Output Drive ($V_{CC} = 3.0$ V)
- CMOS Low Power Dissipation
- Direct Interface with TTL Levels
- I_{OFF} Circuitry Provides Partial Power-down Mode Operation
- ESD Protection:
 - HBM JESD22-A114 Exceeds 4000 V
 - CDM JESD22-C101 Exceeds 1500 V
- Latch-up Performance Exceeds 200 mA
- Multiple Package Options
- Part Number and Package

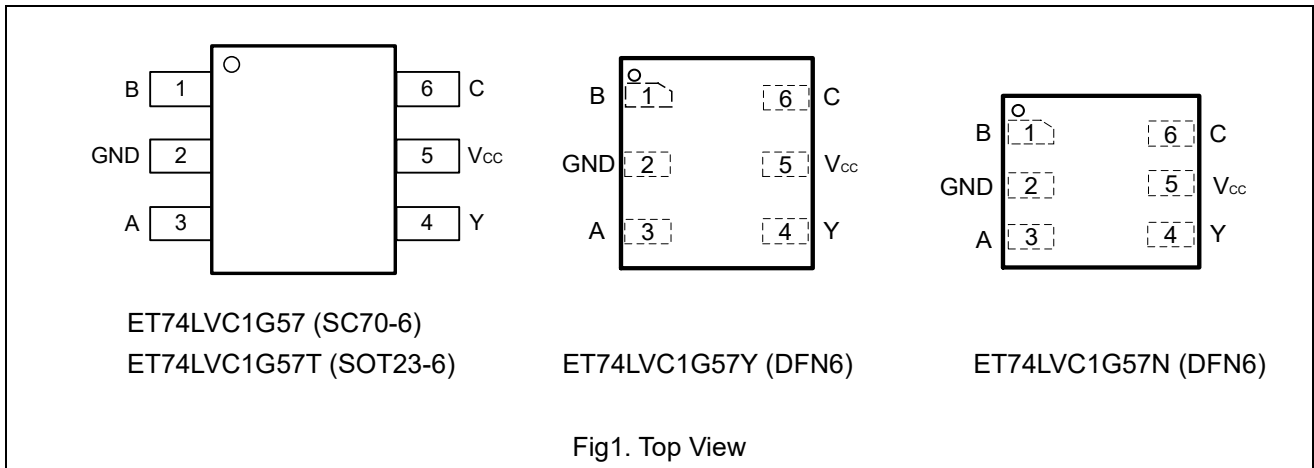
Part No.	Package	Size	MSL
ET74LVC1G57	SC70-6	2.00 mm × 1.25 mm	Level 3
ET74LVC1G57T	SOT23-6	2.90 mm × 2.75 mm	Level 3
ET74LVC1G57Y	DFN6	1.45mm × 1.00 mm	Level 1
ET74LVC1G57N	DFN6	1.00 mm × 1.00 mm	Level 1

ET74LVC1G57

Applications

- Active Noise Cancellation (ANC)
- Bar-code Scanners
- Blood Pressure Monitors
- CPAP Machines
- Cable Solutions
- Embedded PCs
- Field Transmitter: Temperature or Pressure Sensors
- HVAC: Heating, Ventilating and Air Conditioning
- TVs: High-Definition (HDTV), LCD and Digital
- Video Communications Systems

Pin Configuration



Pin Function

Pin No.	Pin Name	Pin Function
ET74LVC1G57/T/Y/N		
1	B	Data Input
2	GND	Ground (0 V)
3	A	Data Input
4	Y	Data Input
5	V _{CC}	Supply Voltage
6	C	Data Input

ET74LVC1G57

Block Diagram

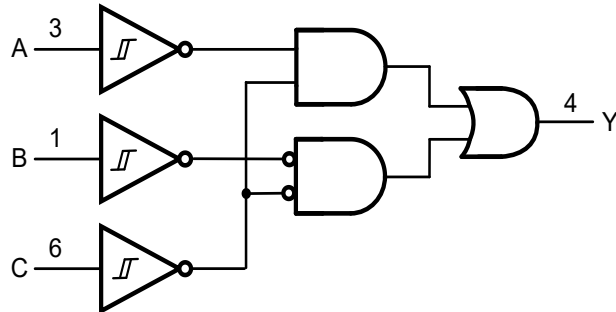


Fig 2. Logic Symbol

Functional Description

Function Table

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

Input			Output
C	B	A	Y
L	L	L	H
L	L	H	L
L	H	L	H
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	H
H	H	H	H

Function Selection Table

Logic function	Figure
2-input AND	See Fig 3.
2-input AND with both Inputs Inverted	See Fig 6.
2-input NAND with Inverted Input	See Fig 4. and Fig 5.
2-input OR with Inverted Input	See Fig 4. and Fig 5.
2-input NOR	See Fig 6.
2-input NOR with both Inputs Inverted	See Fig 3.
2-input XNOR	See Fig 7.
Inverter	See Fig 8.
Buffer	See Fig 9.

ET74LVC1G57

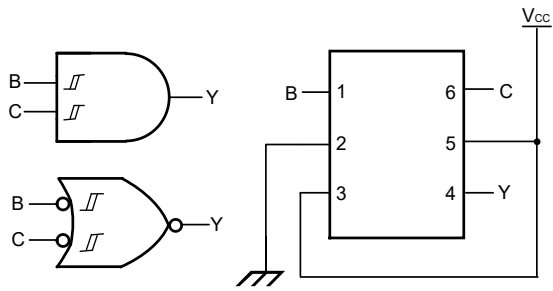


Fig3. 2-input AND gate or
2-input NOR gate with both inputs inverted

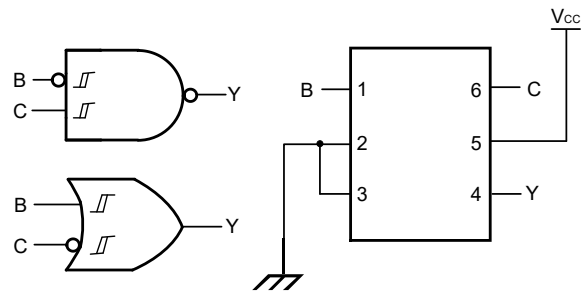


Fig4. 2-input NAND gate with input B inverted or
2-input OR gate with inverted C input

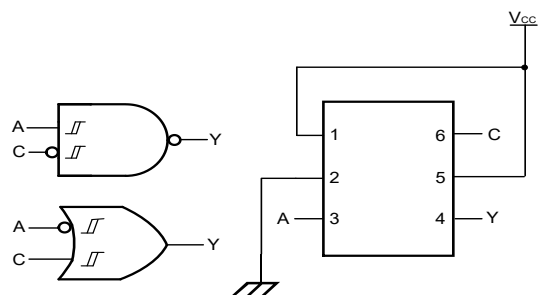


Fig5. 2-input NAND gate with input C inverted or
2-input OR gate with inverted A input

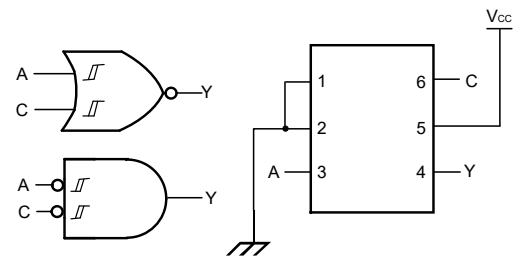


Fig6. 2-input NOR gate or
2-input AND gate with both inputs inverted

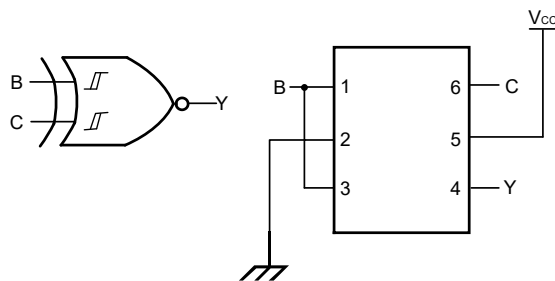


Fig7. 2-input XNOR gate

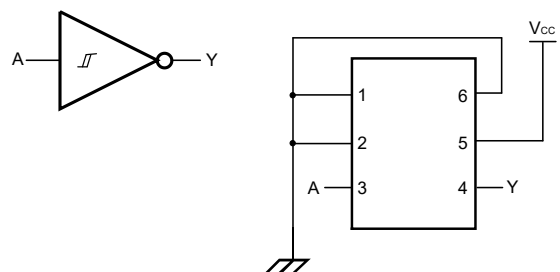


Fig8. Inverter

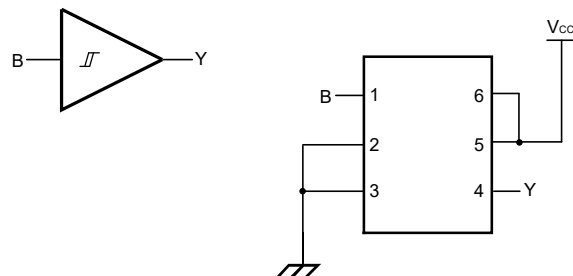


Fig 9. Buffer

ET74LVC1G57

Absolute Maximum Ratings

Symbol	Parameters	Conditions	Value	Unit
V _{CC}	DC Supply Voltage		-0.5 to 6.5	V
I _{IK}	Input Clamping Current		-50	mA
V _I	Input Voltage ⁽¹⁾	V _I < 0 V	-0.5 to 6.5	V
I _{OK}	Output Clamping Current	V _O > V _{CC} or V _O < 0 V	±50	mA
V _O	Output Voltage ⁽¹⁾	V _O > V _{CC} or V _O < 0 V	-0.5 to 6.5	V
		Power-down mode; V _{CC} = 0 V	-0.5 to 6.5	V
I _O	Output Current	V _O = 0 V to V _{CC}	±50	mA
I _{CC}	Supply Current		100	mA
I _{GND}	Ground Current		-100	mA
T _J	Max Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-65 to 150	°C
V _{ESD}	HBM	Per JESD22-A114	±4000	V
	CDM	Per JESD22-C101	±1500	V
I _{LU}	Max Latch up Current	Per EIA/JESD78E	±200	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: The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
R _{θJA}	SC70-6	Thermal Characteristics, Thermal Resistance, Junction-to-Air	270	°C/W
	SOT23-6		220	
	DFN6(1.45×1.00)		330	
	DFN6(1.00×1.00)		360	
P _D	SC70-6	Power Dissipation in Still Air at 25°C	460	mW
	SOT23-6		570	
	DFN6(1.45×1.00)		380	
	DFN6(1.00×1.00)		350	

Recommended Operating Conditions

Symbol	Parameters	Min	Max	Unit
V _{CC}	Supply Voltage Range	1.65	5.5	V
V _I	Input Voltage	0	5.5	V
V _O	Output Voltage	0	V _{CC}	V
T _A	Ambient Temperature	-40	125	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied.

ET74LVC1G57

Electrical Characteristics

Static Characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameters	Conditions	V _{CC} (V)	-40°C ≤ T _A ≤ 85°C			-40°C ≤ T _A ≤ 125°C		Unit
				Min	Typ ⁽²⁾	Max	Min	Max	
V _{OL}	LOW - Level Output Voltage	V _I = V _{T+} or V _{T-}							
		I _O = 100μA	1.65V to 5.5V			0.1		0.1	V
		I _O = 4mA	1.65V			0.45		0.7	V
		I _O = 8mA	2.3V			0.3		0.45	V
		I _O = 12mA	2.7V			0.4		0.6	V
		I _O = 24mA	3.0V			0.55		0.8	V
		I _O = 32mA	4.5V			0.55		0.8	V
V _{OH}	HIGH - Level Output Voltage	V _I = V _{T+} or V _{T-}							
		I _O = -100μA	1.65V to 5.5V	V _{CC} - 0.1			V _{CC} - 0.1		V
		I _O = -4mA	1.65V	1.2			0.95		V
		I _O = -8mA	2.3V	1.9			1.7		V
		I _O = -12mA	2.7V	2.2			1.9		V
		I _O = -24mA	3.0V	2.3			2.0		V
		I _O = -32mA	4.5V	3.8			3.4		V
I _I	Input Leakage Current	V _I = 5.5V or GND	0V to 5.5V		±0.1	±1		±1	μA
I _{OFF}	Power-Off Leakage Current	V _I or V _O = 5.5V	0V		±0.1	±2		±2	μA
I _{CC}	Supply Current	V _I = 5.5V or GND; I _O = 0A	1.65V to 5.5V		0.1	4		4	μA
ΔI _{CC}	Additional Supply Current	V _I = V _{CC} - 0.6V; I _O = 0A	2.3V to 5.5V		5	500		500	μA
C _I	Input Capacitance	Input Capacitance			2.5				pF

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.

Note2: Typical values are measured at maximum V_{CC} and T_A = 25 °C.

ET74LVC1G57

Electrical Characteristics(Continued)

Dynamic Characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Fig 10](#).

Symbol	Parameters	Conditions	V _{CC} (V)	-40°C≤T _A ≤85°C			-40°C≤T _A ≤125°C		Unit
				Min	Typ ⁽²⁾	Max	Min	Max	
T _{PD}	Propagation Delay	A, B, C to Y; See Fig.10 ⁽³⁾	t _{PHL}						
			1.65 V to 1.95V	2.0	10.0	15.0	2.0	18	ns
			2.3V to 2.7V	1.5	7.0	11.0	1.5	14.0	ns
			2.7V	1.5	6.7	10.5	1.5	13.0	ns
			3.0V to 3.6V	1.5	7.0	10.0	1.5	12.0	ns
			4.5V to 5.5V	1.5	5.5	9.5	1.5	11.0	ns
			t _{PLH}						
			1.65 V to 1.95V	4.0	20.0	29.0	4.0	32.0	ns
			2.3V to 2.7V	3.0	17.6	25.0	3.0	28.0	ns
			2.7V	3.0	19.2	24.0	3.0	27.0	ns
			3.0V to 3.6V	3.0	15.5	23.0	3.0	26.0	ns
			4.5V to 5.5V	3.0	13.5	21.0	3.0	24.0	ns
C _{PD}	Power Dissipation Capacitance	V _I =GND to V _{CC} ⁽⁴⁾	3.3V		22			pF	

Note3: T_{pd} is the same as T_{PLH} and T_{PHL}.

Note4: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

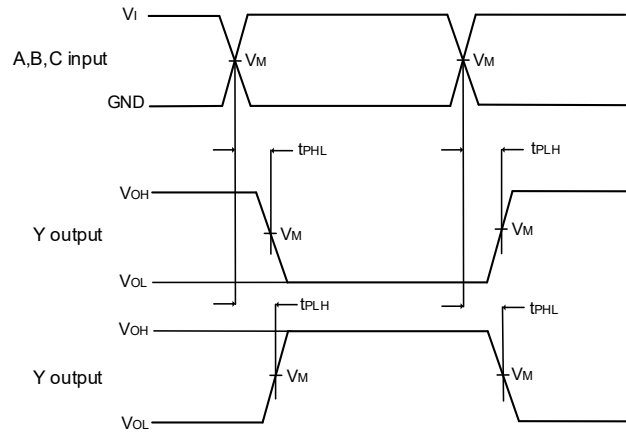
V_{CC} = supply voltage in V;

N = number of inputs switching;

Σ(C_L × V_{CC}² × f_o) = sum of outputs.

ET74LVC1G57

Test Circuit



Measurement points are given in [Table 1](#).

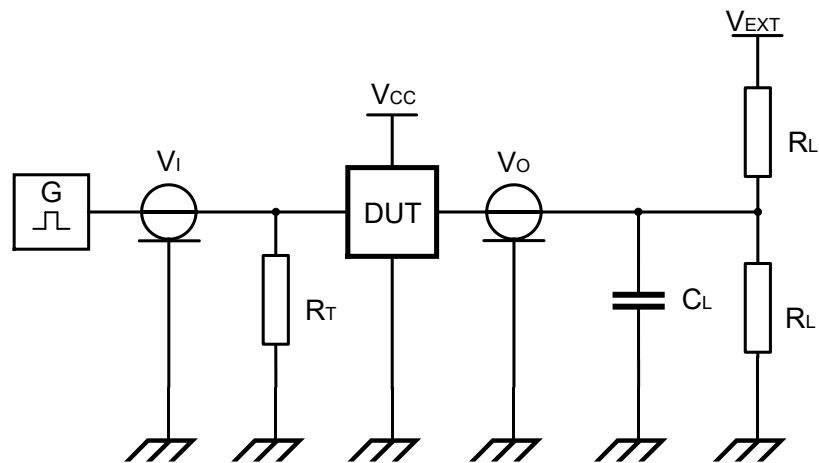
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig.10 Input A, B and C to output Y propagation delay times

Table 1. Measurement Points

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

ET74LVC1G57



Measurement points are given in [Table 2](#).

Definitions test circuit:

R_L = Load resistance;

C_L = Load capacitance including jig and probe capacitance;

R_T = Termination resistance should be equal to output impedance Z_O of the pulse generator;

V_{EXT} = External voltage for measuring switching times.

Fig.11 Test circuit for measuring switching times

Table 2. 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}	≤ 5.0 ns	30 pF	1 k Ω	open
2.3 V to 2.7 V	V_{CC}	≤ 5.0 ns	30 pF	500 Ω	open
2.7 V	2.7 V	≤ 5.0 ns	50 pF	500 Ω	open
3.0 V to 3.6 V	2.7 V	≤ 5.0 ns	50 pF	500 Ω	open
4.5 V to 5.5 V	V_{CC}	≤ 5.0 ns	50 pF	500 Ω	open

ET74LVC1G57

Electrical Characteristics

Transfer Characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameters	Conditions	-40°C ≤ T _A ≤ 85°C			-40°C ≤ T _A ≤ 125°C		Unit
			Min	Typ ⁽²⁾	Max	Min	Max	
V _{T+}	Positive-going Threshold Voltage	See Fig. 12, Fig. 13, Fig. 14 and Fig. 15						
		V _{CC} = 1.8V	0.90	1.15	1.35	0.90	1.35	V
		V _{CC} = 2.3V	1.20	1.45	1.70	1.20	1.70	V
		V _{CC} = 3.0V	1.55	1.85	2.05	1.55	2.05	V
		V _{CC} = 4.5V	2.25	2.55	2.95	2.25	2.95	V
		V _{CC} = 5.5V	2.65	2.95	3.25	2.65	3.25	V
V _{T-}	Negative-going Threshold Voltage	See Fig. 12, Fig. 13, Fig. 14 and Fig. 15						
		V _{CC} = 1.8V	0.40	0.60	0.80	0.40	0.80	V
		V _{CC} = 2.3V	0.55	0.77	1.00	0.55	1.00	V
		V _{CC} = 3.0V	0.80	1.03	1.30	0.80	1.30	V
		V _{CC} = 4.5V	1.25	1.55	1.75	1.25	1.75	V
		V _{CC} = 5.5V	1.60	1.90	2.20	1.60	2.20	V
V _H	Hysteresis Voltage	(V _{T+} - V _{T-}) See Fig. 12, Fig. 13, Fig. 14 and Fig. 15						
		V _{CC} = 1.8V	0.35	0.56	0.85	0.35	0.85	V
		V _{CC} = 2.3V	0.45	0.70	0.95	0.45	0.95	V
		V _{CC} = 3.0V	0.50	0.82	1.05	0.50	1.05	V
		V _{CC} = 4.5V	0.70	1.02	1.25	0.70	1.25	V
		V _{CC} = 5.5V	0.80	1.10	1.40	0.80	1.40	V

ET74LVC1G57

Wave-forms Transfer Characteristics

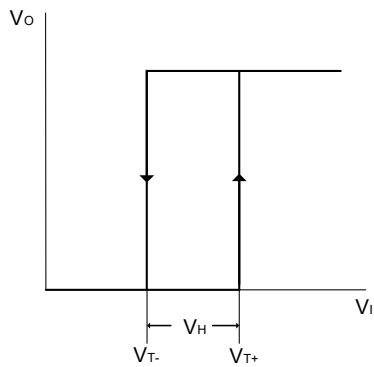
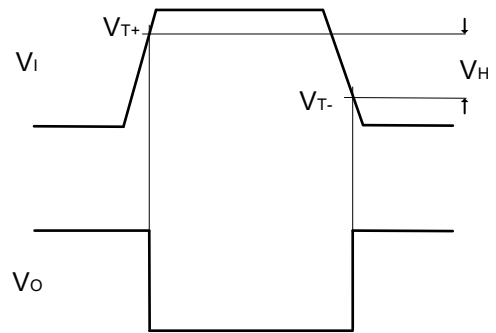


Fig. 12. Transfer characteristic



V_{T+} and V_{T-} limits are at 70 % and 20 %
Fig. 13. Definition of V_{T+} , V_{T-} and V_H

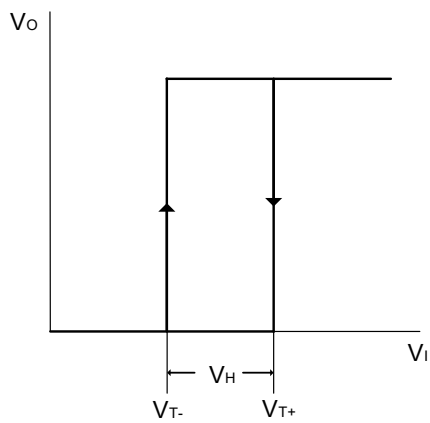
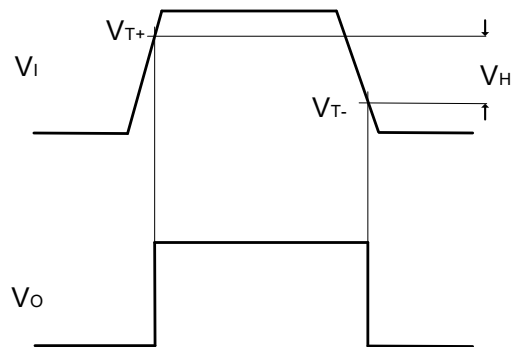


Fig. 14. Transfer characteristic



V_{T+} and V_{T-} limits are at 70 % and 20 %
Fig. 15. Definition of V_{T+} , V_{T-} and V_H

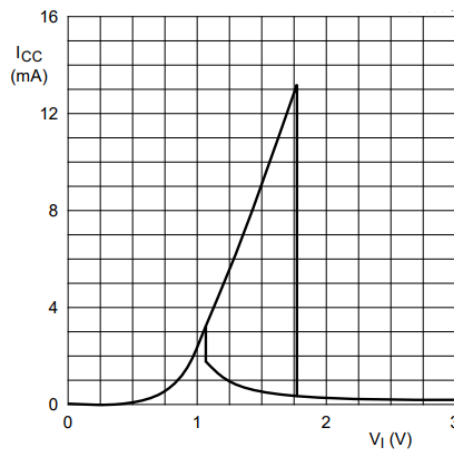


Fig 16. Typical ET74LVC1G57 transfer characteristic; $V_{CC} = 3.0$ V

ET74LVC1G57

Application Circuits

This application shows the ET74LVC1G57 configured as an OR gate with an inverted input. This particular configuration is helpful for dual sensor or switch applications where one of the inputs is normally closed or a logic high 1. Normally this application would require two external gates, but because the ET74LVC1G57 can be configured to meet this function the application can be implemented with a single chip solution.

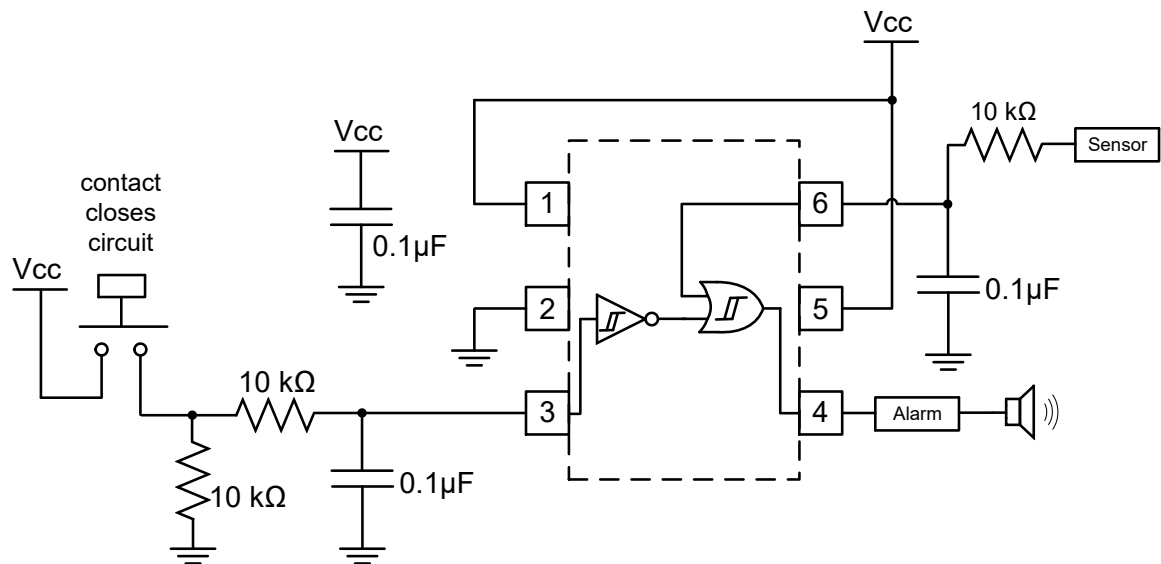


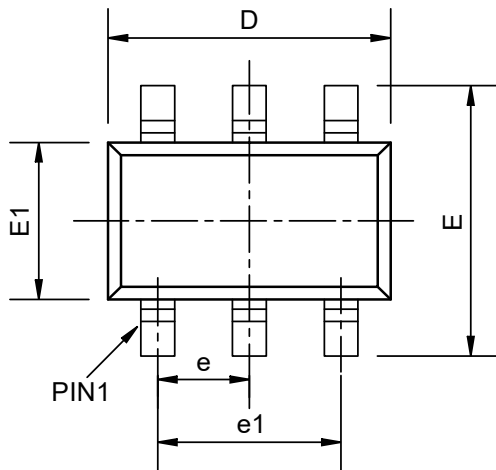
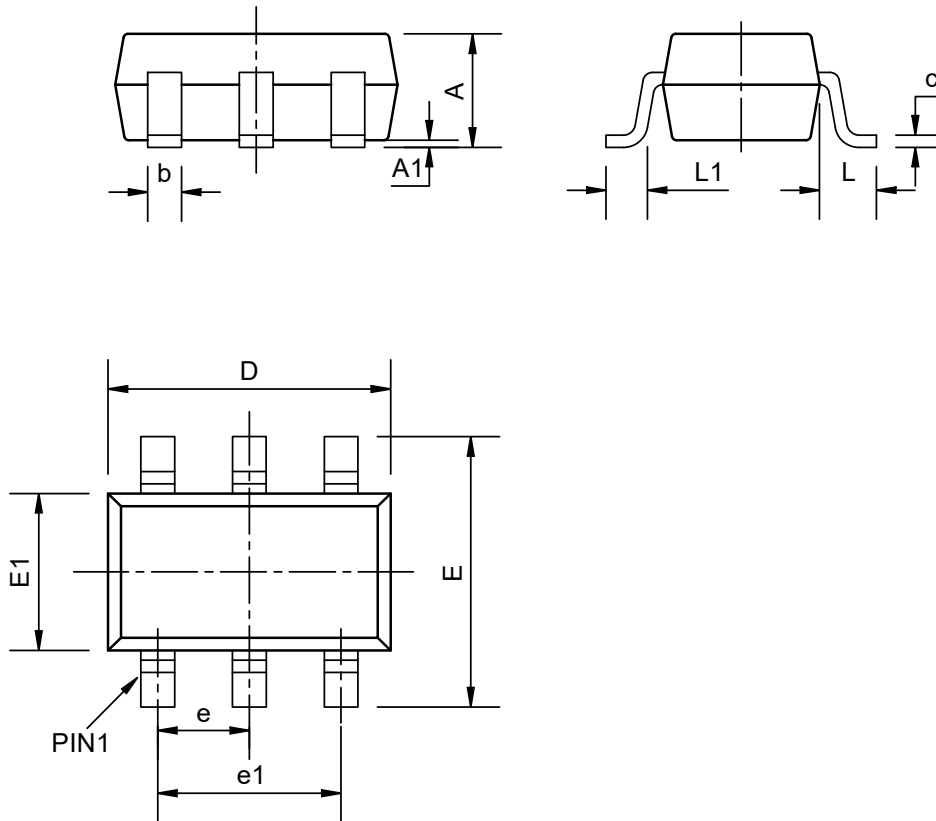
Fig 19. Dual-Sensor Alarm Trigger ⁽⁵⁾

Note5: This application circuit is for reference only.

ET74LVC1G57

Package Dimension

SC70-6 (2.00×1.25)



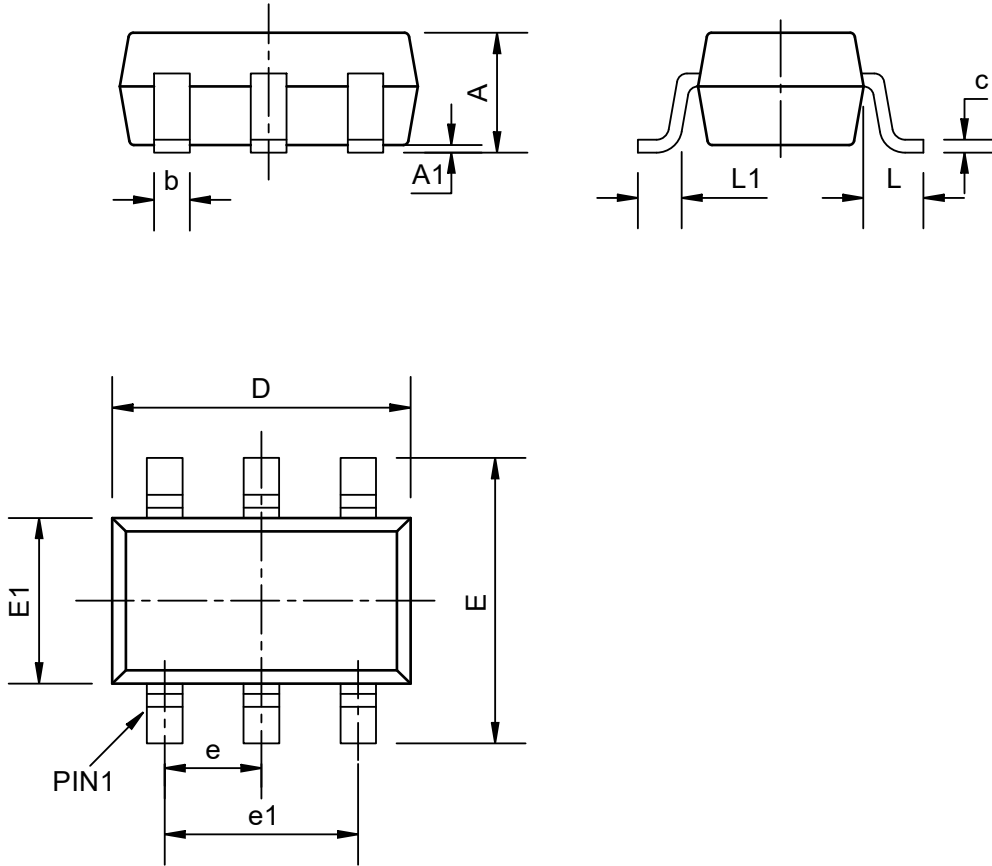
COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.80	--	1.10
A ₁	0.00	--	0.10
b	0.15	--	0.30
c	0.08	--	0.25
D ⁽⁶⁾	1.80	--	2.20
e	--	0.65	--
e ₁	--	1.30	--
E	1.80	--	2.40
E ₁ ⁽⁶⁾	1.15	--	1.35
L	0.325	--	0.525
L ₁	0.26	--	0.46

Note6: . Plastic or metal protrusions of 0.2 mm maximum per side are not included.

ET74LVC1G57

SOT23-6 (2.90×1.50)

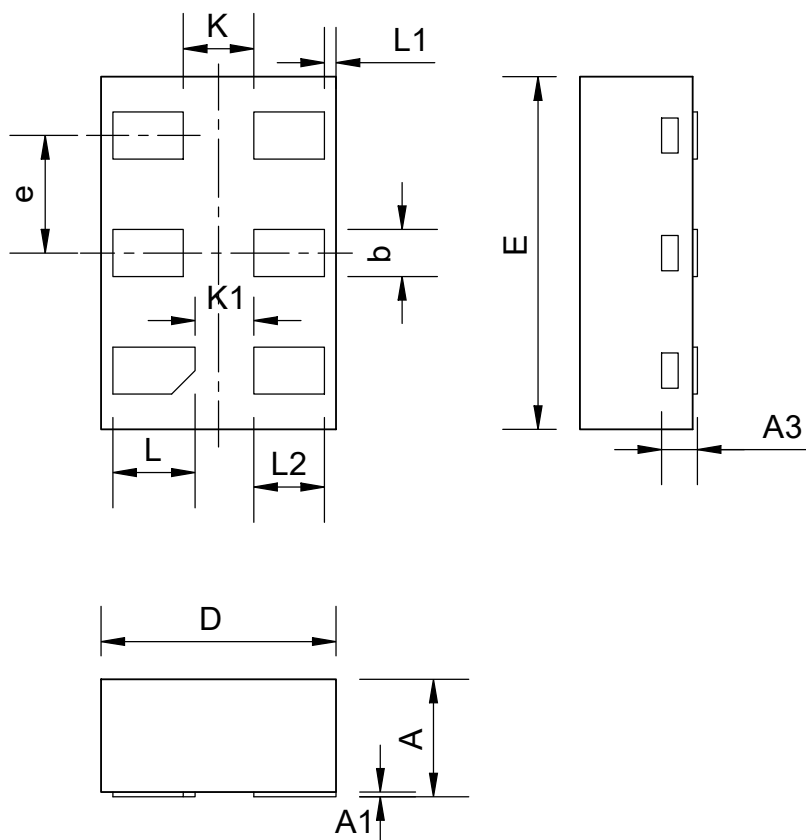


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.90	--	1.10
A ₁	0.013	--	0.10
b	0.25	--	0.40
c	0.10	--	0.26
D	2.70	--	3.10
e	--	0.95	--
e ₁	--	1.90	--
E	2.50	--	3.00
E ₁	1.30	--	1.70
L	0.60	--	0.65
L ₁	0.20	--	0.60
Q	0.23	--	0.33

ET74LVC1G57

DFN6(1.45×1.00)

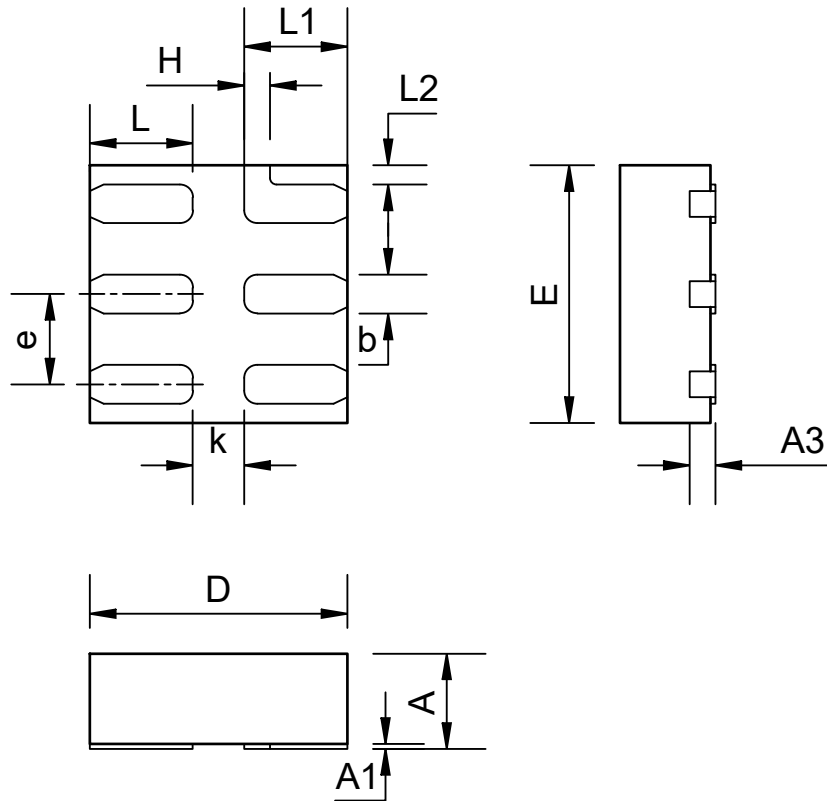


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.450	0.500	0.550
A1	0.000	0.035	0.050
A3	0.152REF		
b	0.150	0.20	0.250
D	0.900	1.000	1.100
E	1.350	1.450	1.550
e	0.500BSC		
K	0.300REF		
K1	0.250REF		
L	0.300	0.350	0.400
L1	0.050REF		
L2	0.250	0.300	0.350

ET74LVC1G57

DFN6(1.00×1.00)



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0	0.02	0.05
A3	0.10REF		
b	0.10	0.15	0.20
D	0.95	1.00	1.05
E	0.95	1.00	1.05
e	0.30	0.35	0.40
H	0.10REF		
K	0.15	--	--
L	0.35	0.40	0.45
L1	0.35	0.40	0.45
L2	0.075REF		

ET74LVC1G57

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2023-04-24	Preliminary Version	Wangar	Tugz	Liujiy
1.0	2023-10-27	Official Version	Wangar	Tugz	Liujiy
1.1	2023-12-28	Update SPEC	Tugz	Wangar	Liujiy
1.2	2024-01-02	Add Marking and Tape	Wangar	Tugz	Liujiy