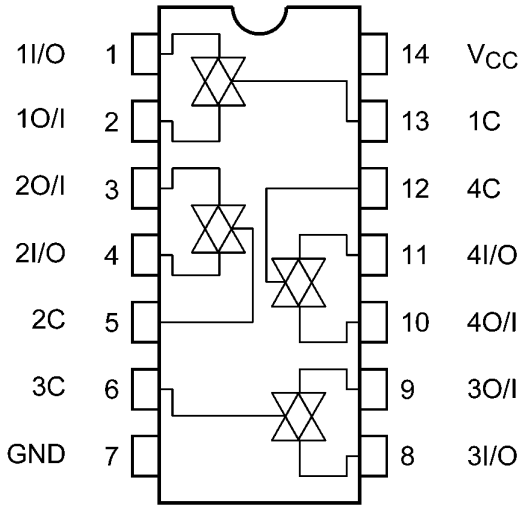
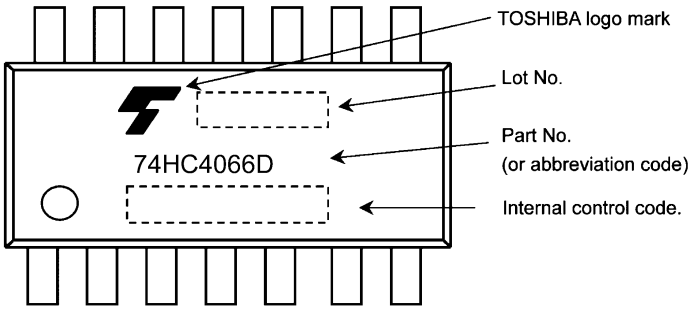
5. Pin Assignment



(top view)

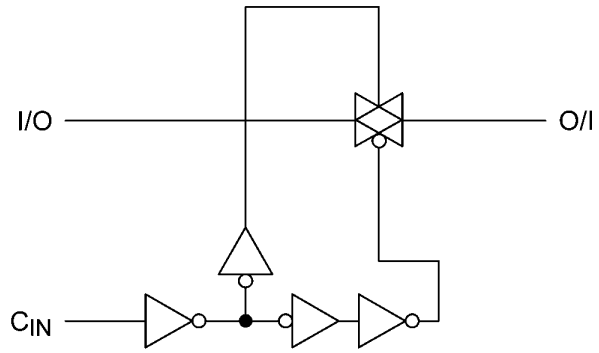
6. Marking



7. Truth Table

Control	Switch Function
H	On
L	Off

8. System Diagram (per circuit)



9. Absolute Maximum Ratings (Note)

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V_{CC}		-0.5 to 13.0	V
Input voltage	V_{IN}		-0.5 to V_{CC} + 0.5	V
Switch I/O voltage	$V_{I/O}$		-0.5 to V_{CC} + 0.5	V
Input diode current	I_{IK}		±20	mA
I/O diode current	$I_{I/OK}$		±20	mA
Switch through current	I_T		±25	mA
V_{CC}/ground current	I_{CC}		±50	mA
Power dissipation	P_D	(Note 1)	500	mW
Storage temperature	T_{stg}		-65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: P_D derates linearly with -8 mW/°C above 85 °C.

10. Operating Ranges (Note)

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V_{CC}		2.0 to 12	V
Input voltage	V_{IN}		0 to V_{CC}	V
Switch I/O voltage	$V_{I/O}$		0 to V_{CC}	V
Operating temperature	T_{opr}	(Note 1)	-40 to 125	°C
Input rise and fall times	t_r,t_f		0 to 50	μs

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused control inputs must be tied to either V_{CC} or GND.

Note 1: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

11. Electrical Characteristics

11.1. DC Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Typ.	Max	Unit
High-level input voltage	V_{IH}	—	2.0	1.50	—	—	V
			4.5	3.15	—	—	
			9.0	6.30	—	—	
			12.0	8.40	—	—	
Low-level input voltage	V_{IL}	—	2.0	—	—	0.50	V
			4.5	—	—	1.35	
			9.0	—	—	2.70	
			12.0	—	—	3.60	
ON-resistance	R_{ON}	V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} to GND $I_{I/O} \leq$ 1 mA	4.5	—	96	170	Ω
			9.0	—	55	85	
			12.0	—	45	80	
		V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} or GND $I_{I/O} \leq$ 1 mA	2.0	—	160	—	
			4.5	—	70	100	
			9.0	—	50	75	
			12.0	—	45	70	
Difference of ON-resistance between switches	ΔR_{ON}	V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} to GND $I_{I/O} \leq$ 1 mA	4.5	—	10	30	Ω
			9.0	—	5	12	
			12.0	—	5	10	
Input/Output leakage current (Switch OFF)	I_{OFF}	V_{OS} = V_{CC} or GND V_{IS} = GND to V_{CC} V_{IN} = V_{IL}	12.0	—	—	±0.1	μA
Input/Output leakage current (Switch ON, output open)	$I_{I/O}$	V_{OS} = V_{CC} or GND V_{IN} = V_{IH}	12.0	—	—	±0.1	μA
Control input leakage current	I_{IN}	V_{IN} = V_{CC} or GND	12.0	—	—	±0.1	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND	6.0	—	—	1.0	μA
			9.0	—	—	4.0	
			12.0	—	—	8.0	

11.2. DC Characteristics (Unless otherwise specified, T_a = -40 to 85 °C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
High-level input voltage	V_{IH}	—	2.0	1.50	—	V
			4.5	3.15	—	
			9.0	6.30	—	
			12.0	8.40	—	
Low-level input voltage	V_{IL}	—	2.0	—	0.50	V
			4.5	—	1.35	
			9.0	—	2.70	
			12.0	—	3.60	
ON-resistance	R_{ON}	V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} to GND $I_{I/O}$ ≤ 1 mA	4.5	—	200	Ω
			9.0	—	100	
			12.0	—	90	
		V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} or GND $I_{I/O}$ ≤ 1 mA	4.5	—	130	
			9.0	—	95	
			12.0	—	90	
Difference of ON-resistance between switches	ΔR_{ON}	V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} to GND $I_{I/O}$ ≤ 1 mA	4.5	—	35	Ω
			9.0	—	15	
			12.0	—	12	
Input/Output leakage current (Switch OFF)	I_{OFF}	V_{OS} = V_{CC} or GND V_{IS} = GND to V_{CC} V_{IN} = V_{IL}	12.0	—	±1.0	μA
Input/Output leakage current (Switch ON, output open)	$I_{I/O}$	V_{OS} = V_{CC} or GND V_{IN} = V_{IH}	12.0	—	±1.0	μA
Control input leakage current	I_{IN}	V_{IN} = V_{CC} or GND	12.0	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND	6.0	—	10.0	μA
			9.0	—	40.0	
			12.0	—	80.0	

11.3. DC Characteristics (Note) (Unless otherwise specified, T_a = -40 to 125 °C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
High-level input voltage	V_{IH}	—	2.0	1.50	—	V
			4.5	3.15	—	
			9.0	6.30	—	
			12.0	8.40	—	
Low-level input voltage	V_{IL}	—	2.0	—	0.50	V
			4.5	—	1.35	
			9.0	—	2.70	
			12.0	—	3.60	
ON-resistance	R_{ON}	V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} to GND $I_{I/O} \leq$ 1 mA	4.5	—	220	Ω
			9.0	—	110	
			12.0	—	100	
		V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} or GND $I_{I/O} \leq$ 1 mA	4.5	—	150	
			9.0	—	110	
			12.0	—	105	
Difference of ON-resistance between switches	ΔR_{ON}	V_{IN} = V_{IH} $V_{I/O}$ = V_{CC} to GND $I_{I/O} \leq$ 1 mA	4.5	—	35	Ω
			9.0	—	15	
			12.0	—	12	
Input/Output leakage current (Switch OFF)	I_{OFF}	V_{OS} = V_{CC} or GND V_{IS} = GND to V_{CC} V_{IN} = V_{IL}	12.0	—	±5.0	μA
Input/Output leakage current (Switch ON, output open)	$I_{I/O}$	V_{OS} = V_{CC} or GND V_{IN} = V_{IH}	12.0	—	±5.0	μA
Control input leakage current	I_{IN}	V_{IN} = V_{CC} or GND	12.0	—	±5.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND	6.0	—	20.0	μA
			9.0	—	80.0	
			12.0	—	160.0	

Note: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

11.4. AC Characteristics
(Unless otherwise specified, C_L = 50 pF, T_a = 25 °C, Input: $t_r = t_f$ = 6 ns)

Characteristics	Symbol	Note	Test Condition	V_{CC} (V)	Min	Typ.	Max	Unit
Phase difference between input to output	$\varphi_{I/O}$		—	2.0	—	10	50	ns
				4.5	—	4	10	
				9.0	—	3	8	
				12.0	—	3	7	
Output enable time	t_{PZL}, t_{PZH}		R_L = 1 kΩ See 12. AC Test Circuit, Figure 1	2.0	—	18	100	ns
				4.5	—	8	20	
				9.0	—	6	12	
				12.0	—	6	12	
Output disable time	t_{PLZ}, t_{PHZ}		R_L = 1 kΩ See 12. AC Test Circuit, Figure 1	2.0	—	20	115	ns
				4.5	—	10	23	
				9.0	—	8	20	
				12.0	—	8	12	
Control input capacitance	C_{IN}		—	5.0	—	3	10	pF
Switch terminal capacitance	C_{OS}		See 12. AC Test Circuit, Figure 2	5.0	—	6	20	pF
Feedthrough capacitance	C_{IOS}		See 12. AC Test Circuit, Figure 2	5.0	—	0.5	2	pF
Power dissipation capacitance	C_{PD}	(Note 1)	See 12. AC Test Circuit, Figure 2	5.0	—	5	—	pF

Note 1: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation.

$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$ (per bit)

11.5. AC Characteristics
(Unless otherwise specified, C_L = 50 pF, T_a = -40 to 85 °C, Input: $t_r = t_f$ = 6 ns)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Phase difference between input to output	$\varphi_{I/O}$	—	2.0	—	65	ns
			4.5	—	13	
			9.0	—	10	
			12.0	—	9	
Output enable time	t_{PZL},t_{PZH}	R_L = 1 kΩ See 12. AC Test Circuit, Figure 1	2.0	—	125	ns
			4.5	—	25	
			9.0	—	22	
			12.0	—	18	
Output disable time	t_{PLZ},t_{PHZ}	R_L = 1 kΩ See 12. AC Test Circuit, Figure 1	2.0	—	145	ns
			4.5	—	29	
			9.0	—	25	
			12.0	—	22	
Control input capacitance	C_{IN}	—	5.0	—	10	pF
Switch terminal capacitance	C_{OS}	See 12. AC Test Circuit, Figure 2	5.0	—	20	pF
Feedthrough capacitance	C_{IOS}	See 12. AC Test Circuit, Figure 2	5.0	—	2	pF

11.6. AC Characteristics (Note)
(Unless otherwise specified, C_L = 50 pF, T_a = -40 to 125 °C, Input: $t_r = t_f$ = 6 ns)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Phase difference between input to output	$\varphi_{I/O}$	—	2.0	—	75	ns
			4.5	—	15	
			9.0	—	12	
			12.0	—	11	
Output enable time	t_{PZL},t_{PZH}	R_L = 1 kΩ See 12. AC Test Circuit, Figure 1	2.0	—	145	ns
			4.5	—	29	
			9.0	—	29	
			12.0	—	22	
Output disable time	t_{PLZ},t_{PHZ}	R_L = 1 kΩ See 12. AC Test Circuit, Figure 1	2.0	—	165	ns
			4.5	—	33	
			9.0	—	29	
			12.0	—	29	
Control input capacitance	C_{IN}	—	5.0	—	10	pF
Switch terminal capacitance	C_{OS}	See 12. AC Test Circuit, Figure 2	5.0	—	20	pF
Feedthrough capacitance	C_{IOS}	See 12. AC Test Circuit, Figure 2	5.0	—	2	pF

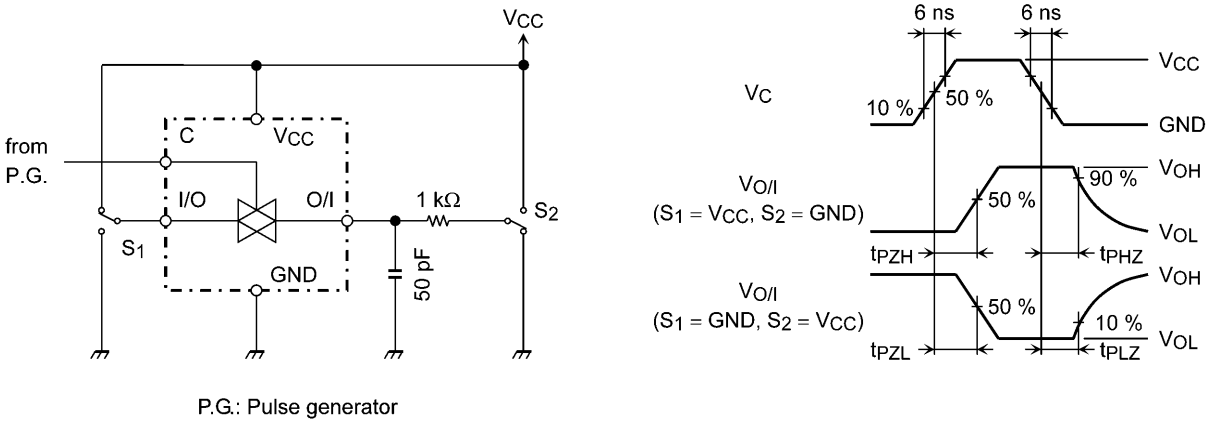
Note: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

11.7. Analog Switch Characteristics (T_a = 25 °C) (Note)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Typ.	Unit
Sine Wave Distortion	THD	R_L = 10 kΩ, C_L = 50 pF, f_{IN} = 1 kHz	V_{IN} = 4.5 V_{p-p}	4.5	0.05	%
			V_{IN} = 9.0 V_{p-p}	9.0	0.04	
Maximum frequency response (switch ON)	$f_{MAX(I/O)}$	V_{IN} is centered at (V_{CC}/2). Adjust input for 0dBm. Increase f_{IN} frequency until dB meter reads -3dB. R_L = 50 Ω, C_L = 10 pF, f_{IN} = 1 MHz, sine wave See 12. AC Test Circuit, Figure 3		4.5	200	MHz
				9.0	200	
Feed through attenuation (switch OFF)	FTH	V_{IN} is centered at (V_{CC}/2). Adjust input for 0dBm. R_L = 600 Ω, C_L = 50 pF, f_{IN} = 1 MHz, sine wave See 12. AC Test Circuit, Figure 4		4.5	-60	dB
				9.0	-60	
Crosstalk (control input to signal output)	X_{talk}	R_L = 600 Ω, C_L = 50 pF, f_{IN} = 1 MHz, square wave ($t_r = t_f$ = 6 ns) See 12. AC Test Circuit, Figure 5		4.5	60	mV
				9.0	100	
Crosstalk (between any switches)	X_{talk}	V_{IN} is centered at (V_{CC}/2). Adjust input for 0dBm. R_L = 600 Ω, C_L = 50 pF, f_{IN} = 1 MHz, sine wave See 12. AC Test Circuit, Figure 6		4.5	-60	dB
				9.0	-60	

Note: These characteristics are determined by design of devices.

12. AC Test Circuit



P.G.: Pulse generator

Figure 1 t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}

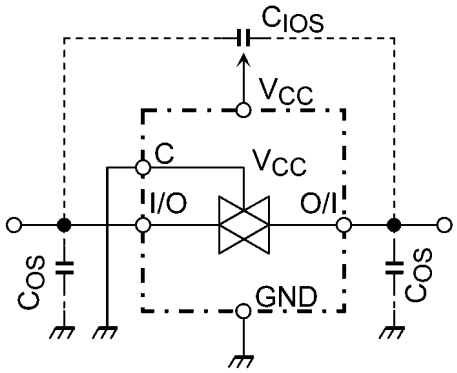


Figure 2 C_{IOS}, C_{OS}

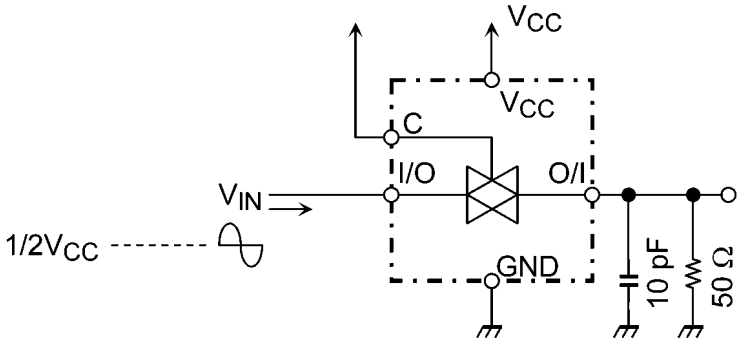


Figure 3 Frequency Response (switch on)

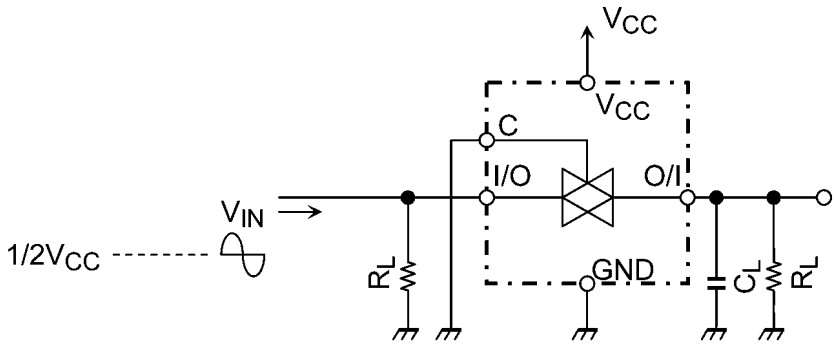


Figure 4 Feedthrough

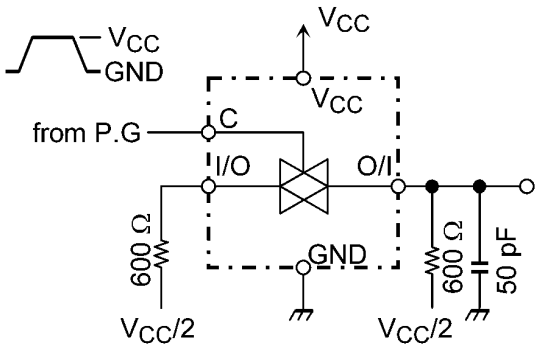


Figure 5 Cross Talk (control input to output signal)

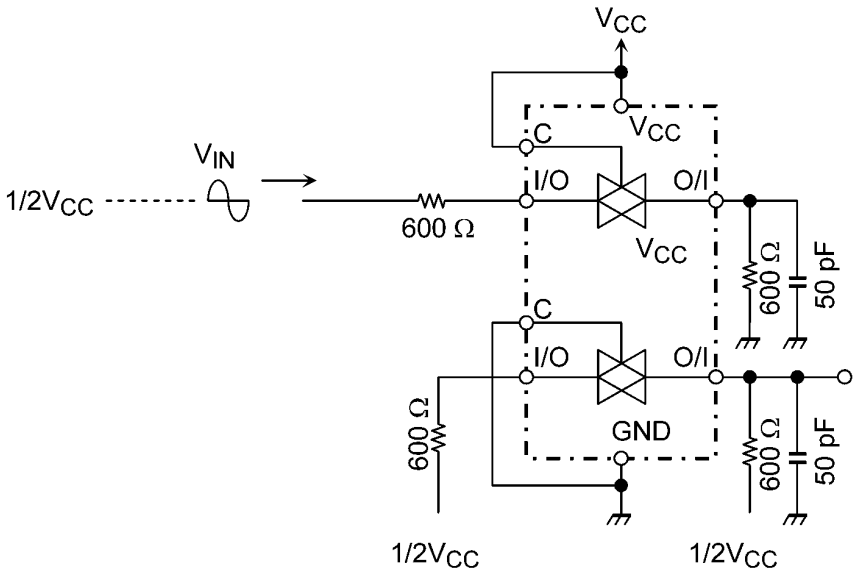
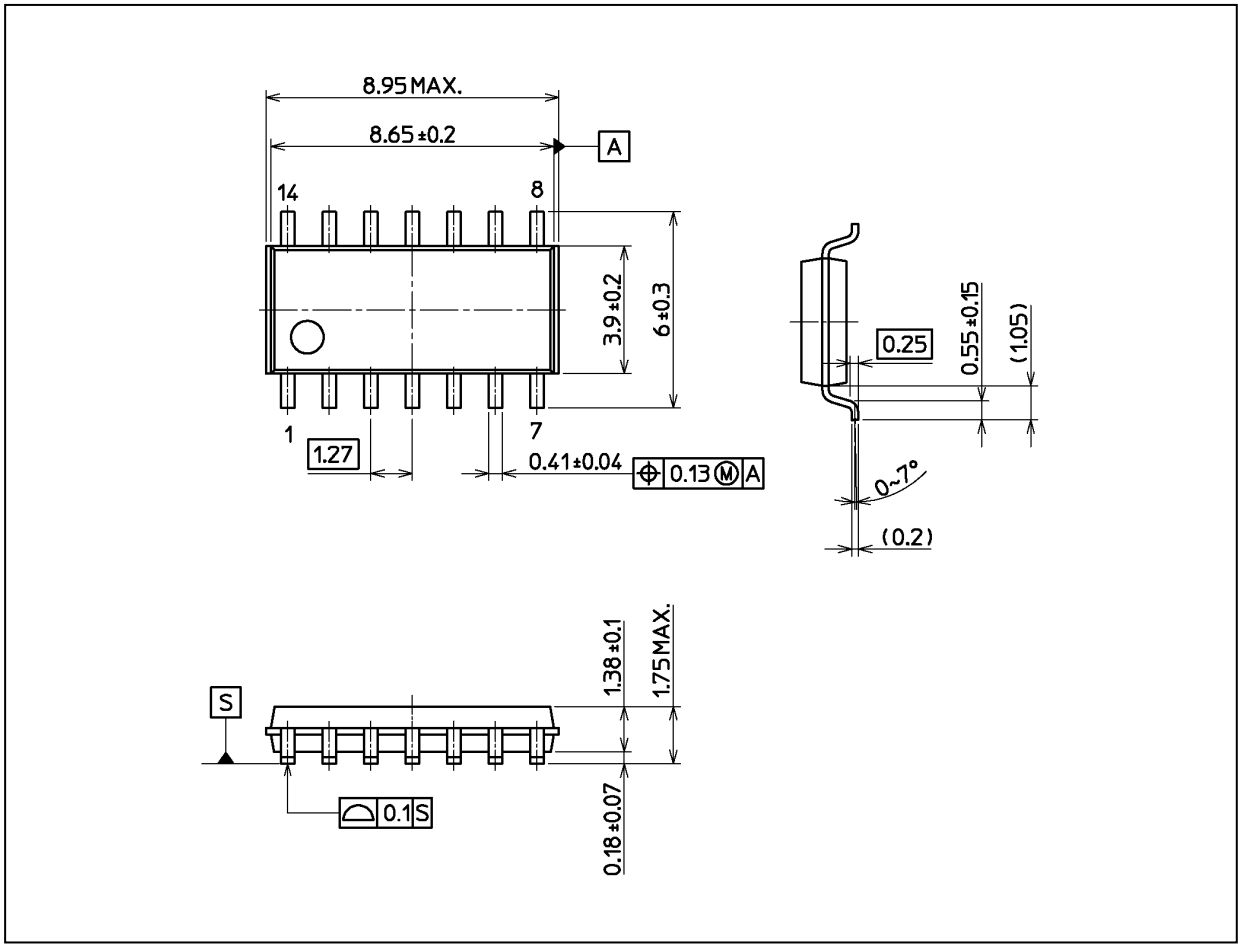


Figure 6 Cross Talk (between any two switches)

Package Dimensions

Unit: mm



Weight: 0.13 g (typ.)

Package Name(s)
Nickname: SOIC14

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