Single D-type Flip-flop Positive-edge Trigger

General Description

The ET74LVC1G80 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 its complement will appear at the Q output.

Schmitt trigger action at all inputs makes the circuit tolerant of slower input rise and fall time.

This device is fully specified for partial power-down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing the damaging back-flow current through the device when it is powered down.

Features

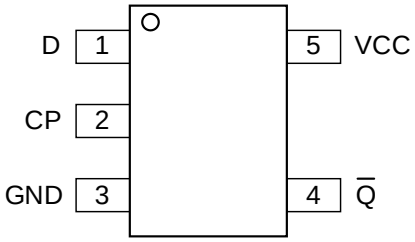
- Designed for 1.65V to 5.5V V_{CC} Operation
- Over-voltage Tolerant Inputs Accept Voltages to 5.5V
- ±32mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- These Devices are Pb-Free and RoHS Compliant
- ESD Protection Complies with JESD22 Standard
  -- HBM: ±4000V Pass (JEDEC JS-001)
- -- CDM: ±1500V Pass (JEDEC JS-002)
- Latch-up Performance Exceeds ±200mA per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET74LVC1G80	SC70-5 (1.3mm × 2.1mm)	Tape and Reel, 3K/Reel	1
ET74LVC1G80T	SOT23-5 (1.6mm × 2.9mm)	Tape and Reel, 3K/Reel	3

Applications

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

Pin Configuration



SC70-5/SOT23-5

Figure1. Pin Configuration

Pin Function

Pin No.	Function	Function
1	D	Data Input
2	CP	Ground
3	GND	Data Input
4	$\overline{Q}$	Data Output
5	VCC	Supply Voltage

Block Diagram

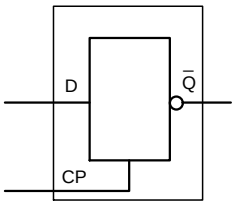


Figure2. Logic Symbol

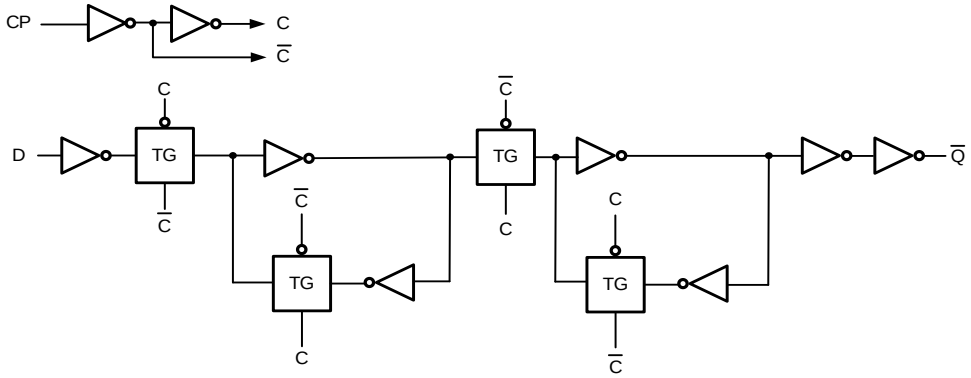


Figure3. Logic Diagram

Function Table

H = High voltage level; L = Low voltage level; ↑ = Low-to-High CP transition; X = don't care;
$\overline{q}$ = 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**	**$\overline{Q}$**
↑	L	H
↑	H	L
L	X	$\overline{q}$

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]	±1500	
I_{LU}	Max Latch Up Current Above V_{CC} and GND at 125°C [4]		±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: I_O absolute maximum rating must be observed.

Note2: HBM tested per JEDEC JS-001;

Note3: CDM tested per JEDEC JS-002;

Note4: Latch Up Current Maximum Rating tested per JEDEC JESD78F.

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	280	°C/W
	SOT23-5		180	
P_D	SC70-5	Power Dissipation in Still Air at 85°C	230	mW
	SOT23-5		360	

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		1.65	5.5	V
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
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

Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Conditions	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	0.65V_{CC}			0.65V_{CC}		V
			2.3~2.7	1.7			1.7		
			2.7~3.6	2.0			2.0		
			4.5~5.5	0.7V_{CC}			0.7V_{CC}		
V_{IL}	Low-Level Input Voltage		1.65~1.95			0.35V_{CC}		0.35V_{CC}	V
			2.3~2.7			0.7		0.7	
			2.7~3.6			0.8		0.8	
			4.5~5.5			0.3V_{CC}		0.3V_{CC}	
V_{OH}	High-Level Output Voltage	V_I = V_{IH} or V_{IL}							V
		I_O = -100μA;	1.65~5.5	V_{CC} - 0.1			V_{CC} - 0.1		
		I_O = -4mA	1.65	1.2	1.54		0.95		
		I_O = -8mA	2.3	1.9	2.15		1.7		
		I_O = -12mA	2.7	2.2	2.5		1.9		
		I_O = -24mA	3.0	2.3	2.62		2.0		
		I_O = -32mA	4.5	3.8	4.11		3.4		
V_{OL}	Low-Level Output Voltage	V_I = V_{IH} or V_{IL}							V
		I_O = -100μA;	1.65~5.5			0.10		0.10	
		I_O = 4mA	1.65		0.07	0.45		0.70	
		I_O = 8mA	2.3		0.09	0.30		0.45	
		I_O = 12mA	2.7		0.16	0.40		0.60	
		I_O = 24mA	3.0		0.17	0.55		0.80	
		I_O = 32mA	4.5		0.18	0.55		0.80	
I_I	Input Leakage Current	V_I = 5.5V or GND;	0~5.5		±0.1	±5		±20	uA

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V_{CC}(V)	T_A = 25°C			-40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
I_{OFF}	Power-Off Leakage Current	V_I or V_O = 5.5V;	0		±0.1	±10		±20	uA
I_{CC}	Supply Current	V_I = 5.5V or GND; I_O = 0mA	1.65~5.5		0.1	10		40	uA
ΔI_{CC}	Additional Supply Current	V_I = V_{CC} - 0.6V; I_O = 0mA	2.3~5.5		5.0	500		500	uA

AC Electrical Characteristics

t_r = t_f = 3ns; Voltages are referenced to GND (ground = 0V); for test circuit see Figure6.

Symbol	Parameter	Conditions	T_A = 25°C			-40°C ≤ T_A ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	
t_{pd}	Propagation Delay (See Figure4)	CP to $\overline{Q}$						ns
		V_{CC} = 1.65V to 1.95V	1.5	8.6	13.4	1.5	17	
		V_{CC} = 2.3V to 2.7V	1.0	5.0	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	4.4	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 (See Figure4)	CP High or Low						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 (See Figure4)	D to CP						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 (See Figure4)	D to CP						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		

AC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	T_A = 25°C			-40°C ≤ T_A ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	
f_{max}	Maximum Frequency (See Figure4)	CP						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		

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C_{IN}	Input Capacitance	V_{CC} = 5V, V_I = 0V or V_{CC}	5	pF
C_{PD}	Power Dissipation Capacitance (5)	10MHz, V_{CC} = 3.3V, V_I = 0V or V_{CC}	25	pF

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;

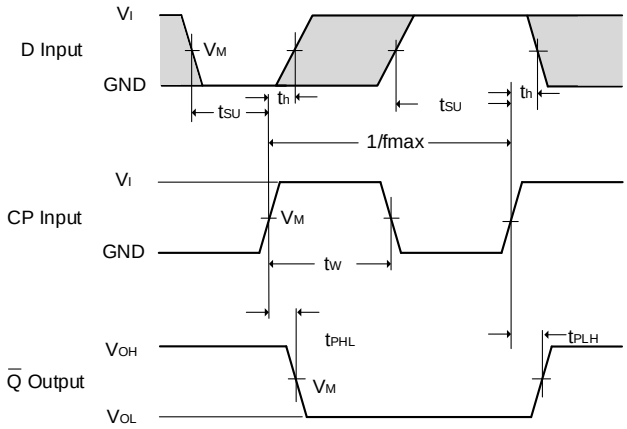
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

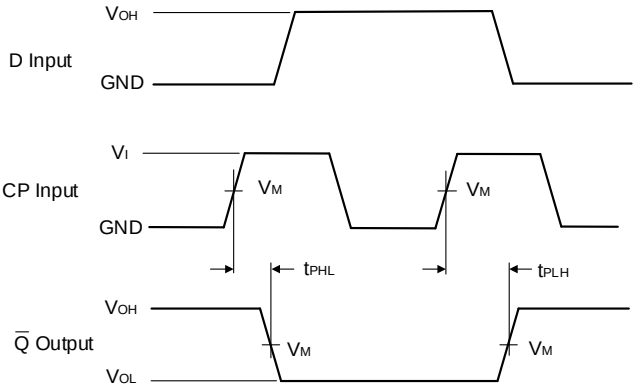
Test Circuit



Measurement points are given in Table1.

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

Figure4. 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



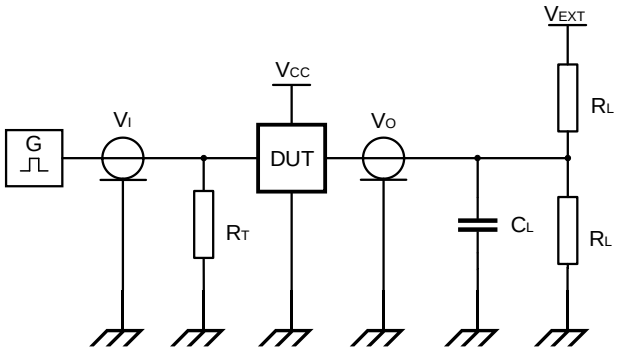
Measurement points are given in Table1.

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

Figure5. Clock (CP) to output (Q) propagation delay times

Table 1. Measurement Points

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



Measurement points are given in Table2.

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.

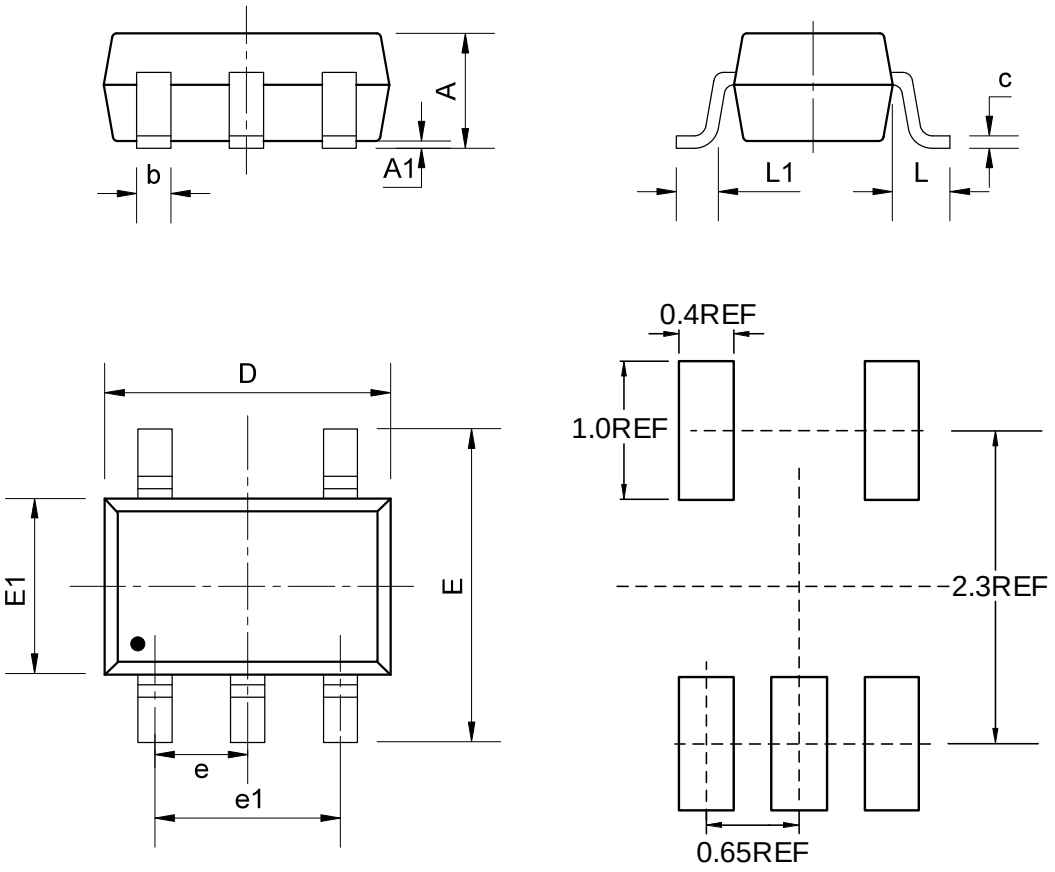
Figure6. Test circuit for measuring switching times

Table2. 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}	≤ 3ns	30pF	1kΩ	Open
2.3V to 2.7V	V_{CC}	≤ 3ns	30pF	500Ω	Open
2.7V	2.7V	≤ 3ns	50pF	500Ω	Open
3.0V to 3.6V	2.7V	≤ 3ns	50pF	500Ω	Open
4.5V to 5.5V	V_{CC}	≤ 3ns	50pF	500Ω	Open

Package Dimension

SC70-5 (1.3mm × 2.1mm)

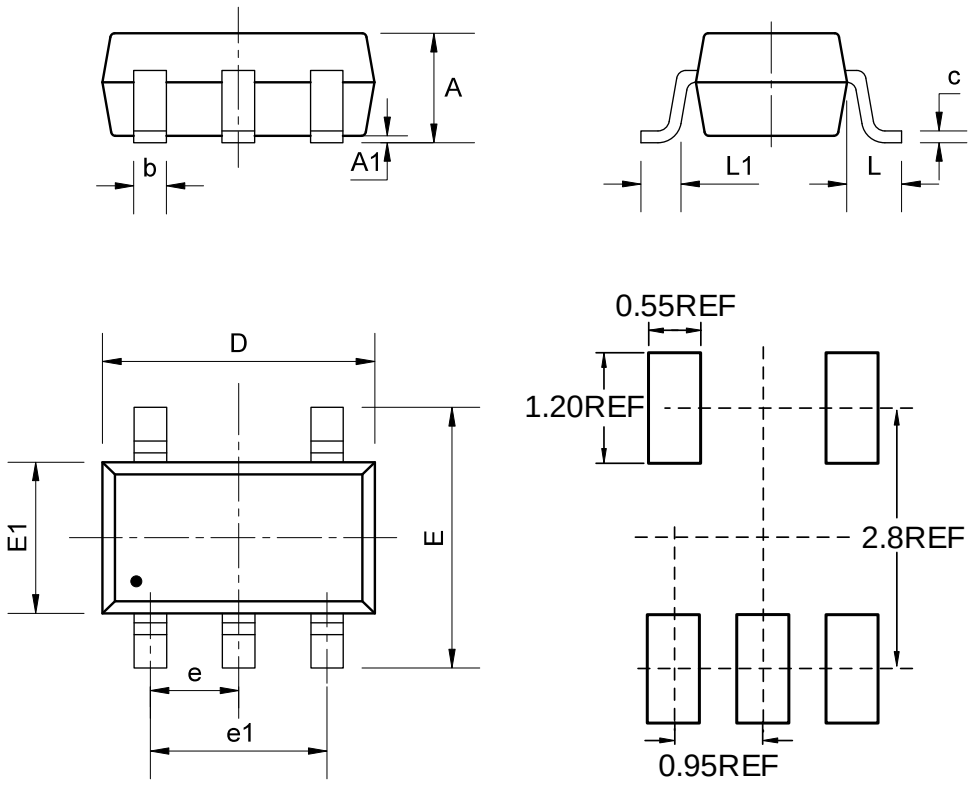


COMMON DIMENSIONS

(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		

SOT23-5 (1.6mm × 2.9mm)



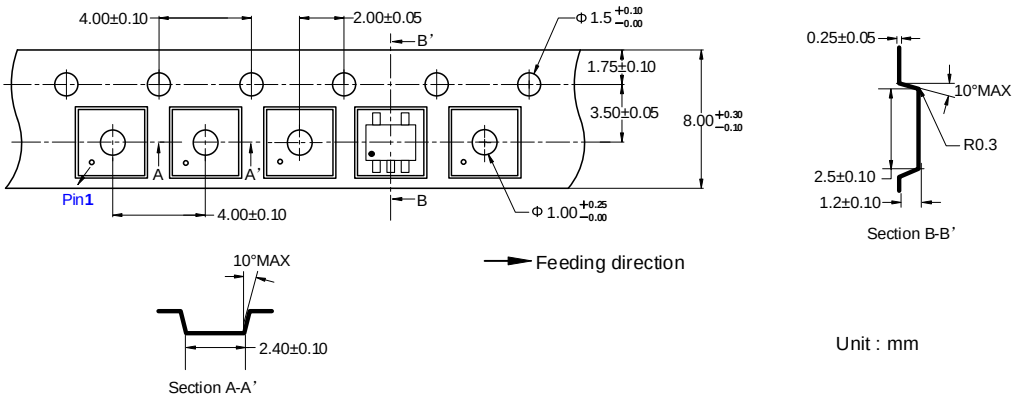
COMMON DIMENSIONS

(Unit: mm)

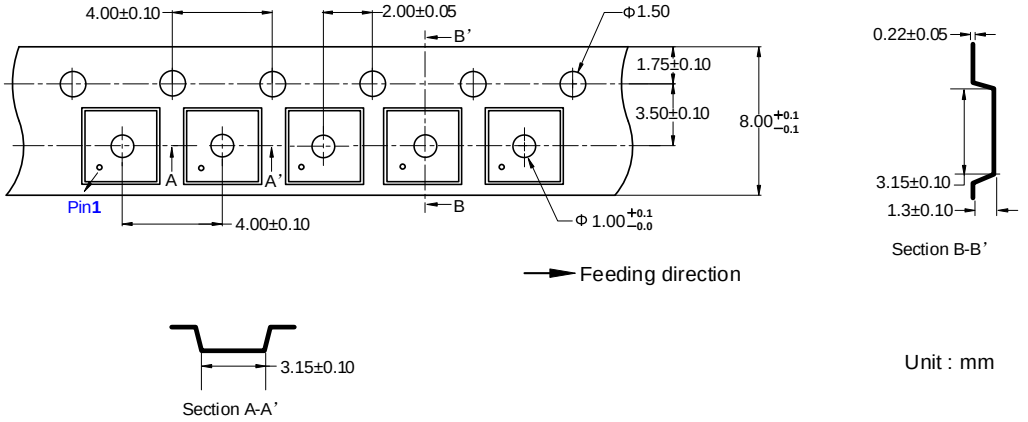
SYMBOL	MIN	NOM	MAX
A	-	-	1.45
A1	0.00	-	0.15
b	0.28	0.35	0.50
c	0.08	0.15	0.22
D	2.75	2.9	3.05
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
E	2.60	2.80	3.00
E1	1.45	1.6	1.75
L	0.60REF		
L1	0.30	0.45	0.60

Tape Information

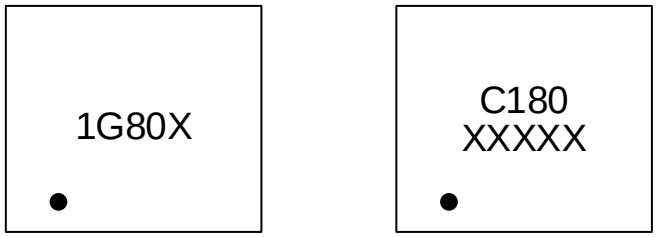
SC70-5 (1.3mm × 2.1mm)



SOT23-5 (1.6mm × 2.9mm)



Marking Information



ET74LVC1G80
1G80 = Part Number
X = Tracking Number

ET74LVC1G80T
C180 = Part Number
XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2024-07-04	Preliminary Version	Ma ruijie	Lu hao	Liu jiaying
1.0	2025-03-29	Official Version	Wang anran	Yang xiaoxu	Liu jiaying
1.1	2025-05-30	Add Packing Option	Yang xiaoxu	Yang xiaoxu	Liu jiaying
1.2	2026-04-22	Update Format and Package	Xu tao	Yang xiaoxu	Liu jiaying