

## Dual Supply Voltage Level Translator/Transceiver; 3-State

### General Description

The ET74AVCH1T45 is a dual-bit, dual-supply transceiver that enables bidirectional level translation. It features two data input-output ports (A and B), a direction control input (DIR) and dual-supply pins (VCC(A) and VCC(B)). Both VCC(A) and VCC(B) can be supplied at any voltage between 0.8V and 3.6V making the device suitable for translating between any of the low voltage nodes (0.8V, 1.2V, 1.8V and 3.3V). Pin A and DIR are referenced to VCC(A) and pin B are referenced to VCC(B). A HIGH on DIR allows transmission from A to B and a LOW on DIR allows transmission from B to A.

The device is fully specified for partial power-down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing any damaging back-flow current through the device when it is powered down. In Suspend mode when either VCC(A) or VCC(B) are at GND level, both A and B are in the high-impedance OFF-state.

The ET74AVCH1T45 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

### Features

- Wide Supply Voltage Range:
  - V<sub>CC(A)</sub>: 0.8V to 3.6V
  - V<sub>CC(B)</sub>: 0.8V to 3.6V
- High Noise Immunity
- Maximum Data Rates:
  - 500Mbit/s (1.8V to 3.3V Translation)
  - 320Mbit/s (<1.8V to 3.3V Translation)
  - 320Mbit/s (Translate to 2.5V or 1.8V)
  - 280Mbit/s (Translate to 1.5V)
  - 240Mbit/s (Translate to 1.2V)
- Bus Hold on Data Inputs
- Suspend Mode
- Inputs Accept Voltages up to 3.6V
- Low Noise Overshoot and Undershoot < 10% of VCC
- I<sub>OFF</sub> Circuitry Provides Partial Power-down Mode Operation
- ESD Protection Complies with JEDEC Standard
  - HBM: ±4000V Pass (JEDEC JS-001)
  - CDM: ±1500V Pass (JEDEC JS-002)
- Latch-up Performance Exceeds ±100mA per JEDEC JESD78F

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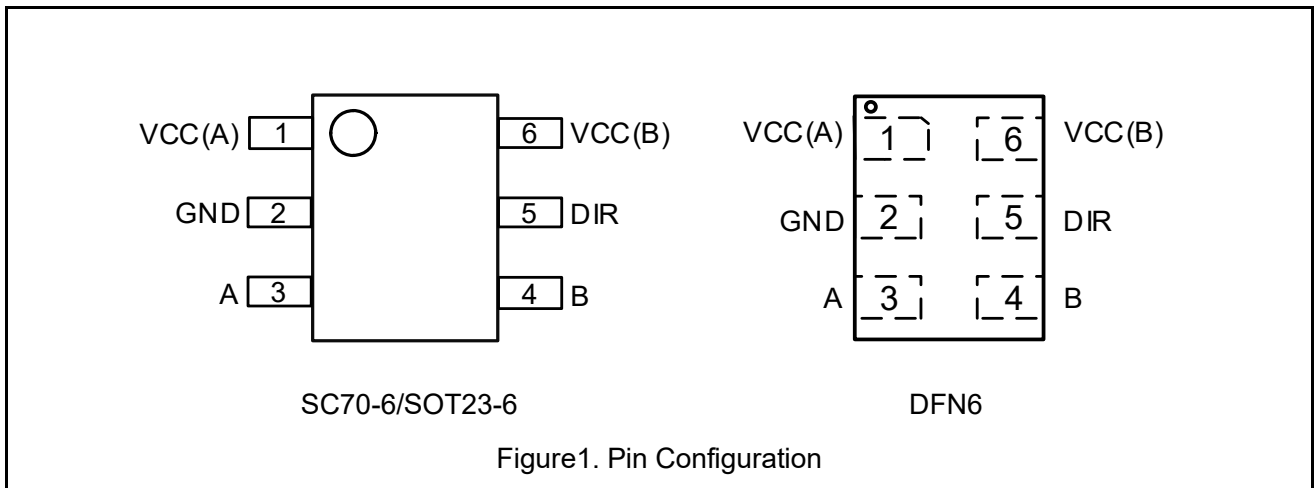
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET74AVCH1T45	SC70-6 (1.3mm × 2.1mm)	Tape and Reel, 3K/Reel	3
ET74AVCH1T45T	SOT23-6 (1.6mm × 2.9mm)	Tape and Reel, 3K/Reel	3
ET74AVCH1T45Y	DFN-6 (1.0mm × 1.45mm)	Tape and Reel, 3K/Reel	1

## Applications

- Personal Electronic
- Industrial Equipment
- Enterprise Infrastructure
- Telecom Equipment

## Pin Configuration



## Pin Function

Pin		I/O	Description
Pin Name	Pin Number		
VCC(A)	1	-	Supply Voltage Pin of A Side (Referenced to pin A and DIR)
GND	2	-	Ground (0V)
A	3	I/O	Data Input or Output
B	4	I/O	Data Input or Output
DIR	5	I	Direction Control
VCC(B)	6	-	Supply Voltage Pin of B Side (Referenced to pin B)

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## Functional Diagram

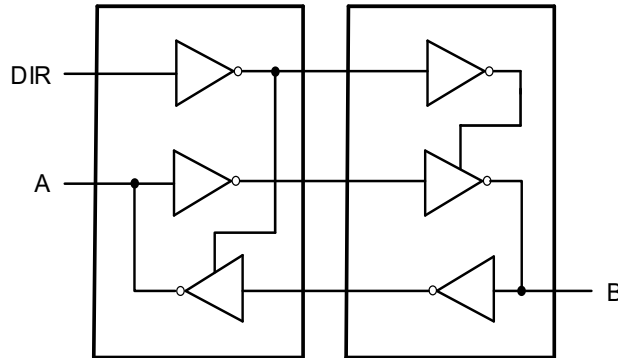


Figure2. Logic symbol

## Functional Description

Supply Voltage	Input	Input/Output <sup>(1)</sup>	
$V_{CC(A)}$ , $V_{CC(B)}$	DIR <sup>(2)</sup>	nA	nB
0.8V to 3.6V	L	A = B	Input
0.8V to 3.6V	H	Input	B = A
GND <sup>(3)</sup>	X	Hi-Z	Hi-Z

**Note1:** The input circuit of the data I/O is always active.

**Note2:** The DIR input circuit is referenced to  $V_{CC(A)}$ .

**Note3:** If at least one of  $V_{CC(A)}$  or  $V_{CC(B)}$  is at GND level, the device goes into suspend mode.

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## Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
$V_{CC(A)}$	Supply Voltage A Side (VCC(A) Pin)		-0.5~4.6	V
$V_{CC(B)}$	Supply Voltage B Side (VCC(B) Pin)		-0.5~4.6	V
$I_{IK}$	Input Clamping Current	$V_I < 0V$	-50	mA
$V_I$	Input Voltage <sup>(4)</sup>		-0.5~4.6	V
$I_{OK}$	Output Clamping Current	$V_O < 0V$	-50	mA
$V_O$	Output Voltage	Active Mode <sup>(4)(5)(6)</sup>	-0.5~ $V_{CCO} + 0.5$	V
		Suspend or 3-state Mode <sup>(4)</sup>	-0.5~4.6	
$I_O$	Output Current	$V_O = 0V$ to $V_{CCO}$	±50	mA
$I_{CC}$	Supply Current	Per $V_{CC(A)}$ or $V_{CC(B)}$ Pin	100	mA
$I_{GND}$	Ground Current	Per GND Pin	-100	mA
$T_{J(MAX)}$	Maximum Junction Temperature		150	°C
$T_{STG}$	Storage Temperature		-65~150	°C

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.

**Note4:** The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.

**Note5:**  $V_{CCO} + 0.5V$  should not exceed 4.6V.

**Note6:**  $V_{CCO}$  is the supply voltage associated with the output port.

## Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	Supply Voltage A Side (VCC(A) Pin)		0.8	3.6	V
$V_{CC(B)}$	Supply Voltage B Side (VCC(B) Pin)		0.8	3.6	
$V_I$	Input Voltage		0	3.6	V
$V_O$	Output Voltage	Active State <sup>(6)</sup>	0	$V_{CCO}$	V
		Suspend or 3-State	0	3.6	
$T_A$	Ambient Temperature		-40	125	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CCI}$ <sup>(7)</sup> = 1.2V to 3.6V		5	ns/V

**Note7:**  $V_{CCI}$  is the supply voltage associated with the input port.

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## Electrical Characteristics

Typical static characteristics at  $T_A = 25^\circ\text{C}$  (unless otherwise noted)<sup>(6)(7)</sup>

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OH}$	High-level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$ $I_O = -1.5\text{mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$		0.69		V
$V_{OL}$	Low-level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$ $I_O = 1.5\text{mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$		0.07		V
$I_I$	Input Leakage Current	DIR Input; $V_I = 0\text{V}$ or $3.6\text{V}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$ to $3.6\text{V}$		$\pm 0.025$	$\pm 0.25$	$\mu\text{A}$
$I_{BHL}^{(8)}$	Bus Hold LOW Current	A or B Port; $V_I = 0.42\text{V}$ ; $V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$		26		$\mu\text{A}$
$I_{BHH}^{(8)}$	Bus Hold HIGH Current	A or B Port; $V_I = 0.78\text{V}$ ; $V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$		-24		$\mu\text{A}$
$I_{BHLO}^{(8)(9)}$	Bus Hold LOW Overdrive Current	$V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$		27		$\mu\text{A}$
$I_{BHHO}^{(8)(9)}$	Bus Hold HIGH Overdrive Current	$V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$		-26		$\mu\text{A}$
$I_{OZ}$	Off-state Output Current	A or B Port; $V_O = 0\text{V}$ or $V_{CCO}$ ; <sup>(6)(10)</sup> $V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$ to $3.6\text{V}$		$\pm 0.5$	$\pm 2.5$	$\mu\text{A}$
$I_{OFF}$	Power-off Leakage Current	A Port; $V_I$ or $V_O = 0\text{V}$ to $3.6\text{V}$ ; $V_{CC(A)} = 0\text{V}$ ; $V_{CC(B)} = 0.8\text{V}$ to $3.6\text{V}$		$\pm 0.1$	$\pm 1$	$\mu\text{A}$
		B Port; $V_I$ or $V_O = 0\text{V}$ to $3.6\text{V}$ ; $V_{CC(B)} = 0\text{V}$ ; $V_{CC(A)} = 0.8\text{V}$ to $3.6\text{V}$		$\pm 0.1$	$\pm 1$	$\mu\text{A}$
$C_I$	Input Capacitance	DIR Input; $V_I = 0\text{V}$ or $3.3\text{V}$ ; $V_{CC(B)} = V_{CC(A)} = 3.3\text{V}$		1.0		pF
$C_{I/O}$	Input / Output Capacitance	A and B Port; $V_O = V_{CCO}$ or GND; $V_{CC(A)} = V_{CC(B)} = 3.3\text{V}$		4.0		pF

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## Electrical Characteristics(continued)

Static characteristics<sup>(6)(7)</sup>

Symbol	Parameter	Conditions	T <sub>A</sub> = -40°C to 85°C		T <sub>A</sub> = -40°C to 125°C		Unit	
			Min	Max	Min	Max		
V <sub>IH</sub>	High-level Input Voltage	Data Input <sup>(7)</sup>						
		V <sub>CCI</sub> = 0.8V	0.7V <sub>CCI</sub>		0.7V <sub>CCI</sub>		V	
		V <sub>CCI</sub> = 1.1V to 1.95V	0.65V <sub>CCI</sub>		0.65V <sub>CCI</sub>			
		V <sub>CCI</sub> = 2.3V to 2.7V	1.6		1.6			
		V <sub>CCI</sub> = 3.0V to 3.6V	2.0		2.0			
		DIR Input					V	
		V <sub>CC(A)</sub> = 0.8V	0.7V <sub>CC(A)</sub>		0.7V <sub>CC(A)</sub>			
		V <sub>CC(A)</sub> = 1.1V to 1.95V	0.65V <sub>CC(A)</sub>		0.65V <sub>CC(A)</sub>			
		V <sub>CC(A)</sub> = 2.3V to 2.7V	1.6		1.6			
		V <sub>CC(A)</sub> = 3.0V to 3.6V	2.0		2.0			
V <sub>IL</sub>	Low-level Input Voltage	Data Input <sup>(7)</sup>						
		V <sub>CCI</sub> = 0.8V		0.3V <sub>CCI</sub>		0.3V <sub>CCI</sub>	V	
		V <sub>CCI</sub> = 1.1V to 1.95V		0.35V <sub>CCI</sub>		0.35V <sub>CCI</sub>		
		V <sub>CCI</sub> = 2.3V to 2.7V		0.7		0.7		
		V <sub>CCI</sub> = 3.0V to 3.6V		0.9		0.9		
		DIR Input					V	
		V <sub>CC(A)</sub> = 0.8V		0.3V <sub>CC(A)</sub>		0.3V <sub>CC(A)</sub>		
		V <sub>CC(A)</sub> = 1.1V to 1.95V		0.35V <sub>CC(A)</sub>		0.35V <sub>CC(A)</sub>		
		V <sub>CC(A)</sub> = 2.3V to 2.7V		0.7		0.7		
		V <sub>CC(A)</sub> = 3.0V to 3.6V		0.9		0.9		
V <sub>OH</sub>	High-level Output Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <sup>(8)</sup>						
		I <sub>O</sub> = -100μA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8V to 3.6V	V <sub>CCO</sub> - 0.1		V <sub>CCO</sub> - 0.1		V
		I <sub>O</sub> = -3mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.2V	0.85		0.85		
		I <sub>O</sub> = -6mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4V	1.05		1.05		
		I <sub>O</sub> = -8mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65V	1.2		1.2		
		I <sub>O</sub> = -9mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3V	1.75		1.75		
		I <sub>O</sub> = -12mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0V	2.3		2.3		

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## Electrical Characteristics(continued)

Symbol	Parameter	Conditions	T <sub>A</sub> = -40°C to 85°C		T <sub>A</sub> = -40°C to 125°C		Unit	
			Min	Max	Min	Max		
V <sub>OL</sub>	Low-level Output Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 100μA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8V to 3.6V		0.1		0.1	V
		I <sub>O</sub> = 3mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.2V		0.25		0.25	
		I <sub>O</sub> = 6mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4V		0.35		0.35	
		I <sub>O</sub> = 8mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65V		0.45		0.45	
		I <sub>O</sub> = 9mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3V		0.55		0.55	
		I <sub>O</sub> = 12mA	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0V		0.7		0.7	
I <sub>I</sub>	Input Leakage Current	DIR Input; V <sub>I</sub> = 0V or 3.6V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8V to 3.6V		±1		±1.5	
I <sub>BHL</sub> <sup>(8)</sup>	Bus Hold LOW Current	A or B port						
		V <sub>I</sub> = 0.49V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4V	15		15		μA
		V <sub>I</sub> = 0.58V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65V	25		25		μA
		V <sub>I</sub> = 0.70V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3V	45		45		μA
		V <sub>I</sub> = 0.80V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.3V	100		90		μA

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## Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	T <sub>A</sub> = -40°C to 85°C		T <sub>A</sub> = -40°C to 125°C		Unit	
			Min	Max	Min	Max		
I <sub>BHH</sub> <sup>(8)</sup>	Bus Hold HIGH Current	A or B port						
		V <sub>I</sub> = 0.91V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4V	-15		-15		μA
		V <sub>I</sub> = 1.07V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65V	-25		-25		μA
		V <sub>I</sub> = 1.60V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3V	-45		-45		μA
		V <sub>I</sub> = 2.00V	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.3V	-100		-100		μA
I <sub>BHLO</sub> <sup>(8)(9)</sup>	Bus Hold LOW Overdrive Current	A or B port						
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4V		125		125		μA
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65V		200		200		μA
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3V		300		300		μA
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.3V		500		500		μA
I <sub>BHHO</sub> <sup>(8)(9)</sup>	Bus Hold HIGH Overdrive Current	A or B port						
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4V		-125		-125		μA
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65V		-200		-200		μA
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3V		-300		-300		μA
		V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.3V		-500		-500		μA
I <sub>oZ</sub>	Off-state Output Current	A or B Port; V <sub>O</sub> = 0V or V <sub>CCO</sub> ;	V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.6V <sup>(6)(10)</sup>		±5		±7.5	μA
I <sub>OFF</sub>	Power-off Leakage Current	A Port; V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V;	V <sub>CC(A)</sub> = 0V; V <sub>CC(B)</sub> = 0.8V to 3.6V		±5		±35	μA
		B Port; V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V;	V <sub>CC(B)</sub> = 0V; V <sub>CC(A)</sub> = 0.8V to 3.6V		±5		±35	

**Note8:** '+/-' represents the direction of the current.

**Note9:** I<sub>BHL</sub>, I<sub>BHH</sub> means the bus hold current; I<sub>BHLO</sub>, I<sub>BHHO</sub> means the minimum overdrive current to flip the level.

**Note10:** For I/O ports, the parameter I<sub>oZ</sub> includes the input leakage current.

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## Electrical Characteristics(continued)

Symbol	Parameter	Conditions	T <sub>A</sub> = -40°C to 85°C		T <sub>A</sub> = -40°C to 125°C		Unit
			Min	Max	Min	Max	
I <sub>CC</sub>	Supply Current	A Port; V <sub>I</sub> = 0V or V <sub>CCI</sub> ; I <sub>O</sub> = 0mA					
		V <sub>CC(A)</sub> = 0.8V to 3.6V; V <sub>CC(B)</sub> = 0.8V to 3.6V		8		11.5	μA
		V <sub>CC(A)</sub> = 3.6V; V <sub>CC(B)</sub> = 0V		8		11.5	μA
		V <sub>CC(A)</sub> = 0V; V <sub>CC(B)</sub> = 3.6V	-2		-8		μA
		B Port; V <sub>I</sub> = 0V or V <sub>CCI</sub> ; I <sub>O</sub> = 0mA					
		V <sub>CC(A)</sub> = 0.8V to 3.6V; V <sub>CC(B)</sub> = 0.8V to 3.6V		8		11.5	μA
		V <sub>CC(A)</sub> = 3.6V; V <sub>CC(B)</sub> = 0V	-2		-8		μA
		V <sub>CC(A)</sub> = 0V; V <sub>CC(B)</sub> = 3.6V		8		11.5	μA
		A Plus B Port (I <sub>CC(A)</sub> + I <sub>CC(B)</sub> ); V <sub>I</sub> = 0V or V <sub>CCI</sub> ; I <sub>O</sub> = 0mA; V <sub>CC(A)</sub> = 0.8V to 3.6V; V <sub>CC(B)</sub> = 0.8V to 3.6V		16		23	μA

## Switching Characteristics

Typical power dissipation capacitance at V<sub>CC(A)</sub> = V<sub>CC(B)</sub> and T<sub>A</sub> = 25°C (unless otherwise noted)<sup>(11)(12)</sup>

Symbol	Parameter	Conditions	V <sub>CC(A)</sub> = V <sub>CC(B)</sub>						Unit
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
C <sub>PD</sub>	Power Dissipation Capacitance	A Port:(Direction A to B); B Port:(Direction B to A)	1	2	2	2	2	2	pF
		A Port:(Direction B to A); B Port:(Direction A to B)	9	11	11	12	14	17	pF

**Note11:** C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

**Note12:** f<sub>i</sub> = 10MHz; V<sub>I</sub> = 0 to V<sub>CC</sub>; t<sub>r</sub> = t<sub>f</sub> = 1ns; C<sub>L</sub> = 0pF; R<sub>L</sub> = ∞Ω.

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## Switching Characteristics (Continued)

Typical switching characteristics at  $V_{CC(A)} = 0.8V$  and  $T_A = 25^\circ C$  (unless otherwise noted)

For test circuit, see [Figure5](#); for wave forms, see [Figure3](#) and [Figure4](#)

Symbol	Parameter	Conditions	$V_{CC(B)}$				Unit
			0.8V	1.2V	1.8V	3.3V	
$t_{pd}$	Propagation Delay	A to B	15.8	8.4	8.0	9.5	ns
		B to A	15.8	12.7	12.2	11.8	ns
$t_{dis}$	Disable Time	DIR to A	23.6	23.6	23.6	23.6	ns
		DIR to B	20.6	15.6	12.7	11.6	ns
$t_{en}$	Enable Time	DIR to A	43.6	33.2	31	30.2	ns
		DIR to B	44.4	38.1	37.6	39.1	ns

Typical switching characteristics at  $V_{CC(B)} = 0.8V$  and  $T_A = 25^\circ C$  (unless otherwise noted)

For test circuit, see [Figure5](#); for wave forms, see [Figure3](#) and [Figure4](#)

Symbol	Parameter	Conditions	$V_{CC(A)}$				Unit
			0.8V	1.2V	1.8V	3.3V	
$t_{pd}$	Propagation Delay	A to B	15.8	12.7	12.2	11.8	ns
		B to A	15.8	8.4	8.0	9.5	ns
$t_{dis}$	Disable Time	DIR to A	23.6	12.4	5.6	3.0	ns
		DIR to B	20.6	19.6	18.6	18.0	ns
$t_{en}$	Enable Time	DIR to A	43.6	34.6	31.0	30.2	ns
		DIR to B	44.4	27.8	22.4	20.0	ns

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## Switching Characteristics: -40°C~85°C (Continued) <sup>(13)(14)</sup>

Symbol	Parameter	Conditions	V <sub>CC(B)</sub>						Unit
			1.2V ± 0.1V		1.8V ± 0.15V		3.3V ± 0.3V		
			Min	Max	Min	Max	Min	Max	
<b>V<sub>CC(A)</sub> = 1.1V to 1.3V</b>									
t <sub>pd</sub>	Propagation Delay	An to Bn	1.0	12.0	0.6	8.8	0.5	7.5	ns
		Bn to An	1.0	12.0	0.7	11.3	0.5	10.5	ns
t <sub>dis</sub>	Disable Time	DIR to An	2.2	14.0	2.2	14.0	2.2	14.0	ns
		DIR to Bn	2.2	13.0	2.0	10.0	2.4	8.0	ns
t <sub>en</sub>	Enable Time	DIR to An	-	35.0	-	33.1	-	31.1	ns
		DIR to Bn	-	34.0	-	30.0	-	29.5	ns
<b>V<sub>CC(A)</sub> = 1.65V to 1.95V</b>									
t <sub>pd</sub>	Propagation Delay	An to Bn	0.5	11.3	0.5	7.5	0.5	6.5	ns
		Bn to An	0.5	10.0	0.5	7.5	0.5	7.1	ns
t <sub>dis</sub>	Disable Time	DIR to An	1.6	10.0	1.6	10.0	1.6	10.0	ns
		DIR to Bn	2.0	11.0	1.4	8.0	1.5	6.0	ns
t <sub>en</sub>	Enable Time	DIR to An	-	34.0	-	32.1	-	30.1	ns
		DIR to Bn	-	28.0	-	26.0	-	24.6	ns
<b>V<sub>CC(A)</sub> = 3.0V to 3.6V</b>									
t <sub>pd</sub>	Propagation Delay	An to Bn	0.5	9.8	0.5	7.1	0.5	5.0	ns
		Bn to An	0.5	7.8	0.5	6.5	0.5	5.0	ns
t <sub>dis</sub>	Disable Time	DIR to An	1.5	6.0	1.5	6.0	1.5	6.0	ns
		DIR to Bn	1.7	9.0	0.6	7.0	1.7	5.5	ns
t <sub>en</sub>	Enable Time	DIR to An	-	31.0	-	28.0	-	27.1	ns
		DIR to Bn	-	26.0	-	24.0	-	23.7	ns

# ET74AVCH1T45

## Switching Characteristics: -40°C~125°C (Continued) <sup>(13)(14)</sup>

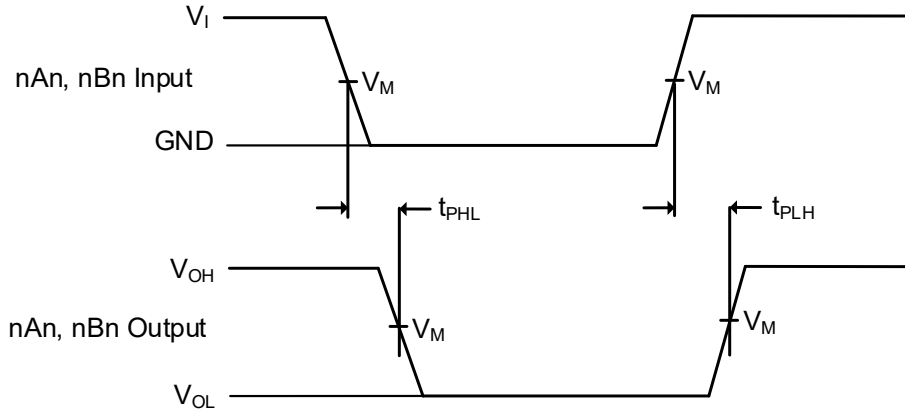
Symbol	Parameter	Conditions	V <sub>CC(B)</sub>						Unit
			1.2V ± 0.1V		1.8V ± 0.15V		3.3V ± 0.3V		
			Min	Max	Min	Max	Min	Max	
<b>V<sub>CC(A)</sub> = 1.1V to 1.3V</b>									
t <sub>pd</sub>	Propagation Delay	An to Bn	1.0	12.0	0.6	8.8	0.5	7.5	ns
		Bn to An	1.0	12.0	0.7	11.3	0.5	10.5	ns
t <sub>dis</sub>	Disable Time	DIR to An	2.2	14.9	2.2	14.9	2.2	14.9	ns
		DIR to Bn	2.2	13.9	2.0	10.9	2.4	8.9	ns
t <sub>en</sub>	Enable Time	DIR to An	-	35.9	-	33.9	-	31.9	ns
		DIR to Bn	-	34.9	-	30.9	-	30.2	ns
<b>V<sub>CC(A)</sub> = 1.65V to 1.95V</b>									
t <sub>pd</sub>	Propagation Delay	An to Bn	0.5	11.3	0.5	7.5	0.5	6.5	ns
		Bn to An	0.5	10.0	0.5	7.5	0.5	7.1	ns
t <sub>dis</sub>	Disable Time	DIR to An	1.6	10.9	1.6	10.9	1.6	10.9	ns
		DIR to Bn	1.8	11.9	1.4	8.9	1.5	6.9	ns
t <sub>en</sub>	Enable Time	DIR to An	-	34.9	-	32.9	-	30.9	ns
		DIR to Bn	-	28.9	-	26.9	-	25.4	ns
<b>V<sub>CC(A)</sub> = 3.0V to 3.6V</b>									
t <sub>pd</sub>	Propagation Delay	An to Bn	0.5	9.8	0.5	7.1	0.5	5.0	ns
		Bn to An	0.5	7.8	0.5	6.5	0.5	5.0	ns
t <sub>dis</sub>	Disable Time	DIR to An	1.5	6.9	1.5	6.9	1.5	6.9	ns
		DIR to Bn	1.7	9.9	0.6	7.9	1.7	6.4	ns
t <sub>en</sub>	Enable Time	DIR to An	-	31.9	-	28.9	-	27.9	ns
		DIR to Bn	-	26.9	-	24.9	-	24.1	ns

**Note13:** t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>; t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>; t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

**Note14:** When testing t<sub>en</sub>, the An or Bn port needs to change its state after the Bn or An port has changed. When testing t<sub>dis</sub>, the An or Bn port does not rely on the output state change of the other port to change.

# ET74AVCH1T45

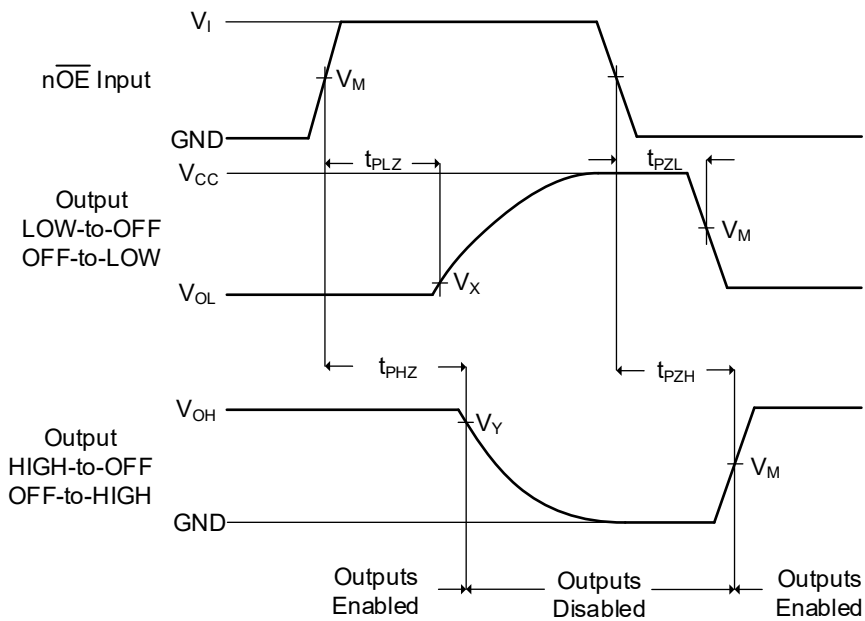
## Test Circuit



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

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

Figure3. The data input (nAn, nBn) to output (nBn, nAn) propagation delay times



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

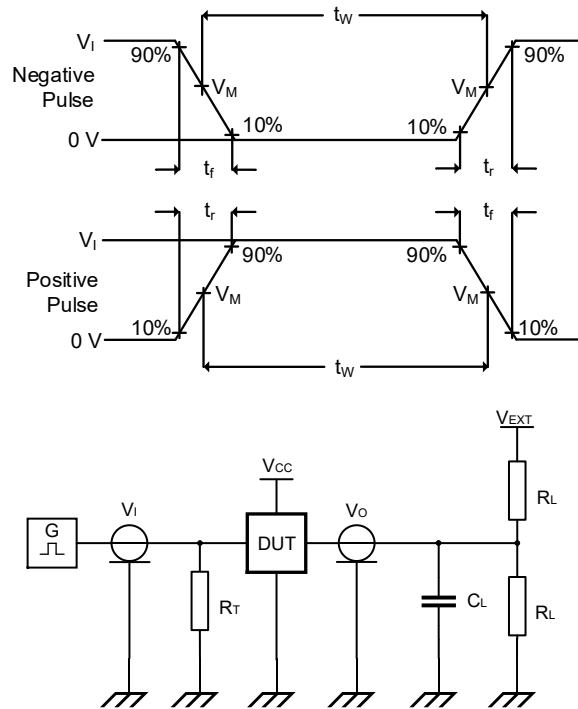
$V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Figure4. Enable and disable times

# ET74AVCH1T45

Table 1. Measurement Points

Supply Voltage	Input	Output		
$V_{CC(A)}, V_{CC(B)}$	$V_M$	$V_M$	$V_X$	$V_Y$
0.8V to 1.6V	$0.5 \times V_{CCI}$	$0.5 \times V_{CCO}$	$V_{OL} + 0.1V$	$V_{OH} - 0.1V$
1.65V to 2.7V	$0.5 \times V_{CCI}$	$0.5 \times V_{CCO}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
3.0V to 3.6V	$0.5 \times V_{CCI}$	$0.5 \times V_{CCO}$	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$



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.

Figure 5. Test circuit for measuring switching times

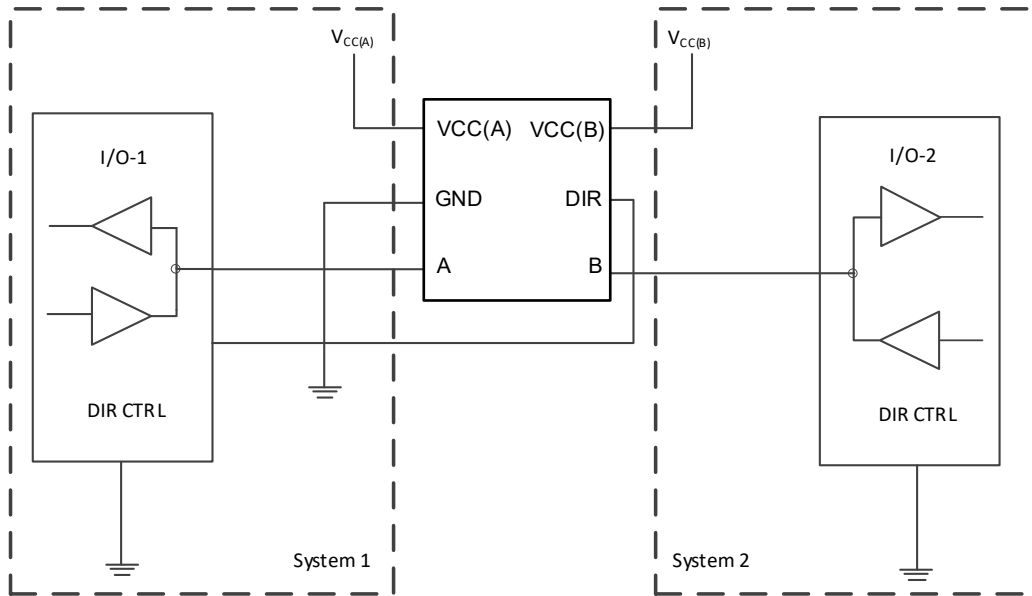
Table 2. Test Data

Supply Voltage	Input		Load		$V_{EXT}$		
$V_{CC(A)}, V_{CC(B)}$	$V_I$	$\Delta t/\Delta V^{(15)}$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
0.8V to 1.6V	$V_{CCI}$	$\leq 1.0ns/V$	15pF	2k $\Omega$	Open	GND	$2 \times V_{CCO}$
1.65V to 2.7V	$V_{CCI}$	$\leq 1.0ns/V$	15pF	2k $\Omega$	Open	GND	$2 \times V_{CCO}$
3.0V to 3.6V	$V_{CCI}$	$\leq 1.0ns/V$	15pF	2k $\Omega$	Open	GND	$2 \times V_{CCO}$

**Note 15:**  $dV/dt \geq 1.0V/ns$

# ET74AVCH1T45

## Application Circuits



Data transmission from System 1 to System 2 and then from System 2 to System 1:

State	DIR Ctrl	IO-1	IO-2	Description
1	H	Output	Input	System 1 data to System 2
2	H	Hi-Z	Hi-Z	System 2 is getting ready to send data to System 1. I/O-1 and I/O-2 are disabled
3	L	Hi-Z	Hi-Z	DIR bit is flipped. I/O-1 and I/O-2 still are disabled
4	L	Input	Output	System 2 data to System 1

Calculate the enable times using the following formulas:

$$t_{PZH}(\text{DIR to A}) = t_{PLZ}(\text{DIR to B}) + t_{PLH}(\text{B to A})$$

$$t_{PZL}(\text{DIR to A}) = t_{PHZ}(\text{DIR to B}) + t_{PHL}(\text{B to A})$$

$$t_{PZH}(\text{DIR to B}) = t_{PLZ}(\text{DIR to A}) + t_{PLH}(\text{A to B})$$

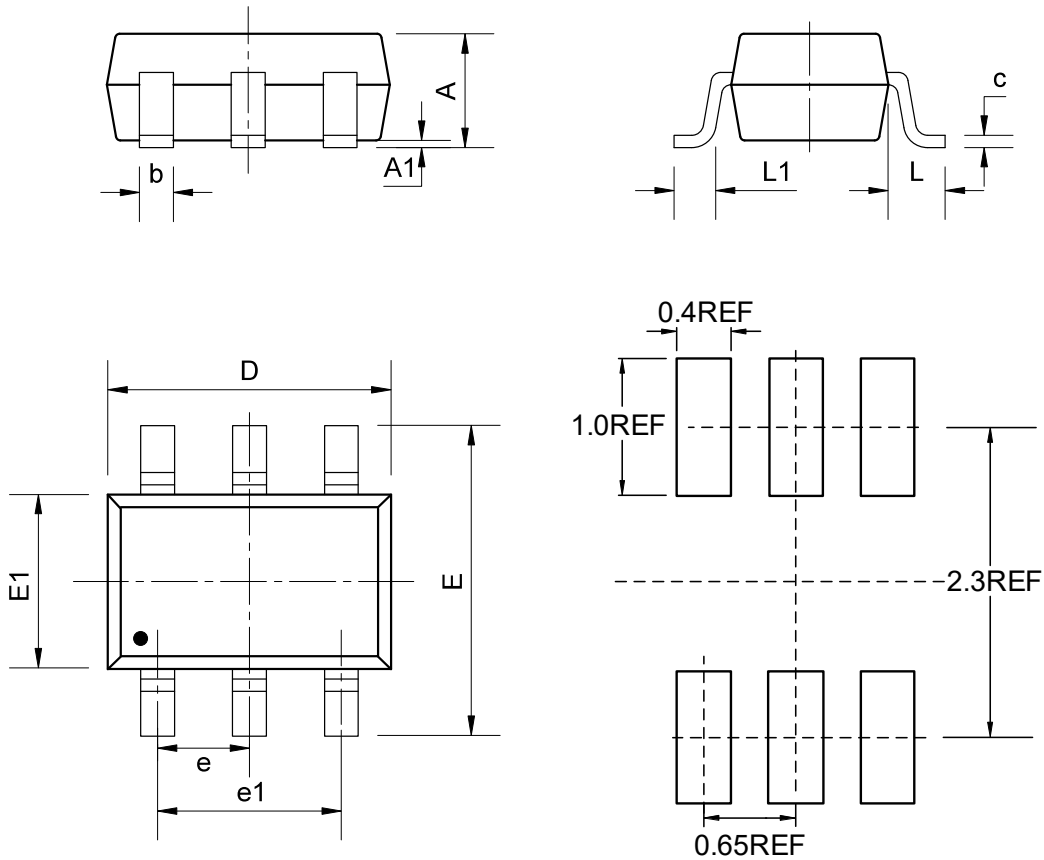
$$t_{PZL}(\text{DIR to B}) = t_{PHZ}(\text{DIR to A}) + t_{PHL}(\text{A to B})$$

Figure6. Application Circuits

# ET74AVCH1T45

## Package Dimension

SC70-6 (1.3mm × 2.1mm)



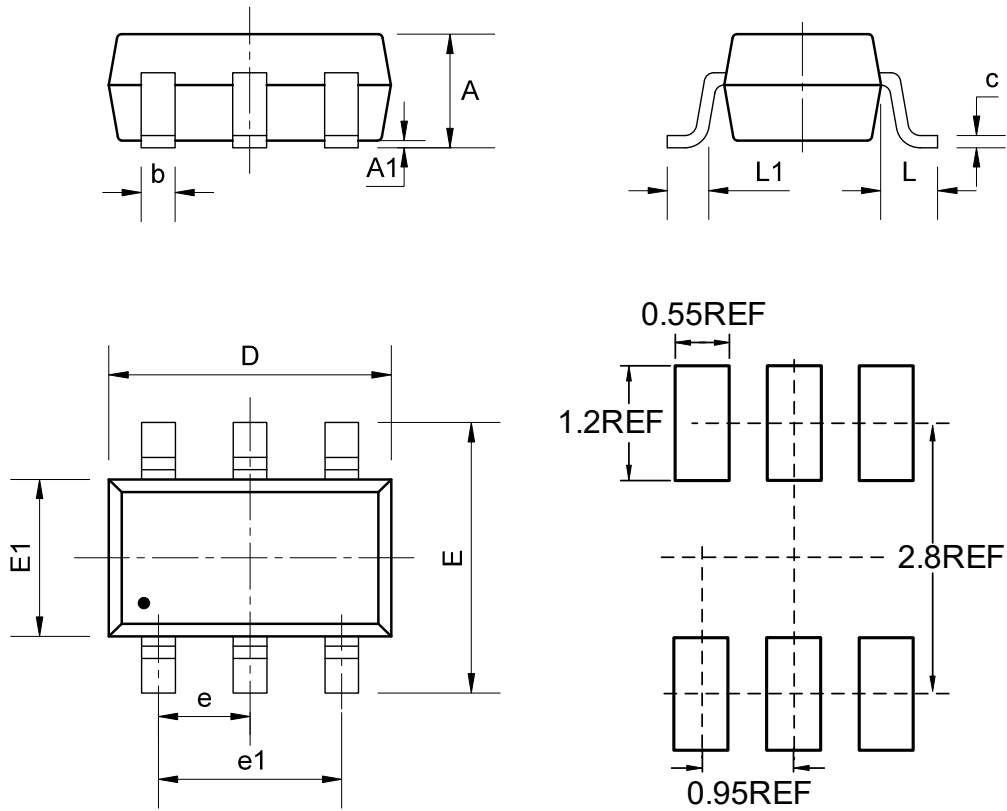
### COMMON DIMENSIONS

(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		

# ET74AVCH1T45

SOT23-6 (1.6mm × 2.9mm)



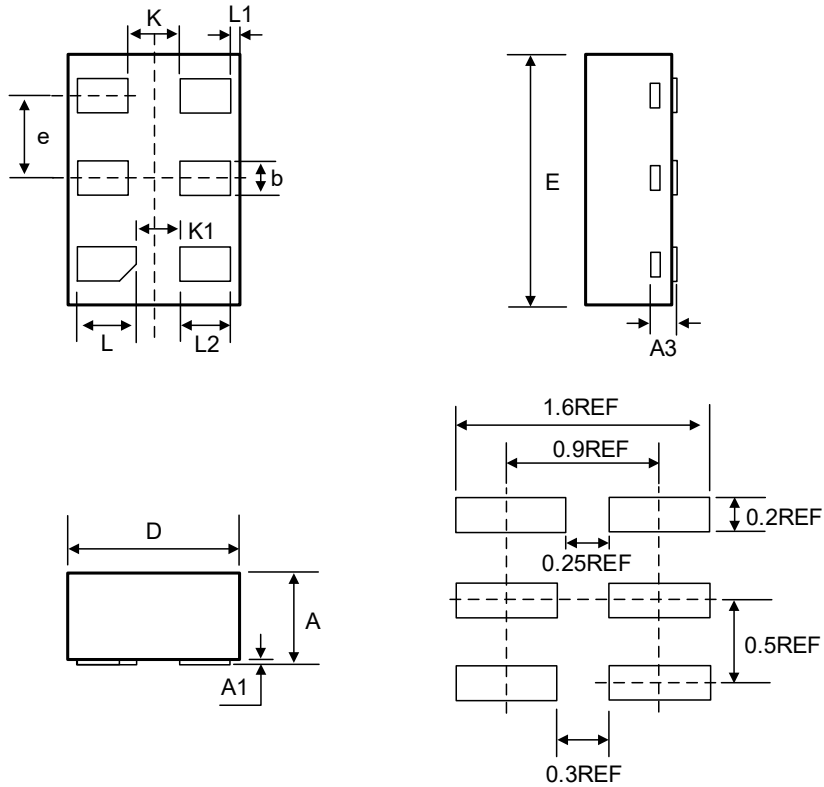
## COMMON DIMENSIONS

(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

# ET74AVCH1T45

DFN6 (1.0mm × 1.45mm)



## COMMON DIMENSIONS

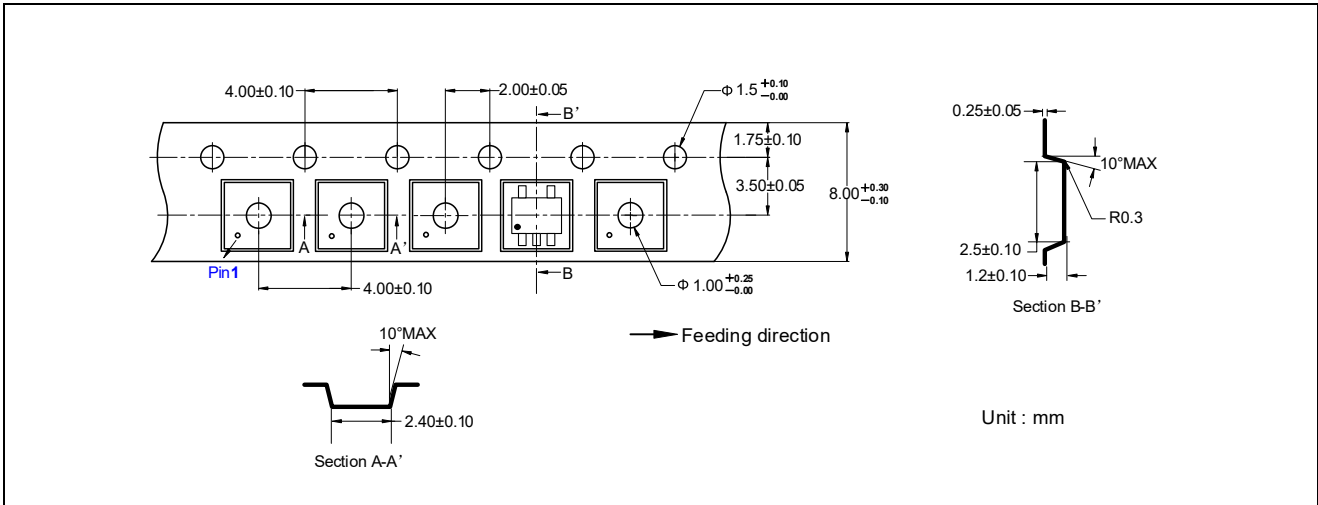
(Unit: mm)

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

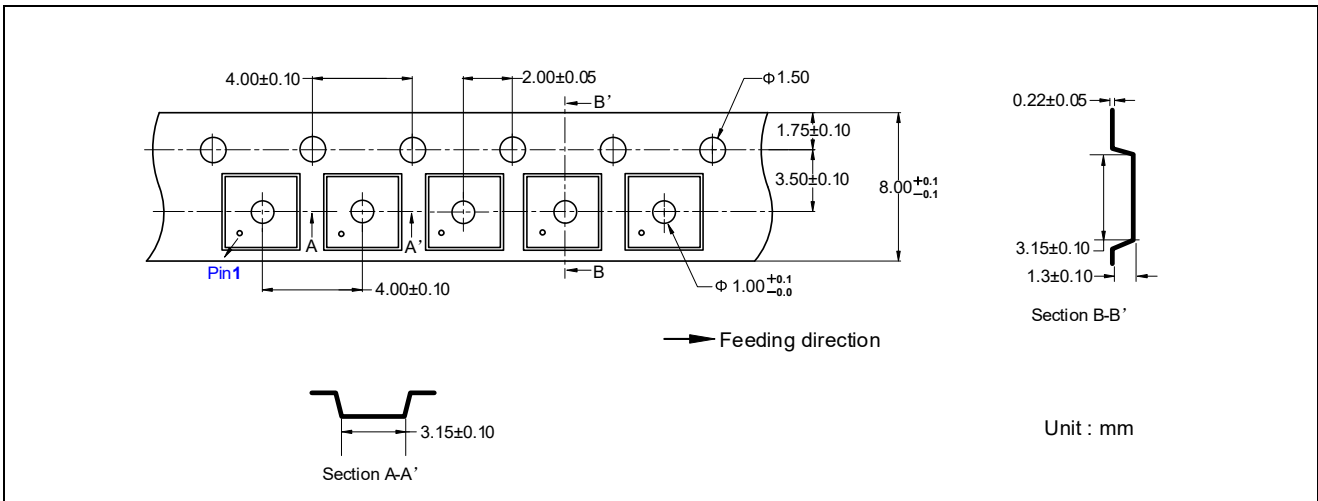
# ET74AVCH1T45

## Tape Information

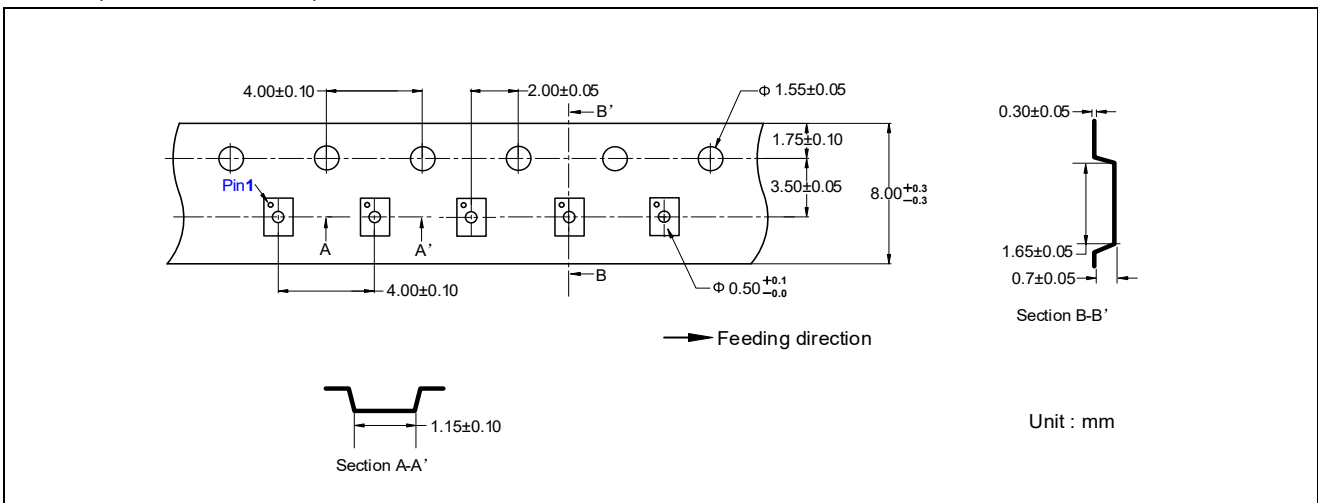
SC70-6 (1.3mm × 2.1mm)



SOT23-6 (1.6mm × 2.9mm)

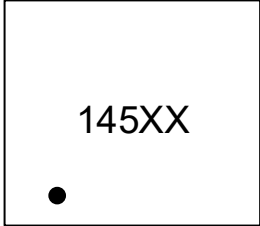
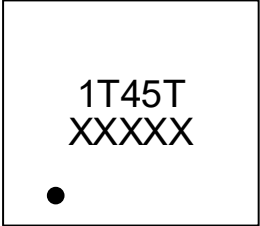
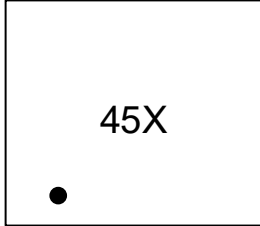


DFN6 (1.0mm × 1.45mm)



# ET74AVCH1T45

## Marking Information

		
ET74AVCH1T45 145 = Part Number XX = Tracking Number	ET74AVCH1T45T 1T45T = Part Number XXXXX = Tracking Number	ET74AVCH1T45Y 45 = Part Number X = Tracking Number

## Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2024-11-03	Preliminary Version	Li cheng	Tu guozhu	Liu jiyang
1.0	2025-03-20	Official Version	Wang anran	Yang xiaoxu	Liu jiyang
1.1	2025-05-14	Update EC Table	Wang anran	Yang xiaoxu	Liu jiyang
1.2	2025-09-24	Add DFN6 Package	Wang qifan	Yang xiaoxu	Liu jiyang
1.3	2025-09-26	Add SOT23-6 Package	Yang xiaoxu	Yang xiaoxu	Liu jiyang
1.4	2025-10-20	Update Format	Wang anran	Yang xiaoxu	Liu jiyang