High Voltage Ultra Low Current Consumption I_O=100mA LDO

■FEATURES

- AEC-Q100 Grade 1 Qualified
- Wide Operation Voltage Range 4.0V to 40V
- Low Current Consumption 9μA typ.
- MLCC correspond
- Output Current I_O(min.)=100mA
- High Precision Output Voltage V_O±1.0%(Ta=25ºC)
  V_O±3.0%(Ta=-40 to +125ºC)
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Package Outline SOT-23-5

■GENERAL DESCRIPTION

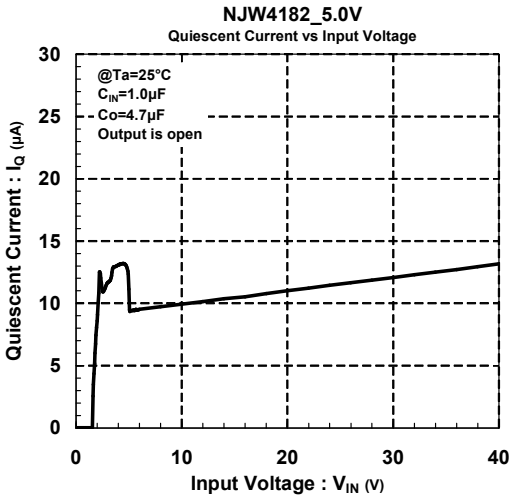
The NJW4182 is a 100mA output low dropout regulator with high maximum input voltage, ultra-low current consumption and small package.

Due to the low current consumption, the NJW4182 is suitable for light load and continuously running applications such as power management microprocessor, RTC, protection circuit, security system and so on.

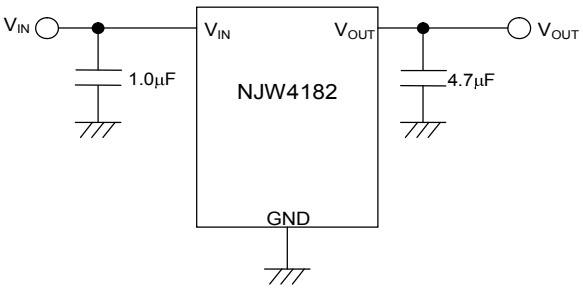
■APPLICATION

- Automotive application
  (Body control unit, Safety system)
- Industrial equipment applications
- Power management microprocessor
- RTC

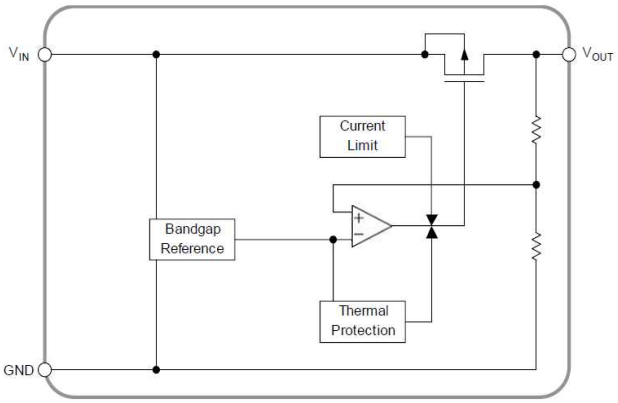
■Quiescent Current Characteristics



■TYPICAL APPLICATION



■BLOCK DIAGRAM

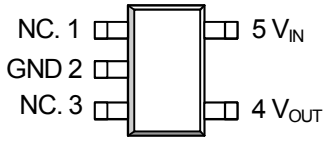


■OUTPUT VOLTAGE RANK

SOT-23-5

PART NUMBER	OUTPUT VOLTAGE
NJW4182F33-H	3.3V
NJW4182F05-H	5.0V

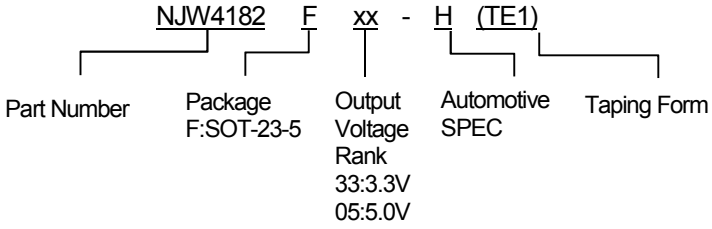
■PIN CONFIGURATION



PIN NO.	SYMBOL	DESCRIPTION
1	NC	Not Internally connected *
2	GND	Ground
3	NC	Not Internally connected *
4	V_{OUT}	Output
5	V_{IN}	Input

Note) NC pin is not connect to internally circuit. This pin can be open or connected to ground. Connecting to ground is recommended to improve thermal dissipation.

■PRODUCT NAME INFORMATION



■ORDERING INFORMATION

PART NUMBER	OUTPUT VOLTAGE	PACKAGE OUTLINE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ(pcs)
NJW4182F05-H(TE1)	5.0V	SOT-23-5	yes	yes	Sn2Bi	AN7	15	3000

Note) "-" is non-evaluation. Please contact your sales representative for more information.

■ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	-0.3 to +45	V
Output Voltage	V_{OUT}	-0.3 to $V_{IN} \leq 17$	V
Power Dissipation (Ta=25°C) SOT-23-5	P_D	(2-layer / 4-layer) 480(1) / 650(2)	mW
Junction Temperature Range	Tj	-40 to +150	°C
Operating Temperature Range	T_{opr}	-40 to +125	°C
Storage Temperature Range	T_{stg}	-40 to +150	°C

(1): Mounted on glass epoxy board based on EIA/JEDEC. (76.2×114.3×1.6mm: 2Layers FR-4)

(2): Mounted on glass epoxy board based on EIA/JEDEC. (76.2×114.3×1.6mm: 4Layers FR-4), internal Cu area: 74.2×74.2mm

■RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Operating Voltage Range	V_{IN}	4.0 to 40	V

■ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN}=V_O+1V$, $C_{IN}=1.0\mu F$, $C_O=4.7\mu F$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	I_O=30mA		-1.0%	-	+1.0%	V
		I_O=30mA, Ta= -40 to +125°C		-3.0%	-	+3.0%	
Quiescent Current	I_Q	I_O=0mA		-	9	18	μA
		I_O=0mA, Ta= -40 to +125°C		-	-	25	
Output Current	Io	$V_O \times 0.9$		100	-	-	mA
		$V_O \times 0.9$, Ta= -40 to +125°C		100	-	-	
Line Regulation	$\Delta V_O/\Delta V_{IN}$	V_{IN}= V_O +1V to 40V, I_O =30mA	Vo=3.3V	-	-	59	mV
			Vo=5.0V	-	-	85	
		V_{IN}= V_O +1V to 40V, I_O =30mA, Ta= -40 to +125°C	Vo=3.3V	-	-	59	
			Vo=5.0V	-	-	85	
Load Regulation	$\Delta V_O/\Delta I_O$	I_O=0mA to 100mA	Vo=3.3V	-	-	60	mV
			Vo=5.0V	-	-	90	
		I_O=0mA to 100mA, Ta= -40 to +125°C	Vo=3.3V	-	-	120	
			Vo=5.0V	-	-	180	
Dropout Voltage	ΔV_{IO}	I_O=60mA		-	0.18	0.3	V
		I_O=60mA , Ta= -40 to +125°C		-	-	0.5	
Ripple Rejection	RR	V_{IN}= V_O+2V, ein =50mVrms, f = 1kHz , Io = 10mA	Vo=3.3V	-	52	-	dB
			Vo=5.0V	-	48	-	
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta Ta$	Ta=-40 to +125°C, I_O=30mA		-	±50	-	ppm/°C

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.

■THERMAL CHARACTERISTICS

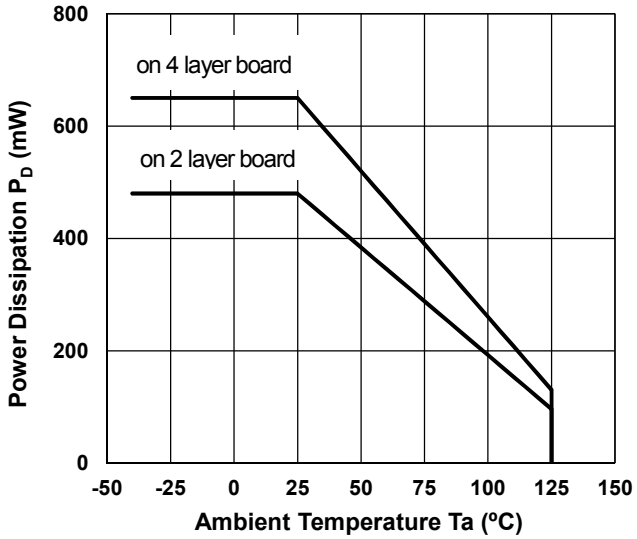
PARAMETER	SYMBOL	VALUE		UNIT
Junction-to-ambient thermal resistance	θja	SOT-23-5	260(3) 192(4)	°C /W
Junction-to-Top of package characterization parameter	ψjt	SOT-23-5	70(3) 60(4)	°C /W

(3): Mounted on glass epoxy board based on EIA/JEDEC. (76.2×114.3×1.6mm: 2Layers FR-4)

(4): Mounted on glass epoxy board based on EIA/JEDEC. (76.2×114.3×1.6mm: 4Layers FR-4), internal Cu area: 74.2×74.2mm

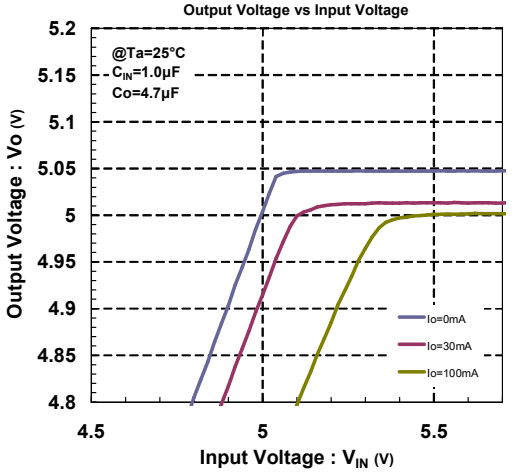
■POWER DISSIPATION vs. AMBIENT TEMPERATURE

NJW4182F Power Dissipation
(Topr=-40˚C to +125˚C, Tjmax=150˚C)

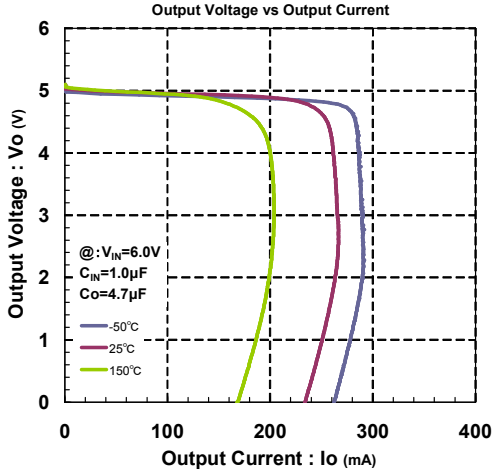


■TYPICAL CHARACTERISTICS

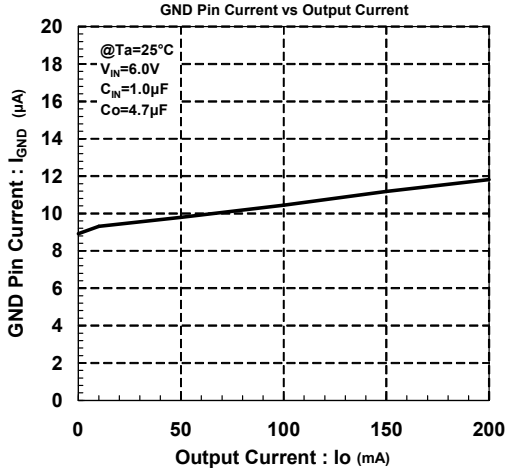
NJW4182_5.0V
Output Voltage vs Input Voltage



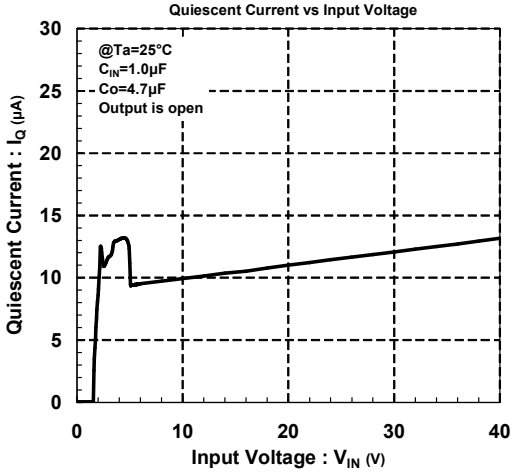
NJW4182_5.0V
Output Voltage vs Output Current



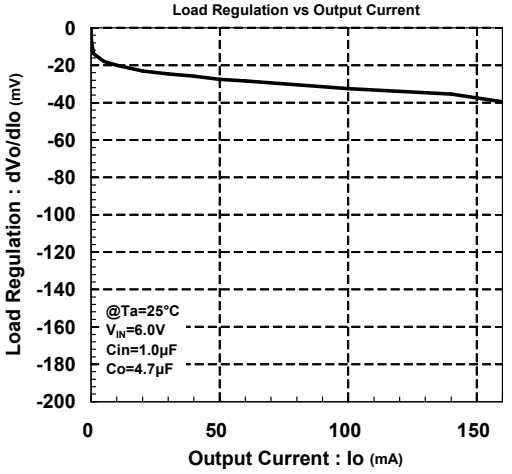
NJW4182_5.0V
GND Pin Current vs Output Current



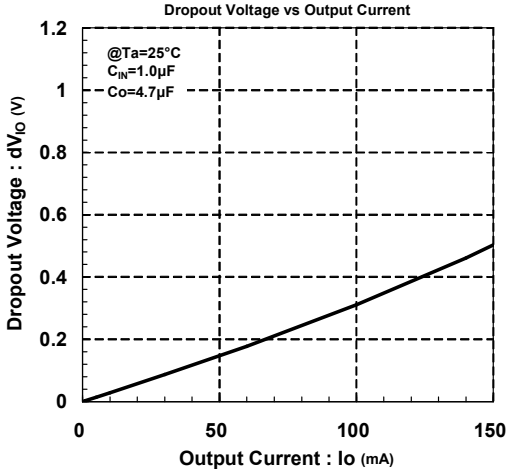
NJW4182_5.0V
Quiescent Current vs Input Voltage



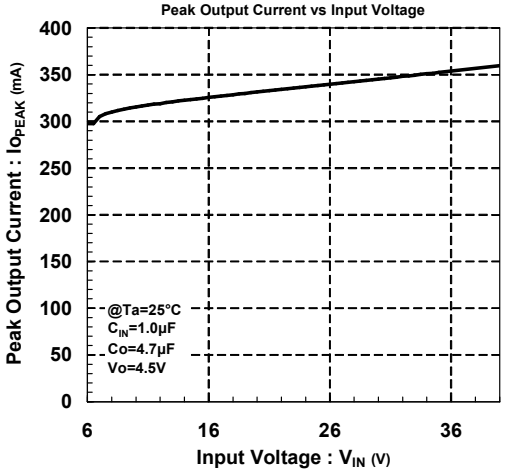
NJW4182_5.0V
Load Regulation vs Output Current



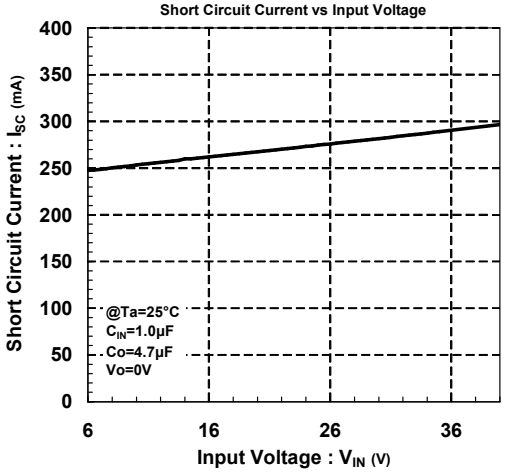
NJW4182_5.0V
Dropout Voltage vs Output Current



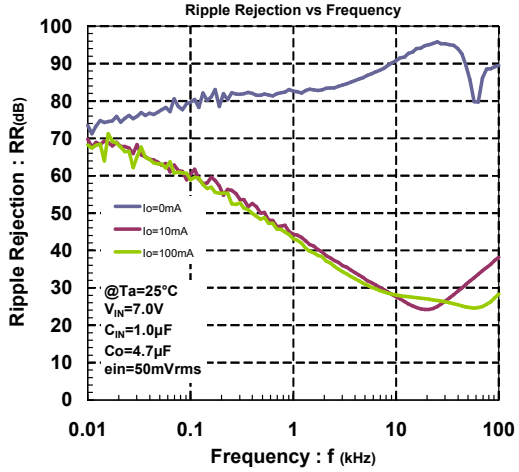
NJW4182_5.0V
Peak Output Current vs Input Voltage



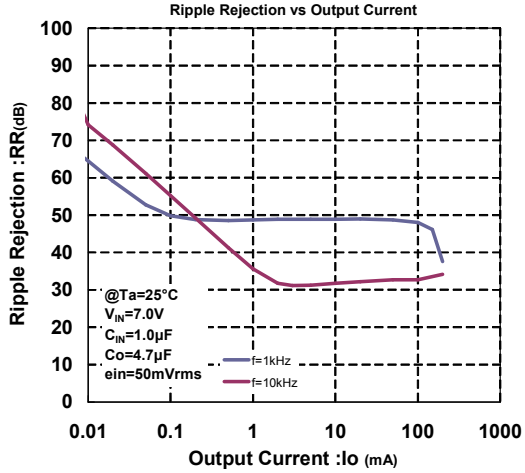
NJW4182_5.0V
Short Circuit Current vs Input Voltage



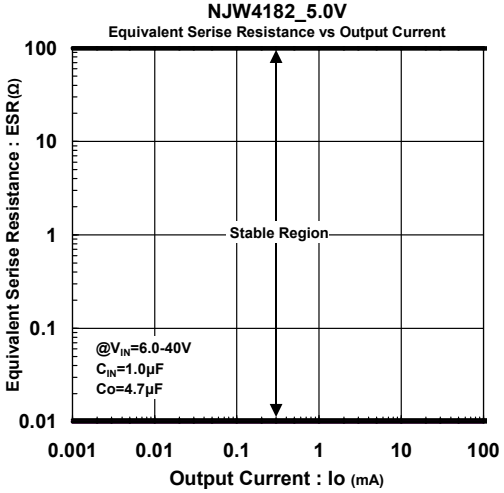
NJW4182_5.0V
Ripple Rejection vs Frequency



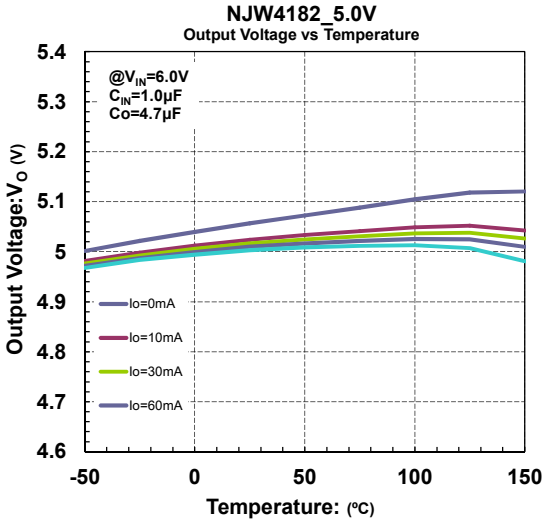
NJW4182_5.0V
Ripple Rejection vs Output Current

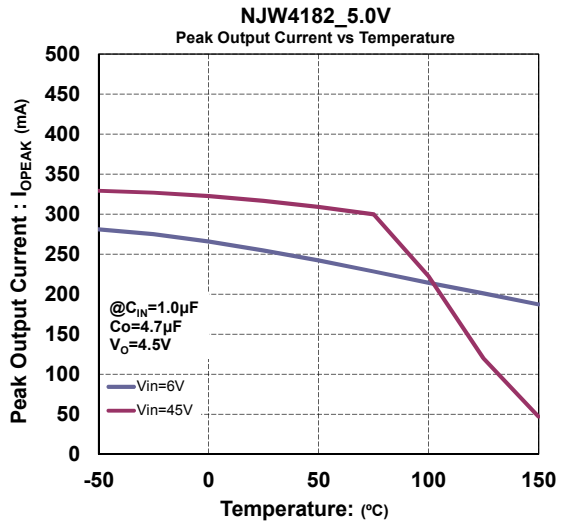


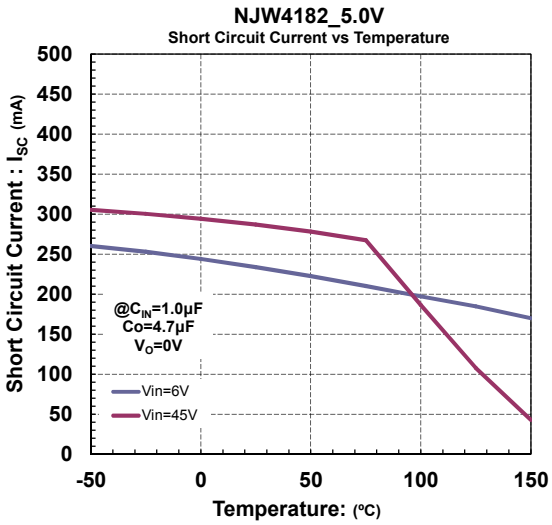
NJW4182_5.0V
Equivalent Serise Resistance vs Output Current

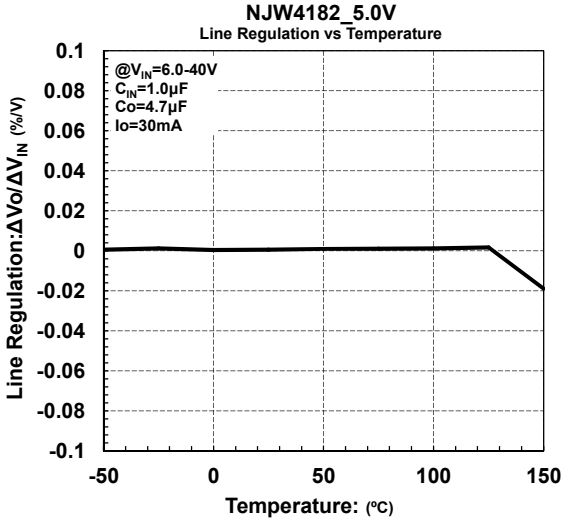


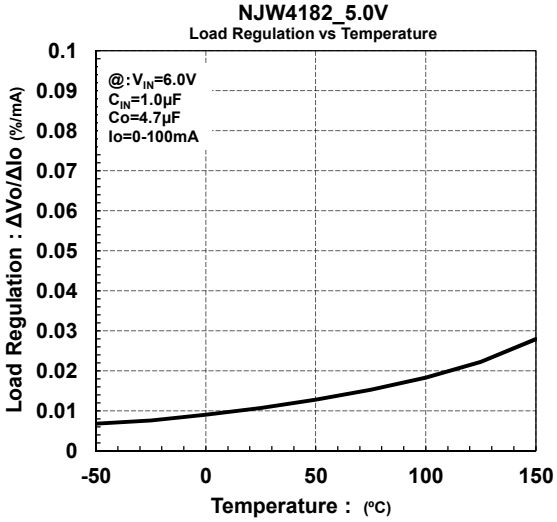
NJW4182_5.0V
Output Voltage vs Temperature

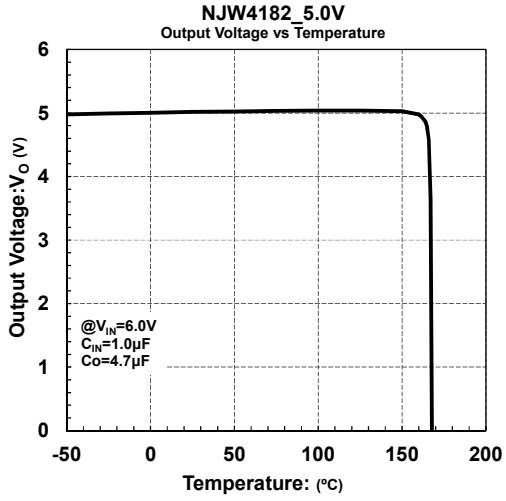


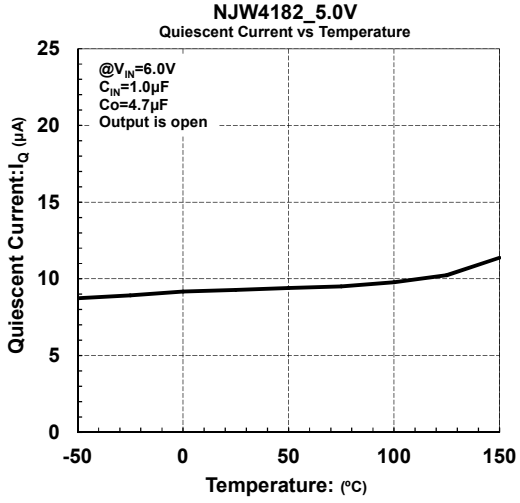

NJW4182_5.0V
Peak Output Current vs Temperature
Peak Output Current : I_{OPEAK} (mA)
500
450
400
350
300
250
200
150
100
50
0
-50
0
50
100
150
Temperature: (°C)
@C_{IN}=1.0µF
Co=4.7µF
V_O=4.5V
Vin=6V
Vin=45V

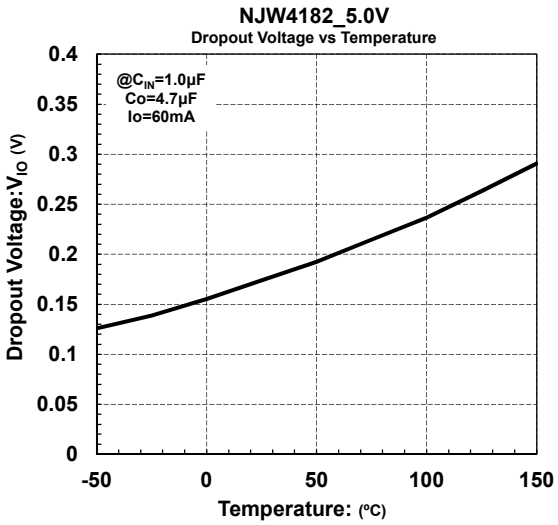

NJW4182_5.0V
Short Circuit Current vs Temperature
Short Circuit Current : I_{SC} (mA)
500
450
400
350
300
250
200
150
100
50
0
-50
0
50
100
150
Temperature: (°C)
@C_{IN}=1.0µF
Co=4.7µF
V_O=0V
Vin=6V
Vin=45V

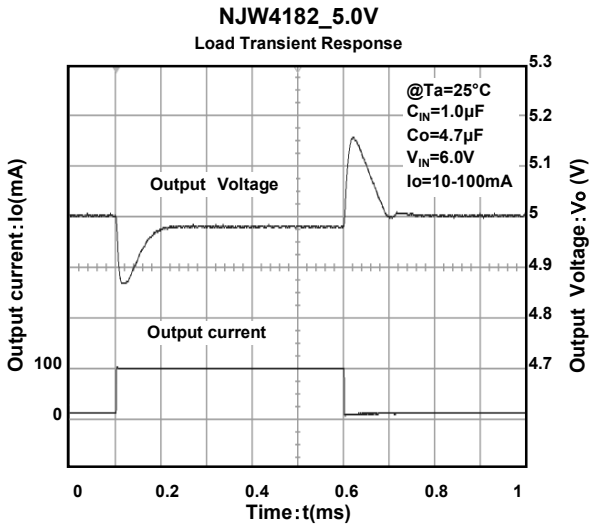

NJW4182_5.0V
Line Regulation vs Temperature
Line Regulation:ΔVo/$ΔV_{IN}$ (%/V)
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-50
0
50
100
150
Temperature: (°C)
@V_{IN}=6.0-40V
C_{IN}=1.0µF
Co=4.7µF
Io=30mA

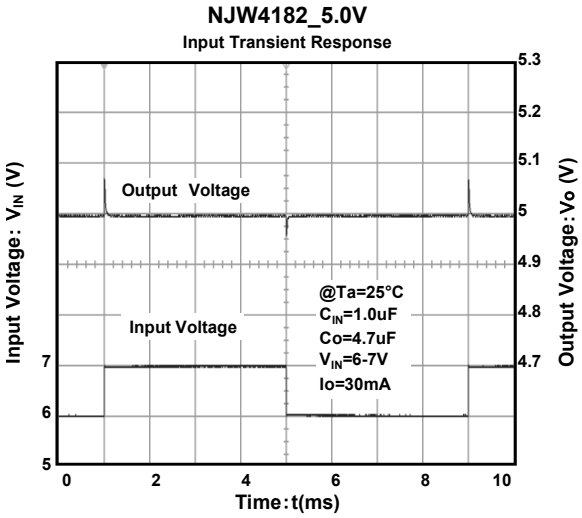

NJW4182_5.0V
Load Regulation vs Temperature
Load Regulation : ΔVo/ΔIo (%/mA)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-50
0
50
100
150
Temperature : (°C)
@:V_{IN}=6.0V
C_{IN}=1.0µF
Co=4.7µF
Io=0-100mA


NJW4182_5.0V
Output Voltage vs Temperature
Output Voltage:V_O (V)
6
5
4
3
2
1
0
-50
0
50
100
150
200
Temperature: (°C)
@V_{IN}=6.0V
C_{IN}=1.0µF
Co=4.7µF

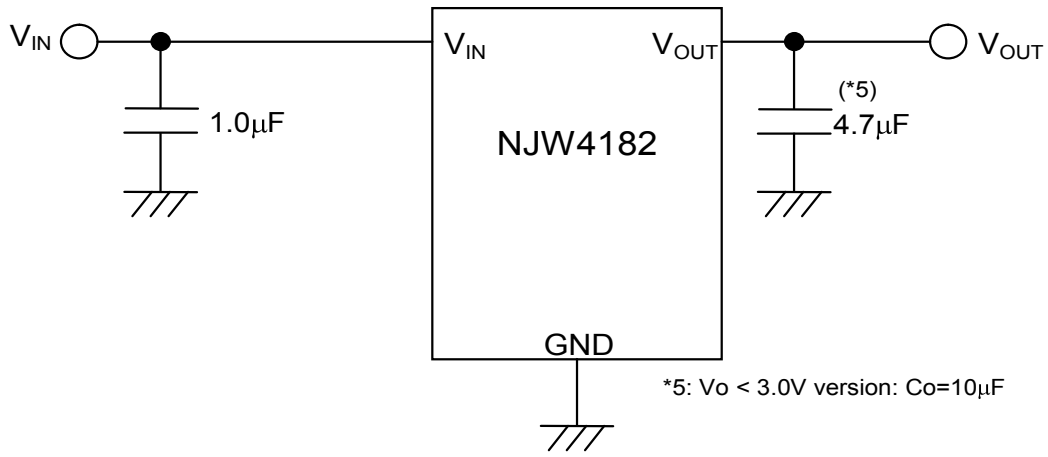

NJW4182_5.0V
Quiescent Current vs Temperature
Quiescent Current:I_Q (µA)
25
20
15
10
5
0
-50
0
50
100
150
Temperature: (°C)
@V_{IN}=6.0V
C_{IN}=1.0µF
Co=4.7µF
Output is open


NJW4182_5.0V
Dropout Voltage vs Temperature
@C_IN=1.0µF
Co=4.7µF
Io=60mA
Dropout Voltage:V_IO (V)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-50
0
50
100
150
Temperature: (°C)


NJW4182_5.0V
Load Transient Response
@Ta=25°C
C_IN=1.0µF
Co=4.7µF
V_IN=6.0V
Io=10-100mA
Output Voltage
Output current
Output current:Io(mA)
100
0
Output Voltage:Vo (V)
5.3
5.2
5.1
5
4.9
4.8
4.7
0
0.2
0.4
0.6
0.8
1
Time:t(ms)


NJW4182_5.0V
Input Transient Response
Output Voltage
Input Voltage
@Ta=25°C
C_IN=1.0uF
Co=4.7uF
V_IN=6-7V
Io=30mA
Input Voltage: V_IN (V)
7
6
5
Output Voltage:Vo (V)
5.3
5.2
5.1
5
4.9
4.8
4.7
0
2
4
6
8
10
Time:t(ms)

■TYPICAL APPLICATION



■APPLICATION NOTE / GLOSSARY

*Overshoot of Output Voltage

Transient fluctuation of output voltage tends to be large compared to other typical regulators because the NJW4182 is designed with the concept of low current consumption characteristics.

In general, overshoot or undershoot of output voltage is more likely to occur when the following cases.

- When input voltage or output current fluctuate sharply
- When output capacitance is small
- When output load is light
- When start up from the condition of narrow voltage difference between an Input and an output.

The NJW4182 can reduce overshoot voltage compared to other low current consumption products by a built-in overshoot protection (OSP).
However, very large overshoot may occur because of delay of the OSP circuit when the input voltage rises from between 2.0V and 2.5V.
The value of overshoot varies with composite conditions, please refer the above and check the actual condition.
In addition, the following measures will be mentioned as a method to reduce the overshoot value.

a. By increasing the input and output capacitors to absorb overshoot value.
b. Adjust the rising speed of the input voltage, to avoid rising from between 2.0V and 2.5V.

*Input Capacitor C_{IN}

The input capacitor C_{IN} is required in order to prevent oscillation and reduce power supply ripple for applications when high power supply impedance or a long power supply line.

Therefore, the recommended capacitance (refer to conditions of ELECTRIC CHARACTERISTIC) or larger input capacitor, connected between V_{IN} and GND as short path as possible, is recommended in order to avoid the problem.

*Output Capacitor C_O

The output capacitor C_O is required for a phase compensation of the internal error amplifier, and the capacitance and the equivalent series resistance (ESR) influence stable operation of the regulator.

If use a smaller output capacitor than the recommended capacitance (refer to conditions of ELECTRIC CHARACTERISTIC), it may cause excess output noise or oscillation of the regulator due to lack of the phase compensation. Therefore, the recommended capacitance or larger output capacitor, connected between V_{OUT} and GND as short path as possible, is recommended for stable operation. The recommended capacitance may be different by output voltage, therefore confirm the recommended capacitance of the required output voltage.

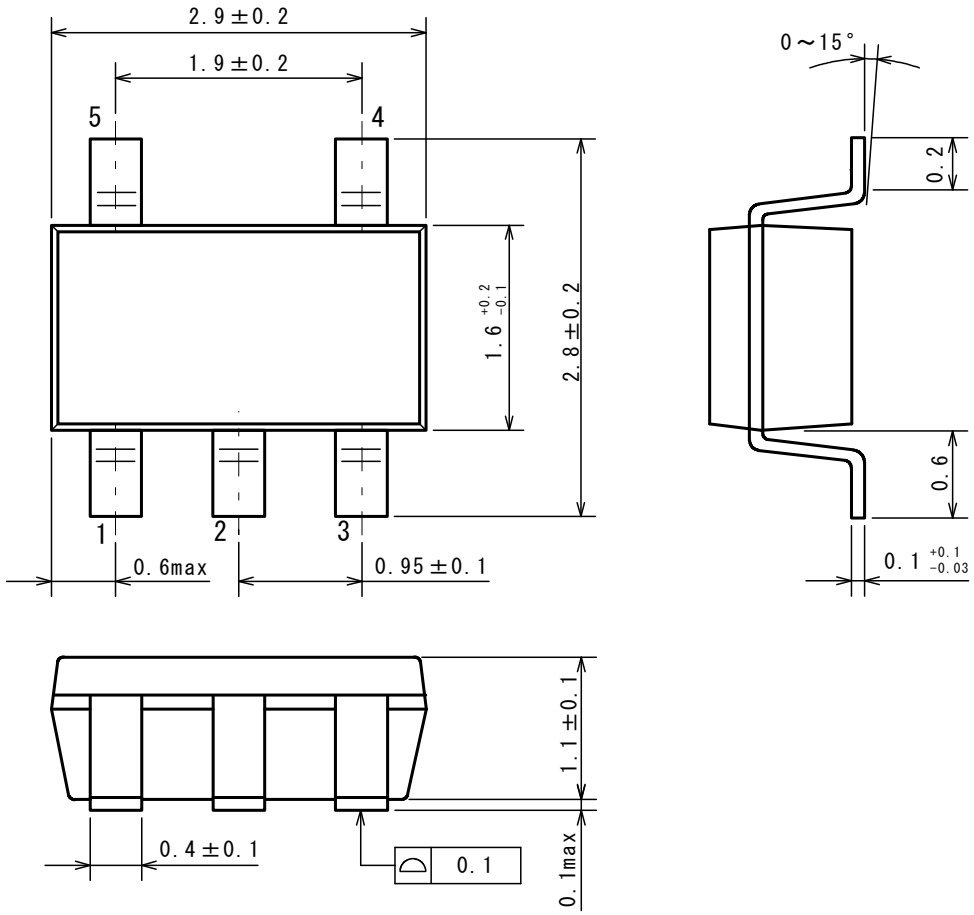
Furthermore, a larger output capacitor reduces output noise and ripple output, and also improves Output Transient Response when a load changes rapidly.

Selecting the output capacitor, should consider varied characteristics of a capacitor: frequency characteristics, temperature characteristics, DC bias characteristics and so on. Therefore, the capacitor that has a sufficient margin of the rated voltage against the output voltage and superior temperature characteristics, is recommended for C_O.

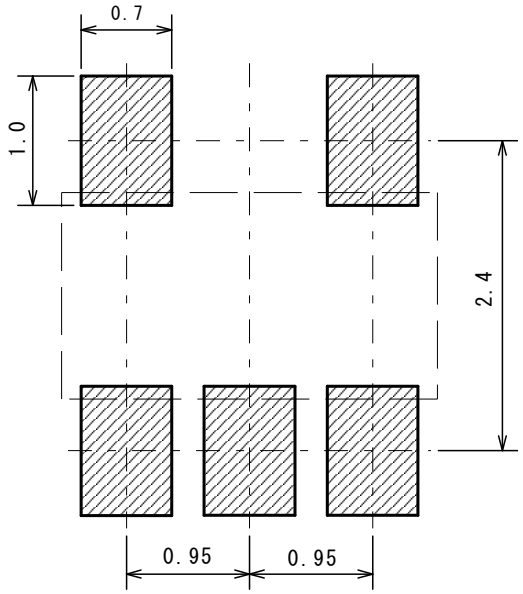
SOT-23-5

■PACKAGE DIMENSIONS

Unit: mm



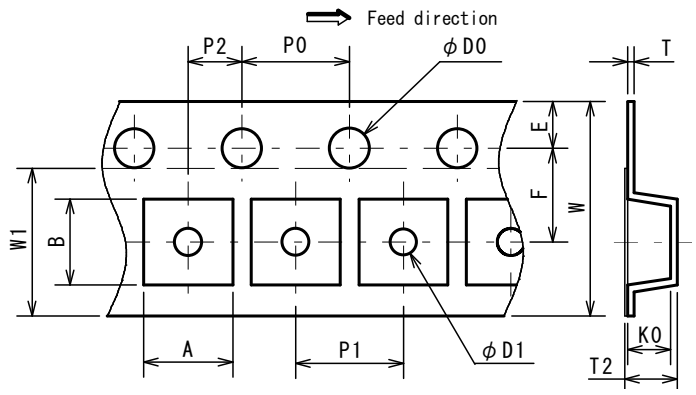
■EXAMPLE OF SOLDER PADS DIMENSIONS



■PACKING SPEC

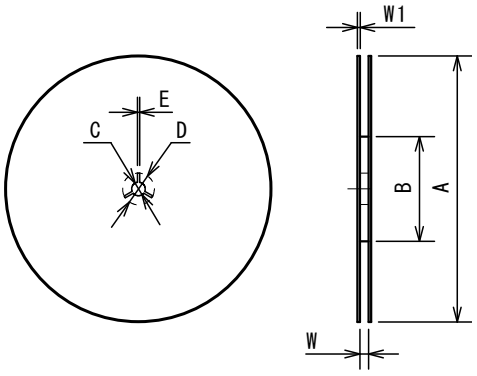
Unit: mm

TAPING DIMENSIONS



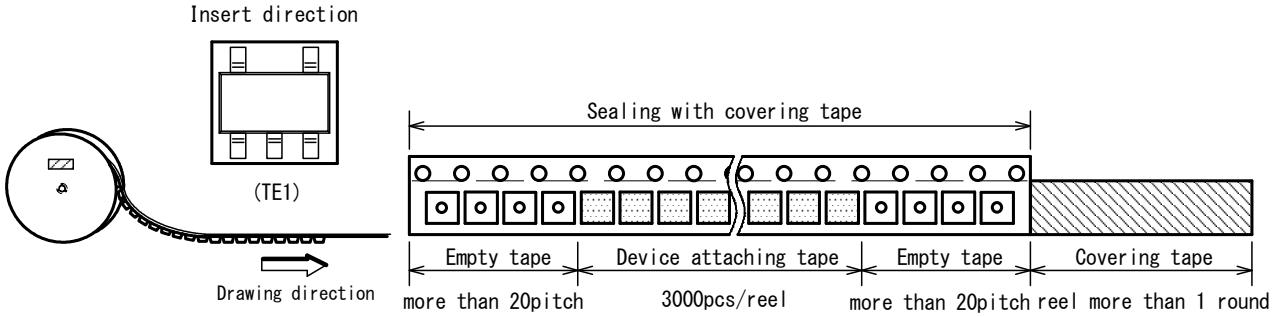
SYMBOL	DIMENSION	REMARKS
A	3.3±0.1	BOTTOM DIMENSION
B	3.2±0.1	BOTTOM DIMENSION
D0	1.55	
D1	1.05	
E	1.75±0.1	
F	3.5±0.05	
P0	4.0±0.1	
P1	4.0±0.1	
P2	2.0±0.05	
T	0.25±0.05	
T2	1.82	
K0	1.5±0.1	
W	8.0±0.3	
W1	5.5	THICKNESS 0.1MAX

REEL DIMENSIONS

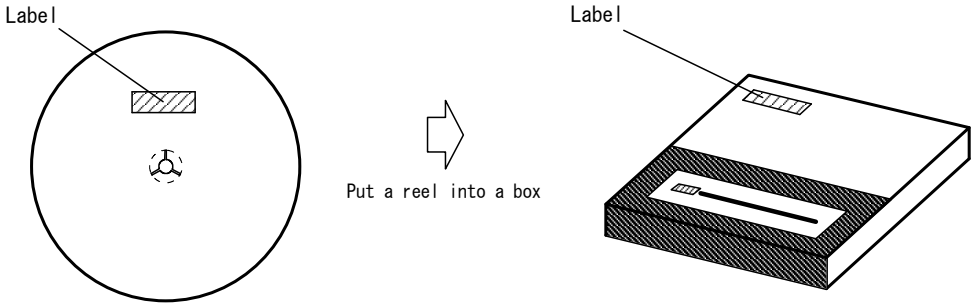


SYMBOL	DIMENSION
A	φ180±1
B	φ 60±1
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	9±0.5
W1	1.2±0.2

TAPING STATE



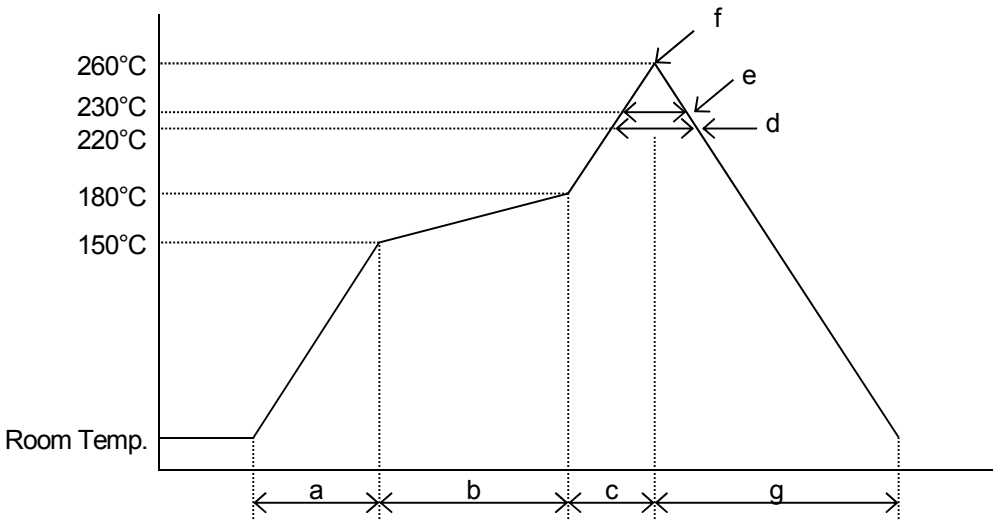
PACKING STATE



■RECOMMENDED MOUNTING METHOD

INFRARED REFLOW SOLDERING METHOD

Recommended reflow soldering procedure



a : Temperature ramping rate	: 1 to 4°C /s
b : Pre-heating temperature	: 150 to 180°C
time	: 60 to 120s
c : Temperature ramp rate	: 1 to 4°C /s
d : 220°C or higher time	: Shorter than 60s
e : 230°C or higher time	: Shorter than 40s
f : Peak temperature	: Lower than 260°C
g : Temperature ramping rate	: 1 to 6°C /s

The temperature indicates at the surface of mold package.

■REVISION HISTORY

DATE	REVISION	CHANGES
27.Apr.2016	Ver.1.0	Original version
7.Jul.2016	Ver.1.1	New Release Automotive "H" spec. Adjusted layout and font
28.Dec.2016	Ver.1.2	Corrected the Label position of Outer box in PACKING SPECIFICATION
20.Dec.2017	Ver.1.3	Added conformity with AEC-Q100 to FEATURES section

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   Various Safety devices

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