200V Half-Bridge Driver

PRODUCT SUMMARY

- **V_{OFFSET}** 200 V max.
- **I_O+/- (min.)** 130 mA/270 mA
- **V_{OUT}** 10 V - 20 V
- **$t_{on/off}$ (typ.)** 680 ns/180 ns
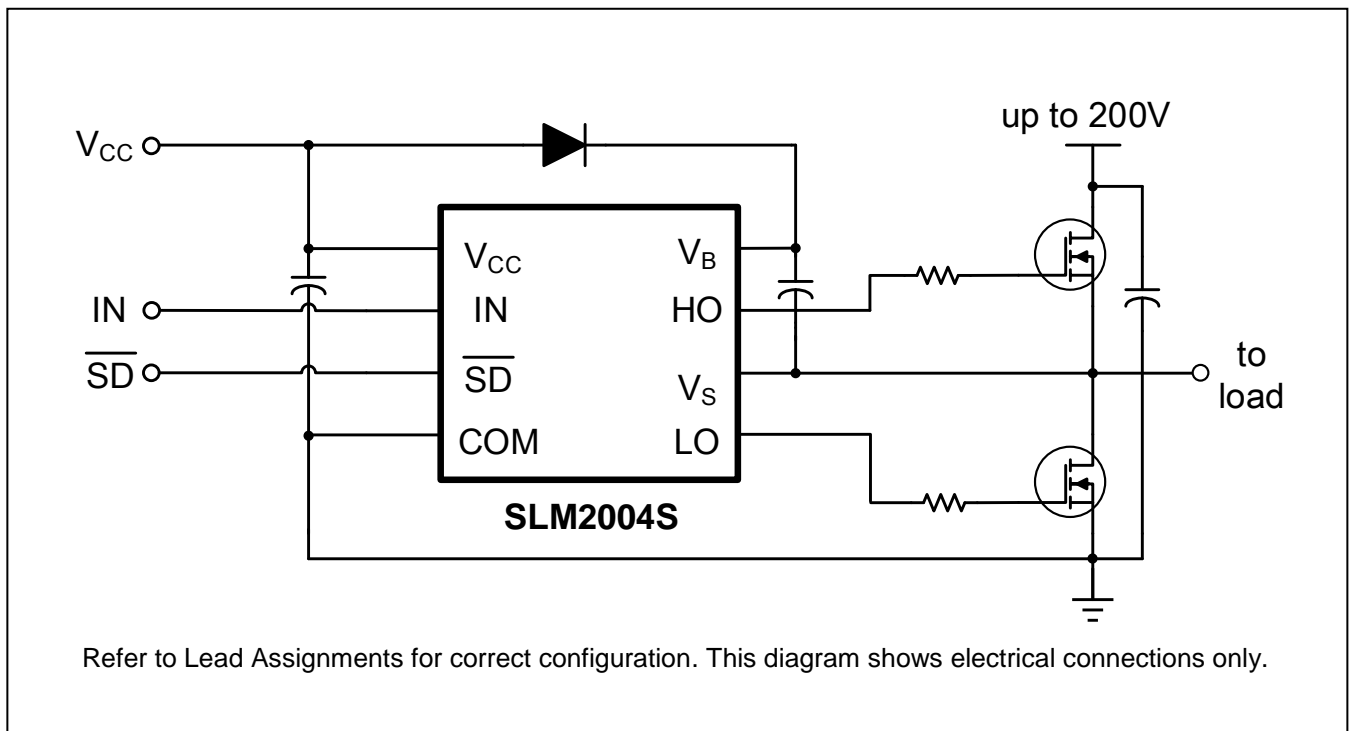- **Deadtime (typ.)** 520 ns

GENERAL DESCRIPTION

The SLM2004S 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 200 V.
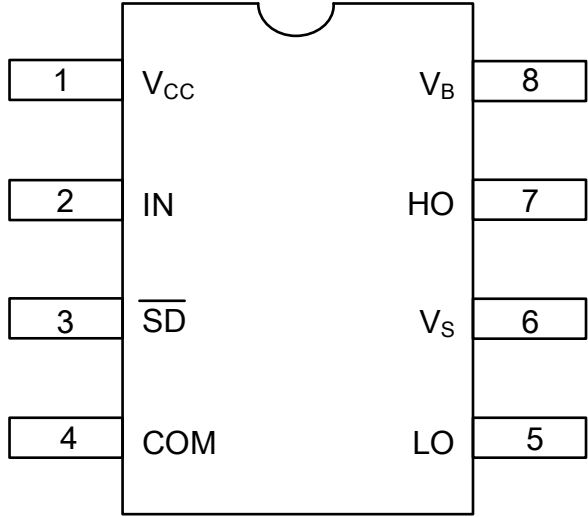
FEATURES

- Floating channel designed for bootstrap operation
- Fully operational to +200 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
- SOP8 package

TYPICAL APPLICATION CIRCUIT

Refer to Lead Assignments for correct configuration. This diagram shows electrical connections only.

PIN CONFIGURATION

Package	Pin Configuration (Top View)
SOP8	

Pin layout (Top View):

1	V_{CC}	V_B	8
2	IN	HO	7
3	$\overline{SD}$	V_S	6
4	COM	LO	5

PIN DESCRIPTION

No.	Pin	Description
1	V_{CC}	Low-side and logic fixed supply
2	IN	Logic input for high-side and low-side gate driver outputs (HO and LO), in phase with HO
3	$\overline{SD}$	Logic input for shutdown
4	COM	Low-side return
5	LO	Low-side gate drive output
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
SLM2004SCA-13GTR	SOP8, Pb-Free	2500/Reel

FUNCTIONAL BLOCK DIAGRAM
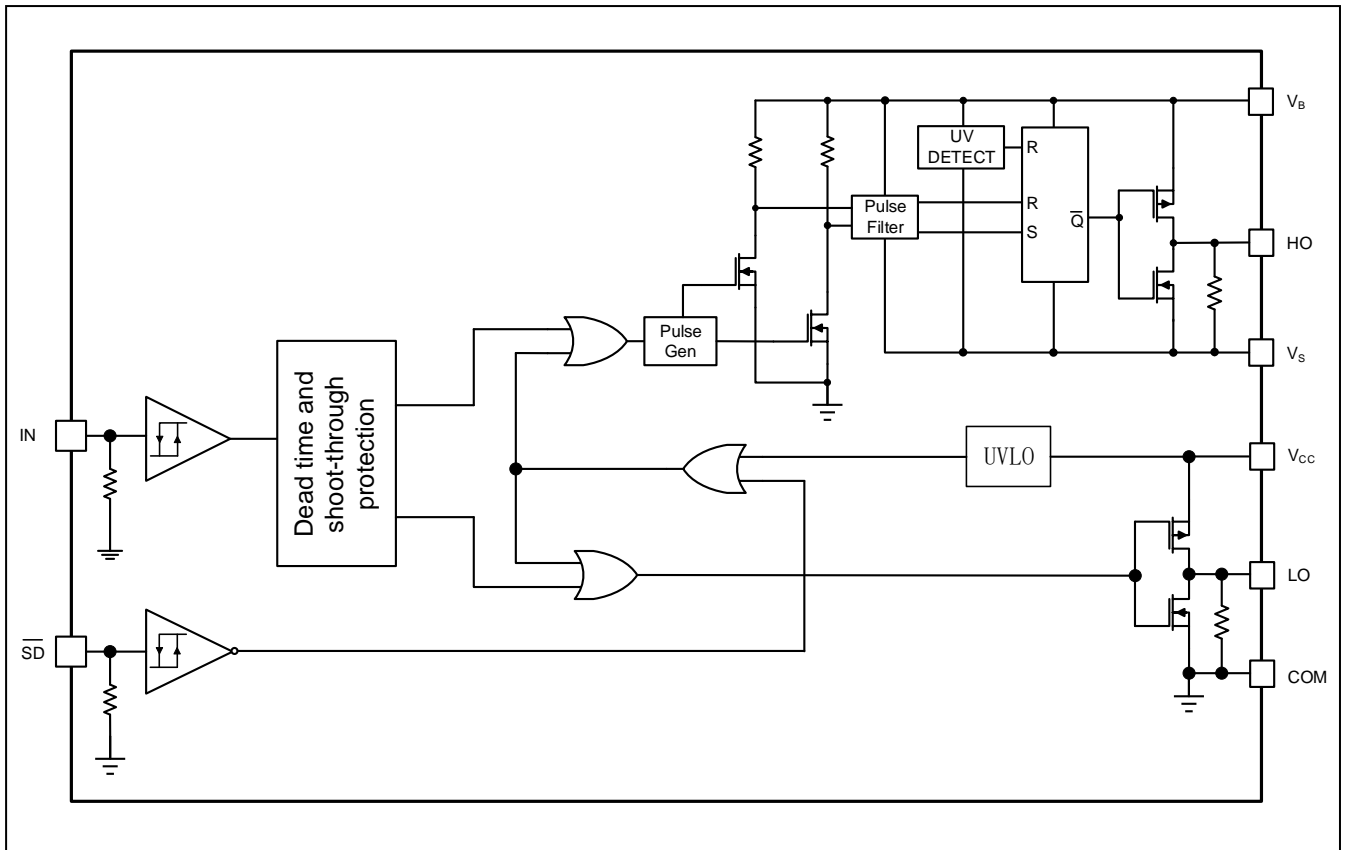
ABSOLUTE MAXIMUM RATINGS

Symbol	Definition	Min.	Max.	Units
V_B	High-side floating absolute voltage	-0.3	225	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	°C
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		200	
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	---	180	280	
t_{sd}	Shutdown propagation delay		---	220	300	ns
t_r	Turn-on rise time		---	70	170	
t_f	Turn-off fall time		---	25	90	
DT	Deadtime, LS turn-off to HS turn-on & HS turn-on to LS turn-off		400	520	650	

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 and are applicable to all logic input leads: IN and $\overline{SD}$. 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 = 20 mA	---	0.45	0.6	
V_{OL}	Low level output voltage, V_O		---	0.15	0.2	
I_{LK}	Offset supply leakage current	V_B = V_S = 200 V	---	---	50	
I_{QBS}	Quiescent V_{BS} supply current	V_{IN} = 0 V	---	60	78	
I_{QCC}	Quiescent V_{CC} supply current		---	220	280	μA
I_{IN+}	Logic "1" input bias current	V_{IN} = 5 V	---	8	15	
I_{IN-}	Logic "0" input bias current	V_{IN} = 0 V	---	---	5	
V_{CCUV+} V_{BSUV+}	V_{CC} and V_{BS} supply undervoltage positive going threshold		8	8.9	9.8	V
V_{CCUV-} V_{BSUV-}	V_{CC} and V_{BS} supply undervoltage negative going threshold		7.4	8.2	9	V

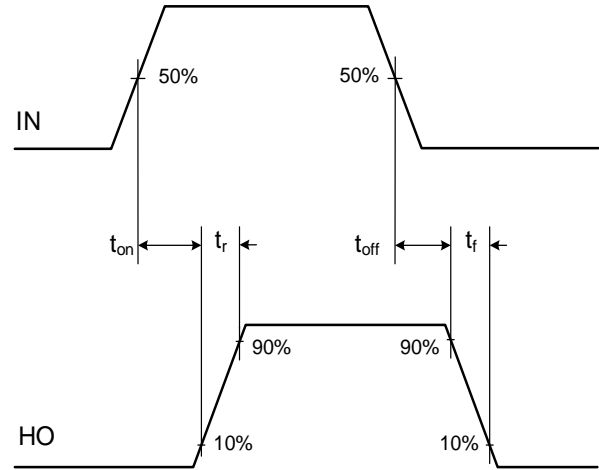| Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
I_{O+}	Output high short circuit pulsed current	$V_O = 0$ V, $V_{IN} = V_{IH}$ PW ⩽ 10 μs	130	290		mA
I_{O-}	Output low short circuit pulsed current	$V_O = 15$ V, $V_{IN} = V_{IL}$ PW ⩽ 10 μs	270	600		
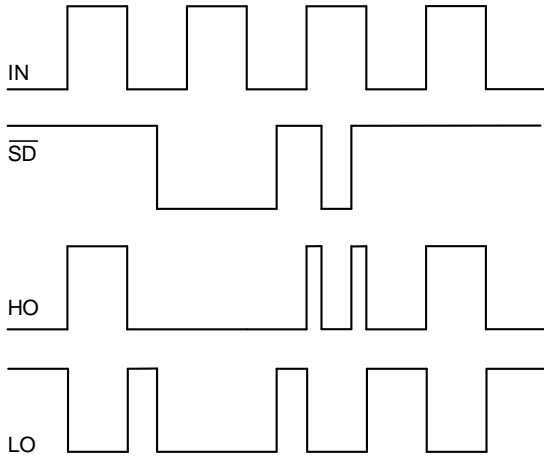
Figure 1. Input/Output Timing Diagram
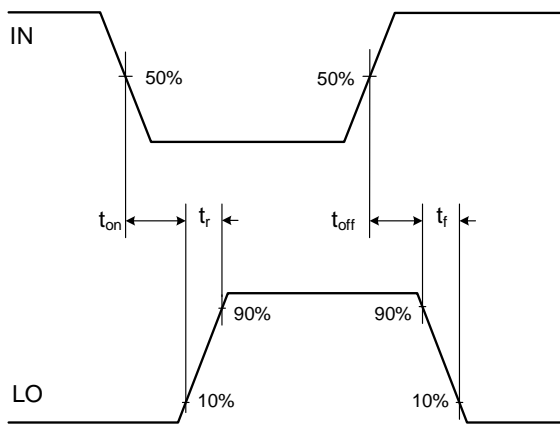

Figure 2. High Side Switching Time Waveform
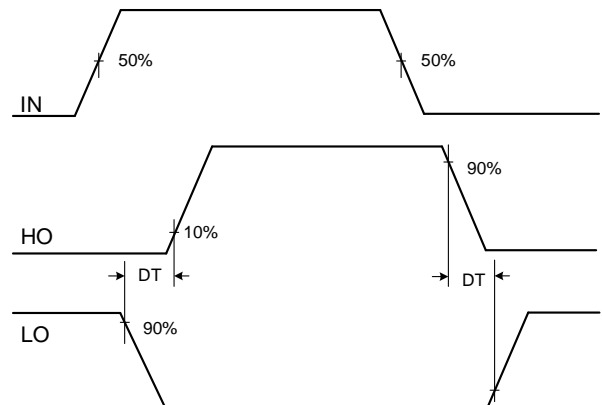

Figure 3. Low Side Switching Time Waveform

Figure 4. Dead Time Waveform

Figure 5. Shutdown Time Waveform
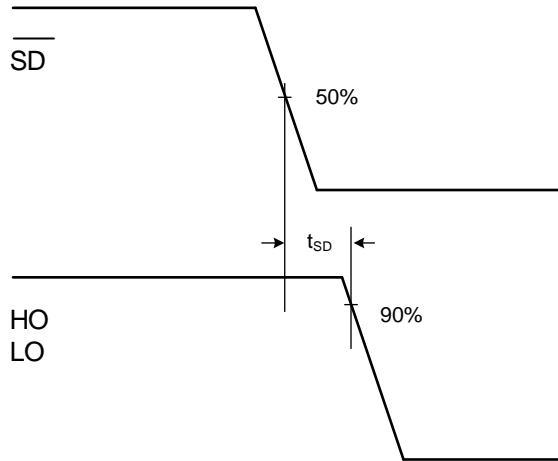
PACKAGE CASE OUTLINES

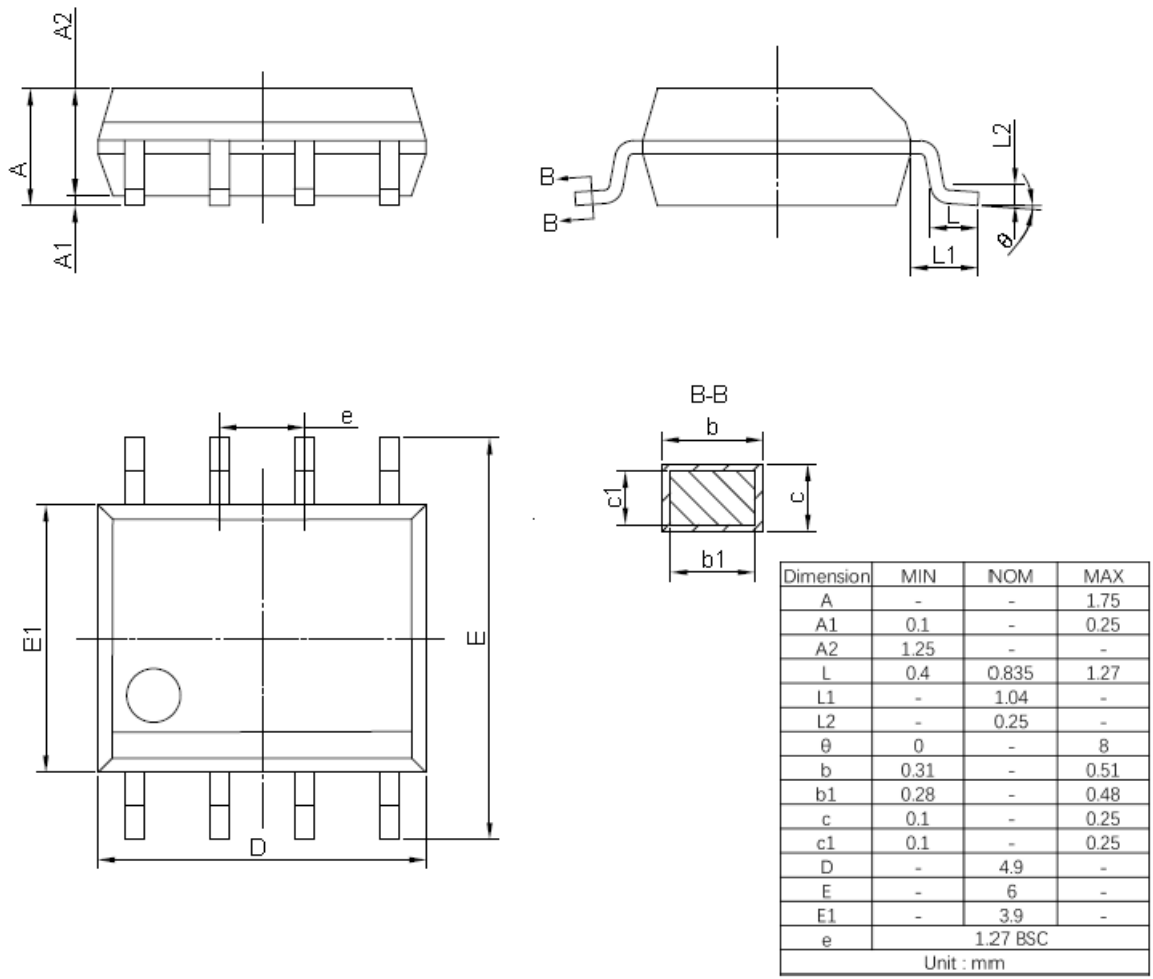| Dimension	MIN	NOM	MAX
A	-	-	1.75
A1	0.1	-	0.25
A2	1.25	-	-
L	0.4	0.835	1.27
L1	-	1.04	-
L2	-	0.25	-
θ	0	-	8
b	0.31	-	0.51
b1	0.28	-	0.48
c	0.1	-	0.25
c1	0.1	-	0.25
D	-	4.9	-
E	-	6	-
E1	-	3.9	-
e	1.27 BSC		
Unit : mm			

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 "Fig 1. "
Rev 1.1 datasheet, 2021-10-29	
Whole datasheet	Update the Logo and format
Page 1	Remove the PDIP package
Page 2	Remove SLM2004SCA-GT and SLM2004SDA-GT in ordering information
Page 5	Update the t_{SD}, t_f and t_{off} in the dynamic electrical characteristics table
	Update the V_{OH}, V_{OL}, I_{QCC} and I_{IN+} in the static electrical characteristics table
Rev 1.2 datasheet, 2022-12-19	
Whole datasheet	Change package name from SOIC-8 to SOP8 and update the package case outlines