



SGM4563

4-Bit Level Translator

For SPI Bus or UART Interface

GENERAL DESCRIPTION

This 4-bit non-inverting translator uses two separate configurable power-supply rails. The A ports are designed to track V_{CCA} . V_{CCA} accepts any supply voltage from 1.2V to 5.5V. The B ports are designed to track V_{CCB} . V_{CCB} accepts any supply voltage from 1.65V to 5.5V. This allows for universal low-voltage bidirectional translation between any of the 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, and 5V voltage nodes. V_{CCA} should not exceed V_{CCB} .

When the output-enable (OE) input is low, all outputs are placed in the high-impedance state. To ensure the high-impedance state during power up or power down, OE should be tied to GND through a pull-down resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver. OE input circuit is supplied by V_{CCA} .

The direction of three channels is from A to B, and the other channel is from B to A, so SGM4563 is the ideal device to finish the level translation of SPI bus or UART interface.

The SGM4563 is available in Green SOIC-14 and UTQFN-1.8×1.8-12L packages. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- 1.2V to 5.5V on A Ports and 1.65V to 5.5V on B Ports ($V_{CCA} \leq V_{CCB}$)
- V_{CC} Isolation: If Either V_{CC} is at GND, All Outputs are in the High-Impedance State
- OE Input Circuit Referenced to V_{CCA}
- Low Power Consumption
- Push-Pull Output
- I_{OFF} : Supports Partial-Power-Down Mode Operation
- -40°C to +85°C Operating Temperature Range
- Available in Green SOIC-14 and UTQFN-1.8×1.8-12L Packages

APPLICATIONS

Smart-Phone
 Portable Equipments
 UART
 GPIO
 SPI Bus



PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4563	SOIC-14	-40°C to +85°C	SGM4563YS14G/TR	SGM4563YS14 XXXXX	Tape and Reel, 2500
	UTQFN-1.8×1.8-12L	-40°C to +85°C	SGM4563YUQN12G/TR	4563 XXXX	Tape and Reel, 3000

NOTE: XXXX = Date Code, XXXXX = Date Code and Vendor Code.

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

V_{CCA} , Supply Voltage Range	-0.3V to 6V
V_{CCB} , Supply Voltage Range	-0.3V to 6V
V_I , Input Voltage Range	
A Ports	-0.3V to 6V
B Ports	-0.3V to 6V
V_O , Voltage Range Applied to Any Output in the High-Impedance or Power-Off State	
A Ports	-0.3V to 6V
B Ports	-0.3V to 6V
V_O , Voltage Range Applied to Any Output in the High or Low State ⁽¹⁾	
A Ports	-0.3V to $V_{CCA} + 0.3V$
B Ports	-0.3V to $V_{CCB} + 0.3V$
I_{IK} , Input Clamp Current ($V_I < 0$)	-50mA
I_{OK} , Output Clamp Current ($V_O < 0$)	-25mA
I_O , Continuous Output Current	±25mA
Continuous Current through V_{CCA} , V_{CCB} , or GND	
	±100mA
Junction Temperature	150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10sec)	260°C

NOTE: 1. The value of V_{CCA} and V_{CCB} are provided in the recommended operating conditions table.

OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

RECOMMENDED OPERATING CONDITIONS
(2, 3)

Supply Voltage Range

V_{CCA} 1.2V to 5.5V

V_{CCB} 1.65V to 5.5V

High-Level Input Voltage, V_{IH}

Data Inputs $V_{CCI} \times 0.85^{(4)}$ to V_{CCI}

OE Input $V_{CCA} \times 0.85$ to 5.5V

Low-Level Input Voltage, V_{IL}

Data Inputs 0V to $V_{CCI} \times 0.2^{(4)}$

OE Input 0V to $V_{CCA} \times 0.2$

Voltage Range Applied to Any Output in the High-Impedance or Power-Off State, V_O

A Ports 0V to 5.5V

B Ports 0V to 5.5V

Operating Temperature Range -40°C to +85°C

NOTES:

2. The A and B sides of an unused data I/O pair must be held in the same state, i.e., both at V_{CCI} or both at GND.

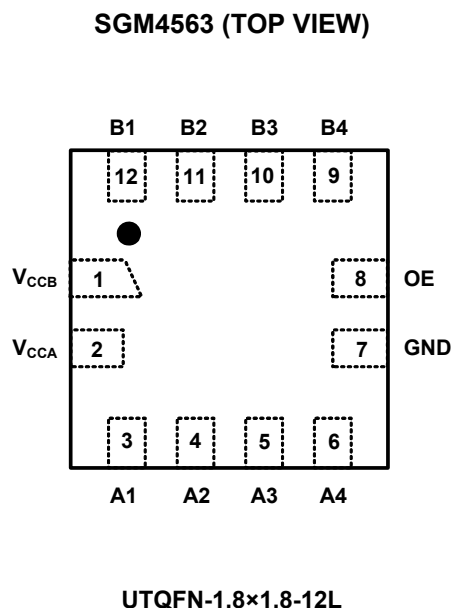
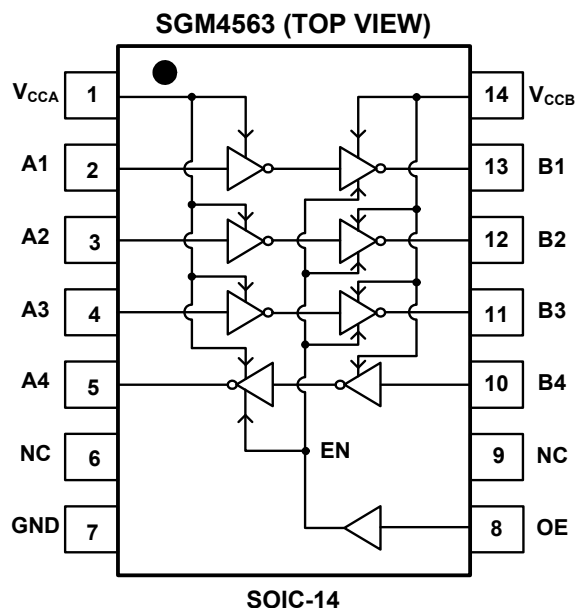
3. V_{CCA} must be less than or equal to V_{CCB} and must not exceed 5.5V.

4. V_{CCI} is the supply voltage associated with the input ports.

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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 very small parametric changes could cause the device not to meet its published specifications.

PIN CONFIGURATIONS



PIN DESCRIPTION

PIN		NAME	FUNCTION
SOIC-14	UTQFN-1.8x1.8-12L		
1	2	V _{CCA}	A Port Supply Voltage. $1.2V \leq V_{CCA} \leq 5.5V$ and $V_{CCA} \leq V_{CCB}$.
2	3	A1	Input 1. Referenced to V _{CCA} .
3	4	A2	Input 2. Referenced to V _{CCA} .
4	5	A3	Input 3. Referenced to V _{CCA} .
5	6	A4	Output of B4. Referenced to V _{CCA} .
6	—	NC	No Connection. Not internally connected.
7	7	GND	Ground.
8	8	OE	3-State Output-Mode Enable. Pull OE “low” to place all outputs in 3-state mode. Referenced to V _{CCA} , OE is powered by V _{CCA} .
9	—	NC	No Connection. Not internally connected.
10	9	B4	Input. Referenced to V _{CCB} .
11	10	B3	Output of A3. Referenced to V _{CCB} .
12	11	B2	Output of A2. Referenced to V _{CCB} .
13	12	B1	Output of A1. Referenced to V _{CCB} .
14	1	V _{CCB}	B Port Supply Voltage. $1.65V \leq V_{CCB} \leq 5.5V$.

ELECTRICAL CHARACTERISTICS ⁽¹⁾(Typical values are at $T_A = +25^\circ\text{C}$, unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
A Port High Level Output Voltage (V_{OHA})		$I_{OH} = -1\text{mA}$ $V_{CCA} = 1.2\text{V}$		1.05		V
		$I_{OH} = -1.5\text{mA}$ $V_{CCA} = 1.4\text{V to } 1.6\text{V}$				
		$I_{OH} = -3\text{mA}$ $V_{CCA} = 1.65\text{V to } 1.95\text{V}$				
		$I_{OH} = -6\text{mA}$ $V_{CCA} = 2.3\text{V to } 2.7\text{V}$		$0.9 \times V_{CCA}$		
		$I_{OH} = -12\text{mA}$ $V_{CCA} = 3\text{V to } 3.6\text{V}$				
		$I_{OH} = -25\text{mA}$ $V_{CCA} = 4.5\text{V to } 5.5\text{V}$				
A Port Low Level Output Voltage (V_{OLA})		$I_{OL} = 3\text{mA}$ $V_{CCA} = 1.2\text{V}$				V
		$I_{OL} = 6\text{mA}$ $V_{CCA} = 1.4\text{V to } 1.6\text{V}$				
		$I_{OL} = 8\text{mA}$ $V_{CCA} = 1.65\text{V to } 1.95\text{V}$		0.25		
		$I_{OL} = 10\text{mA}$ $V_{CCA} = 2.3\text{V to } 2.7\text{V}$				
		$I_{OL} = 12\text{mA}$ $V_{CCA} = 3\text{V to } 3.6\text{V}$				
		$I_{OL} = 15\text{mA}$ $V_{CCA} = 4.5\text{V to } 5.5\text{V}$				
B Port High Level Output Voltage (V_{OHB})		$I_{OH} = -3\text{mA}$ $V_{CCB} = 1.65\text{V to } 1.95\text{V}$				V
		$I_{OH} = -6\text{mA}$ $V_{CCB} = 2.3\text{V to } 2.7\text{V}$		$0.9 \times V_{CCB}$		
		$I_{OH} = -12\text{mA}$ $V_{CCB} = 3\text{V to } 3.6\text{V}$				
		$I_{OH} = -25\text{mA}$ $V_{CCB} = 4.5\text{V to } 5.5\text{V}$				
B Port Low Level Output Voltage (V_{OLB})		$I_{OL} = 8\text{mA}$ $V_{CCB} = 1.65\text{V to } 1.95\text{V}$				V
		$I_{OL} = 10\text{mA}$ $V_{CCB} = 2.3\text{V to } 2.7\text{V}$		0.25		
		$I_{OL} = 12\text{mA}$ $V_{CCB} = 3\text{V to } 3.6\text{V}$				
		$I_{OL} = 15\text{mA}$ $V_{CCB} = 4.5\text{V to } 5.5\text{V}$				
Input Leakage Current (I_i)	OE	$V_i = V_{CCA}$ or GND, $V_{CCA} = 1.2\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		0.5		μA
Power Off Leakage Current (I_{OFF})	A Ports	V_i or $V_o = 0\text{V to } 5.5\text{V}$, $V_{CCA} = 0\text{V}$, $V_{CCB} = 0\text{V to } 5.5\text{V}$		0.1		
	B Ports	V_i or $V_o = 0\text{V to } 5.5\text{V}$, $V_{CCA} = 0\text{V to } 5.5\text{V}$, $V_{CCB} = 0\text{V}$		0.1		
3-State Output Leakage (I_{OZ})	A or B Ports	OE = GND, $V_{CCA} = 1.2\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		0.1		
Quiescent Supply Current (I_{CCA})	$V_i = V_{CCI}$ or GND, $I_o = 0$, OE = V_{CCA}	$V_{CCA} = 1.2\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		0.1		μA
		$V_{CCA} = 1.4\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		0.5		
		$V_{CCA} = 5.5\text{V}$, $V_{CCB} = 0\text{V}$		0.5		
		$V_{CCA} = 0\text{V}$, $V_{CCB} = 5.5\text{V}$		0.1		
Quiescent Supply Current (I_{CCB})	$V_i = V_{CCI}$ or GND, $I_o = 0$, OE = V_{CCA}	$V_{CCA} = 1.2\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		1		μA
		$V_{CCA} = 1.4\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		1		
		$V_{CCA} = 5.5\text{V}$, $V_{CCB} = 0\text{V}$		0.1		
		$V_{CCA} = 0\text{V}$, $V_{CCB} = 5.5\text{V}$		0.1		

ELECTRICAL CHARACTERISTICS ⁽¹⁾(Typical values are at $T_A = +25^\circ\text{C}$, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Quiescent Supply Current ($I_{CCA} + I_{CCB}$)	$V_I = V_{CCI}$ or GND, $I_O = 0$, $OE = V_{CCA}$	$V_{CCA} = 1.2\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	1		μA
		$V_{CCA} = 1.4\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	1		
Quiescent Supply Current (I_{CCZA})	$V_I = V_{CCI}$ or GND, $I_O = 0$, $OE = \text{GND}$	$V_{CCA} = 1.2\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	0.1		μA
		$V_{CCA} = 1.4\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	0.5		
Quiescent Supply Current (I_{CCZB})	$V_I = V_{CCI}$ or GND, $I_O = 0$, $OE = \text{GND}$	$V_{CCA} = 1.2\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	0.1		μA
		$V_{CCA} = 1.4\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	0.1		
OE Input Capacitance (C_i)	$V_{CCA} = 1.2\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$		5		pF
Input/Output Capacitance (C_{IO})	A Ports	$V_{CCA} = 1.2\text{V to } 5.5\text{V}$, $V_{CCB} = 1.65\text{V to } 5.5\text{V}$	4		pF
	B Ports		4		

NOTE:1. V_{CCI} is the supply voltage associated with the input port.

TIMING REQUIREMENTS

		V _{CCB} = 1.8V	V _{CCB} = 2.5V	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
		TYP	TYP	TYP	TYP	
(T _A = +25°C, V _{CCA} = 1.2V, unless otherwise noted.)						
Data Rate		20	20	20	20	Mbps
Pulse Duration (t _w)	Data Inputs	50	50	50	50	ns
(T _A = +25°C, V _{CCA} = 1.5V, unless otherwise noted.)						
Data Rate		40	40	40	40	Mbps
Pulse Duration (t _w)	Data Inputs	25	25	25	25	ns
(T _A = +25°C, V _{CCA} = 1.8V, unless otherwise noted.)						
Data Rate		60	60	60	60	Mbps
Pulse Duration (t _w)	Data Inputs	17	17	17	17	ns
(T _A = +25°C, V _{CCA} = 2.5V, unless otherwise noted.)						
Data Rate			100	100	100	Mbps
Pulse Duration (t _w)	Data Inputs		10	10	10	ns
(T _A = +25°C, V _{CCA} = 3.3V, unless otherwise noted.)						
Data Rate				100	100	Mbps
Pulse Duration (t _w)	Data Inputs			10	10	ns
(T _A = +25°C, V _{CCA} = 5V, unless otherwise noted.)						
Data Rate					100	Mbps
Pulse Duration (t _w)	Data Inputs				10	ns

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CCA} = 1.2V, unless otherwise noted.)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 1.8V	V _{CCB} = 2.5V	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
				TYP	TYP	TYP	TYP	
t _{PD}	t _{PLH}	A	B	23.7	19.3	18.2	18.2	ns
	t _{PHL}			27.5	26.2	27.4	29.6	
	t _{PLH}	B	A	43.3	42.7	31.0	41.2	
	t _{PHL}			20.2	17.6	12.3	17.0	
t _{EN}	t _{PZH}	OE	A	90	89	86	79	ns
	t _{PZL}			62	59	58	55	
	t _{PZH}		B	50	45	44	46	
	t _{PZL}			73	71	72	72	
t _{DIS}	t _{PHZ}	OE	A	1050	1040	1010	1040	ns
	t _{PLZ}			510	510	520	530	
	t _{PHZ}		B	1090	1090	1100	1130	
	t _{PLZ}			510	550	550	550	
t _{rA}		A Ports Rise Time		12.5	13.1	10.8	10.7	ns
t _{fA}		A Ports Fall Time		6.0	4.8	4.0	2.4	ns
t _{rB}		B Ports Rise Time		3.2	2.1	1.6	1.4	ns
t _{fB}		B Ports Fall Time		2.1	1.7	1.5	1.4	ns
t _{SK(O)}		Channel-to-Channel Skew		1	1	1	1	ns
Data Rate				20	20	20	20	Mbps

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CCA} = 1.5V, unless otherwise noted.)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 1.8V	V _{CCB} = 2.5V	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
				TYP	TYP	TYP	TYP	
t _{PD}	t _{PLH}	A	B	15.6	10.9	9.5	8.7	ns
	t _{PHL}			13.5	11.2	10.7	10.7	
	t _{PLH}	B	A	16.7	15.9	15.9	16.0	
	t _{PHL}			10.5	9.0	8.5	8.0	
t _{EN}	t _{PZH}	OE	A	38	38	37	35	ns
	t _{PZL}			35	31	30	28	
	t _{PZH}		B	33	27	25	24	
	t _{PZL}			37	34	34	33	
t _{DIS}	t _{PHZ}	OE	A	1010	1020	1030	1020	ns
	t _{PLZ}			510	510	520	540	
	t _{PHZ}		B	1080	1060	1100	1120	
	t _{PLZ}			510	540	530	530	
t _{rA}		A Ports Rise Time		7.0	6.2	6.0	6.6	ns
t _{fA}		A Ports Fall Time		3.1	2.3	2.0	2.5	ns
t _{rB}		B Ports Rise Time		3.1	2.1	1.6	1.4	ns
t _{fB}		B Ports Fall Time		2.3	1.7	1.5	1.4	ns
t _{SK(O)}		Channel-to-Channel Skew		0.5	0.5	0.5	0.5	ns
Data Rate				40	40	40	40	Mbps

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CCA} = 1.8V, unless otherwise noted.)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 1.8V	V _{CCB} = 2.5V	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
				TYP	TYP	TYP	TYP	
t _{PD}	t _{PLH}	A	B	13.6	8.8	7.1	6.0	ns
	t _{PHL}			9.9	7.8	6.9	6.6	
	t _{PLH}	B	A	11.0	9.7	9.5	9.8	
	t _{PHL}			8.4	6.8	5.7	5.2	
t _{EN}	t _{PZH}	OE	A	26	26	26	25	ns
	t _{PZL}			29	24	23	22	
	t _{PZH}		B	29	22	20	19	
	t _{PZL}			28	25	24	23	
t _{DIS}	t _{PHZ}	OE	A	1040	1030	1070	1060	ns
	t _{PLZ}			510	500	490	490	
	t _{PHZ}		B	1030	1070	1110	1120	
	t _{PLZ}			510	520	530	530	
t _{rA}		A Ports Rise Time		3.9	2.5	2.4	2.9	ns
t _{fA}		A Ports Fall Time		2.2	2.0	1.8	2.2	ns
t _{rB}		B Ports Rise Time		3.7	2.0	1.8	1.5	ns
t _{fB}		B Ports Fall Time		2.1	1.8	1.6	1.6	ns
t _{SK(O)}		Channel-to-Channel Skew		0.5	0.5	0.5	0.5	ns
Data Rate				60	60	60	60	Mbps

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CCA} = 2.5V, unless otherwise noted.)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 2.5V	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
				TYP	TYP	TYP	
t _{PD}	t _{PLH}	A	B	7.1	5.4	4.4	ns
	t _{PHL}			5.4	4.5	4.0	
	t _{PLH}	B	A	5.7	5.3	5.7	
	t _{PHL}			4.3	3.7	3.2	
t _{EN}	t _{PZH}	OE	A	19	18	18	ns
	t _{PZL}			20	19	17	
	t _{PZH}		B	20	17	16	
	t _{PZL}			19	18	18	
t _{DIS}	t _{PHZ}	OE	A	1020	1010	1000	ns
	t _{PLZ}			540	530	520	
	t _{PHZ}		B	1080	1100	1120	
	t _{PLZ}			540	530	530	
t _{rA}		A Ports Rise Time		1.8	1.6	1.8	ns
t _{fA}		A Ports Fall Time		1.5	1.5	1.6	ns
t _{rB}		B Ports Rise Time		1.8	1.7	1.3	ns
t _{fB}		B Ports Fall Time		1.8	1.4	1.4	ns
t _{SK(O)}		Channel-to-Channel Skew		0.5	0.5	0.5	ns
Data Rate				100	100	100	Mbps

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CCA} = 3.3V, unless otherwise noted.)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
				TYP	TYP	
t _{PD}	t _{PLH}	A	B	5.1	4.2	ns
	t _{PHL}			4.0	3.5	
	t _{PLH}	B	A	4.3	4.4	
	t _{PHL}			3.6	2.9	
t _{EN}	t _{PZH}	OE	A	16	16	ns
	t _{PZL}			17	16	
	t _{PZH}		B	17	15	
	t _{PZL}			17	16	
t _{DIS}	t _{PHZ}	OE	A	1050	1040	ns
	t _{PLZ}			540	520	
	t _{PHZ}		B	1090	1210	
	t _{PLZ}			530	520	
t _{rA}		A Ports Rise Time		1.4	1.4	ns
t _{fA}		A Ports Fall Time		1.5	1.5	ns
t _{rB}		B Ports Rise Time		1.5	1.6	ns
t _{fB}		B Ports Fall Time		1.4	1.7	ns
t _{SK(O)}		Channel-to-Channel Skew		0.5	0.5	ns
Data Rate				100	100	Mbps

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CCA} = 5V, unless otherwise noted.)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 5V	UNITS
				TYP	
t _{PD}	t _{PLH}	A	B	4.1	ns
	t _{PHL}			3.0	
	t _{PLH}	B	A	3.9	
	t _{PHL}			2.6	
t _{EN}	t _{PZH}	OE	A	14	ns
	t _{PZL}			15	
	t _{PZH}		B	15	
	t _{PZL}			15	
t _{DIS}	t _{PHZ}	OE	A	1210	ns
	t _{PLZ}			510	
	t _{PHZ}		B	1200	
	t _{PLZ}			530	
t _{rA}		A Ports Rise Time		1.2	ns
t _{fA}		A Ports Fall Time		1.3	ns
t _{rB}		B Ports Rise Time		1.5	ns
t _{fB}		B Ports Fall Time		1.4	ns
t _{SK(O)}		Channel-to-Channel Skew		0.5	ns
Data Rate				100	Mbps

OPERATING CHARACTERISTICS

(T_A = +25°C, unless otherwise noted.)

PARAMETER		TEST CONDITIONS	V _{CCA}									UNIT
			1.2V	1.2V	1.5V	1.8V	2.5V	2.5V	3.3V	3.3V	5V	
			V _{CCB}									
			5V	1.8V	1.8V	1.8V	2.5V	5V	3.3V	5V	5V	
			TYP	TYP	TYP	TYP	TYP	TYP	TYP	TYP	TYP	
C _{PDA}	A Port Inputs, B Port Outputs	C _L = 0, f = 10MHz, t _r = t _f = 1ns, OE = V _{CCA} (Outputs Enabled)	0.6	0.5	0.6	0.6	0.8	0.8	1.1	1.1	1.8	pF
	B Port Inputs, A Port Outputs		5.1	5.1	5.4	6.4	8.8	6.3	10.5	8.4	12.9	
C _{PDB}	A Port Inputs, B Port Outputs		14.4	7.3	7.2	7.1	9.7	13.8	11.5	13.7	13.7	
	B Port Inputs, A Port Outputs		1.6	0.4	0.4	0.4	0.6	1.6	0.9	1.6	1.6	
C _{PDA}	A Port Inputs, B Port Outputs	C _L = 0, f = 10MHz, t _r = t _f = 1ns, OE = GND (Outputs Disabled)	0.014	0.005	0.036	0.015	0.016	0.004	0.009	0.004	0.009	pF
	B Port Inputs, A Port Outputs		0.013	0.005	0.042	0.014	0.018	0.004	0.009	0.004	0.010	
C _{PDB}	A Port Inputs, B Port Outputs		0.006	0.003	0.034	0.001	0.011	0.004	0.003	0.003	0.001	
	B Port Inputs, A Port Outputs		0.004	0.002	0.023	0.001	0.011	0.002	0.003	0.002	0.001	

APPLICATION INFORMATION

Applications

The SGM4563 can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another, such as SPI bus or UART interface.

Architecture

The SGM4563 architecture is shown in Figure 1, the direction of channel1, 2 and 3 is from A to B, the direction of channel 4 is from B to A.

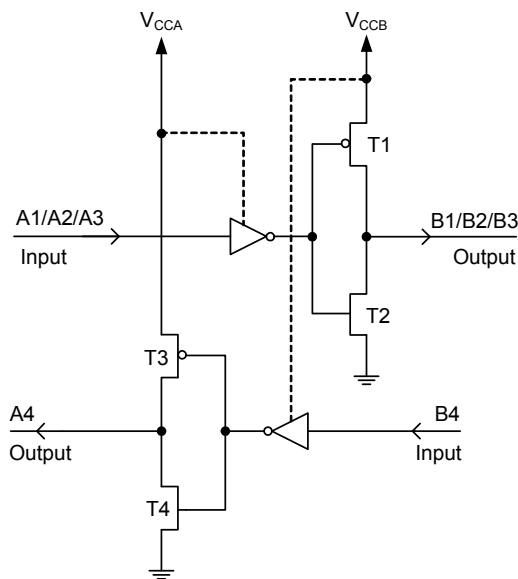


Figure 1. Architecture of SGM4563

Power Up

During operation, ensure that $V_{CCA} \leq V_{CCB}$ at all times. During power-up sequencing, $V_{CCA} \geq V_{CCB}$ does not damage the device, so any power supply can be ramped up first. The SGM4563 has circuitry that disables all output ports when either V_{CC} is switched off ($V_{CCA/B} = 0V$).

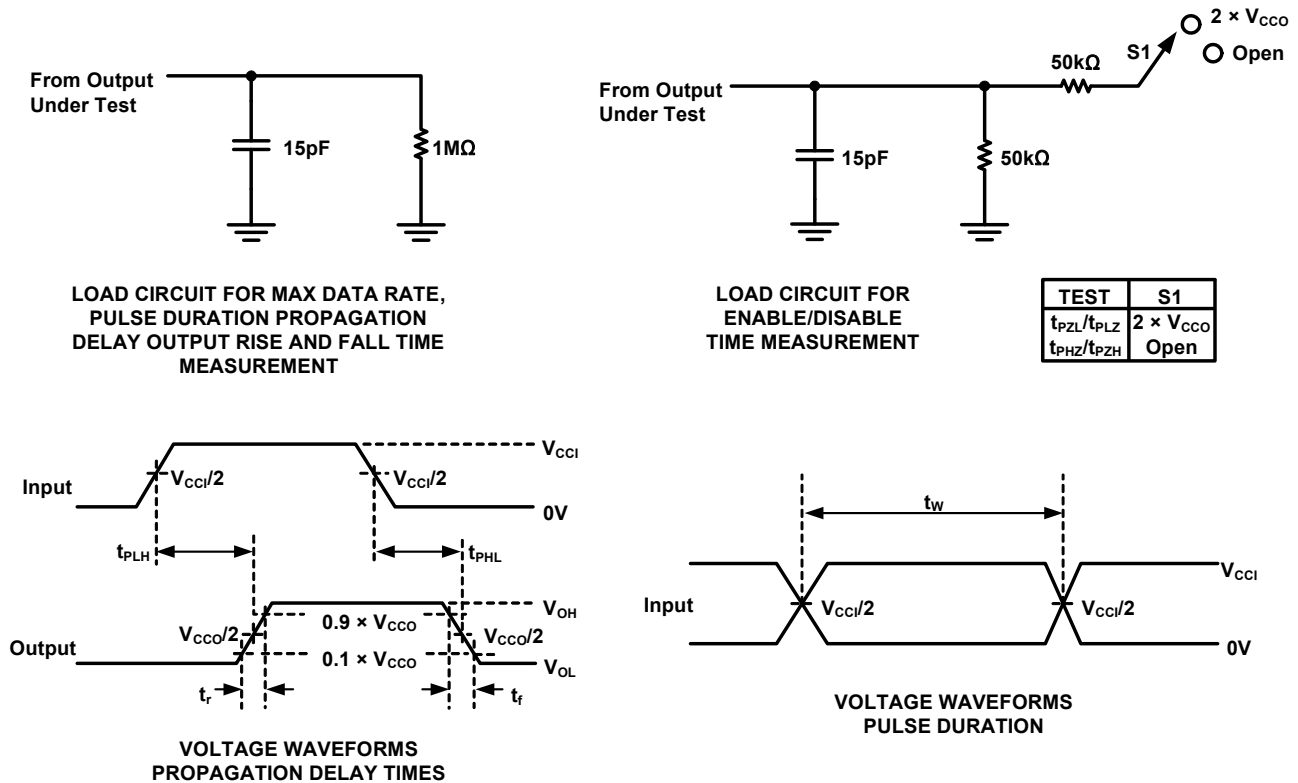
Enable and Disable

The SGM4563 has an OE input that is used to disable the device by setting OE = low, which sets all outputs in the high-impedance (Hi-Z) state. The disable time (t_{DIS}) indicates the delay between when OE goes low and when the outputs are actually disabled (Hi-Z). The enable time (t_{EN}) indicates the amount of time the user must allow for the circuitry to become operational after OE is taken high.

Pull-Up or Pull-Down Resistors on Outputs

The SGM4563 is designed to drive capacitive loads of up to 70pF. If pull-up or pull-down resistors are connected externally to the outputs, their values must be kept higher than 50k Ω to ensure that they do not contend with the output drivers of the SGM4563.

PARAMETER MEASUREMENT INFORMATION



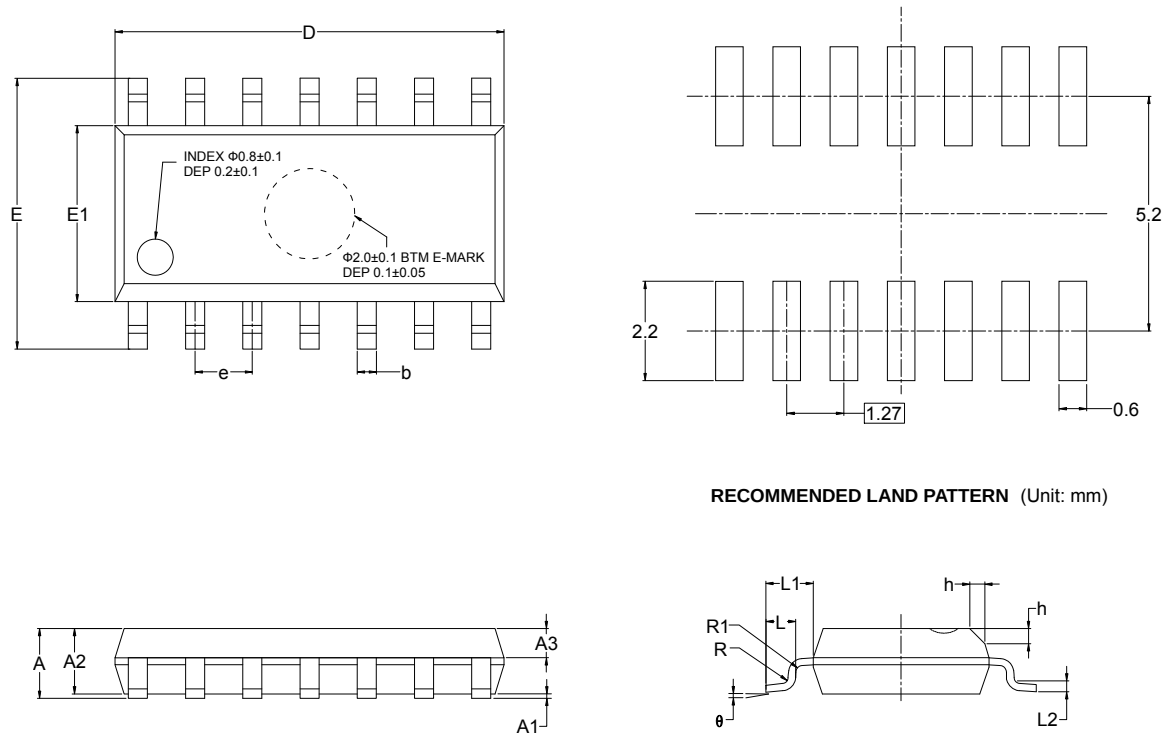
NOTES:

1. C_L includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10MHz, Z_O = 50Ω, dv/dt ≥ 1V/ns.
3. The outputs are measured one at a time, with one transition per measurement.
4. t_{PLH} and t_{PHL} are the same as t_{PD}.
5. V_{CCI} is the V_{CC} associated with the input port.
6. V_{CCO} is the V_{CC} associated with the output port.
7. All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuits and Voltage Waveforms

PACKAGE OUTLINE DIMENSIONS

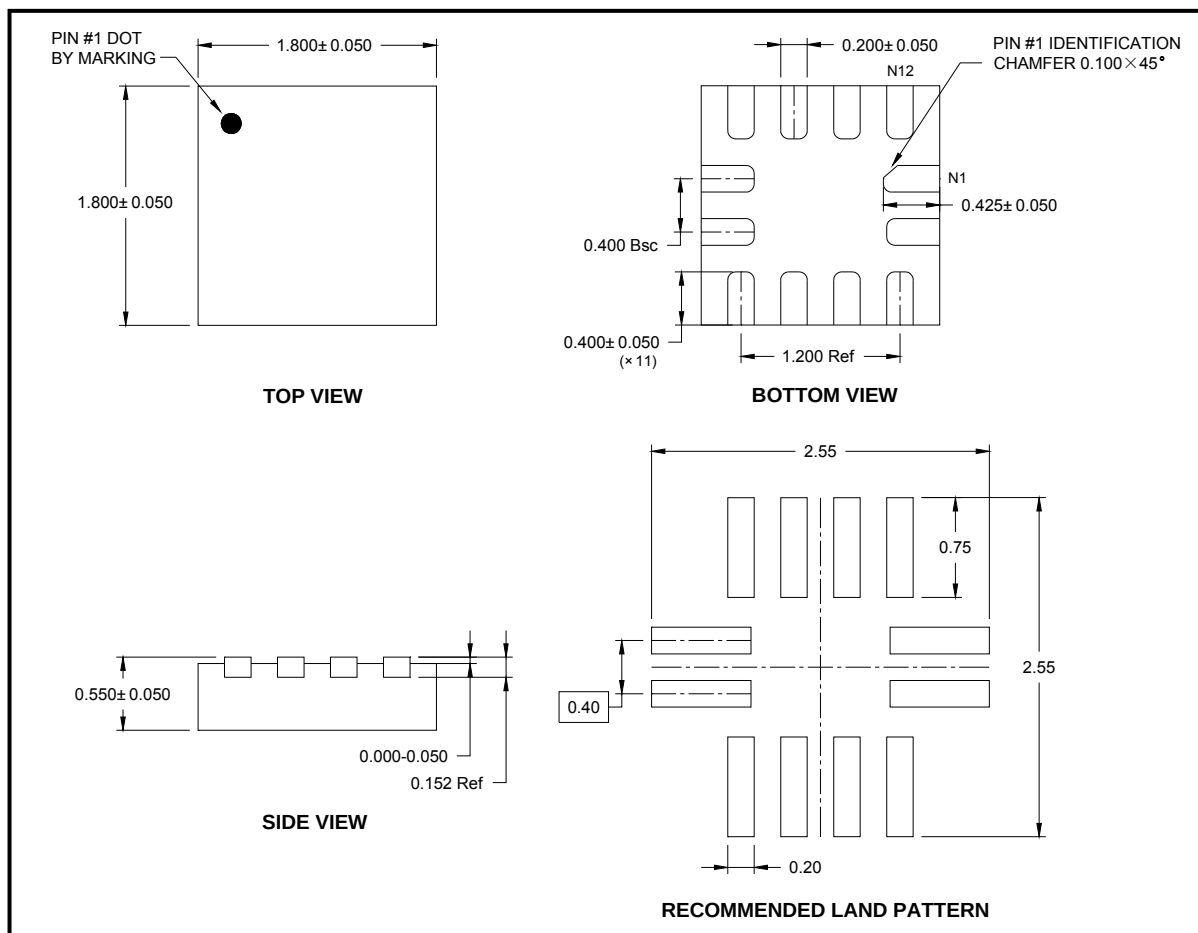
SOIC-14



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	MIN	MOD	MAX	MIN	MOD	MAX
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.004		0.010
A2	1.25		1.65	0.049		0.065
A3	0.55		0.75	0.022		0.030
b	0.36		0.49	0.014		0.019
D	8.53		8.73	0.336		0.344
E	5.80		6.20	0.228		0.244
E1	3.80		4.00	0.150		0.157
e	1.27 BSC			0.050 BSC		
L	0.45		0.80	0.018		0.032
L1	1.04 REF			0.040 REF		
L2	0.25 BSC			0.01 BSC		
R	0.07			0.003		
R1	0.07			0.003		
h	0.30		0.50	0.012		0.020
θ	0°		8°	0°		8°

PACKAGE OUTLINE DIMENSIONS

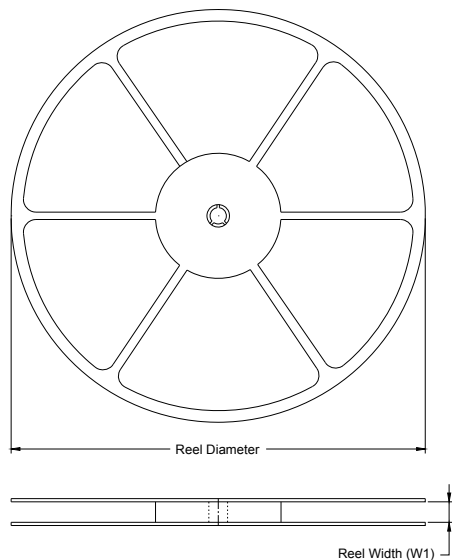
UTQFN-1.8×1.8-12L



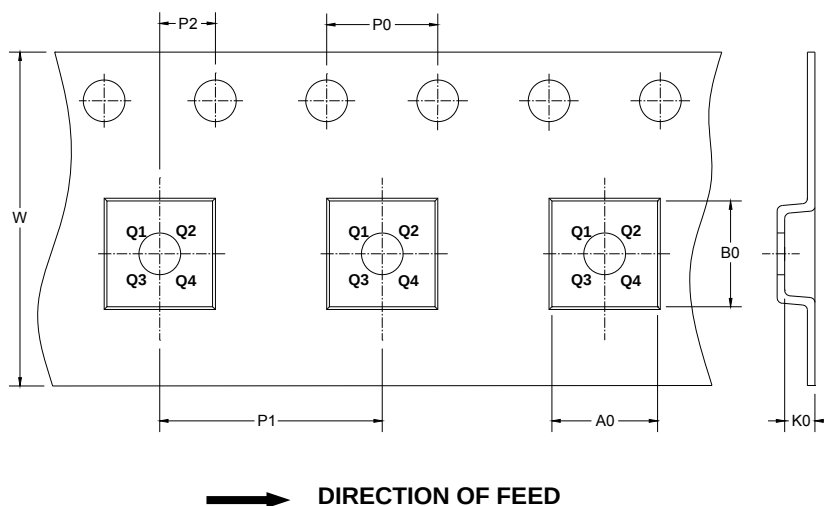
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



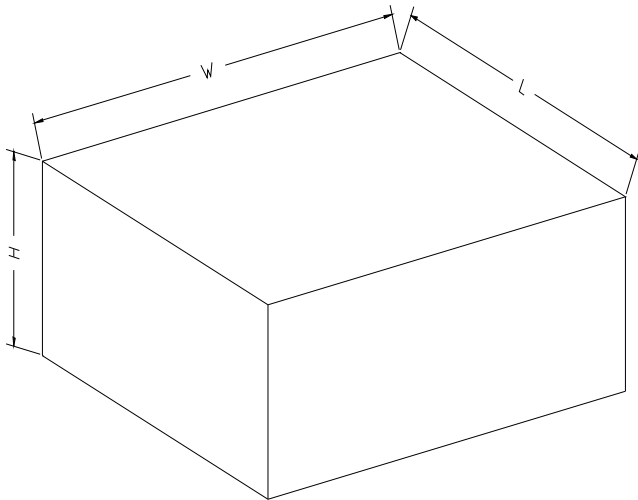
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOIC-14	13"	16.4	6.6	9.3	2.1	4.0	8.0	2.0	16.0	Q1
UTQFN-1.8×1.8-12L	7"	9.0	2.1	2.1	0.8	4.0	4.0	2.0	8.0	Q1

D1000001

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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002