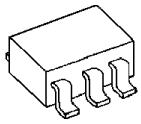
Very Low Output Low Dropout Regulator

■ GENERAL DESCRIPTION

The NJM2841 is a low output voltage, low drop out regulators.
It delivers up to 500mA output current with the output voltage of 0.8 to 2.5V.
The use of an external bias voltage can improve the transient response and the ripple rejection characteristics while maintaining minimum input to output voltage.

■ PACKAGE OUTLINE

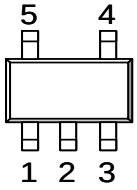


NJM2841F

■ FEATURES

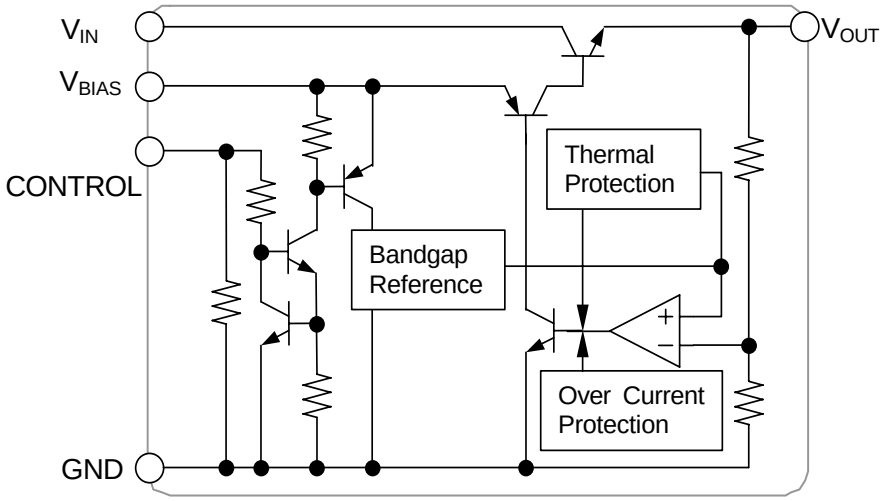
- Output Voltage Range 0.8V to 2.5V
- High Ripple Rejection 86 dB typ. (f=1kHz, V_O=1.2V version)
- Output Noise Voltage V_{NO}=40 μVrms(V_O=1.2V version)
- Output Current I_O(max)=500mA
- High Precision Output V_O±1.0%
- Dual Supply Voltage Type V_{IN}, V_{BIAS}(sequence free)
- High Stability for Load 0.002%/mA (max)
- Output Capacitor with 4.7μF ceramic capacitor
- Low Dropout Voltage 0.1V typ. @I_O=300mA
- ON/OFF Control
- Built-in Thermal Overload Protection and Short Circuit Current Limit Protection
- Bipolar Technology
- Package Outline SOT-23-5(MTP5)

■ PIN CONNECTION



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

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE LANK LIST

Device Name	V_{out}	Device Name	V_{out}
NJM2841F008	0.8V	NJM2841F017	1.7V
NJM2841F009	0.9V	NJM2841F018	1.8V
NJM2841F010	1.0V	NJM2841F019	1.9V
NJM2841F011	1.1V	NJM2841F020	2.0V
NJM2841F012	1.2V	NJM2841F021	2.1V
NJM2841F013	1.3V	NJM2841F022	2.2V
NJM2841F014	1.4V	NJM2841F023	2.3V
NJM2841F015	1.5V	NJM2841F024	2.4V
NJM2841F016	1.6V	NJM2841F025	2.5V

Output Voltage Range: 0.8V to 2.5V (0.1V step)

■ ABABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYNBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+10	V
Bias Voltage	V_{BIAS}	+10	V
Control Voltage	V_{CONT}	+10	V
Power Dissipation	P_D	480 (Note1)	mW
		250 (Note2)	
Operating Temperature	Topr	-40~+85	°C
Storage Temperature	Tstg	-50~+150	°C

Note1: EIA/JEDEC STANDARD Test board (76.2*114.3*1.6mm, 2layers, FR-4) mounting

Note2: Devise itself

■ BIAS VOLTAGE INPUT RANGE

V_{BIAS}= +2.5V to +10V (V_O<1.5V)

V_{BIAS}= +V_O+1V to +10V (V_O≥1.5V)

■ ELECTRICAL CHARACTERISTICS

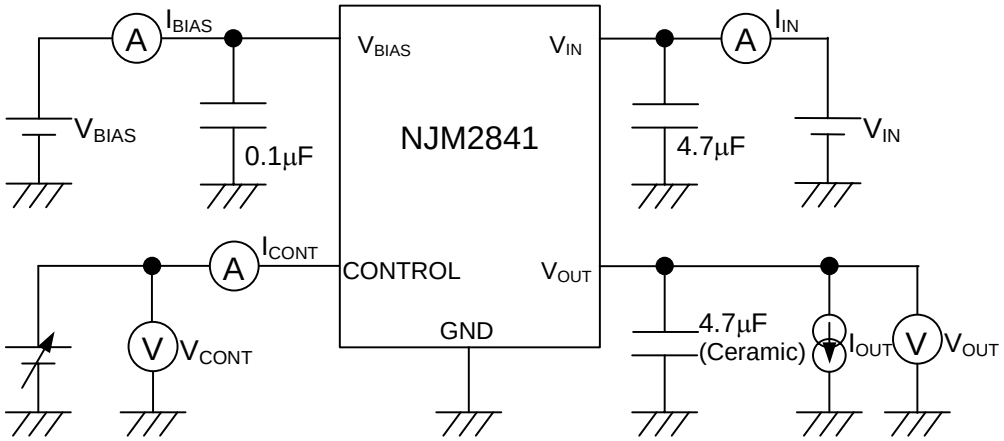
(V_{BIAS}=2.5V(Vo≥1.5V : V_{BIAS}=Vo+1V), V_{IN}=Vo+1V, C_{BIAS}=0.1μF, C_{IN}=4.7μF, Co=4.7μF, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	I_O=30mA	-1.0%	-	+1.0%	V
Unloaded Bias Current	I_{BIAS}	I_O=0mA, except I_{CONT}	-	180	300	μA
Unloaded Input Current	I_{IN}	I_O=0mA, except I_{CONT}	-	-	20	μA
Bias Current at Control OFF	$I_{BIAS(OFF)}$	V_{CONT}=0V	-	-	100	nA
Input Current at Control OFF	$I_{IN(OFF)}$	V_{CONT}=0V	-	-	100	nA
Output Current	I_O	V_O x 0.9V	500	650	-	mA
Line Regulation 1 (V_{BIAS})	$\Delta V_O/\Delta V_{BIAS}$	V_{BIAS}=2.5V to V_O+6V(V_O<1.5V) V_{BIAS}=V_O+1V to V_O+6V(V_O≥1.5V) I_O=30mA	-	-	0.10	%/V
Line Regulation 2 (V_{IN})	$\Delta V_O/\Delta V_{IN}$	V_{IN}=V_O+1V to V_O+6V, I_O=30mA	-	-	0.10	%/V
Load Regulation	$\Delta V_O/\Delta I_O$	I_O=30 to 500mA	-	-	0.002	%/mA
Dropout Voltage	ΔV_{I-O}	I_O=300mA	-	0.10	0.18	V
Ripple Rejection Ratio 1 (V_{BIAS})	RR1(V_{BIAS})	V_{BIAS}=3.5V, e_{BIAS}=200mVrms, f=1kHz, I_O=10mA	Refer to Table 1			dB
Ripple Rejection Ratio 2 (V_{IN})	RR2(V_{IN})	e_{IN}=200mVrms, f=1kHz, I_O=10mA	Refer to Table 1			dB
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta Ta$	Ta=0 to +85°C, I_O=10mA	-	±50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz to 80kHz, I_O=10mA	Refer to Table 1			μVrms
Control Current	I_{CONT}	V_{CONT}=1.6V	-	3	12	μA
Control Voltage for ON-state	$I_{CONT(ON)}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(ON)}$		-	-	0.6	V
Bias Voltage	V_{BIAS}		-	-	10	V
Input Voltage	V_{IN}		-	-	9	V

• Table1

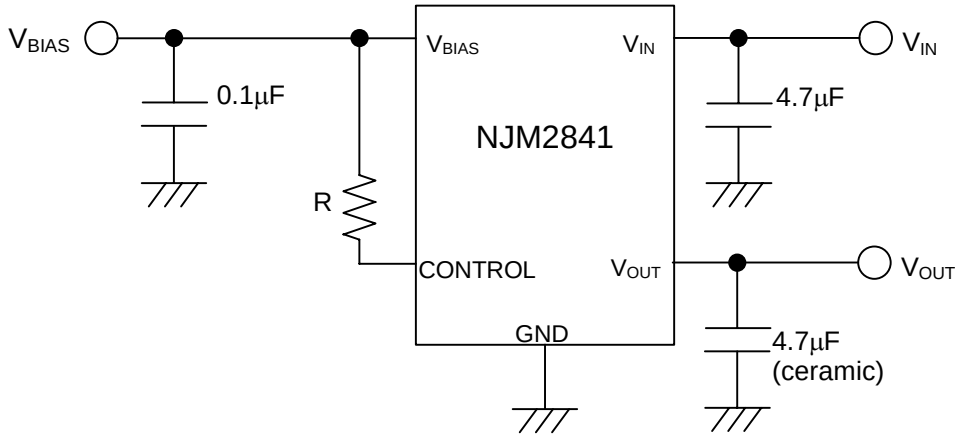
Voltage Rank	RR1(V_{BIAS})				RR2(V_{IN})				V_{NO}			
	MIN.	TYP.	MAX.	UNIT	MIN.	TYP.	MAX.	UNIT	MIN.	TYP.	MAX.	UNIT
0.8V	-	80	-	dB	-	87	-	dB	-	27	-	μVrms
0.9V	-	80	-		-	87	-		-	30	-	
1.0V	-	79	-		-	87	-		-	34	-	
1.2V	-	77	-		-	86	-		-	40	-	
1.5V	-	75	-		-	85	-		-	48	-	
2.5V	-	70	-		-	75	-		-	75	-	

■ TEST CIRCUIT



■ TYPICAL APPLICATION

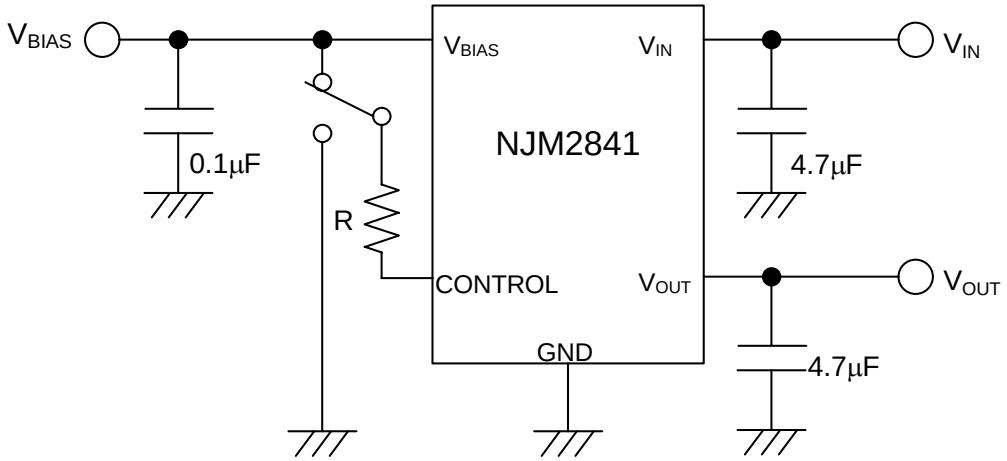
a) In case of where ON/OFF control is not required:



You shall connect control terminal to V_{BIAS} terminal.

Though the I_{CONT} decreases by inserting "R" to between Control terminal and V_{BIAS} terminal, the minimum operating voltage is increased due to the resister "R".

b) In use of ON/OFF control:



State of control terminal:

"H" → output is enabled.

"L" or "open" → output is disabled.

Regarding a Bias Capacitance (C_{BIAS}) and an Input Capacitance (C_{IN})

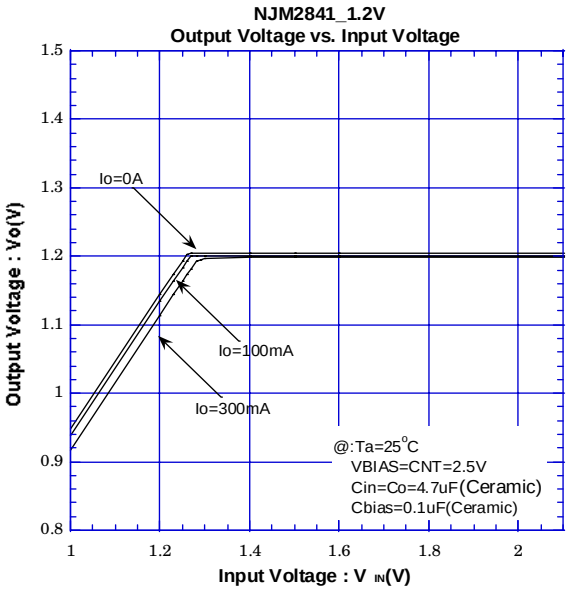
C_{BIAS} and C_{IN} have the effect that prevents the oscillation at the time of the following condition.

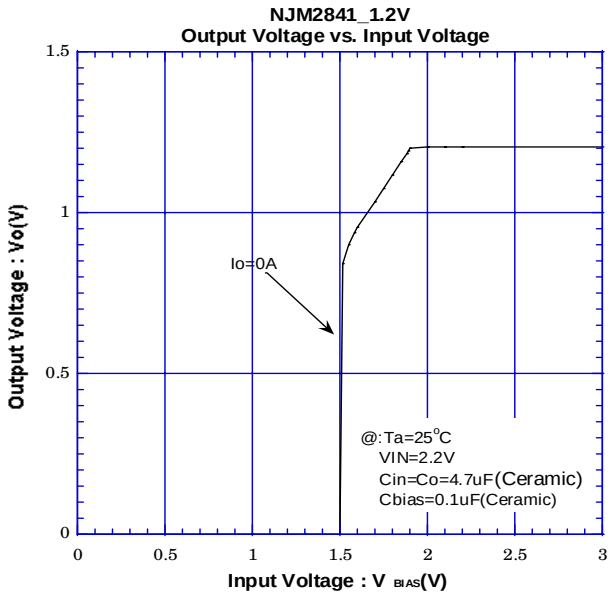
When Source impedance is high.

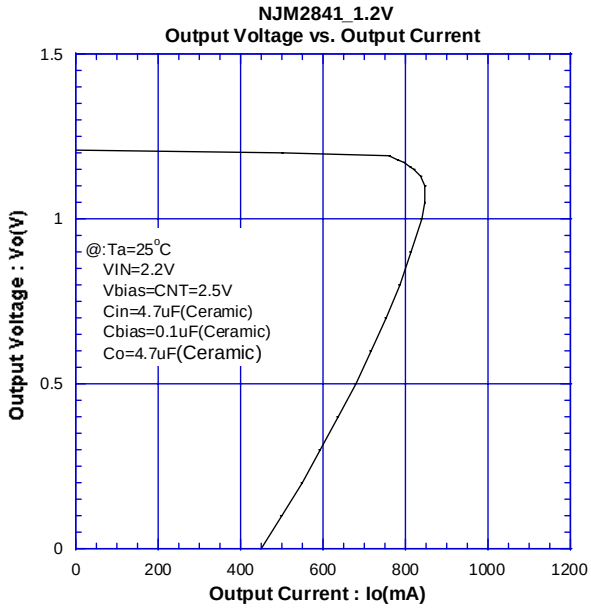
When V_{IN} and/or GND line is long.

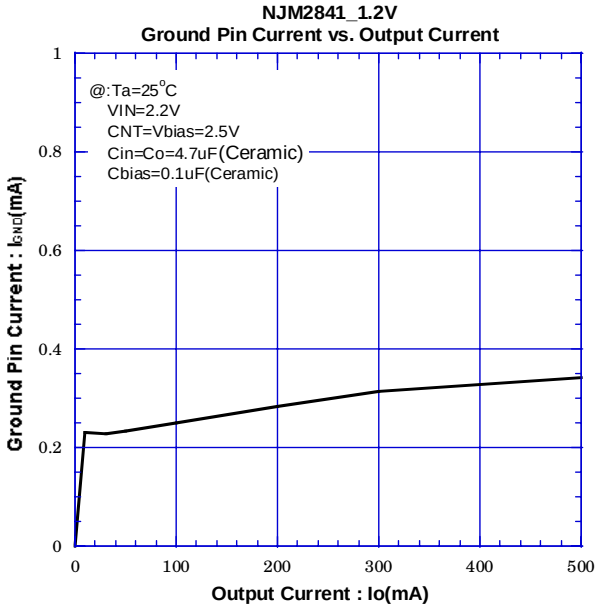
Therefore, you shall connect the C_{BIAS} and C_{IN} that recommendation value or larger (C_{BIAS} ≥0.1μF, C_{IN}≥4.7μF) so that lines that V_{BIAS}-GND and V_{IN}-GND become as short as possible.

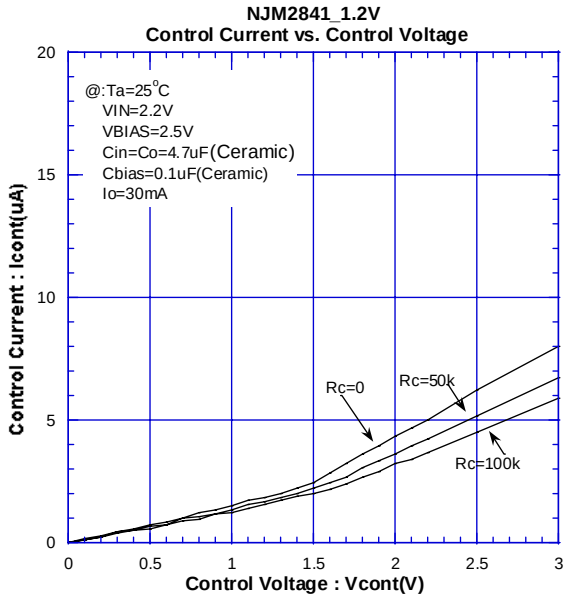
■ TYPICAL CHRACTERISTICS

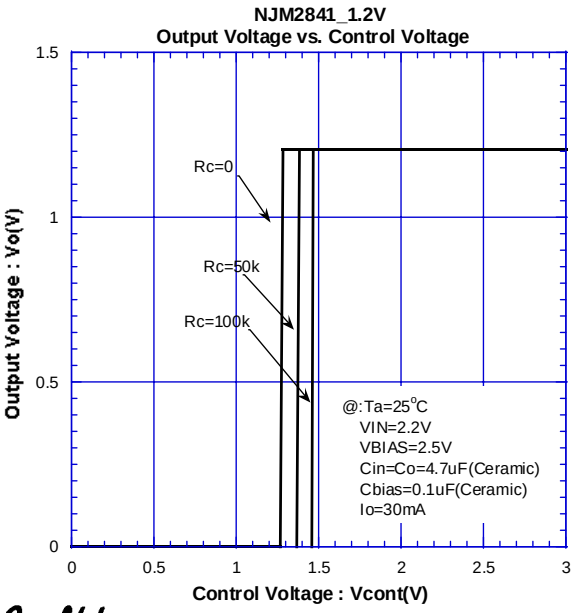




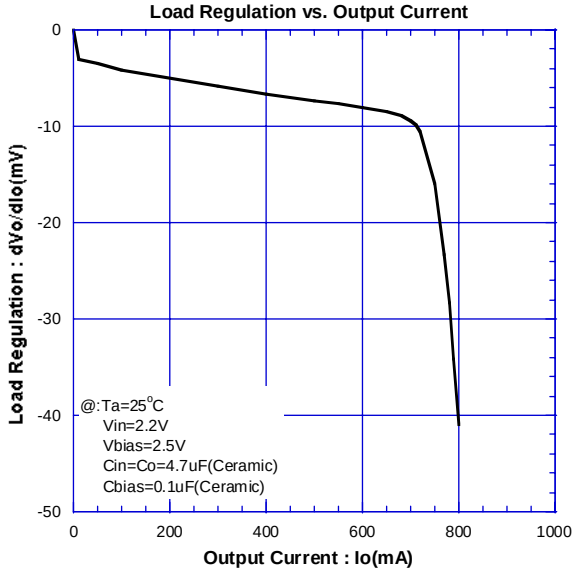




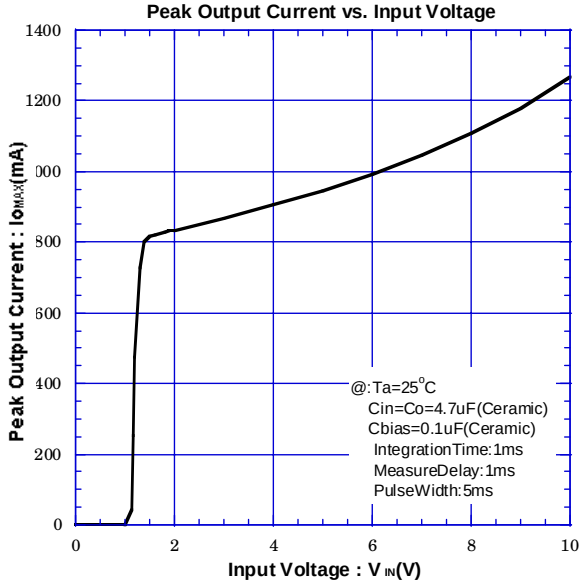




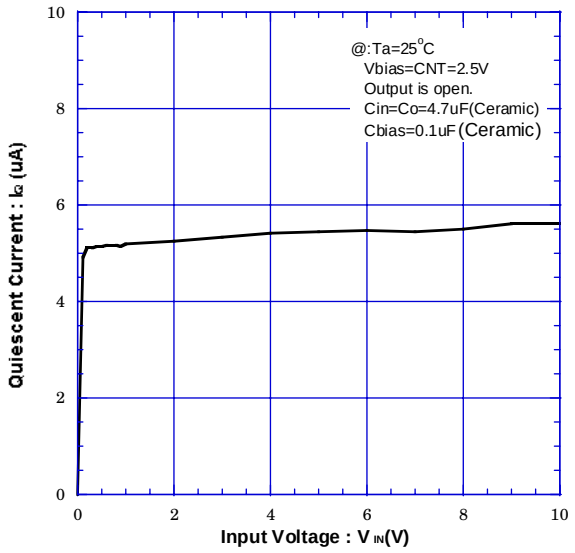
NJM2841_1.2V
Load Regulation vs. Output Current



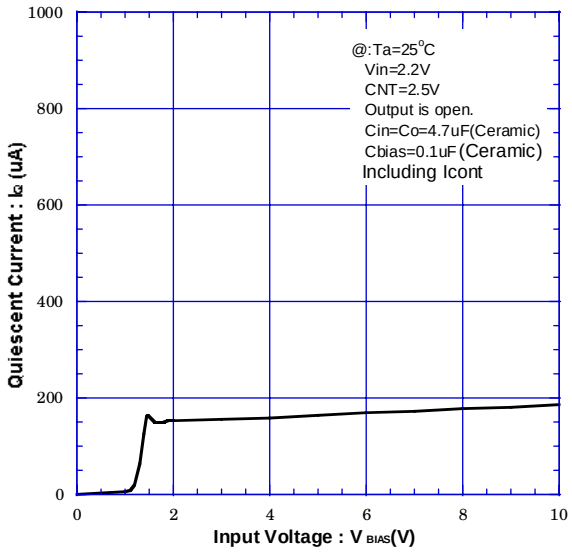
NJM2841_1.2V
Peak Output Current vs. Input Voltage



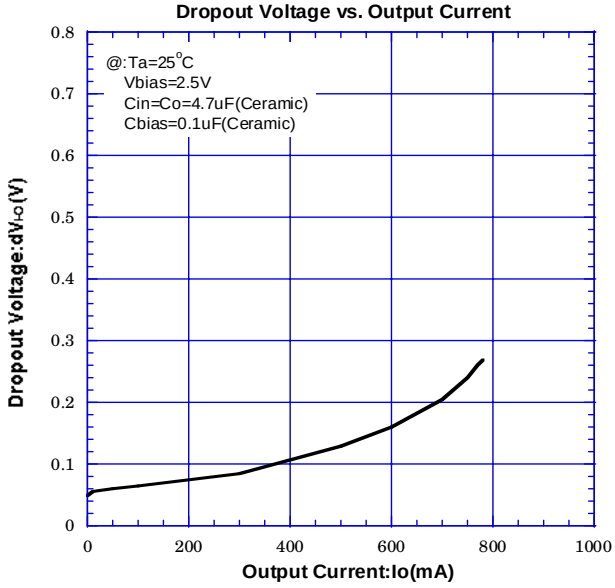
NJM2841_1.2V
Quiescent Current v.s. Input Voltage



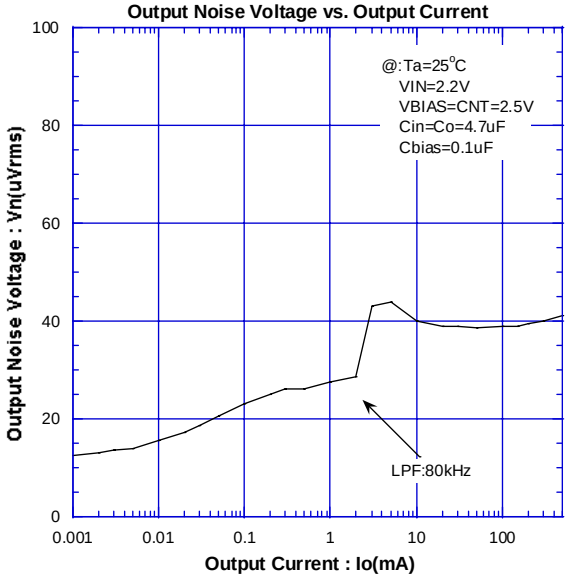
NJM2841_1.2V
Quiescent Current v.s. Input Voltage



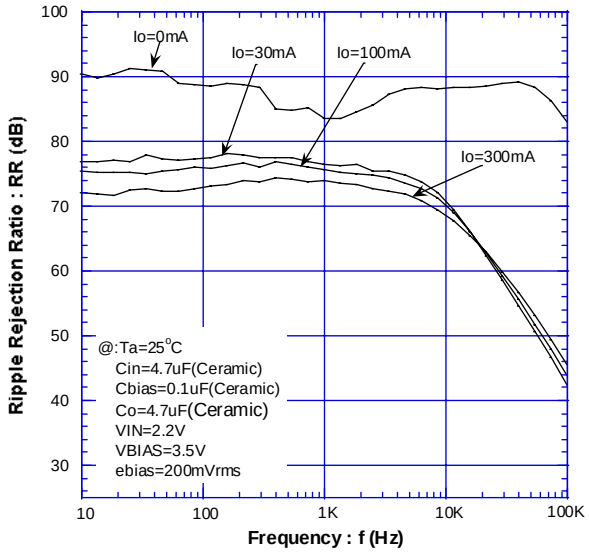
NJM2841_1.2V
Dropout Voltage vs. Output Current



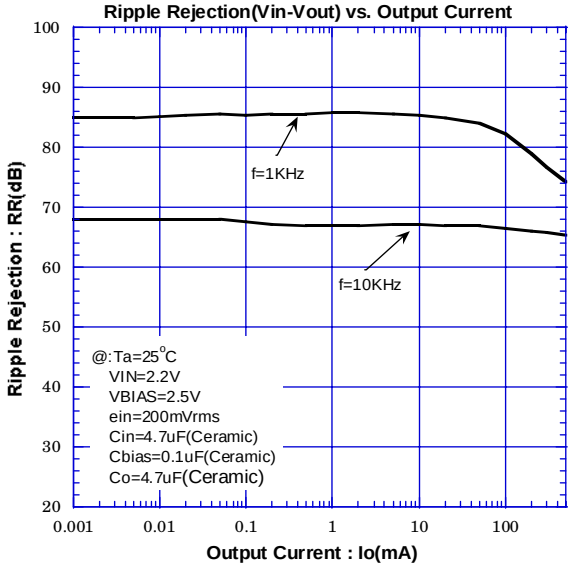
NJM2841_1.2V
Output Noise Voltage vs. Output Current



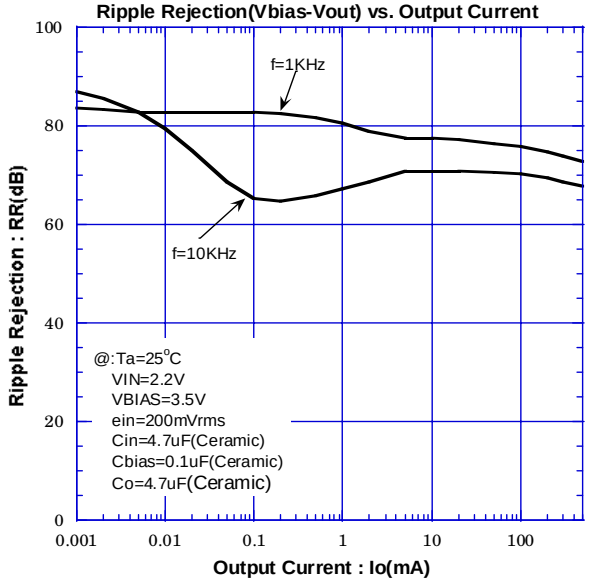
NJM2841_1.2V
Ripple Rejection Ratio[Vbias] v.s. Frequency



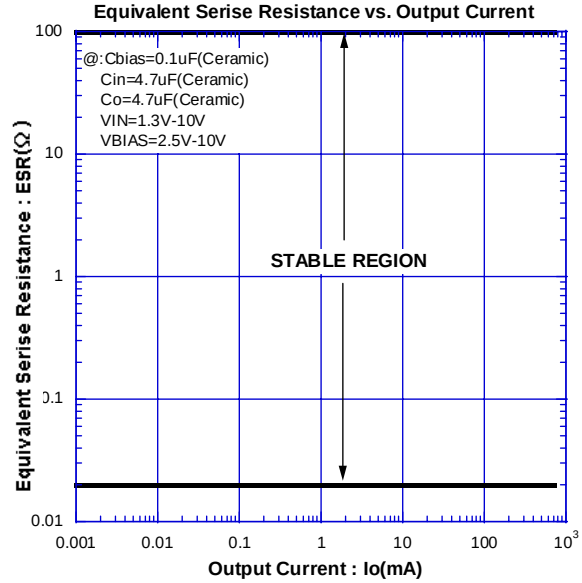
NJM2841_1.2V
Ripple Rejection(Vin-Vout) vs. Output Current



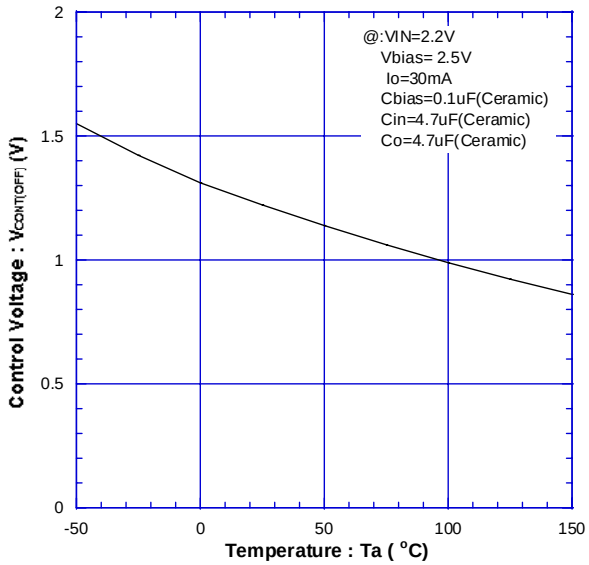
NJM2841_1.2V
Ripple Rejection(Vbias-Vout) vs. Output Current



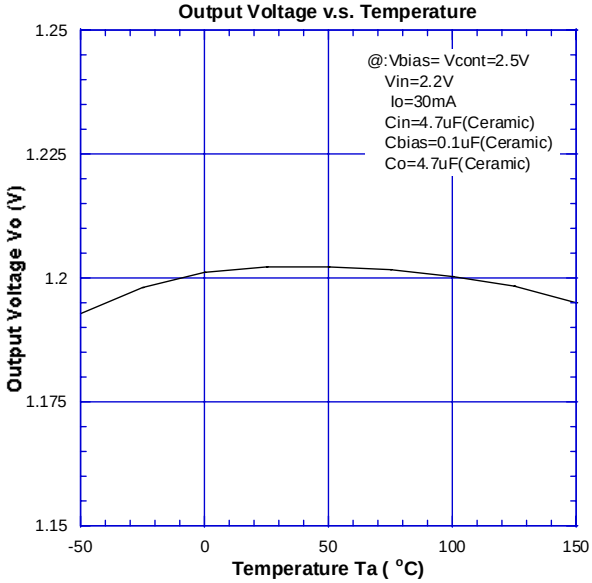
NJM2841_1.2V
Equivalent Serise Resistance vs. Output Current



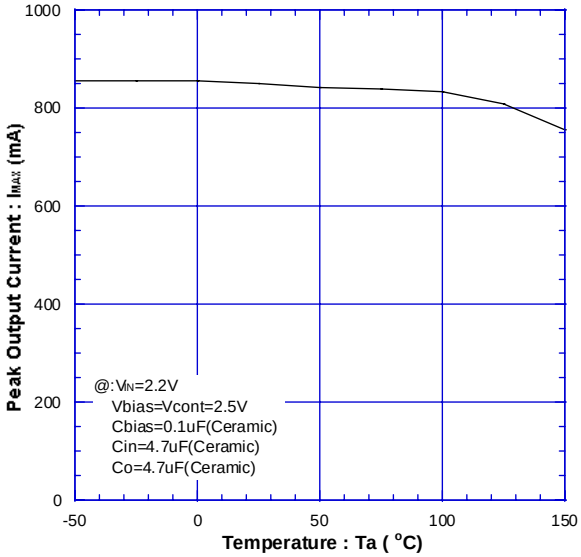
NJM2841_1.2V
Control Voltage v.s. Temperature



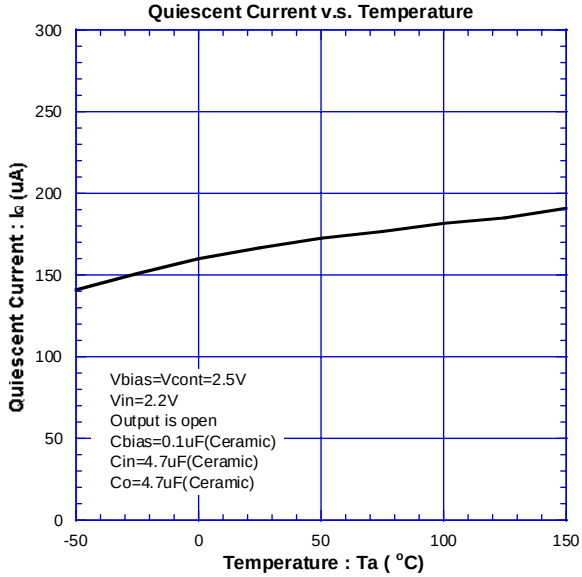
NJM2841_1.2V
Output Voltage v.s. Temperature



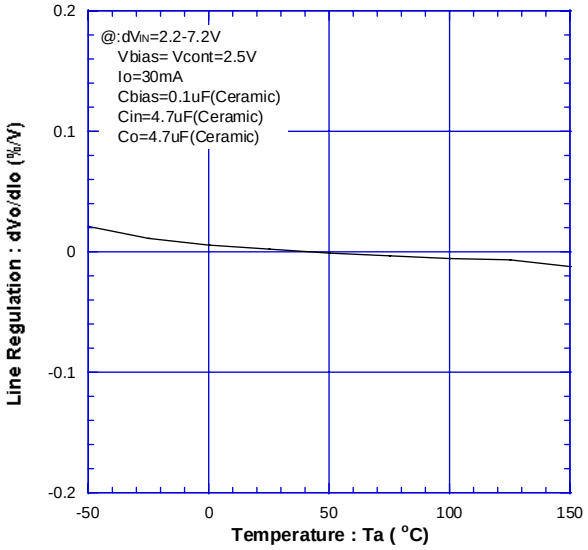
NJM2841_1.2V
Peak Output Current v.s. Temperature



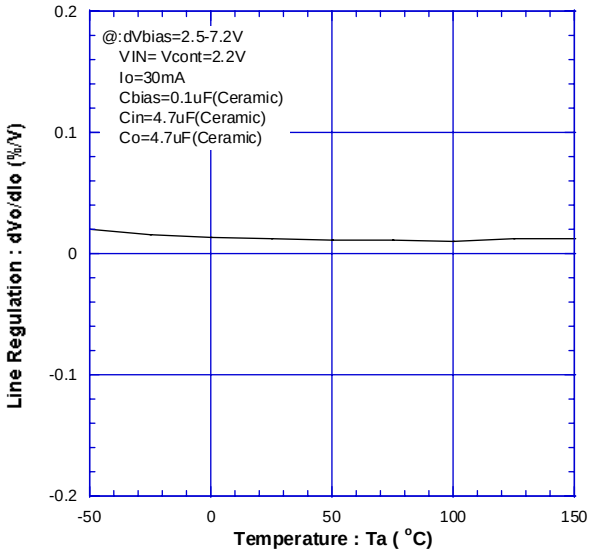
NJM2841_1.2V
Quiescent Current v.s. Temperature



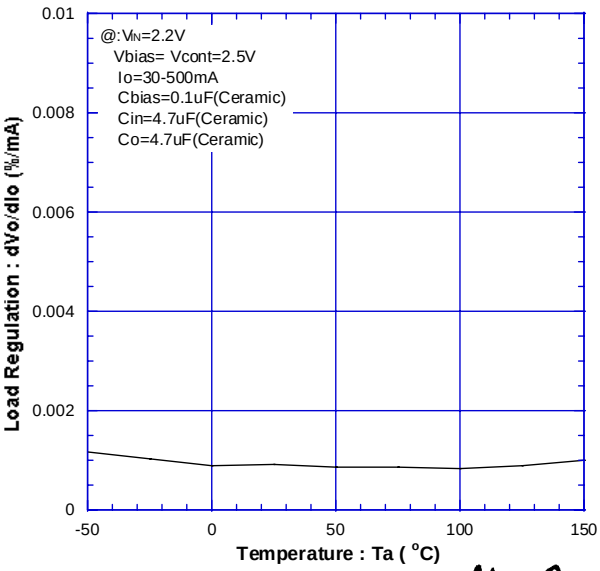
NJM2841_1.2V
Line Regulation(VIN) v.s. Temperature



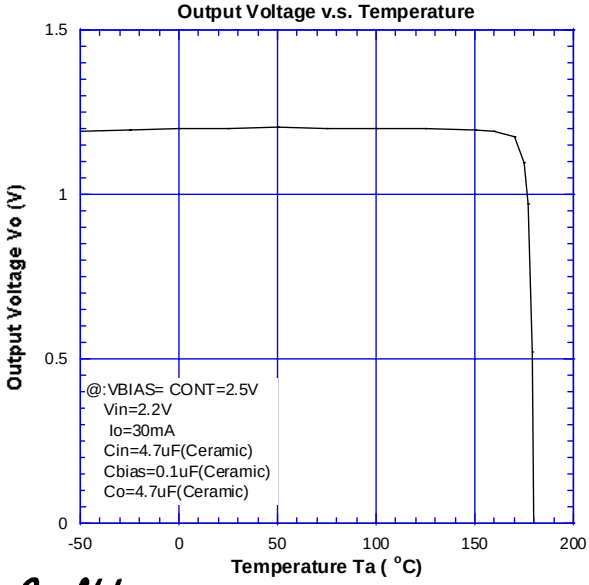
NJM2841_1.2V
Line Regulation(VBIAS) v.s. Temperature

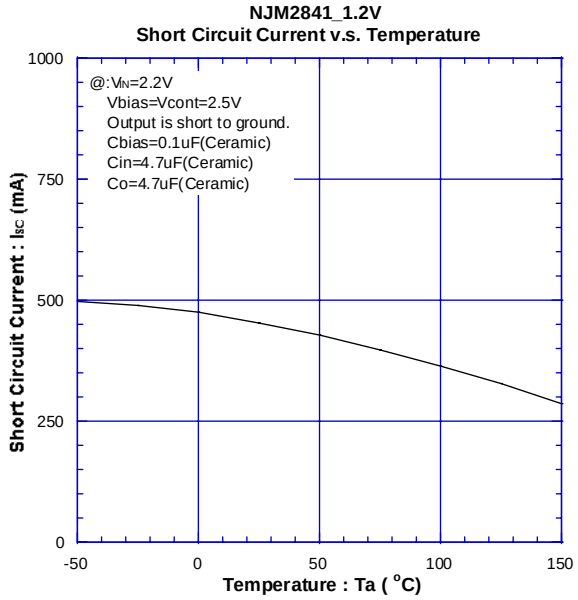


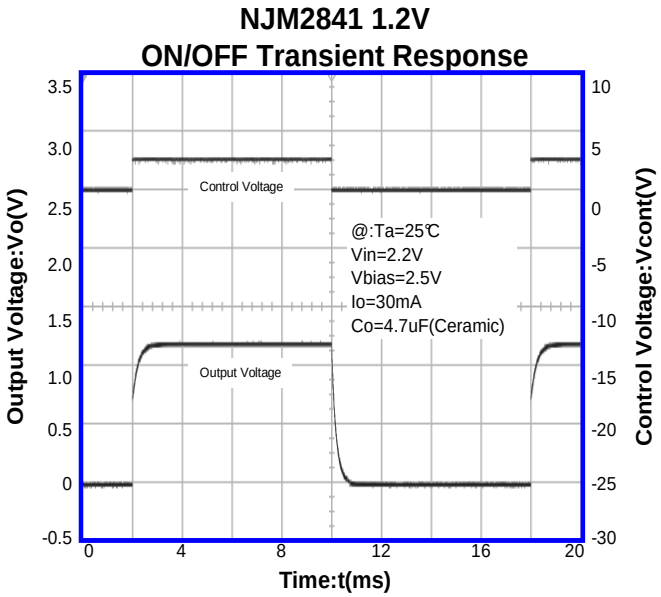
NJM2841_1.2V
Load Regulation v.s. Temperature

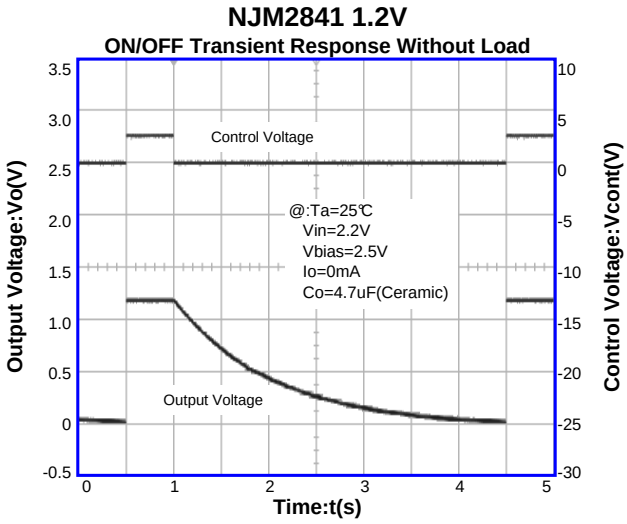


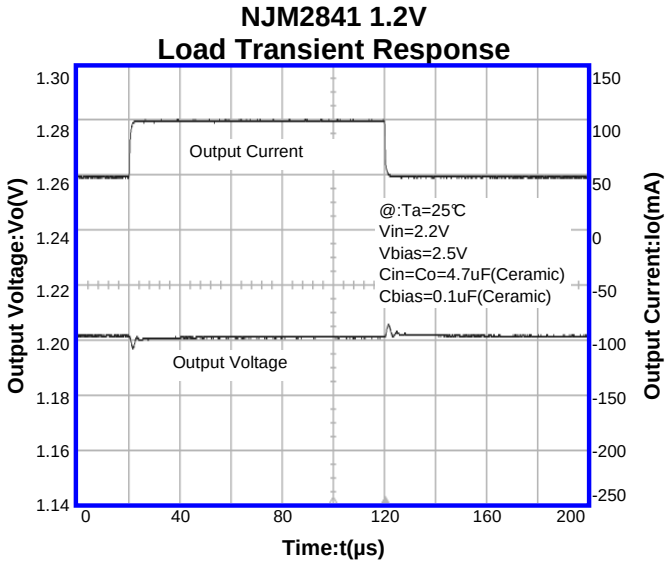
NJM2841_1.2V
Output Voltage v.s. Temperature

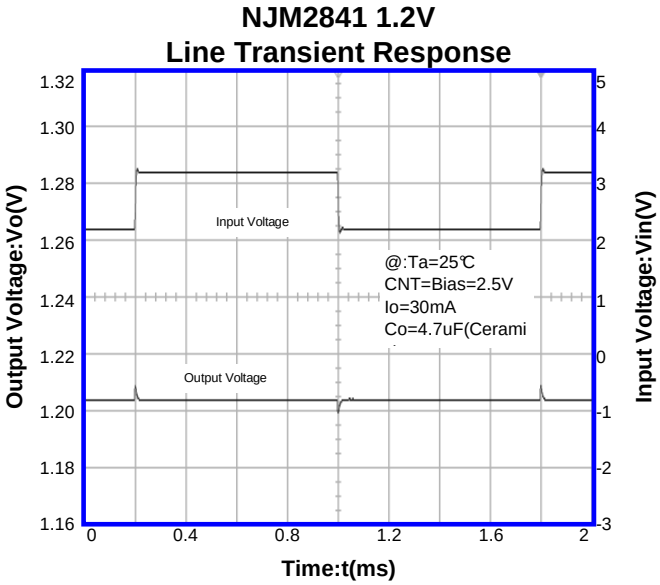


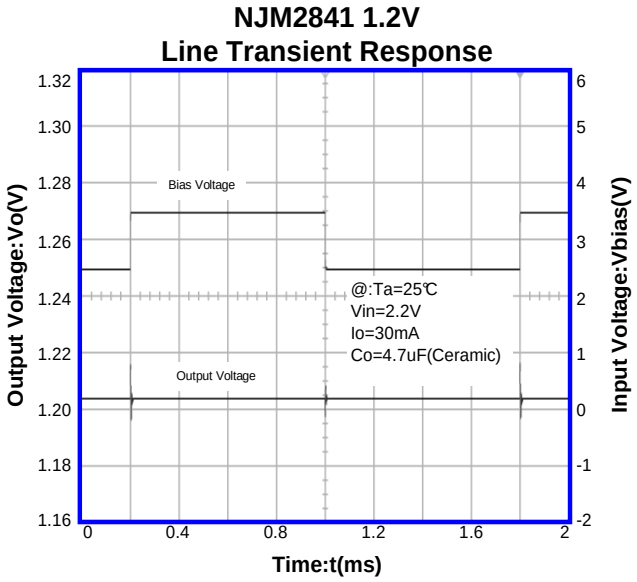

NJM2841_1.2V
Short Circuit Current v.s. Temperature
@:VIN=2.2V
Vbias=Vcont=2.5V
Output is short to ground.
Cbias=0.1uF(Ceramic)
Cin=4.7uF(Ceramic)
Co=4.7uF(Ceramic)
Short Circuit Current : Isc (mA)
Temperature : Ta (°C)


NJM2841 1.2V
ON/OFF Transient Response
Control Voltage
Output Voltage
@:Ta=25℃
Vin=2.2V
Vbias=2.5V
Io=30mA
Co=4.7uF(Ceramic)
Output Voltage:Vo(V)
Control Voltage:Vcont(V)
Time:t(ms)


NJM2841 1.2V
ON/OFF Transient Response Without Load
Control Voltage
Output Voltage
@:Ta=25℃
Vin=2.2V
Vbias=2.5V
Io=0mA
Co=4.7uF(Ceramic)
Output Voltage:Vo(V)
Control Voltage:Vcont(V)
Time:t(s)


NJM2841 1.2V
Load Transient Response
Output Current
Output Voltage
@:Ta=25℃
Vin=2.2V
Vbias=2.5V
Cin=Co=4.7uF(Ceramic)
Cbias=0.1uF(Ceramic)
Output Voltage:Vo(V)
Output Current:Io(mA)
Time:t(µs)


NJM2841 1.2V
Line Transient Response
Input Voltage
Output Voltage
@:Ta=25℃
CNT=Bias=2.5V
Io=30mA
Co=4.7uF(Cerami
Output Voltage:Vo(V)
Input Voltage:Vin(V)
Time:t(ms)


NJM2841 1.2V
Line Transient Response
Bias Voltage
Output Voltage
@:Ta=25℃
Vin=2.2V
Io=30mA
Co=4.7uF(Ceramic)
Output Voltage:Vo(V)
Input Voltage:Vbias(V)
Time:t(ms)

[CAUTION]
The specifications on this databook are only given for information , without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.