DATA SHEET

74F545
Octal bidirectional transceiver (with 3-State inputs/outputs)

Product specification

1990 Mar 01

IC15 Data Handbook

Philips
Semiconductors

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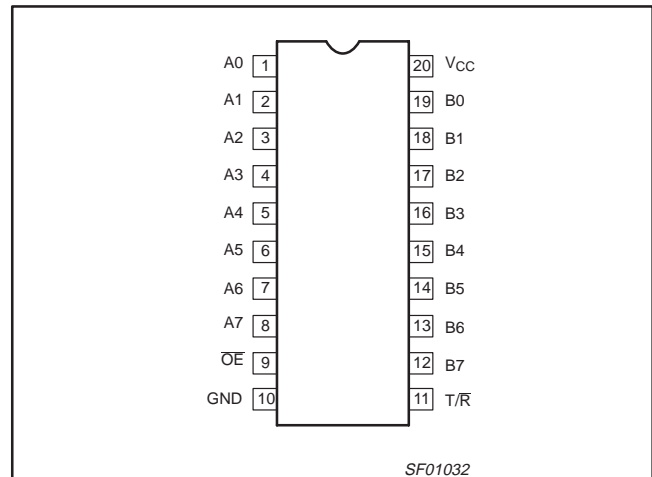# Octal bidirectional transceiver (with 3-State inputs/outputs) 74F545

FEATURES

- High impedance NPN base inputs for reduced loading (70μA in High and Low states) output
- 8-bit bidirectional data flow reduces system package count
- 3-State inputs/outputs for interfacing with bus oriented systems
- 24mA and 64mA bus drive capability on A and B ports, respectively
- Transmit/Receive and Output Enable simplify control logic

DESCRIPTION

The 74F545 is an 8-bit, 3-State, high speed transceiver. It provides bidirectional drive for the bus-oriented microprocessor and digital communications systems. Straight through bidirectional transceivers are featured, with 24mA bus drive capability on the A ports and 64mA bus drive capability on the B ports. One input, Transmit/Receive (T/$\overline{\text{R}}$) determines the direction of logic signals through the bidirectional transceiver. Transmit enables data from A ports to B ports; Receive enables data from B ports to A ports. The Output Enable input disables both A and B ports by placing them in a 3-State condition. The 74F545 performs the same function as the 74F245, the only difference being package pin assignment.

PIN CONFIGURATION

A0	1	20	V_{CC}
A1	2	19	B0
A2	3	18	B1
A3	4	17	B2
A4	5	16	B3
A5	6	15	B4
A6	7	14	B5
A7	8	13	B6
$\overline{\text{OE}}$	9	12	B7
GND	10	11	T/$\overline{\text{R}}$

SF01032

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F545	4.0ns	87mA

ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 0°C to +70°C	PKG DWG #
20-Pin Plastic DIP	N74F545N	SOT146-1
20-Pin Plastic SOL	N74F545D	SOT163-1

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
A0–A7, B0–B7	Data inputs	3.5/0.117	70μA/70μA
$\overline{\text{OE}}$	Output Enable input (active Low)	2.0/0.067	40μA/40μA
T/$\overline{\text{R}}$	Transmit/Receive input	2.0/0.067	40μA/40μA
A0 - A7	Port A 3-State outputs	150/40	3.0mA/24mA
B0 - B7	Port B 3-State outputs	750/107	15mA/64mA

NOTE: One (1.0) FAST Unit Load is defined as: 20μA in the High state and 0.6mA in the Low state.
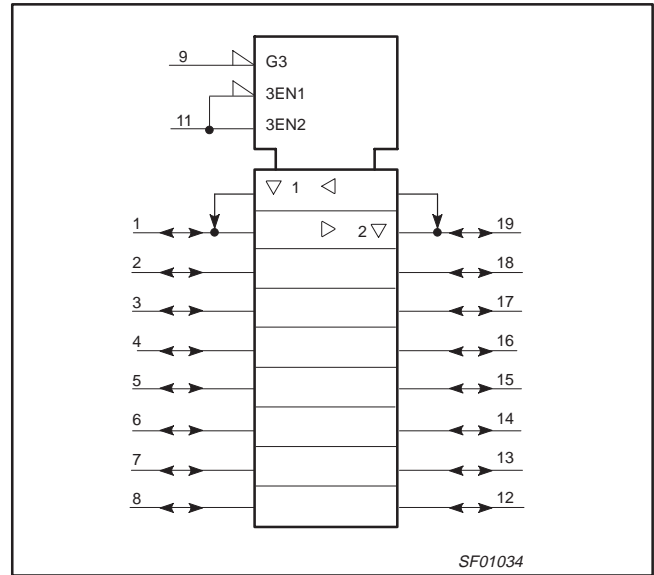
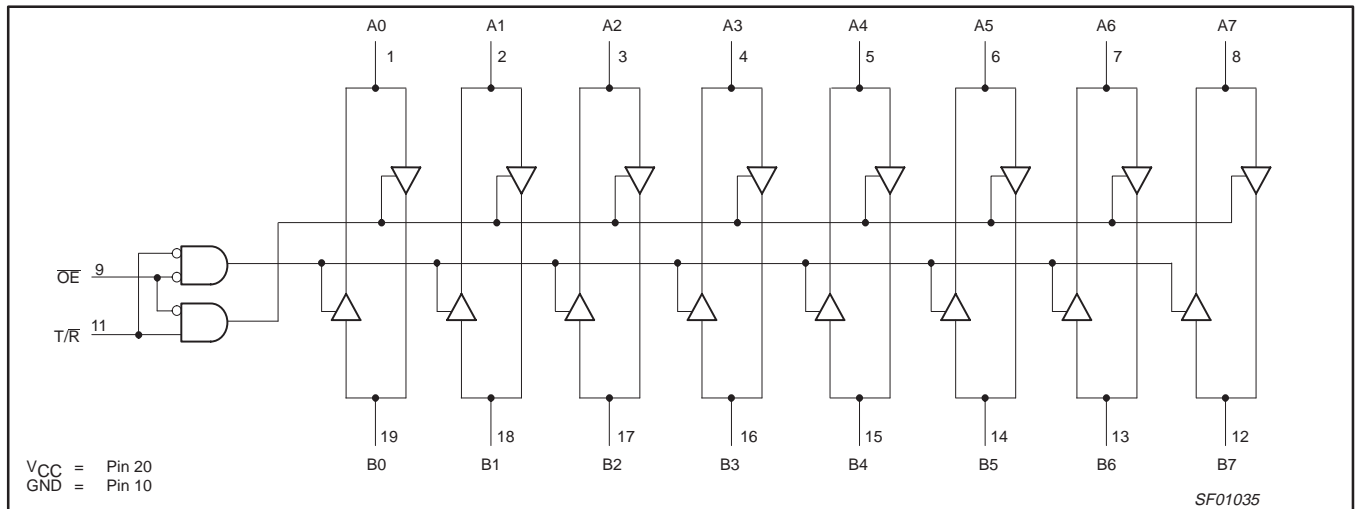## Octal bidirectional transceiver (with 3-State inputs/outputs)

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LOGIC SYMBOL

V_{CC} = Pin 20
GND = Pin 10

SF01033

LOGIC SYMBOL (IEEE/IEC)

SF01034

LOGIC DIAGRAM

V_{CC} = Pin 20
GND = Pin 10

SF01035
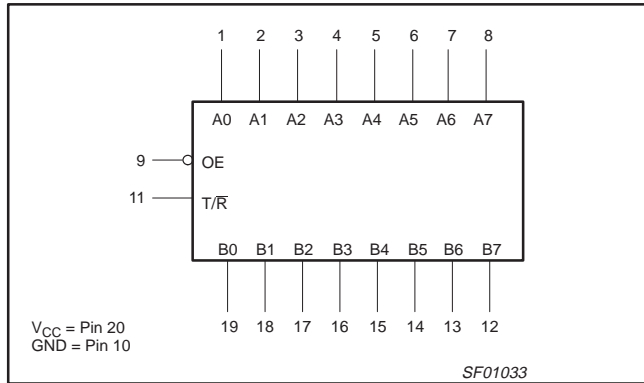
FUNCTION TABLE

INPUTS		OUTPUTS
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B data to Bus A
L	H	Bus A data to Bus B
H	X	Z

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

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ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits set forth in this table may impair the useful life of the device.
Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER		RATING	UNIT
V_{CC}	Supply voltage		−0.5 to +7.0	V
V_{IN}	Input voltage		−0.5 to +7.0	V
I_{IN}	Input current		−30 to +5.0	mA
V_{OUT}	Voltage applied to output in High output state		−0.5 to +5.5	V
I_{OUT}	Current applied to output in Low output state	A0–A7	48	mA
		B0–B7	128	mA
T_{amb}	Operating free-air temperature range		0 to +70	°C
T_{stg}	Storage temperature		−65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER		LIMITS			UNIT
			MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5.0	5.5	V
V_{IH}	High-level input voltage		2.0			V
V_{IL}	Low-level input voltage				0.8	V
I_{IK}	Input clamp current				−18	mA
I_{OH}	High-level output current	A0–A7			−3	mA
		B0–B7			−15	mA
I_{OL}	Low-level output current	A0–A7			24	mA
		B0–B7			64	mA
T_{amb}	Operating free-air temperature range		0		70	°C

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DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS[1]			LIMITS			UNIT
					MIN	TYP[2]	MAX	
V_{OH}	High-level output voltage	A0–A7 B0–B7	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OH} = −3mA ±10%V_{CC}	2.4			V
				I_{OH} = −3mA ±5%V_{CC}	2.7	3.3		V
		B0–B7		I_{OH} = −15mA ±10%V_{CC}	2.0			V
				I_{OH} = −15mA ±5%V_{CC}	2.0			V
V_{OL}	Low-level output voltage	A0–A7	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OL} = 24mA ±10%V_{CC}		0.35	0.50	V
				I_{OL} = 24mA ±5%V_{CC}		0.35	0.50	V
		B0–B7		I_{OL} = MAX ±10%V_{CC}			0.55	V
				I_{OL} = MAX ±5%V_{CC}		0.42	0.55	V
V_{IK}	Input clamp voltage	V_{CC} = MIN, I_I = I_{IK}				−0.73	−1.2	V
I_I	Input current at maximum input voltage	$\overline{OE}$, T/$\overline{R}$	V_{CC} = 0.0V, V_I = 7.0V				100	µA
		A0–A7, B0–B7	V_{CC} = 5.5V, V_I = 5.5V				1.0	mA
I_{IH}	High-level input current	OE, T/$\overline{R}$ only	V_{CC} = MAX, V_I = 2.7V				40	µA
I_{IL}	Low-level input current		V_{CC} = MAX, V_I = 0.5V				−40	µA
I_{OZH}+I_{IH}	Off-state output current High-level voltage applied	V_{CC} = MAX, V_I = 2.7V					70	µA
I_{OZL}+I_{IL}	Off-state output current Low-level voltage applied	V_{CC} = MAX, V_I = 0.5V					−70	µA
I_{OS}	Short-circuit output current[3]	A0–A7	V_{CC} = MAX		−60		−150	mA
		B0–B7			−100		−225	µA
I_{CC}	Supply current (total)[4]	I_{CCH}	V_{CC} = MAX	T/$\overline{R}$=An=4.5V, $\overline{OE}$=GND		84	100	mA
		I_{CCL}		$\overline{OE}$=T/$\overline{R}$ =Bn=GND		96	120	mA
		I_{CCZ}		T/$\overline{R}$=Bn=GND, $\overline{OE}$=4.5V		96	120	mA

NOTES:
1. For conditions shown as MIN or MAX, use the appropriate value under the recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
3. Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} should be performed last.
4. Measure I_{CC} with outputs open.

AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T_{amb} = +25°C V_{CC} = +5.0V C_L = 50pF, R_L = 500Ω			T_{amb} = 0°C to +70°C V_{CC} = +5.0V ± 10% C_L = 50pF, R_L = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay An to Bn, Bn to An	Waveform 1	1.5 2.5	3.5 4.5	5.5 6.5	1.5 2.5	6.5 7.0	ns ns
t_{PZH} t_{PZL}	Output Enable time to High or Low level	Waveform 2 Waveform 3	6.0 5.5	8.5 8.0	10.5 9.5	6.0 5.5	11.0 10.0	ns ns
t_{PHZ} t_{PLZ}	Output Disable time from High or Low level	Waveform 2 Waveform 3	2.5 2.0	5.0 4.5	7.0 6.5	2.5 2.0	8.0 7.5	ns ns

Octal bidirectional transceiver (with 3-State inputs/outputs)
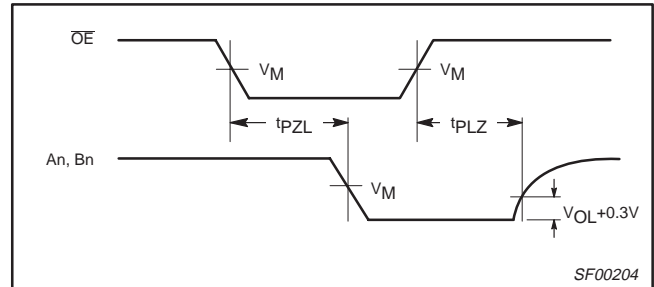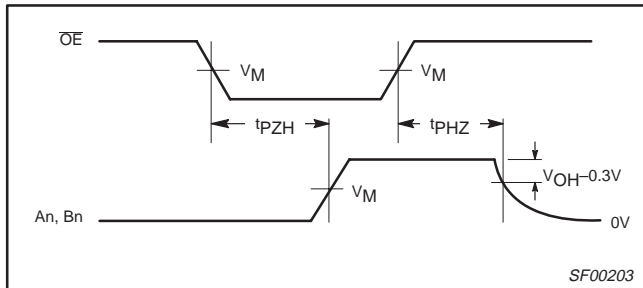
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AC WAVEFORMS

For all waveforms, $V_M = 1.5V$.
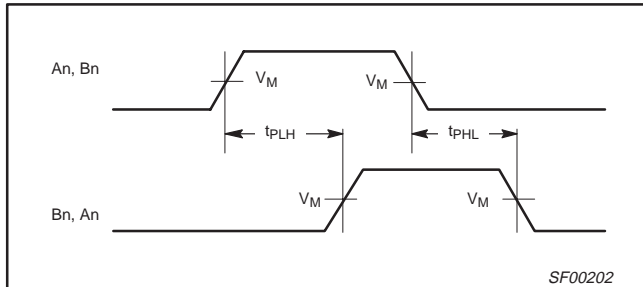
Waveform 1. Propagation Delay Data for Non-Inverting Output

Waveform 3. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

Waveform 2. 3-State Output Enable Time to High Level and Output Disable Time from High Level

TEST CIRCUIT AND WAVEFORM

Test Circuit for 3-State Outputs

SWITCH POSITION

TEST	SWITCH
t_{PLZ}	closed
t_{PZL}	closed
All other	open

Input Pulse Definition

DEFINITIONS:

R_L = Load resistor;
    see AC electrical characteristics for value.

C_L = Load capacitance includes jig and probe capacitance;
    see AC electrical characteristics for value.

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

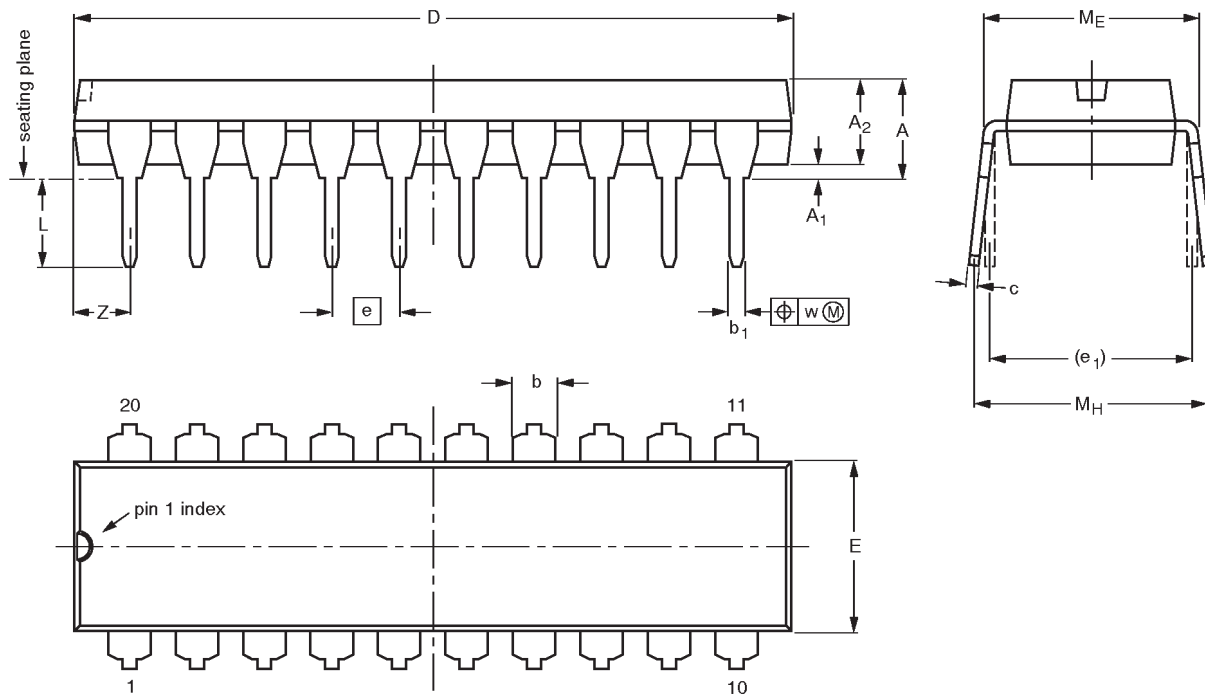| family	INPUT PULSE REQUIREMENTS					
	amplitude	V_M	rep. rate	t_w	t_{TLH}	t_{THL}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

SF00777

Octal bidirectional transceiver (with 3-State inputs/outputs)

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DIP20:   plastic dual in-line package; 20 leads (300 mil)   **SOT146-1**

DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A₁ min.	A₂ max.	b	b₁	c	D (1)	E (1)	e	e₁	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	0.36 0.23	26.92 26.54	6.40 6.22	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.0
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.014 0.009	1.060 1.045	0.25 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.078

Note

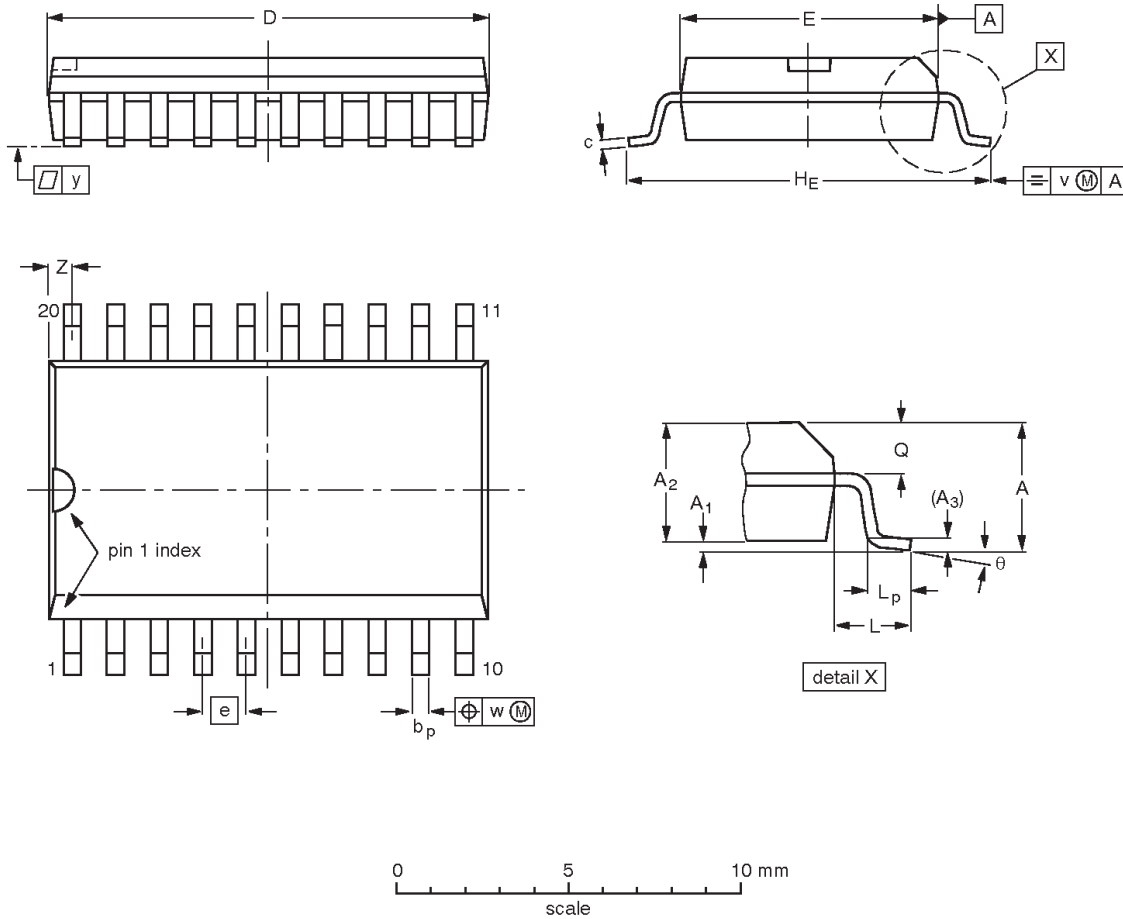1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT146-1			SC603			~~92-11-17~~ 95-05-24

Octal bidirectional transceiver (with 3-State inputs/outputs)

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

SOT163-1

pin 1 index

detail X

scale 0 5 10 mm

DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013AC				~~95-01-24~~ 97-05-22

NOTES

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Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
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[1]   Please consult the most recently issued datasheet before initiating or completing a design.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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