# DIO7005

## 5.5V Low Loss Power Distribution Switch

## Features

- Input voltage: 2.7V to 5.5V
- Typical 75mΩ on-resistance
- Output discharge resistance
- Five different continuous current versions
- Under voltage lockout
- Over current protection, short circuit protection and over temperature protection
- Fault time 5ms typically with blanking
- Reverse blocking (no body diode)
- No reverse current when power ON or power OFF
- Enable polarity: active high or active low
- Green SOT23-5packages

## Applications

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

## Descriptions

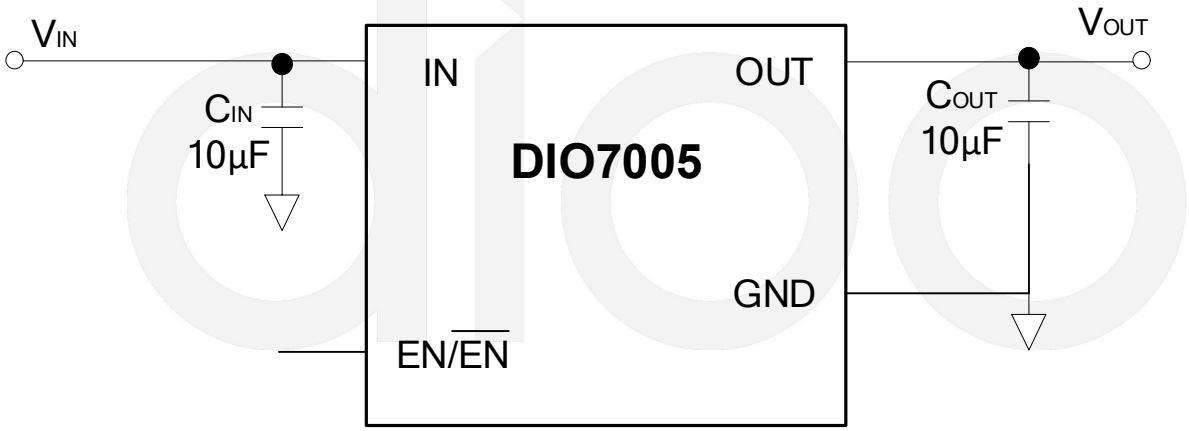
The DIO7005 power distribution switch is intended for applications where precision current limiting is required or heavy capacitive loads and short circuits are encountered. The power switch rising and falling times are controlled to minimize current surges during turning on/off.

The DIO7005A/B/C/D/E provide separately 350mA/700mA/1A/1.5A/2A five current levels.

The DIO7005 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 DIO7005 is available in the SOT23-5 packages. It is rated over the -40°C to 85°C temperature range.

## Typical Application



## Ordering Information

| Order Part Number | Top Marking | Recommended Continuous Current | EN/$\overline{EN}$ | Output Discharge Resistance | Package | |
|---|---|---|---|---|---|---|
| DIO7005HAST5 | 5HAW | 350mA | Active High | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005HBST5 | 5HBW | 700mA | Active High | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005HCST5 | 5HCW | 1A | Active High | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005HDST5 | 5HDW | 1.5A | Active High | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005HEST5 | 5HEW | 2A | Active High | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005LAST5 | 5LAW | 350mA | Active Low | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005LBST5 | 5LBW | 700mA | Active Low | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005LCST5 | 5LCW | 1A | Active Low | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005LDST5 | 5LDW | 1.5A | Active Low | Yes | SOT23-5 | Tape & Reel, 3000 |
| DIO7005LEST5 | 5LEW | 2A | Active Low | Yes | SOT23-5 | Tape & Reel, 3000 |

## Ordering Information Complimentary Note

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

DIO7005

H: Enable Active High

L: Enable Active Low

A: 350mA Continuous Current Version

B: 700mA Continuous Current Version

C: 1A Continuous Current Version

D: 1.5A Continuous Current Version

E: 2A Continuous Current Version

ST5: Stands for SOT23-5

## Pin Assignments

**SOT23-5(Top View)**

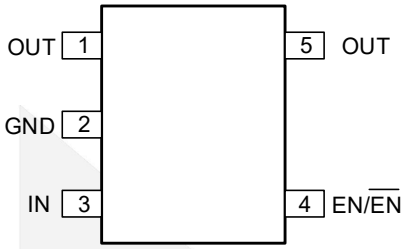



**Figure 1 Pin Assignment**

## Pin Description

| Pin Name | Pin Description |
|---|---|
| OUT | Output pin, decoupled with a 10μF capacitor to GND |
| GND | Ground pin |
| EN/$\overline{EN}$ | Active high or Active low. Do not leave it floating |
| IN | Input pin, decoupled with a 10μF capacitor to GND |

## 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 | $\theta_{JA}$ ,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 |
| | CDM (Charged Device Mode) | 2 | |

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.

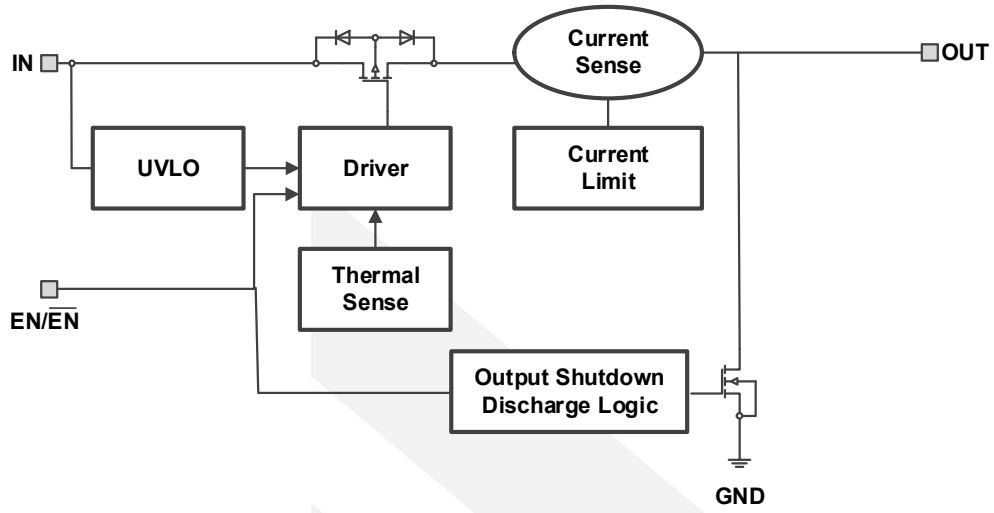
| Parameter | Rating | Unit |
|---|---|---|
| IN | 2.7 to 5.5 | V |
| All other pins | 0 to 5.5 | V |
| Junction Temperature Range | -40 to 125 | °C |
| Ambient Temperature Range | -40 to 85 | °C |

## Electrical Characteristics

$T_A$=25°C, $V_{IN}$ = 5V, unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{IN}$ | Input Voltage Range | | 2.7 | | 5.5 | V |
| $I_{SHDN}$ | Shut down Input Current | Open load, IC Disabled | | 0.2 | 1 | μA |
| $I_Q$ | Quiescent Supply Current | Open load, IC Enabled | | 50 | 88 | μA |
| $R_{DS(ON)}$ | FET $R_{ON}$ | $I_{OUT}$=100mA | | 75 | 99 | mΩ |
| $V_{EN(H)}$ | EN Rising Threshold | $V_{IN}$ = 2.7V to 5.5V | 1.4 | | | V |
| $V_{EN(L)}$ | EN Falling Threshold | $V_{IN}$ = 4.5V to 5.5V | | | 0.6 | V |
| | | $V_{IN}$ = 2.7V to 4.5V | | | 0.5 | |
| $I_{EN}$ | EN Leakage Current | $V_{EN}$=5.0V | | | 1 | μA |
| $V_{IN\_UVLO}$ | IN UVLO Threshold | | | | 2.5 | V |
| $V_{IN\_HYS}$ | IN UVLO Hysteresis | | | 240 | 400 | mV |
| $I_{LIM}$ | Current Limit | DIO7005HA, DIO7005LA | 0.375 | 0.5 | 0.625 | A |
| | | DIO7005HB, DIO7005LB | 0.75 | 1 | 1.25 | |
| | | DIO7005HC, DIO7005LC | 1.1 | 1.5 | 1.9 | |
| | | DIO7005HD, DIO7005LD | 1.5 | 2 | 2.5 | |
| | | DIO7005HE, DIO7005LE | 2.1 | 2.5 | 3.1 | |
| $T_{ON}$ | Turn-on Time | $R_L$=10Ω, $C_{OUT}$=1μF | | 400 | | μs |
| $T_{OFF}$ | Turn-off Time | $R_L$=10Ω, $C_{OUT}$=1μF | | 20 | | μs |
| $T_{SD}$ | Thermal Shut down Temperature | | | 140 | | °C |
| | Thermal Shut down Hysteresis | | | 20 | | °C |

## Block Diagram




## Application Information

### Power Supply Considerations

A 10μF 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 10μF 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.

### Under Voltage Lockout

A voltage sense circuit monitors the input voltage. When the input voltage is below approximately 2.4V, a control signal turns off the power switch.

### Enable

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

### Over-Current Protection

The DIO7005 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 shut down 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 DIO7005 is capable of delivering current up to the current limit threshold ($I_{LIM}$) without damaging the device. Once the threshold has been reached, the device switches into its constant current mode.

**Thermal Protection**

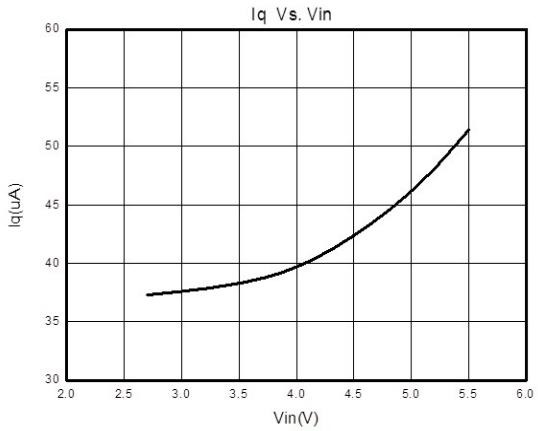
Thermal protection prevents damage to the IC when heavy overload or short circuit conditions are present for extended periods of time. The conditions force the DIO7005 into constant current mode, and under short circuit conditions, the voltage across the switch is equal tothe input voltage. The increased 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 continuesto cycle in this way until the overload or input power is removed.

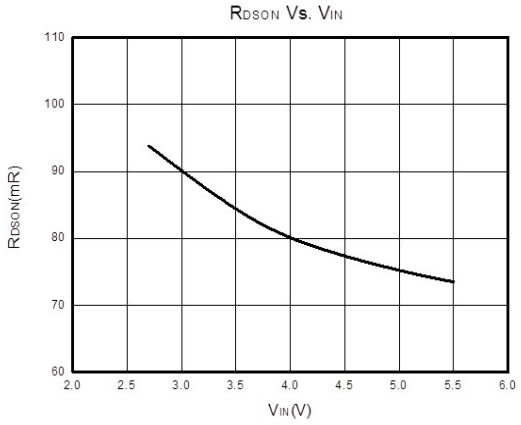
**Reverse-voltage Protection**

The reverse-voltage protection feature turns off the P-channel MOSFET whenever the output voltage exceeds the input voltage by 175mV (typ) for 4ms (typ). A reverse current of $(V_{OUT}-V_{IN})/R_{DS(on)}$ will be present when this occurs. This prevents damage to devices on the input side of the DIO7005 by preventing significant current from sinking into the input capacitance. The DIO7005 devices allow the P-channel MOSFET to turn on once the output voltage goes bellow the input voltage for the same 4ms deglitch time.

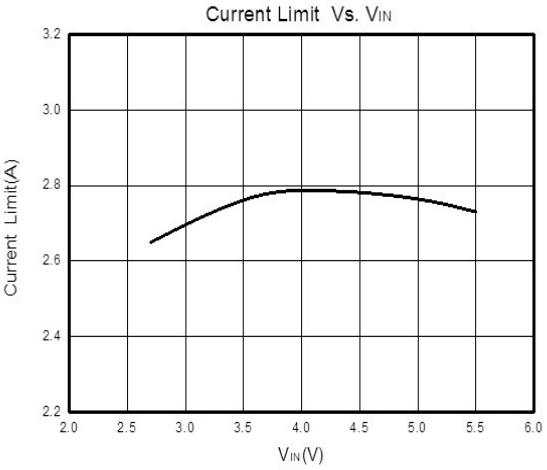
# Typical Performance Characteristics

$T_A$=25°C, $V_{IN}$ = 5V, unless otherwise noted.

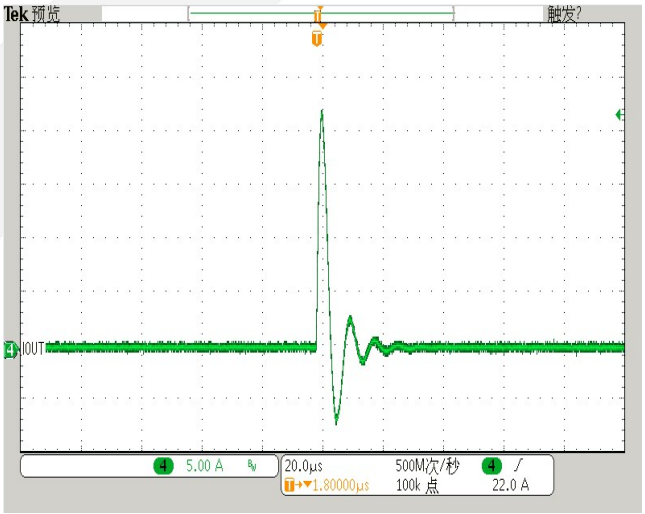


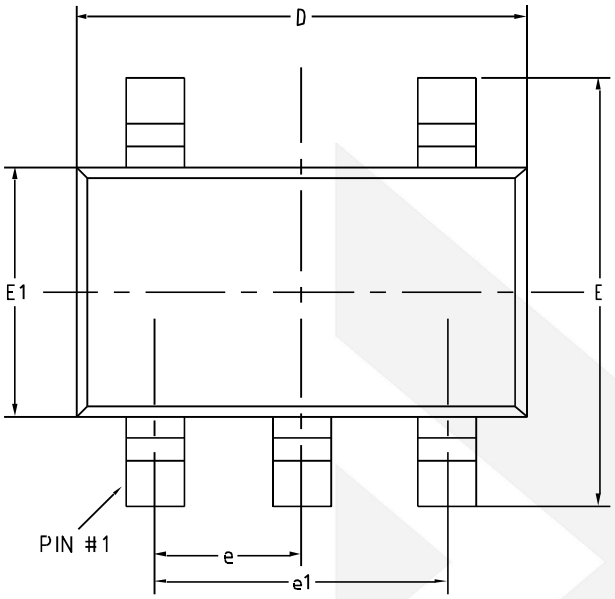

**Current Limit**

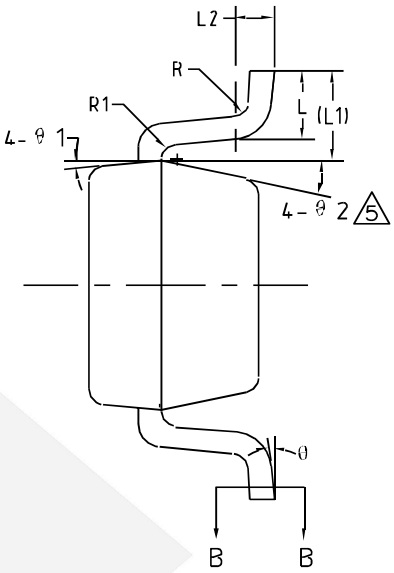


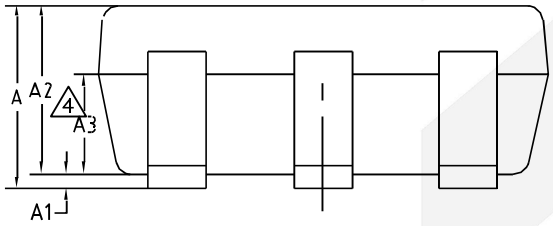

**Output Short Response**

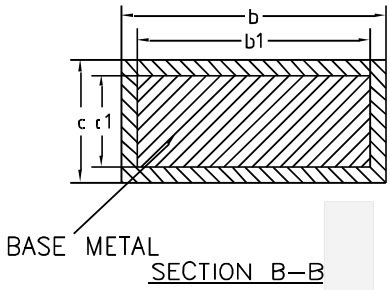


# Physical Dimensions: SOT23-5




| COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER) | | | |
|---|---|---|---|
| **Symbol** | **MIN** | **NOM** | **MAX** |
| A | - | - | 1.25 |
| A1 | 0 | - | 0.15 |
| A2 | 1.00 | 1.10 | 1.20 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.36 | - | 0.50 |
| b1 | 0.36 | 0.38 | 0.45 |
| c | 0.14 | - | 0.20 |
| c1 | 0.14 | 0.15 | 0.16 |
| D | 2.826 | 2.926 | 3.026 |
| E | 2.60 | 2.80 | 3.00 |
| E1 | 1.526 | 1.626 | 1.726 |
| e | 0.90 | 0.95 | 1.00 |
| e1 | 1.80 | 1.90 | 2.00 |
| L | 0.35 | 0.45 | 0.60 |
| L1 | | 0.59REF | |
| L2 | | 0.25BSC | |
| R | 0.10 | - | - |
| R1 | 0.10 | - | 0.25 |
| Θ | 0° | - | 8° |
| Θ1 | 3° | 5° | 7° |
| Θ2 | 6° | - | 14° |

## CONTACT US

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