

DOS2304 700V Half Bridge MOSFET/IGBT Gate Driver With BSD

1 Features and Benefits

- Floating channel designed for bootstrap operation
- Fully operational to +700 V
- 3.3V, 5V and 15V input logic compatible
- Tolerant to negative transient voltage, dV/dt immune
- Allowable negative Vs capability: -9V
- Gate drive supply range from 10V to 20V
- Matched propagation delay for both channels
- Wide operating temperature range -40°C ~125°C
- Cross-conduction prevention
- Internal 100ns deadtime
- Typically output Source/Sink current capability: 300mA/600mA
- RoSH compatible

2 Application

- Motor Control
- Air Conditioners/ Washing Machines
- General Purpose Inverters
- Micro/Mini Inverter Drives

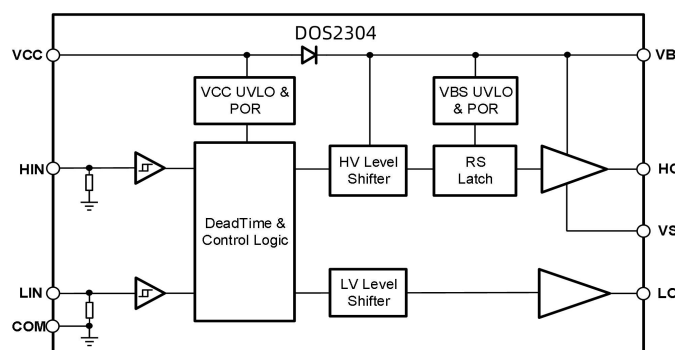
3 Description

The DOS2304 is a high voltage, high speed power MOSFET 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 DOS2304 is integrated with a bootstrap diode to charge the high side, simplifying the peripheral circuit of the chip. The floating channel can be used to drive an N-channel power MOSFET in the high-side configuration which operates up to 700 V.

Device information

Part Number	Package	Body size
DOS2304	SOIC8	4.9mm x 3.9mm

Functional Block Diagram



4 Selection Guide

Part Number	Input logic	Shout-though prevention	Dead time	VBS UVLO	Ton/Toff (ns)	IO+/IO- (mA)
DOS2304	HIN,LIN	YES	100ns	YES	130/130	300/600

5 Function Pin Description

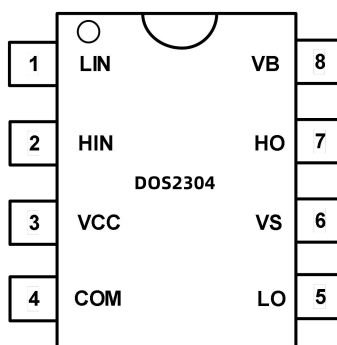


Figure5-1 8-Pin SOIC8 Top view

Table5-1 Lead Definitions

Number	Symbol	Description
1	LIN	Logic input for low side gate driver output (LO), in phase
2	HIN	Logic input for high side gate driver output (HO), in phase
3	VCC	Low side and logic fixed supply
4	COM	Low side return
5	LO	Low side gate drive output
6	VS	High side floating supply return
7	HO	High side gate drive output
8	VB	High side floating supply

6 Product specifications

6.1 Absolute Maximum Ratings

Exceeding the limit maximum rating may cause permanent damage to the device. All voltage parameters are rated with reference to COM and an ambient temperature of 25°C.

Symbol	Definition	MIN.	MAX.	Units
V _B	High side floating supply	-0.3	725	V
V _S	High side floating supply return	V _B – 25	V _B + 0.3	
V _{HO}	High side gate drive output	V _S -0.3	V _B + 0.3	
V _{CC}	Low side and main power supply	-0.3	25	
V _{LO}	Low side gate drive output	-0.3	V _{CC} + 0.3	
V _{IN}	Logic input of HIN & LIN	-0.3	V _{CC} + 0.3	
dV _S /dt	Allowable Offset Supply Voltage Transient	—	50	V/ns

6.2 ESD rating

Symbol	Definition	MIN.	MAX.	Units
ESD	HBM Model	1500	—	V
	Machine Model	500	—	V

6.3 Rated power

Symbol	Definition	MIN.	MAX.	Units
P _D	Package Power Dissipation @ TA ≤25°C	—	625	mW

6.4 Thermal information

Symbol	Definition	MIN.	MAX.	Units
R _{thJA}	Thermal Resistance, Junction to Ambient	--	200	°C/W
T _J	Junction Temperature	—	150	
T _S	Storage Temperature	-55	150	°C
T _L	Lead Temperature (Soldering, 10 seconds)	—	300	°C/W

6.5 Recommended Operating Conditions

For proper operation, the device should be used under the following recommended conditions. The bias ratings of VS and COM are measured at a supply voltage of 15V, and unless otherwise specified, the ratings of all voltage parameters are referenced to COM and the ambient temperature is 25°C.

Symbol	Definition	MIN.	MAX.	Units
V _B	High side floating supply	V _S + 10	V _S + 20	V
V _S	High side floating supply return	-9	700	
V _{HO}	High side gate drive output	V _S	V _B	
V _{CC}	Low side and main power supply	10	20	
V _{LO}	Low side gate drive output	0	V _{CC}	
V _{IN}	Logic input of HIN & LIN	0	V _{CC}	
T _A	Ambient temperature	-40	125	°C

Note1: Transient negative VS can be used for COM-50V with a pulse width of 50ns, guaranteed by design..

Note2: When the input pulse width is less than 1us, the input pulse cannot be transmitted normally .

6.6 Electrical Characteristics

Valid for temperature range at $T_A = 25^\circ\text{C}$, $V_{CC}=V_B = 15\text{V}$, $C_L=1\text{nF}$, unless otherwise specified

6.6.1 Dynamical electrical characteristics

Symbol	Definition	MIN.	TYP.	MAX.	Units	Test Condition
t_{ON}	Turn-on propagation delay	—	130	200	ns	$V_S=0\text{V}$
t_{OFF}	Turn-off propagation delay	—	130	200	ns	$V_S=700\text{V}$
t_R	Turn-on rise time	—	75	130	ns	
t_F	Turn-off fall time	—	35	70	ns	
DT	Deadtime	80	100	190	ns	
MT	Matched propagation time delay	—	—	50	ns	
MDT	Matched deadtime delay	—	—	60	ns	

6.6.2 Static electrical characteristics

Valid for temperature range at $T_A = 25^\circ\text{C}$, $V_{CC}=V_B = 15\text{V}$, $C_L=1\text{nF}$, unless otherwise specified.

Symbol	Definition	MIN.	TYP.	MAX.	Units	Test Condition
V_{CCUV+} V_{BSUV+}	VCC and VBS supply UVLO threshold	8	8.9	9.8	V	
V_{CCUV-} V_{BSUV-}		7.4	8.2	9.0	V	
$V_{CCUVHYS}$ $V_{BSUVHYS}$	hysteresis of V_{CC} and V_{BS} UVLO	—	0.7	—	V	
I_{LK}	High-side floating supply leakage current	—	—	50	μA	$V_B=V_S=700\text{V}$
I_{QBS}	Quiescent VB supply current	—	50	100	μA	$V_{IN}=0\text{V}$ or 5V
I_{QCC}	Quiescent VCC supply current	—	120	240	μA	$V_{IN}=0\text{V}$ or 5V
V_{IH}	Logic “1”(HIN&LIN) input voltage	2.5	—	—	V	$V_{CC}=10\text{V}$ to 20V
V_{IL}	Logic “0” (HIN&LIN) input voltage	—	—	0.8	V	$V_{CC}=10\text{V}$ to 20V
V_{OH}	High level output voltage, $V_{BIAS} - V_O$	—	—	0.1	V	$I_O=0\text{A}$
V_{OL}	Low level output voltage, V_O	—	—	0.1	V	$I_O=0\text{A}$
I_{IN+}	Logic “1” Input bias current	—	5	10	μA	$I_N=5\text{V}$
I_{IN-}	Logic “0” Input bias current	—	—	2	μA	$I_N=0\text{V}$
I_{O+}	Output high short circuit pulsed current	200	300	—	mA	$V_O=0\text{V}$ $PW \leq 10\mu\text{s}$
I_{O-}	Output low short circuit pulsed current	400	600	—	mA	$V_O=15\text{V}$ $PW \leq 10\mu\text{s}$
V_{BSD}	Bootstrap diode conduction voltage		0.6		V	$I_{BSD}=1\text{mA}$
R_{BSD}	Bootstrap diode conduction resistance		200		Ω	$I_{BSD}=10\text{mA}$

7 Function Description

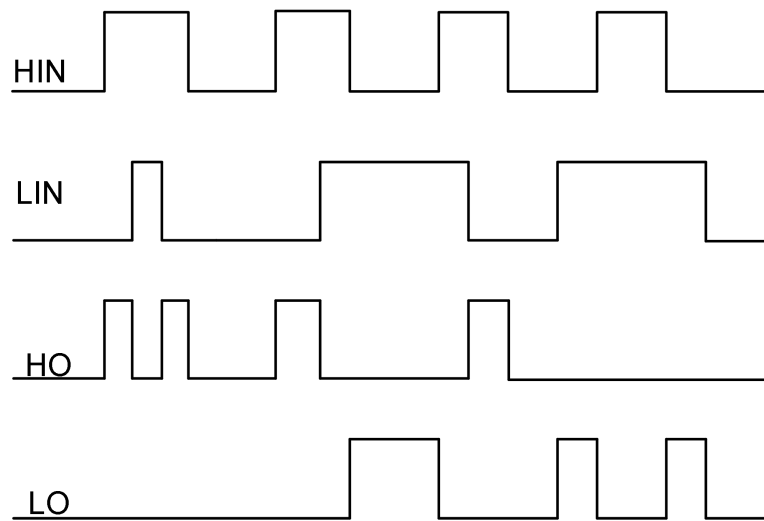


Figure 5 DOS2304 Input and output timing waveform

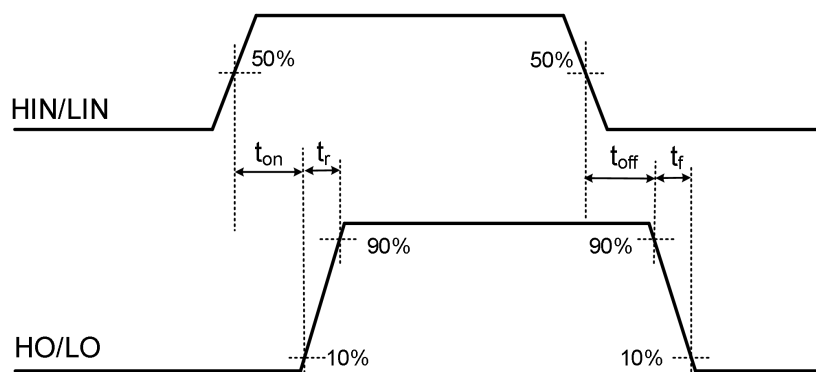


Figure 6. Propagation Time Waveform Definition

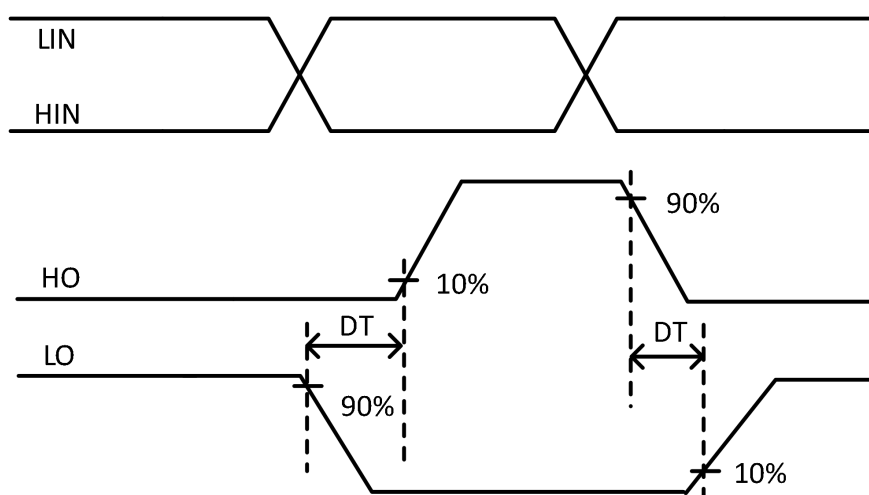


Figure7. Cross Conduction Prevention Delay Time Waveform Definition

8 DOS2304 Description

8.1 Function Block Diagram

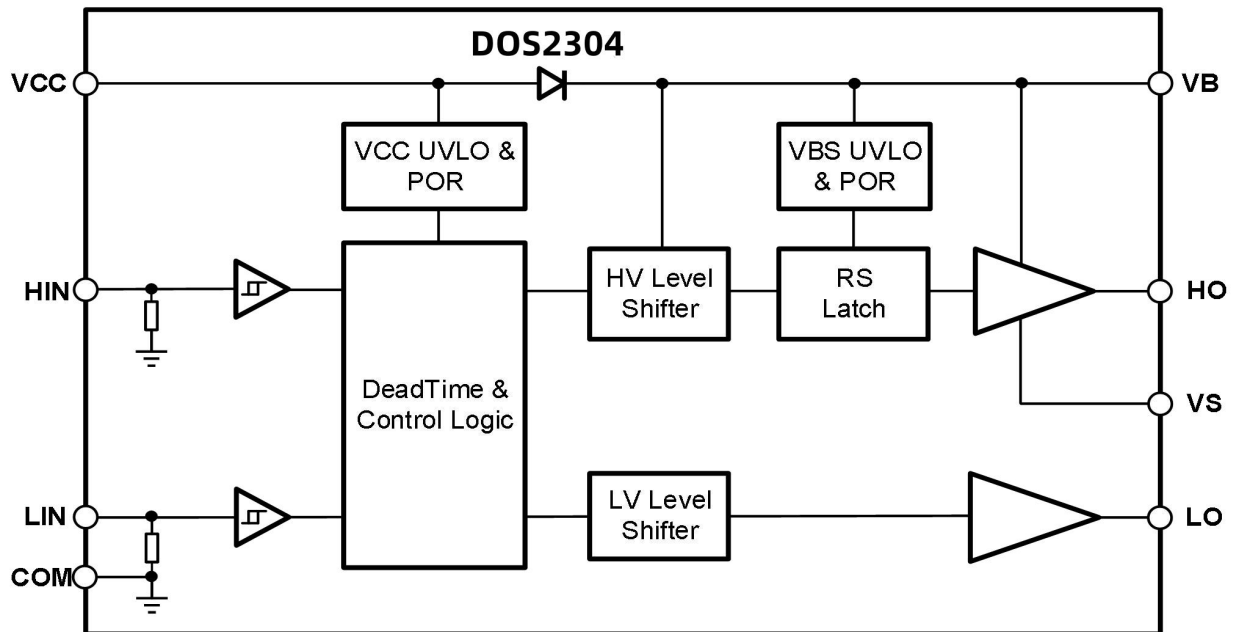


Figure 8-1 Function Block Diagram of DOS2304

8.2 Application message

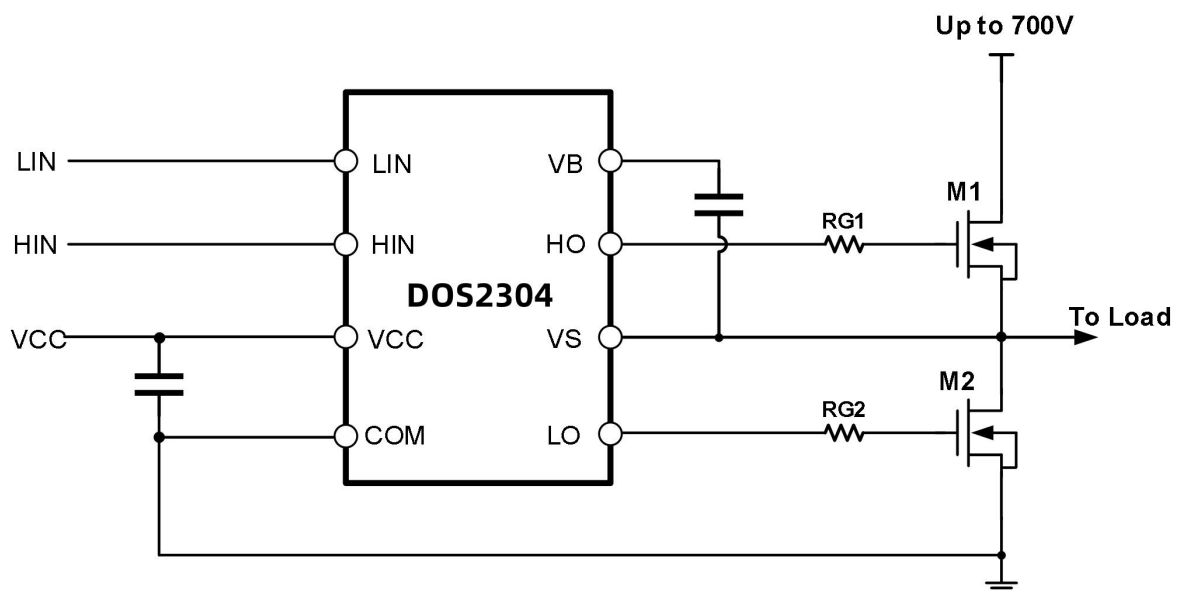


Figure 8-2 Typical application circuit of DOS2304

9 Package Information

SOIC-8 Package Dimensions

Size Symbol	MIN(mm)	TYP(mm)	MAX(mm)	Size Symbol	MIN(mm)	TYP(mm)	MAX(mm)
A	-	-	1.75	D	4.70	4.90	5.10
A1	0.10	-	0.225	E	5.80	6.00	6.20
A2	1.30	1.40	1.50	E1	3.70	3.90	4.10
A3	0.60	0.65	0.70	e	1.27BSC		
b	0.39	-	0.48	h	0.25	-	0.50
b1	0.38	0.41	0.43	L	0.50	-	0.80
c	0.21	-	0.26	L1	1.05BSC		
c1	0.19	0.20	0.21	θ	0	-	8°

SOIC-8 Package Outlines

