LOW DROPOUT VOLTAGE REGULATOR

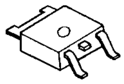
■ GENERAL DESCRIPTION

The NJM2391 is low dropout voltage regulators featuring high precision voltage.

It is suitable for Notebook PCs, PC cards and hard disks where 3.3V need to be generated from 5V supply.

A small TO-252 package is adopted for the space saving.

■ PACKAGE OUTLINE

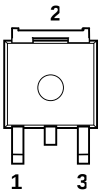


NJM2391DL1

■ FEATURES

- ●Output Current Io(max.)=1A
- ●High Precision Output Voltage Vo±1%
- ●Low Dropout Voltage ΔV_{I-O} =1.1V typ. At Io=1A
- ●Internal Excessive Voltage Protection Circuit
- ●Internal Short Circuit Current Limit
- ●Internal Thermal Overload Protection
- ●Bipolar Technology
- ●Package Outline TO-252

■ PIN CONFIGURATION



PIN FUNCTION
1.V_{IN}
2.GND
3.V_{OUT}

NJM2391DL1

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V^+	+10	V
Power Dissipation	P_D	900(*1) 2500(*2)	W
Operating Temperature	Topr	–40 ~ +85	°C
Storage Temperature	Tstg	–50 ~ +125	°C

(*1): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard size, 2Layers, Cu area 100mm^2)
(*2): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 4Layers)
(For 4Layers: Applying 74.2 × 74.2mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}	Device Name	V_{OUT}
NJM2391DL1-25	2.5V	NJM2391DL1-33	3.3V
NJM2391DL1-26	2.6V	NJM2391DL1-35	3.5V
NJM2391DL1-28	2.85V	NJM2391DL1-05	5.0V
NJM2391DL1-03	3.0V		

■ ELECTRICAL CHARACTERISTICS (C_{IN}=0.1µF, Co=10µF, Tj=25°C)

Measurement is to be conducted is pulse testing

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Vo=2.5V Version Output Voltage	V_O	V_{IN}=5.5V, Io=0.01A	2.475	2.5	2.525	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=4V~9V, Io=1A	–	–	50	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=5. 5V, Io=0~1A	–	–	50	mV
Quiescent Current	I_Q	V_{IN}=5.5V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=5.5V, ein=2V_{P-P} f=120Hz, Io=0.5A	53	63	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=5.5V, Io=0.5A BW=10Hz~100kHz	–	85	185	µV
Vo=2.6V Version Output Voltage	V_O	V_{IN}=5.6V, Io=0.01A	2.574	2.60	2.626	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=4.1V~9.1V, Io=1A	–	–	52	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=5.6V, Io=0~1A	–	–	52	mV
Quiescent Current	I_Q	V_{IN}=5.6V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=5.6V, ein=2V_{P-P} f=120Hz, Io=0.5A	53	63	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=5.6V, Io=0.5A BW=10Hz~100kHz	–	87	187	µV
Vo=2.85V Version Output Voltage	V_O	V_{IN}=5.85V, Io=0.01A	2.82	2.85	2.88	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=4.35V~9.35V, Io=1A	–	–	57	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=5.85V, Io=0~1A	–	–	57	mV
Quiescent Current	I_Q	V_{IN}=5.85V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=5.85V, ein=2V_{P-P} f=120Hz, Io=0.5A	53	63	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=5.85V, Io=0.5A BW=10Hz~100kHz	–	90	190	µV
Vo=3V Version Output Voltage	V_O	V_{IN}=6V, Io=0.01A	2.97	3.00	3.03	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=4.5V~9.5V, Io=1A	–	–	60	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=6V, Io=0~1A	–	–	60	mV
Quiescent Current	I_Q	V_{IN}=6V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=6V, ein=2V_{P-P} f=120Hz, Io=0.5A	52	62	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=6V, Io=0.5A BW=10Hz~100kHz	–	95	195	µV

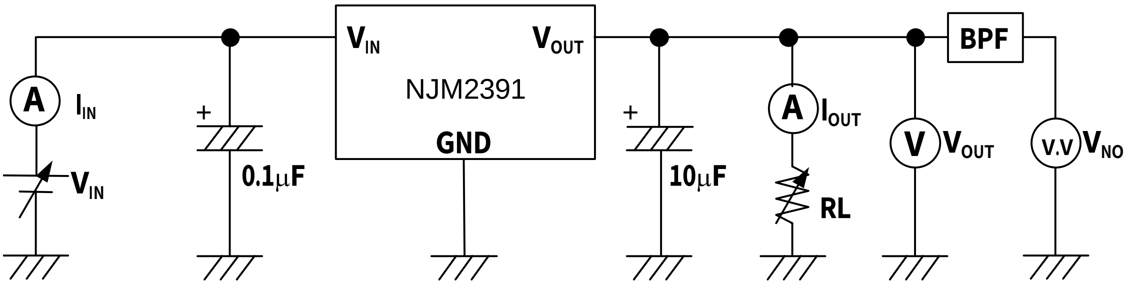
■ ELECTRICAL CHARACTERISTICS (C_{IN}=0.1µF, Co=10µF, Tj=25°C)

Measurement is to be conducted is pulse testing

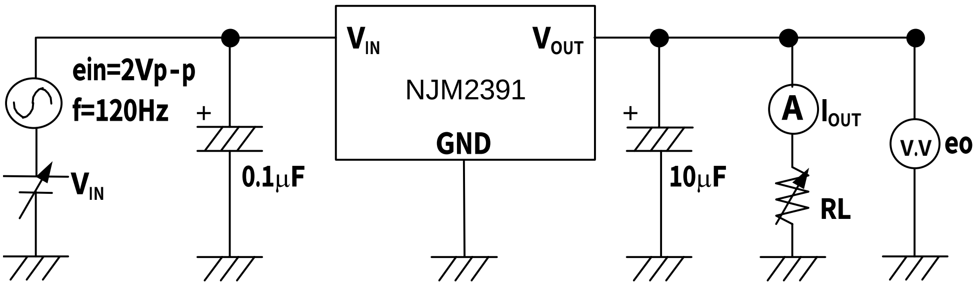
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Vo=3.3V Version Output Voltage	V_O	V_{IN}=6.3V, Io=0.01A	3.267	3.30	3.333	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=4.8V~9.8V, Io=1A	–	–	66	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=6.3V, Io=0~1A	–	–	66	mV
Quiescent Current	I_Q	V_{IN}=6.3V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=6.3V, ein=2V_{P-P} f=120Hz, Io=0.5A	52	62	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=6.3V, Io=0.5A BW=10Hz~100kHz	–	100	200	µV
Vo=3.5V Version Output Voltage	V_O	V_{IN}=6.5V, Io=0.01A	3.465	3.50	3.535	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=5V~10V, Io=1A	–	–	70	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=6.5V, Io=0~1A	–	–	70	mV
Quiescent Current	I_Q	V_{IN}=6.5V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=6.5V, ein=2V_{P-P} f=120Hz, Io=0.5A	52	62	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=6.5V, Io=0.5A BW=10Hz~100kHz	–	105	205	µV
Vo=5V Version Output Voltage	V_O	V_{IN}=8V, Io=0.01A	4.95	5.00	5.05	V
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=6.5V~9.5V, Io=1A	–	–	60	mV
Load Regulation	$\Delta Vo/\Delta Io$	V_{IN}=8V, Io=0~1A	–	–	100	mV
Quiescent Current	I_Q	V_{IN}=8V, Io=0A	–	2.3	4.0	mA
Ripple Rejection	RR	V_{IN}=8V, ein=2V_{P-P} f=120Hz, Io=0.5A	50	60	–	dB
Dropout Voltage	ΔV_{I-O}	Io=1A	–	1.1	1.2	V
Output Noise Voltage	V_{NO}	V_{IN}=8V, Io=0.5A BW=10Hz~100kHz	–	150	260	µV

■TEST CIRCUIT

1.Output Voltage / Line Regulation / Load Regulation
Quiescent Current / Dropout Voltage / Output Noise Voltage



2.Ripple Rejection



$RR=20\log_{10}[ein/eo]$ (dB)

*Input Capacitor C_{IN}

Input Capacitor C_{IN} is required to prevent oscillation and reduce power supply ripple for applications when high power supply impedance or a long power supply line.
Therefore, use the recommended C_{IN} value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and V_{IN} as shortest path as possible to avoid the problem.

*Output Capacitor C_O

Output capacitor (C_O) will be required for a phase compensation of the internal error amplifier.

The capacitance and the equivalent series resistance (ESR) influence to stable operation of the regulator.

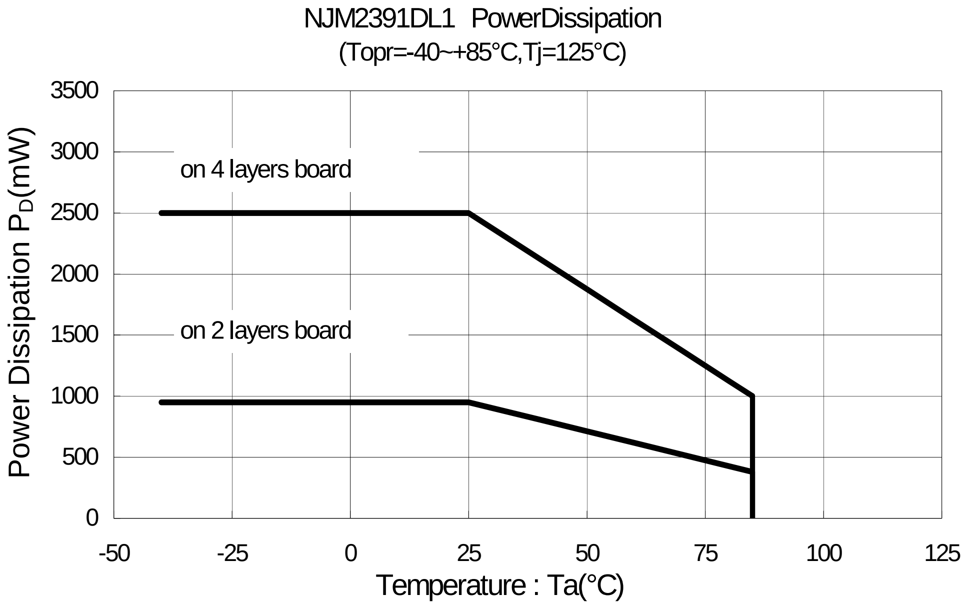
Use of a smaller C_O may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.

On the other hand, Use of a larger C_O reduces output noise and ripple output, and also improves output transient response when rapid load change.

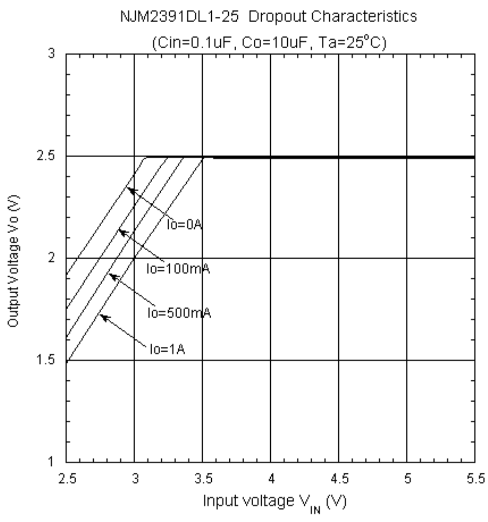
Therefore, use the recommended C_O value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and V_{OUT} as shortest path as possible for stable operation

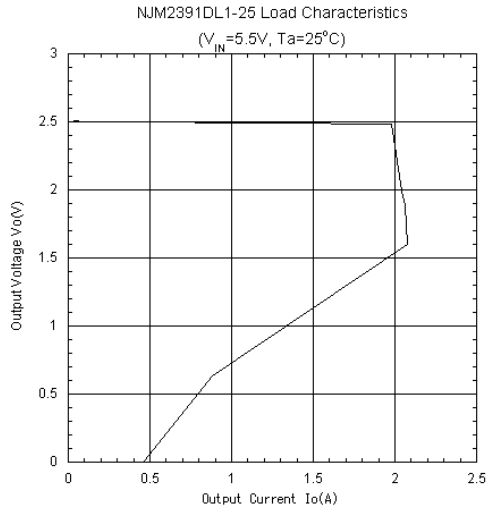
In addition, Please choose an appropriate capacitor in considering varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, and so on) when selecting C_O.

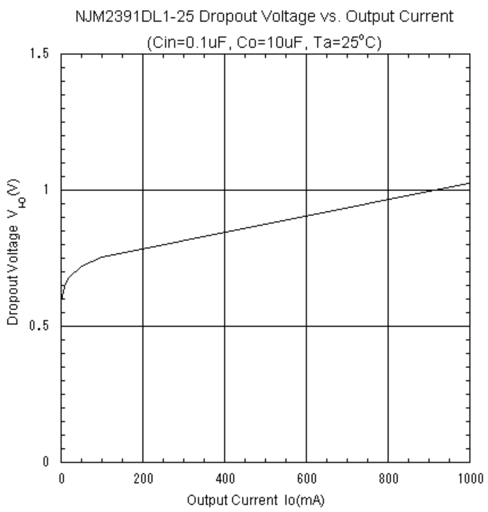
■POWER DISSIPATION vs. AMBIENT TEMPERATURE

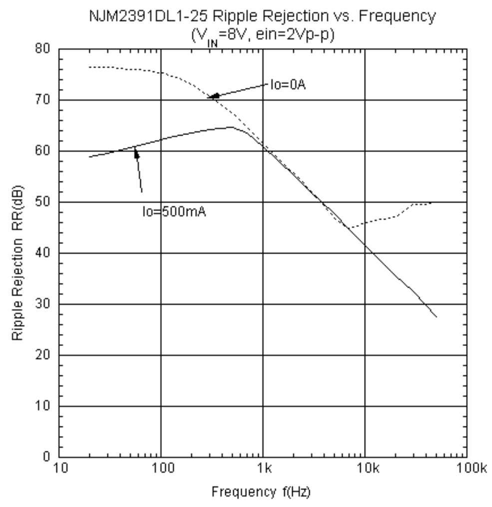


■ELECTRICAL CHARACTERISTICS









■ELECTRICAL CHARACTERISTICS