FAIRCHILD SEMICONDUCTOR™

April 1988
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74F539
Dual 1-of-4 Decoder with 3-STATE Outputs

General Description

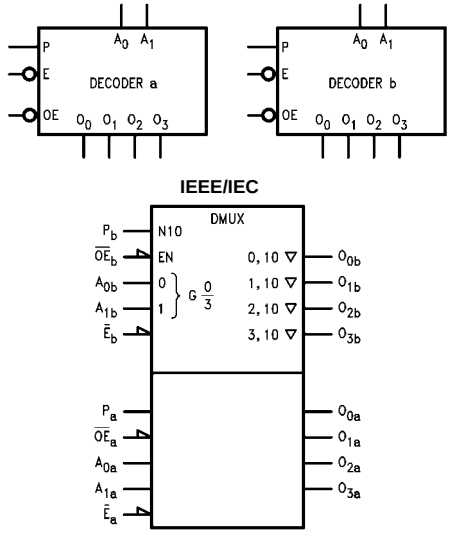
The 74F539 contains two independent decoders. Each accepts two Address (A_0, A_1) input signals and decodes them to select one of four mutually exclusive outputs. A polarity control input (P) determines whether the outputs are active HIGH (P = L) or active LOW (P = H). An active LOW input Enable ($\overline{E}$) is available for data demultiplexing; data is routed to the selected output in non-inverted form in the active LOW mode or in inverted form in the active HIGH mode. A HIGH signal on the active LOW Output Enable ($\overline{OE}$) input forces the 3-STATE outputs to the high impedance state.

Ordering Code:

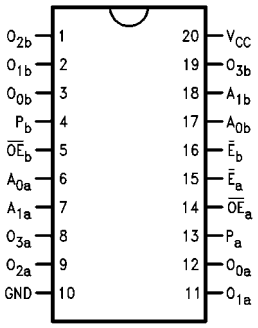
Order Number	Package Number	Package Description
74F539SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
74F539PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbols



Connection Diagram



Unit Loading/Fan Out

Pin Names	Description	U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
A_{0a}–A_{1a}	Side A Address Inputs	1.0/1.0	20 µA/–0.6 mA
A_{0b}–A_{1b}	Side B Address Inputs	1.0/1.0	20 µA/–0.6 mA
$\overline{E}_a$, $\overline{E}_b$	Enable Inputs (Active LOW)	1.0/1.0	20 µA/–0.6 mA
$\overline{OE}_a$, $\overline{OE}_b$	Output Enable Inputs (Active LOW)	1.0/1.0	20 µA/–0.6 mA
P_a, P_b	Polarity Control Inputs	1.0/1.0	20 µA/–0.6 mA
O_{0a}–O_{3a}	Side A 3-STATE Outputs	150/40 (33.3)	–3 mA/24 mA (20 mA)
O_{0b}–O_{3b}	Side B 3-STATE Outputs	150/40 (33.3)	–3 mA/24 mA (20 mA)

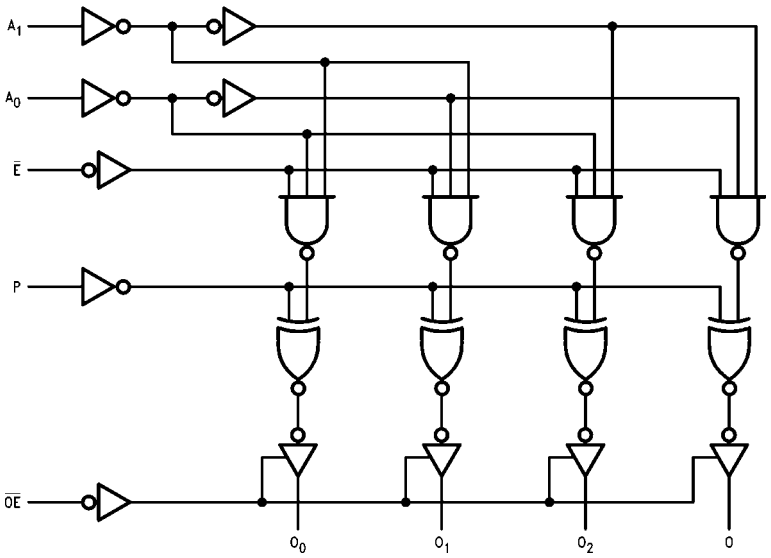
Truth Table

(each half)

Function	Inputs				Outputs			
	$\overline{OE}$	$\overline{E}$	A_1	A_0	O_0	O_1	O_2	O_3
High Impedance	H	X	X	X	Z	Z	Z	Z
Disable	L	H	X	X	$O_n = P$			
Active HIGH	L	L	L	L	H	L	L	L
Output	L	L	L	H	L	H	L	L
(P = L)	L	L	H	L	L	L	H	L
	L	L	H	H	L	L	L	H
Active LOW	L	L	L	L	L	H	H	H
Output	L	L	L	H	H	L	H	H
(P = H)	L	L	H	L	H	H	L	H
	L	L	H	H	H	H	H	L

H = HIGH Voltage Level X = Immaterial
L = LOW Voltage Level Z = High Impedance

Logic Diagram (one half shown)



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Ratings (Note 1)

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	−55°C to +150°C
V_{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Output	
in HIGH State (with V_{CC} = 0V)	
Standard Output	−0.5V to V_{CC}
3-STATE Output	−0.5V to +5.5V
Current Applied to Output	
in LOW State (Max)	twice the rated I_{OL} (mA)

Recommended Operating Conditions

Free Air Ambient Temperature	0°C to +70°C
Supply Voltage	+4.5V to +5.5V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

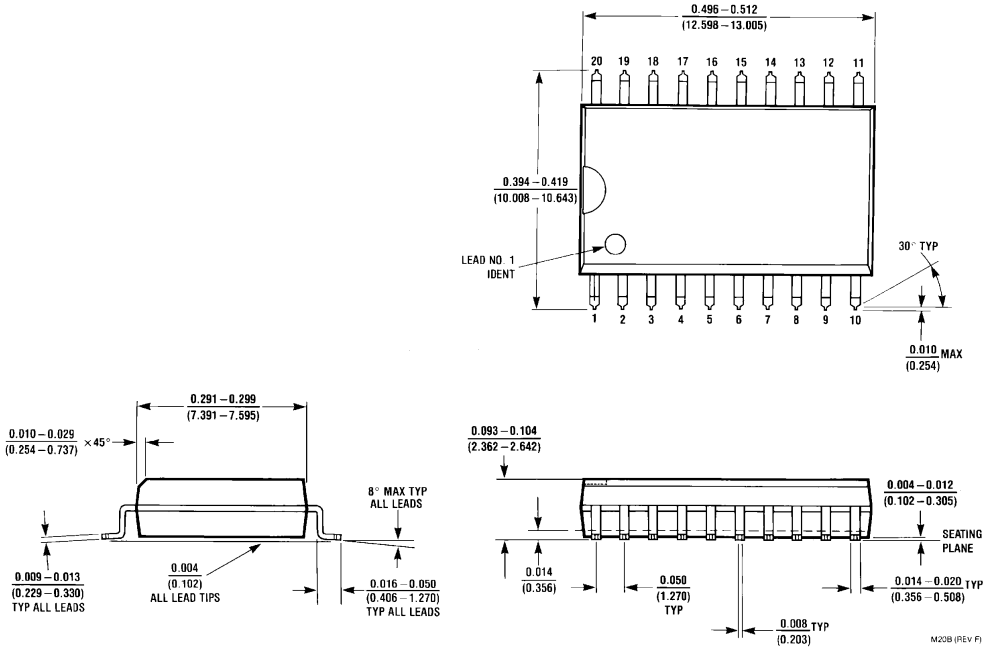
DC Electrical Characteristics

Symbol	Parameter		Min	Typ	Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized as a LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA
		10% V_{CC}	2.4					I_{OH} = −3 mA
		5% V_{CC}	2.7					I_{OH} = −1 mA
		5% V_{CC}	2.7					I_{OH} = −3 mA
V_{OL}	Output LOW Voltage	10% V_{CC}			0.5	V	Min	I_{OL} = 24 mA
I_{IH}	Input HIGH Current				5.0	µA	Max	V_{IN} = 2.7V
I_{BVI}	Input HIGH Current Breakdown Test				7.0	µA	Max	V_{IN} = 7.0V
I_{CEX}	Output HIGH Leakage Current				50	µA	Max	V_{OUT} = V_{CC}
V_{ID}	Input Leakage Test		4.75			V	0.0	I_{ID} = 1.9 µA All Other Pins Grounded
I_{OD}	Output Leakage Circuit Current				3.75	µA	0.0	V_{IOD} = 150 mV All Other Pins Grounded
I_{IL}	Input LOW Current				−0.6	mA	Max	V_{IN} = 0.5V
I_{OZH}	Output Leakage Current				50	µA	Max	V_{OUT} = 2.7V
I_{OZL}	Output Leakage Current				−50	µA	Max	V_{OUT} = 0.5V
I_{OS}	Output Short-Circuit Current		−60		−150	mA	Max	V_{OUT} = 0V
I_{ZZ}	Bus Drainage Test				500	µA	0.0V	V_{OUT} = 5.25V
I_{CCH}	Power Supply Current			28	45	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current			40	60	mA	Max	V_O = LOW
I_{CCZ}	Power Supply Current			40	60	mA	Max	V_O = HIGH Z

AC Electrical Characteristics

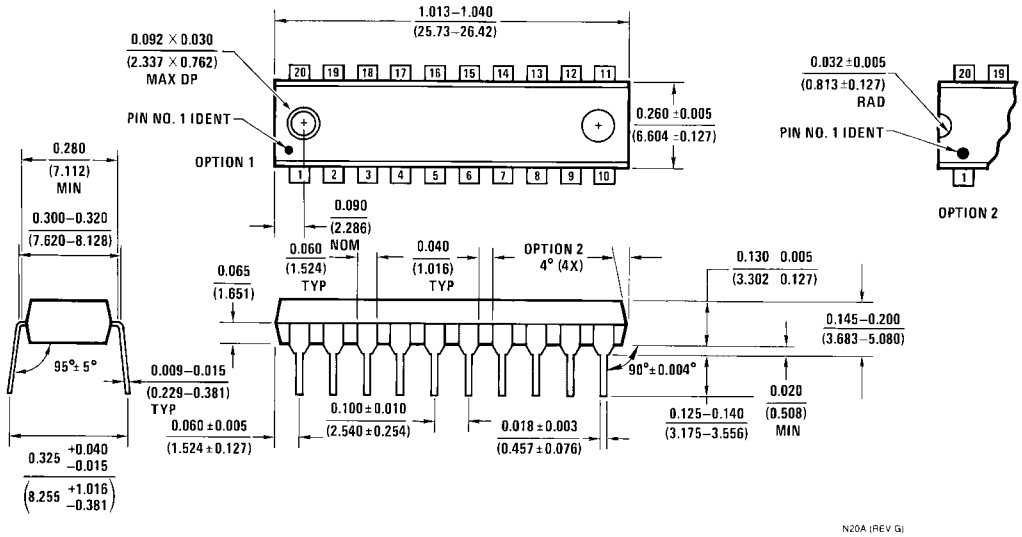
Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF			$T_A = 0°C$ to $+70°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay	4.0	14.5	18.5	3.5	19.5	ns
t_{PHL}	A_n to O_n	4.0	9.5	12.0	4.0	13.0	
t_{PLH}	Propagation Delay	5.0	12.0	16.0	5.5	17.0	ns
t_{PHL}	$\overline{E}$ to O_n	4.0	7.5	9.5	4.0	10.5	
t_{PLH}	Propagation Delay	7.5	14.5	21.5	4.5	22.5	ns
t_{PHL}	P to O_n	5.0	11.0	16.5	4.5	17.5	
t_{PZH}	Output Enable Time	4.5	8.0	10.5	4.0	11.5	ns
t_{PZL}	$\overline{OE}$ to O_n	5.5	10.0	13.0	5.0	14.0	
t_{PHZ}	Output Disable Time	2.0	4.5	6.5	2.0	7.0	
t_{PLZ}	$\overline{OE}$ to O_n	3.0	6.5	8.5	3.0	9.5	

Physical Dimensions inches (millimeters) unless otherwise noted



20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M20B

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N20A