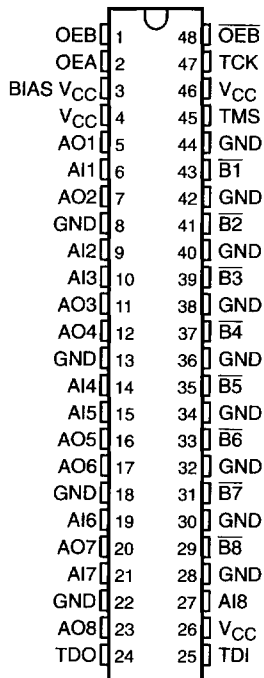


# SN54FB2040, SN74FB2040 8-BIT TTL/BTL TRANSCEIVERS

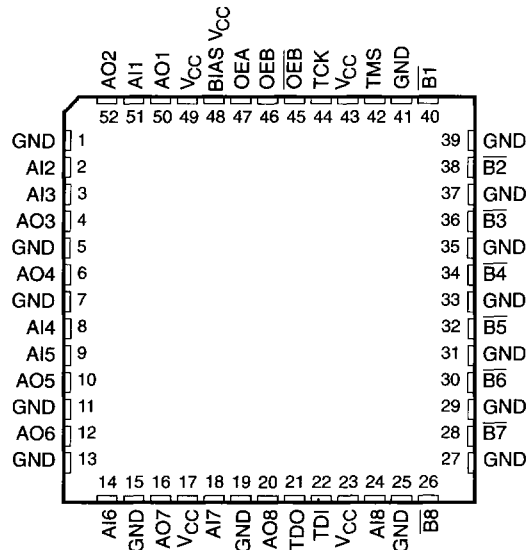
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- Compatible With IEEE 1194.1-1991 (BTL) and IEEE 896.2-1991 (Futurebus+) Standards
- TTL A Port, Backplane Transceiver Logic  $\bar{B}$  Port
- Open-Collector  $\bar{B}$ -Port Outputs Sink 100 mA
- Minimum  $\bar{B}$ -Port Edge Rate = 2 ns
- Isolated Logic-Ground and Bus-Ground Pins Reduce Noise
- BIAS  $V_{CC}$  Pin Minimizes Signal Distortion During Live Insertion/Withdrawal
- Available in Plastic Quad Flatpack (RC) and Ceramic Flatpack (WD) Packages
- B-Port Biasing Network Preconditions the Connector and PC Trace to the Backplane Transceiver Logic High-Level Voltage

SN54FB2040 . . . WD PACKAGE  
(TOP VIEW)



SN74FB2040 . . . RC PACKAGE  
(TOP VIEW)



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## description

The 'FB2040 is an 8-bit transceiver designed to translate signals between TTL and backplane transceiver logic (BTL) environments. It is specifically designed to be compatible with IEEE 1194.1-1991 (BTL) and IEEE 896.2-1991 (Futurebus+) standards.

The  $\bar{B}$  port operates at BTL-signal levels. The open-collector  $\bar{B}$  ports are specified to sink 100 mA and have minimum output edge rates of 2 ns. Two output enables, OEB and  $\bar{OEB}$ , are provided for the  $\bar{B}$  outputs. When OEB is high and  $\bar{OEB}$  is low, the  $\bar{B}$  port is active and reflects the inverse of the data present at the A-input pins. When OEB is low,  $\bar{OEB}$  is high, or  $V_{CC}$  is typically less than 2.5 V, the  $\bar{B}$  port is turned off.

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# SN54FB2040, SN74FB2040

## 8-BIT TTL/BTL TRANSCEIVERS

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### description (continued)

The A port operates at TTL-signal levels and has split input and output pins. 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 when  $V_{CC}$  is typically less than 2.5 V, the A outputs are in the high-impedance state.

Pins are allocated for the four-wire IEEE 1149.1 (JTAG) test bus, which will be implemented in a future version of the 'FB2040. Currently TMS and TCK are not connected and TDI is shorted to TDO.

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

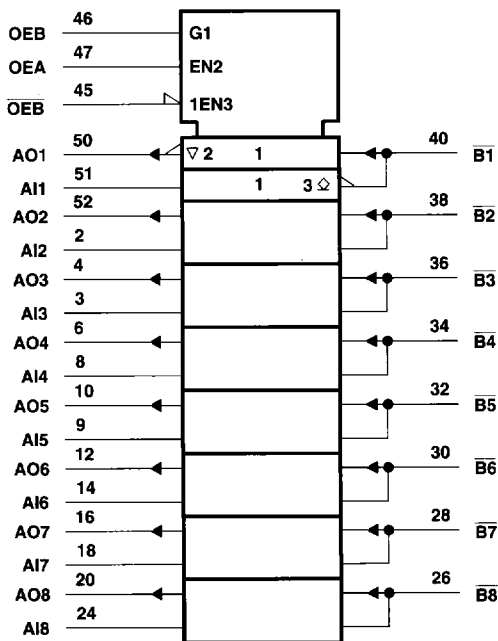
The SN54FB2040 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74FB2040 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE

INPUTS			FUNCTION
OEB	$\bar{\text{OEB}}$	OEA	
L	X	L	Isolation
X	H	L	
L	X	H	$\bar{B}$ data to AO bus
X	H	H	
H	L	L	$\bar{A}$ data to B bus
H	L	H	$\bar{A}$ data to B bus, $\bar{B}$ data to AO bus

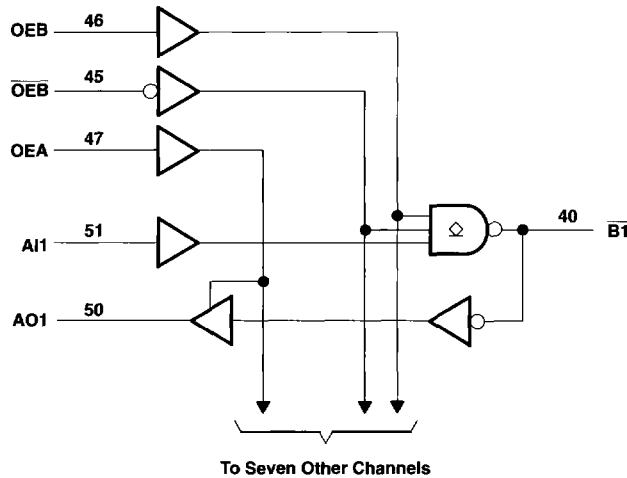
PRODUCT PREVIEW

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the RC package.

functional block diagram



Pin numbers shown are for the RC package.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage range, $V_{CC}$ .....	-0.5 V to 7 V
Input voltage range, $V_I$ (except $\bar{B}$ port) .....	-1.2 V to 7 V
$V_I$ ( $\bar{B}$ port) .....	-1.2 V to 3.5 V
Input current range (except $\bar{B}$ port) .....	-18 mA to 5 mA
Voltage range applied to any $\bar{B}$ output in the disabled or power-off state .....	-0.5 V to 5.5 V
Voltage range applied to any output in the high state .....	-0.5 V to $V_{CC}$
Current applied to any single output in the low state: A port .....	96 mA
( $\bar{B}$ port) .....	200 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air): RC package .....	0.85 W
Storage temperature range .....	-65°C to 150°C

<sup>†</sup> 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.

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# SN54FB2040, SN74FB2040 8-BIT TTL/BTL TRANSCEIVERS

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## recommended operating conditions (see Note 1)

		SN54FB2040			SN74FB2040			UNIT			
		MIN	NOM	MAX	MIN	NOM	MAX				
$V_{CC}$ , BIAS $V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V			
$V_{IH}$	High-level input voltage	B port		1.62	2.3		1.62	2.3		V	
		Except $\bar{B}$ port		2		2					
$V_{IL}$	Low-level input voltage	B port		0.75	1.47		0.75	1.47		V	
		Except $\bar{B}$ port		0.8		0.8					
$I_{IK}$	Input clamp current				-18			-18		mA	
$I_{OH}$	High-level output current	AO port					-3		mA		
$I_{OL}$	Low-level output current	AO port					24		mA		
		$\bar{B}$ port		100		100					
$T_A$	Operating free-air temperature	-55			125			0		70	°C

NOTE 1: Unused or floating pins (input or I/O) must be held high or low.

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

PARAMETER		TEST CONDITIONS	SN54FB2040			SN74FB2040			UNIT	
			MIN	TYP†	MAX	MIN	TYP†	MAX		
$V_{IK}$	$\bar{B}$ port	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$				-1.2			V	
	Except $\bar{B}$ port	$V_{CC} = 4.5\text{ V}$ , $I_I = -40\text{ mA}$				-0.5				
$V_{OH}$	AO port	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -1\text{ mA}$					2.5	3.3	V
			$I_{OH} = -3\text{ mA}$							
$V_{OL}$	AO port	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 20\text{ mA}$					0.35	0.5	V
			$I_{OL} = 24\text{ mA}$							
	$\bar{B}$ port		$I_{OL} = 80\text{ mA}$		0.75			1.1		
			$I_{OL} = 100\text{ mA}$					1.15		
$I_I$	Except $\bar{B}$ port	$V_{CC} = 5.5\text{ V}$ , $V_I = 5.5\text{ V}$				50			$\mu\text{A}$	
$I_{IH}^\ddagger$	Except $\bar{B}$ port	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$				50			$\mu\text{A}$	
$I_{IL}^\ddagger$	Except $\bar{B}$ port	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.5\text{ V}$				-50			$\mu\text{A}$	
	$\bar{B}$ port†	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.75\text{ V}$				-100				
$I_{OH}$	$\bar{B}$ port	$V_{CC} = 0\text{ to }5.5\text{ V}$ , $V_O = 2.1\text{ V}$				100			$\mu\text{A}$	
$I_{OZH}$	AO port	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.7\text{ V}$				50			$\mu\text{A}$	
$I_{OZL}$	AO port	$V_{CC} = 5.5\text{ V}$ , $V_O = 0.5\text{ V}$				-50			$\mu\text{A}$	
$I_{OS}^\S$	AO port	$V_{CC} = 5.5\text{ V}$ , $V_O = 0$				-30		-150		mA
$I_{CC}$	AI port to $\bar{B}$ port	$V_{CC} = 5.5\text{ V}$ , $I_O = 0$				25			mA	
	$\bar{B}$ port to AO port					60				
	Outputs disabled									
$C_i$	AI port and control inputs	$V_I = V_{CC}$ or GND							pF	
$C_o$	AO port	$V_O = V_{CC}$ or GND							pF	
$C_{io}$	B port per P1194.0	$V_{CC} = 0\text{ to }4.5\text{ V}$				6			pF	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$				5				

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ 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.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$			SN54FB2040		SN74FB2040		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	AI	$\bar{B}$	3.9							ns
$t_{PHL}$			3.6							
$t_{PLH}$	$\bar{B}$	AO	3.9							ns
$t_{PHL}$			3.8							
$t_{PLH}$	OEB	$\bar{B}$	5.1							ns
$t_{PHL}$			4.3							
$t_{PLH}$	OEB	$\bar{B}$	4.4							ns
$t_{PHL}$			4.1							
$t_{PZH}$	OEA	AO	3.2							ns
$t_{PZL}$			3							
$t_{PHZ}$	OEA	AO	3.2							ns
$t_{PLZ}$			2.7							
$t_{sk(p)}$	Skew for any single channel $ t_{PHL} - t_{PLH} $		AI to $\bar{B}$ or $\bar{B}$ to AO					0.75	ns	
$t_{sk(o)}$	Skew between drivers in the same package		AI to $\bar{B}$ or $\bar{B}$ to AO			1	1.5	2	ns	
$t_t$	Transition time, B outputs (1.3 V to 1.8 V)							1	3	ns
$t_{PR}$	B-port input pulse rejection							1		ns

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

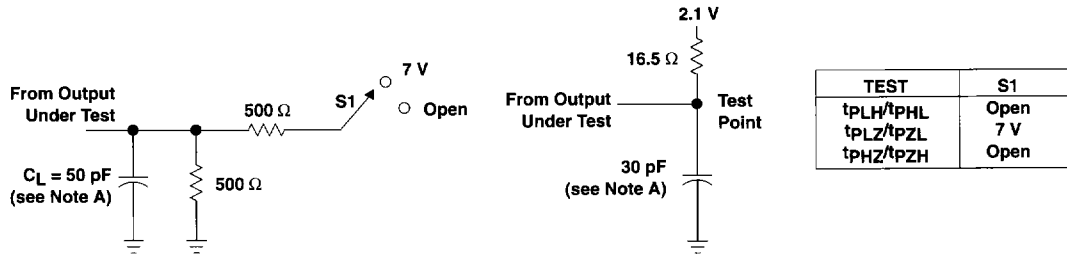
PARAMETER	TEST CONDITIONS		SN54FB2040		SN74FB2040		UNIT
			MIN	MAX	MIN	MAX	
$I_{CC}$ (BIAS $V_{CC}$ )		$V_{CC} = 0$ to 4.5 V	$V_B = 0$ to 2 V, $V_I$ (BIAS $V_{CC}$ ) = 4.5 V to 5.5 V				450
		$V_{CC} = 4.5$ V to 5.5 V					10
$V_O$	B port	$V_{CC} = 0,$	$V_I$ (BIAS $V_{CC}$ ) = 4.5 V to 5.5 V		1.62	2.1	V
$I_O$	B port	$V_{CC} = 0,$	$V_B = 1$ V, $V_I$ (BIAS $V_{CC}$ ) = 4.5 V to 5.5 V		-1		$\mu\text{A}$
		$V_{CC} = 0$ to 5.5 V,	OEB = 0 to 0.8 V		100		
		$V_{CC} = 0$ to 2.2 V,	OEB = 0 to 5 V		100		

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# SN54FB2040, SN74FB2040 8-BIT TTL/BTL TRANSCEIVERS

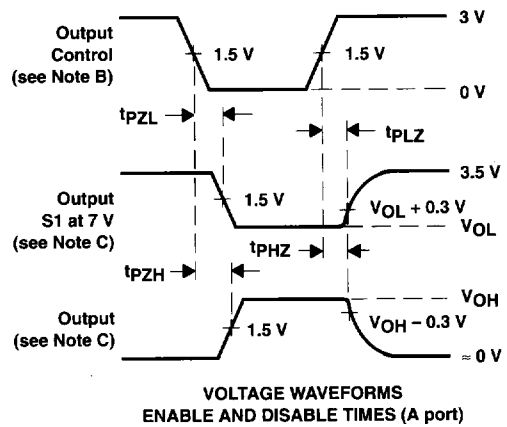
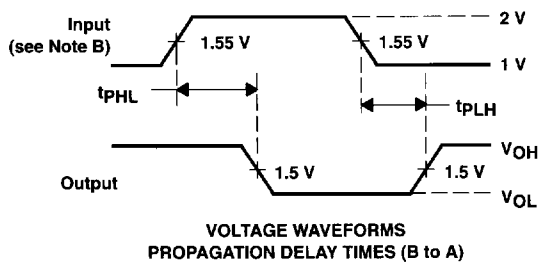
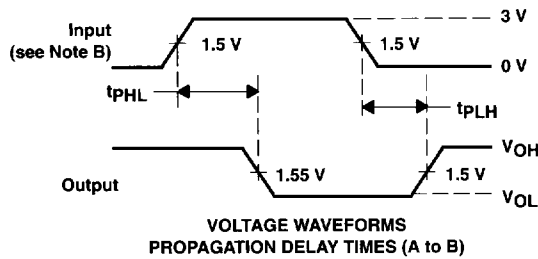
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## PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT FOR A OUTPUTS

LOAD CIRCUIT FOR B OUTPUTS



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- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics: TTL Inputs - PRR  $\leq$  10 MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns. BTL Inputs - PRR  $\leq$  10 MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.  
 C. 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.  
 D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms