

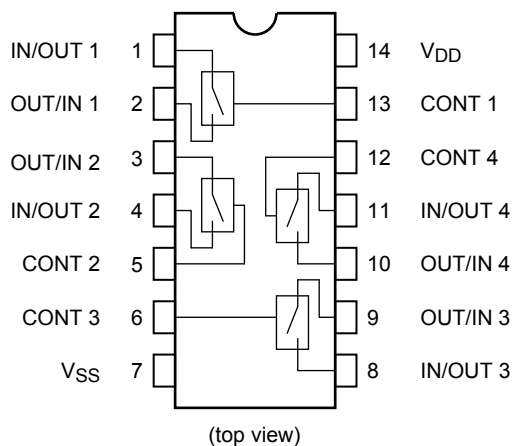
TC4066BP, TC4066BF, TC4066BFN, TC4066BFT

TC4066B Quad Bilateral Switch

TC4066B contains four independent circuits of bidirectional switches. When control input CONT is set to "H" level, the impedance between input and output of the switch becomes low and when it is set to "L" level, the impedance becomes high. This can be applied for switching of analog signals and digital signals.

- ON-resistance, R_{on}
 250Ω (typ.): $V_{DD} - V_{SS} = 5 V$
 110Ω (typ.): $V_{DD} - V_{SS} = 10 V$
 70Ω (typ.): $V_{DD} - V_{SS} = 15 V$
- OFF-resistance, R_{off}
 R_{off} (typ.) $> 10^9 \Omega$

Pin Assignment



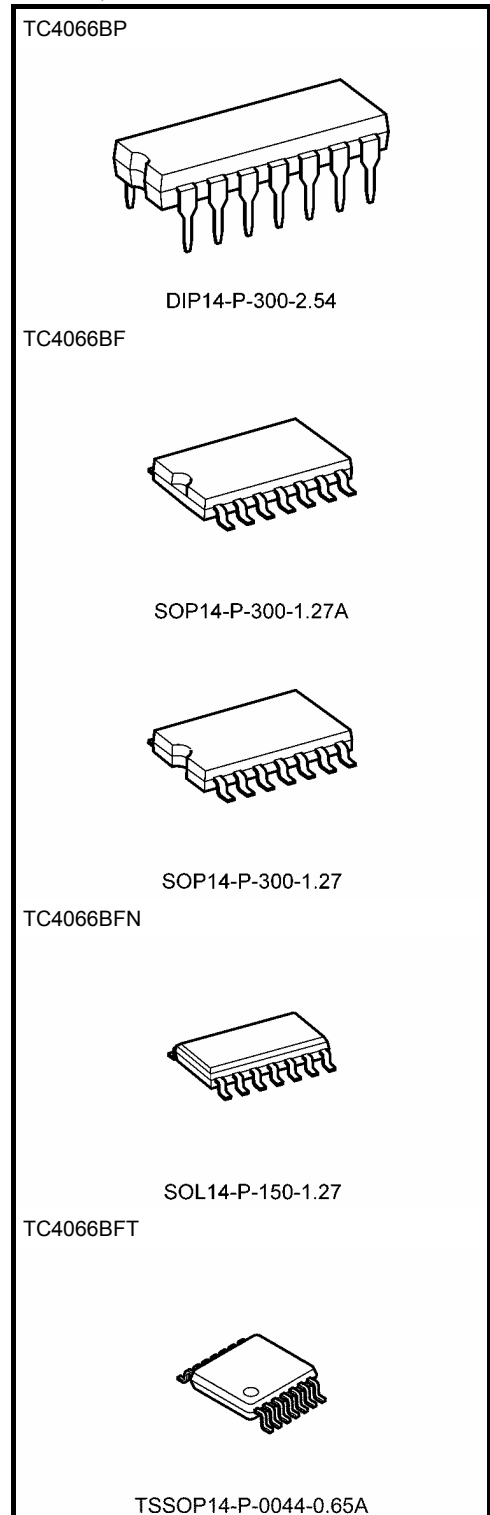
Truth Table

Control	Impedance between IN/OUT-OUT/IN (Note)
H	$0.5 \text{ to } 5 \times 10^2 \Omega$
L	$> 10^9 \Omega$

Note: See static electrical characteristics

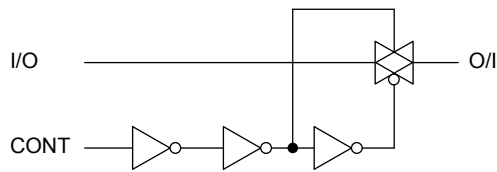
Weight	
DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOP14-P-300-1.27	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)
TSSOP14-P-0044-0.65A	: 0.06 g (typ.)

Note: xxxFN (JEDEC SOP) is not available in Japan.



Logic Diagram

1/4 TC4066B



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
DC supply voltage	V_{DD}	$V_{SS} - 0.5$ to $V_{SS} + 20$	V
Control input voltage	V_{CIN}	$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
Switch I/O voltage	$V_{I/O}$	$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
Potential difference across I/O during ON	$I_{I/O}$	± 0.5	V
Control input current	I_{CIN}	± 10	mA
Power dissipation	P_D	300 (DIP)/180 (SOIC)	mW
Operating temperature range	T_{opr}	-40 to 85	$^{\circ}\text{C}$
Storage temperature range	T_{stg}	-65 to 150	$^{\circ}\text{C}$

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Operating Range ($V_{SS} = 0\text{ V}$) (Note)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
DC supply voltage	V_{DD}	—	3	—	18	V
Input voltage	V_{DD}/V_{OUT}	—	0	—	V_{DD}	V

Note: The Operating Range are required to ensure the normal operation of the device. Unused inputs must be tied to either V_{DD} or V_{SS} .

Static Electrical Characteristics (in case not specifically appointed, $V_{SS} = 0\text{ V}$)

Characteristics	Symbol	Test Condition	V_{DD} (V)	-40°C		25°C			85°C		Unit
				Min	Max	Min	Typ.	Max	Min	Max	
Control input high voltage	V_{IH}	$ I_{IS} < 10\ \mu\text{A}$	5	3.5	—	3.5	2.75	—	3.5	—	V
			10	7.0	—	7.0	5.50	—	7.0	—	
			15	11.0	—	11.0	8.25	—	11.0	—	
Control input low voltage	V_{IL}	$ I_{IS} < 10\ \mu\text{A}$	5	—	1.5	—	2.25	1.5	—	1.5	V
			10	—	3.0	—	4.50	3.0	—	3.0	
			15	—	4.0	—	6.75	4.0	—	4.0	
On-state resistance	R_{ON}	$0 \leq V_{IS} \leq V_{DD}$ $R_L = 10\ \text{k}\Omega$	5	—	800	—	290	950	—	1200	Ω
			10	—	210	—	120	250	—	300	
			15	—	140	—	85	160	—	200	
Δ On-state resistance (between any 2 switches)	$R_{ON\Delta}$	—	5	—	—	—	10	—	—	—	Ω
			10	—	—	—	6	—	—	—	
			15	—	—	—	4	—	—	—	
Input/output leakage current	I_{OFF}	$V_{IN} = 18\ \text{V},$ $V_{OUT} = 0\ \text{V}$ $V_{IN} = 0\ \text{V},$ $V_{OUT} = 18\ \text{V}$	18	—	± 100	—	± 0.1	± 100	—	± 1000	nA
			18	—	± 100	—	± 0.1	± 100	—	± 1000	
Quiescent supply current	I_{DD}	$V_{IN} = V_{SS}, V_{DD}$ (Note)	5	—	0.25	—	0.001	0.25	—	7.5	μA
			10	—	0.50	—	0.001	0.50	—	15.0	
			15	—	1.00	—	0.002	1.00	—	30.0	
Input current	"H" level	I_{IH}	$V_{IH} = 18\ \text{V}$	18	—	0.1	—	10^{-5}	0.1	—	μA
	"L" level	I_{IL}	$V_{IL} = 0\ \text{V}$	18	—	-0.1	—	-10^{-5}	-0.1	—	

Note: All valid input combinations.

Dynamic Electrical Characteristics (Ta = 25°C, VSS = 0 V, CL = 50 pF)

Characteristics	Symbol	Test Condition	Test Condition		Min	Typ.	Max	Unit	
			VSS (V)	VDD (V)					
Phase difference between input to output	ϕ_{I-O}	$C_L = 50 \text{ pF}$	0	5	—	15	40	ns	
			0	10	—	8	20		
			0	15	—	5	15		
Propagation delay time (control-OUT)	t_{pZL}	$R_L = 1 \text{ k}\Omega$	0	5	—	55	120	ns	
		$C_L = 50 \text{ pF}$	0	10	—	25	40		
	t_{pZH}	0	15	—	20	30			
Propagation delay time (control -OUT)	t_{pLZ}	$R_L = 1 \text{ k}\Omega$	0	5	—	45	80	ns	
		$C_L = 50 \text{ pF}$	0	10	—	30	70		
	t_{pHZ}	0	15	—	25	60			
Max control input repetition rate	$f_{\text{max}} \text{ (C)}$	$R_L = 1 \text{ k}\Omega$	0	5	—	10	—	MHz	
		$C_L = 50 \text{ pF}$	0	10	—	12	—		
			0	15	—	12	—		
-3dB cutoff frequency	$f_{\text{max}} \text{ (I-O)}$	$R_L = 1 \text{ k}\Omega$ $C_L = 15 \text{ pF}$	(Note 1)	-5	5	—	30	—	MHz
Total harmonic distortion	—	$R_L = 10 \text{ k}\Omega$ $f = 1 \text{ kHz}$	(Note 2)	-5	5	—	0.03	—	%
-50dB feed through frequency	—	$R_L = 1 \text{ k}\Omega$	(Note 3)	-5	5	—	600	—	kHz
-50dB crosstalk frequency	—	$R_L = 1 \text{ k}\Omega$	(Note 4)	-5	5	—	1	—	MHz
Crosstalk (control-OUT)	—	$R_{IN} = 1 \text{ k}\Omega$		0	5	—	200	—	mV
		$R_{OUT} = 10 \text{ k}\Omega$		0	10	—	400	—	
		$C_L = 15 \text{ pF}$		0	15	—	600	—	
Input capacitance	C_{IN}	Control input		—	5	7.5	pF		
		Switch I/O		—	10	—			
Feed through capacitance	C_{IN-OUT}	—		—	0.5	—	pF		

Note 1: Sine wave of $\pm 2.5 \text{ p-p}$ shall be used for V_{IS} and the frequency of $20 \log_{10} \frac{V_{OS}}{V_{IS}} = -3\text{dB}$ shall be f_{max} .

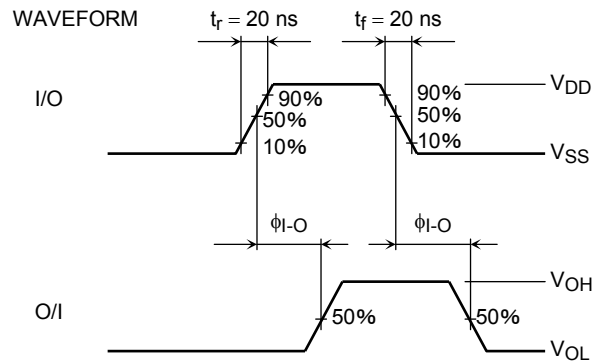
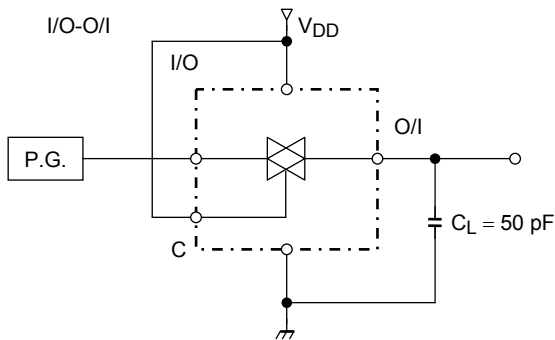
Note 2: V_{IS} shall be sine wave of $\pm 2.5 \text{ V}_{p-p}$

Note 3: Sine wave of $\pm 2.5 \text{ V}_{p-p}$ shall be used for V_{IS} and the frequency of $20 \log_{10} \frac{V_{OUT}}{V_{IS}} = -50\text{dB}$ shall be feed-through.

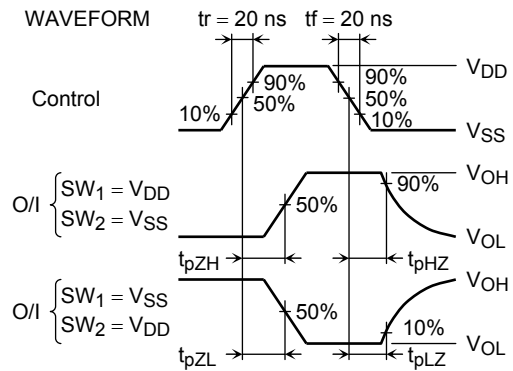
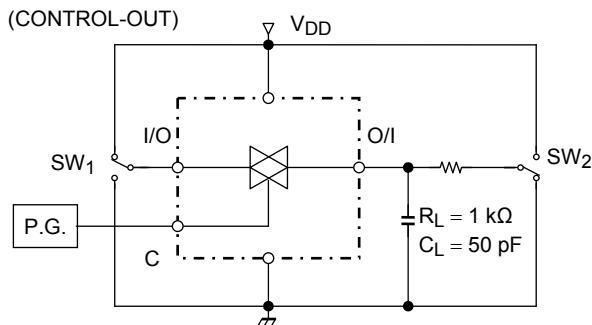
Note 4: Sine wave of $\pm 2.5 \text{ V}_{p-p}$ shall be used for V_{IS} and the frequency of $20 \log_{10} \frac{V_{OUT}}{V_{IS}} = -50\text{dB}$ shall be crosstalk.

Circuit for Measurement of Electrical Characteristics

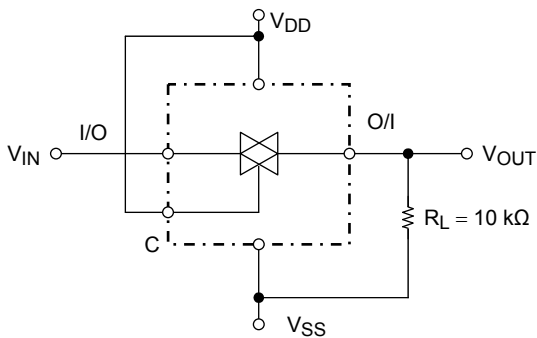
1. ϕ_{I-O}



2. t_{pZH} , t_{pHL} , t_{pLZ} , t_{pHZ}

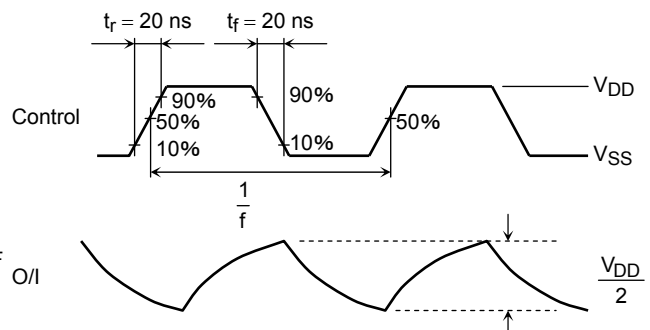
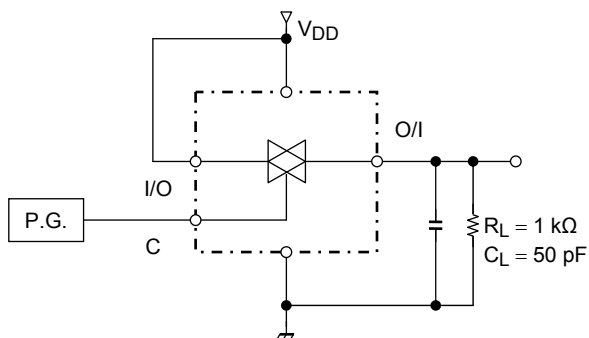


3. RON

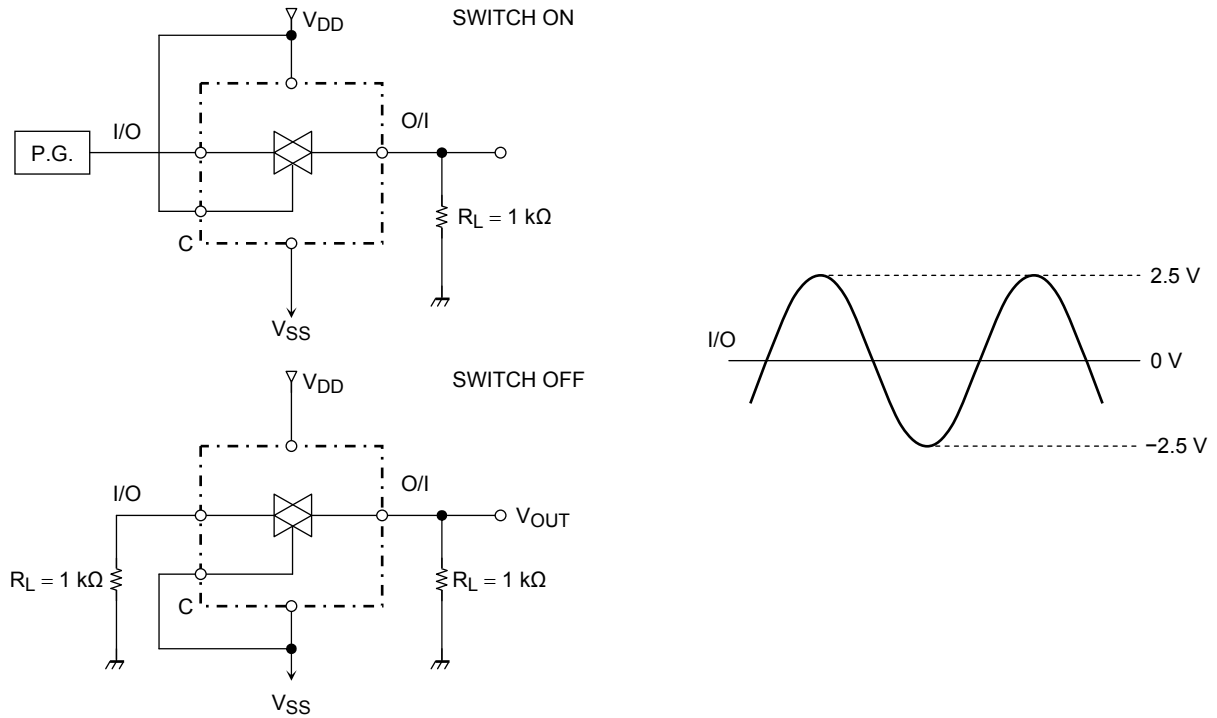


$$R_{ON} = 10 \times \frac{(V_{IN} - V_{OUT})}{V_{OUT}} [k\Omega]$$

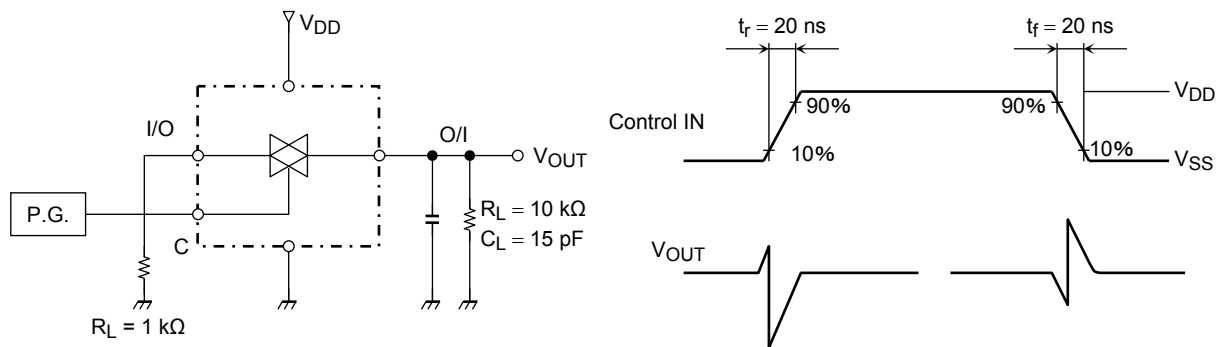
4. $f_{max}(C)$



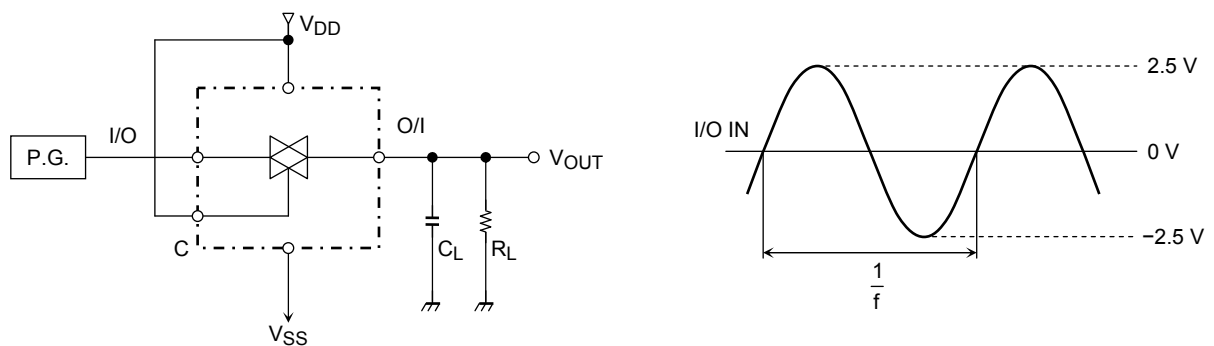
5. Crosstalk between Any Two Switches



6. Crosstalk, Control to Input



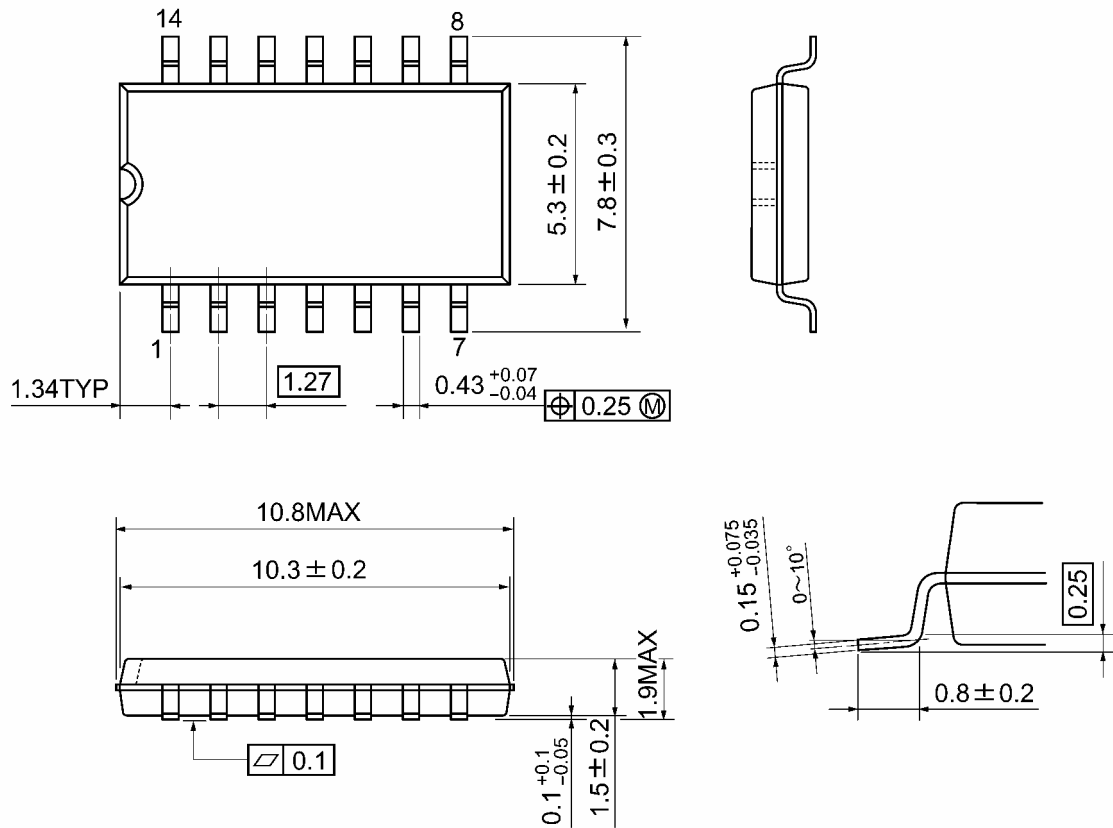
7. Total Harmonic Distortion, f_{max} (I-O), Feedthrough



Package Dimensions

SOP14-P-300-1.27A

Unit: mm

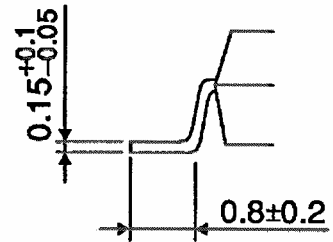
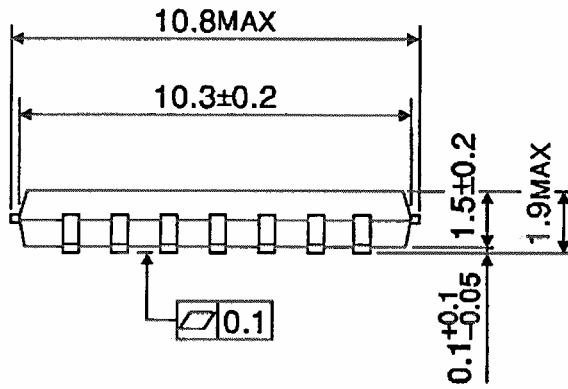
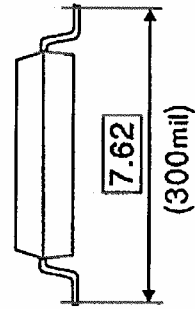
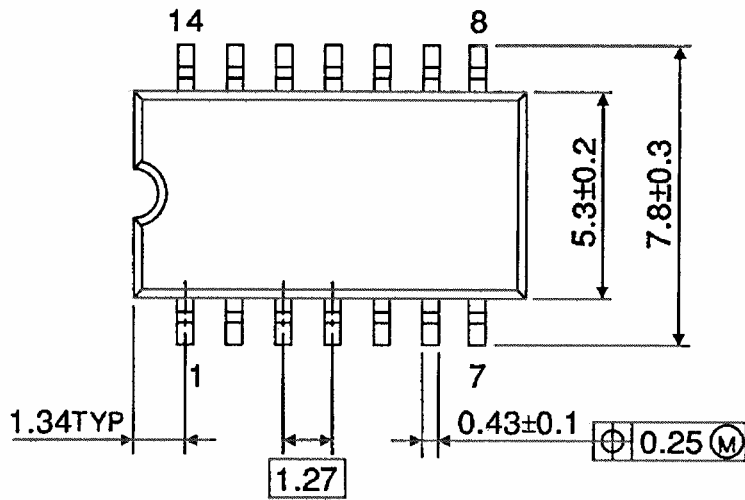


Weight: 0.18 g (typ.)

Package Dimensions

SOP14-P-300-1.27

Unit : mm

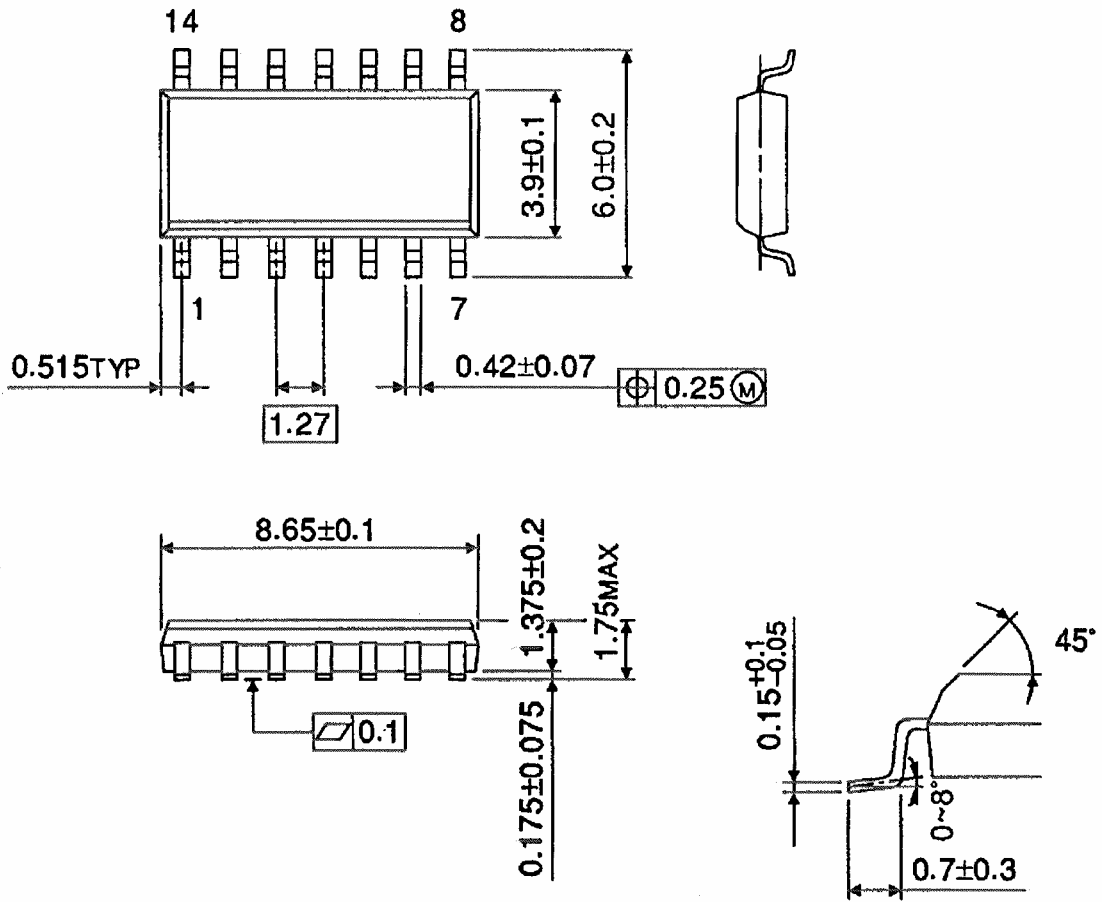


Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



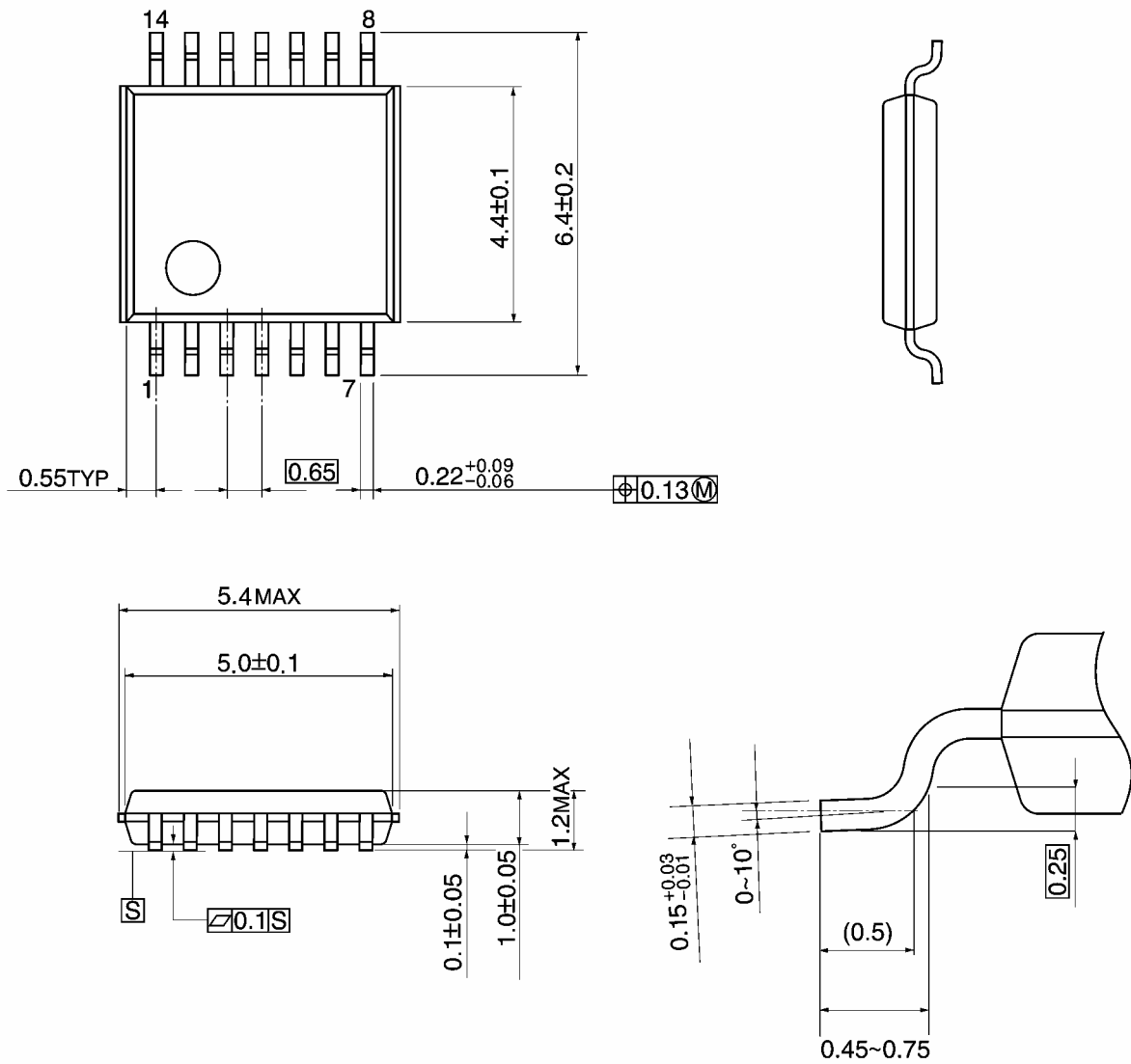
Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A

Unit: mm



Weight: 0.06 g (typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN

- The information contained herein is subject to change without notice.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patents or other rights of TOSHIBA or the third parties.
- Please contact your sales representative for product-by-product details in this document regarding RoHS compatibility. Please use these products in this document in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances. Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations.