

DIO7164

5.5V Low Loss Power Distribution Switch

Features

- Input voltage: 2.7V to 5.5V
- Four different continuous current versions
- Enable polarity: active high or low
- Over temperature protection
- Reverse blocking (no body diode)
- OUT can be forced higher than IN at shutdown
- Compact SOT23-5 package

Applications

- USB Ports/Hubs
- Digital TV
- Set-Top Boxes
- VOIP Phones

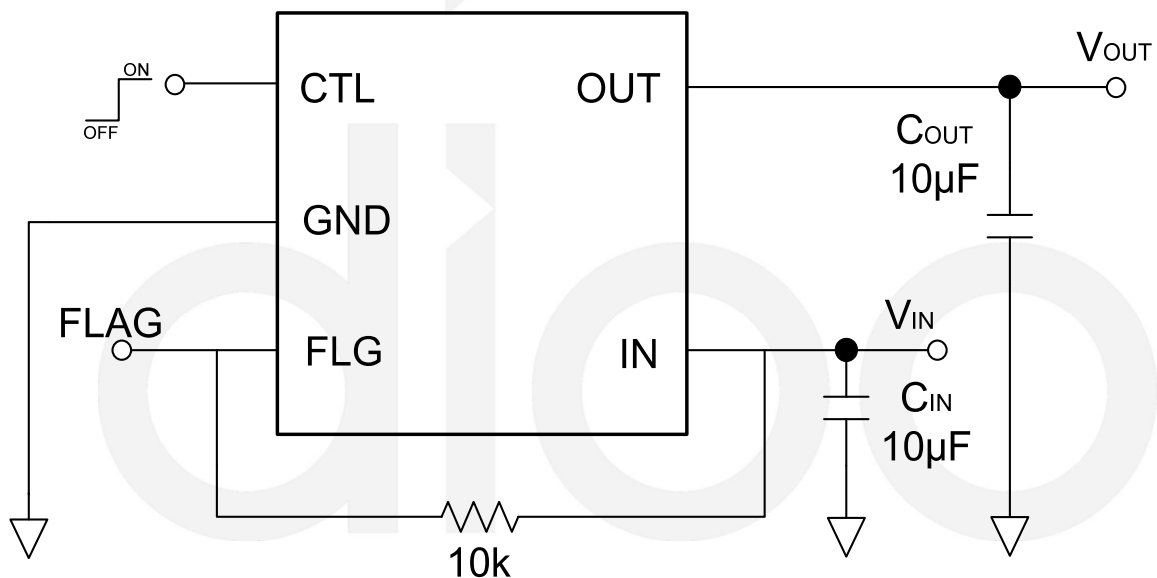
Descriptions

The DIO7164 power distribution switch is intended for applications where precision current limiting is required or heavy capacitive loads and short circuits are encountered. The power switch rising and falling times are controlled to minimize current surges during turning on/off.

The DIO7164A/B/C/D provide separately 0.35A/0.7A/1.0A/1.5A three current levels and it device limits the output current under a safe level by using a constant current mode when the output load exceeds the current limit threshold.

The DIO7164 is available in the SOT23-5 package. It is rated over the -40°C to $+85^{\circ}\text{C}$ temperature range.

Block Diagram





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5.5V, 2A Low Loss Power Distribution Switch

Ordering Information

Order Part Number	Top Marking	CTL		T _A	Package	
DIO7164HAST5	W4HA	Active High	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164LAST5	W4LA	Active Low	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164HBST5	W4HB	Active High	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164LBST5	W4LB	Active Low	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164HCST5	W4HC	Active High	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164LCST5	W4LC	Active Low	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164HDST5	W4HD	Active High	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000
DIO7164LDST5	W4LD	Active Low	Green	-40 to +85°C	SOT23-5	Tape & Reel, 3000

Ordering Information Complimentary Note

Ordering number = Part No. + Enable Active Version + Continuous Current Version + Package Code

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H: Enable Active High

L: Enable Active Low

ST5: Stands for SOT23-5

A: 0.35A Continuous Current Version

B: 0.7A Continuous Current Version

C: 1.0A Continuous Current Version

D: 1.5A Continuous Current Version

Pin Assignments

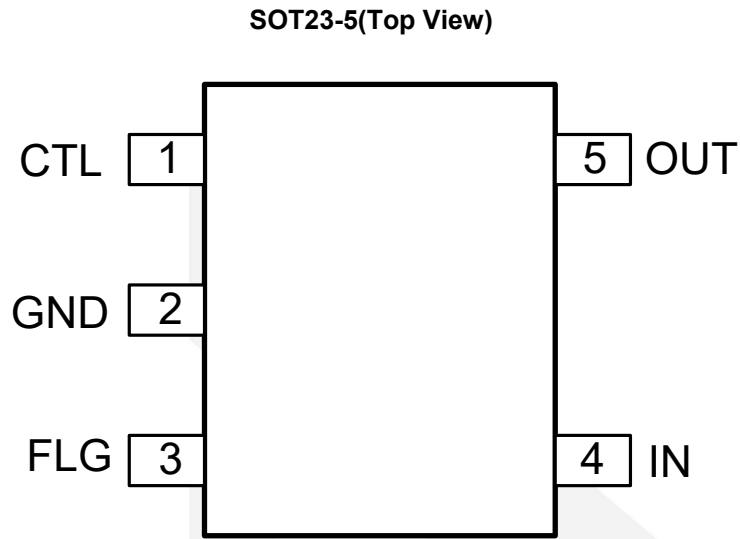


Figure 1 Pin Assignment

Pin Description

Pin Name	Pin Description
CTL	Active high or low. Do not leave it floating
GND	Ground pin
FLG	Fault flag output
IN	Input pin, decoupled with a 10 μ F capacitor to GND
OUT	Output pin, decoupled with a 10 μ F capacitor to GND



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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} , SOT23-5	250	°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)	6	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
IN		2.7 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



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Electrical Characteristics

$T_A=25^{\circ}\text{C}$ $V_{IN} = 5\text{V}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{IN}	Input Voltage Range		2.7		5.5	V
I_{SHDN}	Shutdown Input Current	Open load, IC Disabled		0.2	1	μA
I_Q	Quiescent Supply Current	Open load, IC Disabled		50	88	μA
$R_{DS(ON)}$	FET R_{ON}	$I_{OUT}=100\text{mA}$		75	99	m Ω
$V_{CTL(H)}$	CTL Rising Threshold	Logic High Voltage	1.4			V
$V_{CTL(L)}$	CTL Falling Threshold	Logic low Voltage			0.4	V
I_{CTL}	CTL Leakage Current	$V_{CTL}=5.0\text{V}$			1	μA
V_{IN_UVLO}	IN UVLO Threshold				2.5	V
V_{IN_HYS}	IN UVLO Hysteresis			240	400	mV
I_{LIM}	Current Limit	DIO7164HA, DIO7164LA	0.375	0.5	0.625	A
		DIO7164HB, DIO7164LB	0.75	1	1.25	
		DIO7164HC, DIO7164LC	1.1	1.5	1.9	
		DIO7164HD, DIO7164LD	1.5	2	2.5	
T_{ON}	Turn-on Time	$R_L=10\Omega$, $C_{OUT}=1\mu\text{F}$		400		μs
T_{OFF}	Turn-off Time	$R_L=10\Omega$, $C_{OUT}=1\mu\text{F}$		20		μs
T_{SD}	Thermal Shutdown Temperature			140		$^{\circ}\text{C}$
	Thermal Shutdown Hysteresis			20		$^{\circ}\text{C}$

Specifications subject to change without notice.



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Application Information

Power Supply Considerations

A 10 μ F ceramic capacitor from V_{IN} to GND to prevent the input voltage from dropping during the hot-plug condition is strongly recommended. However higher capacitance could help reduce the voltage drop. Further more, bypassing the output with a 10 μ F ceramic capacitor improves the immunity of the device to short-circuit transients, because an output short will cause ringing on the input without the input capacitor. It could destroy the internal circuitry when the input transient voltage exceeds the absolute maximum supply voltage even for a short duration.

Enable

The logic enable controls the power switch, the bias for the charge pump, driver, and other circuitry to reduce the supply current. The CTL control pin must be driven to a logic high or a logic low for a clearly defined signal input. Floating these control lines may cause unpredictable operation.

Over-Current Protection

The DIO7164 responds to over current conditions by limiting output current to the I_{LIM} levels. When an over current condition is detected, the device maintains a constant output current and reduces the output voltage accordingly. Complete shutdown occurs only if the fault is present long enough to activate thermal limit.

Two possible overload conditions can occur. In the first condition, an excessive load occurs while the device is enabled. When the excessive load occurs, very high currents may flow for a short time before the current limit circuit can react. After the current limit circuit has tripped (reached the overcurrent trip threshold) the device switches into constant current mode to limit the current close to I_{LIM} .

In the second condition, the load is gradually increasing beyond the recommended operating current. The current is permitted to rise until the currentlimit threshold (I_{LIM}) is reached or until the thermal limit of the device is exceeded. The DIO7164 is capable of delivering current up to the currentlimit threshold (I_{LIM}) without damaging the device. Once the threshold has been reached, the device switches into its constant current mode.

Thermal Protection

Thermal protection prevents damage to the IC when heavy overload or short circuit conditions are present for extended periods of time. The conditions force the DIO7164 into constant current mode, and under short circuit conditions, the voltage across the switch is equal to the input voltage. The increased dissipation causes the junction temperature to rise to high levels. The protection circuit senses the junction temperature of the switch and shuts it off. Hysteresis is built into the thermal sense circuit, and after the device has cooled approximately 20 degrees, the switch turns back on. The switch continues to cycle in this way until the overload or input power is removed.



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