SGM4573
Open-Drain, Dual-Supply Translating Transceiver with Auto Direction Sensing

GENERAL DESCRIPTION

The SGM4573 is a 4-bit, dual-supply translating transceiver. The auto direction sensing function allows a bidirectional voltage level translation for the device. The An and Bn are 4-bit input-output ports and OE is an output enable input. V_{CCA} and V_{CCB} are two supply pins that accept the voltage from 1.65V to 3.6V and 2.3V to 5.5V respectively. This makes the translation between voltage nodes of 1.8V, 2.5V, 3.3V and 5V available. An, OE pins track the V_{CCA} supply and Bn pins track the V_{CCB} supply. When OE pin is held low, the outputs enter a high-impedance off-state.

FEATURES

- **V_{CCA} Supply Voltage Range: 1.65V to 3.6V**
- **V_{CCB} Supply Voltage Range: 2.3V to 5.5V**
- **Inputs Accept Voltages up to 5.5V**
- **Push-Pull Data Rate: 24Mbps**
- **I_{OFF} Circuitry Provides Partial Power-Down Mode Operation**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green TSSOP-14 Package**

APPLICATIONS

Computers

Mobile Phones

FUNCTION TABLE

SUPPLY VOLTAGE		CONTROL INPUT	INPUT/OUTPUT	
V_{CCA} (1)	V_{CCB}	OE	An	Bn
1.65V to 3.6V	2.3V to 5.5V	L	Z	Z
1.65V to 3.6V	2.3V to 5.5V	H	Input or Output	Input or Output
GND (2)	GND (2)	*X*	Z	Z

H = High Voltage Level

L = Low Voltage Level

Z = High-Impedance State

X = Don't Care

NOTES:

1. $V_{CCA} \leq V_{CCB}$ and $V_{CCA} \leq 3.6V$.
2. The device enters power-down mode when either V_{CCA} or V_{CCB} is at GND.

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4573	TSSOP-14	-40℃ to +125℃	SGM4573XTS14G/TR	4573 XTS14 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

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

XXXXX
- Vendor Code
- Trace Code
- Date Code - Year

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 (1)

Supply Voltage Range, V_{CCA} .... -0.5V to 6.5V
Supply Voltage Range, V_{CCB} .... -0.5V to 6.5V
Input Voltage Range, V_I (2) .... -0.5V to 6.5V
Output Voltage Range, V_O (2)
Output in Active Mode, A or B Ports ....-0.5V to V_{CCO} + 0.5V
Output in Power-Down Mode or 3-State Mode
A ports .... -0.5V to 4.6V
B ports .... -0.5V to 6.5V
Input Clamp Current, I_{IK} (V_I < 0)...................................-50mA
Output Clamp Current, I_{OK} (V_O < 0)..............................-50mA
Output Current, I_O
Output in High-State ....-50mA
Output in Low-State 50mA
Supply Current, I_{CCA} or I_{CCB}..100mA
Ground Current, I_{GND}..-100mA
Junction Temperature (3) ....+150℃
Storage Temperature Range ....-65℃ to +150℃
Lead Temperature (Soldering, 10s) ....+260℃
ESD Susceptibility
HBM...6000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{CCA}.............................1.65V to 3.6V
Supply Voltage Range, V_{CCB}...............................2.3V to 5.5V
Operating Temperature Range ....-40℃ to +125℃

OVERSTRESS CAUTION

1. 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.

2. The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.

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.

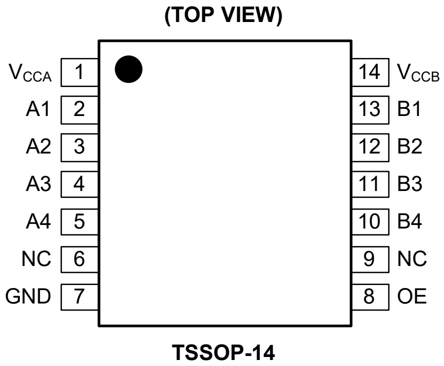
ESD SENSITIVITY CAUTION

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 CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	V_{CCA}	Supply Voltage A.
2, 3, 4, 5	A1, A2, A3, A4	Data Inputs or Outputs (Track the V_{CCA} supply).
6, 9	NC	Not Connected.
7	GND	Ground.
8	OE	Output Enable Input (Track the V_{CCA} supply. Active high).
10, 11, 12, 13	B4, B3, B2, B1	Data Inputs or Outputs (Track the V_{CCB} supply).
14	V_{CCB}	Supply Voltage B.

ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +125℃. All typical values are measured at T_A = +25℃, unless otherwise noted.) [1]

PARAMETER	SYMBOL	CONDITIONS			TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V_{IH}	A ports	V_{CCA} = 1.65V to 1.95V, V_{CCB} = 2.3V to 5.5V		Full	V_{CCA} - 0.2		V_{CCA}	V
			V_{CCA} = 2.3V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	V_{CCA} - 0.4		V_{CCA}	
		B ports	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	V_{CCB} - 0.4		V_{CCB}	
		OE input	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	0.7 × V_{CCA}		V_{CCA}	
Low-Level Input Voltage	V_{IL}	A or B ports	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	0		0.15	V
		OE input	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	0		0.35 × V_{CCA}	
High-Level Output Voltage	V_{OH}	A ports	I_O = -20μA, V_I ≥ V_{CCB} - 0.4V, V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	0.67 × V_{CCA}			V
		B ports	I_O = -20μA, V_I ≥ V_{CCA} - 0.2V, V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full	0.67 × V_{CCB}			
Low-Level Output Voltage	V_{OL}	A or B ports	I_O = 1mA, V_I ≤ 0.15V, V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full			0.4	V
Input Leakage Current	I_I	OE input	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full			±2	μA
Off-State Output Current [2]	I_{OZ}	A or B ports	OE = 0V, V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full			±2	μA
Power-Off Leakage Current	I_{OFF}	A ports	V_{CCA} = 0V, V_{CCB} = 0V to 5.5V		Full			±2	μA
		B ports	V_{CCB} = 0V, V_{CCA} = 0V to 3.6V		Full			±2	
Supply Current	I_{CC}	OE = 0V or V_{CCA}, An, Bn open							
		I_{CCA}	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full			2	μA
			V_{CCA} = 3.6V, V_{CCB} = 0V		Full			2	
			V_{CCA} = 0V, V_{CCB} = 5.5V		Full			-2	
		I_{CCB}	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full			5	
			V_{CCA} = 3.6V, V_{CCB} = 0V		Full			-2	
			V_{CCA} = 0V, V_{CCB} = 5.5V		Full			2	
		I_{CCA} + I_{CCB}	V_{CCA} = 1.65V to 3.6V, V_{CCB} = 2.3V to 5.5V		Full			7	
Input Capacitance	C_I	OE input	V_{CCA} = 3.3V, V_{CCB} = 3.3V		+25℃		3		pF
Input/Output Capacitance	$C_{I/O}$	A ports	V_{CCA} = 3.3V, V_{CCB} = 3.3V	Enabled	+25℃		8		pF
				Disabled	+25℃		5		
		B ports	V_{CCA} = 3.3V, V_{CCB} = 3.3V	Enabled	+25℃		8		
				Disabled	+25℃		5		

NOTES:

1. V_{CCA} ≤ V_{CCB} and V_{CCA} ≤ 3.6V.
2. For transceivers, the parameter I_{OZ} includes the input leakage current.

DYNAMIC CHARACTERISTICS

(Full = -40℃ to +125℃. For test circuit see Figure 1. For waveforms see Figure 2 and Figure 3, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
High to Low Propagation Delay	t_{PHL}	A to B					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			7.5	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			9.5	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			14	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			5.5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			7.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			4.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			5.5	
		B to A					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			7	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			7	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			7	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			6	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			6.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			4.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			5	
Low to High Propagation Delay	t_{PLH}	A to B					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			13.5	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			11	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			10	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			10	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			8.5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			7	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			5.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			6	
		B to A					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			11	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			10	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			10	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			6.5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			5.5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			5.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			4.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			4.5	

DYNAMIC CHARACTERISTICS (continued)

(Full = -40℃ to +125℃. For test circuit see Figure 1. For waveforms see Figure 2 and Figure 3, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Enable Time [1]	t_{EN}	OE to A, B					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			26	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			25	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			24	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			13	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			16.5	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			15	ns
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			9	ns
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			11.5	ns
Disable Time [1]	t_{DIS}	OE to A					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			260	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			260	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			260	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			195	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			195	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			195	ns
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			280	ns
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			280	ns
		OE to B					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			190	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			285	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			200	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			185	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			275	ns
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			185	ns
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			280	ns
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			185	ns

NOTE:

1. t_{EN} is the same as t_{PZL} and t_{PZH}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}.

DYNAMIC CHARACTERISTICS (continued)

(Full = -40℃ to +125℃. For test circuit see Figure 1. For waveforms see Figure 2 and Figure 3, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
High to Low Output Transition Time	t_{THL}	A ports					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full	1.5		10	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full	2		10.5	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full	1.5		11	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full	1.5		8	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full	1		10	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full	1		8	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full	1.5		7	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full	1		7	
		B ports					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full	3		13.5	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full	3		17.5	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full	4		26	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full	2		8	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full	2.5		9	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full	3		13.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full	2.5		7	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full	2		8	
Low to High Output Transition Time	t_{TLH}	A ports					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full	2.5		19.5	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full	2.5		19.5	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full	2.5		21	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full	2.5		12.5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full	2		10.5	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full	2		11.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full	2		9.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full	1.5		9.5	
		B ports					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full	2		18	ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full	1.5		14.5	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full	1.5		11	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full	1.5		16	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full	1.5		13	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full	1.5		11	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full	1.5		11.5	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full	1.5		10	

DYNAMIC CHARACTERISTICS (continued)

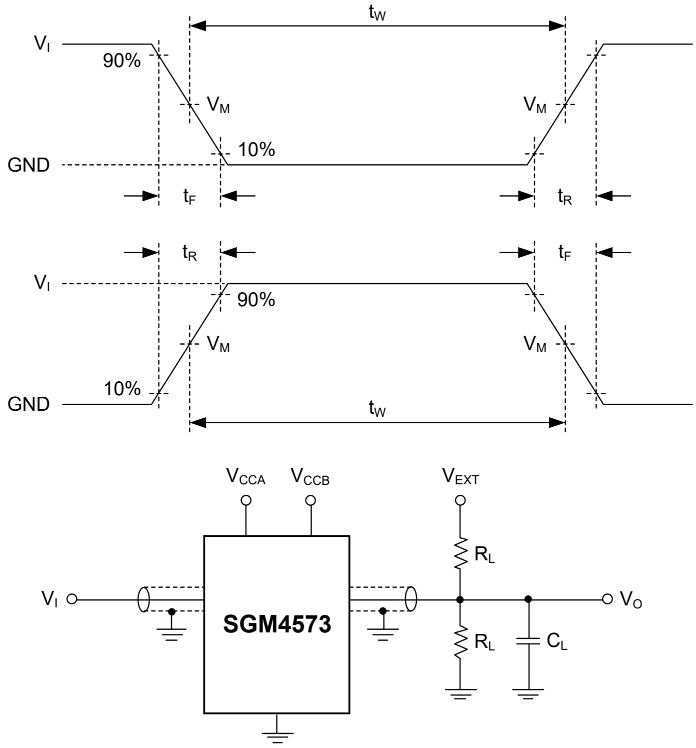
(Full = -40℃ to +125℃. For test circuit see Figure 1. For waveforms see Figure 2 and Figure 3, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Channel-to-Channel Skew [2]	t_{SKO}	Between channels					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			800	ps
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			800	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			800	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			800	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			800	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			800	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			800	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			800	
Pulse Width	t_W	Data inputs					
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full	41			ns
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full	41			
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full	41			
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full	41			
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full	41			
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full	41			
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full	41			
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full	41			
Data Rate	f_{DATA}	V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 2.5V ± 0.2V	Full			24	Mbps
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 3.3V ± 0.3V	Full			24	
		V_{CCA} = 1.8V ± 0.15V, V_{CCB} = 5.0V ± 0.5V	Full			24	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 2.5V ± 0.2V	Full			24	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 3.3V ± 0.3V	Full			24	
		V_{CCA} = 2.5V ± 0.2V, V_{CCB} = 5.0V ± 0.5V	Full			24	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 3.3V ± 0.3V	Full			24	
		V_{CCA} = 3.3V ± 0.3V, V_{CCB} = 5.0V ± 0.5V	Full			24	

NOTE:

2. Skew between any two outputs of the same package switches in the same direction. This parameter is guaranteed by design.

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

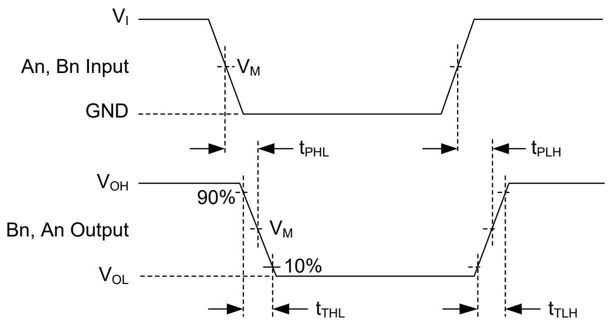
Figure 1. Test Circuit for Measuring Switching Times

Table 1. Test Conditions

SUPPLY VOLTAGE		INPUT		LOAD		V_{EXT}		
V_{CCA}	V_{CCB}	V_I (1)	Δt/ΔV	C_L	R_L (2)	t_{PLH}, t_{PHL}	t_{PLZ}, t_{PZL} (3)	t_{PHZ}, t_{PZH}
1.65V to 3.6V	2.3V to 5.5V	V_{CCI}	≤ 1ns	15pF	50kΩ, 1MΩ	Open	2 × V_{CCO}	Open

NOTES:
1. V_{CCI} is the supply voltage associated with the input.
2. R_L = 50kΩ is used for enable time and disable time measurement.
   R_L = 1MΩ is used for the measurement of pulse width, propagation delay, data rate and output rise and fall.
3. V_{CCO} is the supply voltage associated with the output.

WAVEFORMS

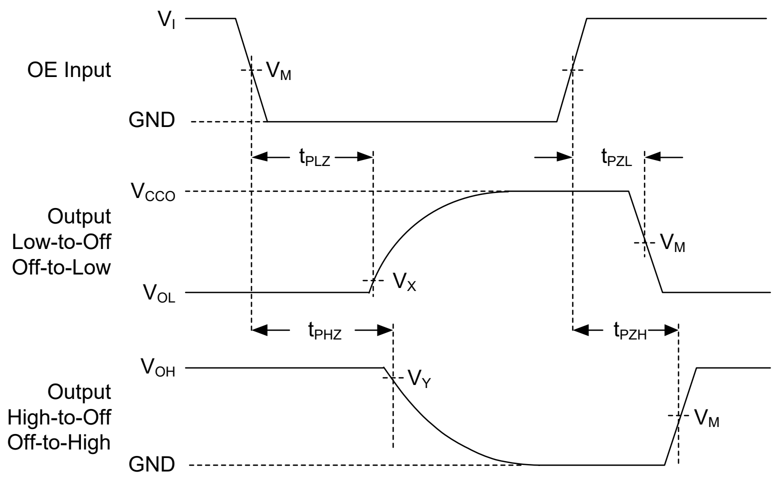


Test conditions are given in Table 1.

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 2. Input (An, Bn) to Output (Bn, An) 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.

V_{CCO} is the supply voltage associated with the output.

Figure 3. Enable and Disable Times

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT (1)	OUTPUT (2)		
V_{CCO} (2)	V_M	V_M	V_X	V_Y
1.8V ± 0.15V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
2.5V ± 0.2V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
3.3V ± 0.3V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.3V	V_{OH} - 0.3V
5.0V ± 0.5V	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 input.
2. V_{CCO} is the supply voltage associated with the output.

APPLICATION INFORMATION

Voltage Level-Translation Applications

SGM4573 can be used between two devices with different power supply voltages.

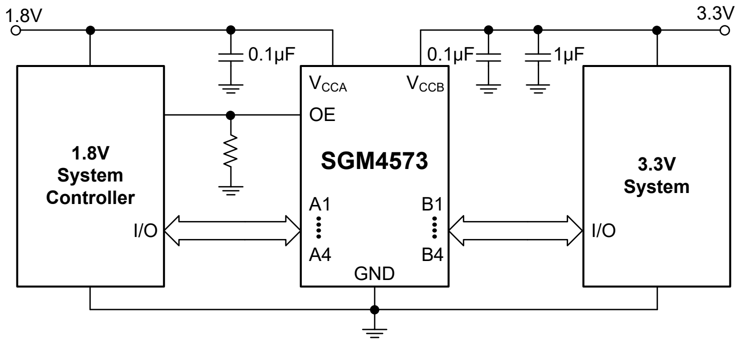


Figure 4. Recommended Application Circuit

Internal Structure

Figure 5 illustrates the internal structure of SGM4573. There is no control mechanism for the bidirectional transmission.

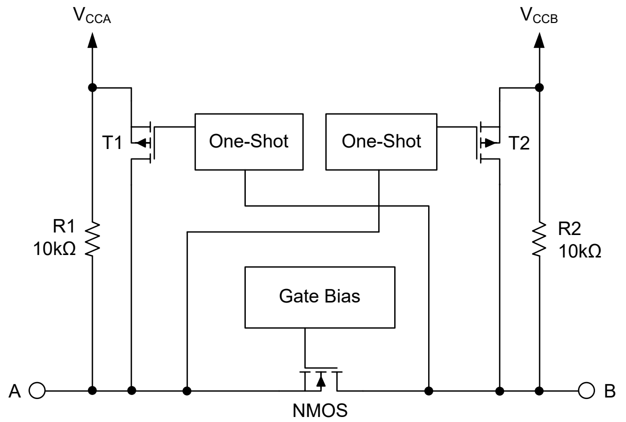


Figure 5. Internal Structure of SGM4573 (one channel)

SGM4573 can transmit the signal transparently with two enable mechanisms:

1. A P-Type transistor is placed between the two ports to turn on or off the transmission.
2. An accelerator is located at the output of SGM4573. Its function is to accelerate the rising edge of the signal.

There is a bias mechanism for the internal transistor and the bias voltage is around one threshold voltage higher than the lower supply voltage of SGM4573. For the application of low-to-high transition, the one-shot mechanism is significant as it can accelerate the transition of output. If the voltage level of the input signal reaches $0.5V_{CCI}$, the one-shot mechanism will be triggered. After that, one-shot mechanism is disabled and the pull-up resistor will dominate. The output impedance is within the range of 50Ω and 70Ω when the device is accelerating. If the users want to transmit a signal from the other direction, please make sure to transmit the signal after the one-shot mechanism is turned off to minimize dynamic current and contention. The pull-up resistors are in the internal of SGM4573.

Input Driver Requirements

The shape of the input signal affects the output directly, because SGM4573 is a voltage translator with switching characteristics. The amount of sinking current is determined by the structure of driver (push-pull or open-drain). In addition, the output impedance and the edge-rate of the driver will determine the properties of propagation delay, max data rate and transition time of high-to-low output. The typical value shown in this datasheet is under the condition of 50Ω output impedance.

APPLICATION INFORMATION (continued)

Output Load Considerations

The application of heavy capacitive load would affect the ability of one-shot mechanism, which means that the output of the device may not reach the positive supply rail within the duration of one-shot pulse. To reduce this possibility, users need to use shorter traces in PCB and less capacitive connectors. In addition, another advantage of using short traces is to provide low-impedance, avoiding oscillation of the signal, allowing reflection of the signal within one-shot duration and avoiding retriggering of one-shot function.

Power-up

For the application of SGM4573, the V_{CCA} should be less than V_{CCB}. However, it does not matter if the power supply voltage is ramping, and the sequence of power-up for both V_{CCA} and V_{CCB} is not defined. If one of the two power supplies is switched off, the internal circuit can disable the operation of SGM4573.

Enable and Disable

The OE pin is used to disable the output of the device, which means that if this pin is low, all of the transmitting pins are in high-impedance mode. The disable time (t_{DIS}) of this process is defined between the start of low position at OE pin and the start of output disables. For the definition of enable time (t_{EN}), it refers to the time between when OE pin is high and when the one-shot circuit is launched. In addition, if the users want to keep the device in off-state (high-impedance mode) when the power supply voltage is rising or falling, please connect OE pin to ground with a suitable resistor. And the value of the selected resistor is determined by the sinking-current capability of the driver.

Pull-up or Pull-down Resistors on I/O Lines

For both A and B sides, each transmission pin is pulled up to the power supply of A and B respectively. An external resistor that is parallel with the internal 10kΩ resistor can be added, which will affect the value of V_{OL}. However, the internal pull-up resistor will be disabled if OE pin is low.

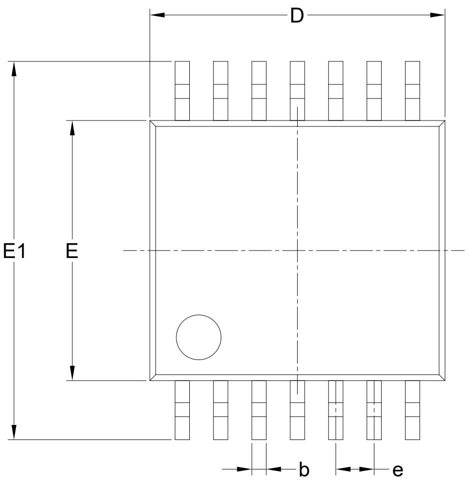
REVISION HISTORY

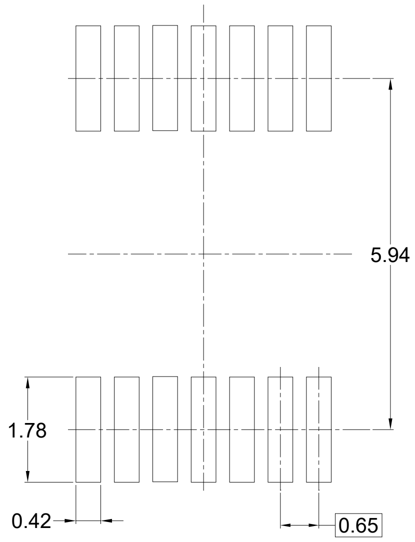
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (APRIL 2022) to REV.A	**Page**
Changed from product preview to production data	All

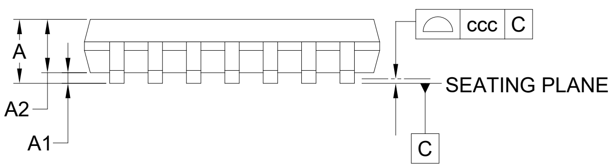
PACKAGE OUTLINE DIMENSIONS

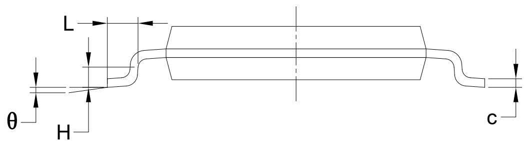
TSSOP-14





RECOMMENDED LAND PATTERN (Unit: mm)



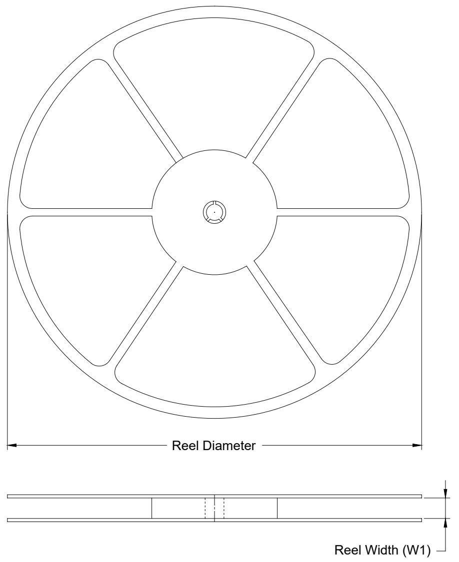


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	4.860	-	5.100
E	4.300	-	4.500
E1	6.200	-	6.600
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

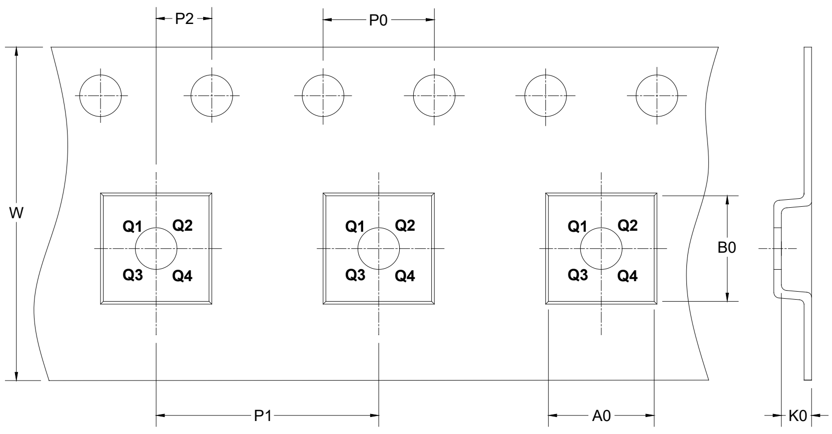
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-153.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

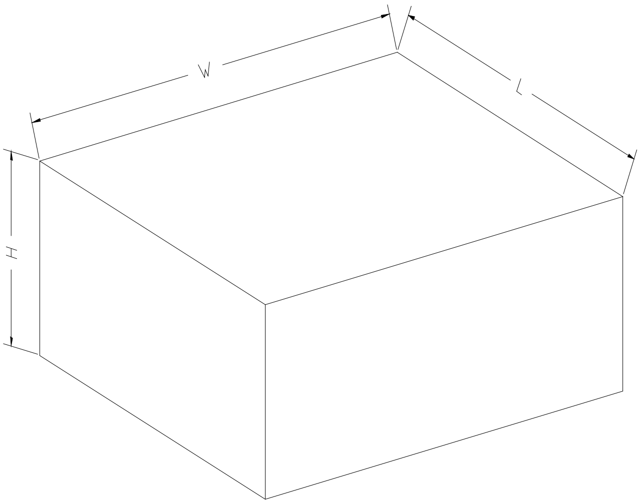
NOTE: The picture is only for reference. Please make the object as the standard.

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
TSSOP-14	13″	12.4	6.95	5.60	1.20	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