



Dual 1-to-8 Low Voltage Clock Buffer/Translator

Description

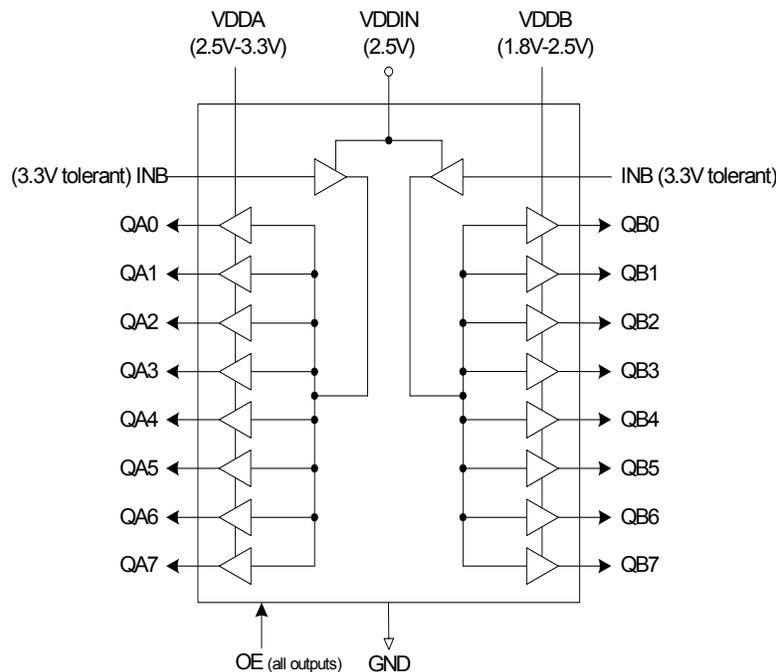
The ICSLV218 is a high-speed clock buffer consisting of two independent single-input to eight-output low-skew, non-inverting clock drivers.

The ICSLV218 has three independent supply rails: The input supply rail, VDDIN, operates from a fixed 2.5 V supply, while the output supply rails, VDDA and VDDB, operate from 2.5 V-3.3 V and 1.8 V-2.5 V supplies respectively. This configuration, combined with 3.3 V tolerance on the INA and INB inputs, allows for many different possibilities of up and/or down voltage translation.

Features

- Dual 1:8 clock drivers
- Pin-compatible with MK74CB218
- Independent supply rails on input and output banks for voltage translation
- 3.3 V input tolerance
- Low skew outputs within same bank (150 ps)
- Output Enable tri-states both banks of eight
- Clock speeds up to 200 MHz
- Industrial temperature range (-40 to 85°C)
- 28-pin SSOP (150 mil body) Pb (lead) free package

Block Diagram

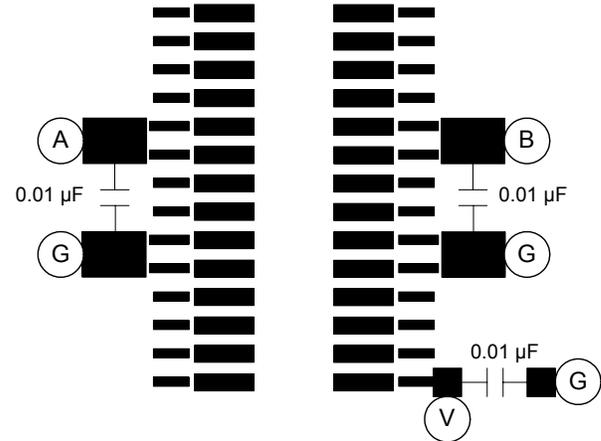




Pin Assignment

| | | | |
|------|----|----|------|
| INA | 1 | 28 | INB |
| QA0 | 2 | 27 | QB0 |
| QA1 | 3 | 26 | QB1 |
| QA2 | 4 | 25 | QB2 |
| VDDA | 5 | 24 | VDDB |
| VDDA | 6 | 23 | VDDB |
| QA3 | 7 | 22 | QB3 |
| QA4 | 8 | 21 | QB4 |
| GND | 9 | 20 | GND |
| GND | 10 | 19 | GND |
| QA5 | 11 | 18 | QB5 |
| QA6 | 12 | 17 | QB6 |
| QA7 | 13 | 16 | QB7 |
| OE | 14 | 15 | VDD |

Suggested Layout



NOTE: 33 ohm series termination resistors for each output are essential for operation.

For simplicity, series termination resistors are not shown for the outputs, but should be placed as close to the device as possible. It is most critical to have the 0.01 μ F decoupling capacitors closest.

(A) = connect to VDDA

(B) = connect to VDDB

(V) = connect to VDD

(G) = connect to low inductance ground plane

Pin Descriptions

| Pin Number | Pin Name | Pin Type | Pin Description |
|------------|---------------|----------|--|
| 1 | INA | Input | Clock input for eight A outputs. 3.3 V tolerant. |
| 2, 3, 4 | QA0, QA1, QA2 | Output | Clock A outputs. |
| 5, 6 | VDDA | Power | Power supply for QA outputs. Connect to a voltage from 2.5 V to 3.3 V. |
| 7, 8 | QA3, QA4 | Output | Clock A outputs. |
| 9, 10 | GND | Power | Connect to ground. |
| 11, 12, 13 | QA5, QA6, QA7 | Output | Clock A outputs. |
| 14 | OE | Input | Output Enable. Tri-states all clock outputs when this input is low. Internal pull-up to VDDIN. |
| 15 | VDD | Power | Power supply for inputs. Connect to 2.5 V. |
| 16, 17, 18 | QB7, QB6, QB5 | Output | Clock B outputs. |
| 19, 20 | GND | Power | Connect to ground. |
| 21, 22 | QB4, QB3 | Output | Clock B outputs. |
| 23, 24 | VDDB | Power | Power supply for QB outputs. Connect to a voltage from 1.8 V to 2.5 V. |
| 25, 26, 27 | QB2, QB1, QB0 | Output | Clock B outputs. |
| 28 | INB | Input | Clock input for eight B outputs. 3.3 V tolerant. |



Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the ICSLV218. These ratings, which are standard values for ICS commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

| Item | Rating |
|---|------------------------------------|
| Supply Voltages, VDDIN, VDDA, or VDDB (referenced to GND) | 5 V |
| Inputs INA and INB (referenced to GND) | -0.5 V to 3.6 V |
| Outputs | -0.5 V to VDDA+0.5 V or VDDB+0.5 V |
| Ambient Operating Temperature | -40 to +85°C |
| Storage Temperature | -65°C to 150°C |
| Soldering Temperature | 260°C (max. of 20 seconds) |



DC Electrical Characteristics

Unless stated otherwise, $V_{DDIN} = V_{DDA} = V_{DDDB} = 2.5\text{ V} \pm 10\%$, Ambient Temperature = -40 to 85°C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|------------------------------|-------------------|---|-----------------------|-----------|------|---------------|
| Operating Voltage | V _{DDIN} | | 2.375 | 2.5 | 2.75 | V |
| | V _{DDA} | | 2.375 | | 3.63 | V |
| | V _{DDDB} | | 1.62 | | 2.75 | V |
| Operating Supply Current | I _{DDIN} | All outputs at 100 MHz, No load | | 25 | | μA |
| | I _{DDA} | All outputs at 100 MHz, No load | | 17 | | mA |
| | I _{DDDB} | All outputs at 100 MHz, No load | | 17 | | mA |
| Input High Voltage | V _{IH} | INA, INB, OE pins | 1.7 | | | V |
| Input Low Voltage | V _{IL} | INA, INB, OE pins | | | 0.7 | V |
| Output High Voltage, QA0-QA7 | V _{OH} | V _{DDA} =3.3 V, I _{OH} = -25 mA | 2.0 | | | V |
| | | V _{DDA} =2.5 V, I _{OH} = -16 mA | 2.0 | | | V |
| Output Low Voltage, QA0-QA7 | V _{OL} | I _{OL} = 25 mA | | | 0.4 | V |
| | | V _{DDA} =2.5 V, I _{OL} = 16 mA | | | 0.4 | V |
| Output High Voltage, QB0-QB7 | V _{OH} | V _{DDDB} = 2.5 V, I _{OH} = -16 mA | 2 | | | V |
| | | V _{DDDB} = 1.8 V, I _{OH} = -8 mA | V _{DD} -0.45 | | | V |
| Output Low Voltage, QB0-QB7 | V _{OL} | V _{DDDB} = 2.5 V, I _{OL} = 16 mA | | | 0.4 | V |
| | | V _{DDDB} = 1.8 V, I _{OL} = 8 mA | | | 0.45 | V |
| Output Impedance | | | | 15 | | Ω |
| Short Circuit Current | | Each output, V _{OUT} =GND or V _{DD} | | ± 100 | | mA |
| Input Capacitance | C _{IN} | | | 7 | | pF |
| On-chip Pull-up Resistor | R _{PU} | OE | | 250 | | k Ω |

Note: Short circuits may be applied indefinitely, but only one output may be shorted at a time to prevent exceeding the power dissipation rating of this package.



AC Electrical Characteristics

Unless stated otherwise, $V_{DDIN} = V_{DDA} = V_{ddb} = 2.5\text{ V} \pm 10\%$, Ambient Temperature = -40 to 85°C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-----------------------------------|----------|--|------|------|------|-------|
| Input Clock Frequency | F_{IN} | INA or INB, Note 3 | 0 | | 200 | MHz |
| Propagation Delay, INA to QA0-QA7 | | $C_L = 10\text{ pF}$ | | | 5 | ns |
| Propagation Delay, INB to QB0-QB7 | | $C_L = 10\text{ pF}$ | | | 5 | ns |
| Output Clock Rise Time | | 20% to 80%, $C_L = 10\text{ pF}$ | | | 2.5 | ns |
| Output Clock Fall Time | | 80% to 20%, $C_L = 10\text{ pF}$ | | | 2.5 | ns |
| Output Duty Cycle | | $C_L = 10\text{ pF}$ | 45 | 48 | 55 | % |
| Output to Output Skew | | Measured on rising edge at $V_{DD}/2$, Note 1 | | 100 | 150 | ps |
| Output Clock A to B Skew | | At $V_{DD}/2$, Note 2 | | | 1500 | ps |
| Output Enable Time | | OE high to output on | | | 20 | ns |
| Output Disable Time | | OE low to tri-state | | | 20 | ns |

Notes:

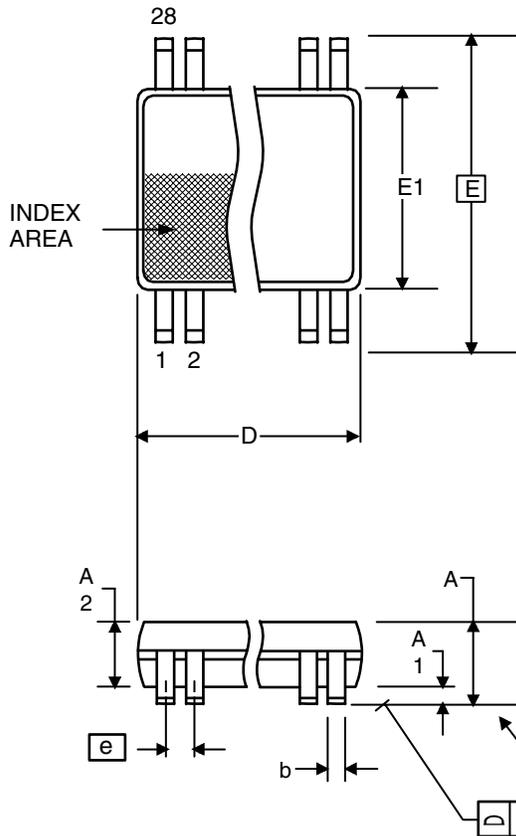
- Between any two A outputs, or any two B outputs, with equal loading.
- Between any clock A output and any clock B output with INA connected to INB, and equal loading.
- Care must be taken not to exceed the absolute maximum junction temperature or power dissipation rating of the package: Power dissipated = $(16\text{ outputs} \times \text{frequency} \times V_{DD}^2 \times C_L) < [(T_j - T_a) / \theta_{JA}]$.

Thermal Characteristics

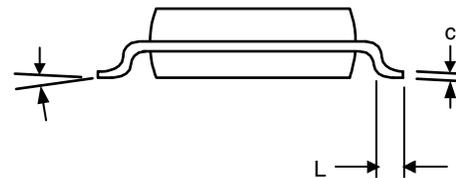
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|--|---------------|----------------|------|------|------|--------------------|
| Thermal Resistance Junction to Ambient | θ_{JA} | Still air | | 100 | | $^\circ\text{C/W}$ |
| | θ_{JA} | 1 m/s air flow | | 80 | | $^\circ\text{C/W}$ |
| | θ_{JA} | 3 m/s air flow | | 67 | | $^\circ\text{C/W}$ |
| Thermal Resistance Junction to Case | θ_{JC} | | | 60 | | $^\circ\text{C/W}$ |

**Package Outline and Package Dimensions (28-pin SSOP, 150 mil Body)**

Package dimensions are kept current with JEDEC Publication No. 95, MO-153



| Symbol | Millimeters | | Inches | |
|----------|-------------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | .053 | .069 |
| A1 | 0.10 | 0.25 | .0040 | .010 |
| A2 | -- | 1.50 | -- | .059 |
| b | 0.20 | 0.30 | .008 | .012 |
| C | 0.18 | 0.25 | .007 | .010 |
| D | 9.80 | 10.00 | .386 | .394 |
| E | 5.80 | 6.20 | .228 | .244 |
| E1 | 3.80 | 4.00 | .150 | .157 |
| e | 0.635 Basic | | 0.025 Basic | |
| L | 0.40 | 1.27 | .016 | .050 |
| α | 0° | 8° | 0° | 8° |
| aaa | -- | 0.10 | -- | 0.004 |

**Ordering Information**

| Part / Order Number | Marking | Shipping Packaging | Package | Temperature |
|---------------------|--------------|--------------------|-------------|--------------|
| ICSLV218RILF | ICSLV218RILF | Tubes | 28-pin SSOP | -40 to +85°C |
| ICSLV218RILFT | ICSLV218RILF | Tape and Reel | 28-pin SSOP | -40 to +85°C |

Parts that are ordered with a "LF" suffix to the part number are the Pb-Free configuration and are RoHS compliant.

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