

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

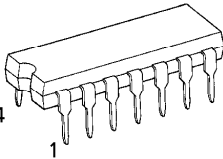
TC4066BP, TC4066BF, TC4066BFN, TC4066BFT

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.

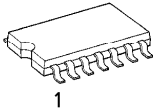
- ON-resistance, Ron
250Ω (TYP.) $V_{DD} - V_{SS} = 5V$
110Ω (TYP.) $V_{DD} - V_{SS} = 10V$
70Ω (TYP.) $V_{DD} - V_{SS} = 15V$
- OFF-resistance, Roff
Roff (TYP.) > 10⁹Ω

(Note) The JEDEC SOP (FN) is not available in Japan.



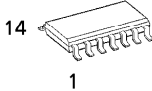
14
1

P (DIP14-P-300-2.54)
Weight : 0.96g (Typ.)



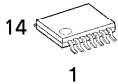
14
1

F (SOP14-P-300-1.27)
Weight : 0.18g (Typ.)



14
1

FN (SOL14-P-150-1.27)
Weight : 0.12g (Typ.)



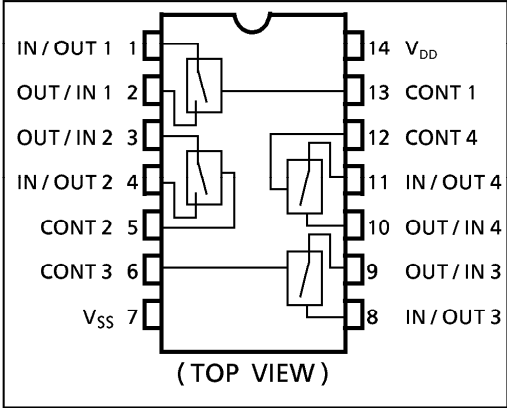
14
1

FT (TSSOP14-P-0044-0.65)
Weight : 0.06g (Typ.)

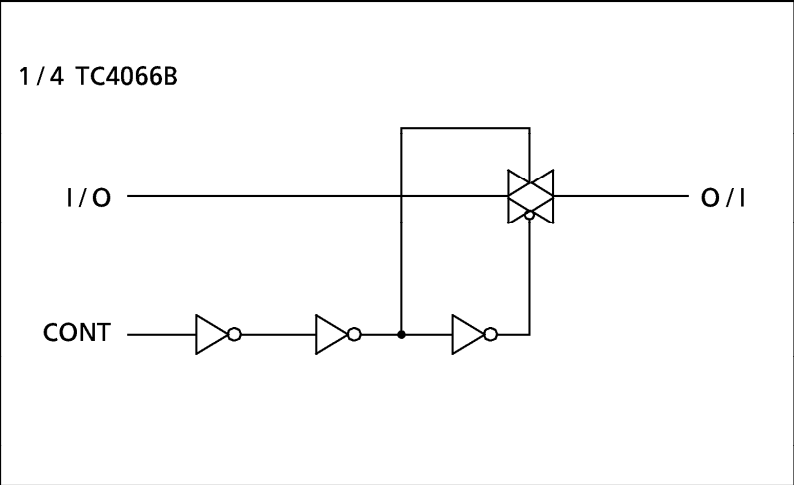
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Control Input Voltage	V_{CIN}	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Switch I/O Voltage	$V_{I/O}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	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}	- 40~85	°C
Storage Temperature Range	T_{stg}	- 65~150	°C

PIN ASSIGNMENT



LOGIC DIAGRAM



TRUTH TABLE

CONTROL	Impedance Between IN / OUT - OUT / IN *
H	$0.5 \sim 5 \times 10^2 \Omega$
L	$> 10^9 \Omega$

* See Static Electrical Characteristics

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● TOSHIBA is continually working to improve the quality and the 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 observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product 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 products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

RECOMMENDED OPERATING CONDITIONS ($V_{SS} = 0V$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V_{DD}		3	—	18	V
Input Voltage	V_{DD}/V_{OUT}		0	—	V_{DD}	

STATIC ELECTRICAL CHARACTERISTICS (In case not specifically appointed, $V_{SS} = 0V$)

CHARACTERISTIC	SYM-BOL	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 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 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}	$0 \leq V_{IS} \leq V_{DD}$ $R_L = 10k\Omega$	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}	$V_{IN} = 18V, V_{OUT} = 0V$ $V_{IN} = 0V, V_{OUT} = 18V$	18	—	± 100	—	± 0.1	± 100	—	± 1000	nA
			18	—	± 100	—	± 0.1	± 100	—	± 1000	
Quiescent Supply Current	I_{DD}	$V_{IN} = V_{SS}, V_{DD} *$	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}	$V_{IH} = 18V$	18	—	0.1	—	10^{-5}	0.1	—	μA
	"L" Level	I_{IL}	$V_{IL} = 0V$	18	—	-0.1	—	-10^{-5}	-0.1	—	

* All valid input combinations.

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- The information contained herein is subject to change without notice.

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, CL = 50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION			MIN.	TYP.	MAX.	UNIT
			V _{SS} (V)	V _{DD} (V)				
Phase Difference between Input to Output	ϕ I - O	C _L = 50pF	0	5	—	15	40	ns
			0	10	—	8	20	
			0	15	—	5	15	
Propagation Delay Time (CONTROL - OUT)	t _{pZL} t _{pZH}	R _L = 1kΩ C _L = 50pF	0	5	—	55	120	
			0	10	—	25	40	
			0	15	—	20	30	
Propagation Delay Time (CONTROL - OUT)	t _{pLZ} t _{pHZ}	R _L = 1kΩ C _L = 50pF	0	5	—	45	80	
			0	10	—	30	70	
			0	15	—	25	60	
Max. Control Input Repetition Rate	f _{MAX} (C)	R _L = 1kΩ C _L = 50pF	0	5	—	10	—	MHz
			0	10	—	12	—	
			0	15	—	12	—	
– 3dB Cutoff Frequency	f _{MAX} (I - O)	R _L = 1kΩ C _L = 15pF (* 1)	– 5	5	—	30	—	
Total Harmonic Distortion	—	R _L = 10kΩ f = 1kHz (* 2)	– 5	5	—	0.03	—	%
– 50dB Feed through Frequency	—	R _L = 1kΩ (* 3)	– 5	5	—	600	—	kHz
– 50dB Crosstalk Frequency	—	R _L = 1kΩ (* 4)	– 5	5	—	1	—	MHz
Crosstalk (CONTROL - OUT)	—	R _{IN} = 1kΩ R _{OUT} = 10kΩ C _L = 15pF	0	5	—	200	—	mV
			0	10	—	400	—	
			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	—	

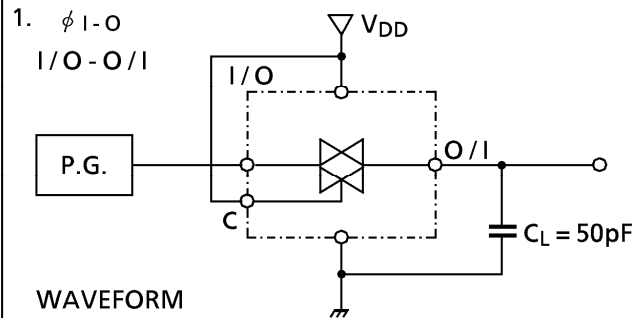
* 1 Sine wave of $\pm 2.5V_{p-p}$ shall be used for V_{is} and the frequency $20 \log_{10} \frac{V_{os}}{V_{is}} = -3dB$ Shall be f_{MAX}.

* 2 V_{is} shall be sine wave of $\pm 2.5V_{p-p}$

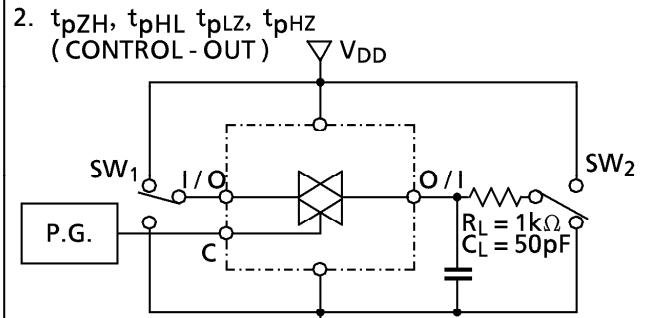
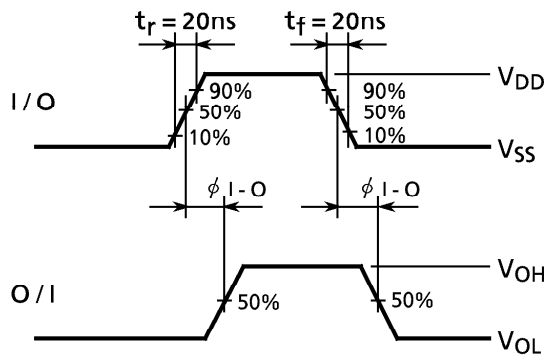
* 3 Sine wave of $\pm 2.5V_{p-p}$ shall be used for V_{is} and the frequency of $20 \log_{10} \frac{V_{OUT}}{V_{is}} = -50dB$ shall be feed-through.

* 4 Sine wave of $\pm 2.5V_{p-p}$ shall be used for V_{is} and the frequency of $20 \log_{10} \frac{V_{OUT}}{V_{is}} = -50dB$ shall be crosstalk.

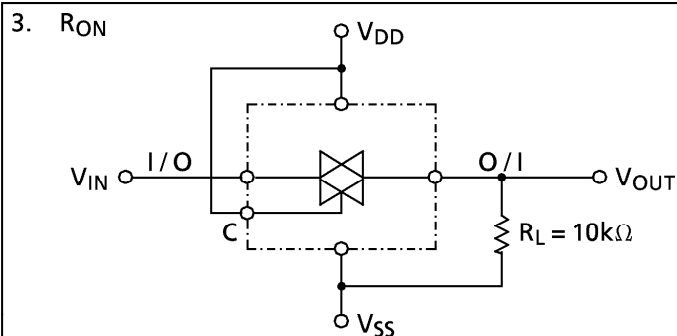
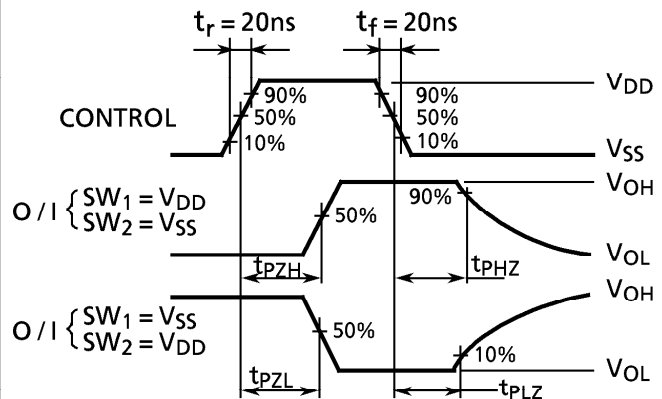
CIRCUIT FOR MEASUREMENT OF ELECTRICAL CHARACTERISTICS



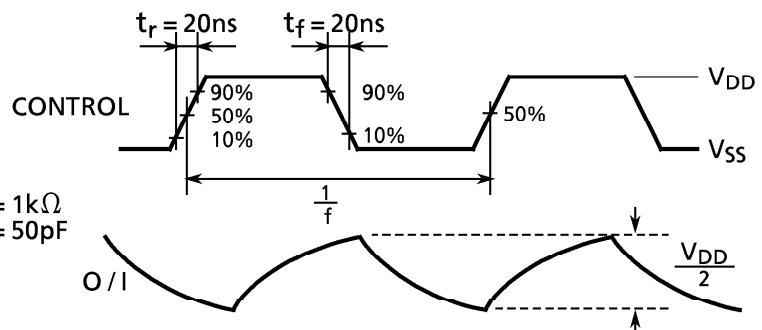
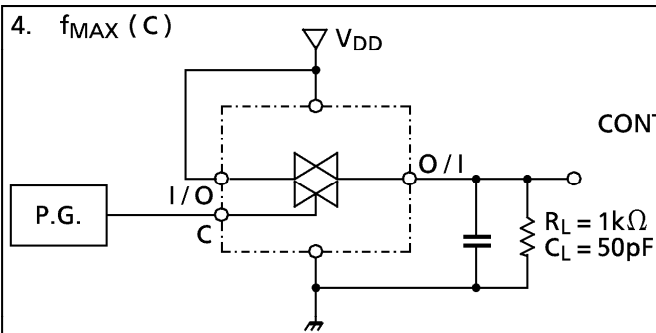
WAVEFORM



WAVEFORM

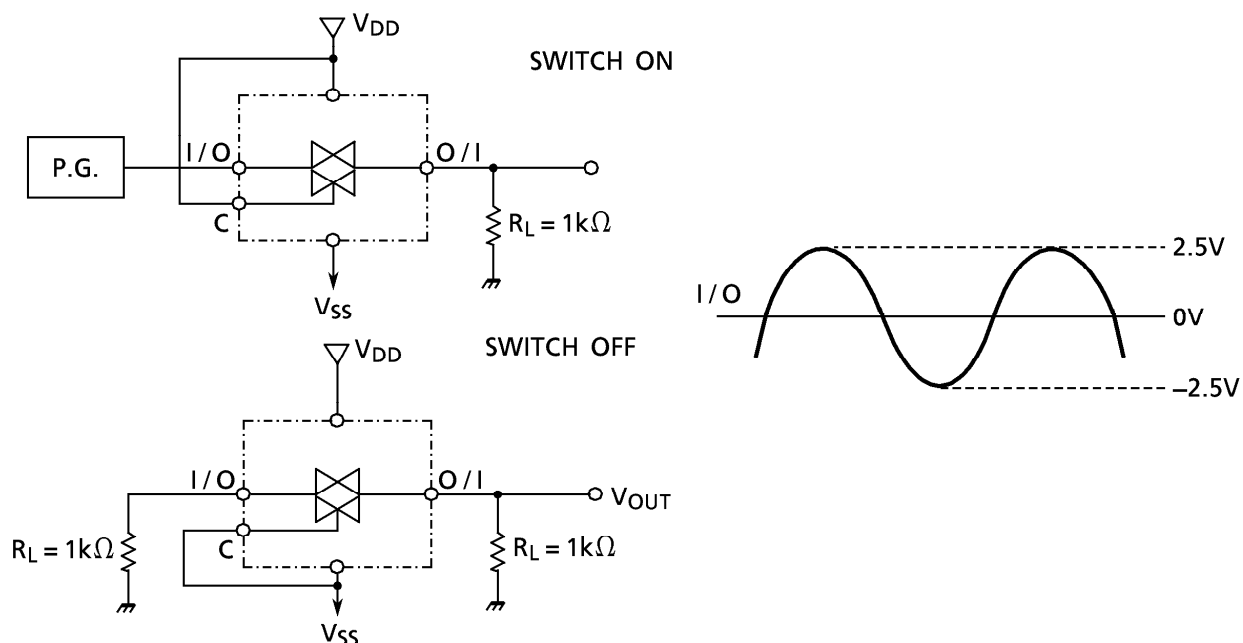


$$R_{ON} = 10 \times \frac{(V_{IN} - V_{OUT})}{V_{OUT}} [k\Omega]$$

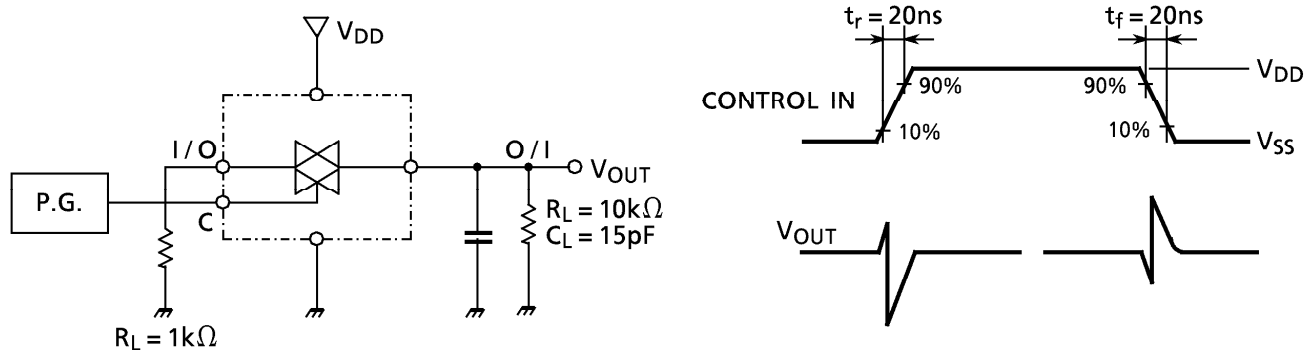
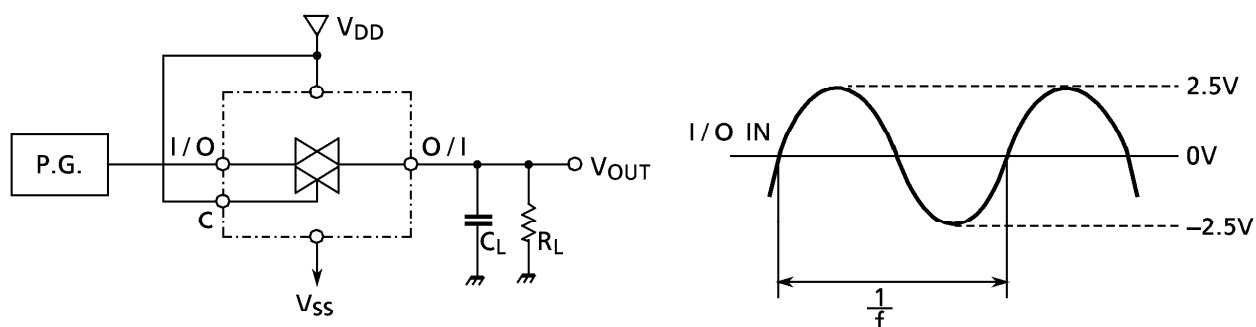


CIRCUIT FOR MEASUREMENT OF ELECTRICAL CHARACTERISTICS

5. CROSSTALK BETWEEN ANY TWO SWITCHES

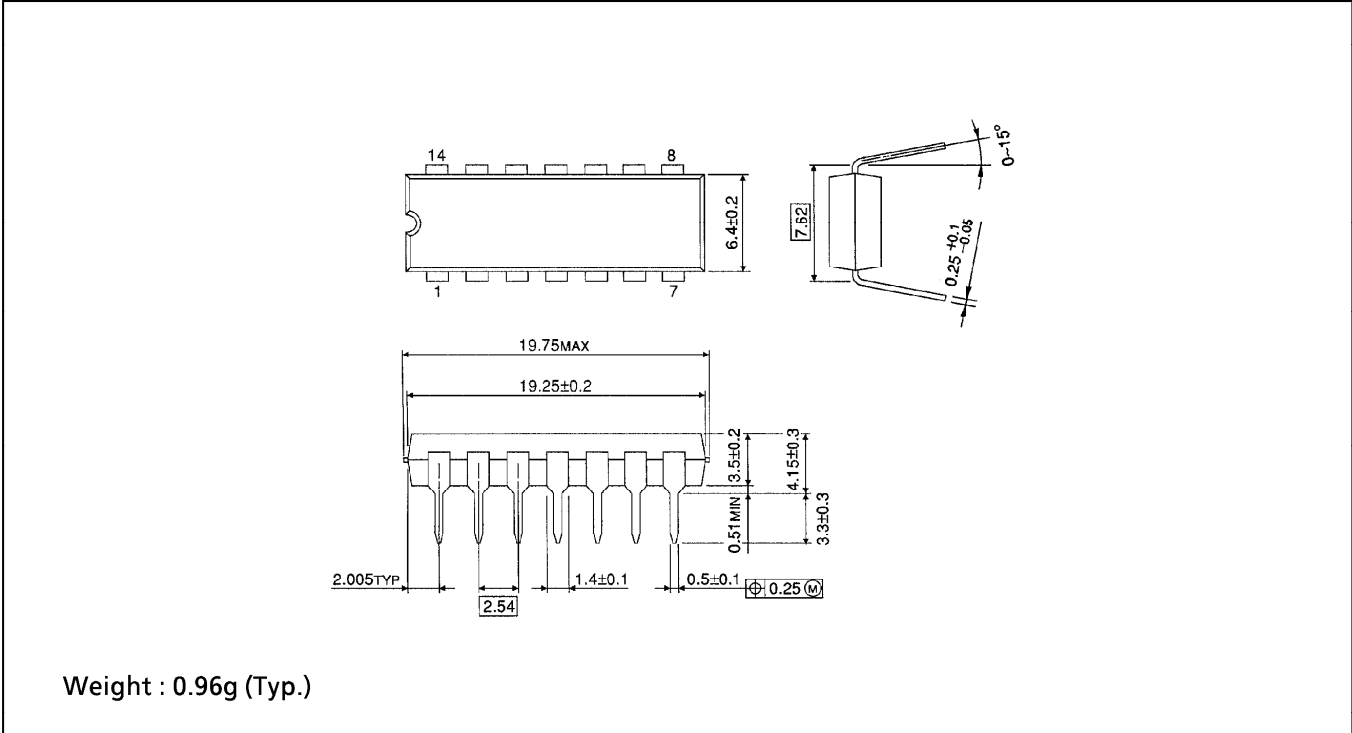


6. CROSSTALK, CONTROL TO INPUT

7. TOTAL HARMONIC DISTORTION, f_{MAX} (I - O), FEEDTHROUGH

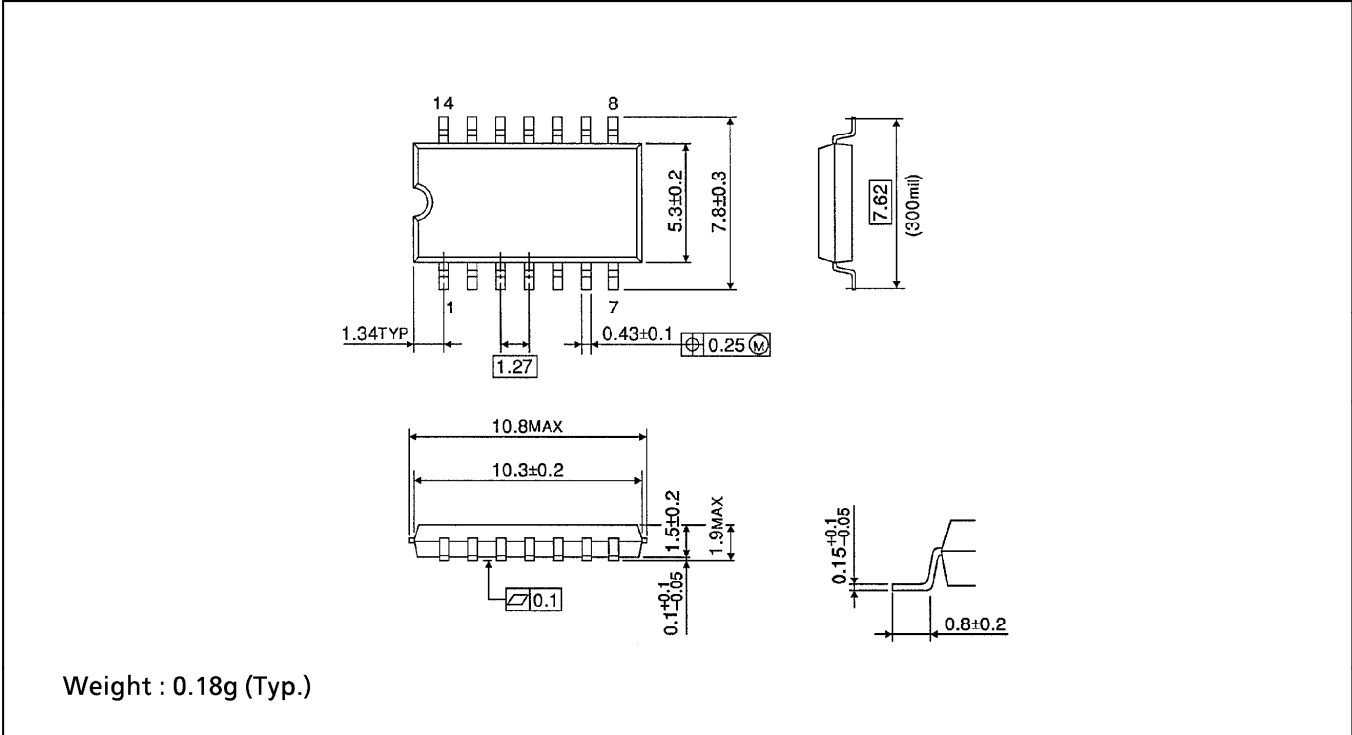
DIP 14PIN OUTLINE DRAWING (DIP14-P-300-2.54)

Unit in mm



SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27)

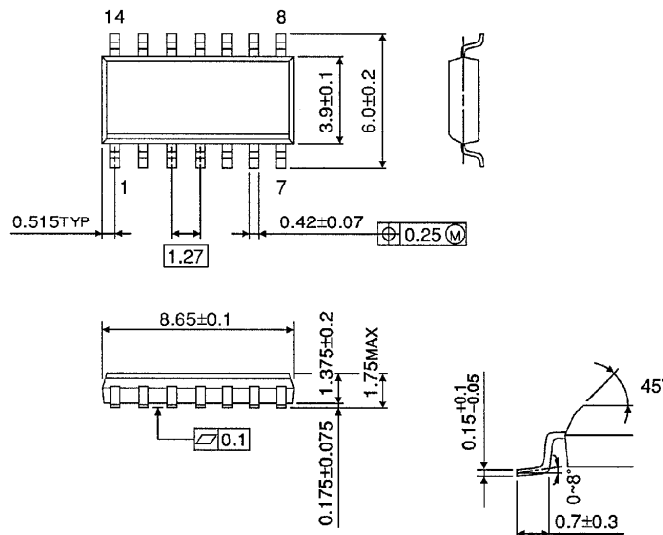
Unit in mm



SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOL14-P-150-1.27)

Unit in mm

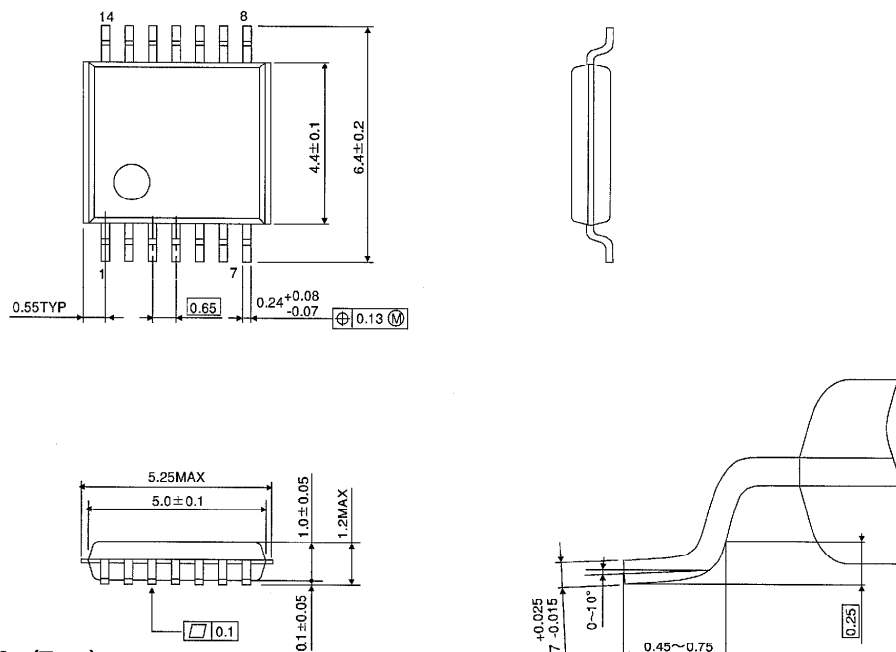
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

TSSOP 14PIN (170mil BODY) OUTLINE DRAWING (TSSOP14-P-0044-0.65)

Unit in mm



Weight : 0.06g (Typ.)