

DIO7758

300 mA, Ultra-Low-Noise, Low-IQ LDO

Features

- Operating input voltage range: 1.6 V to 5.5 V
- Output voltage range: 0.8 V to 3.3 V
- Output current: 300 mA
- Ultra-Low quiescent current: Typ. 25 μ A
- Dropout voltage : 140mV at $I_{OUT}=300$ mA
- PSRR: 75dB at 1 kHz, $I_{OUT} = 20$ mA
- Output voltage Tolerance: $\pm 1\%$
- Stable with ceramic capacitors 1 μ F
- Thermal-overload protection
- Short-circuit protection
- DIO7758A for active discharge option
- Available in small DFN2*2-6 package
- These devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- MP3/MP4 Players
- Cellphones, Radiophone, Digital Cameras
- Bluetooth, Wireless Handsets
- Others portable electronics device

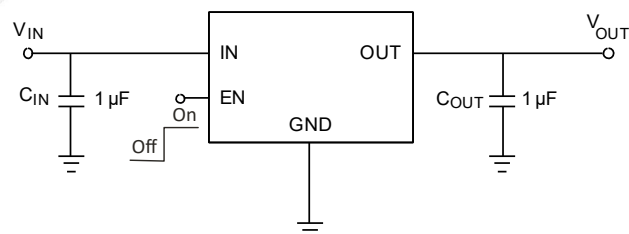
Descriptions

The DIO7758 series is a high-accuracy, low-noise, high-speed, high-PSRR, and low-dropout CMOS Linear regulator with high ripple rejection. The devices offer a new level of cost-effective performance in cellular phones, laptop and notebook computers, and other portable devices.

The DIO7758 has the fold-back maximum output current which depends on the output voltage. So the current limit functions both as short circuit protection and as an output current limiter.

The device is available in the DFN2*2-6 package.

Typical Applications



Ordering Information

Order Part Number	Top Marking		T_A	Package	
DIO7758A08CD6	75AD	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A10CD6	75AE	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A11CD6	75AC	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A12CD6	75AF	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A15CD6	75AG	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A18CD6	75AH	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A25CD6	75AJ	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A28CD6	75AK	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A30CD6	75AM	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000
DIO7758A33CD6	75AN	Green	-40 to 125°C	DFN2*2-6	Tape & Reel,3000

Pin Assignments

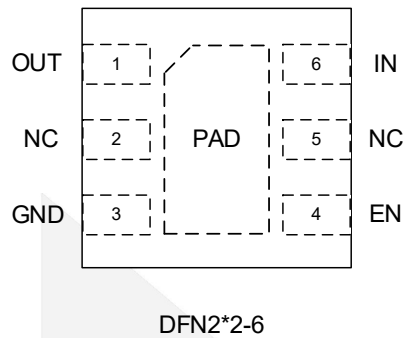


Figure 1 Pin Assignment (Top View)

Pin Definitions

Pin Name	Description
OUT	Output Voltage Pin
EN	Enable Pin. This pin has an internal pull-down resistor. A logic low reduces the supply current to less than 1 μ A. Connect to logic "High" for normal operation.
GND	Power Supply Ground
IN	Input Voltage Pin
NC	No connection
PAD	Connect the thermal pad to a large area GND plane for improved thermal performance.

Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table 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
Input Voltage V_{IN}		-0.3 to 6.5	V
Output Voltage V_{OUT}		-0.3 to V_{IN}	V
Chip Enable Input V_{EN}		-0.3 to V_{IN}	V
Output Current I_{OUT}		300	mA
Lead Temperature Range		260	°C
Operating Junction Temperature $T_{J(MAX)}$		150	°C
Storage Temperature T_{STG}		-55 to 150	°C
MSL		Level-3	
Thermal Resistance		250	°C/W
ESD	HBM	8000	V
	MM	300	

Recommend Operating Ratings

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to absolute maximum ratings.

Parameter	Rating	Unit
Operating Supply voltage	1.6~5.5	V
Operating Temperature Range	-40~125	°C
Thermal Resistance, $R_{\theta JA}$	250	°C/W

Electrical Characteristics

$V_{IN} = V_{OUT} + 1\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = C_{OUT} = 1.0\text{ }\mu\text{F}$, Full = -40°C to $+125^{\circ}\text{C}$, Typical values are at $T_A = 25^{\circ}\text{C}$, unless otherwise specified.

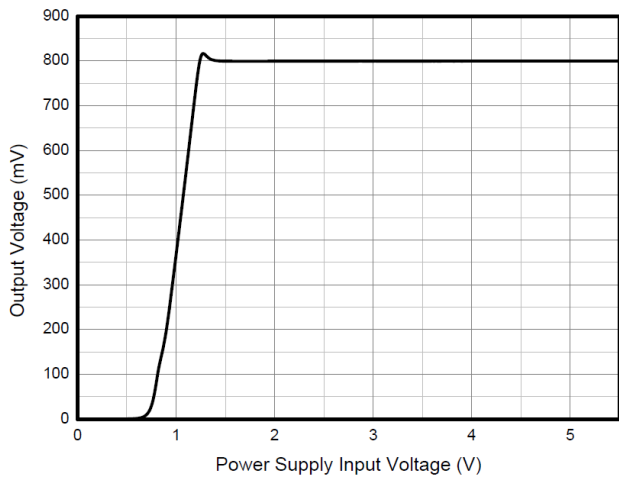
Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{IN}	Input Voltage		1.6		5.5	V
$V_{OUT}^{(1)}$	Output Voltage		0.8		3.3	V
	Output Accuracy	$V_{OUT} < 2\text{ V}, T_A = +25^{\circ}\text{C}$	-20	V_{OUT}	+20	mV
		$V_{OUT} \geq 2\text{ V}, T_A = +25^{\circ}\text{C}$	-1%	V_{OUT}	1%	V
I_{LIM}	Output Current Limit	$V_{OUT} = 90\% V_{OUT(NOM)}$		480		mA
V_{DROP}	Dropout Voltage	$V_{IN} = 0.98 \times V_{OUT(SET)}$, $I_{OUT} = 300\text{ mA}$	$V_{OUT(SET)} = 0.8\text{ V}$	950		mV
			$V_{OUT(SET)} = 1.2\text{ V}$	650		
			$V_{OUT(SET)} = 1.8\text{ V}$	280		
			$V_{OUT(SET)} = 2.5\text{ V}$	200		
			$V_{OUT(SET)} = 2.8\text{ V}$	170		
			$V_{OUT(SET)} = 3.0\text{ V}$	160		
			$V_{OUT(SET)} = 3.3\text{ V}$	150		
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	$V_{OUT(NOM)} + 1.0\text{ V} \leq V_{IN} \leq 5.5\text{ V}$		0.02		%/V
ΔV_{OUT}	Load Regulation	$I_{OUT} = 0\text{ mA to } 350\text{ mA}, T_A = +25^{\circ}\text{C}$			40	mV
I_Q	Quiescent Current	No load		25		μA
I_{SC}	Short Circuit Current	$V_{OUT} = 0\text{ V}$		220		mA
I_{SHDN}	Shut-down Current	$V_{EN} = 0\text{ V}, V_{IN} = 5.5\text{ V}$		0.1		μA
PSRR	Power Supply Rejection Rate	$I_{OUT} = 20\text{ mA}$	$f = 100\text{ Hz}$	80		dB
			$f = 1\text{ kHz}$	75		dB
			$f = 10\text{ kHz}$	70		dB
			$f = 100\text{ kHz}$	60		dB
			$f = 1\text{ MHz}$	45		dB
V_{IH}	EN Pin Threshold Voltage	EN logic high voltage	1			V
V_{IL}		EN logic low voltage			0.4	V
I_{EN}	EN Pull-Down Current	$V_{EN} = 5.5\text{ V}$		0.1		μA
e_n	Output Voltage Noise	$f = 10\text{ Hz to } 100\text{ kHz}, V_{OUT} = 2.8\text{ V}, I_{OUT} = 1\text{ mA}$		70		μV_{RMS}
T_{SD}	Thermal shutdown threshold	Shutdown, temperature increasing	$I_{OUT} = 1\text{ mA}$	175		$^{\circ}\text{C}$
		Reset, temperature decreasing		145		
R_{DISCH}	Output Discharge Resistance	$V_{EN} \leq 0.2\text{ V}, V_{IN} = 5\text{ V}$ (only A version)		100		Ω

t _{ON}	Turn-On Time	From assertion of V _{EN} to V _{OUT} = 90% V _{OUT(NOM)}		120		us
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Note (1): It is not recommended to use at 125°C without load.

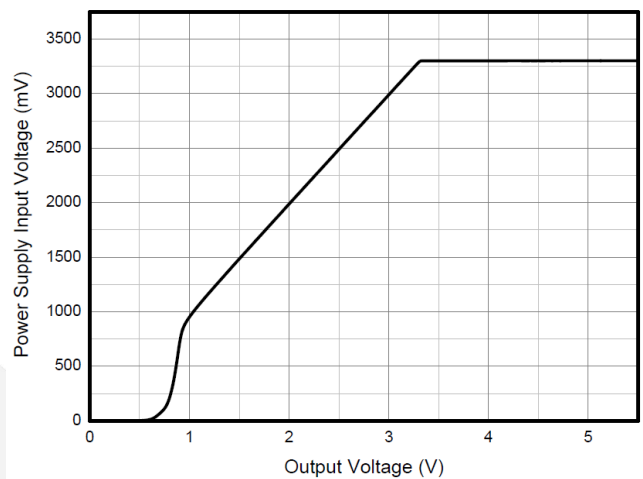


Typical Performance Characteristics



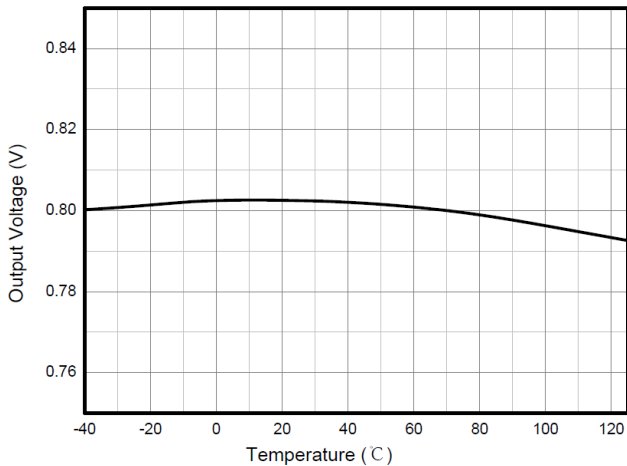
$C_{IN} = C_{out} = 1 \mu F$, $I_{out} = 1 \text{ mA}$, $V_{out} = 0.8 \text{ V}$

Figure 2. Output Voltage vs Input Voltage



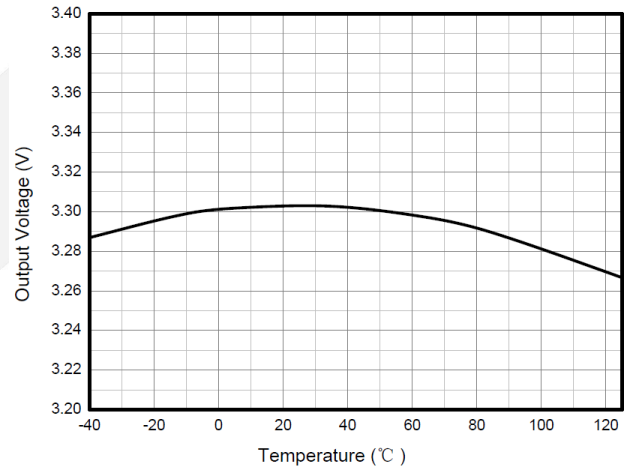
$C_{IN} = C_{out} = 1 \mu F$, $I_{out} = 1 \text{ mA}$, $V_{out} = 3.3 \text{ V}$

Figure 3. Output Voltage vs Input Voltage



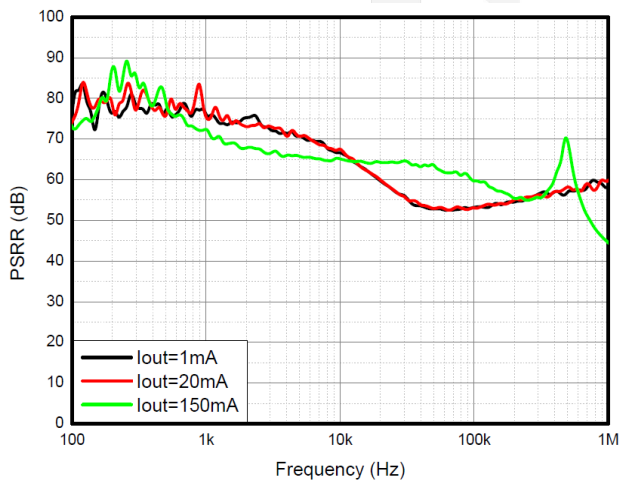
$V_{out} = 0.8 \text{ V}$, $C_{IN} = C_{out} = 1 \mu F$, $I_{out} = 1 \text{ mA}$

Figure 4. Output Voltage vs Temperature



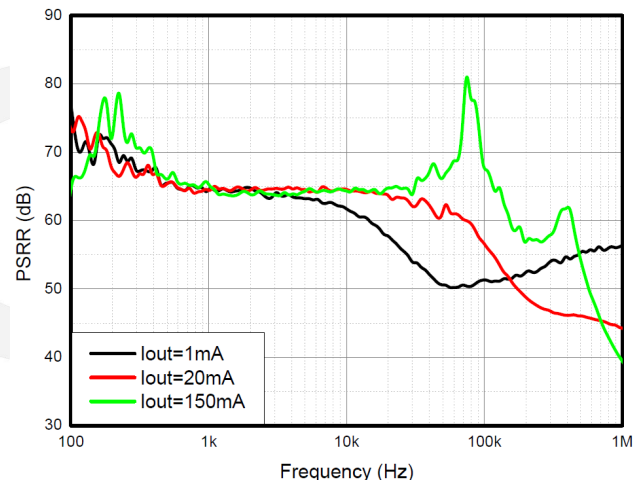
$V_{out} = 3.3 \text{ V}$, $C_{IN} = C_{out} = 1 \mu F$, $I_{out} = 1 \text{ mA}$

Figure 5. Output Voltage vs Temperature



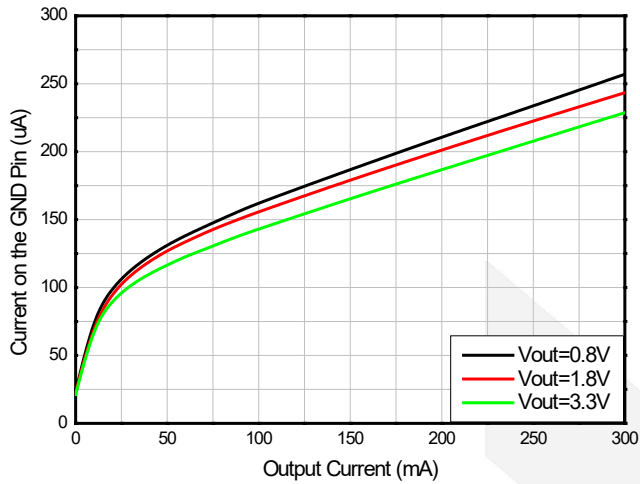
$C_{out} = 1 \mu F$, $V_{IN} = 2.5 \text{ V} + 200 \text{ mVpp}$, $V_{out} = 0.8 \text{ V}$

Figure 6. PSRR vs Frequency



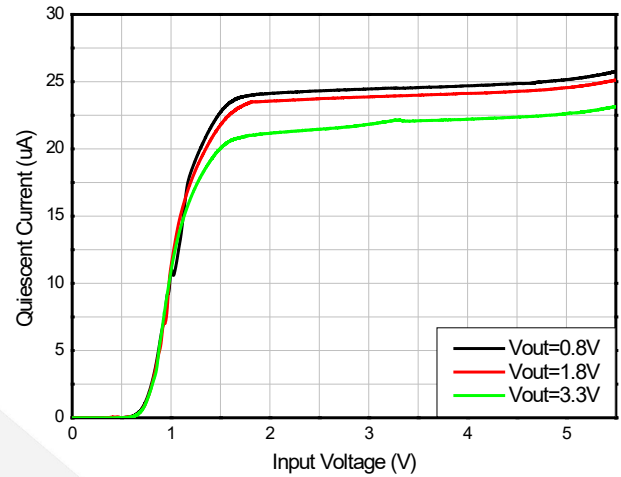
$C_{out} = 1 \mu F$, $V_{IN} = 4.3 \text{ V} + 200 \text{ mVpp}$, $V_{out} = 3.3 \text{ V}$

Figure 7. PSRR vs Frequency



$C_{out} = 1 \mu F$, $V_{IN} = V_{out} + 1 V$ or $2.5 V$ whichever is higher

Figure 8. Current on the GND Pin vs Output Current



$C_{out} = 1 \mu F$, $I_{out} = 0 mA$

Figure 9. Quiescent Current vs Input Voltage

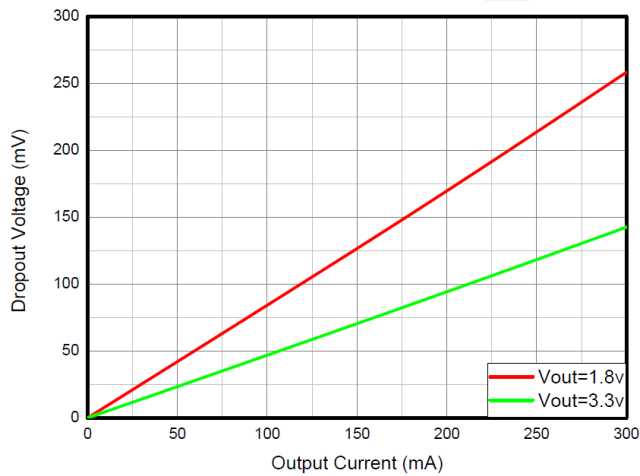
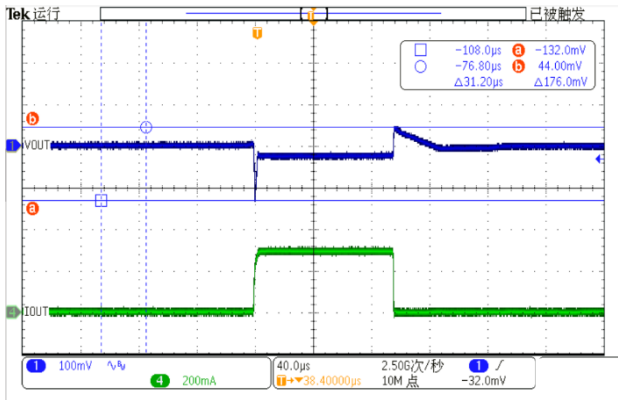
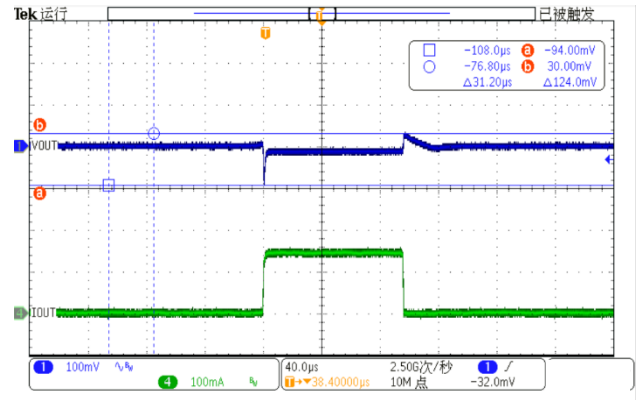


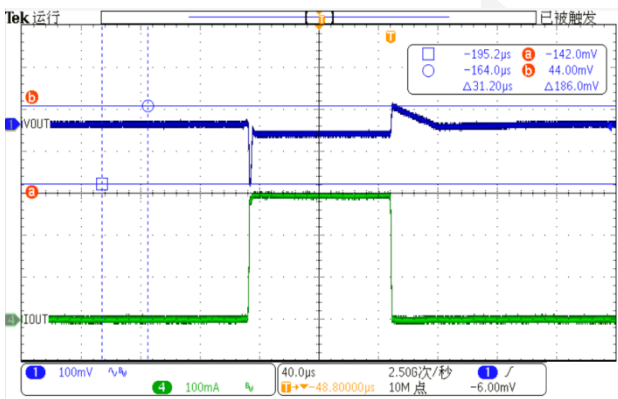
Figure 10. Dropout Voltage vs Output Current



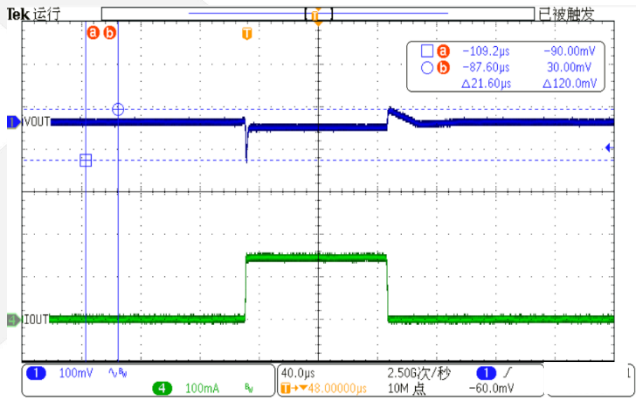
$V_{IN} = 2.5\text{ V}$, $V_{out} = 0.8\text{ V}$, $C_{IN} = C_{out} = 1\text{ }\mu\text{F}$
Figure 11. Load Transient Response at Load
 Step from 1 mA to 300 mA, $V_{out} = 0.8\text{ V}$



$V_{IN} = 2.5\text{ V}$, $V_{out} = 0.8\text{ V}$, $C_{IN} = C_{out} = 1\text{ }\mu\text{F}$
Figure 12. Load Transient Response at Load
 Step from 1 mA to 150 mA, $V_{out} = 0.8\text{ V}$



$V_{IN} = 4.3\text{ V}$, $V_{out} = 3.3\text{ V}$, $C_{IN} = C_{out} = 1\text{ }\mu\text{F}$
Figure 13. Load Transient Response at Load
 Step from 1 mA to 300 mA, $V_{out} = 3.3\text{ V}$



$V_{IN} = 4.3\text{ V}$, $V_{out} = 3.3\text{ V}$, $C_{IN} = C_{out} = 1\text{ }\mu\text{F}$
Figure 14. Load Transient Response at Load
 Step from 1 mA to 150 mA, $V_{out} = 3.3\text{ V}$

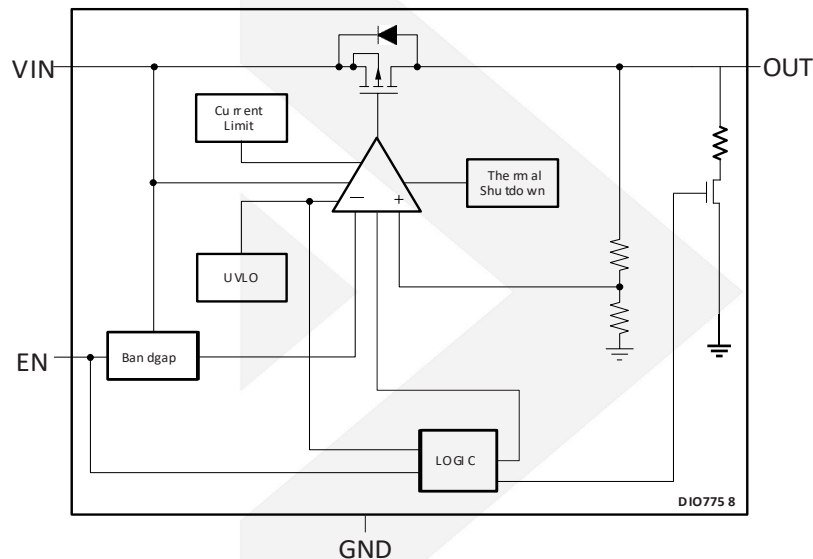
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Detailed Description

Overview

The DIO7758 series of LDO linear regulators is low quiescent current devices with excellent line and load transient performance. These LDOs are designed for power-sensitive applications. A precision bandgap and error amplifier provide overall 1% accuracy. Low output noise, very high PSRR, and low dropout voltage make this series of devices ideal for most battery-operated handheld equipment. All device versions have integrated thermal shutdown, and current limit.

Block Diagram



Internal Current Limit

The DIO7758 internal current limit helps to protect the regulator during fault conditions. During the current limit, the output sources a fixed amount of current that is largely independent of the output voltage. In such a case, the output voltage is not regulated and is $V_{OUT} = I_{CL} \times R_{LOAD}$. The PMOS pass transistor dissipates $(V_{IN} - V_{OUT}) \times I_{CL}$ until the thermal shutdown is triggered and the device turns off. As the device cools down, it is turned on by the internal thermal shutdown circuit. If the fault condition continues, the device cycles between the current limit and thermal shutdown.

The PMOS pass element in the DIO7758 has a built-in body diode that conducts current when the voltage at OUT exceeds the voltage at IN. This current is not limited, so if extended reverse voltage operation is anticipated, external limiting to 5% of the rated output current is recommended.

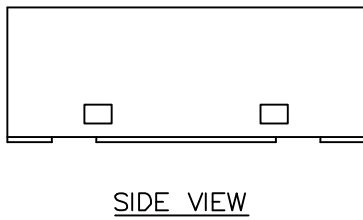
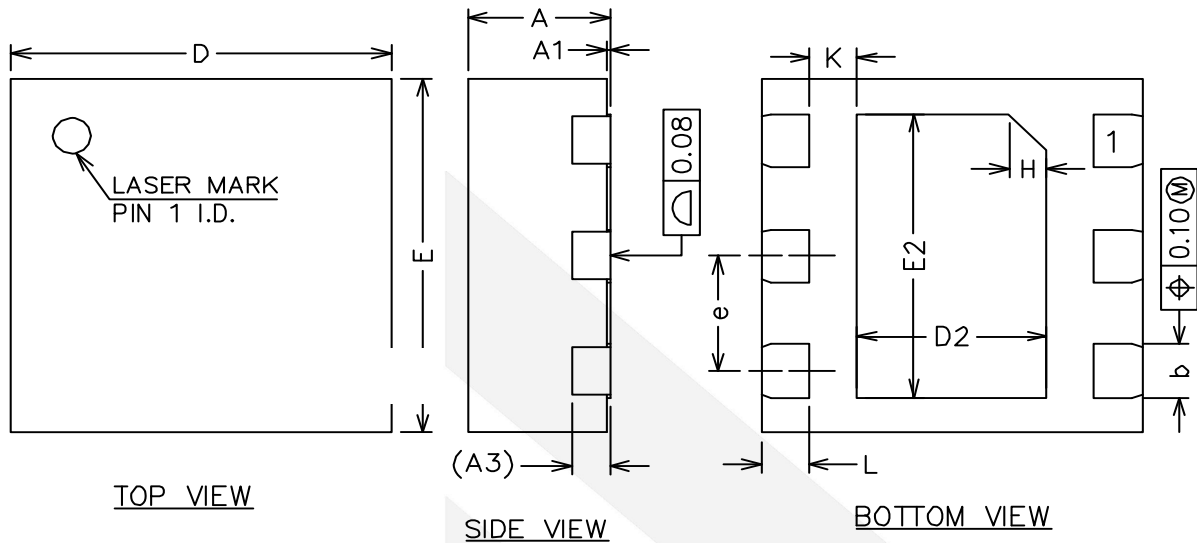
Shut down

The enable pin (EN) is active high. The device is enabled when the voltage at EN pin goes above 1 V. The device is turned off when the EN pin is held at less than 0.4 V. When shutdown capability is not required, EN can be connected to the IN pin.

Dropout Voltage

The DIO7758 uses a PMOS pass transistor to achieve low dropout. When $(V_{IN} - V_{OUT})$ is less than the dropout voltage (V_{DO}), the PMOS pass device is in the linear region of operation and the input-to-output resistance is the $R_{DS(on)}$ of the PMOS pass element. V_{DO} scales approximately with output current because the PMOS device behaves as a resistor in dropout.

Physical Dimensions: DFN 2*2-6



COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3	0.20REF		
b	0.25	0.30	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.80	-	1.10
E2	1.40	-	1.70
e	0.55	0.65	0.75
K	0.15	0.25	0.35
L	0.20	0.25	0.30
H	0.20REF		

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.

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