SGM4T245
4-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs

GENERAL DESCRIPTION

The SGM4T245 is a 4-bit, dual-supply bus transceiver with configurable voltage translation and 3-state outputs. The device can be used as two 2-bit transceivers or as a 4-bit transceiver. The nAn and nBn are four 2-bit input and output ports. nDIR are the direction control inputs and $n\overline{OE}$ are the output enable inputs. V_{CCA} and V_{CCB} are the supply pins. The supply voltage of V_{CCA} and V_{CCB} can range from 1.2V to 5.0V, making the device suitable for bidirectional translating between any of the 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5.0V voltage nodes.

Pins nAn, $n\overline{OE}$ and nDIR are referenced to V_{CCA} and nBn pins are referenced to V_{CCB}. When nDIR is set high, it allows transmission from nAn to nBn. When nDIR is set low, it allows transmission from nBn to nAn. $n\overline{OE}$ can be used to make the outputs disabled so that the buses are effectively isolated. In suspend mode, both nAn and nBn are in high-impedance state when either V_{CCA} or V_{CCB} input is at GND level.

This device is highly suitable for partial power-down applications using power-off leakage current (I_{OFF}) circuit. When the device is powered down, the current backflow will be prevented from passing through the device.

$\overline{OE}$ should be tied to V_{CC} through a pull-up resistor, in order to make sure the high-impedance state during power-up or power-down, the minimum resistance depends on the current-sinking capability of the driver.

The SGM4T245 is available in Green TSSOP-16 and TQFN-2.6×1.8-16L packages. It operates over an ambient temperature range of -40℃ to +125℃.

FEATURES

- **V_{CCA} Supply Voltage Range: 1.2V to 5.0V**
- **V_{CCB} Supply Voltage Range: 1.2V to 5.0V**
- **Input and Output Interface Capability to 6V System Environment**
- **Control Inputs Levels are Referenced to V_{CCA}**
- **Outputs in High-Impedance State when V_{CCA} or V_{CCB} = 0V**
- **Support Partial Power-Down Mode**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green TSSOP-16 and TQFN-2.6×1.8-16L Packages**

APPLICATIONS

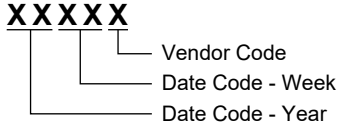
Personal Electronic
Industrial Equipment
Enterprise Infrastructures
Telecom Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4T245	TSSOP-16	-40℃ to +125℃	SGM4T245XTS16G/TR	SGM4T245 XTS16 XXXXX	Tape and Reel, 4000
	TQFN-2.6×1.8-16L	-40℃ to +125℃	SGM4T245XTQA16G/TR	4T245 XXXXX	Tape and Reel, 3000

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 (1)

Supply Voltage Range, V_{CCA} ..... -0.3V to 6.0V
Supply Voltage Range, V_{CCB} ..... -0.3V to 6.0V
Input Voltage, V_I (2) ..... -0.3V to 6.0V
Output Voltage, V_O (2)
Suspend or 3-State Mode ..... -0.3V to 6.0V
Active Mode
A Ports ..... -0.3V to MIN (6.0V, V_{CCA} + 0.3V)
B Ports ..... -0.3V to MIN (6.0V, V_{CCB} + 0.3V)
Input Clamp Current, I_{IK} (V_I < 0) ..... -70mA (MAX)
Output Clamp Current, I_{OK} (V_O < 0) ..... -70mA (MAX)
Output Current, I_O
Continuous Output Current ..... ±70mA
Continuous Output Current through V_{CCA}, V_{CCB}, or 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} ..... 1.2V to 5.0V
Supply Voltage Range, V_{CCB} ..... 1.2V to 5.0V
Input Voltage, V_I ..... 0V to 5.0V
Output Voltage, V_O
Suspend or 3-State Mode ..... 0V to 5.0V
Active Mode
A Ports ..... 0V to V_{CCA}
B Ports ..... 0V to V_{CCB}
Input Transition Rise or Fall Rate, Δt/ΔV ..... 3ns/V (MAX)
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 input and output negative voltage ratings may be exceeded if the input and output clamp 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.

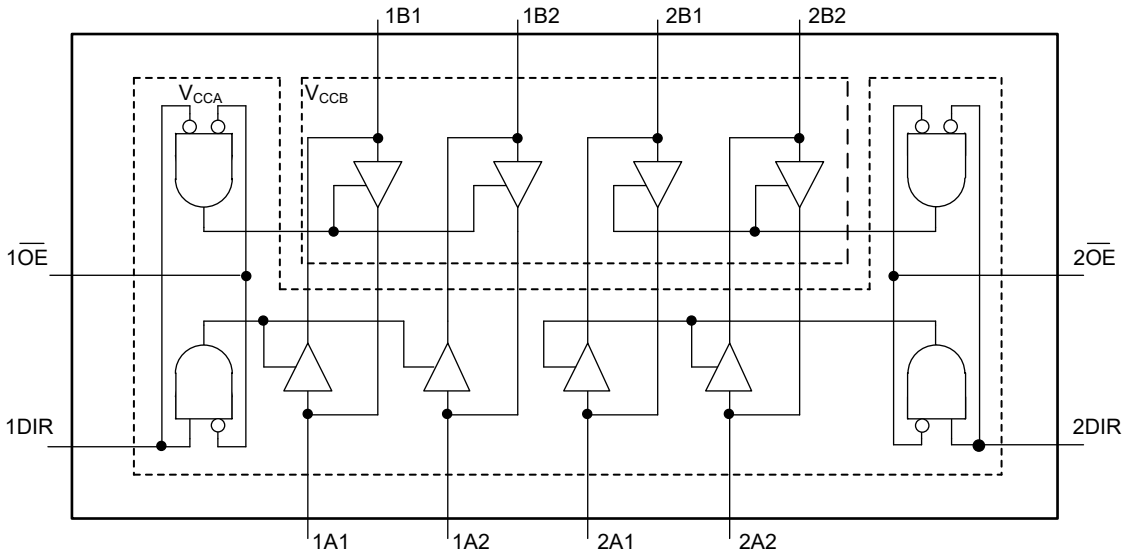
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged 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.

DISCLAIMER

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

LOGIC SYMBOL



FUNCTION TABLE

SUPPLY VOLTAGE	CONTROL INPUT		INPUT/OUTPUT	
V_{CCA}, V_{CCB} (1)	n$\overline{OE}$	nDIR	nAn	nBn
1.2V to 5.0V	L	L	nAn = nBn	Inputs
1.2V to 5.0V	L	H	Inputs	nBn = nAn
1.2V to 5.0V	H	*X*	Z	Z
GND (2)	*X*	*X*	Z	Z

H = High Voltage Level

L = Low Voltage Level

Z = High-Impedance State

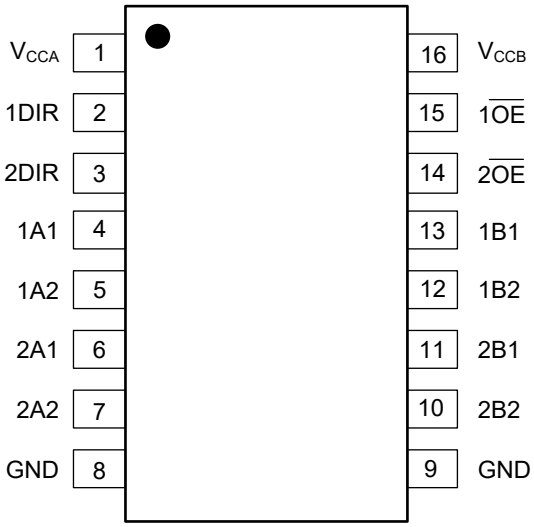
X = Don't Care

NOTES:

1. The nAn, nDIR and n$\overline{OE}$ signals are referenced to V_{CCA}. The nBn signals are referenced to V_{CCB}.
2. If at least one of V_{CCA} or V_{CCB} is at GND level, the device enters suspend mode.

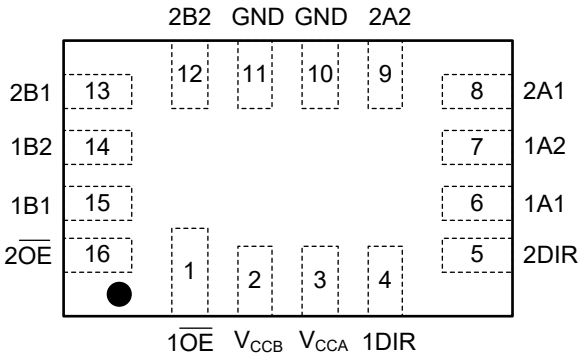
PIN CONFIGURATIONS

(TOP VIEW)



TSSOP-16

(TOP VIEW)



TQFN-2.6×1.8-16L

PIN DESCRIPTION

PIN		NAME	FUNCTION
TSSOP-16	TQFN-2.6×1.8-16L		
1	3	V_{CCA}	Supply Voltage V_{CCA}. The nAn, nDIR and n$\overline{OE}$ signals are referenced to V_{CCA}.
2, 3	4, 5	1DIR, 2DIR	Direction Control Inputs.
4, 5	6, 7	1A1, 1A2	Data Inputs/Outputs.
6, 7	8, 9	2A1, 2A2	Data Inputs/Outputs.
8, 9	10, 11	GND	Ground.
11, 10	13,12	2B1, 2B2	Data Inputs/Outputs.
13, 12	15, 14	1B1, 1B2	Data Inputs/Outputs.
15, 14	16, 1	1$\overline{OE}$, 2$\overline{OE}$	Output Enable Inputs (Active Low).
16	2	V_{CCB}	Supply Voltage V_{CCB}. The nBn signals are referenced to V_{CCB}

ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V_{IH}	Data inputs	V_{CCI} = 1.2V to 1.4V	Full	0.85 × V_{CCI}			V
			V_{CCI} = 1.4V to 2.3V	Full	0.75 × V_{CCI}			
			V_{CCI} = 2.3V to 3.3V	Full	1.75V			
			V_{CCI} = 3.3V to 5.0V	Full	2.2V			
		nDIR, n$\overline{OE}$ inputs	V_{CCI} = 1.2V to 1.4V	Full	0.85 × V_{CCA}			
			V_{CCI} = 1.4V to 2.3V	Full	0.75 × V_{CCA}			
			V_{CCI} = 2.3V to 3.3V	Full	1.75V			
			V_{CCI} = 3.3V to 5.0V	Full	2.2V			
Low-Level Input Voltage	V_{IL}	Data inputs	V_{CCI} = 1.2V to 1.4V	Full			0.1 × V_{CCI}	V
			V_{CCI} = 1.4V to 2.3V	Full			0.15 × V_{CCI}	
			V_{CCI} = 2.3V to 3.3V	Full			0.5V	
			V_{CCI} = 3.3V to 5.0V	Full			0.65V	
		nDIR, n$\overline{OE}$ inputs	V_{CCI} = 1.2V to 1.4V	Full			0.1 × V_{CCA}	
			V_{CCI} = 1.4V to 2.3V	Full			0.15 × V_{CCA}	
			V_{CCI} = 2.3V to 3.3V	Full			0.5V	
			V_{CCI} = 3.3V to 5.0V	Full			0.65V	
High-Level Output Voltage	V_{OH}	V_I = V_{IH}	V_{CCA} = 1.2V to 5.0V, V_{CCB} = 1.2V to 5.0V, I_{OH} = -100μA	+25℃		V_{CCO} - 0.005		V
			V_{CCA} = 1.2V, V_{CCB} = 1.2V, I_{OH} = -1mA	+25℃		1.17		
			V_{CCA} = 1.4V, V_{CCB} = 1.4V, I_{OH} = -5mA	+25℃		1.27		
			V_{CCA} = 1.65V, V_{CCB} = 1.65V, I_{OH} = -16mA	Full	1.10	1.32		
			V_{CCA} = 2.3V, V_{CCB} = 2.3V, I_{OH} = -20mA	Full	1.90	2		
			V_{CCA} = 5.0V, V_{CCB} = 5.0V, I_{OH} = -20mA	Full	4.70	4.83		
Low-Level Output Voltage	V_{OL}	V_I = V_{IL}	V_{CCA} = 1.2V to 5.0V, V_{CCB} = 1.2V to 5.0V, I_{OL} = 100μA	+25℃		0.005		V
			V_{CCA} = 1.2V, V_{CCB} = 1.2V, I_{OL} = 1mA	+25℃		0.02		
			V_{CCA} = 1.4V, V_{CCB} = 1.4V, I_{OL} = 5mA	+25℃		0.09		
			V_{CCA} = 1.65V, V_{CCB} = 1.65V, I_{OL} =16mA	Full		0.25	0.40	
			V_{CCA} = 2.3V, V_{CCB} = 2.3V, I_{OL} = 20mA	Full		0.2	0.36	
			V_{CCA} = 5.0V, V_{CCB} = 5.0V, I_{OL} = 20mA	Full		0.18	0.27	
Input Leakage Current	I_I	Control inputs	V_{CCA} = 1.2V to 5.0V, V_{CCB} = 1.2V to 5.0V, V_I = V_{CCA} or GND	Full		±0.01	11	μA
Power Off Leakage Current	I_{OFF}	A or B Ports	V_{CCA} = 0V, V_{CCB} = 0V to 5.0V, V_I or V_O = 0V to 5.0V	Full		±0.01	14	μA
			V_{CCA} = 0V to 5.0V, V_{CCB} = 0V, V_I or V_O = 0V to 5.0V	Full		±0.01	14	
3-State Output Leakage	I_{OZ} (1)	A or B Ports	V_{CCA} = 5.0V, V_{CCB} = 5.0V, n$\overline{OE}$ = V_{IH} V_O = V_{CCO} or GND, V_I = V_{CCI} or GND,	Full		±0.01	11	μA
Quiescent Supply Current	I_{CCA}	V_{CCA} = 1.2V to 5.0V, V_{CCB} = 1.2V to 5.0V, V_I = V_{CCI} or GND, I_O = 0A		Full			15	μA
	I_{CCB}			Full			24	
	I_{CCA} + I_{CCB}			Full			25	
Input Capacitance	C_I	Control inputs	V_{CCA} = 3.3V, V_{CCB} = 3.3V, V_I = 3.3V or GND	+25℃		12.3		pF
Input/Output Capacitance	C_{IO}	A or B Ports	V_{CCA} = 3.3V, V_{CCB} = 3.3V, V_O = 3.3V or GND	+25℃		9.8		pF

NOTE:

1. For I/O ports, the parameter I_{OZ} includes the input leakage current.

SWITCHING CHARACTERISTICS

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2V	V_{CCB} = 1.5V	V_{CCB} = 1.8V	V_{CCB} = 2.5V	V_{CCB} = 3.3V	V_{CCB} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	62.1	42.9	36.8	31.9	30.9	31.1	ns
t_{PHL}			143.9	97.7	86.2	77.9	75.3	80.2	
t_{PLH}	B	A	50.8	45.8	43.5	41.0	40.2	39.2	ns
t_{PHL}			132.7	87.8	77.2	71.9	70.2	70.9	
t_{PZH}	$\overline{OE}$	A	167.5	150.1	146.1	144.1	144.2	146.6	ns
t_{PZL}			123.5	123.5	123.5	123.5	123.5	124.6	
t_{PZH}	$\overline{OE}$	B	159.3	141.3	134.5	130.5	129.7	131.7	ns
t_{PZL}			132.7	120.3	115.6	110.4	110.9	113.7	
t_{PHZ}	$\overline{OE}$	A	55.6	55.6	55.6	55.6	55.6	56.0	ns
t_{PLZ}			56.4	56.4	56.4	56.4	56.4	56.9	
t_{PHZ}	$\overline{OE}$	B	68.2	63.0	63.8	61.9	70.3	72.8	ns
t_{PLZ}			66.0	60.6	59.9	58.7	61.7	64.8	

SWITCHING CHARACTERISTICS (continued)

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2V	V_{CCB} = 1.5V	V_{CCB} = 1.8V	V_{CCB} = 2.5V	V_{CCB} = 3.3V	V_{CCB} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	46.2	28.0	21.5	16.6	14.6	13.5	ns
t_{PHL}			98.3	54.4	41.9	33.0	29.8	28.0	
t_{PLH}	B	A	31.6	26.3	24.0	21.3	17.6	19.5	ns
t_{PHL}			97.3	52.4	42.6	36.7	34.8	34.4	
t_{PZH}	$\overline{OE}$	A	83.6	66.2	62.6	60.0	59.5	59.5	ns
t_{PZL}			50.7	50.7	50.7	50.7	50.7	50.7	
t_{PZH}	$\overline{OE}$	B	82.3	63.5	57.1	52.2	50.4	49.2	ns
t_{PZL}			66.6	54.1	49.3	45.2	43.8	43.4	
t_{PHZ}	$\overline{OE}$	A	27.8	27.8	27.8	27.8	27.8	27.8	ns
t_{PLZ}			26.3	26.3	26.3	26.3	26.3	26.3	
t_{PHZ}	$\overline{OE}$	B	38.6	33.1	32.9	31.4	38.3	36.1	ns
t_{PLZ}			35.6	30.3	30.5	27.2	30.0	27.6	

SWITCHING CHARACTERISTICS (continued)

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2V	V_{CCB} = 1.5V	V_{CCB} = 1.8V	V_{CCB} = 2.5V	V_{CCB} = 3.3V	V_{CCB} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	42.6	24.4	18.0	12.7	10.8	9.3	ns
t_{PHL}			88.3	45.5	32.1	20.8	20.2	18.2	
t_{PLH}	B	A	25.0	19.4	17.2	14.8	13.8	12.9	ns
t_{PHL}			86.3	40.8	31.5	25.6	23.6	22.9	
t_{PZH}	$\overline{OE}$	A	61.7	44.0	40.3	37.8	37.4	37.3	ns
t_{PZL}			31.5	31.5	31.5	31.5	31.5	31.5	
t_{PZH}	$\overline{OE}$	B	64.5	45.6	38.6	33.6	31.6	30.2	ns
t_{PZL}			50.5	38.5	33.3	30.6	27.7	27.1	
t_{PHZ}	$\overline{OE}$	A	21.6	21.6	21.6	21.6	21.3	21.6	ns
t_{PLZ}			19.8	19.8	19.8	19.8	19.3	19.8	
t_{PHZ}	$\overline{OE}$	B	32.6	27.1	26.3	23.8	30.1	27.9	ns
t_{PLZ}			27.1	22.6	21.7	18.4	21.5	18.5	

SWITCHING CHARACTERISTICS (continued)

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2V	V_{CCB} = 1.5V	V_{CCB} = 1.8V	V_{CCB} = 2.5V	V_{CCB} = 3.3V	V_{CCB} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	39.6	21.0	14.8	9.5	7.6	6.0	ns
t_{PHL}			82.1	38.5	25.8	17.0	14.2	11.1	
t_{PLH}	B	A	19.8	14.2	11.8	9.3	8.2	7.4	ns
t_{PHL}			78.9	32.7	22.7	16.9	14.8	14.4	
t_{PZH}	$\overline{OE}$	A	46.1	29.7	25.6	23.1	22.5	22.2	ns
t_{PZL}			18.9	19.5	19.5	19.5	19.5	19.5	
t_{PZH}	$\overline{OE}$	B	49.8	33.0	26.5	21.0	19.0	17.9	ns
t_{PZL}			39.8	26.7	22.7	18.5	17.0	15.9	
t_{PHZ}	$\overline{OE}$	A	13.4	13.4	13.4	13.4	13.4	13.4	ns
t_{PLZ}			11.0	11.0	11.0	11.0	11.0	11.0	
t_{PHZ}	$\overline{OE}$	B	24.6	18.7	19.5	17.2	23.6	21.0	ns
t_{PLZ}			21.4	16.1	16.3	12.8	15.5	12.5	

SWITCHING CHARACTERISTICS (continued)

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2V	V_{CCB} = 1.5V	V_{CCB} = 1.8V	V_{CCB} = 2.5V	V_{CCB} = 3.3V	V_{CCB} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	38.2	19.8	14.9	8.3	6.4	5.0	ns
t_{PHL}			80.0	36.6	22.5	15.1	12.0	10.6	
t_{PLH}	B	A	18.6	12.0	9.7	7.2	6.4	5.2	ns
t_{PHL}			76.6	29.9	19.7	13.7	12.7	12.4	
t_{PZH}	$\overline{OE}$	A	39.8	24.1	20.2	17.8	17.2	16.8	ns
t_{PZL}			14.1	14.1	14.1	14.4	14.1	14.1	
t_{PZH}	$\overline{OE}$	B	46.1	28.0	21.8	16.5	14.8	13.2	ns
t_{PZL}			40.3	25.2	20.0	15.8	14.0	12.7	
t_{PHZ}	$\overline{OE}$	A	17.4	17.4	17.4	17.4	17.4	17.4	ns
t_{PLZ}			10.9	10.9	10.9	10.9	10.9	10.9	
t_{PHZ}	$\overline{OE}$	B	22.1	16.5	16.8	14.3	21.6	19.1	ns
t_{PLZ}			18.6	13.7	13.2	10.2	12.6	9.9	

SWITCHING CHARACTERISTICS (continued)

(T_A = +25℃, V_{CCA} = 5.0V, unless otherwise noted.)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2V	V_{CCB} = 1.5V	V_{CCB} = 1.8V	V_{CCB} = 2.5V	V_{CCB} = 3.3V	V_{CCB} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	37.3	18.9	12.7	7.4	5.4	3.7	ns
t_{PHL}			76.3	36.5	23.6	14.7	10.4	9.6	
t_{PLH}	B	A	21.3	11.2	8.2	5.8	4.9	3.7	ns
t_{PHL}			83.2	30.5	18.2	11.9	10.3	9.4	
t_{PZH}	$\overline{OE}$	A	37.5	20.6	17.6	15.1	13.9	13.6	ns
t_{PZL}			11.4	11.4	11.4	11.4	11.4	11.4	
t_{PZH}	$\overline{OE}$	B	47.7	27.6	20.9	15.3	13.3	11.7	ns
t_{PZL}			34.2	22.2	17.3	13.1	11.9	11.0	
t_{PHZ}	$\overline{OE}$	A	14.3	14.3	14.3	14.3	14.3	14.3	ns
t_{PLZ}			6.3	6.3	6.3	6.3	6.3	6.3	
t_{PHZ}	$\overline{OE}$	B	20.0	14.5	15.0	12.9	18.1	16.0	ns
t_{PLZ}			17.3	13.4	11.9	8.3	10.5	7.6	

OPERATING CHARACTERISTICS

(T_A = +25℃, unless otherwise noted.)

PARAMETER		TEST CONDITIONS	V_{CCA}/V_{CCB}					UNITS
			1.5V	1.8V	2.5V	3.3V	5.0V	
			TYP	TYP	TYP	TYP	TYP	
C_{PD} (1)(2)	A to B	C_L = 0pF, f = 10MHz, t_R = t_F = 1ns	0.5	0.5	0.9	0.7	1.4	pF
	B to A		0.5	0.5	0.5	0.6	0.7	

NOTES:

1. Power dissipation capacitance per transceiver.
2. 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.

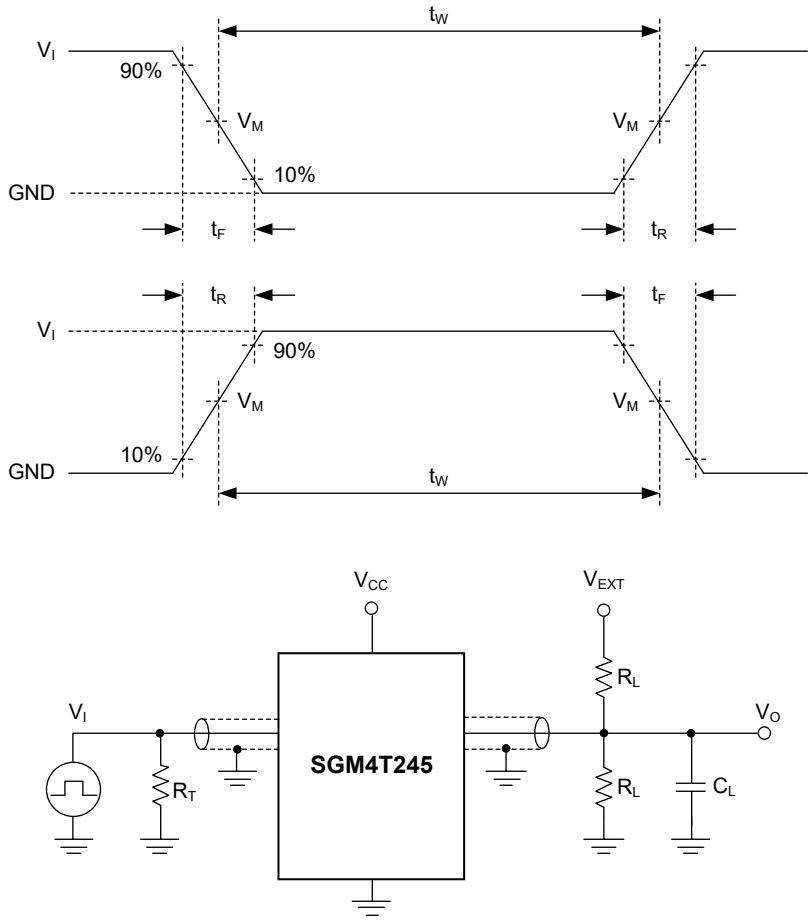
   C_L = Output load capacitance in pF.

   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.

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).

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

Figure 1. Test Circuit for Measuring Switching Times

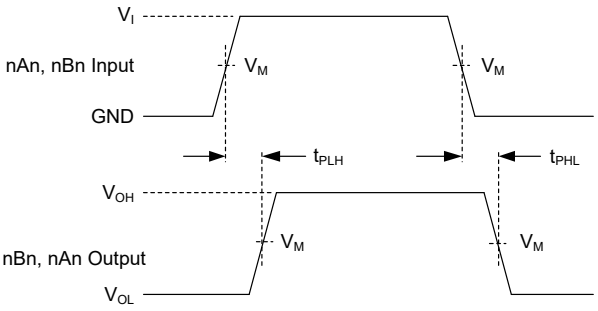
Table 1. Test Conditions

SUPPLY VOLTAGE	INPUT		LOAD		V_{EXT}		
V_{CCA}, V_{CCB}	V_I (1)	Δt/ΔV	C_L	R_L	t_{PD}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ} (2)
1.2V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
1.5V ± 0.1V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
1.8V ± 0.15V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
2.5V ± 0.2V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
3.3V ± 0.3V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
5.0V ± 0.5V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}

NOTES:

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

WAVEFORMS

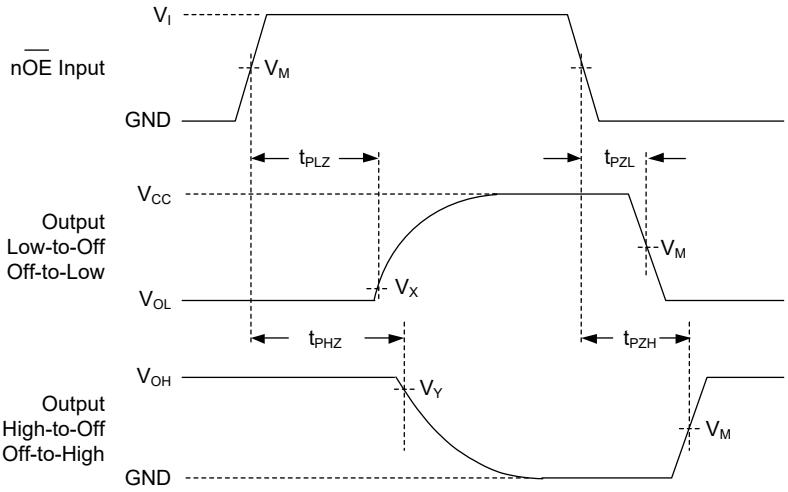


Test conditions are given in Table 1.

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 (nAn, nBn) to Output (nBn, nAn) Propagation Delay Times



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. Enable and Disable Times

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT (1)		OUTPUT		
V_{CCA}, V_{CCB}	V_I	V_M (2)	V_M (3)	V_X	V_Y
1.2V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.1V	V_{OH} - 0.1V
1.5V ± 0.1V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.1V	V_{OH} - 0.1V
1.8V ± 0.15V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
2.5V ± 0.2V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
3.3V ± 0.3V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.3V	V_{OH} - 0.3V
5.0V ± 0.5V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.5V	V_{OH} - 0.5V

NOTES:

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

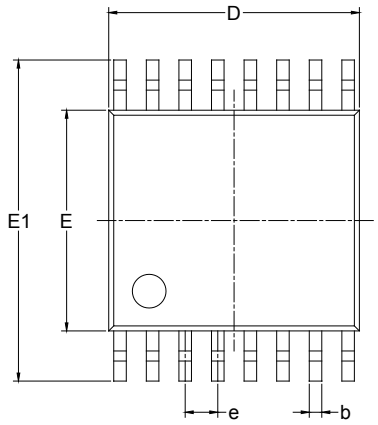
REVISION HISTORY

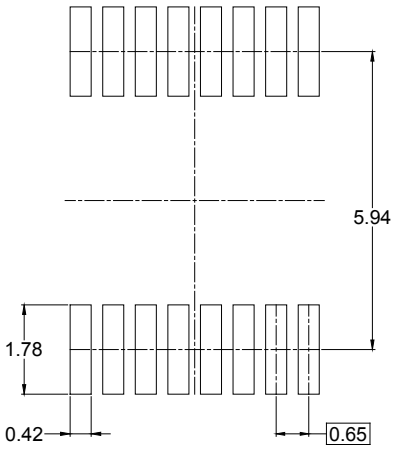
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (JULY 2018) to REV.A	Page
Changed from product preview to production data	All

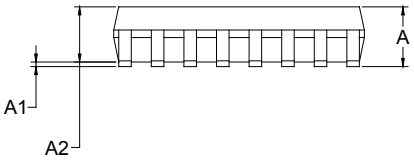
PACKAGE OUTLINE DIMENSIONS

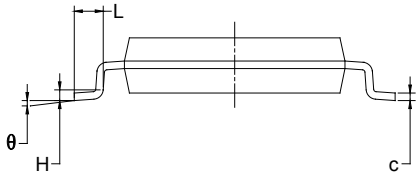
TSSOP-16





RECOMMENDED LAND PATTERN (Unit: mm)

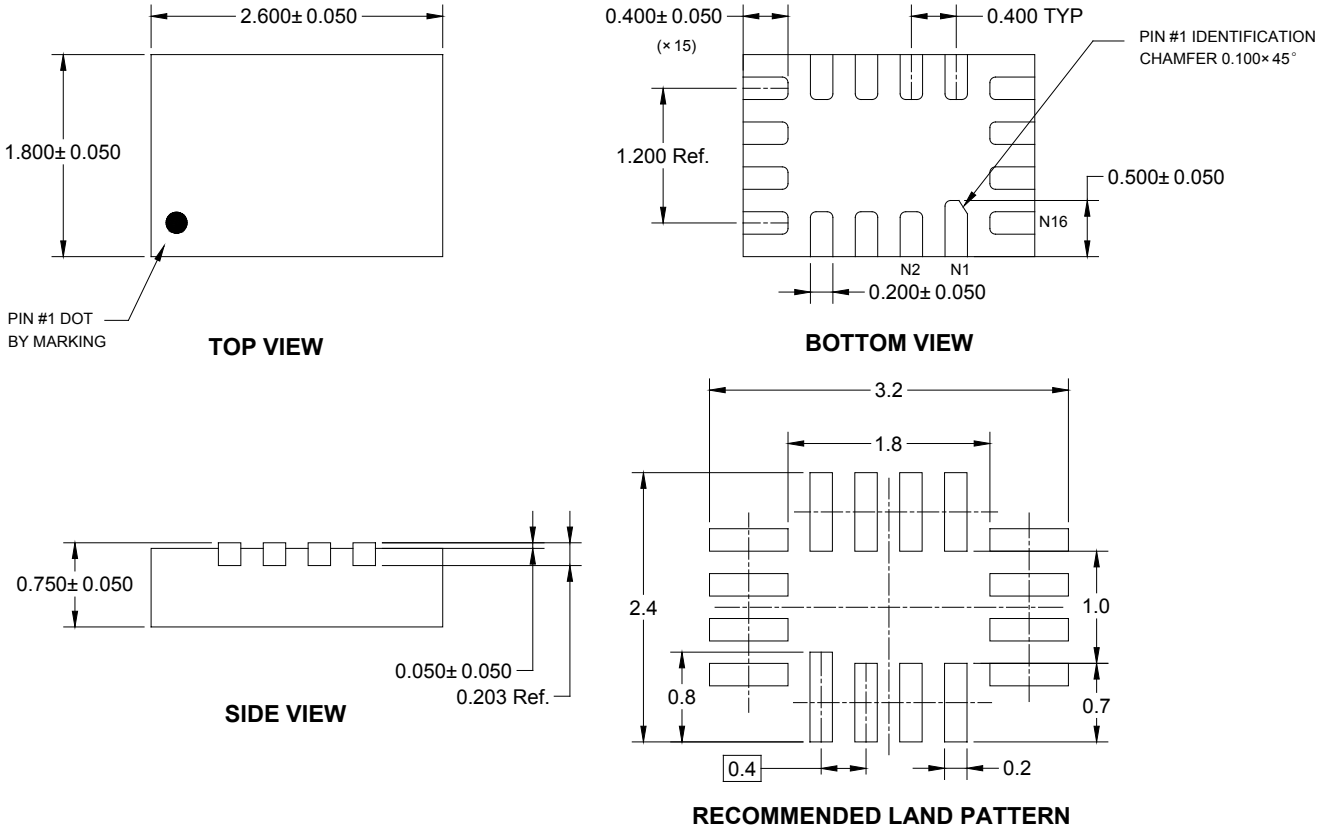




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

PACKAGE OUTLINE DIMENSIONS

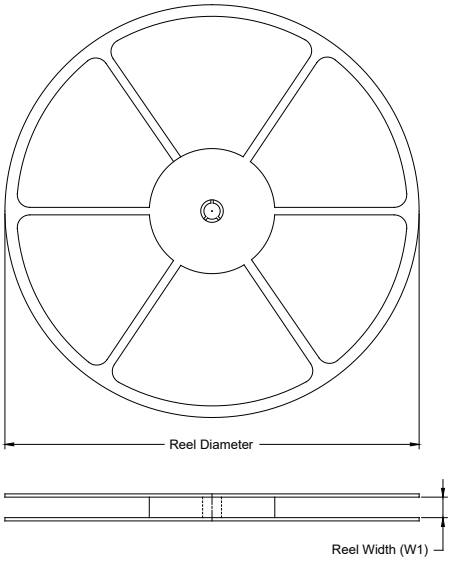
TQFN-2.6×1.8-16L



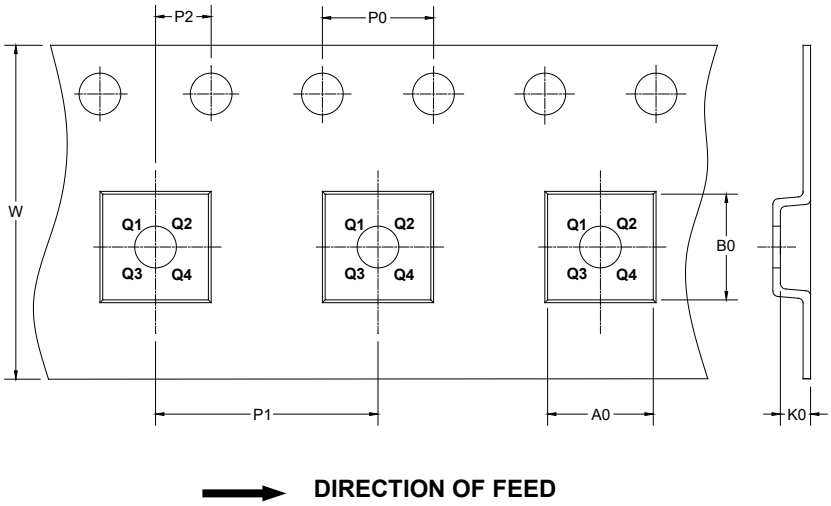
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



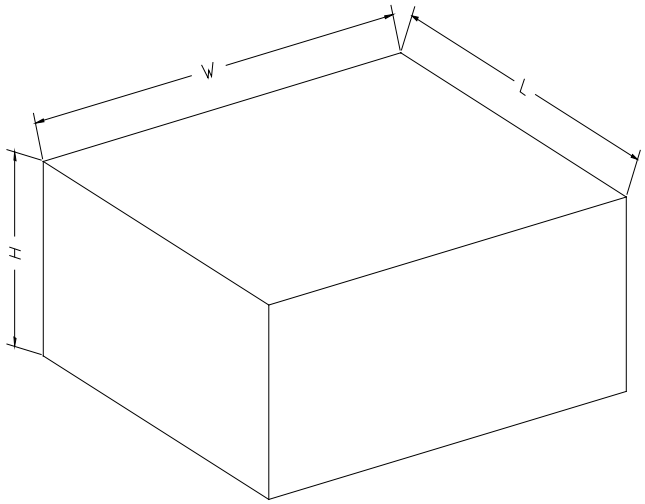
NOTE: The picture is only for reference. Please make the object as the standard.

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
TQFN-2.6×1.8-16L	7″	9.0	2.01	2.81	0.93	4.0	4.0	2.0	8.0	Q1
TSSOP-16	13″	12.4	6.90	5.60	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
7″ (Option)	368	227	224	8
7″	442	410	224	18
13″	386	280	370	5

DD0002

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SGM8255A-2XMS8G/TR SGM2020-1.8YN5G/TR SGM2540YUDV8G/TR SGM2036-2.3YUDH4G/TR
SGM2036-2.6YN5G/TR SGM2203-3.0AYK3LG/TR SGM621AXTDB8G/TR SGM4064YDE8G/TR
SGM836-3.0XTDI6G/TR SGM890B-1.0XN5G/TR SGM2200H-2.8YN3LG/TR SGM2588KYN5G/TR
SGM706B-RXMS8G/TR SGM897PXTN6G/TR SGM2205-12XKC3G/TR SGM2558BYS8G/TR
SGM836-3.0XN6G/TR SGM892B-2.5XUDH4G/TR SGM892B-2.7LXN3G/TR SGM2022-HYN6/TR
SGM2200H-2.5YC5G/TR SGM2205-3.3XS8G/TR