2ch Low Dropout Voltage Regulator with Reset

■ GENERAL DISCRIPTION

The NJM2810 is a 2ch low dropout voltage regulator with reset function.

It provides up to 150mA/100mA as output current, and the reset function monitors individual voltage through V_{DET} terminal with 1% accuracy.

It is suitable for local power supply for small micro controller and other logic applications.

■ PACKAGE OUTLINE

NJM2810RB1

■ FEATURES

<Regulator Block>

- Output Current CH1 = 150mA max.
  CH2 = 100mA max.
- Output Voltage Accuracy Vo1/Vo2 = ±1.0%
- Ripple Rejection 75dB typ. (f=1kHz.Vo=3V Version)
- ON/OFF Control (CH1 Only)
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limit

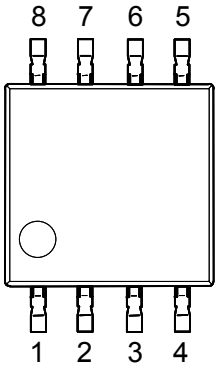
<Reset Block>

- Reset Voltage Accuracy V_{RT} = ±1.0%
- Reset Hold Time td=10mS±1.0mS
- Individual Voltage Detection
- Open Collector Output

<Others>

- Bipolar Technology
- Package Outline TVSP-8

■ PIN CONFIGURATION



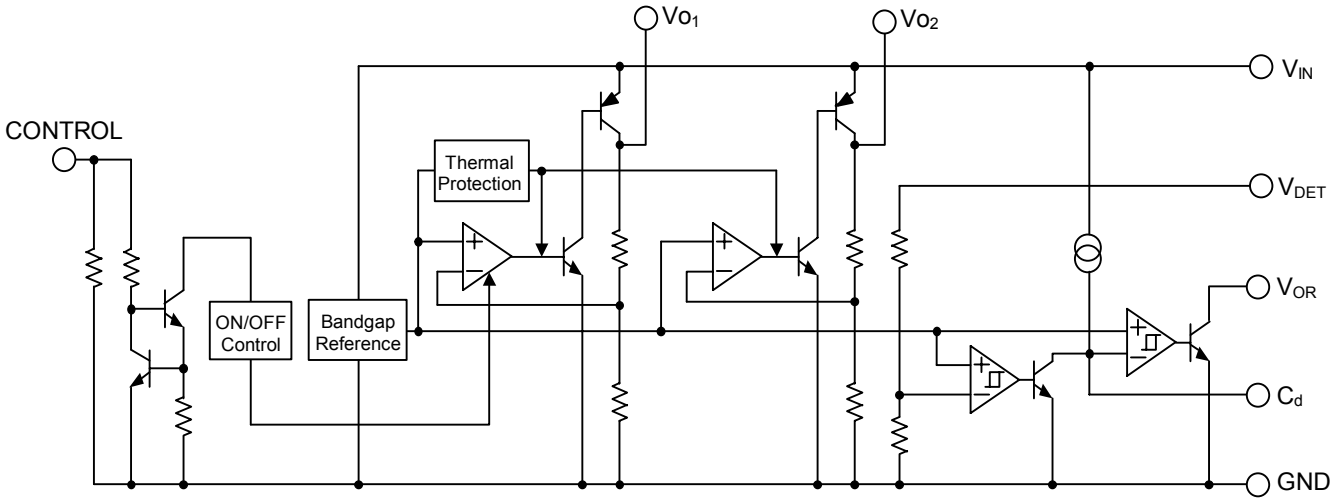
NJM2810RB1

PIN FUNCTION
1. C_d
2. V_{OR}
3. V_{DET}
4. V_{IN}
5. Vo_1
6. Vo_2
7. GND
8. CONTROL

■ OUTPUT VOLTAGE/ DETECTION VOLTAGE RANK LIST

Device Name	Output Voltage		Detection Voltage
	Reg1	Reg2	
NJM2810RB1-CC28	2.1V	2.1V	2.8V
NJM2810RB1-EP42	2.5V	3.3V	4.2V
NJM2810RB1-YY43	5.0V	5.0V	4.3V

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+14	V
Control Voltage	V_{CONT}	+14 (*1)	V
Detection Terminal Voltage	V_{DET}	+14	V
Reset Output Voltage	V_{OR}	+14	V
Power Dissipation	P_D	320	mW
Operating Temperature Range	Topr	−40~+85	°C
Storage Temperature Range	Tstg	−40~+125	°C

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

■ ELECTRICAL CHARACTERISTICS

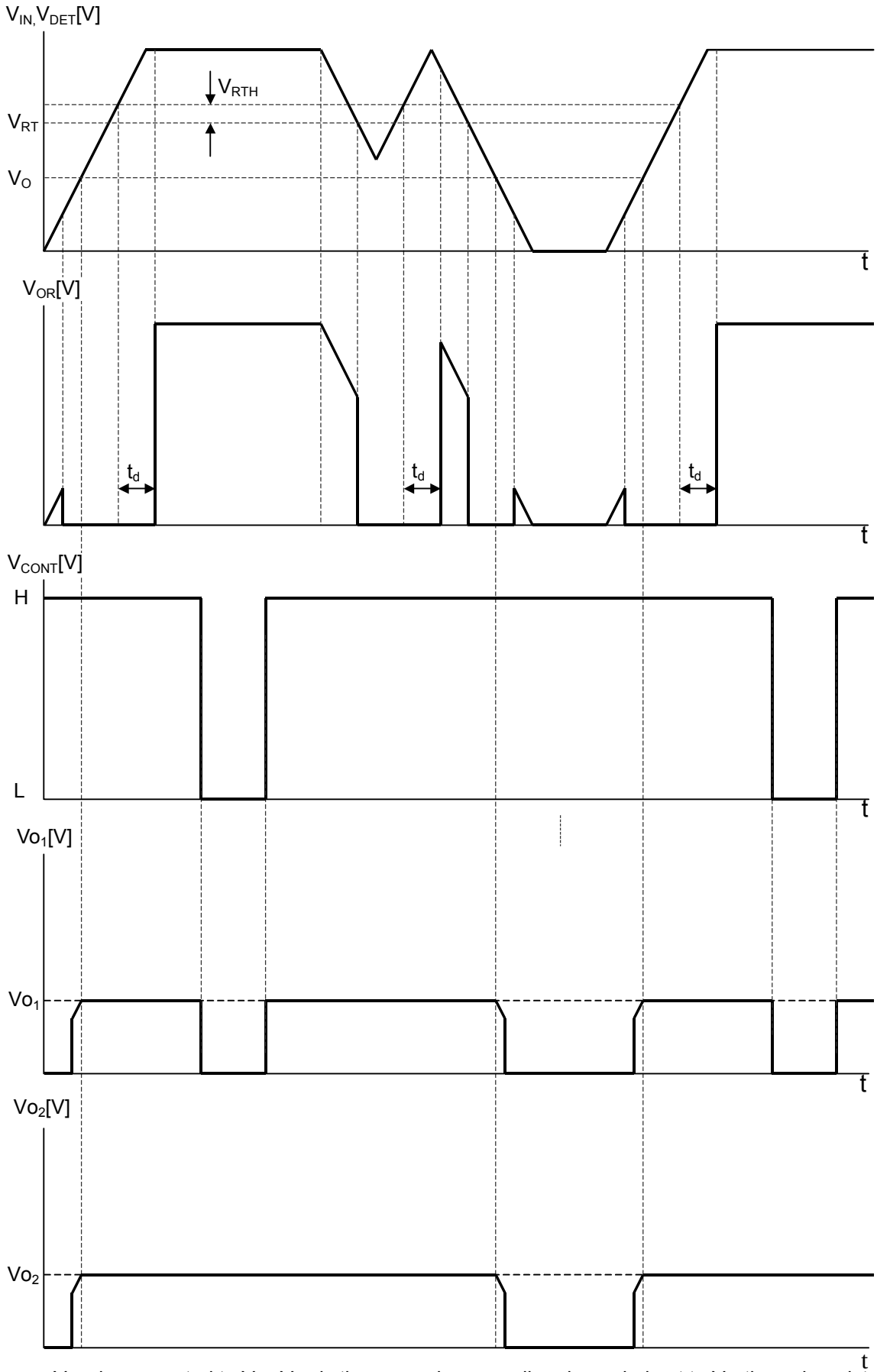
(V_{IN}=Vo+1V, C_{IN}=0.1μF, Co=1μF, C_d=0.1μF (Vo≤2.6V : Co=2.2μF) , Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current 1	I_{Q1}	Io_1=Io_2=0mA, V_{CONT}=V_{IN}, V_{DET}=V_{RT}+1V except I_{CONT}	-	360	520	μA
Quiescent Current 2	I_{Q2}	Io_2=0mA,V_{CONT}=0V, V_{DET}=V_{RT}+1V except I_{CONT}	-	250	350	μA
V_{DET} Terminal Quiescent Current	I_{Q3}	V_{DET}=V_{RT}+1V	-	5	15	μA
Regulator Block 1 (Io=150mA, With ON/OFF Function)						
Output Voltage	Vo_1	Io_1=30mA	-1.0%	-	+1.0%	V
Output Current	Io_1	Vo_1-0.3V	150	200	-	mA
Line Regulation	$\Delta Vo_1/\Delta V_{IN}$	V_{IN}=Vo+1V~Vo+6V(*2), Io_1=30mA	-	-	0.10	%/V
Load Regulation	$\Delta Vo_1/\Delta Io_1$	Io_1=0~100mA	-	-	0.03	%/mA
Dropout Voltage	ΔV_{I-O1}	Io_1=60mA	-	0.10	0.18	V
Ripple Rejection	RR_1	ein=200mVrms,f=1kHz,Io_1=10mA, Vo_1=3V Version	-	75	-	dB
Output Voltage Temperature Coefficient	$\Delta Vo_1/\Delta T$	Ta=0~85°C, Io_1=10mA	-	±50	-	ppm/°C
Output Noise Voltage	V_{NO1}	f=10Hz~80kHz, Io_1=10mA, Vo_1=3V Version	-	45	-	μVrms
Control Voltage for ON-state	$V_{CONT(ON)1}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)1}$		-	-	0.6	V
Control Current	I_{CONT}	V_{CONT}=1.6V	-	3	12	μA
Regulator Block 2 (Io=100mA)						
Output Voltage	Vo_2	Io_2=30mA	-1.0%	-	+1.0%	V
Output Current	Io_2	Vo_2-0.3V	100	130	-	mA
Line Regulation	$\Delta Vo_2/\Delta V_{IN}$	V_{IN}=Vo+1V~Vo+6V(*2), Io_2=30mA	-	-	0.10	%/V
Load Regulation	$\Delta Vo_2/\Delta Io_2$	Io_2=0~60mA	-	-	0.03	%/mA
Dropout Voltage	ΔV_{I-O2}	Io_2=60mA	-	0.10	0.18	V
Ripple Rejection	RR_2	ein=200mVrms,f=1kHz,Io_2=10mA, Vo_2=3V Version	-	75	-	dB
Output Voltage Temperature Coefficient	$\Delta Vo_2/\Delta T$	Ta=0~85°C, Io_2=10mA	-	±50	-	ppm/°C
Output Noise Voltage	V_{NO2}	f=10Hz~80kHz, Io_2=10mA, Vo_2=3V Version	-	45	-	μVrms
Reset Block						
Detection Voltage	V_{RT}	V_{IN}= V_{DET} =H→L	-1.0%	-	+1.0%	V
Hysteresis Voltage	V_{RTH}	V_{IN}= V_{DET} =H→L→H	V_{RT}×3%	V_{RT}×5%	V_{RT}×8%	V
Low Level Output	V_{ORL}	V_{IN}= V_{DET} =V_{RT}-0.5V, R_L=100kΩ	-	100	300	mV
Output Leak Current	I_{ORH}	V_{IN}= V_{DET} =V_{RT}+0.5V	-	-	0.1	μA
On time Output Current	I_{ORL}	V_{IN}= V_{DET} =V_{RT}-0.5V, R_L=0Ω	5	-	-	mA
Reset Output Delay Time	t_d	V_{IN}= V_{DET} =(V_{RT}-0.5V) →(V_{RT}+0.5V),	9	10	11	mS
Operation Voltage Limit	V_{OPL}	V_{ORL}=0.4V	-	0.9	-	V

(*2) "V_{IN} =Vo+1V" means add 1V to Vo of the higher output voltage channel.

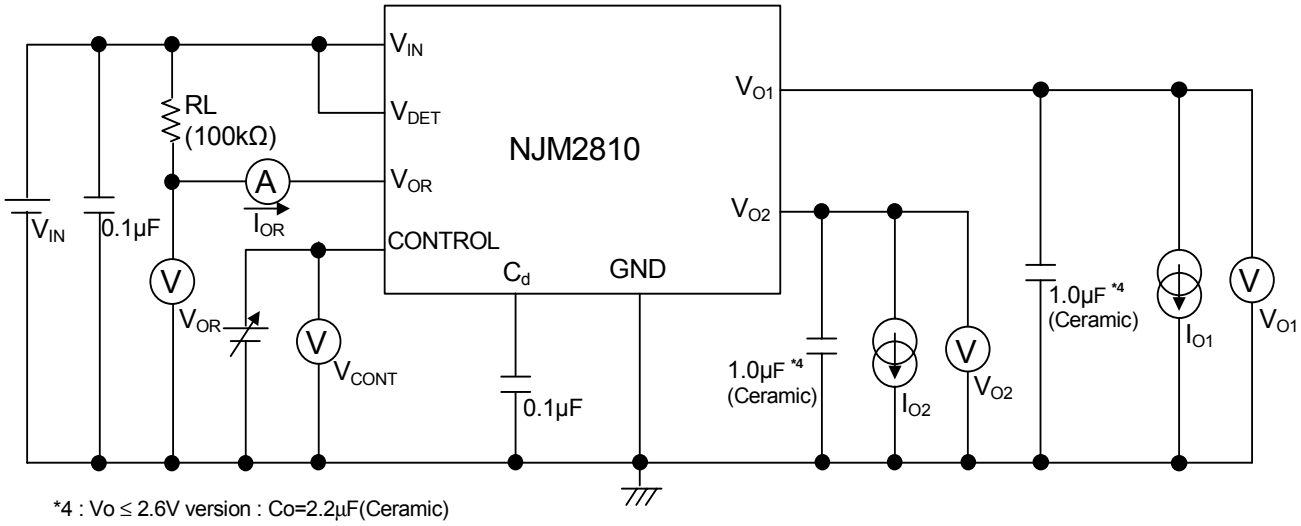
(*3) The above specification is a common specification for all output voltages.
Therefore, it may be different from the individual specification for a specific output voltage.

■ TIMING CHART



∗V_{DET} is connected to V_{IN}. V_{OR} is the case where a pull-up is carried out to V_{IN} through resistance.

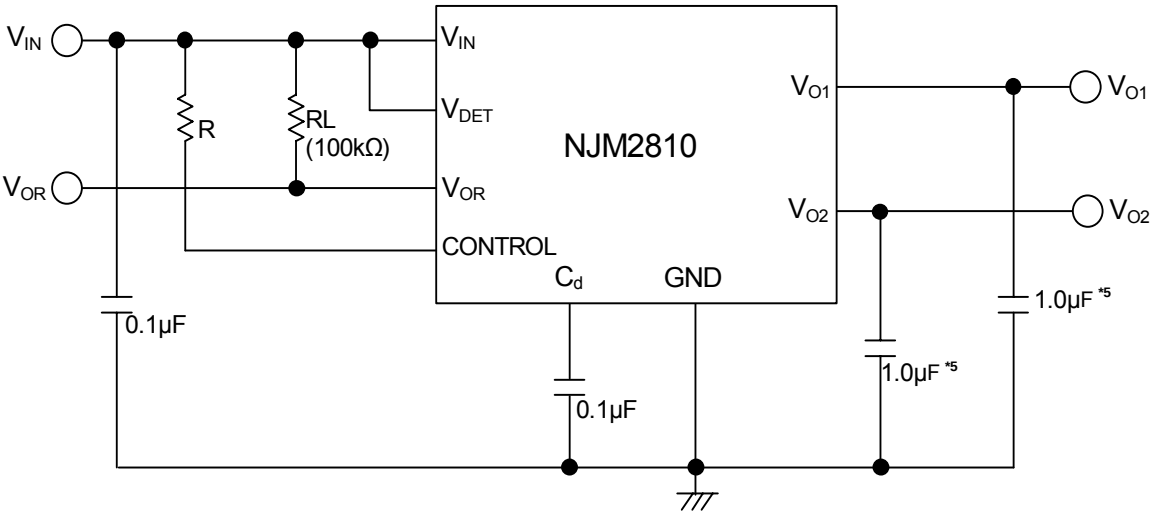
■ TEST CIRCUIT



*4 : Vo ≤ 2.6V version : Co=2.2µF(Ceramic)

■ TYPICAL APPLICATIONS

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



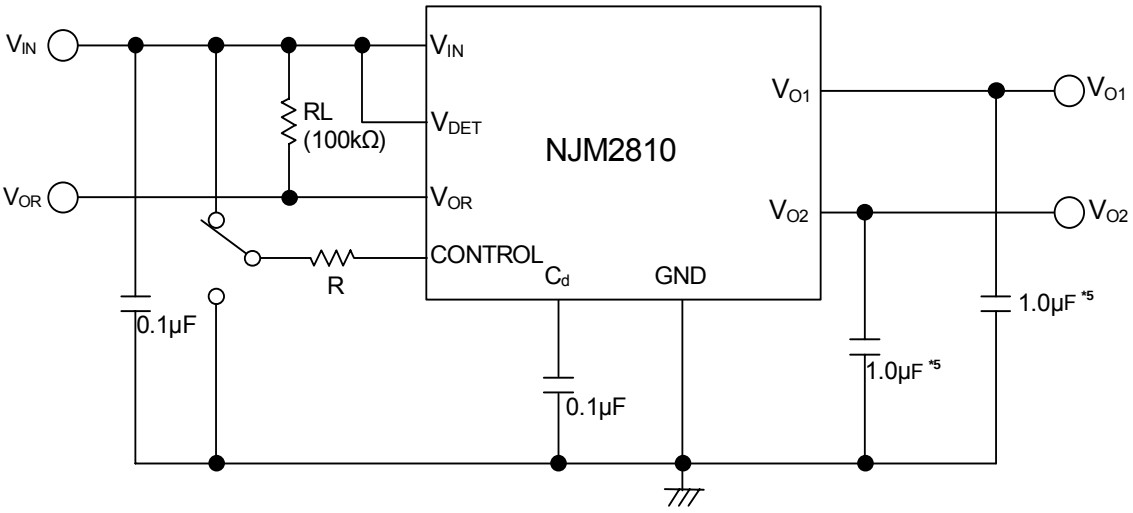
*5 : Vo ≤ 2.6V version : Co=2.2µF

Connect control terminal to V_{IN} terminal

Connect control terminal to resistance “R”

The quiescent current can be reduced by using a resistance “R”. Instead, it increases the minimum operating voltage. For further information, please refer to figure “Output Voltage vs. Control Voltage”.

② In use of ON/OFF CONTROL:



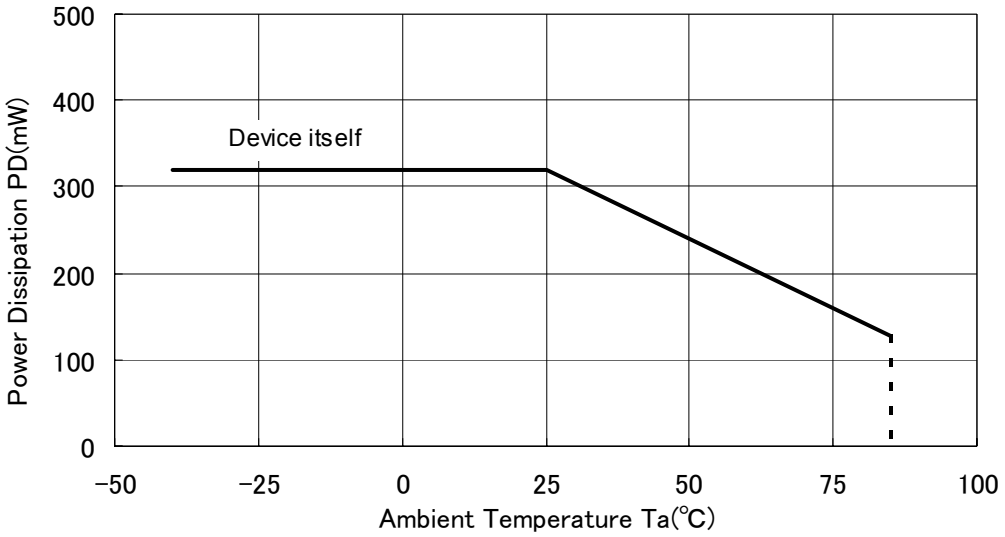
*5 : Vo ≤ 2.6V version : Co=2.2µF

State of control terminal:

- “H” → output is enabled.
- “L” or “open” → output is disabled

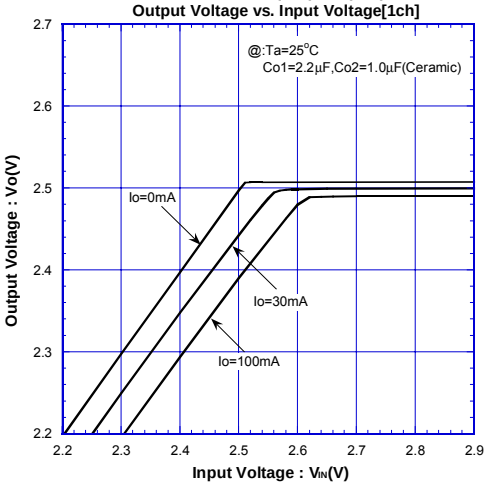
■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

NJM2810RB1 Power Dissipation
(Topr=-40～+85℃,Tj=125℃,P_D=320mW(Ta≦25℃))

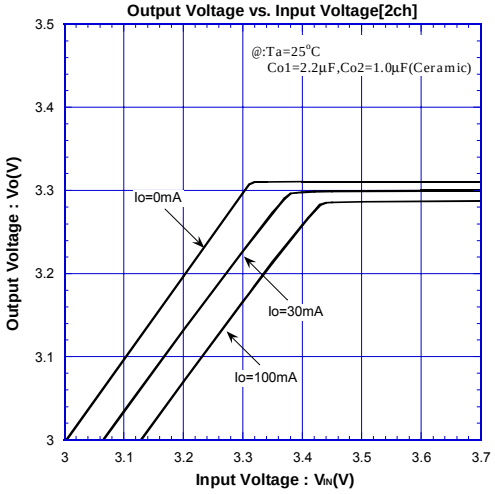


■ TYPICAL CHARACTERISTICS (Regulator Block)

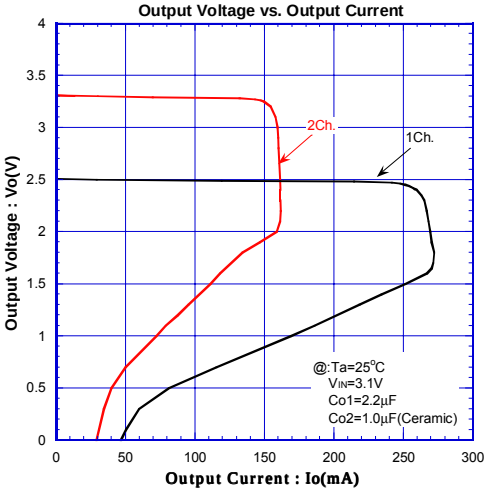
NJM2810_2.5V(1ch)3.3V(2ch)
Output Voltage vs. Input Voltage[1ch]



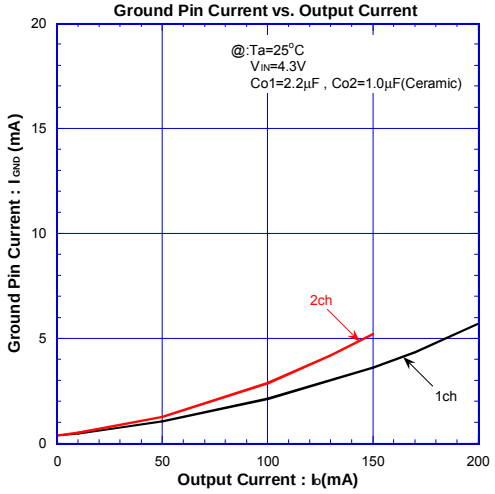
NJM2810_2.5V(1ch)3.3V(2ch)
Output Voltage vs. Input Voltage[2ch]



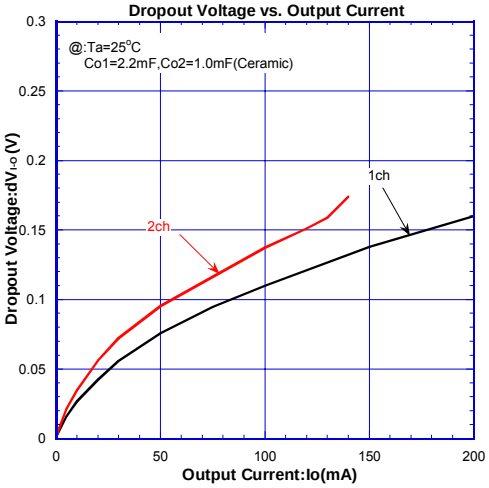
NJM2810_2.5V(1ch)3.3V(2ch)
Output Voltage vs. Output Current



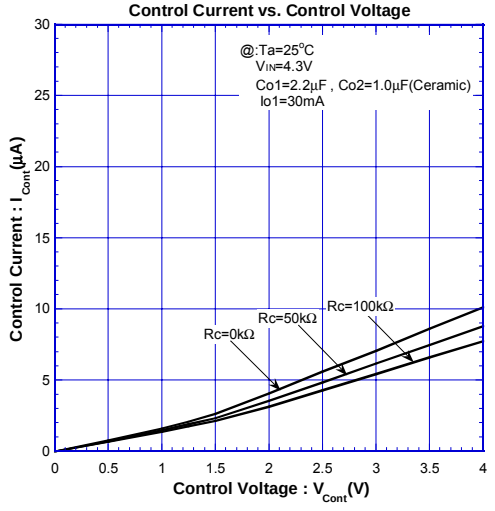
NJM2810_2.5V(1ch)3.3V(2ch)
Ground Pin Current vs. Output Current



NJM2810_2.5V(1ch)3.3V(2ch)
Dropout Voltage vs. Output Current

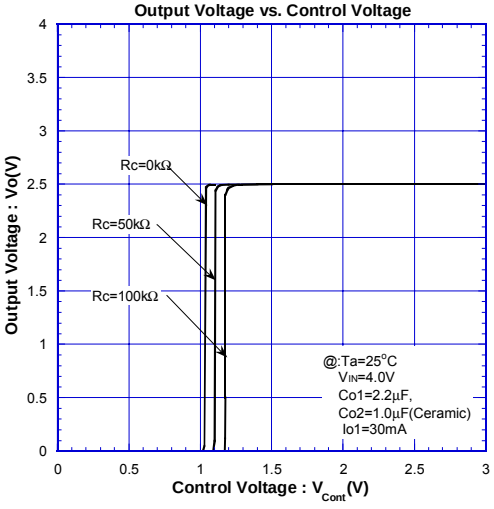


NJM2810_2.5V(1ch)3.3V(2ch)
Control Current vs. Control Voltage

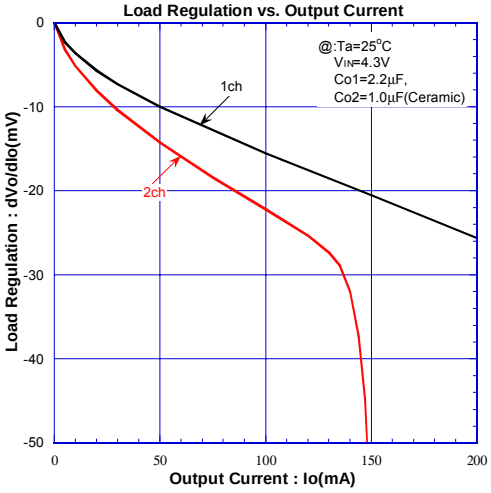


■ TYPICAL CHARACTERISTICS (Regulator Block)

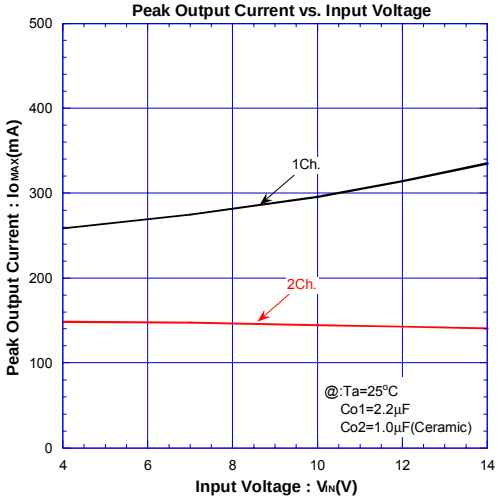
NJM2810_2.5V(1ch)3.3V(2ch)
Output Voltage vs. Control Voltage



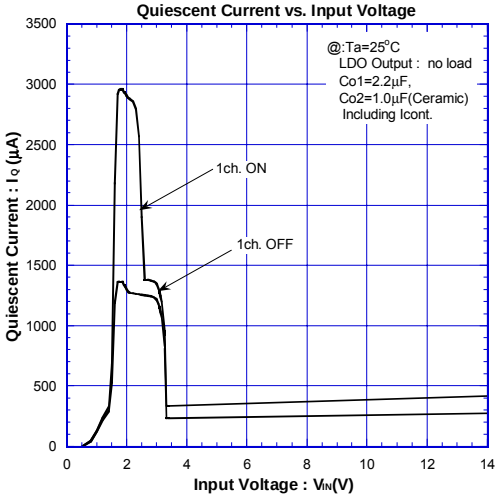
NJM2810_2.5V(1ch)3.3V(2ch)
Load Regulation vs. Output Current



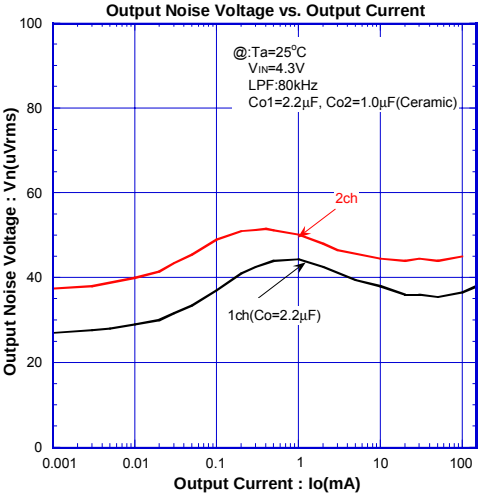
NJM2810_2.5V(1ch)3.3V(2ch)
Peak Output Current vs. Input Voltage



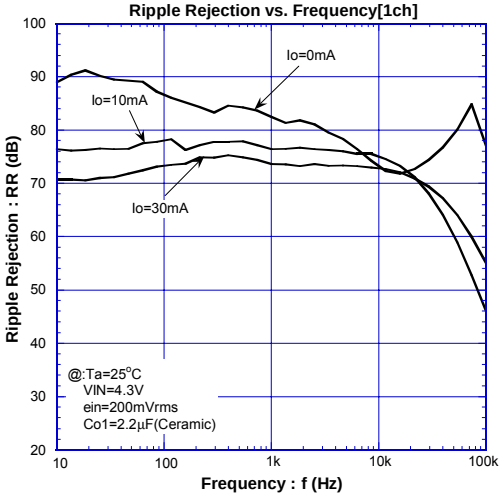
NJM2810_2.5V(1ch)3.3V(2ch)
Quiescent Current vs. Input Voltage



NJM2810_2.5V(1ch)3.3V(2ch)
Output Noise Voltage vs. Output Current

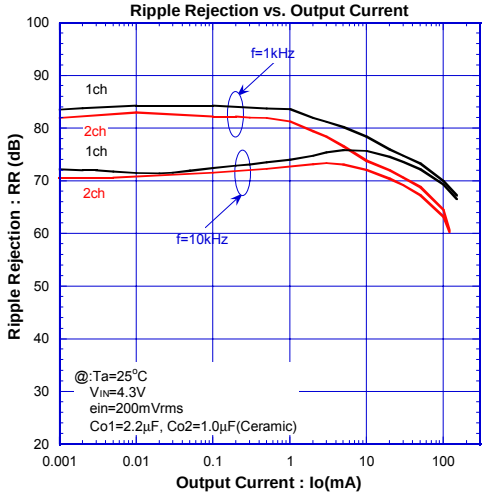


NJM2810_2.5V(1ch)3.3V(2ch)
Ripple Rejection vs. Frequency[1ch]

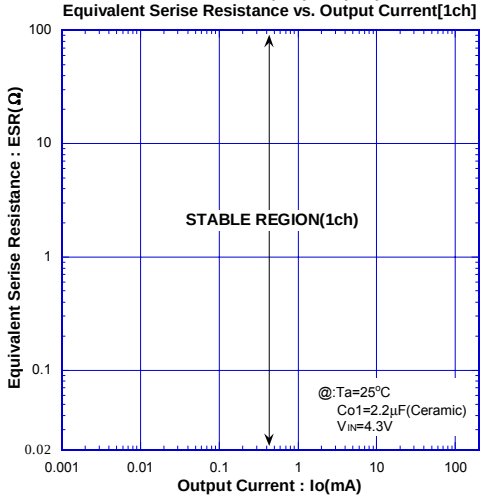


■ TYPICAL CHARACTERISTICS (Regulator Block)

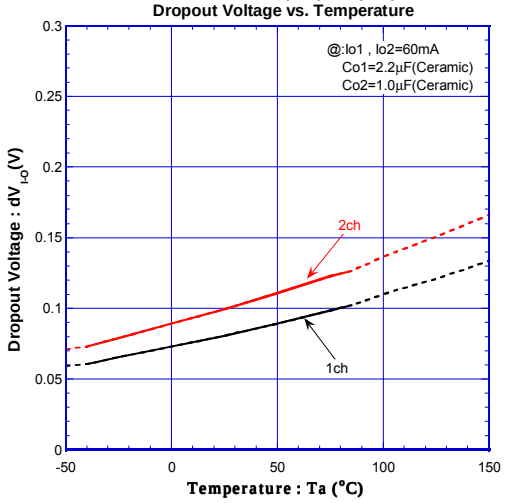
NJM2810_2.5V(1ch)3.3V(2ch)
Ripple Rejection vs. Output Current



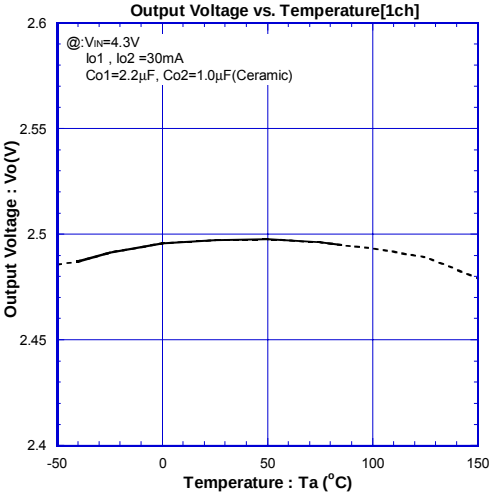
NJM2810_2.5V(1ch)3.3V(2ch)
Equivalent Serise Resistance vs. Output Current[1ch]



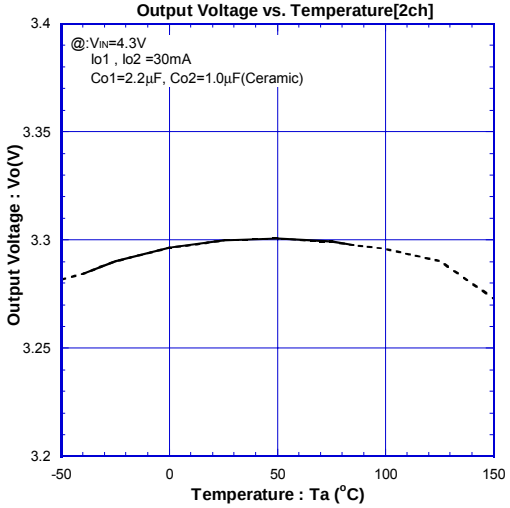
NJM2810_2.5V(1ch)3.3V(2ch)
Dropout Voltage vs. Temperature



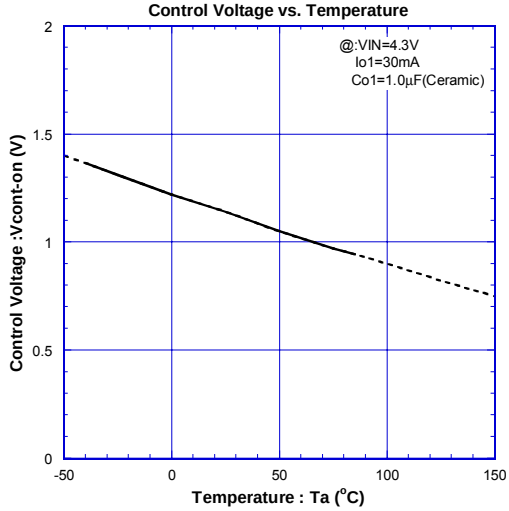
NJM2810_2.5V(1ch)3.3V(2ch)
Output Voltage vs. Temperature[1ch]



NJM2810_2.5V(1ch)3.3V(2ch)
Output Voltage vs. Temperature[2ch]

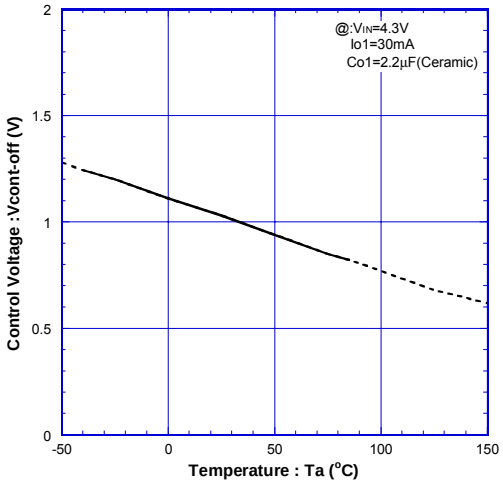


NJM2810_2.5V(1ch)3.3V(2ch)
Control Voltage vs. Temperature

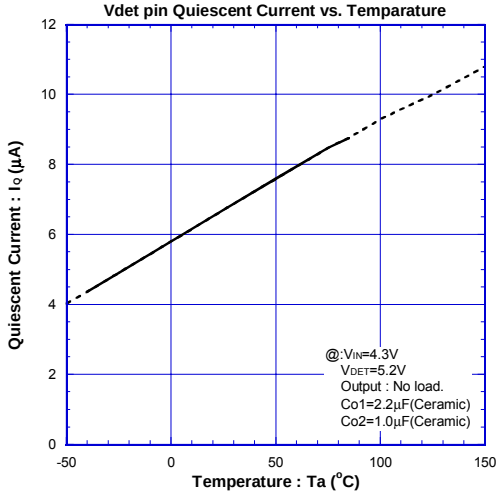


■ TYPICAL CHARACTERISTICS (Regulator Block)

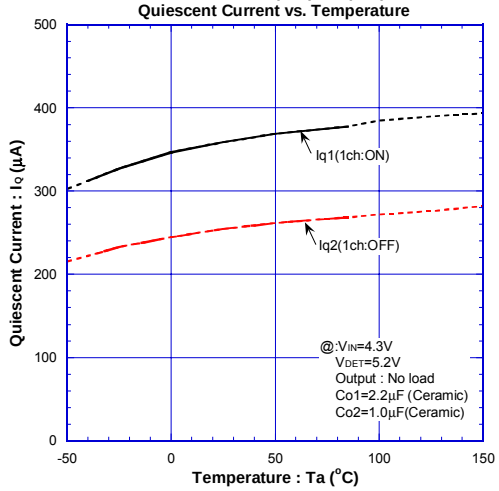
NJM2810_2.5V(1ch)3.3V(2ch)
Control Voltage vs. Temperature



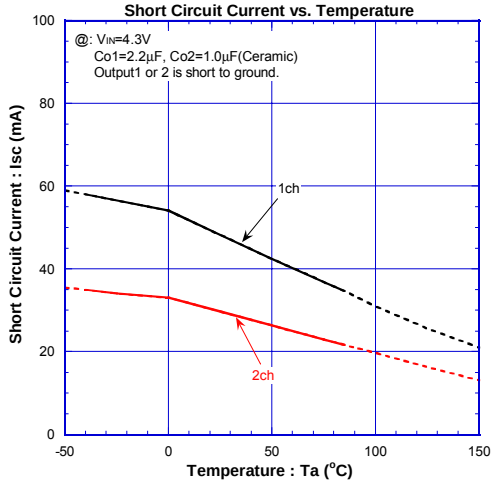
NJM2810_2.5V(1ch)3.3V(2ch)
Vdet pin Quiescent Current vs. Temparature



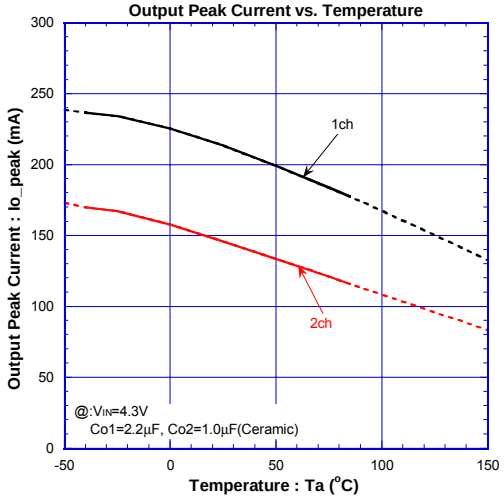
NJM2810_2.5V(1ch)3.3V(2ch)
Quiescent Current vs. Temperature



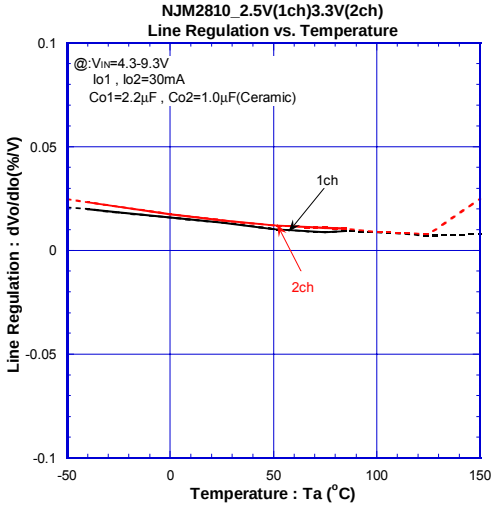
NJM2810_2.5V(1ch)3.3V(2ch)
Short Circuit Current vs. Temperature



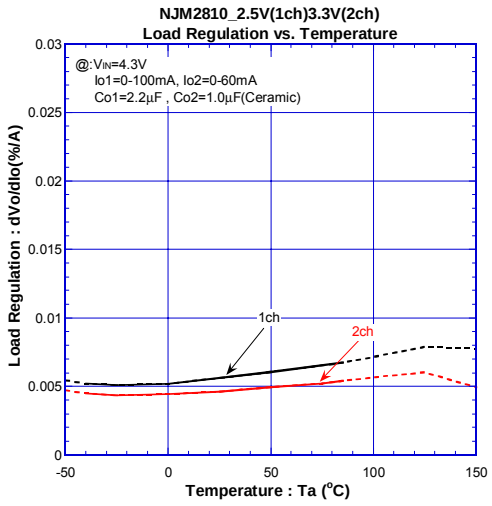
NJM2810_2.5V(1ch)3.3V(2ch)
Output Peak Current vs. Temperature

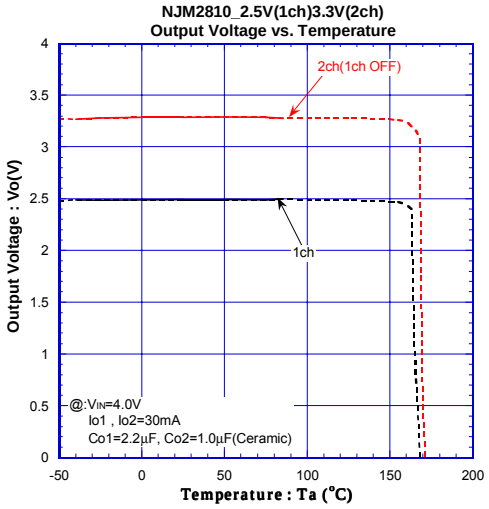


NJM2810_2.5V(1ch)3.3V(2ch)
Line Regulation vs. Temperature



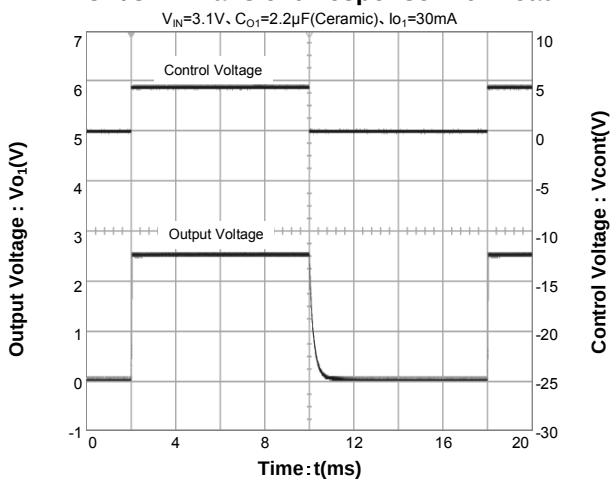
■ TYPICAL CHARACTERISTICS (Regulator Block)



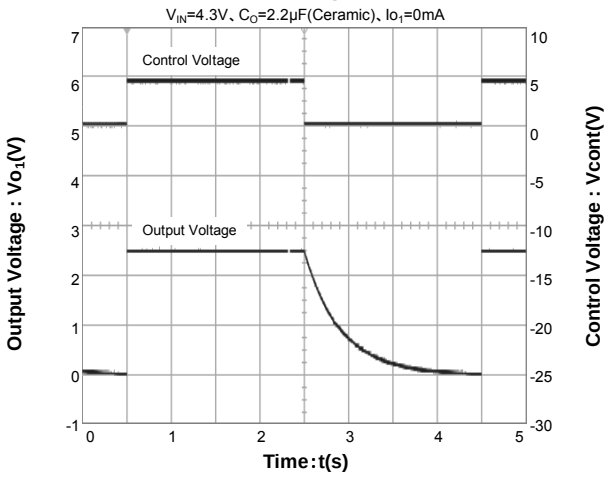


■ TYPICAL CHARACTERISTICS (Regulator Block)

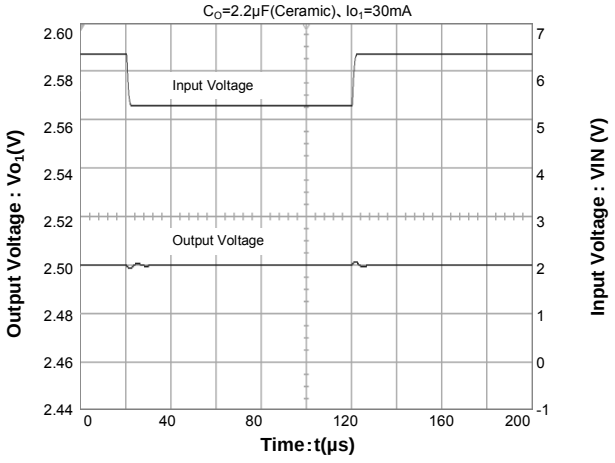
NJM2810_2.5V(1ch)
ON/OFF Transient Response with Load



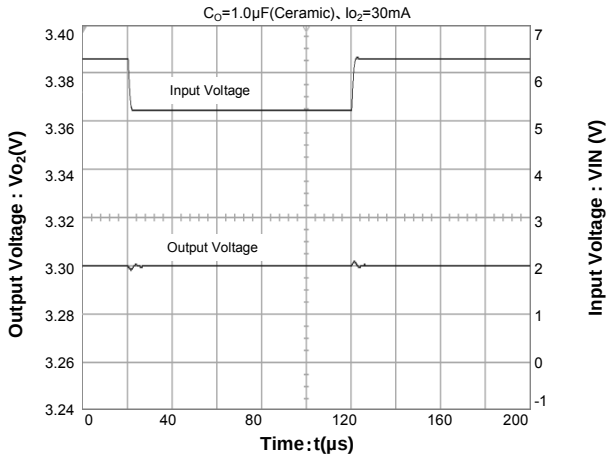
NJM2810_2.5V(1ch)
ON/OFF Transient Response without Load



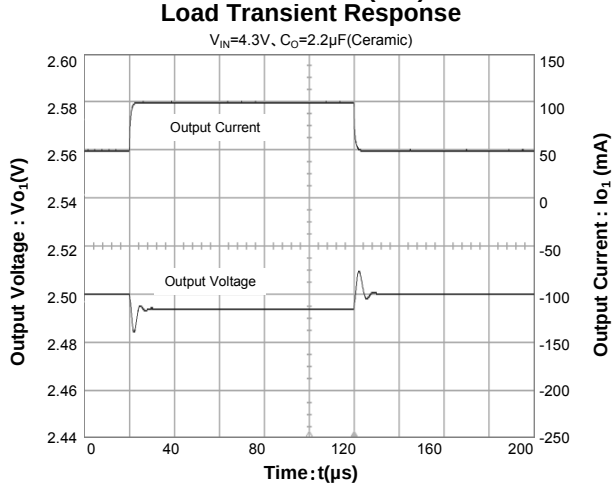
NJM2810_2.5V(1ch)
Line Transient Response



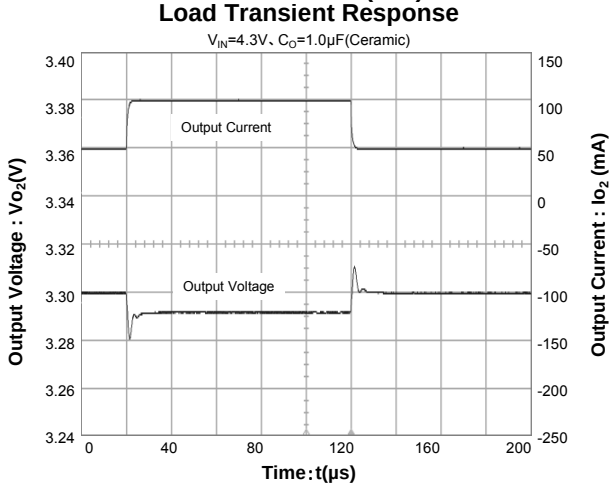
NJM2810_3.3V(2ch)
Line Transient Response



NJM2810_2.5V(1ch)
Load Transient Response

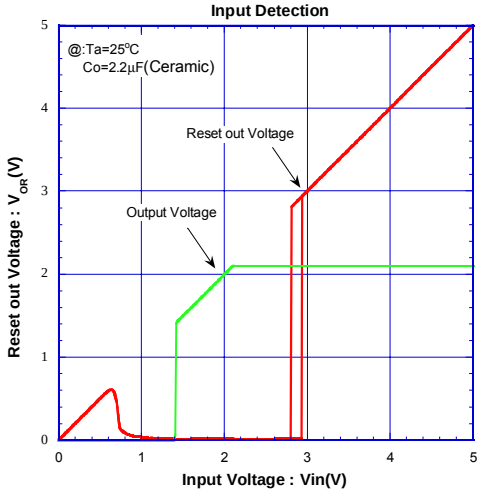


NJM2810_3.3V(2ch)
Load Transient Response

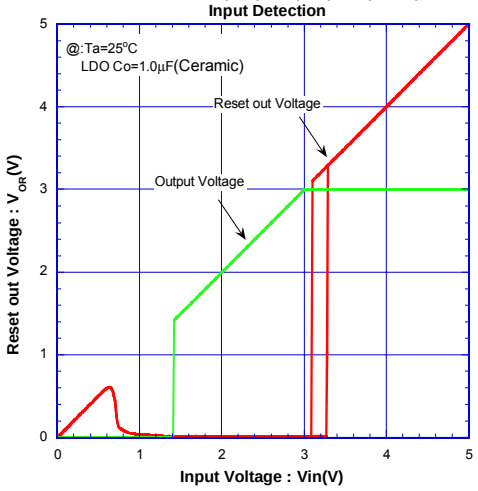


■ TYPICAL CHARACTERISTICS (Reset Block)

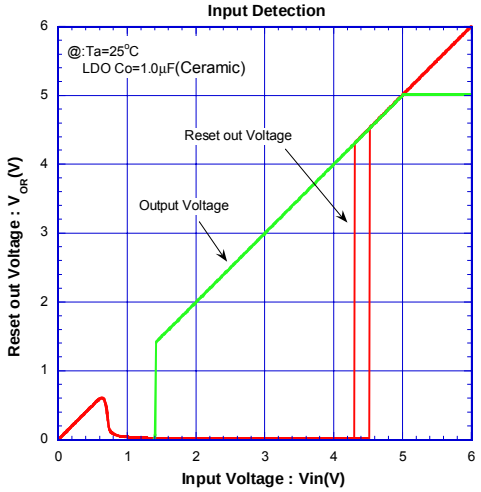
NJM2810_2.1V(1ch)2.1V(2ch)2.8V(Reset)
Input Detection



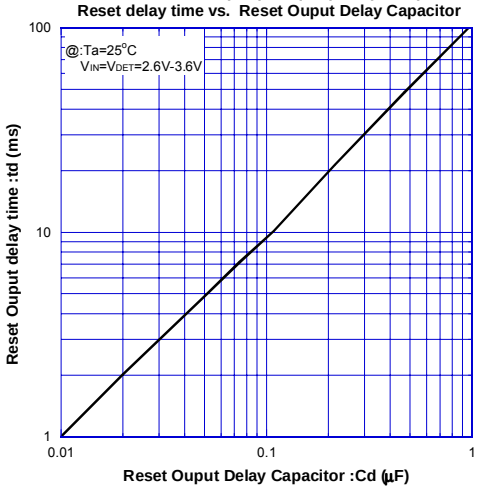
NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Input Detection



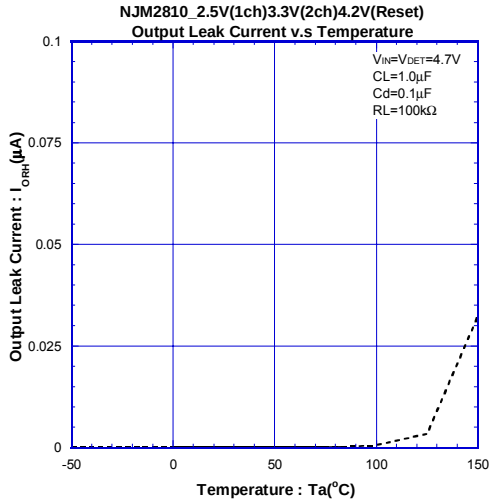
NJM2810_5.0V(1ch)5.0V(2ch)4.3V(Reset)
Input Detection



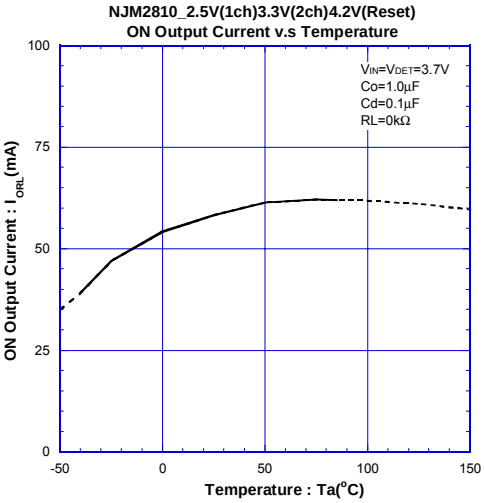
NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Reset delay time vs. Reset Ouput Delay Capacitor



NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Output Leak Current v.s Temperature

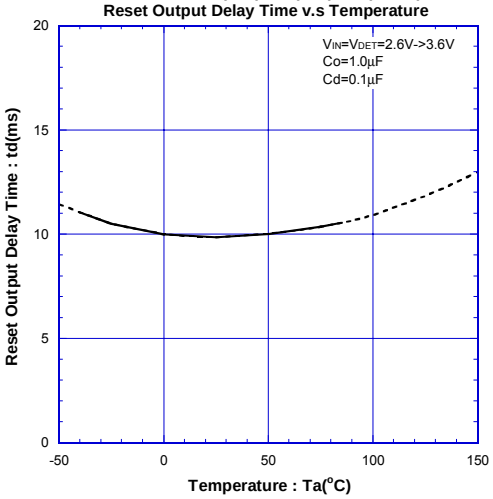


NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
ON Output Current v.s Temperature

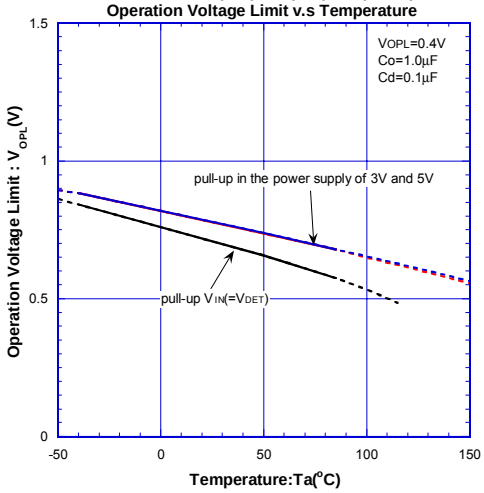


■ TYPICAL CHARACTERISTICS (Reset Block)

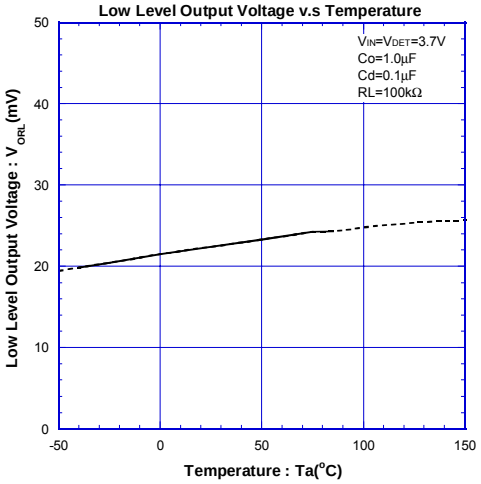
NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Reset Output Delay Time v.s Temperature



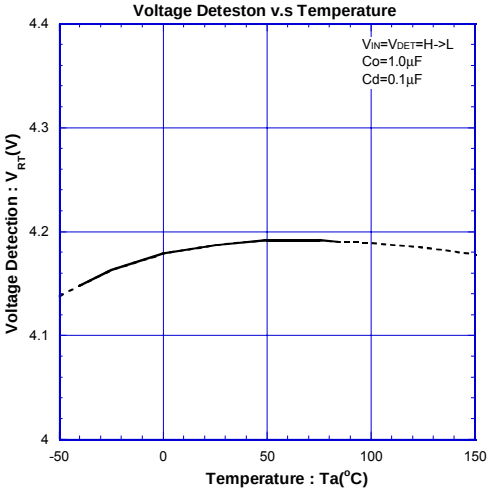
NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Operation Voltage Limit v.s Temperature



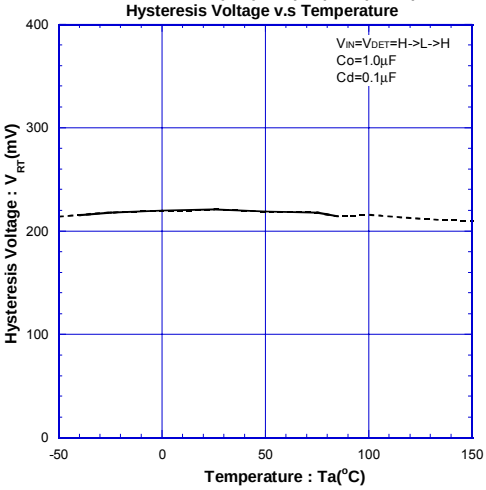
NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Low Level Output Voltage v.s Temperature



NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Voltage Deteston v.s Temperature



NJM2810_2.5V(1ch)3.3V(2ch)4.2V(Reset)
Hysteresis Voltage v.s Temperature



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