



# SGM4548/49/50

## Dual-Channel, High Speed, Level Shifters and Drivers

### GENERAL DESCRIPTION

The SGM4548/49/50 devices are matched dual-channel level shifters and drivers. The unique circuit design provides excellent performance for delivering 2A peak current to highly capacitive loads.

To reduce problems with time and clock skew, SGM4548/49/50 are good options, with matching delays and maintaining integrity of input to output pulse-widths. Matching rise/fall delay times also improve the drive capability and speed. Non-overlapping drive technology is used to minimize the dynamic switching loss.

The SGM4548/49/50 are available in Green SOIC-8 and TDFN-2×2-8L packages. They operate over an ambient temperature range of -40°C to +125°C.

### FEATURES

- **Wide Power Supply Voltage Range**
- **Improved Response Times**
- **Matched Rise Time and Fall Time**
- **Independent Enable Control for Each Channel**
- **Reduced Clock Skew between Dual Channels**
- **Improved Clocking Rate**
- **Low Supply Current and Output Impedance**
- **Output is at Low under UVLO Protection, ENx Pin Floating or Disable Status**
- **High Noise Immunity**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green SOIC-8 and TDFN-2×2-8L Packages**

### APPLICATIONS

CCD Drivers  
Level Shifters and Drivers  
Clock/Line Drivers  
Ultra-Sound Transducer Drivers  
Switch Mode Power Supplies  
Ultrasonic and RF Generators  
Ceramic Speaker Drivers  
Power MOSFET Drivers

**PACKAGE/ORDERING INFORMATION**

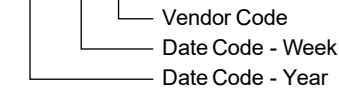
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4548	SOIC-8	-40°C to +125°C	SGM4548XS8G/TR	SGM 4548XS8 XXXXX	Tape and Reel, 2500
	TDFN-2x2-8L	-40°C to +125°C	SGM4548XTDE8G/TR	4548 XXXX	Tape and Reel, 3000
SGM4549	SOIC-8	-40°C to +125°C	SGM4549XS8G/TR	SGM 4549XS8 XXXXX	Tape and Reel, 2500
	TDFN-2x2-8L	-40°C to +125°C	SGM4549XTDE8G/TR	4549 XXXX	Tape and Reel, 3000
SGM4550	SOIC-8	-40°C to +125°C	SGM4550XS8G/TR	SGM 4550XS8 XXXXX	Tape and Reel, 2500
	TDFN-2x2-8L	-40°C to +125°C	SGM4550XTDE8G/TR	4550 XXXX	Tape and Reel, 3000

**MARKING INFORMATION**

NOTE: XXXXX = Date Code and Vendor Code. XXXX = Date Code.

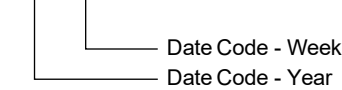
**SOIC-8**

**XXXXX**



**TDFN-2x2-8L**

**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**

- VCC to GND ..... -0.3V to 28V
- ENA, ENB to GND ..... -0.3V to 6V
- INA, INB to GND ..... -0.3V to V<sub>CC</sub> + 0.3V
- Combined Peak Output Current..... 4A
- Package Thermal Resistance
- SOIC-8, θ<sub>JA</sub> ..... 132°C/W
- TDFN-2x2-8L, θ<sub>JA</sub> ..... 118°C/W
- Junction Temperature..... +150°C
- Storage Temperature Range ..... -65°C to +150°C
- Lead Temperature (Soldering, 10s)..... +260°C
- ESD Susceptibility
- HBM..... 6000V
- MM..... 300V

**RECOMMENDED OPERATING CONDITIONS**

- Supply Voltage Range ..... 4.5V to 26.5V
- Operating Temperature Range ..... -40°C to +125°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.

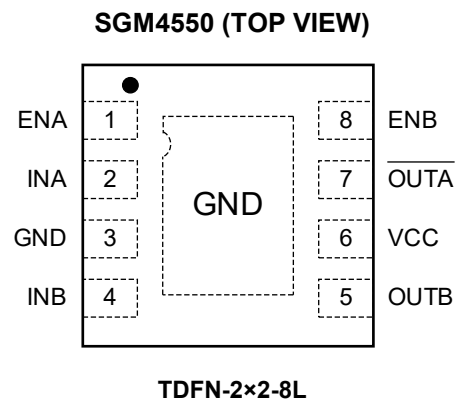
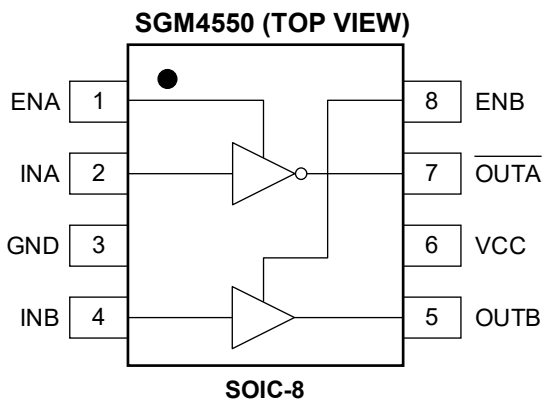
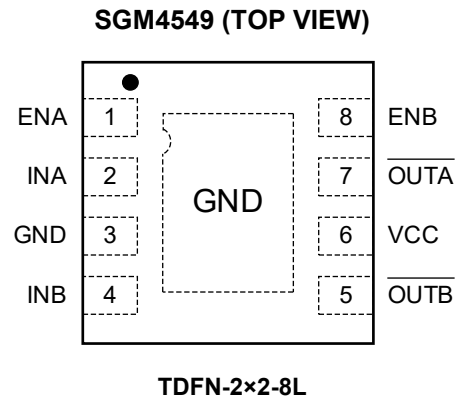
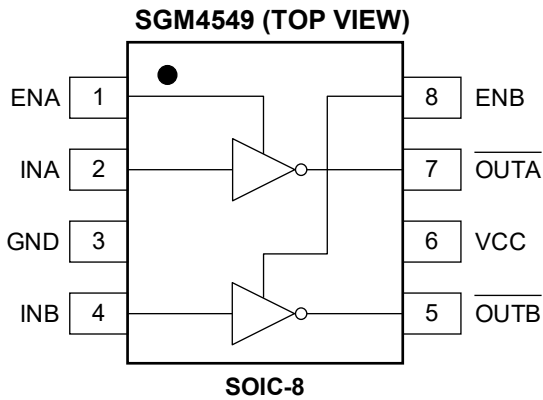
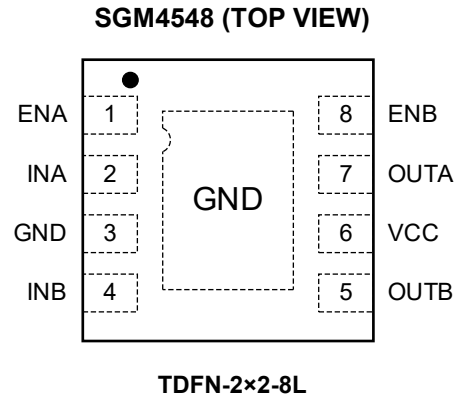
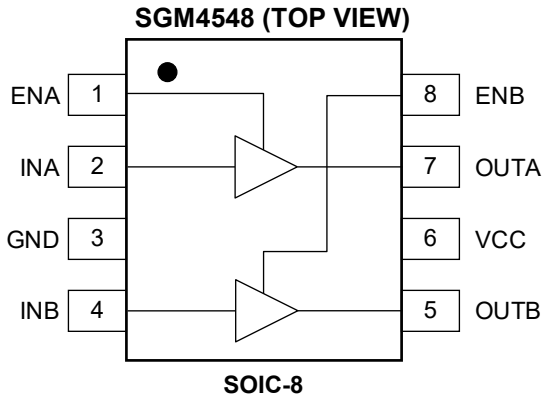
**ESD SENSITIVITY CAUTION**

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 CONFIGURATIONS



## PIN DESCRIPTION

PIN		NAME	FUNCTION
TDFN-2x2-8L	SOIC-8		
1	1	ENA	Enable Input for Channel A. A high signal on this pin will enable the channel A output. Logic low or floating will disable the output of channel A, regardless of the INA logic is high or low.
2	2	INA	Input for Channel A. SGM4548 is the non-inverting input, SGM4549 is the inverting input, and SGM4550 is the inverting input. If INA is unbiased or floating, $\overline{OUTA}/\overline{OUTA}$ will remain low.
3	3	GND	Ground.
4	4	INB	Input for Channel B. SGM4548 is the non-inverting input, SGM4549 is the inverting input, and SGM4550 is the non-inverting input. If INB is unbiased or floating, $\overline{OUTB}/\overline{OUTB}$ will remain low.
5	5	$\overline{OUTB}/\overline{OUTB}$	Output of Channel B.
6	6	VCC	Supply Input.
7	7	$\overline{OUTA}/\overline{OUTA}$	Output of Channel A.
8	8	ENB	Enable Input for Channel B. A high signal on this pin will enable the channel B output. Logic low or floating will disable the output of channel B, regardless of the INB logic is high or low.
Exposed Pad	-	GND	Exposed Pad. It should be connected to ground plane on PCB.

## FUNCTION TABLE

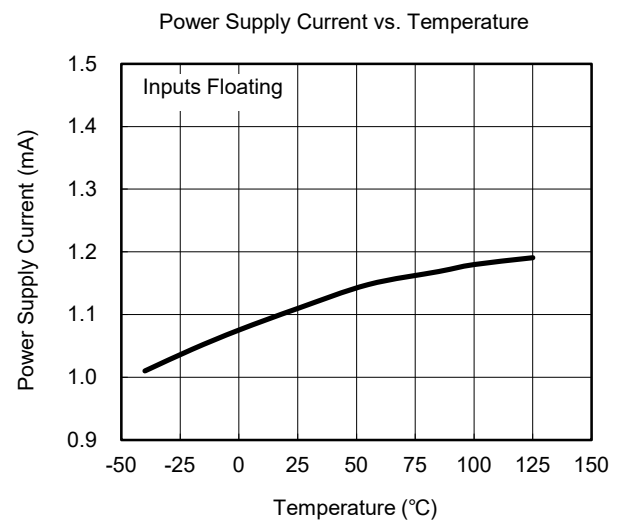
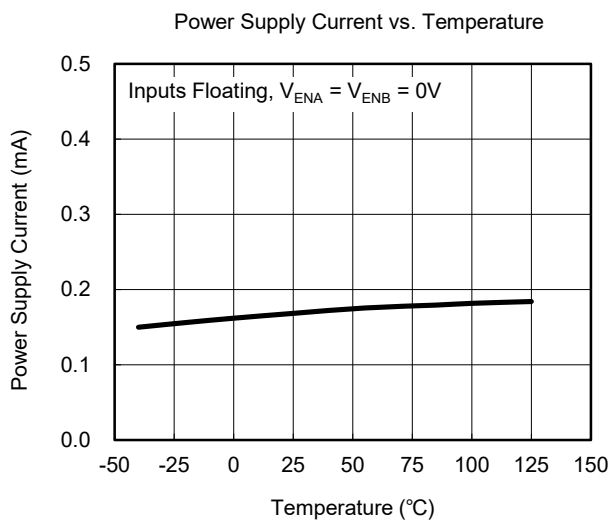
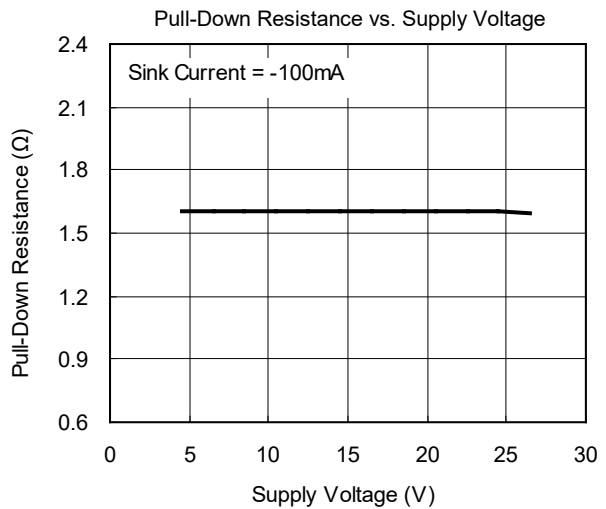
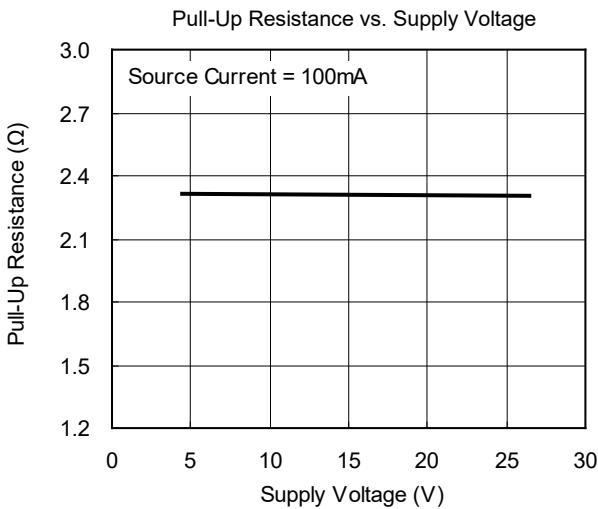
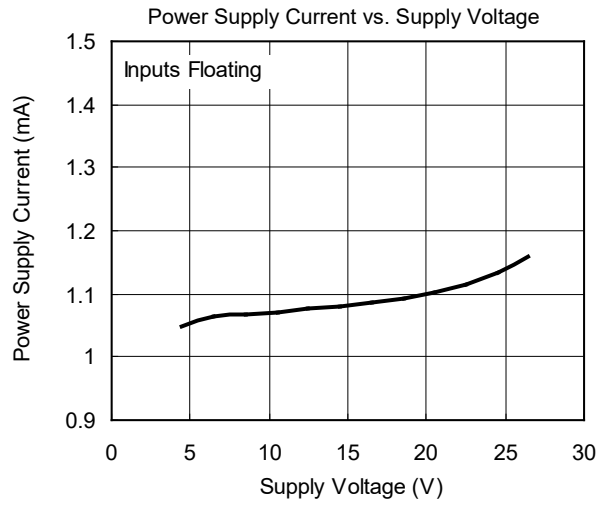
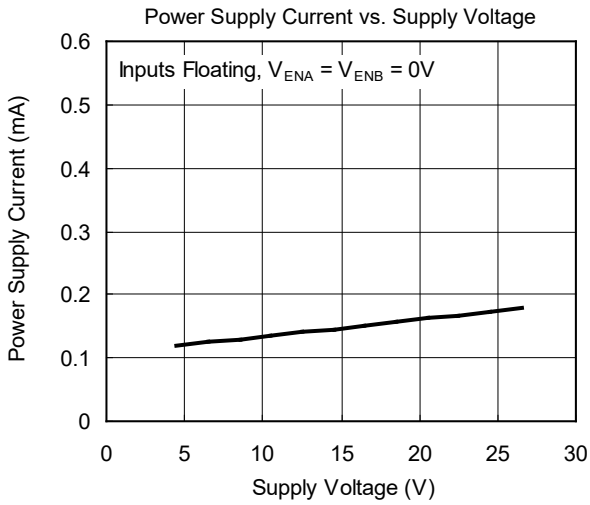
ENA	ENB	INA	INB	SGM4548		SGM4549		SGM4550	
				OUTA	OUTB	$\overline{OUTA}$	$\overline{OUTB}$	$\overline{OUTA}$	OUTB
H	H	L	L	L	L	H	H	H	L
H	H	L	H	L	H	H	L	H	H
H	H	H	L	H	L	L	H	L	L
H	H	H	H	H	H	L	L	L	H
H	H	Floating	Floating	L	L	L	L	L	L
L	L	-	-	L	L	L	L	L	L
Floating	Floating	-	-	L	L	L	L	L	L

**ELECTRICAL CHARACTERISTICS**(V<sub>CC</sub> = 24V, V<sub>ENA</sub> = V<sub>ENB</sub> = 3.3V, T<sub>A</sub> = +25°C, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Input</b>					
Input Signal High Threshold (V <sub>IH</sub> )	T <sub>A</sub> = -40°C to +125°C	1.6			V
Input Signal Low Threshold (V <sub>IL</sub> )	T <sub>A</sub> = -40°C to +125°C			0.7	V
Input Signal Hysteresis (V <sub>HYS</sub> )	T <sub>A</sub> = -40°C to +125°C		0.3		V
Input Signal High Current (I <sub>IH</sub> )	Inverting Input Current, V <sub>INX</sub> = 24V		6	8	μA
	Non-Inverting Input Current, V <sub>INX</sub> = 24V		108	145	
Input Signal Low Current (I <sub>IL</sub> )	Inverting Input Current, V <sub>INX</sub> = 0V		102	125	μA
	Non-Inverting Input Current, V <sub>INX</sub> = 0V		0.1	1	
<b>Output</b>					
Pull-Up Resistance (R <sub>OH</sub> )	Source Current = 100mA		2.3	3.1	Ω
Pull-Down Resistance (R <sub>OL</sub> )	Sink Current = -100mA		1.6	2.2	Ω
Peak Output Current (I <sub>PK</sub> )	Source Current, f = 1kHz, C <sub>L</sub> = 0.1μF		2		A
	Sink Current, f = 1kHz, C <sub>L</sub> = 0.1μF		-2		
Continuous Output Current (I <sub>DC</sub> )	Source/Sink Current		±200		mA
<b>Power Supply</b>					
Power Supply Current (I <sub>CC</sub> )	Inputs Floating, SGM4548		1.12	1.54	mA
	Inputs Floating, SGM4549		1.27	1.70	
	Inputs Floating, SGM4550		1.17	1.58	
	Inputs Floating, V <sub>ENA</sub> = V <sub>ENB</sub> = 0V		0.18	0.24	
Supply Voltage Range (V <sub>CC</sub> )		4.5		26.5	V
Under-Voltage Lockout ON Threshold			3.6	4	V
Under-Voltage Lockout Hysteresis			0.5		V
<b>Enable Logic</b>					
EN Signal High Threshold (V <sub>ENH</sub> )	T <sub>A</sub> = -40°C to +125°C	2.1			V
EN Signal Low Threshold (V <sub>ENL</sub> )	T <sub>A</sub> = -40°C to +125°C			0.6	
EN Signal Hysteresis (V <sub>EN-HYS</sub> )	T <sub>A</sub> = -40°C to +125°C		0.8		
EN Signal High Current (I <sub>ENH</sub> )	V <sub>ENA</sub> = 5.5V or V <sub>ENB</sub> = 5.5V		22	28.5	μA
EN Signal Low Current (I <sub>ENL</sub> )	V <sub>ENA</sub> = 0V or V <sub>ENB</sub> = 0V		0.1	1	
<b>Switching Characteristics</b>					
Rise Time (t <sub>R</sub> )	C <sub>L</sub> = 1000pF		12		ns
Fall Time (t <sub>F</sub> )	C <sub>L</sub> = 1000pF		13		ns
Turn-On Delay Time (t <sub>D1</sub> )	See Figure 1 and Figure 2		21		ns
Turn-Off Delay Time (t <sub>D2</sub> )	See Figure 1 and Figure 2		23		ns
EN to Output Propagation Delay (t <sub>D3</sub> )	See Figure 3 and Figure 4		10		μs
EN to Output Propagation Delay (t <sub>D4</sub> )	See Figure 3 and Figure 4		27		ns
<b>Over-Temperature Protection</b>					
Thermal Shutdown Threshold			150		°C
Thermal Shutdown Threshold Hysteresis			15		°C

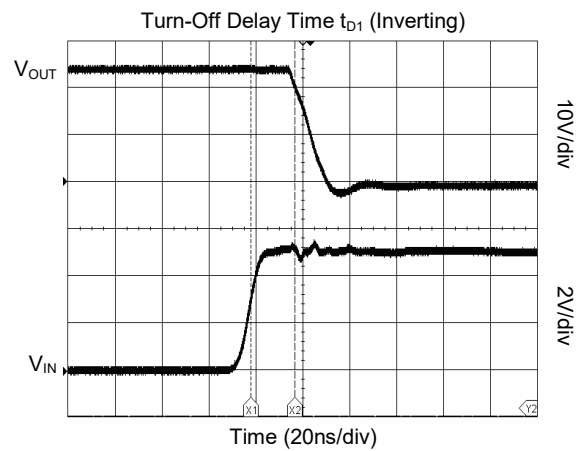
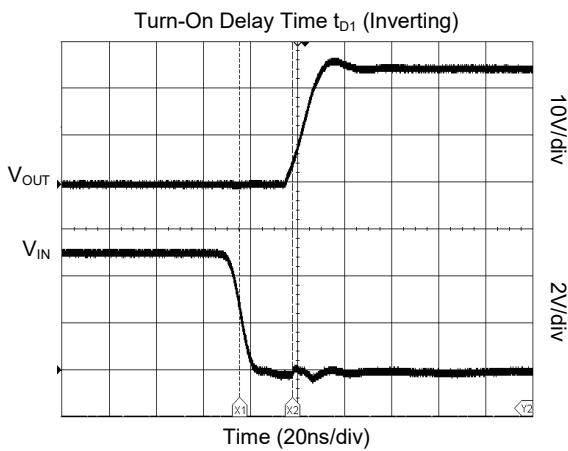
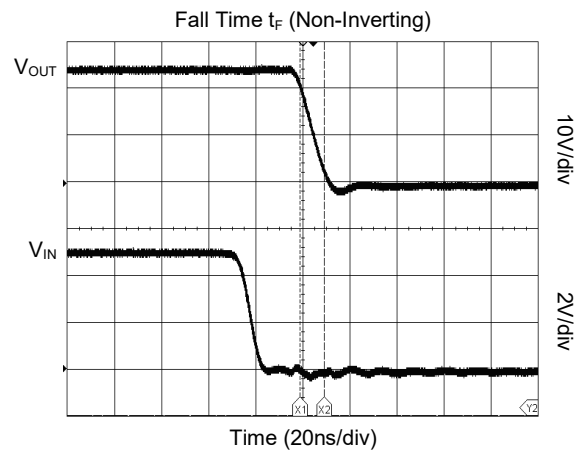
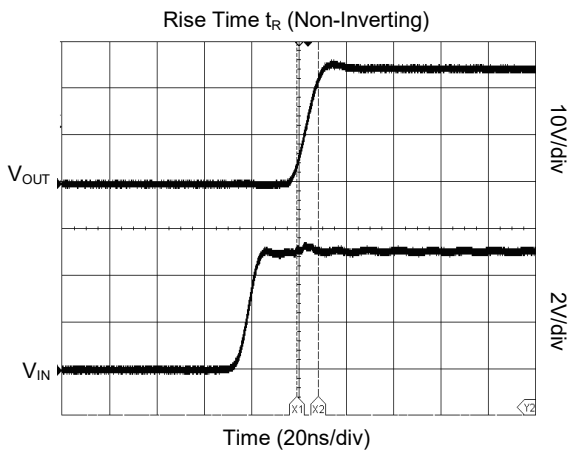
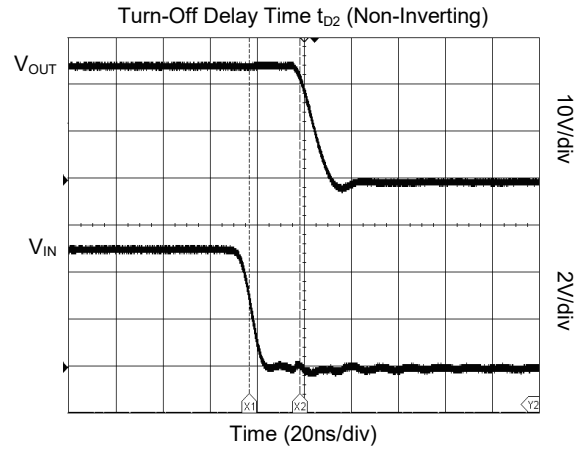
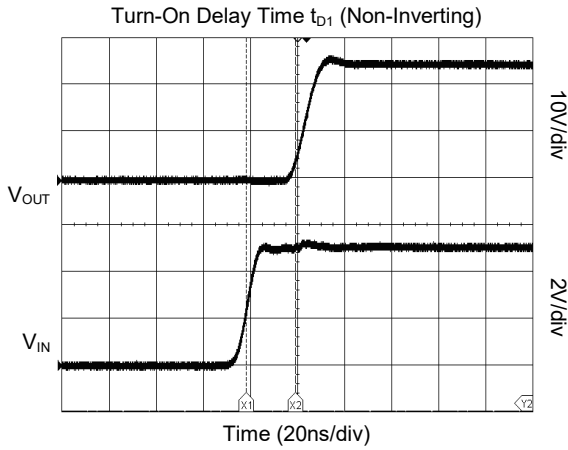
**TYPICAL PERFORMANCE CHARACTERISTICS**

$T_A = +25^\circ\text{C}$ ,  $V_{CC} = 24\text{V}$ ,  $V_{ENA} = V_{ENB} = 5\text{V}$ ,  $C_{IN} = 4.7\mu\text{F}$ ,  $C_L = 1\text{nF}$ , unless otherwise noted.



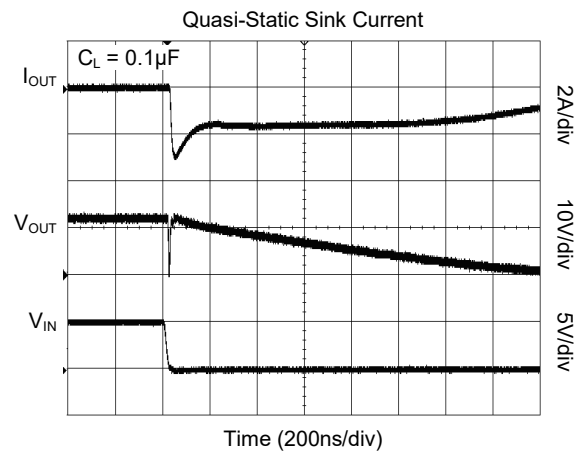
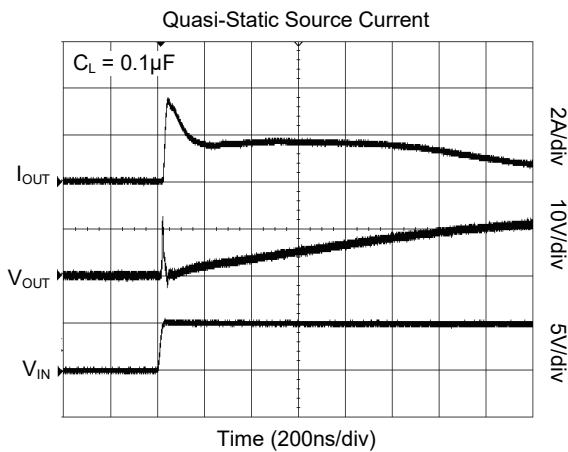
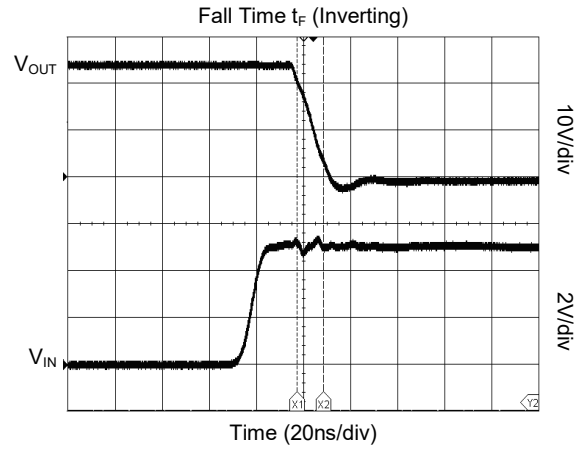
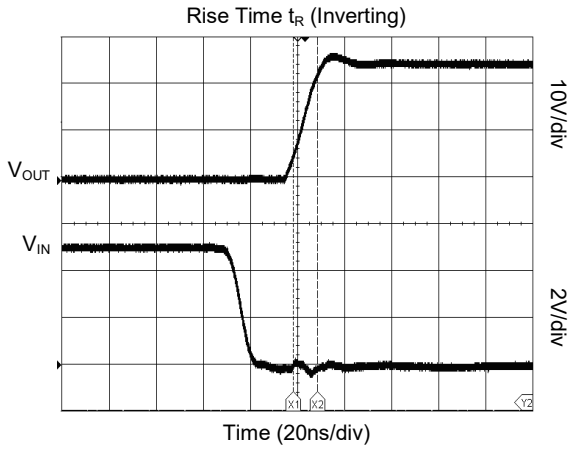
**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

$T_A = +25^\circ\text{C}$ ,  $V_{CC} = 24\text{V}$ ,  $V_{ENA} = V_{ENB} = 5\text{V}$ ,  $C_{IN} = 4.7\mu\text{F}$ ,  $C_L = 1\text{nF}$ , unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_A = +25^\circ\text{C}$ ,  $V_{CC} = 24\text{V}$ ,  $V_{ENA} = V_{ENB} = 5\text{V}$ ,  $C_{IN} = 4.7\mu\text{F}$ ,  $C_L = 1\text{nF}$ , unless otherwise noted.





TIMING TABLE

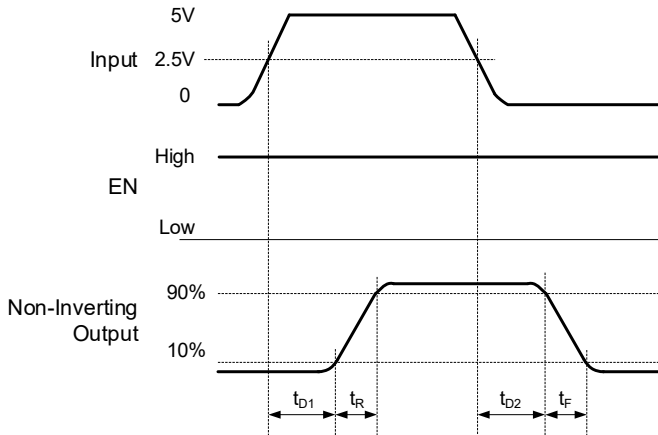


Figure 1. Non-Inverting Input Driver Operation

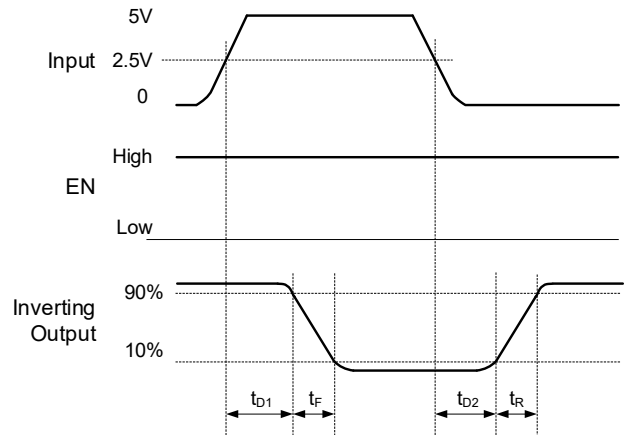


Figure 2. Inverting Input Driver Operation

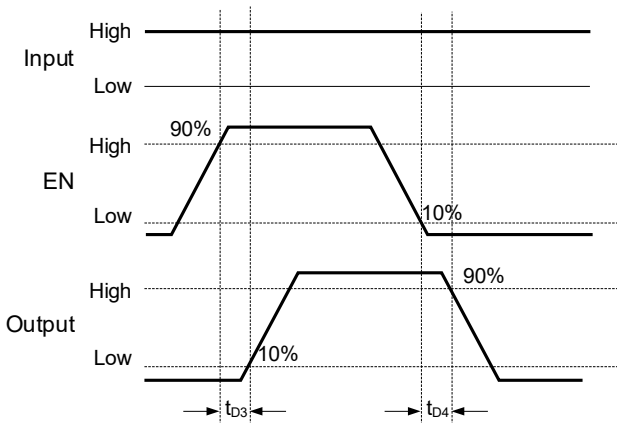


Figure 3. Enable Function (For Non-Inverting Input)

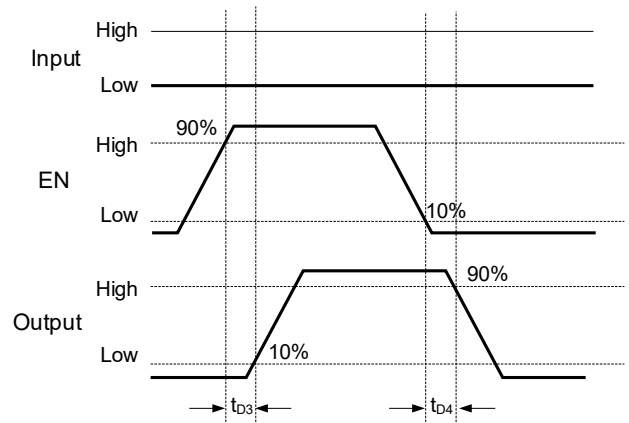


Figure 4. Enable Function (For Inverting Input)

TEST CIRCUIT

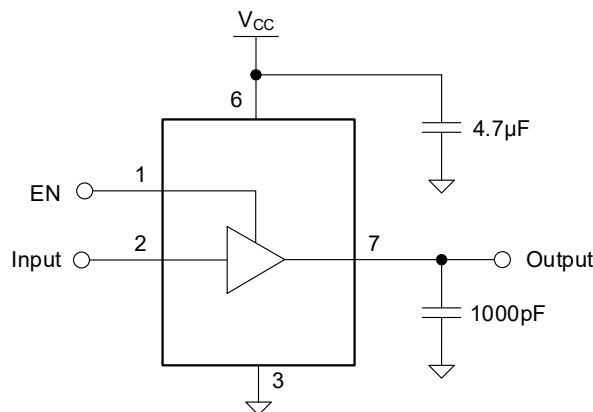


Figure 5. Standard Test Configuration

FUNCTIONAL BLOCK DIAGRAMS

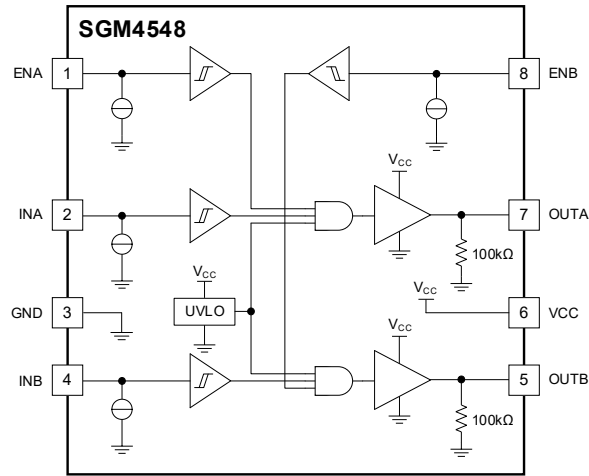


Figure 6. SGM4548 Block Diagram

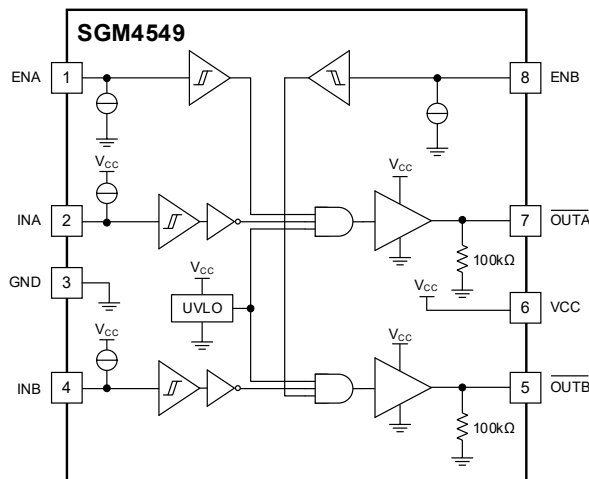


Figure 7. SGM4549 Block Diagram

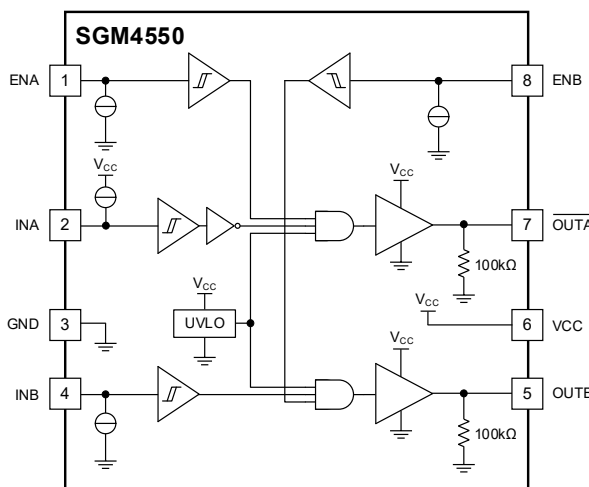


Figure 8. SGM4550 Block Diagram

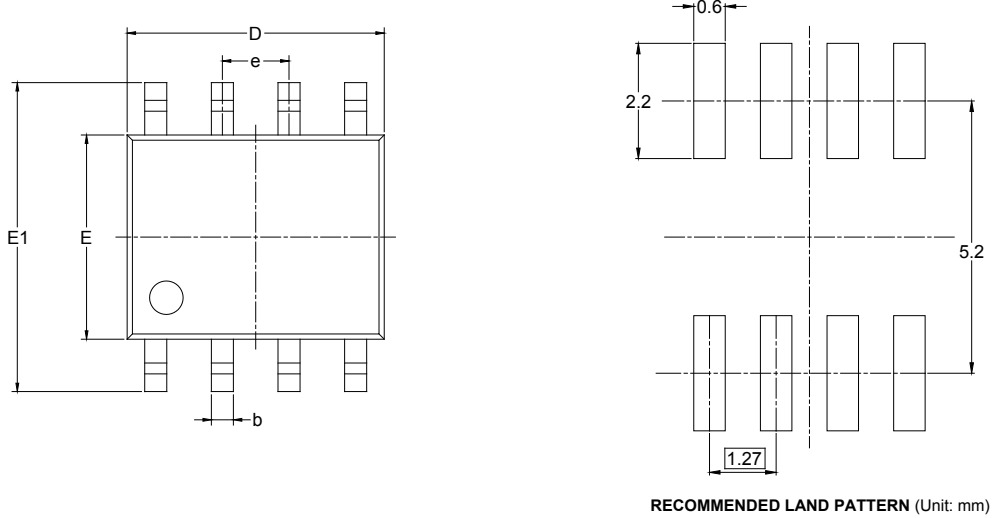
**REVISION HISTORY**

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

<b>JANUARY 2023 – REV.A.2 to REV.A.3</b>	<b>Page</b>
Updated Detailed Description .....	All
<b>DECEMBER 2016 – REV.A.1 to REV.A.2</b>	<b>Page</b>
Updated Operating Temperature Range .....	All
<b>SEPTEMBER 2015 – REV.A to REV.A.1</b>	<b>Page</b>
Changed Electrical Characteristics section .....	5
<b>Changes from Original (JUNE 2015) to REV.A</b>	<b>Page</b>
Changed from product preview to production data .....	All

PACKAGE OUTLINE DIMENSIONS

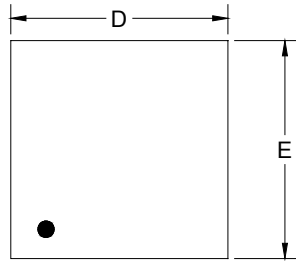
SOIC-8



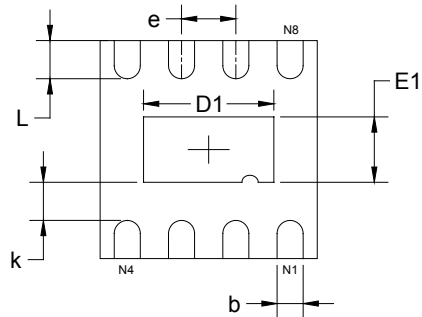
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
$\theta$	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

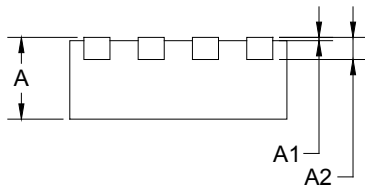
TDFN-2x2-8L



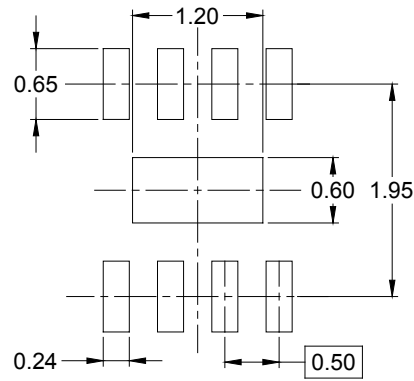
TOP VIEW



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	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E	1.900	2.100	0.075	0.083
E1	0.500	0.700	0.020	0.028
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.250	0.450	0.010	0.018

## 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
SOIC-8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
TDFN-2x2-8L	7"	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1

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
13"	386	280	370	5

DD0002