700V 4A Half Bridge MOSFET/IGBT Gate Driver

Description

The IRS2113STR 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 700 V.

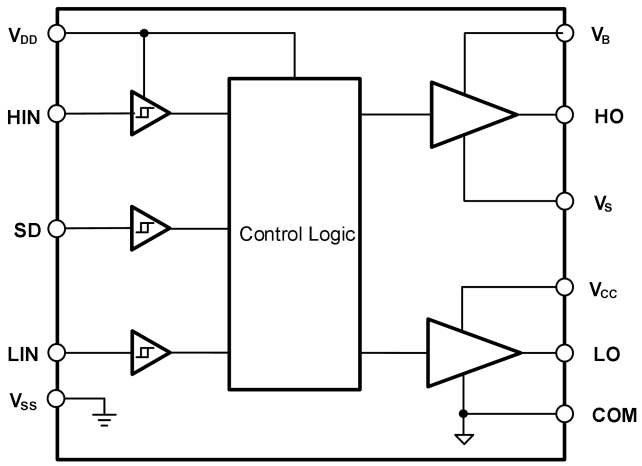
Application

- UPS Universal inverter
- Half-bridge and full-bridge converters in AC and DC power supplies
- High-density switching power supplies for servers, telecommunications, IT and industrial infrastructure
- Solar inverter and motor driver

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
- Separate logic supply range from 3.3V to 20V Logic and power ground ±5V offset
- Undervoltage lockout for both channels
- Cycle by cycle edge-triggered shutdown logic
- Matched propagation delay for both channels
- Wide operating temperature range -40°C ~125°C
- Typically output Source/Sink current capability: 4A/4A

Functional Block Diagram



Function Pin Description

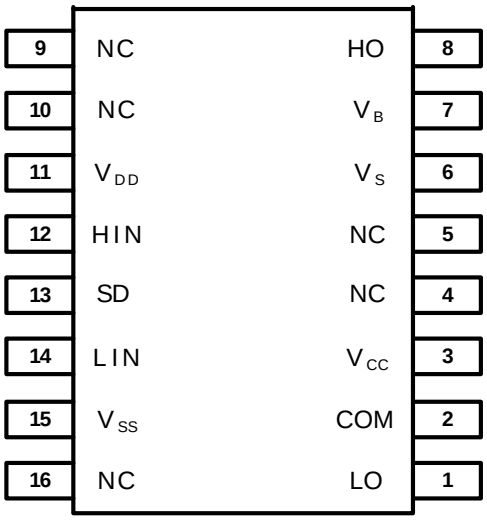


Figure6-1 SOP-16-300mil Top view

Table6-1 Lead Definitions

Number	Symbol	Description
1	LO	Low side gate drive output
2	COM	Low side return
3	V_{CC}	Low side supply
6	V_S	High side floating supply return
7	V_B	High side floating supply
8	HO	High side gate drive output
11	V_{DD}	Logic supply
12	HIN	Logic input for high side gate driver output (HO), in phase
13	SD	Logic input for shutdown
14	LIN	Logic input for low side gate driver output (LO), in phase
15	V_{SS}	Logic ground

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	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_{DD}	Logic supply	-0.3	V_{SS}+25	
V_{SS}	Logic ground	-5	+5	
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	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	VCC	
V_{DD}	Logic supply	V_{SS} + 3	V_{SS} + 20	
V_{SS}	Logic ground	-5	5	
V_{IN}	Logic input of HIN & LIN	0	VCC	
T_A	Ambient temperature	-40	125	°C

Note1：Transient negative VS can be used for VSS-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 .

Electrical Characteristics

Valid for temperature range at T_A= 25°C, V_{DD}=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=0V
t_{OFF}	Turn-off propagation delay		130	200	ns	V_S=700V
t_{sd}	Shutdown propagation delay		130	200	ns	V_S=700V
t_R	Turn-on rise time		25	35	ns	
t_F	Turn-off fall time		17	25	ns	
MT	Matched propagation time delay			10	ns	
V_{CCUV+}	VCC supply UVLO threshold	8	8.9	9.8	V	
V_{CCUV-}		7.4	8.2	9.0	V	
$V_{CCUVHYS}$	hysteresis of V_{CC} UVLO		0.7		V	
V_{BSUV+}	VBS supply UVLO threshold	8	8.9	9.8	V	
V_{BSUV-}		7.4	8.2	9.0	V	
$V_{BSUVHYS}$	hysteresis of V_{BS} UVLO		0.7		V	
I_{LK}	High-side floating supply leakage current			50	μA	V_B=V_S=700V
I_{QBS}	Quiescent VB supply current		70	120	μA	V_{IN}=0V or V_{DD}
I_{QCC}	Quiescent VCC supply current		120	240	μA	V_{IN}=0V or V_{DD}
I_{QDD}	Quiescent VDD supply current		15	30	μA	V_{IN}=0V or V_{DD}
V_{IH}	Logic “1”(HIN&LIN) input voltage	9.5			V	VCC=10Vto 20V
V_{IL}	Logic “0” (HIN&LIN) input voltage			6	V	VCC=10Vto 20V
V_{OH}	High level output voltage, VBIAS - VO			1.4	V	I_O=0A
V_{OL}	Low level output voltage, VO			0.1	V	I_O=0A
I_{IN+}	Logic “1” Input bias current		20	40	μA	V_{IN}=V_{DD}
I_{IN-}	Logic “0” Input bias current			2	μA	V_{IN}=0V
I_{O+}	Output high short circuit pulsed current	3	4		A	V_O=0V, V_{IN}=V_{DD} PW≤10us
I_{O-}	Output low short circuit pulsed current	3	4		A	V_O=15V V_{IN}=V_{DD} PW≤10us

Function Description

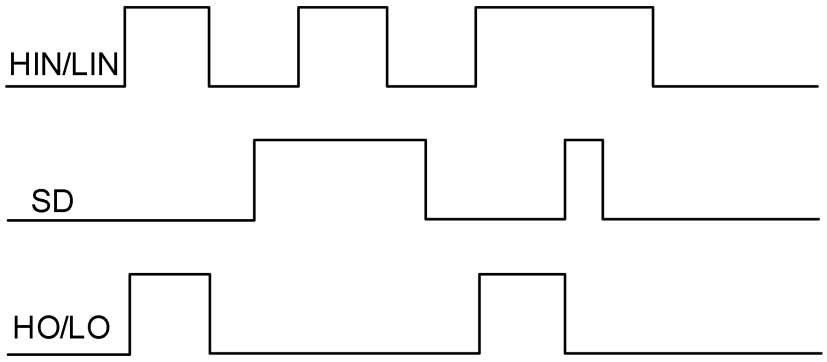


Figure 8-1 IRS2113STR Input and output timing waveform

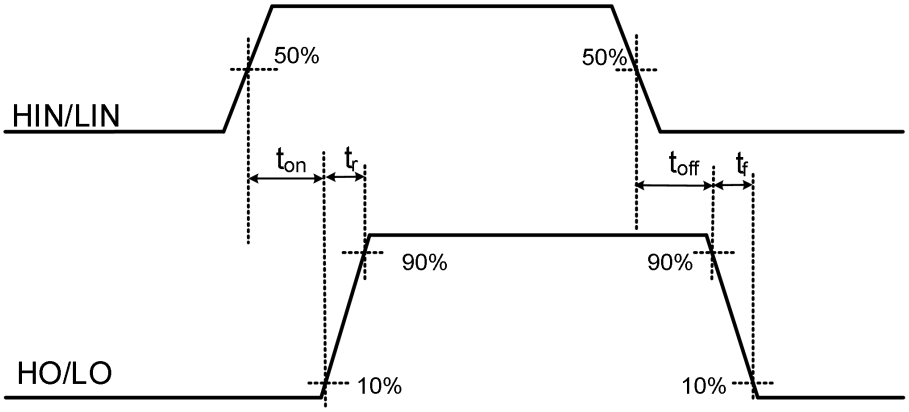


Figure 8-2 Propagation Time Waveform Definition

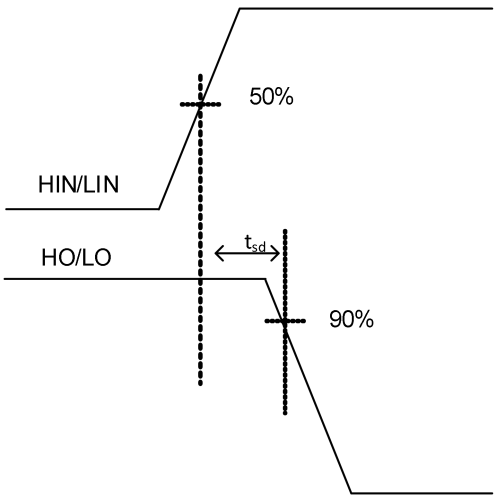


Figure 8-3 Shutdown Propagation Time Waveform Definition

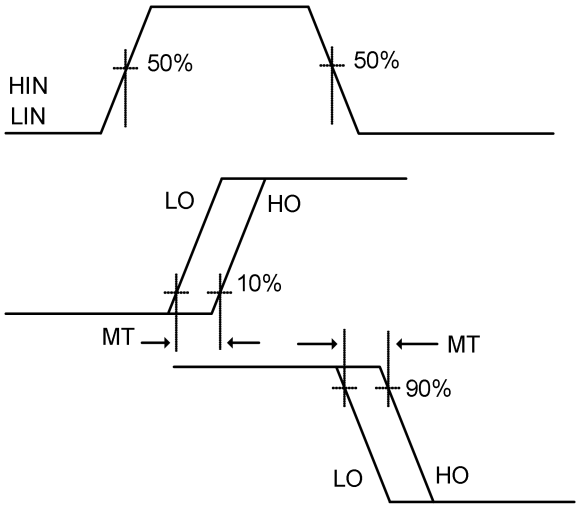


Figure 8-4 Matched propagation time delay Waveform Definition

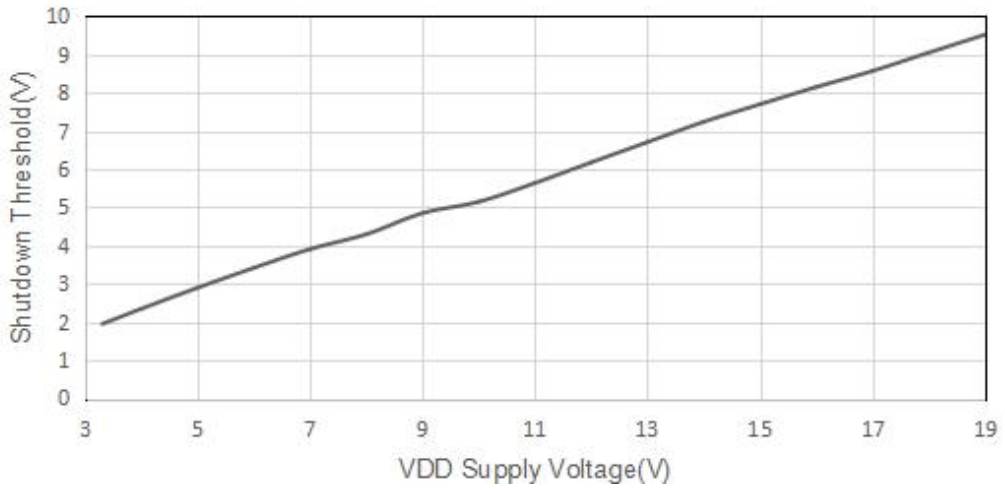


Figure 8-5 Mapping between input threshold voltage and VDD voltage (Typical)

Function Block Diagram

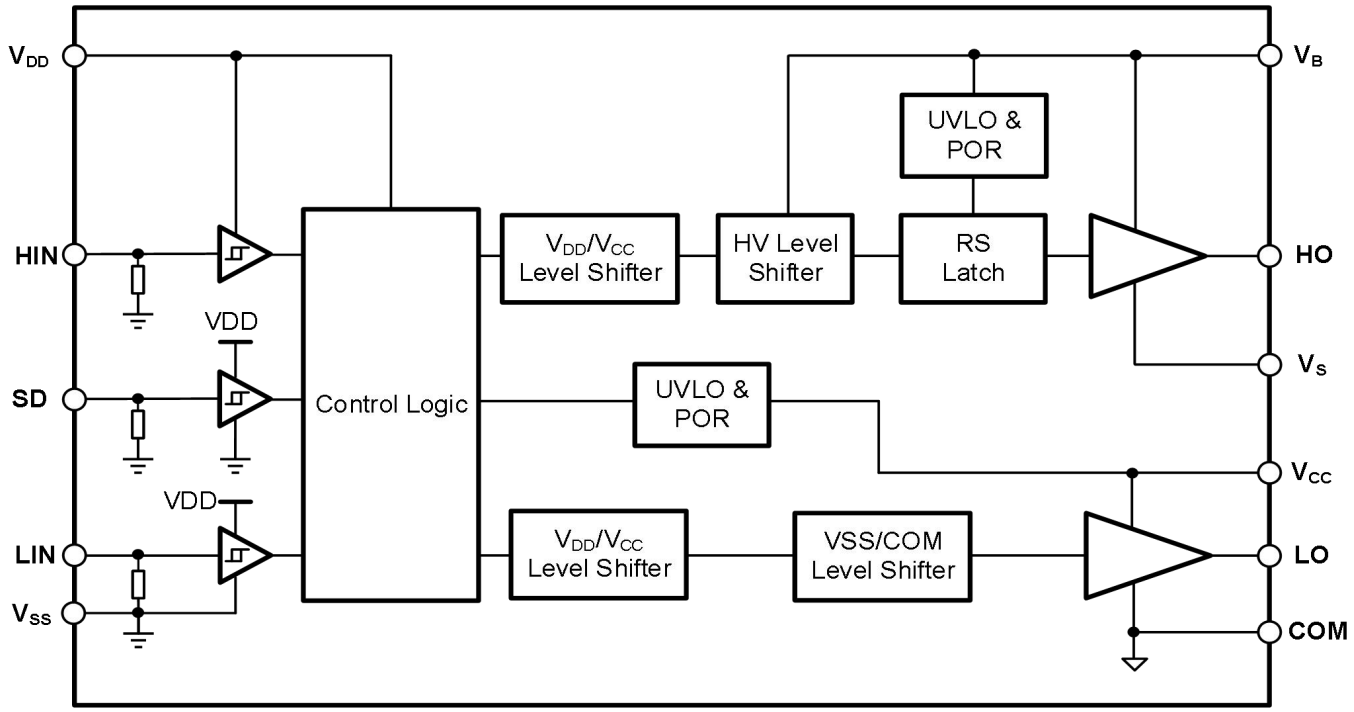


Figure9-1 Function Block Diagram of IRS2113STR

Application message

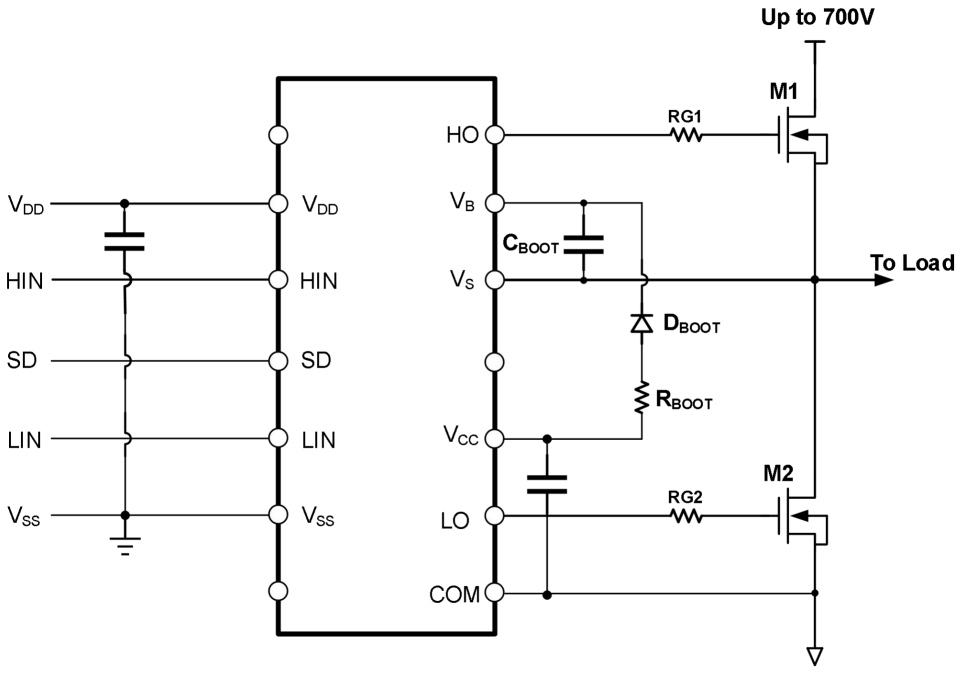
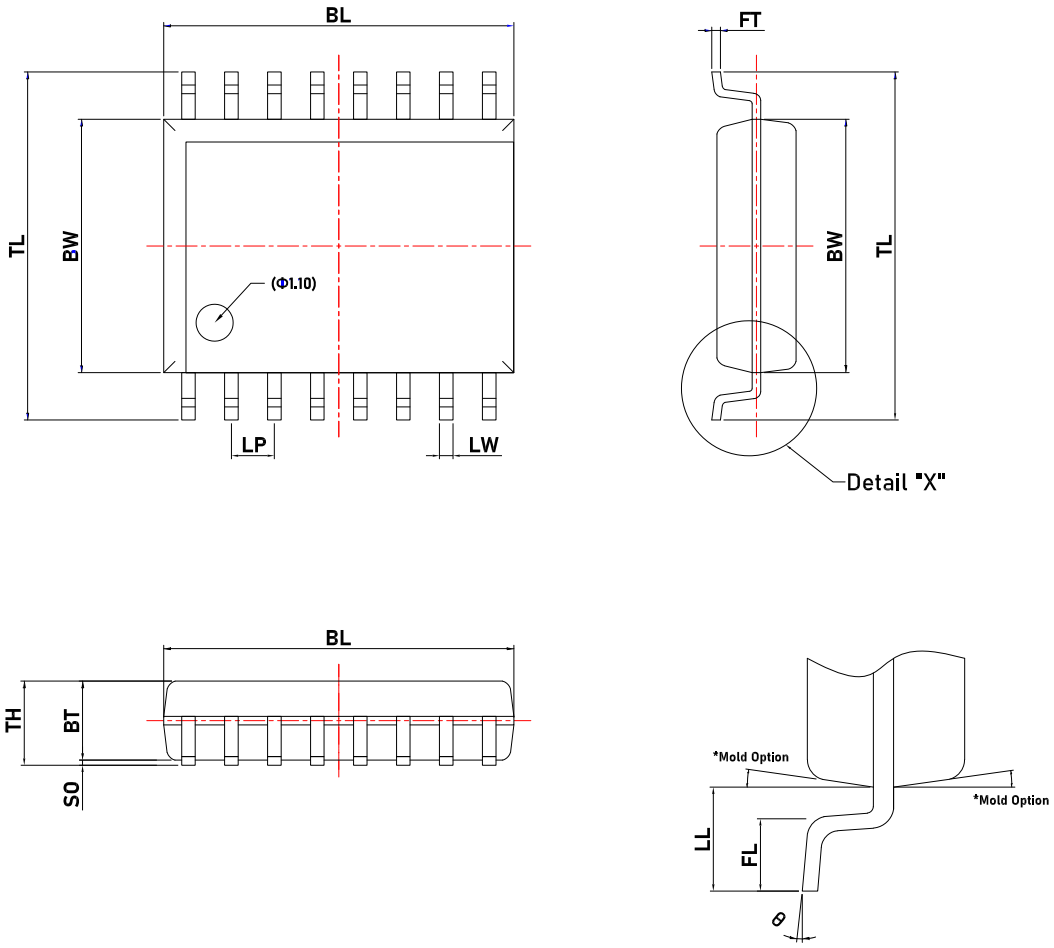


Figure9-2 Typical application circuit of IRS2113STR

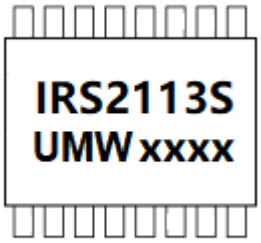
SOP-16-300mil



Dimensions

Item	BL	BW	TL	LW	LP	FT	BT	SO	TH	LL	FL	θ
Unit	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	°
Spec	10.45 (10.35) 10.20	7.70 (7.50) 7.30	10.50 (10.30) 10.10	0.400 TYP	1.270 TYP	0.300 (0.250) 0.170	2.44 (2.34) 2.24	0.250 (0.150) 0.100	2.590 Max.	1.50 (1.40) 1.30	1.00 (0.80) 0.60	8 (4) 0

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRS2113STR	SOP-16-300mil	2000	Tape and reel