RS4G157 Quad 2-Input Multiplexer

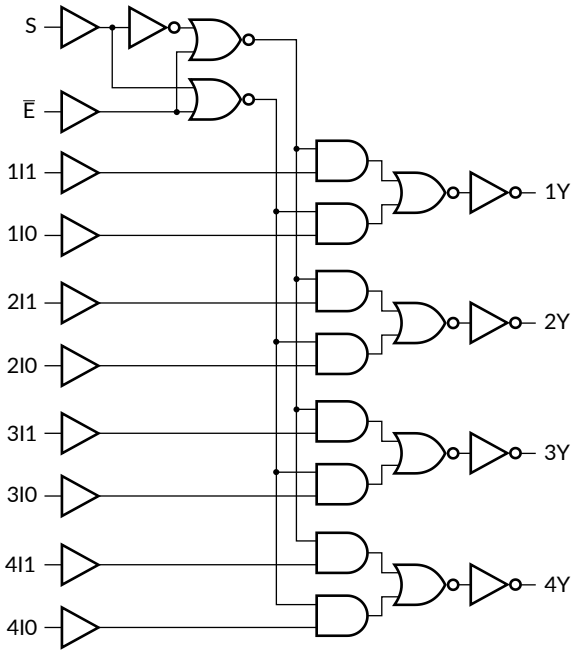
1 FEATURES

- **Operating Voltage Range: 1.65V to 5.5V**
- **Low Power Consumption: 10μA (Max)**
- **Operating Temperature Range: -40°C to +125°C**
- **Inputs Accept Voltage to 5.5V**
- **High Output Drive: ±24mA at V_{CC}=3.0V**
- **I_{off} Supports Live Insertion, Partial-Power Down Mode, and Back-Drive Protection**
- **Micro SIZE PACKAGES: TSSOP16, SOP16**

2 APPLICATIONS

- **Network Switch**
- **Telecom Infrastructure**
- **Servers**
- **I/O Expanders**
- **LED Displays**

Simplified Schematic



3 DESCRIPTIONS

The RS4G157 quad 2-input multiplexer is designed for 1.65V to 5.5V V_{CC} operation.

The RS4G157 selects data from two data inputs (I0 and I1) under control of a common data select input (S). The enable input ($\overline{E}$) is active Low. A HIGH on $\overline{E}$ forces all the outputs (1Y to 4Y) LOW. The state of the common data select input determines the particular register from which the data comes. The output (Y) presents the selected data in the true (non-inverted) form.

The RS4G157 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 TSSOP16 and SOP16 packages. It operates over an ambient temperature range of -40°C to +125°C.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS4G157	TSSOP16	5.00mm×4.40mm
	SOP16	9.90mm×3.90mm

(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 different from page numbers in the current version.

Version	Change Date	Change Item
A.1	2023/11/21	Initial version completed
A.1.1	2024/02/29	Modify packaging naming

5 PACKAGE/ORDERING INFORMATION (1)

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING (2)	MSL(3)	PACKAGE OPTION
RS4G157	RS4G157XTSS16	-40°C ~+125°C	TSSOP16	RS4G157	MSL3	Tape and Reel,4000
	RS4G157XS16	-40°C ~+125°C	SOP16	RS4G157	MSL3	Tape and Reel,4000

NOTE:

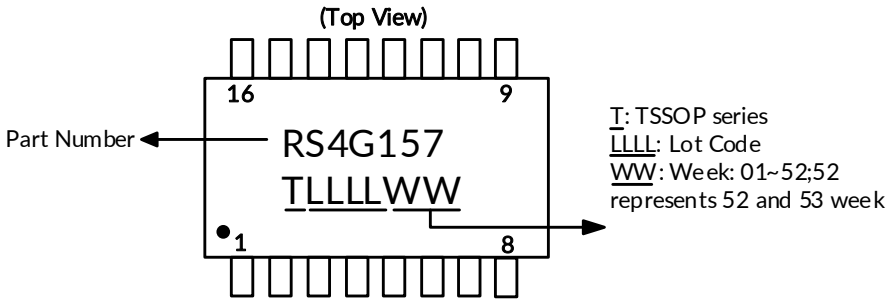
(1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.

(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.

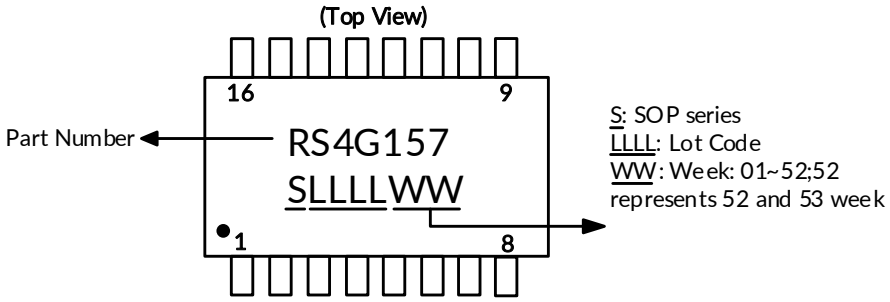
(3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

Marking Information

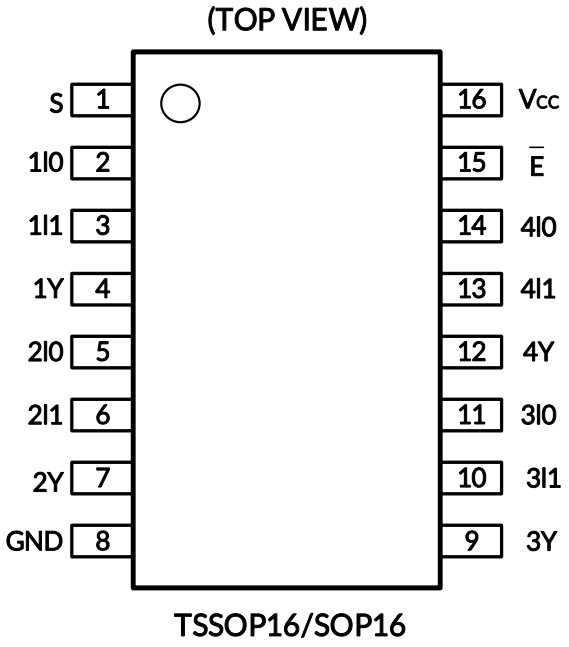
(1) TSSOP16



(2) SOP16



6 PIN CONFIGURATIONS



6.1 PIN DESCRIPTION

PIN	NAME	I/O TYPE (1)	FUNCTION
TSSOP16/SOP16			
1	S	I	Common data select input
2,5,11,14	1I0 to 4I0	I	Data inputs from source 0
3,6,10,13	1I1 to 4I1	I	Data inputs from source 1
4,7,9,12	1Y to 4Y	O	Multiplexer outputs
8	GND	G	Ground (0V)
15	$\overline{E}$	I	Enable input (active LOW)
16	Vcc	P	Supply Voltage

(1) I=input, O=output, P=power, G=Ground.

6.2 FUNCTION TABLE

INPUTS				OUTPUT
$\overline{E}$	S	nI1	nI0	nY
H	X	X	X	L
L	L	X	L	L
L	L	X	H	H
L	H	L	X	L
L	H	H	X	H

(1) H=High Voltage Level
L=Low Voltage Level
X=Don't Care

7 SPECIFICATIONS

7.1 Absolute Maximum Ratings (1)

over operating free-air temperature range (unless otherwise noted) (1) (2)

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		-0.5	6.5	V
V_I	Input voltage range (2)		-0.5	6.5	V
Vo	Voltage range applied to any output in the high-impedance or power-off state (2)		-0.5	6.5	V
Vo	Voltage range 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	V_O = 0 to V_{CC}		±50	mA
	Continuous current through V_{CC} or GND			±100	mA
θ_{JA}	Package thermal impedance (4)	TSSOP16		45	°C/W
		SOP16		150	
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 $T_{J(MAX)}$, $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$. 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), MIL-STD-883K METHOD 3015.9	±2000	V
		Charged-device model (CDM), ANSI/ESDA/JEDEC JS-002-2018	±1000	
		Machine model (MM), JESD22-A115C (2010)	±200	

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°C, Full=-40°C to 125°C, unless otherwise noted.) (1)

8.1 Recommended Operating Conditions

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
Supply voltage	V_{CC}	Operating	1.65	5.5	V
High-level input voltage	V_{IH}	V_{CC}=1.65V to 1.95V	0.75×V_{CC}		V
		V_{CC}=2.3V to 2.7V	1.7		
		V_{CC}=3V to 3.6V	2.2		
		V_{CC}=4.5V to 5.5V	0.7×V_{CC}		
Low-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V		0.25×V_{CC}	V
		V_{CC}=2.3V to 2.7V		0.7	
		V_{CC}=3V to 3.6V		0.8	
		V_{CC}=4.5V to 5.5V		0.3×V_{CC}	
Input voltage	V_I		0	5.5	V
Output voltage	V_O		0	V_{CC}	V
High-level output current	I_{OH}	V_{CC}=1.65V		-4	mA
		V_{CC}=2.3V		-8	
		V_{CC}=3V		-16	
				-24	
		V_{CC}=4.5V		-32	
Low-level output current	I_{OL}	V_{CC}=1.65V		4	mA
		V_{CC}=2.3V		8	
		V_{CC}=3V		16	
				24	
		V_{CC}=4.5V		32	
Input transition rise or fall	Δt / Δv	V_{CC}=1.8V ± 0.15V, 2.5V ± 0.2V		20	ns/V
		V_{CC}=3.3V ± 0.3V		10	
		V_{CC}=5V ± 0.5V		10	
Operating temperature	T_A		-40	125	°C

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

8.2 DC Characteristics

PARAMETER		TEST CONDITIONS	Vcc	TEMP	MIN(2)	TYP(3)	MAX(2)	UNIT
V_{OH}		I_{OH} = -100μA	1.65V to 5.5V	25°C	V_{CC}-0.1			V
		I_{OH} = -4mA	1.65V		1.2			
		I_{OH} = -8mA	2.3V		1.9			
		I_{OH} = -16mA	3V		2.4			
		I_{OH} = -24mA			2.3			
		I_{OH} = -32mA	4.5V		3.8			
V_{OL}		I_{OL} = 100μA	1.65V to 5.5V	25°C			0.1	V
		I_{OL} = 4mA	1.65V				0.45	
		I_{OL} = 8mA	2.3V				0.3	
		I_{OL} = 16mA	3V				0.4	
		I_{OL} = 24mA					0.55	
		I_{OL} = 32mA	4.5V				0.55	
I_I	All inputs	V_I=5.5V or GND	0V to 5.5V	25°C		±0.1	±1	μA
				Full			±5	
I_{off}		V_I or V_O=5.5V	0	25°C		±0.1	±1	μA
				Full			±10	
I_{CC}		V_I=5.5V or GND, I_O=0	1.65V to 5.5V	25°C		0.1	1	μA
				Full			10	
ΔI_{CC}		One input at V_{CC}-0.6V, Other inputs at V_{CC} or GND	3V to 5.5V	Full			500	μA
Ci (Input Capacitance)		nI0, nI1, f=1MHZ	3.3V	25°C		2		pF
		S, $\overline{E}$, f=1MHZ				8		

(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.

8.3 Switching Characteristics

over recommended operating free-air temperature range (T_A = +25°C, unless otherwise noted) (1)

PARAMETER	SYMBOL	TEST CONDITIONS		TEMP	MIN	TYP	MAX	UNIT
Propagation Delay	t_{pd}	nI0, nI1 to nY	V_{CC}=1.8V±0.15V	FULL	8	16	30	ns
			V_{CC}=2.5V±0.2V		3.4	9	17	
			V_{CC}=3.3V±0.3V		2.6	7	12	
			V_{CC}=5V±0.5V		1.3	5	9.2	
		S to nY	V_{CC}=1.8V±0.15V	FULL	11	21	39	ns
			V_{CC}=2.5V±0.2V		4.2	11	21	
			V_{CC}=3.3V±0.3V		2.6	7	12	
			V_{CC}=5V±0.5V		1.6	6	11	
		$\overline{E}$ to nY	V_{CC}=1.8V±0.15V	FULL	11	21	39	ns
			V_{CC}=2.5V±0.2V		3.4	9	17	
			V_{CC}=3.3V±0.3V		3	8	15	
			V_{CC}=5V±0.5V		1.6	6	11	
Transition Time	t_t	nY	V_{CC}=1.8V±0.15V	25°C		7		ns
			V_{CC}=2.5V±0.2V			4		
			V_{CC}=3.3V±0.3V			5		
			V_{CC}=5V±0.5V			3		

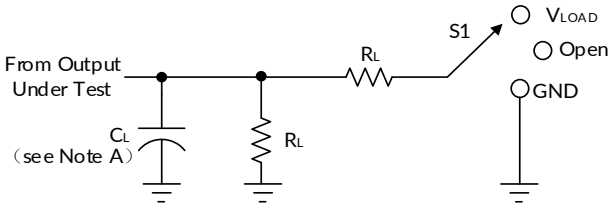
(1) This parameter is ensured by design and/or characterization and is not tested in production.

8.4 Operating Characteristics

T_A = +25°C

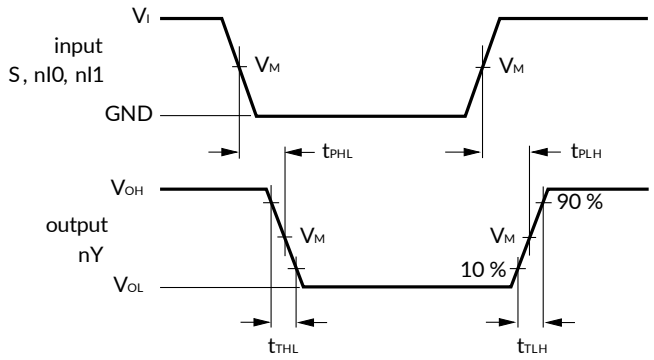
PARAMETER	TEST CONDITIONS	V_{CC} = 1.8V	V_{CC} = 2.5V	V_{CC} = 3.3V	V_{CC} = 5V	UNIT
		TYP	TYP	TYP	TYP	
C_{pd} Power dissipation capacitance	f = 10 MHz	22	25	32	40	pF

9 Parameter Measurement Information



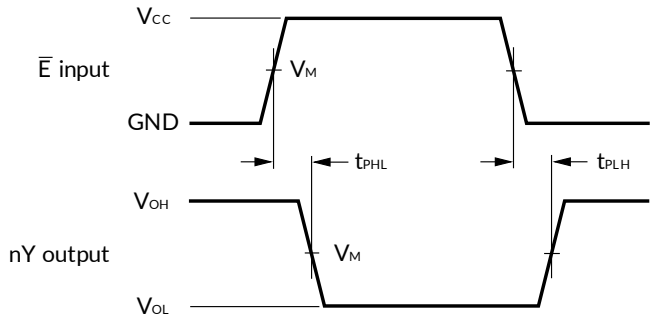
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	30pF	1kΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	30pF	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	2 x V_{CC}	50pF	500Ω	0.3V



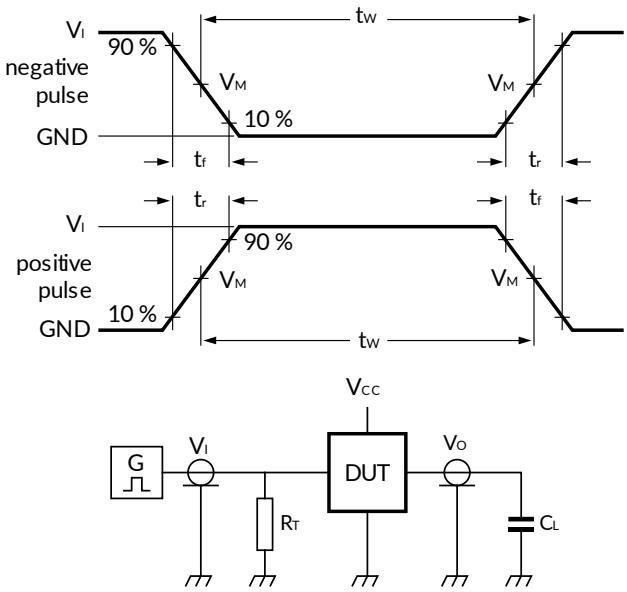
V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Figure 1. Propagation delay input (nI0, nI1, S) to output (nYn)



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

Figure 2. Propagation delay input ($\bar{E}$) to output (nY)

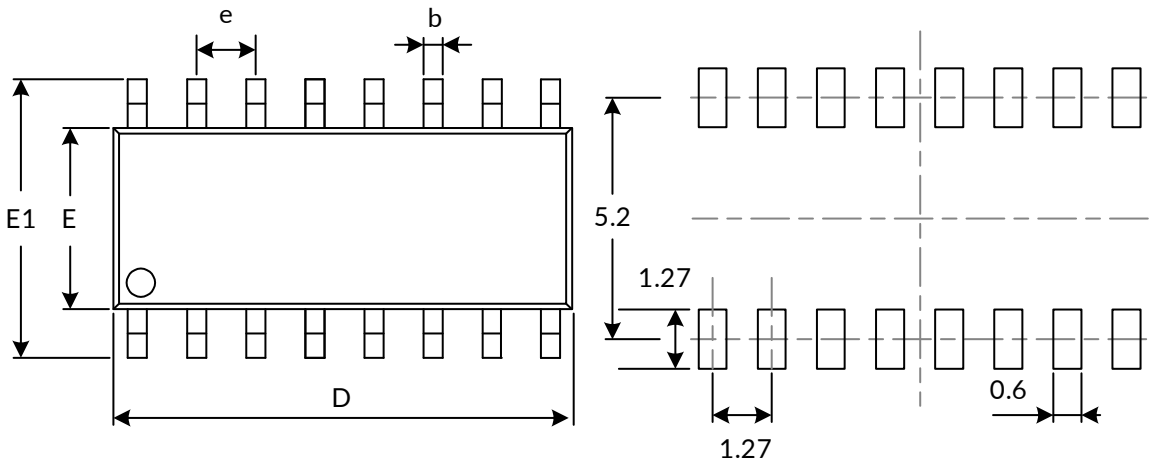


Definitions test circuit:
R_T = Termination resistance should be equal to output impedance Zo of the pulse generator.
C_L = Load capacitance including jig and probe capacitance.
R_L = Load resistance.
S1 = Test selection switch.

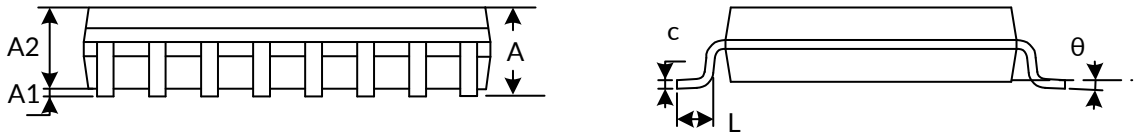
Figure 3. Test circuit for measuring switching times

10 PACKAGE OUTLINE DIMENSIONS

SOP16 (3)



RECOMMENDED LAND PATTERN (Unit: mm)

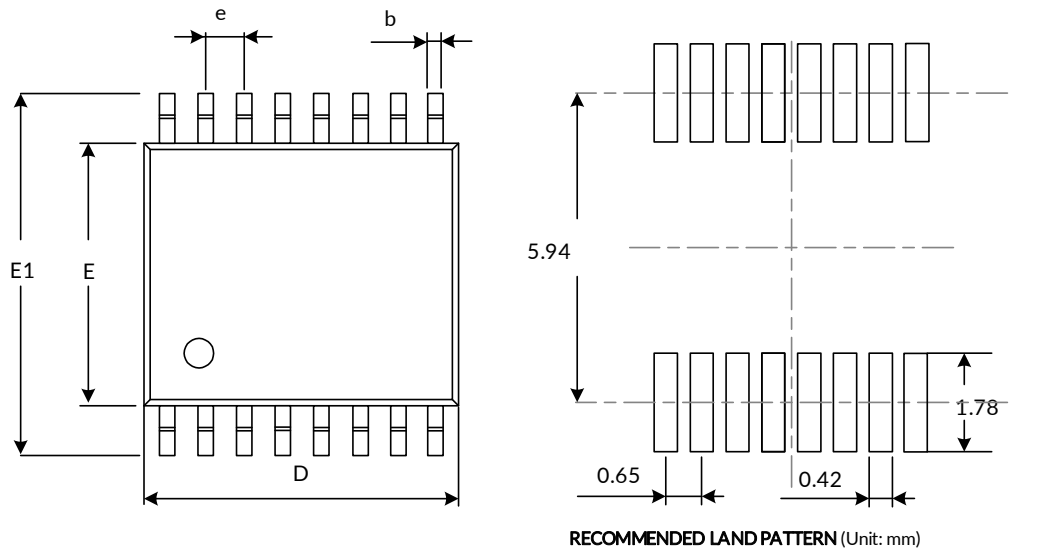


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)		1.750		0.069
A1	0.100	0.225	0.004	0.009
A2	1.300	1.500	0.051	0.059
b	0.390	0.470	0.015	0.019
c	0.200	0.240	0.007	0.010
D (1)	9.800	10.00	0.386	0.394
E (1)	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC) (2)		0.050 (BSC) (2)	
L	0.500	0.800	0.020	0.032
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)



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	0.900	1.050	0.035	0.041
b	0.200	0.280	0.007	0.011
c	0.130	0.170	0.005	0.007
D (1)	4.900	5.100	0.193	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	0.450	0.750	0.017	0.030
H	0.250 TYP		0.010 TYP	
θ	0°	8°	0°	8°

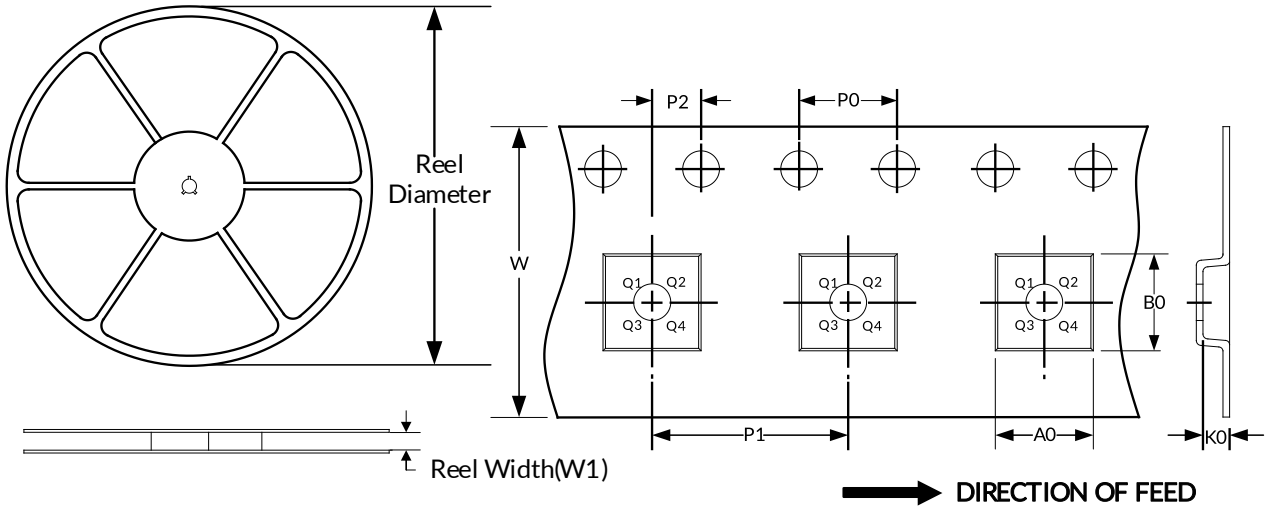
NOTE:

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.

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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