DIO7912
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 μA
- Dropout voltage: 170 mV at I_{OUT}=300 mA
- PSRR: 75dB at 1 kHz, I_{OUT} = 20 mA
- Output Voltage Tolerance: ±1%
- Stable with Ceramic Capacitors 1 μF
- Thermal-Overload Protection
- Short-Circuit Protection
- Quick Output Discharge
  DIO7912A: available
  DIO7912B: not available
- Available in Small DFN1*1-4, SOT23-5, and DFN0.8*0.8-4, SC70-5 Packages
- 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

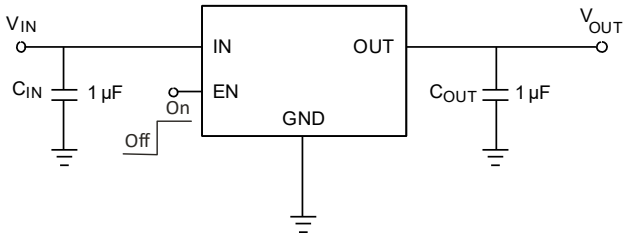
Descriptions

The DIO7912 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 DIO7912 has the fold-back maximum output current which depends on the output voltage. So the current limit functions both as a short circuit protection and as an output current limiter.

The device is available in DFN1*1-4, SOT23-5, DFN0.8*0.8-4, and SC70-5 packages.

Typical Applications



Ordering Information

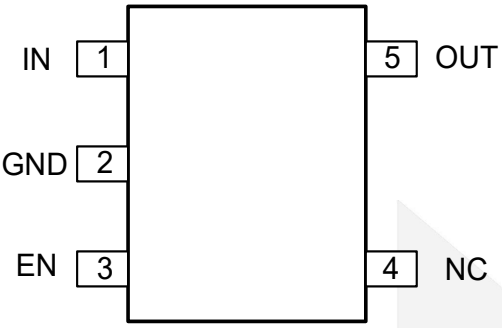
Order Part Number	Top Marking		T_A	Package	
DIO7912AaaST5	MAXYW	Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO7912AaaEN4	YWMX	Green	-40 to 125°C	DFN1*1-4	Tape & Reel,10000
DIO7912AaaCN4	E	Green	-40 to 125°C	DFN0.8*0.8-4	Tape & Reel, 5000
DIO7912AaaSC5	YWMX	Green	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO7912BaaST5	MBXYW	Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO7912BaaEN4	YWUX	Green	-40 to 125°C	DFN1*1-4	Tape & Reel,10000
DIO7912BaaCN4	E	Green	-40 to 125°C	DFN0.8*0.8-4	Tape & Reel, 5000
DIO7912BaaSC5	YWUX	Green	-40 to 125°C	SC70-5	Tape & Reel, 3000

Output Voltage Options										
Option Code "**aa**"	08	10	11	12	15	18	25	28	30	33
Voltage	0.8 V	1.0 V	1.1 V	1.2 V	1.5 V	1.8 V	2.5 V	2.8 V	3.0 V	3.3 V

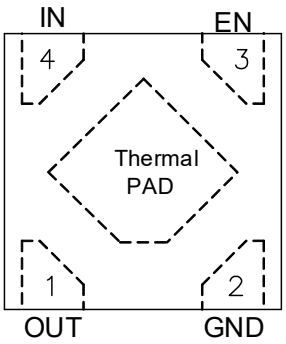
Marking Definition: **MAXYW/YWMX/E/MBXYW/YWUX**	
MAXYW	MA: Product code; Y: year code; W: week code
YWMX	Y: year code; W: week code; M: Product code
E	E: Product code
MBXYW	MB: Product code; Y: year code; W: week code
YWUX	Y: year code; W: week code; U: Product code

Voltage code										
Option Code "**X**"	C	D	E	F	G	H	J	K	M	N
Voltage	0.8 V	1.0 V	1.1 V	1.2 V	1.5 V	1.8 V	2.5 V	2.8 V	3.0 V	3.3 V

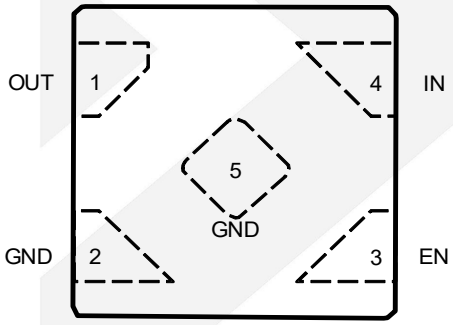
Pin Assignments



SOT23-5/SC70-5



DFN1*1-4



DFN0.8*0.8-4

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 μA. Connect to logic “High” for normal operation.
GND	Power Supply Ground
IN	Input Voltage Pin
NC	No connection

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	
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, $R_{\theta JA}$	SOT23-5	235	°C/W
	DFN1*1-4	250	
	DFN0.8*0.8-4	400	
	SC70-5	307.6	

Electrical Characteristics

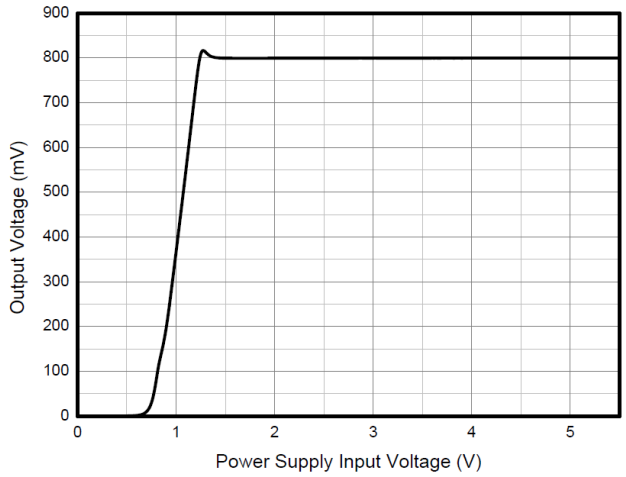
V_{IN} = V_{OUT}+1 V, I_{OUT}=1 mA, C_{IN}=C_{OUT}=1.0 μF, Full = -40℃ to 125℃, Typical values are at T_A = 25°C, unless otherwise specified.

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 V,T_A= +25°C		-20	V_{OUT}	+20	mV
		V_{OUT} ≥ 2 V,T_A= +25°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 x $V_{OUT(SET)}$, I_{OUT}=300 mA	$V_{OUT(SET)}$=0.8 V		950		mV
			$V_{OUT(SET)}$=1.2 V		650		
			$V_{OUT(SET)}$=1.8 V		280		
			$V_{OUT(SET)}$=2.5 V		200		
			$V_{OUT(SET)}$=2.8 V		170		
			$V_{OUT(SET)}$=3.0 V		160		
			$V_{OUT(SET)}$=3.3 V		150		
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	$V_{OUT(NOM)}$ + 1.0 V ≤ V_{IN} ≤ 5.5 V			0.02		%/V
$\triangle V_{OUT}$	Load Regulation	I_{OUT} = 0 mA to 350 mA,T_A= +25°C				40	mV
I_Q	Quiescent Current	No load			25		μA
I_{SC}	Short Circuit Current	V_{OUT} = 0 V			220		mA
I_{SHDN}	Shut-down Current	V_{EN} = 0 V, V_{IN} = 5.5 V			0.1		μA
PSRR	Power Supply Rejection Rate	I_{OUT} = 20 mA	f=100 Hz		80		dB
			f=1 kHz		75		dB
			f=10 kHz		70		dB
			f=100 kHz		60		dB
			f=1 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 V			0.1		μA
e_n	Output Voltage Noise	f = 10 Hz to 100 kHz,V_{OUT}=2.8 V,I_{OUT}=1mA			70		μV_{RMS}
T_{SD}	Thermal shutdown threshold	Shutdown, temperature increasing	I_{OUT}=1 mA		175		℃
		Reset, temperature decreasing			145		
R_{DISCH}	Output Discharge Resistance	V_{EN}≤0.2 V,V_{IN}=5 V （only A version）			100		Ω

t_{ON}	Turn-On Time	From assertion of V_{EN} to V_{OUT} = 90% $V_{OUT(NOM)}$		250		μs

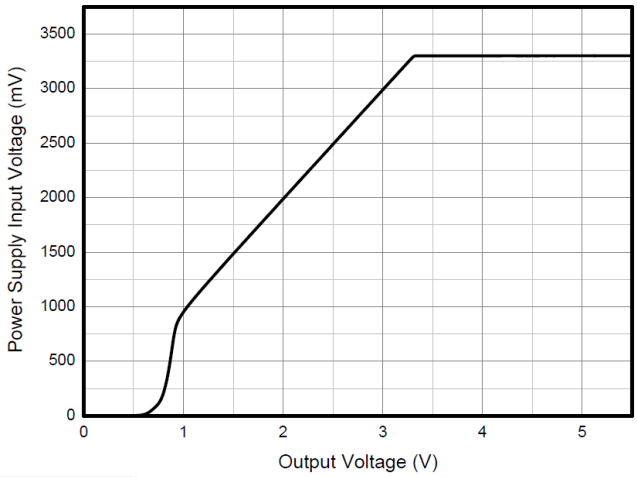
Note (1): It is not recommended to use at 125℃ without load.

Typical Performance Characteristics



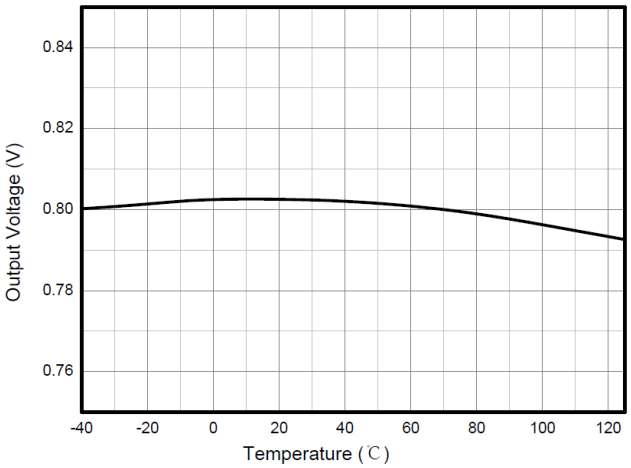
C_{IN} = C_{OUT}= 1 uF， I_{OUT}= 1 mA， V_{OUT} =0.8 V

Figure 2. Output Voltage vs Input Voltage



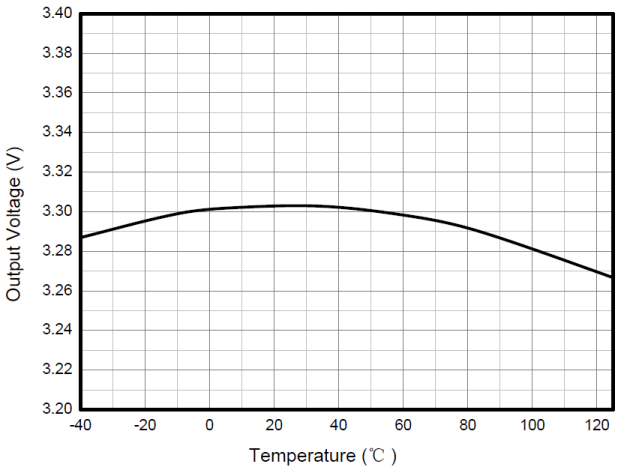
C_{IN} = C_{OUT} = 1 uF， I_{OUT} = 1 mA， V_{OUT}=3.3 V

Figure 3. Output Voltage vs Input Voltage



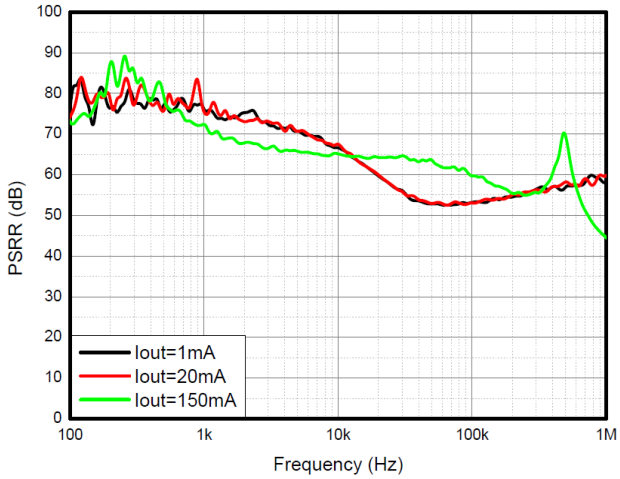
V_{OUT} = 0.8 V， C_{IN} = C_{OUT}= 1 uF， I_{OUT} = 1 mA

Figure 4. Output Voltage vs Temperature



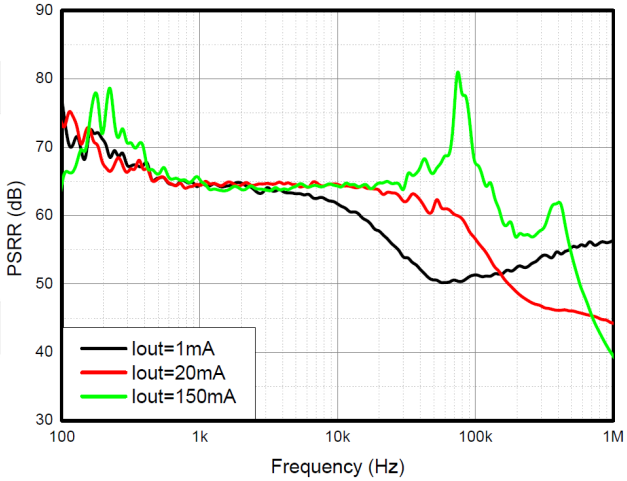
V_{OUT} = 3.3 V， C_{IN} = C_{OUT}= 1 uF， I_{OUT} = 1 mA

Figure 5. Output Voltage vs Temperature



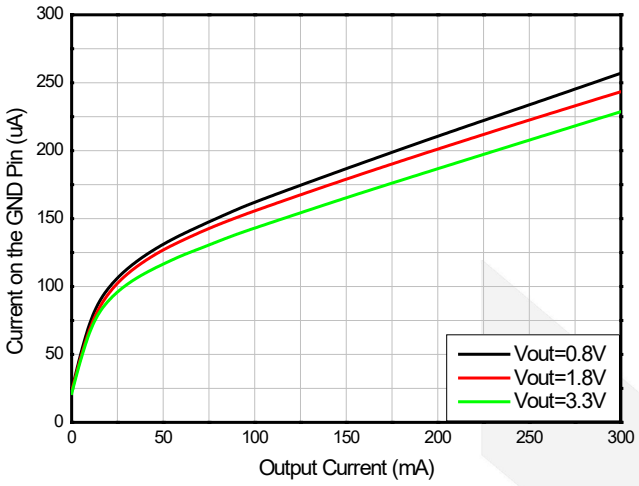
C_{OUT} = 1 uF， V_{IN} = 2.5 V+200 mVpp， V_{OUT} = 0.8 V

Figure 6. PSRR vs Frequency



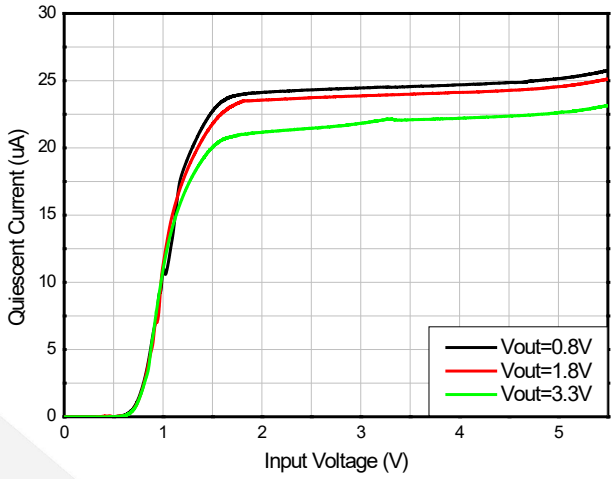
C_{OUT} = 1 uF， V_{IN} = 4.3 V+200 mVpp， V_{OUT} = 3.3 V

Figure 7. PSRR vs Frequency



C_{OUT} = 1 uF, 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 uF , I_{OUT} = 0 mA

Figure 9. Quiescent Current vs Input Voltage

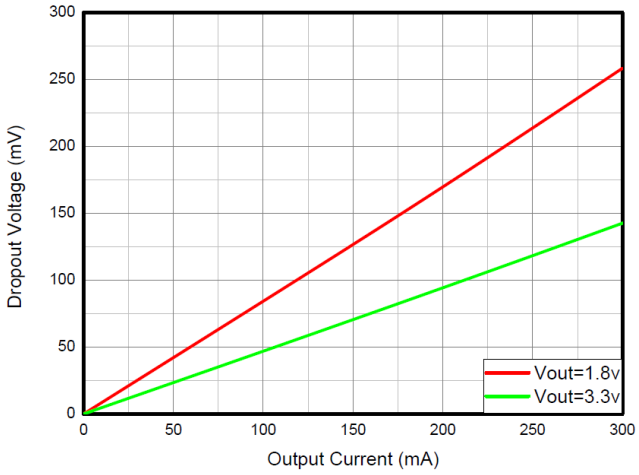
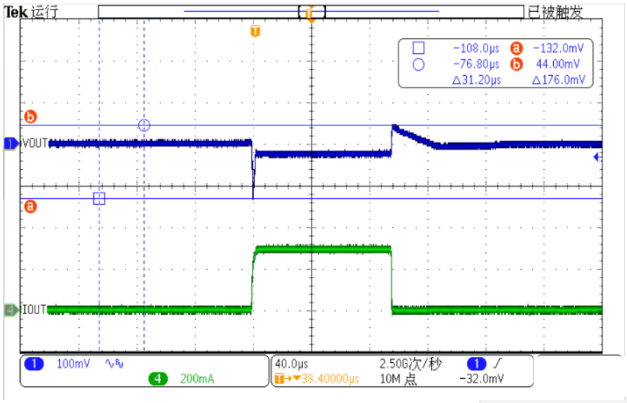
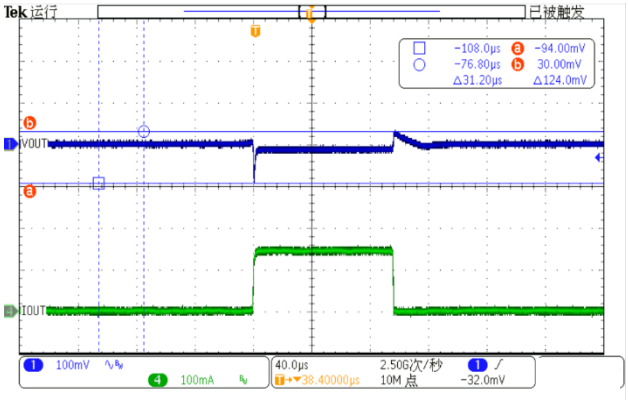


Figure 10. Dropout Voltage vs Output Current



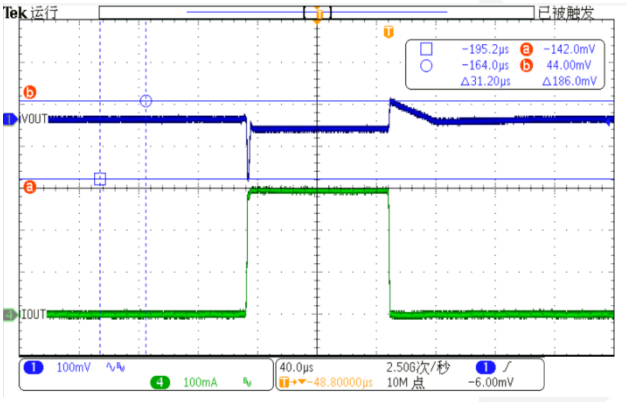
V_{IN} = 2.5 V，V_{OUT} = 0.8 V，C_{IN} = C_{OUT} =1 uF

Figure 11. Load Transient Response at Load Step from 1 mA to 300 mA, V_{OUT} = 0.8 V



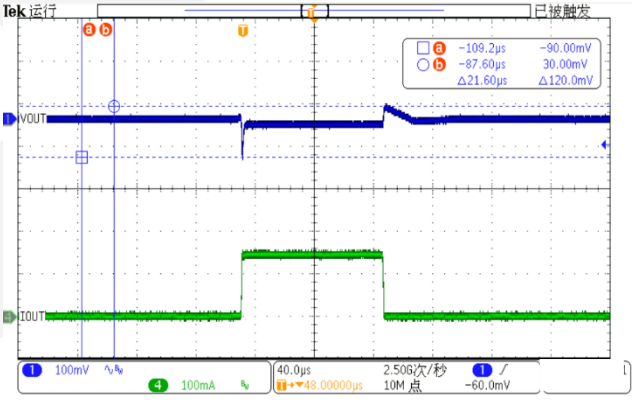
V_{IN} = 2.5 V，V_{OUT} = 0.8 V，C_{IN} = C_{OUT} =1 uF

Figure 12. Load Transient Response at Load Step from 1 mA to 150 mA, V_{OUT} = 0.8 V



V_{IN}=4.3 V，V_{OUT}=3.3 V, C_{IN}=C_{OUT}=1 uF

Figure 13. Load Transient Response at Load Step from 1 mA to 300 mA, V_{OUT} = 3.3 V



V_{IN}=4.3 V，V_{OUT}=3.3 V，C_{IN}=C_{OUT}=1 uF

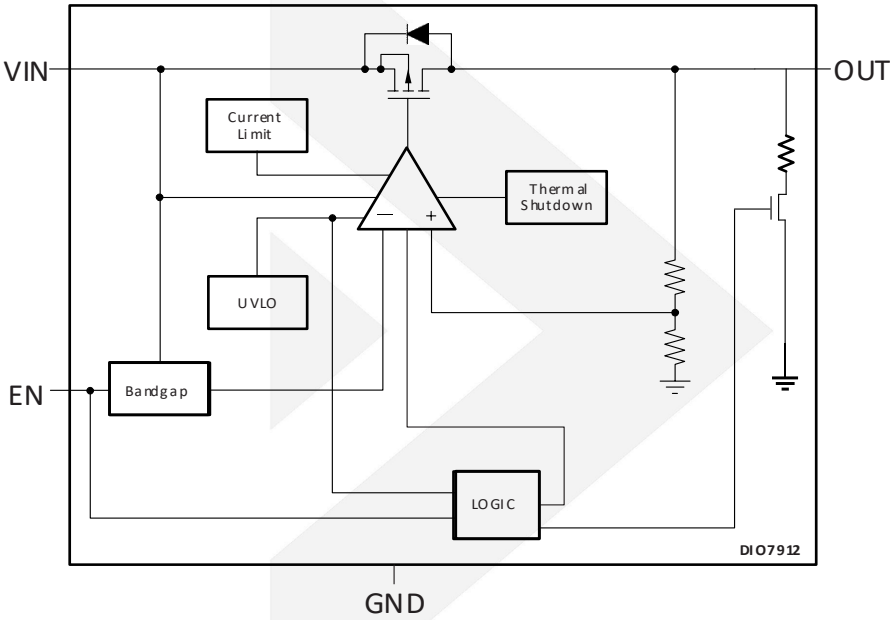
Figure 14. Load Transient Response at Load Step from 1 mA to 150 mA, V_{OUT} = 3.3 V

Detailed Description

Overview

The DIO7912 series of LDO linear regulators are 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 DIO7912 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 $V_{OUT} = I_{CL} \times R_{LOAD}$. 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 DIO7912 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.

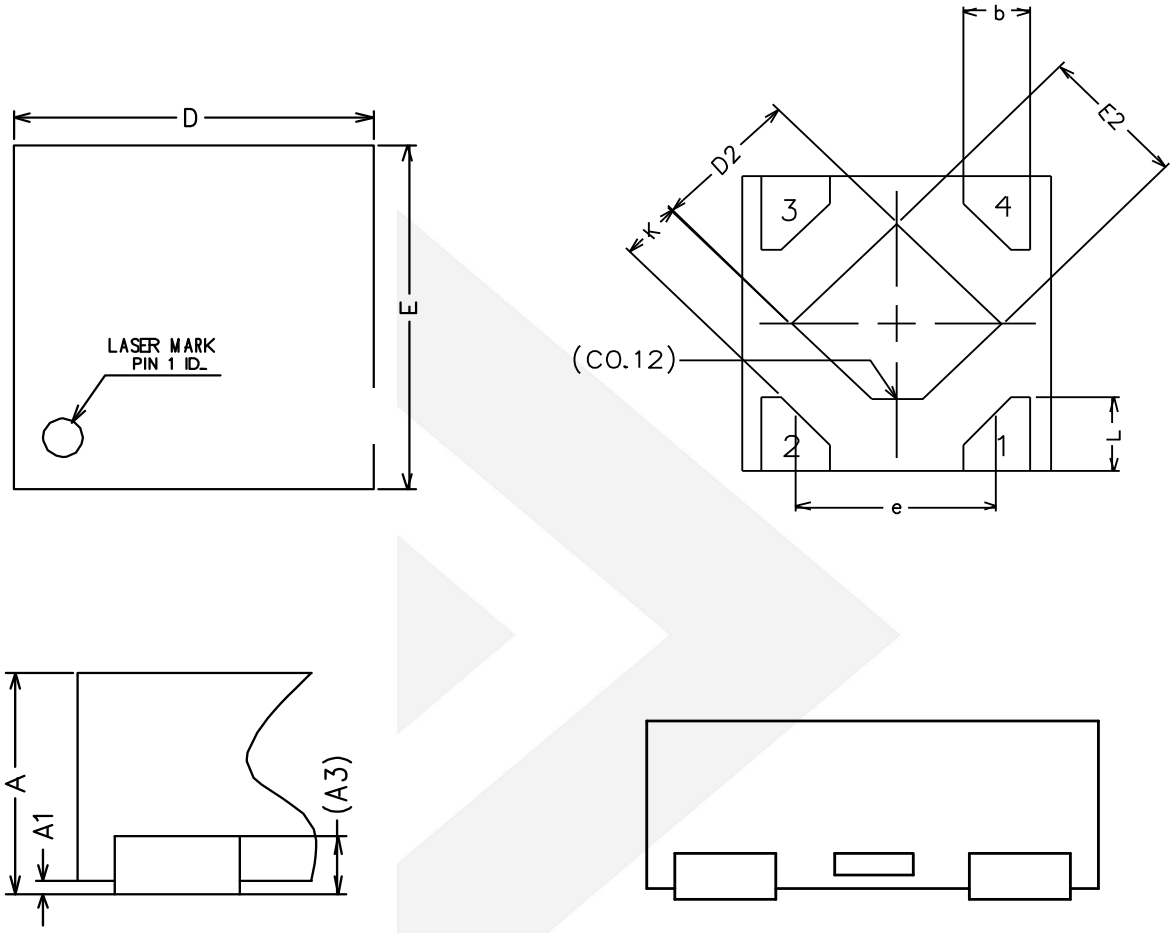
Shut down

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

Dropout Voltage

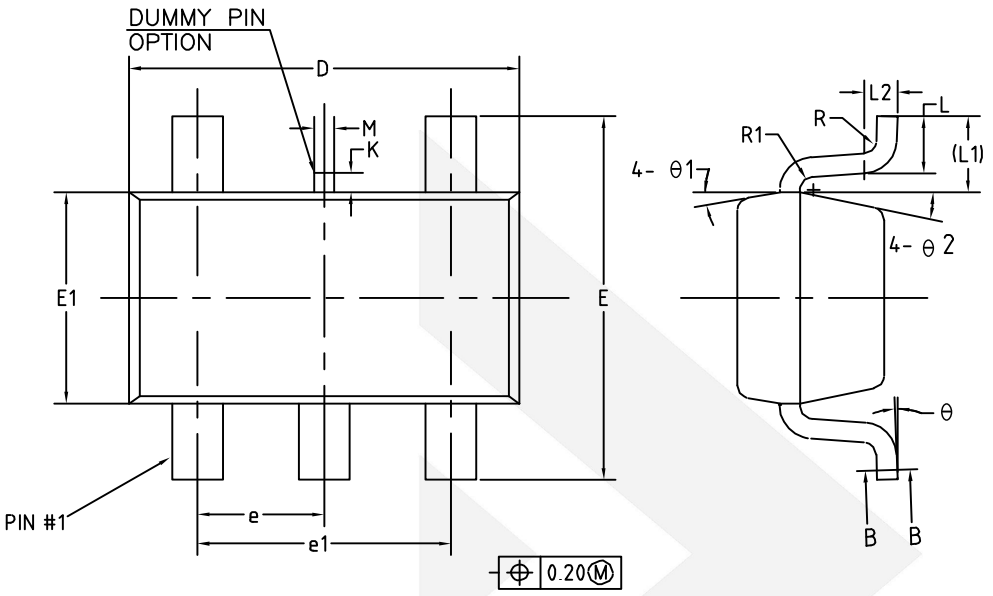
The DIO7912 uses a PMOS pass transistor to achieve low dropout. When $(V_{IN} – V_{OUT})$ is less than the dropout voltage (V_{DO}), the PMOS pass device is in the linear region of operation and the input-to-output resistance is the $R_{DS(on)}$ of the PMOS pass element. V_{DO} scales approximately with output current because the PMOS device behaves as a resistor in dropout.

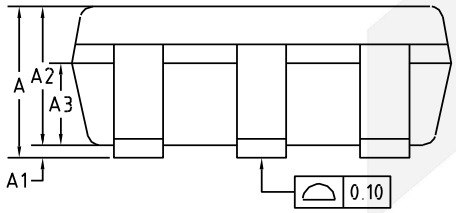
Physical Dimensions: DFN 1*1-4

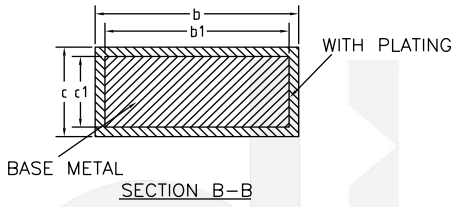


COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	**MIN**	**NOM**	**MAX**
A	0.34	0.37	0.40
A1	0	0.02	0.05
A3		0.10 REF	
b	0.17	0.22	0.27
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
L	0.20	0.25	0.30
e	0.60	0.65	0.70
K	0.15	-	-

Physical Dimensions: SOT23-5

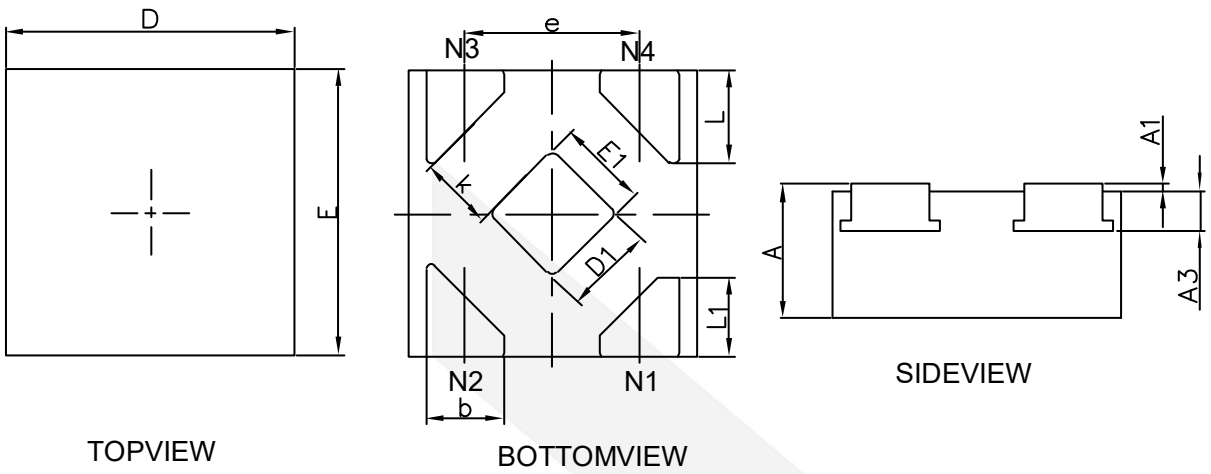


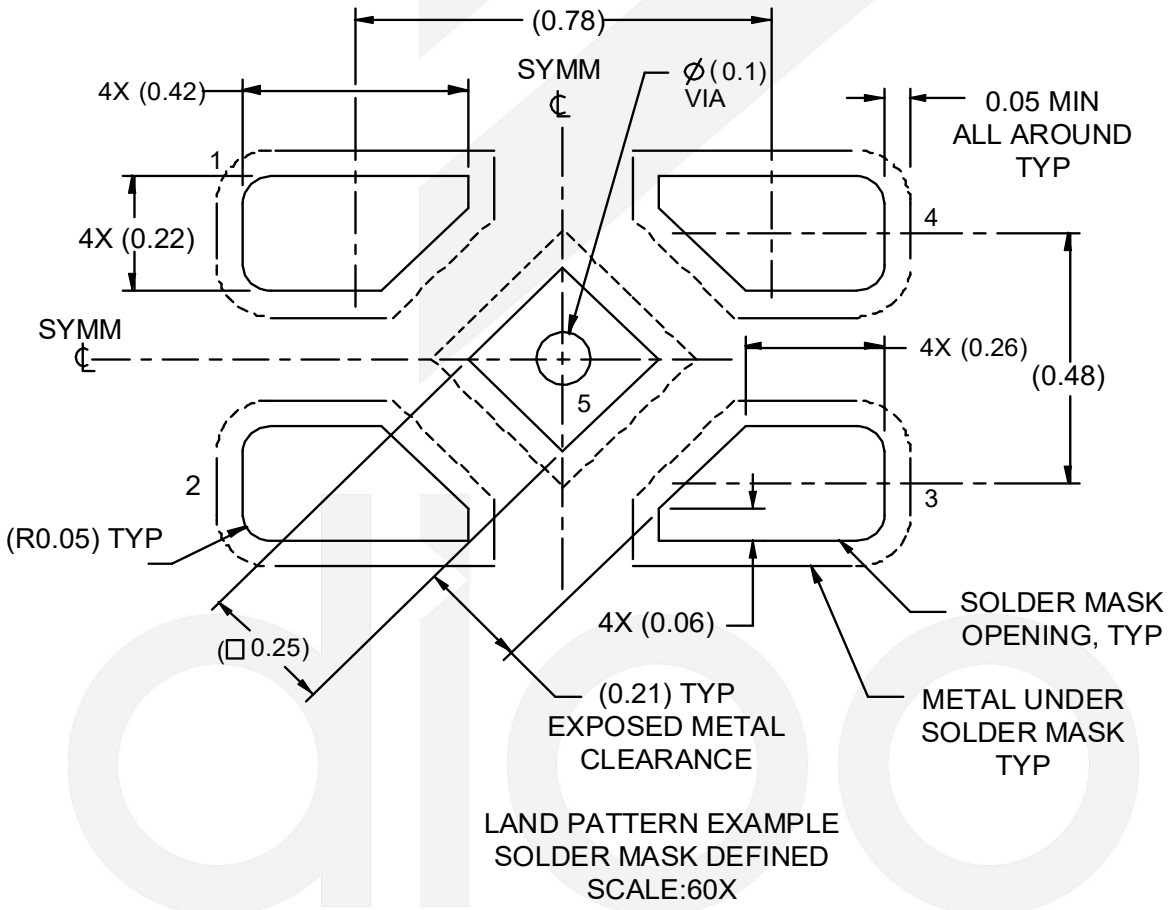




Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.45
b1	0.35	0.38	0.41
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e 1	1.80	1.90	2.00
K	0	-	0.25
L	0.30	0.40	0.60
L1		0.59REF	
L2		0.25BSC	
M	0.10	0.15	0.25
R	0.05	-	0.20
R1	0.05	-	0.20
Θ	0°	-	8°
Θ1	8°	10°	12°
Θ2	10°	12°	14°

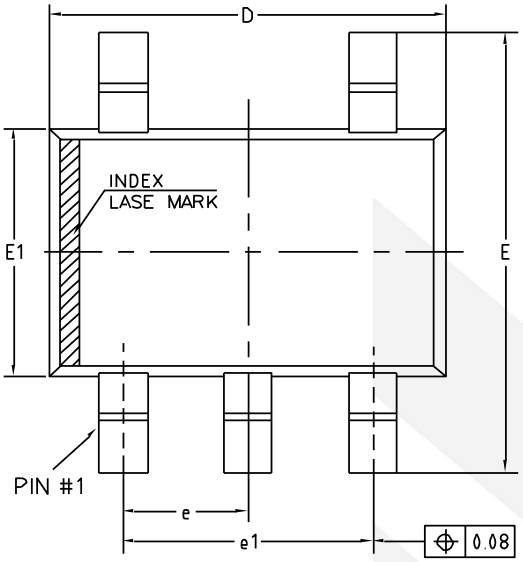
Physical Dimensions: DFN0.8*0.8-4

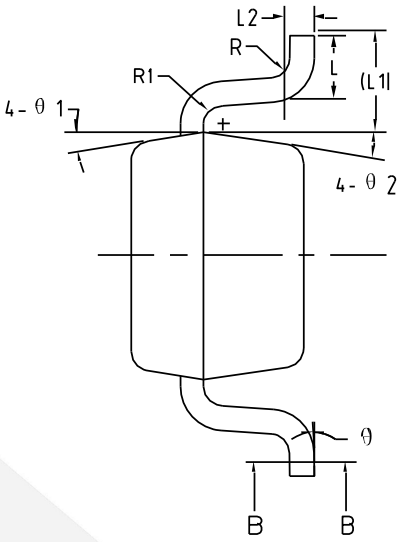


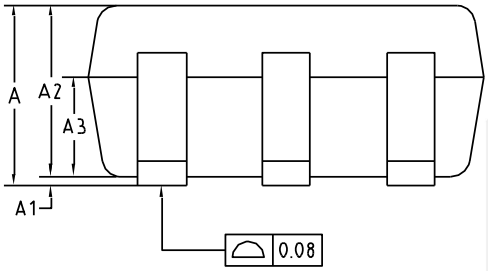


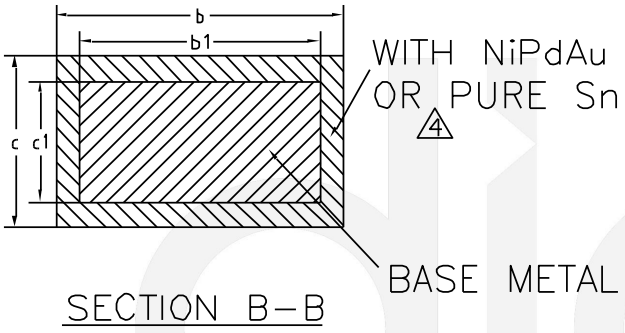
COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	**MIN**	**NOM**	**MAX**
A	0.320	-	0.400
A1	-0.004	-	0.046
A3		0.110REF.	
D	0.750	-	0.850
E	0.750	-	0.850
D1	0.200	-	0.300
E1	0.200	-	0.300
k		0.150MIN.	
b	0.170	-	0.270
e		0.480TYP.	
L	0.210	-	0.320
L1	0.170	-	0.270

Physical Dimensions: SC70-5









SECTION B–B

COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	**MIN**	**NOM**	**MAX**
A	0.85	-	1.05
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.47	0.52	0.57
b	0.23	-	0.33
b1	0.22	0.25	0.28
c	0.12	-	0.18
c1	0.115	0.13	0.14
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.25	1.30	1.35
e	0.65BSC		
e1	1.30BSC		
L	0.28	0.33	0.38
L1	0.50REF		
L2	0.15BSC		
R	0.10	-	-
R1	0.10	-	0.25
Θ	0°	-	8°
Θ1	6°	9°	12°
Θ2	6°	9°	12°

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 phones, handheld products, laptops, medical equipment, and so on. Dioo's product families include analog signal processing and amplifying, LED drivers, and charger ICs. Go to http://www.dioo.com for a complete list of Dioo product families. For additional product information or full datasheet, please contact our sales department or representatives.