MOTOROLA

MC74F3893A

QUAD FUTUREBUS BACKPLANE TRANSCEIVER (3 STATE + OPEN COLLECTOR)

The MC74F3893A is a quad backplane transceiver and is intended to be used in very high speed bus systems.

The MC74F3893A interfaces to "Backplane Transceiver Logic" (BTL). BTL features a reduced (1 V) voltage swing for lower power consumption and a series diode on the drivers to reduce capacitive loading (< 5 pF).

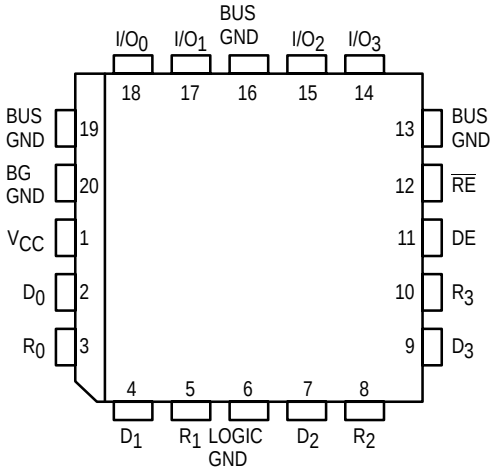
Incident wave switching is employed, therefore BTL propagation delays are short. Although the voltage swing is much less for BTL, so is its receiver threshold region, therefore noise margins are excellent.

BTL offers low power consumption, low ground bounce, reduced EMI and crosstalk, low capacitive loading, superior noise margin and short propagation delays. This results in a high bandwidth, reliable backplane.

The MC74F3893A has four TTL outputs (R_n) on the receiver side with a common Receive Enable input ($\overline{RE}$). It has four data inputs (D_n) which are also TTL. These data inputs are NANDed with the Data Enable input (DE). The four I/O pins (Bus side) are futurebus compatible, sink a minimum of 100 mA, and are designed to drive heavily loaded backplanes with load impedances as low as 10 ohms. All outputs are designed to be glitch-free during power up and power down.

- Quad Backplane Transceiver
- Drives Heavily Loaded Backplanes with Equivalent Load Impedances Down to 10 ohms
- Futurebus Drivers Sink 100 mA
- Reduced Voltage Swing (1 Volt) Produces Less Noise and Reduces Power Consumption
- High Speed Operation Enhances Performance of Backplane Buses and Facilitates Incident Wave Switching
- Compatible with IEEE 896 and IEEE 1194.1 Futurebus Standards
- Built-In Precision Band-Gap (BG) Reference Provides Accurate Receiver Threshold and Improved Noise Immunity
- Glitch-Free Power Up/Power Down Operation On All Outputs
- Pin and Function Compatible with NSC DS3893A and Signetics 74F3893
- Separate Bus Ground Returns for Each Driver to Minimize Ground Noise
- MOS and TTL Compatible High Impedance Inputs

PINOUT: 20-LEAD PLCC (TOP VIEW)



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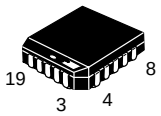
FAST™ SCHOTTKY TTL

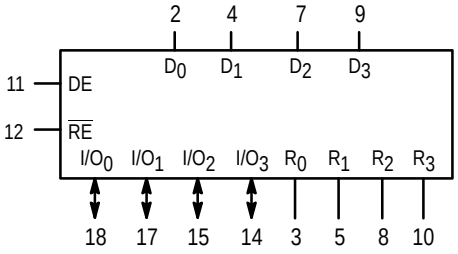


FN SUFFIX
PLASTIC
CASE 775-02

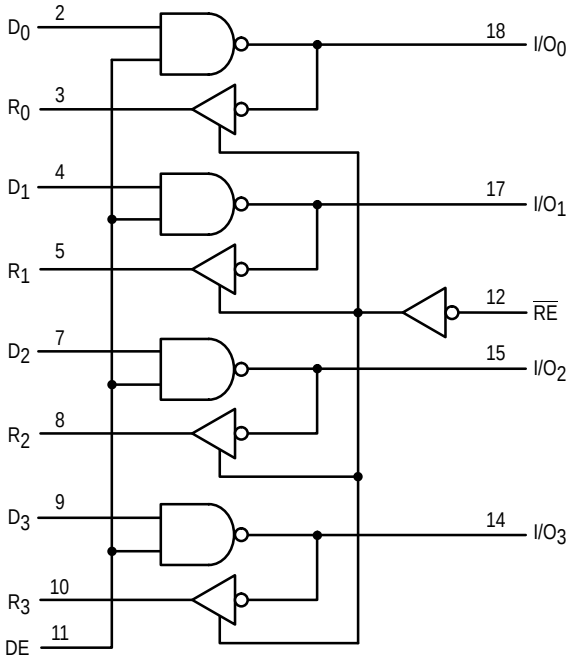
ORDERING INFORMATION

MC74FXXXXAFN	Plastic

LOGIC SYMBOL



LOGIC DIAGRAM



V_{CC} = PIN 1: LOGIC GND = PIN 6
BUS GND = PIN 13,16, 19: BG GND = PIN 20

FUNCTION TABLE

Inputs			Input/Output	Outputs	Operating Mode
DE	RE	D_n	I/O_n	R_n	
H H	L L	L H	H L	L H	Transmit to Bus
H L	H H	L H	$\overline{D_n}$ H	Z Z	Receiver 3-State, Transmit to Bus
L L	L L	X X	H L	L H	Receive, I/O_n = Inputs

H = HIGH voltage level:
L = LOW voltage level:
X = Don't care:
Z = HIGH impedance "Off" state.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
V_{CC}	Supply Voltage		4.5	5.0	5.5	V
V_{IH}	High-Level Input Voltage	D_n, DE, RE	2.0	—	—	V
V_{IL}	Low-Level Input Voltage		—	—	0.8	V
I_{IK}	Input Clamp Current		—	—	–18	mA
V_{TH}	Bus Input Threshold	I/O_n Only	1.475	1.550	1.625	V
I_{OH}	Output Current — High	R_n Only	—	—	–3.0	mA
I_{OL}	Output Current — Low		—	—	100	mA
T_A	Operating Ambient Temperature Range		0	—	70	°C

DC CHARACTERISTICS (Over Recommended Operating Free-Air Temperature Range Unless otherwise specified)

Symbol	Parameter		Limits Min	Limits Typ (2)	Limits Max	Unit	Test Conditions (Note 1)	
V_{OH}	High-Level Output Voltage	R_n	2.5	—	—	V	V_{CC} = MIN: V_{IL} = 1.3 V; $\overline{RE}$ = 0.8 V: I_{OH} = MAX	
V_{OHB}	High-Level Output Bus Voltage	I/O_n	1.9	—	—	V	V_{CC} = MAX: DN = DE = 0.8 V: V_T = 2.0 V: R_T = 10Ω: $\overline{RE}$ = 2.0 V I_{OH} = MAX	
V_{OL}	Output LOW Voltage	R_n	—	0.35	0.5	V	V_{CC} = MIN: V_{IN} = 1.8 V; $\overline{RE}$ = 0.8 V: I_{OL} = 6.0 mA	
V_{OLB}	Low Level Output Bus Voltage	I/O_n	0.75	1.0	1.2	V	D_n = DE = V_{IH}: I_{OL} = 100 mA	
			0.75	1.0	1.1		D_n = DE = V_{IH}: I_{OL} = 80 mA	
V_{OCB}	Driver Output Positive Clamp Voltage	I/O_n	—	—	2.9	V	V_{CC} = MAX or 0 V: DN = DE = 0.8 V: $\overline{RE}$ = 2.0 V	I/O_n = 1.0 mA
			—	—	3.2			I/O_n = 10 mA
V_{IK}	Input Clamp Diode Voltage		—	–0.73	–1.2	V	V_{CC} = MIN, I_I = I_{IK}	
I_I	Input Current at Maximum Input Voltage		—	—	100	µA	V_{CC} = MAX: V_I = 7.0 V: DE = $\overline{RE}$ = D_n = V_{CC}	
I_{IH}	High Level Input Current	D_n, $\overline{RE}$, DE	—	—	20	µA	V_{CC} = MAX: DE = $\overline{RE}$ = D_n = 2.5 V	
I_{IHB}	High-Level I/O Bus Current (Power Off)	I/O_n	—	—	100	µA	V_{CC} = 0 V: DN = DE = 0.8 V: I/O_n = 1.2 V: $\overline{RE}$ = 0 V:	
I_{IL}	Low-Level Input Current	$\overline{RE}$	—	—	–100	µA	V_{CC} = MAX:	DE = 4.5 V
		D_n	—	—	–200			
		DE	—	—	–500		V_I = 0.5V:	D_n = 4.5 V
I_{ILB}	Low-Level I/O Bus Current (Power On)	I/O_n	–250	—	100	µA	V_{CC} = MAX: D_n = DE = 0.8 V: I/O_n = 0.75 V : $\overline{RE}$ = 0 V:	
I_{OZH}	Off-State Output Current, High-Level Voltage Applied	R_n	—	—	20	µA	V_O = 2.5V: $\overline{RE}$ = 2.0 V	V_{CC} = MAX:
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied		—	—	–20		V_{CC} = MAX: V_O = 0.5 V: $\overline{RE}$ = 2.0 V	
I_{OS}	Output Short Circuit Current (Note 3)		–80	—	–200	mA	D_n = 1.2 V: V_O = 0 V: $\overline{RE}$ = 0.8 V	
I_{CC}	Supply Current (Total)		—	55	80	mA	V_{CC} = MAX: ($\overline{RE}$ = V_{IH} or V_{IL})	

NOTES:

1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.
2. All typical values are at V_{CC} = 5.0 V, T_A = + 25°C.
3. Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

AC ELECTRICAL CHARACTERISTICS for Receiver and Receiver Enable

Symbol	Parameter	74F $T_A = +25°C$ $V_{CC}=+5.0V$, $V_T=+2.0V$ $C_D = 30$ pF $R_T = 10\ \Omega$			74F $T_A = 0°C$ to $+70°C$ $V_{CC}=+5.0V \pm 10\%$, $V_T=+2.0V$ $C_D = 30$ pF $R_T = 10\ \Omega$		Unit
		Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay D_n to I/O_n	— —	— —	— —	1.0 1.0	7.0 7.0	ns
t_{PLH} t_{PHL}	Propagation Delay DE to I/O_n	— —	— —	— —	1.0 1.0	7.0 7.0	ns
t_{TLH} t_{THL}	D_n to I/O_n Transition Time 10% to 90%, 90% to 10%	— —	— —	— —	1.0 1.0	5.0 5.0	ns
t_{Dskew}	Skew Between Receivers in Same Package	—	1.0	—	—	—	ns

AC ELECTRICAL CHARACTERISTICS for Receiver

Symbol	Parameter	74F $T_A = +25°C$ $V_{CC}=+5.0V$ $C_L = 50$ pF $R_L = 1.0K\ \Omega$			74F $T_A = 0°C$ to $+70°C$ $V_{CC}=+5.0V \pm 10\%$ $C_L = 50$ pF $R_L = 1.0K\ \Omega$		Unit
		Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay I/O_n to R_n	— —	— —	— —	2.0 2.0	8.0 8.0	ns
t_{Dskew}	Skew Between Receivers in Same Package	—	1.0	—	—	—	ns

AC ELECTRICAL CHARACTERISTICS for Receiver Enable

Symbol	Parameter	74F $T_A = +25°C$ $V_{CC}=+5.0V$ $C_L = 50$ pF $R_L = 500\ \Omega$			74F $T_A = 0°C$ to $+70°C$ $V_{CC}=+5.0V \pm 10\%$ $C_L = 50$ pF $R_L = 500\ \Omega$		Unit
		Min	Typ	Max	Min	Max	
t_{PZH} t_{PZL}	Output Enable to High or Low Level $\overline{RE}$ to R_n	— —	— —	— —	2.0 2.0	12.0 12.0	ns
t_{PHZ} t_{PLZ}	Output Disable From High or Low Level $\overline{RE}$ to R_n	— —	— —	— —	1.0 1.0	8.0 8.0	ns