HD74LVC1G53

2–channel Analog Multiplexer/Demultiplexer

REJ03D0155–0300Z
Rev.3.00
Jul. 02, 2004

Description

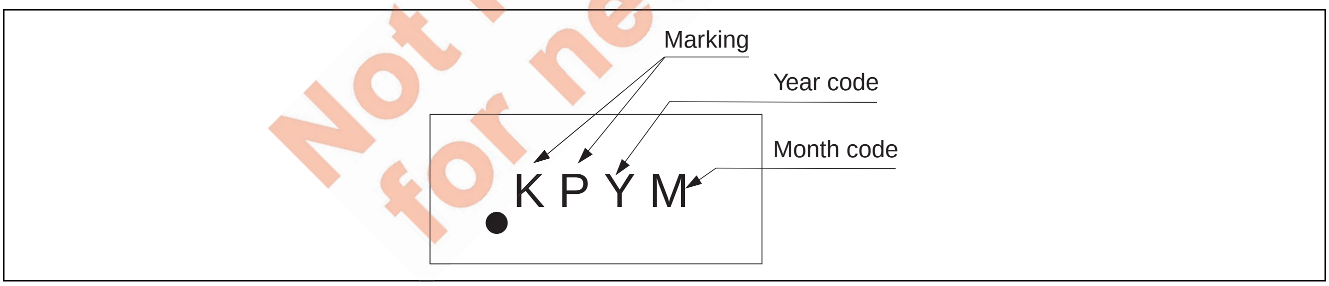
The HD74LVC1G53 has 2–channel analog multiplexer/demultiplexer in a 6-pin package. Applications include signal gating chopping, modulation or demodulation (modem), and signal multiplexing for analog to digital to analog conversion systems. Low voltage and high-speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

Features

- The basic gate function is lined up as renesas uni logic series.
- Supply voltage range: 1.65 to 5.5 V
  Operating temperature range: –40 to +85°C
- Control input: V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LVC1G53CPE	WCSP-6 pin	TBS-6V	CP	E (3,000 pcs/reel)
HD74LVC1G53CLE		TBS-6AV	CL	

Article Indication

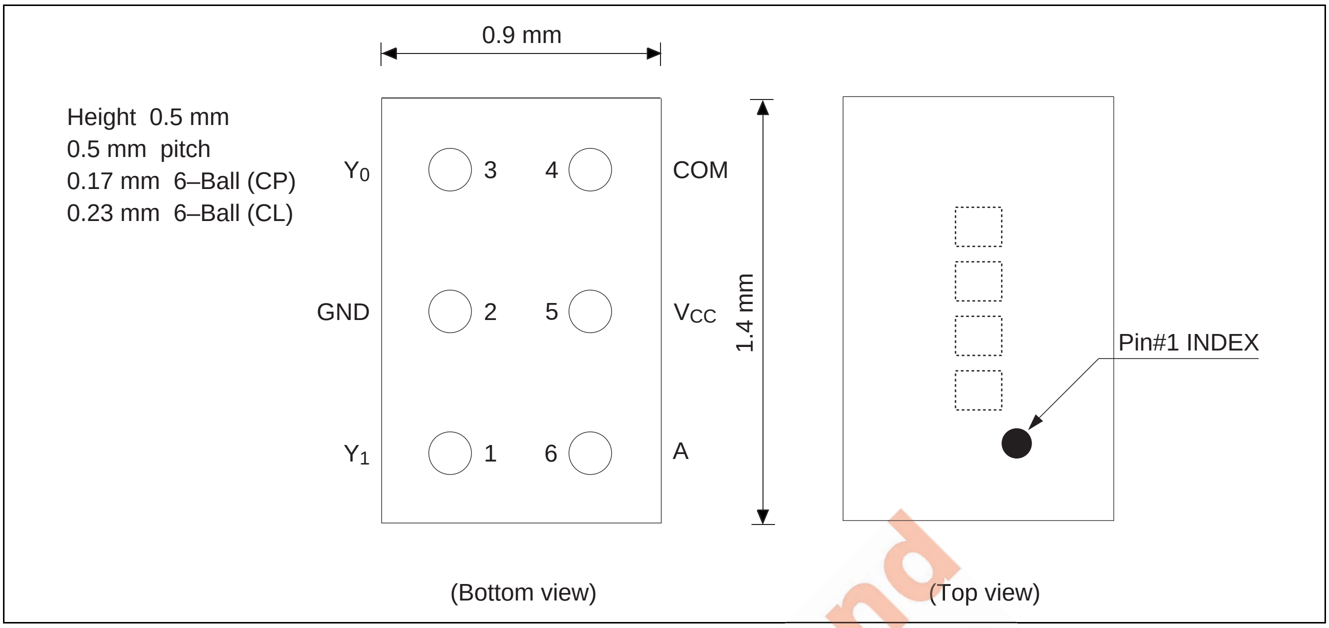


Function Table

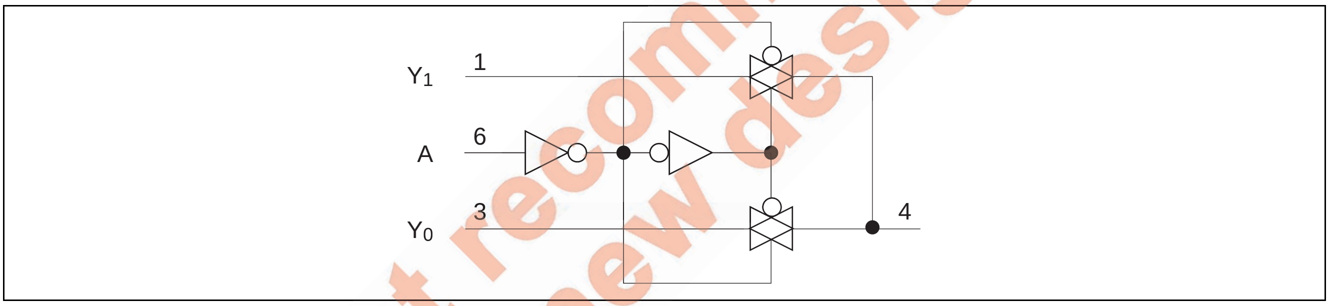
Control	On channel 1
L	Y_0
H	Y_1

H: High level
L: Low level

Pin Arrangement



Logic Diagram



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	V_{CC}	–0.5 to 6.5	V	
Input voltage range [*1]	V_I	–0.5 to 6.5	V	
Output voltage range [*1, 2]	V_O	–0.5 to V_{CC} +0.5	V	Output : H or L
Control Input clamp current	I_{IK}	–50	mA	$V_I < 0$
Output clamp current	I_{OK}	±50	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	±50	mA	$V_O = 0$ to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±100	mA	
Package Thermal impedance	θ_{ja}	143	°C/W	CP
		123		CL
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 if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	1.65	5.5	V	
Control Input voltage range	V_I	0	5.5	V	
Input/Output voltage range	$V_{I/O}$	0	V_{CC}	V	
Input transition rise or fall rate	$\Delta t / \Delta v$	0	20	ns / V	V_{CC} = 1.65 to 1.95 V, 2.3 to 2.7 V
		0	10		V_{CC} = 3.0 to 3.6 V
		0	10		V_{CC} = 4.5 to 5.5 V
Operating free-air temperature	T_a	–40	85	°C	

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

Electrical Characteristics

Ta = –40 to 85°C

Item	Symbol	V_{CC} (V)	Min	Typ	Max	Unit	Test condition	
Input voltage	V_{IH}	1.65 to 1.95	$V_{CC}\times0.65$	—	—	V		
		2.3 to 2.7	$V_{CC}\times0.7$	—	—			
		3.0 to 3.6	$V_{CC}\times0.7$	—	—			
		4.5 to 5.5	$V_{CC}\times0.7$	—	—			
	V_{IL}	1.65 to 1.95	—	—	$V_{CC}\times0.35$			
		2.3 to 2.7	—	—	$V_{CC}\times0.3$			
		3.0 to 3.6	—	—	$V_{CC}\times0.3$			
		4.5 to 5.5	—	—	$V_{CC}\times0.3$			
On–state switch resistance	R_{ON}	1.65	—	13	30	Ω	I_S = 4 mA	V_I=V_{CC} or GND
		2.3	—	10	20		I_S = 8 mA	
		3.0	—	8.5	17		I_S = 24 mA	
		4.5	—	6.5	13		I_S = 32 mA	
Peak on resistance	R_{ON}(P)	1.65	—	86.5	120		I_S = 4 mA	V_I=V_{CC} to GND
		2.3	—	23	30		I_S = 8 mA	
		3.0	—	13	20		I_S = 24 mA	
		4.5	—	8	15		I_S = 32 mA	
Difference of on-state resistance between switches	ΔR_{ON}	1.65	—	—	7		I_S = 4 mA	V_I=V_{CC} to GND
		2.3	—	—	5		I_S = 8 mA	
		3.0	—	—	3		I_S = 24 mA	
		4.5	—	—	2		I_S = 32 mA	
Off-state switch leakage current	$I_{S\ (OFF)}$	5.5	—	—	±1.0	µA	V_I = V_{CC} and V_O = GND or V_I = GND and V_O = V_{CC}, V_A = V_{IL}, V_{IH}	
			—	—	±0.1*[1]			
On-state switch leakage current	$I_{S\ (ON)}$	5.5	—	—	±1.0	µA	V_I = V_{CC} or GND, V_A = V_{IH}, V_{IL} V_O = Open	
			—	—	±0.1*[1]			
Control input current	I_{IN}	5.5	—	—	±1.0	µA	V_{IN} = V_{CC} or GND	
			—	—	±0.1*[1]			
Quiescent supply current	I_{CC}	5.5	—	—	10	µA	V_{IN} = V_{CC} or GND	
			—	—	1.0*[1]			
	ΔI_{CC}	5.5	—	—	500	µA	V_C = V_{CC}–0.6 V	
Control input capacitance	C_{IC}	5.0	—	3.0	—	pF		
Switch terminal capacitance	$C_{I/O(OFF)}$	5.0	—	6.0	—	pF		
	$C_{I/O(ON)}$	5.0	—	13	—			

Note: 1. Ta = 25°C

Switching Characteristics

V_{CC} = 1.8 ± 0.15 V

Item	Symbol	Ta = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*[1]	t_{PLH} t_{PHL}	—	2.0	ns	C_L = 30 pF, R_L = 1.0 kΩ	COM or Yn	Yn or COM
Enable time	t_{ZH} t_{ZL}	2.9	10.3		C_L = 30 pF, R_L = 1.0 kΩ	A	Yn
Disable time	t_{HZ} t_{LZ}	2.1	9.4		C_L = 30 pF, R_L = 1.0 kΩ	A	Yn

V_{CC} = 2.5 ± 0.2 V

Item	Symbol	Ta = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*[1]	t_{PLH} t_{PHL}	—	1.2	ns	C_L = 30 pF, R_L = 500 Ω	COM or Yn	Yn or COM
Enable time	t_{ZH} t_{ZL}	2.1	7.2		C_L = 30 pF, R_L = 500 Ω	A	Yn
Disable time	t_{HZ} t_{LZ}	1.4	7.9		C_L = 30 pF, R_L = 500 Ω	A	Yn

V_{CC} = 3.3 ± 0.3 V

Item	ymbol	Ta = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*[1]	t_{PLH} t_{PHL}	—	0.8	ns	C_L = 50 pF, R_L = 500 Ω	COM or Yn	Yn or COM
Enable time	t_{ZH} t_{ZL}	1.9	5.8		C_L = 50 pF, R_L = 500 Ω	A	Yn
Disable time	t_{HZ} t_{LZ}	1.1	7.2		C_L = 50 pF, R_L = 500 Ω	A	Yn

V_{CC} = 5.0 ± 0.5 V

Item	Symbol	Ta = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*[1]	t_{PLH} t_{PHL}	—	0.6	ns	C_L = 50 pF, R_L = 500 Ω	COM or Yn	Yn or COM
Enable time	t_{ZH} t_{ZL}	1.3	5.4		C_L = 50 pF, R_L = 500 Ω	A	Yn
Disable time	t_{HZ} t_{LZ}	1.0	5.0		C_L = 50 pF, R_L = 500 Ω	A	Yn

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

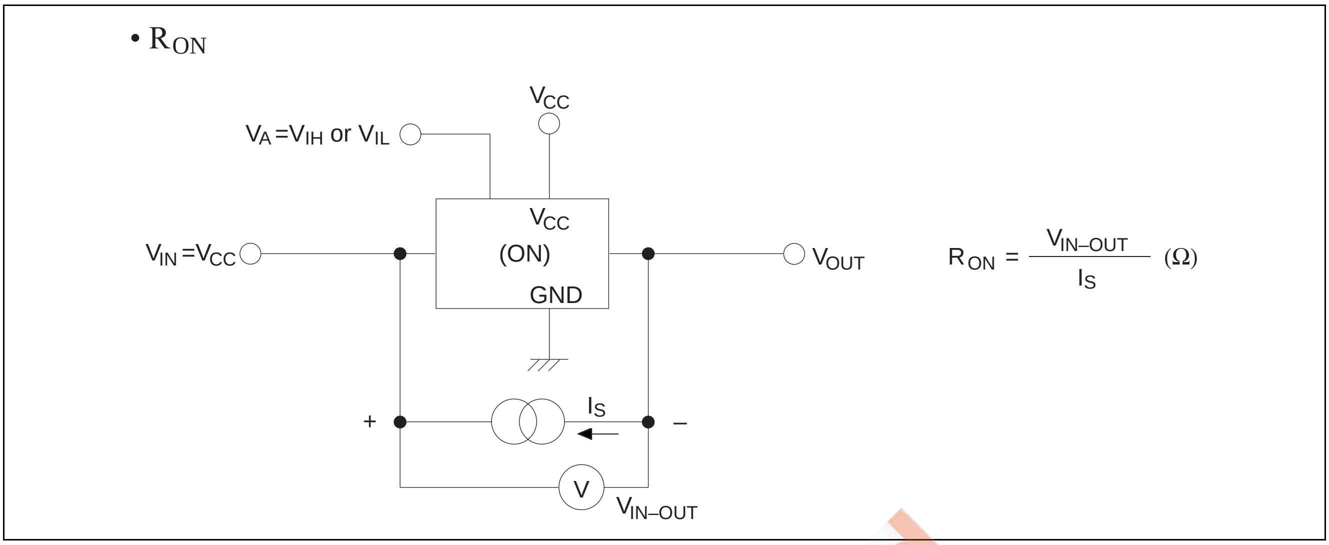
Analog Switch Characteristics

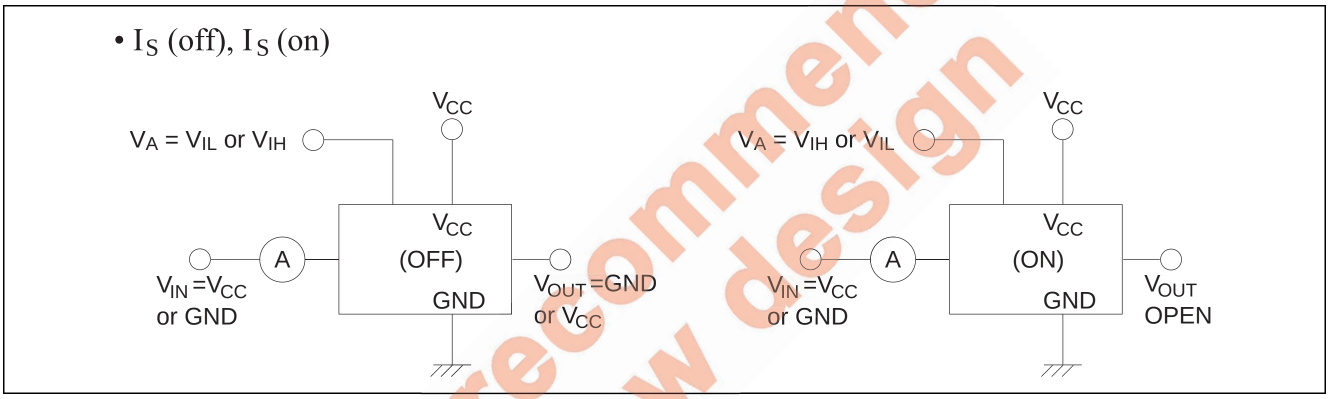
Item	V_{CC} (V)	Ta = 25°C Min	Typ	Max	Unit	Test conditions		FROM (Input)	TO (Output)
Frequency response (Switch ON)	1.65	—	35	—	MHz	C_L = 50 pF, R_L = 600 Ω	Adjust fin voltage to obtain 0dBm at output when fin is 1MHz (sine wave). Increase fin frequency until the dB–meter reads –3 dBm. 20 log(V_O/V_I) = –3 dBm	COM or Y	Y or COM
	2.3	—	120	—					
	3.0	—	190	—					
	4.5	—	215	—					
	1.65	—	>300	—		C_L = 5 pF, R_L = 50 Ω			
	2.3	—	>300	—					
	3.0	—	>300	—					
	4.5	—	>300	—					
Crosstalk (between switches)	1.65	—	–58	—	dB	C_L = 50 pF, R_L = 600 Ω	Adjust fin voltage to obtain 0dBm at input when fin is 1MHz (sine wave).	COM	Y
	2.3	—	–58	—					
	3.0	—	–58	—					
	4.5	—	–58	—					
	1.65	—	–42	—		C_L = 5 pF, R_L = 50 Ω			
	2.3	—	–42	—					
	3.0	—	–42	—					
	4.5	—	–42	—					
Crosstalk (Control input to signal output)	1.65	—	35	—	mV	C_L = 50 pF, R_L = 600 Ω	Adjust RL value to obtain 0A at $I_{IN/OUT}$ when fin is 1MHz (square wave)	A	Y or COM
	2.3	—	50	—					
	3.0	—	70	—					
	4.5	—	100	—					
Feed through attenuation (Switch OFF)	1.65	—	–58	—	dB	C_L = 50 pF, R_L = 600 Ω	Adjust fin voltage to obtain 0dBm at input when fin is 1MHz (sine–wave)	COM or Y	Y or COM
	2.3	—	–58	—					
	3.0	—	–58	—					
	4.5	—	–58	—					
	1.65	—	–42	—		C_L = 5 pF, R_L = 50 Ω			
	2.3	—	–42	—					
	3.0	—	–42	—					
	4.5	—	–42	—					
Sine–wave distortion	1.65	—	0.1	—	%	C_L = 50 pF, R_L = 10 kΩ fin = 1kHz (sine–wave)	V_I=1.4$V_{P–P}$, V_{CC}=1.65V V_I=2.0$V_{P–P}$, V_{CC}=2.3V V_I=2.5$V_{P–P}$, V_{CC}=3.0V V_I=4.0$V_{P–P}$, V_{CC}=4.5V	COM or Y	Y or COM
	2.3	—	0.025	—					
	3.0	—	0.015	—					
	4.5	—	0.01	—					
	1.65	—	0.15	—		C_L = 50 pF, R_L = 10 kΩ fin = 10kHz (sine–wave)			
	2.3	—	0.025	—					
	3.0	—	0.015	—					
	4.5	—	0.01	—					

Operating Characteristics

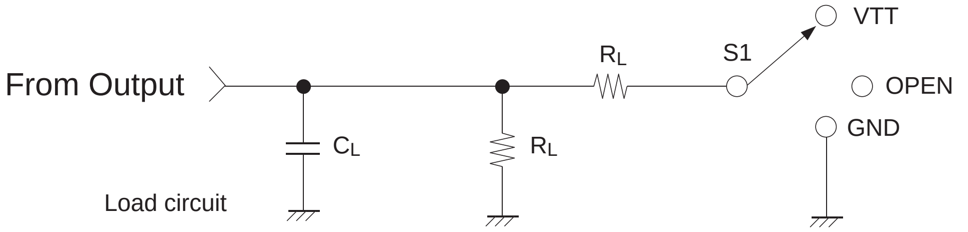
Item	Symbol	V_{CC} (V)	Ta = 25°C Min	Typ	Max	Unit	Test Conditions
Power dissipation capacitance	C_{PD}	1.8	—	9	—	pF	f = 10 MHz
		2.5	—	10	—		
		3.3	—	10	—		
		5.0	—	12	—		

Test Circuit



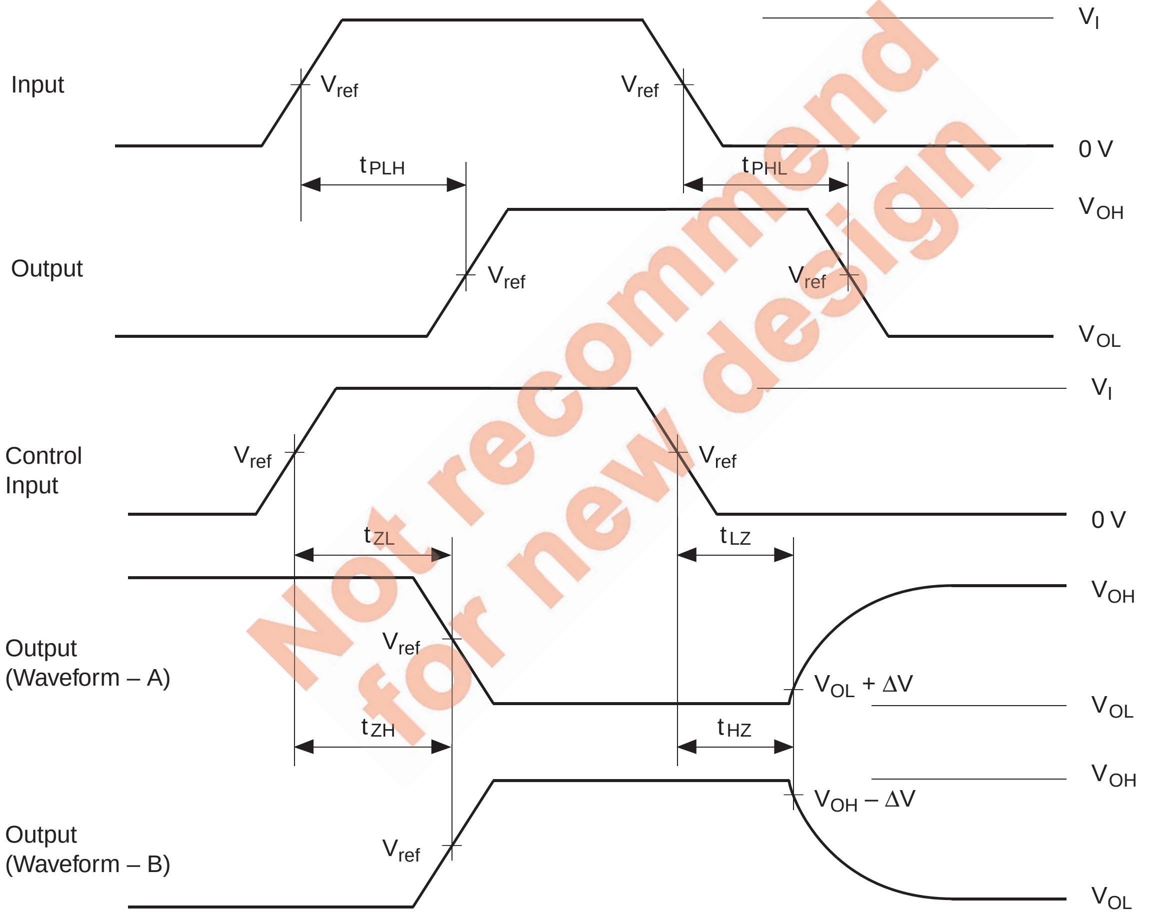


Test Circuit (cont.)



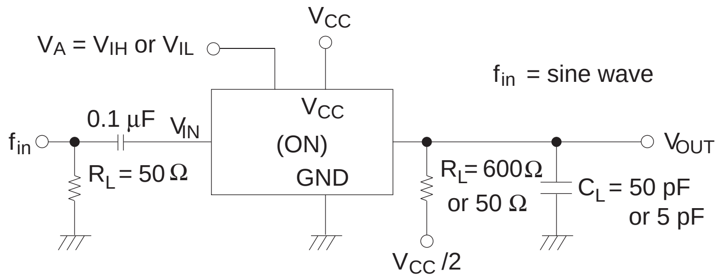
TEST	S1
t_{PLH} / t_{PHL}	OPEN
t_{ZH} / t_{HZ}	GND
t_{ZL} / t_{LZ}	VTT

V_{CC} (V)	INPUTS		V_{ref}	VTT	C_L	R_L	ΔV
	V_I	t_r / t_f					
1.8±0.15	V_{CC}	≤ 2 ns	V_{CC} / 2	2 × V_{CC}	30 pF	1.0 kΩ	0.15 V
2.5±0.2	V_{CC}	≤ 2 ns	V_{CC} / 2	2 × V_{CC}	30 pF	500 Ω	0.15 V
3.3±0.3	V_{CC}	≤ 2.5 ns	V_{CC} / 2	2 × V_{CC}	50 pF	500 Ω	0.3 V
5.0±0.5	V_{CC}	≤ 2.5 ns	V_{CC} / 2	2 × V_{CC}	50 pF	500 Ω	0.3 V

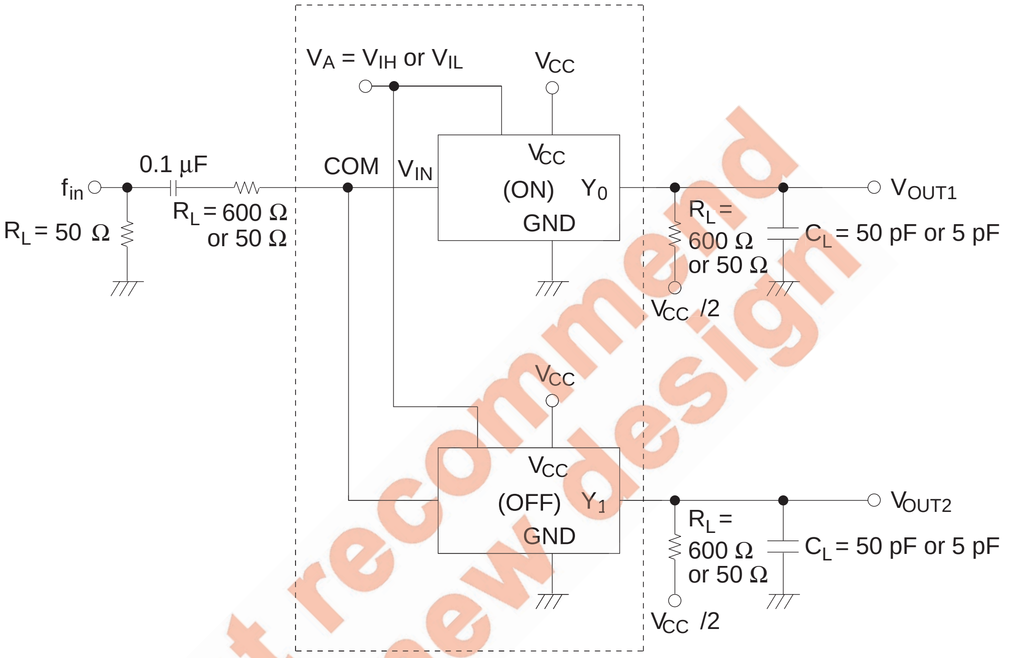


Notes:
1. C_L includes probe and jig capacitance.
2. Waveform–A is for an output with internal conditions such that the output is low except when disabled by the output control.
3. Waveform–B is for an output with internal conditions such that the output is high except when disabled by the output control.
4. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10MHz, Zo = 50 Ω.
5. The output are measured one at a time with one transition per measurement.

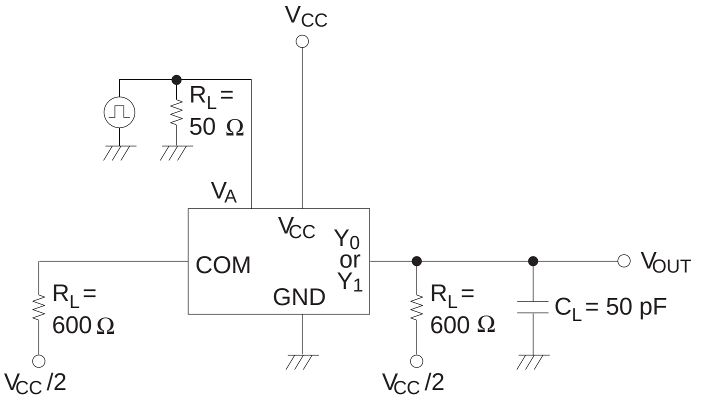
Frequency response (Switch ON)



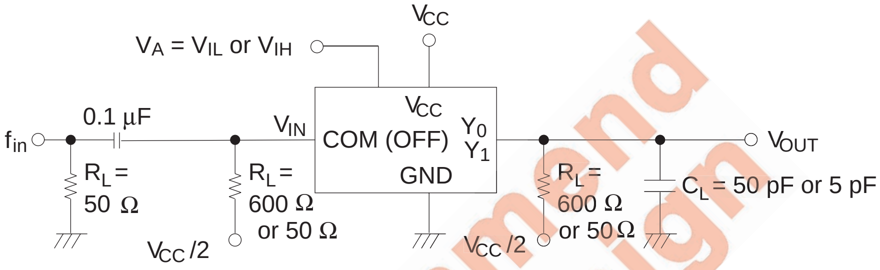
Crosstalk (Between any switches)



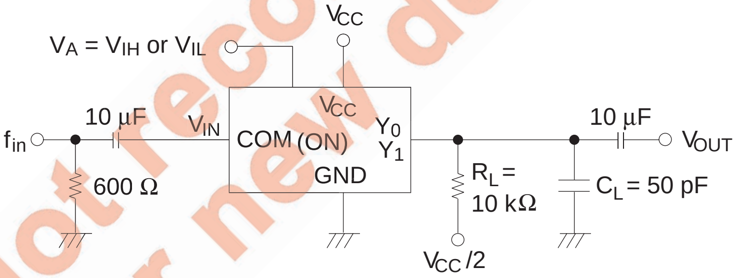
Crosstalk (Control input to signal output)



Feedthrough attenuation (Switch OFF)



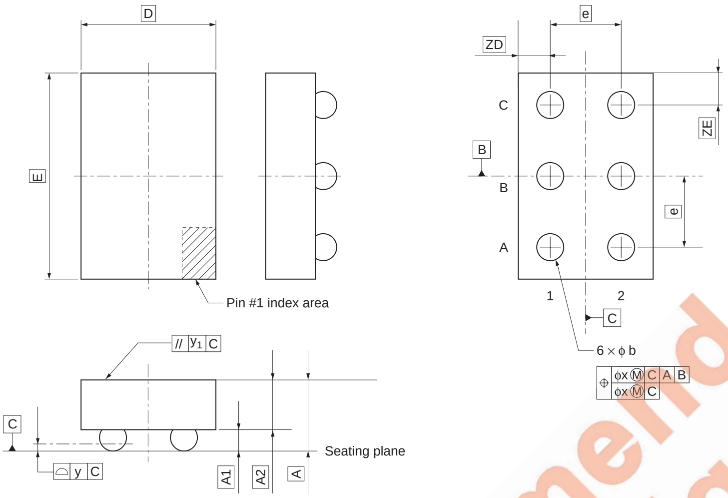
Sine-wave distortion



Package Dimensions

TBS-6V

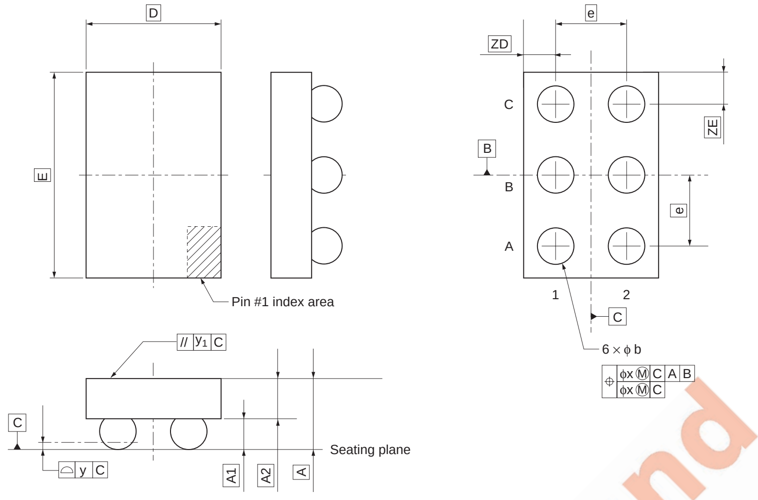
EIAJ Package Code	JEDEC Code	Mass (g)	Lead Material
—	—	0.001	—



Symbol	Dimension in Millimeters		
	Min	Typ	Max
A	——	——	0.50
A_1	0.10	——	0.15
A_2	——	——	0.35
b	0.15	0.17	0.19
D	——	0.90	——
E	——	1.40	——
e	——	0.50	——
x	——	——	0.05
y	——	——	0.05
y_1	——	——	0.20
ZD	——	0.20	——
ZE	——	0.20	——

TBS-6AV

EIAJ Package Code	JEDEC Code	Mass (g)	Lead Material
—	—	0.001	—



*Reference value.

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	0.50
A_1	0.155	—	0.185
A_2	—	—	(0.315)*
b	0.20	—	0.25
D	—	0.90	—
E	—	1.40	—
e	—	0.50	—
x	—	—	0.05
y	—	—	0.05
y_1	—	—	0.20
ZD	—	0.20	—
ZE	—	0.20	—

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