AP22908-EVM

Application Note
AP22908 Application Information and Demo Board User Guide

Description

The AP22908 slew rate controlled load switch is a single P-channel MOSFET power switch designed for high-side load-switching applications. The MOSFET has a typical low $R_{DS(ON)}$ of 40mΩ at 3.6V, allowing increased load current handling capacity with a low forward voltage drop. The turn-on slew rate of the device is controlled internally to avoid inrush current.

The AP22908 load switch is designed to operate from 1.08V to 3.6V, making it ideal for 1.2V, 1.8V, 2.5V, 3.3V and 3.6V systems. The typical quiescent supply current is only 0.05µA.

The AP22908 is available in the wafer level chip SOT26 package.

Applications

- Mobile Device and Smart Phones
- Portable Media Devices
- Wearable Devices
- Advanced Notebook, UMPC and MID
- Portable Medical Devices
- GPS and Navigation Equipment
- Portable Instrumentation

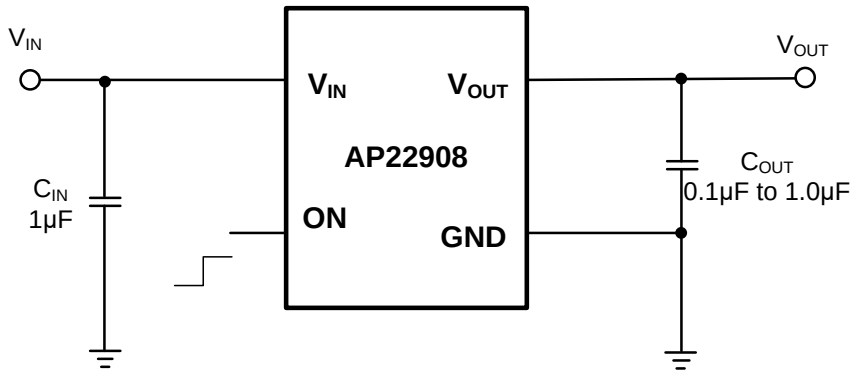
Features

- Wide Input Voltage Range: 1.08V to 3.6V
- Low On-Resistance:
  - 91mΩ Typical @1.2V
  - 53mΩ Typical @1.8V
  - 45mΩ Typical @2.5V
  - 40mΩ Typical @3.6V
- High DC Current Capability up to 1.5A
- Quick Discharging by Output Discharge Resistance
- Ultra Low Quiescent Current 0.05µA
- Active-high Control Pin
  - Minimum 0.9V V_{IH} of ON
- ESD Protection:
  - Human Body Model: 2kV
  - Charged Device Model: 1kV
- Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)
- Halogen and Antimony Free. “Green” Device (Note 3)

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, "Green" and and Lead-free.
3. Halogen- and Antimony-free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Typical Applications Circuit



Absolute Maximum Ratings

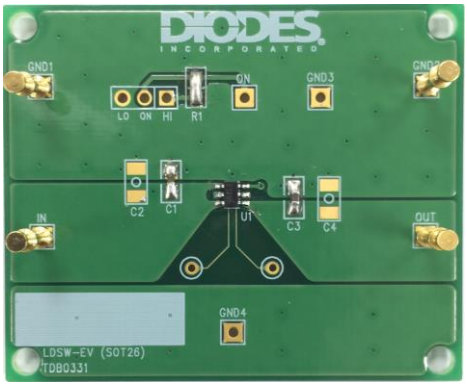
Symbol	Parameter	Ratings		Unit
ESD HBM	Human Body Model ESD Protection	2		kV
ESD CDM	Charged Device Model ESD Protection	1		kV
V_{IN}	Input Voltage	-0.3 to 4		V
V_{OUT}	Output Voltage	-0.3 to 4		V
V_{ON}	ON Voltage	-0.3 to 4		V
I_{LOAD}	Maximum Continuous Load Current	1.5		A
I_{LOAD}	Maximum Pulse Load Current, Pulse <300µs, 2% Duty Cycle	2.5		A
T_J	Maximum Junction Temperature	+125		°C
T_{ST}	Storage Temperature Range	-65 to +150		°C
P_D	Power Dissipation	SOT26	606	mW
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 4)	SOT26	165	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 5)	SOT26	30	°C/W

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	1.08	3.6	V
V_{ON}	ON Voltage Range	0	3.6	V
V_{OUT}	Output Voltage	0	3.6	V
I_{OUT}	Output Current	0	1.5	A
V_{IH}	ON High-Level Input Voltage	0.9	3.6	V
V_{IL}	ON Low-Level Input Voltage	0	0.38	V
T_A	Operating Ambient Temperature	-40	+85	°C

Evaluation Board

Top View



Dimensions: 53.34 mm(L) x 43.82 mm(W)

Application Note
AP22908 Application Information and Demo Board User Guide

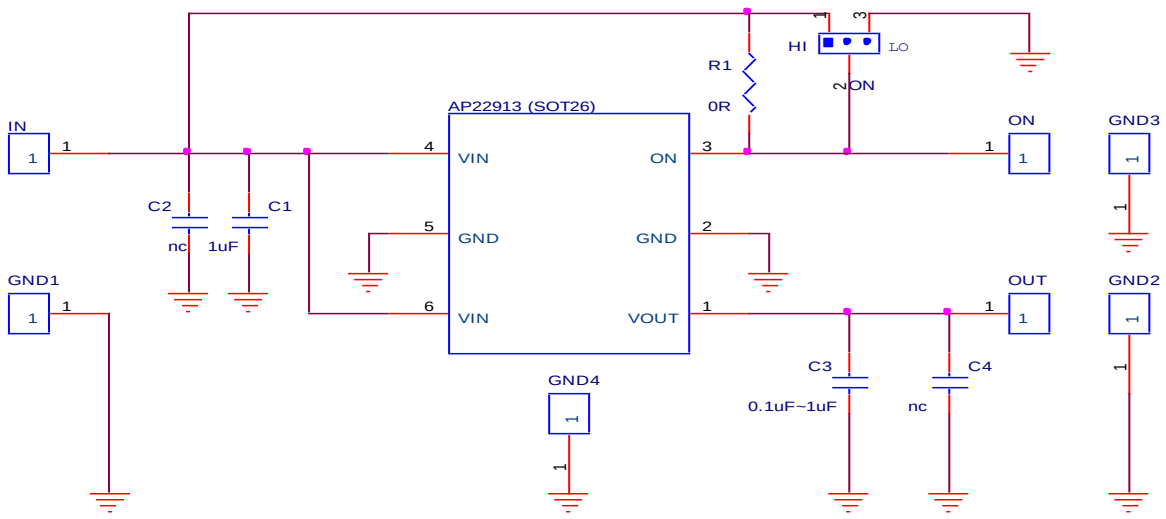
Quick Start Guide

AP22908 is a single p-channel MOSFET load switch. It has an input voltage range between 1.08V to 3.6V and is capable of handling up to 1.5A continuous current. The board demonstrates the AP22908's current handling capacity with its controlled turn on, low $R_{DS(on)}$ and very low quiescent current specification. All inputs and output are brought out to test points for control and monitoring. All passive components are included on the EVM for device operation.

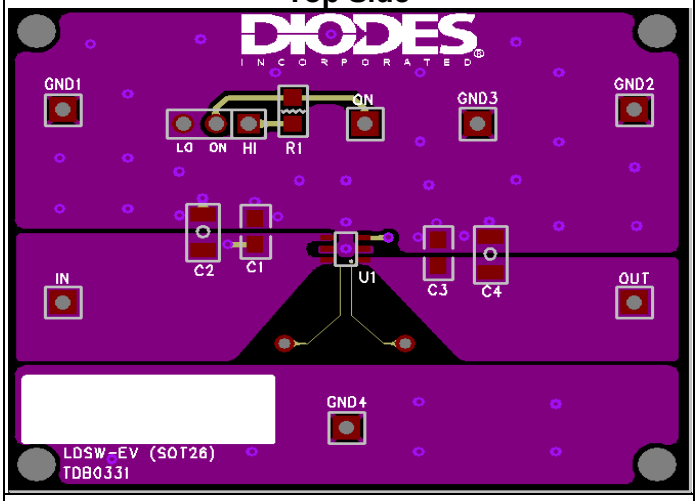
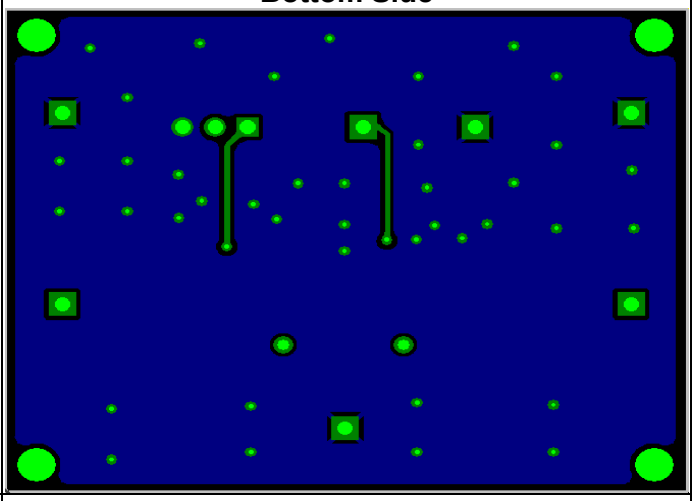
1. Connect a power supply between IN and GND terminals.
2. Connect the positive connection to the IN and the negative connection to the GND.
3. Connect an adjustable current or resistive load to OUT and GND terminals.
4. Connect the positive connection of the load to the OUT and the negative connection to the GND.
5. IN via reserved resistor R1 connect to ON terminal or installed shorting jumper in either the Hi or Lo positions. The default is shorted directly between IN and ON terminals.
6. Turn on the power supply.
7. Increase the load current of OUT and observe that the load current stop increasing after reaching limit level.

Evaluation Board Schematic

AP22908W6



PCB Layout

Top Side	Bottom Side
	
SOT26	SOT26

Bill of Materials

Component Location	Q'ty	Value	Specification	Vendor	Part No.	Size
U1	1	AP22908	1.5A single channel load switch	Diodes	AP22908W6-7	SOT26
C1	1	1μF	X7R 10% 25V Cap MLCC	Taiyo Yuden	TMK107B7105KA-T	0603
C3	1	0.1μF	X7R 10% 25V Cap MLCC	Taiyo Yuden	TMK107B7104KAHT	0603
C2,C4	2	-	NC	-	-	-
R1	1	0Ω	0603 ±1% 1/10W Resistor	Yageo	RC0603FR-100RL	0603
PCB	1	-	AP22908 EV Board	Diodes Inc.	TDB0331	-

Vendors of peripheral components

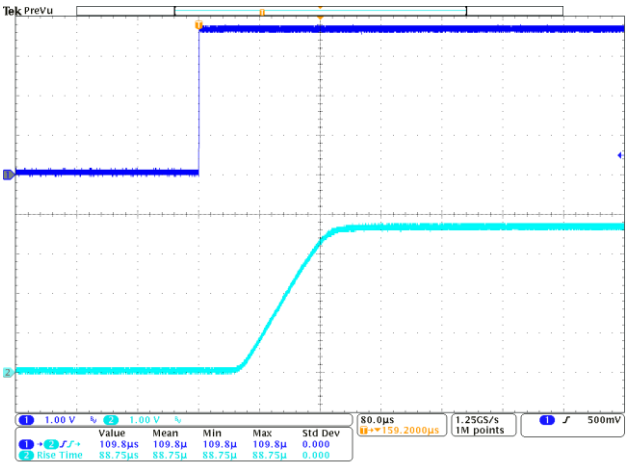
Suggested Capacitors：

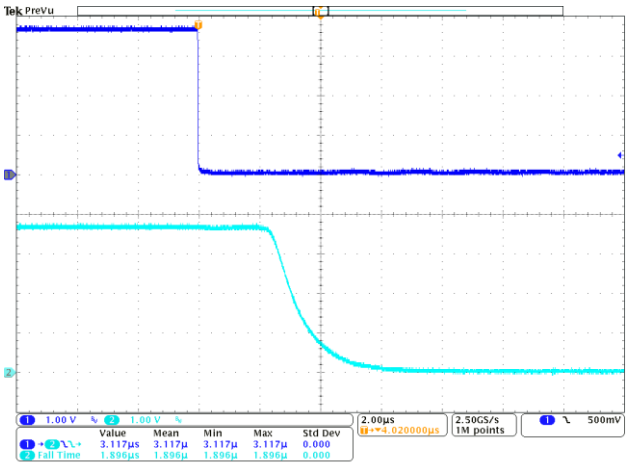
Vendor	Application	Value	Capacitance	Type	Series
Taiyo Yuden	Cin Cout	1μF	25V/X7R,10%	SMD	TMK107B7105KA-T
				SMD	TMK212B7105KG-T
	Cout	0.1μF	25V/X7R,10%	SMD	TMK107B7104KAHT
			50V/X7R, 10%	SMD	UMK212B7104KG-T
Murata	Cin Cout	1μF	25V/X7R,10%	SMD	GCM188R71E105KA64D
				SMD	GRM21BR71E105KA99
	Cout	0.1μF	25V/X7R, 10%	SMD	GRM188R71E104KA01
				SMD	GRM21BR71E104KA01

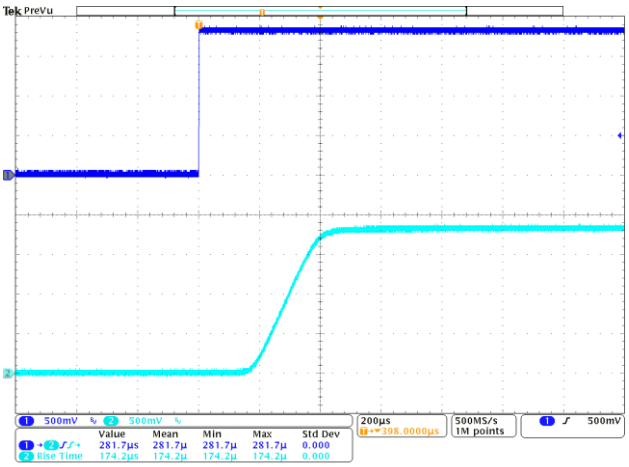
Suggested Resistor：

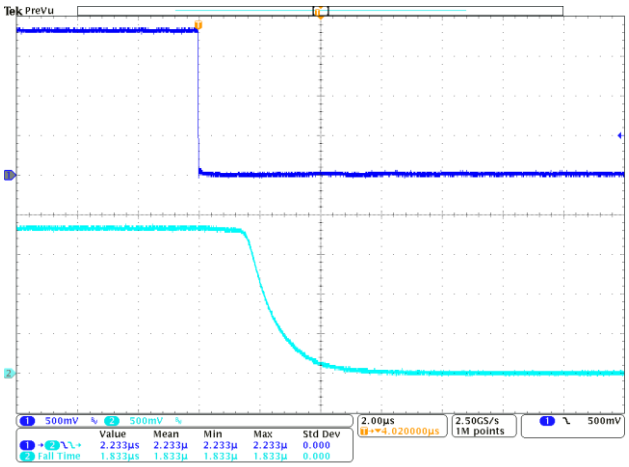
Vendor	Type	Series
Yageo	SMD	RC0603FR

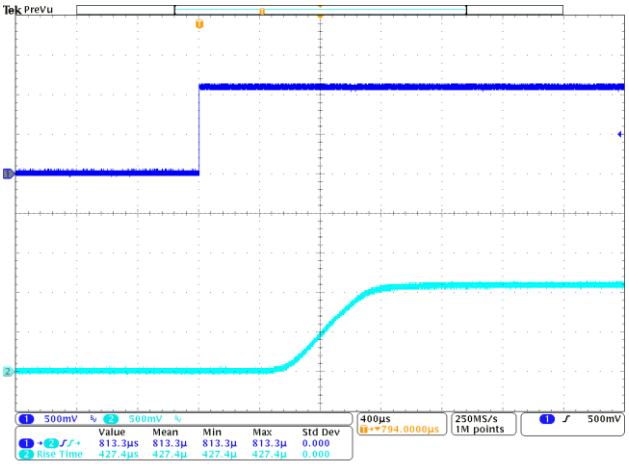
VOUT Turn On/Off Response Example (CH1: V_{ON}, CH2: V_{OUT})

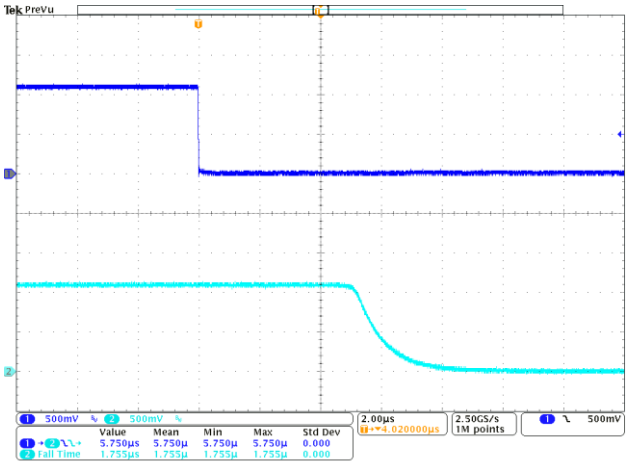












Application Note
AP22908 Application Information and Demo Board User Guide

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.
Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the
failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

www.diodes.com