

## 74F646 Octal Transceiver/Register with 3-STATE Outputs

### General Description

These devices consist of bus transceiver circuits with 3-STATE, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the input bus or from the internal registers. Data on the A or B bus will be clocked into the registers as the appropriate clock pin goes to a high logic level. Control  $\bar{G}$  and direction pins are provided to control the transceiver function. In the transceiver mode, data present at the high impedance port may be stored in either the A or the B register or in both. The select controls can multiplex stored and real-time (transparent mode) data. The direction control determines which bus will receive data when the enable control  $\bar{G}$  is Active LOW. In the isolation mode (control  $\bar{G}$  HIGH), A data may be stored in the B register and/or B data may be stored in the A register.

### Features

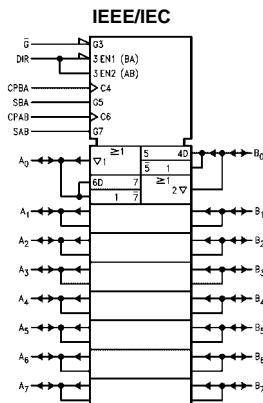
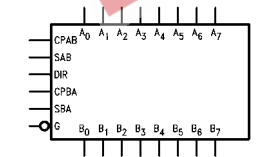
- Independent registers for A and B buses
- Multiplexed real-time and stored data
- 74F646 has non-inverting data paths
- 3-STATE outputs
- 300 mil slim DIP

### Ordering Code:

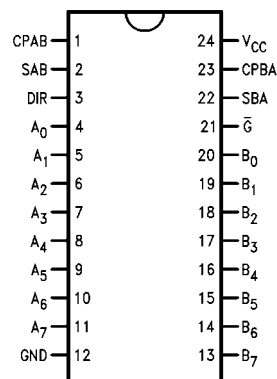
Order Number	Package Number	Package Description
74F646SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74F646MSA	MSA24	24-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide
74F646SPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Logic Symbols



### Connection Diagram



## Unit Loading/Fan Out

Pin Names	Description	U.L.	
		HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
A <sub>0</sub> -A <sub>7</sub>	Data Register A Inputs/ 3-STATE Outputs	3.5/1.083 600/106.6 (80)	70 $\mu$ A/-650 $\mu$ A -12 mA/64 mA (48 mA)
B <sub>0</sub> -B <sub>7</sub>	Data Register B Inputs/ 3-STATE Outputs	3.5/1.083 600/106.6 (80)	70 $\mu$ A/-650 $\mu$ A -12 mA/64 mA (48 mA)
CPAB, CPBA	Clock Pulse Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
SAB, SBA	Select Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
$\bar{G}$	Output Enable Input	1.0/1.0	20 $\mu$ A/-0.6 mA
DIR	Direction Control Input	1.0/1.0	20 $\mu$ A/-0.6 mA

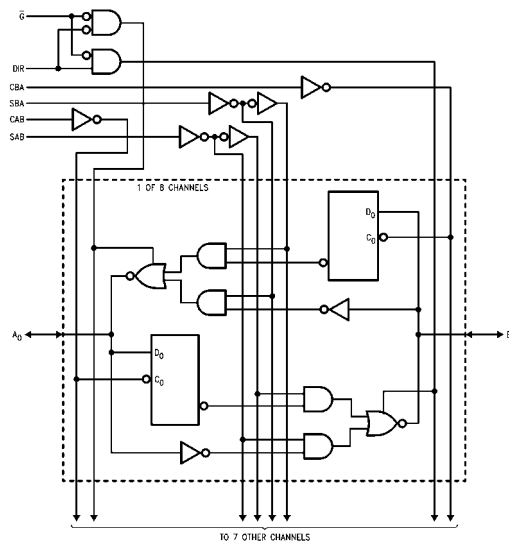
## Function Table

Inputs						Data I/O (Note 1)		Function
$\bar{G}$	DIR	CPAB	CPBA	SAB	SBA	A <sub>0</sub> -A <sub>7</sub>	B <sub>0</sub> -B <sub>7</sub>	
H	X	H or L	H or L	X	X			Isolation
H	X	$\curvearrowright$	X	X	X	Input	Input	Clock A <sub>n</sub> Data into A Register
H	X	X	$\curvearrowright$	X	X			Clock B <sub>n</sub> Data into B Register
L	H	X	X	L	X	Input	Output	A <sub>n</sub> to B <sub>n</sub> —Real Time (Transparent Mode)
L	H	$\curvearrowright$	X	L	X			Clock A <sub>n</sub> Data into A Register
L	H	H or L	X	H	X			A Register to B <sub>n</sub> (Stored Mode)
L	H	$\curvearrowright$	X	H	X			Clock A <sub>n</sub> Data into A Register and Output to B <sub>n</sub>
L	L	X	X	X	L	Output	Input	B <sub>n</sub> to A <sub>n</sub> —Real Time (Transparent Mode)
L	L	X	$\curvearrowright$	X	L			Clock B <sub>n</sub> Data into B Register
L	L	X	H or L	X	H			B Register to A <sub>n</sub> (Stored Mode)
L	L	X	$\curvearrowright$	X	H			Clock B <sub>n</sub> Data into B Register and Output to A <sub>n</sub>

H = HIGH Voltage Level L = LOW Voltage Level X = Irrelevant  $\curvearrowright$  = LOW-to-HIGH Transition

**Note 1:** The data output functions may be enabled or disabled by various signals at the  $\bar{G}$  and DIR Inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the clock inputs.

## Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Absolute Maximum Ratings** (Note 2)

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	-55°C to +150°C
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 3)	-0.5V to +7.0V
Input Current (Note 3)	-30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V)	
Standard Output	-0.5V to V <sub>CC</sub>
3-STATE Output	-0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated I <sub>OL</sub> (mA)
ESD Last Passing Voltage (Min)	4000V

**Recommended Operating Conditions**

Free Air Ambient Temperature	0°C to +70°C
Supply Voltage	+4.5V to +5.5V

**Note 2:** Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 3:** Either voltage limit or current limit is sufficient to protect inputs.

**DC Electrical Characteristics**

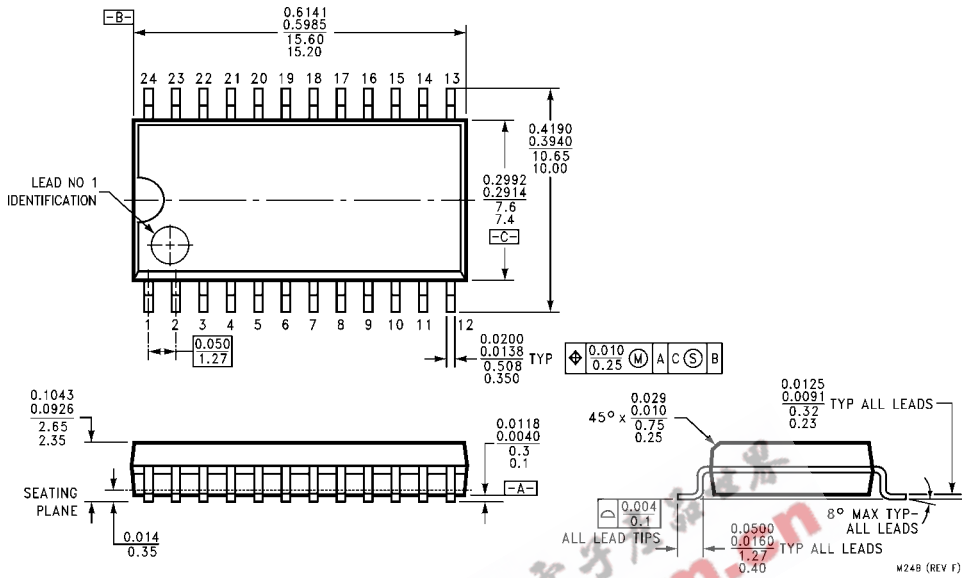
Symbol	Parameter	Min	Typ	Max	Units	V <sub>CC</sub>	Conditions
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA (Non I/O Pins)
V <sub>OH</sub>	Output HIGH Voltage 10% V <sub>CC</sub>	2.0			V	Min	I <sub>OH</sub> = -15 mA (A <sub>n</sub> , B <sub>n</sub> )
V <sub>OL</sub>	Output LOW Voltage 10% V <sub>CC</sub>			0.55	V	Min	I <sub>OL</sub> = 64 mA (A <sub>n</sub> , B <sub>n</sub> )
I <sub>IH</sub>	Input HIGH Current			5.0	μA	Max	V <sub>IN</sub> = 2.7V (Non I/O Pins)
I <sub>BVI</sub>	Input HIGH Current Breakdown Test			7.0	μA	Max	V <sub>IN</sub> = 7.0V (Non I/O Pins)
I <sub>BVIT</sub>	Input HIGH Current Breakdown (I/O)			0.5	mA	Max	V <sub>IN</sub> = 5.5V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>CEX</sub>	Output HIGH Leakage Current			50	μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
V <sub>ID</sub>	Input Leakage Test	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OD</sub>	Output Leakage Circuit Current			3.75	μA	0.0	V <sub>IOD</sub> = 150 mV All Other Pins Grounded
I <sub>IL</sub>	Input LOW Current			-0.6	mA	Max	V <sub>IN</sub> = 0.5V (Non I/O Pins)
I <sub>IH</sub> + I <sub>OZH</sub>	Output Leakage Current			70	μA	Max	V <sub>OUT</sub> = 2.7V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>IL</sub> + I <sub>OZL</sub>	Output Leakage Current			-650	μA	Max	V <sub>OUT</sub> = 0.5V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>OS</sub>	Output Short-Circuit Current	-100		-225	mA	Max	V <sub>OUT</sub> = 0V
I <sub>ZZ</sub>	Bus Drainage Test			500	μA	0.0V	V <sub>OUT</sub> = 5.25V
I <sub>CCH</sub>	Power Supply Current			135	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current			150	mA	Max	V <sub>O</sub> = LOW
I <sub>CCZ</sub>	Power Supply Current			150	mA	Max	V <sub>O</sub> = HIGH Z

AC Electrical Characteristics								
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		Units
		Min	Max	Min	Max	Min	Max	
$t_{MAX}$	Maximum Clock Frequency	90		75		90		MHz
$t_{PLH}$	Propagation Delay	2.0	7.0	2.0	8.5	2.0	8.0	ns
$t_{PHL}$	Clock to Bus	2.0	8.0	2.0	9.5	2.0	9.0	
$t_{PLH}$	Propagation Delay	1.0	7.0	1.0	8.0	1.0	7.5	ns
$t_{PHL}$	Bus to Bus	1.0	6.5	1.0	8.0	1.0	7.0	
$t_{PLH}$	Propagation Delay	2.0	8.5	2.0	11.0	2.0	9.5	ns
$t_{PHL}$	SBA or SAB to A or B	2.0	8.0	2.0	10.0	2.0	9.0	
$t_{PZH}$	Enable Time	2.0	8.5	2.0	10.0	2.0	9.0	ns
$t_{PZL}$	$\overline{OE}$ to A or B	2.0	12.0	2.0	13.5	2.0	12.5	
$t_{PHZ}$	Disable Time	1.0	7.5	1.0	9.0	1.0	8.5	ns
$t_{PLZ}$	$\overline{OE}$ to A or B	2.0	9.0	2.0	11.0	2.0	9.5	
$t_{PZH}$	Enable Time	2.0	14.0	2.0	16.0	2.0	15.0	ns
$t_{PZL}$	DIR to A or B	2.0	13.0	2.0	15.0	2.0	14.0	
$t_{PHZ}$	Disable Time	1.0	9.0	1.0	10.0	1.0	9.5	ns
$t_{PLZ}$	DIR to A or B	2.0	11.0	2.0	12.0	2.0	11.5	

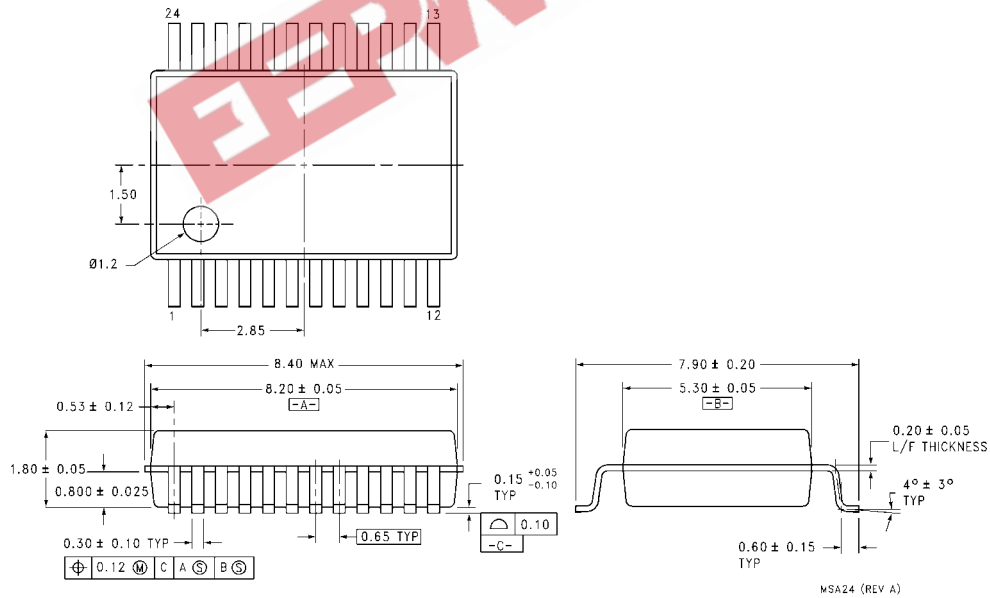
  

AC Operating Requirements								
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		Units
		Min	Max	Min	Max	Min	Max	
$t_S(H)$	Setup Time, HIGH or LOW	5.0		5.0		5.0		ns
$t_S(L)$	Bus to Clock	5.0		5.0		5.0		
$t_H(H)$	Hold Time, HIGH or LOW	2.0		2.5		2.0		ns
$t_H(L)$	Bus to Clock	2.0		2.5		2.0		
$t_W(H)$	Clock Pulse Width	5.0		5.0		5.0		ns
$t_W(L)$	HIGH or LOW	5.0		5.0		5.0		

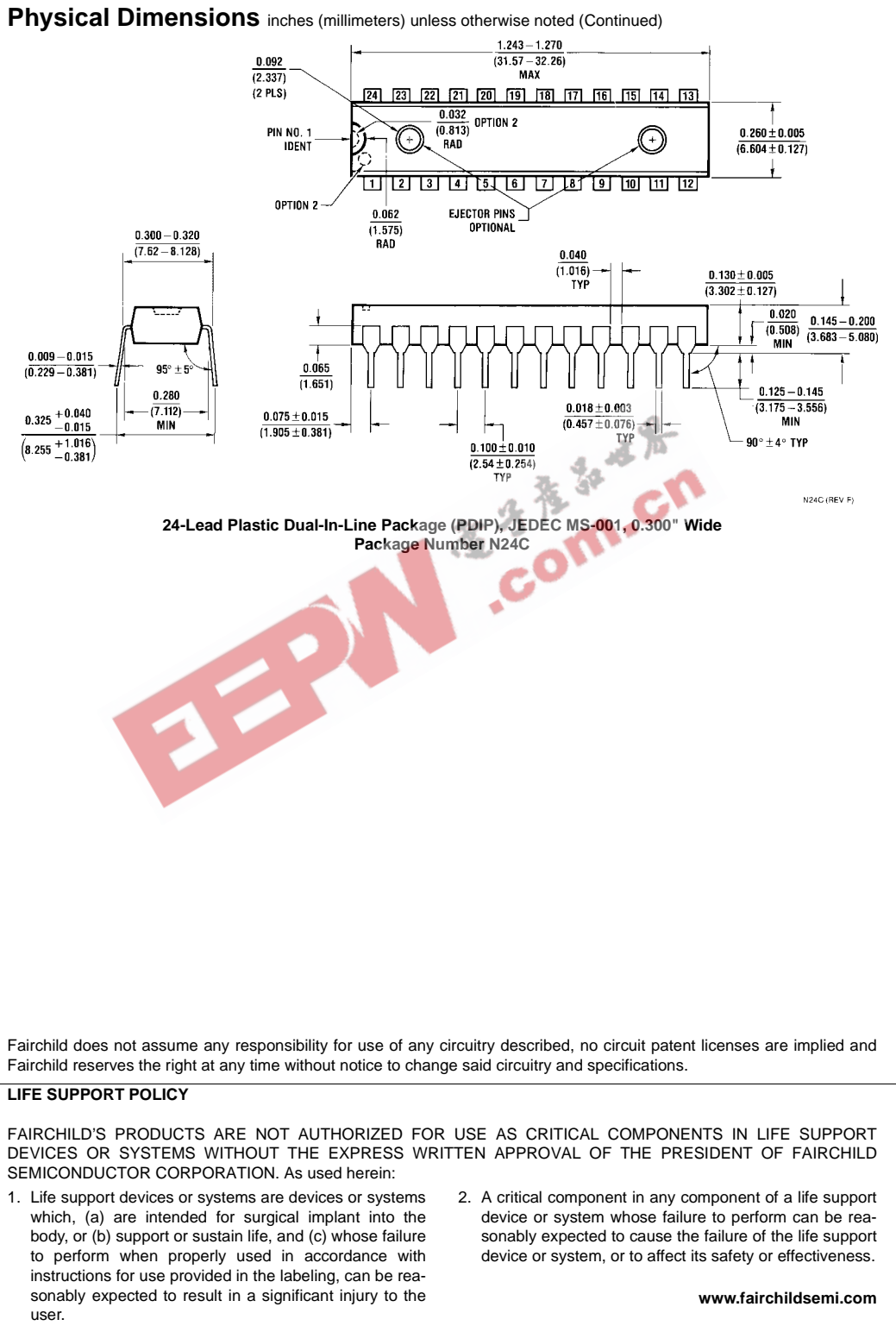
**Physical Dimensions** inches (millimeters) unless otherwise noted



**24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M24B**



**24-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide  
Package Number MSA24**



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