SCAN16512A Low Voltage Universal 16-bit IEEE 1149.1 Bus Transceiver with TRI-STATE Outputs

Check for Samples: SCAN16512A

FEATURES

- **IEEE 1149.1 (JTAG) Compliant**
- **2.7V to 3.6V V_{CC} Operation**
- **TRI-STATE Outputs for Bus-Oriented Applications**
- **Dual Byte-Wide Data for Bus Applications**
- **Power Down High Impedance Inputs and Outputs**
- **Optional Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors (SCANH16512A, SCANH162512A Versions)**
- **Optional 25Ω Series Resistors in Outputs to Minimize Noise and Eliminate Termination Resistors (SCAN162512A, SCANH162512A Versions)**
- **Supports Live Insertion/Withdrawal**
- **Includes CLAMP and HIGHZ Instructions**

DESCRIPTION

The SCAN16512A is a high speed, low-power universal bus transceiver featuring data inputs organized into two 8-bit bytes with output enable and latch enable control signals. This function is configurable as a D-type Latch or Flip-Flop, and can operate in transparent, latched, or clocked mode. This device is compliant with IEEE 1149.1 Standard Test Access Port and Boundary Scan Architecture with the incorporation of the defined boundary-scan test logic and test access port consisting of Test Data Input (TDI), Test Data Out (TDO), Test Mode Select (TMS), Test Clock (TCK), and Test Reset ($\overline{\text{TRST}}$).

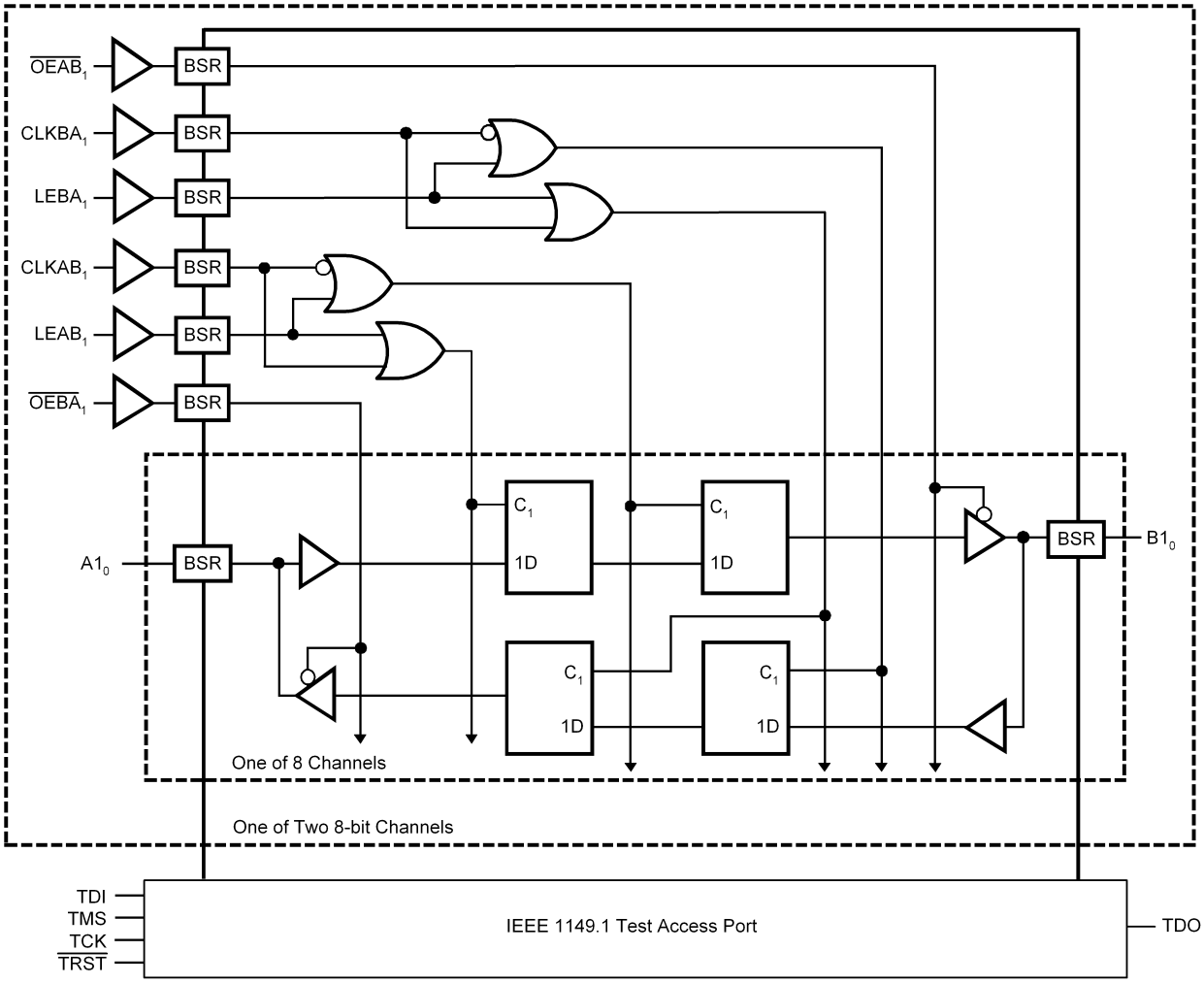
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2004–2011, Texas Instruments Incorporated

Block Diagram



Copyright © 2004–2011, Texas Instruments Incorporated

PIN DESCRIPTIONS

Pin Name	Description
$A1_0$-$A1_7$, $A2_0$-$A2_7$	Normal-function A-bus I/O ports. See Function Table for normal-mode logic.
$B1_0$-$B1_7$, $B2_0$-$B2_7$	Normal-function B-bus I/O ports. See Function Table for normal-mode logic.
$CLKAB_1$, $CLKBA_1$, $CLKAB_2$, $CLKBA_2$	Normal-function clock inputs. See Function Table for normal-mode logic.
GND	Ground
V_{CC}	Supply Voltage
$LEAB_1$, $LEBA_1$, $LEAB_2$, $LEBA_2$	Normal-function latch enables. See Function Table for normal-mode logic.
$\overline{OEAB}_1$, $\overline{OEBA}_1$, $\overline{OEAB}_2$, $\overline{OEBA}_2$	Normal-function output enables. See Function Table for normal-mode logic.
TDO	The Test Data Output to support IEEE Std 1149.1-1990. TDO is the serial output for shifting data through the instruction register or selected data register.
TMS	The Test Mode Select input to support IEEE Std 1149.1-1990. TMS directs the device through it's TAP controller states. An internal pull-up forces TMS high if left unconnected.
TCK	The Test Clock input to support IEEE Std 1149.1-1990. Test operations of the device are synchronous to TCK. Data is captured on the rising edge of TCK and outputs change on the falling edge of TCK.
TDI	The Test Data Input to support IEEE Std 1149.1-1990. TDI is the serial input to shift data through the instruction register or the selected data register. An internal pull-up resistor forces TDI high if left unconnected.
$\overline{TRST}$	The Test Reset Input to support IEEE Std 1149.1-1990. TRST is the asynchronous reset pin which will force the TAP controller to it's initialization state when active. An internal pullup resistor forces $\overline{TRST}$ high if left unconnected.

BGA Pinout

	1	2	3	4	5	6	7	8
A	$A1_0$	$A1_2$	$A1_4$	$A1_6$	$A2_0$	$A2_2$	$A2_4$	$A2_6$
B	$A1_1$	$A1_3$	$A1_5$	$A1_7$	$A2_1$	$A2_3$	$A2_5$	$A2_7$
C	$\overline{TRST}$	$CLKAB_1$	$LEAB_1$	$\overline{OEAB}_1$	GND	$CLKAB_2$	$LEAB_2$	$\overline{OEAB}_2$
D	TMS	GND	V_{CC}	GND	V_{CC}	GND	TDI	TDO
E	TCK	GND	V_{CC}	V_{CC}	GND	GND	N/C	V_{CC}
F	$CLKBA_1$	$LEBA_1$	$\overline{OEBA}_1$	GND	N/C	$CLKBA_2$	$LEBA_2$	$\overline{OEBA}_2$
G	$B1_1$	$B1_3$	$B1_5$	$B1_7$	$B2_1$	$B2_3$	$B2_5$	$B2_7$
H	$B1_0$	$B1_2$	$B1_4$	$B1_6$	$B2_0$	$B2_2$	$B2_4$	$B2_6$

Copyright © 2004–2011, Texas Instruments Incorporated

Connection Diagram

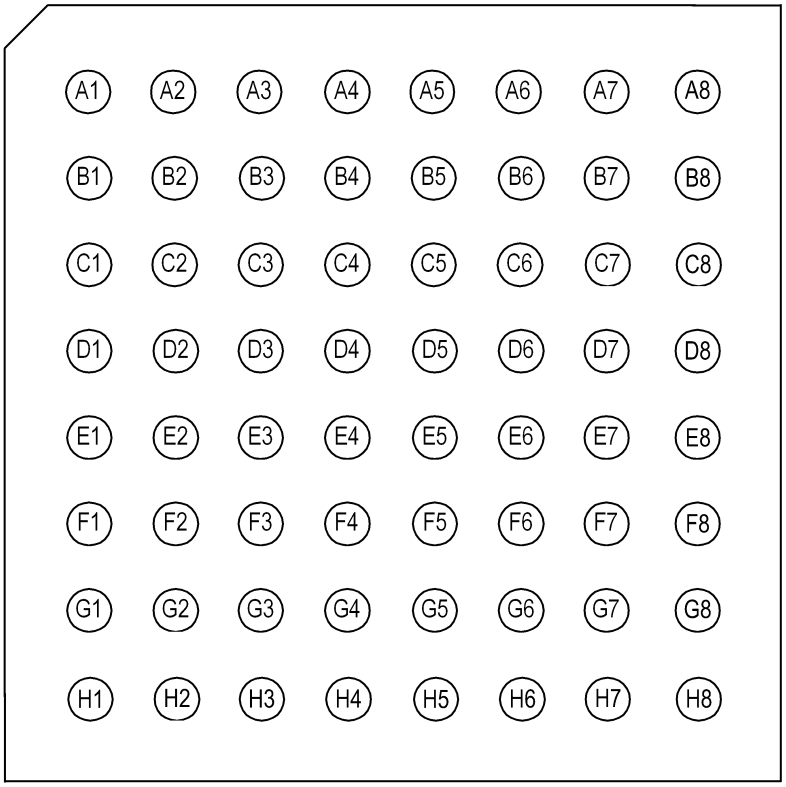


Figure 1. Top View

Function Table(1)(2)

Inputs				Outputs
$\overline{OEAB}$	LEAB	CLKAB	A	B
L	L	L	X	B_0(3)
L	L	↑	L	L
L	L	↑	H	H
L	H	X	L	L
L	H	X	H	H
H	X	X	X	Z

(1) H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial (HIGH or LOW, inputs may not float)
Z = High Impedance

(2) A-to-B data flow is shown. B-to-A data flow is similar, but uses $\overline{OEBA}$, LEBA, and CLKBA.

(3) Output level before the indicated steady-state input conditions were established.

Copyright © 2004–2011, Texas Instruments Incorporated

Functional Description

In the normal mode, these devices are 16-bit universal bus transceivers that combine D-type latches and D-type flip-flops to allow data flow in transparent, latched, or clocked modes. They can be used as two 8-bit transceivers, or as one 16-bit transceiver. The test circuitry can be activated by the TAP to take snapshot samples of the data appearing at the device pins or to perform a self test on the boundary-test cells. Activating the TAP may affect the normal functional operation of the universal bus transceivers. When the TAP is activated, the test circuitry performs boundary-scan test operations according to the protocol described in IEEE Std 1149.1-1990.

Data flow in each direction is controlled by output-enable ($\overline{OEAB}$ and $\overline{OEBA}$), latch-enable (LEAB and LEBA), and clock (CLKAB and CLKBA) inputs. For A-to-B data flow, the devices operate in the transparent mode when LEAB is high. When LEAB is low, the A data is latched while CLKAB is held at a static low or high logic level. Otherwise, if LEAB is low, A data is stored on a low-to-high transition of CLKAB. When $\overline{OEAB}$ is LOW, the B outputs are active. When $\overline{OEAB}$ is HIGH, the B outputs are in the high-impedance state. B-to-A data flow is similar to A-to-B data flow but uses the $\overline{OEBA}$, LEBA, and CLKBA inputs.

Five dedicated test pins are used to observe and control the operation of the test circuitry: test data input (TDI), test data output (TDO), test mode select (TMS), test clock (TCK), and test reset ($\overline{TRST}$). All testing and scan operations are synchronized to the TAP interface.

For details about the sequence of boundary scan cells in the SCAN16512A, please refer to the BSDL (Boundary Scan Description Language) file available on our website.

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings(1)

Supply Voltage (V_{CC})		−0.5V to +4.6V
DC Input Diode Current (I_{IK})	V_I = −0.5V	−50 mA
DC Output Diode Current (I_{OK})	V_O = −0.5V	−50 mA
DC Input Voltage (V_I)		−0.5V to 4.6V
DC Output Voltage (V_O)		−0.5V to 4.6V
DC Output Source/Sink Current (I_O)		±50 mA
DC V_{CC} or Ground Current per Supply Pin		±100 mA
Junction Temperature		+150°C
Storage Temperature		−65°C to +150°C
Lead Temperature (Solder, 4sec)	64L BGA	220 °C
Thermal Resistance	BGA θ_{JA}	62°C/W
Package Derating		16.1mW/°C above 25°C
ESD (Min)		2000V

(1) Absolute maximum ratings are those values beyond which damage to the device may occur.

Recommended Operating Conditions

Supply Voltage (V_{CC})	SCAN16512A	2.7V to 3.6V
Input Voltage (V_I)		0V to 3.6V
Output Voltage (V_O)		0V to 3.6V
Operating Temperature (T_A)	Industrial	−40°C to +85°C

Copyright © 2004–2011, Texas Instruments Incorporated

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	Industrial T_A = −40°C to +85°C		Units	Conditions
			Min	Max		
V_{IH}	Minimum High Input Voltage	2.7 3.6	2.0 2.0		V	V_{OUT} = 0.1V or V_{CC} −0.1V
V_{IL}	Maximum Low Input Voltage	2.7 3.6		0.8 0.8	V	V_{OUT} = 0.1V or V_{CC} −0.1V
V_{OH}	Minimum High Output Voltage All Outputs, All Options	2.7 3.6	2.5 3.4		V	I_{OUT} = −100 µA
	Minimum High Output Voltage TDO Outputs, All Options	2.7	2.2		V	V_{IN} = V_{IL} or V_{IH}, I_{OH} = −12mA
		3.0	2.2		V	V_{IN} = V_{IL} or V_{IH} I_{OH} = −24mA
	Minimum High Output Voltage A and B Ports: SCAN16512A and SCANH16512A options	2.7	2.2		V	V_{IN} = V_{IL} or V_{IH} I_{OH} = −12mA
		3.0	2.2		V	V_{IN} = V_{IL} or V_{IH} I_{OH} = −24mA
	Minimum High Output Voltage A and B Ports: SCAN162512A and SCANH162512A options (25Ω series resistor options)	2.7	2.2		V	V_{IN} = V_{IL} or V_{IH} I_{OH} = -4mA
		3.0	2.2		V	V_{IN} = V_{IL} or V_{IH} I_{OH} = -12mA
V_{OL}	Maximum Low Output Voltage All Outputs, All Options	2.7 3.6		0.2 0.2	V	I_{OUT} = 100 µA
	Maximum Low Output Voltage TDO Outputs, All Options	2.7		0.4	V	V_{IN} = V_{IL} or V_{IH}, I_{OL} = 12mA
		3.0		0.55	V	V_{IN} = V_{IL} or V_{IH}, I_{OL} = 24mA
	Maximum Low Output Voltage A and B Ports: SCAN16512A and SCANH16512A Options	2.7		0.4	V	V_{IN} = V_{IL} or V_{IH}, I_{OL} = 12mA
		3.0		0.55	V	V_{IN} = V_{IL} or V_{IH}, I_{OL} = 24mA
	Maximum Low Output Voltage A and B Ports: SCAN162512A and SCANH162512A Options (25Ω series resistor options)	2.7		0.4	V	V_{IN} = V_{IL} or V_{IH}, I_{OL} = 4mA
		3.0		0.6	V	V_{IN} = V_{IL} or V_{IH}, I_{OL} = 12mA
I_{IN}	Maximum Input Leakage Current	3.6		±5.0	µA	V_I = V_{CC}, GND
I_{ILR}	Input Low Current	3.6	-20	-250	µA	V_{IN} = GND
I_{OZ}	Maximum I/O Leakage Current	3.6		±10.0	µA	V_I (OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, GND
$I_{I(HOLD)}$	Bus Hold Input Minimum Drive Hold Current (1)	2.7	±35		µA	V_I = 0.8V or 2.0V
		3.6		±500		V_I = 0 to 3.6V
V_{IKL}	Input Clamp Diode Voltage	2.7		-1.5	V	I_{IN} = -18mA
I_{OFF}	Power-off Leakage Current	0.0		±10.0	µA	V_O = V_{CC}, GND
I_{CC}	Maximum Quiescent Supply Current	3.6		20	µA	
I_{CCt}	Maximum I_{CC} Per Input	3.6		0.5	mA	V_I = V_{CC}–0.6V

(1) Applies to devices with Bus Hold feature only.

Copyright © 2004–2011, Texas Instruments Incorporated

Noise Specifications

Applies to SCAN16512A and SCANH16512A options, C_L = 30pF, R_L = 500Ω to GND

Symbol	Parameter	V_{CC} (V)	Industrial T_A = 25°C Typical Limits	Units
V_{OLP}	Quiet Output Maximum Dynamic VOL(1)	3.3	1.2	V
V_{OLV}	Quiet Output Minimum Dynamic VOL(1)	3.3	-1.5	V
V_{OHP}	Quiet Output Maximum Dynamic VOH(2)	3.3	VOH + 0.9	V
V_{OHV}	Quiet Output Minimum Dynamic VOH(2)	3.3	VOH - 1.5	V

(1) Maximum number of outputs is defined as n. (n-1) outputs are switched LOW while the quiet output is monitored in a LOW (VOL) state. Also, (n-1) outputs are switched HIGH while the quiet output is monitored in a LOW (VOL) state.
(2) Maximum number of outputs is defined as n. (n-1) outputs are switched LOW while the quiet output is monitored in a HIGH (VOH) state. Also, (n-1) outputs are switched HIGH while the quiet output is monitored in a HIGH (VOH) state.

Noise Specifications

Applies to SCAN162512A and SCANH162512A options, C_L = 30pF, R_L = 500Ω to GND

Symbol	Parameter	V_{CC} (V)	Industrial T_A = 25°C Typical Limits	Units
V_{OLP}	Quiet Output Maximum Dynamic VOL(1)	3.3	0.5	V
V_{OLV}	Quiet Output Minimum Dynamic VOL(1)	3.3	-0.4	V
V_{OHP}	Quiet Output Maximum Dynamic VOH(2)	3.3	VOH + 0.5	V
V_{OHV}	Quiet Output Minimum Dynamic VOH(2)	3.3	VOH - 0.5	V

(1) Maximum number of outputs is defined as n. (n-1) outputs are switched LOW while the quiet output is monitored in a LOW (VOL) state. Also, (n-1) outputs are switched HIGH while the quiet output is monitored in a LOW (VOL) state.
(2) Maximum number of outputs is defined as n. (n-1) outputs are switched LOW while the quiet output is monitored in a HIGH (VOH) state. Also, (n-1) outputs are switched HIGH while the quiet output is monitored in a HIGH (VOH) state.

AC Electrical Characteristics

Normal Operation, over recommended operating supply voltage and temperature ranges unless otherwise specified.

Symbol	Parameter	SCAN16512A, SCANH16512A T_A = −40°C to +85°C C_L = 30 pF R_L = 500Ω to GND		Units
		Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay A to B, B to A		5.5 5.5	ns
t_{PLH}, t_{PHL}	Propagation Delay CLKAB to B, CLKBA to A		6.0 6.0	ns
t_{PLH}, t_{PHL}	Propagation Delay LEAB to B, LEBA to A		6.0 6.0	ns
t_{PLZ}, t_{PHZ}	Disable Time, $\overline{OEAB}$ to B, $\overline{OEBA}$ to A		7.5 7.5	ns
t_{PZL}, t_{PZH}	Enable Time, $\overline{OEAB}$ to B, $\overline{OEBA}$ to A		7.5 7.5	ns

Copyright © 2004–2011, Texas Instruments Incorporated

AC Electrical Characteristics

Normal Operation, over recommended operating supply voltage and temperature ranges unless otherwise specified.

Symbol	Parameter	SCAN162512A T_A = −40°C to +85°C C_L = 30 pF R_L = 500Ω to GND		Units
		Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay A to B, B to A		6.0 6.0	ns
t_{PLH}, t_{PHL}	Propagation Delay CLKAB to B, CLKBA to A		6.5 6.5	ns
t_{PLH}, t_{PHL}	Propagation Delay LEAB to B, LEBA to A		6.5 6.5	ns
t_{PLZ}, t_{PHZ}	Disable Time, $\overline{OEAB}$ to B, $\overline{OEBA}$ to A		8.0 8.0	ns
t_{PZL}, t_{PZH}	Enable Time, $\overline{OEAB}$ to B, $\overline{OEBA}$ to A		8.0 8.0	ns

AC Electrical Characteristics

Normal Operation, over recommended operating supply voltage and temperature ranges unless otherwise specified.

Symbol	Parameter	SCANH162512A T_A = −40°C to +85°C C_L = 30 pF R_L = 500Ω to GND		Units
		Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay A to B, B to A		6.0 6.0	ns
t_{PLH}, t_{PHL}	Propagation Delay CLKAB to B, CLKBA to A		6.5 6.5	ns
t_{PLH}, t_{PHL}	Propagation Delay LEAB to B, LEBA to A		6.5 6.5	ns
t_{PLZ}, t_{PHZ}	Disable Time, $\overline{OEAB}$ to B, $\overline{OEBA}$ to A		8.0 8.0	ns
t_{PZL}, t_{PZH}	Enable Time, $\overline{OEAB}$ to B, $\overline{OEBA}$ to A		8.0 8.0	ns

Copyright © 2004–2011, Texas Instruments Incorporated

AC Operating Requirements

Normal Operation, over recommended operating supply voltage and temperature ranges unless otherwise specified

Symbol	Parameter	All Options T_A = −40°C to +85°C C_L = 30 pF, R_L = 500Ω to GND Ensured Minimum	Units
t_S	Setup Time, A to CLKAB or B to CLKBA	1.5	ns
t_H	Hold Time, A to CLKAB or B to CLKBA	2.0	ns
t_S	Setup Time, A to LEAB or B to LEBA	1.5	ns
t_H	Hold Time, A to LEAB or B to LEBA	2.5	ns
t_W	Pulse Width, CLKAB or CLKBA, high or low	2.0	ns
t_W	Pulse Width, LEAB or LEBA high	2.0	ns
f_{max}	Maximum CLKAB or CLKBA Clock Frequency	250	MHz

AC Operating Requirements

can Test Operation, over recommended operating supply voltage and temperature ranges unless otherwise specified

Symbol	Parameter	All Options T_A = −40°C to +85°C C_L = 30 pF, R_L = 500Ω to GND Ensured Minimum	Units
t_S	Setup Time, H or L, TMS to TCK	2.0	ns
t_H	Hold Time, H or L, TCK to TMS	1.0	ns
t_S	Setup Time, H or L, TDI to TCK	1.0	ns
t_H	Hold Time, H or L, TCK to TDI	2.0	ns
t_W	Pulse Width TCK High or Low	10	ns
t_W	Pulse Width $\overline{TRST}$, Low	2.5	ns
f_{max}	Maximum TCK Clock Frequency	25	MHz
t_{REC}	Recovery Time, $\overline{TRST}$ to TCK	2.0	ns

Copyright © 2004–2011, Texas Instruments Incorporated

AC LOADING AND WAVEFORMS

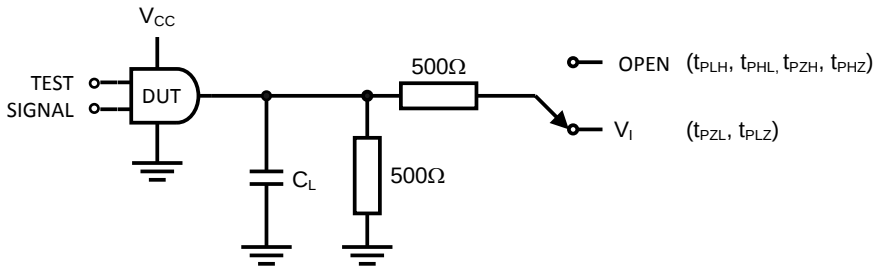
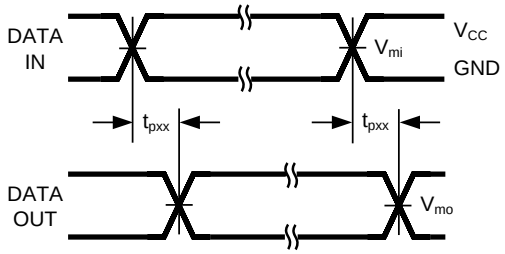
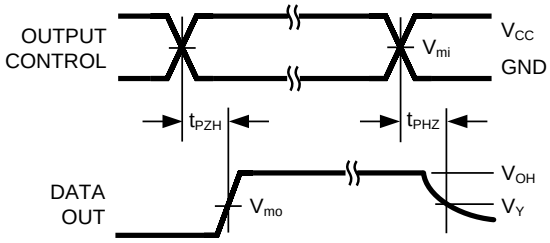


Figure 2. AC Test Circuit (C_L Includes Probe and Jig Capacitance)

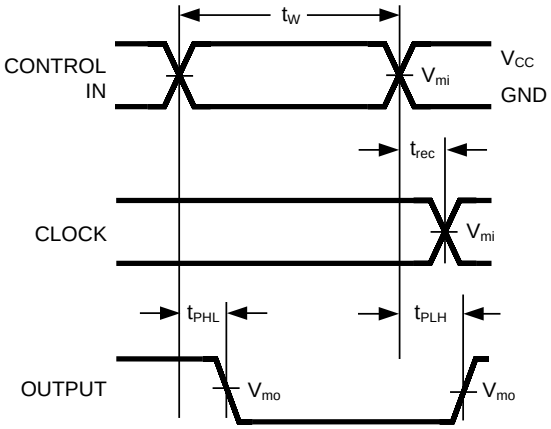
V_I	C_L
V_{CC} * 2	30pF



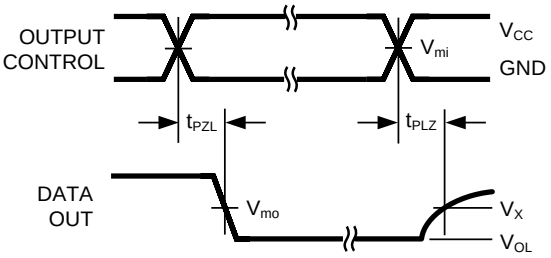
Waveform for Inverting and Non-inverting Functions



Tristate Output High Enable and Disable Times for Logic



Propagation Delay, Pulse Width and t_{REC} Waveforms



Tristate Output Low Enable and Disable Times for Logic

Figure 3. Timing Waveforms
(Input Characteristics; f = 1MHz, t_r = t_f = 2.5ns)

Symbol	V_{CC}
	2.7 - 3.6V
V_{mi}	1.5V
V_{mo}	1.5V
V_x	V_{OL} + 0.3V
V_y	V_{OH} - 0.3V

Copyright © 2004–2011, Texas Instruments Incorporated

CAPACITANCE AND I/O CHARACTERISTICS

Refer to TI's website for IBIS models at www.ti.com/lsds/ti/analog/interface.page

Table 1. Device ID Register

Ordering Code	Features	Device ID	Manufacturer & LSB
SCAN16512ASM	No bus hold, no series resistor	FC30	01F
SCANH16512ASM	With bus hold only	FC31	01F
SCAN162512ASM	With 25Ω series resistors in outputs	FC32	01F
SCANH162512ASM	With 25Ω series resistors and bus hold	FC33	01F

Copyright © 2004–2011, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated