

Single D-type Flip-Flop; Positive Edge Trigger

General Description

The ET74LVC1G79 is a single positive edge triggered D-type flip-flop, Data at the D-input that meets the set-up and hold time requirements on the LOW-to-HIGH clock transition will be stored in the flip-flop and appear at the Q output. Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in mixed 3.3V and 5V 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 back-flow current through the device when it is powered down.

Features

- Wide Supply Voltage Range from 1.65V to 5.5V
- Over Voltage Tolerant Inputs to 5.5V
- High Noise Immunity
- $\pm 24\text{mA}$ Output Drive ($V_{CC} = 3.0\text{V}$)
- CMOS Low Power Consumption
- Direct Interface with TTL Levels
- I_{OFF} Circuitry Provides Partial Power-down Mode Operation
- ESD Protection Exceeds JESD22
 - 4000V Human-Body Model (A114-A)
 - 1500V Charged-Device Model (C101)
- Latch-up Performance Exceeds 200mA per JESD78, Class II

Applications

- Server
- LED Display Screen
- Network Switches
- Telecommunications Infrastructure
- Motor Driver
- I/O Extender

Ordering Information

Part No.	Package	MSL
ET74LVC1G79	SC70-5	3
ET74LVC1G79T	SOT23-5	3

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Pin Configuration

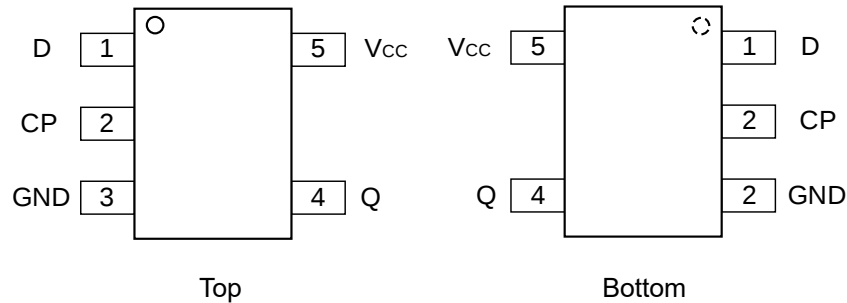


Fig 1. Top View & Bottom View

Pin Function

Pin No.	Pin Name	Pin Function
1	D	Data Input
2	CP	Clock Pulse Input
3	GND	Ground
4	Q	Data Output
5	V _{CC}	Supply Voltage

Functional Diagram

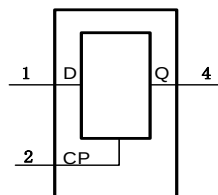


Fig 2. Logic Symbol

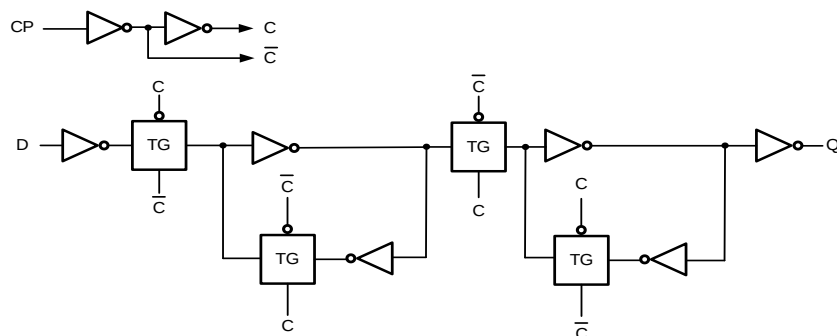


Fig 3. Logic Diagram

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Function Table

H = High voltage level; L = Low voltage level; ↑ = Low-to-High CP transition; X = don't care;
q = lower case letter indicates the state of referenced input, one set-up time prior to the LOW-to-HIGH CP transition.

Input		Output
CP	D	Q
↑	L	L
↑	H	H
L	X	q

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply Voltage		-0.5~+6.5	V
I _{IK}	Input Clamping Current	V _I < 0V	-50	mA
V _I	Input Voltage ⁽¹⁾		-0.5~+6.5	V
I _{OK}	Output Clamping Current	V _O > 0V or V _O < 0V	±50	mA
V _O	Output Voltage	Active Mode ⁽¹⁾	-0.5~V _{CC} +0.5	V
		Power-Down Mode V _{CC} =0V ⁽¹⁾	-0.5~+6.5	V
I _O	Output Current	V _O = 0V to V _{CC}	±50	mA
I _{CC}	Supply Current		+100	mA
I _{GND}	Ground Current		-100	mA
T _J	Operating Junction Range		-40 to +150	°C
T _{STG}	Storage Temperature		-65 to +150	°C
V _{ESD}	Human Body Mode ⁽²⁾		±4000	V
	Charged Device Mode ⁽³⁾		±1500	V
I _{LU}	Latch-up Current ⁽⁴⁾		±200	mA

Note1: I_O absolute maximum rating must be observed.

Note2: HBM tested per EIA/JESD22-A114-A;

Note3: CDM tested per EIA/JESD22-C101;

Note4: Latch-up Current Maximum Rating tested per EIA/JESD78E;

Recommended Operating Conditions

Symbol	Parameter	Conditions	Rating	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~V _{CC}	V
		Power-Down Mode V _{CC} = 0V	0~5.5	V
T _A	Ambient Temperature		-40 to +125	°C
Δt/ΔV	Input Transition Rise and Fall Rate	V _{CC} = 1.65V to 2.7V	<20	ns/V
		V _{CC} = 2.7V to 5.5V	<10	ns/V

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Electrical Characteristics

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

Sym bol	Parameter	Conditions	-40°C ≤ T _A ≤ +85°C			-40°C ≤ T _A ≤ +125°C		Unit
			Min	Typ ⁽⁵⁾	Max	Min	Max	
V _{IH}	High-Level Input Voltage	V _{CC} = 1.65V to 1.95V	0.65V _{CC}			0.65V _{CC}		V
		V _{CC} = 2.3V to 2.7V	1.7			1.7		
		V _{CC} = 2.7V to 3.6V	2.0			2.0		
		V _{CC} = 4.5V to 5.5V	0.7V _{CC}			0.7V _{CC}		
V _{IL}	Low-Level Input Voltage	V _{CC} = 1.65V to 1.95V			0.35V _{CC}		0.35V _{CC}	V
		V _{CC} = 2.3V to 2.7V			0.7		0.7	
		V _{CC} = 2.7V to 3.6V			0.8		0.8	
		V _{CC} = 4.5V to 5.5V			0.3V _{CC}		0.3V _{CC}	
V _{OH}	High-Level Output Voltage	V _I = V _{IH} or V _{IL}						V
		I _O = -100μA; V _{CC} = 1.65V to 5.5V	V _{CC} - 0.1			V _{CC} - 0.1		
		I _O = -4mA; V _{CC} = 1.65V	1.2	1.54		0.95		
		I _O = -8mA; V _{CC} = 2.3V	1.9	2.15		1.7		
		I _O = -12mA; V _{CC} = 2.7V	2.2	2.5		1.9		
		I _O = -24mA; V _{CC} = 3.0V	2.3	2.62		2.0		
		I _O = -32mA; V _{CC} = 4.5V	3.8	4.11		3.4		
V _{OL}	Low-Level Output Voltage	V _I = V _{IH} or V _{IL}						V
		I _O = -100μA; V _{CC} = 1.65V to 5.5V			0.10		0.10	
		I _O = 4mA; V _{CC} = 1.65V		0.07	0.45		0.70	
		I _O = 8mA; V _{CC} = 2.3V		0.09	0.30		0.45	
		I _O = 12mA; V _{CC} = 2.7V		0.16	0.40		0.60	
		I _O = 24mA; V _{CC} = 3.0V		0.17	0.55		0.80	
		I _O = 32mA; V _{CC} = 4.5V		0.18	0.55		0.80	
I _I	Input Leakage Current	V _I = 5.5V or GND; V _{CC} = 0V to 5.5V		±0.1	±5		±20	uA
I _{OFF}	Power-Off Leakage Current	V _I or V _O = 5.5V; V _{CC} = 0V		±0.1	±10		±20	uA
I _{CC}	Supply Current	V _I = 5.5V or GND; V _{CC} = 1.65V to 5.5V; I _O = 0A		0.1	10		40	uA
ΔI _{CC}	Additional Supply Current	V _I = V _{CC} - 0.6V; I _O = 0A; V _{CC} = 2.3V to 5.5V		5.0	500		500	uA
C _I	Input Capacitance			4.5				pF

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Dynamic Characteristics

Voltages are referenced to GND (ground = 0V); for test circuit see [Fig.6](#).

Sym bol	Parameter	Conditions	-40°C ≤ T _A ≤ +85°C			-40°C ≤ T _A ≤ +125°C		Unit
			Min	Typ ⁽⁵⁾	Max	Min	Max	
t _{pd}	Propagation Delay	CP to Q; See Fig.4						ns
		V _{CC} = 1.65V to 1.95V	1.5	8.2	13.4	1.5	17	
		V _{CC} = 2.3V to 2.7V	1.0	4.6	7.1	1.0	9.0	
		V _{CC} = 2.7V	1.0	4.5	7.1	1.0	9.0	
		V _{CC} = 3.0V to 3.6V	1.0	4.3	5.7	1.0	7.5	
		V _{CC} = 4.5V to 5.5V	1.0	3.0	4.0	1.0	5.5	
t _w	Pulse Width	CP High or Low; See Fig.4						ns
		V _{CC} = 1.65V to 1.95V	3			3.0		
		V _{CC} = 2.3V to 2.7V	2.5			2.5		
		V _{CC} = 2.7V	2.5			2.5		
		V _{CC} = 3.0V to 3.6V	2.5			2.5		
		V _{CC} = 4.5V to 5.5V	2.0			2.0		
t _{su}	Set-up Time	D to CP; See Fig.4						ns
		V _{CC} = 1.65V to 1.95V	2.5			2.5		
		V _{CC} = 2.3V to 2.7V	1.7			1.7		
		V _{CC} = 2.7V	1.7			1.7		
		V _{CC} = 3.0V to 3.6V	1.3			1.2		
		V _{CC} = 4.5V to 5.5V	1.2			1.2		
t _h	Hold time	D to CP; See Fig.4						ns
		V _{CC} = 1.65V to 1.95V	0			0		
		V _{CC} = 2.3V to 2.7V	0			0		
		V _{CC} = 2.7V	0.5			0.5		
		V _{CC} = 3.0V to 3.6V	0.5			0.5		
		V _{CC} = 4.5V to 5.5V	0.5			0.5		
f _{max}	Maximum Frequency	CP; See Fig.4						MHz
		V _{CC} = 1.65V to 1.95V	160			160		
		V _{CC} = 2.3V to 2.7V	160			160		
		V _{CC} = 2.7V	160			160		
		V _{CC} = 3.0V to 3.6V	160			160		
		V _{CC} = 4.5V to 5.5V	200			200		
C _{PD} ⁽⁵⁾	Power Dissipation Capacitance	V _I = GND to V _{CC} ; V _{CC} = 3.3V		27				pF

Note5: All typical values are measured at T_A = 25°C and V_{CC} = 3.3V.

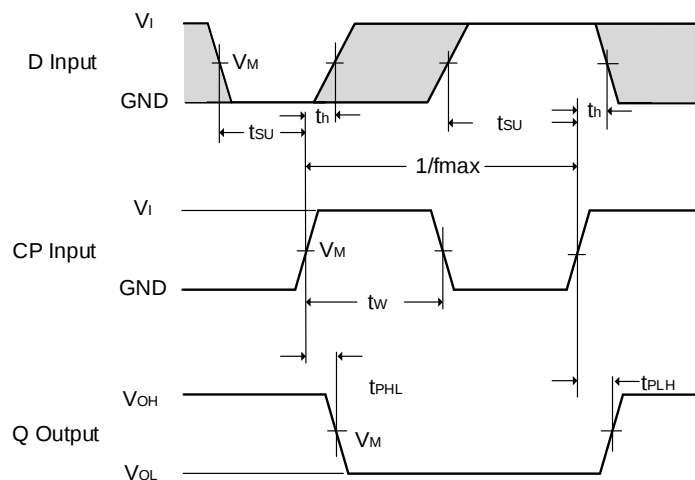
Note6: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

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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;
 $\Sigma(C_L \times V_{CC}^2 \times f_o) = \text{Sum of Outputs.}$

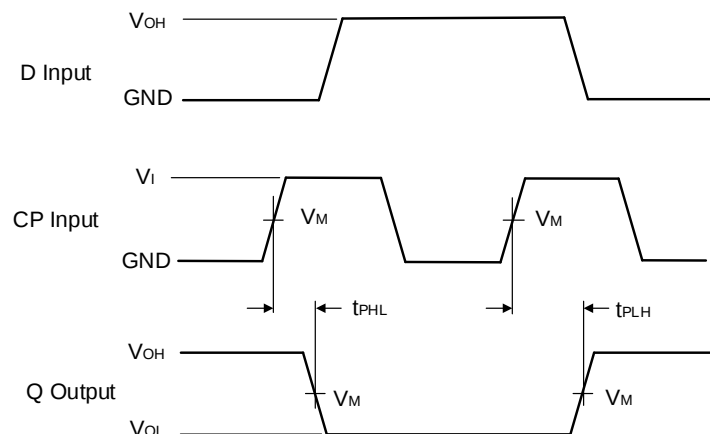
Test Circuit



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

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

Fig.4 Clock (CP) to output (Q) propagation delay times, clock pulse width, D to CP set-up times, CP to D hold times and maximum clock pulse frequency



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

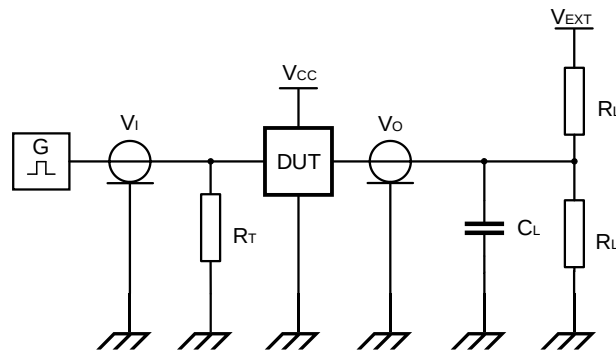
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig.5 Clock (CP) to output (Q) propagation delay times

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Table 1.Measurement Points

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



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.6 Test circuit for measuring switching times

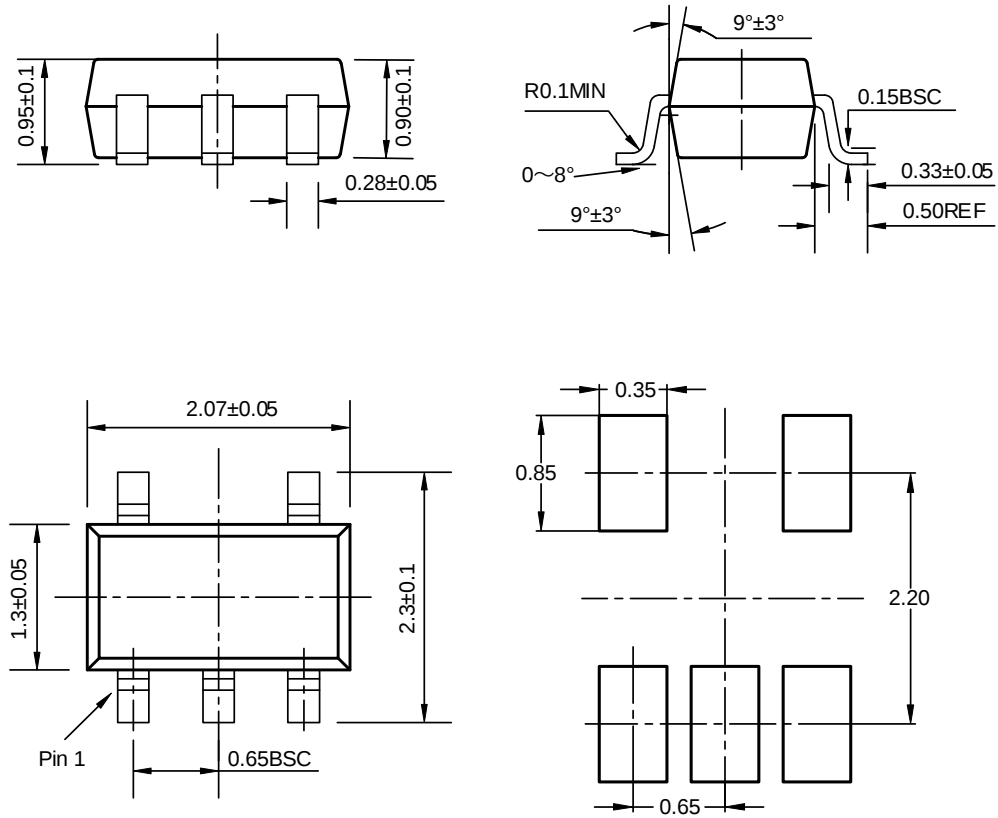
Table 2.Test Data

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

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Package Dimension

SC70-5

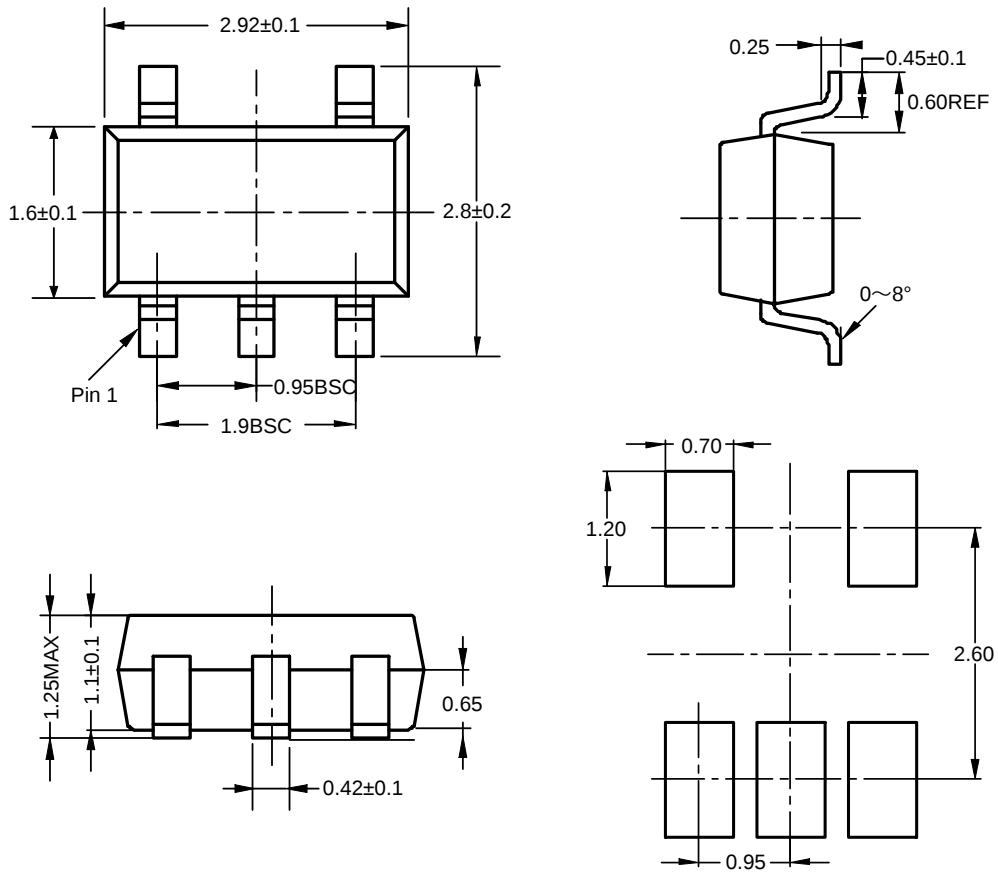


Recommended Land Pattern

Unit: mm

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SOT23-5



Recommended Land Pattern

Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2024-08-20	Preliminary Version	Yuyf	Tugz	Liuji
1.0	2025-03-29	Official Version	Wangar	Yangxx	Liuji