

High Voltage Very low current consumption $I_o=100\text{mA}$ Regulator

■ GENERAL DESCRIPTION

The NJW4181 is a high input voltage and low current consumption 100mA series regulator low current consumption $I_q=9\mu\text{A}$ and small package.

It has two package lineup. SOT-89 is able to direct replace to 3-terminal 78L series. ESON6, tiny DFN package, corresponds to a demand on miniaturization of sensor application and so on.

Due to the low current consumption of $9\mu\text{A}$, the NJW4181 is suitable for light load and continuously running applications such as power management microprocessor, RTC, protection circuit, security system and so on.

■ PACKAGE OUTLINE



NJW4181KG1



NJW4181U3

■ FEATURES

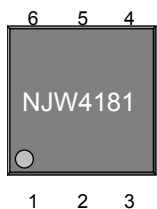
- Wide Operating Voltage Range 35V (max.)
- Low Current Consumption 9 μA (typ.)
- Correspond to Low ESR capacitor (MLCC)
- Output Current $I_o(\text{min.})=100\text{mA}$
- High Precision Output $V_o \pm 1.0\%$
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Internal Reverse Current Protection
- Package Outline DFN6-G1(ESON6-G1), SOT-89-3

■ PRODUCT CLASSIFICATION

Device Name	Version	ON/OFF Function	Package	Status
NJW4181KG1-xxA	A	Yes	DFN6-G1(ESON6-G1)	PLAN
NJW4181U2-xxA	A	Yes	SOT-89-5	PLAN
NJW4181KG1-xxB	B	-	DFN6-G1(ESON6-G1)	
NJW4181U3-xxB	B	-	SOT-89-3	

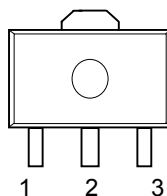
xx=Output Voltage ex) 33=3.3V 05=5.0V

■ PIN CONFIGURATION



NJW4181KG1

1. N.C.
2. GND
3. N.C.
4. V_{IN}
5. N.C.
6. V_{OUT}



NJW4181U3

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

■ INPUT VOLTAGE RANGE

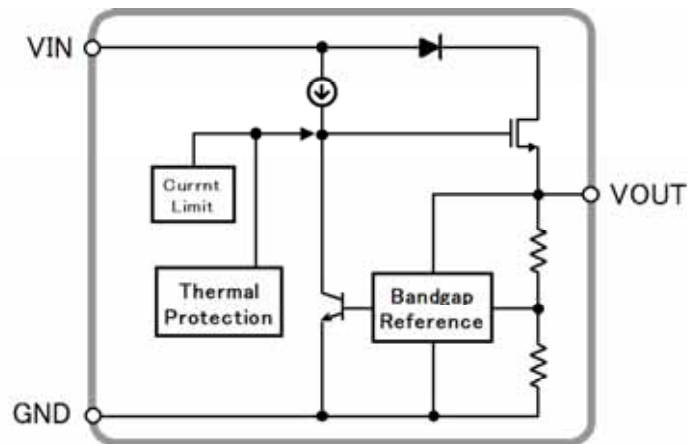
$V_o \leq 3\text{V}$: $V_{IN} = +4.7\text{V}$ to $+35\text{V}$

$3\text{V} < V_o \leq 5\text{V}$: $V_{IN} = V_o + 1.7\text{V}$ to $+35\text{V}$

$V_o > 5\text{V}$: $V_{IN} = V_o + 2.0\text{V}$ to $+35\text{V}$

NJW4181

■BLOCK DIAGRAM



■OUTPUT VOLTAGE RANK LIST

DFN6-G1(ESON6-G1)

SOT-89-3

Device Name	V _{OUT}	Device Name	V _{OUT}
NJW4181KG1-25B	2.5V	NJW4181U3-25B	2.5V
NJW4181KG1-33B	3.3V	NJW4181U3-33B	3.3V
NJW4181KG1-05B	5.0V	NJW4181U3-05B	5.0V
NJW4181KG1-08B	8.0V	NJW4181U3-08B	8.0V
NJW4181KG1-15B	15.0V	NJW4181U3-12B	12.0V
		NJW4181U3-15B	15.0V

■ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT	
Input Voltage	V _{IN}	-0.3 to +40	V	
Output Voltage	V _{OUT}	-0.3 ~ V _{IN} +7 ≤ 17 (Vo≤5.0V) -0.3 ~ +17 (Vo>5.0V)	V	
Power Dissipation	P _D	DFN6-G1	mW	
		(ESON6-G1)		
		SOT-89-3		420 (*1)
				2400 (*4)
Junction Temperature	T _J	-40 to +150	°C	
Operating Temperature	T _{opr}	-40 to +85	°C	
Storage Temperature	T _{stg}	-40 to +150	°C	

(*1): Mounted on glass epoxy board (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 2Layers FR-4, with Exposed Pad)

(*2): Mounted on glass epoxy board (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 4Layers FR-4, with Exposed Pad)
(4Layers: Applying 99.5×99.5mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

(*3): Mounted on glass epoxy board. (76.2×114.3×1.6mm:based on EIA/JEDEC standard size, 2Layers, Cu area 100mm²)

(*4): Mounted on glass epoxy board. (76.2×114.3×1.6mm:based on EIA/JEDEC standard, 4Layers)

(4Layers: Applying 74.2×74.2mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

■ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN}=V_O+2.3V(3V<V_O\leq 5V: V_{IN} = V_O+2.0V, V_O\leq 3V: V_{IN} = 5.0V)$)

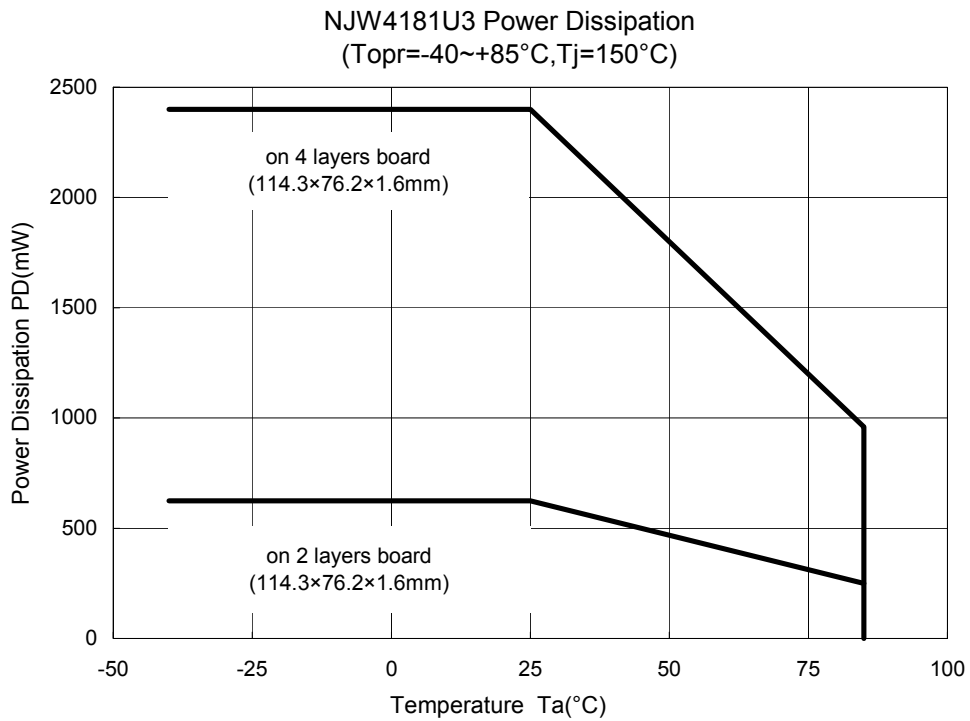
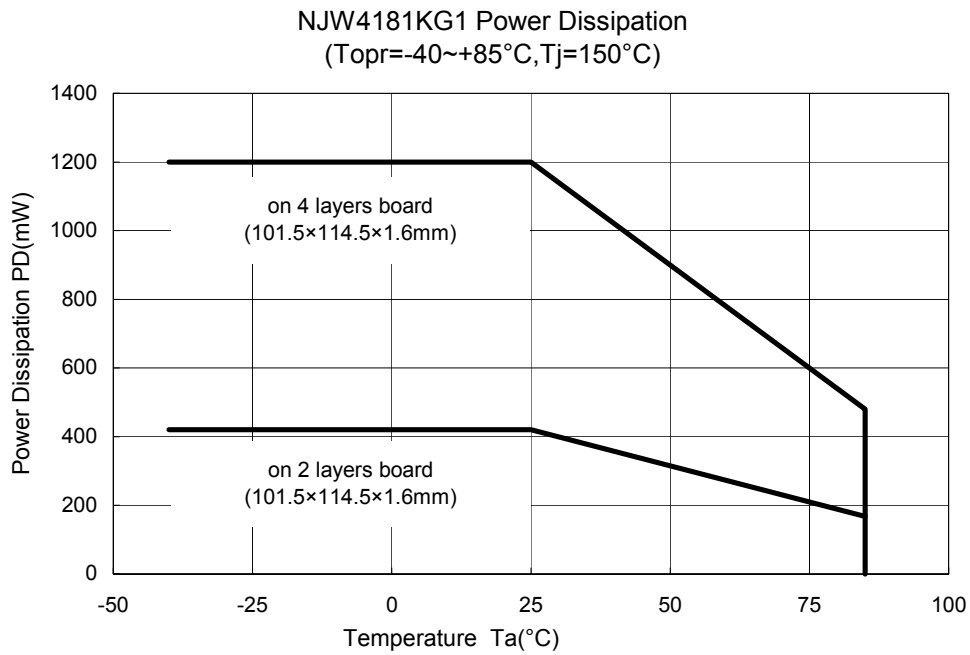
$C_{IN} = 0.1 \mu F, C_O = 2.2\mu F, T_a = 25^\circ C$

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	$I_O=30mA$	-1.0%	-	+1.0%	V
Quiescent Current	I_Q	$I_O=0mA$	-	9	20	μA
Output Current	I_O	$V_O \times 0.9$	100	-	-	mA
Line Regulation	$\Delta V_O/\Delta V_{IN}$	$V_O\leq 3V: V_{IN} = +5.0V$ to +35V $3V<V_O\leq 5V: V_{IN} = V_O+2.0V$ to +35V $V_O>5V: V_{IN} = V_O+2.3V$ to +35V, $I_O=30mA$	-	-	0.05	%/V
Load Regulation	$\Delta V_O/\Delta I_O$	$I_O=0mA$ to 100mA	-	-	0.005	%/mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_a$	$T_a=0$ to $85^\circ C, I_O=10mA$	-	± 100	-	ppm/ $^\circ C$
Sink Current under Reverse Current Protection operating	$I_{REVERSE}$	$V_{IN} = 0V, V_O=5V(V_O \leq 5.0V)$	-	0	1	μA
		$V_{IN} = 0V, V_O=15V(V_O > 5.0V)$		100	200	
Input Voltage	V_{IN}	$V_O\leq 3V$	4.7	-	35	V
		$3V<V_O\leq 5V$	$V_O+1.7$	-	35	
		$V_O>5V$	$V_O+2.0$	-	35	

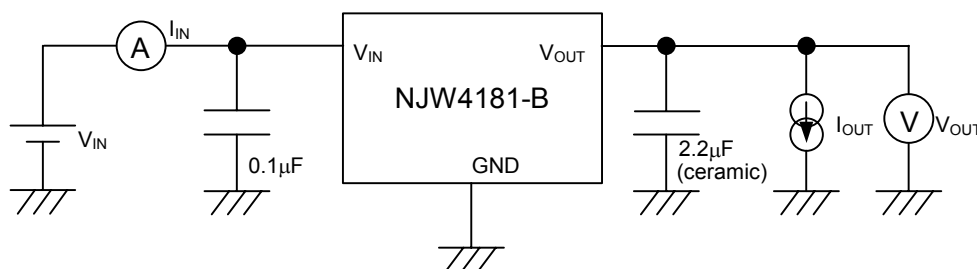
The above specification is a common specification for all output voltages.

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

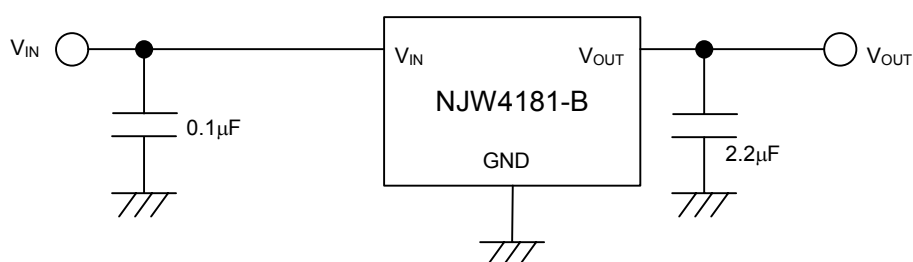
POWER DISSIPATION vs. AMBIENT TEMPERATURE



■ TEST CIRCUIT



■ TYPICAL APPLICATION



*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 the V_{IN} pin 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 the V_{OUT} pin as shortest path as possible for stable operation

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.

*Reverse Current Protection

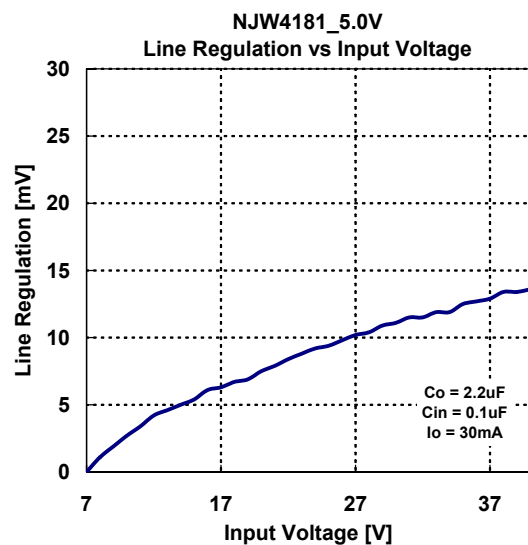
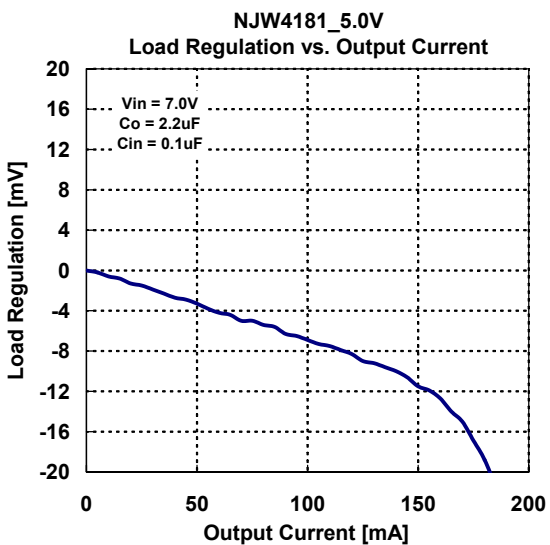
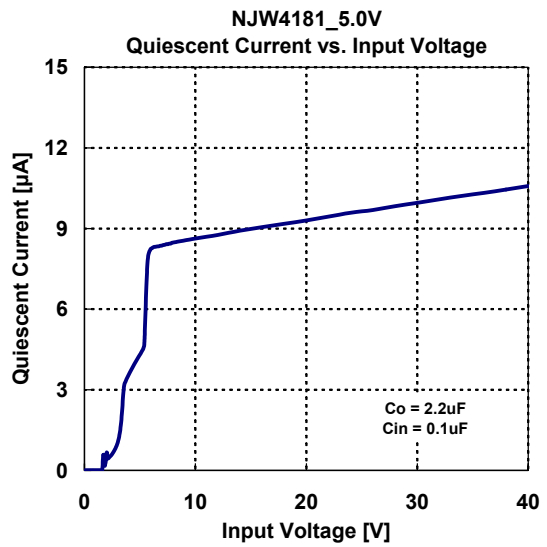
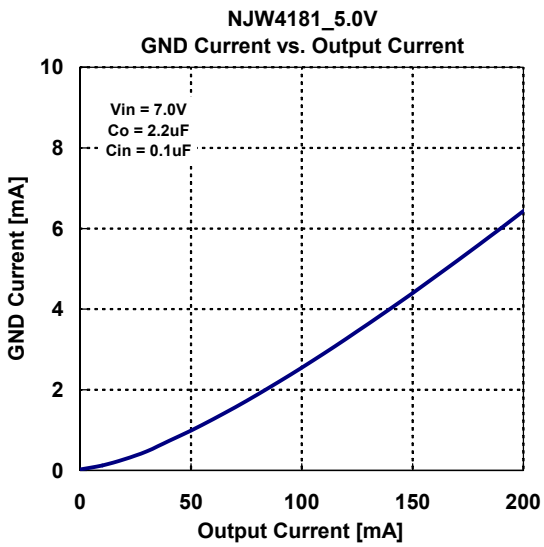
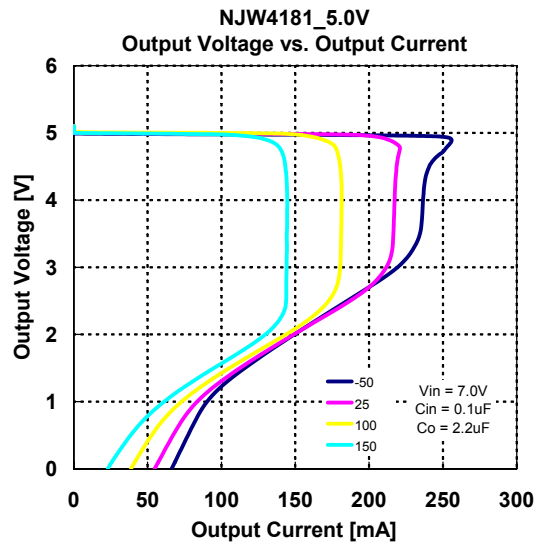
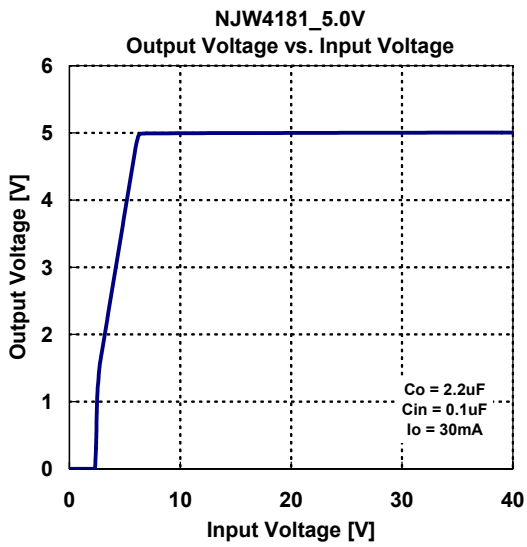
NJW4181 is built-in a Reverse Current Protection. This circuit restrains reverse current from the V_O pin to the V_{IN} pin when the input voltage is less than the output voltage.

In case of the voltage rank 5.0V or below, reverse voltage differential between output and input should keep $V_{IN}+7V$ or less, to prevent IC breaking due to huge reverse current.

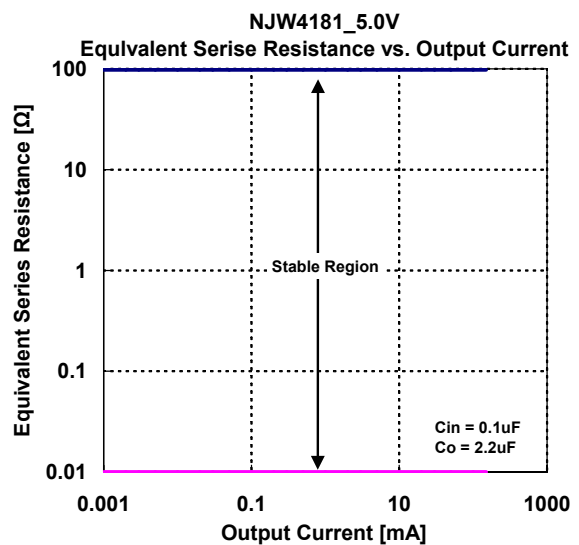
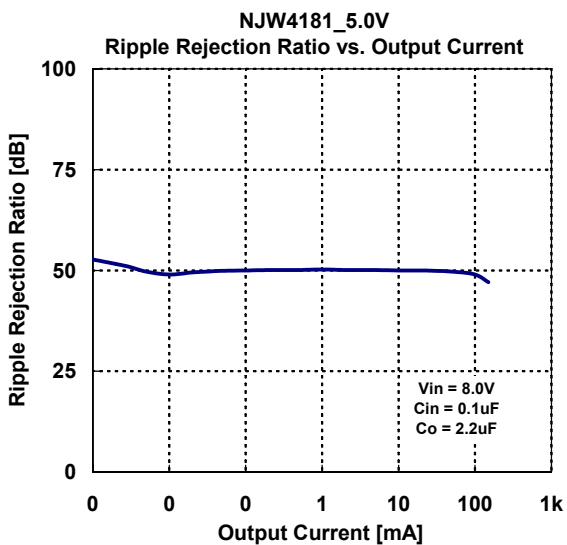
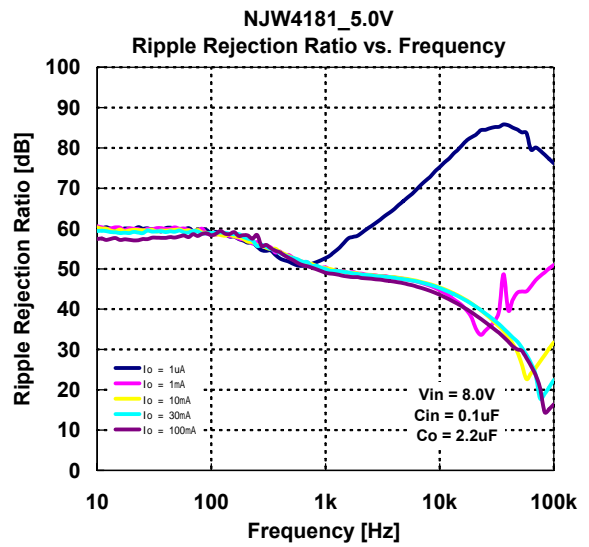
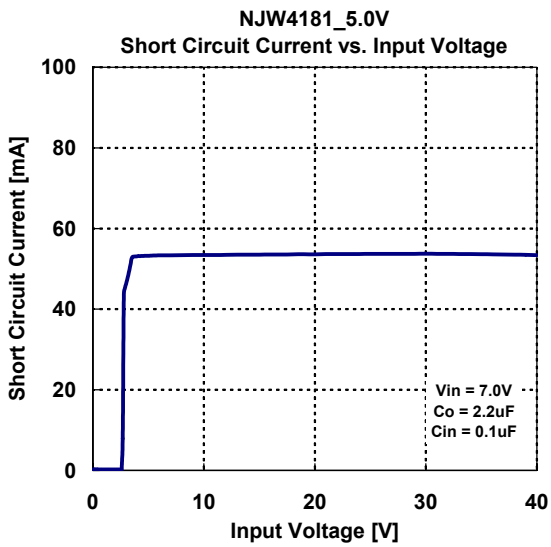
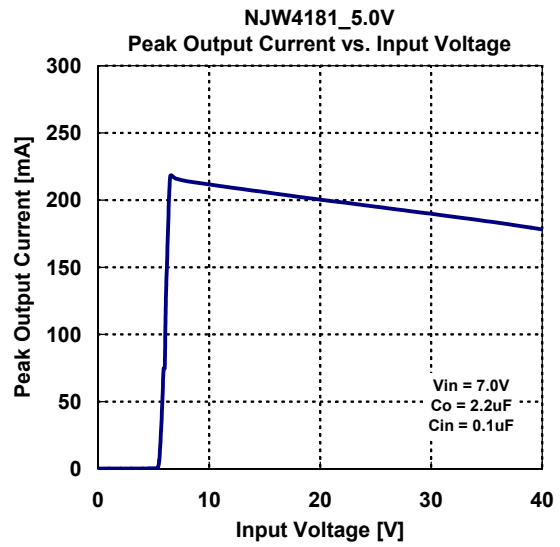
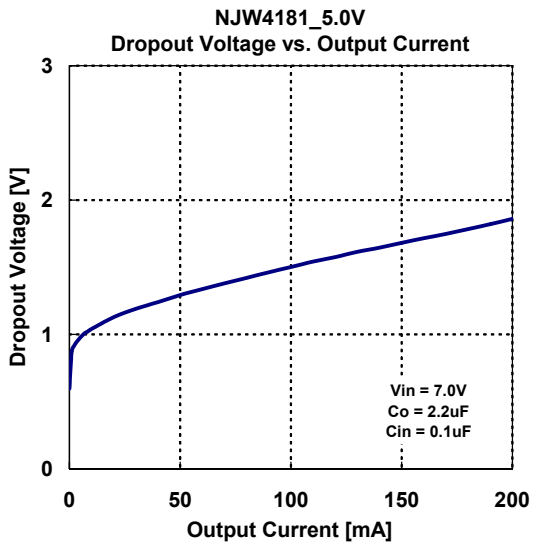
And also, the absolute maximum ratings of the V_O pin (17V) should not be exceeded.

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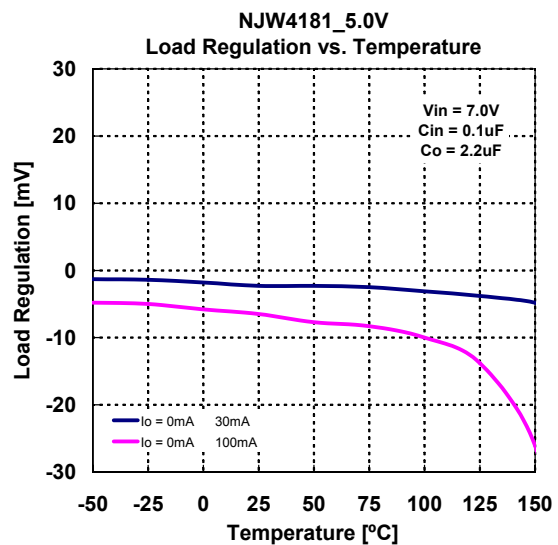
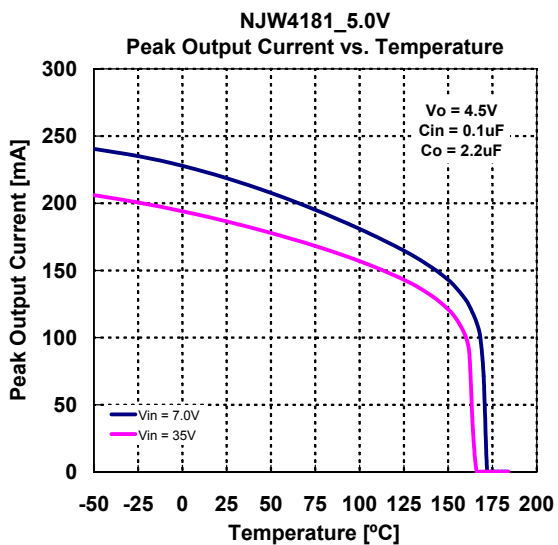
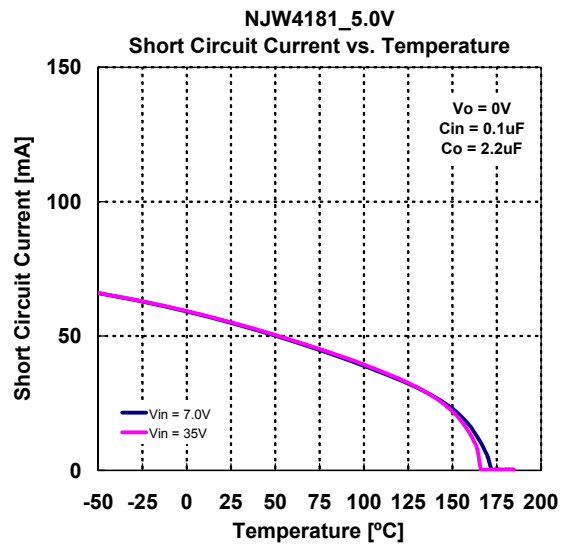
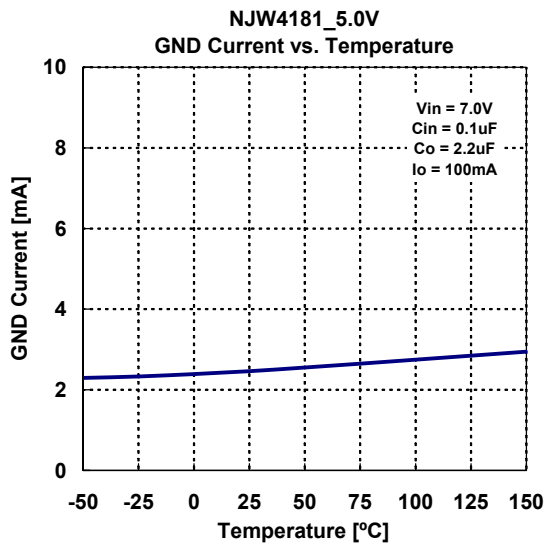
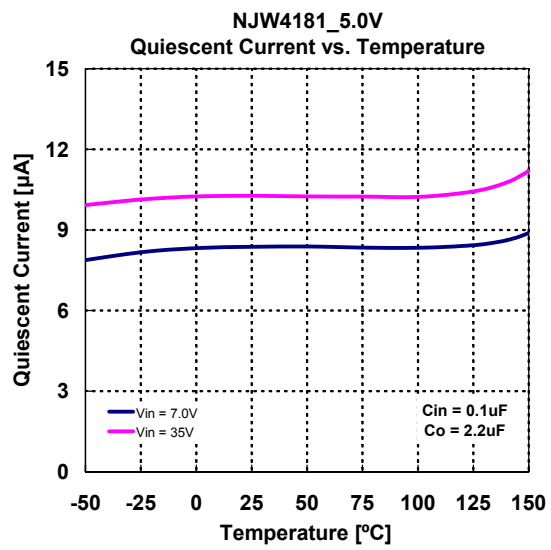
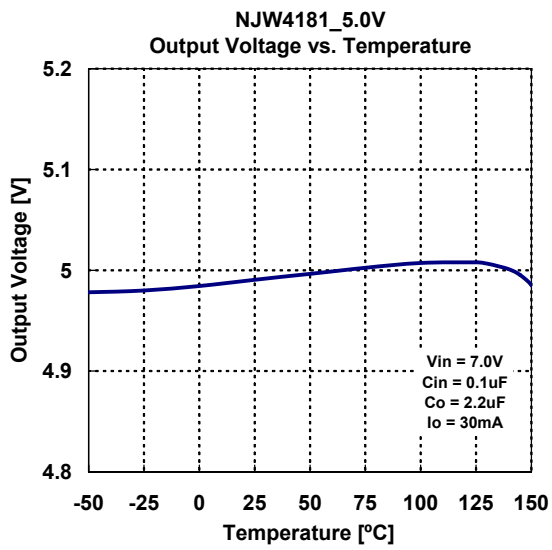
NJW4181-05 TYPICAL CHARACTERISTICS



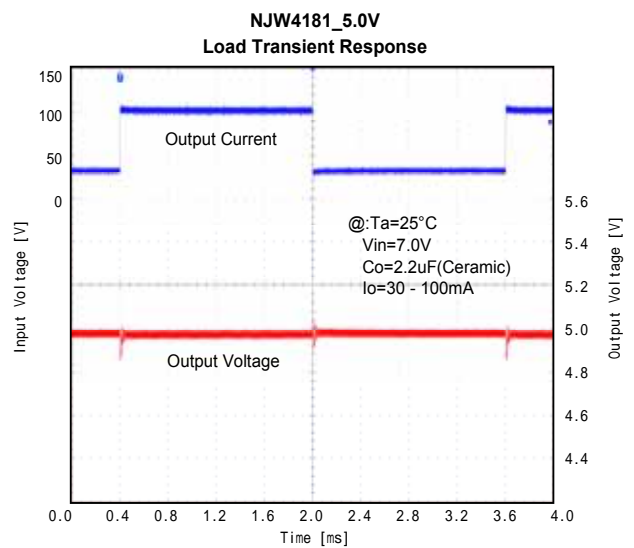
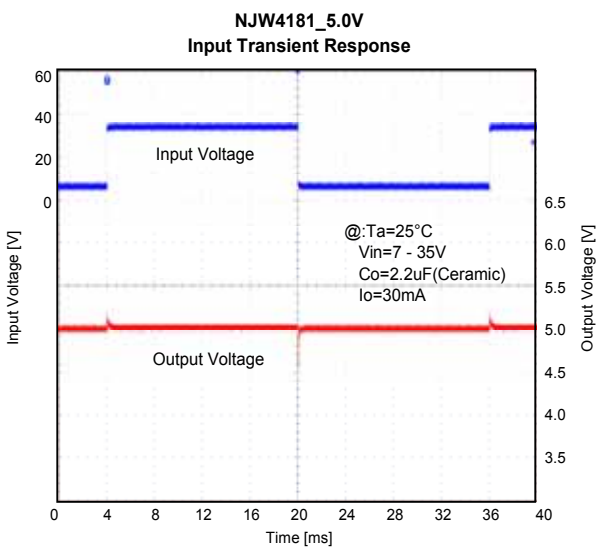
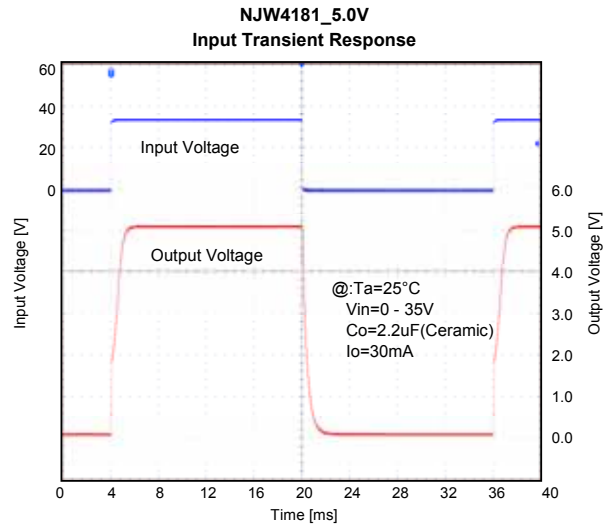
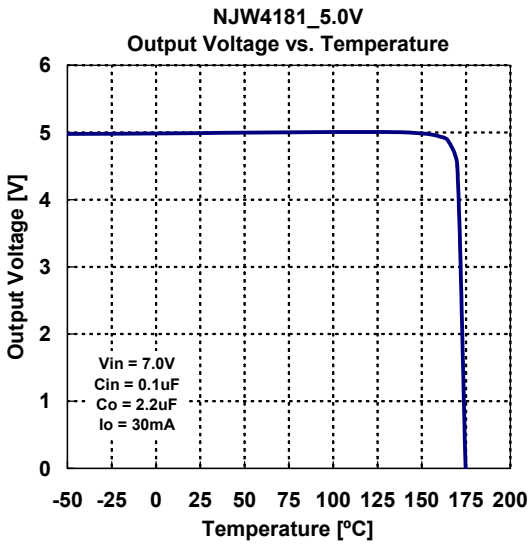
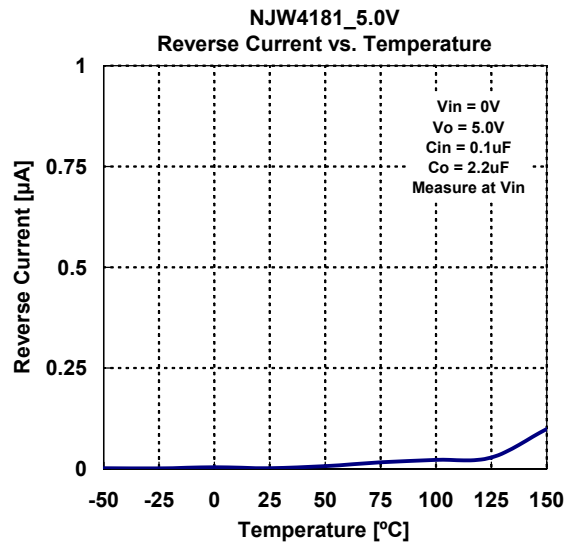
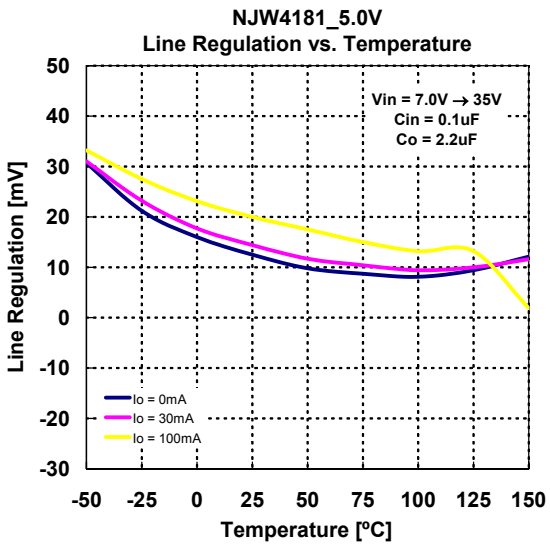
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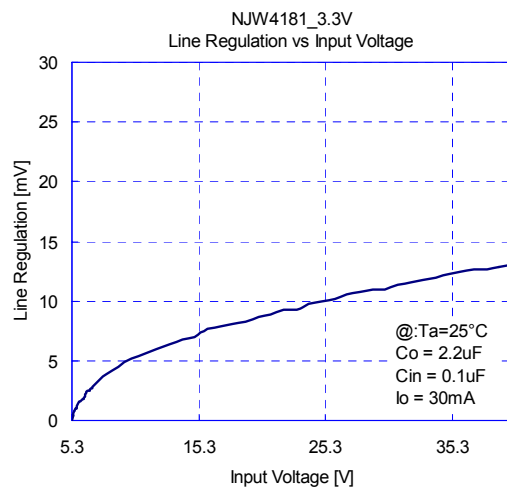
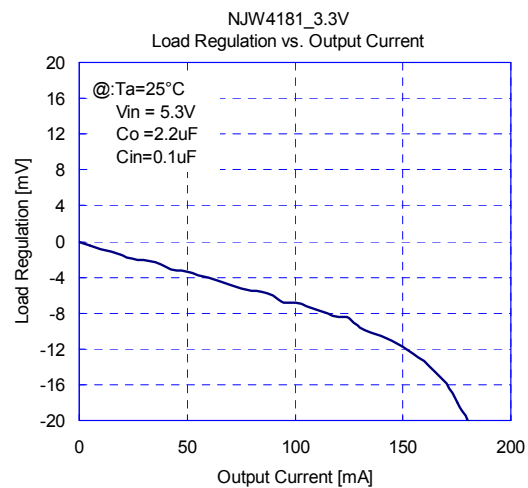
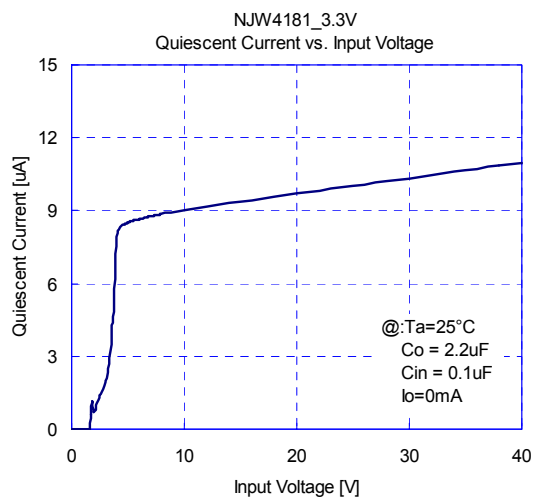
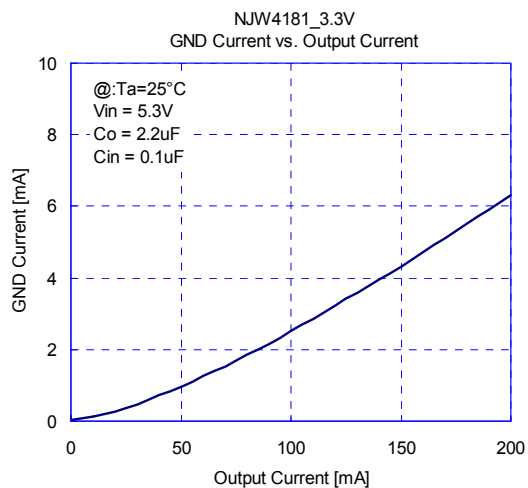
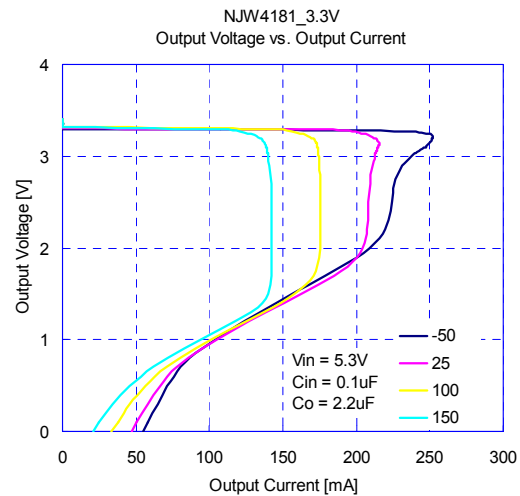
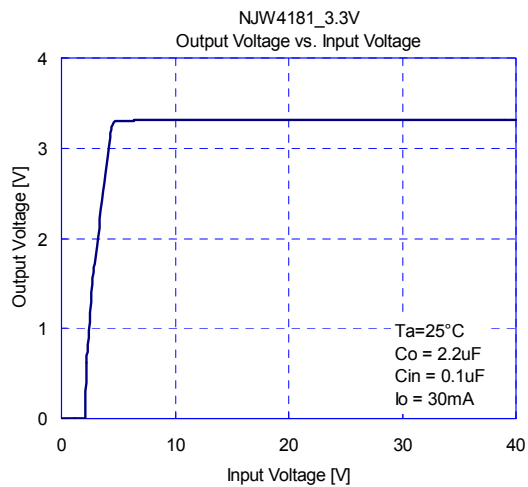


NJW4181-05 TYPICAL CHARACTERISTICS

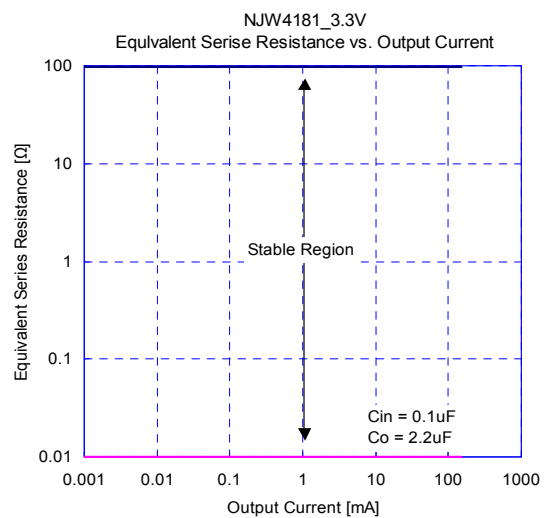
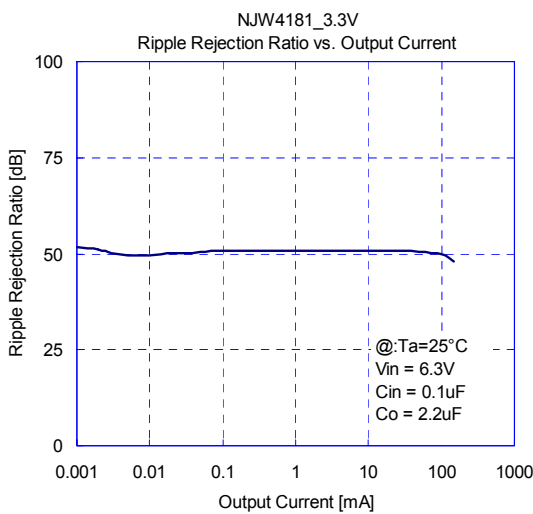
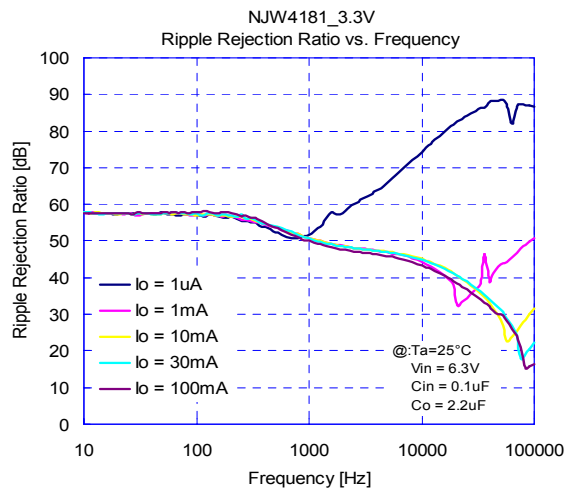
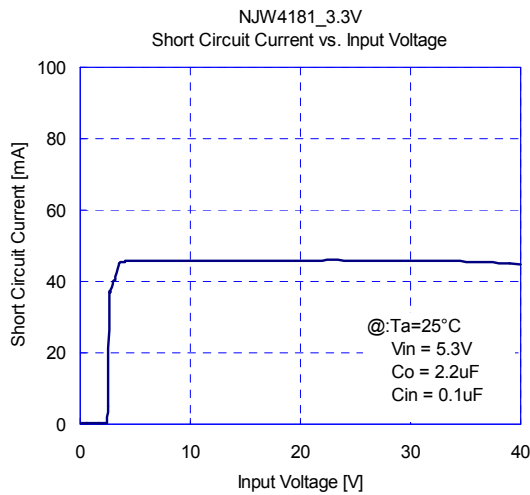
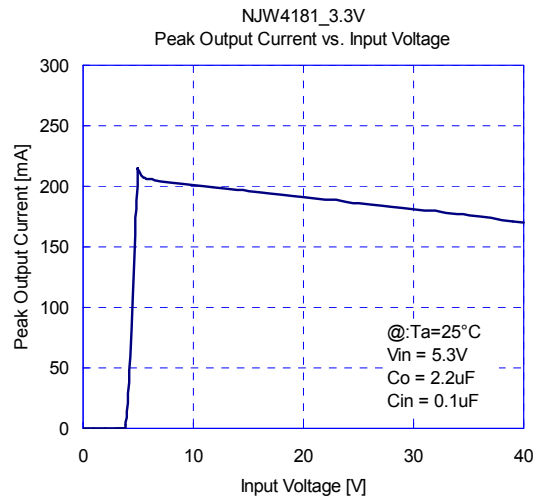
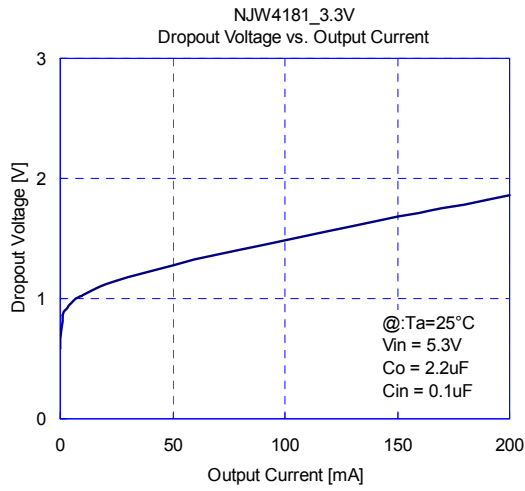


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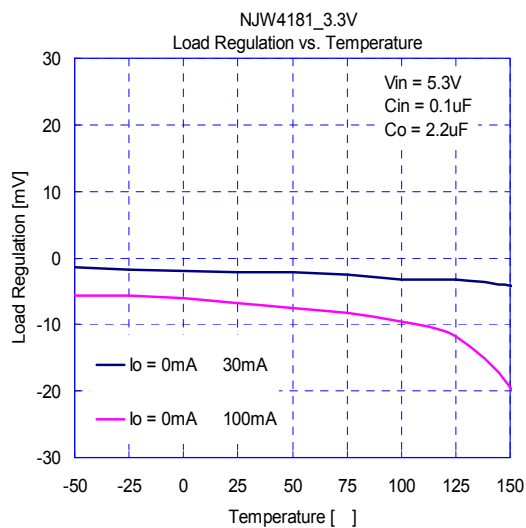
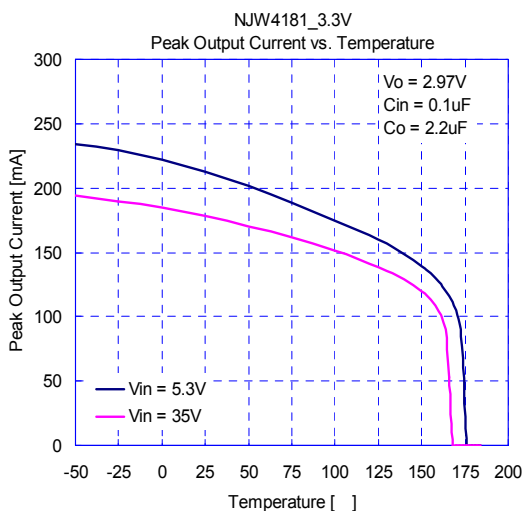
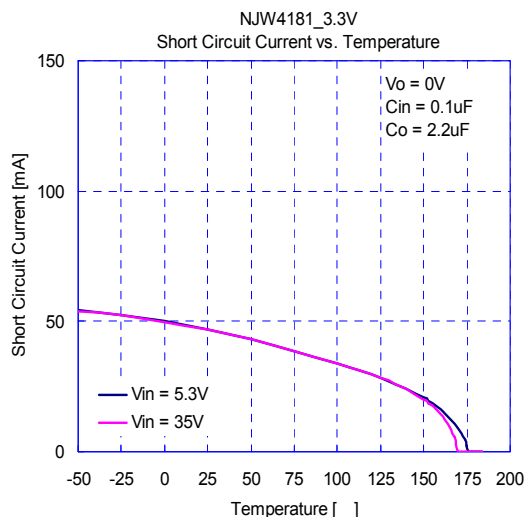
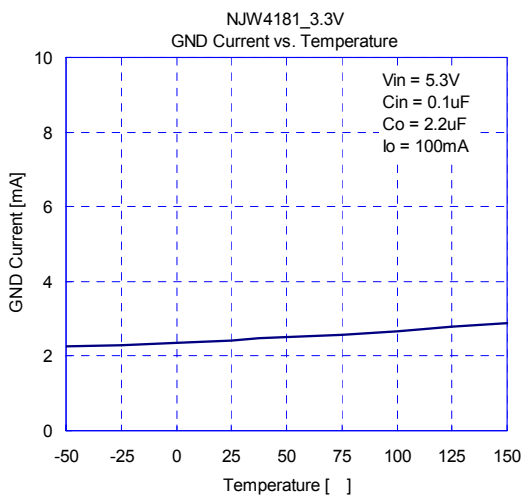
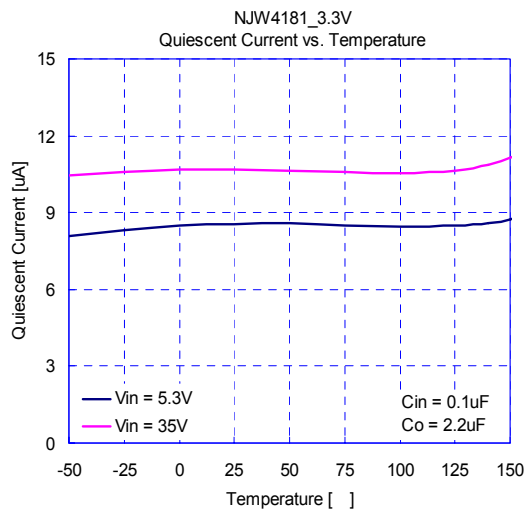
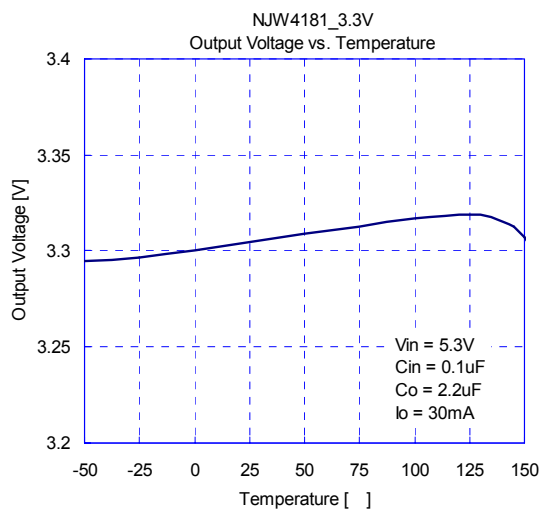
■ NJW4181-33 TYPICAL CHARACTERISTICS



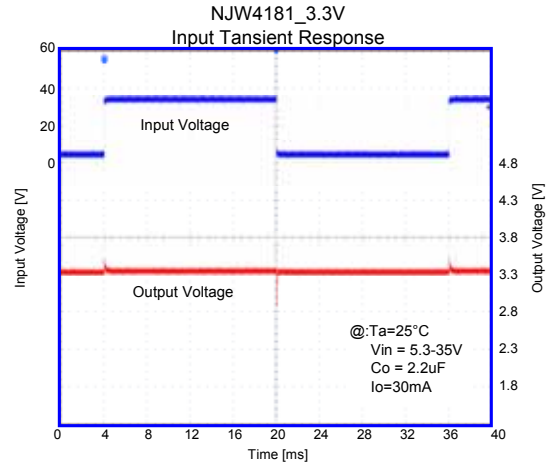
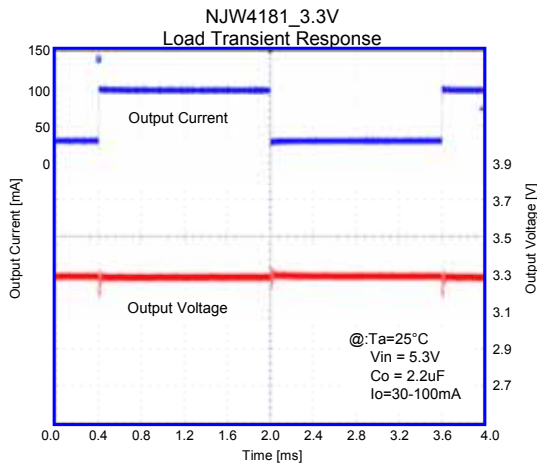
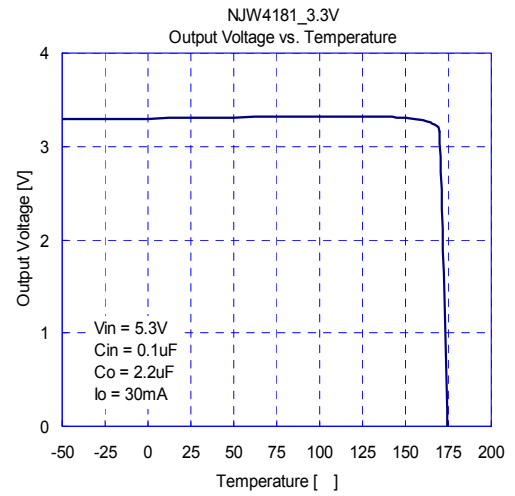
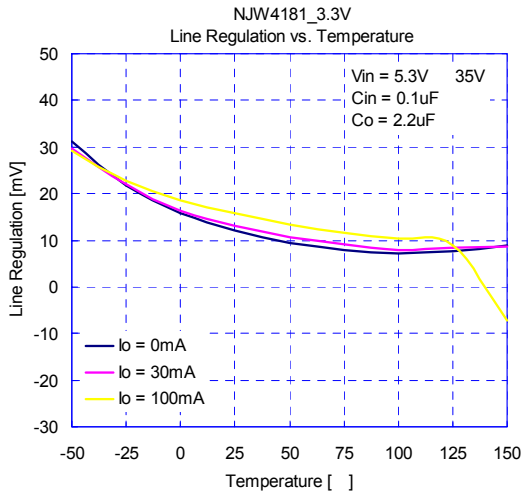
■ NJW4181-33 TYPICAL CHARACTERISTICS



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[CAUTION]
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