RS3G11 Triple 3-Input Positive-AND Gate

1 FEATURES

- **Operating Voltage Range:1.65V to 5.5V**
- **Low Power Consumption:1μA (Max)**
- **Operating Temperature Range:**
  -40°C to +125°C
- **Inputs Accept Voltage to 5.5V**
- **High Output Drive: ±24mA at V_CC=3.0V**
- **Micro SIZE PACKAGES: SOIC-14(SOP14), TSSOP14**

2 APPLICATIONS

- **Active Noise Elimination**
- **Bar Code Scanner**
- **Blood Pressure Monitor**
- **CPAP Machine**
- **Fingerprint Identification**
- **Network Attached Storage (NAS)**

3 DESCRIPTIONS

The RS3G11 triple 3-input positive-AND gate is designed for 1.65V to 5.5V V_CC operation.

The RS3G11 device contains three AND gates and performs the Boolean function $Y = A \cdot B \cdot C$ or $Y = \overline{\overline{A} + \overline{B} + \overline{C}}$ in positive logic. The device 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.

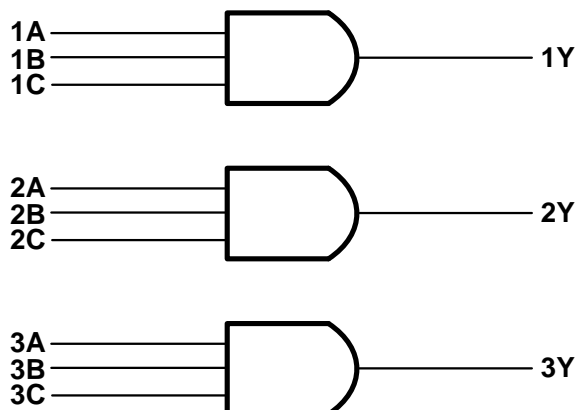The RS3G11 is available in Green SOIC-14(SOP14) and TSSOP-14 packages. It operates over an ambient temperature range of -40°C to +125°C.

Device Information [1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS3G11	SOIC-14 (SOP14)	8.65mm×3.90mm
	TSSOP14	5.00mm×4.40mm

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

LOGIC SYMBOL

4 FUNCTION TABLE

INPUTS			OUTPUT
A	B	C	Y
L	L	L	L
L	L	H	L
L	H	L	L
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	L
H	H	H	H

Y=A•B•C
H=High Voltage Level
L=Low Voltage Level

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5 Revision History

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

Version	Change Date	Change Item
A.1	2023/01/05	Initial version completed

6 PACKAGE/ORDERING INFORMATION [1]

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING [2]	PACKAGE OPTION
RS3G11	RS3G11XP	-40°C ~+125°C	SOIC-14(SOP14)	RS3G11	Tape and Reel,4000
	RS3G11XQ	-40°C ~+125°C	TSSOP-14	RS3G11	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.

7 PIN CONFIGURATIONS

TOP VIEW

```
          ○
1A  │ 1        14 │  Vcc
1B  │ 2        13 │  1C
2A  │ 3        12 │  1Y
2B  │ 4        11 │  3C
2C  │ 5        10 │  3B
2Y  │ 6         9 │  3A
GND │ 7         8 │  3Y
```

SOIC-14(SOP14)/TSSOP-14
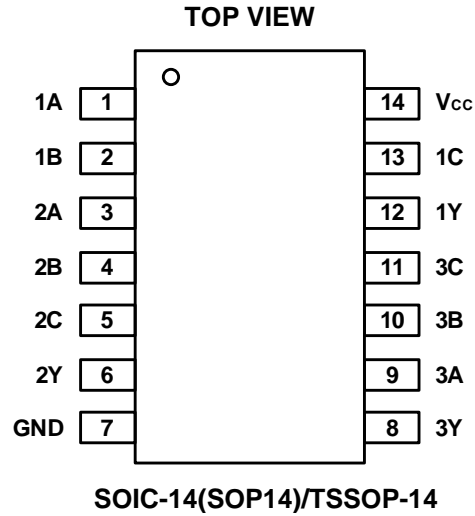
PIN DESCRIPTION

PIN SOIC-14(SOP14)/TSSOP-14	NAME	I/O TYPE [1]	FUNCTION
1	1A	I	Channel 1 logic input
2	1B	I	Channel 1 logic input
3	2A	I	Channel 2 logic input
4	2B	I	Channel 2 logic input
5	2C	I	Channel 2 logic input
6	2Y	O	Logic level output2
7	GND	-	Ground
8	3Y	O	Logic level output3
9	3A	I	Channel 3 logic input
10	3B	I	Channel 3 logic input
11	3C	I	Channel 3 logic input
12	1Y	O	Logic level output1
13	1C	I	Channel 1 logic input
14	Vcc	-	Power Supply

(1) I=input, O=output.

8 SPECIFICATIONS

8.1 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			±50	mA
	Continuous current through V_{CC} or GND			±100	mA
θ_{JA}	Package thermal impedance [4]	SOIC-14(SOP14)		104.5	°C/W
		TSSOP14		89.21	
T_J	Junction temperature [5]		-65	150	°C
Tstg	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.

8.2 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), per ANSI/ESDA/JEDEC JS-001[1]	±4000	V
		Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002[2]	±1500	
		Machine model (MM)	±300	

(1) JEDEC document JEP155 states that 500 V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250 V CDM allows safe manufacturing with a standard ESD control process.

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.

9 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]

9.1 Recommended Operating Conditions

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
Supply voltage	V_{CC}	Operating	1.65	5.5	V
		Data retention only	1.5		
High-level input voltage	V_{IH}	V_{CC}=1.65V to 1.95V	0.65 x V_{CC}		V
		V_{CC}=2.3V to 2.7V	1.7		
		V_{CC}=3V to 3.6V	2		
		V_{CC}=4.5V to 5.5V	0.7 x V_{CC}		
Low-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V		0.35 x 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 x V_{CC}	
Input voltage	V_I		0	5.5	V
Output voltage	V_O		0	V_{CC}	V
Input transition rise or fall	$\Delta t/\Delta v$	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		5	
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.

9.2 DC Characteristics

PARAMETER		TEST CONDITIONS	Vcc	TEMP	MIN(2)	TYP(3)	MAX(2)	UNIT
VOH		IOH = -100μA	1.65V to 5.5V	Full	Vcc-0.1			V
		IOH = -4mA	1.65V		1.2			
		IOH = -8mA	2.3V		1.9			
		IOH = -16mA	3V		2.4			
		IOH = -24mA			2.3			
		IOH = -32mA	4.5V		3.8			
VOL		IOL = 100μA	1.65V to 5.5V	Full			0.1	V
		IOL = 4mA	1.65V				0.45	
		IOL = 8mA	2.3V				0.3	
		IOL = 16mA	3V				0.4	
		IOL = 24mA					0.55	
		IOL = 32mA	4.5V				0.55	
II	All inputs	VI=5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	μA
				Full			±5	
Ioff		VI or VO=5.5V	0	+25°C		±0.1	±1	μA
				Full			±10	
ICC		VI=5.5V or GND, IO=0	1.65V to 5.5V	+25°C		0.1	1	μA
				Full			10	
ΔICC		One input at Vcc-0.6V, Other inputs at Vcc or GND	3V to 5.5V	Full			500	μA
Ci (Input Capacitance)		VI=Vcc or GND	3.3V	+25°C		4		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.
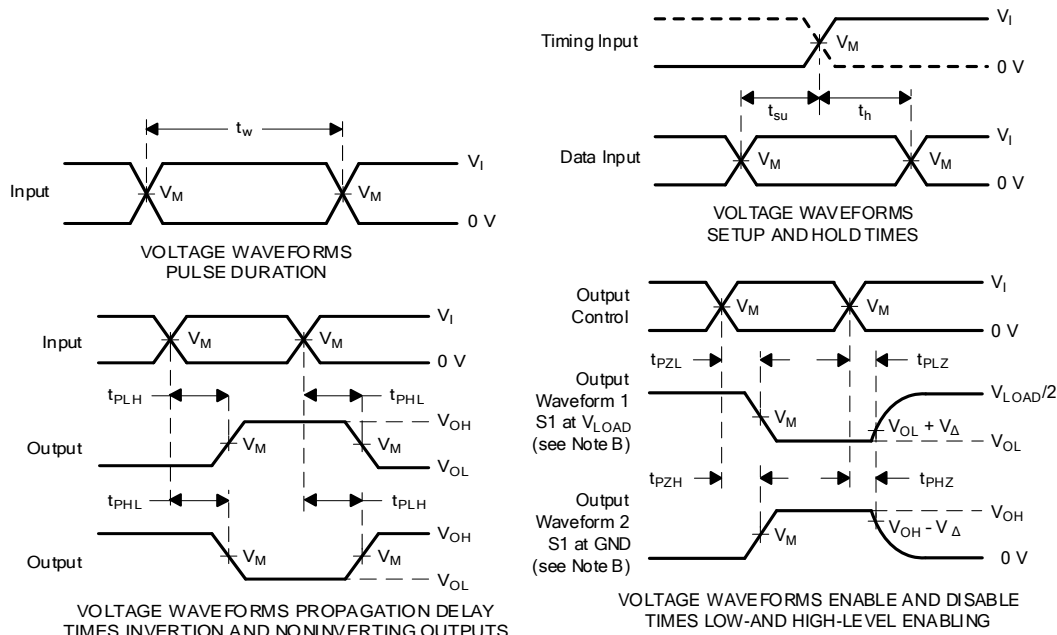
9.3 AC Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS		MIN(2)	TYP(3)	MAX(2)	UNIT
Propagation Delay	tpd	Vcc=1.8V±0.15V	CL=30pF, RL=1KΩ		13.3		ns
		Vcc=2.5V±0.2V	CL=30pF, RL=500Ω		5.4		
		Vcc=3.3V±0.3V	CL=50pF, RL=500Ω		4.3		
		Vcc=5V±0.5V	CL=50pF, RL=500Ω		3.5		
Power dissipation capacitance	Cpd	Vcc=1.8V	f=10MHz		16		pF
		Vcc=2.5V			18		
		Vcc=3.3V			18		
		Vcc=5V			20		

(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.

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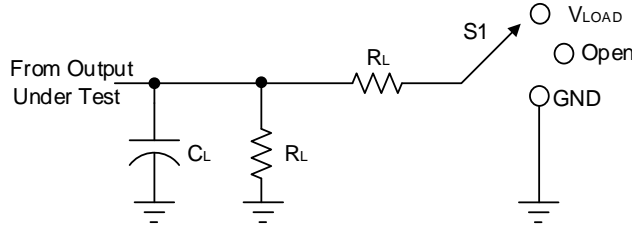
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

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}	15pF	30pF	1MΩ	1kΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	V_{CC}/2	2 x V_{CC}	15pF	30pF	1MΩ	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	15pF	50pF	1MΩ	500Ω	0.3V
5V±0.5V	V_{CC}	≤2.5ns	V_{CC}/2	2 x V_{CC}	15pF	50pF	1MΩ	500Ω	0.3V

VOLTAGE WAVEFORMS
PULSE DURATION

VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES

VOLTAGE WAVEFORMS PROPAGATION DELAY
TIMES INVERTION AND NONINVERTING OUTPUTS

VOLTAGE WAVEFORMS ENABLE AND DISABLE
TIMES LOW- AND HIGH-LEVEL ENABLING

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 ≤ 10 MHz, Z_O = 50 Ω.
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}.
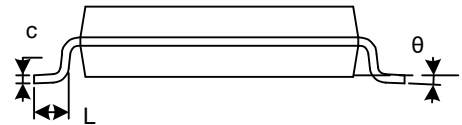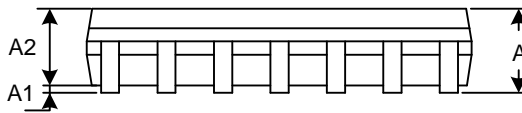H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

11 PACKAGE OUTLINE DIMENSIONS
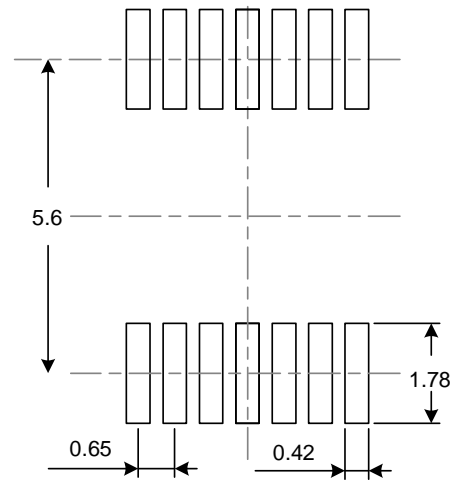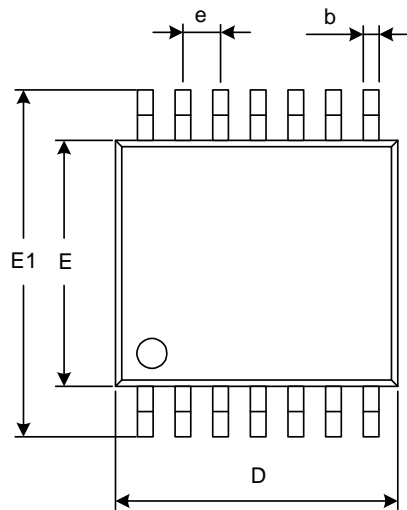## SOIC-14(SOP14)
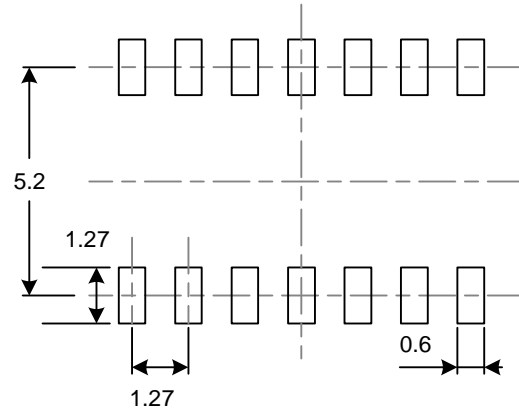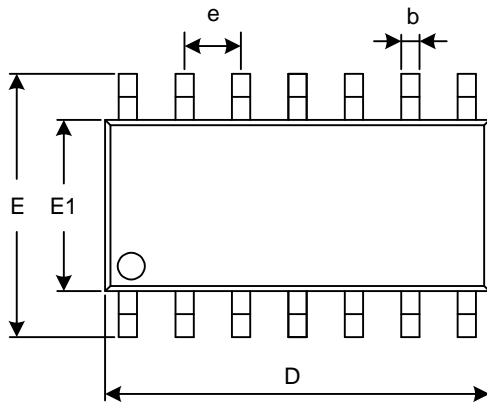
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	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	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TSSOP-14

RECOMMENDED LAND PATTERN (Unit: mm)
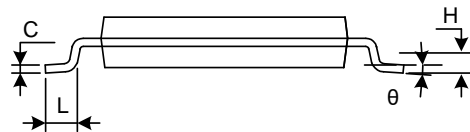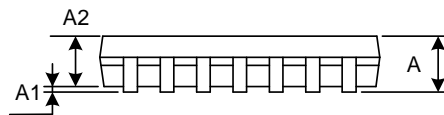
| Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°

NOTE:
   A. All linear dimension is in millimeters.
   B. This drawing is subject to change without notice.
   C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
   D. BSC: Basic Dimension. Theoretically exact value shown without tolerances.

12 TAPE AND REEL INFORMATION

REEL DIMENSIONS   TAPE DIMENSION
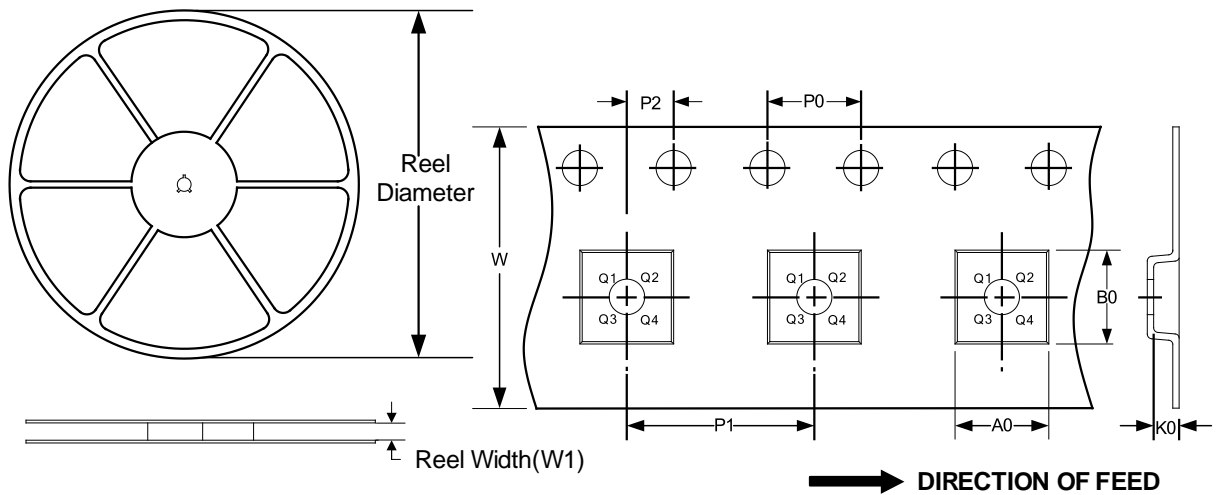
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOIC-14(SOP14)	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	Q1
TSSOP-14	13"	12.4	6.95	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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