

GENERAL DESCRIPTION

The SGM4556YVS is a 2-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 1.2V to 5.0V for A ports and 1.65V to 5.5V for B ports. The device provides a bidirectional translation function among the different voltage nodes (including 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5V).

The SGM4556YVS has an output-enabled (OE) function, which controls the outputs states. When OE goes low, all outputs enter into the high-impedance state. When V_{CCA} is powered, the OE has an internal pull-down current source. The OE should be connected to GND via a pull-down resistor, and the minimum resistor value is depended on the current source capability of the driver.

The SGM4556YVS is available in a Green VSSOP-8 package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **Power Supply Voltage Range ($V_{CCA} \leq V_{CCB}$)**
 - **A Ports: 1.2V to 5.0V**
 - **B Ports: 1.65V to 5.5V**
- **Support V_{CCA} or V_{CCB} Isolation**
 - **When V_{CCA} or V_{CCB} is Low, Device Enters Power-Down Mode**
- **OE Input Tracks the V_{CCA} Supply**
- **Support Partial-Power-Down Function**
- **Support Push-Pull Output**
- **Low Power Consumption**
- **-40°C to +85°C Operating Temperature Range**
- **Available in a Green VSSOP-8 Package**

APPLICATIONS

Universal Asynchronous Receiver/Transmitter (UART)
General Purpose I/O (GPIO)

TYPICAL APPLICATION

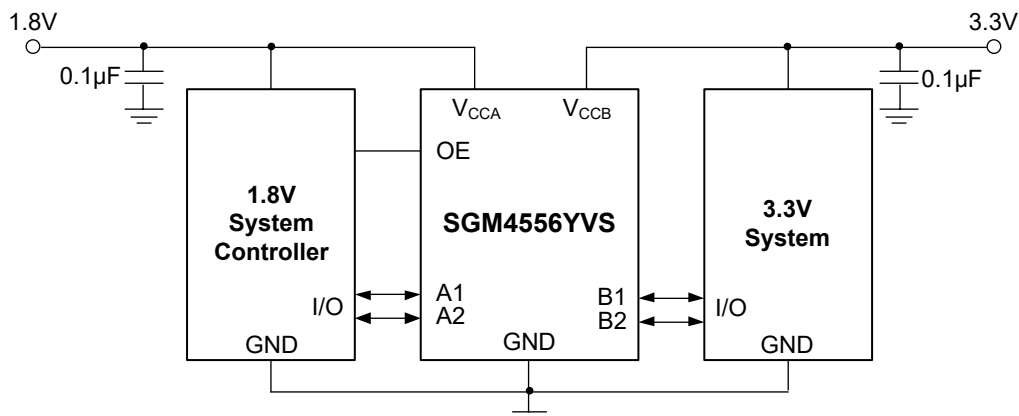


Figure 1. Typical Application Circuit

SGM4556YVS

2-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing

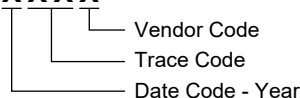
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4556YVS	VSSOP-8	-40°C to +85°C	SGM4556YVS8G/TR	4556 XXXX	Tape and Reel, 3000

MARKING INFORMATION

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

XXXX



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

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} ($V_O < 0$) -50mA

Continuous Output Current, I_O $\pm 50mA$

Continuous Current through V_{CCA} , V_{CCB} , or GND $\pm 100mA$

Package Thermal Resistance

VSSOP-8, θ_{JA} 221.5°C/W

VSSOP-8, θ_{JB} 151.1°C/W

VSSOP-8, θ_{JC} 126.9°C/W

Junction Temperature +150°C

Storage Temperature Range -65°C to +150°C

Lead Temperature (Soldering, 10s) +260°C

ESD Susceptibility ⁽³⁾⁽⁴⁾

HBM $\pm 4000V$

CDM $\pm 1000V$

NOTES:

1. When the input and output current ratings are observed, the input and I/O negative voltage ratings may be exceeded.
2. V_{CCA} and V_{CCB} values are shown in the recommended operating conditions in Electrical Characteristics section.
3. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
4. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

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

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.

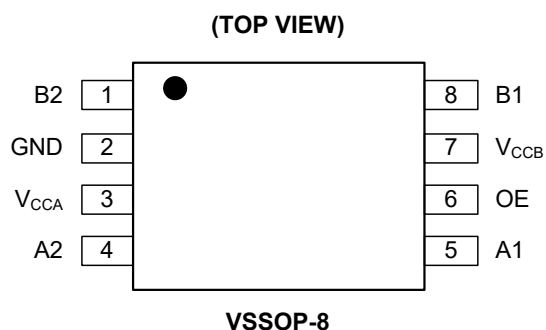
ESD SENSITIVITY CAUTION

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



PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	B2	I/O	Channel 2 Input/Output B. It tracks the V_{CCB} supply.
2	GND	G	Ground.
3	V_{CCA}	P	Supply Voltage on A Ports. It can be operated from 1.2V to 5.0V, and V_{CCA} is always $\leq V_{CCB}$.
4	A2	I/O	Channel 2 Input/Output A. It tracks the V_{CCA} supply.
5	A1	I/O	Channel 1 Input/Output A. It tracks the V_{CCA} supply.
6	OE	I	Output-Enabled Control Pin. Active high. When OE goes low, all outputs enter into the high-impedance state. It tracks the V_{CCA} supply.
7	V_{CCB}	P	Supply Voltage on B Ports. It can be operated from 1.65V to 5.5V.
8	B1	I/O	Channel 1 Input/Output B. It tracks the V_{CCB} supply.

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

2-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing

SGM4556YVS

ELECTRICAL CHARACTERISTICS

(T_A = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER		SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Recommended Operating Conditions ⁽¹⁾								
Supply Voltage	A Ports	V _{CCA}			1.2		5.0	V
	B Ports	V _{CCB}			1.65		5.5	
High-Level Input Voltage	Data Inputs	V _{IH}	V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V		V _{CCI} × 0.85		V _{CCI}	V
	OE Input		V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V		V _{CCA} × 0.85		5.5	
Low-Level Input Voltage	Data Inputs	V _{IL}	V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V		0		V _{CCI} × 0.2	V
	OE Input		V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V		0		V _{CCA} × 0.2	
Voltage Range Applied to Any Output in the High-Impedance or Power-Off State	A Ports	V _O	V _{CCA} = 0V, V _{CCB} = 1.65V to 5.5V		0		5.0	V
	B Ports		V _{CCA} = 1.2V to 5.0V, V _{CCB} = 0V		0		5.5	
Input Transition Rise or Fall Rate	A Ports	Δt/ΔV	V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V				40	ns/V
	B Ports		V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V				40	
Electrical Characteristics ^{(1) (2)}								
High-Level Output Voltage	A Ports	V _{OHA}	I _{OH} = -20μA	V _{CCA} = 1.2V, T _A = +25°C		1.05		V
				V _{CCA} = 1.4V to 5.0V, T _A = -40°C to +85°C	V _{CCA} - 0.4			
Low-Level Output Voltage	A Ports	V _{OLA}	I _{OL} = 20μA	V _{CCA} = 1.2V, T _A = +25°C		0.1		V
				V _{CCA} = 1.4V to 5.0V, T _A = -40°C to +85°C			0.4	
High-Level Output Voltage	B Ports	V _{OHB}	I _{OH} = -20μA	V _{CCB} = 1.65V to 5.5V, T _A = -40°C to +85°C	V _{CCB} - 0.4			V
Low-Level Output Voltage	B Ports	V _{OLB}	I _{OL} = 20μA	V _{CCB} = 1.65V to 5.5V, T _A = -40°C to +85°C			0.4	V
Input Leakage Current	OE Input	I _I	V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V	T _A = +25°C			±1	μA
				T _A = -40°C to +85°C			±1.5	
Power-Off Leakage Current	A Ports	I _{OFF}	V _I or V _O = 0V to 5.0V, V _{CCA} = 0V, V _{CCB} = 0V to 5.5V	T _A = +25°C			±0.5	μA
				T _A = -40°C to +85°C			±1	
	B Ports		V _I or V _O = 0V to 5.5V, V _{CCA} = 0V to 5.0V, V _{CCB} = 0V	T _A = +25°C			±0.5	
				T _A = -40°C to +85°C			±1	
3-State Output Leakage	A or B Ports	I _{OZ}	OE = GND, V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V	T _A = +25°C			±0.5	μA
				T _A = -40°C to +85°C			±1	

2-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing

SGM4556YVS

ELECTRICAL CHARACTERISTICS (continued)

(T_A = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER		SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Quiescent Supply Current	A Ports	I _{CCA}	V _I = V _{CCI} or GND, I _O = 0A	V _{CCA} = 1.2V, V _{CCB} = 1.65V to 5.5V, T _A = +25°C		0.1		μA
				V _{CCA} = 1.4V to 5V, V _{CCB} = 1.65V to 5.5V, T _A = -40°C to +85°C			10	
				V _{CCA} = 5.0V, V _{CCB} = 0V, T _A = -40°C to +85°C			10	
				V _{CCA} = 0V, V _{CCB} = 5.5V, T _A = -40°C to +85°C			-1	
	B Ports	I _{CCB}	V _I = V _{CCI} or GND, I _O = 0A	V _{CCA} = 1.2V, V _{CCB} = 1.65V to 5.5V, T _A = +25°C		1		μA
				V _{CCA} = 1.4V to 5.0V, V _{CCB} = 1.65V to 5.5V, T _A = -40°C to +85°C			10	
				V _{CCA} = 5V, V _{CCB} = 0V, T _A = -40°C to +85°C			-1	
				V _{CCA} = 0V, V _{CCB} = 5.5V, T _A = -40°C to +85°C			10	
	A and B Ports	I _{CCA} + I _{CCB}	V _I = V _{CCI} or GND, I _O = 0A	V _{CCA} = 1.2V, V _{CCB} = 1.65V to 5.5V		1		μA
				V _{CCA} = 1.4V to 5.0V, V _{CCB} = 1.65V to 5.5V			20	
	A Ports	I _{CCZA}	V _I = V _{CCI} or GND, I _O = 0A, OE = GND	V _{CCA} = 1.2V, V _{CCB} = 1.65V to 5.5V		0.1		μA
				V _{CCA} = 1.4V to 5.0V, V _{CCB} = 1.65V to 5.5V			10	
	B Ports	I _{CCZB}	V _I = V _{CCI} or GND, I _O = 0A, OE = GND	V _{CCA} = 1.2V, V _{CCB} = 1.65V to 5.5V		0.1		μA
				V _{CCA} = 1.4V to 5.0V, V _{CCB} = 1.65V to 5.5V			10	
OE Input Capacitance		C _I	V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V			4		pF
Input/Output Capacitance	A Ports	C _{IO}	V _{CCA} = 1.2V to 5.0V, V _{CCB} = 1.65V to 5.5V			4.5		pF
	B Ports					4.5		

NOTES:

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

TIMING REQUIREMENTS

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

PARAMETER	SYMBOL	V _{CCB} = 1.8V	V _{CCB} = 2.5V	V _{CCB} = 3.3V	V _{CCB} = 5V	UNITS
		TYP	TYP	TYP	TYP	
(V _{CCA} = 1.2V)						
Data Rate		20	20	20	20	Mbps
Pulse Duration (Data Inputs)	t _W	50	50	50	50	ns
(V _{CCA} = 1.5V)						
Data Rate		40	40	40	40	Mbps
Pulse Duration (Data Inputs)	t _W	25	25	25	25	ns
(V _{CCA} = 1.8V)						
Data Rate		60	60	60	60	Mbps
Pulse Duration (Data Inputs)	t _W	17	17	17	17	ns
(V _{CCA} = 2.5V)						
Data Rate			100	100	100	Mbps
Pulse Duration (Data Inputs)	t _W		10	10	10	ns
(V _{CCA} = 3.3V)						
Data Rate				100	100	Mbps
Pulse Duration (Data Inputs)	t _W			10	10	ns
(V _{CCA} = 5V)						
Data Rate					100	Mbps
Pulse Duration (Data Inputs)	t _W				10	ns

2-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing

SGM4556YVS

SWITCHING CHARACTERISTICS

Switching Characteristics at $V_{CCA} = 1.2V$

($V_{CCA} = 1.2V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	$V_{CCB} = 1.8V$	$V_{CCB} = 2.5V$	$V_{CCB} = 3.3V$	$V_{CCB} = 5V$	UNITS
			TYP	TYP	TYP	TYP	
Propagation Delay	t_{PD}	t_{PLH} From An to Bn	24.9	22.3	22.1	23.0	ns
			34.8	33.3	34.5	38.0	
		t_{PHL} From Bn to An	29.8	29.7	25.1	30.6	
			24.0	21.2	20.1	19.8	
Enable Time	t_{EN}	t_{PZH} From OE to An	66.9	67.3	66.7	65.8	ns
			48.2	47.6	47.2	46.2	
		t_{PZL} From OE to Bn	32.6	28.8	28.5	29.6	
			62.7	60.5	61.5	65.5	
Disable Time	t_{DIS}	t_{PHZ} From OE to An	1161	1170	1165	1168	ns
			521	524	528	529	
		t_{PLZ} From OE to Bn	1135	1166	1180	1186	
			532	567	578	563	
Rise Time	t_{RA}	A ports	21.9	21.6	20.0	18.8	ns
	t_{RB}	B ports	3.9	2.3	1.9	1.6	ns
Fall Time	t_{FA}	A ports	7.0	7.4	6.7	7.7	ns
	t_{FB}	B ports	2.3	1.9	1.7	1.6	ns
Channel-to-Channel Skew	t_{SKO}		0.5	0.5	0.5	0.5	ns
Data Rate			20	20	20	20	Mbps

Switching Characteristics at $V_{CCA} = 1.5V$

($V_{CCA} = 1.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	$V_{CCB} = 1.8V$	$V_{CCB} = 2.5V$	$V_{CCB} = 3.3V$	$V_{CCB} = 5V$	UNITS
			TYP	TYP	TYP	TYP	
Propagation Delay	t_{PD}	t_{PLH} From An to Bn	14.8	14.2	13.2	12.5	ns
			16.5	13.8	13.3	13.5	
		t_{PHL} From Bn to An	13.0	13.6	11.5	10.8	
			13.0	9.9	9.5	8.3	
Enable Time	t_{EN}	t_{PZH} From OE to An	28.9	29.0	28.8	28.6	ns
			27.6	23.3	22.2	21.7	
		t_{PZL} From OE to Bn	22.8	18.4	17.4	17.1	
			31.2	26.8	26.5	26.6	
Disable Time	t_{DIS}	t_{PHZ} From OE to An	1141	1132	1139	1138	ns
			536	531	535	534	
		t_{PLZ} From OE to Bn	1112	1151	1165	1173	
			530	558	568	553	
Rise Time	t_{RA}	A ports	7.7	7.9	8.4	8.2	ns
	t_{RB}	B ports	4.0	2.3	1.8	1.5	ns
Fall Time	t_{FA}	A ports	3.1	2.9	3.0	2.4	ns
	t_{FB}	B ports	2.3	2.0	1.8	1.6	ns
Channel-to-Channel Skew	t_{SKO}		0.5	0.5	0.5	0.5	ns
Data Rate			40	40	40	40	Mbps

2-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing

SGM4556YVS

SWITCHING CHARACTERISTICS (continued)

Switching Characteristics at $V_{CCA} = 1.8V$

($V_{CCA} = 1.8V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	$V_{CCB} = 1.8V$	$V_{CCB} = 2.5V$	$V_{CCB} = 3.3V$	$V_{CCB} = 5V$	UNITS
			TYP	TYP	TYP	TYP	
Propagation Delay	t_{PD}	t_{PLH} From An to Bn	12.2	12.3	11.4	10.6	ns
			12.4	9.5	8.7	8.4	
		t_{PHL} From Bn to An	8.6	10.6	9.1	7.4	
			10.5	7.5	8.0	5.7	
Enable Time	t_{EN}	t_{PZH} From OE to An	19.0	19.0	19.0	19.1	ns
			21.7	17.9	16.5	15.8	
		t_{PZL} From OE to Bn	20.1	15.6	14.6	14.0	
			22.6	19.2	18.7	18.5	
Disable Time	t_{DIS}	t_{PHZ} From OE to An	1170	1169	1170	1170	ns
			541	540	541	542	
		t_{PLZ} From OE to Bn	1099	1142	1157	1166	
			533	560	566	554	
Rise Time	t_{RA}	A ports	4.8	4.6	4.4	3.9	ns
	t_{RB}	B ports	4.3	2.3	1.8	1.6	ns
Fall Time	t_{FA}	A ports	2.3	2.6	2.5	2.3	ns
	t_{FB}	B ports	2.3	2.1	1.8	2.2	ns
Channel-to-Channel Skew	t_{SKO}		0.5	0.5	0.5	0.5	ns
Data Rate			60	60	60	60	Mbps

Switching Characteristics at $V_{CCA} = 2.5V$

($V_{CCA} = 2.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	$V_{CCB} = 2.5V$	$V_{CCB} = 3.3V$	$V_{CCB} = 5V$	UNITS
			TYP	TYP	TYP	
Propagation Delay	t_{PD}	t_{PLH} From An to Bn	9.4	7.1	5.2	ns
			6.1	5.7	5.1	
		t_{PHL} From Bn to An	7.8	5.5	4.6	
			5.7	5.2	4.1	
Enable Time	t_{EN}	t_{PZH} From OE to An	13.0	12.7	13.0	ns
			14.4	13.0	12.2	
		t_{PZL} From OE to Bn	13.7	12.5	12.1	
			14.5	14.1	13.4	
Disable Time	t_{DIS}	t_{PHZ} From OE to An	1188	1188	1189	ns
			571	571	573	
		t_{PLZ} From OE to Bn	1127	1151	1158	
			566	570	553	
Rise Time	t_{RA}	A ports	2.6	3.2	3.7	ns
	t_{RB}	B ports	2.2	2.2	2.3	ns
Fall Time	t_{FA}	A ports	2.4	2.6	2.7	ns
	t_{FB}	B ports	1.8	2.2	1.8	ns
Channel-to-Channel Skew	t_{SKO}		0.5	0.5	0.5	ns
Data Rate			100	100	100	Mbps

2-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing

SGM4556YVS

SWITCHING CHARACTERISTICS (continued)

Switching Characteristics at $V_{CCA} = 3.3V$

($V_{CCA} = 3.3V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	$V_{CCB} = 3.3V$	$V_{CCB} = 5V$	UNITS
			TYP	TYP	
Propagation Delay	t_{PD}	From An to Bn	t_{PLH}	6.2	ns
			t_{PHL}	5.0	
		From Bn to An	t_{PLH}	5.0	
			t_{PHL}	4.6	
Enable Time	t_{EN}	From OE to An	t_{PZH}	11.5	ns
			t_{PZL}	12.3	
		From OE to Bn	t_{PZH}	11.8	
			t_{PZL}	12.4	
Disable Time	t_{DIS}	From OE to An	t_{PHZ}	1196	ns
			t_{PLZ}	583	
		From OE to Bn	t_{PHZ}	1139	
			t_{PLZ}	578	
Rise Time		A ports	t_{RA}	5.8	ns
		B ports	t_{RB}	1.9	ns
Fall Time		A ports	t_{FA}	4.4	ns
		B ports	t_{FB}	2.0	ns
Channel-to-Channel Skew	t_{SKO}			0.5	ns
Data Rate				100	Mbps

Switching Characteristics at $V_{CCA} = 5V$

($V_{CCA} = 5V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	$V_{CCB} = 5V$	UNITS
			TYP	
Propagation Delay	t_{PD}	From An to Bn	t_{PLH}	ns
			t_{PHL}	
		From Bn to An	t_{PLH}	
			t_{PHL}	
Enable Time	t_{EN}	From OE to An	t_{PZH}	ns
			t_{PZL}	
		From OE to Bn	t_{PZH}	
			t_{PZL}	
Disable Time	t_{DIS}	From OE to An	t_{PHZ}	ns
			t_{PLZ}	
		From OE to Bn	t_{PHZ}	
			t_{PLZ}	
Rise Time		A ports	t_{RA}	ns
		B ports	t_{RB}	ns
Fall Time		A ports	t_{FA}	ns
		B ports	t_{FB}	ns
Channel-to-Channel Skew	t_{SKO}			ns
Data Rate				Mbps

OPERATING CHARACTERISTICS

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

PARAMETER		CONDITIONS	V _{CCA}									UNITS
			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)	61	56	13	7	7	7	8	8	9	pF
	B Port Inputs, A Port Outputs		9	9	9	9	9	9	9	9	10	pF
C _{PDB}	A Port Inputs, B Port Outputs		10	9	9	9	9	9	9	9	9	pF
	B Port Inputs, A Port Outputs		20	92	7	7	7	9	8	9	10	pF
C _{PDA}	A Port Inputs, B Port Outputs	C _L = 0, f = 10MHz, t _R = t _F = 1ns, OE = GND (Outputs Disabled)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	pF
	B Port Inputs, A Port Outputs		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	pF
C _{PDB}	A Port Inputs, B Port Outputs		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	pF
	B Port Inputs, A Port Outputs		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	pF

WAVEFORMS

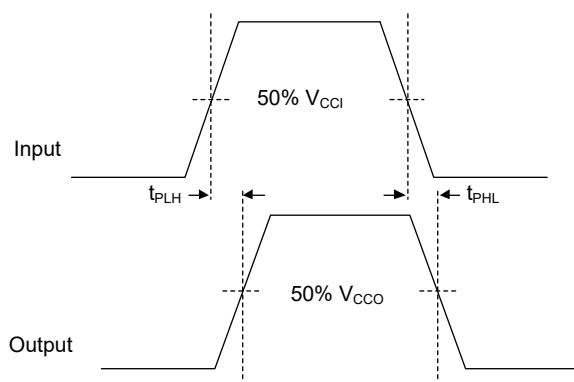


Figure 2. Propagation Delay

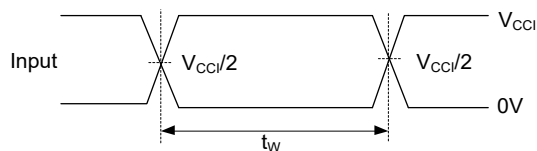


Figure 3. Pulse Duration

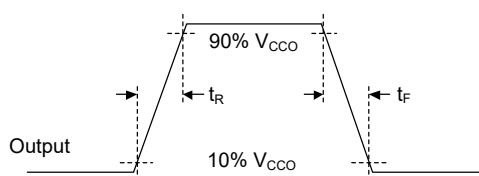
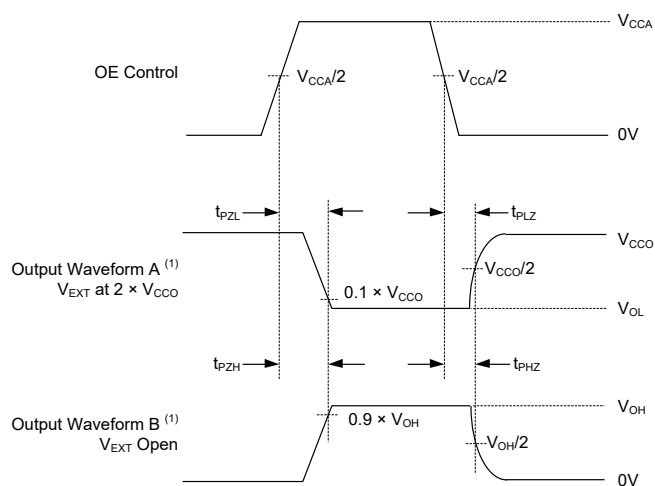


Figure 4. Rise Time and Fall Time of Data Output

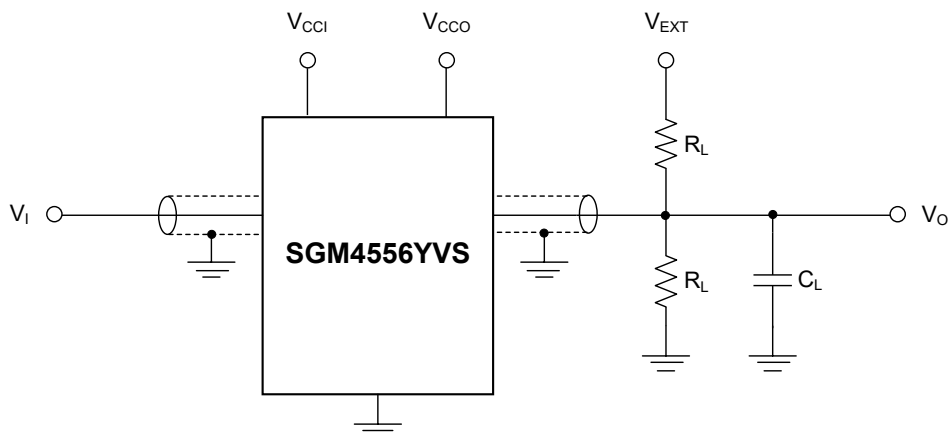


NOTE:

1. Waveform A shows an output that is high except for OE is high. Waveform B shows an output that is low except for OE is high.

Figure 5. Enable and Disable Times

TEST CIRCUIT



Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance includes jig and probe capacitance.

V_{EXT} = External voltage for measuring switching times.

V_{CCI} = Supply voltage associated with the input.

V_{CCO} = Supply voltage associated with the output.

Figure 6. Test Circuit for Measuring Switching Times

APPLICATION INFORMATION

Applications

For the application of the SGM4556YVS, it is often used in the voltage-level translation system.

Architecture

The SGM4556YVS can switch the direction of the transmission for A ports and B ports automatically without any external control. The output drivers can keep high or low in a DC state, however, they are designed to be weak so that they can be overdriven by external drivers when the data on the bus starts flowing in the opposite direction.

Figure 7 shows the architecture of an SGM4556YVS cell. The main explanation of the internal circuit for the SGM4556YVS is shown as below:

- The one-shot circuitry can be used to detect the rising edges or the falling edges of the signal for A ports and B ports automatically.
- When in the rising edge, two PMOSFETs (T1 and T3) are turned on by one-shot in a short time. The feature speeds up the transition from low to high.
- When in the falling edge, two NMOSFETs (T2 and T4) are turned on by one-shot in a short time. The feature speeds up the transition from high to low.
- The output impedance is 140Ω (TYP) when V_{CCO} voltage range is from 1.2V to 1.8V, it is 50Ω (TYP) when V_{CCO} voltage range is from 1.8V to 3.3V and 40Ω (TYP) when V_{CCO} voltage range is from 3.3V to 5V.

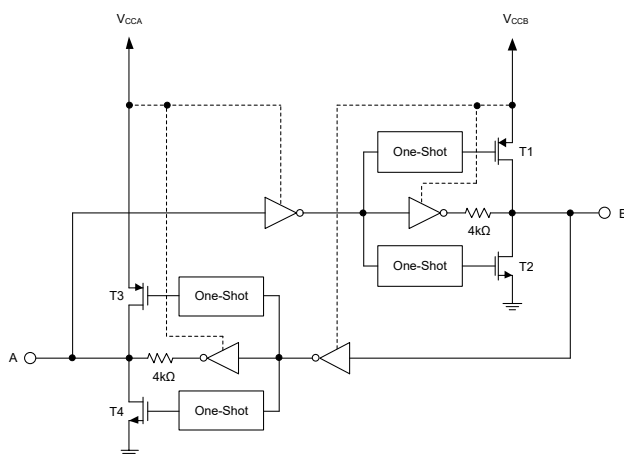
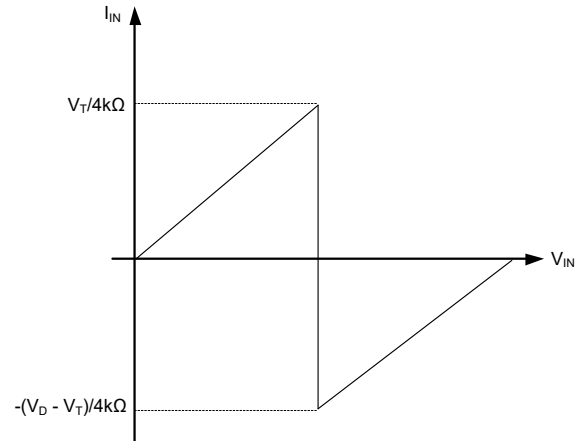


Figure 7. Architecture of an SGM4556YVS I/O Cell

Input Driver Requirements

Figure 8 shows a typical V_{IN} vs. I_{IN} curve. To ensure proper operation, the SGM4556YVS data I/Os must be driven by a device with a drive strength of at least $\pm 2\text{mA}$.



NOTES:

1. V_T = Input threshold voltage (typically $V_{CC}/2$).
2. V_D = External driver supply voltage.

Figure 8. Typical V_{IN} vs. I_{IN} Curve

Power-Up

For the application of the SGM4556YVS, 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. The SGM4556YVS has a circuitry that disables all output ports when either V_{CC} is switched off ($V_{CCA}/V_{CCB} = 0\text{V}$).

Enable and Disable

The function of OE is used to disable SGM4556YVS by setting the transmitting I/O pins to high-impedance mode. The definition of disable time (t_{DIS}) is the time period between OE goes low and when all of the I/O pins are in high-impedance mode. The enable time (t_{EN}) is defined as the time period between OE goes to high position and one-shot part starts to operate.

Pull-Up or Pull-Down Resistors on I/O Lines

The SGM4556YVS features the drive capability that is designed to drive up to 70pF capacitive loads. The output drivers have the low DC drive strength. When the data I/Os are externally connected to the pull-up or pull-down resistors, the values must be greater than 50kΩ to ensure that they don't conflict with the output driver. Therefore, the SGM4556YVS is not used in one-wire or I^2C applications. For the bidirectional data I/Os, an open-drain driver is connected. For these applications, please use the open-drain output SGM4553 which is pin-compatible with the SGM4556YVS.

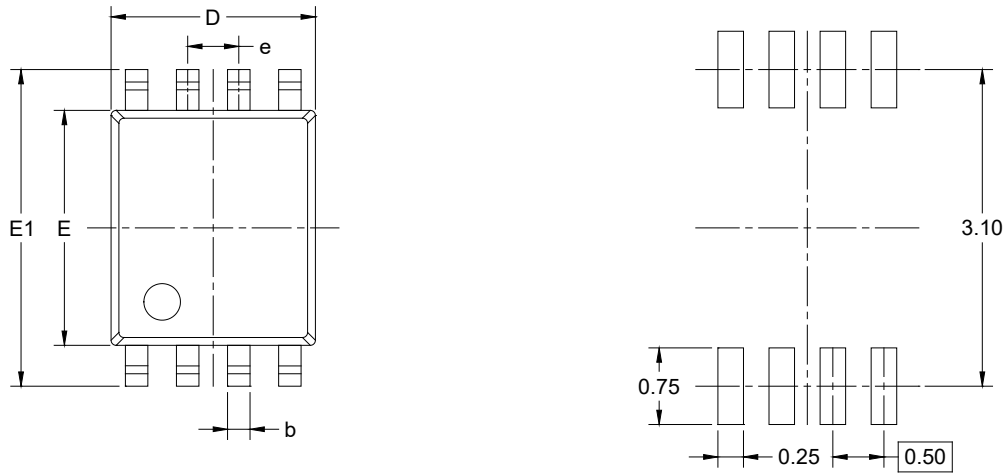
REVISION HISTORY

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

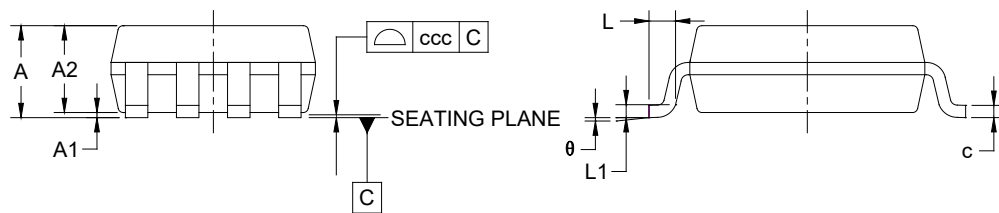
Changes from Original to REV.A (AUGUST 2026)	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

VSSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	1.000
A1	0.000	-	0.150
A2	0.600	-	0.850
b	0.170	-	0.270
c	0.080	-	0.230
D	1.900	-	2.100
E	2.200	-	2.400
E1	3.000	-	3.200
e	0.500 BSC		
L	0.150	-	0.400
L1	0.120 BSC		
θ	0°	-	8°
ccc	0.100		

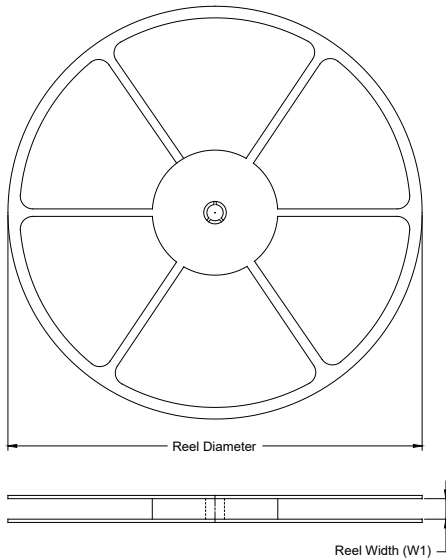
NOTES:

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-187 CA.

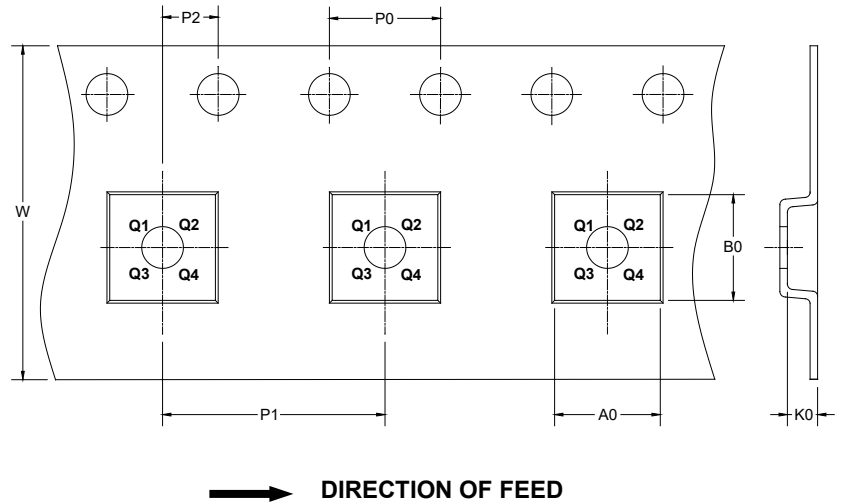
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

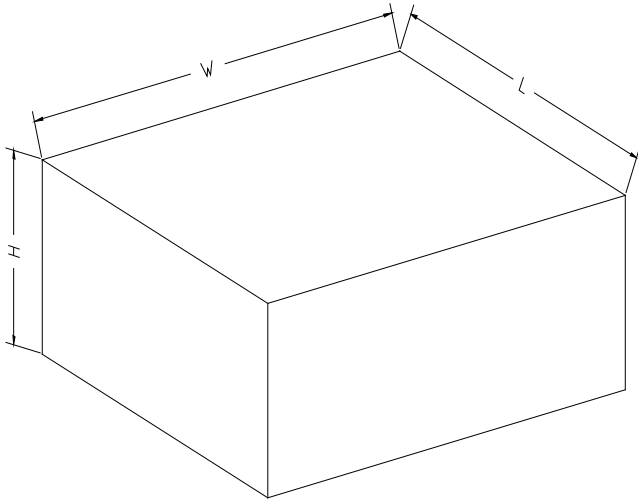
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
VSSOP-8	7"	9.5	2.25	3.35	1.05	4.0	4.0	2.0	8.0	Q3

DD0001

PACKAGE INFORMATION

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