

Single Inverter

General Description

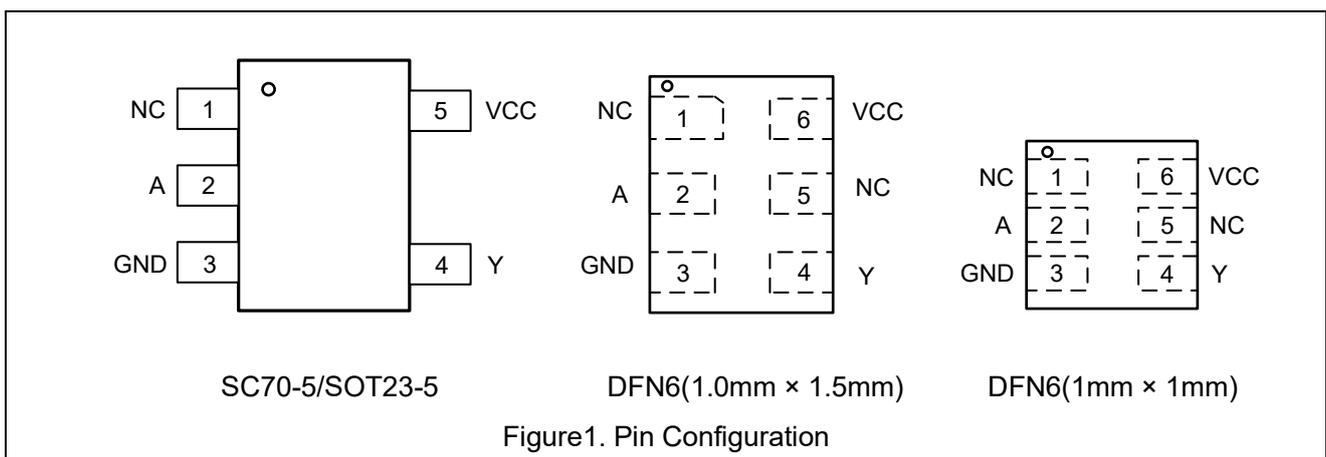
The ET74HC1G04 is an inverter operating from a 2V to 6V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

Features

- $\pm 2.6\text{mA}$ Balanced Sink and Source Output Capability
- Over-voltage Tolerant Inputs Accept Voltages to 6V
- Designed for 2V to 6V V_{CC} Operation
- These Devices are Pb-Free and RoHS Compliant
- ESD Protection Complies with JESD22 Standard
 - HBM: $\pm 4000\text{V}$ Pass (JEDEC JS-001)
 - CDM: $\pm 1000\text{V}$ Pass (JEDEC JS-002)
- Latch-up Performance Exceeds $\pm 100\text{mA}$ per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET74HC1G04	SC70-5 (1.3mm \times 2.1mm)	Tape and Reel, 3K/Reel	1
ET74HC1G04T	SOT23-5 (1.6mm \times 2.9mm)	Tape and Reel, 3K/Reel	3
ET74HC1G04Y	DFN6 (1.0mm \times 1.5mm)	Tape and Reel, 3K/Reel	1
ET74HC1G04N	DFN6 (1.0mm \times 1.0mm)	Tape and Reel, 5K/Reel	1

Pin Configuration



ET74HC1G04

Pin Function

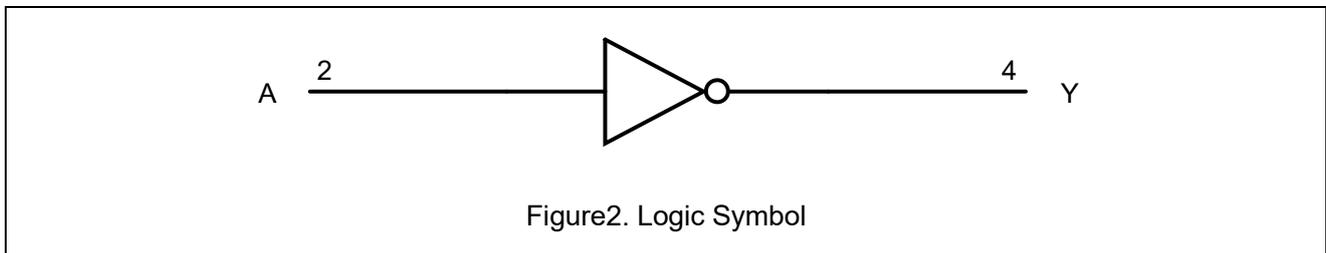
SC70-5/ SOT23-5

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

DFN6

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

Block Diagram



Function Table

Input A	Output Y
L	H
H	L

ET74HC1G04

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V _{CC}	DC Supply Voltage (VCC Pin)		-0.5 to 7.0	V
V _I	DC Input Voltage ⁽¹⁾		-0.5 ≤ V _I ≤ 7.0	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 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 _{θJA}	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	300	°C /W
	SOT23-5		250	
	DFN6 (1.0mm × 1.5mm)		440	
	DFN6 (1.0mm × 1.0mm)		440	
P _D	SC70-5	Power Dissipation in Still Air at 85°C	215	mW
	SOT23-5		260	
	DFN6 (1.0mm × 1.5mm)		150	
	DFN6 (1.0mm × 1.0mm)		150	

ET74HC1G04

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage	2	6	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

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		2.0	1.5			1.5		V
			4.5	3.15			3.15		
			6.0	4.2			4.2		
V _{IL}	Low-Level Input Voltage		2.0			0.5		0.5	V
			4.5			1.35		1.35	
			6.0			1.8		1.8	
V _{OH}	High-Level Output Voltage	I _{OH} = -20uA	2~6	V _{CC} - 0.1	V _{CC}		V _{CC} - 0.1		V
		I _{OH} = -2mA	4.5	4.13	4.32		3.7		
		I _{OH} = -2.6mA	6.0	5.63	5.81		5.2		
V _{OL}	Low-Level Output Voltage	I _{OL} = 20uA	2~6		0.0	0.1		0.1	V
		I _{OL} = 2mA	4.5		0.15	0.33		0.4	
		I _{OL} = 2.6mA	6.0		0.16	0.33		0.4	
I _{IN}	Input Leakage Current	V _I = 6V or GND	0~6		±0.1			±1.0	μA
I _{OFF}	Power Off Leakage Current	V _I = 6V or V _O = 6V	0			1		10	μA
I _{CC}	Quiescent Supply Current	V _I = 6V or GND	6			1		10	μA

ET74HC1G04

AC Electrical Characteristics

$t_r = t_f = 3\text{ns}$;

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)	C _L = 50pF	2.0		26	116		136	ns
		C _L = 50pF	4.5		9	23		27	
		C _L = 15pF	5.0		7				
		C _L = 50pF	6.0		8	21		24	

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C _{IN}	Input Capacitance	V _{CC} = 6V, 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}	26	pF
		10MHz, V _{CC} = 6V, 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;

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

AC Test Circuit

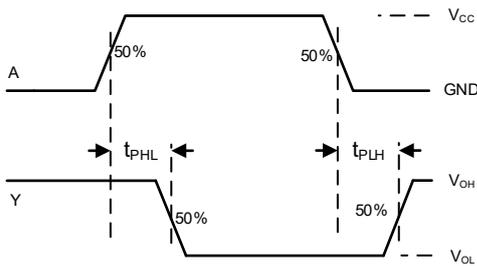


Figure3. Switching Waveform

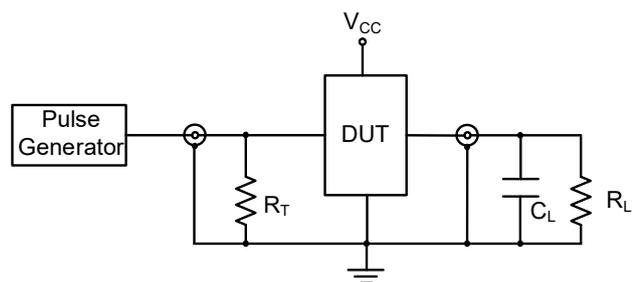
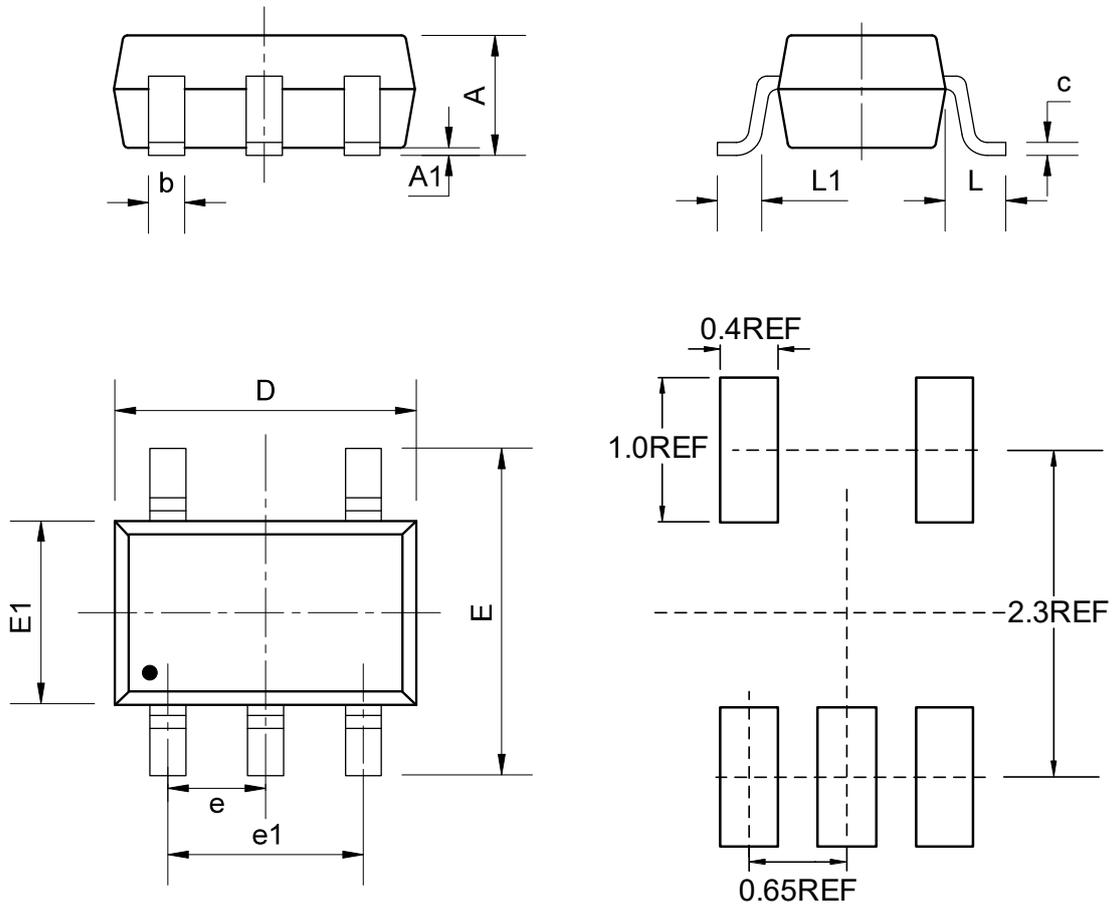


Figure4. Test Circuit

ET74HC1G04

Package Dimension

SC70-5 (1.3mm × 2.1mm)



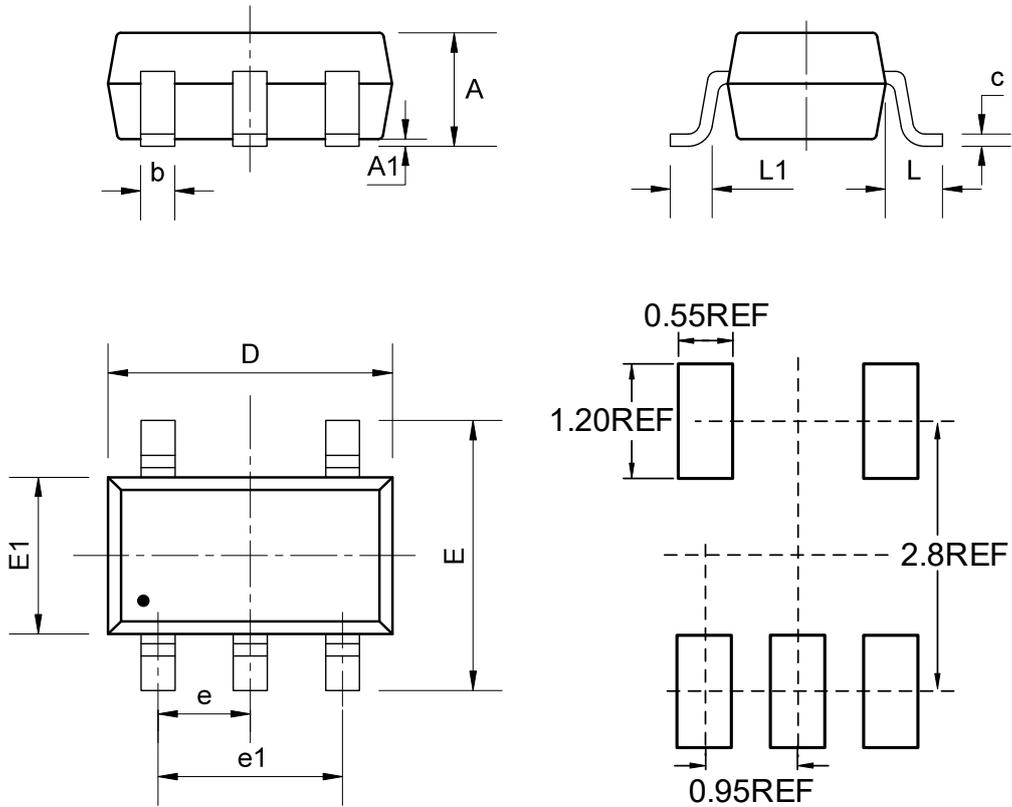
COMMON DIMENSIONS

(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		

ET74HC1G04

SOT23-5 (1.6mm × 2.9mm)



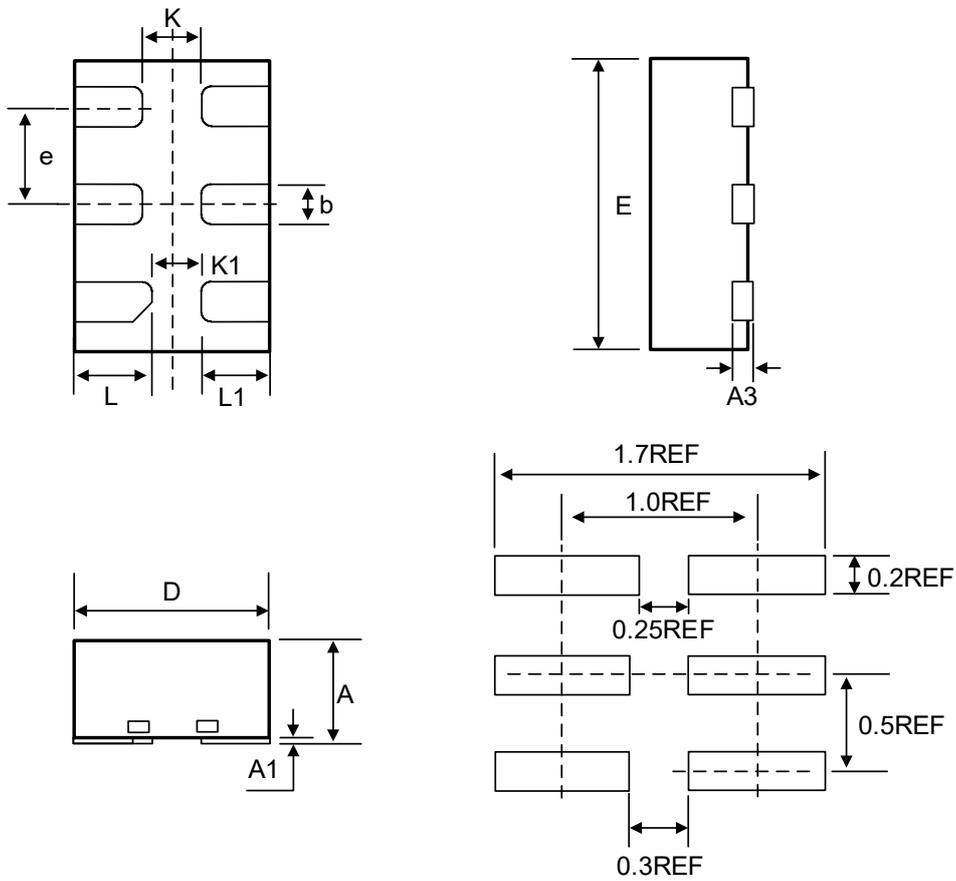
COMMON DIMENSIONS

(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

ET74HC1G04

DFN6 (1.0mm × 1.5mm)



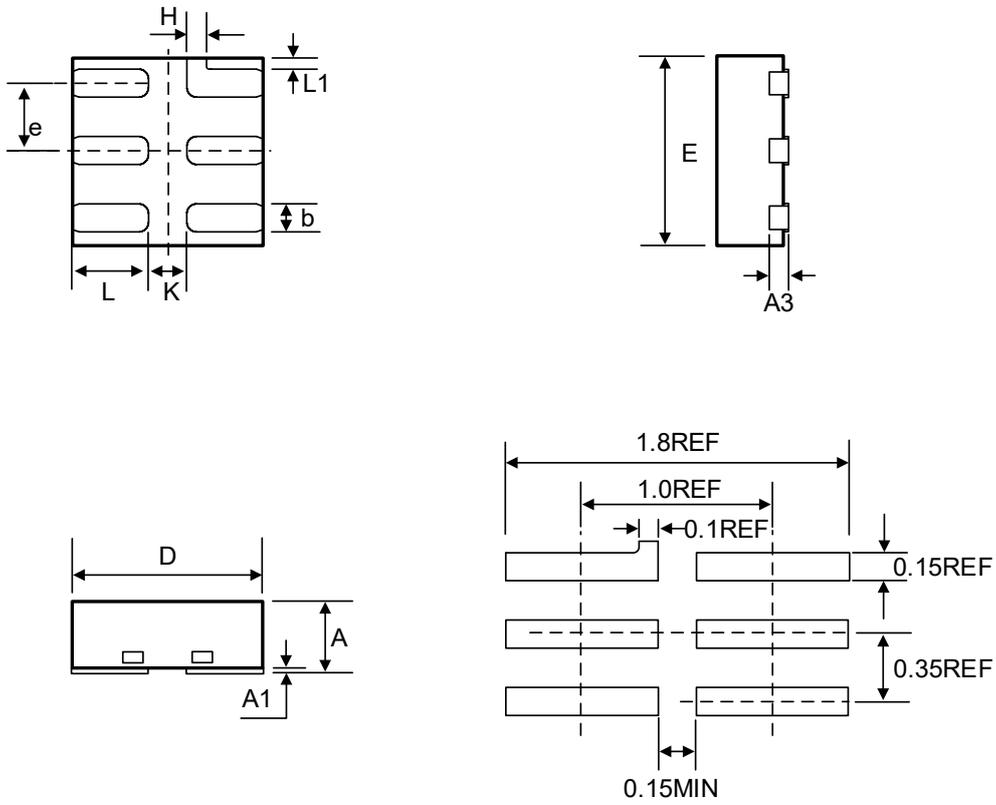
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	0.50	--	0.60
A1	0.00	0.02	0.05
A3	0.10REF		
b	0.15	0.20	0.25
D	0.90	1.00	1.10
E	1.40	1.50	1.60
e	0.50BSC		
K	0.30REF		
K1	0.25REF		
L	0.35	0.40	0.45
L1	0.30	0.35	0.40

ET74HC1G04

DFN6 (1.0mm × 1.0mm)



COMMON DIMENSIONS

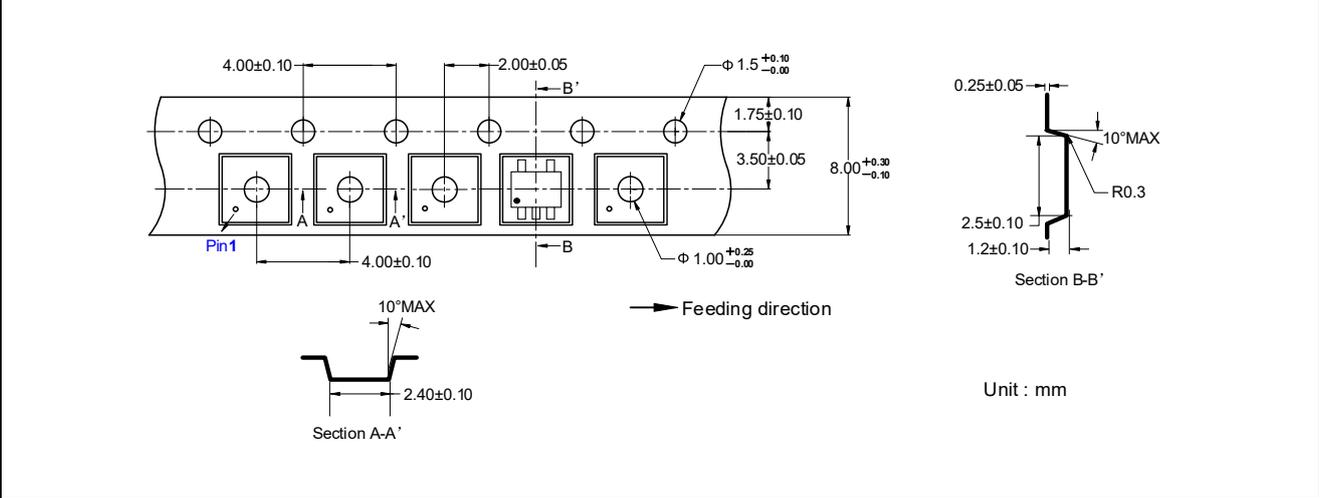
(Unit: mm)

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	0.075REF		

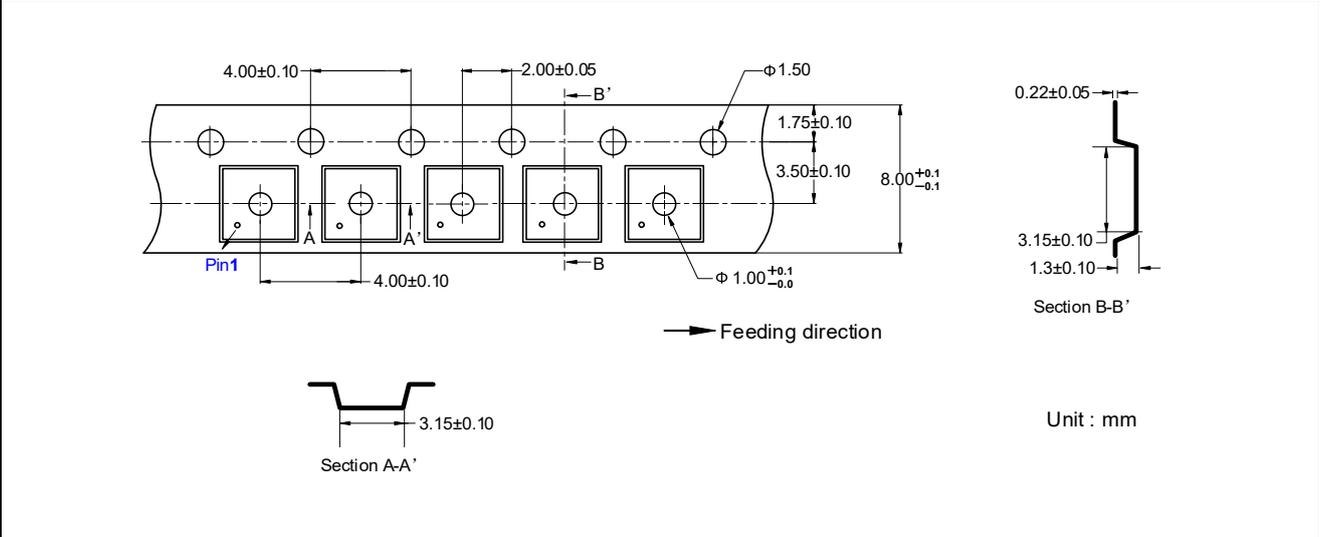
ET74HC1G04

Tape Information

SC70-5 (1.3mm × 2.1mm)



SOT23-5 (1.6mm × 2.9mm)



DFN6 (1.0mm × 1.5mm)

