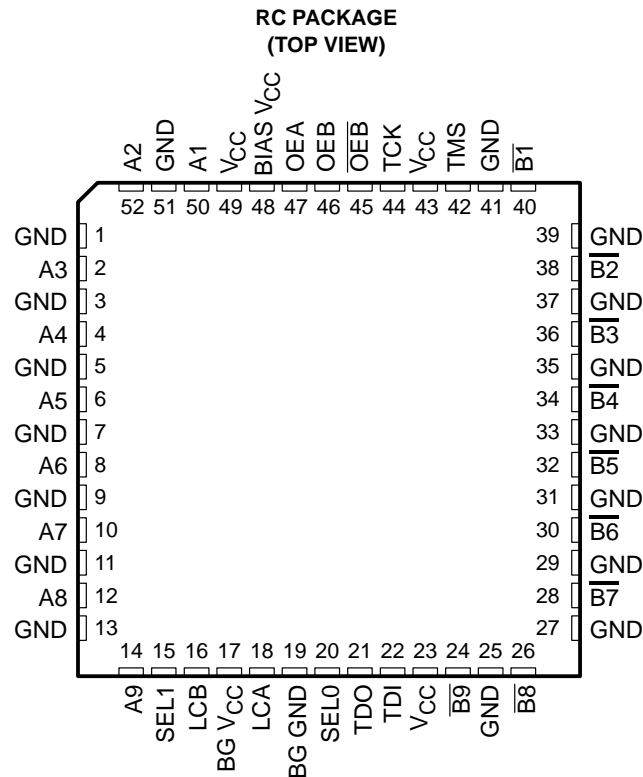


SN74FB2031 9-BIT TTL/BTL ADDRESS/DATA TRANSCEIVER

SCBS176N – NOVEMBER 1991 – REVISED JUNE 2001

- Compatible With IEEE Std 1194.1-1991 (BTL)
- TTL A Port, Backplane Transceiver Logic (BTL) \bar{B} Port
- Open-Collector \bar{B} -Port Outputs Sink 100 mA
- High-Impedance State During Power Up and Power Down
- BIAS V_{CC} Minimizes Signal Distortion During Live Insertion or Withdrawal
- \bar{B} -Port Biasing Network Preconditions the Connector and PC Trace to the BTL High-Level Voltage
- TTL-Input Structures Incorporate Active Clamping to Aid in Line Termination



description

The SN74FB2031 is a 9-bit transceiver designed to translate signals between TTL and backplane transceiver logic (BTL) environments. The device is designed specifically to be compatible with IEEE Std 1194.1-1991.

The \bar{B} port operates at BTL-signal levels. The open-collector \bar{B} ports are specified to sink 100 mA. Two output enables (OEB and \overline{OEB}) are provided for the \bar{B} outputs. When OEB is low, \overline{OEB} is high, or V_{CC} is less than 2.1 V, the \bar{B} port is turned off.

The A port operates at TTL signal levels. The A outputs reflect the inverse of the data at the \bar{B} port when the A-port output enable (OEA) is high. When OEA is low or V_{CC} is less than 2.1 V, the A outputs are in the high-impedance state.

Pins are allocated for the four-wire IEEE Std 1149.1 (JTAG) test bus, although currently there are no plans to release a JTAG-featured version. TMS and TCK are not connected and TDI is shorted to TDO.



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.

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

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2001, Texas Instruments Incorporated

SN74FB2031

9-BIT TTL/BTL ADDRESS/DATA TRANSCEIVER

SCBS176N – NOVEMBER 1991 – REVISED JUNE 2001

description (continued)

BIAS V_{CC} establishes a voltage between 1.62 V and 2.1 V on the BTL outputs when V_{CC} is not connected.

BG V_{CC} and BG GND are the supply inputs for the bias generator.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	QFP – RC	Tube	SN74FB2031RC	FB2031

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

Function Tables

TRANSCEIVER

INPUTS			FUNCTION
OEA	OEB	\overline{OEB}	
L	H	L	\overline{A} data to B bus
H	L	X	\overline{B} data to A bus
H	X	H	
H	H	L	\overline{A} data to B bus, \overline{B} data to A bus
L	L	X	Isolation
L	X	H	

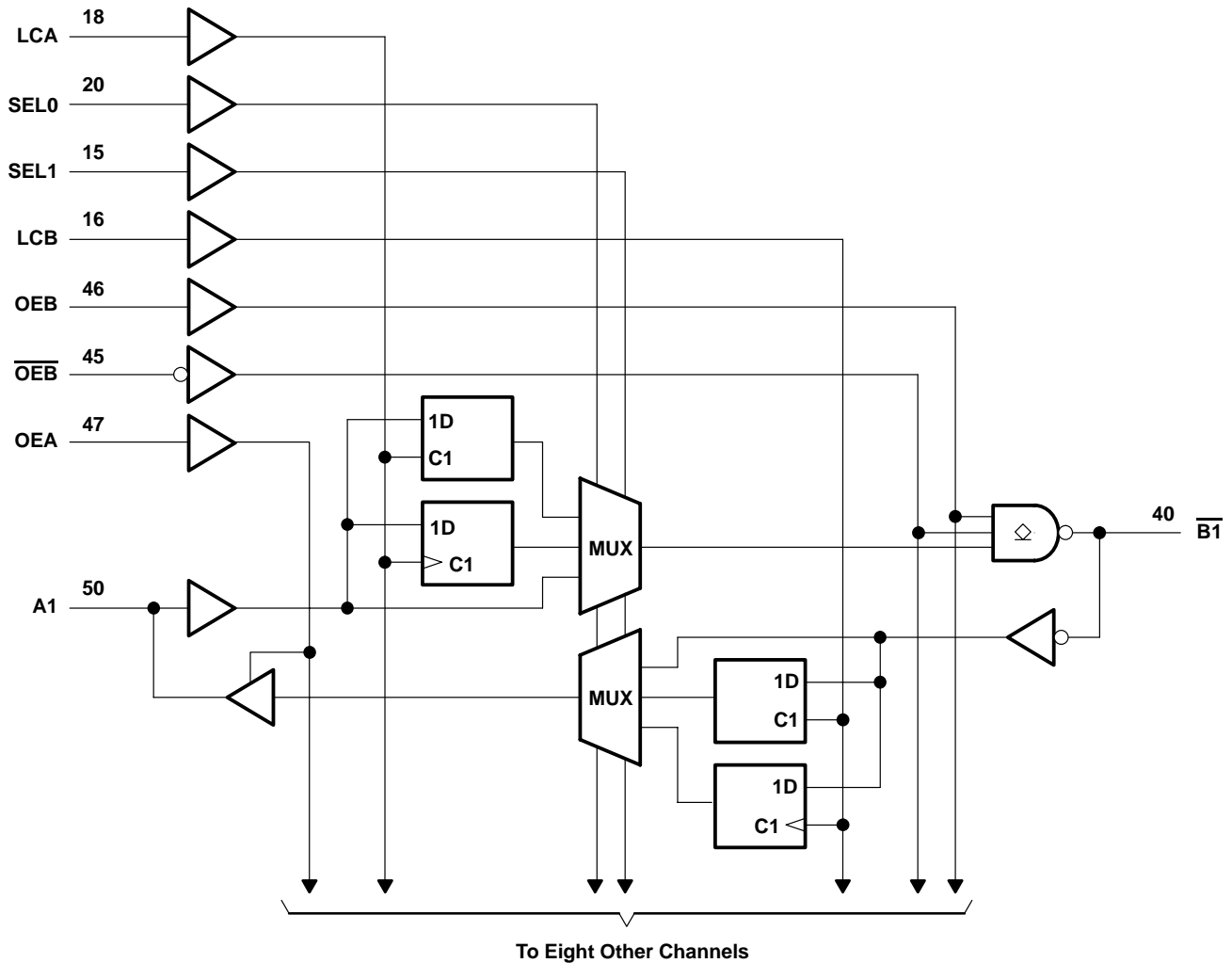
STORAGE MODE

LCA, LCB	RESULT
0	Transparent
1	Latches latched
↑	Flip-flops triggered

SELECT

SEL1	SEL0	MUX A→B	MUX B→A
0	0	Latch	Latch
0	1	Through	Through
1	0	Flip-flop	Flip-flop
1	1	Flip-flop	Latch

functional block diagram



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input voltage range, V_I : Except \overline{B} port	-1.2 V to 7 V
\overline{B} port	-1.2 V to 3.5 V
Voltage range applied to any \overline{B} output in the disabled or power-off state, V_O	-0.5 V to 3.5 V
Voltage range applied to any output in the high state, V_O	-0.5 V to V_{CC}
Input clamp current, I_{IK} : Except \overline{B} port	-40 mA
\overline{B} port	-18 mA
Current applied to any single output in the low state, I_O : A port	48 mA
\overline{B} port	200 mA
Package thermal impedance, θ_{JA} (see Note 1)	44°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

SN74FB2031

9-BIT TTL/BTL ADDRESS/DATA TRANSCEIVER

SCBS176N – NOVEMBER 1991 – REVISED JUNE 2001

recommended operating conditions (see Note 2)

		MIN	NOM	MAX	UNIT
V_{CC} , BIAS V_{CC} , BG V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	\overline{B} port	1.62	2.3	V
		Except \overline{B} port	2		
V_{IL}	Low-level input voltage	\overline{B} port	0.75	1.47	V
		Except \overline{B} port		0.8	
I_{OH}	High-level output current			-3	mA
I_{OL}	Low-level output current	A port		24	mA
		\overline{B} port		100	
T_A	Operating free-air temperature	0		70	°C

NOTE 2: To ensure proper device operation, all unused inputs must be terminated as follows: A and control inputs to V_{CC} (5 V) or GND, and B inputs to GND only. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	\overline{B} port	$V_{CC} = 4.5$ V,	$I_I = -18$ mA			-1.2	V
	Except \overline{B} port	$V_{CC} = 4.5$ V,	$I_I = -40$ mA			-0.5	
V_{OH}	A port	$V_{CC} = 4.5$ V,	$I_{OH} = -3$ mA	2.5	3.3		V
V_{OL}	A port	$V_{CC} = 4.5$ V,	$I_{OL} = 24$ mA		0.35	0.5	V
	\overline{B} port	$V_{CC} = 4.5$ V	$I_{OL} = 80$ mA	0.75		1.1	
			$I_{OL} = 100$ mA			1.15	
I_I	Except \overline{B} port	$V_{CC} = 5.5$ V,	$V_I = 5.5$ V			50	μA
$I_{IH}‡$	Except \overline{B} port	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			50	μA
$I_{IL}‡$	Except \overline{B} port	$V_{CC} = 5.5$ V,	$V_I = 0.5$ V			-50	μA
	\overline{B} port	$V_{CC} = 5.5$ V,	$V_I = 0.75$ V			-100	
I_{OZH}	A port	$V_{CC} = 2.1$ V to 5.5 V,	$V_O = 2.7$ V			50	μA
I_{OZL}	A port	$V_{CC} = 2.1$ V to 5.5 V,	$V_O = 0.5$ V			-50	μA
I_{OZPU}	A port	$V_{CC} = 0$ to 2.1 V,	$V_O = 0.5$ V to 2.7 V			50	μA
I_{OZPD}	A port	$V_{CC} = 2.1$ V to 0,	$V_O = 0.5$ V to 2.7 V			-50	μA
I_{OH}	\overline{B} port	$V_{CC} = 0$ to 5.5 V,	$V_O = 2.1$ V			100	μA
$I_{OS}§$	A port	$V_{CC} = 5.5$ V,	$V_O = 0$	-30		-150	mA
I_{CC}	A port to \overline{B} port	$V_{CC} = 5.5$ V,	$I_O = 0$			78	mA
	\overline{B} port to A port					78	
C_i		$V_I = 0.5$ V or 2.5 V			4.5		pF
C_{io}	A port	$V_O = 0.5$ V or 2.5 V			8.5		pF
	\overline{B} port per IEEE Std 1194.1-1991	$V_{CC} = 0$ to 5.5 V				6	

† All typical values are at $V_{CC} = 5$ V, $T_A = 25$ °C.

‡ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.



SN74FB2031 9-BIT TTL/BTL ADDRESS/DATA TRANSCEIVER

SCBS176N – NOVEMBER 1991 – REVISED JUNE 2001

live-insertion specifications over recommended operating free-air temperature range

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
I_{CC} (BIAS V_{CC})	$V_{CC} = 0$ to 4.5 V	$V_B = 0$ to 2 V,	V_I (BIAS V_{CC}) = 4.5 V to 5.5 V	450		μA
	$V_{CC} = 4.5$ V to 5.5 V			10		
V_O	\bar{B} port	$V_{CC} = 0,$	V_I (BIAS V_{CC}) = 5 V	1.62	2.1	V
I_O	\bar{B} port	$V_{CC} = 0,$	$V_B = 1$ V,	V_I (BIAS V_{CC}) = 4.5 V to 5.5 V		μA
		$V_{CC} = 0$ to 5.5 V,	OEB = 0 to 0.8 V	100		
		$V_{CC} = 0$ to 2.2 V,	OEB = 0 to 5 V	100		

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

				MIN	MAX	UNIT
f_{clock}	Clock frequency			150		MHz
t_w	Pulse duration	LCA or LCB		3.3		ns
t_{su}	Setup time	Clock mode	Data before LCA \uparrow	1.4		ns
			Data before LCB \uparrow	2.8		
		Latch mode	Data before LCA \uparrow	1.1		
			Data before LCB \uparrow	2.4		
t_h	Hold time	Clock mode	Data after LCA \uparrow	0.6		ns
			Data after LCB \uparrow	0		
		Latch mode	Data after LCA \uparrow	0.9		
			Data after LCB \uparrow	0		



SN74FB2031

9-BIT TTL/BTL ADDRESS/DATA TRANSCEIVER

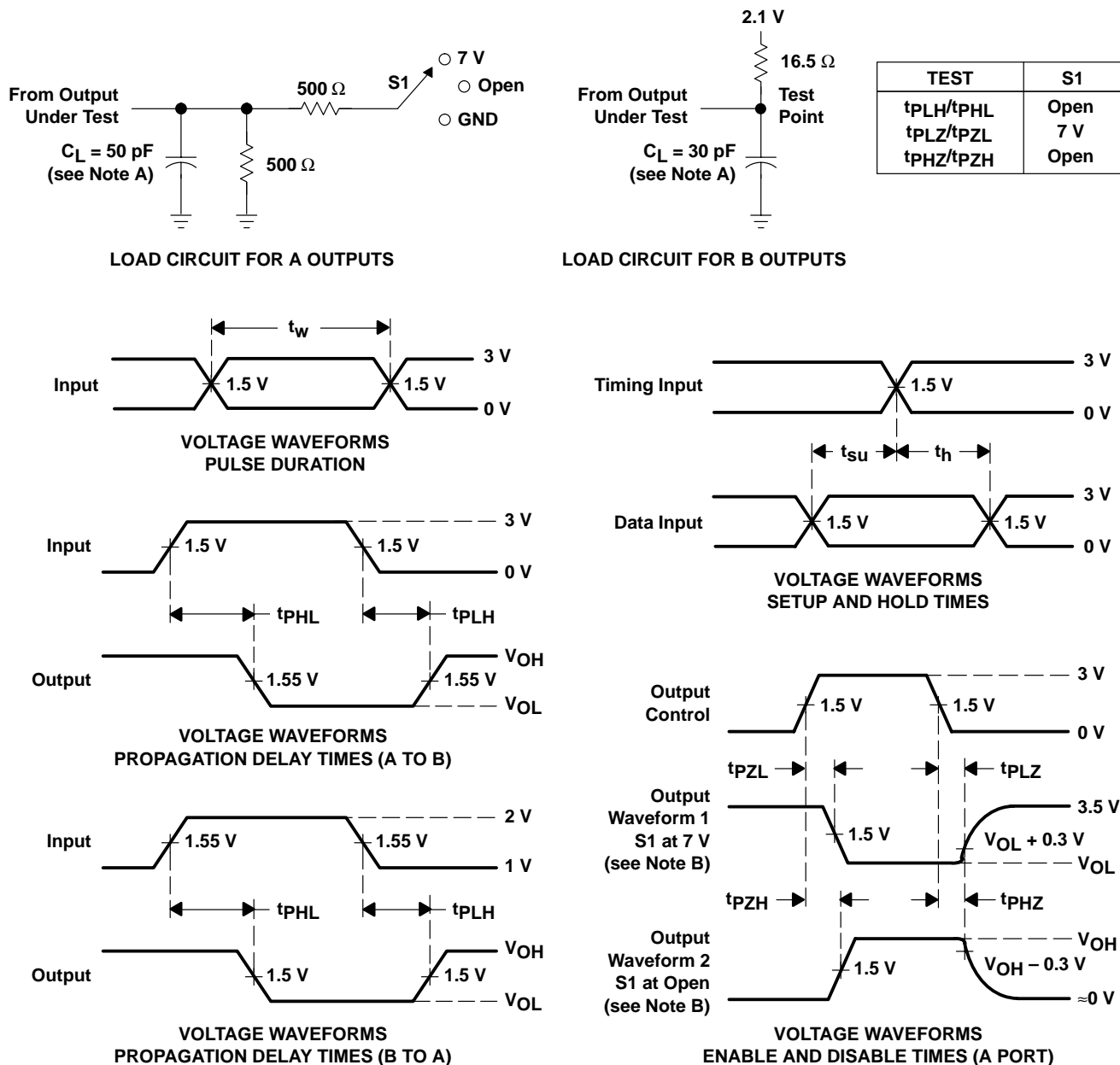
SCBS176N – NOVEMBER 1991 – REVISED JUNE 2001

switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
f_{\max}			150			150		MHz
t_{PLH}	A (through mode)	\bar{B}	3.7	4.5	5.9	3.2	6.6	ns
t_{PHL}			2.9	4	5.7	2.6	5.9	
t_{PLH}	A (transparent)	\bar{B}	4.1	5	6.5	3.6	7.3	ns
t_{PHL}			3.3	4.5	6.1	3	6.5	
t_{PLH}	LCA	\bar{B}	4.5	5.4	7	3.9	7.8	ns
t_{PHL}			4	5.1	6.7	3.4	7.4	
t_{PLH}	LCB	A	2.8	3.7	4.7	1.9	6	ns
t_{PHL}			2.5	3.4	4.9	1.8	5.5	
t_{PLH}	SEL1 or SEL0	A	2.5	3.8	5.3	1.9	6.3	ns
t_{PHL}			2.2	3.5	5.1	1.6	5.6	
t_{PLH}	SEL1 or SEL0	\bar{B}	4.1	5.3	6.9	3.7	7.8	ns
t_{PHL}			3.7	5.2	6.9	3.3	7.7	
t_{PLH}	\bar{B} (through mode)	A	3.1	4	5.6	2.2	7.1	ns
t_{PHL}			2.6	3.4	4.9	1.4	5.7	
t_{PLH}	\bar{B} (transparent)	A	3.3	4.2	5.9	2.4	7.6	ns
t_{PHL}			2.8	3.9	5.5	1.8	6.3	
t_{PLH}	OEB or \overline{OEB}	\bar{B}	3.7	4.6	6.1	3.2	6.7	ns
t_{PHL}			2.9	4.3	5.8	2.5	6.4	
t_{PZH}	OEA	A	2.3	3.1	4.5	1.6	5	ns
t_{PZL}			1.9	2.7	4.1	1.6	4.4	
t_{PHZ}	OEA	A	2.2	3.1	4.5	1.5	5.2	ns
t_{PLZ}			2.5	3.3	4.9	2	5.2	
$t_{sk(p)}$ Pulse skew	A	\bar{B}	0.5					ns
	\bar{B}	A	0.3					
$t_{sk(o)}$ Output skew	A	\bar{B}	0.2					ns
	\bar{B}	A	0.3					
t_t	Transition time, \bar{B} outputs (1.3 V to 1.8 V)		0.6	2	2.8	0.4	2.9	ns
	Transition time, A outputs (10% to 90%)		0.5	3.5	4.7	0	5.4	
$t_{(pr)}$	\bar{B} -port input pulse rejection		1			1		ns



PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: TTL inputs: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$; BTL inputs: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74FB2031RC	ACTIVE	QFP	RC	52	96	TBD	CU SNPB	Level-2-240C-1 YEAR
SN74FB2031RCG3	ACTIVE	QFP	RC	52	96	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR
SN74FB2031RCR	ACTIVE	QFP	RC	52	500	TBD	CU SNPB	Level-2-240C-1 YEAR
SN74FB2031RCRG3	ACTIVE	QFP	RC	52	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN74FB2031 :

- Military: [SN54FB2031](#)

NOTE: Qualified Version Definitions:

- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION



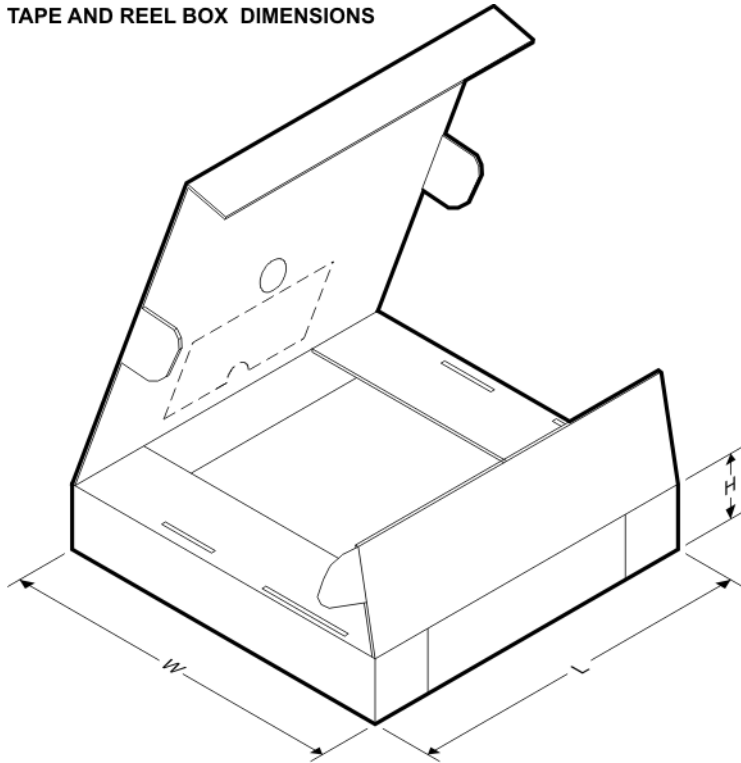
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74FB2031RCR	QFP	RC	52	500	330.0	24.4	14.2	14.2	2.6	24.0	24.0	Q2
SN74FB2031RCRG3	QFP	RC	52	500	330.0	24.4	14.2	14.2	2.6	24.0	24.0	Q2

TAPE AND REEL BOX DIMENSIONS

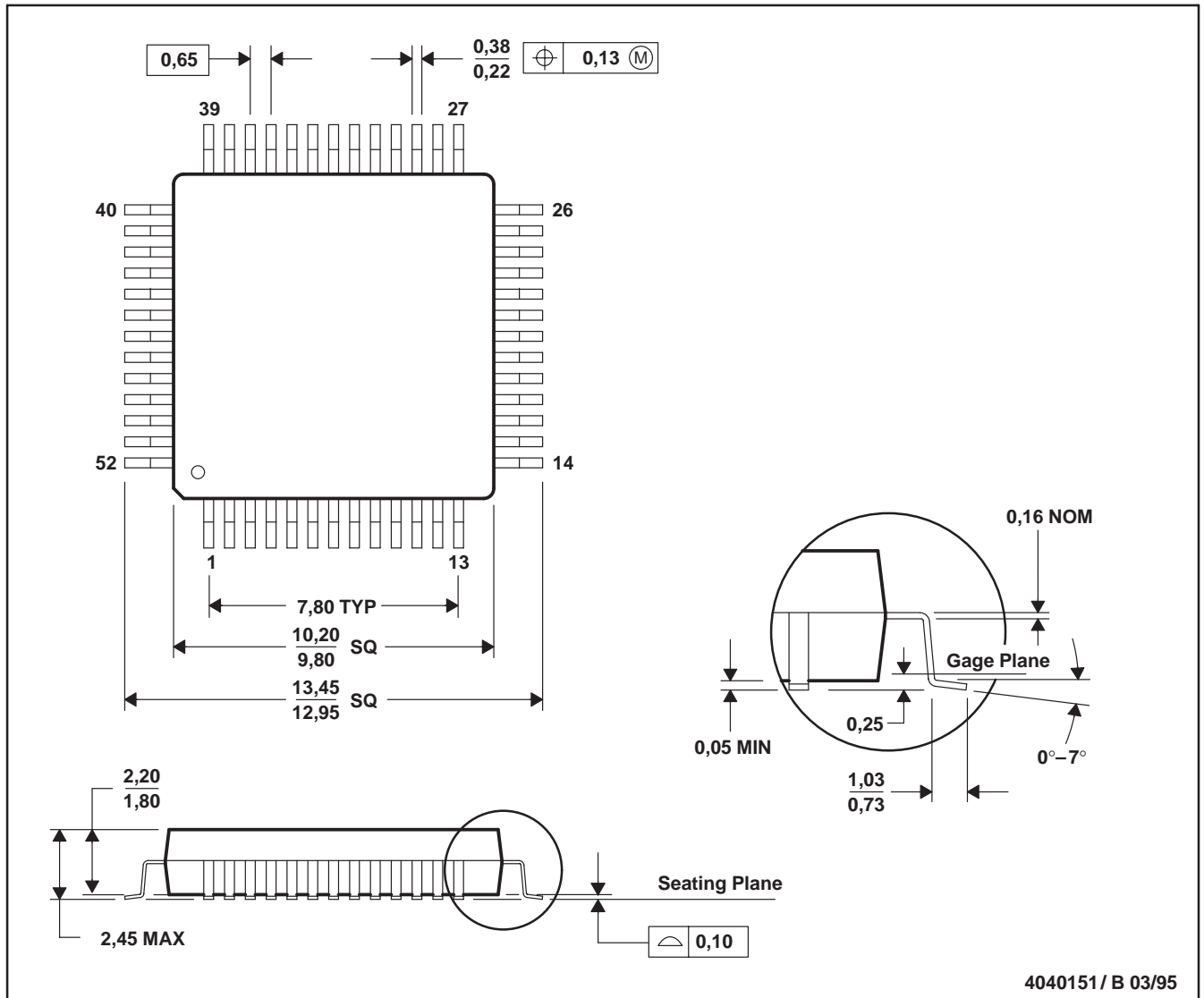


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74FB2031RCR	QFP	RC	52	500	346.0	346.0	41.0
SN74FB2031RCRG3	QFP	RC	52	500	346.0	346.0	41.0

RC (S-PQFP-G52)

PLASTIC QUAD FLATPACK



- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-022

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

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

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated