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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74CBTS16212A

24-bit FET Bus-Exchange Switches
with Schottky diode clamping

ADE-205-680 (Z)

Preliminary
Rev. 0
Feb. 2002

Description

The HD74CBTS16212A devices provide 24-bits of high speed TTL-compatible bus switching or exchanging. The low on state resistance of the switch allows connections to be made with minimal propagation delay. Each device operates as a 24-bit bus switch or a 12-bit bus exchanger that provides data exchanging between the four signal ports via the data-select (S0, S1, S2) terminals.

Features

- Minimal propagation delay through the switch.
- 5 Ω switch connection between two ports.
- TTL-compatible input levels.
- Ultra low quiescent power.
  -Ideally suited for notebook applications.
- Package type
  Product code example: HD74CBTS16212ATEL

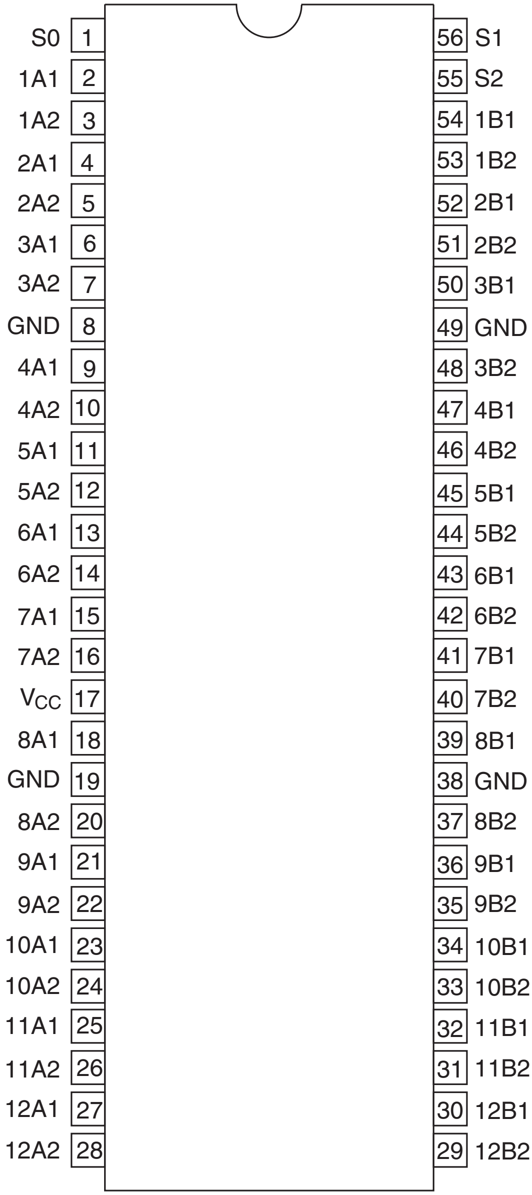
Package type	Package code	Package suffix	Taping code
TSSOP–56pin	TTP–56DAV	T	EL(1,000pcs / Reel)

Function Table

Inputs			Inputs / Outputs		
S2	S1	S0	A1	A2	Function
L	L	L	Z	Z	Disconnect
L	L	H	B1 port	Z	A1 port = B1 port
L	H	L	B2 port	Z	A1 port = B2 port
L	H	H	Z	B1 port	A2 port = B1 port
H	L	L	Z	B2 port	A2 port = B2 port
H	L	H	Z	Z	Disconnect
H	H	L	B1 port	B2 port	A1 port = B1 port A2 port = B2 port
H	H	H	B2 port	B1 port	A1 port = B2 port A2 port = B1 port

H: High level
L: Low level
Z: High impedance

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	V_{CC}	–0.5 to 7.0	V	
Input voltage range [*1]	V_I	–0.5 to 7.0	V	
Input clamp current	I_{IK}	–50	mA	$V_I < 0$
Continuous output current	I_O	128	mA	$V_O = 0$ to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±100	mA	
Maximum power dissipation at Ta = 25°C (in still air) [*2]	P_T	1.32	W	
Storage temperature	Tstg	–65 to 150	°C	

Notes: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

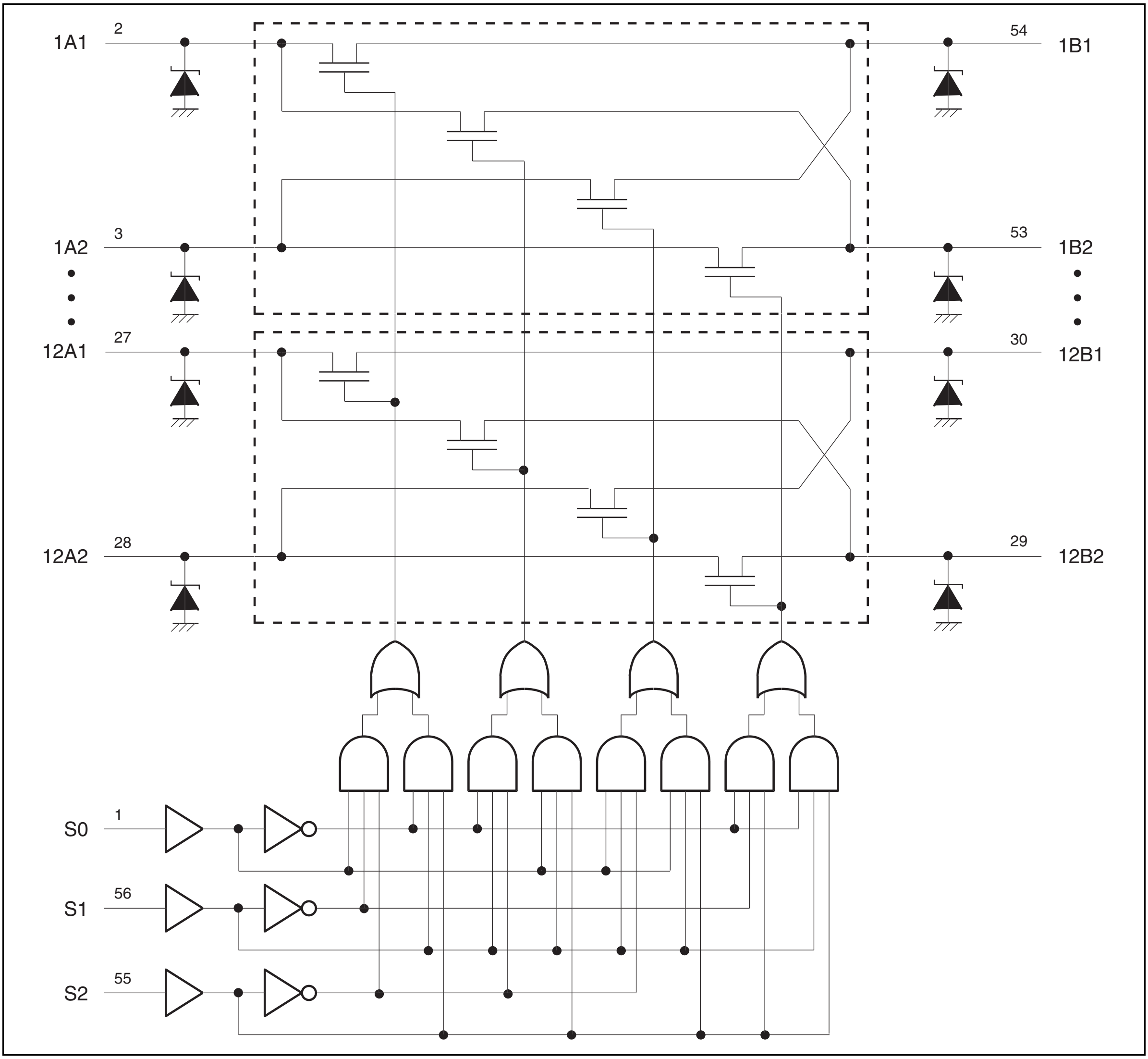
1. The input and output voltage ratings may be exceeded even if the input and output clamp-current ratings are observed.
2. The maximum package power dissipation was calculated using a junction temperature of 150°C.

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	4.0	5.5	V	
Input voltage range	V_I	0	5.5	V	
Output voltage range	$V_{I/O}$	0	5.5	V	
Input transition rise or fall rate	Δt / Δv	0	5	ns / V	V_{CC} = 4.5 to 5.5 V
Operating free-air temperature	Ta	–40	85	°C	

Note: Unused or floating inputs must be held high or low.

Block Diagram



DC Electrical Characteristics

(Ta = –40 to 85°C)

Item	Symbol	V_{CC} (V)	Min	Typ [*1]	Max	Unit	Test conditions
Clamp diode voltage	V_{IK}	4.5	—	—	–1.2	V	I_{IN} = –18 mA
Input voltage	V_{IH}	4.0 to 5.5	2.0	—	—	V	
	V_{IL}	4.0 to 5.5	—	—	0.8		
On-state switch resistance [*2]	R_{ON}	4.0	—	14	20	Ω	V_{IN} = 2.4 V, I_{IN} = 15 mA Typ at V_{CC} = 4.0 V
		4.5	—	4	7		V_{IN} = 0 V, I_{IN} = 64 mA
		4.5	—	4	7		V_{IN} = 0 V, I_{IN} = 30 mA
		4.5	—	6	12		V_{IN} = 2.4 V, I_{IN} = 15 mA
Input current	I_{IN}	0 to 5.5	—	—	±1.0	µA	V_{IN} = 5.5 V or GND control inputs
Off-state leakage current	I_{OZ}	5.5	–1.0	—	—	µA	$V_{\overline{O}}$ = GND A or B
		5.5	—	—	20		$V_{\overline{O}}$ = 5.5 V A or B
Quiescent supply current	I_{CC}	5.5	—	—	3	µA	V_{IN} = V_{CC} or GND, I_O = 0 mA
Increase in I_{CC} per input [*3]	ΔI_{CC}	5.5	—	—	2.5	mA	One input at 3.4 V, other inputs at V_{CC} or GND

Notes: For condition shown as Min or Max use the appropriate values under recommended operating conditions.

1. All typical values are at V_{CC} = 5 V (unless otherwise noted), Ta = 25°C.
2. Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lower voltage of the two (A or B) terminals.
3. This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

Capacitance

(Ta = 25°C)

Item	Symbol	V_{cc} (V)	Min	Typ	Max	Unit	Test conditions
Control input capacitance	C_{IN}	5.0	—	5	—	pF	V_{IN} = 0 or 3 V
Input / output capacitance	$C_{I/O\ (OFF)}$	5.0	—	11	—	pF	V_O = 0 or 3 V S0, S1, or S2 = V_{CC}

Note: This parameter is determined by device characterization is not production tested.

Switching Characteristics

(Ta = −40 to 85°C)

- V_{CC} = 4.0 V

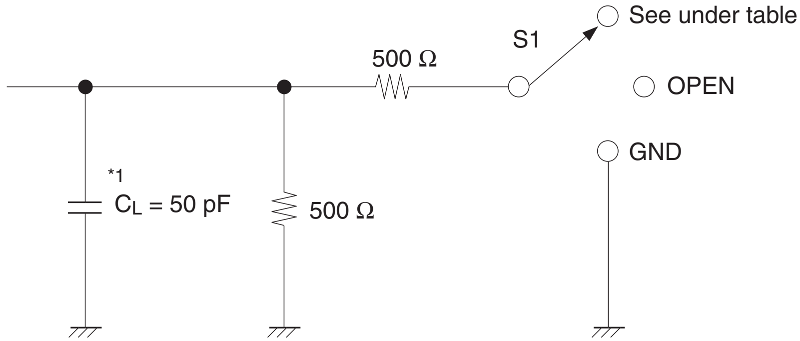
Item	Symbol	Min	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time *1	t_{PLH} t_{PHL}	—	0.35	ns	C_L = 50 pF R_L = 500 Ω	A or B	B or A
Propagation delay time	t_{PLH} t_{PHL}	—	10.0	ns	C_L = 50 pF R_L = 500 Ω	S	A or B
Enable time	t_{ZH} t_{ZL}	—	10.4	ns	C_L = 50 pF R_L = 500 Ω	S	A or B
Disable time	t_{HZ} t_{LZ}	—	9.2	ns	C_L = 50 pF R_L = 500 Ω	S	A or B

- V_{CC} = 5.0±0.5 V

Item	Symbol	Min	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time *1	t_{PLH} t_{PHL}	—	0.25	ns	C_L = 50 pF R_L = 500 Ω	A or B	B or A
Propagation delay time	t_{PLH} t_{PHL}	1.5	9.1	ns	C_L = 50 pF R_L = 500 Ω	S	A or B
Enable time	t_{ZH} t_{ZL}	1.5	9.7	ns	C_L = 50 pF R_L = 500 Ω	S	A or B
Disable time	t_{HZ} t_{LZ}	1.5	8.8	ns	C_L = 50 pF R_L = 500 Ω	S	A or B

Note: 1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

Test Circuit

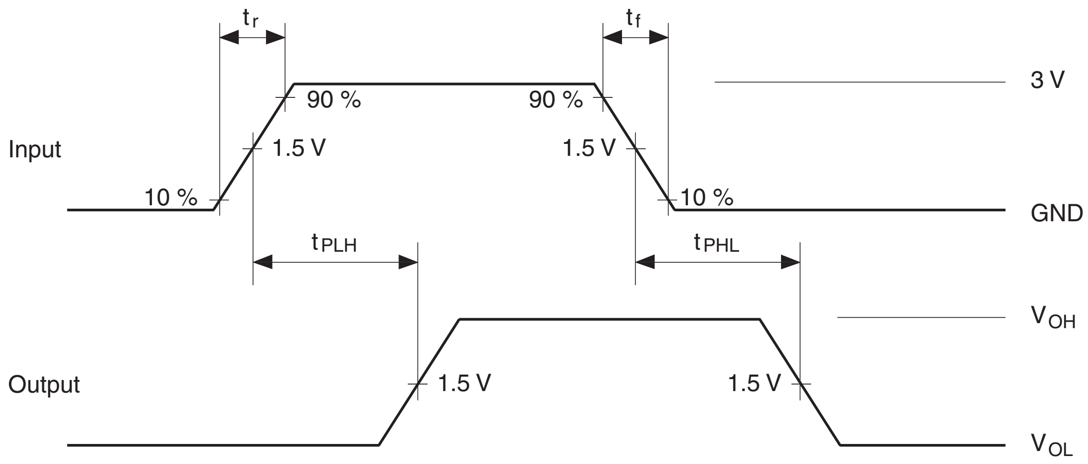


Load circuit for outputs

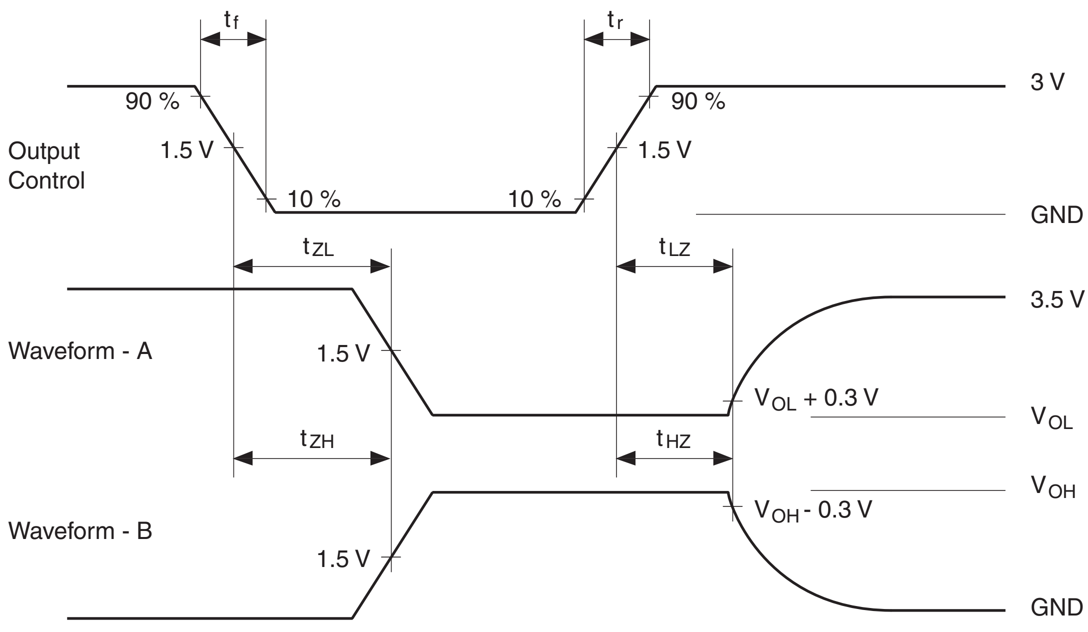
Symbol	S1
t_{PLH} / t_{PHL}	OPEN
t_{ZH} / t_{HZ}	OPEN
t_{ZL} / t_{LZ}	7 V

Note: 1. C_L includes probe and jig capacitance.

Waveforms – 1



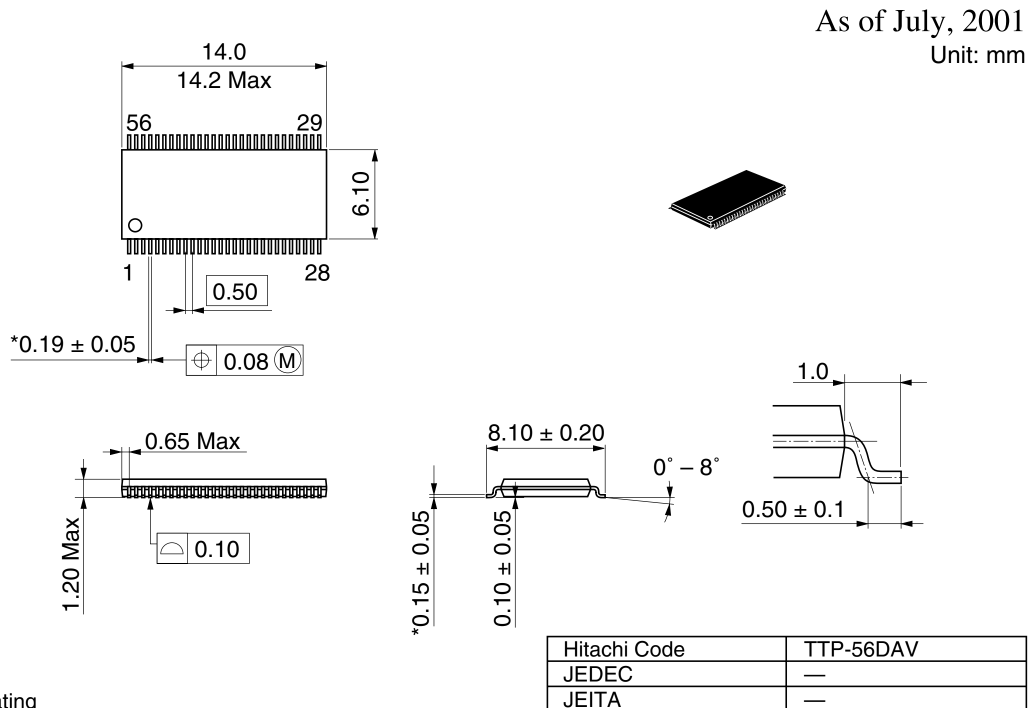
Waveforms – 2



Notes: 1. All input pulses are supplied by generators having the following characteristics : PRR ≤ 10 MHz, Z_O = 50 Ω, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns.

2. Waveform - A is for an output with internal conditions such that the output is low except when disabled by the output control.
3. Waveform - B is for an output with internal conditions such that the output is high except when disabled by the output control.
4. The output are measured one at a time with one transition per measurement.

Package Dimensions



Hitachi Code	TTP-56DAV
JEDEC	—
JEITA	—
Mass (reference value)	0.32 g

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