Single 3-Input AND Gate

General Description

The ETQ74LVC1G11 is a single 3-input AND gate. Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

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

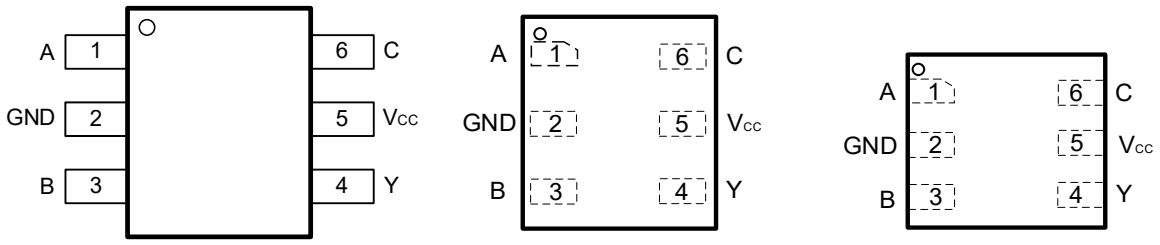
This device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing the potentially damaging back-flow current through the device when it is powered down.

Features

- Designed for 1.65V to 5.5V V_{CC} Operation
- Over-voltage Tolerant Inputs Accept Voltages to 5.5V
- High Noise Immunity
- ±32mA Balanced Output Sink and Source Capability
- CMOS Low Power Dissipation
- Direct Interface with TTL Levels
- I_{OFF} Circuitry Provides Partial Power-Down Mode Operation
- Multiple Package Options Automotive AEC-Q100 Grade 1 Qualified
  -- Ambient Temperature Range of -40°C to 125°C
  -- ESD HBM ±2KV PASS
  -- ESD CDM ±1KV PASS
  -- Latch Up Current to ±200mA PASS
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ETQ74LVC1G11	SC70-6 (1.3mm × 2.1mm)	Tape and Reel, 3K/Reel	1
ETQ74LVC1G11T	SOT23-6 (1.6mm × 2.9mm)	Tape and Reel, 3K/Reel	1
ETQ74LVC1G11Y	DFN6 (1.0mm × 1.45mm)	Tape and Reel, 3K/Reel	1
ETQ74LVC1G11N	DFN6 (1.0mm × 1.0mm)	Tape and Reel, 5K/Reel	1

Pin Configuration



SC70-6/SOT23-6 DFN6(1.0mm × 1.45mm) DFN6(1.0mm × 1.0mm)

Figure1. Pin Configuration

Pin Function

SC70-5/ SOT23-5/ DFN6(1.0mm × 1.45mm)/ DFN6(1.0mm × 1.0mm)

Pin No.	Pin Name	Pin Function
1	A	Data Input
2	GND	Ground
3	B	Data Input
4	Y	Data Output
5	V_{CC}	Supply Voltage
6	C	Data Input

Block Diagram

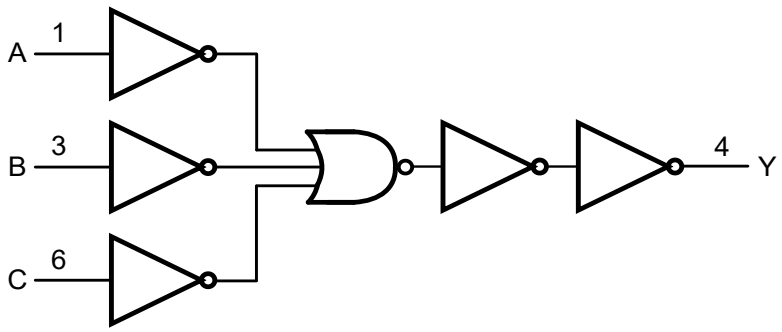


Figure2. Logic Symbol

Functional Table

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

H = HIGH voltage level;

L = LOW voltage level;

X = Don't care.

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)	±2000	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 the Maximum Ratings 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 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
$R_{\theta JA}$	SC70-6	Thermal Characteristics, Thermal Resistance, Junction-to-air	270	°C/W
	SOT23-6		220	
	DFN6 (1.0mm × 1.45mm)		330	
	DFN6 (1.0mm × 1.0mm)		360	
P_D	SC70-6	Power Dissipation in Still Air at 25°C	460	mW
	SOT23-6		570	
	DFN6 (1.0mm × 1.45mm)		380	
	DFN6 (1.0mm × 1.0mm)		350	

Recommended Operating Conditions

Symbol	Parameters	Min	Max	Unit
V_{CC}	Supply Voltage Range	1.65	5.5	V
V_I	Input Voltage	0	V_{CC}	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.

Electrical Characteristics

DC Electrical Characteristics

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

Symbol	Parameters	Conditions	V_{CC}(V)	-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		1.65~1.95	0.65V_{CC}			0.65V_{CC}		V
			2.3~2.7	1.7			1.7		V
			2.7~3.6	2.0			2.0		V
			4.5~5.5	0.7V_{CC}			0.7V_{CC}		V
V_{IL}	LOW-Level Output Voltage		1.65~1.95			0.35V_{CC}		0.35V_{CC}	V
			2.3~2.7			0.7		0.7	V
			2.7~3.6			0.8		0.8	V
			4.5~5.5			0.3V_{CC}		0.3V_{CC}	V
V_{OL}	LOW-Level Output Voltage	V_I = V_{T+} or V_{T-}							
		I_O = 100μA	1.65~5.5			0.1		0.1	V
		I_O = 4mA	1.65		0.07	0.45		0.7	V
		I_O = 8mA	2.3		0.12	0.3		0.45	V
		I_O = 12mA	2.7		0.17	0.4		0.6	V
		I_O = 24mA	3.0		0.33	0.55		0.8	V
		I_O = 32mA	4.5		0.39	0.55		0.8	V
V_{OH}	HIGH-Level Output Voltage	V_I = V_{T+} or V_{T-}							
		I_O = -100μA	1.65~5.5	V_{CC} - 0.1			V_{CC} - 0.1		V
		I_O = -4mA	1.65	1.2	1.54		0.95		V
		I_O = -8mA	2.3	1.9	2.15		1.7		V
		I_O = -12mA	2.7	2.2	2.50		1.9		V
		I_O = -24mA	3.0	2.3	2.62		2.0		V
		I_O = -32mA	4.5	3.8	4.11		3.4		V
I_{IN}	Input Leakage Current	V_I = 5.5V or GND	0~5.5		±0.1	±1		±1	μA

DC Electrical Characteristics (Continued)

Symbol	Parameters	Conditions	V_{CC}(V)	-40°C ≤ T_A ≤ 85°C			-40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ[5]	Max	Min	Max	
I_{OFF}	Power-Off Leakage Current	V_I or V_O = 5.5V	0		±0.1	±2		±2	μA
I_{CC}	Supply Current	V_I = 5.5V or GND; I_O = 0mA	1.65~5.5		0.1	4		4	μA
ΔI_{CC}	Additional Supply Current	V_I = V_{CC} - 0.6V; I_O = 0mA	2.3~5.5		5	500		500	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.

Note5: Typical values are measured at maximum V_{CC} and T_A = 25°C.

AC Electrical Characteristics

Symbol	Parameters	Conditions	V_{CC}(V)	-40°C ≤ T_A ≤ 85°C			-40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ[5]	Max	Min	Max	
t_{pd}	Propagation Delay	A, B, C to Y; (See Figure3)[6]	t_{PHL}						
			1.65~1.95	2.0	6.8	15.0	2.0	15	ns
			2.3~2.7	1.5	4.1	9.0	1.5	10.0	ns
			2.7	1.5	3.6	8.0	1.5	9.0	ns
			3.0~3.6	1.5	3.1	7.2	1.5	7.5	ns
			4.5~5.5	1.5	2.5	5.7	1.5	6.0	ns
			t_{PLH}						
			1.65~1.95	2.0	5.8	13.0	2.0	14.0	ns
			2.3~2.7	1.5	3.6	8.0	1.5	9.0	ns
			2.7	1.5	3.0	7.5	1.5	8.5	ns
			3.0~3.6	1.5	2.7	6.9	1.5	7.2	ns
			4.5~5.5	1.5	1.9	5.4	1.5	5.7	ns

Note6: t_{pd} is the same as t_{PLH} and t_{PHL}.

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C_{IN}	Input Capacitance	V_{CC} = 5.5V, V_I = 0V or V_{CC}	4	pF
C_{PD}	Power Dissipation Capacitance (7)	10MHz, V_{CC} = 3.3V, V_I = 0V or V_{CC}	13	pF

Note7: 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;

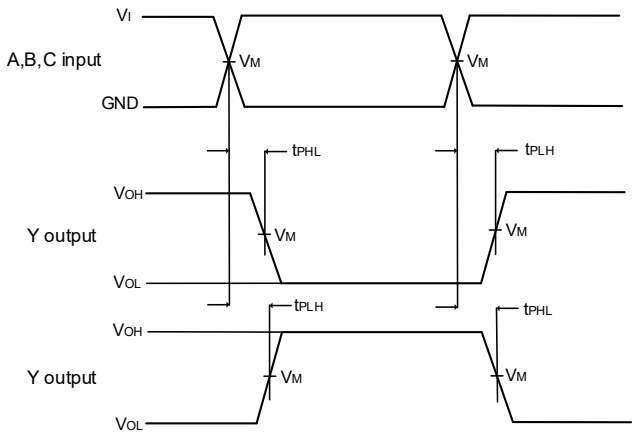
C_L = output load capacitance in pF;

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



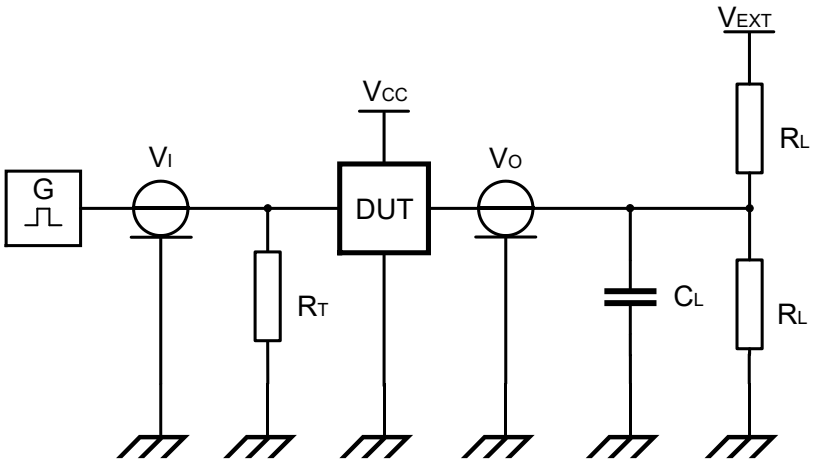
Measurement points are given in Table1.

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

Figure3. Input A, B and C to output Y propagation delay times

Table1. Measurement Points

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

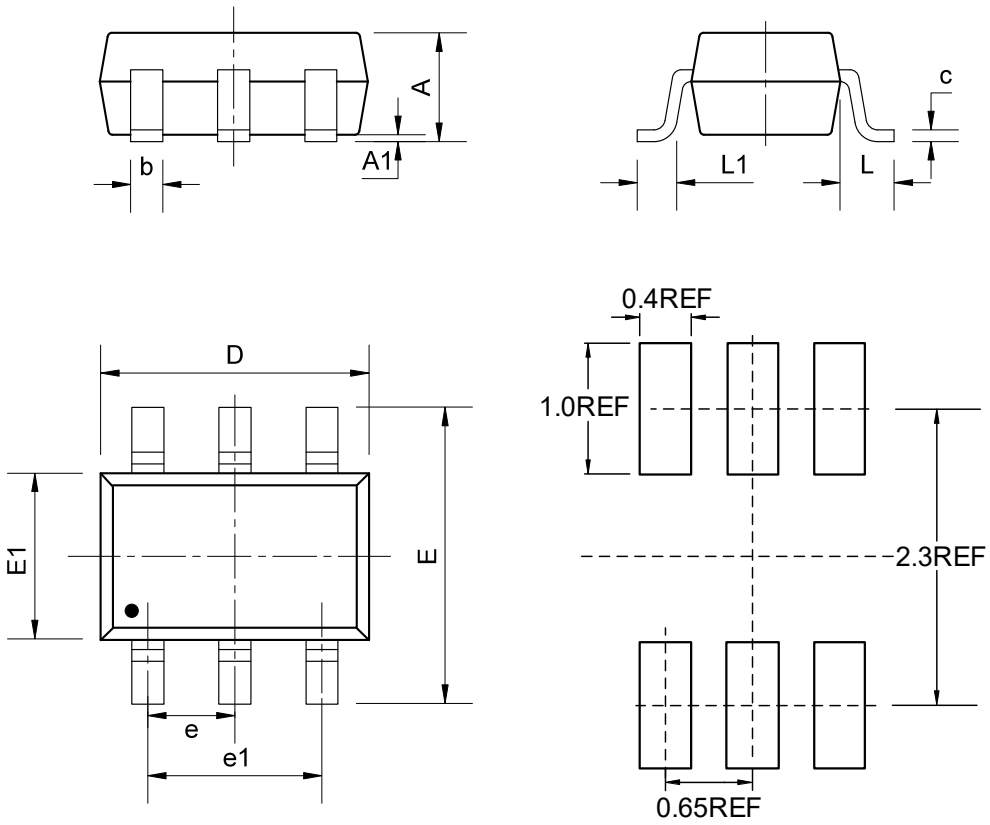
Figure4. Test circuit for measuring switching times

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}	3.0ns	30pF	1kΩ	open
2.3V to 2.7V	V_{CC}	3.0ns	30pF	500Ω	open
2.7V	2.7V	3.0ns	50pF	500Ω	open
3.0V to 3.6V	2.7V	3.0ns	50pF	500Ω	open
4.5V to 5.5V	V_{CC}	3.0ns	50pF	500Ω	open

Package Dimension

SC70-6 (1.3mm × 2.1mm)

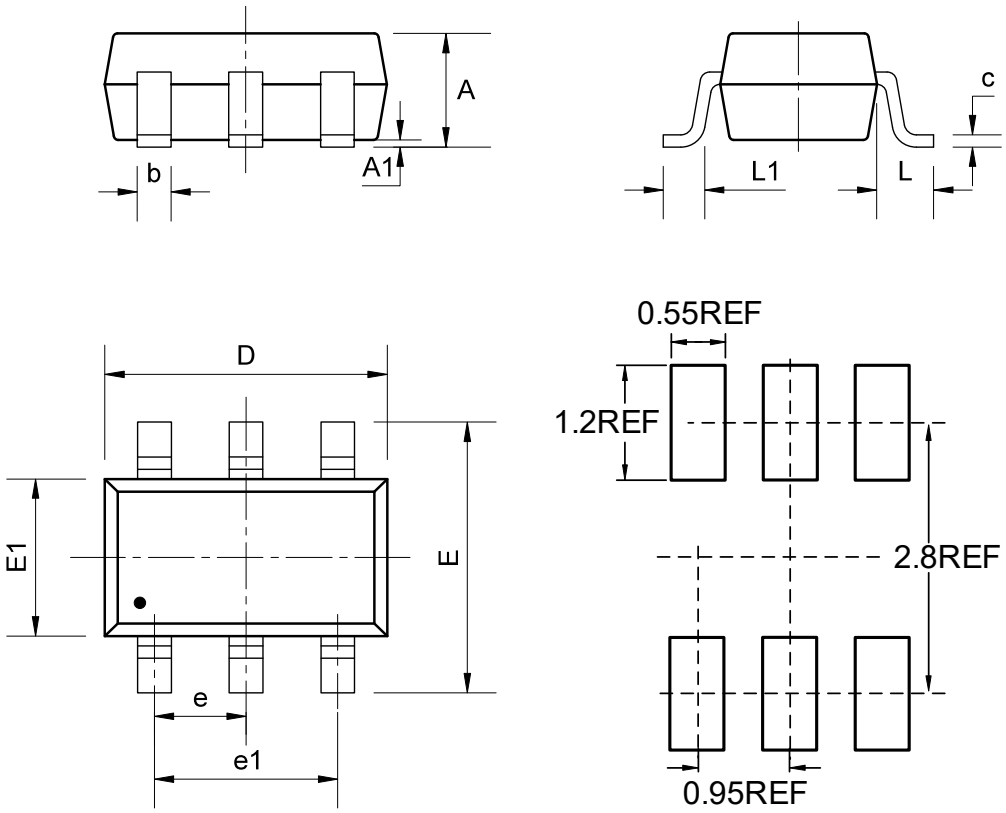


COMMON DIMENSIONS

(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		

SOT23-6(1.6mm × 2.9mm)

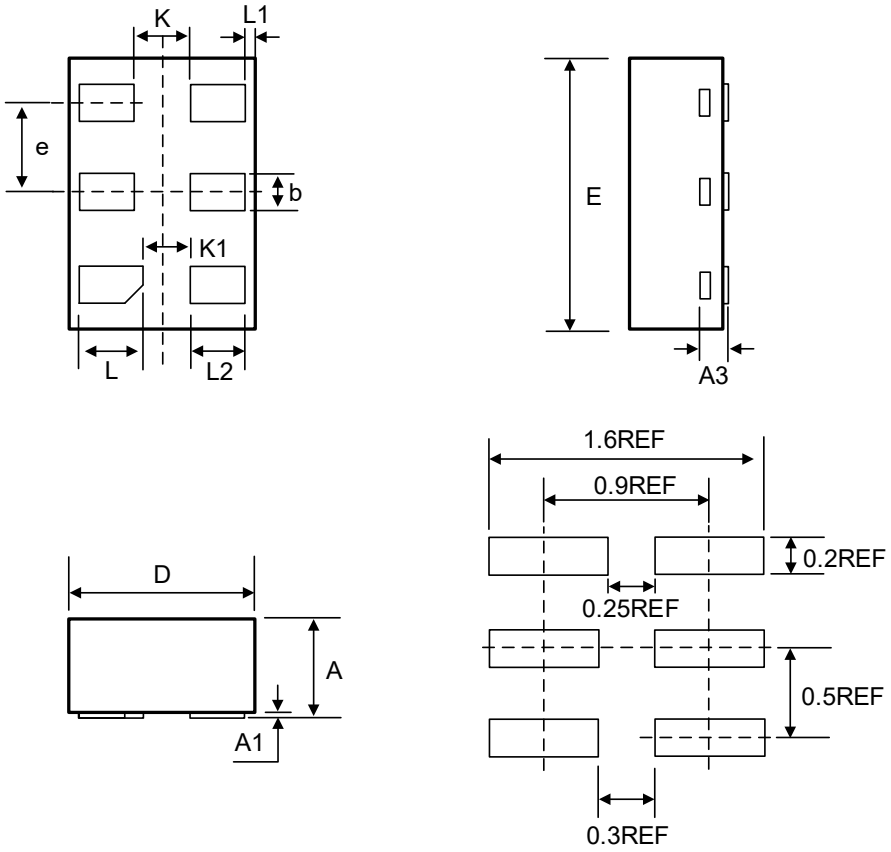


COMMON DIMENSIONS

(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

DFN6(1.0mm × 1.45mm)

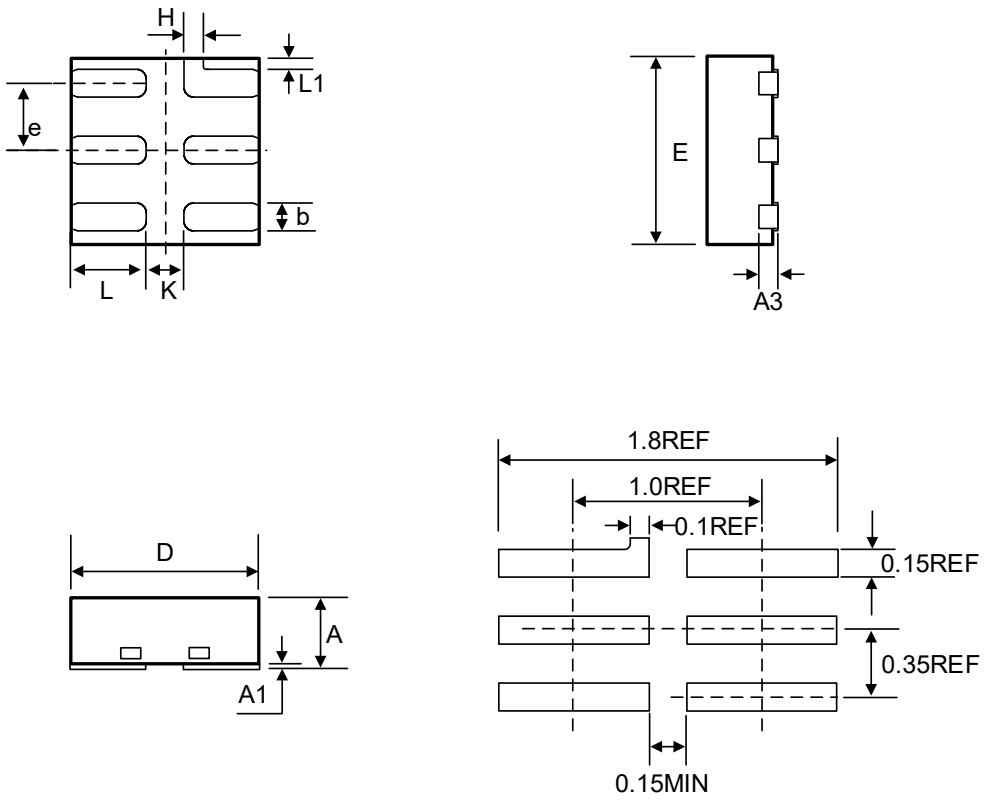


COMMON DIMENSIONS

(Unit: mm)

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

DFN6(1.0mm × 1.0mm)



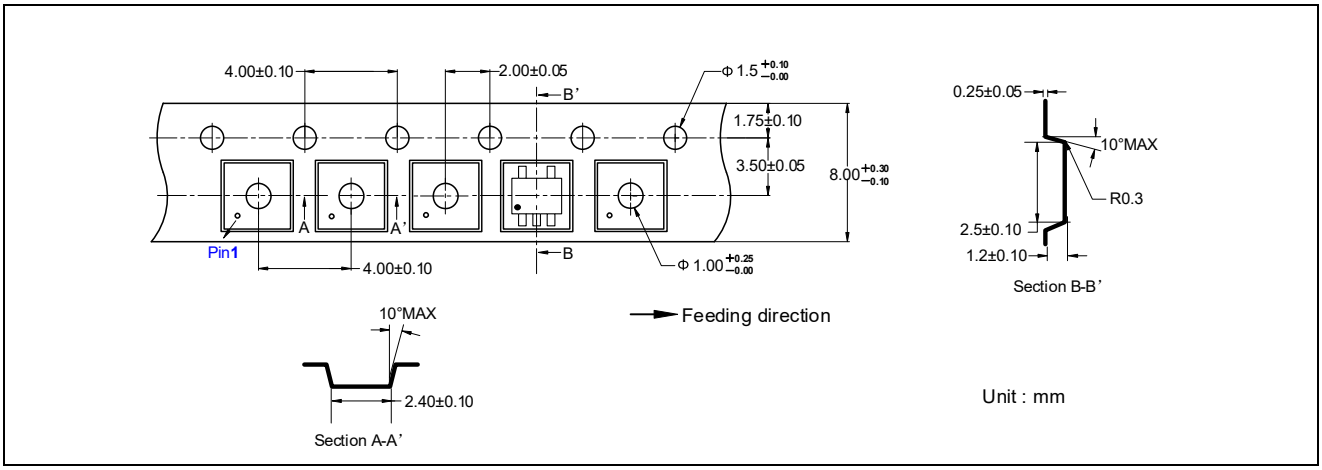
COMMON DIMENSIONS

(Unit: mm)

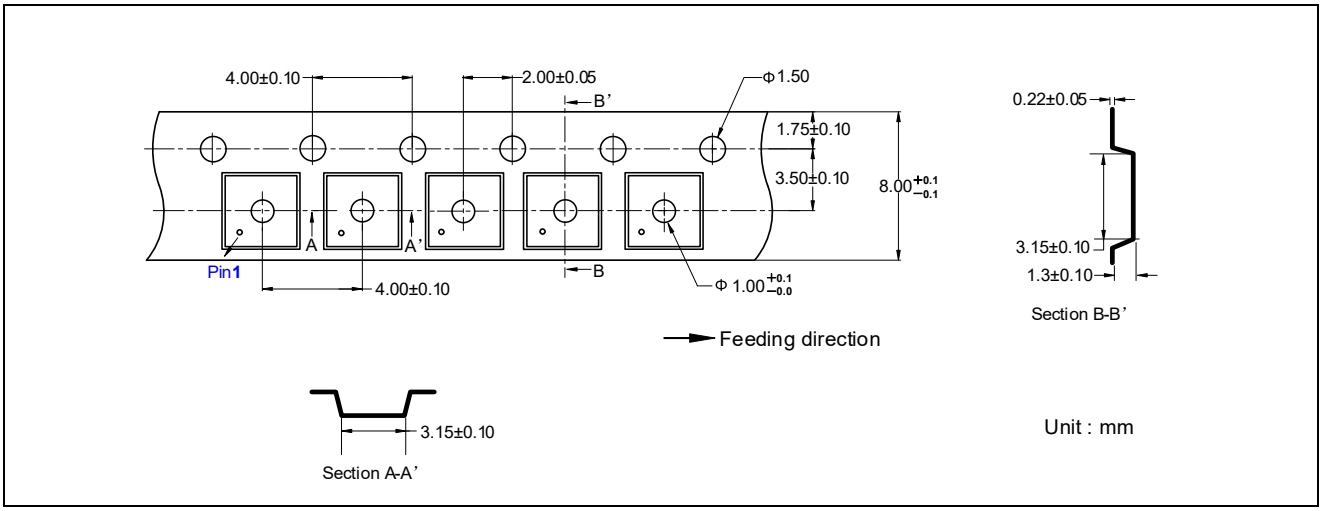
SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0.00	0.02	0.05
A3		0.10REF	
b	0.10	0.15	0.20
D	0.95	1.00	1.05
E	0.95	1.00	1.05
e	0.30	0.35	0.40
H		0.10REF	
K	0.15	--	--
L	0.35	0.40	0.45
L1		0.075REF	

Tape Information

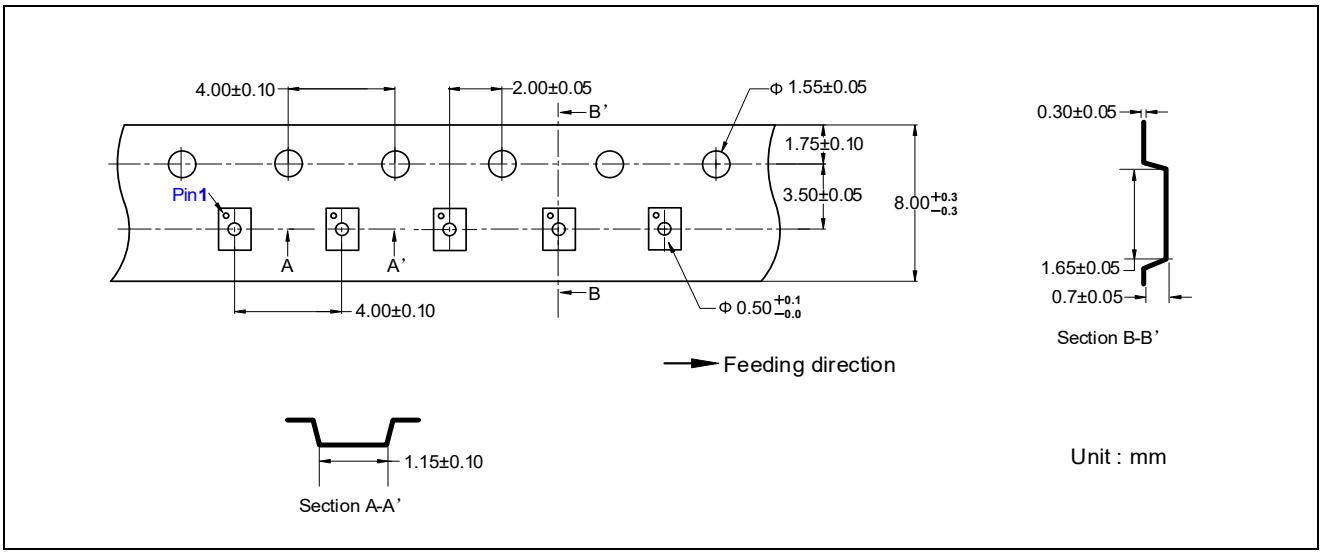
SC70-6 (1.3mm × 2.1mm)



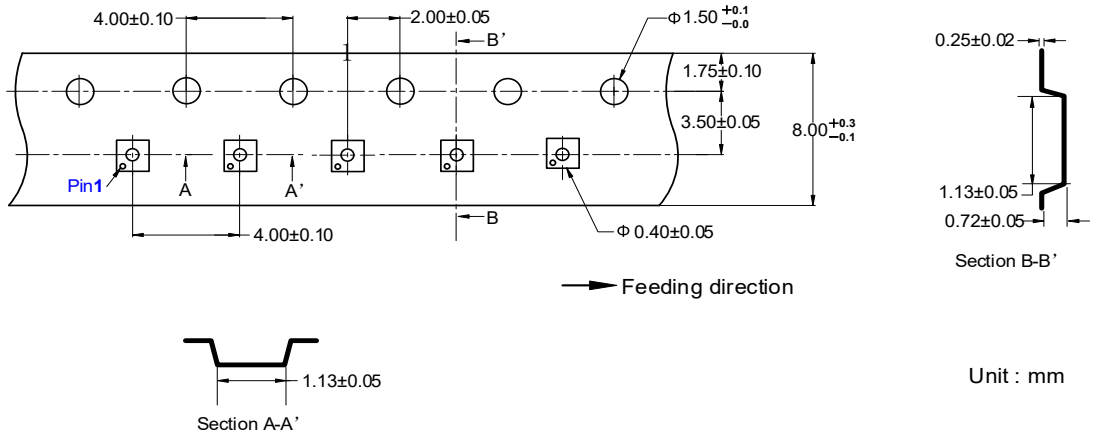
SOT23-6 (1.6mm × 2.9mm)



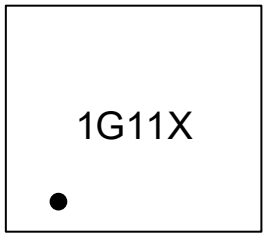
DFN6 (1.0mm × 1.45mm)



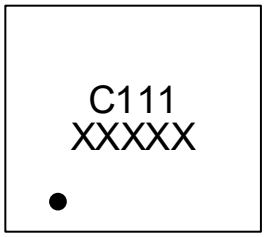
DFN6 (1.0mm × 1.0mm)



Marking Information



ETQ74LVC1G11
1G11 = Part Number
X = Tracking Number



ETQ74LVC1G11T
C111 = Part Number
XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-10-23	Preliminary Version	Wang anran	Yang xiaoxu	Liu jiaying
0.1	2025-12-16	Update Format, Add Tape and Marking	Xu tao	Yang xiaoxu	Liu jiaying
1.0	2026-04-15	Official Version	Xu tao	Yang xiaoxu	Liu jiaying