Document No.	853-1489
ECN No.	00730
Date of Issue	October 17, 1990
Status	Product Specification
ACL Products	

74AC/ACT11153
Dual 4-input multiplexer

FEATURES

- Separate Output Enable inputs for each section
- Common Select inputs
- Output capability: ±24 mA
- CMOS (AC) and TTL (ACT) voltage level inputs
- 50Ω incident wave switching
- Center-pin V_{CC} and ground configuration to minimize high-speed switching noise
- I_{CC} category: MSI

DESCRIPTION

The 74AC/ACT11153 high-performance CMOS devices combine very high speed and high output drive comparable to the most advanced TTL families.

The 74AC/ACT11153 device provides two identical 4-input multiplexers with non-inverting outputs which select two bits from four sources selected by common select inputs (S_0, S_1). When the individual Enable (1$\overline{E}$, 2$\overline{E}$) inputs of the 4-input multiplexers are High, the outputs are forced Low.

The 74AC/ACT11153 devices are the logic implementation of a 2-pole, 4-posi-

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T_{amb} = 25°C; GND = 0V; V_{CC} = 5.0V	TYPICAL AC	TYPICAL ACT	UNIT
t_{PLH}/ t_{PHL}	Propagation delay $1I_n$, $2I_n$ to nY	C_L = 50pF	4.7	5.9	ns
C_{PD}	Power dissipation capacitance per multiplexer[1]	f = 1MHz; C_L = 50pF	30	34	pF
C_{IN}	Input capacitance	V_I = 0V or V_{CC}	3.5	3.5	pF
I_{LATCH}	Latch-up current	Per Jedec JC40.2 Standard 17	500	500	mA

Note:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_I + \Sigma (C_L \times V_{CC}^2 \times f_O) \text{ where:}$$

f_I = input frequency in MHz, C_L = output load capacitance in pF,

f_O = output frequency in MHz, V_{CC} = supply voltage in V,

$\Sigma (C_L \times V_{CC}^2 \times f_O)$ = sum of outputs

ORDERING INFORMATION

| PACKAGES	TEMPERATURE RANGE	ORDER CODE
16-pin plastic DIP (300mil-wide)	-40°C to +85°C	74AC11153N 74ACT11153N
16-pin plastic SO (150mil-wide)	-40°C to +85°C	74AC11153D 74ACT11153D

tion switch; the position of the switch being determined by the logic levels supplied to the two select inputs.

The '11153 is the non-inverting version of the '11352.

PIN CONFIGURATION

N and D Packages
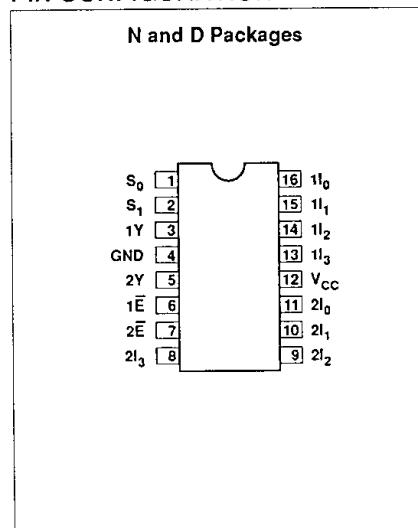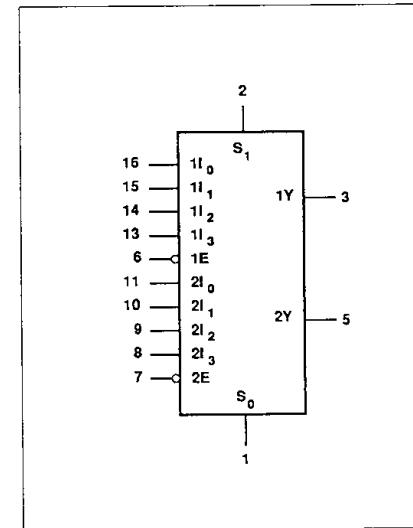
LOGIC SYMBOL

LOGIC SYMBOL (IEEE/IEC)
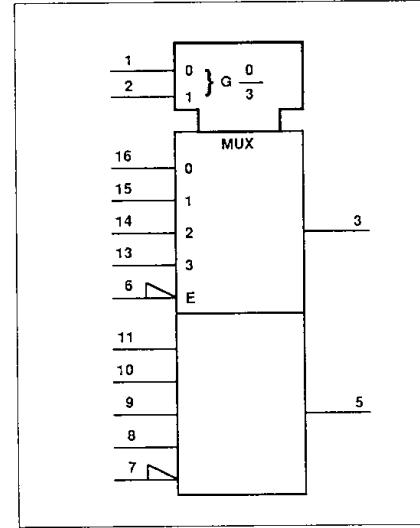
Dual 4-input multiplexer

74AC/ACT11153

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 2	S_0, S_1	Common select inputs
16, 15, 14, 13	$1I_0 - 1I_3$	Port A data inputs
11, 10, 9, 8	$2I_0 - 2I_3$	Port B data inputs
6	$1\overline{E}$	Port A enable input (active Low)
7	$2\overline{E}$	Port B enable input (active Low)
3, 5	1Y, 2Y	Data outputs
4	GND	Ground (0V)
12	V_{CC}	Positive supply voltage

FUNCTION TABLE

INPUTS							OUTPUT
$n\overline{E}$	S_0	S_1	nI_0	nI_1	nI_2	nI_3	nY
H	X	X	X	X	X	X	L
L	L	L	L	X	X	X	L
L	L	L	H	X	X	X	H
L	H	L	X	L	X	X	L
L	H	L	X	H	X	X	H
L	L	H	X	X	L	X	L
L	L	H	X	X	H	X	H
L	H	H	X	X	X	L	L
L	H	H	X	X	X	H	H

H = High voltage level steady state
L = Low voltage level steady state
X = Don't care
Z = High-impedance "OFF" state

LOGIC DIAGRAM
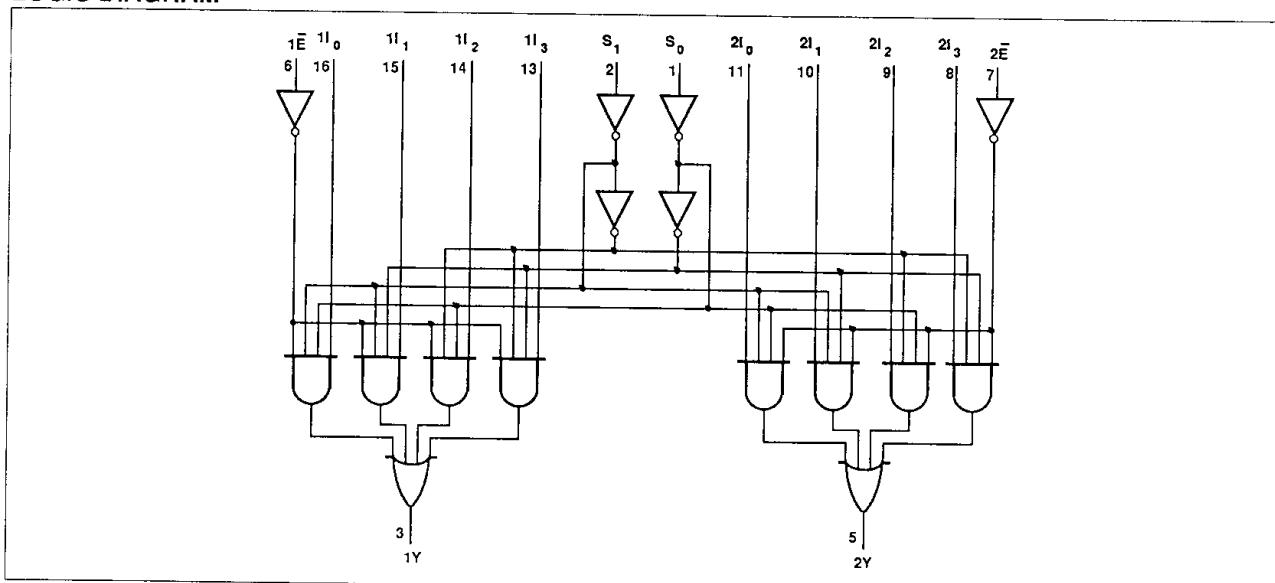
Dual 4-input multiplexer

74AC/ACT11153

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	AC11153			ACT11153			UNIT
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	DC supply voltage	3.0[1]	5.0	5.5	4.5	5.0	5.5	V
V_I	Input voltage	0		V_{CC}	0		V_{CC}	V
V_O	Output voltage	0		V_{CC}	0		V_{CC}	V
$\Delta t/\Delta v$	Input transition rise or fall rate	0		10	0		10	ns/V
T_{amb}	Operating free-air temperature range	-40		+85	-40		+85	°C

NOTE:
1. No electrical or switching characteristics are specified at V_{CC} < 3V. Operation between 2V and 3V is not recommended, but within that range, a device output will maintain a previously established logic state.

ABSOLUTE MAXIMUM RATINGS[1]

SYMBOL	PARAMETER	TEST CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		-0.5 TO +7.0	V
I_{IK} or V_I	DC input diode current[2]	V_I < 0	-20	mA
		V_I > V_{CC}	20	
	DC input voltage		-0.5 to V_{CC} +0.5	V
I_{OK} or V_O	DC output diode current[2]	V_O < 0	-50	mA
		V_O > V_{CC}	50	
	DC output voltage		-0.5 to V_{CC} +0.5	V
I_O	DC output source or sink current per output pin	V_O = 0 to V_{CC}	±50	mA
I_{CC} or I_{GND}	DC V_{CC} current		±100	mA
	DC ground current		±100	
T_{STG}	Storage temperature		-65 to 150	°C
P_{TOT}	Power dissipation per package	Above 70°C; derate linearly by 8mW/K	500	mW
	Power dissipation per package Plastic surface mount (SO)	Above 70°C; derate linearly by 8mW/K	400	mW

NOTES:
1. Stresses beyond those listed 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.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Dual 4-input multiplexer

74AC/ACT11153

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		V_{CC}	74AC11153				74ACT11153				UNIT
					T_{amb} = +25°C		T_{amb} = -40°C to +85°C		T_{amb} = +25°C		T_{amb} = -40°C to +85°C		
				V	Min	Max	Min	Max	Min	Max	Min	Max	
V_{IH}	High-level input voltage			3.0	2.10		2.10						V
				4.5	3.15		3.15		2.0		2.0		
				5.5	3.85		3.85		2.0		2.0		
V_{IL}	Low-level input voltage			3.0		0.90		0.90					V
				4.5		1.35		1.35		0.8		0.8	
				5.5		1.65		1.65		0.8		0.8	
V_{OH}	High-level output voltage	$V_I = V_{IL}$ or V_{IH}	I_{OH} = -50µA	3.0	2.9		2.9						V
				4.5	4.4		4.4		4.4		4.4		
				5.5	5.4		5.4		5.4		5.4		
			I_{OH} = -4mA	3.0	2.58		2.48						
			I_{OH} = -24mA	4.5	3.94		3.8		3.94		3.8		
				5.5	4.94		4.8		4.94		4.8		
			I_{OH} = -75mA[1]	5.5			3.85				3.85		
V_{OL}	Low-level output voltage	$V_I = V_{IL}$ or V_{IH}	I_{OL} = 50µA	3.0		0.1		0.1					V
				4.5		0.1		0.1		0.1		0.1	
				5.5		0.1		0.1		0.1		0.1	
			I_{OL} = 12mA	3.0		0.36		0.44					
			I_{OL} = 24mA	4.5		0.36		0.44		0.36		0.44	
				5.5		0.36		0.44		0.36		0.44	
			I_{OL} = 75mA[1]	5.5				1.65				1.65	
I_I	Input leakage current	$V_I = V_{CC}$ or GND		5.5		±0.1		±1.0		±0.1		±1.0	µA
I_{CC}	Quiescent supply current	$V_I = V_{CC}$ or GND, I_0 = 0mA		5.5		8.0		80		8.0		80	µA
ΔI_{CC}	Supply current, TTL inputs High[2]	One input at 3.4V, other inputs at V_{CC} or GND		5.5						0.9		1.0	mA

NOTES:
1. Not more than one output should be tested at a time, and the duration of the test should not exceed 10ms.
2. This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0V or V_{cc}.

Dual 4-input multiplexer

74AC/ACT11153

AC ELECTRICAL CHARACTERISTICS AT 3.3V ±0.3V

SYMBOL	PARAMETER	WAVEFORM	74AC11153					UNIT
			T_{amb} = +25°C			T_{amb} = -40°C to +85°C		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay nI_n to nY	1	2.3 2.6	6.9 7.1	8.4 8.7	2.3 2.6	9.5 9.9	ns
t_{PLH} t_{PHL}	Propagation delay S_n to nY	1	2.3 2.6	7.4 7.6	9.5 9.9	2.3 2.6	10.5 11.0	ns
t_{PLH} t_{PHL}	Propagation delay $n\overline{E}$ to nY	2	1.8 1.0	5.3 5.2	6.7 7.2	1.8 1.0	7.5 8.5	ns

AC ELECTRICAL CHARACTERISTICS AT 5.0V ±0.5V

SYMBOL	PARAMETER	WAVEFORM	74AC11153					UNIT
			T_{amb} = +25°C			T_{amb} = -40°C to +85°C		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay nI_n to nY	1	1.9 2.5	4.5 5.0	6.1 6.9	1.9 2.5	6.9 7.8	ns
t_{PLH} t_{PHL}	Propagation delay S_n to nY	1	2.0 1.6	4.7 5.5	6.8 7.7	2.0 1.6	7.6 8.6	ns
t_{PLH} t_{PHL}	Propagation delay $n\overline{E}$ to nY	2	1.4 1.8	3.6 4.3	5.1 5.8	1.4 1.8	5.7 6.7	ns

AC ELECTRICAL CHARACTERISTICS AT 5.0V ±0.5V

SYMBOL	PARAMETER	WAVEFORM	74ACT11153					UNIT
			T_{amb} = +25°C			T_{amb} = -40°C to +85°C		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay nI_n to nY	1	2.8 3.0	5.4 6.4	7.5 8.8	2.8 3.0	8.3 9.8	ns
t_{PLH} t_{PHL}	Propagation delay S_n to nY	1	2.8 3.1	6.4 6.8	9.8 10.0	2.8 3.1	10.9 11.0	ns
t_{PLH} t_{PHL}	Propagation delay $n\overline{E}$ to nY	2	2.2 2.9	5.5 5.6	8.6 6.6	2.2 2.9	9.3 7.6	ns

AC WAVEFORMS

Waveform 1. Waveforms Showing the Data Inputs (nI_n) and Select Input (S_n) to Output (nY) Propagation Delays

Waveform 2. Waveforms Showing the Enable Input ($n\overline{E}$) to Output (nY) Propagation Delays
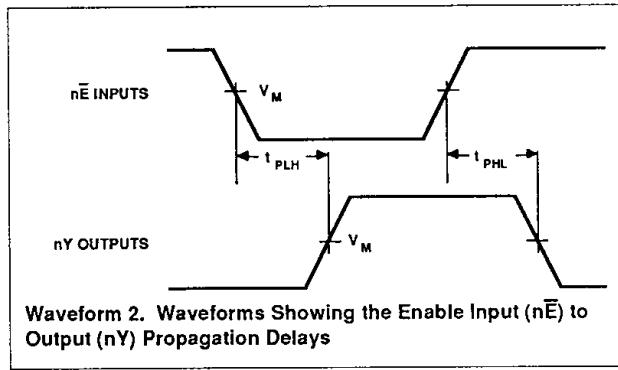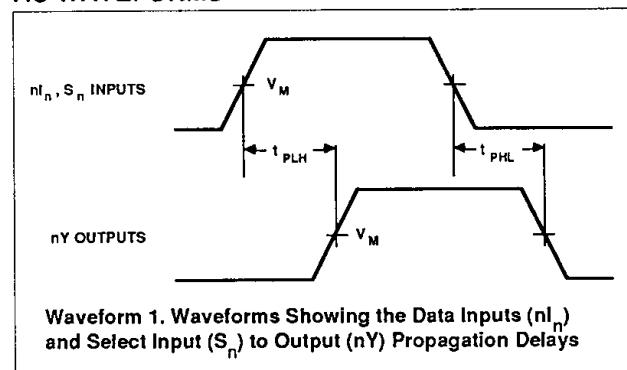
Dual 4-input multiplexer

74AC/ACT11153

WAVEFORM CONDITIONS

	INPUTS	OUTPUTS
AC	V_{IN} = GND to V_{CC}, V_M = 50% V_{CC}	V_{OUT} = V_{OL} to V_{OH}
ACT	V_{IN} = GND to 3.0V, V_M = 1.5V	V_M = 50% V_{CC}

TEST CIRCUIT

Test Circuit
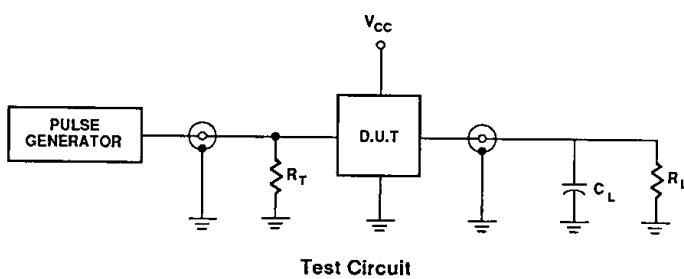
DEFINITIONS

C_L = Load capacitance, 50pF; includes jig and probe capacitance

R_L = Load resistor, 500Ω

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators

Input pulses: PRR ≤ 10MHz

$t_r = t_f$ = 3ns