Very Low Output Negative Voltage Regulator

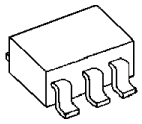
■ GENERAL DESCRIPTION

The NJM2829 is a negative voltage regulator that delivers up to 100mA output current with the output voltage of -0.8 to -1.3V with ON/OFF control.

Advanced Bipolar technology achieves low noise, high ripple rejection, and high precision voltage.

It has soft-start and shunt SW function. 2.2μF Output capacitor and small package can make NJM2829 suitable for portable items.

■ PACKAGE OUTLINE

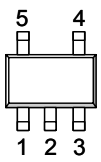


NJM2829F3

■ FEATURES

- High Precision Output V_O±1.5%
- High Ripple Rejection 80dB typ. (f=1kHz, V_O=-1.0V version)
- Output Capacitor with 2.2μF ceramic capacitor
- Output Current I_O(max)=100mA
- ON/OFF Control (Positive voltage control from 0V to +5V)
- Soft-start Function
- Shunt SW Function
- Built-in Thermal Overload Protection and Short Circuit Current Limit Protection
- Bipolar Technology
- Package Outline SC-88A

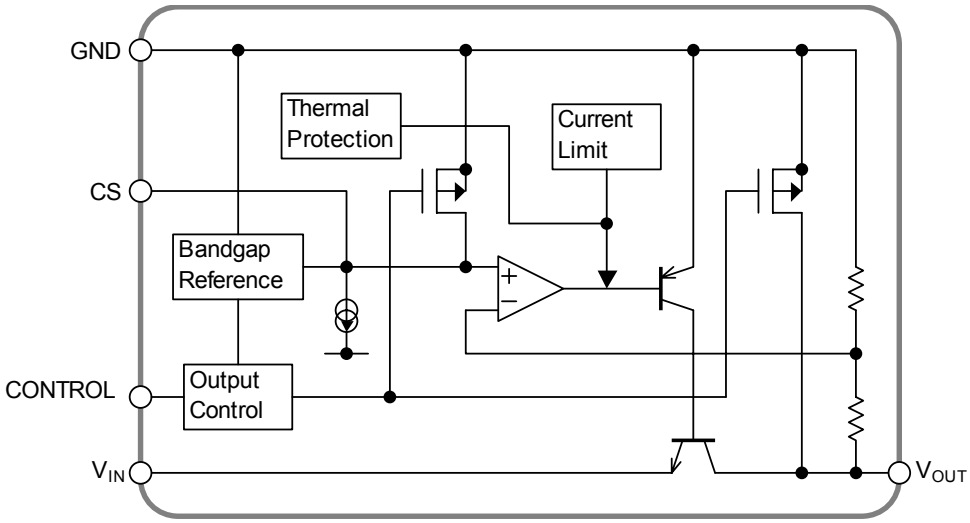
■ PIN CONNECTION



1. GND
2. V_{IN}
3. V_{OUT}
4. CONTROL
5. CS

NJM2829F3

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{out}
NJM2829F3 -080	-0.8V
NJM2829F3 -095	-0.95V
NJM2829F3 -100	-1.0V
NJM2829F3 -120	-1.2V
NJM2829F3 -130	-1.3V

Output Voltage Range: -0.8V to -1.3V

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	-14	V
Control Voltage	V_{CONT}	+5	V
Output Sink Current at OFF-state	$I_{SINK(OFF)}$	10	mA
Power Dissipation	P_D	250(*1)	mW
Operating Temperature	Topr	- 40 ~ +85	°C
Storage Temperature	Tstg	- 40 ~ +125	°C

(*1): Mounted on glass epoxy board. (114.3×76.2×1.6mm : 2layer,FR-4)

■ OPERATING VOLTAGE RANGE

V_{IN}=-3.2 ~ -12V

■ ELECTRICAL CHARACTERISTICS

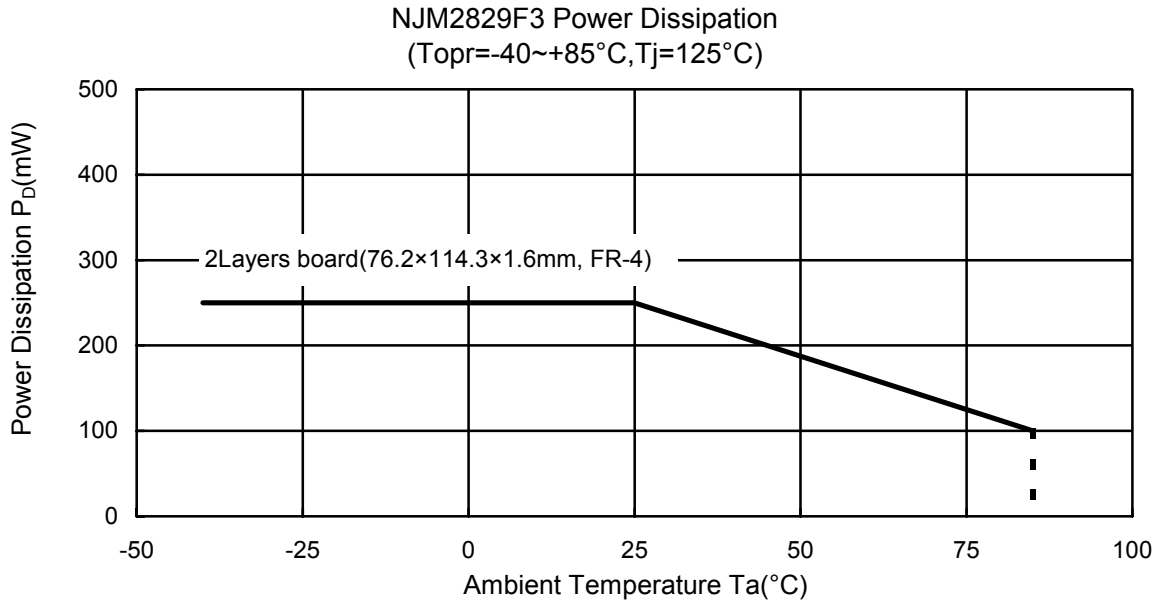
(V_{IN}=-3.2V, V_{CONT}=3V, C_{IN}=0.1µF, Co=2.2µF(Vo > -0.9V :Co=4.7µF) , Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Io=30mA	-1.5%	-	+1.5%	V
Quiescent Current	I_Q	Io=0mA, except Icont	-	140	220	µA
Quiescent Current at OFF-state	$I_{Q(OFF)}$	V_{CONT}=0V	-	-	100	nA
Output Current	Io	V_O×0.9	100	130	-	mA
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo-3.2V~ -12V, Io=30mA	-	-	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0~60mA	-	-	0.04	%/mA
Ripple Rejection	RR	V_{IN}=-4.0V,ein=200mVrms,f=1kHz, Io=10mA,Vo=-1.0V Version	-	80	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta Ta$	Ta=0~+85°C, Io=10mA	-	±50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz~80kHz, Io=10mA, Vo=--1.0V Version	-	40	-	µVrms
CS Terminal Charge Current	Ics	V_{CS}=0V	4	5.3	6.5	µA
Output Resistance at OFF-state	$R_{O(OFF)}$	V_{CONT}=0V	-	560	-	Ω
Control Current	I_{CONT}	V_{CONT}=1.6V	-	2	4	µA
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		-	-	0.6	V
Input Voltage	V_{IN}		-12	-	-	V

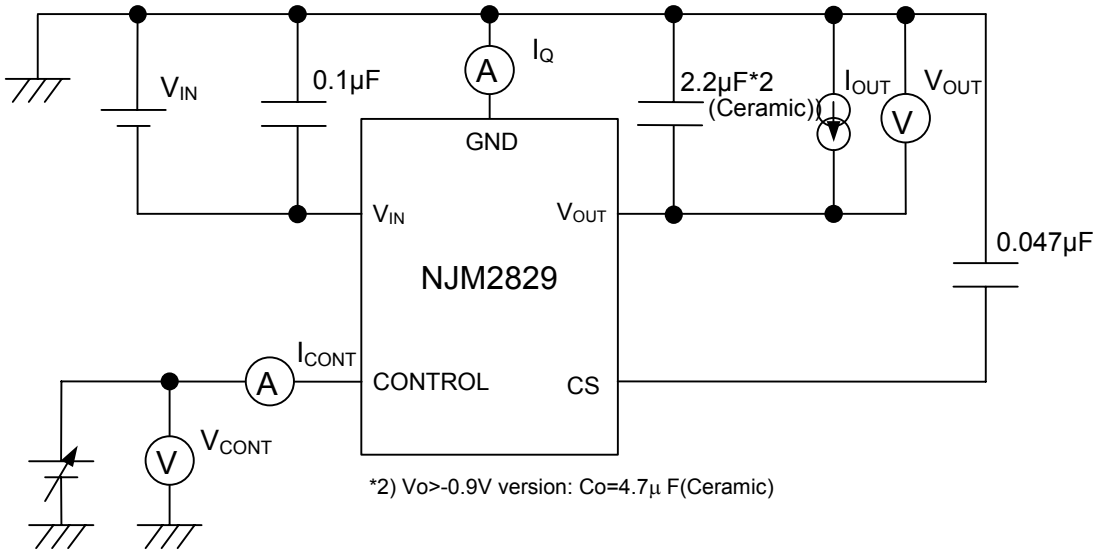
The above specification is a common specification for all output voltages.

Therefore, it may be different from the individual specification for a specific output voltage.

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



■ **TEST CIRCUIT**



■ TYPICAL APPLICATION

∗ON/OFF control

ON/OFF control can be achieved by applying positive control voltage to CONTROL terminal.

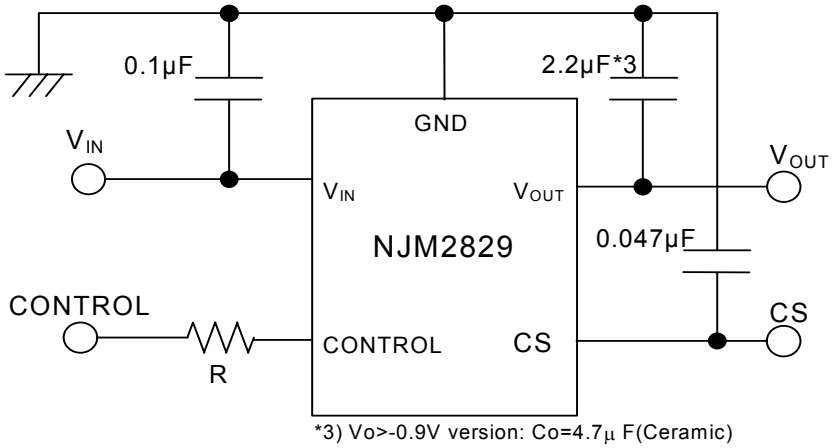
Apply positive Vcont ("H") to make chip to be ON (Enabled), and either Vcont is "L" or open (High Z) to make chip to be OFF (Disabled).

The relations between Vcont and the state is as follows:

Vcont +1.6V ≤ Vcont ≤ +5V ("H" level):	ON state
Vcont 0V ≤ Vcont ≤ +0.6V ("L" level):	OFF state
Vcont +0.6V < Vcont < +1.6V ("L" level):	Undefined

In case ON/OFF control is not used, keep applying positive Vcont to CONTROL terminal to make chip ON.

Note that negative Vcont does not make the chip enabled.



*3) Vo>-0.9V version: Co=4.7µ F(Ceramic)

*In the case of using a resistance "R" to CONTROL terminal.

If this resistor is inserted, it can reduce the control current when the control voltage is high.

The applied voltage to control terminal should set to consider voltage drop through the resistor “R” and the minimum control voltage for ON-state.

The $V_{CONT\,(ON)}$ and I_{CONT} have temperature dependence as shown in the "Control Current vs. Temperature" and " Control Voltage vs. Temperature" characteristics.

Therefore, the resistance "R" should be selected to consider the temperature characteristics.

*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

The recommended capacitance depends on the output voltage rank. Especially, low voltage regulator requires larger C_O value.

In addition, you should consider varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, a DC bias characteristic and so on) and unevenness peculiar to a capacitor supplier enough.

When selecting C_O, recommend that have withstand voltage margin against output voltage and superior temperature characteristic.