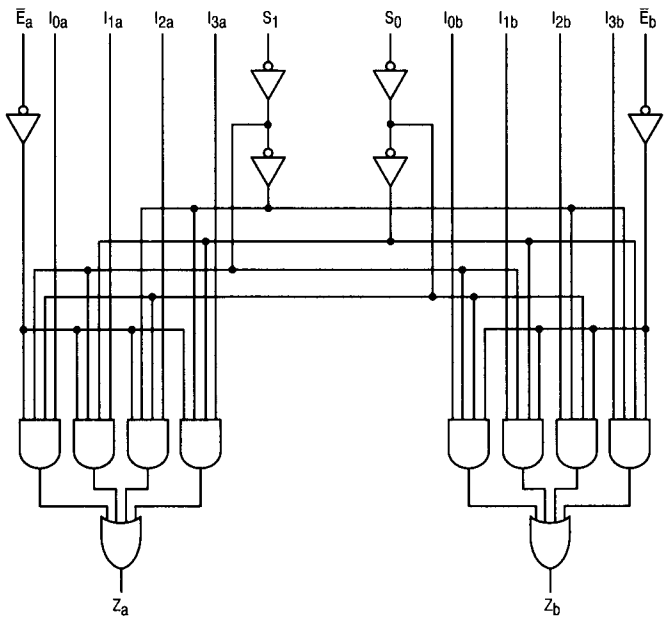
MOTOROLA

Dual 4-Input Data Selector/Multiplexer

ELECTRICALLY TESTED PER:
MIL-M-38510/33902

The 54F153 is a high-speed Dual 4-Input Multiplexer with common select inputs and individual enable inputs for each section. It can select two lines of data from four sources, The two buffered outputs present data in the true (non-inverted) form. In addition to multiplexer operations, the F153 can generate any two functions of three variables.

LOGIC DIAGRAM



FUNCTIONAL DESCRIPTION

The F153 is a dual 4-Input Multiplexer. It can select two bits of data from up to four sources under the control of the common Select inputs (S_0, S_1). The two 4-input multiplexer circuits have individual active LOW Enables ($\bar{E}_a$, $\bar{E}_b$) which can be used to strobe the outputs independently. When the Enables (E_a, E_b) are HIGH, the corresponding outputs (Z_a, Z_b) are forced LOW.

The F153 is the logic implementation of a 2-pole, 4-position switch, where the position of the switch is determined by the logic levels supplied to the two Select inputs.The logic equations for the outputs are shown below:

$Z_a = \bar{E}_a \bullet (I_{0a} \bullet \bar{S}_1 \bullet \bar{S}_0 + I_{1a} \bullet \bar{S}_1 \bullet S_0 + I_{2a} \bullet S_1 \bullet \bar{S}_0 + I_{3a} \bullet S_1 \bullet S_0)$.

$Z_b = \bar{E}_b \bullet (I_{0b} \bullet \bar{S}_1 \bullet \bar{S}_0 + I_{0b} \bullet \bar{S}_1 \bullet S_0 + I_{2b} \bullet S_1 \bullet \bar{S}_0 + I_{3b} \bullet S_1 \bullet S_0)$.

The F153 can be used to move data from a group of registers to a common output bus. The particular register from which the data came would be determined by the state of the Select Inputs. A less obvious application is a function generator. The F153 can generate two functions of three variables. This is useful for implementing highly irregular random logic.

Military 54F153

MPO

AVAILABLE AS:

1) JAN: JM38510/33902BXA
2) SMD: N/A
3) 883: 54F153/BXAJC

X = CASE OUTLINE AS FOLLOWS:
PACKAGE: CERDIP: E
CERFLAT: F
LCC: 2

THE LETTER "M" APPEARS BEFORE THE / ON LCC.

PIN ASSIGNMENTS

FUNCT.	DIL 620-09	FLATS 650-05	LCC 756A-02	BURN-IN (COND. A)
$\bar{E}_a$	1	1	2	V_{CC}
S_1	2	2	3	V_{CC}
I_{3a}	3	3	4	V_{CC}
I_{2a}	4	4	5	V_{CC}
I_{1a}	5	5	7	V_{CC}
I_{0a}	6	6	8	V_{CC}
Z_a	7	7	9	OPEN
GND	8	8	10	GND
Z_b	9	9	12	OPEN
I_{0b}	10	10	13	V_{CC}
I_{1b}	11	11	14	V_{CC}
I_{2b}	12	12	15	V_{CC}
I_{3b}	13	13	17	V_{CC}
S_0	14	14	18	V_{CC}
$\bar{E}_b$	15	15	19	V_{CC}
V_{CC}	16	16	20	V_{CC}

BURN-IN CONDITIONS:
V_{CC} = 5.0 V MIN/6.0 V MAX

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TRUTH TABLE							
Select Inputs		Inputs (a or b)					Outputs
S_0	S_1	$\bar{E}_n$	I_0	I_1	I_2	I_3	Z_n
X	X	H	X	X	X	X	L
L	L	L	L	X	X	X	L
L	L	L	H	X	X	X	H
H	L	L	X	L	X	X	L
H	L	L	X	H	X	X	H
L	H	L	X	X	L	X	L
L	H	L	X	X	H	X	H
H	H	L	X	X	X	L	L
H	H	L	X	X	X	H	H

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Table 1

Test Type	S1
t_{PLH}	open
t_{PHL}	open
t_{PHZ}	open
t_{PZH}	open
t_{PLZ}	closed
t_{PZL}	closed

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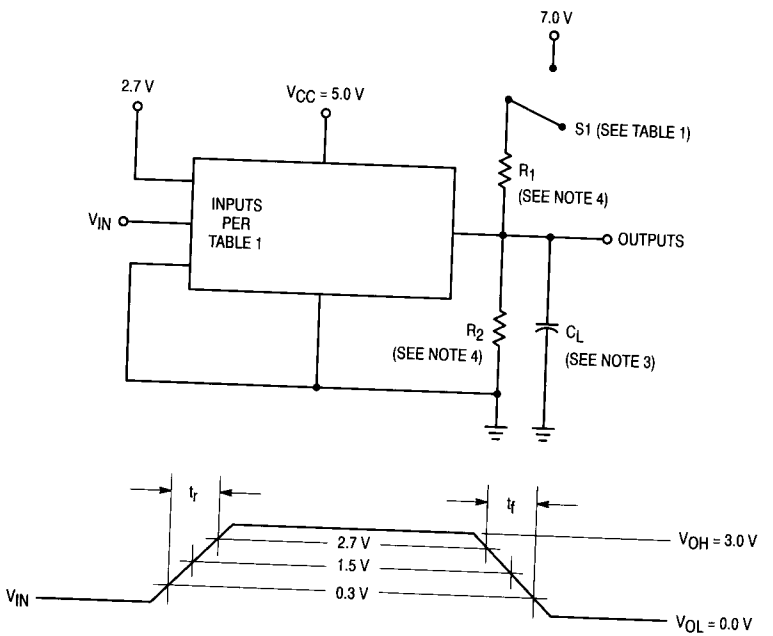
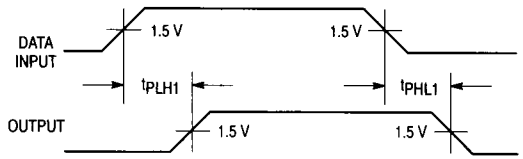
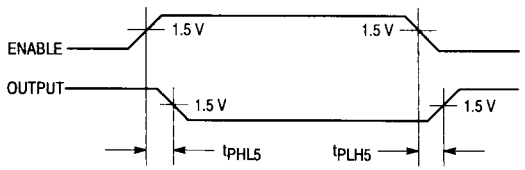
AC TEST CIRCUIT

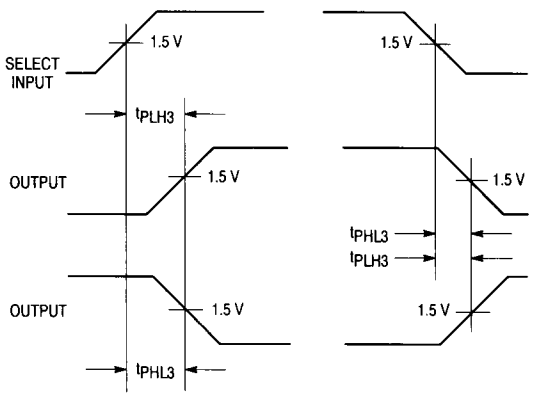


REFERENCE TO NOTES ON PAGE 4-63

WAVEFORMS







NOTES:
1. V_{IN} = Input pulse and has the following characteristics: PRR ≤ 1.0 MHz, $t_r = t_f \leq 2.5$ ns, $Z_{OUT} \approx 50\ \Omega$.
2. Terminal conditions (pins not designated may be high ≥ 2.0 V, low ≤ 0.8 V, or open).
3. $C_L = 50$ pF ± 10% including scope probe, wiring and stray capacitance, without package in test fixture.
4. $R_1 = R_2 = 499\ \Omega \pm 5.0\%$.
5. Voltage measurements are to be made with respect to network ground terminal.

Symbol	Parameter	Limits						Unit	Test Condition (Unless Otherwise Specified)
	Static Parameters:	+ 25°C		+ 125°C		− 55°C			
		Subgroup 1		Subgroup 2		Subgroup 3			
		Min	Max	Min	Max	Min	Max		
V_{OH}	Logical "1" Output Voltage	2.5		2.5		2.5		V	V_{CC} = 4.5 V, I_{OH} = −1.0 mA, V_{IH} = 2.0 V, other inputs are open, S = 0.8 V or (2.0 V), $\overline{E}$ = 0.8 V or open.
V_{OL}	Logical "0" Output Voltage		0.5		0.5		0.5	V	V_{CC} = 4.5 V, I_{OL} = 20 mA, V_{IL} = 0.8 V, other inputs are open, S = 0.8 V or (2.0 V), $\overline{E}$ = 2.0 V or open.
V_{IC}	Input Clamping Voltage			−1.2				V	V_{CC} = 4.5 V, I_{IN} = −18 mA, other inputs are open.
I_{IH1}	Logical "1" Input Current		20		20		20	µA	V_{CC} = 5.5 V, V_{IH} = 2.7 V, other inputs are open, $\overline{E}$ = 4.5 V, S = 0 V, 4.5 V or (2.7 V).
I_{IH2}	Logical "1" Input Current		100		100		100	µA	V_{CC} = 5.5 V, V_{IHH} = 7.0 V, other inputs are open, $\overline{E}$ = 4.5 V or (7.0 V), S = 0 V, 4.5 V or (7.0 V).
I_{IL}	Logical "0" Input Current	−0.03	−0.6	−0.03	−0.6	−0.03	−0.6	mA	V_{CC} = 5.5 V, V_{IN} = 0.5 V, other inputs are open, $\overline{E}$ = 0 V, S = 4.5 V, 0 V or (0.5 V).
I_{OD}	Diode Current	60		60		60		mA	V_{CC} = 4.5 V, all inputs are open, V_{OUT} = 2.5 V, $\overline{E}$ = 5.5 V or 0 V.
I_{OS}	Output Short Circuit Current	−60	−150	−60	−150	−60	−150	mA	V_{CC} = 5.5 V, V_{IN} = 4.5 V, all other inputs are open, V_{OUT} = 0 V.
I_{CC}	Power Supply Current		20		20		20	mA	V_{CC} = 5.5 V, V_{IN} = 0 V (all inputs).
V_{IH}	Logical "1" Input Voltage	2.0		2.0		2.0		V	V_{CC} = 4.5 V.
V_{IL}	Logical "0" Input Voltage		0.8		0.8		0.8	V	V_{CC} = 4.5 V.
	Functional Tests	Subgroup 7		Subgroup 8A		Subgroup 8B			per Truth Table with V_{CC} = 4.5 V, (**Repeat at**), V_{CC} = 5.5 V, V_{INL} = 0.5 V, and V_{INH} = 2.5 V.

Symbol	Parameter	Limits						Units	Test Condition (Unless Otherwise Specified)
	Switching Parameters:	+25°C		+125°C		−55°C			
		Subgroup 9		Subgroup 10		Subgroup 11			
		Min	Max	Min	Max	Min	Max		
t_{PHL1}	Propagation Delay /Data-Output I_n to Z_n	2.5	6.5	2.5	8.0	2.5	8.0	ns	V_{CC} = 5.0 V, C_L = 50 pF, $R_1 = R_2$ = 499 Ω.
t_{PLH1}	Propagation Delay /Data-Output I_n to Z_n	3.0	7.0	2.5	9.0	2.5	9.0	ns	V_{CC} = 5.0 V, C_L = 50 pF, $R_1 = R_2$ = 499 Ω.
t_{PHL3}	Propagation Delay /Data-Output S_0 or S_1 to Z_n	3.5	9.0	3.5	11	3.5	11	ns	V_{CC} = 5.0 V, C_L = 50 pF, $R_1 = R_2$ = 499 Ω.
t_{PLH3}	Propagation Delay /Data-Output S_0 or S_1 to Z_n	4.5	10.5	4.5	14	4.5	14	ns	V_{CC} = 5.0 V, C_L = 50 pF, $R_1 = R_2$ = 499 Ω.
t_{PHL5}	Propagation Delay /Data-Output $\overline{E}$ to Z_n	3.0	7.0	2.5	9.0	2.5	9.0	ns	V_{CC} = 5.0 V, C_L = 50 pF, $R_1 = R_2$ = 499 Ω.
t_{PLH5}	Propagation Delay /Data-Output $\overline{E}$ to Z_n	4.5	9.0	4.5	11.5	4.5	11.5	ns	V_{CC} = 5.0 V, C_L = 50 pF, $R_1 = R_2$ = 499 Ω.