

### GENERAL DESCRIPTION

The SGM48017/8/9 are high-speed gate drivers capable of effectively driving MOSFET and IGBT power switches. They allow for up to 8A source and 13A sink peak currents at  $V_{DD} = 20V$ . The SGM48017/8/9 provide a set of comprehensive protection features such as thermal shutdown protection, under-voltage lockout and short-circuit protection. They operate with a wide supply range of 4.5V to 20V.

The SGM48017/8/9 are available in a Green SOT-23-5 package. They operate over a temperature range of  $-40^{\circ}C$  to  $+125^{\circ}C$ .

### APPLICATIONS

- Power MOSFETs
- IGBT Driving for Power Supplies
- Motor Drivers

### FEATURES

- Simple and Reliable
- 8A Source and 13A Sink Peak Currents
- Wide Supply Voltage Range: 4.5V to 20V
- Fast Propagation Delay: 30ns (TYP)
- Fast Rise Time: 7ns (TYP)
- Fast Fall Time: 8ns (TYP)
- Ringing Suppression
- Negative Voltage Capability on INx Pin:
  - 10V when  $(V_{DD} - V_{INx}) \leq 22V$
- Negative Voltage Capability on EN Pin:
  - 10V when  $(V_{DD} - V_{EN}) \leq 22V$
- Negative Voltage Capability on OUT Pin:
  - 5V (Pulse < 500ns)
- Comprehensive Protection Features
  - Thermal Shutdown Protection
  - Under-Voltage Lockout
  - Short-Circuit Protection
- $-40^{\circ}C$  to  $+125^{\circ}C$  Operating Temperature Range
- Available in a Green SOT-23-5 Package

### TYPICAL APPLICATIONS

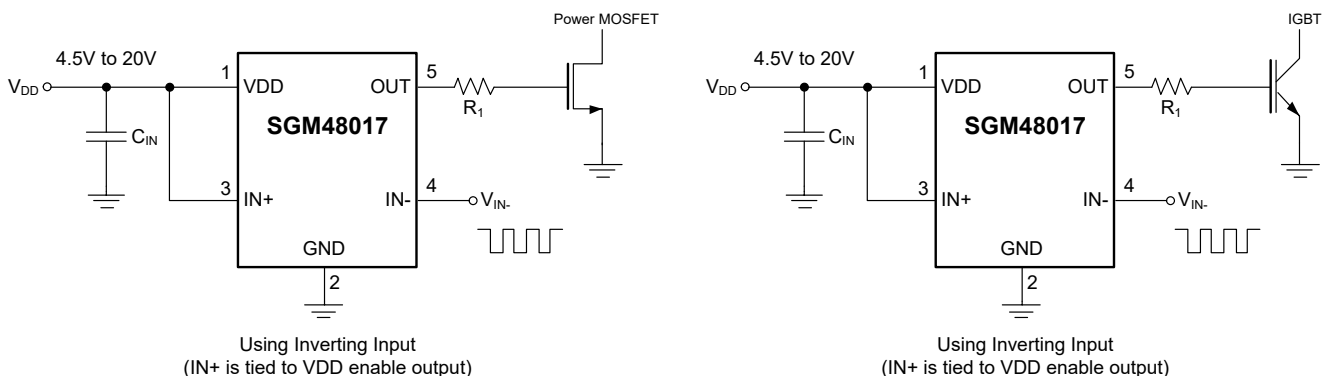
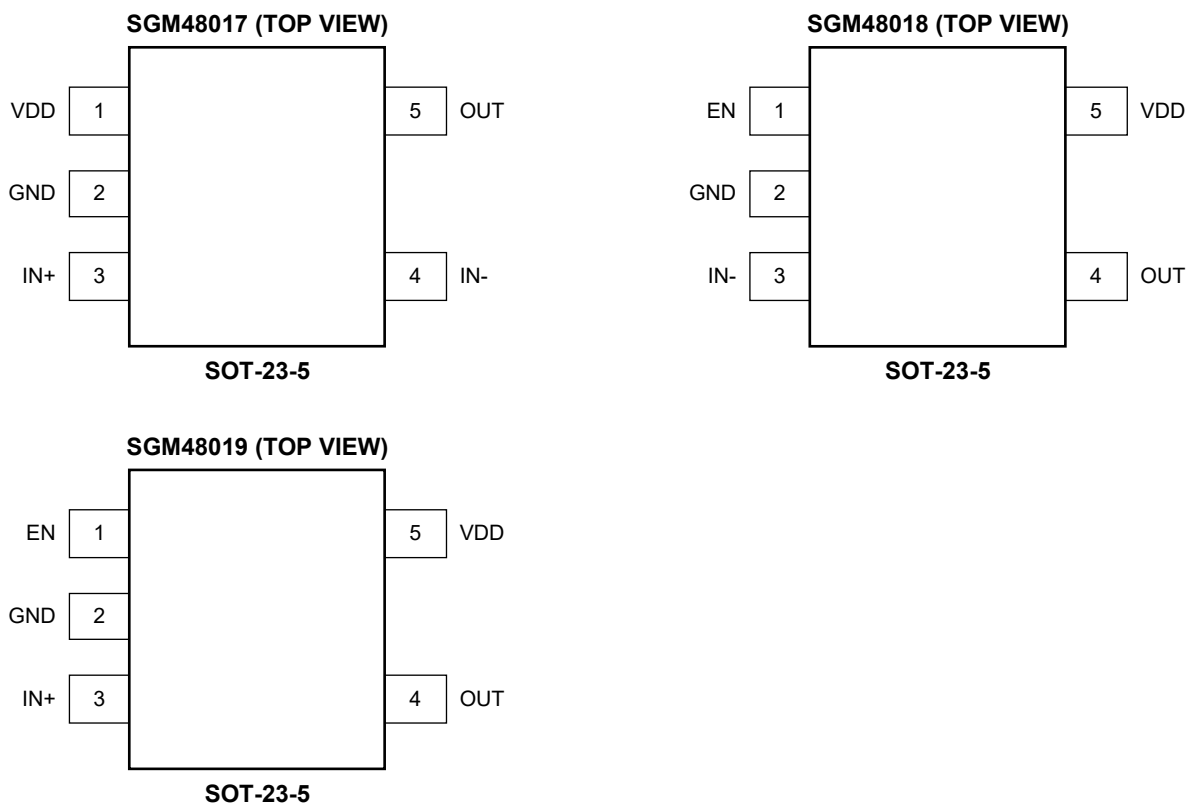


Figure 1. Typical Application Circuits



# Power MOSFET and IGBT Gate Drivers with Comprehensive Protections

## PIN CONFIGURATIONS



## PIN DESCRIPTION

PIN			NAME	I/O	FUNCTION
SGM48017	SGM48018	SGM48019			
1	5	5	VDD	P	Supply Input. Place a 4.7 $\mu$ F decoupling capacitor between this pin and GND pin close to the device.
2	2	2	GND	G	Ground. All signals are referenced to this pin.
3	—	3	IN+	I	Non-Inverting Input. OUT is held low if IN+ is floating. For the SGM48017, when the driver is used in inverting configuration, pull IN+ high in order to enable output.
4	3	—	IN-	I	Inverting Input. OUT is held low if IN- is floating. For the SGM48017, when the driver is used in non-inverting configuration, pull IN- low in order to enable output.
5	4	4	OUT	O	Source/Sink Current Output of Driver.
—	1	1	EN	I	Enable Input. EN is biased low to disable output regardless of input state. EN is biased high or left floating to enable output. EN is allowed to float.

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

# Power MOSFET and IGBT Gate Drivers SGM48017/SGM48018/SGM48019 with Comprehensive Protections

## ELECTRICAL CHARACTERISTICS

(V<sub>DD</sub> = 12V, C<sub>IN</sub> = 4.7μF, typical values are at T<sub>J</sub> = +25°C, Full = -40°C to +125°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>Power Supplies</b>							
VDD Operating Supply Voltage	V <sub>DD</sub>		Full	4.5		20	V
VDD Operating Supply Current	I <sub>VDD</sub>	INx, EN floating	+25°C		90	120	μA
		V <sub>IN+</sub> = 5V, V <sub>IN-</sub> = 0V, SGM48017 only	+25°C		750	960	
		V <sub>EN</sub> = 5V, V <sub>IN-</sub> = 0V, SGM48018 only	+25°C		815	1040	
		V <sub>EN</sub> = 5V, V <sub>IN+</sub> = 5V, SGM48019 only	+25°C		775	990	
VDD Under-Voltage Lockout Voltage	V <sub>UVLO</sub>	V <sub>DD</sub> rising	Full	3.8	4.1	4.4	V
VDD Under-Voltage Lockout Voltage Hysteresis	V <sub>HYS</sub>		+25°C		200		mV
<b>Inputs (INx, EN)</b>							
Input Low Voltage	V <sub>IL</sub>		Full			0.7	V
Input High Voltage	V <sub>IH</sub>		Full	2.5			V
Input Low Current	I <sub>IL</sub>	Inverting input current, V <sub>INx</sub> = 0V	+25°C		110	140	μA
		Non-inverting input current, V <sub>INx</sub> = 0V	+25°C		0.1	1	
Input High Current	I <sub>IH</sub>	Inverting input current, V <sub>INx</sub> = 20V	+25°C		0.2	2	μA
		Non-inverting input current, V <sub>INx</sub> = 20V	+25°C		115	150	
EN Low Current	I <sub>ENL</sub>	V <sub>EN</sub> = 0V	+25°C		110	145	μA
EN High Current	I <sub>ENH</sub>	V <sub>EN</sub> = 20V	+25°C		0.2	2	μA
<b>Outputs</b>							
Pull-Up Resistance <sup>(1)</sup>	R <sub>OH</sub>	V <sub>DD</sub> = 12V, I <sub>OUT_SOURCE</sub> = 50mA	Full		4.7	7.4	Ω
		V <sub>DD</sub> = 4.5V, I <sub>OUT_SOURCE</sub> = 50mA	Full		5.3	8.3	
Pull-Down Resistance	R <sub>OL</sub>	V <sub>DD</sub> = 12V, I <sub>OUT_SINK</sub> = -50mA	Full		255	440	mΩ
		V <sub>DD</sub> = 4.5V, I <sub>OUT_SINK</sub> = -50mA	Full		265	460	
Peak Output Current	I <sub>PK_SOURCE</sub>	V <sub>DD</sub> = 20V, C <sub>L</sub> = 0.22μF, f <sub>SW</sub> = 1kHz	+25°C		8		A
	I <sub>PK_SINK</sub>		+25°C		13		A
<b>Switching Characteristics</b>							
Rise Time	t <sub>R</sub>	C <sub>L</sub> = 2.2nF, see Figure 2 through Figure 9	+25°C		7		ns
Fall Time	t <sub>F</sub>		+25°C		8		ns
Propagation Delay (IN+) to OUT	t <sub>D1</sub>	C <sub>L</sub> = 2.2nF, 3V input pulse, see Figure 2, Figure 4 and Figure 8	+25°C		26		ns
	t <sub>D2</sub>		+25°C		30		ns
Propagation Delay (IN-) to OUT	t <sub>D3</sub>	C <sub>L</sub> = 2.2nF, 3V input pulse, see Figure 3, Figure 5 and Figure 6	+25°C		30		ns
	t <sub>D4</sub>		+25°C		26		ns
Propagation Delay (EN) to OUT	t <sub>D5</sub>	C <sub>L</sub> = 2.2nF, 3V input pulse, see Figure 7 and Figure 9	+25°C		26		ns
	t <sub>D6</sub>		+25°C		30		ns
<b>Protection Circuits</b>							
Thermal Shutdown Temperature	T <sub>TSD</sub>				165		°C
Thermal Shutdown Temperature Hysteresis	T <sub>HYS</sub>				30		°C

NOTE:

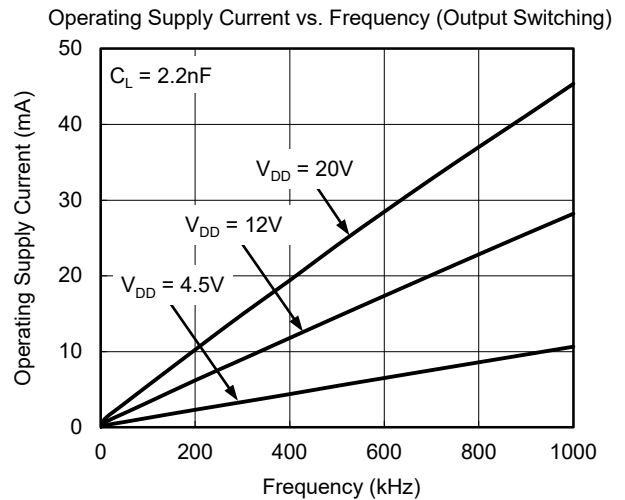
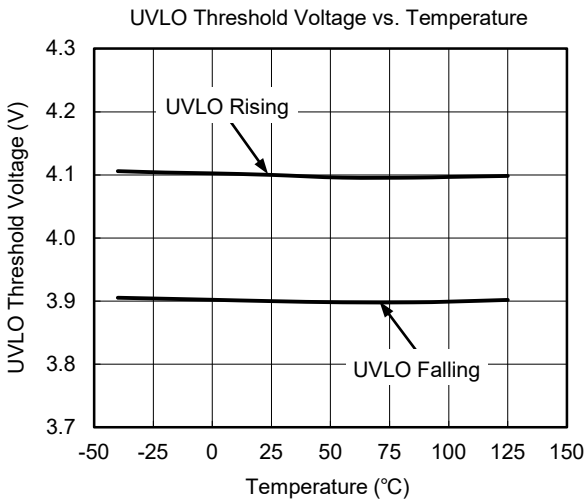
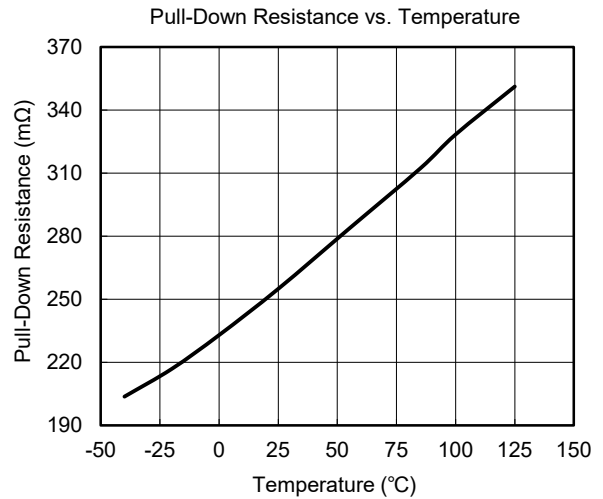
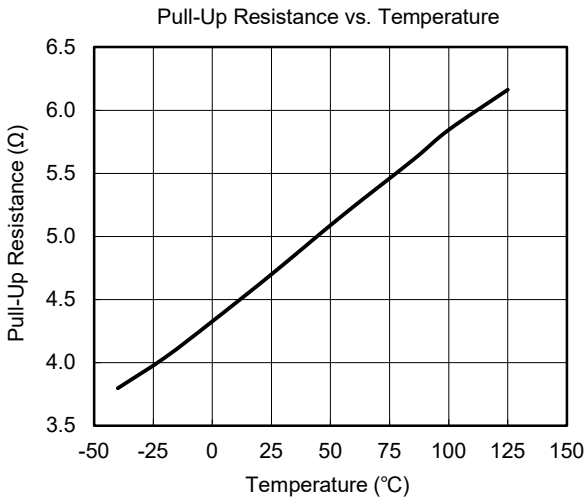
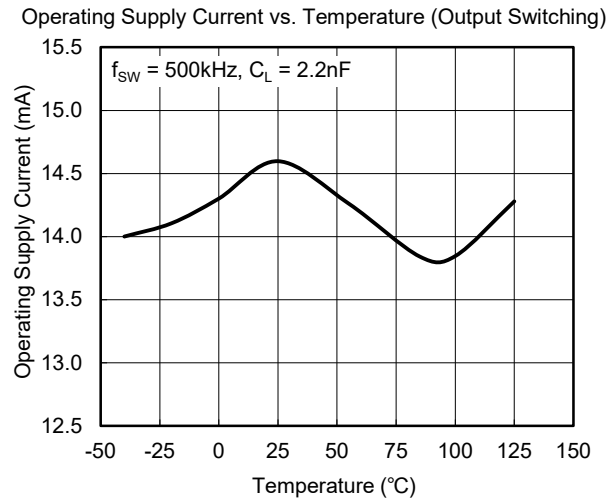
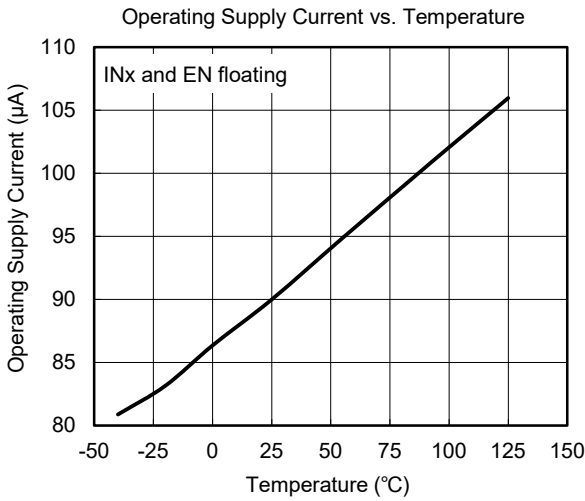
1. R<sub>OH</sub> represents constant pull-up resistance only. Pull-up resistance R<sub>OH\_PULSE</sub> operates in pulse mode during the output rising stage, R<sub>OH\_PULSE</sub> = 565mΩ (TYP).

# Power MOSFET and IGBT Gate Drivers with Comprehensive Protections

## SGM48017/SGM48018/SGM48019

### TYPICAL PERFORMANCE CHARACTERISTICS

At  $T_J = +25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$ ,  $C_{IN} = 4.7\mu\text{F}$ , unless otherwise noted.

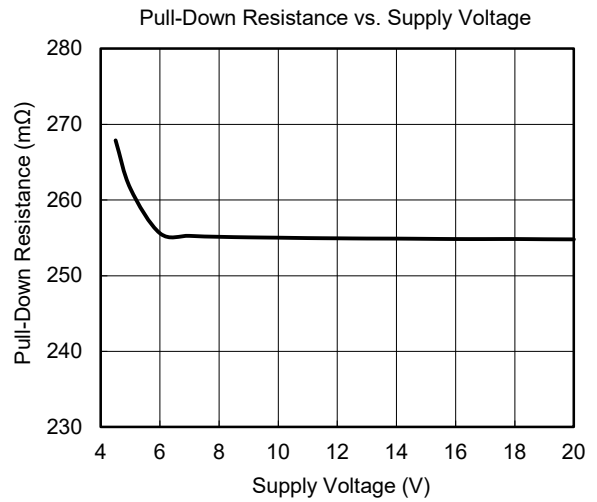
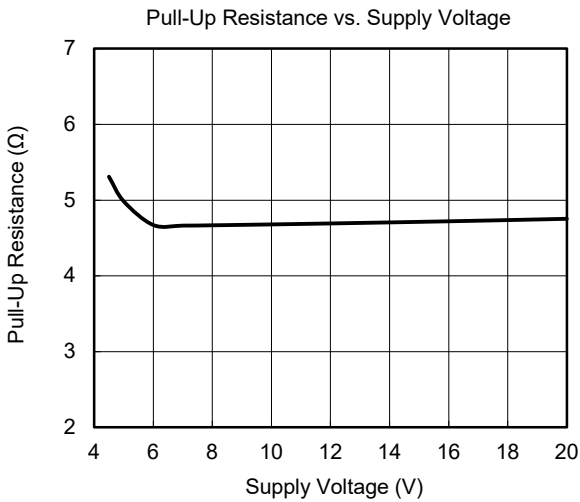
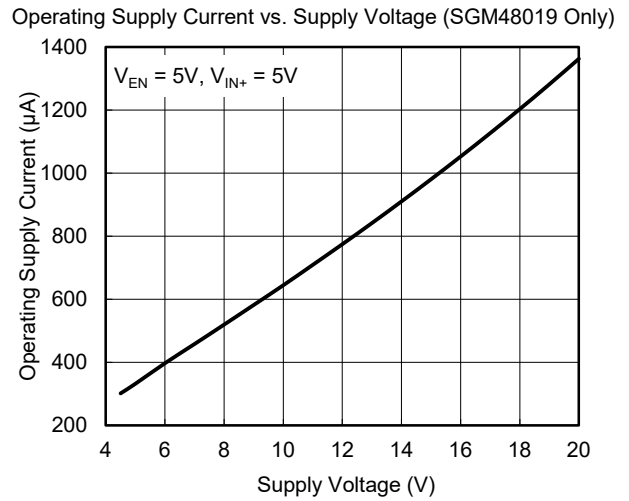
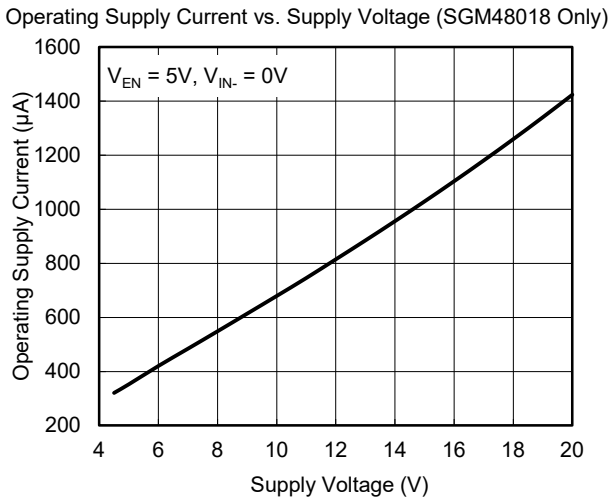
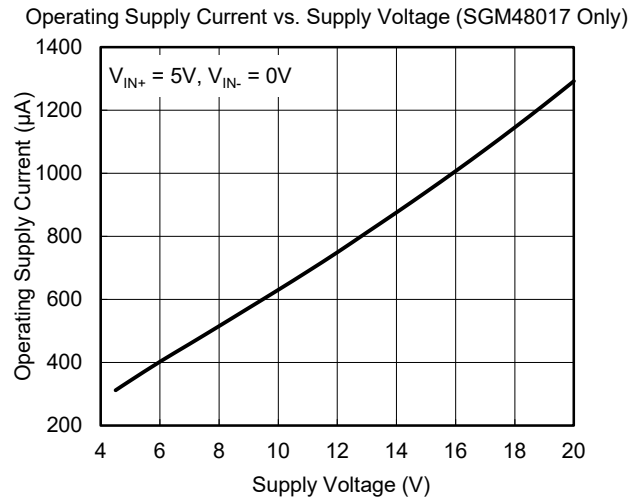
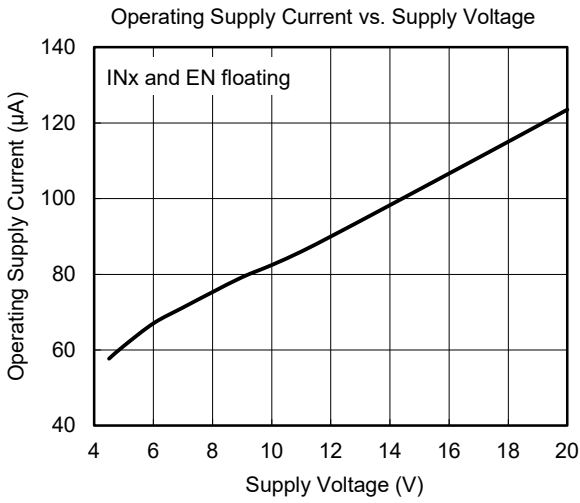


# Power MOSFET and IGBT Gate Drivers with Comprehensive Protections

## SGM48017/SGM48018/SGM48019

### TYPICAL PERFORMANCE CHARACTERISTICS (continued)

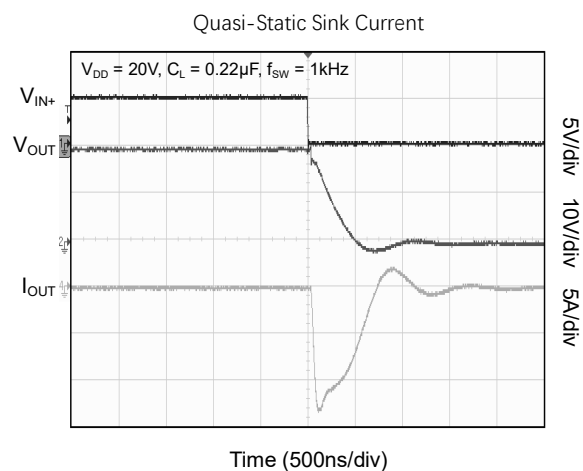
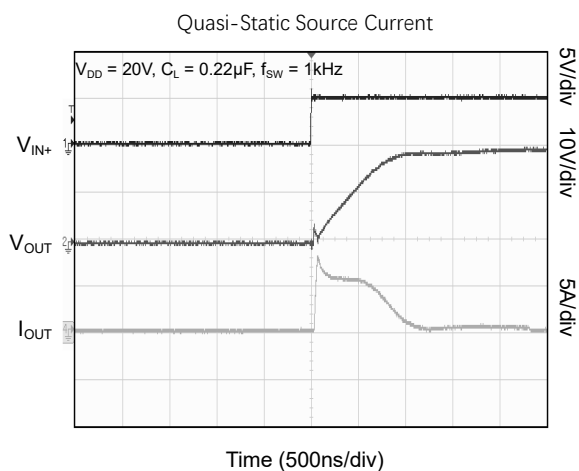
At  $T_J = +25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$ ,  $C_{IN} = 4.7\mu\text{F}$ , unless otherwise noted.



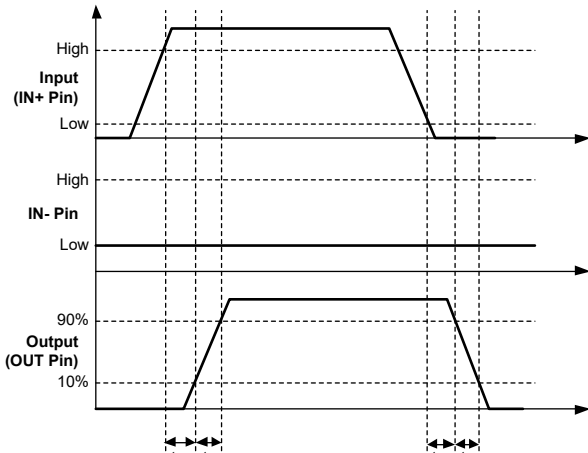
# Power MOSFET and IGBT Gate Drivers SGM48017/SGM48018/SGM48019 with Comprehensive Protections

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At  $T_J = +25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$ ,  $C_{IN} = 4.7\mu\text{F}$ , unless otherwise noted.

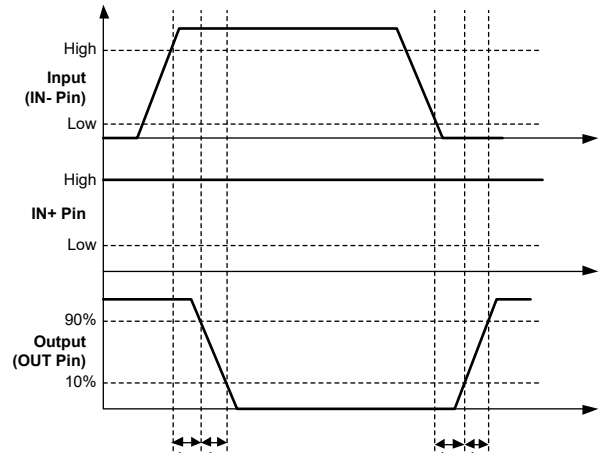


**TIMING DIAGRAMS**



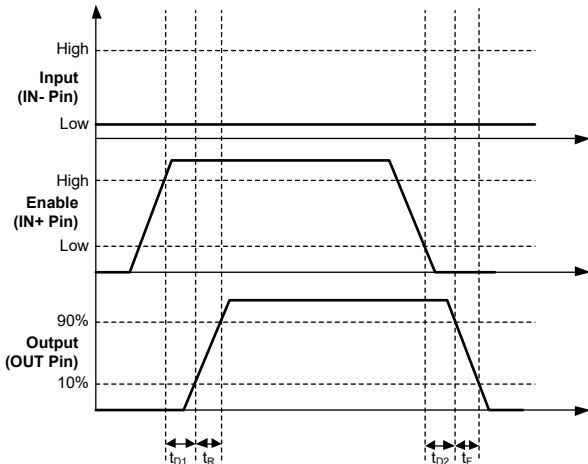
(PWM Input to IN+ Pin (IN- Pin Tied Low), SGM48017)

**Figure 2. Non-Inverting Configuration**



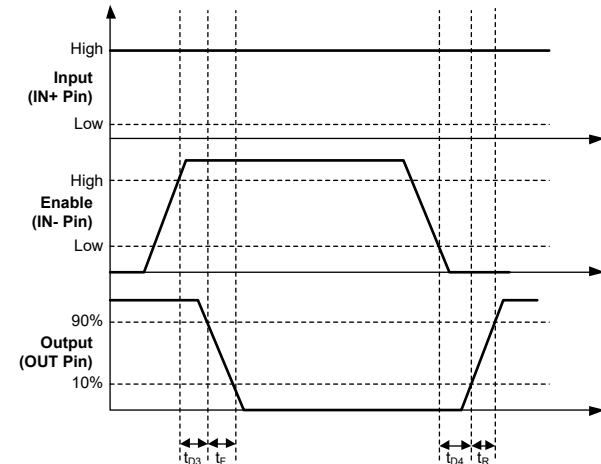
(PWM Input to IN- Pin (IN+ Pin Tied High), SGM48017)

**Figure 3. Inverting Configuration**



(Enable Signal Applied to IN+ Pin, PWM Input to IN- Pin, SGM48017)

**Figure 4. Enable and Disable Functions Using IN+ Pin**



(Enable Signal Applied to IN- Pin, PWM Input to IN+ Pin, SGM48017)

**Figure 5. Enable and Disable Functions Using IN- Pin**



TIMING DIAGRAMS (continued)

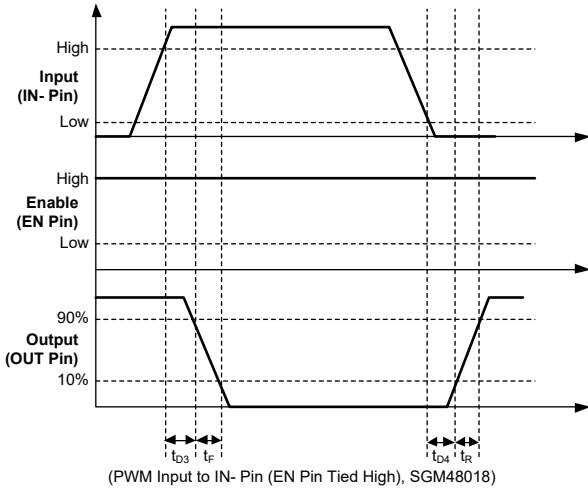


Figure 6. Inverting Configuration

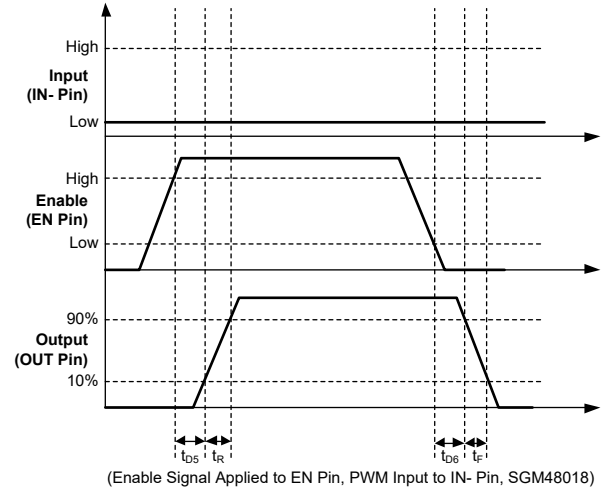


Figure 7. Enable and Disable Functions Using EN Pin

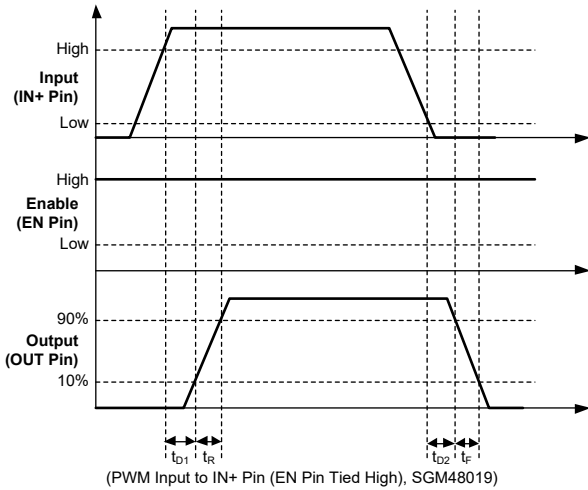


Figure 8. Non-Inverting Configuration

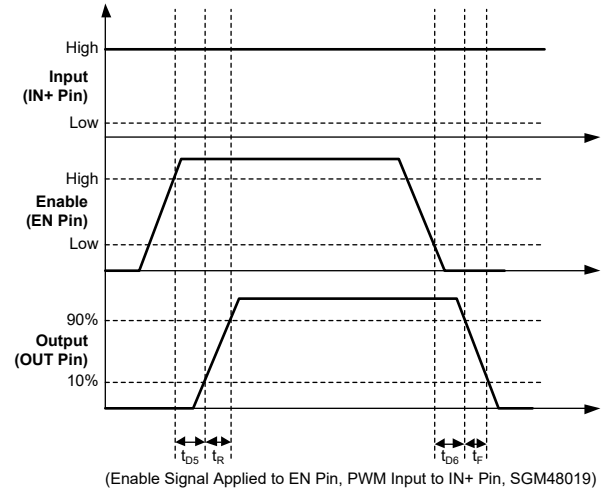


Figure 9. Enable and Disable Functions Using EN Pin

# Power MOSFET and IGBT Gate Drivers SGM48017/SGM48018/SGM48019 with Comprehensive Protections

## FUNCTION TABLE

SGM48017			SGM48018			SGM48019		
IN+	IN-	OUT	EN	IN-	OUT	EN	IN+	OUT
L	L	L	L	L	L	L	L	L
L	H	L	L	H	L	L	H	L
H	L	H	H	L	H	H	L	L
H	H	L	H	H	L	H	H	H
-	Floating	L	Floating	L	H	Floating	L	L
Floating	-	L	Floating	H	L	Floating	H	H
-	-	-	-	Floating	L	-	Floating	L

## FUNCTIONAL BLOCK DIAGRAMS

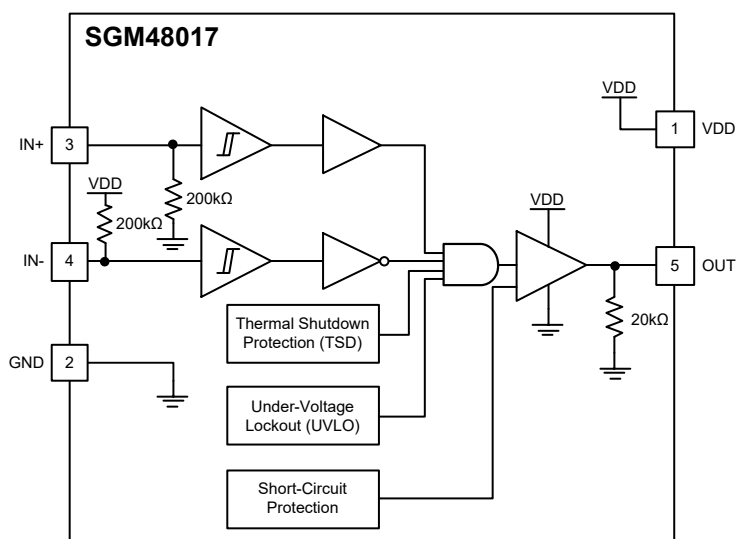
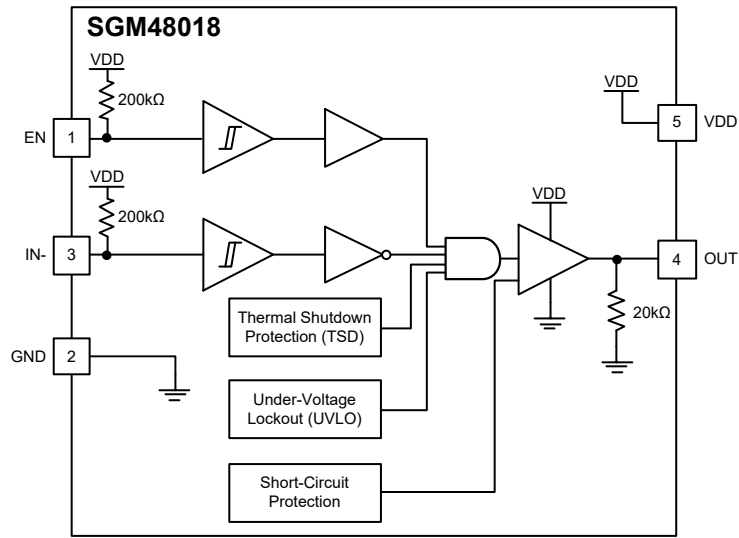
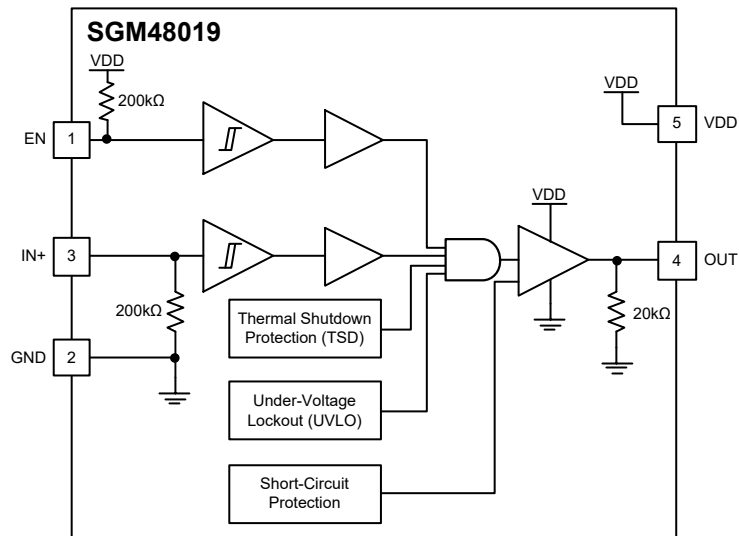


Figure 10. SGM48017 Block Diagram

**FUNCTIONAL BLOCK DIAGRAMS (continued)**



**Figure 11. SGM48018 Block Diagram**



**Figure 12. SGM48019 Block Diagram**

**DETAILED DESCRIPTION**

The SGM48017/8/9 are reliable and high-speed gate drivers for power MOSFETs and IGBTs with a comprehensive set of protection features such as thermal shutdown protection, under-voltage lockout and short-circuit protection. The outputs are forced low immediately if any of the above mentioned conditions occurs, except short-circuit protection. When

short-circuit protection occurs, the outputs enter into high impedance, and the driver will be re-enabled after the protection period (16ms, TYP) expires.

The SGM48017/8/9 offer a unique output stage design. It can effectively suppress the output voltage ringing and the overshoot/undershoot on the outputs.

# Power MOSFET and IGBT Gate Drivers SGM48017/SGM48018/SGM48019 with Comprehensive Protections

---

## REVISION HISTORY

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

### Changes from Original (SEPTEMBER 2020) to REV.A

Page

---

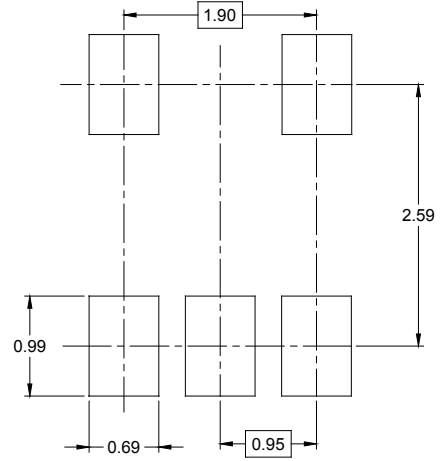
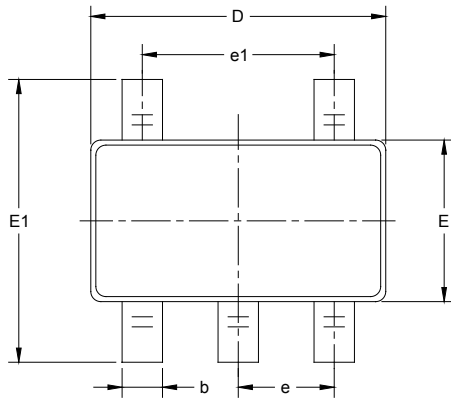
Changed from product preview to production data.....	All
--	-----

---

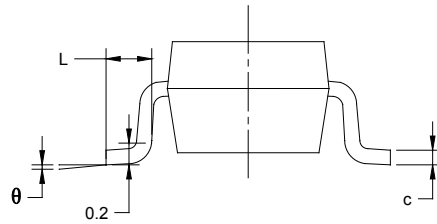
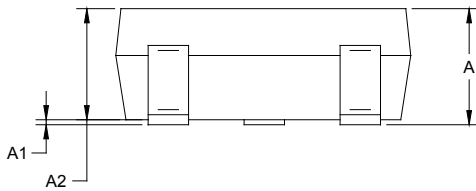
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

# 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
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

000001

# 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