600V Half-Bridge Driver

PRODUCT SUMMARY

- V_{OFFSET} 600 V max.
- I_O+/- 450 mA/ 950 mA
- V_{OUT} 10 V - 20 V
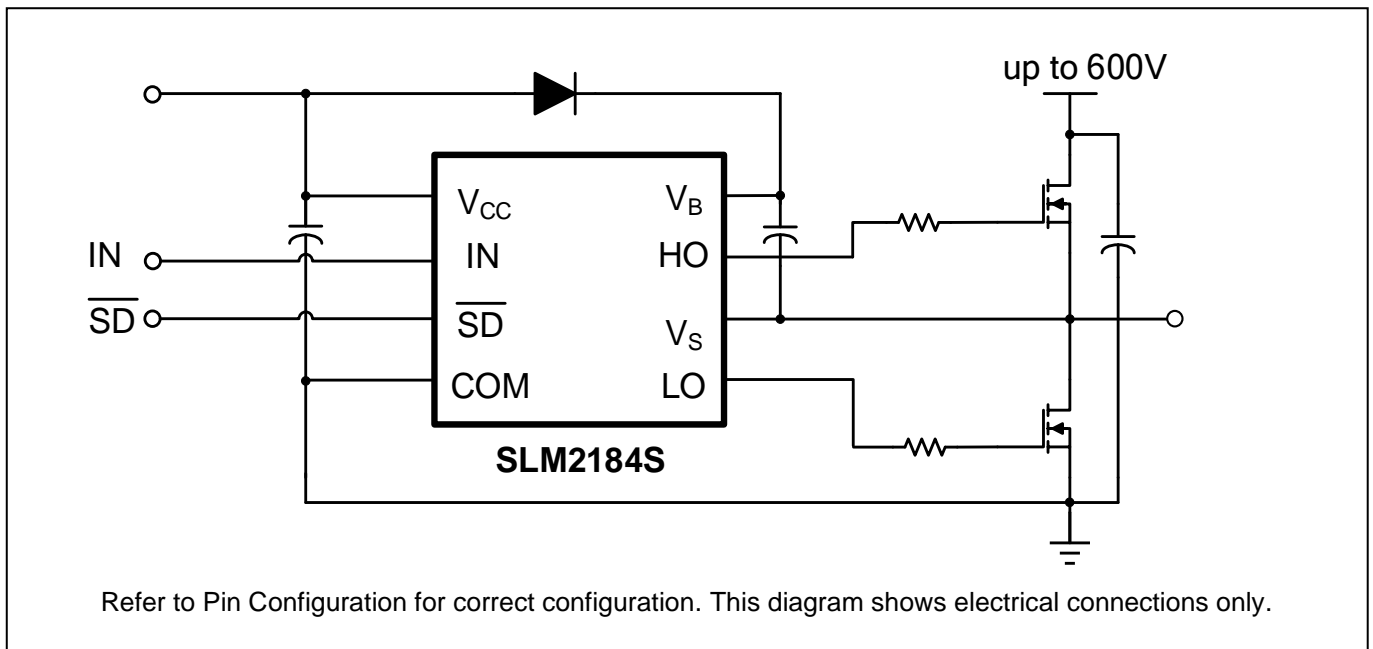- $t_{on/off}$ **(typ.)** 680 ns/200 ns
- **Deadtime (typ.)** 520 ns

GENERAL DESCRIPTION

The SLM2184S is a high voltage, high speed power MOSFET and IGBT drivers with dependent high- and low-side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3 V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross conduction. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high-side configuration which operates up to 600 V.

FEATURES

- Floating channel designed for bootstrap operation
- Fully operational to +600 V
- Tolerant to negative transient voltage, dV/dt immune
- Gate drive supply range from 10 V to 20 V
- Undervoltage lockout
- 3.3 V, 5 V, and 15 V logic compatible
- Cross-conduction prevention logic
- Matched propagation delay for both channels
- Internal set deadtime
- Shutdown input turns off both channels
- RoHS compliant
- SOP-8 package

TYPICAL APPLICATION CIRCUIT

Refer to Pin Configuration for correct configuration. This diagram shows electrical connections only.

PIN CONFIGURATION

Package	Pin Configuration (Top View)
SOP-8	

Pin configuration (Top View):
- 1 IN
- 2 $\overline{SD}$
- 3 COM
- 4 LO
- 8 V_B
- 7 HO
- 6 V_S
- 5 V_{CC}

PIN DESCRIPTION

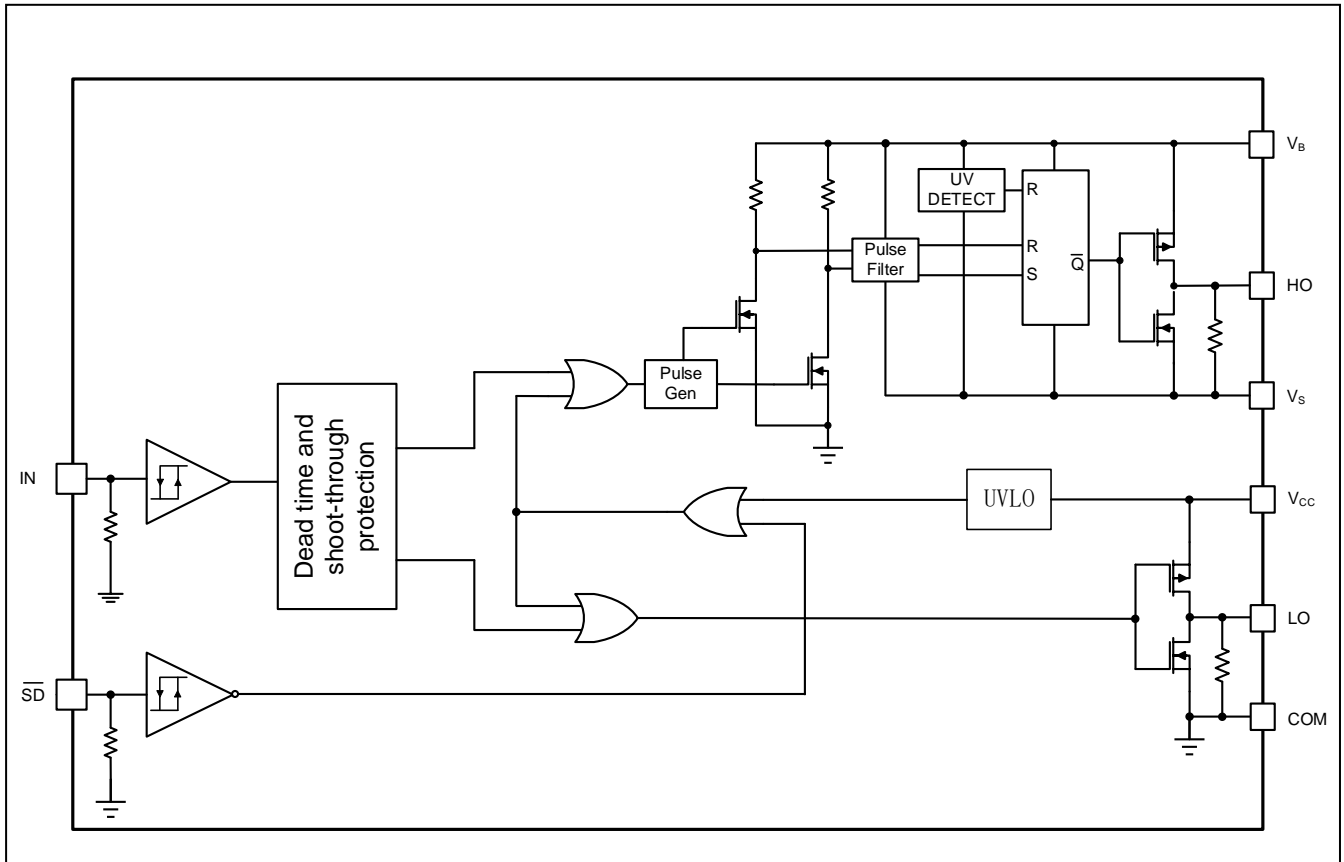| No.	Pin	Description
1	IN	Logic input to control the high-side and low-side gate driver output (HO/LO). HO: In phase with IN. LO: Out of phase with IN.
2	$\overline{SD}$	Input logic for shutdown control. If $\overline{SD}$ is low, both high side and low side gate output is low.
3	COM	Low-side return
4	LO	Low-side gate drive output
5	V_{CC}	Low-side and logic fixed supply
6	V_S	High-side floating supply return
7	HO	High-side gate drive output
8	V_B	High-side floating supply

ORDERING INFORMATION

Industrial Range: -40°C to +125°C

Order Part No.	Package	QTY
SLM2184SCA-13GTR	SOP8, Pb-Free	2500/Reel

FUNCTIONAL BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Symbol	Definition	Min.	Max.	Units
V_B	High-side floating absolute voltage	-0.3	625	V
V_S	High-side floating supply offset voltage	V_B - 25	V_B + 0.3	
V_{HO}	High-side floating output voltage	V_S - 0.3	V_B + 0.3	
V_{CC}	Low-side and logic fixed supply voltage	-0.3	25	
V_{LO}	Low-side output voltage	-0.3	V_{CC} + 0.3	
V_{IN}	Logic input voltage (IN & $\overline{SD}$)	-0.3	V_{CC} + 0.3	
dV_S/dt	Allowable offset supply voltage transient	---	50	V/ns
P_D	Package power dissipation @ $T_A \leqslant$ +25°C	---	0.625	W
θ_{JA}	Thermal resistance, junction to ambient	---	200	°C/W
T_J	Junction temperature	---	150	°C
T_S	Storage temperature	-55	150	
T_L	Lead temperature (soldering, 10 seconds)	---	300	

Note: Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

RECOMMENDED OPERATION CONDITIONS

Symbol	Definition	Min.	Max.	Units
V_B	High-side floating absolute voltage	V_S + 10	V_S + 20	V
V_S	High-side floating supply offset voltage		600	
V_{ST}	Transient high-side floating supply offset voltage	-40 (within 400ns)	600	
V_{HO}	High-side floating output voltage	V_S	V_B	
V_{CC}	Low-side and logic fixed supply voltage	10	20	
V_{LO}	Low-side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (IN & $\overline{SD}$)	0	V_{CC}	
T_A	Ambient temperature	- 40	125	°C

Note: The input/output logic timing diagram is shown in Figure 1. For proper operation the device should be used within the recommended conditions. The V_S offset rating is tested with all supplies biased at a 15 V differential.

DYNAMIC ELECTRICAL CHARACTERISTICS

V_{BIAS} (V_{CC}, V_{BS}) = 15 V, C_L = 1000 pF and T_A = 25°C unless otherwise specified.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
t_{on}	Turn-on propagation delay	V_S = 0 V	---	680	820	
t_{off}	Turn-off propagation delay	V_S = 0 V	---	200	400	
t_{sd}	Shutdown propagation delay		---	160	220	
t_r	Turn-on rise time		---	40	80	ns
t_f	Turn-off fall time		---	20	40	
DT	Deadtime, LS turn-off to HS turn-on & HS turn-on to LS turn-off		400	520	650	
MT	Delay matching, HS & LS turn-on/off		---	---	60	

STATIC ELECTRICAL CHARACTERISTICS

V_{BIAS} (V_{CC}, V_{BS}) = 15 V and T_A = 25°C unless otherwise specified. The V_{IN}, V_{TH}, and I_{IN} parameters are referenced to COM. The V_O and I_O parameters are referenced to COM and are applicable to the respective output leads: HO or LO.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{IH}	Logic "1" input voltage	V_{CC} = 10 V to 20V	2.5	---	---	
V_{IL}	Logic "0" input voltage		---	---	0.8	
VSD, TH+	SD input positive going threshold		2.5	---	---	
VSD, TH-	SD input negative going threshold		---	---	0.8	V
V_{OH}	High level output voltage, V_{BIAS} - V_O	I_O = 2 mA	---	0.05	0.2	
V_{OL}	Low level output voltage, V_O		---	0.02	0.1	
I_{LK}	Offset supply leakage current	V_B = V_S = 600 V	---	---	50	
I_{QBS}	Quiescent V_{BS} supply current	V_{IN} = 0 V	---	60	78	
I_{QCC}	Quiescent V_{CC} supply current		---	210	305	µA
I_{IN+}	Logic "1" input bias current	V_{IN} = 5 V	---	8	10	
I_{IN-}	Logic "0" input bias current	V_{IN} = 0 V	---	---	5	
V_{CCUV+} V_{BSUV+}	V_{CC} & V_{BS} supply undervoltage positive going threshold		8	8.9	9.8	V

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{CCUV-} V_{BSUV-}	V_{CC} & V_{BS} supply undervoltage negative going threshold		7.4	8.2	9	
I_{O+}	Output high short circuit pulsed current	$V_O = 0$ V, $V_{IN} = V_{IH}$, PW $\leqslant$ 10 µs	320	450		mA
I_{O-}	Output low short circuit pulsed current	$V_O = 15$ V, $V_{IN} = V_{IL}$, PW $\leqslant$ 10 µs	680	950		

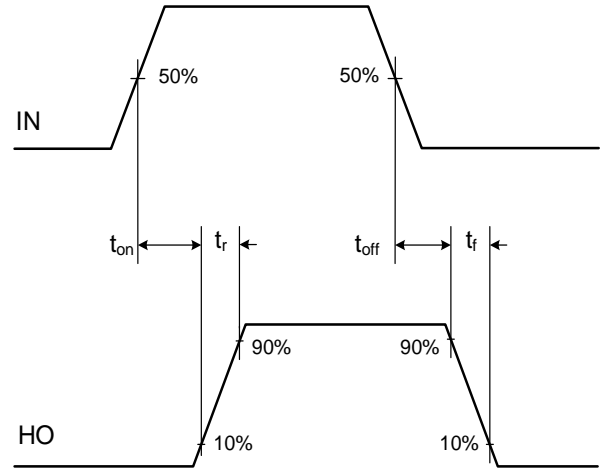Figure 1. Input/Output Timing Diagram
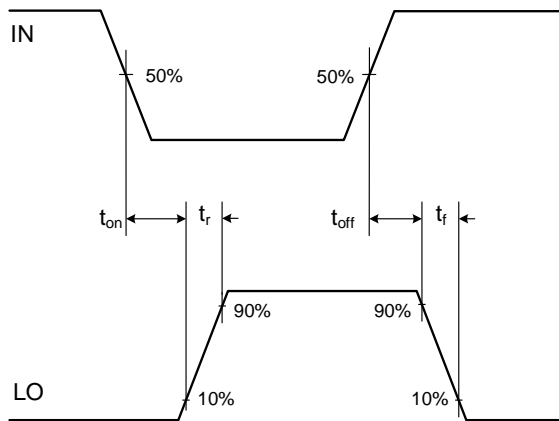
Figure 2. High Side Switching Time Waveform
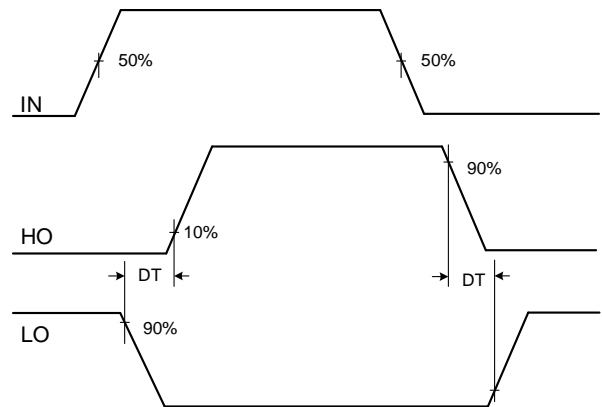
Figure 3. Low Side Switching Time Waveform

Figure 4. Dead Time Waveform

Figure 5. Shutdown Time Waveform
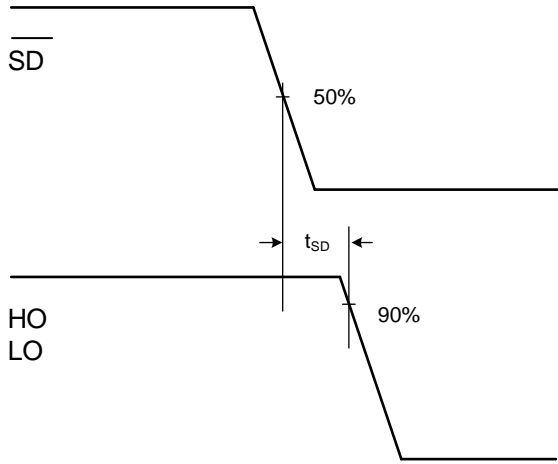
PACKAGE CASE OUTLINES

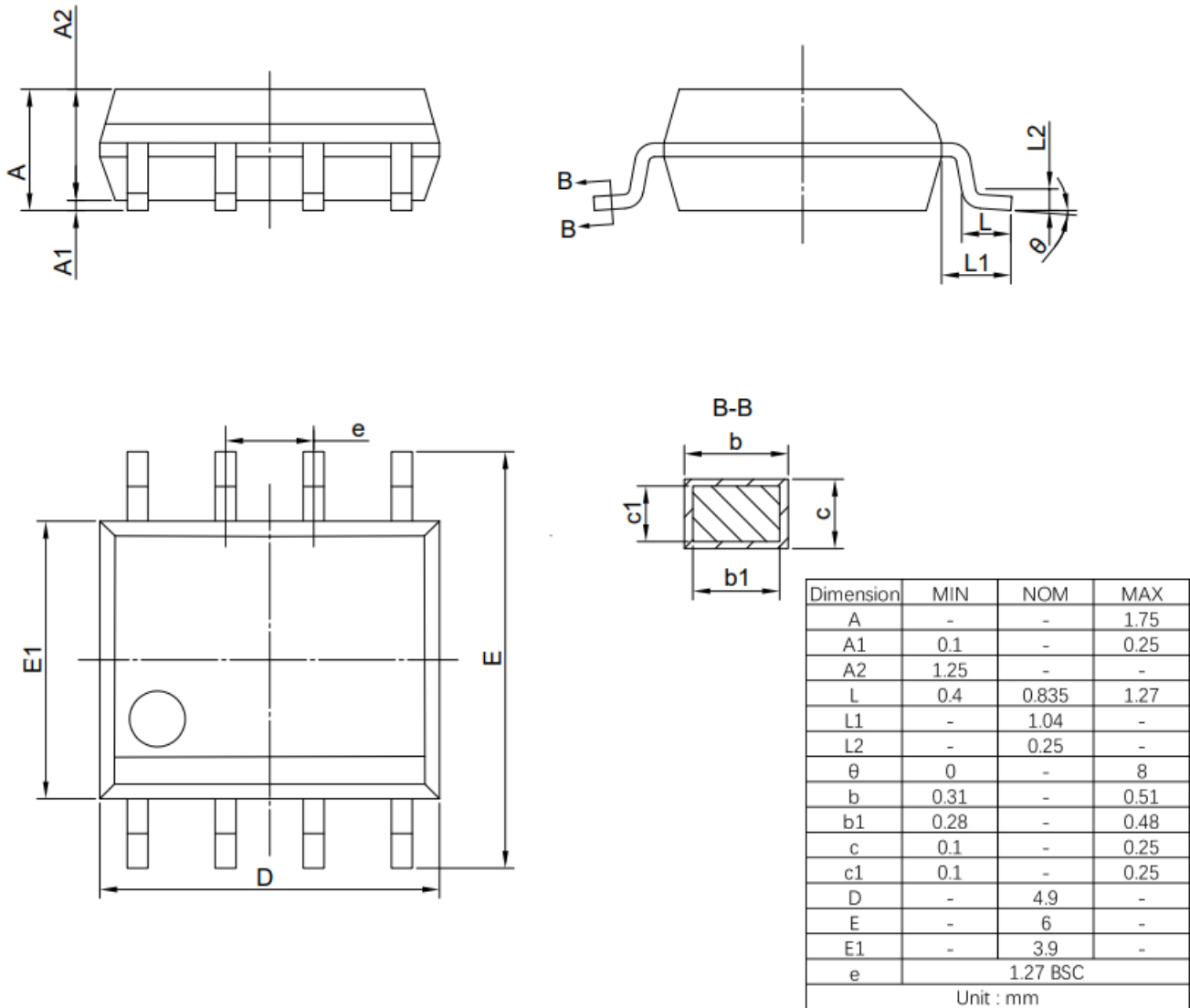| Dimension	MIN	NOM	MAX
A	-	-	1.75
A1	0.1	-	0.25
A2	1.25	-	-
L	0.4	0.835	1.27
L1	-	1.04	-
L2	-	0.25	-
θ	0	-	8
b	0.31	-	0.51
b1	0.28	-	0.48
c	0.1	-	0.25
c1	0.1	-	0.25
D	-	4.9	-
E	-	6	-
E1	-	3.9	-
e	1.27 BSC		
Unit : mm			

Figure 6. SOP8 Outline Dimensions

REVISION HISTORY

Note: page numbers for previous revisions may differ from page numbers in current version

Page or Item	Subjects (major changes since previous revision)
Rev 1.0 Datasheet, 2019-8-27	
Whole document	New company logo released
Page 1	Remove "Figure 1." and "June 2019"
Rev 1.1 Datasheet, 2021-9-7	
Whole datasheet	Update the Logo and format
Page 1	Remove package option PDIP-8
Page 2	Remove the order part No. SLM2184SCA-GT and SLM2184SDA-GT in the ordering information
Page 3	Updated the Functional Block Diagram
Page 5	Update the t_{off} value in the Dynamic Electrical Characteristics.
	Update the I_{QCC}, I_{IN+} , I_{O+} and I_{O-} value in the Static Electrical Characteristics.
Rev 1.2 Datasheet, 2022-12-29	
Page 8	SOP8 Outline Dimensions Update