LDO with Reverse Current Protection / Soft Start / Discharge Function

**FEATURES**
- AEC-Q100 Grade 1 Qualified
- Operating Voltage Range 2.3V to 6.5V
- Output Voltage Accuracy $V_O \pm 2\%$
- Output Current $I_O$(min.)=500mA
- Reverse Current Protection
- Adjustable soft-start Function
- Discharge Function
- ON/OFF Control
- Correspond to Low ESR capacitor (MLCC)
- Thermal Shutdown Circuit
- Over Current Protection Circuit
- Package Outline DFN8-WA

**GENERAL DESCRIPTION**

The NJM12884 is a low dropout regulator which achieves high ripple rejection, low noise and high speed response with the bipolar technology.

Adjustable soft-start function is useful for reducing inrush current and controlling power-on sequence. Moreover the discharge function makes effective sequence control with the soft-start function.

In addition, the reverse current protection makes external SBD unnecessary.

**APPLICATION**
- Automotive infotainment
- Automotive ECU unit
- Industrial equipment

**TYPICAL APPLICATION**

**BLOCK DIAGRAM**

Reverse Current Protection Characteristics

![Graph showing Reverse Current vs Input Voltage](image)

**NJM12884_3.3V Reverse Current vs Input Voltage**

- Reverse Current, $I_{RV}$(mA)
- Input Voltage, $V_{IN}$(V)

Network of Capacitors:

- $C_0=0.47\,\mu F$ (Ceramic)
- $C_1=0.33\,\mu F$ (Ceramic)
- $C_2=0.01\,\mu F$ (Ceramic)

Additional Capacitor: $C_s=0.33\,\mu F$

*Connected when soft start is Required.*
■ OUTPUT VOLTAGE RANK
DFN8-WA

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>OUTPUT VOLTAGE</th>
<th>PART NUMBER</th>
<th>OUTPUT VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJM12884KWA-15-H</td>
<td>1.5V</td>
<td>NJM12884KWA-33-H</td>
<td>3.3V</td>
</tr>
<tr>
<td>NJM12884KWA-18-H</td>
<td>1.8V</td>
<td>NJM12884KWA-05-H</td>
<td>5.0V</td>
</tr>
<tr>
<td>NJM12884KWA-25-H</td>
<td>2.5V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

■ PIN CONFIGURATION
DFN8-WA

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V_OUT</td>
<td>Output</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Not internally connected *</td>
</tr>
<tr>
<td>3</td>
<td>Cs</td>
<td>Soft Start</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>CONTROL</td>
<td>ON/OFF Control</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>Not internally connected *</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>Not internally connected *</td>
</tr>
<tr>
<td>8</td>
<td>V_IN</td>
<td>Input</td>
</tr>
</tbody>
</table>

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

NJM12884 KWA - xx - H (TE3)

Part Number Package KWA:DFN8-WA Output Voltage Rank Automotive SPEC Taping Form

■ ORDERING INFORMATION

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>OUTPUT VOLTAGE</th>
<th>PACKAGE OUTLINE</th>
<th>RoHS</th>
<th>HALOGEN-FREE</th>
<th>TERMINAL FINISH</th>
<th>MARKING</th>
<th>WEIGHT (mg)</th>
<th>MOQ(pcs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJM12884KWA-33-H(TE3)</td>
<td>3.3V</td>
<td>DFN8-WA</td>
<td>yes</td>
<td>yes</td>
<td>Sn2Bi</td>
<td>88433</td>
<td>18</td>
<td>3000</td>
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</tbody>
</table>

Note) "*" is non-evaluation. Please contact your sales representative for more information.
### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATINGS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>$V_{IN}$</td>
<td>-0.3 to +7 V</td>
<td></td>
</tr>
<tr>
<td>Control Pin Voltage</td>
<td>$V_{CONT}$</td>
<td>-0.3 to +7 V</td>
<td></td>
</tr>
<tr>
<td>Output Voltage</td>
<td>$V_{OUT}$</td>
<td>Vo≤1.8V: -0.3 to +5.5 V, Vo&gt;1.8V: -0.3 to +7 V</td>
<td></td>
</tr>
<tr>
<td>Soft start Pin Voltage</td>
<td>$V_{CS}$</td>
<td>-0.3 to +4 V</td>
<td></td>
</tr>
<tr>
<td>Power Dissipation (Ta=25°C)</td>
<td>$P_D$</td>
<td>(2-layer / 4-layer) 610(1) / 1800(2) mW</td>
<td></td>
</tr>
</tbody>
</table>

DFN8-WA

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATINGS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction Temperature Range</td>
<td>$T_j$</td>
<td>-40 to +150 ℃</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>$T_{opr}$</td>
<td>-40 to +125 ℃</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>$T_{stag}$</td>
<td>-50 to +150 ℃</td>
<td></td>
</tr>
</tbody>
</table>

(1): Mounted on glass epoxy board. (101.5x114.5x1.6mm: based on EIA/JEDEC standard, 2Layers FR-4, with Exposed Pad)
(2): Mounted on glass epoxy board. (101.5x114.5x1.6mm: based on EIA/JEDEC standard, 4Layers FR-4, with Exposed Pad)
(For 4Layers: Applying 99.5x99.5mm inner Cu area and thermal via holes to a board based on JEDEC standard JESD51-5)

### Recommended Operating Conditions

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATINGS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Voltage Range</td>
<td>$V_{IN}$</td>
<td>2.3 to 6.5 V</td>
<td></td>
</tr>
<tr>
<td>Control Voltage</td>
<td>$V_{CONT}$</td>
<td>0 to 6.5 V</td>
<td></td>
</tr>
</tbody>
</table>
## ELECTRICAL CHARACTERISTICS
(Unless other noted, $V_{IN}=V_O+1V$, $C_R=0.33\mu F$, $C_O=0.33\mu F (Co=0.47\mu F)$: $2.9V<V_O\leq3.4V$, $Co=2.2\mu F$: $1.7V<V_O2.9V$, $Co=4.7\mu F$: $Vo\leq1.7V$, $Cs=0.01\mu F$, $Ta=25^\circ C$)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage</td>
<td>$V_O$</td>
<td>$I_O=100mA$</td>
<td>-1.0%</td>
<td>-</td>
<td>+1.0%</td>
<td>V</td>
</tr>
<tr>
<td>Quiescent Current</td>
<td>$I_Q$</td>
<td>$I_O=0mA$, except $I_{CONT}$</td>
<td>-</td>
<td>200</td>
<td>280</td>
<td>$\mu A$</td>
</tr>
<tr>
<td>Quiescent Current at OFF-state</td>
<td>$I_Q(\text{OFF})$</td>
<td>$V_{CONT}=0V$</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>$\mu A$</td>
</tr>
<tr>
<td>Output Current</td>
<td>$I_O$</td>
<td>$V_O x 0.9$</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>Line Regulation</td>
<td>$\Delta V_O/\Delta V_N$</td>
<td>$V_N=V_O+1V$ to 6.5V, $I_O=100mA$, $Ta=40$ to $+125^\circ C$</td>
<td>$V_O=3.3V$</td>
<td>-</td>
<td>-</td>
<td>7.3</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>$\Delta V_O/\Delta I_O$</td>
<td>$I_O=0$ to 500mA, $Ta=40$ to $+125^\circ C$</td>
<td>$V_O=3.3V$</td>
<td>-</td>
<td>-</td>
<td>83</td>
</tr>
<tr>
<td>Dropout Voltage$^{(3)}$</td>
<td>$\Delta V_O$</td>
<td>$I_O=300mA$</td>
<td>-</td>
<td>0.18</td>
<td>0.25</td>
<td>V</td>
</tr>
<tr>
<td>Average Temperature Coefficient of Output Voltage</td>
<td>$\Delta V_O/\Delta Ta$</td>
<td>$Ta=40$ to $+125^\circ C$, $I_O=100mA$</td>
<td>-</td>
<td>±50</td>
<td>-</td>
<td>ppm$^\circ C$</td>
</tr>
<tr>
<td>Ripple Rejection</td>
<td>RR</td>
<td>$f=200mVrms$, $f=1kHz$, $Io=10mA$</td>
<td>$V_O=3.3V$</td>
<td>-</td>
<td>-</td>
<td>68</td>
</tr>
<tr>
<td>Output Noise Voltage</td>
<td>$V_{NO}$</td>
<td>$f=10Hz$ to $80kHz$, $Io=10mA$</td>
<td>$V_O=3.3V$</td>
<td>-</td>
<td>-</td>
<td>28</td>
</tr>
<tr>
<td>Control Current</td>
<td>$I_{CONT}$</td>
<td>$V_{CONT}=1.6V$</td>
<td>-</td>
<td>3</td>
<td>12</td>
<td>$\mu A$</td>
</tr>
<tr>
<td>Control Voltage at ON-state</td>
<td>$V_{CONT(\text{ON})}$</td>
<td>$V_{CONT}=1.8V$, $Ta=40$ to $+125^\circ C$</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>Control Voltage at OFF-state</td>
<td>$V_{CONT(\text{OFF})}$</td>
<td>$Ta=40$ to $+125^\circ C$</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>V</td>
</tr>
<tr>
<td>Soft Start Time</td>
<td>$I_S(\text{ON})$</td>
<td>$V_{CONT}=L\rightarrow H$, $Io=100mA$, $Cs=0.022\mu F$</td>
<td>-</td>
<td>1.2</td>
<td>-</td>
<td>msec</td>
</tr>
<tr>
<td>Discharge Current at OFF-state</td>
<td>$I_{DIS}$</td>
<td>$V_{IN}=2.3V$, $V_{CONT}=0V$, $V_O=0.5V$</td>
<td>2</td>
<td>9</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{IN}=6.5V$, $V_{CONT}=0V$, $V_O=0.5V$</td>
<td>15</td>
<td>25</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

$^{(3)}$: Except Output Voltage Rank less than 2.1V

The above specifications are common specifications for all output voltages. Therefore, it may be different from the individual specification for a specific output voltage.
### THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction-to-ambient thermal resistance</td>
<td>$\theta_{ja}$</td>
<td>DFN8-WA</td>
<td>205(4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>70(5)</td>
</tr>
<tr>
<td>Junction-to-Top of package characterization parameter</td>
<td>$\psi_{jt}$</td>
<td>DFN8-WA</td>
<td>29(4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18(5)</td>
</tr>
</tbody>
</table>

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

(For 4Layers: Applying 99.5×99.5mm inner Cu area and thermal via holes to a board based on JEDEC standard JESD51-5)

### POWER DISSIPATION vs. AMBIENT TEMPERATURE

![Power Dissipation vs. Ambient Temperature Graph]

**NJM12884KWA (DFN8-WA)**

*Power Dissipation (Topr = -40°C to +125°C, Tj=150°C)*

- on 4 layers board (5)
- on 2 layers board (4)
## TYPICAL CHARACTERISTICS

### NJM12884_3.3V

**Output Voltage vs Input Voltage**

- @Ta=25°C
- $V_{IN}=4.3V$
- $C_{IN}=0.33\mu F$ (Ceramic)
- $C_{S}=0.01\mu F$ (Ceramic)
- $C_{O}=0.47\mu F$ (Ceramic)

**Output Voltage vs Output Current**

- @Ta=25°C
- $V_{IN}=4.3V$
- $C_{IN}=0.33\mu F$ (Ceramic)
- $C_{S}=0.01\mu F$ (Ceramic)
- $C_{O}=0.47\mu F$ (Ceramic)

**Ground pin Current vs Output Current**

- @Ta=25°C
- $V_{IN}=4.3V$
- $C_{IN}=0.33\mu F$ (Ceramic)
- $C_{S}=0.01\mu F$ (Ceramic)
- $C_{O}=0.47\mu F$ (Ceramic)

**Dropout Voltage vs Output Current**

- @Ta=25°C
- $V_{IN}=4.3V$
- $C_{IN}=0.33\mu F$ (Ceramic)
- $C_{S}=0.01\mu F$ (Ceramic)
- $C_{O}=0.47\mu F$ (Ceramic)

**Control Current vs Control Voltage**

- @Ta=25°C
- $V_{IN}=4.3V$
- $C_{IN}=0.33\mu F$ (Ceramic)
- $C_{S}=0.01\mu F$ (Ceramic)
- $C_{O}=0.47\mu F$ (Ceramic)
Load Regulation vs Output Current

Quiescent Current vs Input Voltage

Peak Output Current vs Input Voltage

Short Circuit Current vs Input Voltage

Discharge Current vs Output Voltage

Reverse Current vs Input Voltage
Automotive NJM12884-H

**Output Noise Voltage vs Output Current**

@: Ta=25°C  
Vin=4.3V  
Cin=0.33μF(Ceramic)  
Cs=0.01μF(Ceramic)  
Co=0.47μF(Ceramic)

**Equivalent Series Resistance vs Output Current**

STABLE REGION

**Ripple Rejection vs Frequency**

@: Ta=25°C  
Vin=4.3V  
ein=200mVrms  
Cin=0.33μF(Ceramic)  
Cs=0.01μF(Ceramic)  
Co=0.47μF(Ceramic)

**Ripple Rejection vs Output Current**

f=1kHz  
f=10kHz

**Output Voltage vs Temperature**

@: Vin=4.3V  
Cin=0.33μF(Ceramic)  
Co=0.47μF(Ceramic)

**Dropout Voltage vs Temperature**

@: Io=300mA  
Cin=0.33μF(Ceramic)  
Co=0.47μF(Ceramic)
**TYPICAL APPLICATION**

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

   ![Diagram 1](image1)

   *\( \text{V}_{\text{IN}} \) 0.33\( \mu \text{F} \)
   
   *6: 2.9V<\( \text{V}_{\text{O}} \)≤3.4V version: \( \text{C}_{\text{o}} = 0.47 \mu \text{F} \) (Ceramic)
   
   1.7V<\( \text{V}_{\text{O}} \)≤2.9V version: \( \text{C}_{\text{o}} = 2.2 \mu \text{F} \) (Ceramic)
   
   \( \text{V}_{\text{O}} \)≤1.7V version: \( \text{C}_{\text{o}} = 4.7 \mu \text{F} \) (Ceramic)

   Connect CONTROL Pin to \( \text{V}_{\text{IN}} \) Pin

2. In use of ON/OFF CONTROL

   ![Diagram 2](image2)

   *\( \text{V}_{\text{IN}} \) 0.33\( \mu \text{F} \)
   
   *7: 2.9V<\( \text{V}_{\text{O}} \)≤3.4V version: \( \text{C}_{\text{o}} = 0.47 \mu \text{F} \) (Ceramic)
   
   1.7V<\( \text{V}_{\text{O}} \)≤2.9V version: \( \text{C}_{\text{o}} = 2.2 \mu \text{F} \) (Ceramic)
   
   \( \text{V}_{\text{O}} \)≤1.7V version: \( \text{C}_{\text{o}} = 4.7 \mu \text{F} \) (Ceramic)

   State of CONTROL Pin:
   
   "H" → output is enabled.
   
   "L" or "open" → output is disabled
**APPLICATION NOTE / GLOSSARY**

*Reverse Current Protection*

The NJM12884 has built-in Reverse Current Protection circuit. This circuit prevents the large reverse current when output voltage is higher than input voltage. Therefore external schottky-barrier diode(SBD) is not required.

*Soft Start capacitor Cs*

The Soft Start function can control the rise time of Output Voltage and reduce the inrush current by connecting the Cs capacitor. The Soft Start time is defined as 10% to 90% of the Output Voltage. The Cs capacitor is not essential, but it used for noise bypass of bandgap reference either. Therefore Output Noise Voltage increases when the capacitor isn't connected. If the Cs capacitor is not used, the Cs Pin should be OPEN.

---

**NJM12884 Soft Start Time vs Cs Pin Capacitor**

- Soft-Start Time vs. Cs Pin Capacitor
- Soft-Start (0.022μF) vs. Temperature

**NJM12884_3.3V Output Noise Voltage vs Cs Pin Capacitor**

- Output Noise Voltage vs. Cs Pin Capacitor
- Inrush Current vs Cs pin capacitor
*Discharge Function
The NJM12884 has a built-in discharge circuit to discharge the charged output capacitors.
Discharge circuit operates when the CONTROL Pin is set in LOW level. The circuit discharges the charged output capacitors rapidly.

*Input Capacitor \( C_{IN} \)
The input capacitor \( C_{IN} \) is required in order to prevent oscillation and reduce power supply ripple of 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 \( C_{O} \).
■ PACKAGE OUTLINE
DFN8-WA(ESON8-WA)

* This package is not correspond "Wettable flank" and side of terminal is not plated.

■ SOLDER FOOT PRINT
DFN8-WA(ESON8-WA)
Automotive NJM12884-H

Packaging Spec

Taping Dimensions

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DIMENSION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.3±0.1</td>
<td>BOTTOM DIMENSION</td>
</tr>
<tr>
<td>B</td>
<td>3.3±0.1</td>
<td>BOTTOM DIMENSION</td>
</tr>
<tr>
<td>D0</td>
<td>1.5±0.1</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>1.5±0.1</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1.75±0.1</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5.5±0.05</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>4.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>8.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>2.0±0.05</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>1.3±0.07</td>
<td></td>
</tr>
<tr>
<td>K0</td>
<td>0.9±0.05</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>12.0±1</td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>9.5</td>
<td>THICKNESS D. max</td>
</tr>
</tbody>
</table>

Reel Dimensions

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DIMENSION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>φ254±2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>φ100±1</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>φ13±0.2</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>φ21±0.8</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>2±0.5</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>13.5±1</td>
<td></td>
</tr>
<tr>
<td>W2</td>
<td>17.5±1</td>
<td></td>
</tr>
</tbody>
</table>

Taping State

Insert direction

Sealing with covering tape

Empty tape

Devices

Empty tape

Covering tape

more than 160mm

3000pcs/reel

more than 100mm

more than 400mm

Packing State

Put a reel into a box

Label

New Japan Radio Co., Ltd.
http://www.njr.com/
RECOMMENDED MOUNTING METHOD

INFRARED REFLOW SOLDERING METHOD

Recommended reflow soldering procedure

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

The temperature indicates at the surface of mold package.
## REVISION HISTORY

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.Jul.2016</td>
<td>Ver.1.1</td>
<td>Added output voltage lineup. Reconsidered significant figures in Line/Load Regulation</td>
</tr>
<tr>
<td>12.Apr.2017</td>
<td>Ver.2.0</td>
<td>Revised the package outline as leads length extended 0.3 to 0.4mm in order to strengthen BLR and changed the package name DFN8-W2 to DFN8-WA. Along with this revise, renamed the part number NJM12884KW2 to NJM12884KWA and renamed package names in related section.</td>
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<tr>
<td></td>
<td></td>
<td>Revised the MOQ in ORDERING INFORMATION from 1500 to 3000pcs. Along with this revise, revised the related values of REEL DIMENSIONS, Taping State and PACKING STATE in PACKING SPEC.</td>
</tr>
<tr>
<td>7.Aug.2017</td>
<td>Ver.2.1</td>
<td>Added comment of wettable flank on PACKAGE OUTLINE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed the description in ORDERING INFORMATION and ELECTRICAL CHARACTERISTICS to only released output voltage rank.</td>
</tr>
<tr>
<td>26.Sep.2017</td>
<td>Ver.2.2</td>
<td>Correction of following errors: - Value of $\psi_{jt}$ in THERMAL CHARACTERISTICS - Test condition of Soft Start Time in ELECTRICAL CHARACTERISTICS</td>
</tr>
<tr>
<td>20.Dec.2017</td>
<td>Ver.2.3</td>
<td>Added conformity with AEC-Q100 to FEATURES section</td>
</tr>
</tbody>
</table>
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