UMW IRS21814STR

700V Half Bridge MOSFET/IGBT Gate Driver

1.Description

The UMW IRS21814STR 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 3.3V 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 700V.

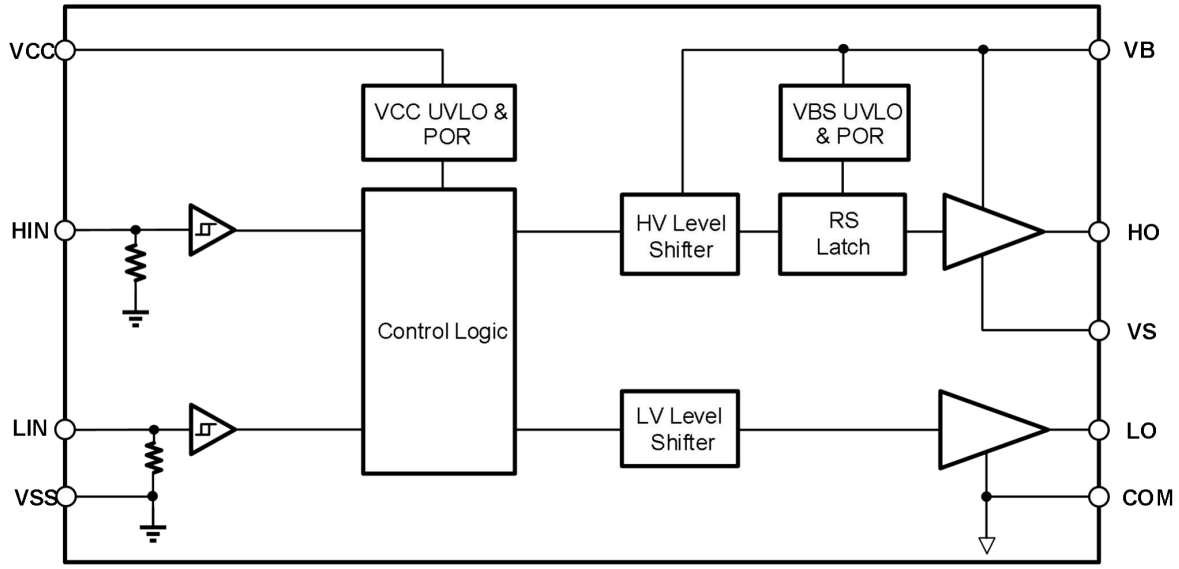
2.Application

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

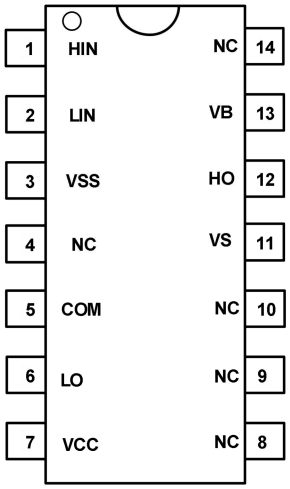
3.Features

- Floating channel designed for bootstrap operation
- Fully operational to +700 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
- Turn-on/Turn-off propagation delay - Ton/Toff =130ns/130ns
- Undervoltage lockout for both channels
  --UVLO forward 8.9V
  --UVLO reverse 8.2V
- Matched propagation delay for both channels
- Typically output Source/Sink current capability: 4A/4A

4.Functional Block Diagram



5.Pinning Information



SOP-14

Table7-1 Lead Definitions

Number	Symbol	Description
1	HIN	Logic input for high side gate driver output (HO), in phase
2	LIN	Logic input for low side gate driver output (LO), in phase
3	VSS	Logic ground
4	NC	No connect
5	COM	Low side return
6	LO	Low side gate drive output
7	VCC	Low side and logic fixed supply
8	NC	No connect
9	NC	No connect
11	VS	High side floating supply return
12	HO	High side gate drive output
13	VB	High side floating supply
14	NC	No connect

6.Absolute Maximum Ratings

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

Parameter	Symbol	Min	Max	Units
High side floating supply	V_B	-0.3	725	V
High side floating supply return	V_S	V_B-25	V_B+0.3	V
High side gate drive output	V_{HO}	V_S-0.3	V_B+0.3	V
Low side and main power supply	V_{CC}	-0.3	25	V
Low side gate drive output	V_{LO}	-0.3	V_{CC}+0.3	V
Logic input (HIN, LIN)	V_{IN}	V_{SS}-0.3	V_{SS}+5	V
Logic ground	V_{SS}	V_{CC}-25	V_{CC}+0.3	V
dV/dt noise Immunity	dV_S/dt		50	V/ns
HBM Model	ESD	1.5		kV
Machine Model		500		V
Package Power Dissipation @ T_A ≤25°C	P_D		0.625	W
Thermal Resistance, Junction to Ambient	Rth_{JA}		200	°C/W
Junction Temperature	T_J		150	°C
Storage Temperature	T_S	-55	150	°C
Lead Temperature (Soldering, 10 seconds)	T_L		300	°C

7.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.

Parameter	Symbol	Min	Max	Units
High side floating supply	V_B	V_S+10	V_S+20	V
High side floating supply return	V_S	-9	700	V
High side gate drive output	V_{HO}	V_S	V_B	V
Low side and main power supply	V_{CC}	10	20	V
Low side gate drive output	V_{LO}	0	VCC	V
Logic input of HIN & LIN	V_{IN}	0	VCC	V
Logic ground	V_{SS}	-5	5	V
Ambient temperature	T_A	-40	125	°C

8.Electrical Characteristic

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Turn-on propagation delay	t_{ON}	V_S=0V		130	220	ns
Turn-off propagation delay	t_{OFF}	V_S=0V or 700V		130	220	ns
Shut-down propagation delay	t_{sd}			130	220	ns
Turn-on rise time	t_R	V_S=0V		40	60	ns
Turn-off fall time	t_F	V_S=0V		20	35	ns
Matched propagation time delay	MT				50	ns
V_{CC} supply UVLO threshold	V_{CCUV+}		8	8.9	9.8	V
	V_{CCUV-}		7.4	8.2	9	V
hysteresis of V_{CC} UVLO	$V_{CCUVHYS}$			0.7		V
V_{BS} supply UVLO threshold	V_{BSUV+}		8	8.9	9.8	V
	V_{BSUV-}		7.4	8.2	9	V
hysteresis of V_{BS} UVLO	$V_{BSUVHYS}$			0.7		V
High-side floating supply leakage curent	I_{LK}	V_B=V_S=700V			50	μA
Quiescent VB supply current	I_{QBS}	V_{IN}=0V or 5V		50	100	μA
Quiescent V_{CC} supply current	I_{QCC}	V_{IN}=0V or 5V		150	240	μA
Logic “1” input voltage	V_{IH}	V_{CC}=10V to 20V	2.5			V
Logic “0” input voltage	V_{IL}	V_{CC}=10V to 20V			0.8	V
High level output voltage, VBIAS -VO	V_{OH}	I_O=0A			1.4	V
Low level output voltage, VO	V_{OL}	I_O=20mA			0.1	V
Logic “1” Input bias current	I_{IN+}	LIN=5V		25	60	μA
Logic “0” input bias current	I_{IN-}	LIN=0V			2	μA
Output high short circuit pulsed current	I_{O+}	V_O=0V, PW≤10μs	3	4		A
Output low short circuit pulsed current	I_{O-}	V_O=15V, PW≤10μs	3	4		A

9.Function Description

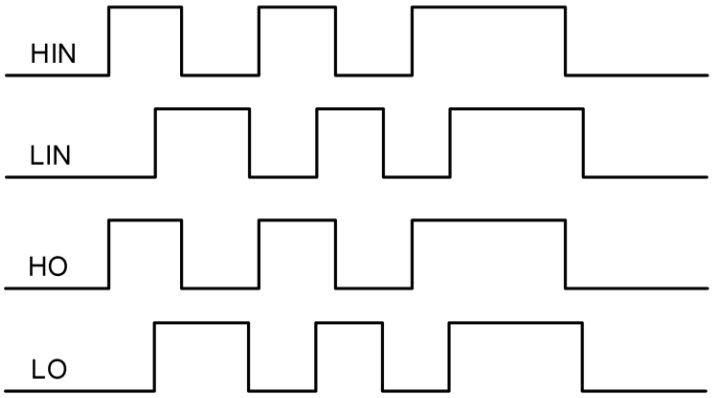


Figure 1. IRS21814STR Input and output timing waveform

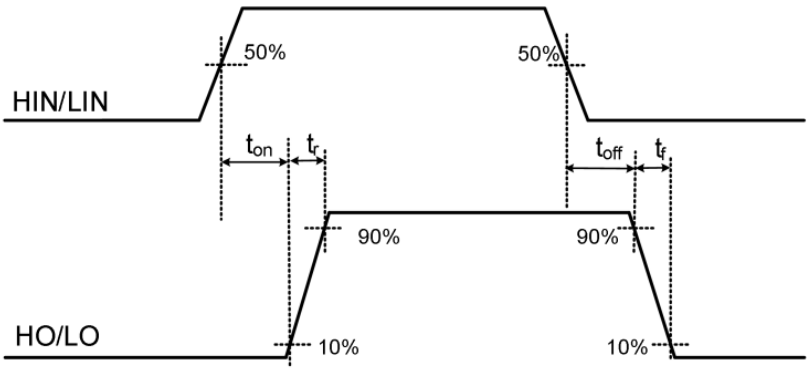


Figure 2. Propagation Time Waveform Definition

10.1Typical Characteristic

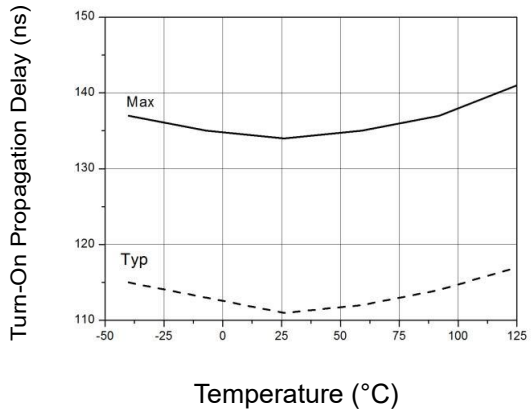


Figure 1: Turn-On Propagation Delay vs. Temperature

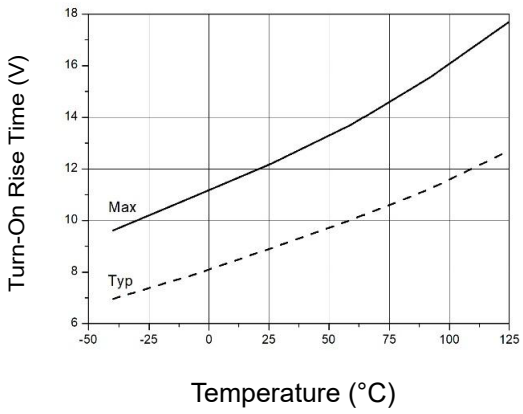


Figure 2: Turn-On Rise Time vs. Temperature

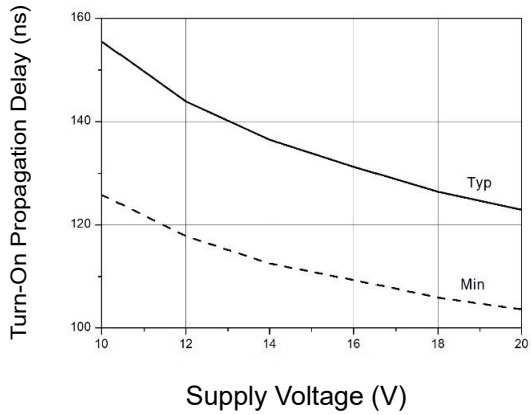


Figure 3: Turn-on Propagation Delay vs. Supply Voltage

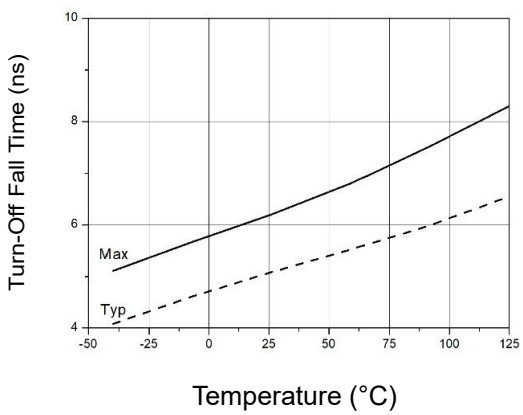


Figure 4: Turn-Off Fall Time vs. Temperature

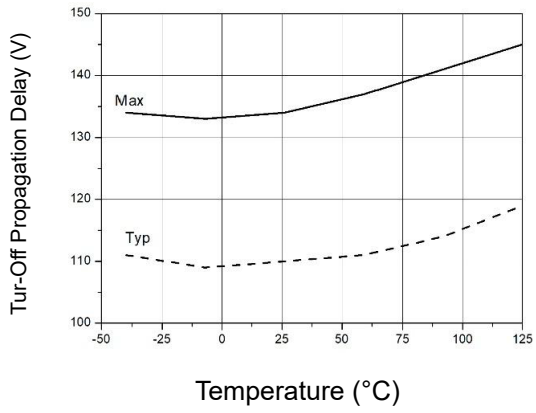


Figure 5: Turn-Off Propagation Delay vs. Temperature

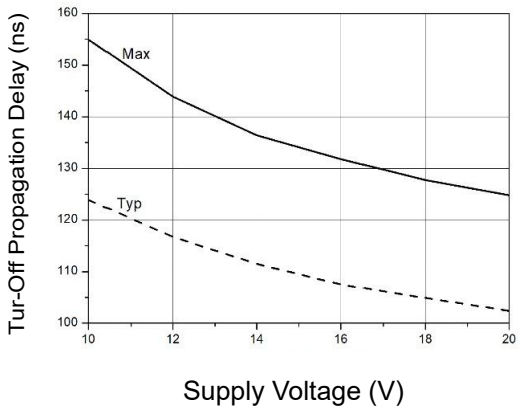


Figure 6: Turn-off Propagation Delay vs. Supply Voltage

10.2Typical Characteristic

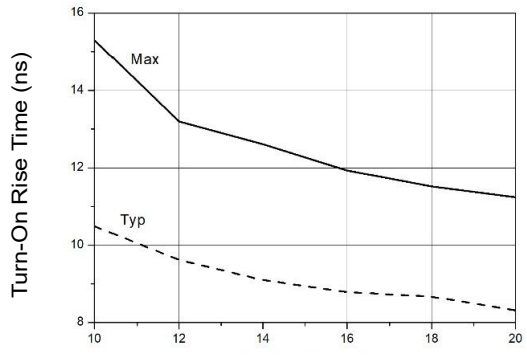


Figure 7: Turn-On Rise Time vs. Supply Voltage

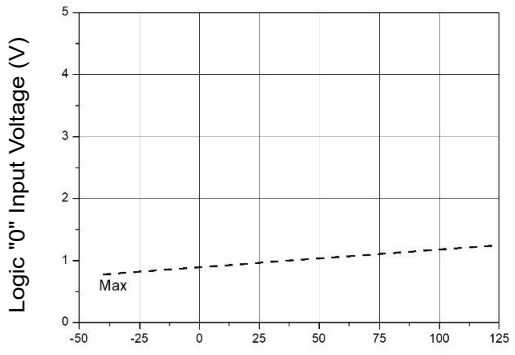


Figure 8: Logic “0” Input Voltage vs. Temperature

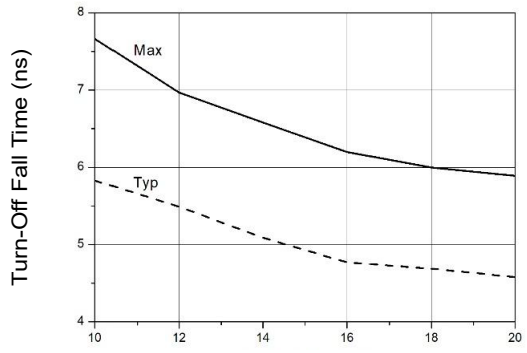


Figure 9: Turn-Off Fall Time vs. Supply Voltage

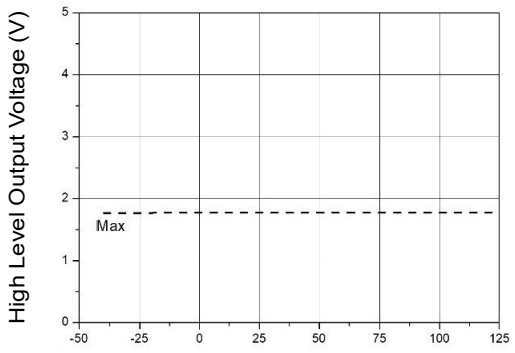


Figure 10: High Level Output Voltage vs. Temperature (Io = 0mA)

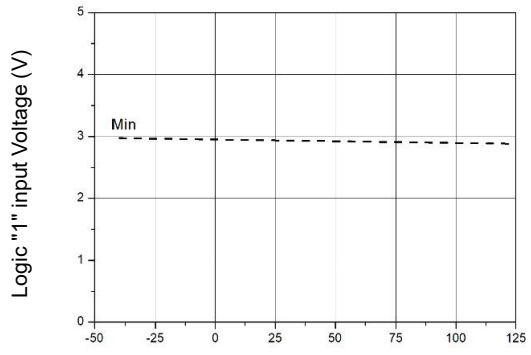


Figure 11: Logic “1” Input Voltage vs. Temperature

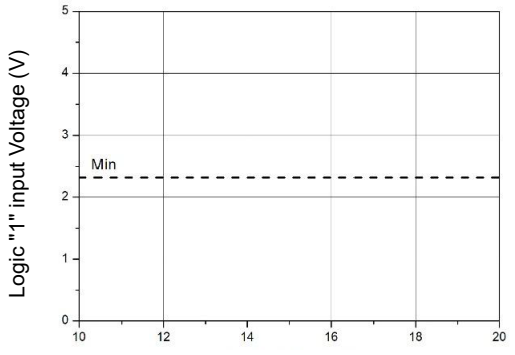


Figure 12: Logic “1” Input Voltage vs. Supply Voltage

10.3Typical Characteristic

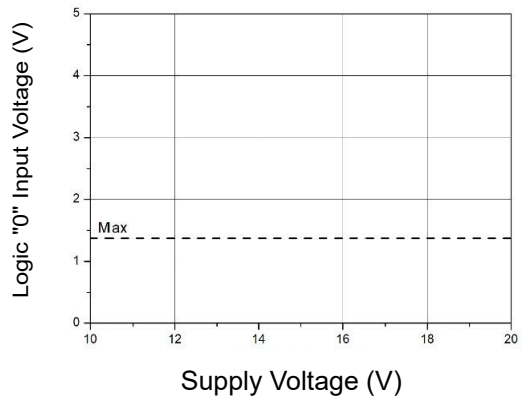


Figure 13: Logic “0” Input Voltage vs. Supply Voltage

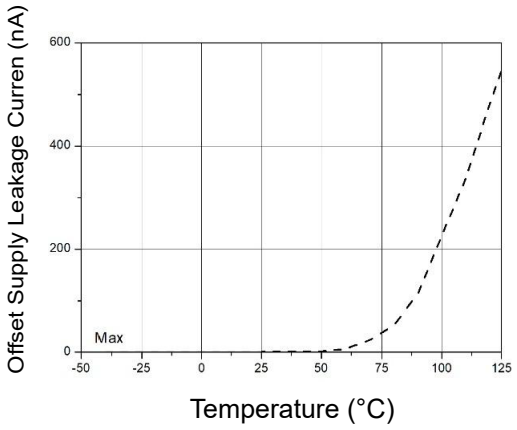


Figure 14: Offset Supply Leakage Current vs. Temperature

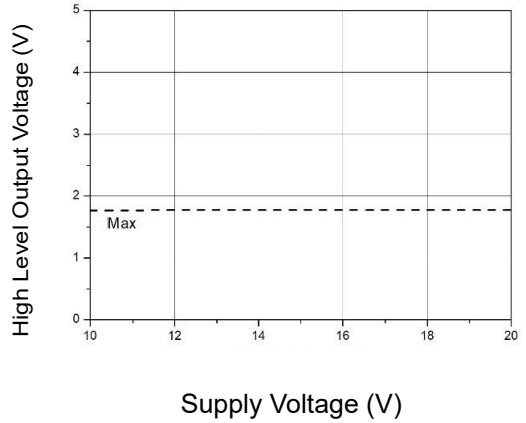


Figure 15: High Level Output Voltage vs. Supply Voltage (Io = 0mA)

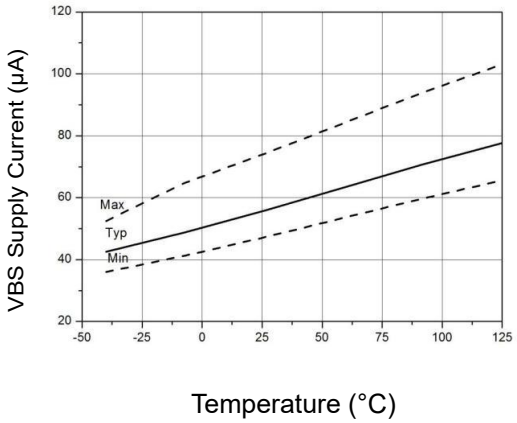


Figure 16: VBS Supply Current vs. Temperature

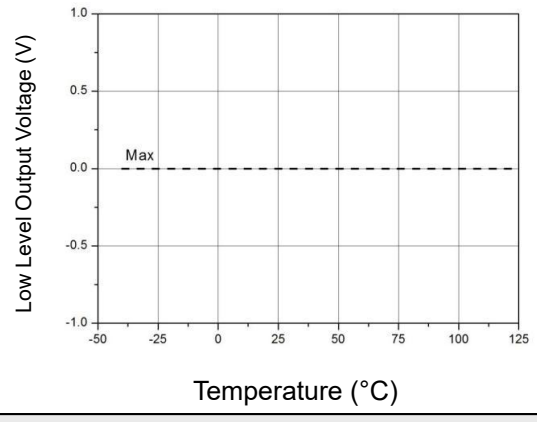


Figure 17: Low Level Output vs. Temperature

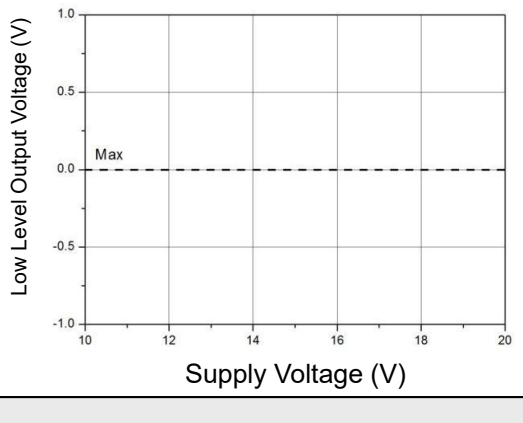


Figure 18: Low Level Output vs. Supply Voltage

10.4Typical Characteristic

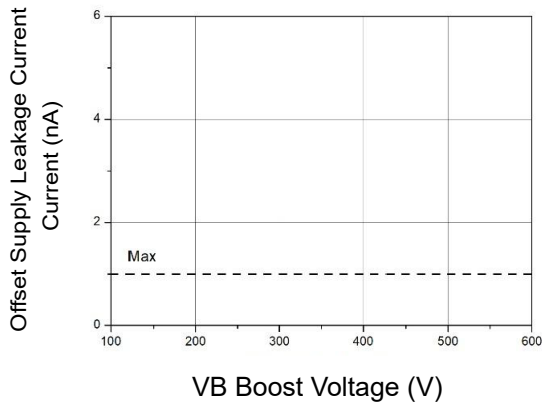


Figure 19: Offset Supply Leakage Current vs. VB Boost Voltage

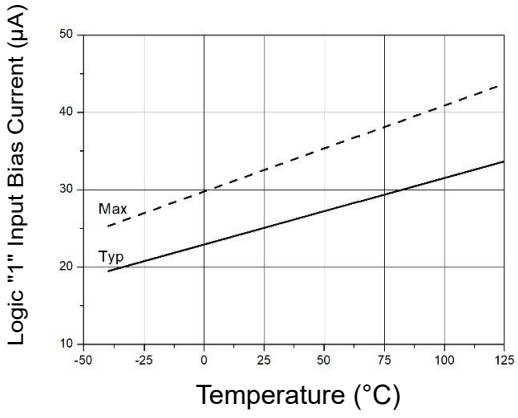


Figure 20: Logic “1” Input Bias Current vs. Temperature

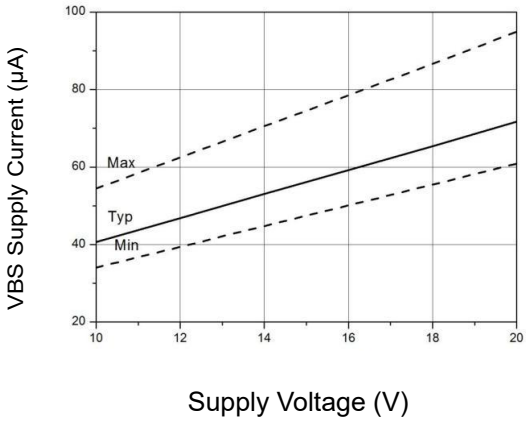


Figure 21: VBS Supply Current vs. VBS Floating Supply Voltage

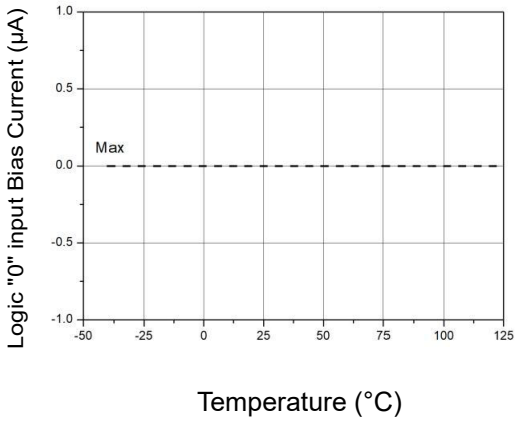


Figure 22: Logic “0” Input Bias Current vs. Temperature

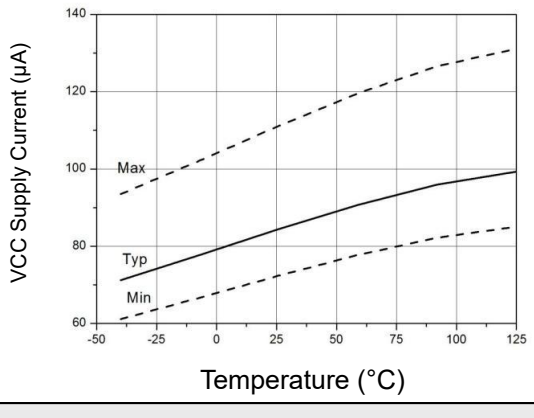


Figure 23: VCC Supply Current vs. Temperature

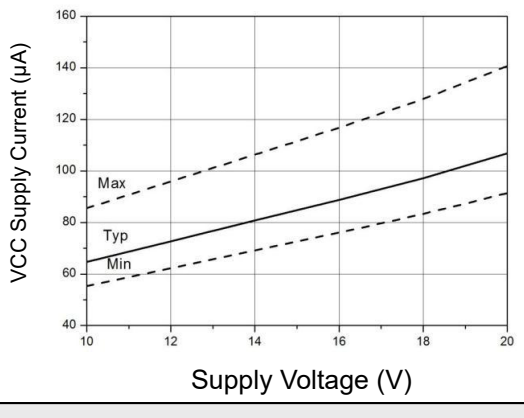


Figure 24: VCC Supply Current vs. Supply Voltage

10.5Typical Characteristic

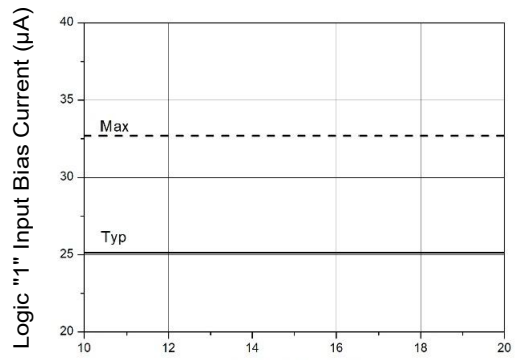


Figure 25: Logic “1” Input Bias Current vs. Supply Voltage

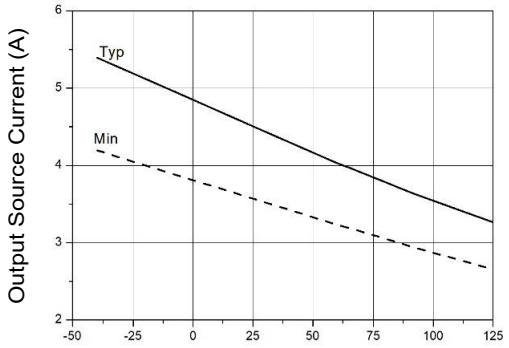


Figure 26: Output Source Current vs. Temperature

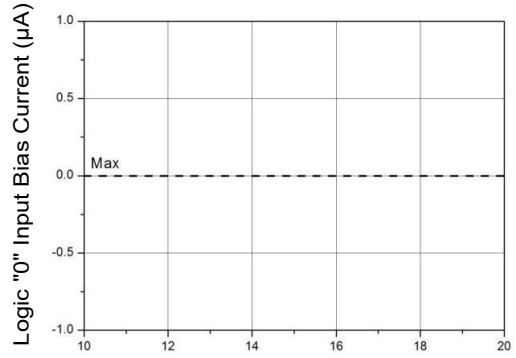


Figure 27: Logic “0” Input Bias Current vs. Supply Voltage

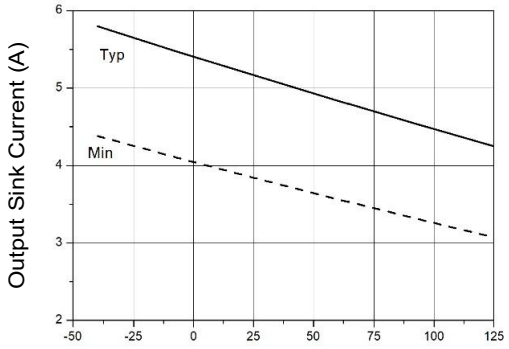


Figure 28: Output Sink Current vs. Temperature

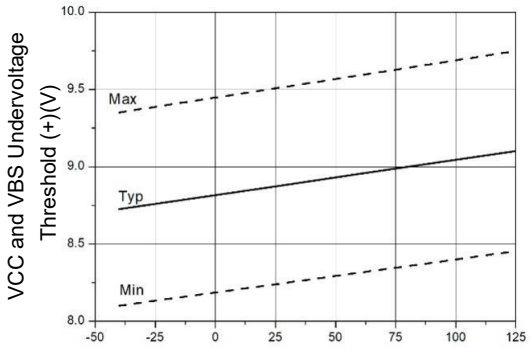


Figure 29: VCC and VBS Undervoltage Threshold (+) vs. Temperature

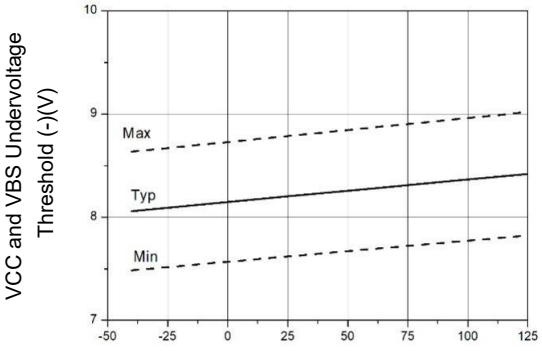


Figure 30: VCC and VBS Undervoltage Threshold (-) vs. Temperature

10.6Typical Characteristic

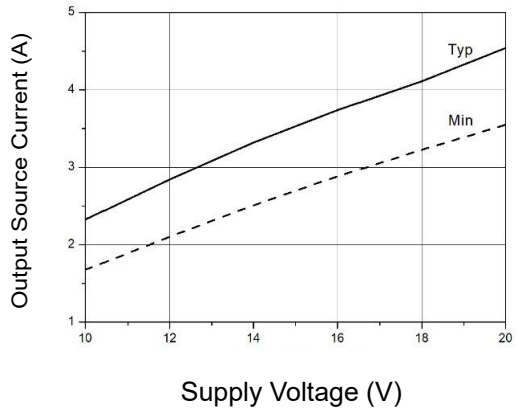


Figure 31: Output Source Current vs. Supply Voltage

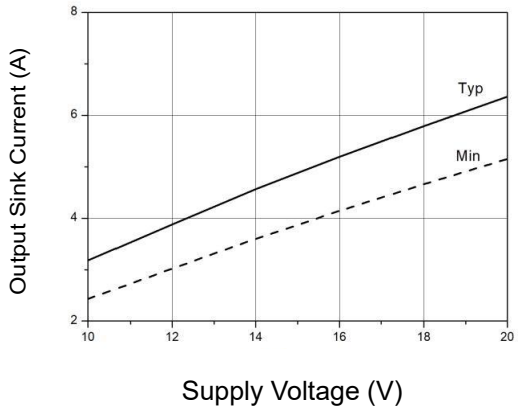


Figure 32: Output Sink Current vs. Supply Voltage

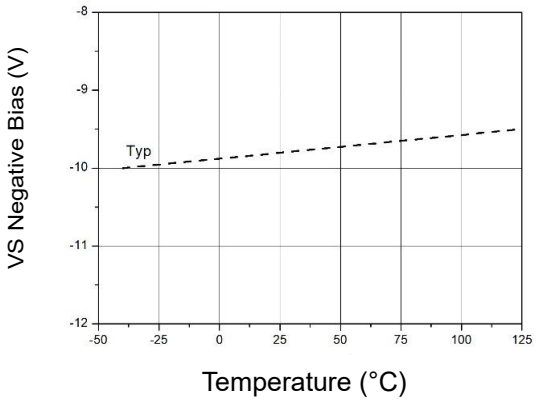


Figure 33: VS Negative Bias vs. Temperature

11.Function Block Diagram

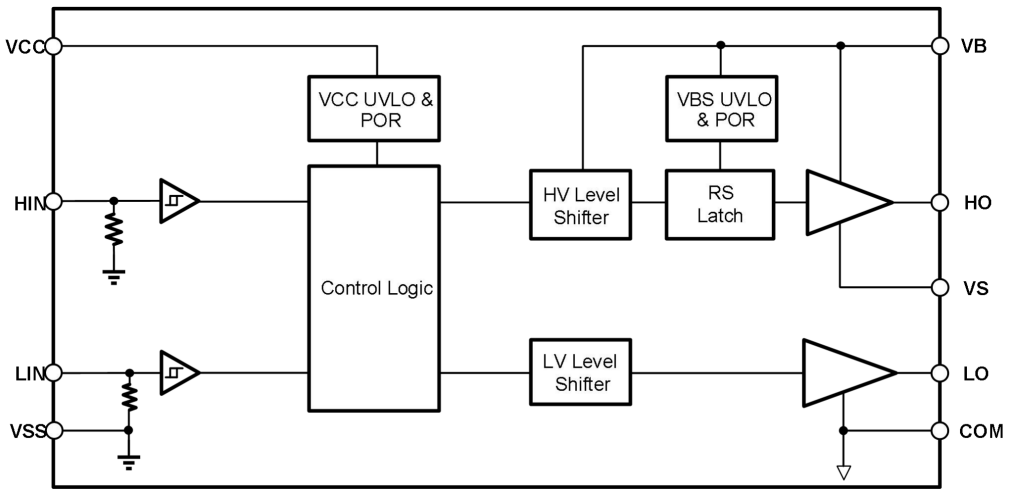


Figure 34. Function Block Diagram of IRS21814STR

12.Application message

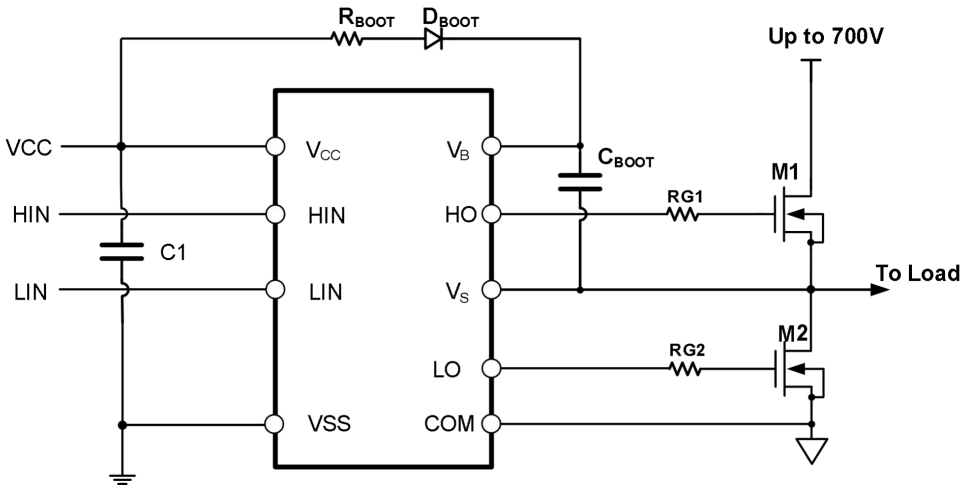
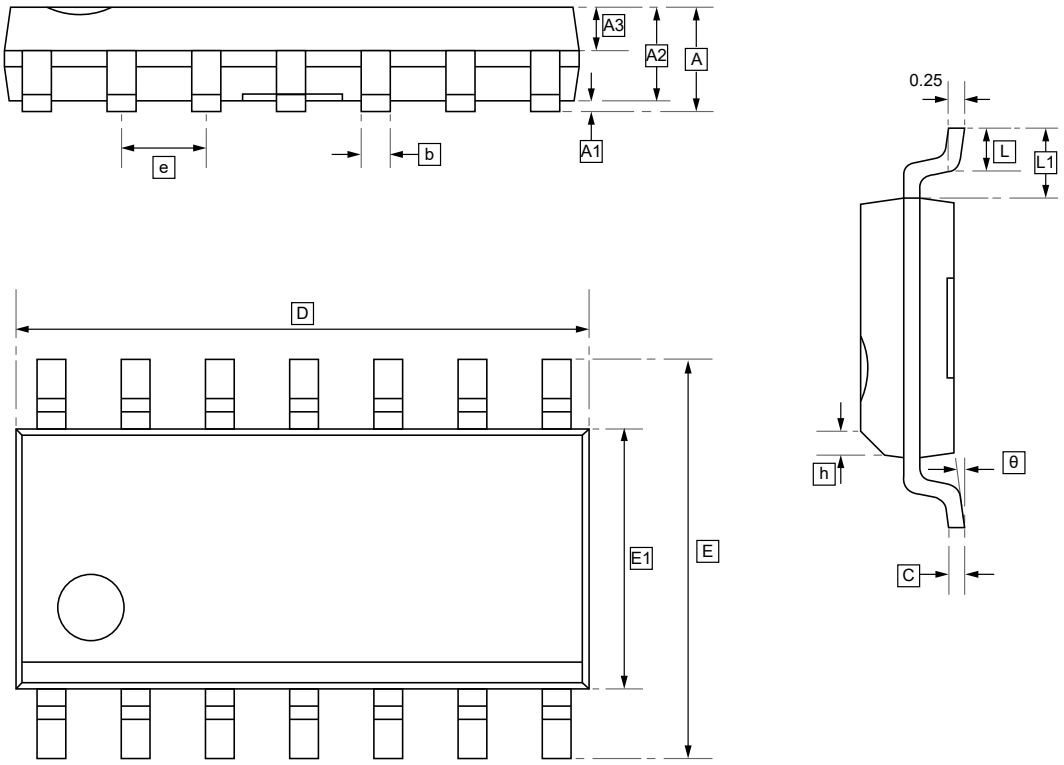


Figure 35. Typical application circuit of IRS21814STR

13.SOP-14 Package Outline Dimensions

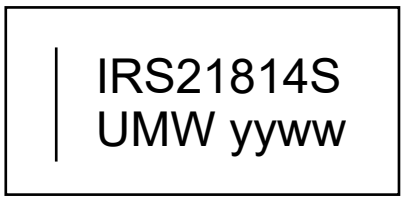


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	C	D	E	E1	e	h	L
Min	-	0.05	1.35	0.65	0.203	0.17	8.45	5.80	3.80	1.24	0.25	0.40
Max	1.75	0.25	1.55	0.75	0.305	0.25	8.85	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

14.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRS21814STR	SOP-14	2500	Tape and reel

15.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.