

DIO7805

Low Iq , Wide Input Voltage Low Dropout Regulator

Features

- Operating Input Voltage Range: 2.5V to 30V
- Fixed Voltage Options Available: 5V (upon request)
- Ultra-Low Quiescent Current: typical 4 μ A over Temperature
- PSRR: 60dB at 1kHz
- Stable with Small 1 μ F Ceramic Capacitor
- Soft-start to Reduce Inrush Current and Overshoots
- Thermal Shutdown and Current Limit Protection
- SOA Limiting for High Vin/High Iout – Static/Dynamic
- Available in TO252-3 and SOT89-3 Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Descriptions

The DIO7805 is 300mA LDO Linear Voltage Regulator. It is a very stable and accurate device with ultra-low quiescent current consumption (typical 4 μ A over the full temperature range) and a wide input voltage range (up to 30V). The regulator incorporates several protection features such as Thermal Shutdown and Current Limiting.

Applications

- Wireless Chargers
- Portable Equipment
- Communication Systems

Typical Applications

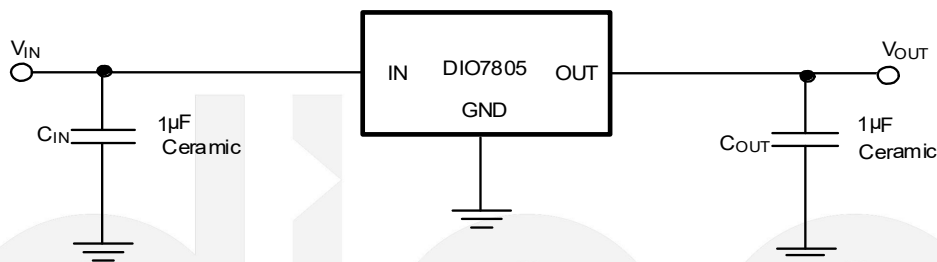


Figure 1. Typical Application Schematic



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Ordering Information

Order Part Number	Voltage Option	Top Marking		T _A	Package	
DIO7805TA3	5.0V	DIO78H	Green	-40 to 85°C	TO252-3	Tape & Reel,2500
DIO7805TC3	5.0V	DIO78H	Green	-40 to 85°C	SOT89-3	Tape & Reel,2500

Pin Assignment

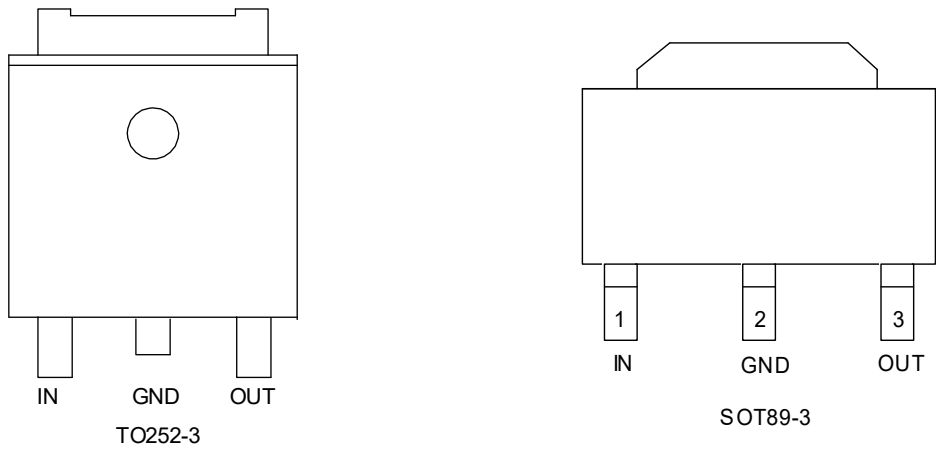


Figure 2. Top View

Pin Descriptions

Name	Description
IN	Input pin. A small capacitor is needed from this pin to ground to assure stability.
GND	Power supply ground.
OUT	Regulated output voltage pin. A small 1µF ceramic capacitor is needed from this pin to ground to assure stability.

Absolute Maximum Ratings

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Symbol	Parameter	Rating	Unit
V _{IN}	Input Voltage (Note 1)	-0.3 to 30	V
V _{OUT}	Output Voltage	-0.3 to V _{IN} +0.3 (max. 6)	V
t _{SC}	Output Short Circuit Duration	Indefinite	s
T _{J(MAX)}	Maximum Junction Temperature	150	°C
T _{STG}	Storage Temperature	-55 to 150	°C
HBM	ESD Capability, Human Body Model	2000	V

Electrical Characteristics

$-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$; $V_{IN} = 2.5\text{V}$ or 6V , whatever is greater; $I_{OUT} = 1\text{mA}$, $C_{IN} = C_{OUT} = 1\mu\text{F}$, unless otherwise noted.

Typical values are at $T_J = 25^{\circ}\text{C}$. (Note 2)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{IN}	Operating Input Voltage		2.5		30	V
V_{OUT}	Output Voltage Accuracy (fixed versions)	$-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$, $6\text{V} < V_{IN} < 16\text{V}$, $0.1\text{mA} < I_{OUT} < 300\text{mA}$ (Note 4)	-2%		2%	V
Reg_{LINE}	Line Regulation	$6\text{V} \leq V_{IN} \leq 16\text{V}$, $I_{OUT}=1\text{mA}$		10		mV
Reg_{LOAD}	Load Regulation	$I_{OUT} = 0.1\text{mA}$ to 300mA		10		mV
V_{DO}	Dropout voltage	$V_{DO} = V_{IN} - (V_{OUT(NOM)} - 3\%)$, $I_{OUT} = 150\text{mA}$ (Note 3)		240		mV
I_{LIM}	Maximum Output Current	$V_{IN} = 6\text{V}$ (Note 4)	300		800	mA
I_Q	Quiescent Current	$I_{OUT} = 0\text{mA}$		4.0	8.0	uA
I_{GND}	Ground current	$I_{OUT} = 10\text{mA}$		50		uA
		$I_{OUT} = 300\text{mA}$		300		
PSRR	Power Supply Rejection Ratio	$V_{IN} = 6\text{V} + 100\text{mV}_{pp}$ $V_{OUT} = 5\text{V}$ $I_{OUT} = 1\text{mA}$, $C_{OUT} = 1\mu\text{F}$			60	dB
V_N	Output Noise Voltage	$V_{OUT} = 5\text{V}$, $I_{OUT} = 10\text{mA}$ $f = 100\text{Hz}$ to 100kHz		36		uVrms
T_{SD}	Thermal Shutdown Temperature (Note 5)	Temperature increasing from $T_J = 25^{\circ}\text{C}$		150		$^{\circ}\text{C}$
T_{SDH}	Thermal Shutdown Hysteresis(Note 5)	Temperature falling from T_{SD}		25		$^{\circ}\text{C}$

Specifications subject to change without notice.

Note:

1. Refer to ELECTRICAL CHARACTERISTICS and APPLICATION INFORMATION for Safe Operating Area.
2. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at $T_J = T_A = 25^{\circ}\text{C}$. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
3. Voltage dropout for voltage variants below 2.1V is given by minimum input voltage 2.5V.
4. Respect SOA
5. Guaranteed by design and characterization.

Typical Performance Characteristic

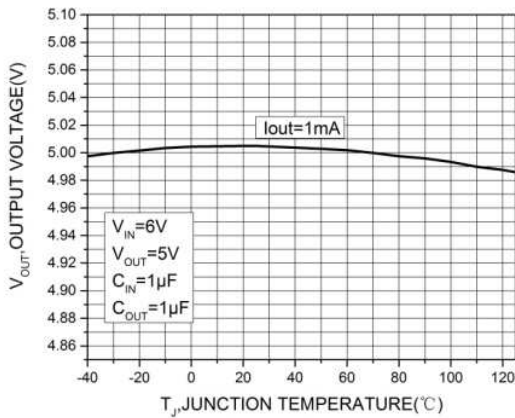


Figure 3. Output Voltage vs Temperature
V_{OUT}=5V

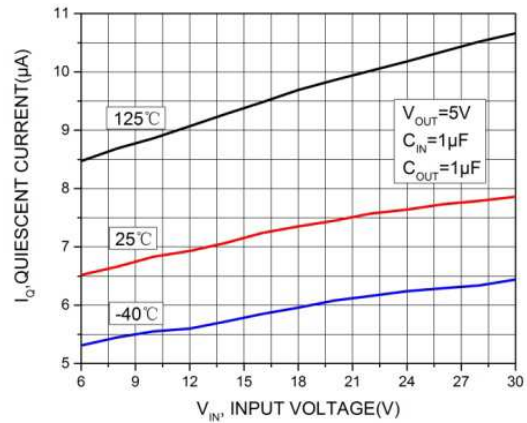


Figure 4. Quiescent Current vs Input Voltage
V_{OUT}=5V

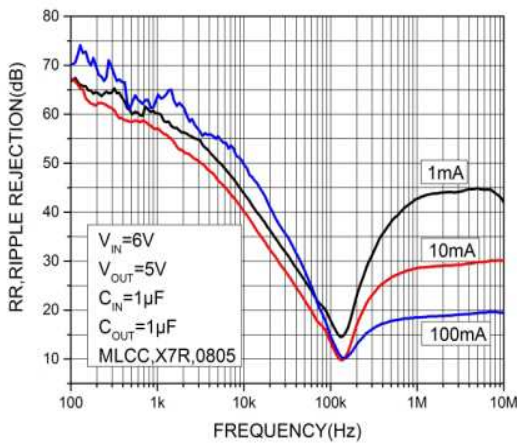


Figure 5. Power Supply Rejection Ratio vs Current
V_{IN}=6V, C_{OUT}=1µF

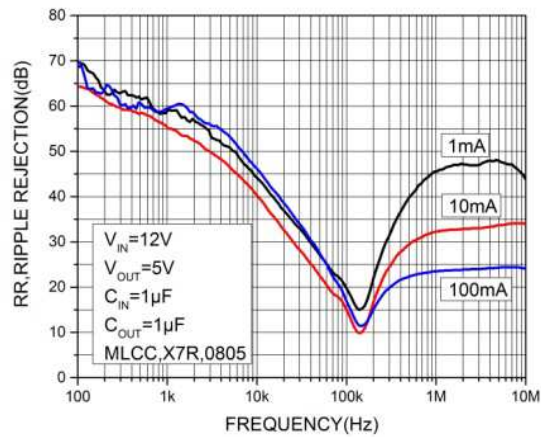


Figure 6. Power Supply Rejection Ratio vs Current
V_{IN}=12V, C_{OUT}=1µF

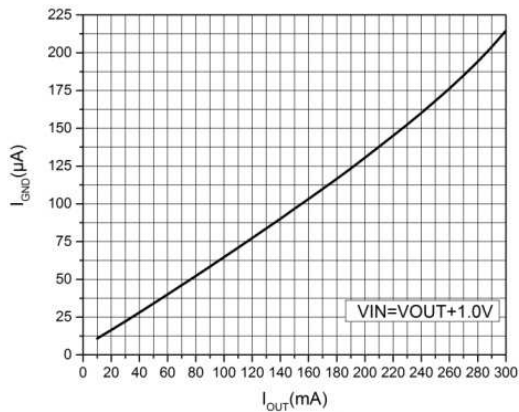


Figure 7. I_{GND} vs I_{OUT}

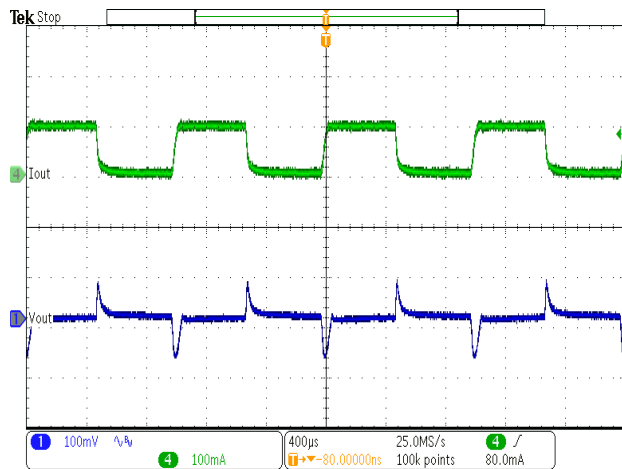


Figure 8. Load transient response
V_{IN}=6.0V, V_{OUT}=5.0V, I_{LOAD}=5mA-100mA

Functional Block Diagram

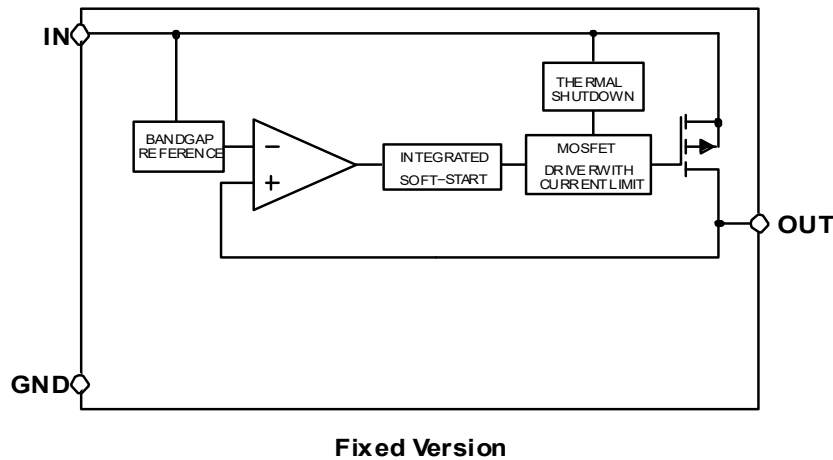


Figure 9. Functional Block Diagram

Application Information

The DIO7805 is the member of new family of Wide Input Voltage Range Low Dropout Regulators which delivers Ultra Low Ground Current consumption, Good Noise and Power Supply Rejection Ratio Performance.

Input Decoupling (C_{IN})

It is recommended to connect at least $1\mu\text{F}$ ceramic X5R or X7R capacitor between IN and GND pin of the device. This capacitor will provide a low impedance path for any unwanted AC signals or noise superimposed onto constant input voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes.

Higher capacitance and lower ESR capacitors will improve the overall line transient response.

Output Decoupling (C_{OUT})

The DIO7805 does not require a minimum Equivalent Series Resistance (ESR) for the output capacitor. The device is designed to be stable with standard ceramics capacitors with values of $1\mu\text{F}$ or greater. The X5R and X7R types have the lowest capacitance variations over temperature thus they are recommended.

Power Dissipation and Heat Sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material, and the ambient temperature affect the rate of junction temperature rise for the part. For reliable operation junction temperature should be limited to 125°C .

The maximum power dissipation the DIO7805 can handle is given by:



DIO7805

$$P_{D(MAX)} = \frac{[T_{J(MAX)} - T_A]}{R_{\theta JA}} \quad (\text{eq.1})$$

The power dissipated by the DIO7805 for given application conditions can be calculated from the following equations:

$$P_D \approx V_{IN} (I_{GND} + I_{OUT}) + I_{OUT}(V_{IN} - V_{OUT}) \quad (\text{eq.2})$$

or

$$V_{IN(MAX)} \approx \frac{P_{D(MAX)} + (V_{OUT} \times I_{OUT})}{I_{OUT} + I_{GND}} \quad (\text{eq.3})$$

Hints

V_{IN} and GND printed circuit board traces should be as wide as possible. When the impedance of these traces is high, there is a chance to pick up noise or cause the regulator to malfunction. Place external components, especially the output capacitor, as close as possible to the DIO7805, and make traces as short as possible.



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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.