NJU77240/NJU77241/NJU77242

Excellent EMI Immunity Rail-to-Rail Input, Open-Drain Output Low power CMOS Comparators

■ FEATURES (V+=3V, V=0V, Ta=25°C)
- Rail-to-Rail Input
- Open-Drain Output
- Supply Current 6µA/ch typ.
- Propagation Delay 840ns typ.
- Operating Voltage 1.8 to 5.5V
- Input Offset Voltage 6mV max.
- Operating Temperature -40 to 125°C
- Integrated EMI filter EMIRR=62dB typ. @f=900MHz
- Package
  - NJU77240 SOT-23-5, SC88A
  - NJU77241 SOT-23-5, SC88A, DFN6-G1 (ESON6-G1)
  - NJU77242 MSOP8 (TVSP8)*
  *meet JEDEC MO-187-DA / thin type, DFN8-U1 (ESON8-U1)

■ GENERAL DESCRIPTION
The NJU77240/NJU77241/NJU77242 are rail-to-rail input CMOS comparators featuring low-power and open-drain output.

These comparators operate from 1.8V to 5.5V and low supply current of 6µA/ch. typ. This feature is suitable for battery powered application.

The NJU77241/NJU77242 are available in small size package, DFN6-G1 (1616), DFN8-U1 (2020), significantly reducing the required portable application's board area.

■ APPLICATIONS
- Portable and Battery-Powered Applications
- Alarm and Surveillance Circuits
- Industrial Instruments
- Sensor Applications

■ RELATED PRODUCTS

<table>
<thead>
<tr>
<th>Features</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail-to-Rail Input</td>
<td>NJU77230</td>
<td>NJU77231</td>
</tr>
<tr>
<td>Push-Pull Output, Low power CMOS Comparators</td>
<td>NJU77232</td>
<td></td>
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</table>

■ PIN CONFIGURATIONS

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
<th>NJU77240F</th>
<th>NJU77240F3</th>
<th>NJU77241F</th>
<th>NJU77241F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>SOT-23-5</td>
<td>SC-88A</td>
<td>SOT-23-5</td>
<td>SC-88A</td>
</tr>
</tbody>
</table>

Pin Functions

+INPUT 1 5 V+
V 2 6
-INPUT 3 4 OUTPUT

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
<th>NJU77241KG1</th>
<th>NJU77242RB1</th>
<th>NJU77242KU1</th>
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</thead>
<tbody>
<tr>
<td>Package</td>
<td>DFN6-G1 (ESON6-G1)*</td>
<td>MSOP8 (TVSP8)</td>
<td>DFN8-U1 (ESON8-U1)</td>
</tr>
</tbody>
</table>

Pin Functions

V 1 5 6 7 8
NC 2 3 4
OUTPUT 5

A OUTPUT 1
A -INPUT 2
A +INPUT 3
B OUTPUT 4
B -INPUT 5
B +INPUT 6

*Connect to exposed pad to V
NJU77240/NJU77241/NJU77242

■ BLOCK DIAGRAM

![Block Diagram Image]

■ PRODUCT NAME INFORMATION

NJU77240 F (TE1)

■ ORDERING INFORMATION

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PACKAGE</th>
<th>RoHS</th>
<th>HALOGEN-FREE</th>
<th>TERMINAL FINISH</th>
<th>MARKING</th>
<th>WEIGHT (mg)</th>
<th>MOQ (pcs)</th>
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<tbody>
<tr>
<td>NJU77240F</td>
<td>SOT-23-5</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>1K</td>
<td>15</td>
<td>3000</td>
</tr>
<tr>
<td>NJU77240F3</td>
<td>SC-88A</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>F3</td>
<td>7.5</td>
<td>3000</td>
</tr>
<tr>
<td>NJU77241F</td>
<td>SOT-23-5</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>1L</td>
<td>15</td>
<td>3000</td>
</tr>
<tr>
<td>NJU77241F3</td>
<td>SC-88A</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>F4</td>
<td>7.5</td>
<td>3000</td>
</tr>
<tr>
<td>NJU77241KG1</td>
<td>DFN6-G1</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>77241</td>
<td>3.5</td>
<td>3000</td>
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<tr>
<td>NJU77242RB1</td>
<td>MSOP8 (TVSP8)</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>77242</td>
<td>18</td>
<td>2000</td>
</tr>
<tr>
<td>NJU77242KU1</td>
<td>DFN8-U1</td>
<td>Yes</td>
<td>Yes</td>
<td>Sn2Bi</td>
<td>77242</td>
<td>5.3</td>
<td>3000</td>
</tr>
</tbody>
</table>

■ ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATING</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>V⁺ - V</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>Input Voltage (1,2)</td>
<td>Vᵢᵣₚ</td>
<td>V - 0.3 to V⁺ + 0.3</td>
<td>V</td>
</tr>
<tr>
<td>Input Current (2)</td>
<td>Iᵢᵣₚ</td>
<td>10</td>
<td>mA</td>
</tr>
<tr>
<td>Differential Input Voltage (3)</td>
<td>Vᵢᵣₛ</td>
<td>±7</td>
<td>V</td>
</tr>
<tr>
<td>Output Terminal Input Voltage (4)</td>
<td>Vᵢᵣₛ</td>
<td>V - 0.3 to V⁺ + 7</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation (Ta=25°C)</td>
<td>Pᵢᵣₛ</td>
<td>2-Layer/4-Layer</td>
<td>mW</td>
</tr>
<tr>
<td>SOT-23-5</td>
<td></td>
<td>480 / 650</td>
<td></td>
</tr>
<tr>
<td>SC-88A</td>
<td></td>
<td>360 / 490</td>
<td></td>
</tr>
<tr>
<td>DFN6-G1</td>
<td></td>
<td>330 / 1200</td>
<td></td>
</tr>
<tr>
<td>MSOP8 (TVSP8)</td>
<td></td>
<td>510 / 680</td>
<td></td>
</tr>
<tr>
<td>DFN8-U1</td>
<td></td>
<td>450 / 1200</td>
<td></td>
</tr>
<tr>
<td>Junction Temperature Range</td>
<td>TＪｍａｘ</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>TＪｂｊ</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

(1) The absolute maximum input voltage is limited at 7V.
(2) Input voltages outside the supply voltage will be clamped by ESD protection diodes. If the input voltage exceeds the supply voltage, the input current must be limited to 10 mA or less by using a restriction resistance.
(3) Differential voltage is the voltage difference between +INPUT and - INPUT.
For supply voltage less than +7V, the absolute maximum rating is equal to the supply voltage.
(4) The absolute maximum of Output Terminal Input Voltage is limited at 7V.
(5) 2-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm: based on EIAJDEC standard, 2-layer FR-4)
4-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm: based on EIAJDEC standard, 4-layer FR-4), internal Cu area: 74.2 x 74.2mm
(6) 2-Layer: Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIAJDEC standard, 2-layer FR-4, with Exposed Pad)
4-Layer: Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIAJDEC standard, 4-layer FR-4, with Exposed Pad)
*For 4-layer: Applying 99.5×99.5mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5
**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>2-Layer / 4-Layer</td>
<td>°C/W</td>
</tr>
<tr>
<td>SOT-23-5</td>
<td></td>
<td>259 / 193</td>
<td></td>
</tr>
<tr>
<td>SC-88A</td>
<td></td>
<td>352 / 256</td>
<td></td>
</tr>
<tr>
<td>DFN6-G1</td>
<td></td>
<td>381 / 106</td>
<td></td>
</tr>
<tr>
<td>MSOP8 (TVSP8)</td>
<td></td>
<td>244 / 185</td>
<td></td>
</tr>
<tr>
<td>DFN8-U1</td>
<td></td>
<td>278 / 107</td>
<td></td>
</tr>
<tr>
<td>Junction-to-Top of Package Characterization Parameter</td>
<td>$\psi_{jt}$</td>
<td>2-Layer / 4-Layer</td>
<td>°C/W</td>
</tr>
<tr>
<td>SOT-23-5</td>
<td></td>
<td>67 / 58</td>
<td></td>
</tr>
<tr>
<td>SC-88A</td>
<td></td>
<td>91 / 73</td>
<td></td>
</tr>
<tr>
<td>DFN6-G1</td>
<td></td>
<td>64 / 26</td>
<td></td>
</tr>
<tr>
<td>MSOP8 (TVSP8)</td>
<td></td>
<td>51 / 45</td>
<td></td>
</tr>
<tr>
<td>DFN8-U1</td>
<td></td>
<td>42 / 25</td>
<td></td>
</tr>
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</table>

(7) 2-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm: based on EIA/JDEC standard, 2-layer FR-4)
4-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm: based on EIA/JDEC standard, 4-layer FR-4), internal Cu area: 74.2 x 74.2mm
(8) 2-Layer: Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JDEC standard, 2-layer FR-4, with Exposed Pad)
4-Layer: Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JDEC standard, 4-layer FR-4, with Exposed Pad)
*For 4-Layer: Applying 99.5×99.5mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

**POWER DISSIPATION vs. AMBIENT TEMPERATURE**

![Power Dissipation vs. Temperature 2-Layer](image1)

![Power Dissipation vs. Temperature 4-Layer](image2)

**RECOMMENDED OPERATING CONDITIONS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V^+$ / $V^-$</td>
<td>1.8 to 5.5</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>$T_{opr}$</td>
<td>-40 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>Output Terminal Input Voltage</td>
<td>$V_o$</td>
<td>$V$ to $V+5.5$</td>
<td>V</td>
</tr>
</tbody>
</table>
**ELECTRICAL CHARACTERISTICS**

### DC CHARACTERISTICS

(Unless otherwise specified, \(V^+ = 3V, V^- = 0V, T_a = 25°C\) °C)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current (per comparator) (\text{I}_{\text{SUPPLY}})</td>
<td></td>
<td>(V_{\text{ID}}=100mV, V_{\text{COM}}=0V, R_L=\infty)</td>
<td>-</td>
<td>6</td>
<td>10</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{ID}}=100mV, V_{\text{COM}}=3V, R_L=\infty)</td>
<td>-</td>
<td>9</td>
<td>14</td>
<td>µA</td>
</tr>
<tr>
<td>Input Offset Voltage (V_{\text{IO}})</td>
<td></td>
<td>(V_{\text{COM}}=0V)</td>
<td>-</td>
<td>1</td>
<td>6</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{COM}}=3V)</td>
<td>-</td>
<td>1</td>
<td>7</td>
<td>mV</td>
</tr>
<tr>
<td>Input Offset Current (\text{I}_{\text{IO}})</td>
<td></td>
<td></td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>pA</td>
</tr>
<tr>
<td>Input Bias Current (\text{I}_{\text{B}})</td>
<td></td>
<td></td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>pA</td>
</tr>
<tr>
<td>Common Mode Input Voltage Range (V_{\text{ICM}})</td>
<td>CMR≥50dB</td>
<td></td>
<td>0</td>
<td>-</td>
<td>3</td>
<td>V</td>
</tr>
<tr>
<td>Open-Loop Voltage Gain (A_v)</td>
<td></td>
<td>(R_L=5.1k\Omega)</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Common Mode Rejection Ratio (\text{CMR})</td>
<td></td>
<td>(V_{\text{ICM}}=0V \to 3V)</td>
<td>50</td>
<td>70</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Supply Voltage Rejection Ratio (\text{SVR})</td>
<td></td>
<td>(V_{\text{COM}}=0V, V^+=1.8V \to 5.5V, )</td>
<td>65</td>
<td>85</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Output Leakage Current (\text{I}_{\text{LEAK}})</td>
<td></td>
<td>(V_O=3.0V)</td>
<td>-</td>
<td>0.001</td>
<td>500</td>
<td>nA</td>
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<tr>
<td>Low-level Output Voltage (V_{\text{OL}})</td>
<td></td>
<td>(I_{\text{SINK}}=3mA)</td>
<td>-</td>
<td>0.2</td>
<td>0.3</td>
<td>V</td>
</tr>
</tbody>
</table>

### SWITCHING CHARACTERISTICS

(Unless otherwise specified, \(V^+=+3V, V^- = 0V, T_a = 25°C, C_L=15pF, R_L=5.1k\Omega\))

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propagation Delay Low to High (t_{\text{PLH}})</td>
<td></td>
<td>Overdrive=100mV</td>
<td>-</td>
<td>840</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Propagation Delay High to Low (t_{\text{PHL}})</td>
<td></td>
<td>Overdrive=100mV</td>
<td>-</td>
<td>450</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Output Signal Rising Time (t_{\text{TLH}})</td>
<td></td>
<td>Overdrive=100mV</td>
<td>-</td>
<td>260</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Output Signal Falling Time (t_{\text{THL}})</td>
<td></td>
<td>Overdrive=100mV</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

### TIMING WAVEFORM

![Timing Waveform Diagram](chart.png)
TYPICAL CHARACTERISTICS

Supply Current per Comparator vs. Supply Voltage

- Supply Voltage $V^+$, $V^-$, $V_{COM}$, $V_{ID}$, $R_L = \infty$
- Temperature: $Ta=-40^\circ C$, $25^\circ C$, $125^\circ C$

Supply Current per Comparator vs. Temperature

- Supply Voltage $V^+$, $V^-$, $V_{COM}$, $V_{ID}$, $R_L = \infty$
- Input Voltage $V = 1.8V$, $3V$, $5.5V$

Supply Current per Comparator vs. Common-Mode Input Voltage

- Supply Voltage $V^+$, $V^-$, $V_{COM}$, $V_{ID}$, $R_L = \infty$
- Temperature: $Ta=-40^\circ C$, $25^\circ C$, $125^\circ C$
TYPICAL CHARACTERISTICS

Input Offset Voltage vs. Temperature

$V^-=0V$, $V_{com}=0V$

$V^+=1.8V$
$V^-=3V$
$V^+=5.5V$

Input Offset Voltage vs. Temperature

$V^-=0V$, $V_{com}=V^+$

$V^+=1.8V$
$V^-=3V$
$V^+=5.5V$

Input Offset Voltage vs. Temperature

$V^+=3V$, $V^-=0V$, $V_{com}=0V$

$V^+=3V$, $V^-=V^+$

Input Offset Voltage vs. Supply Voltage

$V^-=0V$, $V_{com}=0V$

$Ta=25^\circ C$
$Ta=-40^\circ C$
$Ta=125^\circ C$

Input Offset Voltage vs. Supply Voltage

$V^-=0V$, $V_{com}=V^+$

$Ta=-40^\circ C$
$Ta=25^\circ C$
$Ta=125^\circ C$

Ambient Temperature $[\degree C]$

Input Offset Voltage [mV]

Ambient Temperature $[\degree C]$

Input Offset Voltage [mV]

Supply Voltage $V^+ [V]$

Supply Voltage $V^+ [V]$
**TYPICAL CHARACTERISTICS**

Input Offset Voltage vs. Common-Mode Input Voltage

- **V+=1.8V, V-=0V**
  - Ta=25ºC
  - Ta=-40ºC
  - Ta=125ºC

- **V+=3V, V-=0V**
  - Ta=25ºC
  - Ta=-40ºC
  - Ta=125ºC

- **V+=5.5V, V-=0V**
  - Ta=25ºC
  - Ta=-40ºC
  - Ta=125ºC
TYPICAL CHARACTERISTICS

- **Input Bias Current vs. Temperature**
  - $V_{CBD}=V/2, V_o=0V$
  - $V=1.8V$, $V=3V$, $V=5.5V$

- **Open-Loop Voltage Gain vs. Temperature**
  - $V=3V$, $V_o=0V$, $R_L=5.1k\Omega$

- **Supply Voltage Rejection Ratio vs. Temperature**
  - $V=1.8V$ to $5.5V$, $V_o=0V$, $V_{CBD}=V$

- **Common-Mode Rejection Ratio vs. Temperature**
  - $V=3V$, $V_o=0V$, $V_{CBD}=0$ to $3V$

- **Output Leakage Current vs. Temperature**
  - $V_o=0V$, $V_{CBD}=V$
  - $V=1.8V$, $V=3V$, $V=5.5V$
■ TYPICAL CHARACTERISTICS

Low-level Output Voltage vs. Output Current
V\text{+}=1.8V, V\text{−}=0V, V_{\text{ID}}=100mV

Low-level Output Voltage vs. Temperature
V\text{+}=1.8V, V\text{−}=0V, V_{\text{ID}}=100mV, I_{\text{out}}=3mA

Low-level Output Voltage vs. Output Current
V\text{+}=3V, V\text{−}=0V, V_{\text{ID}}=100mV

Low-level Output Voltage vs. Temperature
V\text{+}=3V, V\text{−}=0V, V_{\text{ID}}=100mV, I_{\text{out}}=3mA

Low-level Output Voltage vs. Output Current
V\text{+}=5.5V, V\text{−}=0V, V_{\text{ID}}=100mV

Low-level Output Voltage vs. Temperature
V\text{+}=5.5V, V\text{−}=0V, V_{\text{ID}}=100mV, I_{\text{out}}=3mA
TYPICAL CHARACTERISTICS

Propagation Delay Low to High vs. Temperature

Propagation Delay High to Low vs. Temperature

Output Signal Rising Time vs. Temperature

Output Signal Falling Time vs. Temperature

Response time (Rise)

Response time (Fall)
■ TYPICAL TEST CIRCUIT

- Supply Current (\(I_{\text{SUPPLY}}\))
  - \(V^+=3\,\text{V}, V^-=0\,\text{V}, V_{\text{com}}=0\,\text{V}, V_{\text{ID}}=100\,\text{mV}\)
  - \(V^+=3\,\text{V}, V^-=0\,\text{V}, V_{\text{com}}=3\,\text{V}, V_{\text{ID}}=100\,\text{mV}\)

- Output Leakage Current (\(I_{\text{LEAK}}\))
  - \(V^+=3\,\text{V}, V^-=0\,\text{V}, V_{\text{ID}}=100\,\text{mV}, V_{\text{O}}=3\,\text{V}\)

- Low-level Output Voltage (\(V_{\text{OL}}\))
  - \(V^+=3\,\text{V}, V^-=0\,\text{V}, I_{\text{SINK}}=3\,\text{mA}, V_{\text{ID}}=100\,\text{mV}\)

- Propagation Delay (\(t_{\text{PLH}}, t_{\text{PHL}}\)), Output Signal Rising Time (\(t_{\text{TLH}}\)), Output Signal Falling Time (\(t_{\text{THL}}\))
  - \(V^+=3\,\text{V}, V^-=0\,\text{V}, V_{\text{COM}}=0\,\text{V}, R_L=5.1\,\text{k}\Omega, C_L=15\,\text{pF}, \text{Over drive}=100\,\text{mV}\)

- Input Wave Form (Rise Measurement)
  - Over Drive
  - Over Drive

- Input Wave Form (Fall Measurement)
  - Over Drive
  - Over Drive
**APPLICATION NOTE**

- **Input Voltage Exceeding the Supply Voltage**

Inputs of the NJU77240/NJU77241/NJU77242 are protected by ESD diodes (shown in Figure 1) that will conduct if the input voltages exceed the power supplies by more than approximately 300mV. Momentary voltages greater than 300mV beyond the power supply, inputs can be tolerated if the current is limited to 10mA. Figure 2 is easily accomplished with an input resistor. If the input voltage exceeds the supply voltage, the input current must be limited 10mA or less by using a restriction resistance \( R_{\text{LIMIT}} \) as shown in figure 2.

![Figure 1. Simplified Schematic](image1)

- **Bypass Capacitor**

It is advised to add a bypass capacitor between the supply voltage and ground as close as possible to device.

![Figure 2. Input Current Protection for Voltages exceeding the Supply Voltage.](image2)
EMIRR (EMI Rejection Ratio) Definition

EMIRR is a parameter indicating the EMI robustness of an OP-Amp. The definition of EMIRR is given by the following formula (1). We can grasp the tolerance of the RF signal by measuring an RF signal and offset voltage shift quantity.

\[
\text{EMIRR} = 20 \cdot \log\left(\frac{V_{\text{RF PEAK}}}{|\Delta V_{\text{IO}}|}\right) \quad \ldots (1)
\]

\(V_{\text{RF PEAK}}\): RF Signal Amplitude [V]
\(|\Delta V_{\text{IO}}|\): Input offset voltage shift quantity [V]

Offset voltage shift is small so that a value of EMIRR is big. And it understands that the tolerance for the RF signal is high. In addition, about the input offset voltage shift with the RF signal, there is the thinking that influence applied to the input terminal is dominant. Therefore, generally the EMIRR becomes value that applied an RF signal to +INPUT terminal.

*For details, refer to "Application Note for EMI Immunity" in our HP: http://www.njr.com/
■ PACKAGE DIMENSIONS

Unit: mm

■ EXAMPLE OF SOLDER PADS DIMENSIONS
■ PACKAGE DIMENSIONS

Language: English

Dimensions:
- 2.0 ± 0.2
- 1.3 ± 0.2
- 2.1 ± 0.2
- 0.25 ± 0.1
- 0.425 ± 0.2
- 0.65 ± 0.07
- 0.23 ± 0.05
- 0.65
- 0.9 ± 0.1
- 0.95 ± 0.05
- 0.1

Notes:
- Unit: mm
- Angle: 0 ~ 10°

■ EXAMPLE OF SOLDER PADS DIMENSIONS

Dimensions:
- 0.3
- 0.8
- 1.9
- 0.65

Language: English

Notes:
- Unit: mm
- Angle: 0 ~ 10°
NJU77240/NJU77241/NJU77242

DFN6-G1 (ESON6-G1)

■ PACKAGE DIMENSIONS

■ EXAMPLE OF SOLDER PADS DIMENSIONS

Unit: mm

Ver.6
http://www.njr.com/
■ PACKAGE DIMENSIONS

- **Unit: mm**

- **Surface Mount Orientation**
  - **Length:** 2.9 ± 0.1
  - **Width:** 2.8 ± 0.1
  - **Height:** 4.0 ± 0.2
  - **Body Width:** 0.475 ± 0.1
  - **Body Height:** 1.0 max

- **Angle:** 0~10°

- **Solder Pad Dimensions**
  - **0.2 ± 0.05**
  - **0.05 (M)**

■ EXAMPLE OF SOLDER PADS DIMENSIONS

- **Dimensions:**
  - 0.23
  - 0.65
  - 1.0 max
  - 3.5
  - 1.95

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■ PACKAGE DIMENSIONS

- 2.0 ± 0.05

■ EXAMPLE OF SOLDER PADS DIMENSIONS

- 0.075

Unit: mm
### PACKING SPEC

#### TAPE DIMENSIONS

![Diagram of tape dimensions with labels and 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>3.2±0.1</td>
<td>BOTTOM DIMENSION</td>
</tr>
<tr>
<td>D0</td>
<td>1.55</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1.75±0.1</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3.5±0.05</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>4.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>4.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>2.0±0.05</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>0.25±0.05</td>
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</tr>
<tr>
<td>T2</td>
<td>1.82</td>
<td></td>
</tr>
<tr>
<td>K0</td>
<td>1.5±0.1</td>
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</tr>
<tr>
<td>W</td>
<td>8.0±0.3</td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>5.5</td>
<td>THICKNESS 0.1 MAX</td>
</tr>
</tbody>
</table>

#### REEL DIMENSIONS

![Diagram of reel dimensions with labels and dimensions]

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>φ180±1</td>
</tr>
<tr>
<td>B</td>
<td>φ 60±1</td>
</tr>
<tr>
<td>C</td>
<td>φ 13±0.2</td>
</tr>
<tr>
<td>D</td>
<td>φ 21±0.8</td>
</tr>
<tr>
<td>E</td>
<td>2±0.5</td>
</tr>
<tr>
<td>W</td>
<td>9±0.5</td>
</tr>
<tr>
<td>W1</td>
<td>1.2±0.2</td>
</tr>
</tbody>
</table>

#### TAPE STATE

- **Insert direction**: (TE1)
- **Sealing with covering tape**: more than 20pitch, 3000pcs/reel, more than 20pitch/reel more than 1 round

#### PACKING STATE

- **Label**: Put a reel into a box

---

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**PACKING SPEC**

**Taping Dimensions**

![Diagram of taping dimensions with dimensions labeled:](image)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DIMENSION</th>
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<tbody>
<tr>
<td>A</td>
<td>2.3±0.1</td>
<td>BOTTOM DIMENSION</td>
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<tr>
<td>B</td>
<td>2.5±0.1</td>
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<tr>
<td>D0</td>
<td>1.55±0.05</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>1.05±0.05</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1.75±0.1</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3.5±0.05</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>4.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>4.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>2.0±0.05</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>0.25±0.05</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>1.3±0.1</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>8.0±0.2</td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>5.5</td>
<td>THICKNESS 0.1max</td>
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</table>

**Reel Dimensions**

![Diagram of reel dimensions with dimensions labeled:](image)

<table>
<thead>
<tr>
<th>SYMBOL</th>
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<tbody>
<tr>
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<td>B</td>
<td>φ 60±1</td>
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<tr>
<td>C</td>
<td>φ 13±0.2</td>
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<td>D</td>
<td>φ 21±0.8</td>
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<td>E</td>
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<td>W</td>
<td>9±0.5</td>
</tr>
<tr>
<td>W1</td>
<td>1.2±0.2</td>
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</tbody>
</table>

**Taping State**

![Diagram of taping state with directions labeled:](image)

**Packing State**

![Diagram of packing state with label and box:](image)
PACKING SPEC

**TAPING DIMENSIONS**

- **Feed direction**
- **A**
- **B**
- **W1**
- **P2**
- **P0**
- **P1**
- **φD0**
- **E**
- **F**
- **W**
- **T**
- **T2**

<table>
<thead>
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<td>B</td>
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<td>BOTTOM DIMENSION</td>
</tr>
<tr>
<td>D0</td>
<td>1.5±0.1</td>
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</tr>
<tr>
<td>D1</td>
<td>0.5±0.1</td>
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<td>E</td>
<td>1.75±0.1</td>
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<tr>
<td>F</td>
<td>3.5±0.05</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>4.0±0.1</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>4.0±0.1</td>
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<td>P2</td>
<td>2.0±0.05</td>
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</tr>
<tr>
<td>T</td>
<td>0.25±0.05</td>
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<td>T2</td>
<td>0.65±0.05</td>
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<tr>
<td>W</td>
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<tr>
<td>W1</td>
<td>5.5</td>
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</tbody>
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**REEL DIMENSIONS**

- **A**
- **E**
- **C**
- **D**
- **W**
- **W1**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DIMENSION</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
<td>φ 60±0.5</td>
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</tr>
<tr>
<td>C</td>
<td>φ 13±0.2</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>φ 21±0.8</td>
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<tr>
<td>E</td>
<td>2±0.5</td>
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</tr>
<tr>
<td>W</td>
<td>9±0.5</td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>1.2</td>
<td></td>
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</table>

**TAPING STATE**

- Insert direction
- Sealing with covering tape
- Empty tape
- Devices
- Empty tape
- Covering tape

**PACKING STATE**

- Label
- Put a reel into a box
- New Japan Radio Co., Ltd.

http://www.njr.com/
PACKING SPEC

TAPE DIMENSIONS

![Diagram of tape dimensions]

REEL DIMENSIONS

![Diagram of reel dimensions]

TAPING STATE

![Diagram of taping state]

PACKING STATE

![Diagram of packing state]
PACKING SPEC

TAPING DIMENSIONS

- SYMBOL  |  DIMENSION | REMARKS
- A   | 2.25±0.05  | BOTTOM DIMENSION
- B   | 2.25±0.05  | BOTTOM DIMENSION
- D0  | 1.5±0.1    | THICKNESS 0.1max
- D1  | 0.5±0.1    | THICKNESS 0.1max
- E   | 1.75±0.1   | THICKNESS 0.1max
- F   | 3.5±0.05   | THICKNESS 0.1max
- P0  | 4.0±0.1    | THICKNESS 0.1max
- P1  | 4.0±0.1    | THICKNESS 0.1max
- P2  | 2.0±0.05   | THICKNESS 0.1max
- T   | 0.25±0.05  | THICKNESS 0.1max
- T2  | 1.00±0.07  | THICKNESS 0.1max
- K0  | 0.65±0.05  | THICKNESS 0.1max
- W   | 8.0±0.2    | THICKNESS 0.1max
- W1  | 5.5        | THICKNESS 0.1max

REEL DIMENSIONS

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

TAPING STATE

Insert direction

Sealing with covering tape

Empty tape

Devices

Empty tape

covering tape

more than 40 pitch

3000pcs/reel

more than 25 pitch reel more than 1 round

PACKING STATE

Label

Put a reel into a box
RECOMMENDED MOUNTING METHOD

*Recommended reflow soldering procedure

| Temperature ramping rate | 1 to 4°C/s |
| Pre-heating temperature time | 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>
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<tr>
<td>2016/11/30</td>
<td>Ver.0</td>
<td>First edition</td>
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<td>2017/5/24</td>
<td>Ver.1</td>
<td>Added information of NJU77242.</td>
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<td>2017/6/6</td>
<td>Ver.2</td>
<td>Corrected BLOCK DIAGRAM.</td>
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<td>2017/10/12</td>
<td>Ver.3</td>
<td>Changed GENERAL DESCRIPTION and APPLICATION Corrected ELECTRICAL CHARACTERISTICS</td>
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<tr>
<td>2017/12/1</td>
<td>Ver.4</td>
<td>Changed TITLE Corrected ELECTRICAL CHARACTERISTICS</td>
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<td>2018/8/7</td>
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<td>Changed TEST CONDITION in ELECTRICAL CHARACTERISTICS Changed RECOMMENDED OPERATING CONDITIONS Changed TEST CONDITION in TYPICAL CHARACTERISTICS</td>
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<td>2019/3/29</td>
<td>Ver.6</td>
<td>Changed PARAMETER in RECOMMENDED OPERATING CONDITIONS Changed TIMING WAVEFORM Changed TEST CONDITION in TYPICAL CHARACTERISTICS</td>
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</tbody>
</table>
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   - Equipment Used in the Deep Sea
   - Power Generator Control Equipment (Nuclear, steam, hydraulic, etc.)
   - Life Maintenance Medical Equipment
   - Fire Alarms / Intruder Detectors
   - Vehicle Control Equipment (Airplane, railroad, ship, etc.)
   - Various Safety Devices

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