2ch ULTRA LOW NOISE LOW DROPOUT VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

The NJM2898 is a 2ch ultra low noise low dropout voltage regulator designed for VCO Applications.

Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

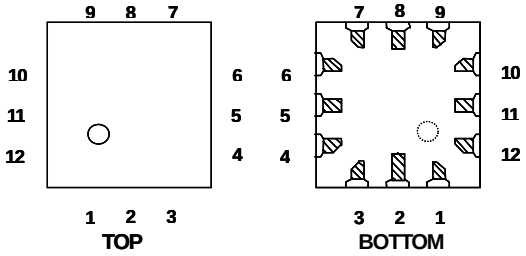
■ PACKAGE OUTLINE

NJM2898PB1

■ FEATURES

- High Ripple Rejection 75dB typ. (f=1kHz,Vo=3V Version)
- Output Noise Voltage Vno=19μVrms typ. (Cp=0.01μF, Co=1.0μF(Ceramic))
  Vno=12μVrms typ. (Cp=0.1μF, Co=10μF(Tantalum))
- Output capacitor with 1.0uF ceramic capacitor
- Output Current Io(max.)=100mA × 2ch
- High Precision Output Vo±1.0%
- Low Dropout Voltage 0.10V typ. (Io=60mA)
- ON/OFF Control (Active High)
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline FFP12-B1 (2.0×2.0×0.85mm)

■ PIN CONFIGURATION

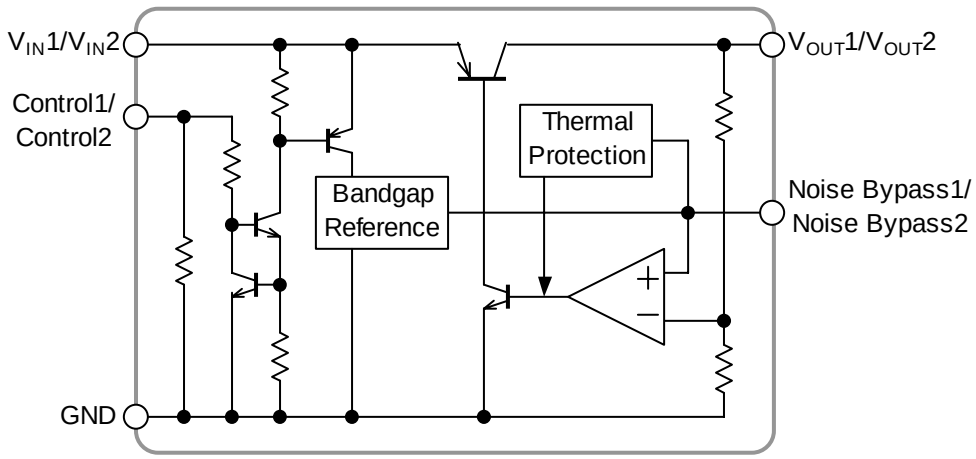


NJM2898PB1

PIN FUNCTION

1. $V_{OUT}2$	7. CONTROL1
2. $V_{OUT}2$	8. $V_{OUT}1$
3. GND	9. $V_{OUT}1$
4. CONTROL2	10. NOISE BYPASS1
5. $V_{IN}2$	11. NC
6. $V_{IN}1$	12. NOISE BYPASS2

■ EQUIVALENT CIRCUIT



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}	
	CH1	CH2
NJM2898PB1-2828	2.8V	2.8V
NJM2898PB1-JJ	2.85V	2.85V
NJM2898PB1-0303	3.0V	3.0V
NJM2898PB1-0521	5.0V	2.1V

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+14	V
Control Voltage	V_{CONT}	+14(*1)	V
Power Dissipation	P_D	350(*2)	mW
Operating Temperature	Topr	-40 ~ +85	°C
Storage Temperature	Tstg	-40 ~ +125	°C

(*1): When input voltage is less than +14V, the absolute maximum control voltage is equal to the input voltage.

(*2): Mounted on glass epoxy board based on EIA/JEDEC. (114.3x76.2x1.6mm: 2Layers)

■ ELECTRICAL CHARACTERISTICS

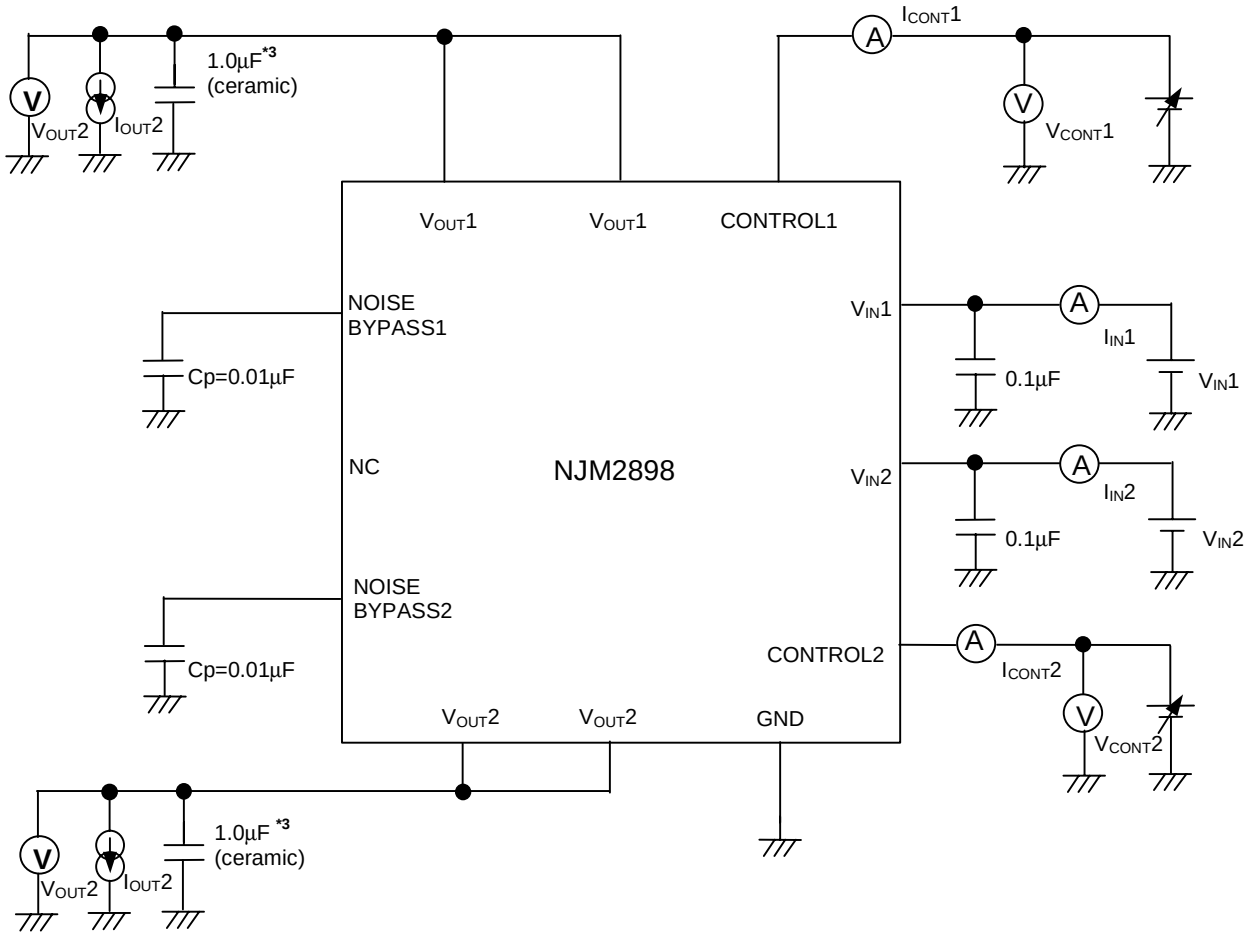
(1CH/2CH: V_{IN}=Vo+1V, C_{IN}=0.1µF, Co=1.0uF: Vo≥2.7V (Co=2.2uF: Vo≤2.6V), Cp=0.01µF, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Io=30mA	-1.0%	–	+1.0%	V
Quiescent Current	I_Q	Io=0mA, except Icont, per 1ch	–	120	180	µA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V, per 1ch	–	–	100	nA
Output Current	Io	Vo–0.3V	100	130	-	mA
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V ~ Vo+6V, Io=30mA	–	–	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 ~ 100mA	–	–	0.03	%/mA
Dropout Voltage	ΔV_{I-O}	Io=60mA	–	0.10	0.18	V
Ripple Rejection	RR	ein=200mVrms,f=1kHz, Io=10mA, Vo=3V Version	–	75	–	dB
Average Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta Ta$	Ta=0 ~ 85°C, Io=10mA	–	±50	–	ppm/°C
Output Noise Voltage1	V_{NO1}	f=10Hz ~ 80kHz, Io=10mA, Cp=0.01µF, Co=1.0µF(Ceramic), Vo=3V Version	–	19	–	µVrms
Output Noise Voltage2	V_{NO2}	f=10Hz ~ 80kHz, Io=10mA, Cp=0.1µF, Co=10µF(Tantalum), Vo=3V Version		12		µVrms
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	–	–	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		–	–	0.6	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.

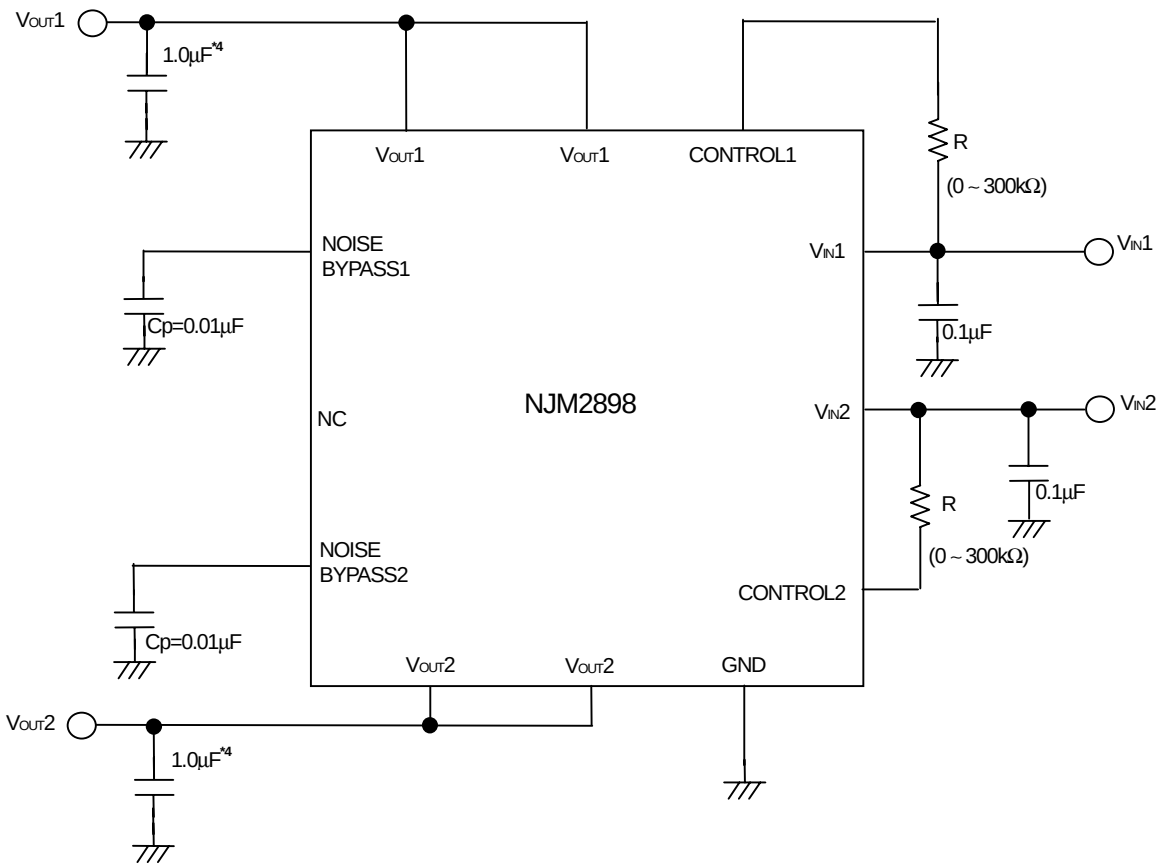
■ TEST CIRCUIT



*3 Vo≤2.6V version: Co=2.2µF(ceramic)

■ TYPICAL APPLICATION

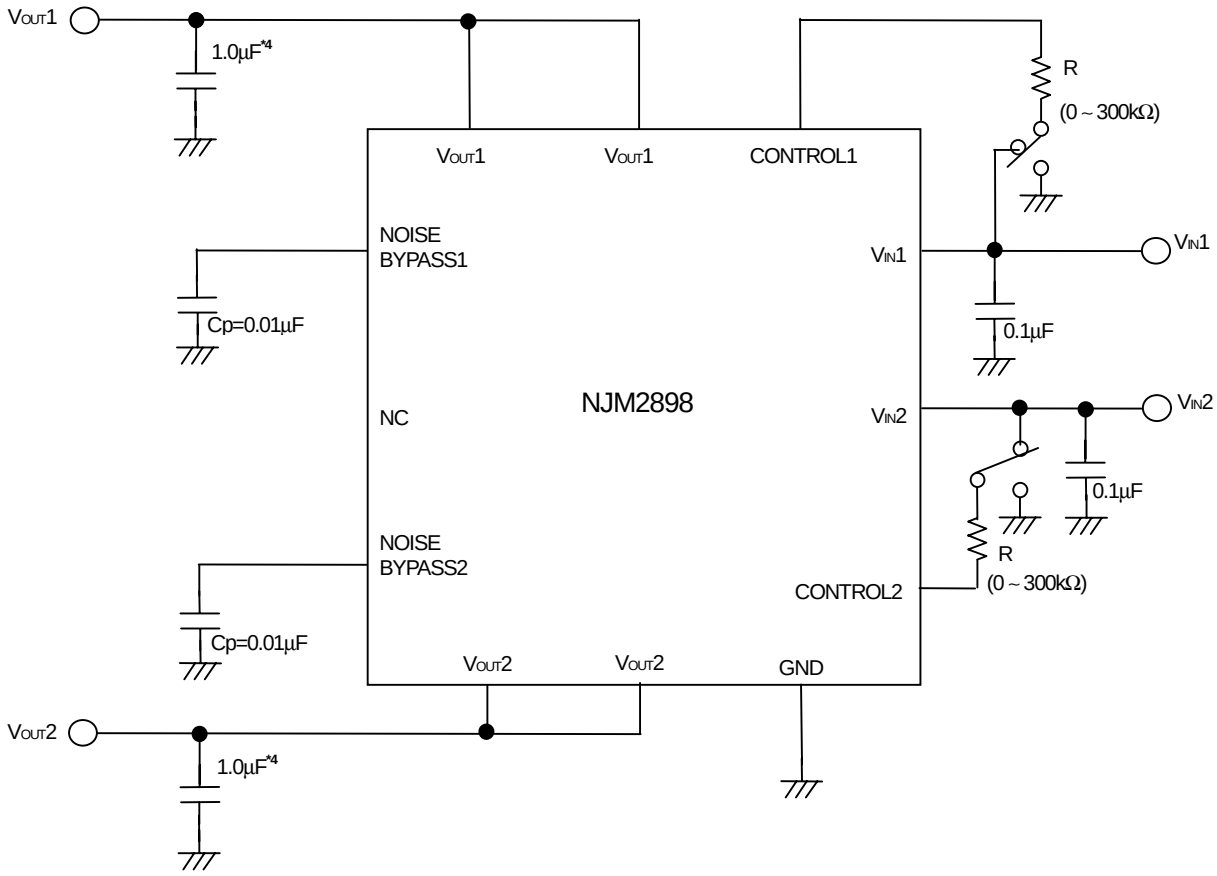
① In the case where ON/OFF Control is not required:



*4 Vo≤2.6V version: Co=2.2µF

Connect control terminal to V_{IN} terminal

② In use of ON/OFF CONTROL:



*4 Vo≤2.6V version: Co=2.2µF

State of control terminal:

- "H"→ output is enabled.
- "L" or "open" → output is disabled.

∗Noise bypass Capacitance Cp

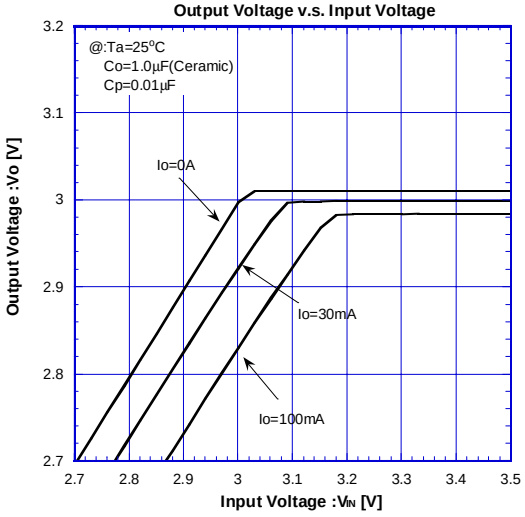
Noise bypass capacitance Cp reduces noise generated by band-gap reference circuit.
Noise level and ripple rejection will be improved when larger Cp is used.
Use of smaller Cp value may cause oscillation.
Use the Cp value of 0.01uF greater to avoid the problem.

∗In the case of using a resistance "R" between V_{IN} and control.

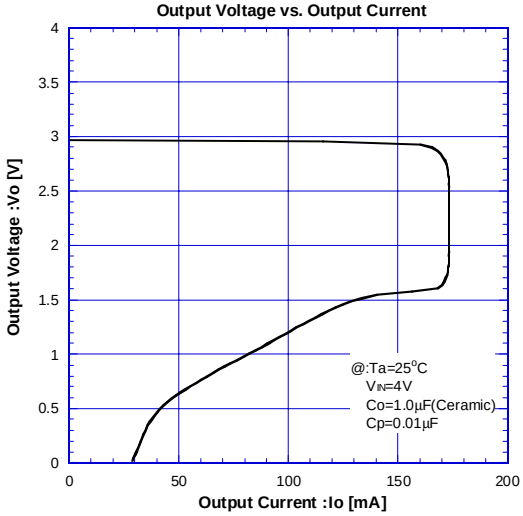
The current flow into the control terminal while the IC is ON state (I_{CONT}) can be reduced when a pull up resistance "R" is inserted between V_{IN} and the control terminal.
The minimum control voltage for ON state ($V_{CONT\ (ON)}$) is increased due to the voltage drop caused by I_{CONT} and the resistance "R". The I_{CONT} is temperature dependence as shown in the "Control Current vs. Temperature" characteristics. Therefore, the resistance "R" should be carefully selected to ensure the control voltage exceeds the $V_{CONT\ (ON)}$ over the required temperature range.

■ ELECTRICAL CHARACTERISTICS

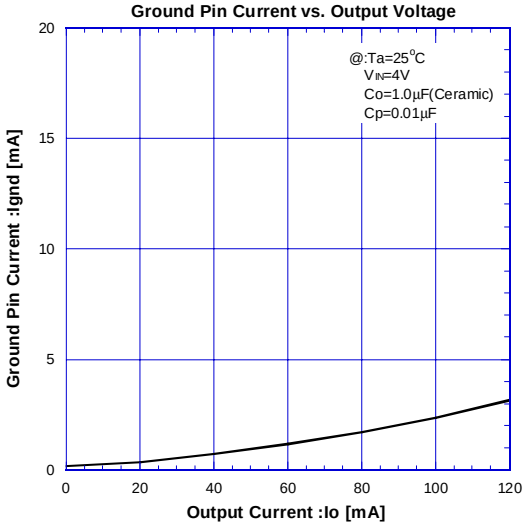
NJM2898_3V
Output Voltage v.s. Input Voltage



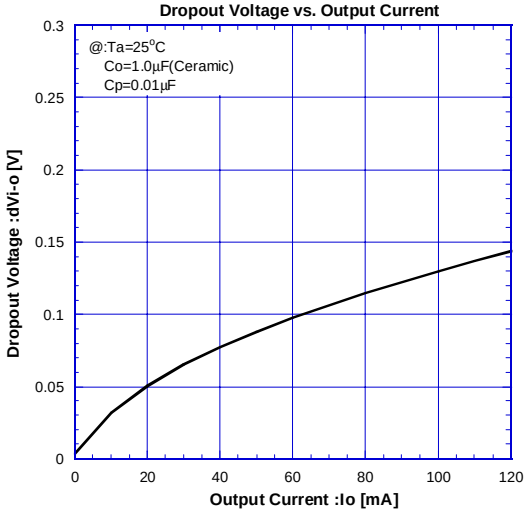
NJM2898_3.0V
Output Voltage vs. Output Current



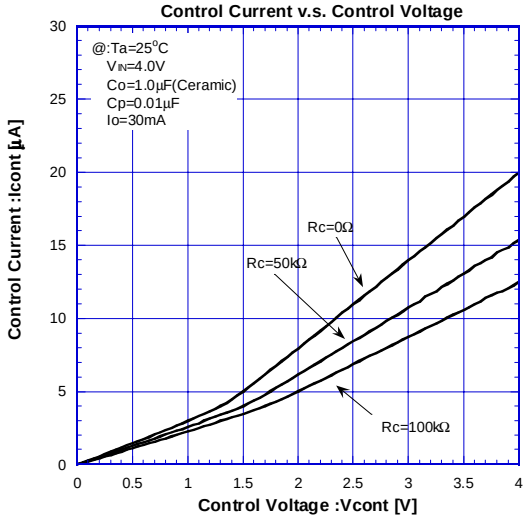
NJM2898_3V
Ground Pin Current vs. Output Voltage



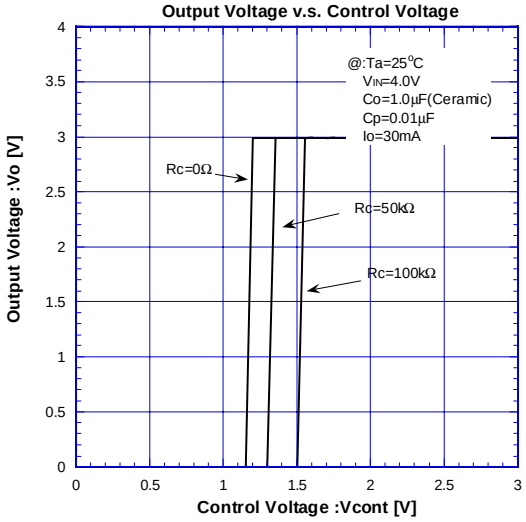
NJM2898_3.0V
Dropout Voltage vs. Output Current



NJM2898_3.0V
Control Current v.s. Control Voltage

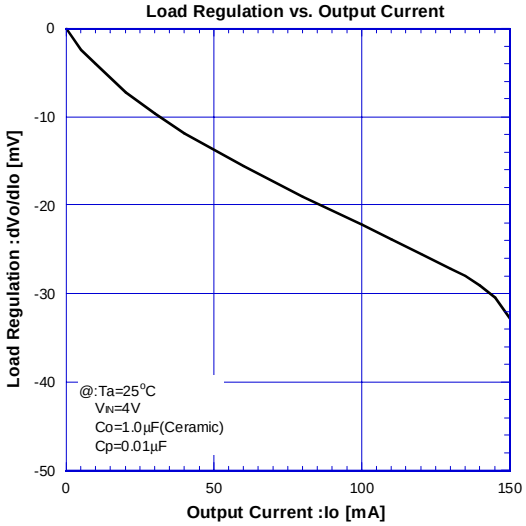


NJM2898_3.0V
Output Voltage v.s. Control Voltage

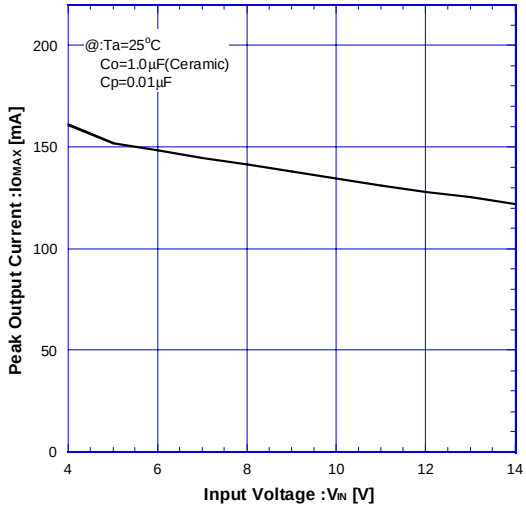


■ ELECTRICAL CHARACTERISTICS

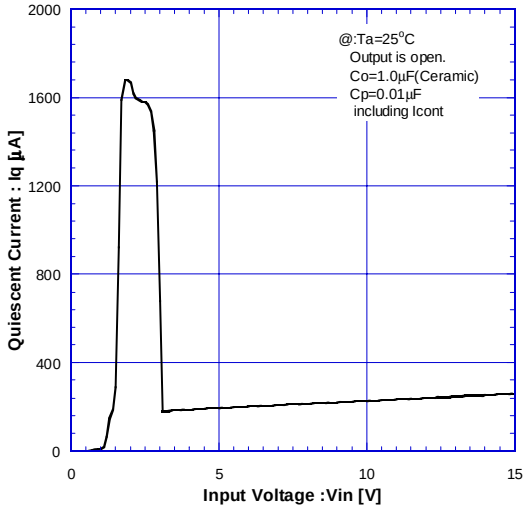
NJM2898_3.0V
Load Regulation vs. Output Current



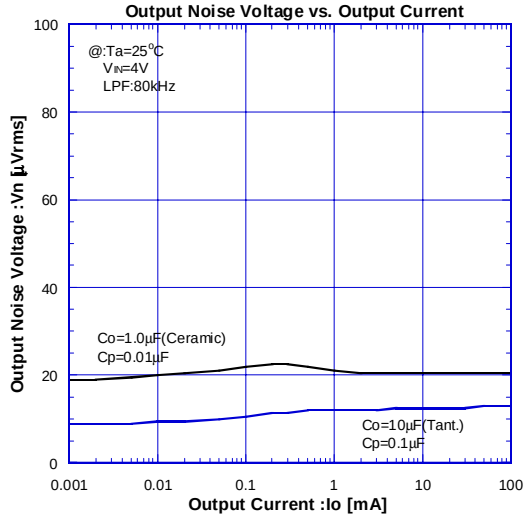
NJM2898_3.0V
Peak Output Current vs. Input Voltage



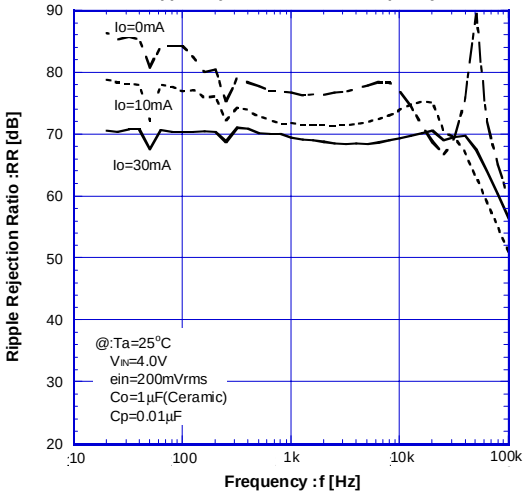
NJM2898_3.0V
Quiescent Current v.s. Input Voltage



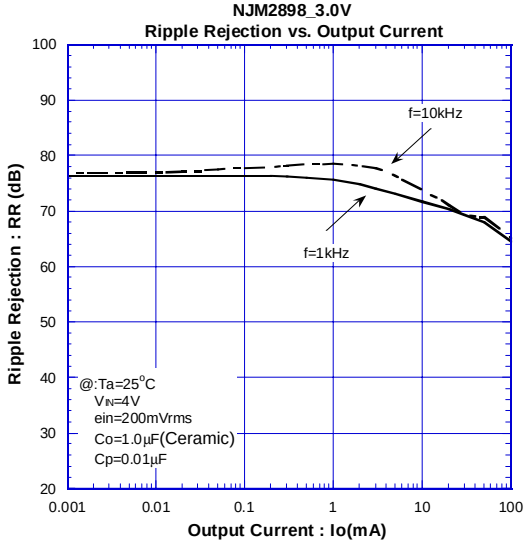
NJM2898_3V
Output Noise Voltage vs. Output Current



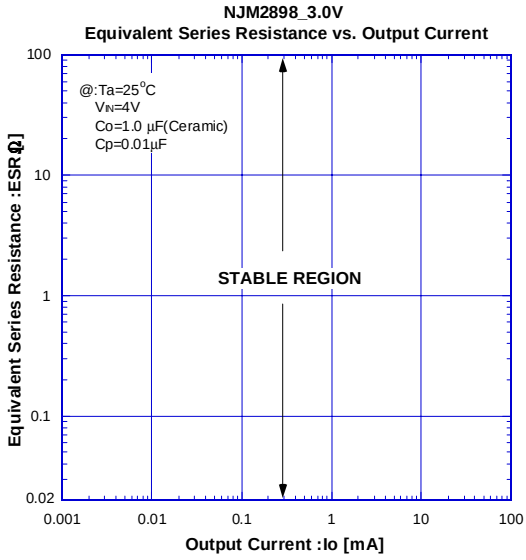
NJM2898_3.0V
Ripple Rejection Ratio v.s. Frequency

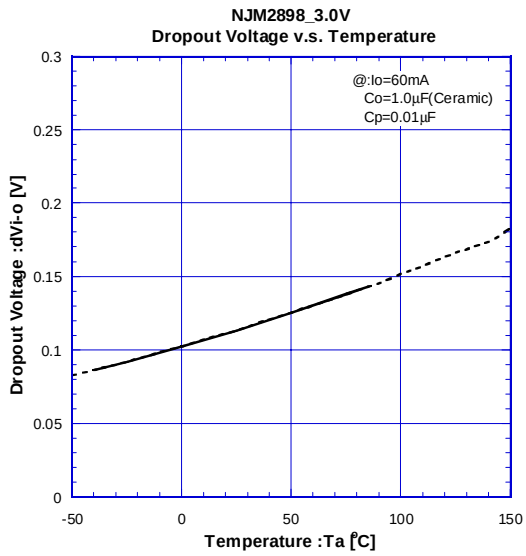


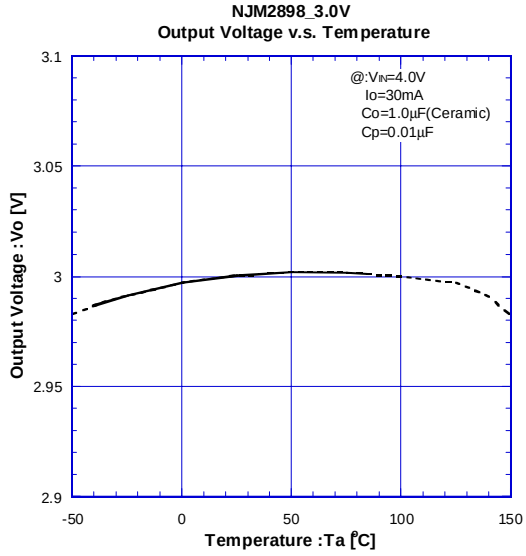
NJM2898_3.0V
Ripple Rejection vs. Output Current

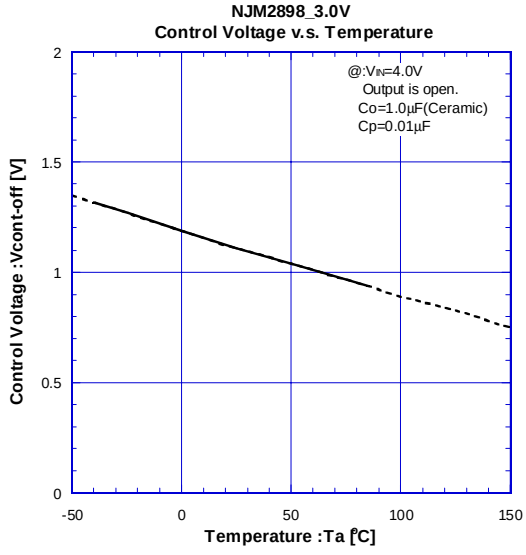


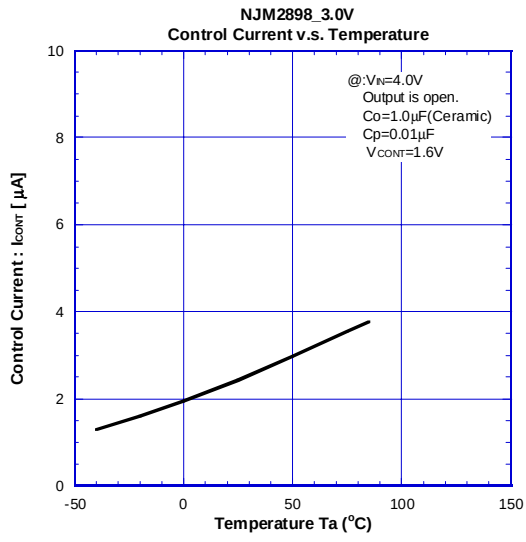
■ ELECTRICAL CHARACTERISTICS





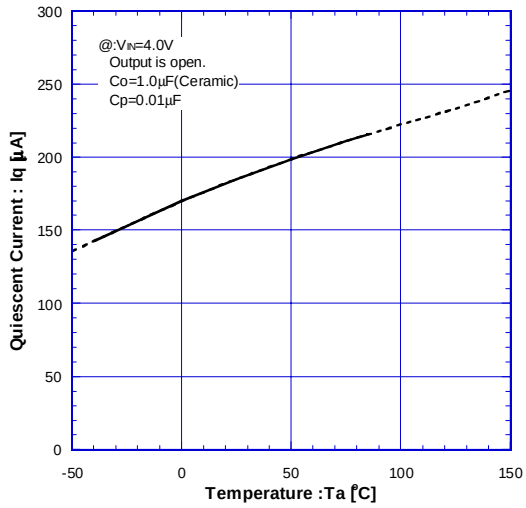




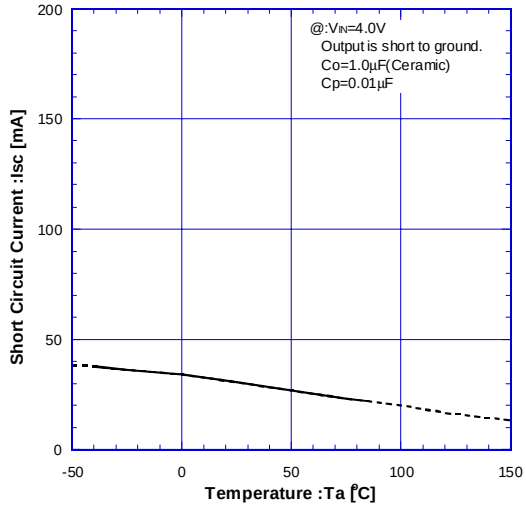


■ ELECTRICAL CHARACTERISTICS

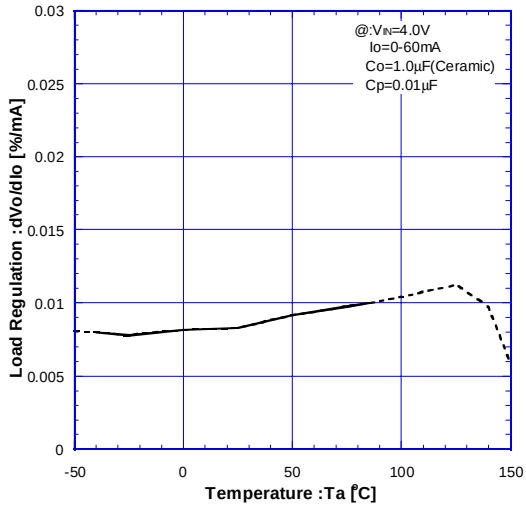
NJM2898_3.0V
Quiescent Current v.s. Temperature



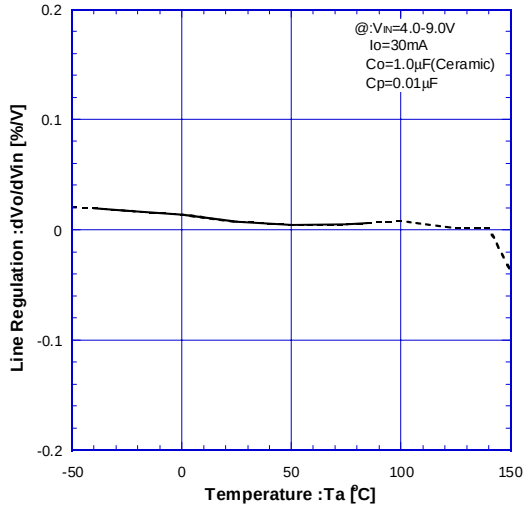
NJM2898_3.0V
Short Circuit Current v.s. Temperature



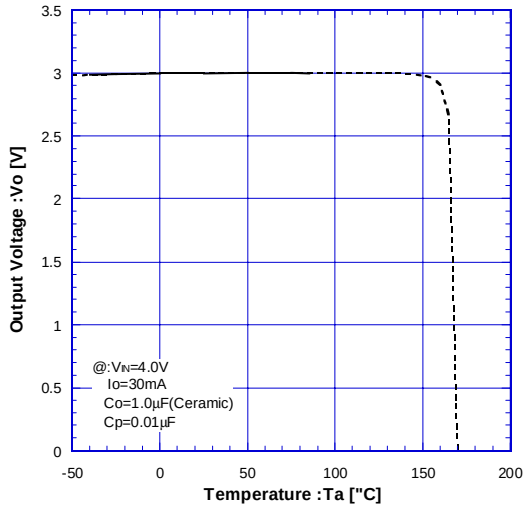
NJM2898_3.0V
Load Regulation v.s. Temperature



NJM2898_3.0V
Line Regulation v.s. Temperature

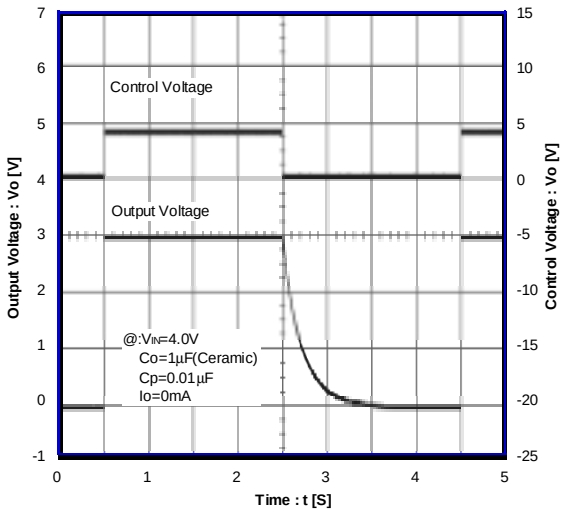


NJM2898_3.0V
Output Voltage v.s. Temperature

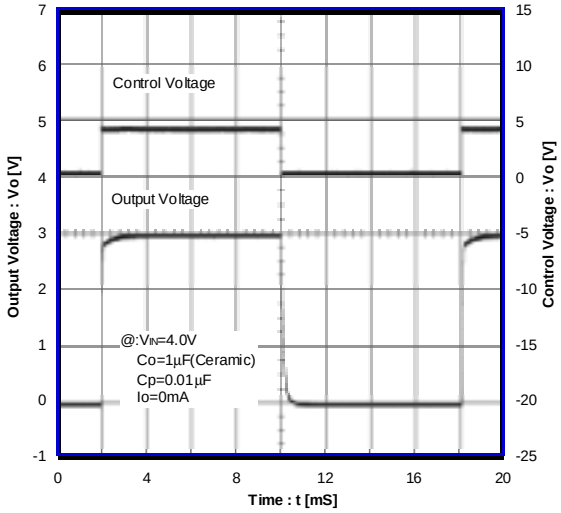


■ ELECTRICAL CHARACTERISTICS

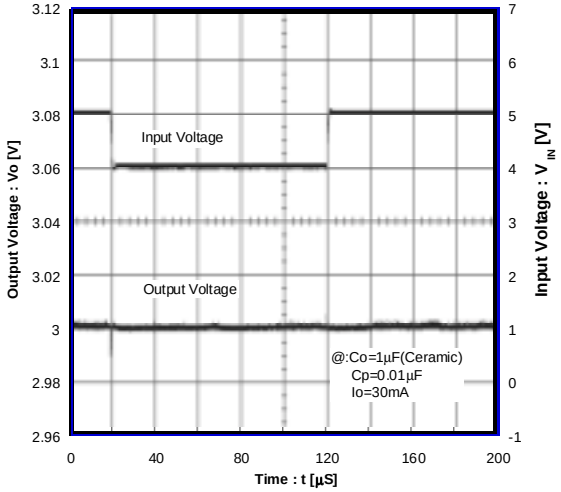
NJM2898_3V
ON/OFF Transient Response without Load



NJM2898_3V
ON/OFF Transient Response



NJM2898_3V
Line Transient Response



NJM2898_3V
Load Transient Response