Hex Schmidt-Trigger Inverters

General Description

The ET74LVC14A is a hex inverter with Schmitt-trigger inputs. This device features reduced input threshold levels to allow interfacing to TTL logic levels. Inputs also include clamp diodes, this enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}. Schmitt trigger inputs transform slowly changing input signals into sharply defined jitter-free output signals.

Features

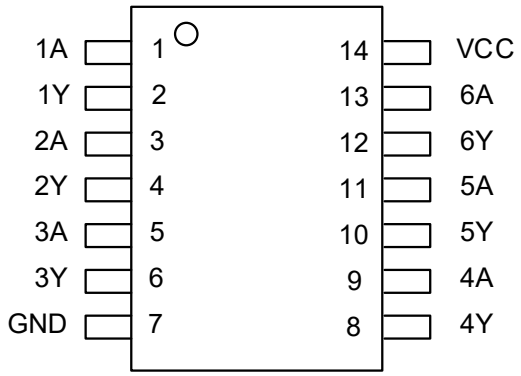
- Designed for 1.65V to 5.5V V_{CC} Operation
- Max t_{pd} of 6.4ns at 3.3V
- ±24mA Balanced Output Sink Capability
- Latch-up performance exceeds 200mA per JESD78, Class II
- ESD Protection Complies with JESD22 Standard
  -- HBM: ±2000V Pass (JEDEC JS-001)
  -- CDM: ±1000V Pass (JEDEC JS-002)
- Latch-up Performance Exceeds ±200mA per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	MSL
ET74LVC14AM14	SOP14 (8.65mm × 6mm)	3
ET74LVC14AV	TSSOP14 (4.96mm × 6.4mm)	3
ET74LVC14AP	DIP14 (19.10mm × 6.35mm)	3

Applications

- Mobile Device
- AV Receiver
- Audio Dock: Portable
- Blu-ray Player and Home Theater
- Personal Digital Assistant (PDA)
- Power: Telecom/Server AC/DC Supply: Single
- Controller: Analog and Digital
- Solid State Drive (SSD): Client and Enterprise
- TV: LCD, Digital, and High-Definition (HDTV)
- Tablet: Enterprise
- Video Analytics: Server
- Wireless Headset, Keyboard, and Mouse

Pin Configuration



SOP14/TSSOP14/DIP14

Figure1. Pin Configuration

Pin Function

No.	Name	Function
1	1A	Channel 1 Input.
2	1Y	Channel 1 Output.
3	2A	Channel 2 Input.
4	2Y	Channel 2 Output.
5	3A	Channel 3 Input.
6	3Y	Channel 3 Output.
7	GND	Ground.
8	4Y	Channel 4 Iutput.
9	4A	Channel 4 Input.
10	5Y	Channel 5 Output.
11	5A	Channel 5 Input.
12	6Y	Channel 6 Output.
13	6A	Channel 6 Input.
14	VCC	Positive Voltage Supply.

Block Diagram

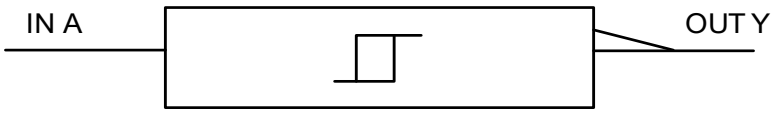


Figure2. Logic Symbol

Functional Table

Input A	Output Y
H	L
L	H

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage(VCC Pin)		-0.5 to 6.5	V
I_{IK}	DC Input Diode Current, V_I < GND		-50	mA
V_I	DC Input Voltage (1)		-0.5 ≤ V_I ≤ 6.5	V
I_{OK}	DC Output Diode Current, V_O < GND		±50	mA
V_O	DC Output Voltage Output in Higher or Low State		-0.5 to V_{CC} + 0.5	V
I_O	DC Output Sink Current, V_O = 0V to V_{CC}		±50	mA
I_{CC}	DC Supply Current per Supply Pin		100	mA
I_{GND}	DC Ground Current per Supply Pin		-100	mA
T_J	Max Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-65 to 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)		±200	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 JEDEC JS-001;

Note3: CDM tested per JEDEC JS-002;

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

Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage	Operating	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	Operating in Free Air	-40	125	°C

Electrical Characteristics

DC Electrical Characteristics

Over operating free-air temperature range; typical values measured at T_A = 25°C (unless otherwise noted)

Symbol	Parameter	V_{CC} (V)	T_A = 25°C			-40°C ≤ T_A ≤ 85°C		-40°C ≤ T_A ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V_{T+}	Positive-going Threshold Voltage	1.65	0.4		1.3	0.4	1.3	0.4	1.3	V
		1.95	0.6		1.5	0.6	1.5	0.6	1.5	
		2.3	0.8		1.7	0.8	1.7	0.8	1.7	
		2.5	0.8		1.7	0.8	1.7	0.8	1.7	
		2.7	0.8		2	0.8	2	0.8	2	
		3	0.9		2	0.9	2	0.9	2	
		3.6	1.1		2	1.1	2	1.1	2	
		4.5								
		5								
V_{T-}	Negative-going Threshold Voltage	1.65	0.15		0.85	0.15	0.85	0.15	0.85	V
		1.95	0.25		0.95	0.25	0.95	0.25	0.95	
		2.3	0.4		1.2	0.4	1.2	0.4	1.2	
		2.5	0.4		1.2	0.4	1.2	0.4	1.2	
		2.7	0.4		1.4	0.4	1.4	0.4	1.4	
		3	0.6		1.5	0.6	1.5	0.6	1.5	
		3.6	0.8		1.7	0.8	1.7	0.8	1.7	
		4.5								
		5								
V_H	Hysteresis Voltage	1.65	0.1		1.15	0.1	1.15	0.1	1.15	V
		1.95	0.15		1.25	0.15	1.25	0.15	1.25	
		2.3	0.25		1.3	0.25	1.3	0.25	1.3	
		2.5	0.25		1.3	0.25	1.3	0.25	1.3	
		2.7	0.3		1.1	0.3	1.1	0.3	1.1	
		3	0.3		1.2	0.3	1.2	0.3	1.2	
		3.6	0.3		1.2	0.3	1.2	0.3	1.2	
		4.5								
		5								

DC Electrical Characteristics (Continued)

Over operating free-air temperature range; typical values measured at T_A = 25°C (unless otherwise noted)

Symbol	Parameter	Condition		V_{CC} (V)	T_A = 25°C			-40°C ≤ T_A ≤ 85°C		-40°C ≤ T_A ≤ 125°C		Unit
					Min	Typ	Max	Min	Max	Min	Max	
V_{OH}	High −Level Output Voltage	V_I = V_{IH} or V_{IL}	I_{OH} = -100μA	1.65~5.5	V_{CC} - 0.2			V_{CC} - 0.2		V_{CC} - 0.3		V
			I_{OH} = -4mA	1.65	1.29			1.2		1.05		
			I_{OH} = -8mA	2.3	1.9			1.7		1.65		
			I_{OH} = -12mA	2.7	2.2			2.2		2.05		
				3	2.4			2.4		2.25		
			I_{OH} = -24mA	3	2.3			2.2		2		
				5.5	4.8			4.7		4.5		
V_{OL}	Low −Level Output Voltage	V_I = V_{IH} or V_{IL}	I_{OL} = 100μA	1.65~5.5			0.1		0.2		0.3	V
			I_{OL} = 4mA	1.65			0.24		0.45		0.6	
			I_{OL} = 8mA	2.3			0.3		0.7		0.75	
			I_{OL} = 12mA	2.7			0.4		0.4		0.6	
			I_{OL} = 24mA	3			0.55		0.55		0.8	
				5.5			0.55		0.55		0.8	
I_I	Input Leakage Current	V_I = V_{CC} or 0		5.5			±1		±5		±20	μA
I_{CC}	Supply Current	V_I = V_{CC} or 0, I_O = 0mA		5.5			1		10		40	μA
ΔI_{CC}		One Input at V_{CC} - 0.6V, Other Inputs at V_{CC} or GND		1.65~5.5			500		500		5000	μA
C_I	Input Capacitance	V_I = V_{CC} or 0		5.5		5						pF

Switching Characteristics

Over operating free-air temperature range; typical values measured at T_A = 25°C (unless otherwise noted)

Symbol	Parameter	From	To	V_{CC}	T_A = 25°C			-40°C ≤ T_A ≤ 85°C		-40°C ≤ T_A ≤ 125°C		Unit
					Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	Propagation Delay	A or B	Y	1.8V ± 0.15V	1	5	10.5	1	11	1	13	ns
				2.5V ± 0.2V	1	3.4	7.3	1	7.8	1	10	
				2.7V	1	3.6	7.3	1	7.5	1	9.5	
				3.3V ± 0.3V	1	3.2	6.2	1	6.4	1	8	
				5.5V								
$T_{sk(o)}$				3.3V ± 0.3V			1		1		1.5	ns

Operating Characteristics

Over operating free-air temperature range; typical values measured at T_A = 25°C (unless otherwise noted)

Symbol	Parameter	Condition	V_{CC}	Typ	Unit
C_{PD}	Power Dissipation Capacitance (5)	f = 10MHz, No Load	1.8V	11	pF
			2.5V	12	pF
			3.3V	15	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.

AC Test Circuit

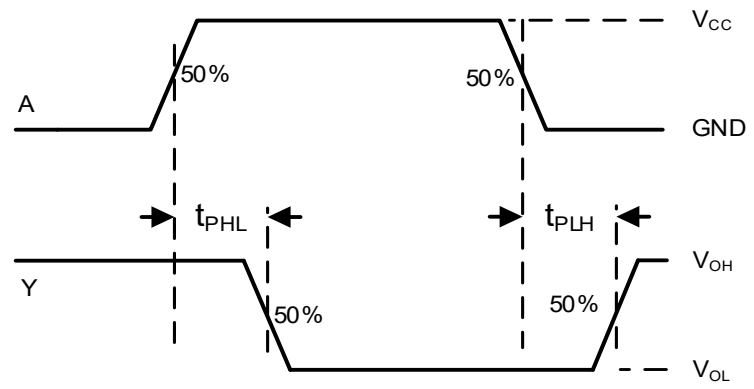


Figure3. Switching Waveform

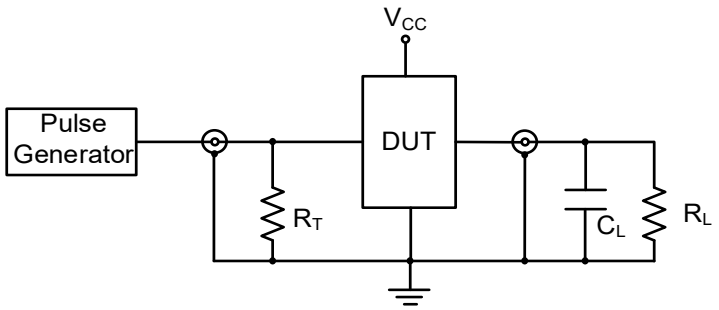


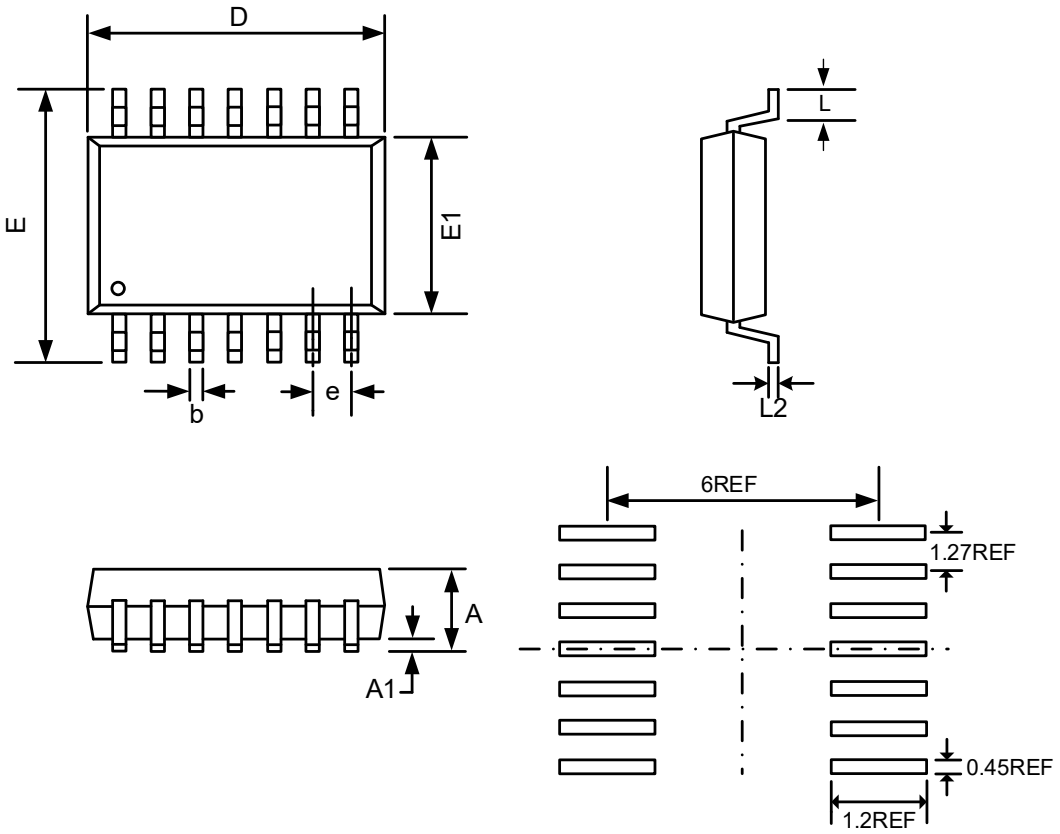
Figure4. Test Circuit

Table1. Measurement Points and Test Data

V_{CC}	Input		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
1.8V ± 0.15V	V_{CC}	≤ 2ns	$V_{CC}/2$	2 × V_{CC}	30pF	1kΩ	0.15V
2.5V ± 0.2V	V_{CC}	≤ 2ns	$V_{CC}/2$	2 × V_{CC}	30pF	500Ω	0.15V
2.7V	2.7V	≤ 2.5ns	1.5V	6V	50pF	500Ω	0.3V
3.3V ± 0.3V	2.7V	≤ 2.5ns	1.5V	6V	50pF	500Ω	0.3V
5.5V	V_{CC}	≤ 2.5ns	$V_{CC}/2$	2 × V_{CC}	50pF	500Ω	0.3V

Package Dimension

SOP14 (3.9mm × 8.65mm)

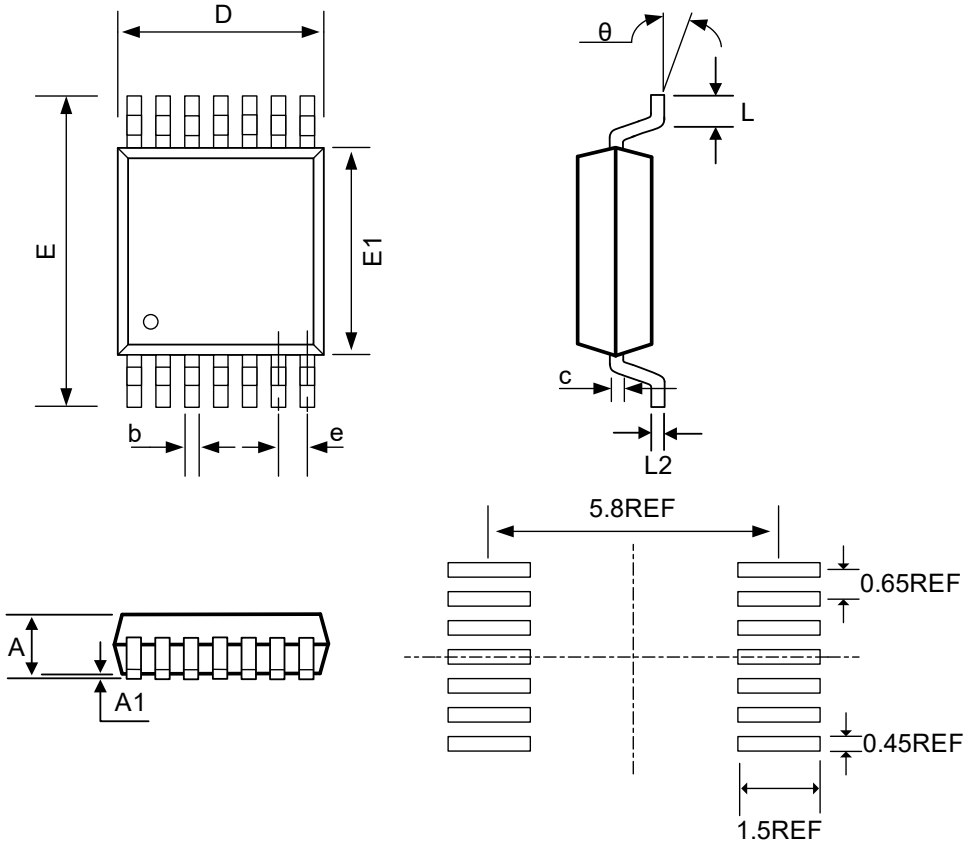


COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	MAX
A	--	1.75
A1	0.10	0.25
b	0.36	0.51
D	8.55	8.75
E	5.80	6.20
E1	3.80	4.00
e	1.22	1.32
L	0.45	0.75
L2	0.25 BSC	

TSSOP14 (4.4mm × 5.0mm)

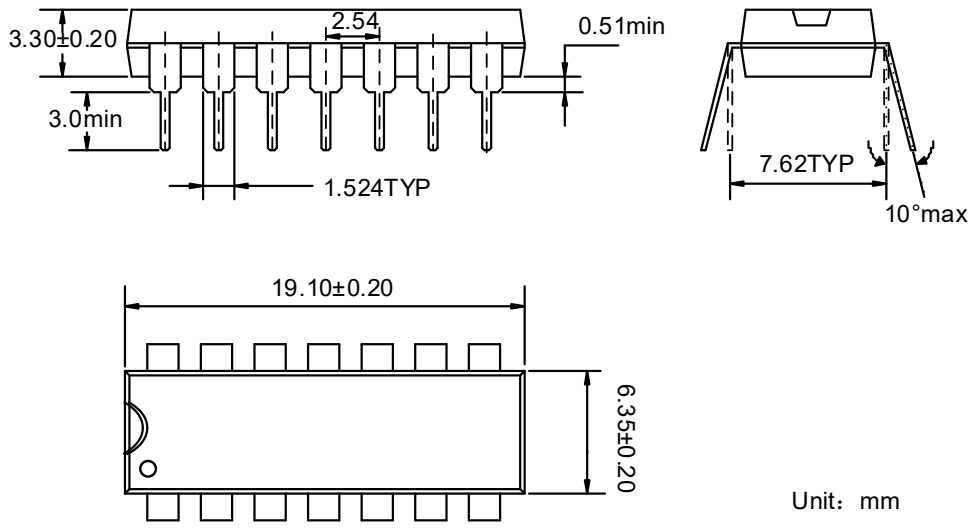


COMMON DIMENSIONS

(Unit: mm)

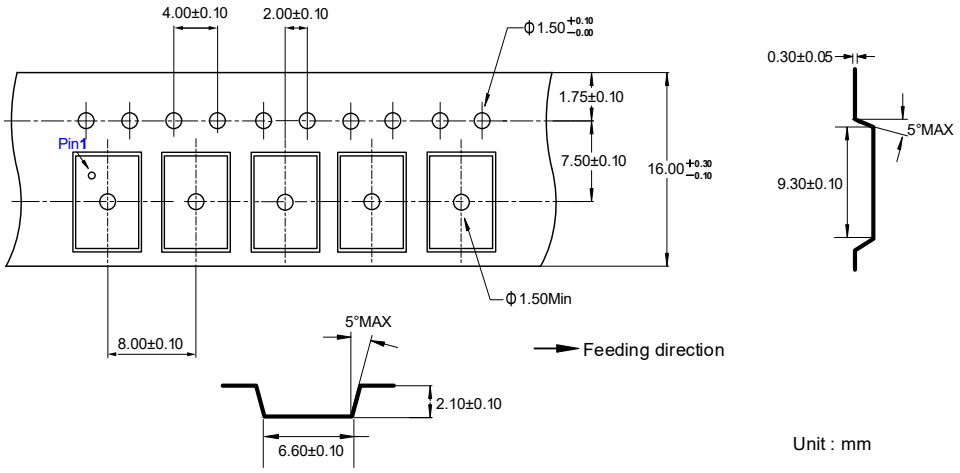
SYMBOL	MIN	MAX
A	--	1.20
A1	0.05	0.15
b	0.19	0.30
c	0.15 REF	
D	4.86	5.10
E	6.20	6.60
E1	4.30	4.50
e	0.65BSC	
L	0.45	0.75
L2	0.25 REF	
θ	0°	8°

DIP14 (19.10mm × 6.35mm)

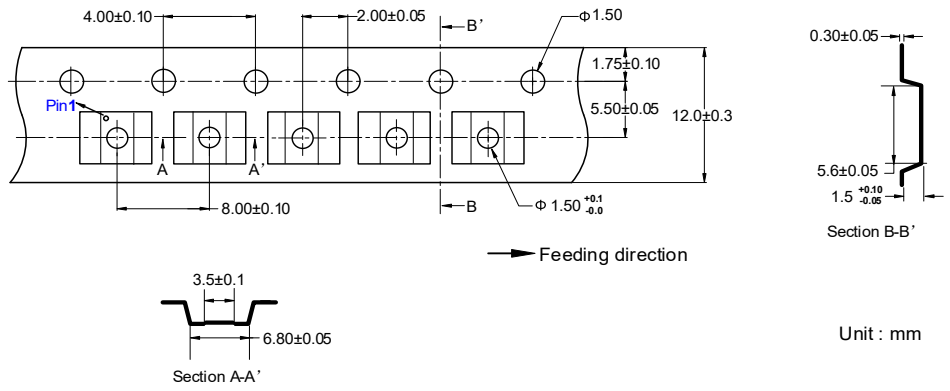


Tape Information

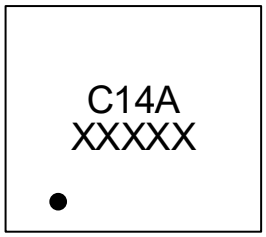
SOP14 (3.9mm × 8.65mm)



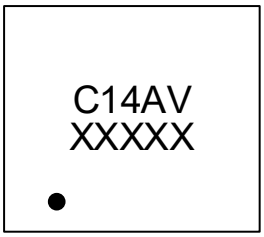
TSSOP14 (4.4mm × 5.0mm)



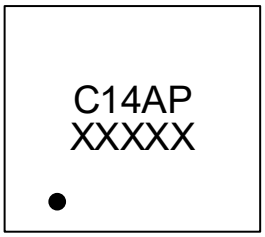
Marking Information



ET74LVC14AM14
C14A= Part Number
XXXXX = Tracking Number



ET74LVC14AV
C14AV = Part Number
XXXXX = Tracking Number



ET74LVC14AP
C14AP = Part Number
XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2026-3-30	Official Version	Xu tao	Yang xiaoxu	Liu jiaying