

Octal transceiver with direction pin (3-State)

74AC245
74ACT245

FEATURES

- 74ACT245 has TTL-compatible inputs
- 74AC245 has CMOS-compatible inputs
- 3-State outputs source/sink 24mA
- Non-inverting buffers, bidirectional data path
- Meets or exceeds JEDEC standard for 74AC(T)XX family
- Superior ground bounce noise immunity

DESCRIPTION

The 74AC245/74ACT245 is an octal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The '245' features an output enable ($\overline{OE}$) input for easy cascading and a send/receive (DIR) input for direction control. $\overline{OE}$ controls the outputs so that the buses are effectively isolated.

The '245' is functionally identical to the '640', but the '640' has true (non-inverting) outputs.

QUICK REFERENCE DATA

GND = 0V; $T_{amb} = 25^{\circ}\text{C}$; $t_r = t_f \leq 2.5 \text{ ns}$

SYMBOL	PARAMETER	CONDITIONS	TYPICAL			UNIT
			AC		ACT	
			$V_{CC} = 3.3\text{V}$	$V_{CC} = 5.0\text{V}$	$V_{CC} = 5.0\text{V}$	
t_{PHL}/t_{PLH}	Propagation delay An to Bn; Bn to An	$C_L = 50\text{pF}$	4.4	3.3	4.3	ns
C_I	Input capacitance		4.5			pF
C_{PD}	Power dissipation capacitance per transceiver	$V_I = \text{GND to } V_{CC}^1$ outputs enabled outputs disabled	31 5.5		30 4	pF

NOTES:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW)
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ 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;
 $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

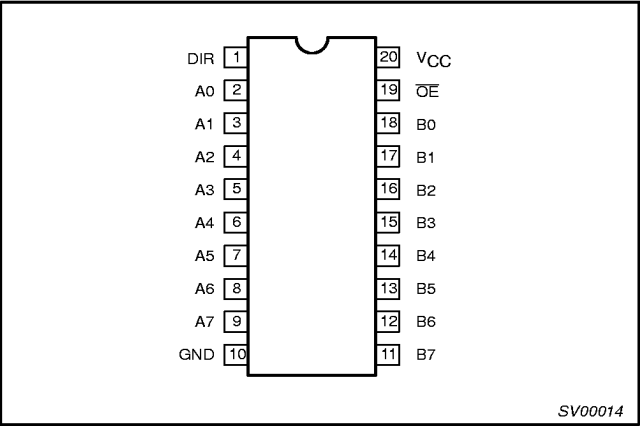
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
20-Pin Plastic SO	-40°C to $+85^{\circ}\text{C}$	74AC245 D 74ACT245 D	74AC245 D 74ACT245 D	SOT163-1
20-Pin Plastic SSOP Type II	-40°C to $+85^{\circ}\text{C}$	74AC245 DB 74ACT245 DB	74AC245 DB 74ACT245 DB	SOT339-1
20-Pin Plastic TSSOP Type I	-40°C to $+85^{\circ}\text{C}$	74AC245 PW 74ACT245 PW	74AC245PW DH 74ACT245PW DH	SOT360-1

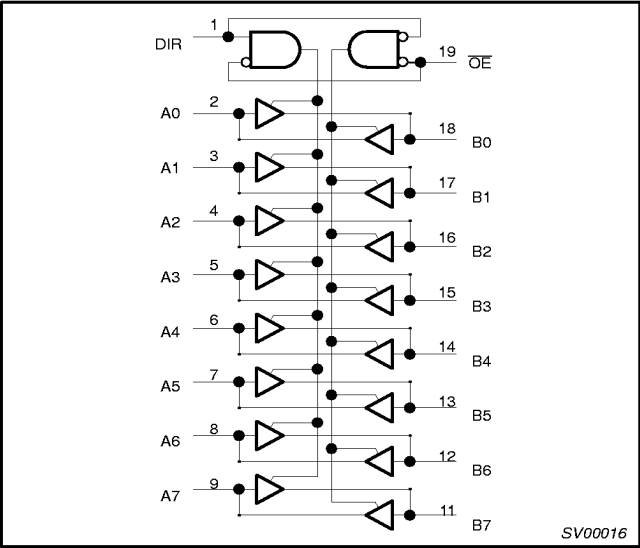
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PIN CONFIGURATION



LOGIC SYMBOL



PIN DESCRIPTION

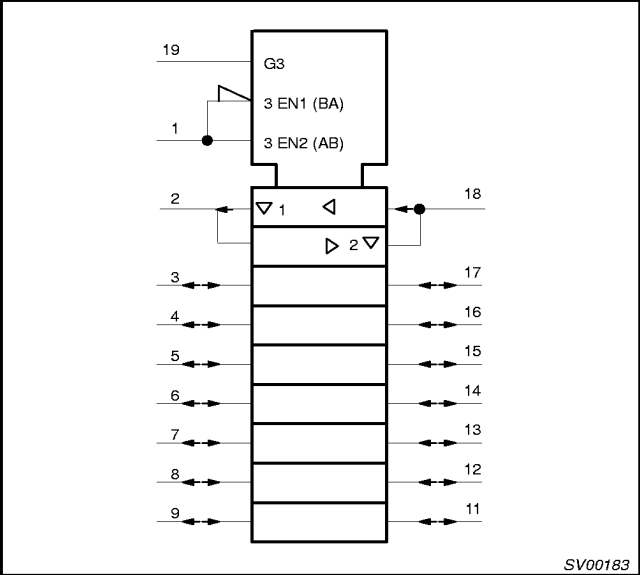
PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	DIR	Direction control input
2, 3, 4, 5, 6, 7, 8, 9	A0 – A7	Data inputs/outputs (A side)
18, 17, 16, 15, 14, 13, 12, 11	B0 – B7	Data inputs/outputs (B side)
19	$\overline{OE}$	Output enable input (active–Low)
10	GND	Ground (0V)
20	V _{CC}	Positive supply voltage

FUNCTION TABLE

INPUTS		INPUTS/OUTPUTS	
$\overline{OE}n$	DIR	A _n	B _n
L	L	A _n = B _n	Inputs
L	H	Inputs	B _n = A _n
H	X	Z	Z

H = High voltage level
L = Low voltage level
X = Don't care
Z = High impedance "Off" state

LOGIC SYMBOL (IEEE/IEC)



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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 transceiver with direction pin (3-State)

74AC245
74ACT245**DC ELECTRICAL CHARACTERISTICS (74AC245)**

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

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74ACT245**DC ELECTRICAL CHARACTERISTICS (74ACT245)**

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			V
			5.5	4.76			
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 transceiver with direction pin (3-State)

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74ACT245**AC CHARACTERISTICS FOR 74AC245**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 A _n to B _n ; B _n to A _n	3.3 5.0	2.0 1.5	4.3 3.2	8.0 6.0	1.5 1.0	9.0 7.0	ns	1	
t _{PHL}	Propagation delay A _n to B _n ; B _n to A _n	3.3 5.0	2.0 1.5	4.4 3.4	8.0 6.0	1.5 1.0	9.0 7.0	ns	1	
t _{PZH}	3-State output enable time OE to A _n ; OE to B _n	3.3 5.0	2.0 1.5	6.1 4.2	11.0 8.0	1.5 1.0	12.5 9.0	ns	2	
t _{PZL}	3-State output enable time OE to A _n ; OE to B _n	3.3 5.0	2.0 1.5	6.7 4.6	11.0 8.0	1.5 1.0	12.5 9.0	ns	2	
t _{PHZ}	3-State output disable time OE to A _n ; OE to B _n	3.3 5.0	2.0 1.5	5.7 4.0	10.0 7.5	1.5 1.0	11.5 8.5	ns	2	
t _{PLZ}	3-State output disable time OE to A _n ; OE to B _n	3.3 5.0	2.0 1.5	5.1 3.7	10.0 7.5	1.5 1.0	11.5 8.5	ns	2	

NOTE:

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

AC CHARACTERISTICS FOR 74ACT245GND = 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 A _n to B _n ; B _n to A _n	5.0	2.0	4.3	7.0	1.5	8.0	ns	1
t _{PHL}	Propagation delay A _n to B _n ; B _n to A _n	5.0	2.0	4.3	7.0	1.5	8.0	ns	1
t _{PZH}	3-State output enable time OE to A _n ; OE to B _n	5.0	2.0	6.7	9.5	1.5	11.0	ns	2
t _{PZL}	3-State output enable time OE to A _n ; OE to B _n	5.0	2.0	7.0	10.5	1.5	12.0	ns	2
t _{PHZ}	3-State output disable time OE to A _n ; OE to B _n	5.0	2.0	4.9	9.0	1.5	10.0	ns	2
t _{PLZ}	3-State output disable time OE to A _n ; OE to B _n	5.0	2.0	4.5	9.0	1.5	10.0	ns	2

NOTE:

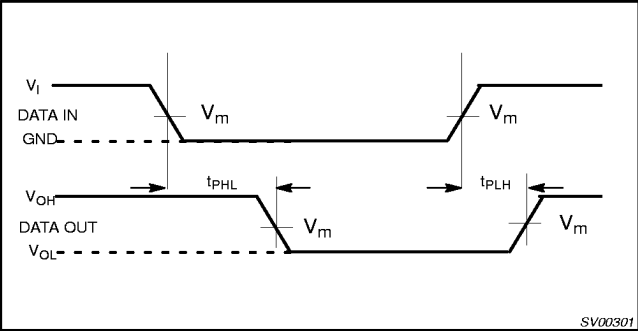
1. These values are at $V_{CC} = 5.0V \pm 0.5V$

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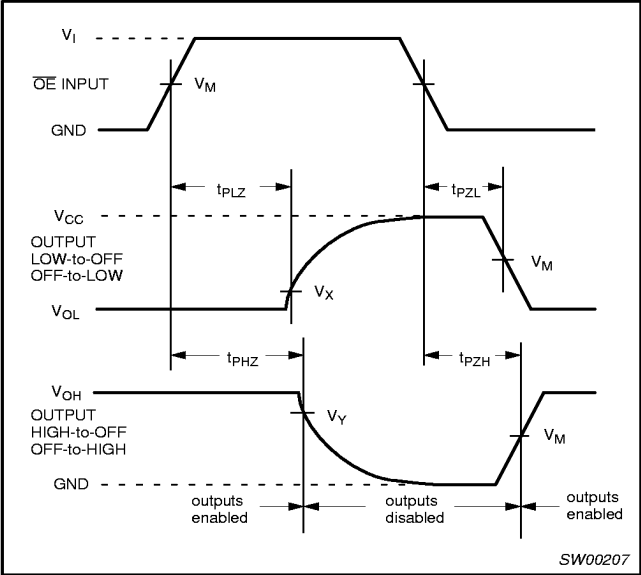
AC WAVEFORMS

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



Waveform 1. Input (An or Bn) to Output (Bn or An) Propagation Delays

$V_X = V_{OL} + 0.3V$
 $V_Y = V_{OH} - 0.3V$



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT

SWITCH POSITION	
TEST	SWITCH
tPLH/tPHL	Open
tPLZ/tPZL	2 x VCC
tPHZ/tPZH	Open

FAMILY	V _{IN} Input Requirements	V _m Input	V _m Output
AC	GND to V _{CC}	50% V _{CC}	50% V _{CC}
ACT	GND to 3.0V	1.5V	50% V _{CC}

DEFINITIONS

R_L = Load resistor; see AC characteristics for value.

C_L = Load capacitance, see AC characteristics

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

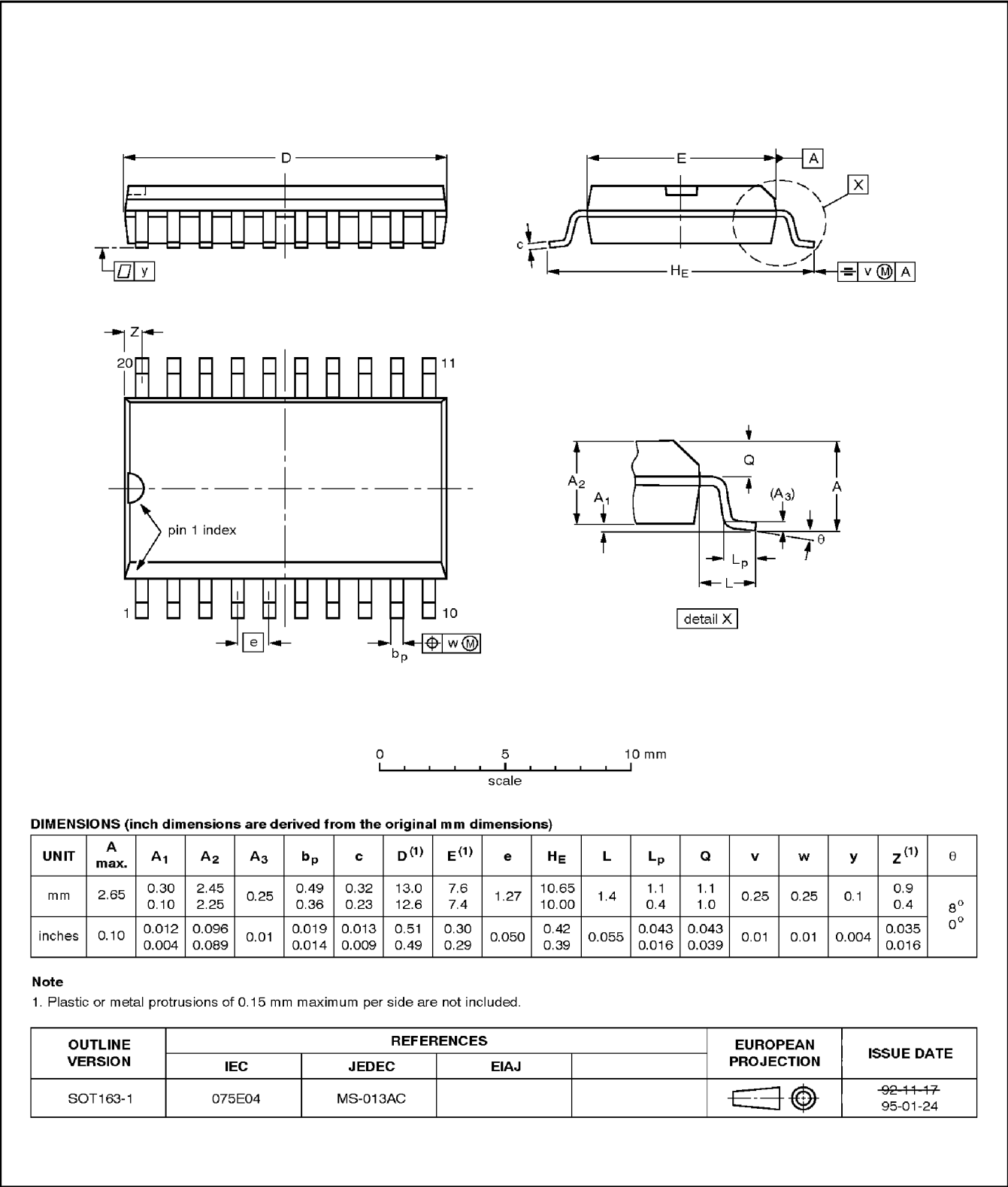
Waveform 3. Load circuitry for switching times.

Octal transceiver with direction pin (3-State)

74AC24574ACT245

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

SOT163-1

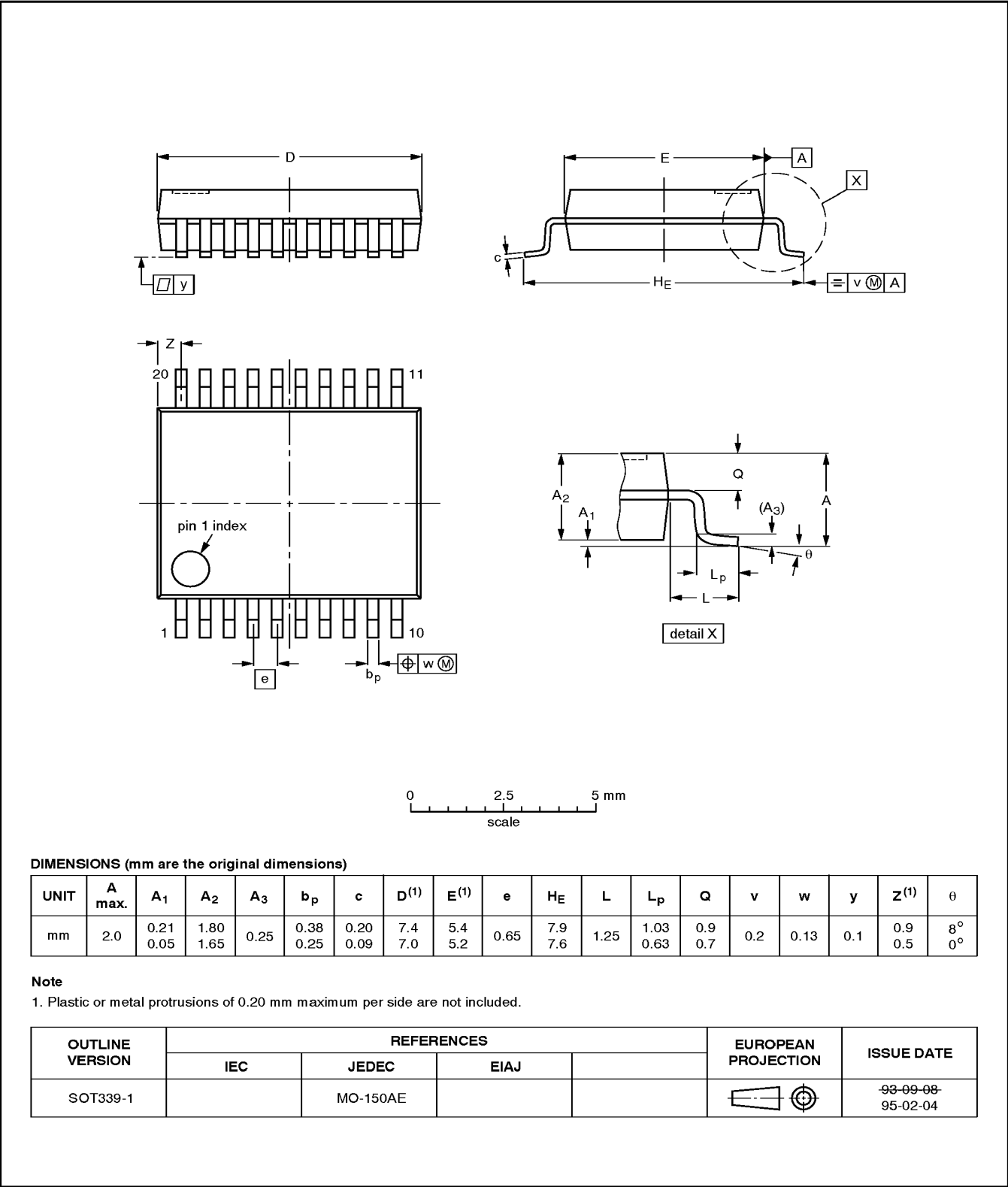


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SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



Octal transceiver with direction pin (3-State)

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74ACT245

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

SOT360-1

