

Octal buffer/line driver; inverting (3-State)

74AC240
74ACT240

FEATURES

- 74ACT240 has TTL-compatible inputs
- 74AC240 has CMOS-compatible inputs
- 3-State outputs source/sink 24mA
- 3-State outputs drive bus lines or buffer memory address registers
- Meets or exceeds JEDEC standard for 74AC(T)XX family

DESCRIPTION

The 74AC240/74ACT240 is an octal inverting buffer/line driver with 3-State outputs. The 3-State outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH on $n\overline{OE}$ causes the outputs to assume a high impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

The '240' is functionally identical to the '244', but the '240' has inverting outputs.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYPICAL			UNIT
			AC		ACT	
			$V_{CC} = 3.3V$	$V_{CC} = 5.0V$	$V_{CC} = 5.0V$	
t_{PHL}/t_{PLH}	Propagation delay An to Bn; Bn to An	$C_L = 50pF$	4.5	3.2	4.1	ns
C_I	Input capacitance		4.5			pF
C_{PD}	Power dissipation capacitance	$V_I = GND$ to V_{CC} ¹ outputs enabled outputs disabled	26 4		26 3	pF

NOTE:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

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

f_i = input frequency in MHz; C_L = output load capacity in pF;

f_o = output frequency in MHz; V_{CC} = supply voltage in V;

$\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DRAWING NUMBER
20-Pin Plastic SOL	-40°C to +85°C	74AC240D 74ACT240D	74AC240D 74ACT240D	SOT163-1
20-Pin Plastic SSOP Type II	-40°C to +85°C	74AC240DB 74ACT240DB	74AC240DB 74ACT240DB	SOT339-1
20-Pin Plastic TSSOP Type I	-40°C to +85°C	74AC240PW 74ACT240PW	74AC240PW DH 74ACT240PW DH	SOT360-1

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
2, 4, 6, 8	1A0 – 1A3	Data inputs
11, 13, 15, 17	2A0 – 2A3	Data inputs
18, 16, 14, 12	1Y0 – 1Y3	Data outputs
9, 7, 5, 3	2Y0 – 2Y3	Data outputs
1, 19	1 $\overline{OE}$, 2 $\overline{OE}$	Output enables
10	GND	Ground (0V)
20	V_{CC}	Positive supply voltage

FUNCTION TABLE

INPUTS		OUTPUTS
$n\overline{OE}$	nAx	nYx
L	L	H
L	H	L
H	X	Z

H = High voltage level

L = Low voltage level

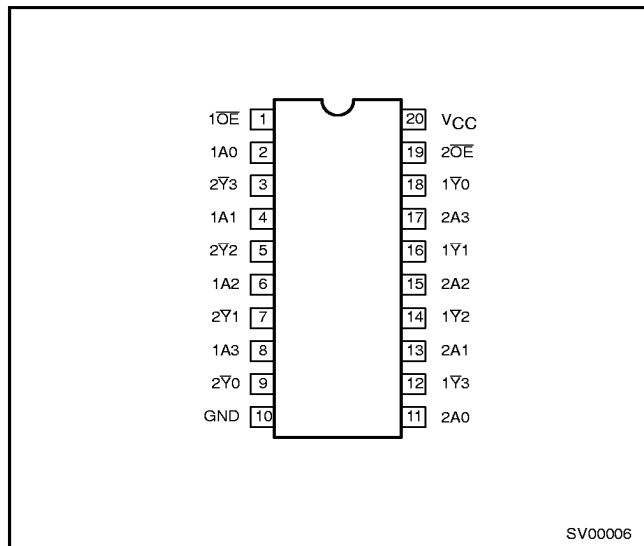
X = Don't care

Z = High impedance "Off" state

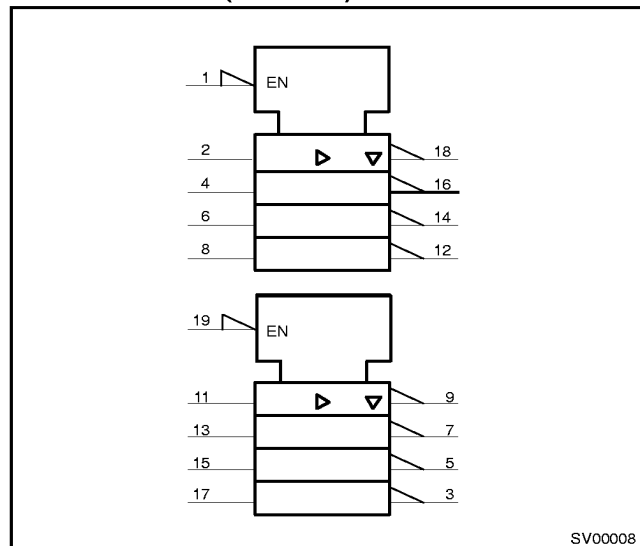
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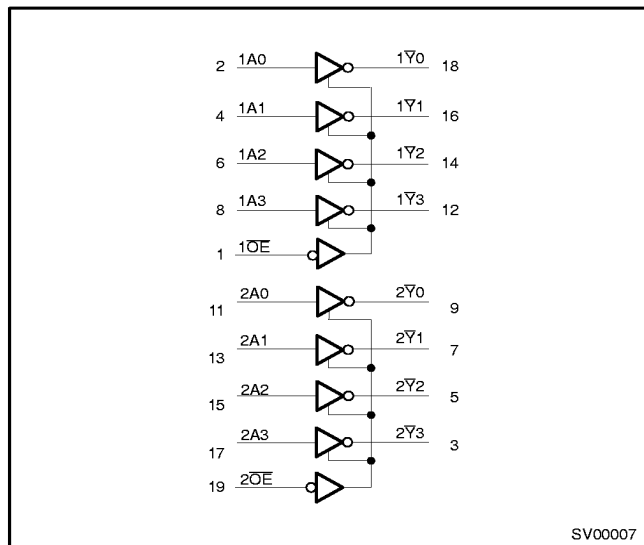
PIN CONFIGURATION



LOGIC SYMBOL (IEEE/IEC)



LOGIC SYMBOL



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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
V_{CC}	DC supply voltage for 'AC	2.0	6.0	V
V_{CC}	DC supply voltage for 'ACT	4.5	5.5	V
V_I	DC input voltage range	0	V_{CC}	V
V_O	DC output voltage range	0	V_{CC}	V
T_{amb}	Operating free-air temperature range	-40	+85	°C
$\Delta V/\Delta t$	Minimum input edge rate — AC devices V_{IN} from 30% to 70% of V_{CC} V_{CC} @ 3.3V, 4.5V, 5.5V	125		mV/ns
	— ACT devices V_{IN} from 0.8V to 2.0V V_{CC} @ 4.5V, 5.5V	125		

ABSOLUTE MAXIMUM RATINGS¹

in accordance with the Absolute Maximum Rating System (IEC134)

Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		-0.5 to +7.0	V
I_{IK}	DC input diode current	$V_I = -0.5V$	-20	mA
		$V_I = V_{CC} + 0.5V$	+20	
V_I	DC input voltage		-0.5 to $V_{CC} + 0.5$	V
I_{OK}	DC output diode current	$V_O = -0.5V$	-20	mA
		$V_O = V_{CC} + 0.5V$	+20	
V_O	DC output voltage		-0.5 to $V_{CC} + 0.5$	V
I_O	DC output source or sink current		± 50	mA
I_{CC}, I_{GND}	DC V_{CC} or GND current per output		± 50	mA
I_{CC}, I_{GND}	DC V_{CC} or GND current		± 200	mA
T_{stg}	Storage temperature range		-65 to 150	°C
P_{TOT}	Power dissipation per package — plastic mini-pack (SO) — plastic shrink mini-pack (SSOP and TSSOP)	above +70°C derate linearly with 8 mW/K	500	mW
		above +60°C derate linearly with 5.5 mW/K	500	

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Octal buffer/line driver; inverting (3-State)

74AC240
74ACT240**DC ELECTRICAL CHARACTERISTICS (74AC240)**

Over recommended operating conditions voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	TEST CONDITIONS	V _{CC} (V)	LIMITS			UNIT
				Temp = -40°C to +85°C			
				MIN	TYP ¹	MAX	
V _{IH}	HIGH level Input voltage	V _{OUT} = 0.1V or (V _{CC} – 0.1V)	3.0	2.1	1.5		V
			4.5	3.15	2.25		
			5.5	3.85	2.75		
V _{IL}	LOW level Input voltage	V _{OUT} = 0.1V or (V _{CC} – 0.1V)	3.0		1.5	0.9	V
			4.5		2.25	1.35	
			5.5		2.75	1.65	
V _{OH}	HIGH level output voltage	I _{OUT} = –50 μA	3.0	2.9	2.99		V
			4.5	4.4	4.49		
			5.5	5.4	5.49		
		V _{IN} = V _{IL} or V _{IH} ; I _{OH} = –12mA ¹	3.0	2.46			V
		V _{IN} = V _{IL} or V _{IH} ; I _{OH} = –24mA ¹	4.5	3.76			
		V _{IN} = V _{IL} or V _{IH} ; I _{OH} = –24mA ¹	5.5	4.76			
V _{OL}	LOW level output voltage	I _{OUT} = 50 μA	3.0		0.01	0.1	V
			4.5		0.01	0.1	
			5.5		0.01	0.1	
		V _{IN} = V _{IL} or V _{IH} ; I _{OL} = 12mA ¹	3.0			0.44	V
		V _{IN} = V _{IL} or V _{IH} ; I _{OL} = 24mA ¹	4.5			0.44	
		V _{IN} = V _{IL} or V _{IH} ; I _{OL} = 24mA ¹	5.5			0.44	
I _{IN}	Input leakage current	V _{IN} = V _{CC} , GND	5.5			± 1.0	μA
I _{OZ}	3-State output OFF-state current	V _{IN} = V _{IL} , V _{IH} V _{OUT} = V _{CC} , GND	5.5			± 2.5	μA
I _{OLD}	Dynamic output current ²	V _{OLD} = 1.65V max	5.5	75			mA
I _{OHD}	Dynamic output current ²	V _{OHD} = 3.85V min	5.5			–75	mA
I _{CC}	Quiescent supply current	V _{IN} = V _{CC} or GND	5.5			40	μA

NOTES:

1. All outputs loaded
2. Maximum test duration 2.0 ms; one output loaded at a time

Octal buffer/line driver; inverting (3-State)

74AC240
74ACT240**DC ELECTRICAL CHARACTERISTICS (74ACT240)**

Over recommended operating conditions voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	TEST CONDITIONS	V _{CC} (V)	LIMITS			UNIT
				Temp = -40°C to +85°C			
				MIN	TYP ¹	MAX	
V _{IH}	HIGH level Input voltage	V _{OUT} = 0.1V or (V _{CC} – 0.1V)	4.5	2.0	1.5		V
			5.5	2.0	1.5		
V _{IL}	LOW level Input voltage	V _{OUT} = 0.1V or (V _{CC} – 0.1V)	4.5		1.5	0.8	V
			5.5		1.5	0.8	
V _{OH}	HIGH level output voltage	I _{OUT} = –50 μA	4.5	4.4	4.49		V
			5.5	5.4	5.49		
		V _{IN} = V _{IL} or V _{IH} ; I _{OH} = –24mA ¹	4.5	3.76	3.86		V
			5.5	4.76	4.86		
V _{OL}	LOW level output voltage	I _{OUT} = 50 μA	4.5		0.01	0.1	V
			5.5		0.01	0.1	
		V _{IN} = V _{IL} or V _{IH} ; I _{OL} = 24mA ¹	4.5			0.44	V
			5.5			0.44	
I _{IN}	Input leakage current	V _{IN} = V _{CC} , GND	5.5			± 1.0	μA
I _{OZ}	3-State output OFF-state current	V _{IN} = V _{IL} , V _{IH} V _{OUT} = V _{CC} , GND	5.5			± 2.5	μA
ΔI _{CC}	Additional quiescent supply current per input pin	V _{IN} = V _{CC} – 2.1V Other inputs at V _{CC} or GND; I _{OUT} = 0	5.5			1.5	mA
I _{OLD}	Dynamic output current ²	V _{OLD} = 1.65V max	5.5	75			mA
I _{OHD}	Dynamic output current ²	V _{OHD} = 3.85V min	5.5			–75	mA
I _{CC}	Quiescent supply current	V _{IN} = V _{CC} or GND	5.5			40	μA

NOTES:

1. All outputs loaded
2. Maximum test duration 2.0ms, one output loaded at a time

Octal buffer/line driver; inverting (3-State)

74AC240
74ACT240**AC CHARACTERISTICS FOR 74AC240**GND = 0V; $t_r = t_f = 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$; .

SYMBOL	PARAMETER	V _{CC} ¹	LIMITS						UNIT	WAVEFORM
			T _{amb} = +25°C			T _{amb} = −40°C to +85°C				
			MIN	TYP	MAX	MIN	MAX			
t _{PLH}	Propagation delay I _n to Y _n	3.3 5.0	2.0 1.5	4.5 3.2	7.5 5	1.5 1.0	8.5 6	ns	1, 3	
t _{PHL}	Propagation delay I _n to Y _n	3.3 5.0	2.0 1.5	4.4 3.2	7.5 5	1.5 1.0	8.5 6	ns	1, 3	
t _{PZH}	3-State output enable time OE to Y _n	3.3 5.0	2.0 1.5	4.6 3.3	9.5 6.5	1.5 1.0	11 7.5	ns	2, 3	
t _{PZL}	3-State output enable time OE to Y _n	3.3 5.0	2.0 1.5	5.8 4.1	9.5 6.5	1.5 1.0	11 7.5	ns	2, 3	
t _{PHZ}	3-State output disable time OE to Y _n	3.3 5.0	2.0 1.5	5 3.3	9.5 6.5	1.5 1.0	10.5 7.5	ns	2, 3	
t _{PLZ}	3-State output disable time OE to Y _n	3.3 5.0	2.0 1.5	4.4 3	9.5 6.5	1.5 1.0	10.5 7.5	ns	2, 3	

NOTE:

1. Voltage range 3.3V is $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$
Voltage range 5.0V is $V_{CC} = 5.0\text{V} \pm 0.5\text{V}$

AC CHARACTERISTICS FOR 74ACT240GND = 0V; $t_r = t_f = 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$; .

SYMBOL	PARAMETER	V _{CC} ¹	LIMITS					UNIT	WAVEFORM
			T _{amb} = +25°C			T _{amb} = −40°C to +85°C			
			MIN	TYP	MAX	MIN	MAX		
t _{PLH}	Propagation delay I _N to Y _N	5.0	2.0	4.1	7.5	1.5	8.5	ns	1, 3
t _{PHL}	Propagation delay I _N to Y _N	5.0	2.0	4.1	7.5	1.5	8.5	ns	1, 3
t _{PZH}	3-State output enable time OE to Y _N	5.0	2.0	4.2	8.5	1.5	9.5	ns	2, 3
t _{PZL}	3-State output enable time OE to Y _N	5.0	2.0	5	8.5	1.5	9.5	ns	2, 3
t _{PHZ}	3-State output disable time OE to Y _N	5.0	2.0	4.4	8	1.5	9	ns	2, 3
t _{PLZ}	3-State output disable time OE to Y _N	5.0	2.0	4	8	1.5	9	ns	2, 3

NOTE:

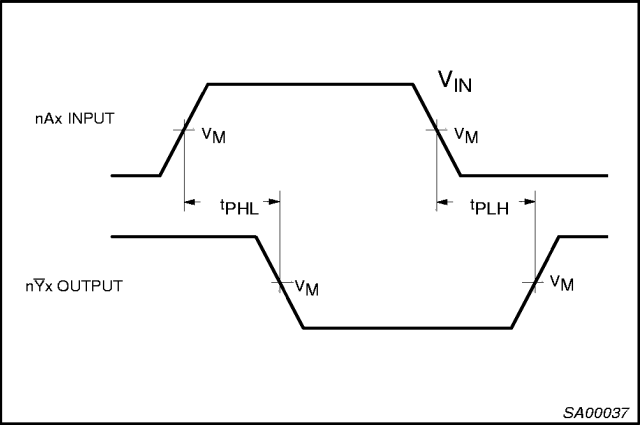
1. These values are at $V_{CC} = 5.0\text{V} \pm 0.5\text{V}$

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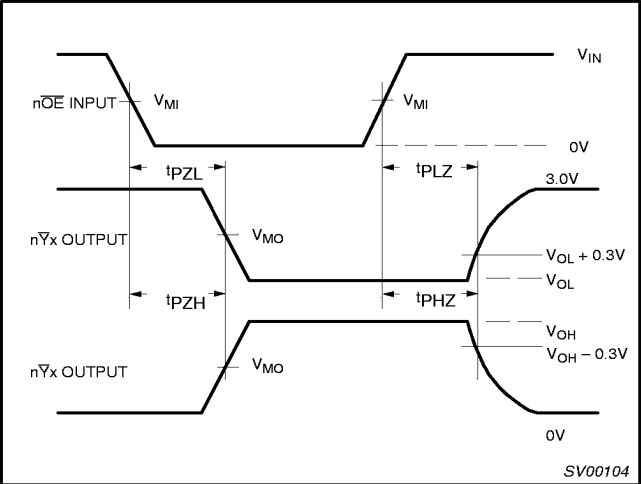
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AC WAVEFORMS

$V_{MI} = 50\% V_{CC}$ for 'AC' devices; 1.5V for 'ACT' devices
 $V_M = 50\% V_{CC}$ for 'AC'/ACT devices

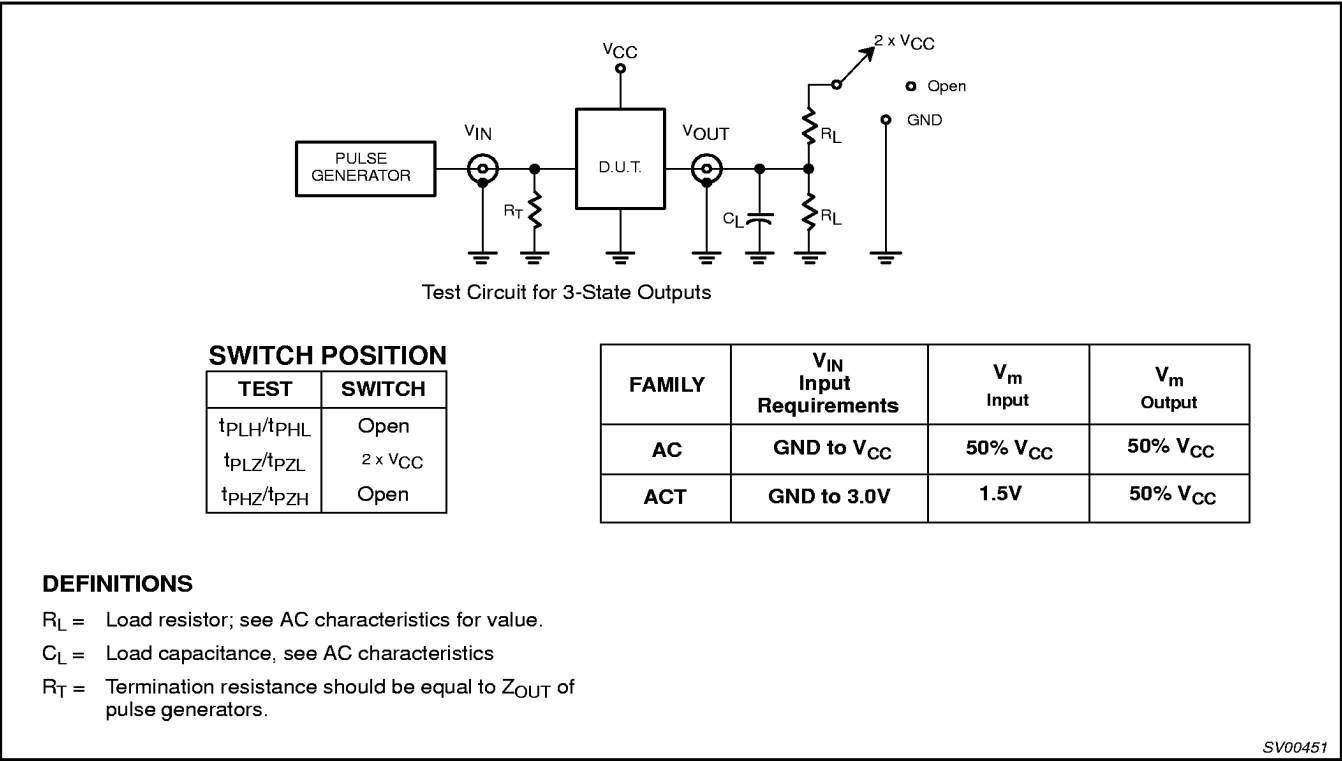


Waveform 1. Input (nAx) to Output (nYx) Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT



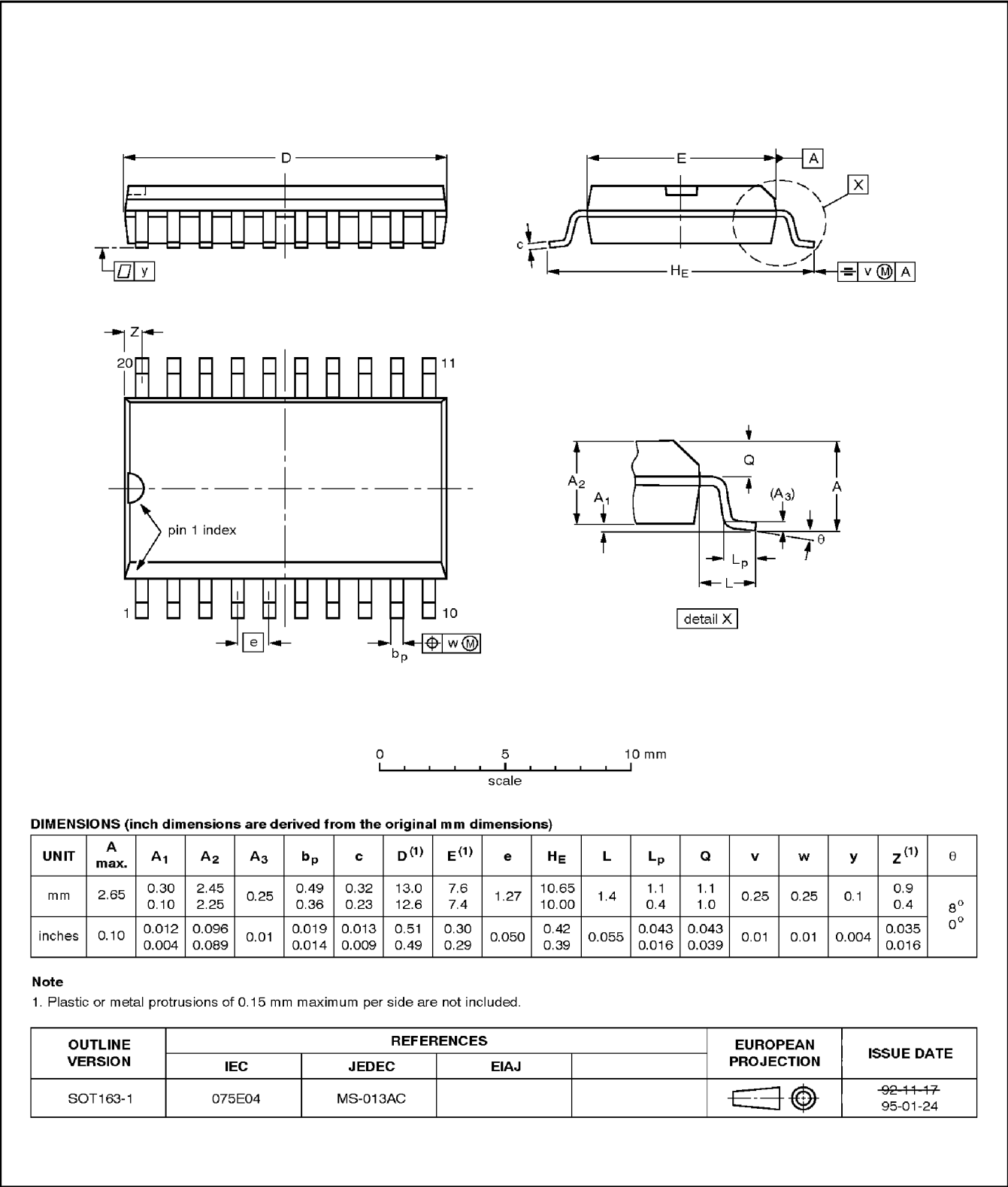
Waveform 3. Load circuitry for switching times.

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SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

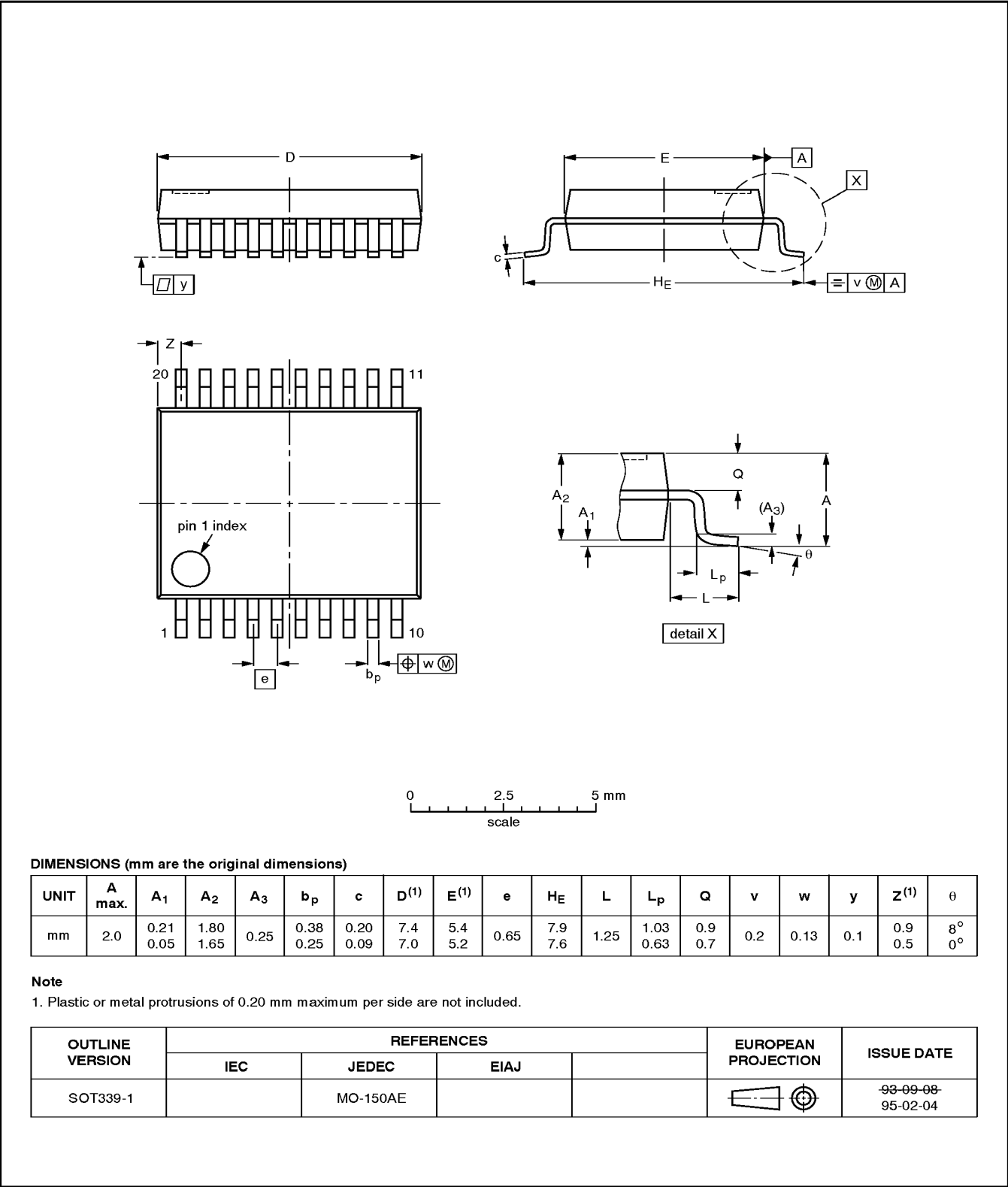


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SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



Octal buffer/line driver; inverting (3-State)

74AC240
74ACT240

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

