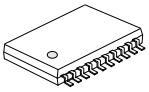
# U74LVC640

*CMOS IC*

## OCTAL BUS TRANSCEIVER WITH 3-STATE INVERTING OUTPUTS



TSSOP-20

### ■ DESCRIPTION

The **U74LVC640** is designed for asynchronous communication between data buses and has inverting outputs. While the direction-control(DIR) input is high, data transmits from the A bus to the B bus. In contrast, Data transmits from the B bus to the A bus DIR input is low. The output-enable($\overline{OE}$) will disable the device and isolate from the buses when high voltage is applied on it.

### ■ FEATURES

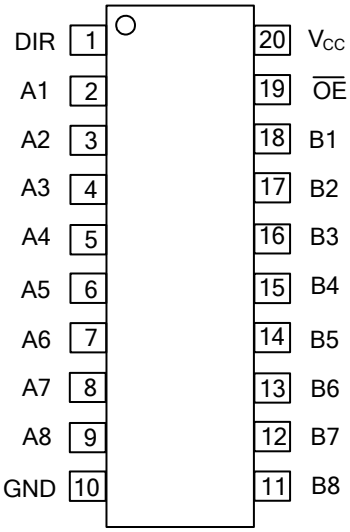
* Supply Voltage Range From 1.2V to 3.6V
* Input Accept Voltages up to 5.5V
* Partial-Power-Down Mode Operation
* Max $t_{PD}$ is 6.3ns at 3.3V

### ■ ORDERING INFORMATION

| Ordering Number | Package | Packing |
|---|---|---|
| U74LVC640G-P20-R | TSSOP-20 | Tape Reel |

| | |
|---|---|
| U74LVC640G-P20-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Halogen Free | (1) R: Tape Reel, T: Tube<br>(2) P20: TSSOP-20<br>(3) G: Halogen Free |

## ■ PIN CONFIGURATION

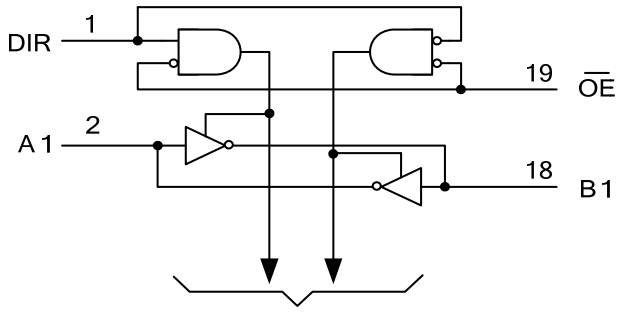



## ■ FUNCTION TABLE

| INPUT | | FUNCTION |
|---|---|---|
| $\overline{OE}$ | DIR | |
| H | X | Isolation |
| L | H | Transmit data from A bus to B bus, B=A |
| L | L | Transmit data from B bus to A bus, A=B |

Note: H: HIGH voltage level L: LOW voltage level X: Don't care

## ■ LOGIC DIAGRAM (Negative Logic)




Seven Other channels

## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | -0.5~6.5 | V |
| Input Voltage | $V_{IN}$ | -0.5~ 6.5 | V |
| Voltage Applied To Output In High-Impedance Or Power-Off State | $V_{OUT}$ | -0.5~6.5 | V |
| Voltage applied to output in high or low state | | -0.5~Vcc+0.5 | |
| Input Clamp Current | $I_{IK}$ | -50 | mA |
| Output Clamp Current | $I_{OK}$ | -50 | mA |
| Output Current | $I_{OUT}$ | ±50 | mA |
| $V_{CC}$ or GND Current | $I_{CC}$ | ±100 | mA |
| Storage Temperature | $T_{STG}$ | -65 ~ +150 | ˚C |

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ OPERATING CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | | TYP | UNIT |
|---|---|---|---|---|---|
| Power Dissipation Capacitance Per Transceiver | $C_{PD}$ | $\overline{OE}$ =0 f=10MHZ | $V_{CC}$ =1.8V | 42 | pF |
| | | | $V_{CC}$ =2.5V | 43 | |
| | | | $V_{CC}$ =3.3V | 45 | |
| | | $\overline{OE}$ =1 f=10MHZ | $V_{CC}$ =1.8V | 1 | |
| | | | $V_{CC}$ =2.5V | 1 | |
| | | | $V_{CC}$ =3.3V | 2 | |

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | Min | TYP | Max | UNIT |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | Operating | 1.65 | | 3.6 | V |
| | | Data retention only | 1.5 | | | |
| High-Level Input Voltage | $V_{IH}$ | $V_{CC}$ = 1.65 V ~ 1.95 V | 0.65*Vcc | | | V |
| | | $V_{CC}$ = 2.3 V ~ 2.7 V | 1.7 | | | |
| | | $V_{CC}$ = 2.7 V ~ 3.6 V | 2 | | | |
| Low-Level Input Voltage | $V_{IL}$ | $V_{CC}$ = 1.65 V ~ 1.95 V | | | 0.35*Vcc | V |
| | | $V_{CC}$ = 2.3 V ~ 2.7 V | | | 0.7 | |
| | | $V_{CC}$ = 2.7 V ~ 3.6 V | | | 0.8 | |
| Input Voltage | $V_{IN}$ | | 0 | | 5.5 | V |
| Output Voltage | $V_{OUT}$ | | 0 | | Vcc | V |
| Output High Current | $I_{OH}$ | $V_{CC}$ = 1.65 V | | | -4 | mA |
| | | $V_{CC}$ = 2.3 V | | | -8 | |
| | | $V_{CC}$ = 2.7 V | | | -12 | |
| | | $V_{CC}$ = 3 V | | | -24 | |
| Output Low Current | $I_{OL}$ | $V_{CC}$ = 1.65 V | | | 4 | mA |
| | | $V_{CC}$ = 2.3 V | | | 8 | |
| | | $V_{CC}$ = 2.7 V | | | 12 | |
| | | $V_{CC}$ = 3 V | | | 24 | |

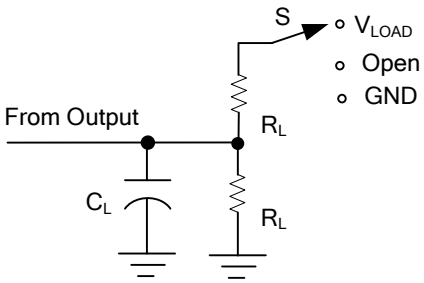
## ■ ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | Min | TYP | Max | UNIT |
|---|---|---|---|---|---|---|
| High-Level Output Voltage | $V_{OH}$ | $I_{OH}$ = –100μA,$V_{CC}$=1.65 V to 3.6 V | Vcc-0.2 | | | V |
| | | $I_{OH}$ = –4mA, $V_{CC}$=1.65V | 1.29 | | | |
| | | $I_{OH}$ = –8mA , $V_{CC}$=2.3V | 1.9 | | | |
| | | $I_{OH}$ = –12mA , $V_{CC}$=2.7V | 2.2 | | | |
| | | $I_{OH}$ = –12mA , $V_{CC}$=3V | 2.4 | | | |
| | | $I_{OH}$ = –24mA , $V_{CC}$=3V | 2.3 | | | |
| Low-Level Output Voltage | $V_{OL}$ | $I_{OH}$ = 100μA, $V_{CC}$=1.65 V to 3.6 V | | | 0.1 | V |
| | | $I_{OH}$ = 4mA, $V_{CC}$=1.65V | | | 0.24 | |
| | | $I_{OH}$ = 8mA, $V_{CC}$=2.3V | | | 0.3 | |
| | | $I_{OH}$ = 12mA , $V_{CC}$=2.7V | | | 0.4 | |
| | | $I_{OH}$ = 24mA , $V_{CC}$=3V | | | 0.55 | |
| Input Current | $I_{I(LEAK)}$ | $V_{IN}$ = 5.5 V or GND , $V_{CC}$=3.6V | | | ±1 | μA |
| Power OFF Leakage Current | $I_{OFF}$ | $V_{IN}$ = 5.5 V or GND , $V_{CC}$=0V | | | ±1 | μA |
| Output Off-State Current | $I_{OZ}$ | $V_{OUT}$ = 0 to 5.5 V , $V_{CC}$=3.6V | | | ±1 | μA |
| Quiescent Supply Current | $I_Q$ | $V_{IN}$=$V_{CC}$ or GND,$I_{OUT}$=0,$V_{CC}$=3.6V | | | 1 | μA |
| | | $V_{IN}$=3.6~5.5v,IOUT=0,$V_{CC}$=3.6V | | | 1 | μA |
| Additional Quiescent Current Per Input Pin | $\Delta I_Q$ | $V_{CC}$=2.7V ~ 3.6V, $V_{IN}$= $V_{CC}$ -0.6V, $I_{OUT}$=0 | | | 500 | μA |

## ■ SWITCHING CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | Min | TYP | Max | UNIT |
|---|---|---|---|---|---|---|
| Propagation Delay (From A to B Or From B to A) | $t_{PLH}$ / $t_{PHL}$ | $V_{CC}$ =1.8 V ± 0.15 V | 1 | 6 | 12.2 | ns |
| | | $V_{CC}$ =2.5 V ± 0.2 V | 1 | 3.9 | 7.8 | |
| | | $V_{CC}$ =2.7 V | 1 | 4.2 | 7.1 | |
| | | $V_{CC}$ =3.3 V ± 0.3 V | 1.5 | 3.8 | 6.1 | |
| 3-State Output Enable Time ( From $\overline{OE}$ to A or B) | $t_{PZH}$ / $t_{PZL}$ | $V_{CC}$ =1.8 V ± 0.15 V | 1 | 7 | 14.8 | ns |
| | | $V_{CC}$ =2.5 V ± 0.2 V | 1 | 4.5 | 10 | |
| | | $V_{CC}$ =2.7 V | 1 | 5.4 | 9.3 | |
| | | $V_{CC}$ =3.3 V ± 0.3 V | 1.5 | 4.4 | 8.3 | |
| 3-State Output Disable Time ( From $\overline{OE}$ A to A or B) | $t_{PLZ}$ / $t_{PLH}$ | $V_{CC}$ =1.8 V ± 0.15 V | 1 | 7.8 | 16.5 | ns |
| | | $V_{CC}$ =2.5 V ± 0.2 V | 1 | 4 | 9 | |
| | | $V_{CC}$ =2.7 V | 1 | 4.4 | 8.3 | |
| | | $V_{CC}$ =3.3 V ± 0.3 V | 1.7 | 4.1 | 7.3 | |

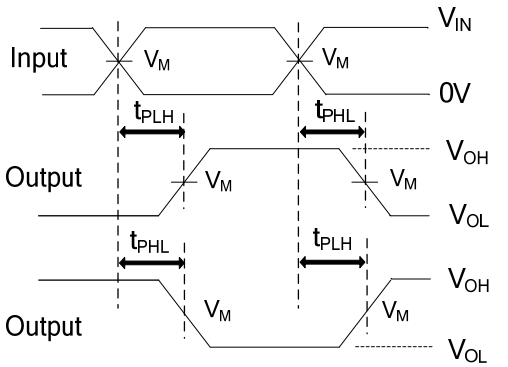
## ■ TEST CIRCUIT AND WAVEFORMS



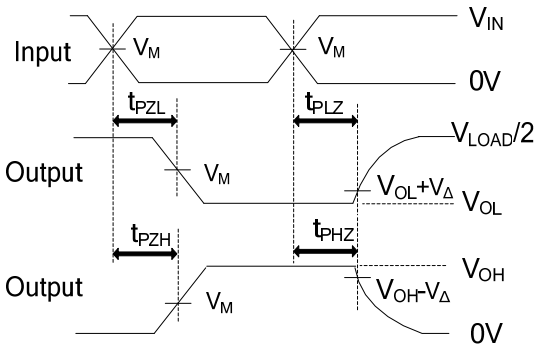

| TEST | S |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PHZ}/t_{PZH}$ | GND |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |

**TEST CIRCUIT**

| $V_{CC}$ | INPUTS | | $V_M$ | $V_\Delta$ | $C_L$ | $R_L$ | $V_{LOAD}$ |
|---|---|---|---|---|---|---|---|
| | $V_{IN}$ | $t_R/t_F$ | | | | | |
| 1.8V ±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 0.15V | 30 pF | 1 kΩ | 2 x $V_{CC}$ |
| 2.5V ±0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 0.15V | 30 pF | 500Ω | 2 x $V_{CC}$ |
| 2.7 V | 2.7 V | ≤2.5ns | 1.5V | 0.3V | 50 pF | 500Ω | 6V |
| 3.3V ±0.3V | 2.7 V | ≤2.5ns | 1.5V | 0.3V | 50 pF | 500Ω | 6V |




**PROPAGATION DELAY TIMES**




**ENABLE AND DISABLE TIMES**

Note: $C_L$ includes probe and jig capacitance.
All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, Zo = 50Ω.