SGM4575xQ
Automotive 4-Bit Fixed Direction Voltage-Level Translator with Schmitt-Trigger Inputs and 3-State Outputs

GENERAL DESCRIPTION

The SGM4575xQ series are 4-bit, dual-supply non-inverting fixed direction voltage-level translators. The A and B ports track the V_{CCA} supply and V_{CCB} supply respectively. The supply voltage range is from 1.1V to 5.5V for both A and B ports. The device has an output enable (OE) function, which controls the input and output states. It refers to the minimum values of V_{CCA} and V_{CCB}. The fixed direction feature allows data to transmit from A port to B port when OE goes high. When OE goes low, all I/Os enter into the high-impedance state.

The SGM4575-04Q is a 4-bit, dual-supply non-inverting fixed direction voltage level translator with all 4 channels in the same direction commonly used for GPIO translation.

The SGM4575-13Q is a 4-bit, dual-supply non-inverting fixed direction voltage level translator with 1 channel in the opposing direction commonly used for GPIO, SPI, and I2S translation.

The SGM4575-22Q is a 4-bit, dual-supply non-inverting fixed direction voltage level translator with 2 channels in the opposing direction commonly used for GPIO, UART, and JTAG translation.

The SGM4575xQ is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The SGM4575-04Q, SGM4575-13Q and SGM4575-22Q are available in Green TQFN-2.5×3-14L and TSSOP-14 packages and is rated over the -40℃ to +125℃ temperature range.

APPLICATIONS

General I/O Level Shifting
Push-Pull Level Shifting (Like UART, SPI, JTAG)
Automotive Applications
Battery Powered Equipment
Industrial Equipment
Medical Equipment
Telecom Equipment

FEATURES

- **AEC-Q100 Qualified for Automotive Applications**
  Device Temperature Grade 1
  T_A = -40℃ to +125℃
- **V_{CCA} Supply Voltage Range: 1.1V to 5.5V**
- **V_{CCB} Supply Voltage Range: 1.1V to 5.5V**
- **Inputs Accept Voltages Higher than the Supply Voltage and up to 5.5V**
- **Up to 200Mbps (TYP) Supporting for 3.3V to 5.0V**
- **Low Power Consumption**
  - **1.61μA (TYP) at +25℃**
- **Slow and Noisy Inputs are Allowed by Schmitt-Trigger Inputs**
- **Integrated Static Pull-Down Resistors for Inputs Help the Channels Avoid Floating**
- **Outputs are Disabled when V_{CC} ≤ 100mV or Floating**
- **I_{OFF} Allows Operation in Partial-Power-Down Mode**
- **OE with V_{CC_MIN} Circuitry Allows for Control from Either A or B Port**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green TQFN-2.5×3-14L and TSSOP-14 Packages**

FUNCTION TABLE

CONTROL INPUT	PORTS		OPERATION
OE	INPUTS	OUTPUTS	
H	L	L	Unidirectional, non-inverting
H	H	H	Unidirectional, non-inverting
L	*X*	Z	Isolation

H = High Voltage Level
L = Low Voltage Level
Z = High-Impedance State
X = Don't Care.

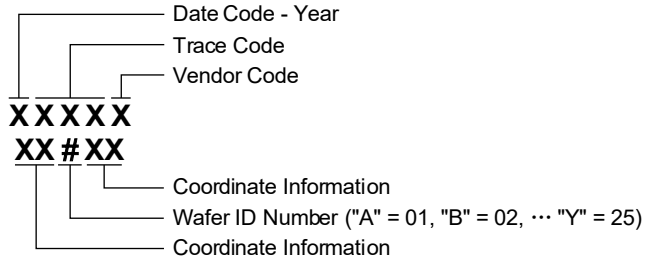
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE TOP MARKING	PACKING OPTION
SGM4575-04Q	TQFN-2.5×3-14L	-40℃ to +125℃	SGM4575-04QTWB14G/TR	2FVWB XXXXX XX#XX	Tape and Reel, 3000
	TSSOP-14	-40℃ to +125℃	SGM4575-04QTS14G/TR	2FT TS14 XXXXX	Tape and Reel, 4000
SGM4575-13Q	TQFN-2.5×3-14L	-40℃ to +125℃	SGM4575-13QTWB14G/TR	2FXWB XXXXX XX#XX	Tape and Reel, 3000
	TSSOP-14	-40℃ to +125℃	SGM4575-13QTS14G/TR	2FU TS14 XXXXX	Tape and Reel, 4000
SGM4575-22Q	TQFN-2.5×3-14L	-40℃ to +125℃	SGM4575-22QTWB14G/TR	25OWB XXXXX XX#XX	Tape and Reel, 3000
	TSSOP-14	-40℃ to +125℃	SGM4575-22QTS14G/TR	25M TS14 XXXXX	Tape and Reel, 4000

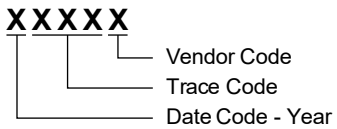
MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code. XX#XX = Coordinate Information and Wafer ID Number.

TQFN-2.5×3-14L



TSSOP-14



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage A, V_{CCA} ..... -0.5V to 6.5V
Supply Voltage B, V_{CCB} ..... -0.5V to 6.5V
Input Voltage, V_I (1)
A or B Ports ..... -0.5V to 6.5V
OE ..... -0.5V to 6.5V
Output Voltage, V_O (1) (2)
3-State Mode ..... -0.5V to 6.5V
Active Mode ..... -0.5V to MIN(6.5V, V_{CCO} + 0.5V)
Input Clamp Current, I_{IK}, V_{IN} < 0V ..... -20mA
Output Clamp Current, I_{OK}, V_{OUT} < 0V ..... -20mA
Continuous Output Current, I_O ..... ±25mA
Continuous Current through V_{CC} or GND, I_O ..... ±100mA
Junction Temperature (3) ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃

NOTES:
1. The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.
2. V_{CCO} is the supply voltage associated with the data output port.
3. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage A, V_{CCA} ..... 1.1V to 5.5V
Supply Voltage B, V_{CCB} ..... 1.1V to 5.5V
Input Voltage, V_I ..... 0V to 5.5V
Output Voltage, V_O
Active Mode ..... 0V to V_{CCO}
3-State Mode ..... 0V to 5.5V
Operating Ambient Temperature Range ..... -40℃ to +125℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

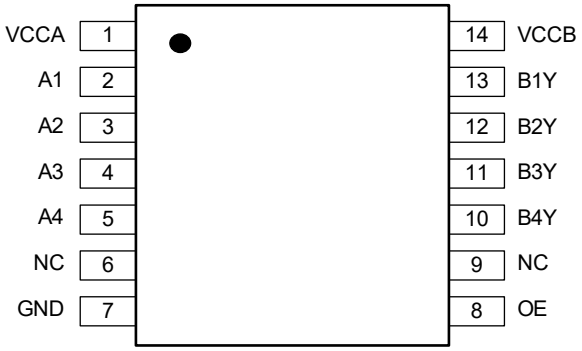
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

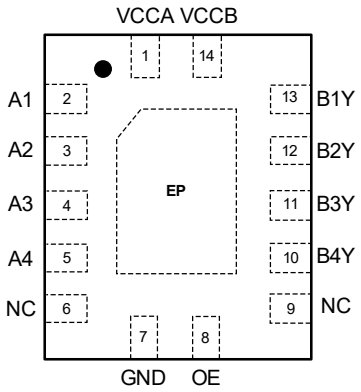
PIN CONFIGURATIONS OF SGM4575-04Q

(TOP VIEW)



TSSOP-14

(TOP VIEW)



TQFN-2.5×3-14L

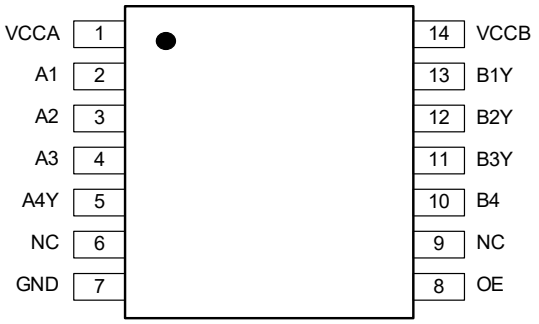
PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	VCCA	-	Supply Voltage on A Port. 1.1V ≤ V_{CCA} ≤ 5.5V.
2	A1	I	Input A1. It tracks the V_{CCA} supply.
3	A2	I	Input A2. It tracks the V_{CCA} supply.
4	A3	I	Input A3. It tracks the V_{CCA} supply.
5	A4	I	Input A4. It tracks the V_{CCA} supply.
7	GND	-	Ground.
6, 9	NC	-	No Internal Connection.
10	B4Y	O	Output B4. It tracks the V_{CCB} supply.
11	B3Y	O	Output B3. It tracks the V_{CCB} supply.
12	B2Y	O	Output B2. It tracks the V_{CCB} supply.
13	B1Y	O	Output B1. It tracks the V_{CCB} supply.
14	VCCB	-	Supply Voltage on B Port. 1.1V ≤ V_{CCB} ≤ 5.5V.
8	OE	I	Output Enable Pin (Active-High).

NOTE: I = input, O = output.

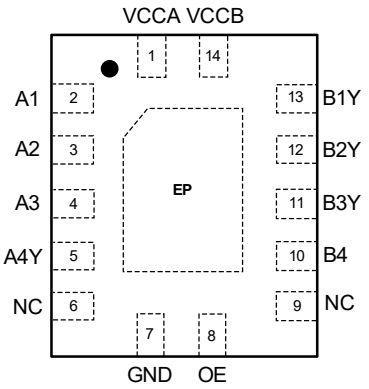
PIN CONFIGURATIONS OF SGM4575-13Q

(TOP VIEW)



TSSOP-14

(TOP VIEW)



TQFN-2.5×3-14L

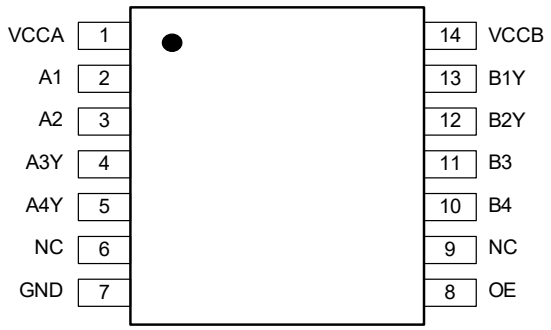
PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	VCCA	-	Supply Voltage on A Port. 1.1V ≤ V_{CCA} ≤ 5.5V.
2	A1	I	Input A1. It tracks the V_{CCA} supply.
3	A2	I	Input A2. It tracks the V_{CCA} supply.
4	A3	I	Input A3. It tracks the V_{CCA} supply.
5	A4Y	O	Output A4. It tracks the V_{CCA} supply.
7	GND	-	Ground.
6, 9	NC	-	No Internal Connection.
10	B4	I	Input B4. It tracks the V_{CCB} supply.
11	B3Y	O	Output B3. It tracks the V_{CCB} supply.
12	B2Y	O	Output B2. It tracks the V_{CCB} supply.
13	B1Y	O	Output B1. It tracks the V_{CCB} supply.
14	VCCB	-	Supply Voltage on B Port. 1.1V ≤ V_{CCB} ≤ 5.5V.
8	OE	I	Output Enable Pin (Active-High).

NOTE: I = input, O = output.

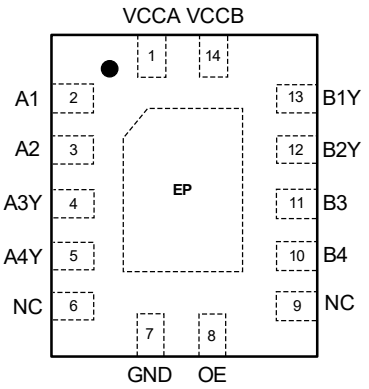
PIN CONFIGURATIONS OF SGM4575-22Q

(TOP VIEW)



TSSOP-14

(TOP VIEW)



TQFN-2.5×3-14L

PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	VCCA	-	Supply Voltage on A Port. 1.1V ≤ V_{CCA} ≤ 5.5V.
2	A1	I	Input A1. It tracks the V_{CCA} supply.
3	A2	I	Input A2. It tracks the V_{CCA} supply.
4	A3Y	O	Output A3. It tracks the V_{CCA} supply.
5	A4Y	O	Output A4. It tracks the V_{CCA} supply.
7	GND	-	Ground.
6, 9	NC	-	No Internal Connection.
10	B4	I	Input B4. It tracks the V_{CCB} supply.
11	B3	I	Input B3. It tracks the V_{CCB} supply.
12	B2Y	O	Output B2. It tracks the V_{CCB} supply.
13	B1Y	O	Output B1. It tracks the V_{CCB} supply.
14	VCCB	-	Supply Voltage on B Port. 1.1V ≤ V_{CCB} ≤ 5.5V.
8	OE	I	Output Enable Pin (Active-High).

NOTE: I = input, O = output.

ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +125℃, all typical values are measured at V_{CCI} = 5.5V, V_{CCO} = 5.5V and T_A = +25℃. V_{CCI} is the supply voltage associated with the data input ports. V_{CCO} is the supply voltage associated with the data output ports, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Positive-Going Input Threshold Voltage	V_{T+}	Data Inputs (Referenced to V_{CCI})	V_{CCA} = 1.1V, V_{CCB} = 1.1V	+25℃	0.44		0.88	V
			V_{CCA} = 1.4V, V_{CCB} = 1.4V	+25℃	0.60		0.98	
			V_{CCA} = 1.65V, V_{CCB} = 1.65V	+25℃	0.76		1.13	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V	+25℃	1.08		1.56	
			V_{CCA} = 3.0V, V_{CCB} = 3.0V	+25℃	1.48		1.92	
			V_{CCA} = 4.5V, V_{CCB} = 4.5V	+25℃	2.19		2.74	
			V_{CCA} = 5.5V, V_{CCB} = 5.5V	+25℃	2.65		3.33	
		OE (Referenced to V_{CCA} or V_{CCB})	V_{CCA} = 1.1V, V_{CCB} = 1.1V	+25℃	0.44		0.88	V
			V_{CCA} = 1.4V, V_{CCB} = 1.4V	+25℃	0.60		0.98	
			V_{CCA} = 1.65V, V_{CCB} = 1.65V	+25℃	0.76		1.13	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V	+25℃	1.08		1.56	
			V_{CCA} = 3.0V, V_{CCB} = 3.0V	+25℃	1.48		1.92	
			V_{CCA} = 4.5V, V_{CCB} = 4.5V	+25℃	2.19		2.74	
			V_{CCA} = 5.5V, V_{CCB} = 5.5V	+25℃	2.65		3.33	
Negative-Going Input Threshold Voltage	V_{T-}	Data Inputs (Referenced to V_{CCI})	V_{CCA} = 1.1V, V_{CCB} = 1.1V	+25℃	0.17		0.48	V
			V_{CCA} = 1.4V, V_{CCB} = 1.4V	+25℃	0.28		0.59	
			V_{CCA} = 1.65V, V_{CCB} = 1.65V	+25℃	0.35		0.69	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V	+25℃	0.56		0.97	
			V_{CCA} = 3.0V, V_{CCB} = 3.0V	+25℃	0.89		1.5	
			V_{CCA} = 4.5V, V_{CCB} = 4.5V	+25℃	1.51		1.97	
			V_{CCA} = 5.5V, V_{CCB} = 5.5V	+25℃	1.88		2.4	
		OE (Referenced to V_{CCA} or V_{CCB})	V_{CCA} = 1.1V, V_{CCB} = 1.1V	+25℃	0.17		0.48	V
			V_{CCA} = 1.4V, V_{CCB} = 1.4V	+25℃	0.28		0.59	
			V_{CCA} = 1.65V, V_{CCB} = 1.65V	+25℃	0.35		0.69	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V	+25℃	0.56		0.97	
			V_{CCA} = 3.0V, V_{CCB} = 3.0V	+25℃	0.89		1.5	
			V_{CCA} = 4.5V, V_{CCB} = 4.5V	+25℃	1.51		1.97	
			V_{CCA} = 5.5V, V_{CCB} = 5.5V	+25℃	1.88		2.46	
Input-Threshold Hysteresis (V_{T+} - V_{T-})	ΔV_T	Data Inputs (Referenced to V_{CCI})	V_{CCA} = 1.1V, V_{CCB} = 1.1V	+25℃	0.2		0.4	V
			V_{CCA} = 1.4V, V_{CCB} = 1.4V	+25℃	0.25		0.5	
			V_{CCA} = 1.65V, V_{CCB} = 1.65V	+25℃	0.3		0.55	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V	+25℃	0.38		0.65	
			V_{CCA} = 3.0V, V_{CCB} = 3.0V	+25℃	0.46		0.72	
			V_{CCA} = 4.5V, V_{CCB} = 4.5V	+25℃	0.58		0.93	
			V_{CCA} = 5.5V, V_{CCB} = 5.5V	+25℃	0.69		1.06	
		OE (Referenced to V_{CCA} or V_{CCB})	V_{CCA} = 1.1V, V_{CCB} = 1.1V	+25℃	0.15		0.41	V
			V_{CCA} = 1.4V, V_{CCB} = 1.4V	+25℃	0.2		0.5	
			V_{CCA} = 1.65V, V_{CCB} = 1.65V	+25℃	0.23		0.55	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V	+25℃	0.32		0.65	
			V_{CCA} = 3.0V, V_{CCB} = 3.0V	+25℃	0.39		0.72	
			V_{CCA} = 4.5V, V_{CCB} = 4.5V	+25℃	0.57		0.97	
			V_{CCA} = 5.5V, V_{CCB} = 5.5V	+25℃	0.69		1.18	

ELECTRICAL CHARACTERISTICS (continued)

(Full = -40℃ to +125℃, all typical values are measured at V_{CCI} = 5.5V, V_{CCO} = 5.5V and T_A = +25℃. V_{CCI} is the supply voltage associated with the data input ports. V_{CCO} is the supply voltage associated with the data output ports, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
High-Level Output Voltage	V_{OH}	I_{OH} = -0.1mA	V_{CCO} = 1.1V to 5.5V	+25℃		V_{CCO} - 0.01		V
		I_{OH} = -0.5mA	V_{CCO} = 1.1V	+25℃		1.08		
		I_{OH} = -3mA	V_{CCO} = 1.4V	+25℃		1.36		
		I_{OH} = -4.5mA	V_{CCO} = 1.65V	+25℃		1.55		
		I_{OH} = -8mA	V_{CCO} = 2.3V	+25℃		2.18		
		I_{OH} = -10mA	V_{CCO} = 3.0V	+25℃		2.88		
		I_{OH} = -12mA	V_{CCO} = 4.5V	+25℃		4.39		
Low-Level Output Voltage	V_{OL}	I_{OL} = 0.1mA	V_{CCO} = 1.1V to 5.5V	+25℃		0.01		V
		I_{OL} = 0.5mA	V_{CCO} = 1.1V	+25℃		0.02		
		I_{OL} = 3mA	V_{CCO} = 1.4V	+25℃		0.07		
		I_{OL} = 4.5mA	V_{CCO} = 1.65V	+25℃		0.09		
		I_{OL} = 8mA	V_{CCO} = 2.3V	+25℃		0.12		
		I_{OL} = 10mA	V_{CCO} = 3.0V	+25℃		0.12		
		I_{OL} = 8mA	V_{CCO} = 4.5V	+25℃		0.08		
		I_{OL} = 12mA	V_{CCO} = 4.5V	+25℃		0.12		
Input Leakage Current	I_I	OE, V_I = V_{CC} or GND	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		1.0		μA
		Data Inputs (Ax, Bx) V_I = V_{CCI} or GND	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		1.0		
Partial Power Down Current	I_{OFF}	A or B Output Ports, V_I or V_O = 0V or 5.5V	V_{CCA} = 0V, V_{CCB} = 1.1V to 5.5V	+25℃		1.0		μA
			V_{CCA} = 1.1V to 5.5V, V_{CCB} = 0V	+25℃		1.0		
Floating Supply Partial Power Down Current (1)	I_{OFF_FLOAT}	A or B Output Ports, V_I or V_O = GND	V_{CCA} floating, V_{CCB} = 1.1V to 5.5V	+25℃		±0.01		μA
			V_{CCB} floating, V_{CCA} = 1.1V to 5.5V	+25℃		±0.01		
Tri-State Output Current	I_{OZ}	A or B Output Ports, V_I = 0V or V_{CCI} V_O = 0V or V_{CCO}	OE = 0V, V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		±0.01		μA
			V_{CCA} = 0V, V_{CCB} = 1.1V to 5.5V	+25℃		±0.01		
			V_{CCB} = 0V, V_{CCA} = 1.1V to 5.5V,	+25℃		±0.01		
Supply Current SGM4575-04Q	I_{CCA}	V_I = V_{CCI} or GND I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		TBD		μA
			V_{CCA} = 0V, V_{CCB} = 5.5V	+25℃		TBD		
			V_{CCA} = 5.5V, V_{CCB} = 0V	+25℃		TBD		
			V_{CCA} = 5.5V, V_{CCB} floating	+25℃		TBD		
	I_{CCB}	V_I = V_{CCI} or GND I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		TBD		
			V_{CCA} = 0V, V_{CCB} = 5.5V	+25℃		TBD		
			V_{CCA} = 5.5V, V_{CCB} = 0V	+25℃		TBD		
			V_{CCA} floating, V_{CCB} = 5.5V	+25℃		TBD		
	I_{CCA} + I_{CCB}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		TBD		

ELECTRICAL CHARACTERISTICS (continued)

(Full = -40℃ to +125℃, all typical values are measured at V_{CCI} = 5.5V, V_{CCO} = 5.5V and T_A = +25℃. V_{CCI} is the supply voltage associated with the data input ports. V_{CCO} is the supply voltage associated with the data output ports, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Supply Current SGM4575-13Q	I_{CCA}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		0.63		μA
			V_{CCA} = 0V, V_{CCB} = 5.5V	+25℃		-0.02		
			V_{CCA} = 5.5V, V_{CCB} = 0V	+25℃		0.1		
			V_{CCA} = 5.5V, V_{CCB} floating	+25℃		0.1		
	I_{CCB}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		0.98		
			V_{CCA} = 0V, V_{CCB} = 5.5V	+25℃		0.25		
			V_{CCA} = 5.5V, V_{CCB} = 0V	+25℃		-0.02		
			V_{CCA} floating, V_{CCB} = 5.5V	+25℃		0.25		
	I_{CCA} + I_{CCB}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		1.6		
Supply Current SGM4575-22Q	I_{CCA}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		0.82		μA
			V_{CCA} = 0V, V_{CCB} = 5.5V	+25℃		-0.02		
			V_{CCA} = 5.5V, V_{CCB} = 0V	+25℃		0.1		
			V_{CCA} = 5.5V, V_{CCB} floating	+25℃		0.1		
	I_{CCB}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		0.90		
			V_{CCA} = 0V, V_{CCB} = 5.5V	+25℃		0.26		
			V_{CCA} = 5.5V, V_{CCB} = 0V	+25℃		-0.02		
			V_{CCA} floating, V_{CCB} = 5.5V	+25℃		0.26		
	I_{CCA} + I_{CCB}	V_I = V_{CCI} or GND, I_O = 0	V_{CCA} = 1.1V to 5.5V, V_{CCB} = 1.1V to 5.5V	+25℃		1.72		
Control Input Capacitance	C_I	V_I = 3.3V or GND	V_{CCA} = 3.3V, V_{CCB} = 3.3V	+25℃		5.1		pF
Data I/O Capacitance	$C_{I/O}$	OE = GND, V_O = 1.65V, DC +1MHz -16dBm sine wave	V_{CCA} = 3.3V, V_{CCB} = 3.3V	+25℃		6.2		pF

NOTE: 1. Floating is defined as a node that is both not actively driven by an external device and has leakage not exceeding 10nA.

DYNAMIC CHARACTERISTICS

(Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCB}									UNITS
			1.2V ± 0.1V			1.5V ± 0.1V			1.8V ± 0.15V			
			MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	
V_{CCA} = 1.2V ± 0.1V (2)												
Propagation Delay	t_{PD}	A to B		13.4			10.2			8.9		ns
		B to A		13.4			12.2			11.9		
Disable Time	t_{DIS}	OE to A		29.4			29.3			29.1		ns
		OE to B		29.6			25.6			25.5		
Enable Time	t_{EN}	OE to A		19.3			19.1			19.2		ns
		OE to B		18.9			14.5			12.9		
V_{CCA} = 1.5V ± 0.1V (2)												
Propagation Delay	t_{PD}	A to B		12.3			9.0			7.7		ns
		B to A		10.1			8.9			8.5		
Disable Time	t_{DIS}	OE to A		21.0			20.8			20.7		ns
		OE to B		25.6			21.1			20.9		
Enable Time	t_{EN}	OE to A		12.9			12.3			12.4		ns
		OE to B		17.0			12.2			10.5		
V_{CCA} = 1.8V ± 0.15V (2)												
Propagation Delay	t_{PD}	A to B		11.9			8.5			7.2		ns
		B to A		8.8			7.7			7.2		
Disable Time	t_{DIS}	OE to A		21.0			19.1			19.4		ns
		OE to B		25.8			19.3			19.4		
Enable Time	t_{EN}	OE to A		10.8			9.9			9.8		ns
		OE to B		16.8			11.4			9.7		
V_{CCA} = 2.5V ± 0.2V (2)												
Propagation Delay	t_{PD}	A to B		11.5			8.0			6.7		ns
		B to A		7.4			6.1			5.6		
Disable Time	t_{DIS}	OE to A		17.6			15.9			14.8		ns
		OE to B		25.1			19.3			17.9		
Enable Time	t_{EN}	OE to A		8.5			7.3			7.0		ns
		OE to B		16.5			11.2			9.0		
V_{CCA} = 3.3V ± 0.3V (2)												
Propagation Delay	t_{PD}	A to B		11.3			7.7			6.4		ns
		B to A		6.8			5.5			5.0		
Disable Time	t_{DIS}	OE to A		19.3			16.9			16.2		ns
		OE to B		24.9			19.2			17.4		
Enable Time	t_{EN}	OE to A		7.7			6.4			5.8		ns
		OE to B		16.4			11.1			8.9		
V_{CCA} = 5.0V ± 0.5V (2)												
Propagation Delay	t_{PD}	A to B		11.2			7.5			6.2		ns
		B to A		6.7			5.0			4.5		
Disable Time	t_{DIS}	OE to A		16.2			14.8			13.3		ns
		OE to B		24.9			19.5			16.9		
Enable Time	t_{EN}	OE to A		7.2			5.6			5.0		ns
		OE to B		16.4			11.1			8.8		

DYNAMIC CHARACTERISTICS (continued)

(Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCB}									UNITS
			2.5V ± 0.2V			3.3V ± 0.3V			5.0V ± 0.5V			
			MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	
V_{CCA} = 1.2V ± 0.1V (2)												
Propagation Delay	t_{PD}	A to B		7.4			6.8			6.6		ns
		B to A		11.5			11.3			11.1		
Disable Time	t_{DIS}	OE to A		29.4			29.4			29.5		ns
		OE to B		22.5			24.0			21.4		
Enable Time	t_{EN}	OE to A		19.1			19.1			18.9		ns
		OE to B		11.1			10.6			10.5		
V_{CCA} = 1.5V ± 0.1V (2)												
Propagation Delay	t_{PD}	A to B		6.2			5.5			5.1		ns
		B to A		8.0			7.7			7.5		
Disable Time	t_{DIS}	OE to A		20.4			20.4			20.5		ns
		OE to B		17.4			19.2			16.3		
Enable Time	t_{EN}	OE to A		12.3			12.4			12.3		ns
		OE to B		8.5			7.7			7.2		
V_{CCA} = 1.8V ± 0.15V (2)												
Propagation Delay	t_{PD}	A to B		5.7			5.0			4.5		ns
		B to A		6.6			6.3			6.1		
Disable Time	t_{DIS}	OE to A		19.1			19.0			18.6		ns
		OE to B		15.9			17.3			14.9		
Enable Time	t_{EN}	OE to A		9.8			9.7			9.6		ns
		OE to B		7.5			6.7			6.1		
V_{CCA} = 2.5V ± 0.2V (2)												
Propagation Delay	t_{PD}	A to B		5.1			4.4			3.9		ns
		B to A		5.0			4.7			4.5		
Disable Time	t_{DIS}	OE to A		13.9			14.4			14.9		ns
		OE to B		14.6			15.6			12.4		
Enable Time	t_{EN}	OE to A		6.7			6.6			6.6		ns
		OE to B		6.6			5.5			4.8		
V_{CCA} = 3.3V ± 0.3V (2)												
Propagation Delay	t_{PD}	A to B		4.8			4.1			3.5		ns
		B to A		4.4			4.1			3.8		
Disable Time	t_{DIS}	OE to A		14.9			14.8			15.5		ns
		OE to B		14.0			15.1			11.9		
Enable Time	t_{EN}	OE to A		5.3			5.2			5.1		ns
		OE to B		6.2			5.1			4.3		
V_{CCA} = 5.0V ± 0.5V (2)												
Propagation Delay	t_{PD}	A to B		4.5			3.8			3.3		ns
		B to A		3.9			3.5			3.3		
Disable Time	t_{DIS}	OE to A		11.8			11.4			11.4		ns
		OE to B		15.3			15.4			11.6		
Enable Time	t_{EN}	OE to A		4.3			4.0			3.9		ns
		OE to B		6.1			4.8			3.9		

NOTES:

1. Specified by design and characterization, not production tested.

2. t_{PD} is the same as t_{PLH} and t_{PHL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}. t_{EN} is the same as t_{PZL} and t_{PZH}.

TYPICAL POWER DISSIPATION CAPACITANCE

(T_A = +25℃, V_{CCA} = V_{CCB}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		V_{CCA} = V_{CCB}						UNITS
				1.2V ± 0.1V	1.5V ± 0.1V	1.8V ± 0.15V	2.5V ± 0.2V	3.3V ± 0.3V	5.0V ± 0.5V	
Power Dissipation Capacitance (1)	C_{PDA}	A Port, C_L = 0, R_L = Open f = 10MHz t_{RISE} = t_{FALL} = 1ns	A to B: outputs enabled	2	2	2	2	2	2	pF
			A to B: outputs disabled	2	2	2	2	2	2	
			B to A: outputs enabled	16	17	17	18	19	21	
			B to A: outputs disabled	2	2	2	2	2	2	
	C_{PDB}	B Port, C_L = 0, R_L = Open f = 10MHz t_{RISE} = t_{FALL} = 1ns	A to B: outputs enabled	16	16	17	18	19	20	pF
			A to B: outputs disabled	2	2	2	2	2	2	
			B to A: outputs enabled	2	2	2	2	2	2	
			B to A: outputs disabled	2	2	2	2	2	2	

NOTE:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

   $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$

   where:

   f_i = Input frequency in MHz.

   f_o = Output frequency in MHz.

   C_L = Output load capacitance in pF.

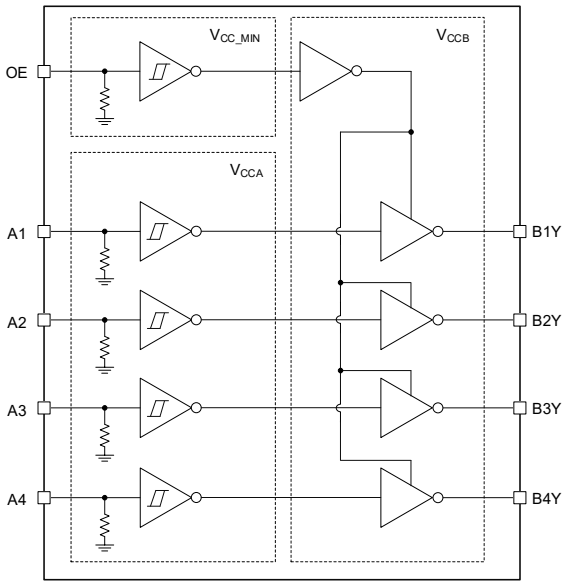
   V_{CC} = Supply voltage in Volts.

   N = Number of inputs switching.

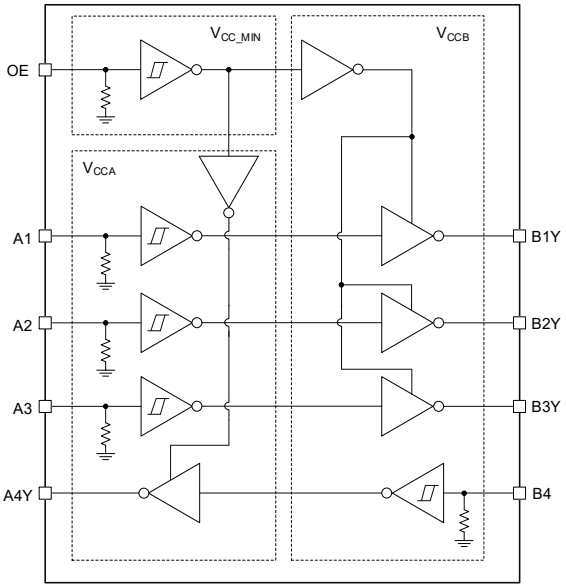
   $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = Sum of the outputs.

FUNCTIONAL BLOCK DIAGRAM

SGM4575-04Q



SGM4575-13Q



SGM4575-22Q

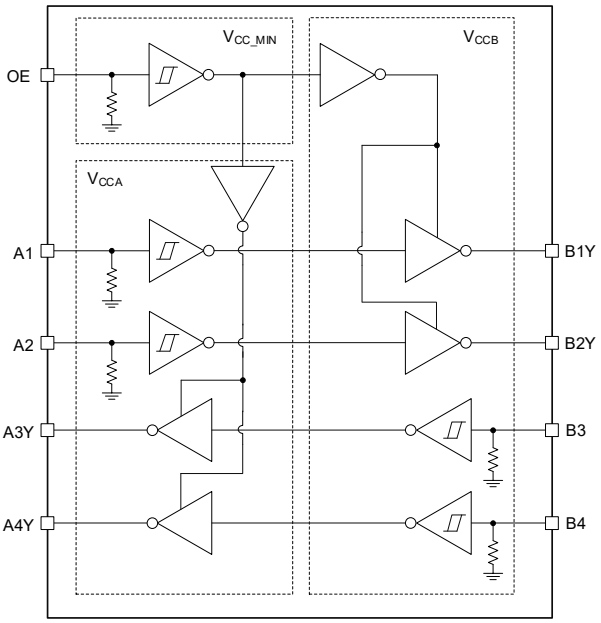
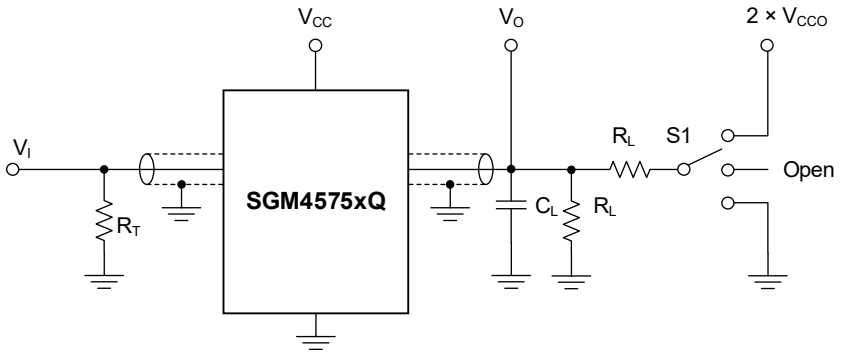


Figure 1. Block Diagram

TEST CIRCUIT



Test conditions are given in Table 1.

Definitions for test circuit:

R_L: Load resistance.

C_L: Load capacitance (includes jig and probe).

R_T: Termination resistance (equals to output impedance Z_O of the pulse generator).

S1: Test selection switch.

V_{EXT}: External voltage used to measure switching time.

f = 1MHz, Z_O = 50Ω, Δt/ΔV ≤ 1ns/V.

Figure 2. Test Circuit for Measuring Switching Times

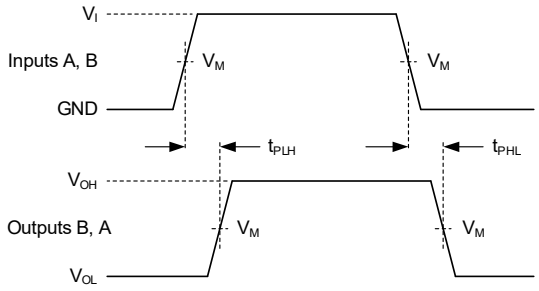
Table 1. Test Conditions

SUPPLY VOLTAGE	INPUT		LOAD		V_{EXT}		
V_{CC}	V_I (1)	Δt/ΔV	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ} (2)
1.1V to 1.6V	V_{CCI}	≤ 1.0ns/V	5pF	10kΩ	Open	GND	2 × V_{CCO}
1.65V to 2.7V	V_{CCI}	≤ 1.0ns/V	5pF	10kΩ	Open	GND	2 × V_{CCO}
3.0V to 3.6V	V_{CCI}	≤ 1.0ns/V	5pF	10kΩ	Open	GND	2 × V_{CCO}

NOTES:

1. V_{CCI} is the supply voltage associated with the data input ports.
2. V_{CCO} is the supply voltage associated with the data output ports.

WAVEFORMS

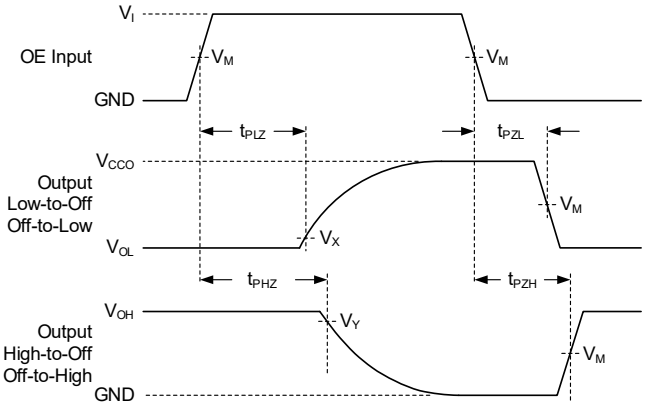


Test conditions are given in Table 1.

Measurement points are given in Table 2.

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

Figure 3. Inputs (A, B) to Outputs (B, A) Propagation Delays



Test conditions are given in Table 1.

Measurement points are given in Table 2.

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

Figure 4. Enable and Disable Times

Table 2. Measurement Points

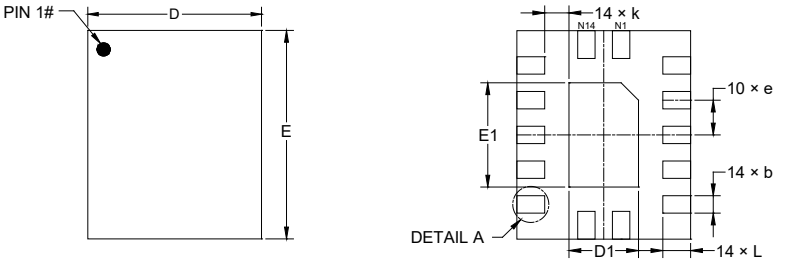
SUPPLY VOLTAGE	INPUTS (1)		OUTPUTS		
V_{CC}	V_I	V_M (2)	V_M (3)	V_X	V_Y
1.1V to 1.6V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.1V	V_{OH} - 0.1V
1.65V to 2.7V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
3.0V to 5.5V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.3V	V_{OH} - 0.3V

NOTES:

1. V_{CCI} is the supply voltage associated with the data input ports.
2. The measurement points should be V_{IH} or V_{IL} when $\Delta t/\Delta V$ > 1.0ns/V.
3. V_{CCO} is the supply voltage associated with the data output ports.

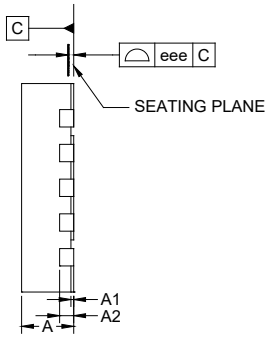
PACKAGE OUTLINE DIMENSIONS

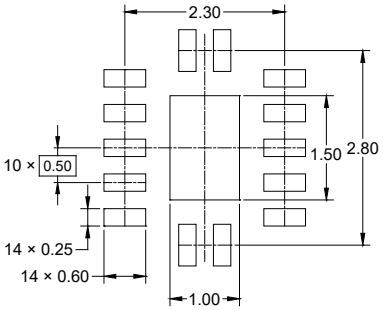
TQFN-2.5×3-14L



TOP VIEW

BOTTOM VIEW





SIDE VIEW

RECOMMENDED LAND PATTERN (Unit: mm)

ALTERNATE A-1 ALTERNATE A-2

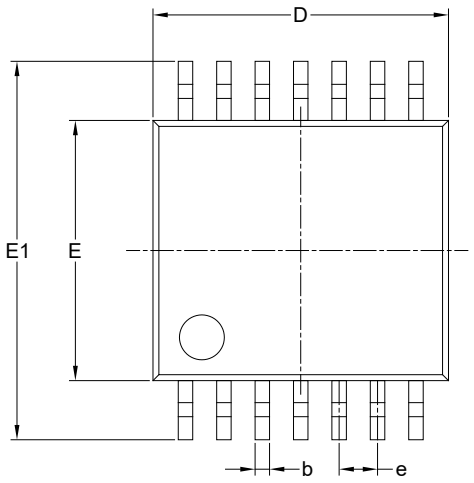
DETAIL A
ALTERNATE TERMINAL CONSTRUCTION

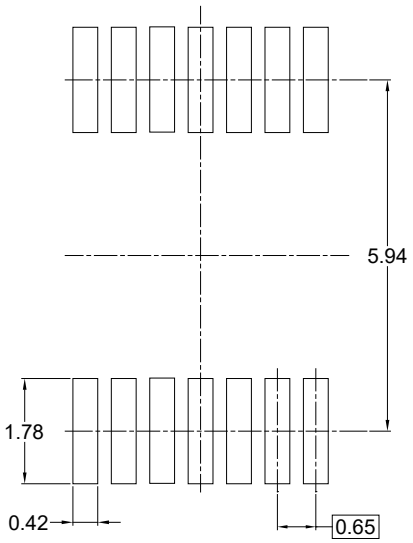
Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2		0.203 REF	
b	0.200	-	0.300
D	2.400	-	2.600
D1	0.900	-	1.100
E	2.900	-	3.100
E1	1.400	-	1.600
e		0.500 BSC	
k		0.350 REF	
L	0.300	-	0.500
eee		0.080	

NOTE: This drawing is subject to change without notice.

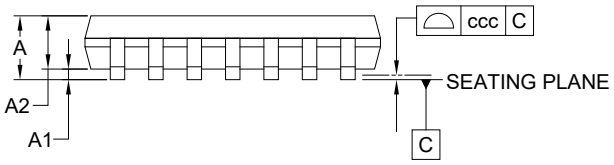
PACKAGE OUTLINE DIMENSIONS

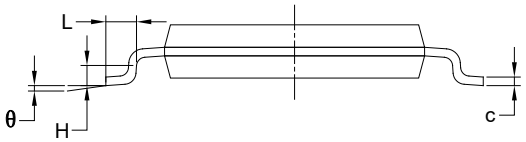
TSSOP-14





RECOMMENDED LAND PATTERN (Unit: mm)



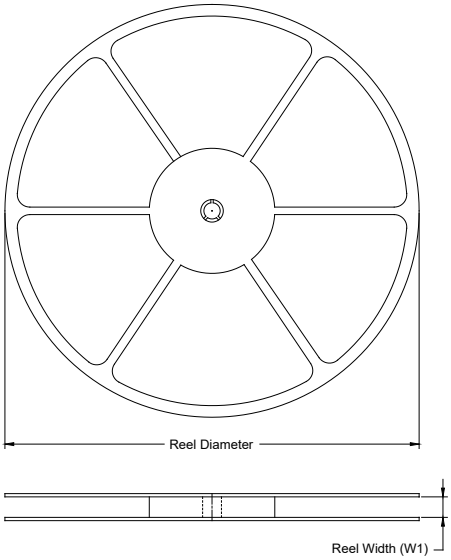


Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	4.860	-	5.100
E	4.300	-	4.500
E1	6.200	-	6.600
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

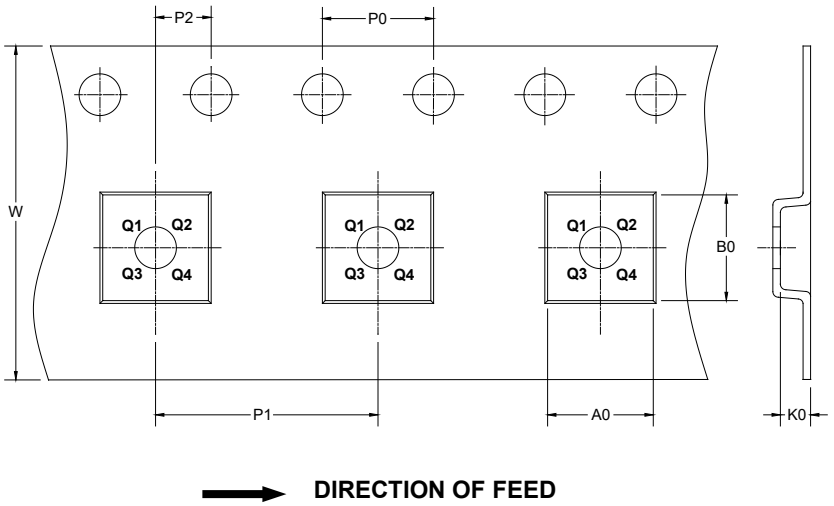
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-153.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



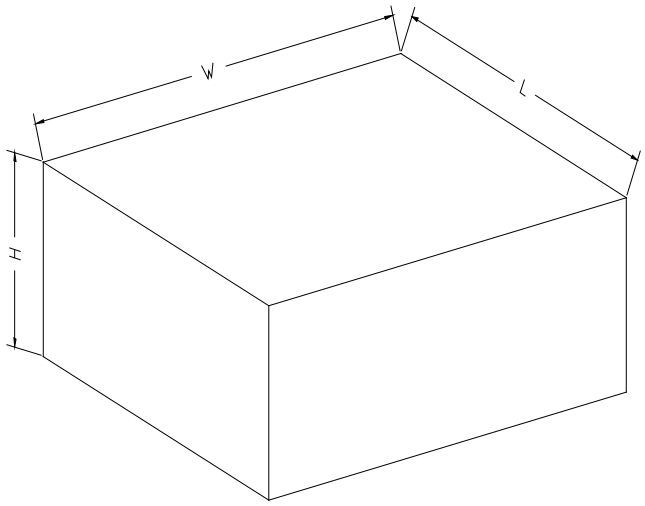
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TQFN-2.5×3-14L	13"	12.4	2.80	3.30	1.15	4.0	4.0	2.0	12.0	Q1
TSSOP-14	13"	12.4	6.80	5.40	1.50	4.0	8.0	2.0	12.0	Q1

DD0001

CARTON BOX DIMENSIONS



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

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13″	386	280	370	5

DD0002