SGM4578
8-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications

GENERAL DESCRIPTION

The SGM4578 is an 8-bit, non-inverting, bidirectional voltage-level translator which features two independent configurable power-supply lines. The A and B ports track the V_{CCA} supply and V_{CCB} supply respectively. The supply voltage range is 1.65V to 5.5V for A ports and 2.3V to 5.5V for B ports. The device provides a bidirectional translation function between the different voltage nodes (including 1.8V, 2.5V, 3.3V and 5V).

The SGM4578 has an output enable (OE) function, which controls the inputs and outputs states. When OE goes low, all I/Os enter into the high-impedance state. It is beneficial for reducing quiescent current consumption. When V_{CCA} is powered, OE has an internal pull-down current source.

The SGM4578 is available in the Green TSSOP-20 and TQFN-3×3-20L packages. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Power Supply Voltage Ranges ($V_{CCA} \leq V_{CCB}$)**
  - **A Ports: 1.65V to 5.5V**
  - **B Ports: 2.3V to 5.5V**
- **Direction-Control Signal is Not Required**
- **Data Rates**
  - **Push-Pull: 24Mbps**
  - **Open-Drain: 2Mbps**
- **Support V_{CCA} or V_{CCB} Isolation**
  - **When V_{CCA} or V_{CCB} is Low, Device Enters Power-Down Mode**
- **No Specific Power Sequences Required for V_{CCA} and V_{CCB}**
- **Support Partial-Power-Down Function**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TSSOP-20 and TQFN-3×3-20L Packages**

APPLICATIONS

Universal Asynchronous Receiver/Transmitter

I^2C/SMBus Interfaces

General Purpose I/O (GPIO)

TYPICAL APPLICATION

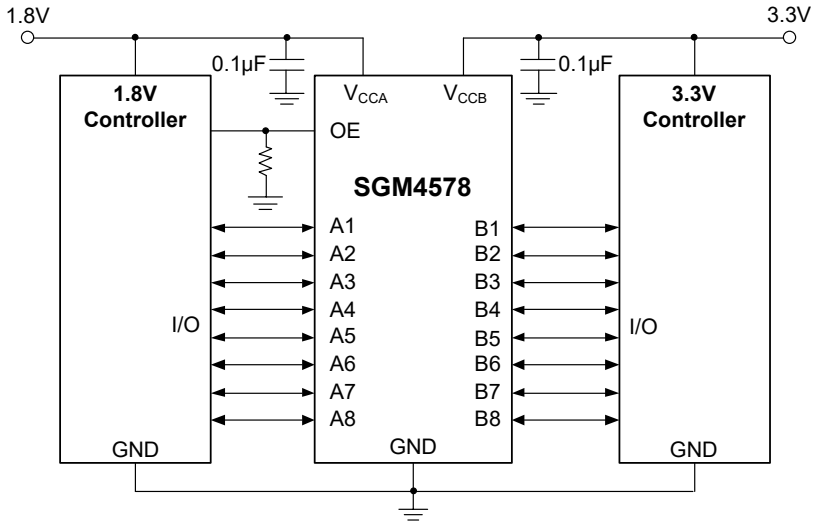


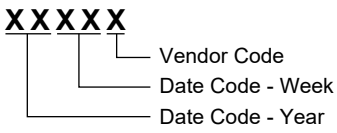
Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4578	TSSOP-20	-40℃ to +85℃	SGM4578YTS20G/TR	SGM4578YTS20 XXXXX	Tape and Reel, 4000
	TQFN-3×3-20L	-40℃ to +85℃	SGM4578YTQG20G/TR	SGM 4578QG XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: 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

Supply Voltage Range
- V_{CCA} ..... -0.3V to 6V
- V_{CCB} ..... -0.3V to 6V

A Ports, B Ports, OE Input Voltage Range, V_I (1) ..... -0.3V to 6V

Output Voltage Range for the High-Impedance or Power-Off State, V_O (1)
- A Ports ..... -0.3V to 6V
- B Ports ..... -0.3V to 6V

Output Voltage Range for the High or Low State, V_O (1) (2)
- A Ports ..... -0.3V to V_{CCA} + 0.3V
- B Ports ..... -0.3V to V_{CCB} + 0.3V

Input Clamp Current, I_{IK} (V_I < 0) ..... -50mA

Output Clamp Current, I_{OK} (V_O < 0) ..... -25mA

Continuous Output Current, I_O ..... ±50mA

Continuous Current through V_{CCA}, V_{CCB}, or GND ..... ±100mA

Package Thermal Resistance
- TSSOP-20, θ_{JA} ..... 87.3℃/W
- TSSOP-20, θ_{JB} ..... 56.3℃/W
- TSSOP-20, θ_{JC} ..... 35.7℃/W
- TQFN-3×3-20L, θ_{JA} ..... 48.5℃/W
- TQFN-3×3-20L, θ_{JB} ..... 23.1℃/W
- TQFN-3×3-20L, $\theta_{JC\ (TOP)}$ ..... 54.9℃/W
- TQFN-3×3-20L, $\theta_{JC\ (BOT)}$ ..... 11℃/W

Junction Temperature ..... +150℃

Storage Temperature Range ..... -65℃ to +150℃

Lead Temperature (Soldering, 10s) ..... +260℃

ESD Susceptibility

HBM 4000V

MM 300V

CDM 1000V

RECOMMENDED OPERATING CONDITIONS (3, 4)

Supply Voltage Range (5)
- V_{CCA} ..... 1.65V to 5.5V
- V_{CCB} ..... 2.3V to 5.5V

High-Level Input Voltage, V_{IH}
- A Port I/Os (V_{CCA} = 1.65V, V_{CCB} = 2.3V to 5.5V) ..... V_{CCI} - 0.1V to V_{CCI}
- A Port I/Os (V_{CCA} = 1.95V to 5.5V, V_{CCB} = 2.3V to 5.5V) ..... V_{CCI} - 0.4V to V_{CCI}
- B Port I/Os ..... V_{CCI} - 0.4V to V_{CCI}
- OE Input ..... V_{CCA} × 0.8V to 5.5V

Low-Level Input Voltage, V_{IL}
- A Port I/Os ..... 0V to 0.15V
- B Port I/Os ..... 0V to 0.15V
- OE Input ..... 0V to V_{CCA} × 0.25V

Operating Temperature Range ..... -40℃ to +85℃

NOTES:

1. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

2. V_{CCA} and V_{CCB} values are shown in the recommended operating conditions table.

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

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

5. Ensure that $V_{CCA} \le V_{CCB}$ and V_{CCA} must not exceed 5.5V.

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

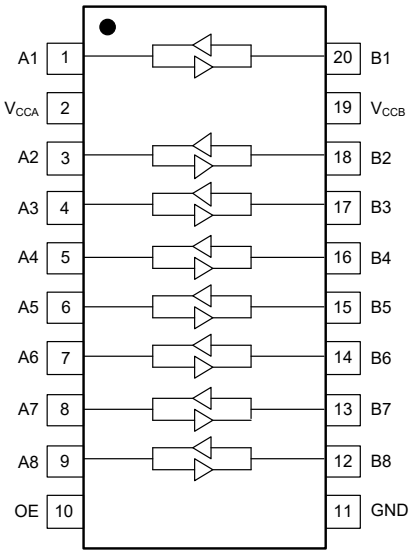
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

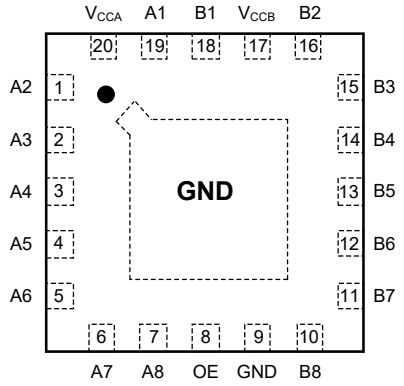
PIN CONFIGURATIONS

(TOP VIEW)



TSSOP-20

(TOP VIEW)



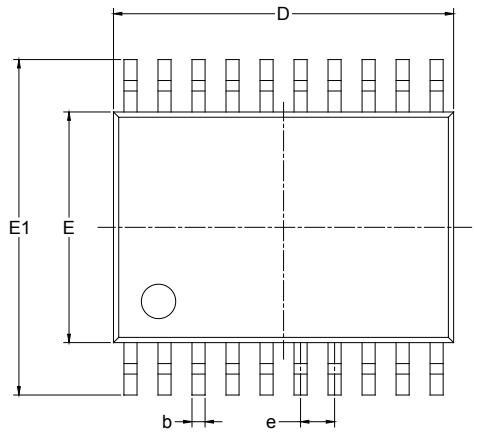
TQFN-3×3-20L

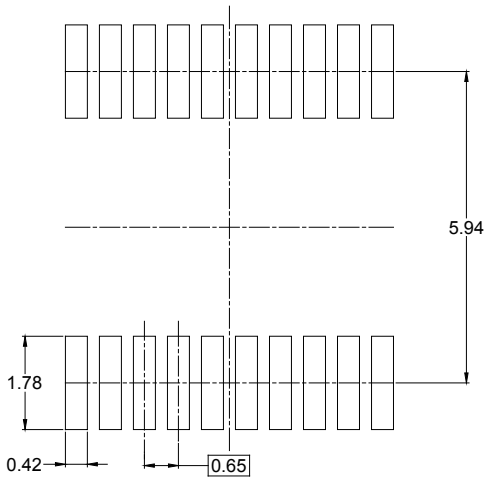
PIN DESCRIPTION

PIN		NAME	TYPE	FUNCTION
TSSOP-20	TQFN-3×3-20L			
1	19	A1	I/O	Input/Output 1. It tracks the V_{CCA} supply.
2	20	V_{CCA}	P	Supply Voltage on A Ports. It can be operated from 1.65V to 5.5V, and V_{CCA} is always ≤ V_{CCB}.
3	1	A2	I/O	Input/Output 2. It tracks the V_{CCA} supply.
4	2	A3	I/O	Input/Output 3. It tracks the V_{CCA} supply.
5	3	A4	I/O	Input/Output 4. It tracks the V_{CCA} supply.
6	4	A5	I/O	Input/Output 5. It tracks the V_{CCA} supply.
7	5	A6	I/O	Input/Output 6. It tracks the V_{CCA} supply.
8	6	A7	I/O	Input/Output 7. It tracks the V_{CCA} supply.
9	7	A8	I/O	Input/Output 8. It tracks the V_{CCA} supply.
10	8	OE	I	Output Enable Control Pin. Active high. When OE goes low, all outputs enter into the high-impedance state. It tracks the V_{CCA} supply.
11	9	GND	G	Ground.
12	10	B8	I/O	Input/Output 8. It tracks the V_{CCB} supply.
13	11	B7	I/O	Input/Output 7. It tracks the V_{CCB} supply.
14	12	B6	I/O	Input/Output 6. It tracks the V_{CCB} supply.
15	13	B5	I/O	Input/Output 5. It tracks the V_{CCB} supply.
16	14	B4	I/O	Input/Output 4. It tracks the V_{CCB} supply.
17	15	B3	I/O	Input/Output 3. It tracks the V_{CCB} supply.
18	16	B2	I/O	Input/Output 2. It tracks the V_{CCB} supply.
19	17	V_{CCB}	S	Supply Voltage on B Ports. It can be operated from 2.3V to 5.5V.
20	18	B1	I/O	Input/Output 1. It tracks the V_{CCB} supply.
—	Exposed Pad	GND	—	Exposed pad should be soldered to PCB board and connected to GND or left floating.

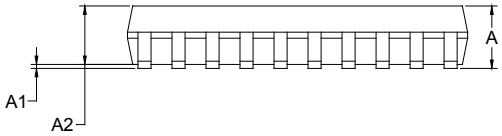
PACKAGE OUTLINE DIMENSIONS

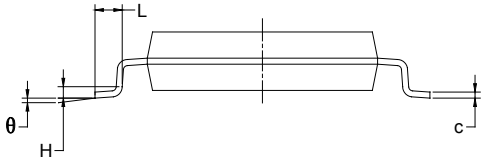
TSSOP-20





RECOMMENDED LAND PATTERN (Unit: mm)

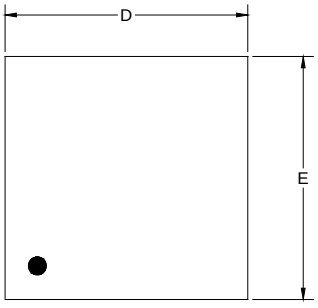




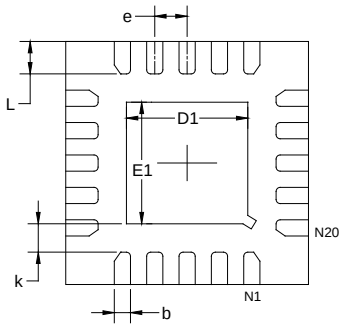
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.100		0.043
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	6.400	6.600	0.252	0.259
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

PACKAGE OUTLINE DIMENSIONS

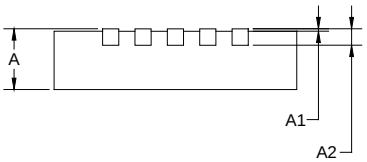
TQFN-3×3-20L



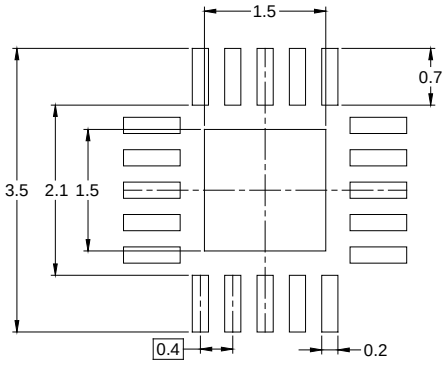
TOP VIEW



BOTTOM VIEW



SIDE VIEW



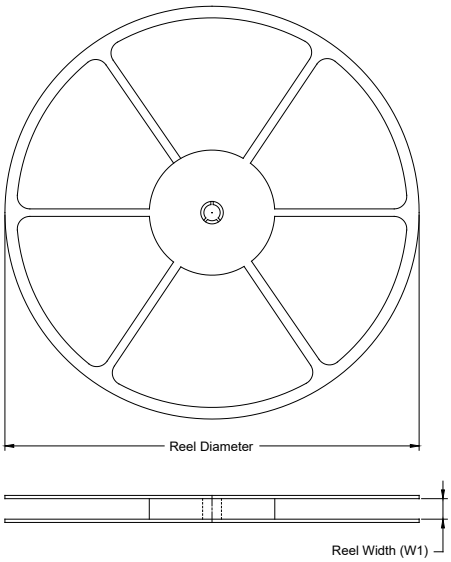
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.924	3.076	0.115	0.121
D1	1.400	1.600	0.055	0.063
E	2.924	3.076	0.115	0.121
E1	1.400	1.600	0.055	0.063
k	0.200 MIN		0.008 MIN	
b	0.150	0.250	0.006	0.010
e	0.400 TYP		0.016 TYP	
L	0.324	0.476	0.013	0.019

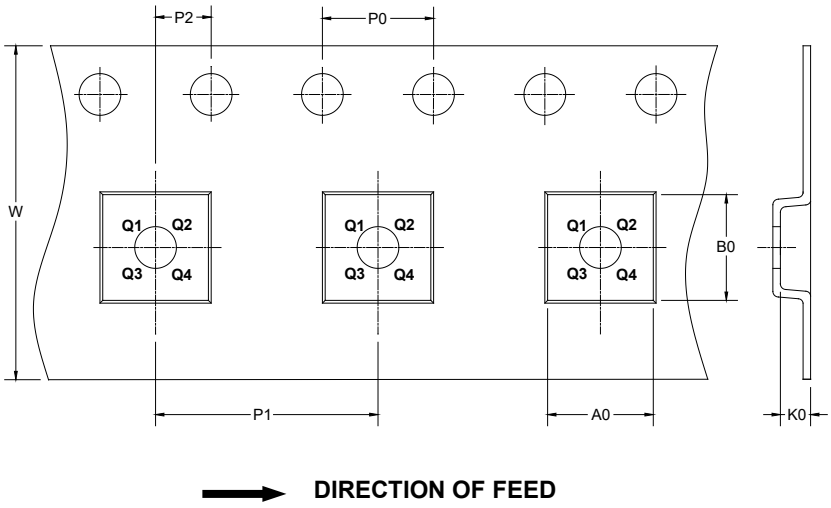
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



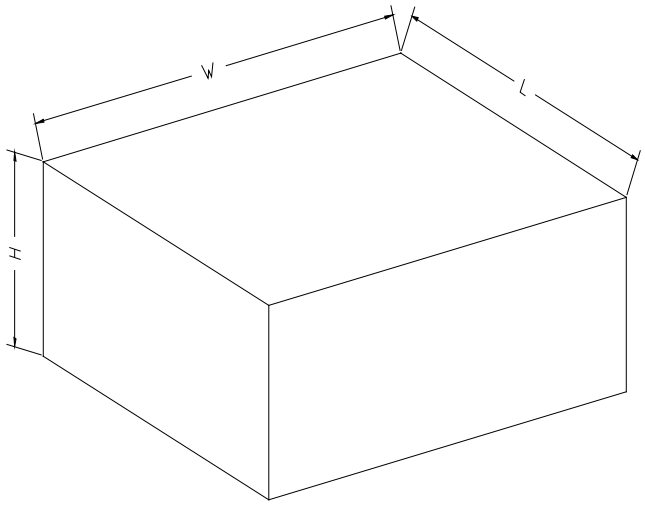
NOTE: The picture is only for reference. Please make the object as the standard.

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	Assembly House
TSSOP-20	13″	12.4	6.80	6.85	1.70	4.0	8.0	2.0	12.0	Q1	JCET-D8
TSSOP-20	13″	16.4	6.80	6.90	1.50	4.0	8.0	2.0	16.0	Q1	HTTS
TQFN-3×3-20L	13″	12.4	3.30	3.30	1.10	4.0	8.0	2.0	12.0	Q2	JCET-D3

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