SGM4565C
SIM Card Interface Level Translator with EMI Filter and ESD Protection

GENERAL DESCRIPTION

The SGM4565C is a SIM card interface level translator between host controller and SIM card. It provides the high-speed level shifting function between host's 1.08V to 3.6V logic level and SIM card's 1.62V to 3.6V logic level. The signals include Data, CLK and Reset.

The SGM4565C is available in a Green UTQFN-1.8×1.4-10L package.

FEATURES

- **Support 1.62V to 3.6V SIM Card Supply Voltage**
- **Support 1.08V to 3.6V Host Microcontroller Supply Voltage**
- **Support up to 10MHz Clock Frequency**
- **Automatic Level Translation of Data, Reset and CLK Signals between Host and SIM Card**
- **Support Automatic Enable and Disable by V_{CCB}**
- **Integrated Pull-Up and Pull-Down Resistors**
- **Integrated EMI Filters**
- **Available in a Green UTQFN-1.8×1.4-10L Package**

APPLICATIONS

Smart Phone
SIM Card Terminals
POS Machine

TYPICAL APPLICATION

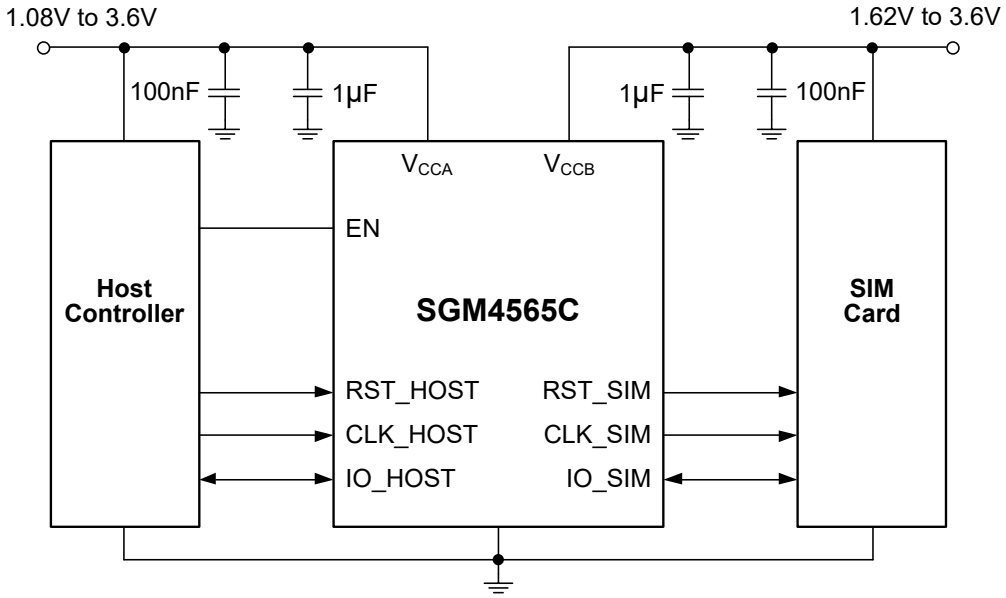


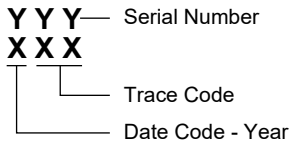
Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4565C	UTQFN-1.8×1.4-10L	-40℃ to +125℃	SGM4565CXUWQ10G/TR	2BU XXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXX = Date Code and Trace 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
- Host Supply, V_{CCA} ..... -0.5V to 4.6V
- SIM Supply, V_{CCB} ..... -0.5V to 4.6V

Input/Output Voltage Range (Host Side)
- CLK_HOST, $V_{I(CLK\_HOST)}$ ... -0.5V to MIN (4.6V, V_{CCA} + 0.3V)
- RST_HOST, $V_{I(RST\_HOST)}$ ... -0.5V to MIN (4.6V, V_{CCA} + 0.3V)
- IO_HOST, $V_{I(IO\_HOST)}$ ..... -0.5V to MIN (4.6V, V_{CCA} + 0.3V)
- EN, $V_{I(EN)}$ ..... -0.5V to 4.6V

Input/Output Voltage Range (SIM Side)
- CLK_SIM, $V_{I(CLK\_SIM)}$ ..... -0.5V to MIN (4.6V, V_{CCB} + 0.3V)
- RST_SIM, $V_{I(RST\_SIM)}$ ..... -0.5V to MIN (4.6V, V_{CCB} + 0.3V)
- IO_SIM, $V_{I(IO\_SIM)}$ ..... -0.5V to MIN (4.6V, V_{CCB} + 0.3V)

Package Thermal Resistance
- UTQFN-1.8×1.4-10L, θ_{JA} ..... 178.7℃/W
- UTQFN-1.8×1.4-10L, θ_{JB} ..... 76.7℃/W
- UTQFN-1.8×1.4-10L, θ_{JC} ..... 130.4℃/W

Junction Temperature ..... +150℃

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

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

ESD Susceptibility (1) (2)

HBM ..... ±8000V

CDM ..... ±1000V

NOTES:

1. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.

2. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range
- Host Supply, V_{CCA} ..... 1.08V to 3.6V
- SIM Supply, V_{CCB} ..... 1.62V to 3.6V

Input/Output Voltage Range (Host Side)
- CLK_HOST, $V_{I(CLK\_HOST)}$ ..... 0V to V_{CCA}
- RST_HOST, $V_{I(RST\_HOST)}$ ..... 0V to V_{CCA}
- IO_HOST, $V_{I(IO\_HOST)}$ ..... 0V to V_{CCA}
- EN, $V_{I(EN)}$ ..... 0V to 3.6V

Input/Output Voltage Range (SIM Side)
- CLK_SIM, $V_{I(CLK\_SIM)}$ ..... 0V to V_{CCB}
- RST_SIM, $V_{I(RST\_SIM)}$ ..... 0V to V_{CCB}
- IO_SIM, $V_{I(IO\_SIM)}$ ..... 0V to V_{CCB}

Operating 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

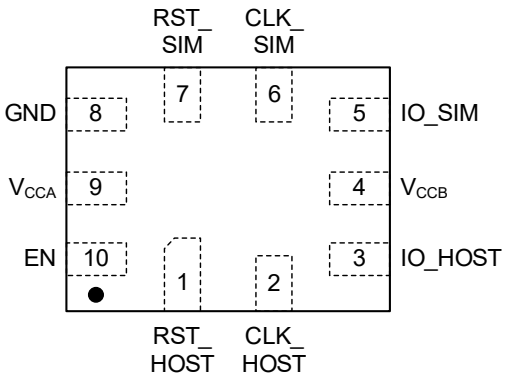
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

(TOP VIEW)



UTQFN-1.8×1.4-10L

PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	RST_HOST	I	Host Controller Reset Input Pin.
2	CLK_HOST	I	Host Controller Clock Input Pin.
3	IO_HOST	I/O	Host Side Bidirectional Data Input/Output Pin. The output of the host must be on an open-drain driver.
4	V_{CCB}	P	SIM Card Supply Voltage. When V_{CCB} < V_{CCB_DIS}, the chip is disabled. 100nF and 1μF ceramic capacitors should be placed as close as possible to V_{CCB} pin.
5	IO_SIM	I/O	SIM Card Side Bidirectional Data Input/Output Pin. The output of the SIM card must be on an open-drain driver.
6	CLK_SIM	O	SIM Card Clock Output Pin.
7	RST_SIM	O	SIM Card Reset Output Pin.
8	GND	G	Ground.
9	V_{CCA}	P	Host Controller Supply Voltage for the Input/Output Pins (CLK_HOST, RST_HOST, IO_HOST, EN). 100nF and 1μF ceramic capacitors should be placed as close as possible to V_{CCA} pin.
10	EN	I	Host Controller Driven Enable Pin. A logic low reduces the supply current. Connect to V_{CCA} for normal operation.

NOTE: I = input, O = output, I/O = input/output, P = power, G = ground.

FUNCTIONAL DESCRIPTION

Table 1. Function Table

Supply Voltage		Input	Input/Output		Operational Mode
V_{CCA}	V_{CCB}	EN (1)	Host	SIM Card	
1.08V to 3.6V	1.62V to 3.6V	H	Host = SIM Card	SIM Card = Host	Active
1.08V to 3.6V	1.62V to 3.6V	L	Condition D, See Table 2		Shutdown Mode
GND	1.62V to 3.6V	X	Condition A, See Table 2		Shutdown Mode
1.08V to 3.6V	GND	X	Condition B, See Table 2		Shutdown Mode
GND	GND	X	Condition C, See Table 2		Shutdown Mode

NOTE:

1. H = High-level voltage, L = Low-level voltage, X = Don't care.

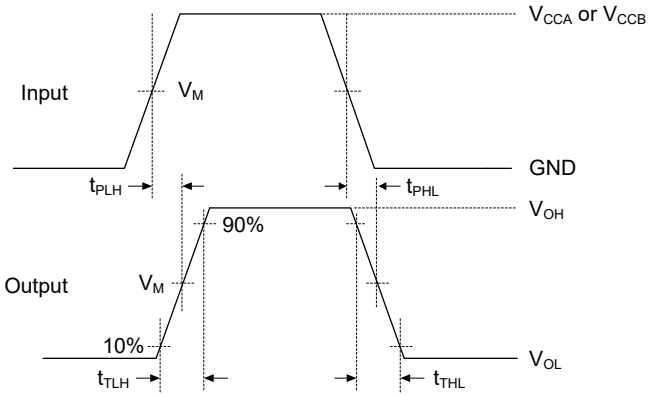
Table 2. Pin Condition (1)

Pin Name	Condition A (2)	Condition B (3)	Condition C	Condition D (4)
RST_HOST	100kΩ pull low	100kΩ pull low	100kΩ pull low	100kΩ pull low
CLK_HOST	100kΩ pull low	100kΩ pull low	100kΩ pull low	100kΩ pull low
IO_HOST	5kΩ pull to V_{CCA}	5kΩ pull to V_{CCA}	5kΩ pull to V_{CCA}	5kΩ pull to V_{CCA}
RST_SIM	580Ω pull low	100kΩ pull low	100kΩ pull low	580Ω pull low
CLK_SIM	580Ω pull low	100kΩ pull low	100kΩ pull low	580Ω pull low
IO_SIM	120Ω pull low	100Ω pull low	Hi-Z	70Ω pull low

NOTES:

1. See Figure 3.
2. For condition A, 580Ω and 120Ω are the results corresponding to V_{CCA} = 0V and V_{CCB} = 3.6V.
3. For condition B, 100Ω is the result corresponding to V_{CCA} = 3.6V and V_{CCB} = 0V.
4. For condition D, 580Ω and 70Ω are the results corresponding to V_{CCA} = 3.6V and V_{CCB} = 3.6V.

WAVEFORM



NOTES:

1. See the Dynamic Characteristics table for measurement points.
2. V_{OL} and V_{OH} are typical output voltages that generate with the output load.
3. t_{PHL} and t_{PLH} are the same as t_{PD}.
4. t_{THL} and t_{TLH} are the same as t_T.

Figure 2. Propagation Delay (Data Input to Data Output)

FUNCTIONAL BLOCK DIAGRAM

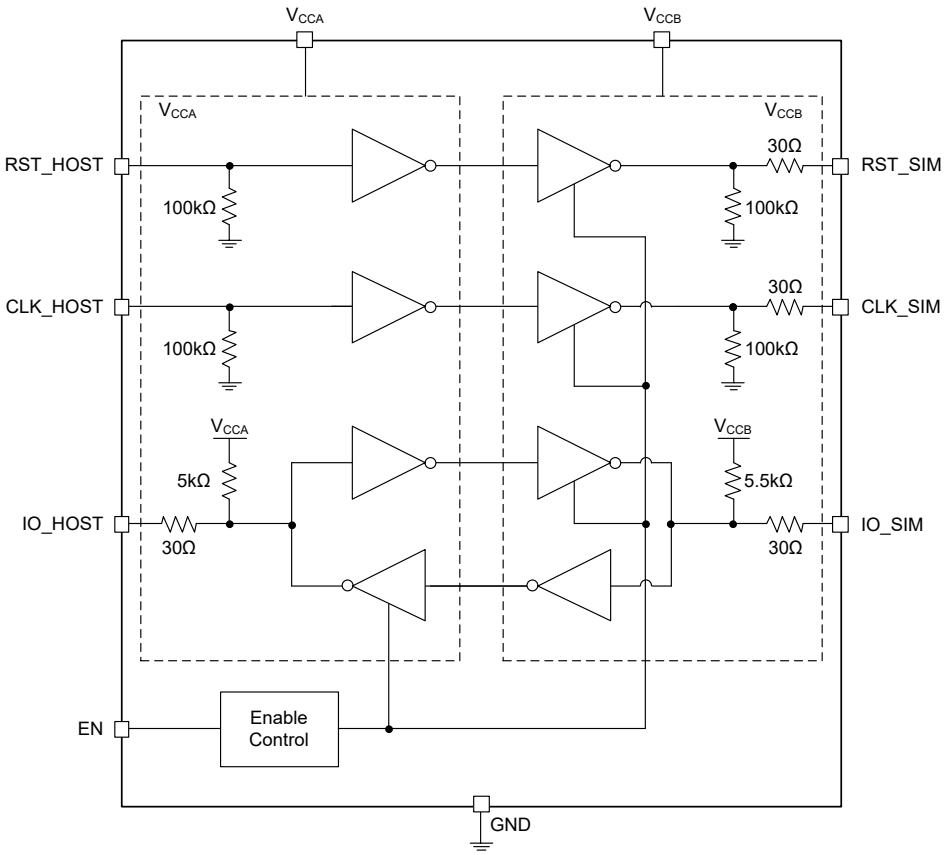
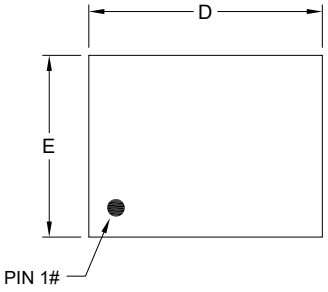


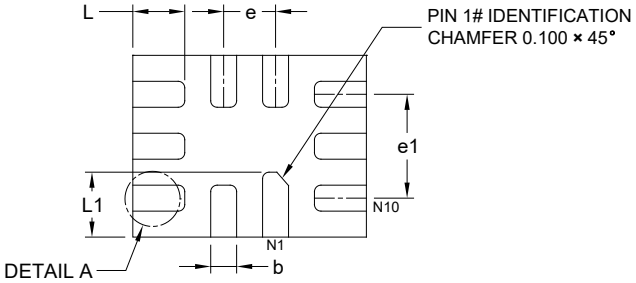
Figure 3. Block Diagram

PACKAGE OUTLINE DIMENSIONS

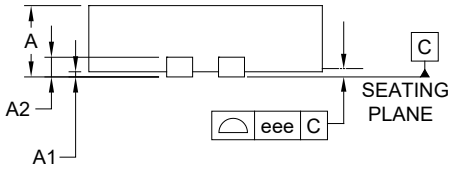
UTQFN-1.8×1.4-10L



TOP VIEW

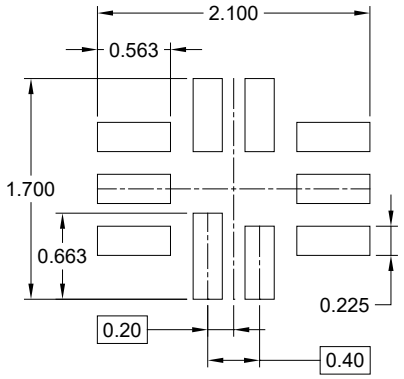


BOTTOM VIEW



SIDE VIEW

DETAIL A
ALTERNATE TERMINAL CONSTRUCTION



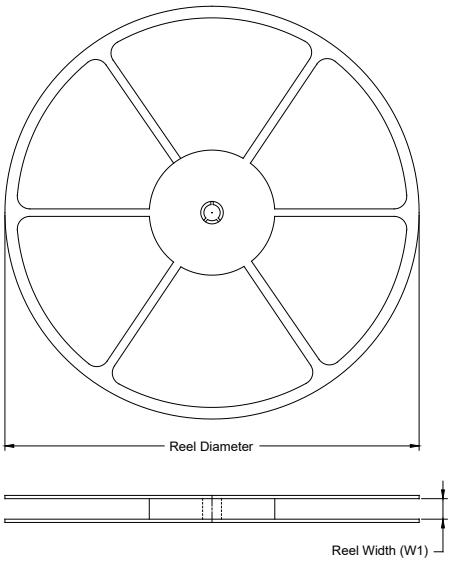
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.450	-	0.600
A1	0.000	-	0.050
A2		0.152 REF	
b	0.150	0.200	0.250
D	1.750	1.800	1.850
E	1.350	1.400	1.450
e		0.400 TYP	
e1		0.800 REF	
L	0.350	0.400	0.450
L1	0.450	0.500	0.550
L2	0.000	-	0.100
eee	-	0.080	-

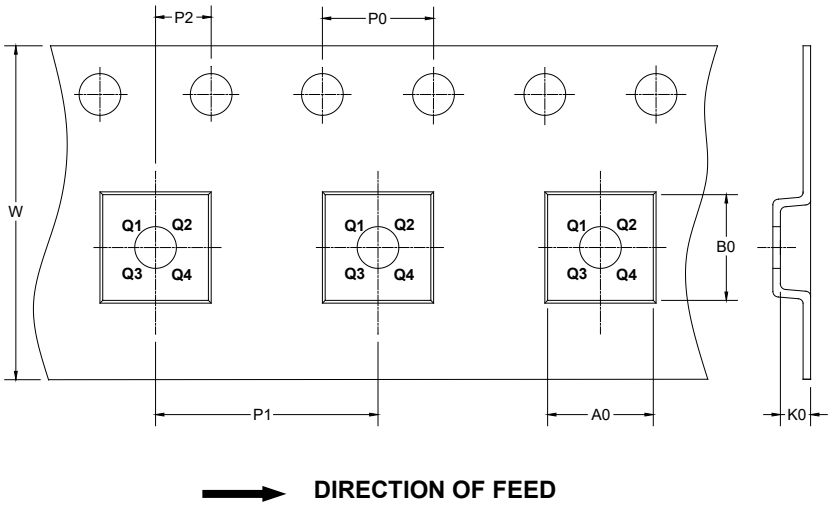
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



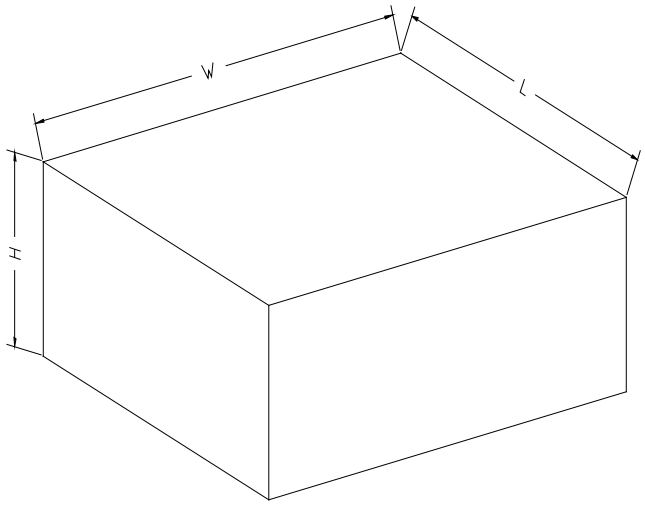
NOTE: The picture is only for reference. Please make the object as the standard.

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
UTQFN-1.8×1.4-10L	7″	9.0	1.75	2.10	0.70	4.0	4.0	2.0	8.0	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
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002