

RS2G123 Double Retriggerable Monostable Multivibrator with Schmitt-Trigger Inputs

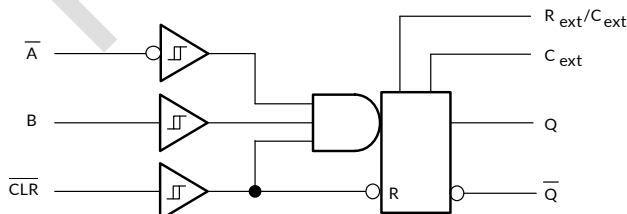
1 FEATURES

- **Operating Voltage Range: 2V to 5.5V**
- **CMOS Low Power Consumption**
- **Schmitt-Trigger Circuitry on $\bar{A}$ and B Inputs**
- **Inputs Accept Voltage to 5.5V**
- **High Output Drive: $\pm 24\text{mA}$ at $V_{CC}=3.0\text{V}$**
- **Edge Triggered from Active-High or Active-Low Gated Logic Inputs**
- **Retriggerable for Very Long Pulses Up to 100 % Duty Factor**
- **Direct Reset Terminates Output Pulse**
- **Power-On-Reset on Outputs**
- **I_{off} Supports Live Insertion, Partial-PowerDown Mode, and Back-Drive Protection**
- **Operating Temperature Range: -40°C to $+125^{\circ}\text{C}$**
- **Micro Size Packages: SOP16, TSSOP16**

2 APPLICATIONS

- **AV Receiver**
- **DVD Recorders and Players**
- **Desktop PCs or Notebook PCs**
- **Blu-ray Player and Home Theater**
- **Embedded PCs**
- **Digital Video Cameras (DVC)**
- **Digital Radio and Internet Radio Players**
- **Personal Digital Assistant (PDA)**
- **Wireless Headsets, Keyboards, and Mice**
- **Video Analytics Servers**
- **Network Attached Storage (NAS)**
- **Mobile Internet Devices**

Logic Diagram (Positive Logic)



3 DESCRIPTIONS

The RS2G123 is a double retriggerable monostable multivibrator designed for 2V to 5.5V V_{CC} operation.

This monostable multivibrator features output pulse-duration control by three methods. In the first method, the $\bar{A}$ input is low, and the B input goes high. In the second method, the B input is high, and the $\bar{A}$ input goes low. In the third method, the $\bar{A}$ input is low, the B input is high, and the clear ($\overline{\text{CLR}}$) input goes high.

The output pulse duration is programmed by selecting external resistance and capacitance values. The external timing capacitor must be connected between C_{ext} and R_{ext}/C_{ext} (positive) and an external resistor connected between R_{ext}/C_{ext} and V_{CC} . To obtain variable pulse durations, connect an external variable resistance between R_{ext}/C_{ext} and V_{CC} . The output pulse duration also can be reduced by taking $\overline{\text{CLR}}$ low.

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. The $\bar{A}$ and B inputs have Schmitt triggers with sufficient hysteresis to handle slow input transition rates with jitter-free triggering at the outputs.

The RS2G123 is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

This device available in Green SOP16 and TSSOP16 packages. It operates over an ambient temperature range of -40°C to $+125^{\circ}\text{C}$.

Device Information ⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2G123	SOP16	9.90mm×3.90mm
	TSSOP16	5.00mm×4.40mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

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4 REVISION HISTORY

Note: Page numbers for previous revisions may differ from page numbers in the current version.

Version	Change Date	Change Item
A.0	2024/08/09	Preliminary version completed

Preliminary version

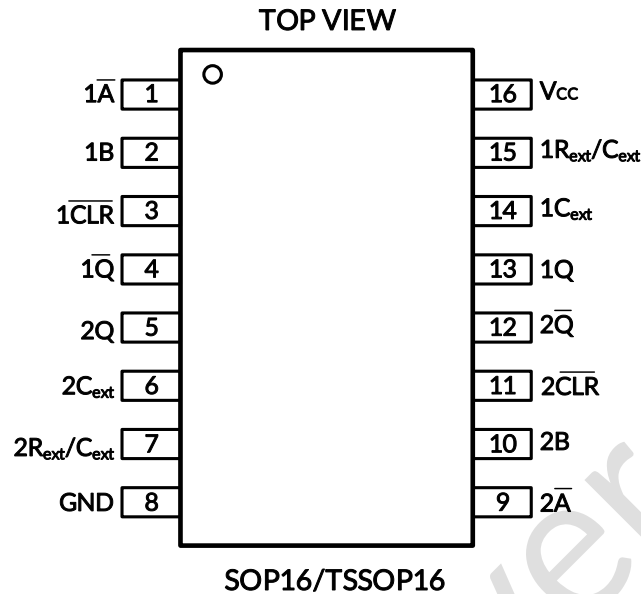
5 PACKAGE/ORDERING INFORMATION ⁽¹⁾

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ⁽²⁾	MSL ⁽³⁾	PACKAGE OPTION
RS2G123	RS2G123XS16	-40°C ~+125°C	SOP16	RS2G123	MSL3	Tape and Reel, 4000
	RS2G123XTSS16	-40°C ~+125°C	TSSOP16	RS2G123	MSL3	Tape and Reel, 4000

NOTE:

- (1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
- (2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.
- (3) RUNIC classify the MSL level with using the common preconditioning setting in our assembly factory conforming to the JEDEC industrial standard J-STD-20F. Please align with RUNIC if your end application is quite critical to the preconditioning setting or if you have special requirement.

6 PIN CONFIGURATIONS



6.1 Pin Description

PIN		I/O ⁽¹⁾	FUNCTION
NAME	NO.		
1 $\bar{A}$	1	I	Channel 1 falling edge trigger input when 1B = L; Hold low for other input methods
1B	2	I	Channel 1 rising edge trigger input when 1 $\bar{A}$ = H; Hold high for other input methods
1 $\overline{CLR}$	3	I	Channel 1 rising edge trigger when 1 $\bar{A}$ = H and 1B = L; Hold high for other input methods; Can cut pulse length short by driving low during output
1 $\bar{Q}$	4	O	Channel 1 inverted output
2Q	5	O	Channel 2 output
2C _{ext}	6	-	Channel 2 external capacitor negative connection
2R _{ext} /C _{ext}	7	-	Channel 2 external capacitor and resistor junction connection
GND	8	-	Ground
2 $\bar{A}$	9	I	Channel 2 falling edge trigger input when 2B = L; Hold low for other input methods
2B	10	I	Channel 2 rising edge trigger input when 2 $\bar{A}$ = H; Hold high for other input methods
2 $\overline{CLR}$	11	I	Channel 2 rising edge trigger when 2 $\bar{A}$ = H and 2B = L; Hold high for other input methods; Can cut pulse length short by driving low during output
2 $\bar{Q}$	12	O	Channel 2 inverted output
1Q	13	O	Channel 1 output
1C _{ext}	14	-	Channel 1 external capacitor negative connection
1R _{ext} /C _{ext}	15	-	Channel 1 external capacitor and resistor junction connection
V _{CC}	16	-	Power supply

(1) I=input, O=output.

6.2 Function Table

INPUTS			OUTPUTS	
CLR	$\bar{A}$	B	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑		
H	↓	H		
↑	L	H		

(1) H = High Voltage Level, L = Low Voltage Level, X = Irrelevant; ↑ = Transition from Low to High, ↓ = Transition from High to Low;
 = One High Level Pulse,  = One Low Level Pulse.

7 SPECIFICATIONS

7.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage		-0.5	6.5	V
V _I	Input voltage ⁽²⁾		-0.5	6.5	V
V _O	Voltage applied to any output in the high-impedance or power-off state ⁽²⁾		-0.5	6.5	V
V _O	Voltage applied to any output in the high or low state ^{(2) (3)}		-0.5	V _{CC} +0.5	V
I _{IK}	Input clamp current	V _I <0		-50	mA
I _{OK}	Output clamp current	V _O <0		-50	mA
I _O	Continuous output current			±50	mA
	Continuous current through V _{CC} or GND			±100	mA
θ _{JA}	Package thermal impedance ⁽⁴⁾	SOP16		150	°C/W
		TSSOP16		45	
T _J	Junction temperature ⁽⁵⁾		-65	150	°C
T _{stg}	Storage temperature		-65	150	°C

- (1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V_{CC} is provided in the Recommended Operating Conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD-51.
- (5) The maximum power dissipation is a function of T_{J(MAX)}, R_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. All numbers apply for packages soldered directly onto a PCB.

7.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-Body Model (HBM), ANSI/ESDA/JEDEC JS001-2023	±2000	V
		Charged-Device Model (CDM), ANSI/ESDA/JEDEC JS-002-2022	±1000	V
		Machine Model (MM), JESD22-A115C(2010)	±100	V



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8 ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (TYP values are at $T_A = +25^{\circ}\text{C}$, Full = -40°C to 125°C , unless otherwise noted.)⁽¹⁾

8.1 Recommended Operating Conditions

			MIN	MAX	UNIT
V_{CC}	Supply Voltage	Operating	2	5.5	V
		Data retention only			
V_{IH}	High-Level Input Voltage	$V_{CC} = 2\text{ V to } 2.7\text{ V}$	$0.75 \times V_{CC}$		V
		$V_{CC} = 3\text{ V to } 3.6\text{ V}$	$0.7 \times V_{CC}$		
		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	$0.7 \times V_{CC}$		
V_{IL}	Low-Level Input Voltage	$V_{CC} = 2\text{ V to } 2.7\text{ V}$		$0.25 \times V_{CC}$	V
		$V_{CC} = 3\text{ V to } 3.6\text{ V}$		$0.3 \times V_{CC}$	
		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$		$0.3 \times V_{CC}$	
V_I	Input Voltage		0	5.5	V
V_O	Output Voltage		0	V_{CC}	V
I_{OH}	High-Level Output Current	$V_{CC} = 2.3\text{ V}$		-8	mA
		$V_{CC} = 3\text{ V}$		-16	
				-24	
		$V_{CC} = 4.5\text{ V}$		-32	
I_{OL}	Low-Level Output Current	$V_{CC} = 2.3\text{ V}$		8	mA
		$V_{CC} = 3\text{ V}$		16	
				24	
		$V_{CC} = 4.5\text{ V}$		32	
$R_{ext}^{(2)}$	External Timing Resistance	$2\text{ V} \leq V_{CC} < 3\text{ V}$	5		k Ω
		$V_{CC} \geq 3\text{ V}$	1		
$C_{ext}^{(2)}$	External Timing Capacitance	$2\text{ V} \leq V_{CC} < 2.5\text{ V}$	10		nF
		$2.5\text{ V} \leq V_{CC} < 3\text{ V}$	100		pF
T_A	Operating Temperature		-40	125	$^{\circ}\text{C}$

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

(2) R_{ext}/C_{ext} is an I/O and must not be connected directly to GND or V_{CC} .

8.2 Electrical Characteristics

All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

PARAMETER		TEST CONDITIONS	V _{CC}	-40°C to 85°C			-40°C to 125°C			UNIT
				MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	
V _{OH}		I _{OH} = -100 μA	2V to 5.5V	V _{CC} - 0.1			V _{CC} - 0.1			V
		I _{OH} = -8 mA	2.3V	1.9			1.9			
		I _{OH} = -16 mA	3 V	2.4			2.4			
		I _{OH} = -24 mA		2.2			2.2			
		I _{OH} = -32 mA	4.5V	3.8			3.8			
V _{OL}		I _{OL} = 100 μA	2V to 5.5V	0.1			0.1			V
		I _{OL} = 8 mA	2.3V	0.3			0.3			
		I _{OL} = 16 mA	3 V	0.4			0.4			
		I _{OL} = 24 mA		0.6			0.6			
		I _{OL} = 32 mA	4.5V	0.55			0.55			
I _I	R _{ext} /C _{ext} ⁽⁴⁾	B = GND, A = CL _R = V _{CC}	2V to 5.5V	±0.25			±0.25			μA
	A, B, CL _R	V _I = 5.5 V or GND		±1			±1			
I _{off}	A, B, Q, CL _R	V _I or V _O = 5.5 V	0	±10			±10			μA
I _{CC}	Quiescent	V _I = V _{CC} or GND, I _O = 0	5.5V	20			20			μA
I _{CC}	Active State	V _I = V _{CC} or GND, R _{ext} /C _{ext} = 0.5 V _{CC}	2V	200			200			μA
			2.3V	220			220			
			3V	280			280			
			4.5V	650			650			
			5.5V	975			975			
C _I		V _I = V _{CC} or GND	3.3V	3						pF

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

(2) Limits are 100% production tested at 25°C . Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

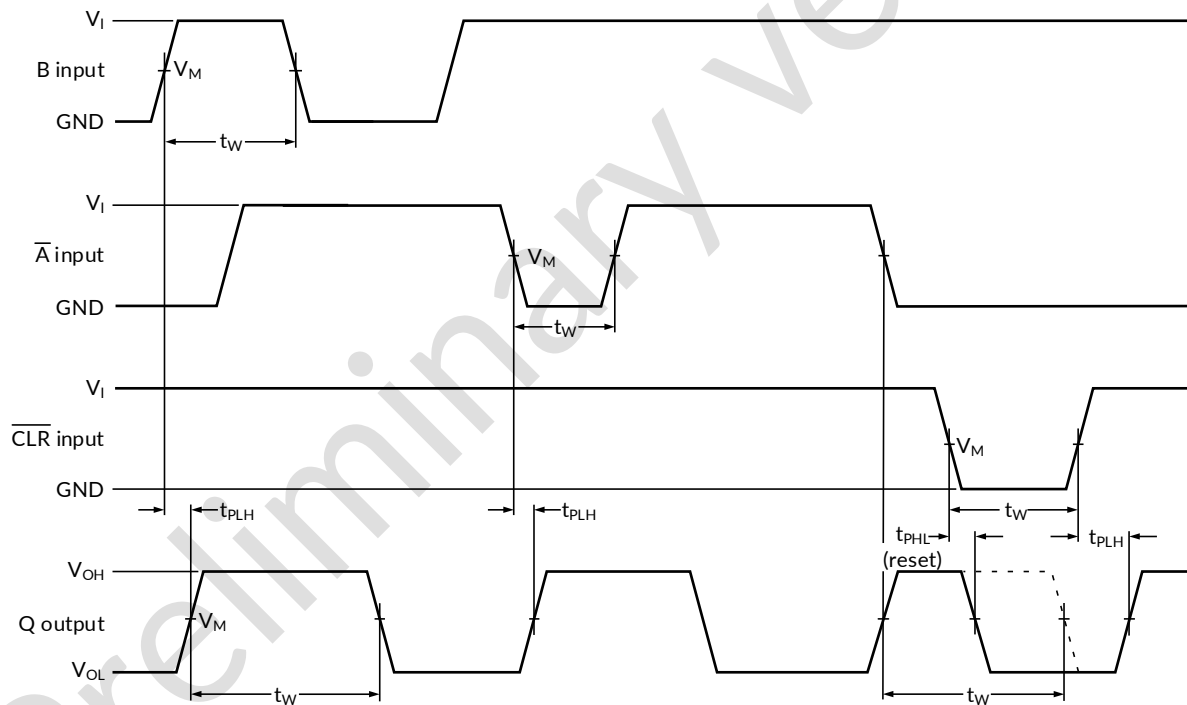
(4) This test is performed with the terminal in the OFF-state condition.

8.3 Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted)

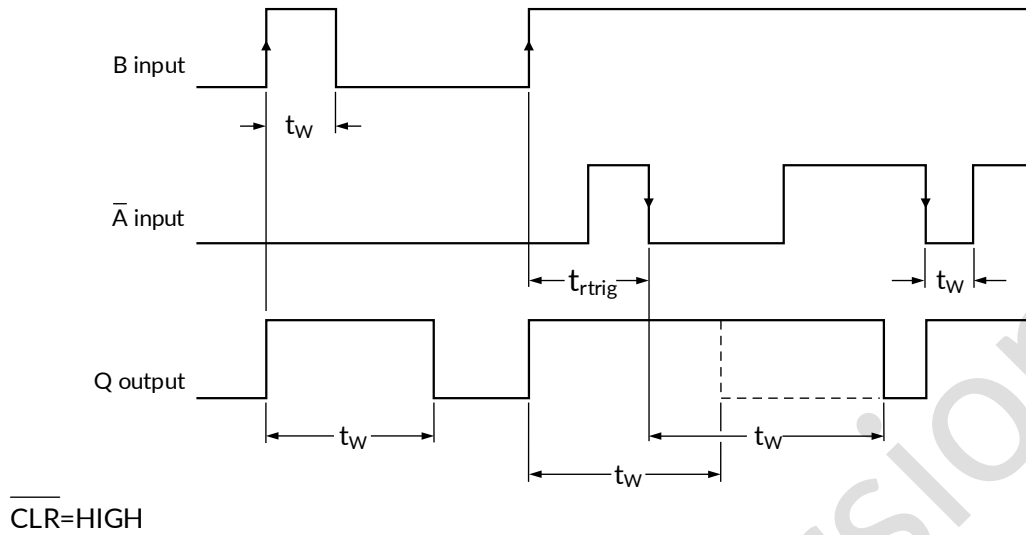
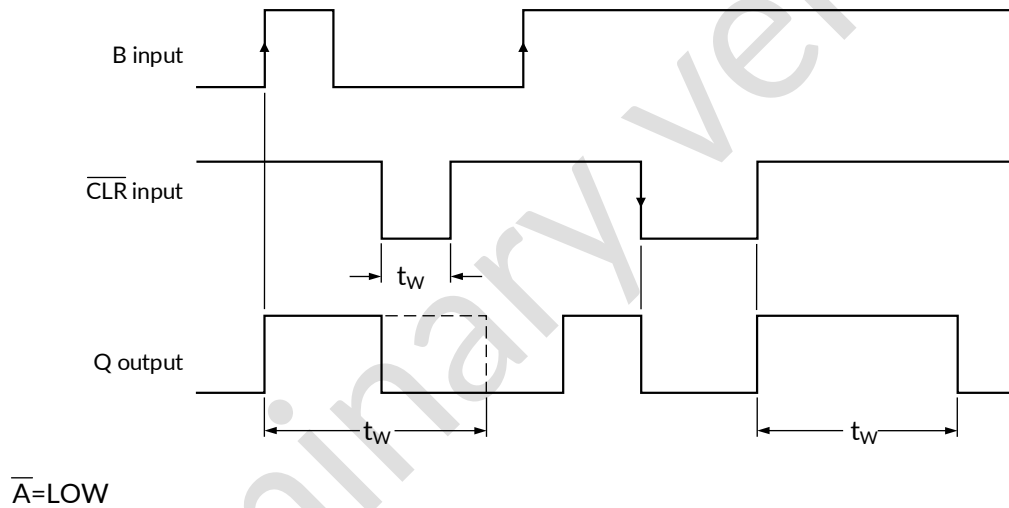
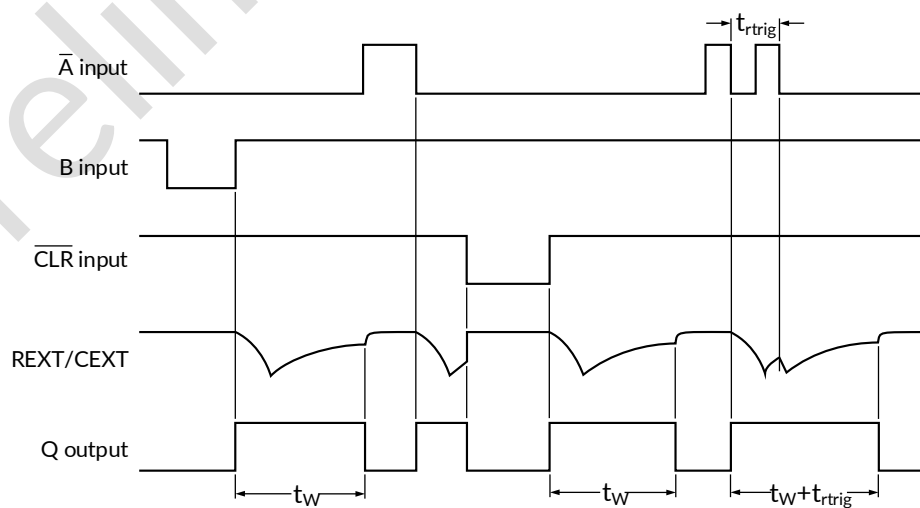
PARAMETER			TEST CONDITIONS		-40°C to 125°C						UNIT
					V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		
					MIN	TYP	MIN	TYP	MIN	TYP	
t _{wIN}	Pulse Duration	CLR			8		5		4		ns
		A or B Trigger			8		5		4		
t _{rr}	Pulse Retrigger Time	R _{ext} = 1 kΩ	C _{ext} = 100 pF			41		35		ns	
			C _{ext} = 0.01 μF			2		1.67		μs	
			C _{ext} = 0.1 μF			TBD		TBD			
		R _{ext} = 5 kΩ	C _{ext} = 100 pF	46					ns		
			C _{ext} = 0.01 μF	1.01					μs		
			C _{ext} = 0.1 μF	TBD							

8.4 Timing Diagram



V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Figure 1. Propagation Delays from Inputs ($\overline{A}$, B, $\overline{CLR}$) to Output (Q)


Figure 2. Output Pulse Control Using Retrigger Pulse

Figure 3. Output Pulse Control Using Reset Input $\overline{CLR}$

Figure 4. Input and Output Timing

8.5 Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		V _{CC} (V)	Operating free-air temperature (T _A)						UNIT	
					25°C			-40°C to 85°C		-40°C to 125°C		
					MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	MIN ⁽²⁾	MAX ⁽²⁾	MIN ⁽²⁾		MAX ⁽²⁾
$\bar{A}$ or B to Q	t _{pd}	C _L =50PF		2.5		13	19.5		22		23.5	ns
		C _L =50PF		3.3		9.5	14.5		16.5		18	ns
		C _L =15PF		5		7	10.5		12		13	ns
$\overline{CLR}$ to Q	t _{pd}	C _L =50PF		2.5		15	22.5		17.5		19	ns
		C _L =50PF		3.3		10.5	16		16		16.5	ns
		C _L =15PF		5		7.5	11.5		10.5		11.5	ns
$\overline{CLR}$ Trigger	t _{pd}	C _L =50PF		2.5		10.5	16		25.5		27	ns
		C _L =50PF		3.3		9	13.5		19		19.5	ns
		C _L =15PF		5		6.5	10		13		14.5	ns
Output Pulse Width	t _w	C _{ext} = 28 pF, R _{ext} = 2 kΩ		3.3		180			240		300	ns
				5		150			200		240	ns
		C _{ext} = 0.01 μF, R _{ext} = 5 kΩ		2.5		TBD			TBD		TBD	μs
				3.3		TBD			TBD		TBD	μs
				5		TBD			TBD		TBD	μs
		C _{ext} = 0.01 μF, R _{ext} = 10 kΩ		2.5		100		90	110	85	120	μs
				3.3		100		90	110	85	120	μs
				5		100		90	110	85	120	μs
		C _{ext} = 0.1 μF, R _{ext} = 10 kΩ		2.5		1		0.9	1.1	0.85	1.2	ms
				3.3		1		0.9	1.1	0.85	1.2	ms
				5		1		0.9	1.1	0.85	1.2	ms
Power Capacitance Dissipation	C _{pd}	$\bar{A}$ = low, B = high, $\overline{CLR}$ =10MHz	R _{ext} = 1 kΩ, No C _{ext}	3.3		170					pF	
				5		165						
			R _{ext} =5 kΩ, No C _{ext}	2.5		115						

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

(2) This parameter is ensured by design and/or characterization and is not tested in production.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

8.6 Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

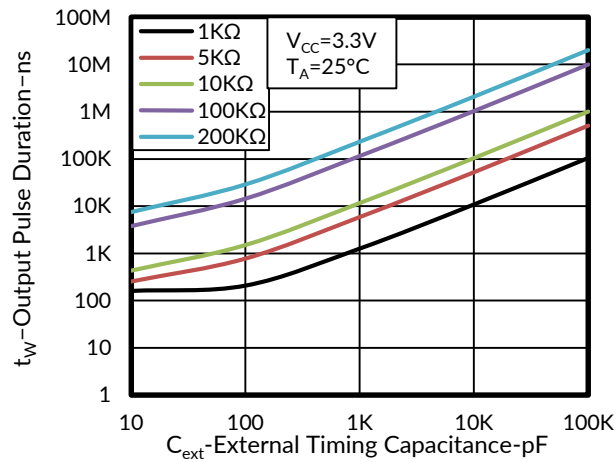


Figure 5. Output Pulse Duration vs External Timing Capacitance

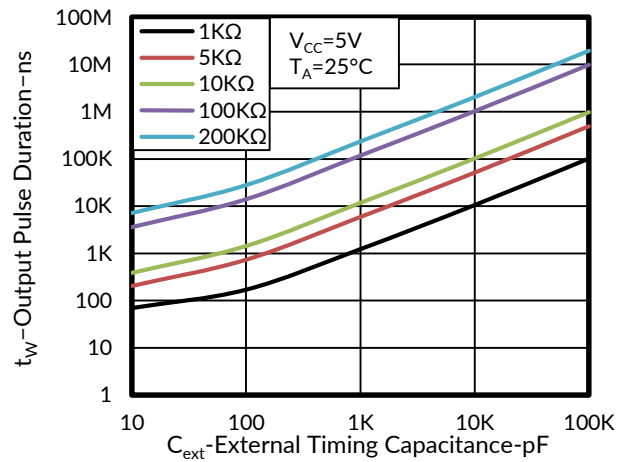


Figure 6. Output Pulse Duration vs External Timing Capacitance

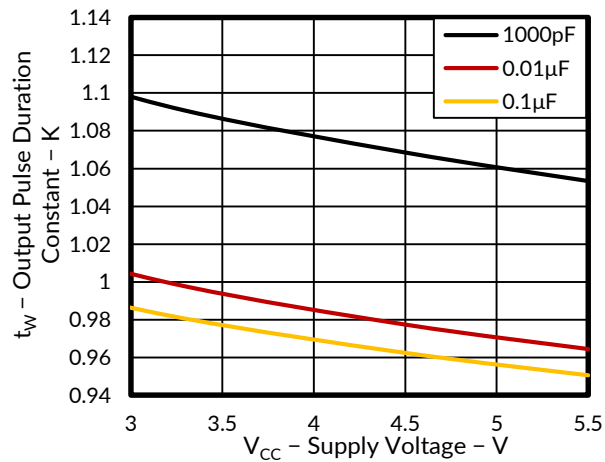
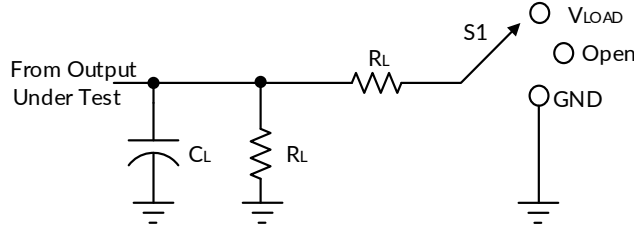


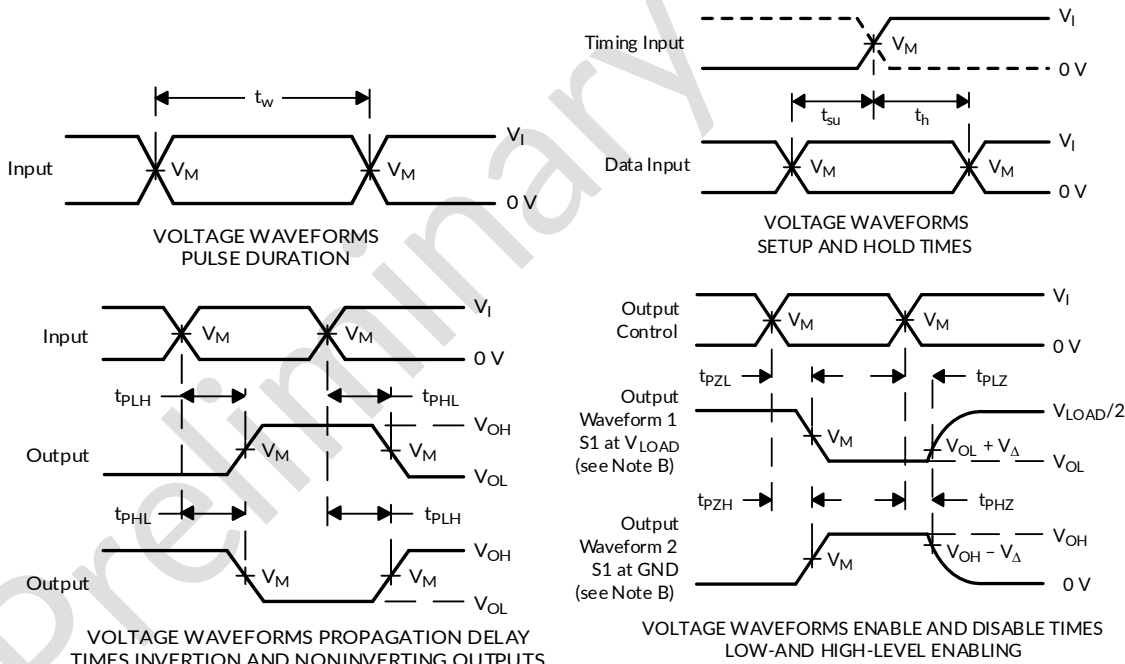
Figure 7. Output Pulse Duration Constant vs Supply Voltage

9 PARAMETER MEASUREMENT INFORMATION



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

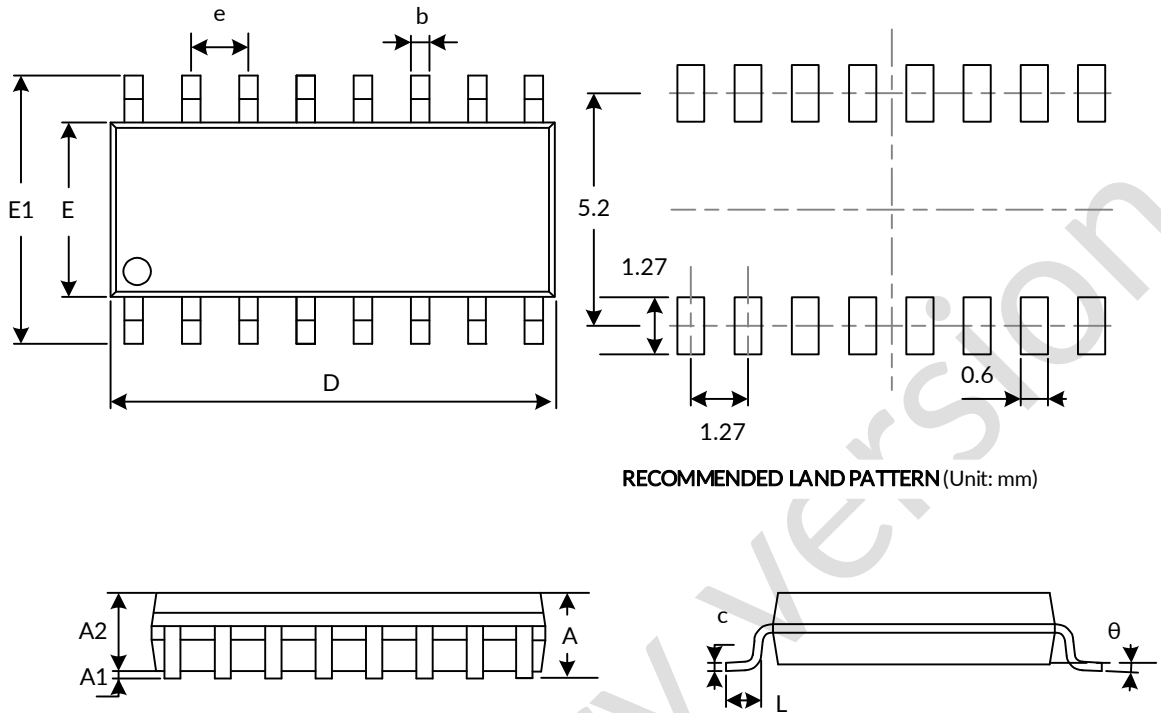
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500Ω	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1MΩ	0.3V



- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_o = 50 \Omega$.
 D. The outputs are measured one at a time, with one transition per measurement.
 E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 F. t_{PZL} and t_{PZH} are the same as t_{en} .
 G. t_{PLH} and t_{PHL} are the same as t_{pd} .
 H. All parameters and waveforms are not applicable to all devices.

Figure 8. Load Circuit and Voltage Waveforms

10 PACKAGE OUTLINE DIMENSIONS SOP16⁽³⁾

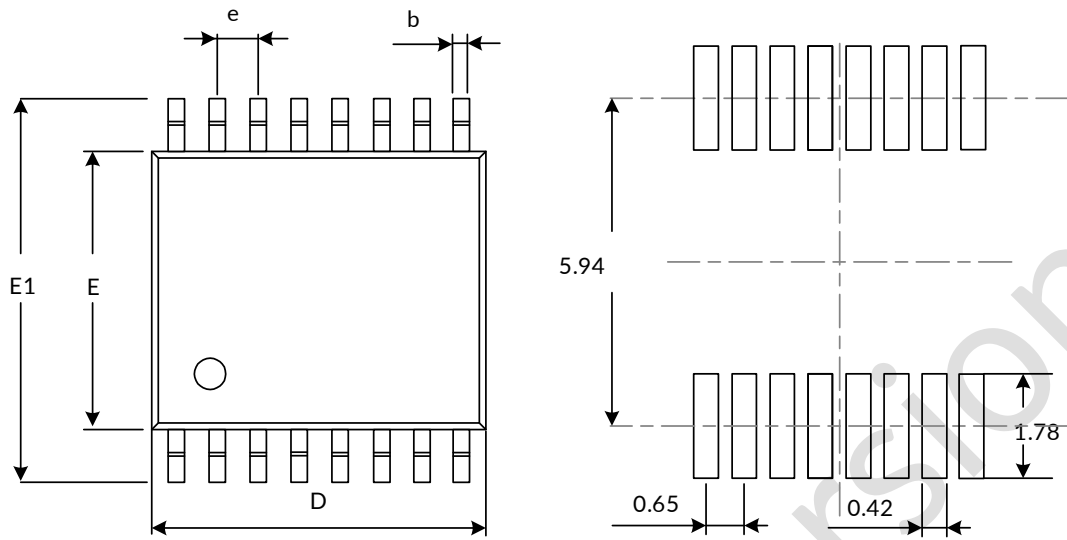
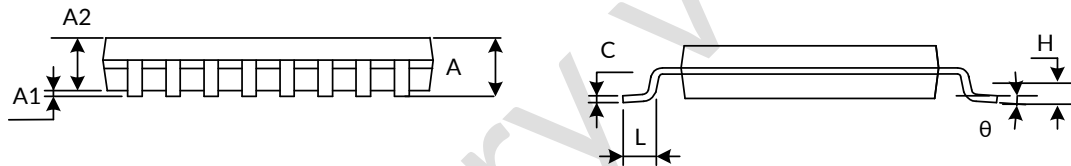


RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D ⁽¹⁾	9.800	10.200	0.386	0.402
E ⁽¹⁾	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC) ⁽²⁾		0.050 (BSC) ⁽²⁾	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

NOTE:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

TSSOP16 (3)

RECOMMENDED LAND PATTERN (Unit: mm)


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D ⁽¹⁾	4.860	5.100	0.191	0.201
E ⁽¹⁾	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 (BSC) ⁽²⁾		0.026 (BSC) ⁽²⁾	
L	0.500	0.700	0.02	0.028
H	0.250 TYP		0.010 TYP	
θ	1°	7°	1°	7°

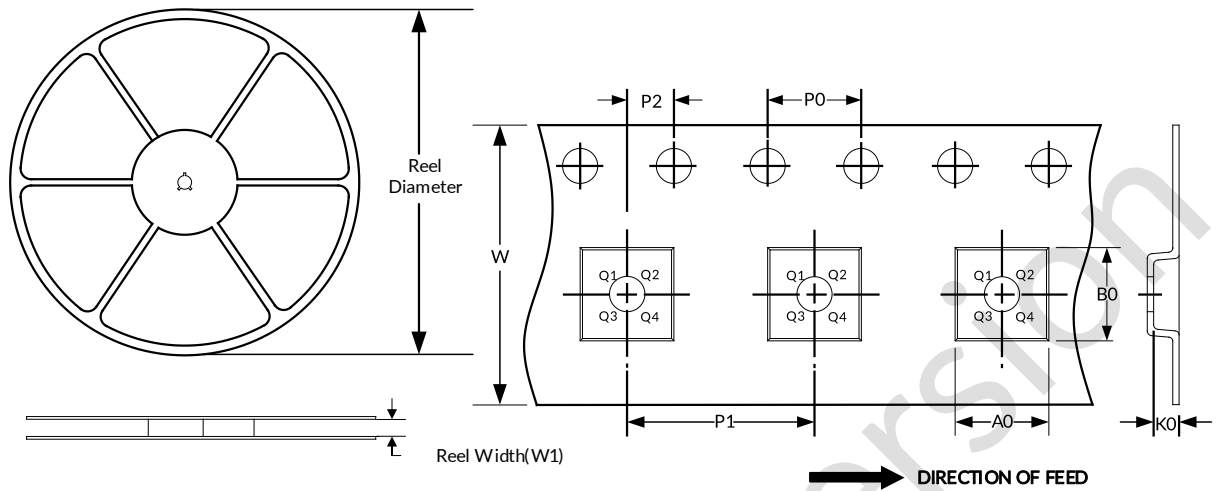
NOTE:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

11 TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOP16	13"	16.4	6.50	10.30	2.10	4.0	8.0	2.0	16.0	Q1
TSSOP16	13"	12.4	6.90	5.60	1.20	4.0	8.0	2.0	12.0	Q1

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

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Preliminary version