250V Half Bridge MOSFET/IGBT Gate Driver

Description

The UMW IRS2005STR 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.

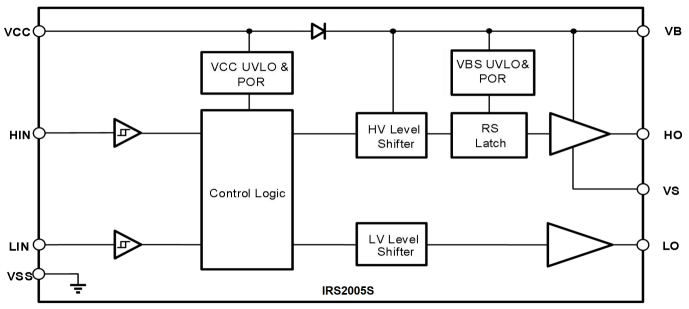
Application

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

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 ±50 V/nsec
- Allowable negative Vs capability: -9V
- Gate drive supply range from 10V to 20V
- Undervoltage lockout for both channels
  --UVLO forward 8.9V
  --UVLO reverse 8.2V
- Propagation delay
  --Ton/Toff =130ns/130ns
  --Matching delay time 50ns
- Wide operating temperature range -40°C ~125°C
- Typically output Source/Sink current capability: 290mA/600mA

Functional Block Diagram



Function Pin Description

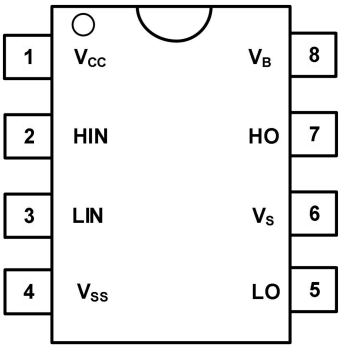


Figure7-1 8-Pin SOIC8 Top view

Table7-1 Lead Definitions

Number	Symbol	Description
1	V_{CC}	Low side and logic fixed supply
2	HIN	Logic input for high side gate driver output (HO), in phase
3	LIN	Logic input for low side gate driver output (LO), in phase
4	V_{SS}	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

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_B	High side floating supply	-0.3	275	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	25Note1	
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
ESD	HBM Model	1500	—	V
	Machine Model	500	—	V
P_D	Package Power Dissipation @ TA ≤25°C	—	625	mW
Rth_{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	

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_B	High side floating supply	VS + 10	VS + 20	V
V_S	High side floating supply return	-9Note2	250	
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：All power supplies tested at 25V.

Note2：In order to ensure that the IC works,the range of the VS should be between -8V to 200V.

Electrical Characteristics

Valid for temperature range at T_A= 25ºC, V_{CC}=V_B= 15V, C_L=1nF, unless otherwise specified

Symbol	Definition	MIN.	TYP.	MAX.	Units	Test Condition
t_{ON}	Turn-on propagation delay	—	130	200	ns	V_S=0/250V
t_{OFF}	Turn-off propagation delay	—	130	200	ns	V_S=0V
t_R	Turn-on rise time	—	70	170	ns	
t_F	Turn-off fall time	—	30	90	ns	
MT	Matching delay ON and OFF	—	—	50	ns	
t_{PWMIN}	Minimum pulse width	—	60	—	ns	
V_{CCUV+}	VCC supply UVLO threshold	8.0	8.9	9.8	V	
V_{CCUV-}		7.4	8.2	9	V	
V_{BSUV+}	VBS supply UVLO threshold	8.0	8.9	9.8	V	
V_{BSUV-}		7.4	8.2	9	V	
I_{LK}	High-side floating supply leakage current	—	—	50	μA	V_B=V_S=250V
I_{QBS}	Quiescent VB supply current	—	50	75	μA	V_{IN}=0V
I_{QCC}	Quiescent VCC supply current	—	120	250	μA	V_{IN}=0V
V_{IH}	Logic “1”(HIN&LIN) input voltage	2.5	—	—	V	VCC=10Vto 20V
V_{IL}	Logic “0” (HIN&LIN) input voltage	—	—	0.8	V	VCC=10Vto 20V
V_{OH}	High level output voltage, VBIAS - VO	—	0.05	0.2	V	I_O=2mA
V_{OL}	Low level output voltage, VO	—	0.02	0.1	V	
I_{IN+}	Logic “1” Input bias current	—	3	10	μA	V_{IN}=5V
I_{IN-}	Logic “0” Input bias current	—	0	5	μA	V_{IN}=0V
I_{O+}	Output high short circuit pulsed current	200	290	—	mA	V_O=0V PW≤10us
I_{O-}	Output low short circuit pulsed current	420	600	—	mA	V_O=15V PW≤10us
R_{BSD}	Bootstrap diode conduction resistance	—	60	—	Ω	I_{BSD}=1mA
V_{BSD}	Bootstrap diode conduction voltage drop	—	0.8	—	V	I_{BSD}=1mA

Function Description

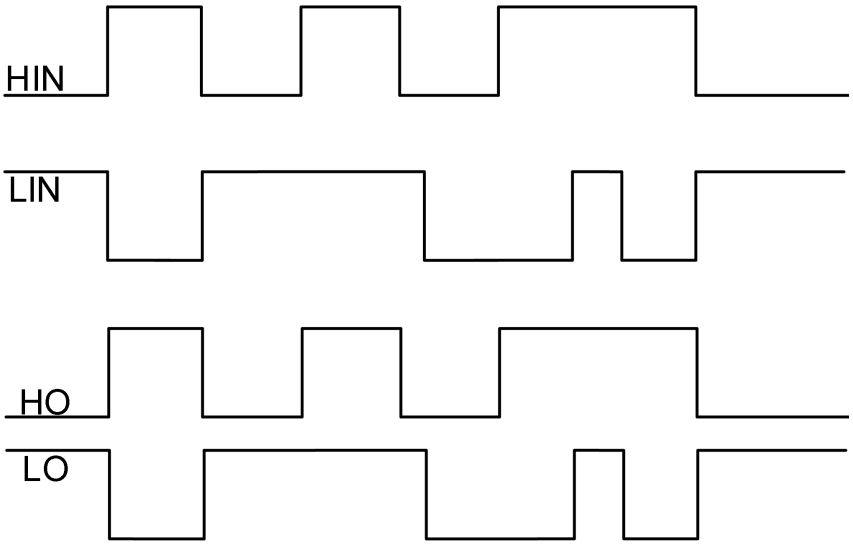


Figure 9-1 IRS2005STR Input and output timing waveform

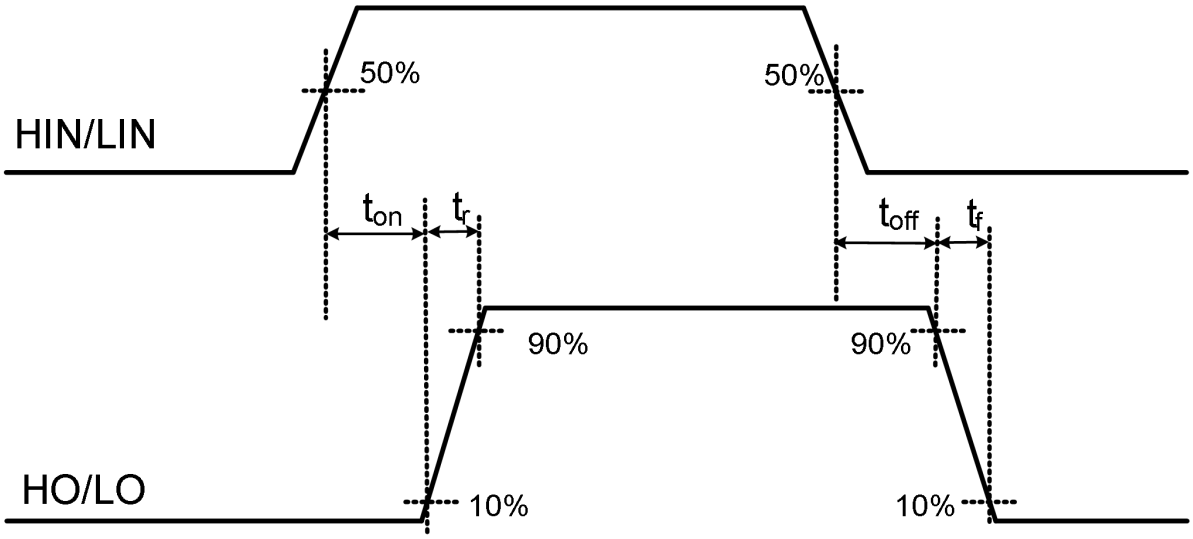


Figure 9-2 Propagation Time Waveform Definition

Function Block Diagram

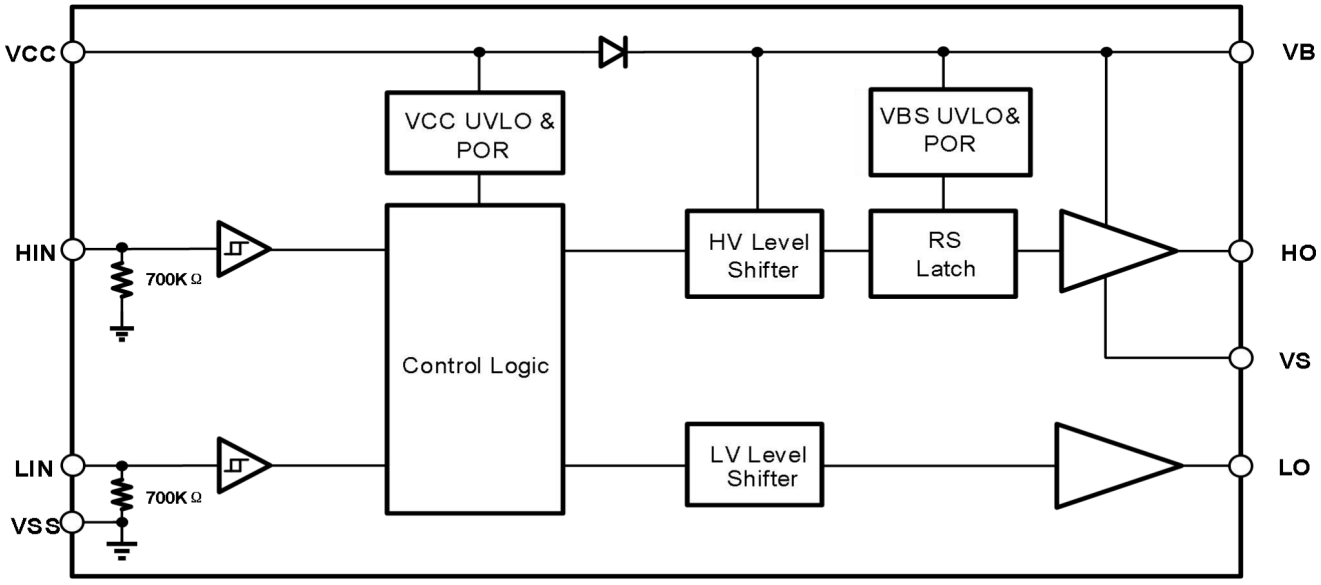


Figure10-1 Function Block Diagram of IRS2005STR

Application message

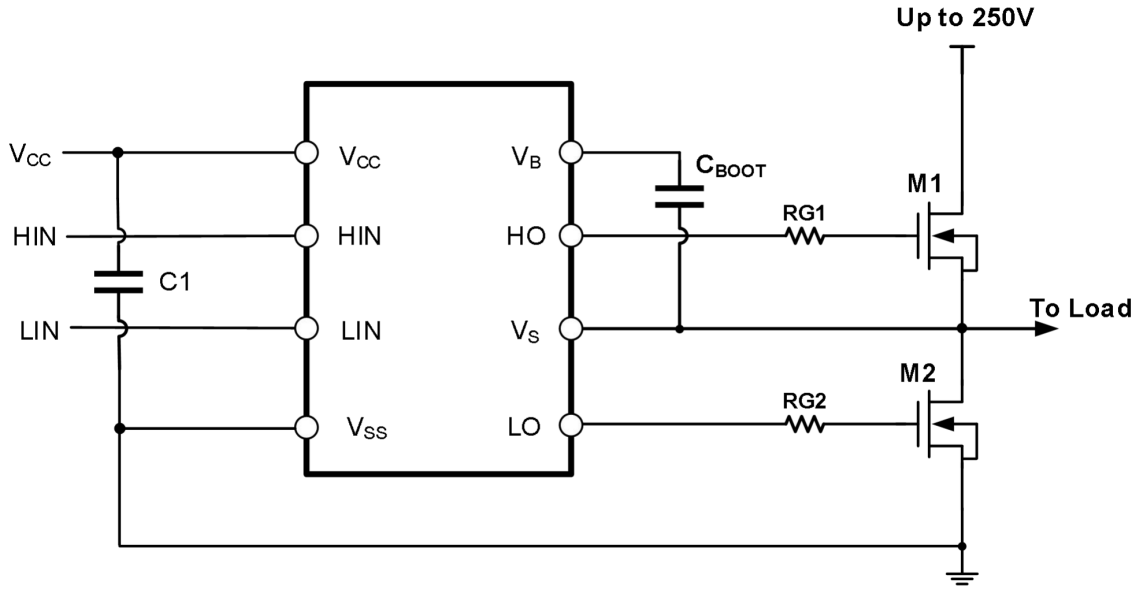
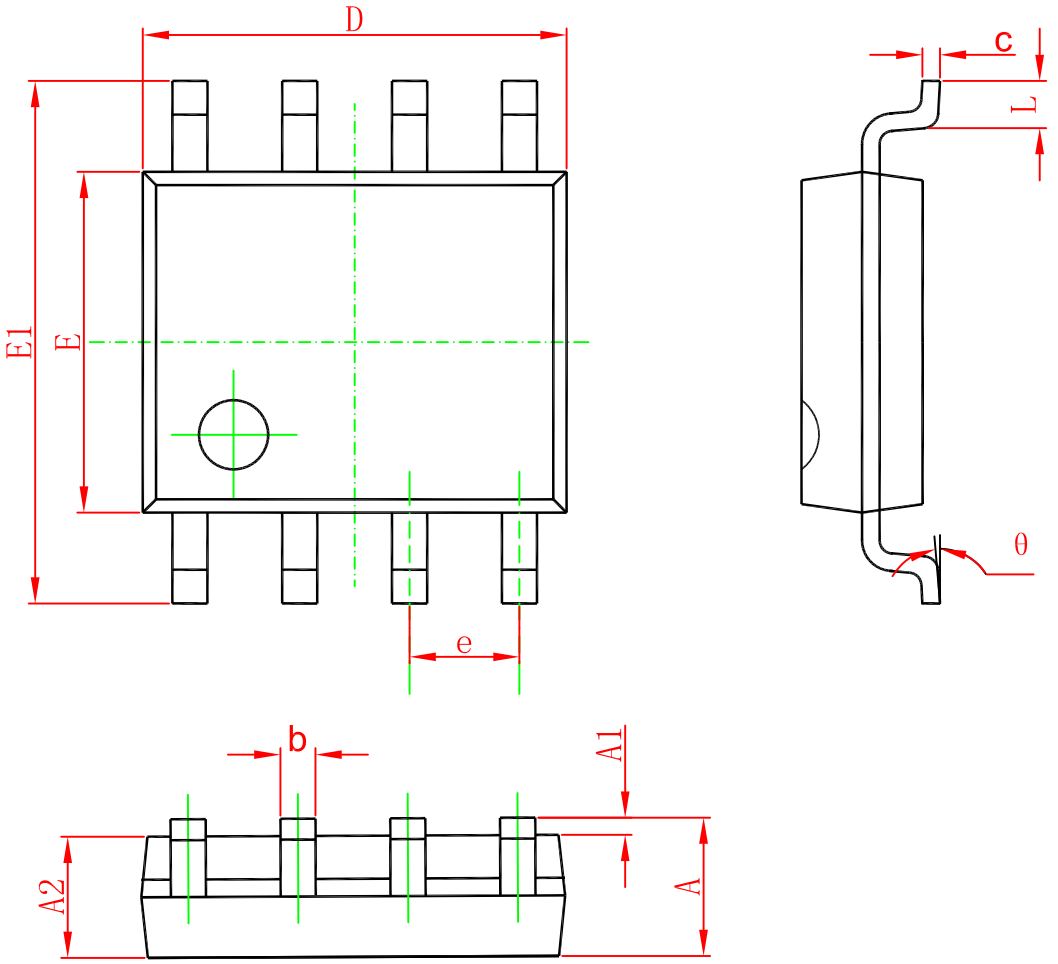


Figure10-2 Typical application circuit of IRS2005STR

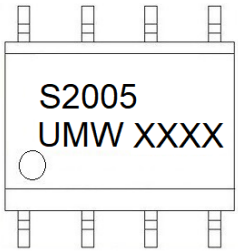
PACKAGING INFORMATION

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 IRS2005STR	SOP-8	2500	Tape and reel