DIO7195B

5.5V Full-Function 2.5A DC Load Switch with Adjustable Current Limit

Features

- **Input voltage: 1.8V to 5.5V**
- **Quiescent supply current 80µA with open load**
- **Turn-on controlled**
- **Continuous Current Max:2.5A**
- **0.045A-2.5A Current**
- **P-channel MOSFET current-limited architecture**
- **Under-Voltage Lockout**
- **Over-Voltage Lockout**
- **Low shutdown current**
- **Fast current limit response**
- **Thermal shutdown protection**
- **Reverse current blocking**
- **Package: six ball advanced 0.98x1.48mm WLCSP-6**

Applications

- **Handheld electronic device**
- **Portable Enterprise / Industrial Devices**
- **Digital Cameras**
- **Peripheral Ports and Accessories**
- **Medical Equipment**
- **Hot Swap**

Descriptions

The DIO7195B is load switch that provides full protection to systems and loads that may encounter large current conditions.

A P-channel MOSFET current-limit makes the current prevented, when the MOSFET is off. And the output voltage higher than input in addition. The perfectly thermal shutdown protection that shuts off the switch to prevent damage to the part when a continuous over-current condition causes excessive heating.

When the switch current reaches the current limit, the parts operate in a constant-current mode to prohibit excessive currents from causing damage.

The DIO7195B does not turn off after a current limit fault, but remains in the constant-current mode indefinitely.
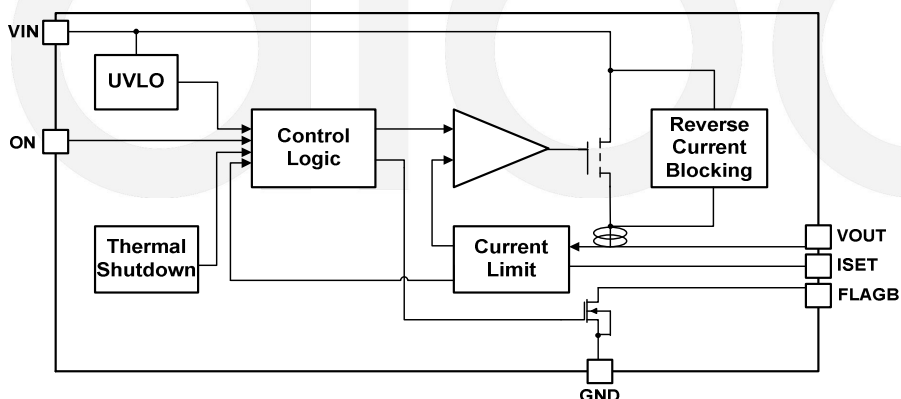
Block Diagram

Figure 1 Functional Block Diagram

Ordering Information

Order Part Number	Top Marking		T$_A$	Package	
DIO7195BWL6	D795	Green	-40 to 85°C	WLCSP-6	Tape & Reel,3000

Pin Assignment
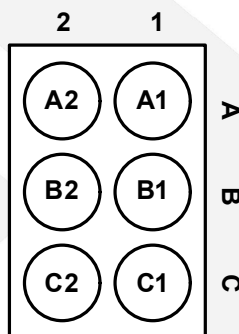
**Figure 2 Pin Assignment
(bottom view)**

Pin Definitions

Pin Name	Name	Pin Description
A1	FLAGB	Fault Output. Active low, open-drain output that indicates an over-current supply, under-voltage, or over-temperature state.
B1	VOUT	Switch Output. Output of the power switch.
C1	ISET	Current Limit Set Input. A resistor from ISET to ground sets the current limit for the switch.
C2	GND	Ground.
B2	VIN	Supply Input. Input to the power switch and the supply voltage.
A2	ON	Active high, ON control input.

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter		Rating	Unit
All pins		-0.3 to 6	V
Package Thermal Resistance	θ_{JA}	85	°C/W
Junction Temperature Range		150	°C
Lead Temperature (Soldering, 10 sec.)		260	°C
Storage Temperature Range (T_{STG})		-65 to 150	°C
ESD Susceptibility	HBM (Human Body Mode)	7	kV

Note: Input and output negative ratings may be exceeded if input and output diode current ratings are observed.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Parameter	Rating	Unit
VIN	1.8 to 5.5	V
All other pins	0 to 5.5	V
Junction Temperature Range	-40 to 125	°C
Ambient Temperature Range	-40 to 85	°C

DIO7195B

Electrical Characteristics

T_A=25°C V_{IN} =3.3V, unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_{IN}	Input Voltage Range			1.8		5.5	V
I_Q	Quiescent Supply Current	I_{OUT}=0mA, V_{ON}=V_{IN}	V_{IN}=1.8V		70		µA
			V_{IN}=3.3V		75		µA
			V_{IN}=5.5V		80		µA
$R_{DS(ON)}$	On Resistance	T_A=25°C,I_{OUT}=200mA			55	80	mΩ
		T_A=-40 to 85°C, I_{OUT}=200mA				135	
V_{IH}	On Input Logic High Voltage On	V_{IN}=1.8V		0.8			V
		V_{IN}=5.5V		1.4			
V_{IL}	On Input Logic Low Voltage	V_{IN}=1.8V				0.5	V
		V_{IN}=5.5V				1.0	
I_{IN}	On Input Leakage	V_{ON}=V_{IN} or GND		-1	0	1	µA
V_{IN_SD}	V_{IN} Shutdown Current	V_{ON}=0V, V_{IN}=5.5V, V_{OUT}=Short to GND		-2		2	µA
V_{FLB_L}	FLAGB Output Logic Low Voltage	V_{IN}=5V, I_{SINK}=2mA			0.05	0.20	V
		V_{IN}=1.8V, I_{SINK}=2mA			0.12	0.30	V
I_{FLB_H}	FLAGB Output Logic High Leakage Current	V_{IN}=5V, Switch ON				1	µA
I_{SDT}	VOUT Shutdown Current	V_{ON}=0V,V_{OUT}=5.5V, V_{IN}=Short-to-GND		-2		2	µA
$V_{BREAKDOWN}$	Reverse Breakdown Voltage	V_{IN}=V_{ON}=0V, I_{OUT}=200µA			8		V
I_{LIM}	Current Limit	V_{IN}=4.5V	R_{SET}=430Ω		2.5		A
			R_{SET}=680Ω		1.6		
			R_{SET}=910Ω	0.9	1.0	1.1	
			R_{SET}=1.5KΩ		0.5		
			R_{SET}=15.8KΩ		45		mA
T_{SD}	Thermal Shutdown Temperature	Shutdown Threshold			140		°C
		Return from Shutdown			130		°C
	Thermal Shutdown Hysteresis				10		°C
V_{OVLO}	Over-Voltage Lockout	V_{IN} Increasing		5.6	5.8	6.1	V

5.5V Full-Function 2.5A DC Load Switch with Adjustable Current Limit

| V_{OVLO_HYST}	Over-Voltage Lockout Hysteresis			200		mV
TF_D	Delay time	From current limit to FLAGB		3		ms
V_{UVLO}	Under-Voltage Lockout	V_{IN} Increasing	1.55	1.65	1.75	V
V_{UVLO_HYST}	Under-Voltage Lockout Hysteresis			50		mV
td_{ON}	Delay On Time	$R_L=500\Omega$, $C_L=0.1\mu F$		80		µs
t_R	V_{OUT} Rise Time	$R_L=500\Omega$, $C_L=0.1\mu F$		80		µs
t_{ON}	Turn On Time	$R_L=500\Omega$, $C_L=0.1\mu F$		160		µs
td_{OFF}	Delay Off Time	$R_L=500\Omega$, $C_L=0.1\mu F$		7		µs
t_F	V_{OUT} Fall Time	$R_L=500\Omega$, $C_L=0.1\mu F$		140		µs
t_{OFF}	Turn Off Time	$R_L=500\Omega$, $C_L=0.1\mu F$		146		µs
t_{SC}	Short-Circuit Response Time	$V_{IN}=V_{OUT}=3.3V$		5		µs

Typical Performance Characteristics

Typical value: $V_{IN}=3.3V$, $C_{IN}=1uF$, $C_{OUT}=1uF$, $T_A=25°C$, unless otherwise specified.

Enable Start up
(Vin=5V, $R_{Load}=2.5ohm$)
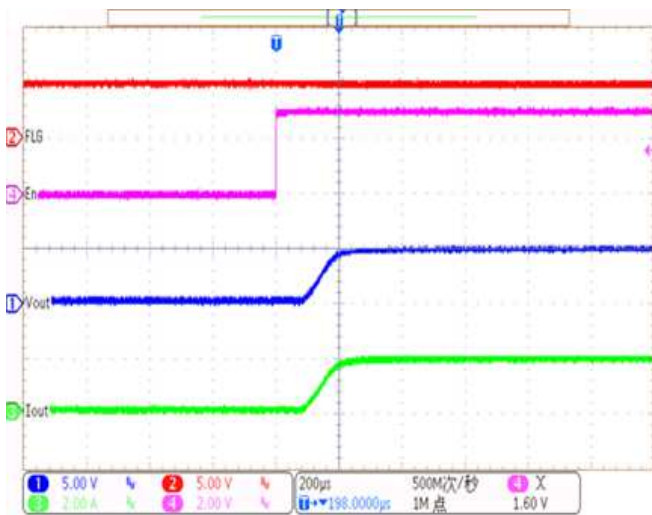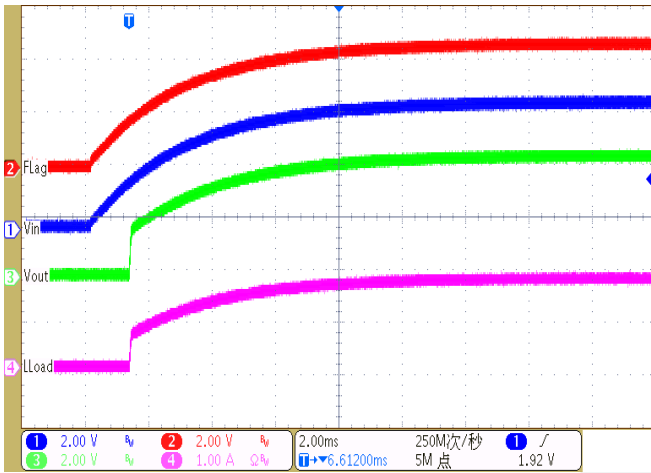
Enable Shut down
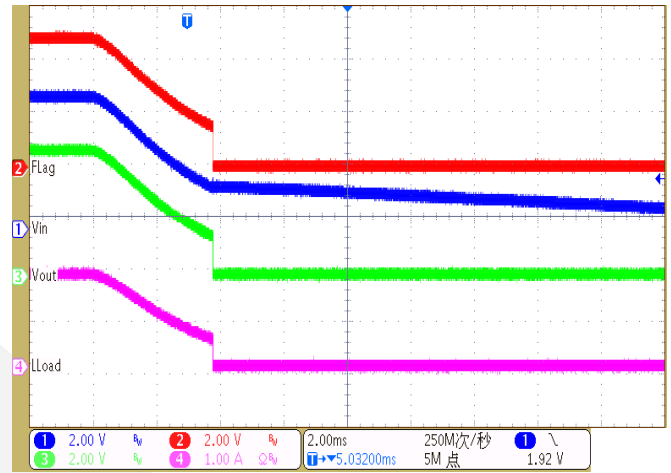**(Vin=5V, $R_{Load}=2.5ohm$)**
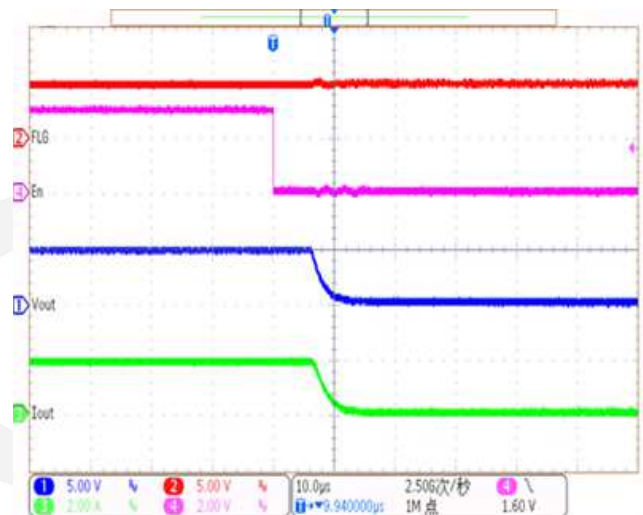
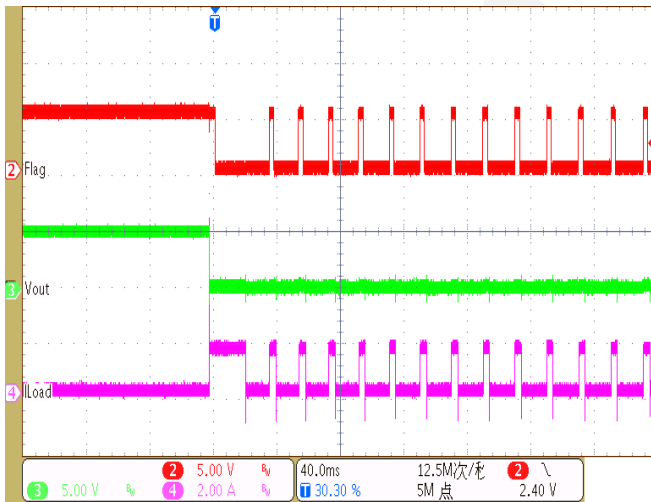**5.5V Full-Function 2.5A DC Load Switch with Adjustable Current Limit**

Power on (Vin=5V, R$_{Load}$=2.5ohm)

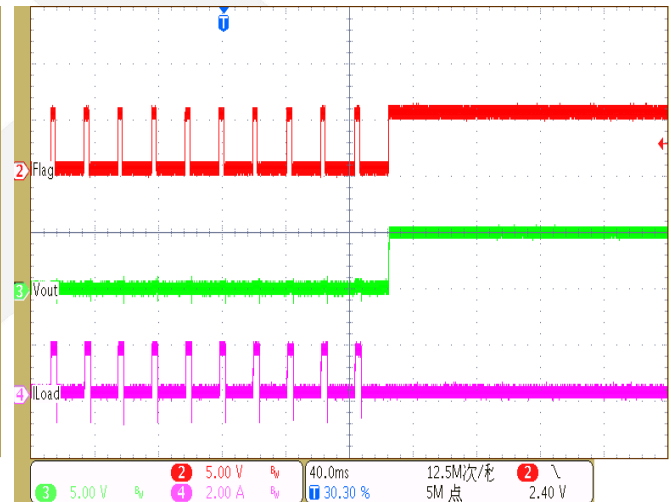### Power off (Vin=5V, R$_{Load}$=2.5ohm)
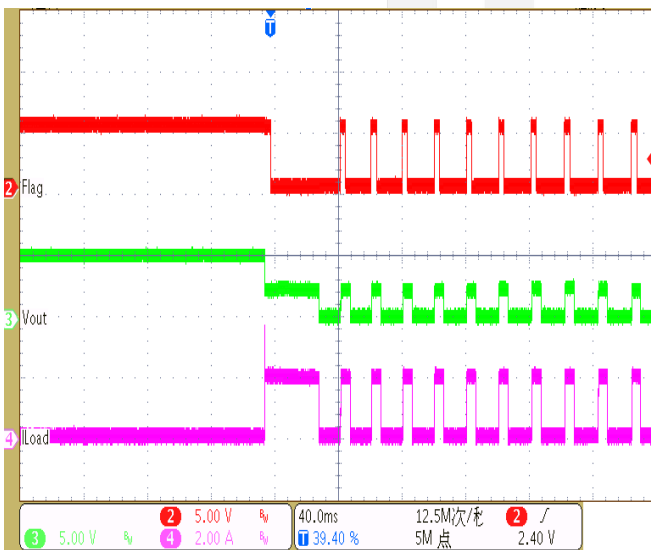

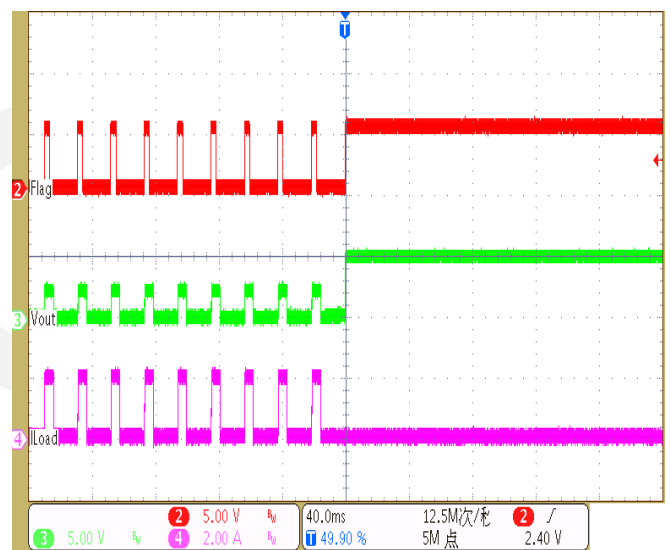### Short circuit protection

Short circuit protection recovery

Over Load (No Load to 1ohm Response)

Over Load (1ohm to No Load Response)

Application Information

The DIO7195B is current-limited switch that protects system and load from damaged or disrupted by the application of high currents. The controller protects against system malfunctions through current limiting, under-voltage lockout, and thermal shutdown.

Current Limit

The current limit ensures the current through the switch does not exceed the maximum. The DIO7195B does not including limit blanking period, so it remains in a constant current state until the ON pin is deactivated or the thermal shutdown turns off the switch. The current limit is set with an external resistor connected between I_{SET} and GND. This resistor is selected using the following equation:

$$I_{\lim} \approx \frac{910}{R_{SET}}(A)$$

A short-circuit detection feature is introduced to preventing the switch from large power dissipation during heavy load. The switch is put into short- circuit current-limiting mode if the switch is loaded with a heavy load.

The DIO7195B has no current limit blanking period. When the output voltage drops below 1.1V, the short-circuit detection threshold voltage, the current limit value is re-conditioned and the short-circuit current-limit value is decreased, this value is about 60% of typical current limit. This keeps the power dissipation of the part below a certain limit even at dead-short conditions at 5.5V input voltage.

On/Off Control

The ON/Off pin controls the state of the switch. The DIO7195B does not turn off in response to an over-current condition, but remains operating inconstant-current mode as long as ON is active and the thermal shutdown or under-voltage lockout have not activated.

Fault Report

FLAGB signals the fault mode by activating low up on the detection of an over-current, input under-voltage, over-voltage or over-temperature condition, the FLAGB goes low at the end of the blanking time, and remains low during the faults and immediately returns high at the end of the fault condition. FLAGB is an open-drain MOSFET that requires a pull-up resistor between VIN and FLAGB. During shutdown, the pull-down on FLAGB is disabled to reduce current draw from the supply.

Under-Voltage Lockout (UVLO)

The under-voltage lockout turns the switch off if the input voltage drops below the under-voltage lockout threshold. With the ON pin active, the input voltage rising above the under-voltage lockout threshold causes a controlled turn-on of the switch, which limits current over shoot.

Thermal Shutdown

The thermal shutdown protects the die from internally or externally generated excessive temperatures. During an over-temperature condition, FLAGB is activated and the switch is turned off. The switch automatically turns on again if temperature of the die drops below the threshold temperature.

Reverse-Current Blocking

The reverse-current blocking feature that protects the input source against current flow from output to input. For a standard USB power design, this is an important feature to protect the USB host from being damaged due to reverse current flow on V_{BUS}.
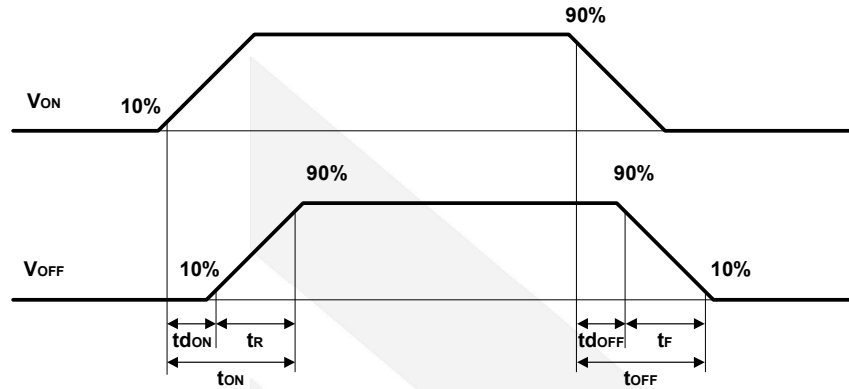

Figure 3 Timing diagram

td_{ON}=Delay On Time; t_R= V_{OUT} Rise Time; t_{ON}=Turn-On Time.

td_{OFF}= Delay Off Time; t_F= V_{OUT} Fall Time.

t_{OFF}=Turn-Off Time.

Typical Application
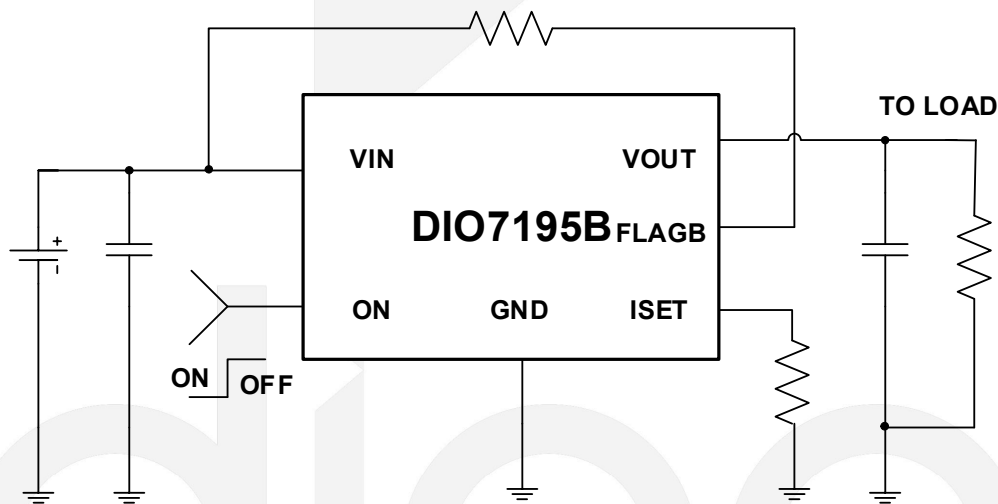

Figure 4 Typical application

CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as, cell phone, handheld products, laptop, and medical equipment and so on. Dioo's product families include analog signal processing and amplifying, LED drivers and charger IC. Go to http://www.dioo.com for a complete list of Dioo product families.

For additional product information, or full datasheet, please contact with our Sales Department or Representatives.