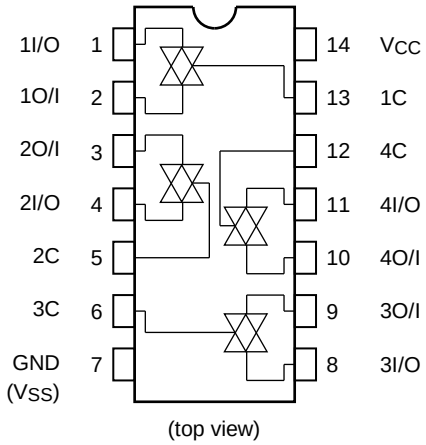
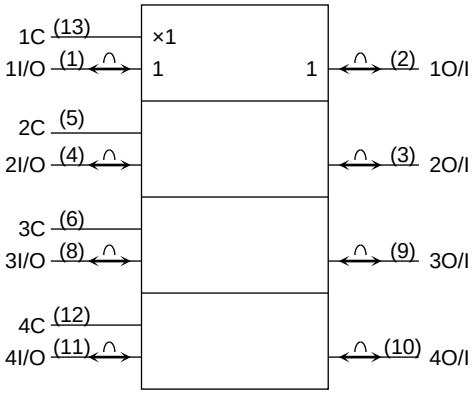
Pin Assignment



(top view)

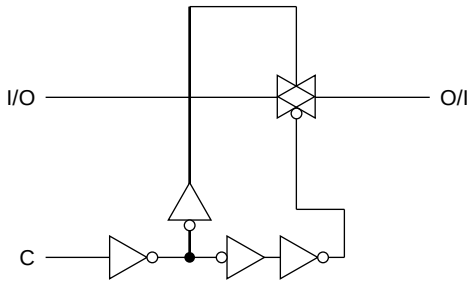
IEC Logic Symbol



Truth Table

Control	Switch Function
H	On
L	Off

System diagram (Per Circuit)



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 13	V
Control 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
Control input diode current	I_{IK}	±20	mA
I/O diode current	$I_{I/OK}$	±20	mA
Switch through Current	I_T	±25	mA
DC V_{CC}/ground current	I_{CC}	±50	mA
Power dissipation	P_D	500 (DIP) (Note 1)/180 (SOP/TSSOP)	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: 500 mW in the range of Ta = -40 to 65°C. From Ta = 65 to 85°C a derating factor of -10 mW/°C should be applied up to 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 12	V
Control 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}	-40 to 85	°C
Input rise and fall time	t_r, t_f	0 to 1000 (V_{CC} = 2.0 V) 0 to 500 (V_{CC} = 4.5 V) 0 to 400 (V_{CC} = 6.0 V) 0 to 250 (V_{CC} = 10.0 V)	ns

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.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
High-level control input voltage	V_{IHC}	—	2.0	1.50	—	—	1.50	—	V
			4.5	3.15	—	—	3.15	—	
			9.0	6.30	—	—	6.30	—	
			12.0	8.40	—	—	8.40	—	
Low-level control input voltage	V_{ILC}	—	2.0	—	—	0.50	—	0.50	V
			4.5	—	—	1.35	—	1.35	
			9.0	—	—	2.70	—	2.70	
			12.0	—	—	3.60	—	3.60	
ON resistance	R_{ON}	$V_{IN} = V_{IHC}$ $V_{I/O} = V_{CC}$ to GND $I_{I/O} \leq 1$ mA	4.5	—	96	170	—	200	Ω
			9.0	—	55	85	—	100	
			12.0	—	45	80	—	90	
		$V_{IN} = V_{IHC}$ $V_{I/O} = V_{CC}$ or GND $I_{I/O} \leq 1$ mA	2.0	—	160	—	—	—	
			4.5	—	70	100	—	130	
			9.0	—	50	75	—	95	
			12.0	—	45	70	—	90	
Difference of ON resistance between switches	ΔR_{ON}	$V_{IN} = V_{IHC}$ $V_{I/O} = V_{CC}$ to GND $I_{I/O} \leq 1$ mA	4.5	—	10	—	—	—	Ω
			9.0	—	5	—	—	—	
			12.0	—	5	—	—	—	
Input/output leakage current (switch off)	I_{OFF}	$V_{OS} = V_{CC}$ or GND $V_{IS} = GND$ or V_{CC} $V_{IN} = V_{ILC}$	12.0	—	—	±100	—	±1000	nA
Switch input leakage current (switch on, output open)	I_{IZ}	$V_{OS}=V_{CC}$ or GND $V_{IN} = V_{IHC}$	12.0	—	—	±100	—	±1000	nA
Control input current	I_{IN}	$V_{IN} = V_{CC}$ or GND	12.0	—	—	±100	—	±1000	nA
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	1.0	—	10.0	μA
			9.0	—	—	4.0	—	40.0	
			12.0	—	—	8.0	—	80.0	

AC Characteristics (C_L = 50 pF, input: $t_r = t_f$ = 6 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Phase difference between input and output	φ_{I-O}	—	2.0	—	10	50	—	65	ns
			4.5	—	4	10	—	13	
			9.0	—	3	8	—	10	
			12.0	—	3	7	—	9	
Output enable time	t_{pZL} t_{pZH}	R_L = 1 kΩ C_L = 50 pF	2.0	—	18	100	—	125	ns
			4.5	—	8	20	—	25	
			9.0	—	6	12	—	22	
			12.0	—	6	12	—	18	
Output disable time	t_{pLZ} t_{pHZ}	R_L = 1 kΩ C_L = 50 pF	2.0	—	20	115	—	145	ns
			4.5	—	10	23	—	29	
			9.0	—	8	20	—	25	
			12.0	—	8	18	—	22	
Maximum control input frequency		R_L = 1 kΩ C_L = 50 pF V_{OUT} = 1/2 V_{CC}	2.0	—	30	—	—	—	MHz
			4.5	—	30	—	—	—	
			9.0	—	30	—	—	—	
			12.0	—	30	—	—	—	
Control input capacitance	C_{IN}	—		—	5	10	—	10	pF
Switch terminal capacitance	$C_{I/O}$	—		—	6	—	—	—	pF
Feed through capacitance	C_{IOS}	—		—	0.5	—	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 1)		—	15	—	—	—	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:

$$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per channel)}$$

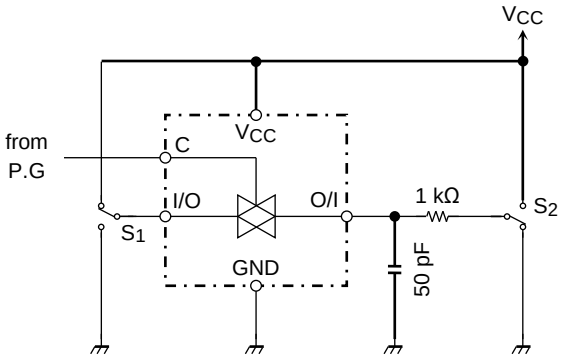
Analog Switch Characteristics (Note) (GND = 0 V, Ta = 25°C)

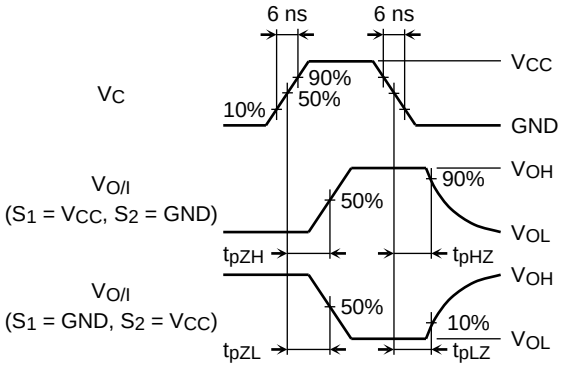
Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Sine wave distortion (T.H.D)		f_{IN} = 1 kHz, V_{IN} = 4 V_{p-p}, @V_{CC} = 4.5 V R_L = 10 kΩ, V_{IN} = 8 V_{p-p}, @V_{CC} = 9.0 V C_L = 50 pF	4.5 9.0	0.05 0.04	%
Frequency response (switch on)	f_{max}	Adjust f_{IN} voltage to obtain 0dBm at V_{OS} Increase f_{IN} frequency until dB meter reads -3dB R_L = 50 Ω, C_L = 10 pF f_{IN} = 1 MHz, sine wave	4.5 9.0	200 200	MHz
Feedthrough attenuation (switch off)		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	4.5 9.0	-60 -60	dB
Crosstalk (control input to signal output)		R_L = 600 Ω, C_L = 50 pF f_{IN} = 1 MHz, square wave (t_r = t_f = 6 ns)	4.5 9.0	60 100	mV
Crosstalk (between any switches)		Adjust V_{IN} to obtain 0dBm at input R_L = 600 Ω, C_L = 50 pF f_{IN} = 1 MHz, sine wave	4.5 9.0	-60 -60	dB

Note: These characteristics are determined by design of devices.

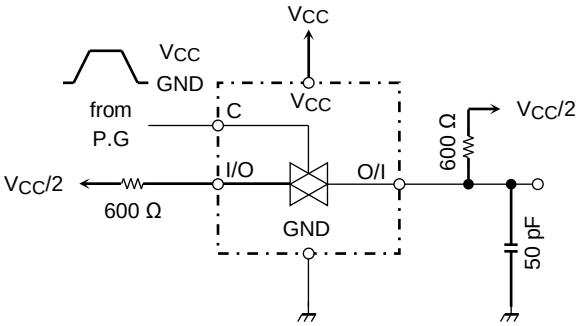
Switching Characteristics Test Circuits

1. t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

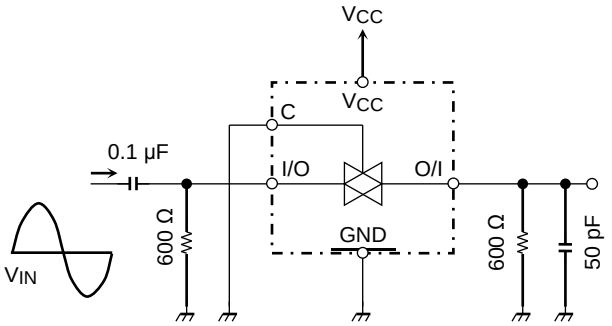




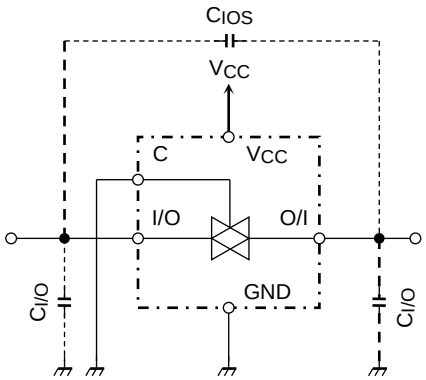
2. Cross Talk (control input-switch output)
f_{IN} = 1 MHz duty = 50% tr = tf = 6 ns



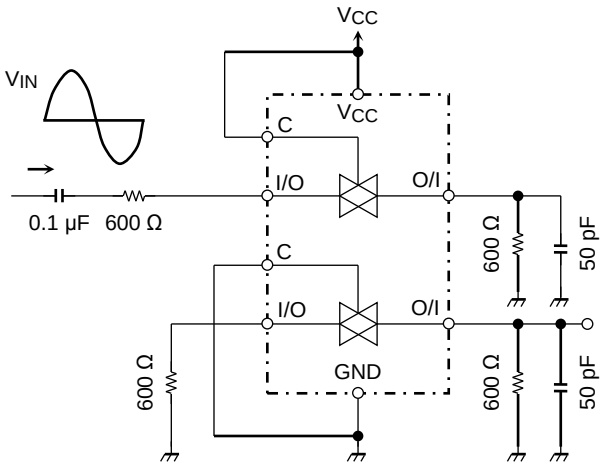
3. Feedthrough Attenuation



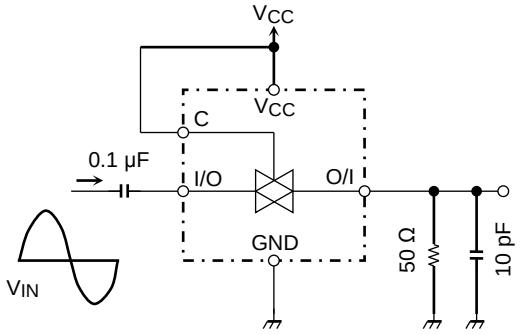
4. C_{IOS}, $C_{I/O}$



5. Crosstalk (between any two switches)

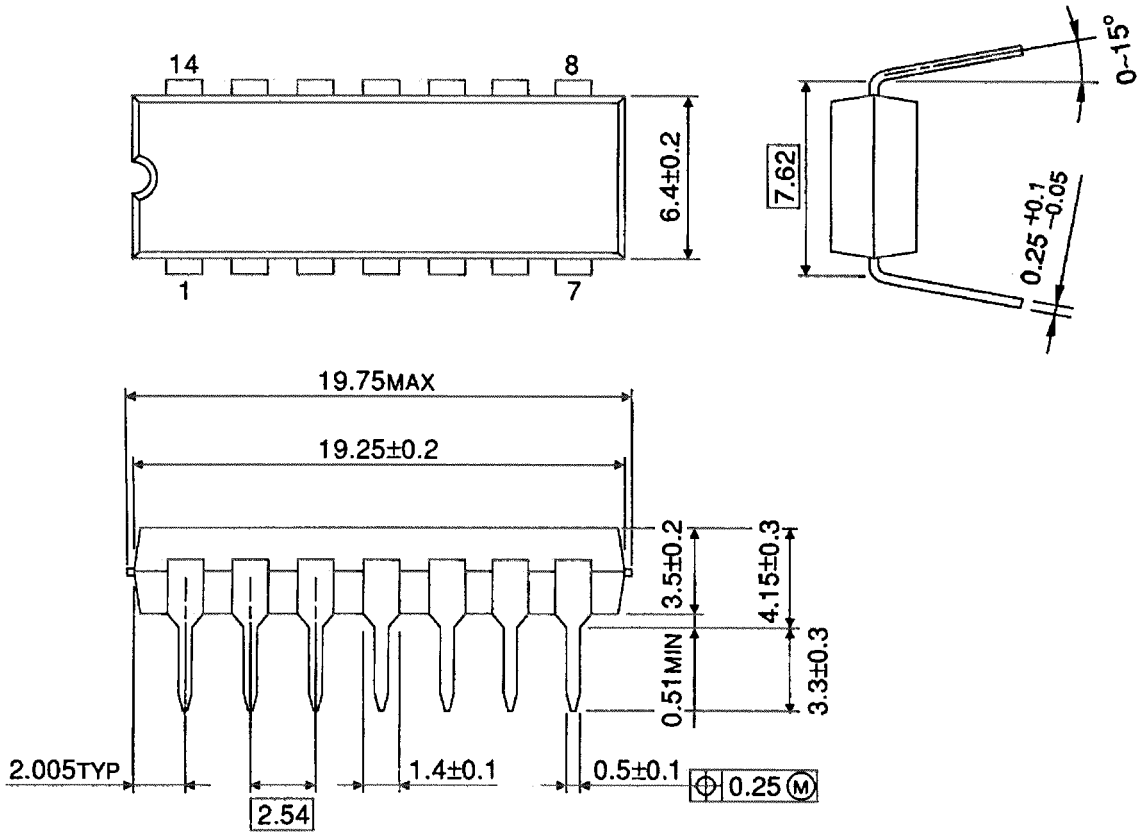


6. Frequency Response (switch on)



Package Dimensions

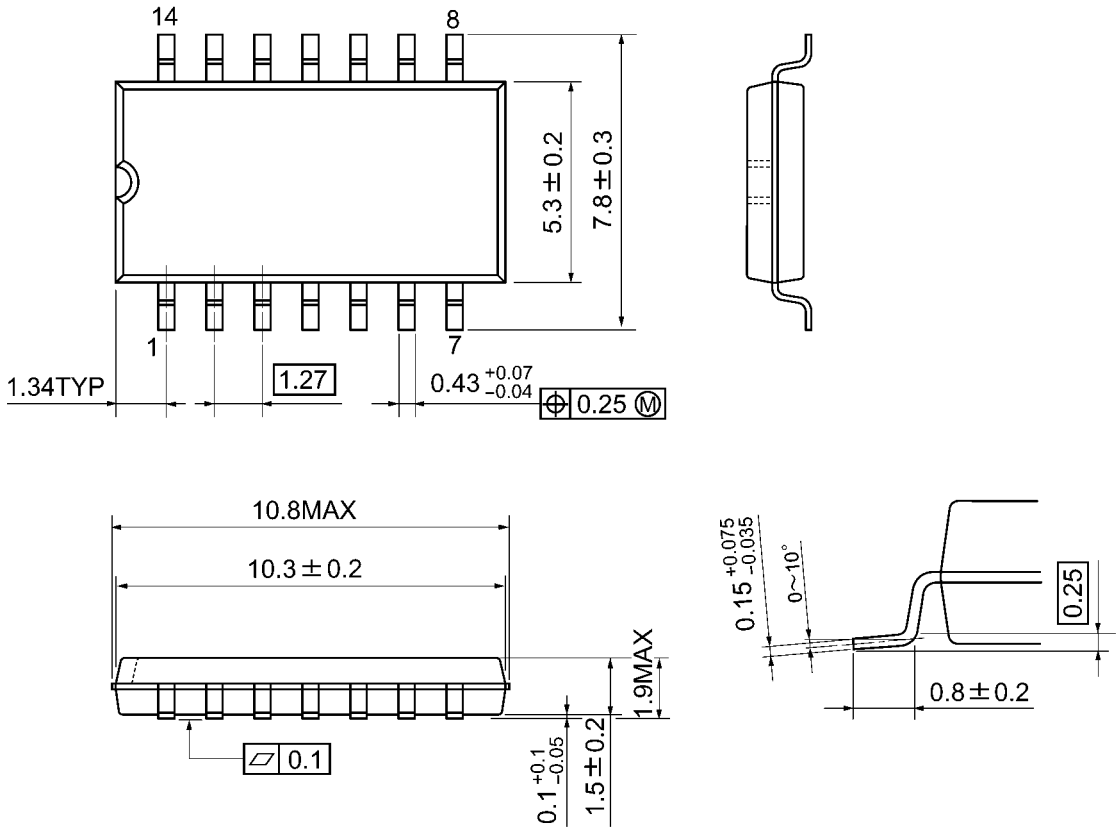
DIP14-P-300-2.54 Unit : mm



Weight: 0.96 g (typ.)

Package Dimensions

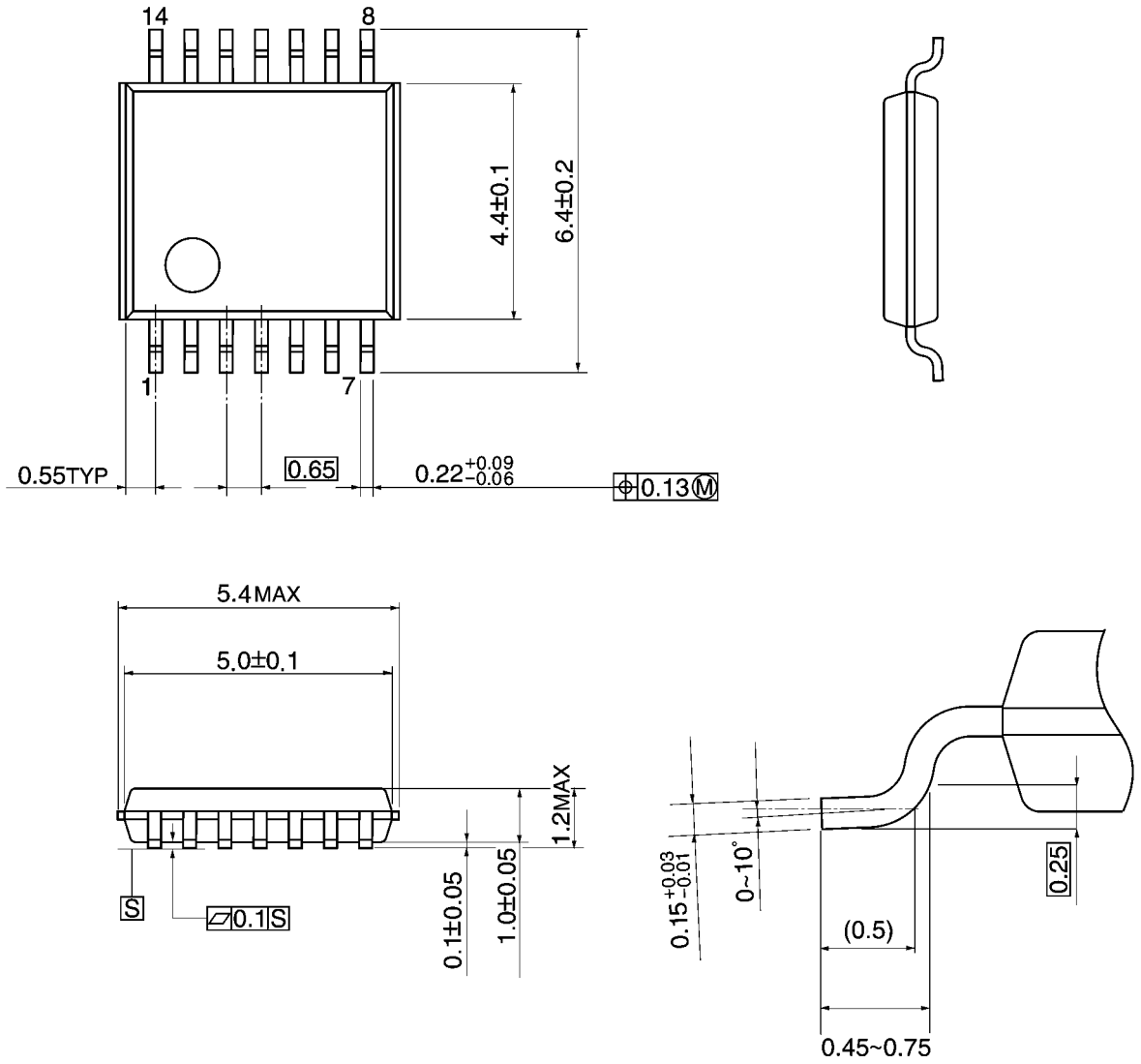
SOP14-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

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