

### Description

The IRS2003S 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 floating channel can be used to drive an N-channel power MOSFET in the high-side configuration which operates up to 250 V.

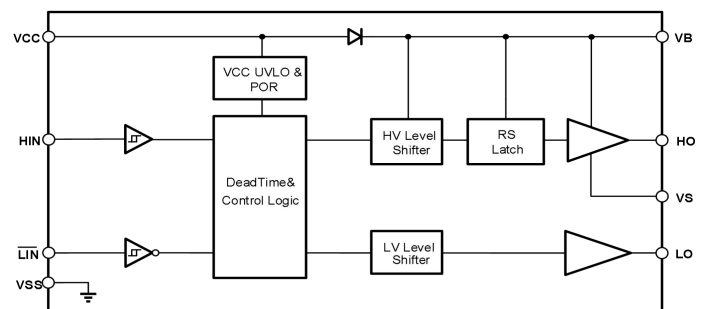
### Features and Benefits

- Floating channel designed for bootstrap operation
- Fully operational to +250 V
- 3.3V, 5V and 15V input logic compatible
- dV/dt noise Immunity  $\pm 50$  V/nsec
- Allowable negative Vs capability: -9V
- Gate drive supply range from 10V to 20V
- Cross-conduction prevention logic  
--Deadtime 520ns
- Propagation delay  
--Ton/Toff =680ns/150ns
- Wide operating temperature range -40°C ~125°C
- Typically output Source/Sink current capability: 290mA/600mA
- Integrated Bootstrap diode

### Application

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

### Functional Block Diagram



Function Pin Description

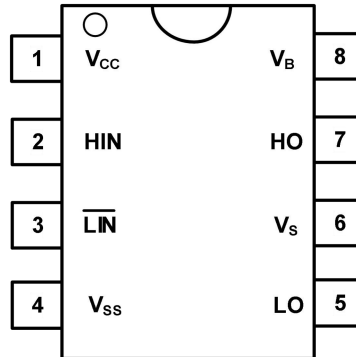


Figure7-1 8-Pin SOP8 Top view

Table7-1 Lead Definitions

Number	Symbol	Description
1	V <sub>CC</sub>	Low side and logic fixed supply
2	HIN	Logic input for high side gate driver output (HO), in phase
3	$\overline{\text{LIN}}$	Logic input for low side gate driver output (LO), out of phase
4	V <sub>SS</sub>	Low side return
5	LO	Low side gate drive output
6	V <sub>S</sub>	High side floating supply return
7	HO	High side gate drive output
8	V <sub>B</sub>	High side floating supply

**250V Half Bridge MOSFET/IGBT Gate Driver**
**Absolute Maximum Ratings**

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

Symbol	Definition	MIN.	MAX.	Units
V <sub>B</sub>	High side floating supply	-0.3	275	V
V <sub>S</sub>	High side floating supply return	V <sub>B</sub> - 25	V <sub>B</sub> + 0.3	
V <sub>HO</sub>	High side gate drive output	V <sub>S</sub> - 0.3	V <sub>B</sub> + 0.3	
V <sub>CC</sub>	Low side and main power supply	-0.3	25 <sup>Note1</sup>	
V <sub>LO</sub>	Low side gate drive output	-0.3	V <sub>CC</sub> + 0.3	
V <sub>IN</sub>	Logic input of HIN & LIN	-0.3	V <sub>CC</sub> + 0.3	
dV <sub>S</sub> /dt	Allowable Offset Supply Voltage Transient		50	V/ns

**ESD rating**

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

**Rated power**

Symbol	Definition	MIN	MAX	Units
P <sub>D</sub>	Package Power Dissipation @ TA ≤ 25°C		625	mW

**Thermal information**

Symbol	Definition	MIN.	MAX.	Units
R <sub>thJA</sub>	Thermal Resistance, Junction to Ambient		200	°C/W
T <sub>J</sub>	Junction Temperature		150	°C
T <sub>S</sub>	Storage Temperature	-55	150	
T <sub>L</sub>	Lead Temperature (Soldering, 10 seconds)		300	

**Recommended Operating Conditions**

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

Symbol	Definition	MIN.	MAX.	Units
V <sub>B</sub>	High side floating supply	V <sub>S</sub> + 10	V <sub>S</sub> + 20	V
V <sub>S</sub>	High side floating supply return <sup>Note2</sup>	-9	250	
V <sub>HO</sub>	High side gate drive output	V <sub>S</sub>	V <sub>B</sub>	
V <sub>CC</sub>	Low side and main power supply	10	20	
V <sub>LO</sub>	Low side gate drive output	0	V <sub>CC</sub>	
V <sub>IN</sub>	Logic input of HIN & LIN	0	V <sub>CC</sub>	
T <sub>A</sub>	Ambient temperature	-40	125	°C

Note1: All power supplies tested at 25V.

Note2: Transient negative VS can be used for VSS-50V with a pulse width of 50ns, guaranteed by design.

**250V Half Bridge MOSFET/IGBT Gate Driver**
**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

**Dynamical electrical characteristics**

Symbol	Definition	MIN.	TYP.	MAX.	Units	Test Condition
$t_{ON}$	Turn-on propagation delay		680	740	ns	$V_S = 0$
$t_{OFF}$	Turn-off propagation delay		150	220	ns	$V_S = 250\text{V}$
$t_R$	Turn-on rise time		70	170	ns	$V_S = 0\text{V}$
$t_F$	Turn-off fall time		30	90	ns	
DT	Deadtime	400	520	650	ns	
MT	Matching delay ON and OFF			30	ns	

**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
$V_{CCUV+}$	VCC supply UVLO threshold	8.0	8.9	9.8	V	
$V_{CCUV-}$		7.4	8.2	9	V	
$I_{LK}$	High-side floating supply leakage current			50	$\mu\text{A}$	$V_B = V_S = 250\text{V}$
$I_{QBS}$	Quiescent $V_B$ supply current		50	75	$\mu\text{A}$	$V_{IN} = 0\text{V}$ or $5\text{V}$
$I_{QCC}$	Quiescent VCC supply current		120	250	$\mu\text{A}$	$V_{IN} = 0\text{V}$ or $5\text{V}$
$V_{IH}$	Logic "1" ( $\overline{HIN}$ & $\overline{LIN}$ ) input voltage	2.5			V	$V_{CC} = 10\text{V}$ to $20\text{V}$
$V_{IL}$	Logic "0" ( $\overline{HIN}$ & $\overline{LIN}$ ) input voltage			0.8	V	$V_{CC} = 10\text{V}$ to $20\text{V}$
$V_{OH}$	High level output voltage, $V_{BIAS} - V_O$		0.05	0.2	V	$I_o = 2\text{mA}$
$V_{OL}$	Low level output voltage, $V_O$		0.02	0.1	V	
$I_{IN+}$	Logic "1" Input bias current		10	20	$\mu\text{A}$	$\overline{HIN} = 5\text{V}$ , $\overline{LIN} = 0\text{V}$
$I_{IN-}$	Logic "0" Input bias current		15	30	$\mu\text{A}$	$\overline{HIN} = 0\text{V}$ , $\overline{LIN} = 5\text{V}$
$I_{O+}$	Output high short circuit pulsed current	200	290		mA	$V_O = 0\text{V}$ $PW \leq 10\mu\text{s}$
$I_{O-}$	Output low short circuit pulsed current	420	600		mA	$V_O = 15\text{V}$ $PW \leq 10\mu\text{s}$
$R_{BSD}$	Bootstrap diode conduction resistance		200		$\Omega$	$I_{BSD} = 1\text{mA}$
$V_{BSD}$	Bootstrap diode conduction voltage drop		0.6		V	$I_{BSD} = 1\text{mA}$

Function Description

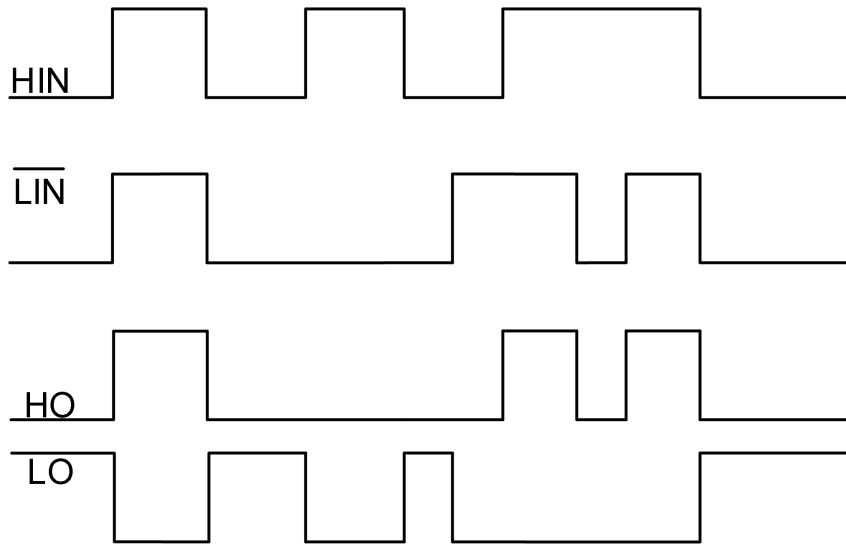


Figure 9-1 IRS2003S Input and output timing waveform

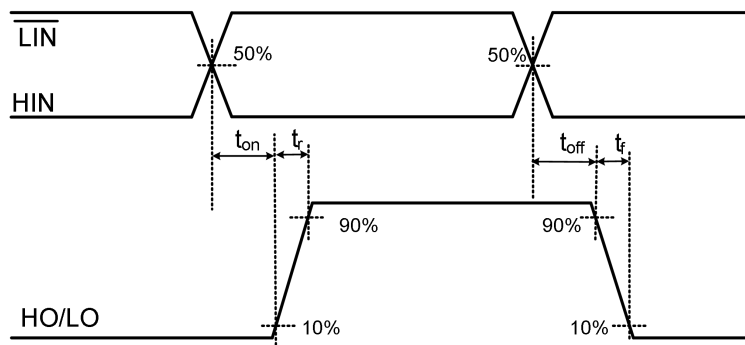


Figure 9-2 Propagation Time Waveform Definition

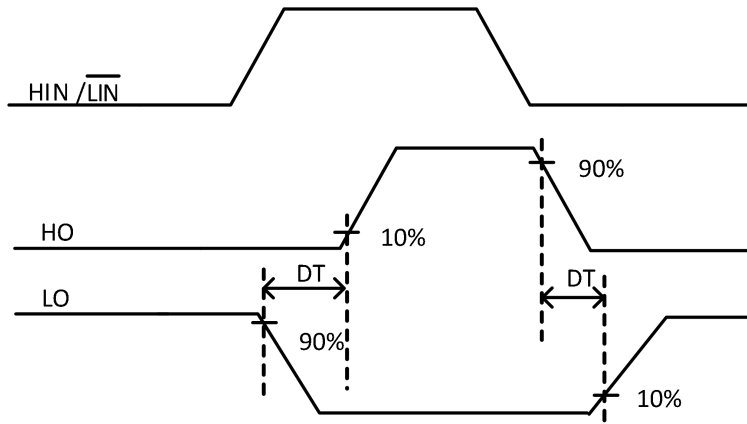


Figure 9-3 Cross Conduction Prevention Delay Time Waveform Definition

Function Block Diagram

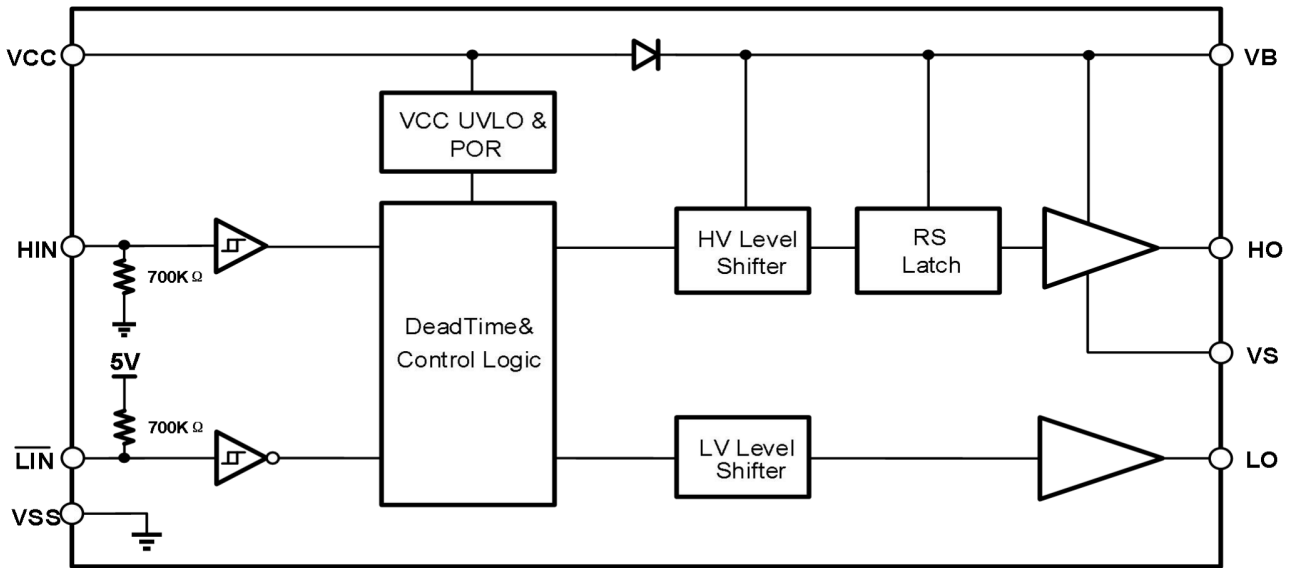


Figure10-1 Function Block Diagram of IRS2003S

Application message

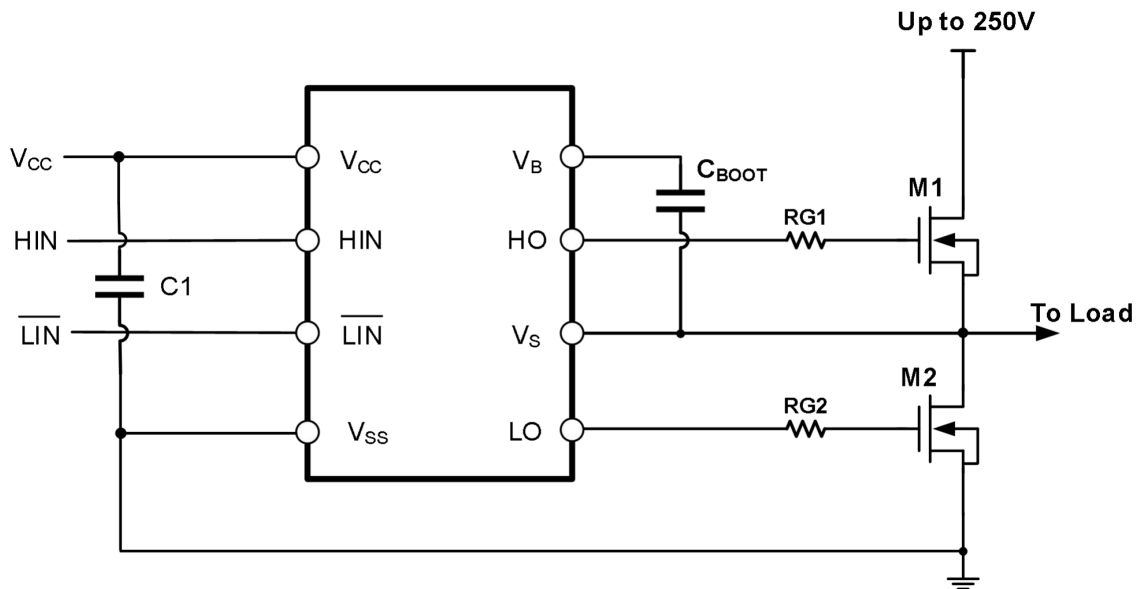
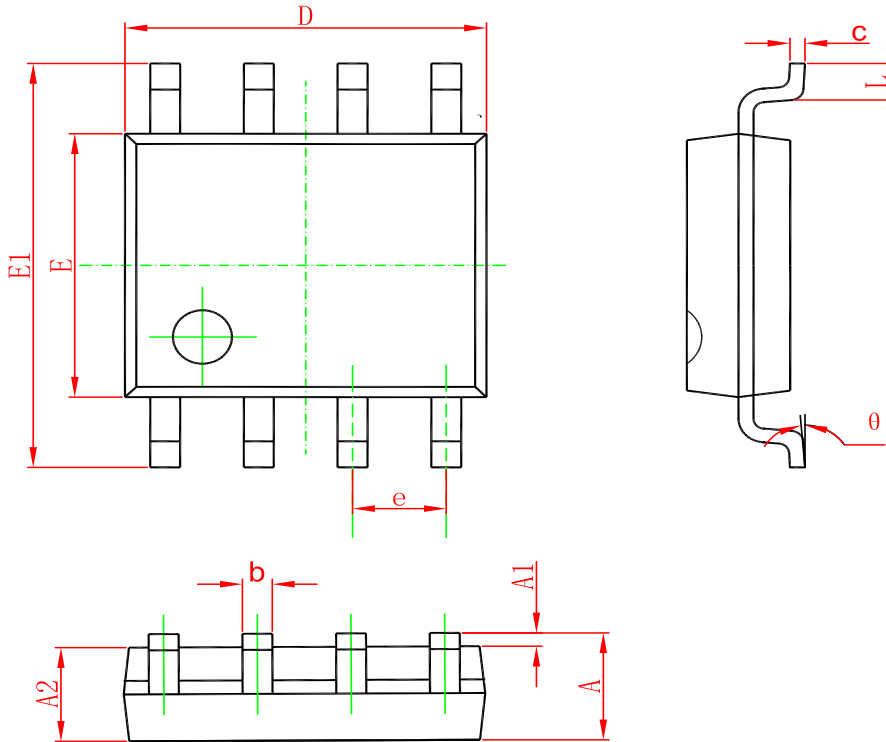


Figure10-2 Typical application circuit of IRS2003S

PACKAGE OUTLINE DIMENSIONS

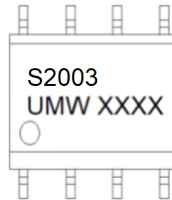
SOP-8



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	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



**Marking**



**Ordering information**

Order code	Package	Baseqty	Deliverymode
UMW IRS2003STR	SOP-8	2500	Tape and reel