1. General Description

The EM74HC240; EM74HCT240 are 8-bit inverting buffer/line drivers with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables ($1\overline{OE}$ and $2\overline{OE}$), each controlling four of the 3-state outputs. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

2. Features and Benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- High noise immunity
- CMOS low power dissipation
- Latch-up performance exceeds 250 mA
- Octal bus interface
- Non-inverting 3-state outputs
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- Input levels:
  - For EM74HC240: CMOS level
  - For EM74HCT240: TTL level
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 Class 3A exceeds 6000 V
  - CDM ANSI/ESDA/JEDEC JS-002 Class C3 exceeds 2000 V
- Multiple package options

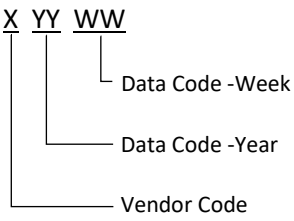
3.Ordering Information

Table 1. Ordering information

Type number	Topside Marking	Package		
		Name	Description	Quantity
EM74HC240D	HC240 XYYWW	SOP-20L	plastic small outline package; 20 leads; body width 7.5 mm	3000
EM74HCT240D	HCT240 XYYWW			
EM74HC240PW	HC240 XYYWW	TSSOP-20L	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	3000
EM74HCT240PW	HCT240 XYYWW			

MARKING INFORMATION

NOTE: XYYWW = Vendor Code and Data Code.



4. Function Diagram

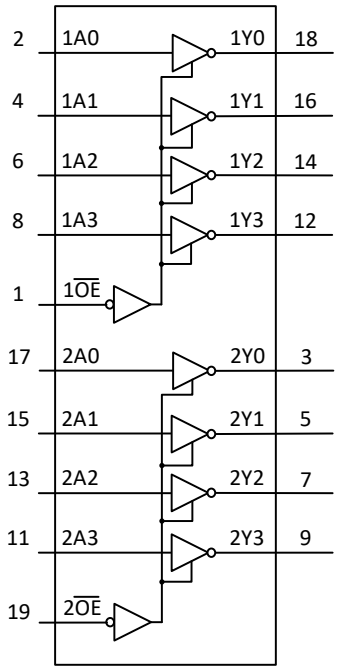


Fig. 1. Functional diagram

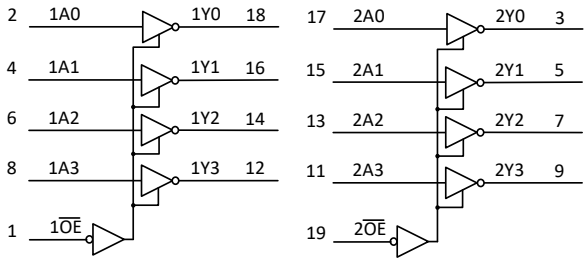


Fig. 2. Logic symbol

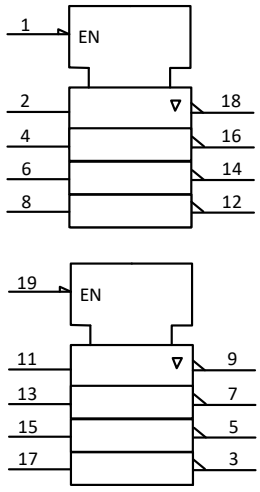


Fig. 3. IEC logic symbol

5.Pinning Information

5.1. Pinning

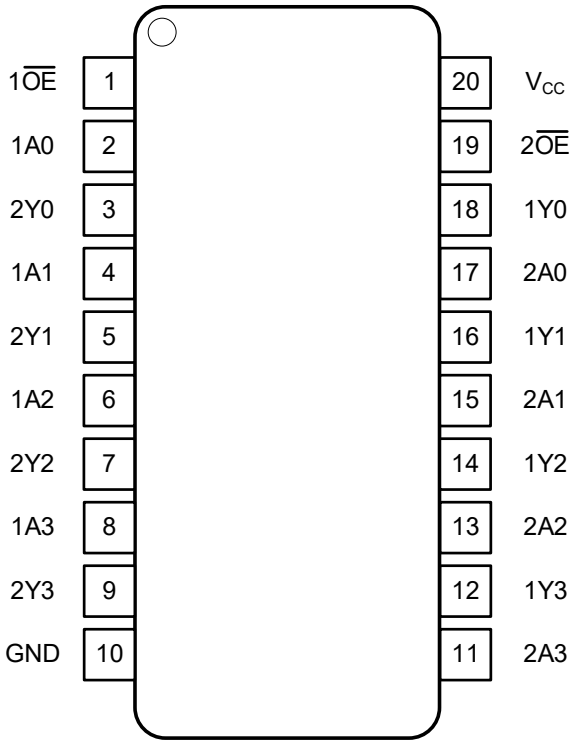


Fig. 4. Top view pin configuration SOP and TSSOP

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1$\overline{OE}$, 2$\overline{OE}$	1, 19	Output enable input(active LOW)
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	Data input
2Y0, 2Y1, 2Y2, 2Y3	3, 5, 7, 9	Bus output
GND	10	Ground (0V)
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	Data input
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	Bus output
V_{CC}	20	Supply voltage

6. Functional Description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Input		Output
$n\overline{OE}$	**nAn**	**nYn**
L	L	H
L	H	L
H	X	Z

7. Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Table 4. Absolute Maximum Ratings

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	7.0	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V [1]		±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1]		±20	mA
I_O	output current	$V_O = -0.5$ V to $(V_{CC} + 0.5$ V)		±25	mA
I_{CC}	supply current			50	mA
I_{GND}	ground current		-50		mA
P_{tot}	total power dissipation			500	mW
T_{stg}	storage temperature		-65	150	°C

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

8. Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. EnergyMath does not recommend exceeding them or designing to Absolute Maximum Ratings.

Table 5. Recommended Operating Conditions

Symbol	Parameter	Conditions	EM74HC240			EM74HCT240			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	2.7	5.0	5.5	V
V_I	input voltage		0		V_{CC}	0		V_{CC}	V
V_O	output voltage		0		V_{CC}	0		V_{CC}	V
T_{amb}	ambient temperature		-40		125	-40		125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 2.0 V			625				ns/V
		V_{CC} = 4.5 V		1.67	139		1.67	139	ns/V
		V_{CC} = 6.0 V			83				ns/V

9.Static Characteristics

Table 6. Static characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V). Typical values measured at T_{amb} = 25°C (unless otherwise noted).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
EM74HC240								
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5			1.5		V
		V_{CC} = 4.5 V	3.15			3.15		V
		V_{CC} = 6.0 V	4.2			4.2		V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V			0.5		0.5	V
		V_{CC} = 4.5 V			1.35		1.35	V
		V_{CC} = 6.0 V			1.8		1.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}						
		I_O = -20 µA; V_{CC} = 2.0 V	1.9			1.9		V
		I_O = -20 µA; V_{CC} = 4.5 V	4.4			4.4		V
		I_O = -20 µA; V_{CC} = 6.0 V	5.9			5.9		V
		I_O = -6.0 mA; V_{CC} = 4.5 V	3.84			3.7		V
		I_O = -7.8 mA; V_{CC} = 6.0 V	5.34			5.2		V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}						
		I_O = 20 µA; V_{CC} = 2.0 V			0.1		0.1	V
		I_O = 20 µA; V_{CC} = 4.5 V			0.1		0.1	V
		I_O = 20 µA; V_{CC} = 6.0 V			0.1		0.1	V
		I_O = 6.0 mA; V_{CC} = 4.5 V			0.33		0.4	V
		I_O = 7.8 mA; V_{CC} = 6.0 V			0.33		0.4	V
I_I	input leakage current	V_I = V_{CC} or GND ; V_{CC} = 6.0 V			±1		±1	µA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL} ; V_{CC} = 6.0 V ; V_O = V_{CC} or GND			±5		±10	µA
I_{CC}	supply current	V_I = V_{CC} or GND ; I_O = 0 A ; V_{CC} = 6.0 V			20		40	µA
C_I	input capacitance	Pin $\overline{OE}$		4.0				pF
		Pin nAn		7.7				pF

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
EM74HCT240								
V_{IH}	HIGH-level input voltage	V_{CC} = 3 V	2.0			2.0		V
		V_{CC} = 4.5 V	2.0			2.0		V
		V_{CC} = 5.5 V	2.1			2.1		V
V_{IL}	LOW-level input voltage	V_{CC} = 3 V			0.7		0.7	V
		V_{CC} = 4.5 V			0.8		0.8	V
		V_{CC} = 5.5 V			0.8		0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL};						
		I_O = -20 µA; V_{CC} = 3 V	2.9			2.9		V
		I_O = -20 µA; V_{CC} = 4.5 V	4.4			4.4		V
		I_O = -6.0 mA; V_{CC} = 4.5 V	3.84			3.7		V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL};						
		I_O = 20 µA; V_{CC} = 3 V			0.1		0.1	V
		I_O = 20 µA; V_{CC} = 4.5 V			0.1		0.1	V
		I_O = 6.0 mA; V_{CC} = 4.5 V			0.33		0.4	V
I_I	input leakage current	V_I = V_{CC} or GND ; V_{CC} = 5.5 V			±1		±1	µA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL} ; V_{CC} = 5.5 V ; V_O = V_{CC} or GND			±5		±10	µA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V			20		40	µA
ΔI_{CC}	additional supply current	per pin ; V_I = V_{CC} - 2.1 V; I_O = 0 A; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V			400		490	µA
C_I	input capacitance	Pin $\overline{OE}$		4.0				pF
		Pin nAn		7.7				pF

10. Dynamic Characteristics

Table 7. Dynamic characteristics

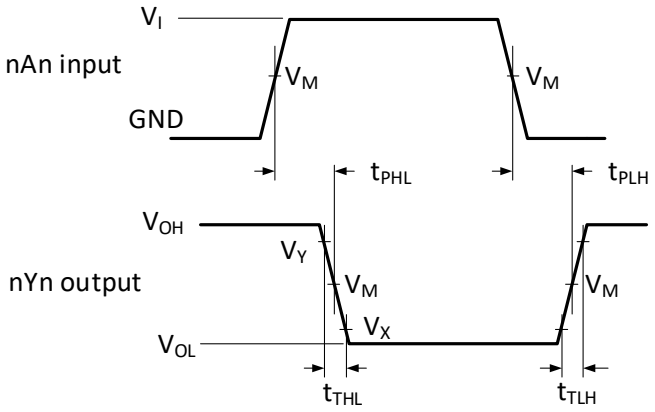
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7. Typical values measured at T_{amb} = 25°C (unless otherwise noted).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
EM74HC240								
t_{pd}	propagation delay	nAn to nYn; see Fig. 5 [1]						
		V_{CC} = 2.0 V			35		40	ns
		V_{CC} = 4.5 V			20		25	ns
		V_{CC} = 6.0 V			15		20	ns
t_{en}	enable time	$n\overline{OE}$ to nYn; see Fig. 6 [2]						
		V_{CC} = 2.0 V			35		40	ns
		V_{CC} = 4.5 V			20		25	ns
		V_{CC} = 6.0 V			15		20	ns
t_{dis}	disable time	$n\overline{OE}$ to nYn; see Fig. 6 [3]						
		V_{CC} = 2.0 V			35		40	ns
		V_{CC} = 4.5 V			20		25	ns
		V_{CC} = 6.0 V			15		20	ns
t_t	transition time	see Fig. 5 [4]						
		V_{CC} = 2.0 V			9		11	ns
		V_{CC} = 4.5 V			6		8	ns
		V_{CC} = 6.0 V			4		5	ns
C_{PD}	power dissipation capacitance	Per buffer ; V_I = GND to V_{CC} [5]		18				pF

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
EM74HCT240								
t_{pd}	propagation delay	nA to nY; V_{CC} = 4.5 V; see Fig. 5 [1]			20		25	ns
t_{en}	enable time	n$\overline{OE}$ to nYn; V_{CC} = 4.5 V; see Fig. 6 [2]			20		25	ns
t_{dis}	disable time	n$\overline{OE}$ to nYn; V_{CC} = 4.5 V; see Fig. 6 [3]			20		25	ns
t_t	transition time	V_{CC} = 4.5 V; see Fig. 5 [4]			6		8	ns
C_{PD}	power dissipation capacitance	per buffer ; V_I = GND to (V_{CC} -1.5 V) [5]		18				pF

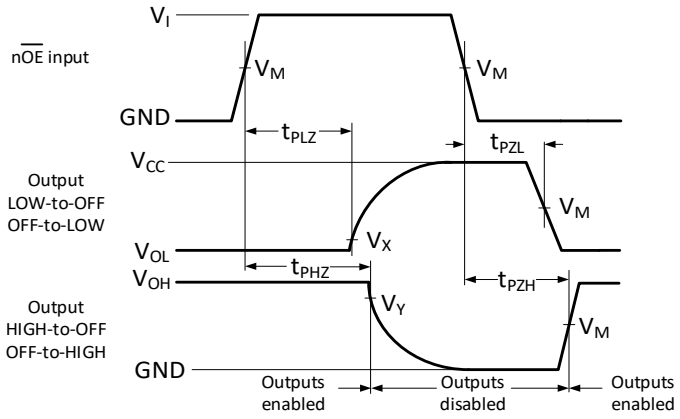
[1] t_{pd} is the same as t_{PHL} and t_{PLH}.
[2] t_{en} is the same as t_{PZH} and t_{PZL}.
[3] t_{dis} is the same as t_{PLZ} and t_{PHZ}.
[4] t_t is the same as t_{THL} and t_{TLH}.
[5] C_{PD} is used to determine the dynamic power dissipation (P_D in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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.

10.1. Waveforms and test circuit



Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 5. The input nAn to output nYn propagation delays

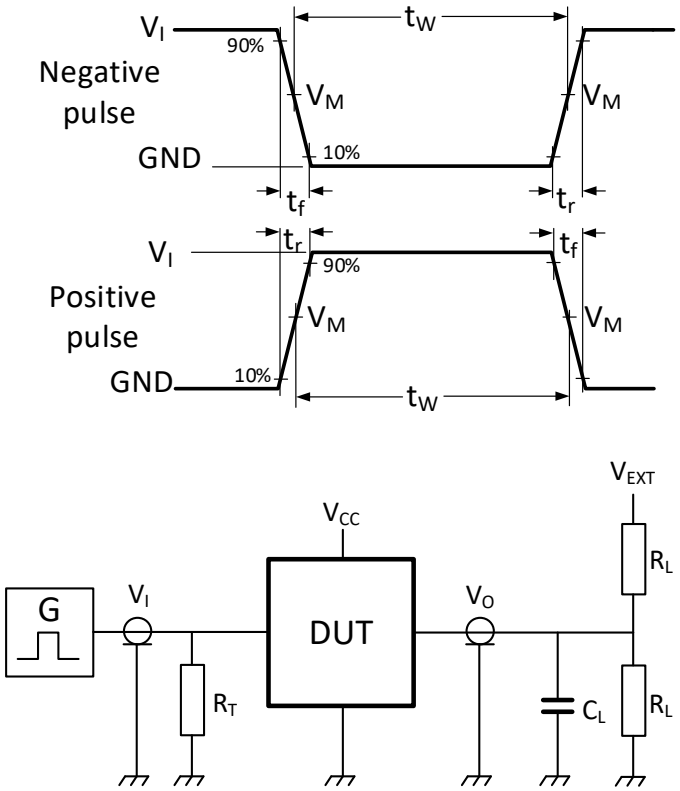


Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 6. 3-state enable and disable times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
EM74HC240	$0.5V_{CC}$	$0.5V_{CC}$	$0.1V_{CC}$	$0.9V_{CC}$
EM74HCT240	1.3 V	1.3 V	$0.1V_{CC}$	$0.9V_{CC}$



Test data is given in Table 9.
Definitions for test circuit:
R_L = Load resistance.
C_L = Load capacitance including jig and probe capacitance.
R_T = Termination resistance should be equal to the output impedance Z_o of the pulse generator.
V_{EXT} = External voltage for measuring switching times.

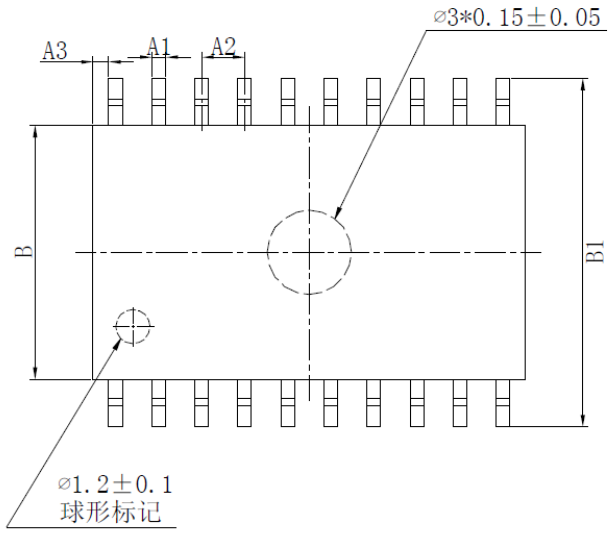
Fig. 7. Test circuit for measuring switching times

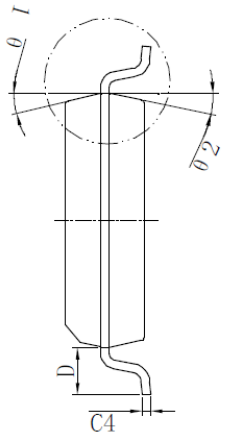
Table 9. Test data

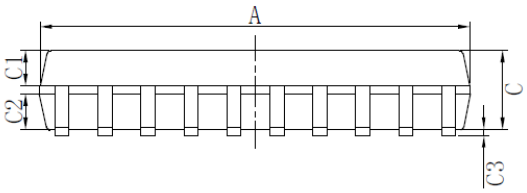
Type	Input		Load		V_{EXT}		
	V_I	$t_r = t_f$	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
EM74HC240	V_{CC}	≤ 2.5 ns	50 pF	500Ω	open	GND	$2V_{CC}$
EM74HCT240	3 V	≤ 2.5 ns	50 pF	500Ω	open	GND	$2V_{CC}$

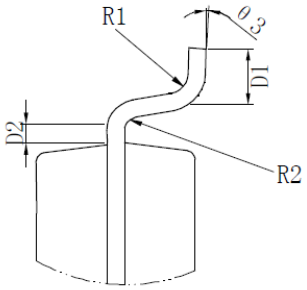
11. Package Outline

SOP-20L



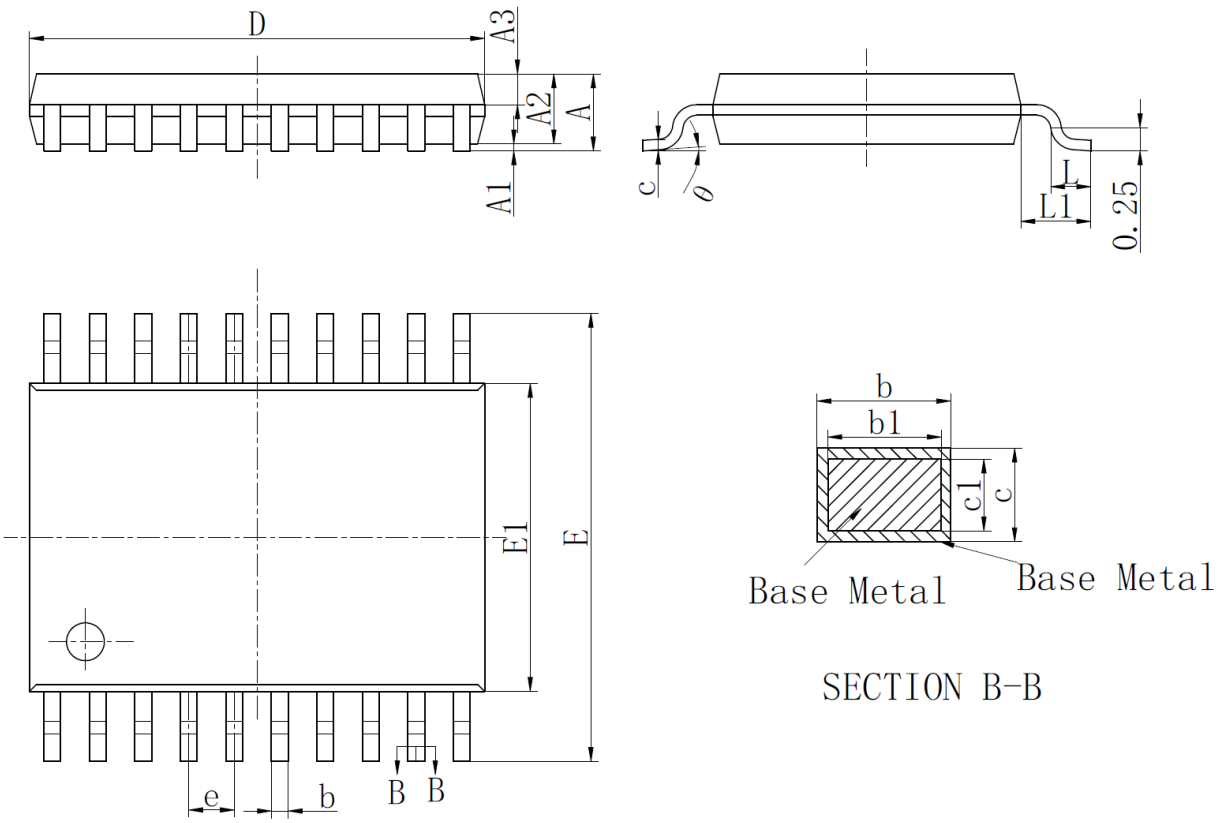






Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min.	Max.		Min.	Max.
A	12.600	12.900	C4	0.246	0.262
A1	0.381	0.431	D	1.353	1.453
A2	1.240	1.300	D1	0.764	0.964
A3	0.450	0.460	D2	0.18TYP	
B	7.400	7.600	R1	0.30TYP	
B1	10.206	10.406	R2	0.20TYP	
C	2.150	2.300	θ1	12° TYP	
C1	0.938	1.038	θ2	12° TYP	
C2	0.938	1.2038	θ3	0° ~ 8°	
C3	0.145	0.205			

TSSOP-20L



Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min.	Max.		Min.	Max.
A	-	1.20	E	6.20	6.60
A1	0.05	0.15	e	0.65BSC	
A2	0.80	1.05	L	0.45	0.75
A3	0.39	0.49	L1	1.00REF	
b	0.20	0.28	θ	0°	8°
b1	0.19	0.25			
c	0.13	0.17			
c1	0.12	0.14			
D	6.40	6.60			
E1	4.30	4.50			

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
CDM	Charged Device Model
TTL	Transistor-Transistor Logic

13. Revision History

Table 11. Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
EM74HC_HCT240 Rev. 1.0	May 22, 2025	Product datasheet		