

# DATA SHEET

## **74ABT657**

Octal transceiver with parity  
generator/checker (3-State)

Product data sheet  
Supersedes data of 1995 Dec 11

2004 Oct 27

# Octal transceiver with parity generator/checker (3-State)

74ABT657

## FEATURES

- Combinational functions in one package
- Low static and dynamic power dissipation with high speed and high output drive
- Output capability: +64 mA/−32 mA
- Power-up 3-State
- Latch-up protection exceeds 500 mA per JEDEC Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model

## DESCRIPTION

The 74ABT657 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT657 is an octal transceiver featuring non-inverting buffers with 3-State outputs and an 8-bit parity generator/checker, and is intended for bus-oriented applications. The buffers have a guaranteed current sinking capability of 64 mA. The Transmit/Receive (T/R) input determines the direction of the data flow through the bidirectional transceivers. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports.

The Output Enable ( $\overline{OE}$ ) input disables both the A and B ports by placing them in a high-impedance condition when the  $\overline{OE}$  input is HIGH. The parity select (ODD/EVEN) input gives the user the option of odd or even parity systems. The parity (PARITY) pin is an output from the generator/checker when transmitting from the port A to B (T/R = HIGH) and an input when receiving from port B to A port (T/R = Low). When transmitting (T/R = HIGH) the parity select (ODD/EVEN) input is set, then the A port data is polled to determine the number of HIGH bits. The parity (PARITY) output then goes to the logic state determined by the parity select (ODD/EVEN) setting and by the number of HIGH bits on port A. For example, if the parity select (ODD/EVEN) is set LOW (even parity), and the number of HIGH bits on port A is odd, then the parity (PARITY) output will be HIGH, transmitting even parity. If the number of HIGH bits on port A is even, then the parity (PARITY) output will be LOW, keeping even parity. When in receive mode (T/R = LOW) the B port is polled to determine the number of HIGH bits. If parity select (ODD/EVEN) is LOW (even parity) and the number of HIGHs on port B is:

- (1) odd and the parity (PARITY) input is HIGH, then  $\overline{ERROR}$  will be HIGH, signifying no error.
- (2) even and the parity (PARITY) input is HIGH, then  $\overline{ERROR}$  will be asserted LOW, indicating an error.

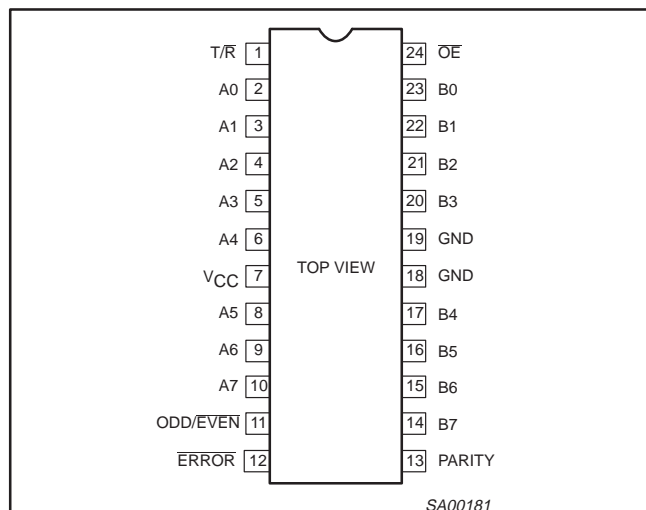
## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; GND = 0 V	TYPICAL	UNIT
$t_{PLH}$ $t_{PHL}$	Propagation delay An to Bn or Bn to An	$C_L = 50\text{ pF}$ ; $V_{CC} = 5\text{ V}$	3.3	ns
$C_{IN}$	Input capacitance	$V_I = 0\text{ V}$ or $V_{CC}$	4	pF
$C_{I/O}$	I/O capacitance	Outputs disabled; $V_O = 0\text{ V}$ or $V_{CC}$	7	pF
$I_{CCZ}$	Total supply current	Outputs disabled; $V_{CC} = 5.5\text{ V}$	500	nA

## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DWG NUMBER
24-Pin plastic SO	−40 °C to +85 °C	74ABT657D	SOT137-1
24-Pin Plastic SSOP Type II	−40 °C to +85 °C	74ABT657DB	SOT340-1
24-Pin Plastic DIP	−40 °C to +85 °C	74ABT657N	SOT222-1
24-Pin Plastic TSSOP Type I	−40 °C to +85 °C	74ABT657PW	SOT355-1

## PIN CONFIGURATION



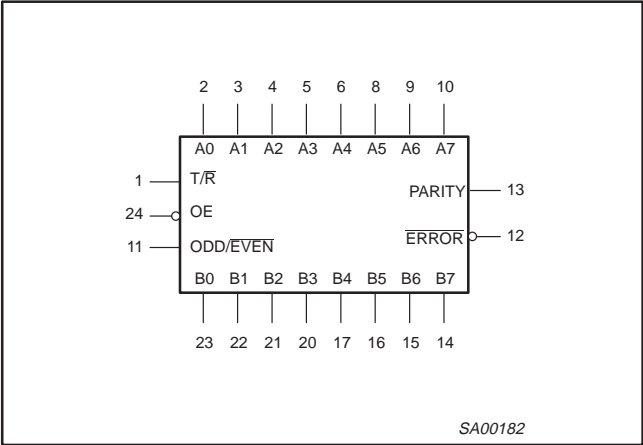
## PIN DESCRIPTION

SYMBOL	PIN NUMBER	NAME AND FUNCTION
13	PARITY	Parity output
11	ODD/EVEN	Parity select input
12	ERROR	Error output
1	T/R	Transmit/receive input
2, 3, 4, 5, 6, 8, 9, 10	A0 to A7	A port 3-State outputs
23, 22, 21, 20, 17, 16, 15, 14	B0 to B7	B port 3-State outputs
24	$\overline{OE}$	Output enable input (active-LOW)
18, 19	GND	Ground (0 V)
7	$V_{CC}$	Positive supply voltage

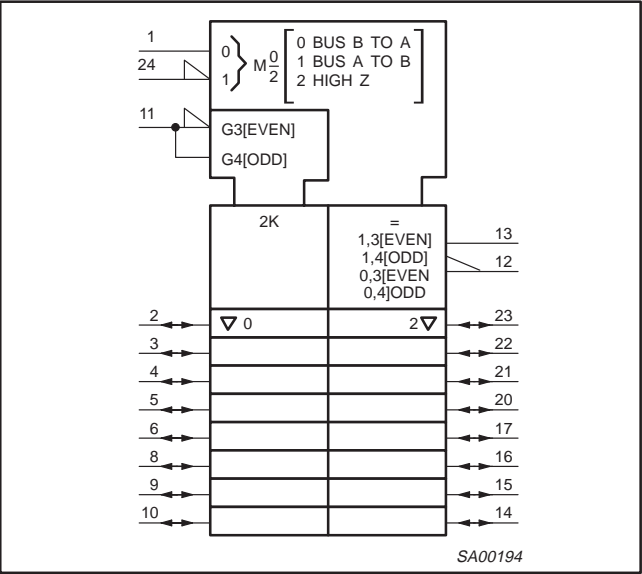
Octal transceiver with parity generator/checker  
(3-State)

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LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

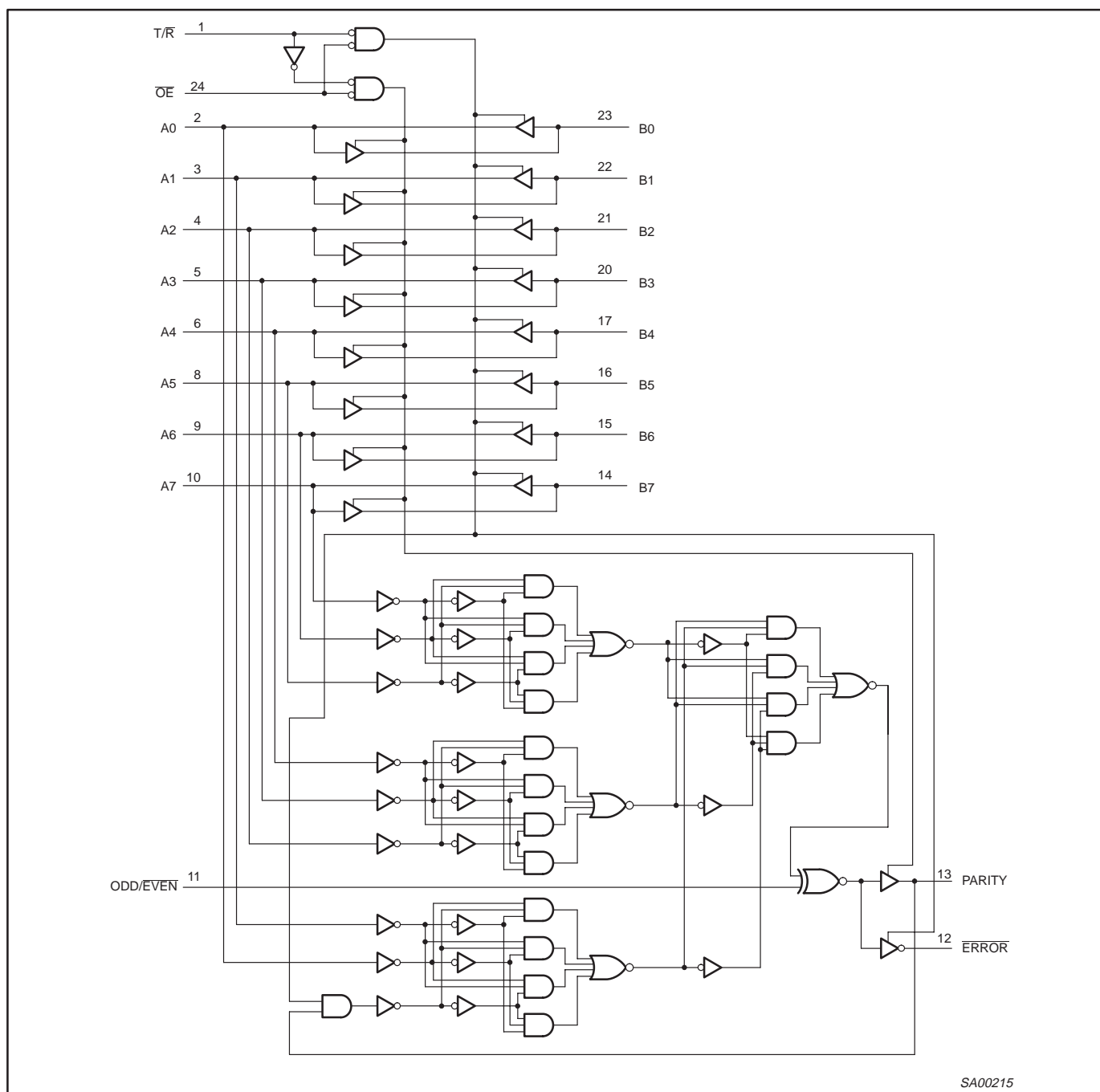
NUMBER OF HIGH INPUTS	INPUTS			INPUT/ OUTPUT	OUTPUTS	
	OE	T/R	ODD/EVEN	PARITY	ERROR	OUTPUTS MODE
0, 2, 4, 6, 8	L	H	H	H	Z	Transmit
	L	H	L	L	Z	Transmit
	L	L	H	H	H	Receive
	L	L	H	L	L	Receive
	L	L	L	H	L	Receive
	L	L	L	L	H	Receive
1, 3, 5, 7	L	H	H	L	Z	Transmit
	L	H	L	H	Z	Transmit
	L	L	H	H	L	Receive
	L	L	H	L	H	Receive
	L	L	L	H	H	Receive
	L	L	L	L	L	Receive
Don't care	H	X	X	Z	Z	3-State

H = HIGH voltage level  
L = LOW voltage level  
X = Don't care  
Z = High-impedance "off" state

# Octal transceiver with parity generator/checker (3-State)

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## LOGIC DIAGRAM



# Octal transceiver with parity generator/checker (3-State)

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## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
$V_{CC}$	DC supply voltage		−0.5 to +7.0	V
$I_{IK}$	DC input diode current	$V_I < 0$ V	−18	mA
$V_I$	DC input voltage <sup>3</sup>		−1.2 to +7.0	V
$I_{OK}$	DC output diode current	$V_O < 0$ V	−50	mA
$V_{OUT}$	DC output voltage <sup>3</sup>	output in Off or HIGH state	−0.5 to +5.5	V
$I_{OUT}$	DC output current	output in LOW state	128	mA
$T_{stg}$	Storage temperature range		−65 to 150	°C

### 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.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		Min	Max	
$V_{CC}$	DC supply voltage	4.5	5.5	V
$V_I$	Input voltage	0	$V_{CC}$	V
$V_{IH}$	HIGH-level input voltage	2.0		V
$V_{IL}$	LOW-level input voltage		0.8	V
$I_{OH}$	HIGH-level output current		−32	mA
$I_{OL}$	LOW-level output current		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0	5	ns/V
$T_{amb}$	Operating free-air temperature range	−40	+85	°C

# Octal transceiver with parity generator/checker (3-State)

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## DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER		TEST CONDITIONS	LIMITS					UNIT
				T <sub>amb</sub> = +25 °C			T <sub>amb</sub> = -40 °C to +85 °C		
				Min	Typ	Max	Min	Max	
V <sub>IK</sub>	Input clamp voltage		V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = -18 mA		-0.9	-1.2		-1.2	V
V <sub>OH</sub>	HIGH-level output voltage		V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -3 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.5	3.5		2.5		V
			V <sub>CC</sub> = 5.0 V; I <sub>OH</sub> = -3 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	3.0	4.0		3.0		V
			V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -32 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.0	2.6		2.0		V
V <sub>OL</sub>	LOW-level output voltage		V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 64 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		0.42	0.55		0.55	V
I <sub>I</sub>	Input leakage current	Control pins	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V		±0.01	±1.0		±1.0	μA
		Data pins	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V		±5	±100		±100	μA
I <sub>OFF</sub>	Power-off leakage current		V <sub>CC</sub> = 0 V; V <sub>O</sub> or V <sub>I</sub> ≤ 4.5 V		±5.0	±100		±100	μA
I <sub>PULPD</sub>	Power-up/down 3-State output current <sup>3</sup>		V <sub>CC</sub> = 2.0 V; V <sub>O</sub> = 0.5 V; V <sub>I</sub> = GND or V <sub>CC</sub> ; V <sub>OE</sub> = V <sub>CC</sub>		±5.0	±50		±50	μA
I <sub>IH</sub> + I <sub>OZH</sub>	3-State output HIGH current		V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.7 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		5.0	50		50	μA
I <sub>IL</sub> + I <sub>OZL</sub>	3-State output LOW current		V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 0.5 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		-5.0	-50		-50	μA
I <sub>CEX</sub>	Output HIGH leakage current		V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>		5.0	50		50	μA
I <sub>O</sub>	Output current <sup>1</sup>		V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.5 V	-50	-80	-180	-50	-180	mA
I <sub>CCH</sub>	Quiescent supply current		V <sub>CC</sub> = 5.5 V; Outputs HIGH; V <sub>I</sub> = GND or V <sub>CC</sub>		0.5	250		250	μA
I <sub>CCL</sub>			V <sub>CC</sub> = 5.5 V; Outputs LOW; V <sub>I</sub> = GND or V <sub>CC</sub>		20	30		30	mA
I <sub>CCZ</sub>			V <sub>CC</sub> = 5.5 V; Outputs 3-State; V <sub>I</sub> = GND or V <sub>CC</sub>		0.5	250		250	μA
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>		Outputs enabled, one data input at 3.4 V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V		0.5	1.5		1.5	mA
			Outputs 3-State, one data input at 3.4 V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V		50	250		250	μA
			Outputs 3-State, one enable input at 3.4 V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V		0.5	1.5		1.5	mA

### NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- This is the increase in supply current for each input at 3.4 V.
- This parameter is valid for any  $V_{CC}$  between 0 V and 2.1 V with a transition time of up to 10 msec. For  $V_{CC} = 2.1\text{ V}$  to  $V_{CC} = 5\text{ V} \pm 10\%$ , a transition time of up to 100  $\mu\text{sec}$  is permitted.

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## AC CHARACTERISTICS

GND = 0 V;  $t_R = t_F = 2.5$  ns;  $C_L = 50$  pF,  $R_L = 500$   $\Omega$ 

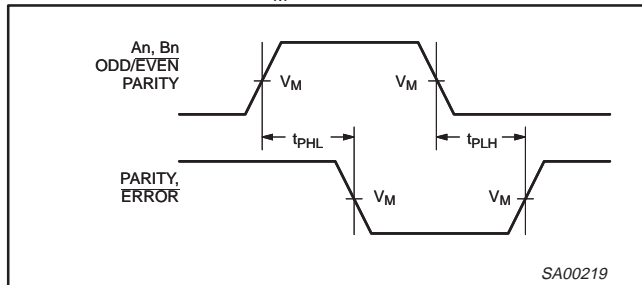
SYMBOL	PARAMETER	WAVEFORMS	LIMITS					UNIT
			T <sub>amb</sub> = +25 °C V <sub>CC</sub> = +5.0 V			T <sub>amb</sub> = −40 °C to +85 °C V <sub>CC</sub> = +5.0 V ± 10 %		
			Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay An to Bn or Bn to An	2	1.1 1.2	2.5 3.0	4.1 3.9	1.1 1.2	4.6 4.3	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay An to PARITY	1, 2	2.5 2.8	5.1 5.0	6.7 7.4	2.5 2.8	8.1 8.9	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay ODD/EVEN to PARITY, ERROR	1, 2	1.7 1.9	3.5 3.7	4.6 5.1	1.7 1.9	5.3 5.8	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Bn to ERROR	1, 2	3.9 4.0	7.3 7.9	10.2 10.5	3.9 4.0	12.3 12.9	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay PARITY to ERROR	1, 2	2.7 3.2	4.5 5.2	5.9 6.7	2.7 3.2	7.7 8.1	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time <sup>1</sup> to HIGH or LOW level	3, 4	1.3 1.9	3.6 4.2	5.5 5.3	1.3 1.9	6.5 6.5	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from HIGH or LOW level	3, 4	2.4 2.2	3.6 3.4	5.6 7.3	2.4 2.2	6.2 7.8	ns

### NOTES:

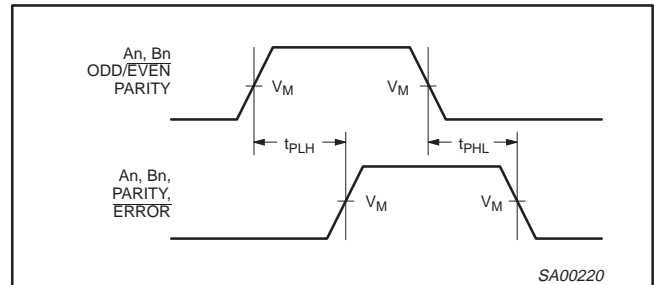
- These delay times reflect the 3-State recovery time only and do not include the delay through the buffers and the parity check circuitry which affect the ERROR output. To assure **valid** information at the ERROR pin, time must be allowed for the signal to propagate through the drivers (B to A), through the parity check circuitry (same as A to PARITY), and to the ERROR output.

Valid data at the ERROR pin  $\geq (B \text{ to } A) + (A \text{ to } PARITY)$ .

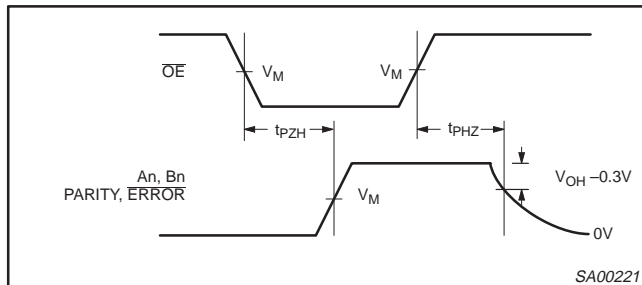
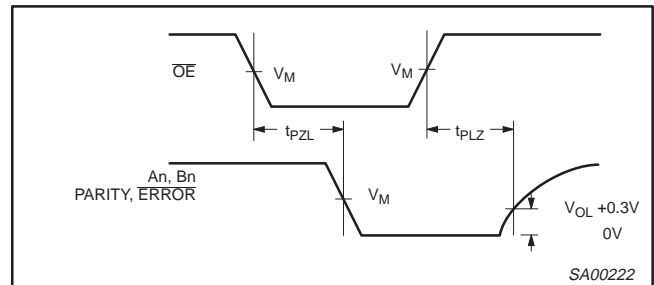
## AC WAVEFORMS

NOTE: For all waveforms,  $V_M = 1.5$  V.

Waveform 1. Propagation delay for inverting output



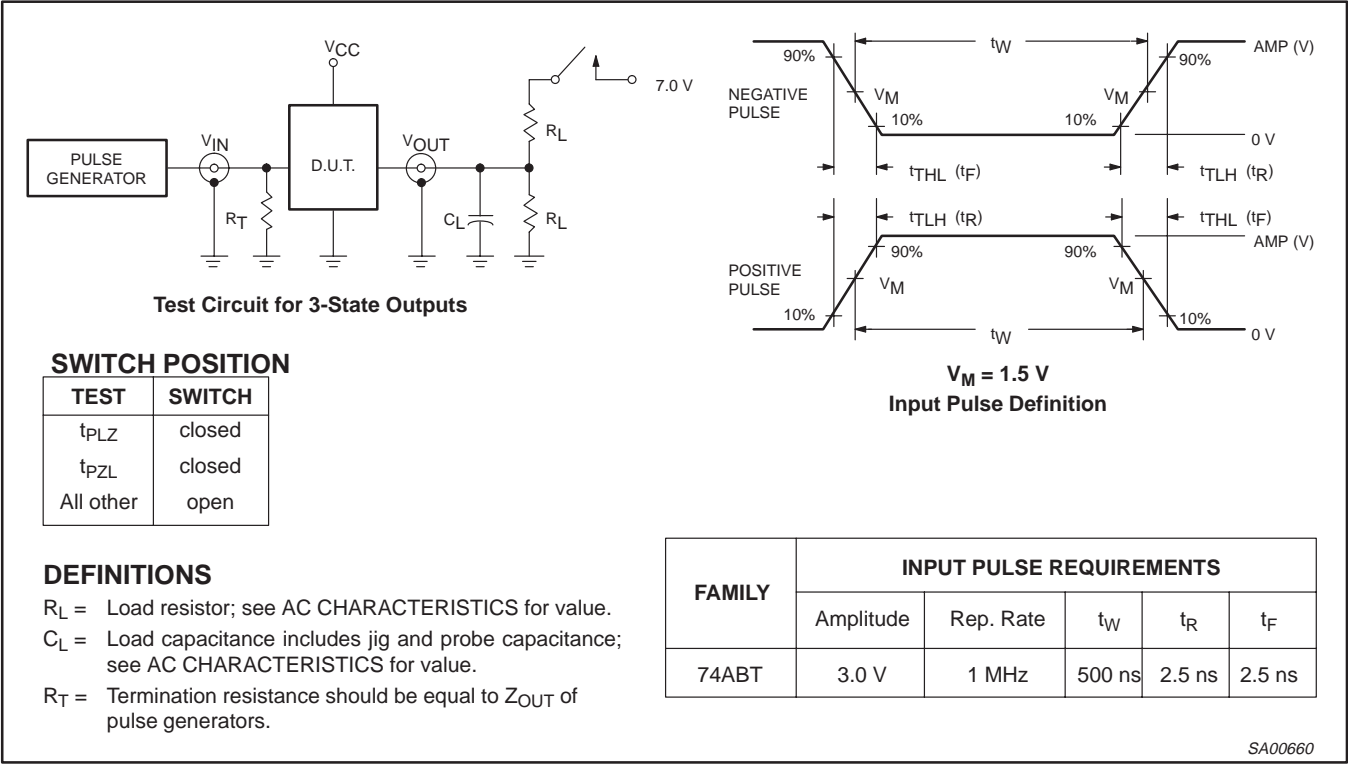
Waveform 2. Propagation delay For non-inverting output

Waveform 3. 3-State Output Enable time to HIGH level and  
Output Disable time from HIGH levelWaveform 4. 3-State Output Enable time to LOW level and  
Output Disable time from LOW level

Octal transceiver with parity generator/checker  
(3-State)

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TEST CIRCUIT AND WAVEFORM



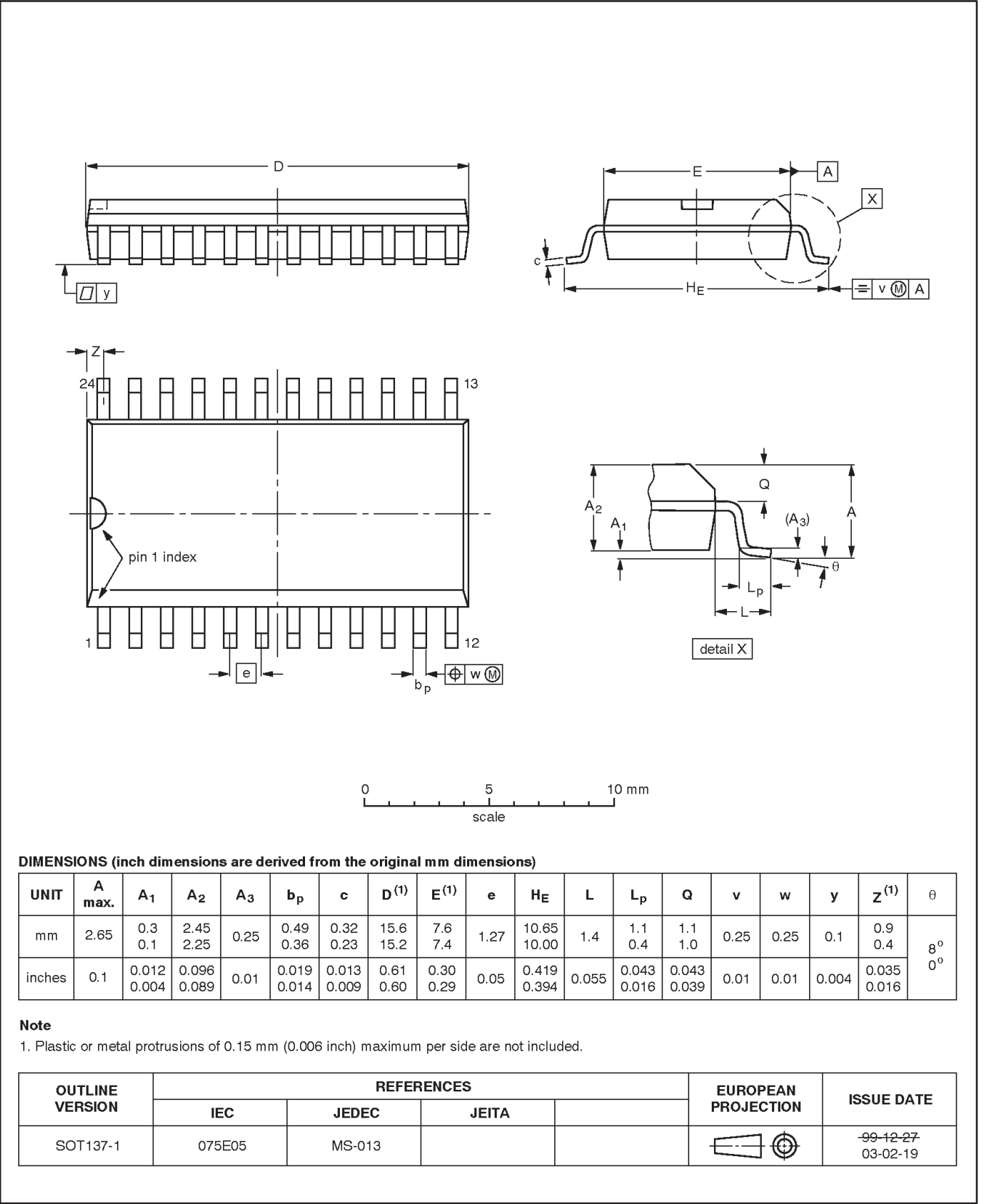


Octal transceiver with parity generator/checker  
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SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1

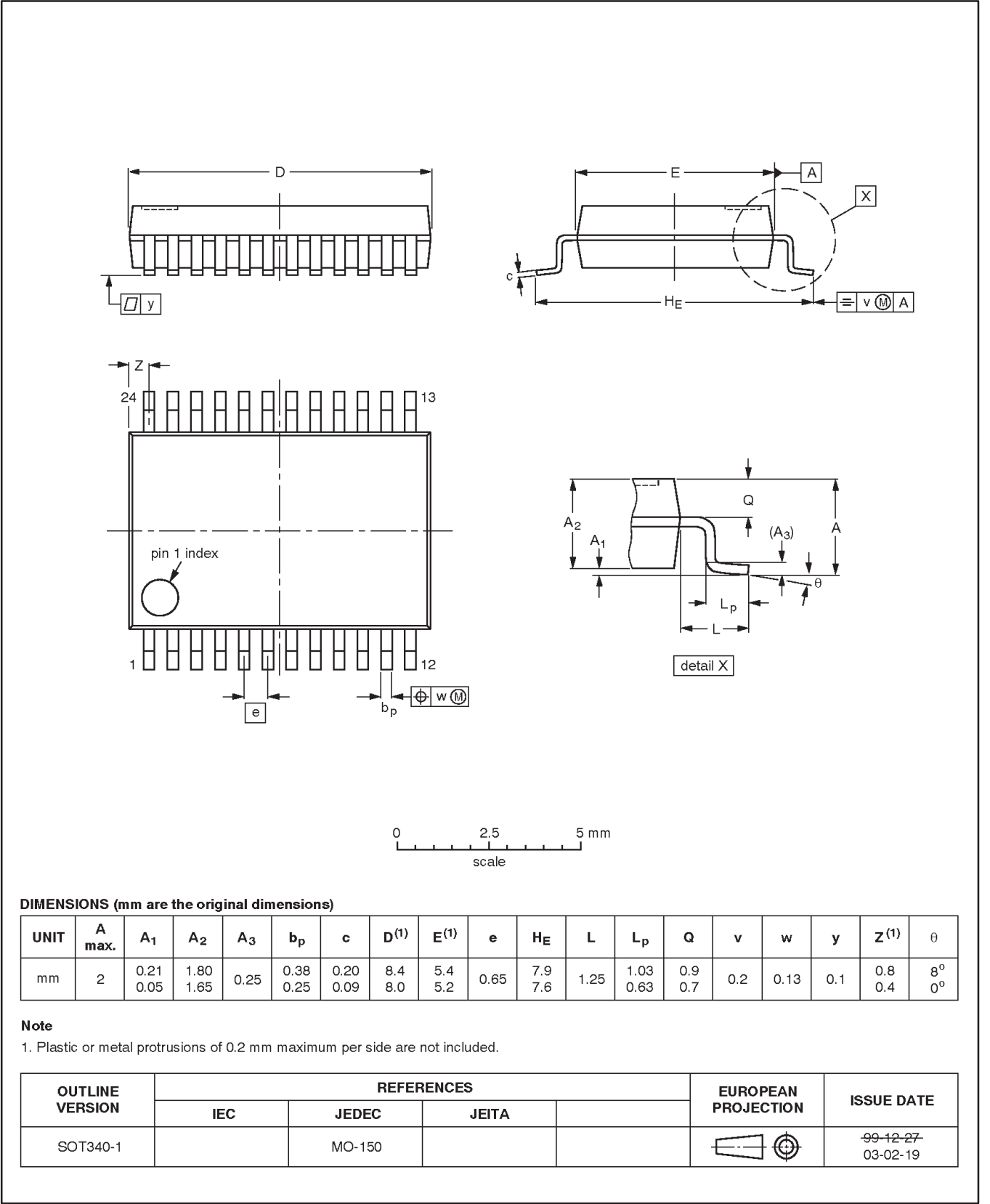


Octal transceiver with parity generator/checker  
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SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1

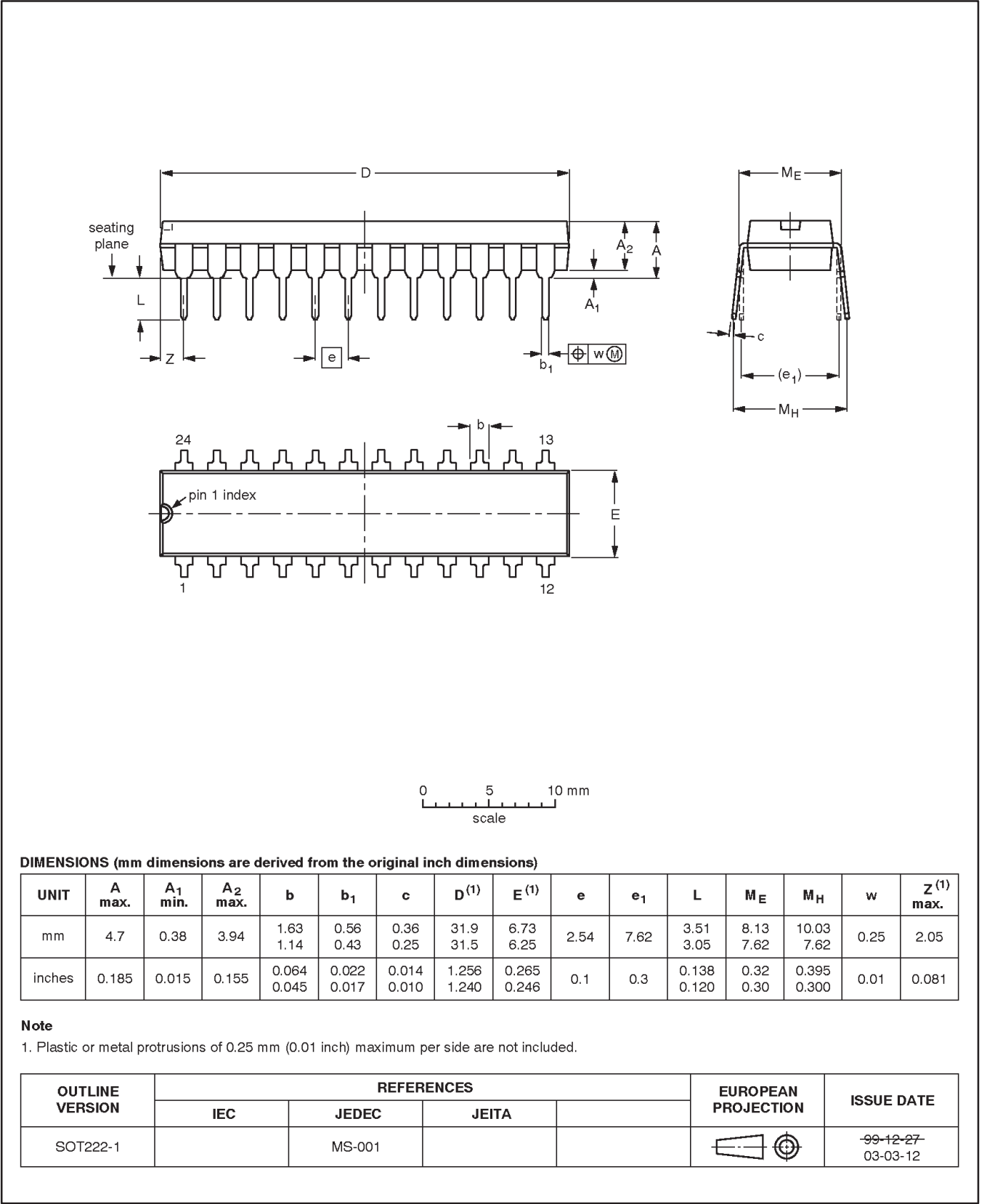


Octal transceiver with parity generator/checker  
(3-State)

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DIP24: plastic dual in-line package; 24 leads (300 mil)

SOT222-1

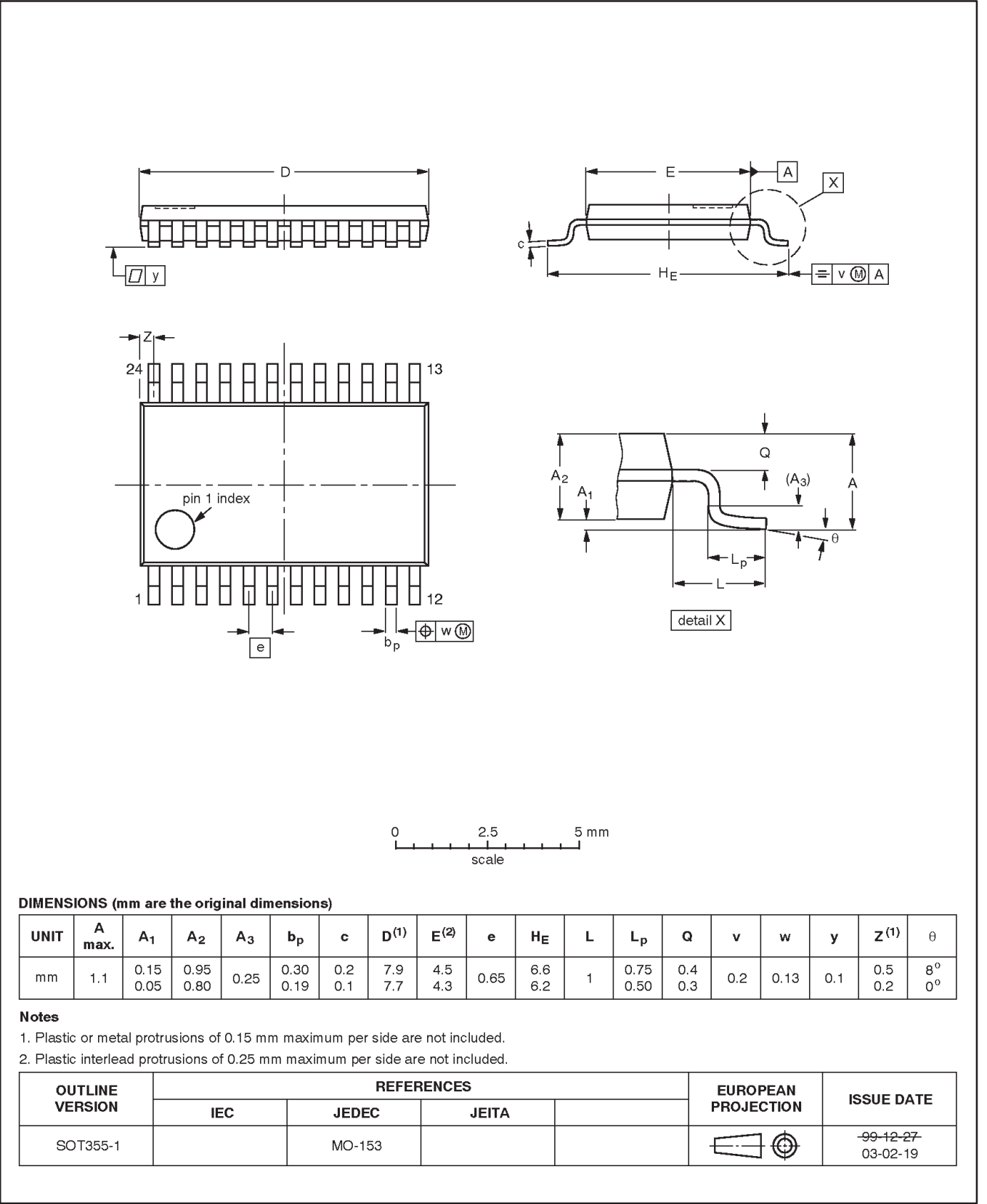


Octal transceiver with parity generator/checker  
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TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm

SOT355-1



# Octal transceiver with parity generator/checker (3-State)

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## REVISION HISTORY

Rev	Date	Description
_2	20041027	<p><b>Product data sheet (9397 750 14239). Supersedes data of 1995 Dec 11.</b></p> <p>Modifications:</p> <ul style="list-style-type: none"> <li>Ordering information table on page 2: <ul style="list-style-type: none"> <li>Removed "North America" column; renamed column "Outside North America" to "Order Code"</li> </ul> </li> <li>AC Characteristics table on page 7: <ul style="list-style-type: none"> <li>Propagation delay An to Bn or Bn to An  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PLH(typ)}</math> from 3.3 ns to 2.5 ns; <math>t_{PLH(max)}</math> changed from 5.0 ns to 4.1 ns  changed <math>t_{PHL(max)}</math> from 4.3 ns to 3.9 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PLH(max)}</math> from 5.5 ns to 4.6 ns; changed <math>t_{PHL(max)}</math> from 4.8 ns to 4.3 ns</li> <li>Propagation delay An to PARITY  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PLH(typ)}</math> from 6.5 ns to 5.1 ns; <math>t_{PLH(max)}</math> changed from 8.7 ns to 6.7 ns  changed <math>t_{PHL(typ)}</math> from 7.0 ns to 5.0 ns; changed <math>t_{PHL(max)}</math> from 9.1 ns to 7.4 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PLH(max)}</math> from 10.1 ns to 8.1 ns; changed <math>t_{PHL(max)}</math> from 10.6 ns to 8.9 ns</li> <li>Propagation delay ODD/EVEN to PARITY, ERROR  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PLH(typ)}</math> from 5.0 ns to 3.5 ns; <math>t_{PLH(max)}</math> changed from 6.6 ns to 4.6 ns  changed <math>t_{PHL(typ)}</math> from 5.0 ns to 3.7 ns; changed <math>t_{PHL(max)}</math> from 6.6 ns to 5.1 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PLH(max)}</math> from 7.3 ns to 5.3 ns; changed <math>t_{PHL(max)}</math> from 7.3 ns to 5.8 ns</li> <li>Propagation delay Bn to ERROR  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PLH(typ)}</math> from 9.2 ns to 7.3 ns; <math>t_{PLH(max)}</math> changed from 11.7 ns to 10.2 ns  changed <math>t_{PHL(typ)}</math> from 9.6 ns to 7.9 ns; changed <math>t_{PHL(max)}</math> from 12.1 ns to 10.5 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PLH(max)}</math> from 13.8 ns to 12.3 ns; changed <math>t_{PHL(max)}</math> from 14.5 ns to 12.9 ns</li> <li>Propagation delay PARITY to ERROR  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PLH(typ)}</math> from 6.0 ns to 4.5 ns; <math>t_{PLH(max)}</math> changed from 7.6 ns to 5.9 ns  changed <math>t_{PHL(typ)}</math> from 6.4 ns to 5.2 ns; changed <math>t_{PHL(max)}</math> from 8.0 ns to 6.7 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PLH(max)}</math> from 9.4 ns to 7.7 ns; changed <math>t_{PHL(max)}</math> from 9.4 ns to 8.1 ns</li> <li>Output enable time to HIGH or LOW level  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PZH(typ)}</math> from 3.8 ns to 3.6 ns; <math>t_{PZH(max)}</math> changed from 5.6 ns to 5.5 ns  changed <math>t_{PZL(typ)}</math> from 4.4 ns to 4.2 ns; changed <math>t_{PZL(max)}</math> from 7.0 ns to 5.3 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PZH(max)}</math> from 6.6 ns to 6.5 ns; changed <math>t_{PZL(max)}</math> from 8.2 ns to 6.5 ns</li> <li>Output disable time from HIGH or LOW level  <math>T_{amb} = 25\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V}</math>:  changed <math>t_{PHZ(typ)}</math> from 5.1 ns to 3.6 ns; <math>t_{PHZ(max)}</math> changed from 7.0 ns to 5.6 ns  changed <math>t_{PLZ(min)}</math> from 2.7 ns to 2.2 ns; changed <math>t_{PLZ(typ)}</math> from 5.4 ns to 3.4 ns;  changed <math>t_{PLZ(max)}</math> from 7.6 ns to 7.3 ns  <math>T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}; V_{CC} = +5.0\text{ V} \pm 10\%</math>:  changed <math>t_{PHZ(max)}</math> from 7.6 ns to 6.2 ns;  changed <math>t_{PLZ(min)}</math> from 2.7 ns to 2.2 ns; changed <math>t_{PLZ(max)}</math> from 8.1 ns to 7.8 ns</li> </ul> </li> <li>Added Revision History table.</li> </ul>
_1	19951211	<b>Product specification. ECN 853-1615 16106 of 11 December 1995.</b>

# Octal transceiver with parity generator/checker (3-State)

74ABT657

## Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definitions
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Date of release: 10-04  
Document number: 9397 750 14239

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