SGM4548/49/50
High Speed, Dual Level Shifters and Drivers

GENERAL DESCRIPTION

The SGM4548/49/50 ICs are matched dual-channel level shifters and drivers. Unique circuit design provides very high speed drivers capable of delivering peak currents of 2A into highly capacitive loads. Improved speed and drive capability are enhanced by matched rise and fall delay times. These matched delays maintain the integrity of input-to-output pulse-widths to reduce timing errors and clock skew problems. Dynamic switching losses are minimized with non-overlapped drive techniques.

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℃ to +85℃.

FEATURES

- **Improved Response Times**
- **Matched Rise and Fall Times**
- **Independent Enable Function for Each Output**
- **Reduced Clock Skew between Dual Channels**
- **Low Output Impedance**
- **Output is at LOW under UVLO Protection, Enable Pin Floating or Disable Status**
- **High Noise Immunity**
- **Improved Clocking Rate**
- **Low Supply Current**
- **Wide Operating Voltage Range**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green SOIC-8 and TDFN-2×2-8L Packages**

APPLICATIONS

Clock/Line Drivers
CCD Drivers
Ultra-Sound Transducer Drivers
Power MOSFET Drivers
Switch Mode Power Supplies
Class D Switching Amplifiers
Ultrasonic and RF Generators
Ceramic Speaker Driver
Level Shifters and I/O Drivers

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4548	SOIC-8	-40℃ to +85℃	SGM4548YS8G/TR	SGM 4548YS8 XXXXX	Tape and Reel, 2500
	TDFN-2×2-8L	-40℃ to +85℃	SGM4548YTDE8G/TR	4548 XXXX	Tape and Reel, 3000
SGM4549	SOIC-8	-40℃ to +85℃	SGM4549YS8G/TR	SGM 4549YS8 XXXXX	Tape and Reel, 2500
	TDFN-2×2-8L	-40℃ to +85℃	SGM4549YTDE8G/TR	4549 XXXX	Tape and Reel, 3000
SGM4550	SOIC-8	-40℃ to +85℃	SGM4550YS8G/TR	SGM 4550YS8 XXXXX	Tape and Reel, 2500
	TDFN-2×2-8L	-40℃ to +85℃	SGM4550YTDE8G/TR	4550 XXXX	Tape and Reel, 3000

NOTE: XXXX = Date Code. 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

VCC to GND ..... -0.3V to 28V
ENA, ENB to GND ..... -0.3V to 6V
INA, INB to GND ..... -0.3V to V_{CC} + 0.3V
Combined Peak Output Current 4A
Junction Temperature ..... 150℃
Package Thermal Resistance
SOIC-8, θ_{JA} ..... 132℃/W
TDFN-2×2-8L, θ_{JA} ..... 118℃/W
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10sec) ..... 260℃
ESD Susceptibility
HBM 6000V
MM 300V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 4.5V to 26.5V
Operating Temperature Range ..... -40℃ to +85℃

OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

ESD SENSITIVITY CAUTION

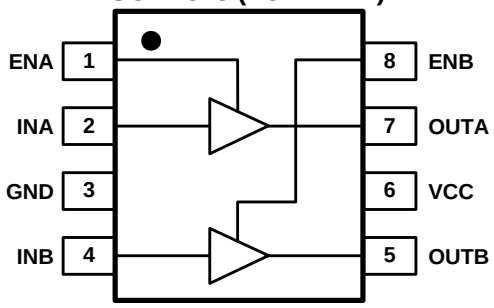
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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, specification or other related things if necessary without notice at any time.

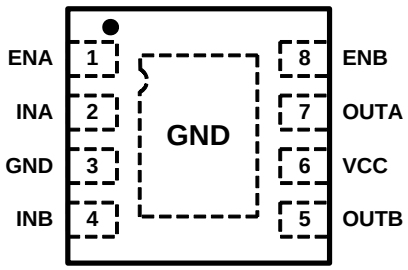
PIN CONFIGURATIONS

SGM4548 (TOP VIEW)



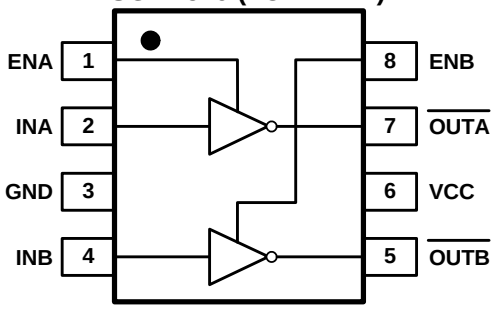
SOIC-8

SGM4548 (TOP VIEW)



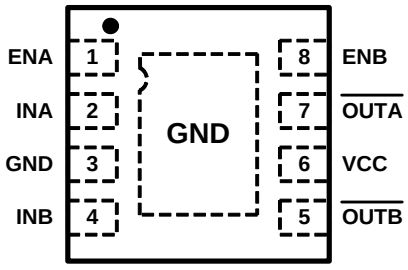
TDFN-2×2-8L

SGM4549 (TOP VIEW)



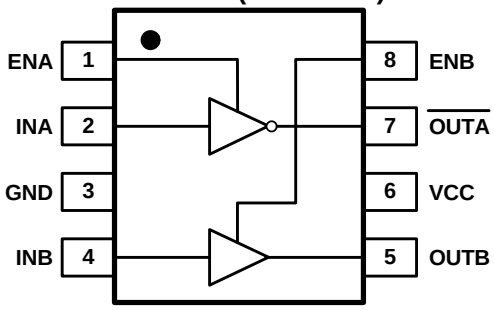
SOIC-8

SGM4549 (TOP VIEW)



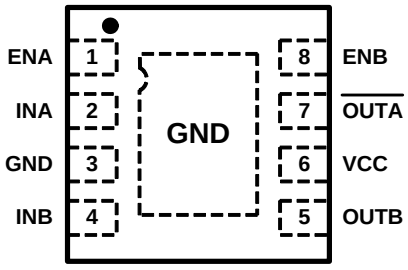
TDFN-2×2-8L

SGM4550 (TOP VIEW)



SOIC-8

SGM4550 (TOP VIEW)



TDFN-2×2-8L

PIN DESCRIPTION

PIN		NAME	FUNCTION
TDFN-2×2-8L	SOIC-8		
1	1	ENA	Enable Input for Channel A. ENA biased LOW or floating disables channel A output regardless of INA state. ENA biased HIGH enables channel A output.
2	2	INA	Input for Channel A. Non-inverting input in SGM4548, inverting input in SGM4549, and inverting input in SGM4550. OUTA/$\overline{\text{OUTA}}$ is held LOW if INA is unbiased or floating.
3	3	GND	Ground. All signals referenced to this pin.
4	4	INB	Input for Channel B. Non-inverting input in SGM4548, inverting input in SGM4549, and non-inverting input in SGM4550. OUTB/$\overline{\text{OUTB}}$ is held LOW if INB is unbiased or floating.
5	5	OUTB/$\overline{\text{OUTB}}$	Output of Channel B.
6	6	VCC	Supply Input.
7	7	OUTA/$\overline{\text{OUTA}}$	Output of Channel A.
8	8	ENB	Enable Input for Channel B. ENB biased LOW or floating disables channel B output regardless of INB state. ENB biased HIGH enables channel B output.
Exposed Pad	—	GND	Exposed pad should be soldered to PCB board and connected to GND.

FUNCTION TABLE

				SGM4548		SGM4549		SGM4550	
ENA	ENB	INA	INB	OUTA	OUTB	$\overline{\text{OUTA}}$	$\overline{\text{OUTB}}$	$\overline{\text{OUTA}}$	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

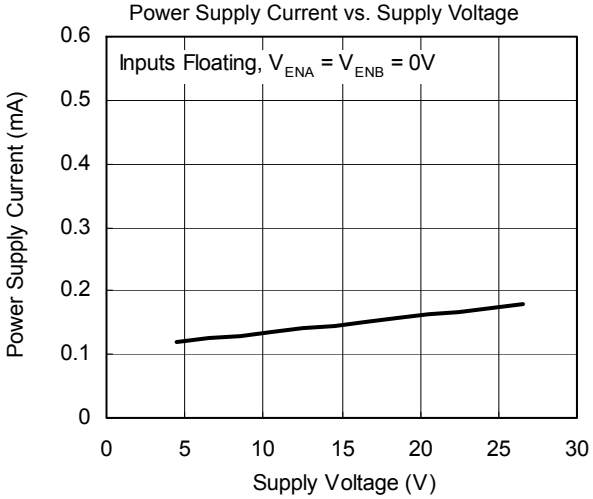
(V_{CC} = 24V, V_{ENA} = V_{ENB} = 3.3V, T_A = 25℃, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT					
Input Signal High Threshold (V_{IH})	T_A = -40℃ to +85℃	1.6			V
Input Signal Low Threshold (V_{IL})	T_A = -40℃ to +85℃			0.7	V
Input Signal Hysteresis (V_{HYS})	T_A = -40℃ to +85℃		0.3		V
Input Signal High Current (I_{IH})	Inverting Input Current, V_{INX} = 24V		6	8	μA
	Non-Inverting Input Current, V_{INX} = 24V		108	135	
Input Signal Low Current (I_{IL})	Inverting Input Current, V_{INX} = 0V		102	115	μA
	Non-Inverting Input Current, V_{INX} = 0V		0.1	1	
OUTPUT					
Pull-Up Resistance (R_{OH})	Source Current = 100mA		2.3	3.1	Ω
Pull-Down Resistance (R_{OL})	Sink Current = -100mA		1.6	2.2	Ω
Peak Output Current (I_{PK})	Source Current, f = 1kHz, C_L =0.1μF		2		A
	Sink Current, f = 1kHz, C_L =0.1μF		-2		
Continuous Output Current (I_{DC})	Source/Sink Current		±200		mA
POWER SUPPLY					
Power Supply Current (I_{CC})	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_{ENA} = V_{ENB} = 0V		0.18	0.24	
Supply Voltage Range (V_{CC})		4.5		26.5	V
Under-Voltage Lockout ON Threshold			3.6	4	V
Under-Voltage Lockout Hysteresis			0.5		V
ENABLE LOGIC					
EN Signal High Threshold (V_{ENH})	T_A = -40℃ to +85℃	2.1			V
EN Signal Low Threshold (V_{ENL})	T_A = -40℃ to +85℃			0.6	
EN Signal Hysteresis (V_{EN-HYS})	T_A = -40℃ to +85℃		0.8		
EN Signal High Current (I_{ENH})	V_{ENA} = 5.5V or V_{ENB} = 5.5V		22	28.5	μA
EN Signal Low Current (I_{ENL})	V_{ENA} = 0V or V_{ENB} = 0V		0.1	1	
SWITCHING CHARACTERISTICS					
Rise Time (t_R)	C_L = 1000pF		12		ns
Fall Time (t_F)	C_L = 1000pF		13		ns
Turn-On Delay Time (t_{D1})	See Figure 1, Figure 2		21		ns
Turn-Off Delay Time (t_{D2})	See Figure 1, Figure 2		23		ns
EN to Output Propagation Delay (t_{D3})	See Figure 3, Figure 4		10		μs
EN to Output Propagation Delay (t_{D4})	See Figure 3, Figure 4		27		ns
OVER-TEMPERATURE PROTECTION					
Thermal Shutdown Threshold			150		℃
Thermal Shutdown Threshold Hysteresis			15		℃

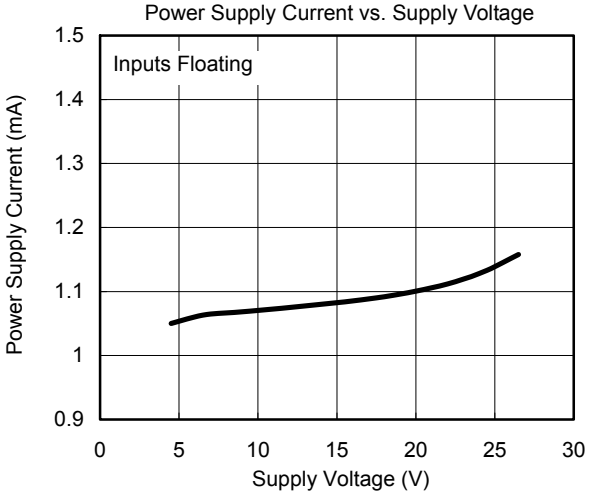
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, V_{CC} = 24V, V_{ENA} = V_{ENB} = 5V, C_{IN} = 4.7μF, C_L = 1nF, unless otherwise noted.

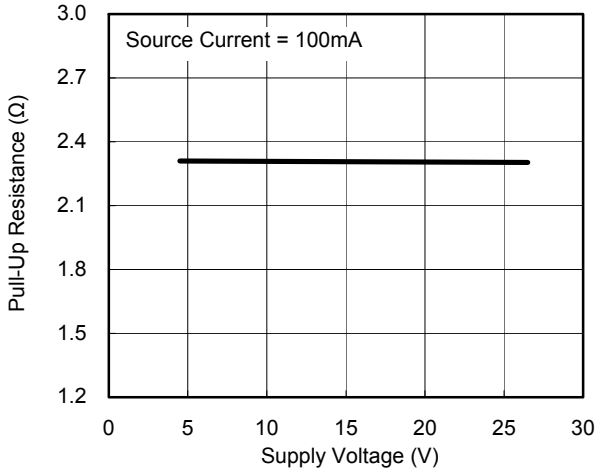
Power Supply Current vs. Supply Voltage



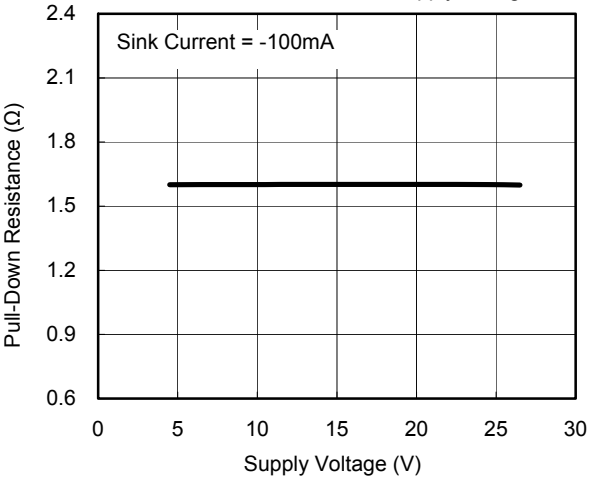
Power Supply Current vs. Supply Voltage



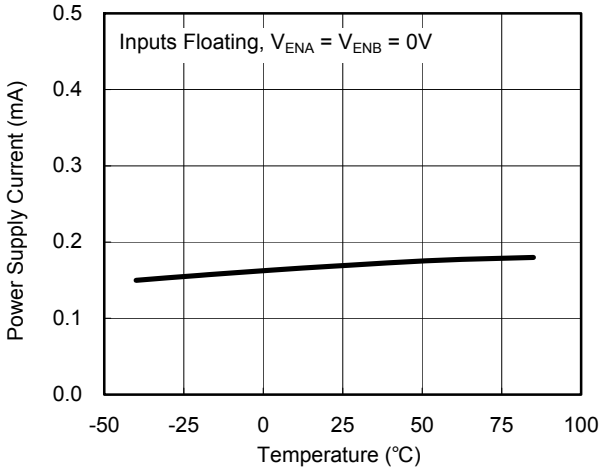
Pull-Up Resistance vs. Supply Voltage



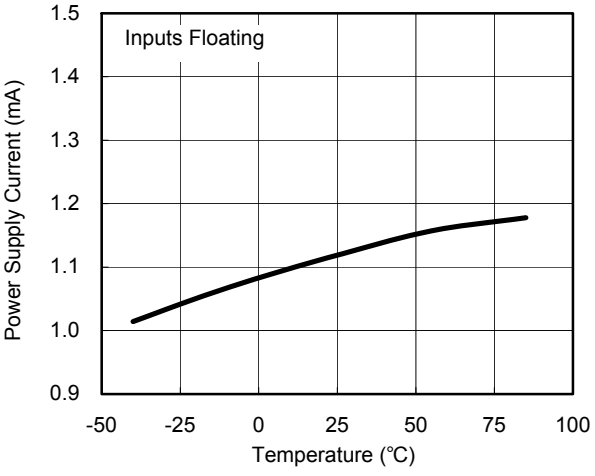
Pull-Down Resistance vs. Supply Voltage



Power Supply Current vs. Temperature



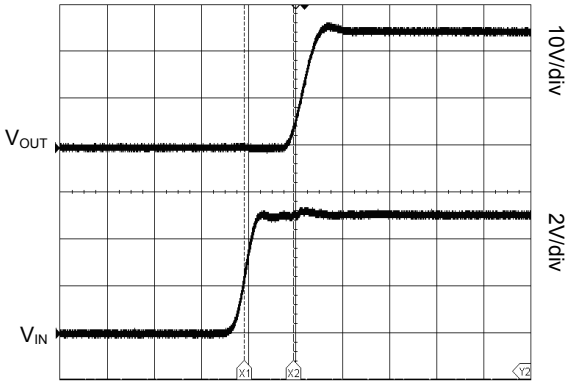
Power Supply Current vs. Temperature



TYPICAL PERFORMANCE CHARACTERISTICS

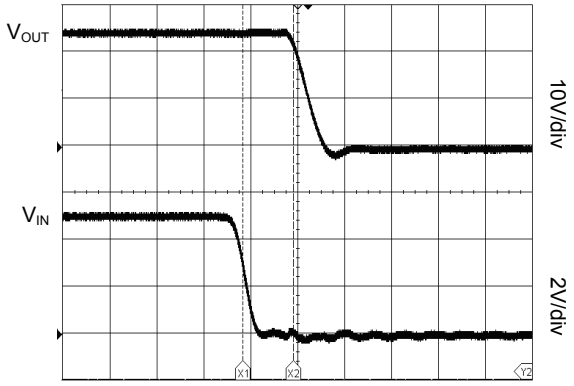
T_A = +25℃, V_{CC} = 24V, V_{ENA} = V_{ENB} = 5V, C_{IN} = 4.7μF, C_L = 1nF, unless otherwise noted.

Turn-On Delay Time t_{D1} (Non-Inverting)



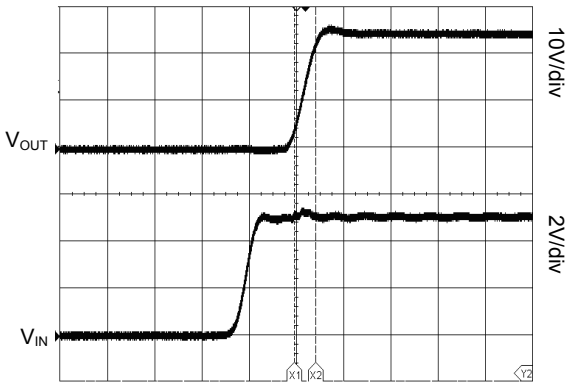
Time (20ns/div)

Turn-Off Delay Time t_{D2} (Non-Inverting)



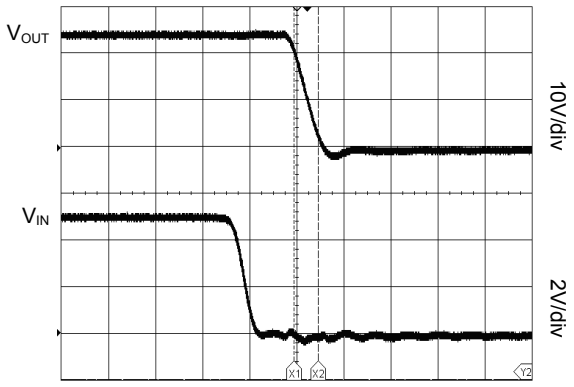
Time (20ns/div)

Rise Time t_R (Non-Inverting)



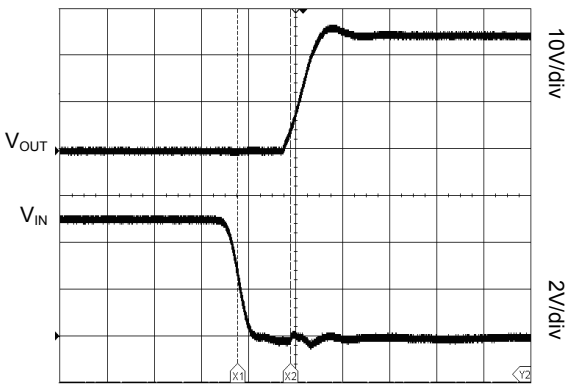
Time (20ns/div)

Fall Time t_F (Non-Inverting)



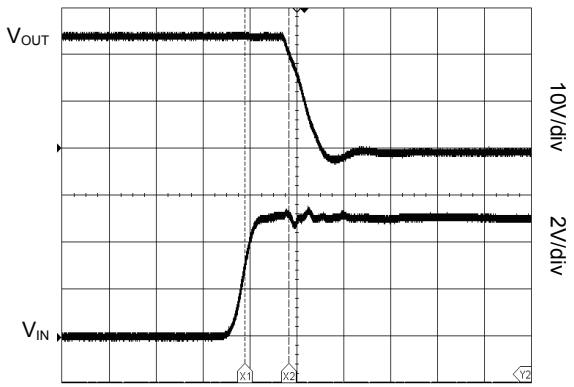
Time (20ns/div)

Turn-On Delay Time t_{D1} (Inverting)



Time (20ns/div)

Turn-Off Delay Time t_{D1} (Inverting)

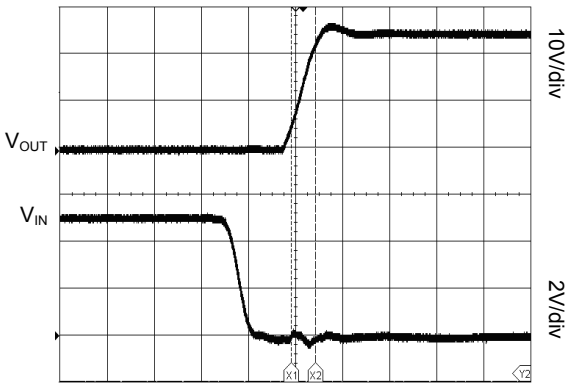


Time (20ns/div)

TYPICAL PERFORMANCE CHARACTERISTICS

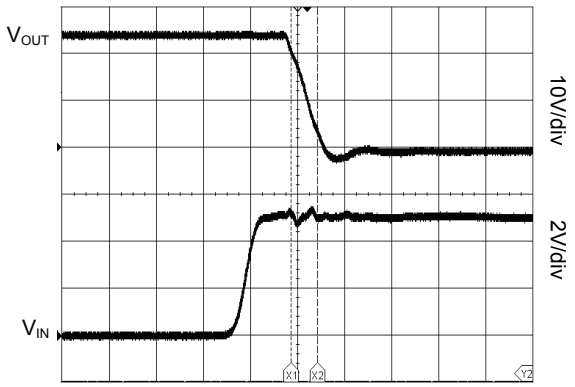
T_A = +25℃, V_{CC} = 24V, V_{ENA} = V_{ENB} = 5V, C_{IN} = 4.7μF, C_L = 1nF, unless otherwise noted.

Rise Time t_R (Inverting)



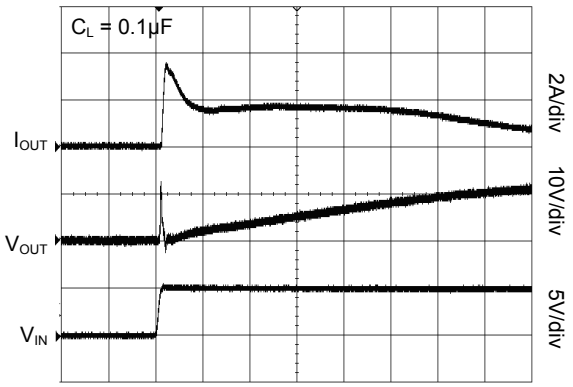
Time (20ns/div)

Fall Time t_F (Inverting)



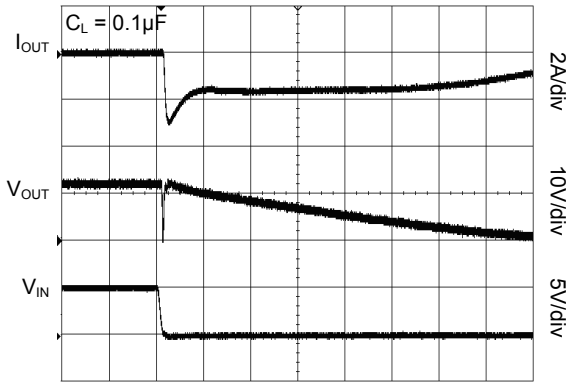
Time (20ns/div)

Quasi-Static Source Current



Time (200ns/div)

Quasi-Static Sink Current



Time (200ns/div)

TIMING TABLE

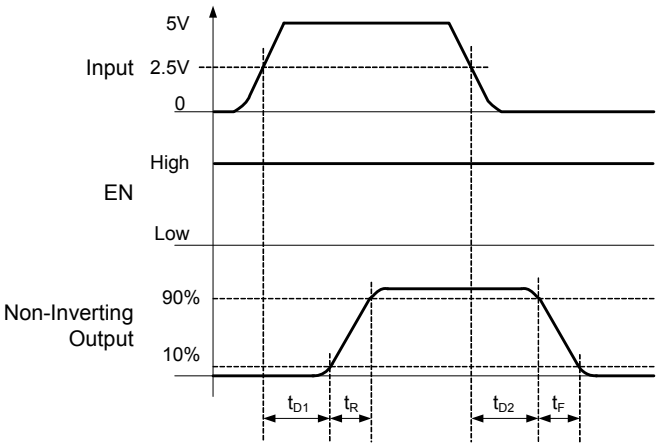


Figure 1. Non-Inverting Input Driver Operation

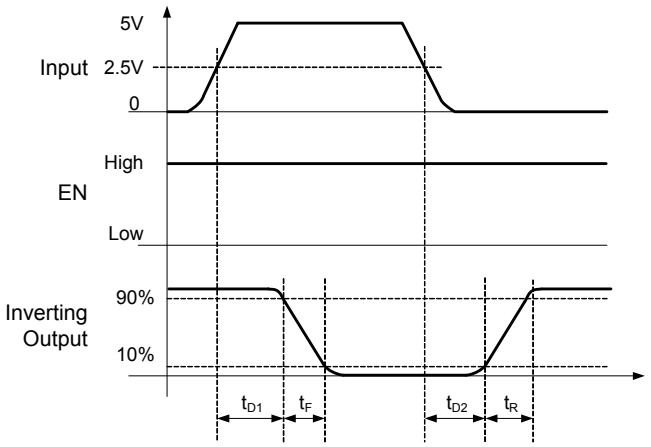


Figure 2. Inverting Input Driver Operation

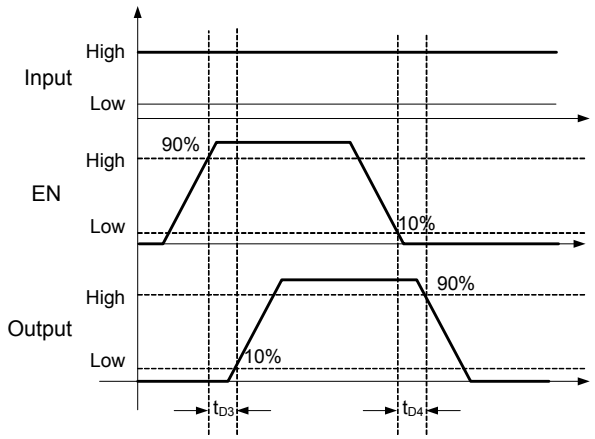


Figure 3. Enable Function
(For Non-Inverting Input Driver Operation)

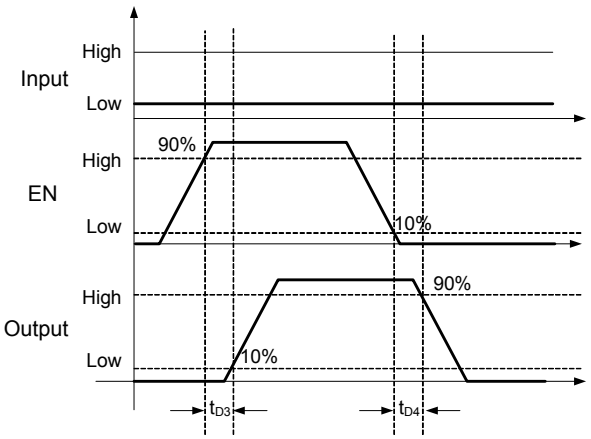


Figure 4. Enable Function
(For Inverting Input Driver Operation)

TEST CIRCUIT

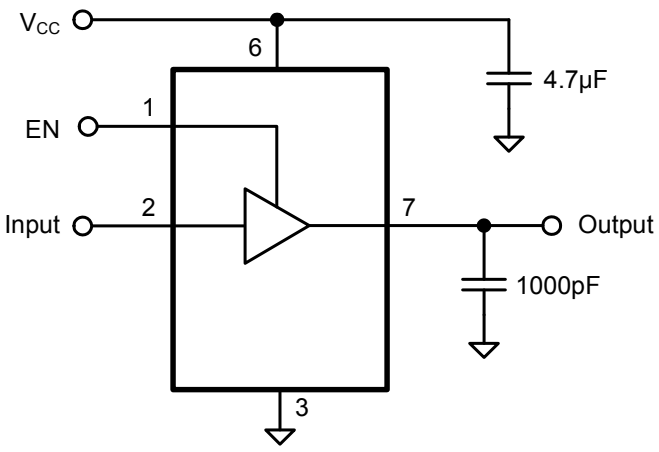


Figure 5. Standard Test Configuration

FUNCTIONAL BLOCK DIAGRAMS

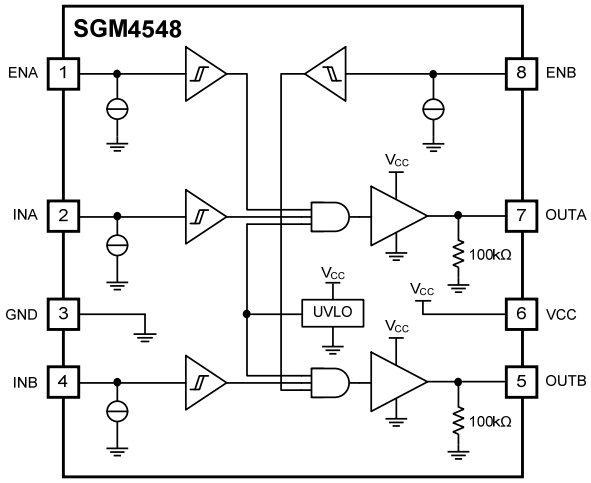


Figure 6. SGM4548 Block Diagram

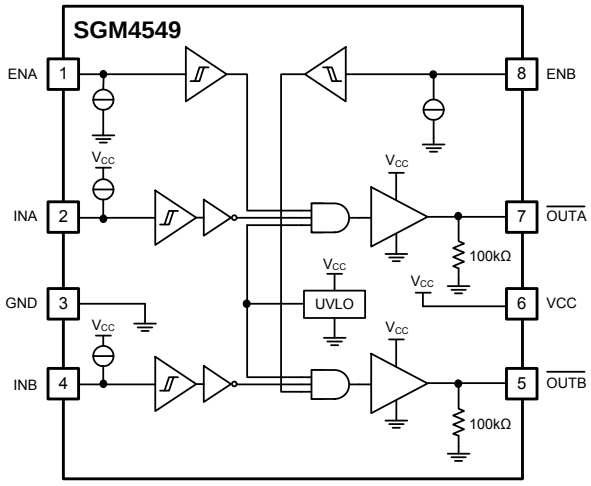


Figure 7. SGM4549 Block Diagram

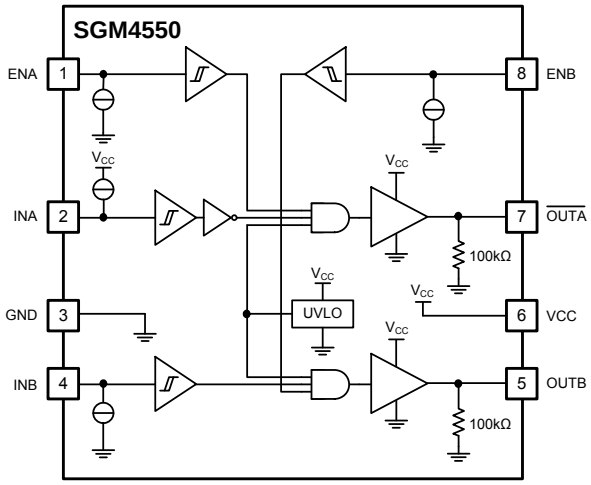
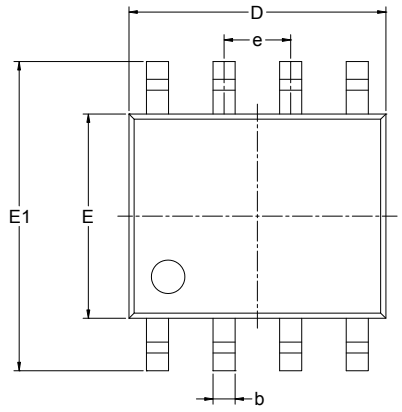
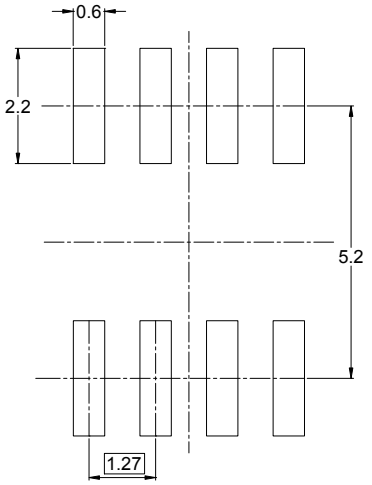


Figure 8. SGM4550 Block Diagram

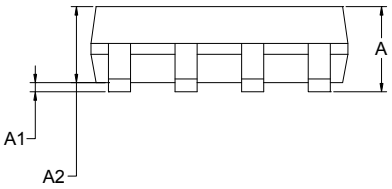
PACKAGE OUTLINE DIMENSIONS

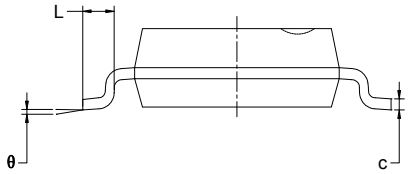
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

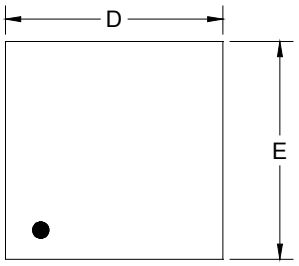




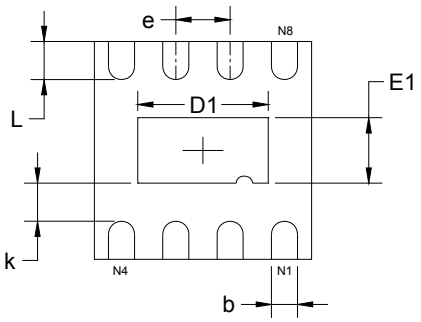
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

PACKAGE OUTLINE DIMENSIONS

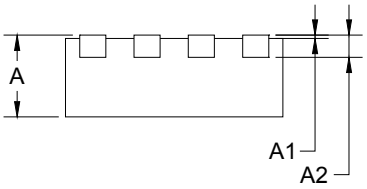
TDFN-2×2-8L



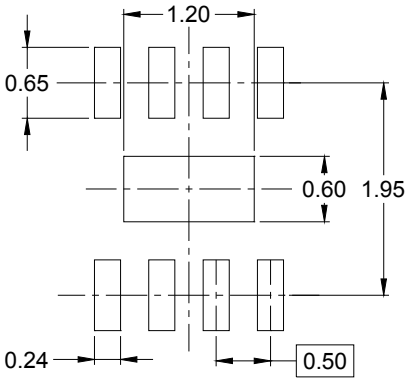
TOP VIEW



BOTTOM VIEW



SIDE VIEW

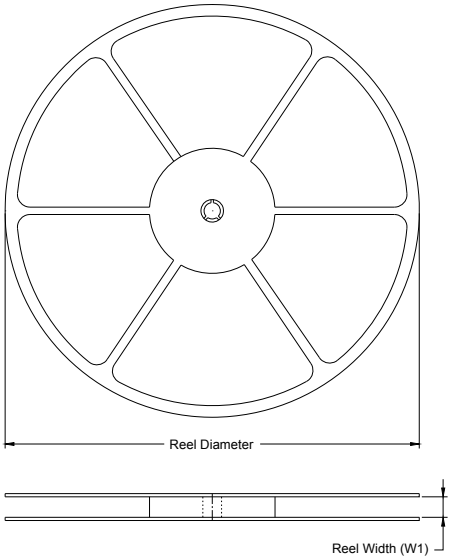


RECOMMENDED LAND PATTERN (Unit: mm)

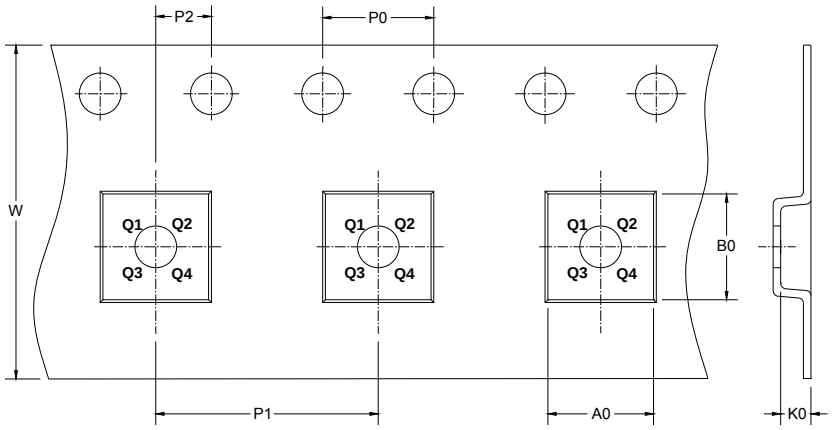
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E	1.900	2.100	0.075	0.083
E1	0.500	0.700	0.020	0.028
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	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



DIRECTION OF FEED

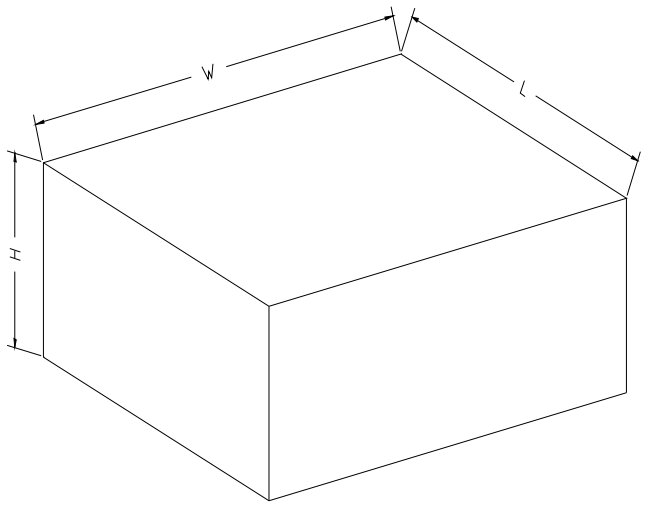
NOTE: The picture is only for reference. Please make the object as the standard.

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
TDFN-2×2-8L	7″	9.5	2.30	2.30	1.10	4.00	4.00	2.00	8.00	Q1
SOIC-8	13″	12.4	6.4	5.4	2.1	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