

OUTPUT COUPLING CAPACITOR-LESS LOW VOLTAGE VIDEO AMPLIFIER WITH LPF

FEATURES

- Operating Voltage 2.5 to 3.45V
- Output Capacitor is unnecessary
- 6dB Amp. , 75Ω Driver (2-System drive)
- LPF Characteristics 0dB at 6.75MHz
 -40dB at 54MHz
- CMOS Technology
- Package Outline MSOP8*,DFN8-U1
 *MEET JEDEC MO-187-DA / THIN TYPE

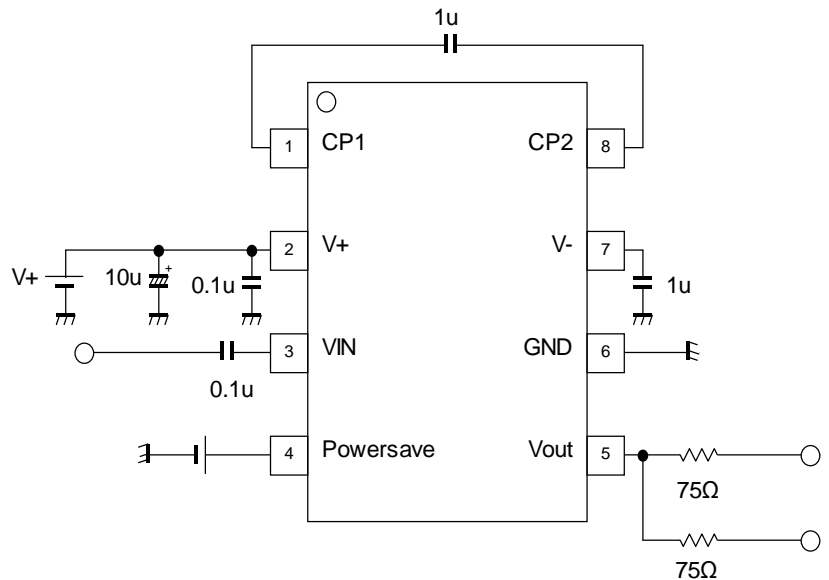
GENERAL DESCRIPTION

The NJU71031 is a Low Voltage Video Amplifier with LPF circuit. By the internal charge pump circuit, output capacitor is unnecessary. The NJU71031 features low power and small package, and is suitable for low power design on downsizing of portable video system and system with video output.

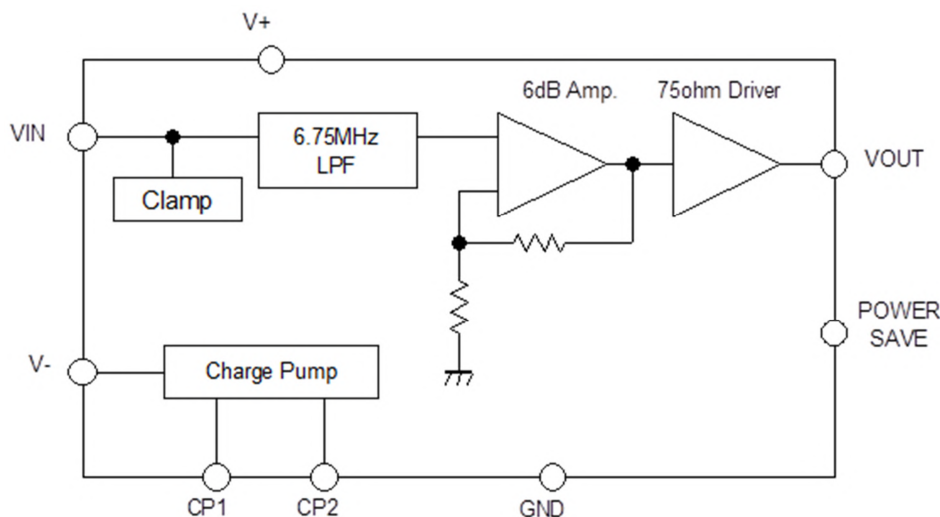
APPLICATION

- Car Camera
- Car Navigation
- CCTV

APPLICATION CIRCUIT (2-System drive)



EQUIVALENT CIRCUIT · BLOCK DIAGRAM



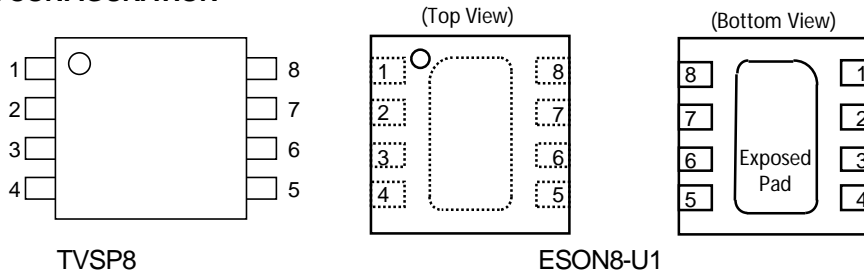
■Voltage Gain Valuation

| Voltage Gain | Part No. |
|--------------|----------|
| 12dB | NJU71032 |

■Built in short to battery protection circuit video driver

| Output type | Part No. |
|--------------|-------------|
| Single-end | NJU71091-T1 |
| Differential | NJU71094-T1 |

■PIN CONFIGURATION



| PIN NO. | SYMBOL | DESCRIPTION |
|---------|------------|------------------------------|
| 1 | CP1 | Flying Capacitor Terminal |
| 2 | V+ | Power Supply Terminal |
| 3 | VIN | Video Signal Input Terminal |
| 4 | POWER SAVE | Power save Control Terminal |
| 5 | VOUT | Video Signal Output Terminal |
| 6 | GND | GND Terminal |
| 7 | V- | Flying Capacitor Terminal |
| 8 | CP2 | Flying Capacitor Terminal |

Exposed Pad:

Connect the Exposed Pad on land of float, OR connect to be the same potential as the IC of the V- terminal.

■MARK INFORMATION



■ORDERING INFORMATION

| PART NUMBER | PACKAGE OUTLINE | RoHS | HALOGEN-FREE | TERMINAL FINISH | MARKING | WEIGHT (mg) | MOQ(pcs) |
|-------------|-----------------|------|--------------|-----------------|---------|-------------|----------|
| NJU71031RB1 | MSOP8 | Yes | Yes | Sn-2Bi | 71031 | 18.0 | 3,000 |
| NJU71031KU1 | DHN8-U1 | Yes | Yes | Sn-2Bi | 71031 | 5.3 | 3,000 |

■ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--|------------------|-----------------------------------|------|
| Supply Voltage | V+ | 3.55 | V |
| Power Dissipation (Ta=25°C) ⁽⁴⁾ | P _D | MSOP8: 580 *1 DFN8-U1: 1135 *2 | mW |
| Operating Temperature Range | T _{opr} | -40 to 85 | °C |
| Storage Temperature Range | T _{stg} | -55 to 150 | °C |

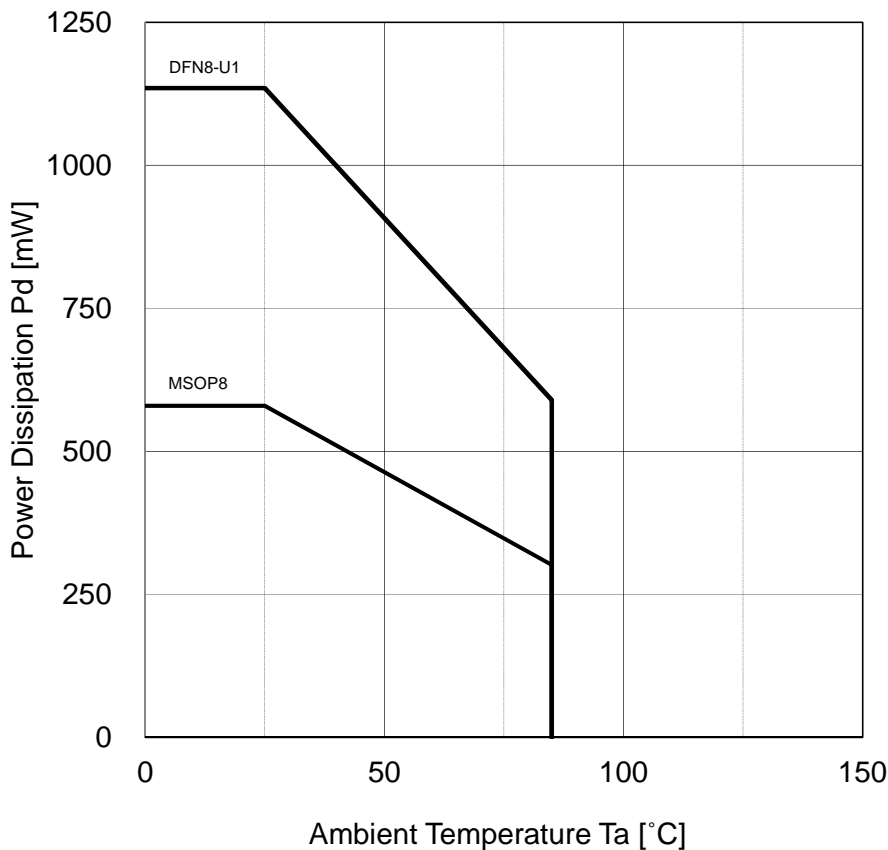
1) At on a board of EIA/JEDEC specification. (114.3 x 76.2 x 1.6mm 2 layers, FR-4)

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 a thermal via hole to a board based on JEDEC standard JESD51-5)

■RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|----------------|--------|-------------|------|
| Supply Voltage | V+ | 2.5 to 3.45 | V |

■POWER DISSIPATION vs. AMBIENT TEMPERATURE



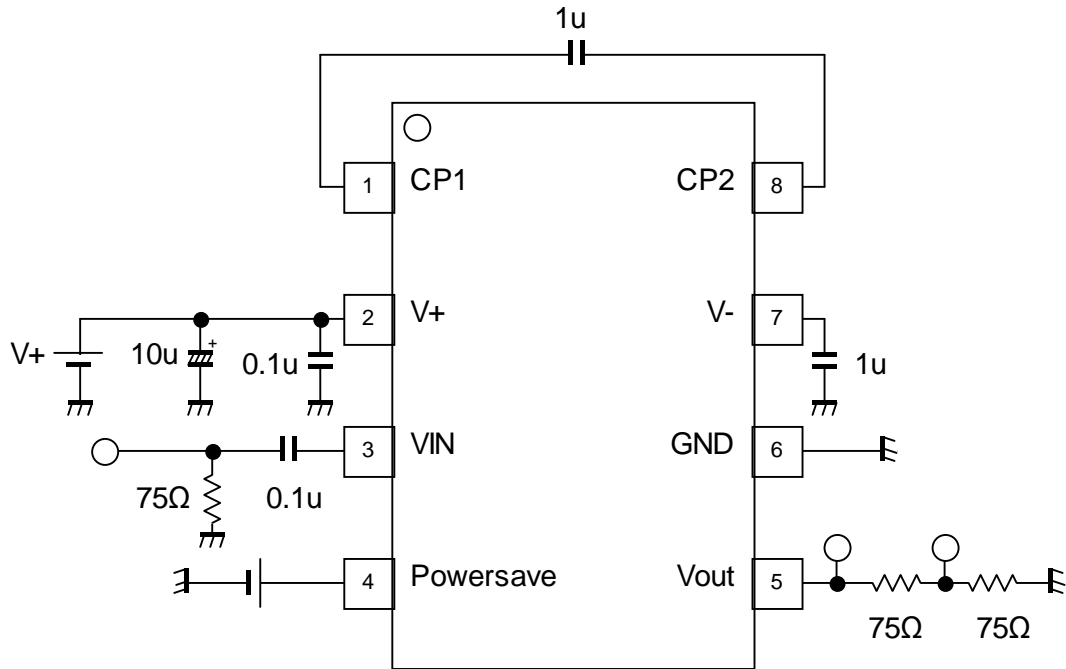
■ ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$, $V^+=3.0\text{V}$, $R_L=150\Omega$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|---------------|--|------|------|-------|---------------|
| Operating Current | I_{cc} | No Signal | - | 14 | 22 | mA |
| Operating Current at Power Save | I_{save} | No Signal, Power Save Mode | - | 0.1 | 10 | μA |
| Maximum Output Voltage Swing | V_{om} | $f=100\text{kHz}$, $\text{THD}=1\%$ | 2.4 | 3.0 | - | Vp-p |
| Voltage Gain | G_v | $V_{IN}=100\text{kHz}$, 1.0Vp-p , Input Sine Signal | 5.6 | 6.0 | 6.4 | dB |
| Low Pass Filter Characteristic | $G_{fy6.75M}$ | $V_{IN}=6.75\text{MHz}/100\text{kHz}$, 1.0Vp-p | -1.0 | 0 | 1.0 | dB |
| | G_{fy54M} | $V_{IN}=54\text{MHz}/100\text{kHz}$, 1.0Vp-p | - | -40 | -24 | |
| Differential Gain | DG | $V_{IN}=1.0\text{Vp-p}$, 10step Video Signal | - | 0.5 | - | % |
| Differential Phase | DP | $V_{IN}=1.0\text{Vp-p}$, 10step Video Signal | - | 0.5 | - | deg |
| S/N Ratio | SN_v | 100kHz to 6MHz, $V_{IN}=1.0\text{Vp-p}$ 100% White Video Signal, $R_L=75\Omega$ | - | +70 | - | dB |
| Switching Noise Level | N_{swpl} | $R_L=75\Omega$, 10% White Video Signal input | - | 4 | 7 | mVpp |
| SW Change Voltage High Level | V_{thPH} | Active | 1.25 | - | V^+ | V |
| SW Change Voltage Low Level | V_{thPL} | Non-active | 0 | - | 0.45 | |

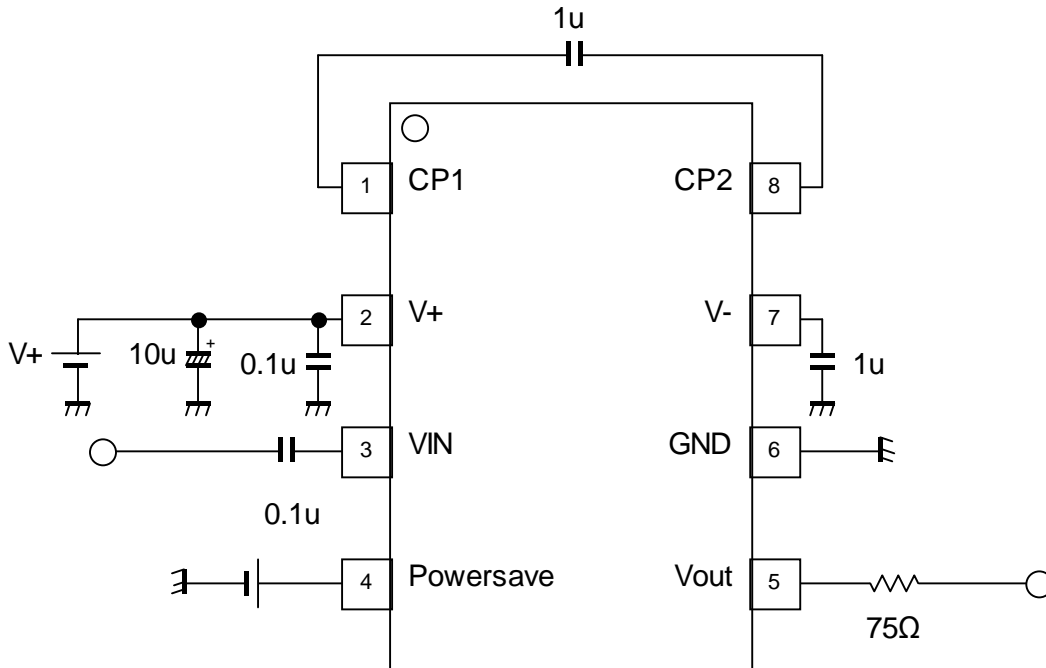
■ CONTROL TERMINAL

| PARAMETER | STATUS | MODE |
|------------|--------|--------------------------------------|
| POWER SAVE | H | Power save: OFF Active mode |
| | L | Power save: ON Non-Active mode(Mute) |
| | OPEN | Power save: ON Non-Active mode(Mute) |

■TEST CIRCUIT



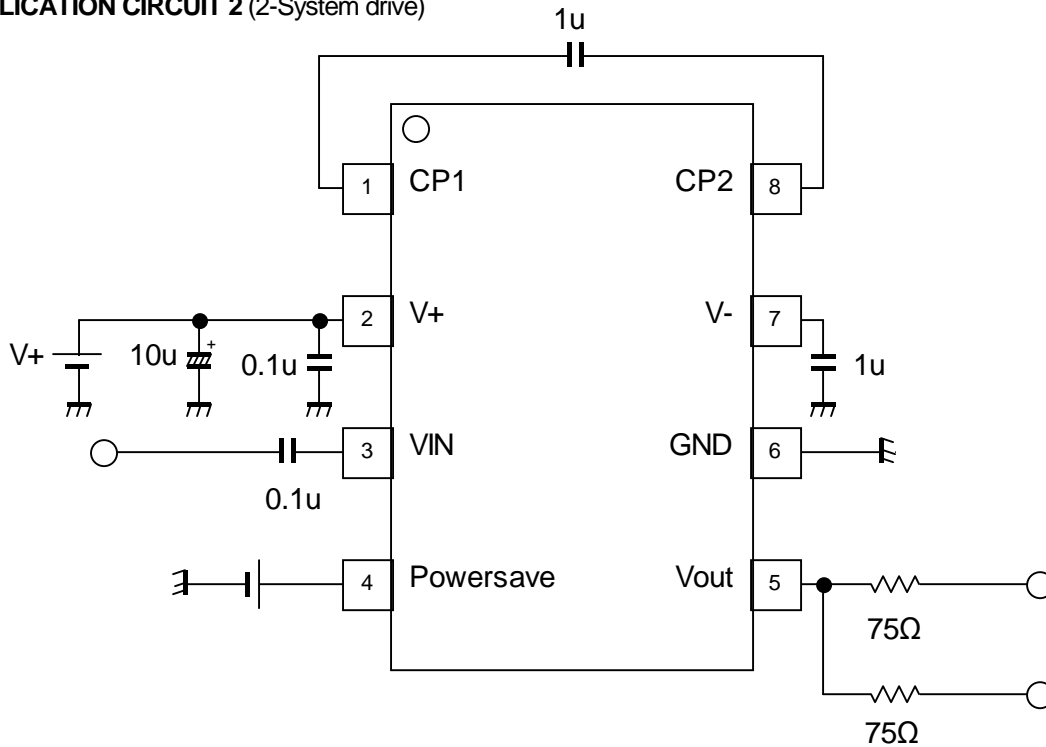
APPLICATION CIRCUIT 1(Standard)



DFN8-U1 Exposed Pad:

Connect the Exposed Pad on land of float, or connect to be the same potential as the IC of the V- terminal.

APPLICATION CIRCUIT 2 (2-System drive)



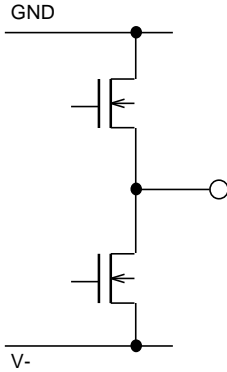
DFN8-U1 Exposed Pad:

Connect the Exposed Pad on land of float, or connect to be the same potential as the IC of the V- terminal.

■TERMINAL FUNCTION

| PINNo. | PINNAME | FUNCTION | EQUIVALENTCIRCUIT | DC VOLTAGE |
|--------|------------|------------------------------|-------------------|------------|
| 1 | CP1 | Flying Capacitor Terminal | | - |
| 2 | V+ | Power Supply | - | - |
| 3 | VIN | Video Signal Input Terminal | | 0V |
| 4 | POWER SAVE | Power Save Control Terminal | | - |
| 5 | VOUT | Video Signal Output Terminal | | 0V |

■ TERMINAL FUNCTION

| PINNo. | PINNAME | FUNCTION | EQUIVALENT CIRCUIT | DC VOLTAGE |
|--------|---------|---------------------------|--|------------|
| 6 | GND | Ground | - | - |
| 7 | V- | Flying Capacitor Terminal | - | - |
| 8 | CP2 | Flying Capacitor Terminal |  | - |

APPLICATION

When coax multiplex transmission, we recommend that you adjust the output signal.
Please refer to figure1.

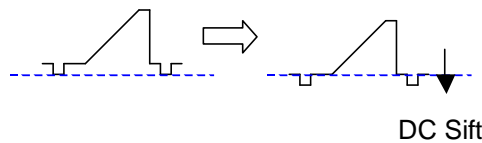
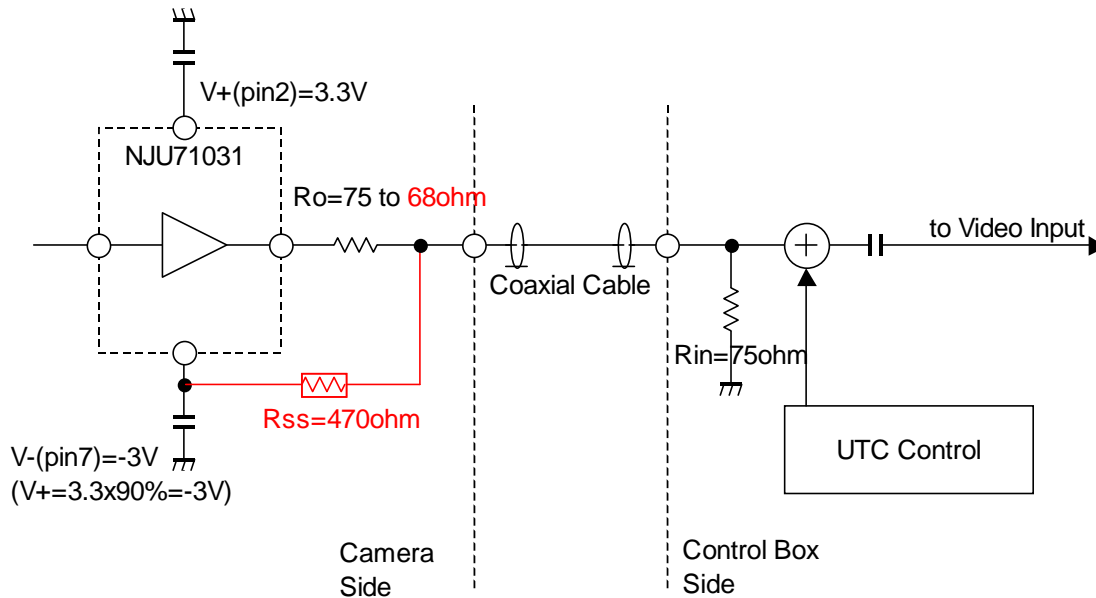


Figure1: How to shift the output DC signal

The rare case, there is to be superimposed the directly DC control signal on the video signal when superimposed a control signal to the video signal by using a coaxial cable.

In that case, the following symptoms will appear.

- The control signal appears on the screen.
- Loss of synchronization of the video signal

Shows the proposed measures on the next page.

A case of multiple coaxial transmission: UTC(Up The Coaxial)

This is one of a case at the multiplex coaxial transmission used in CCTV.

It is a system that control signals of camera multiplexing to the coaxial cable.

This system is superimposed on the control signal pulse in the vertical blanking period as shown in Figure 2.

This is because do not affect the video signal.

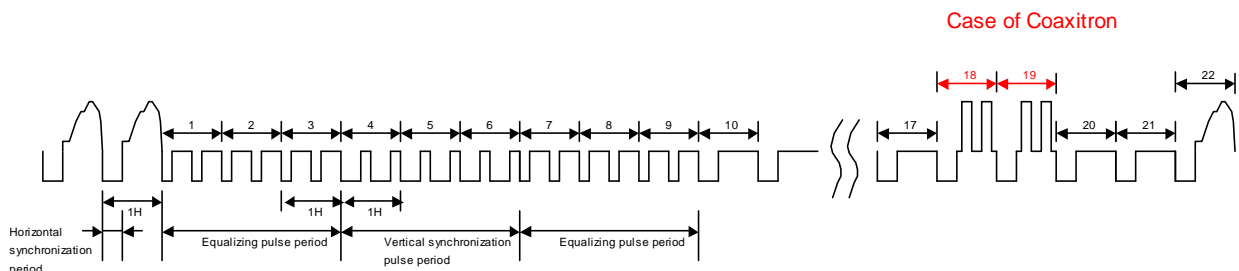


Figure2: A case of UTC

Proposed measures is shift the output DC signal by using the V- terminal (pin 7) of NJU71031.

The steps are as follows:

1. A resistor: R_{ss} add between the R_o (75Ω) and V- terminal (7pin).
2. Reduce R_o (75Ω).

By adding a R_{ss} , level of the video signal is attenuated.

Example: Level of the video signal will be reduced 5% at connected $R_{ss} = 470\Omega$ and $R_o = 75\Omega$.

Therefore, increase 5% of video output level by changed to 68Ω the R_o .

*Table 1 shows an external resistor value and the swing of video output signal at $V+$ (pin2) = 3.3V, 3V.

3. Please evaluation of S/N.

It is because the noise of the charge pump may change.

| | Value (typ.) | | UNIT |
|---|--------------|-------|----------|
| $V+$ (pin2) | 3.3 | 3 | V |
| V -(pin7) ($V+ \times 90\%$) | -2.97 | -2.7 | V |
| Termination resistance | 75 | 75 | ohm |
| Resistance (between V_{ss} and V_{out}) | 470 | 470 | ohm |
| Output resistance(R_o) | 68 | 68 | ohm |
| Sync. Voltage of V_{out} | -0.209 | -0.19 | V |
| Swing of V_{out} | 0.975 | 0.975 | V_{pp} |

Table 1: external resistor value and the swing of video output signal at $V+$ (pin2) = 3.3V, 3V.

• Case of 2-system 75ohm drive

Shown in Figure 3, 2-system drive will be possible at system 1 (75Ω for multiplex coaxial system) and system -2(75Ω system for monitoring).

However, shown in Figure 4, 2-system drive is not recommended, case of system 1and 2 (75Ω for multiplex coaxial system)

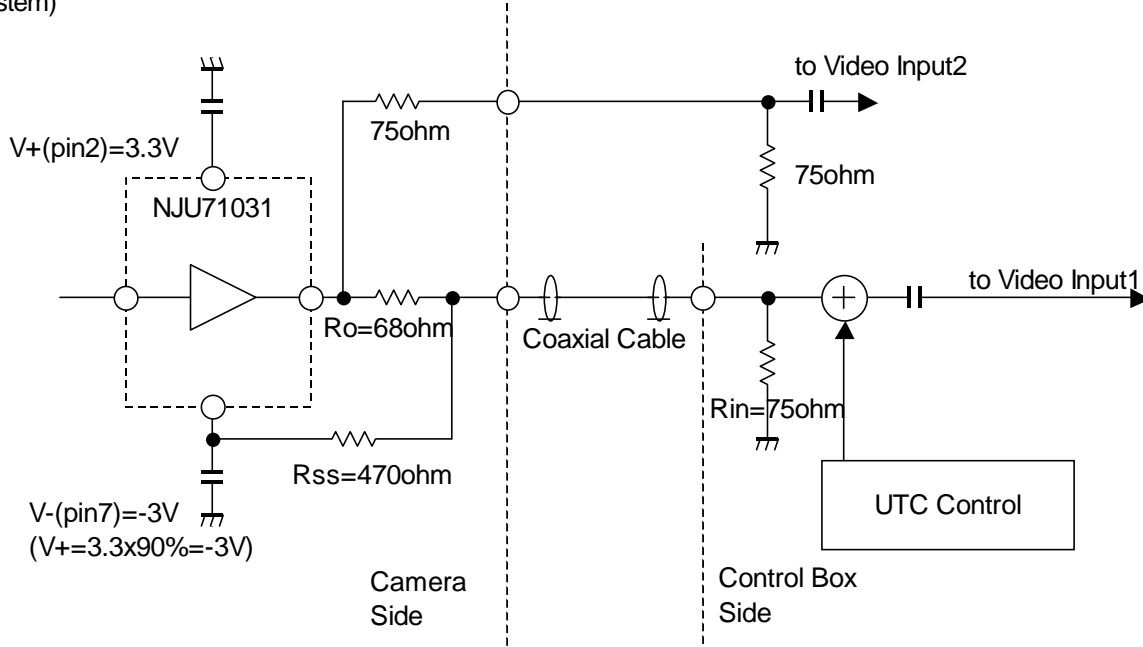


Figure 3: Recommended 2-system drive circuit

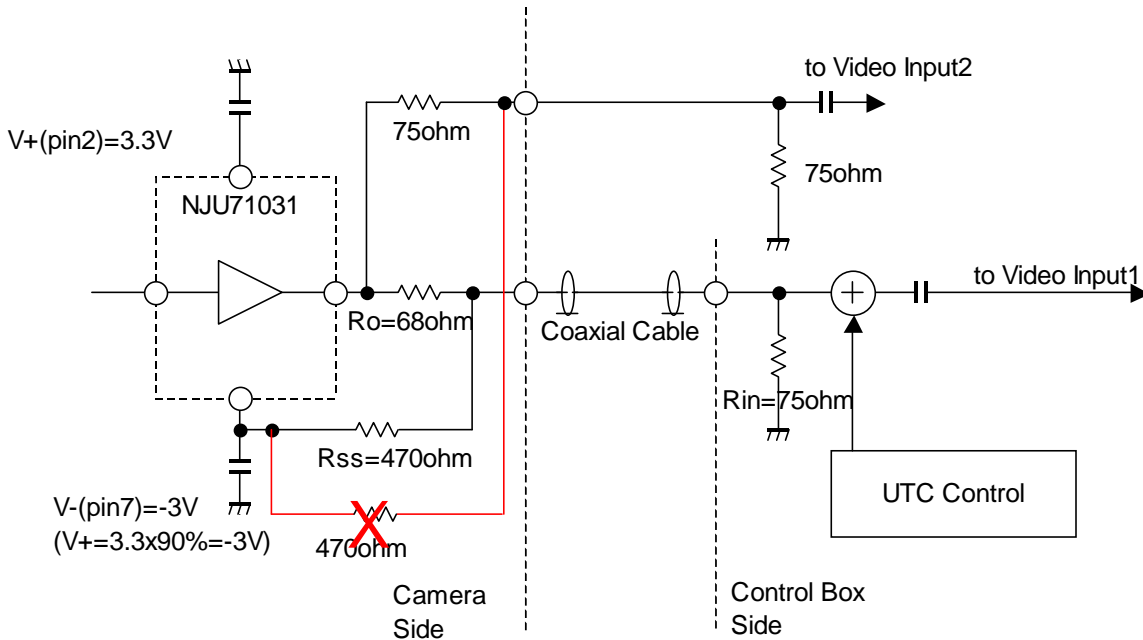
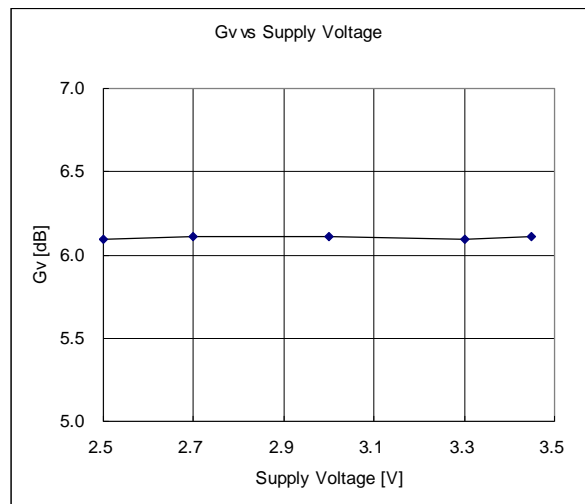
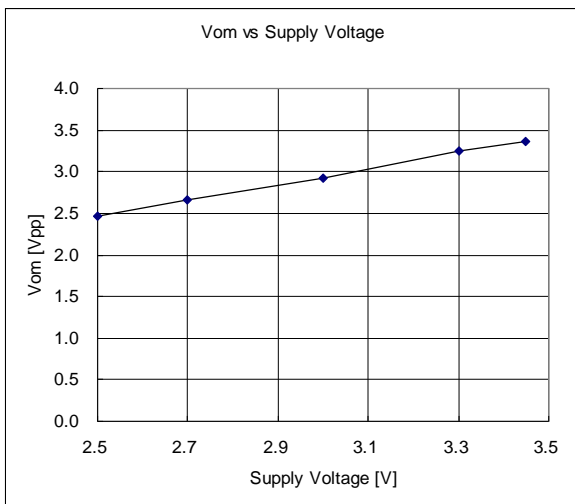
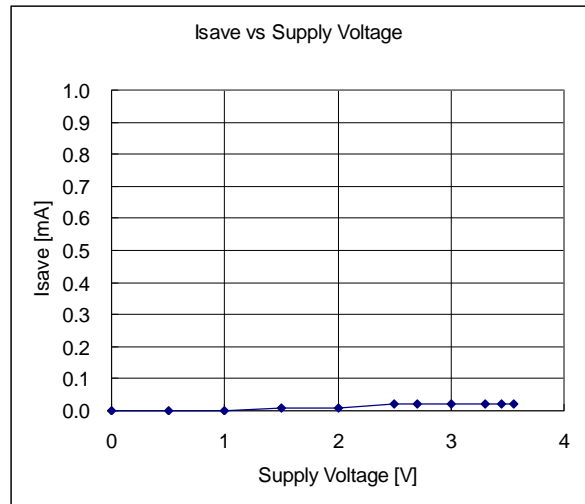
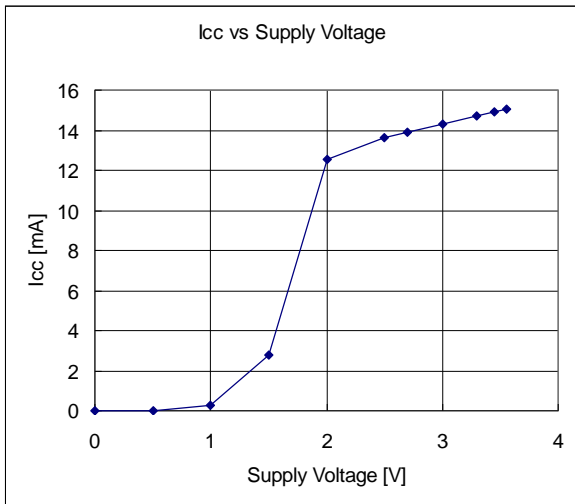
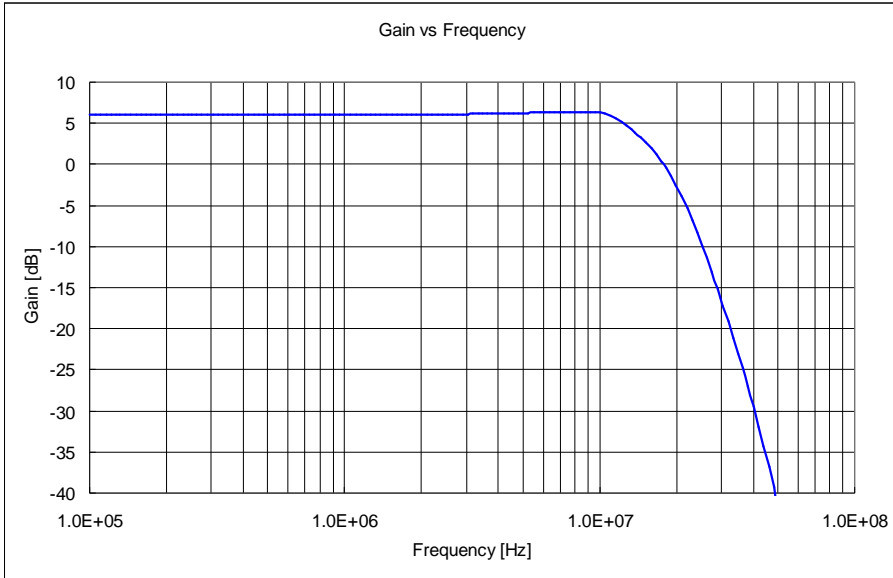
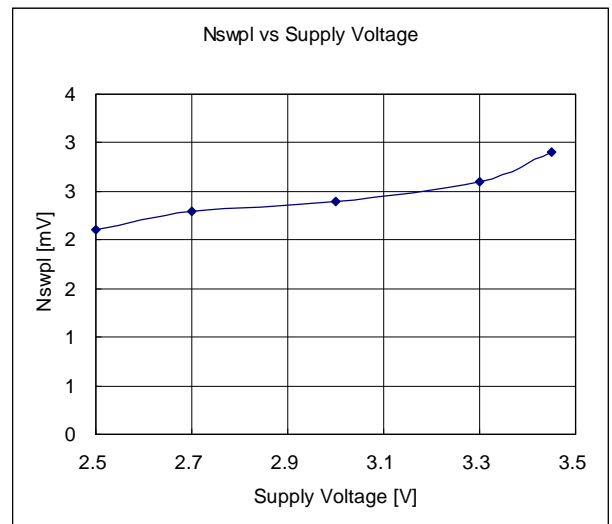
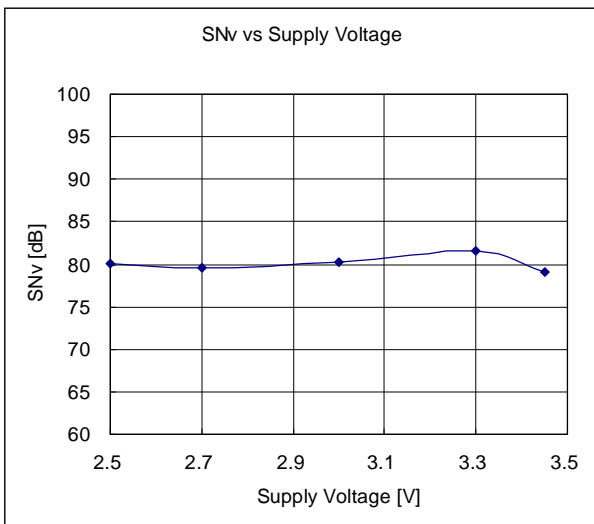
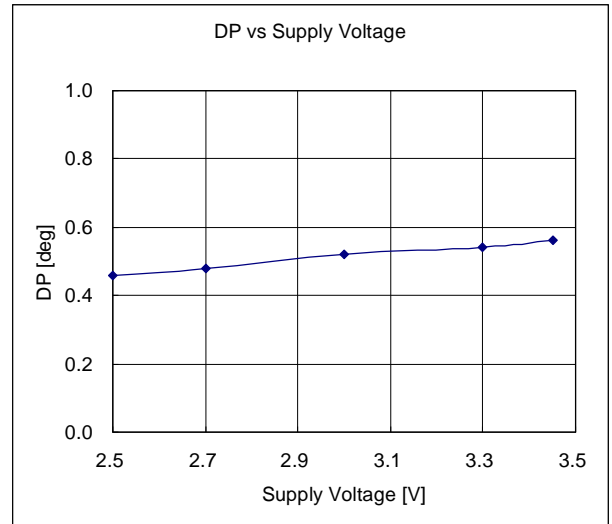
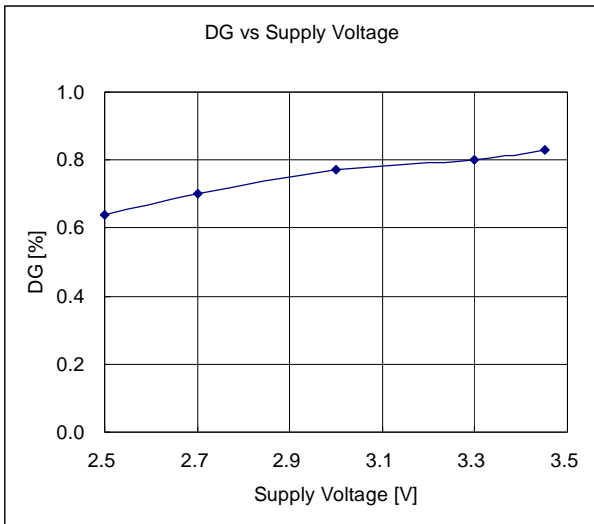
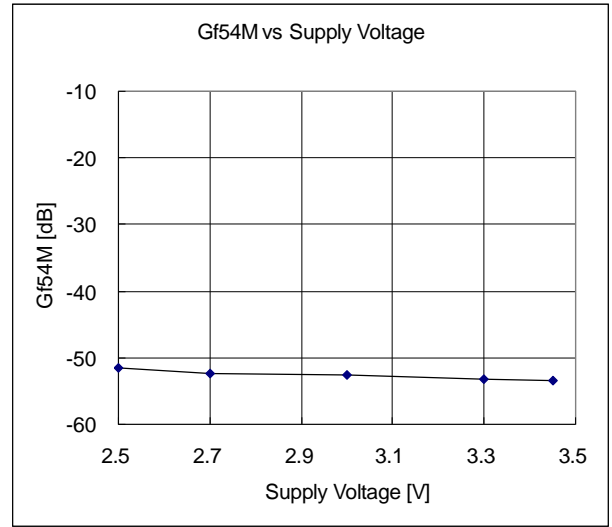
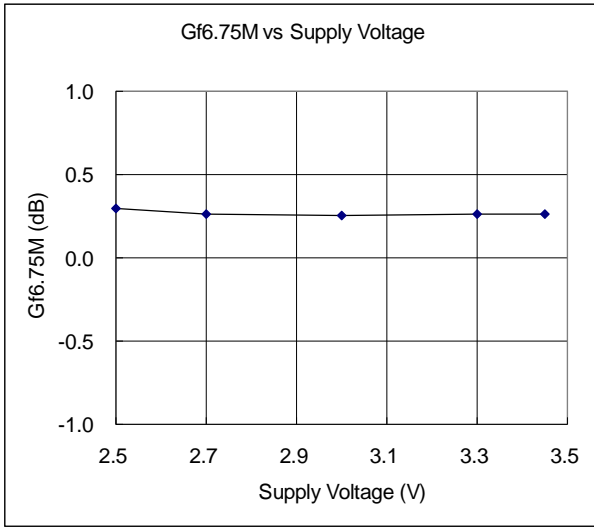


Figure 4: Not recommended 2-system drive circuit

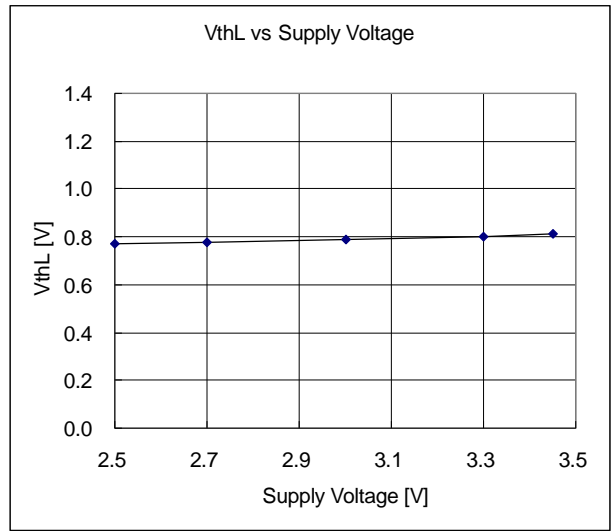
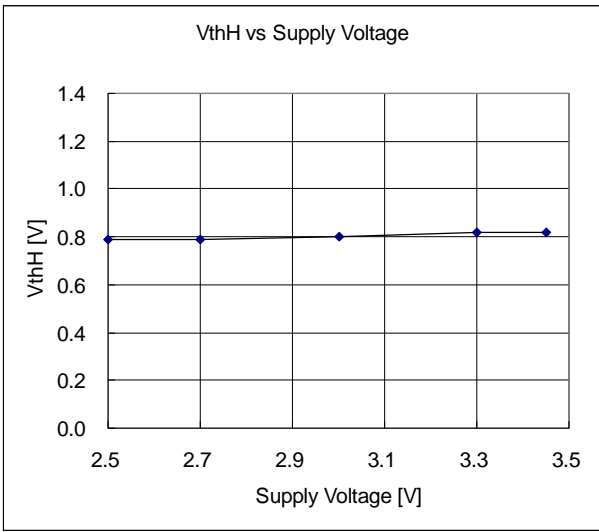
■ TYPICAL CHARACTERISTICS



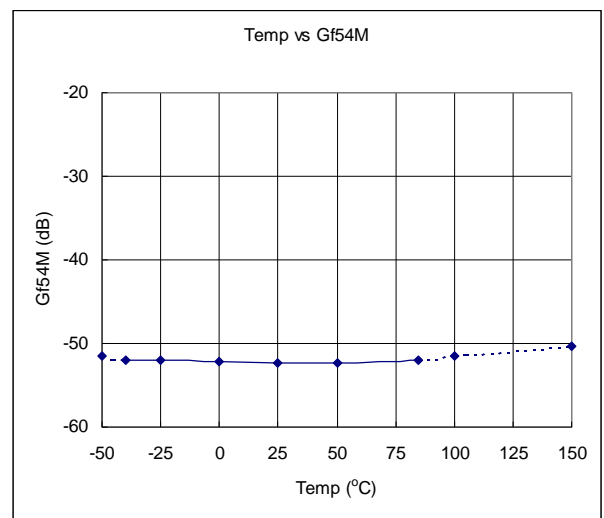
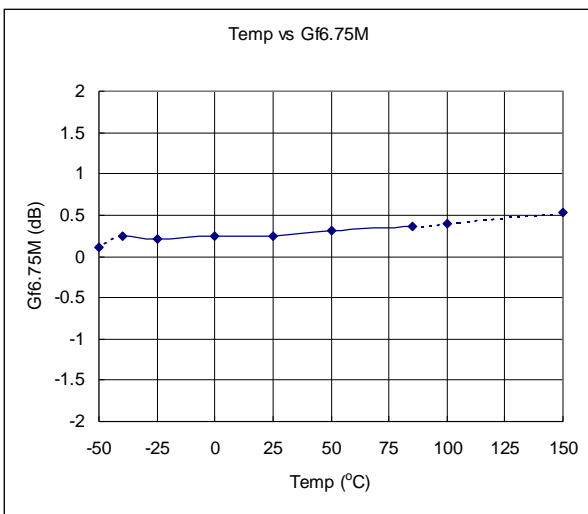
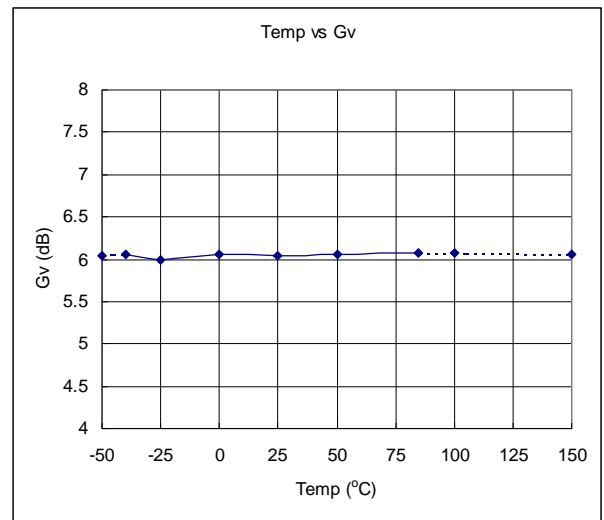
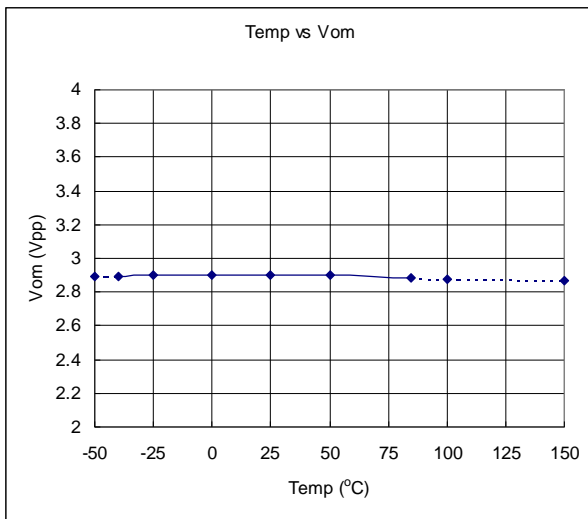
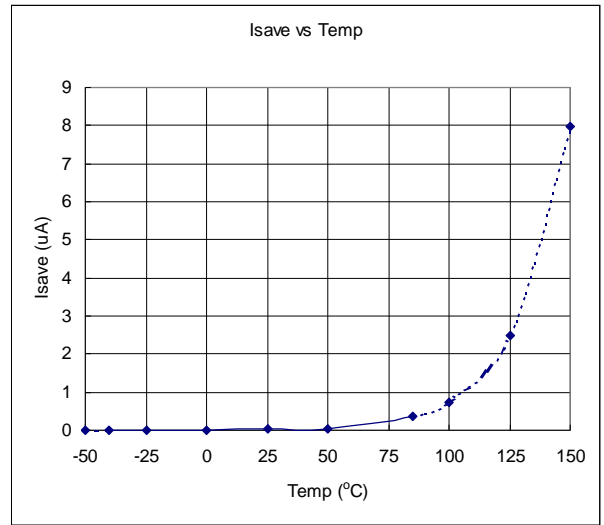
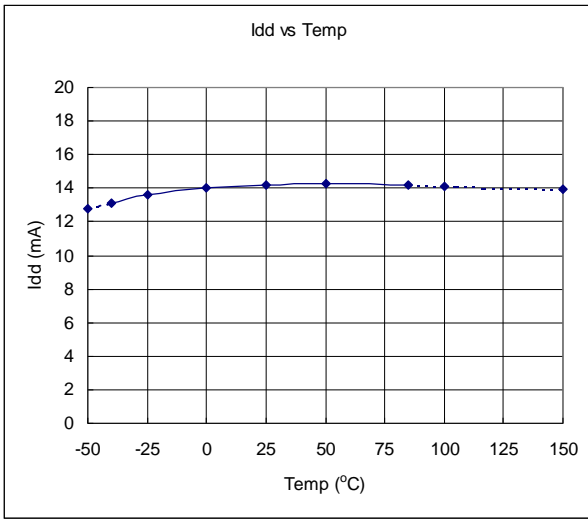
■ TYPICAL CHARACTERISTICS



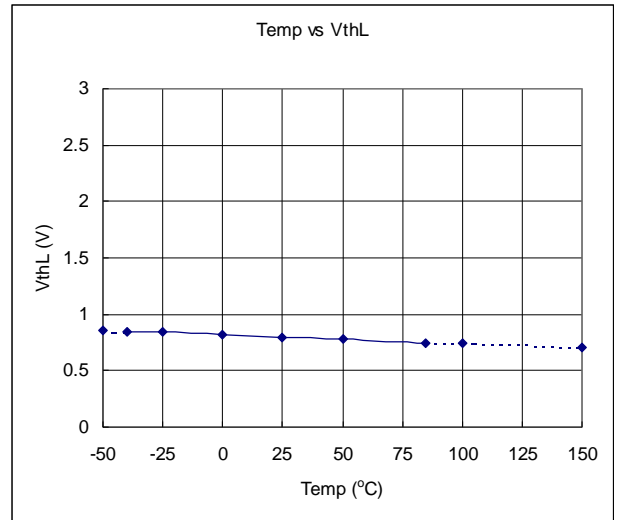
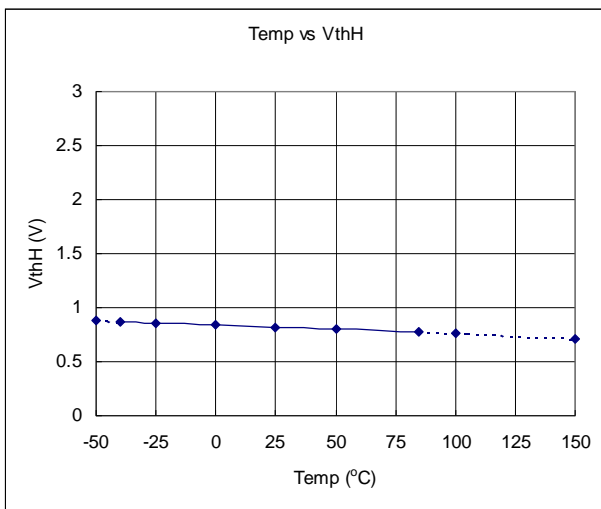
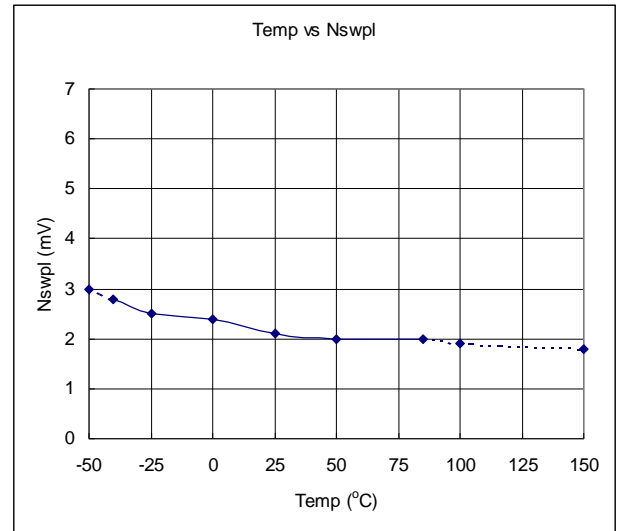
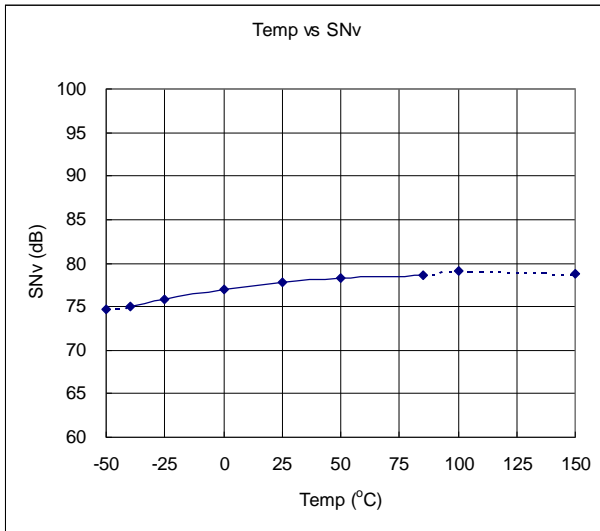
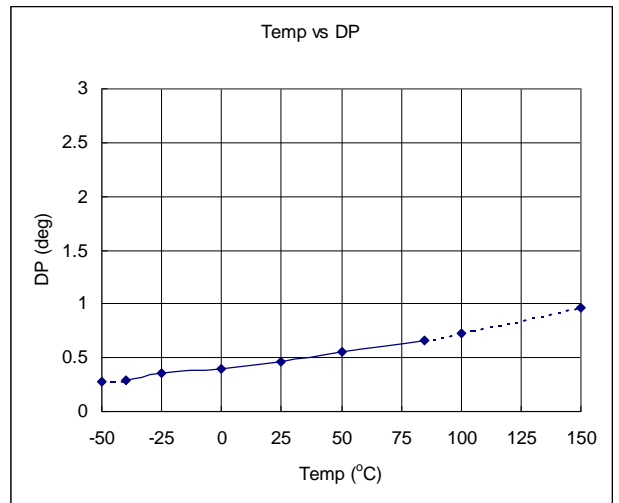
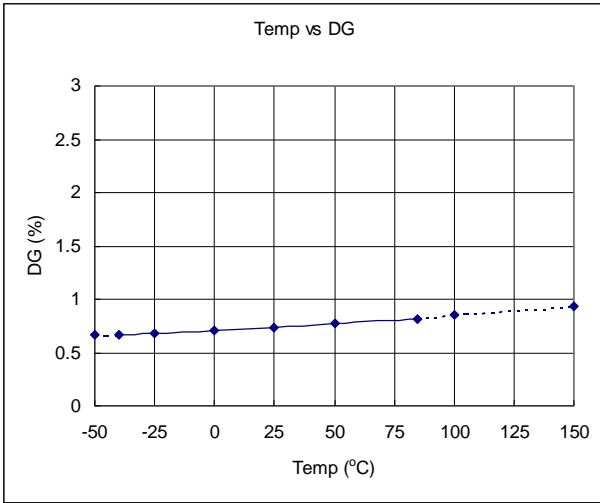
■ TYPICAL CHARACTERISTICS



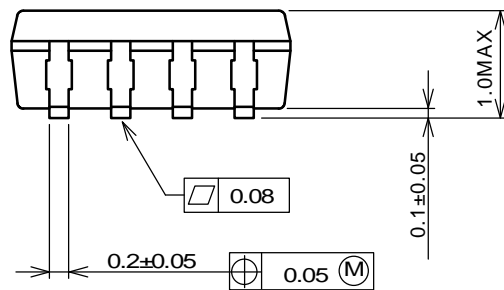
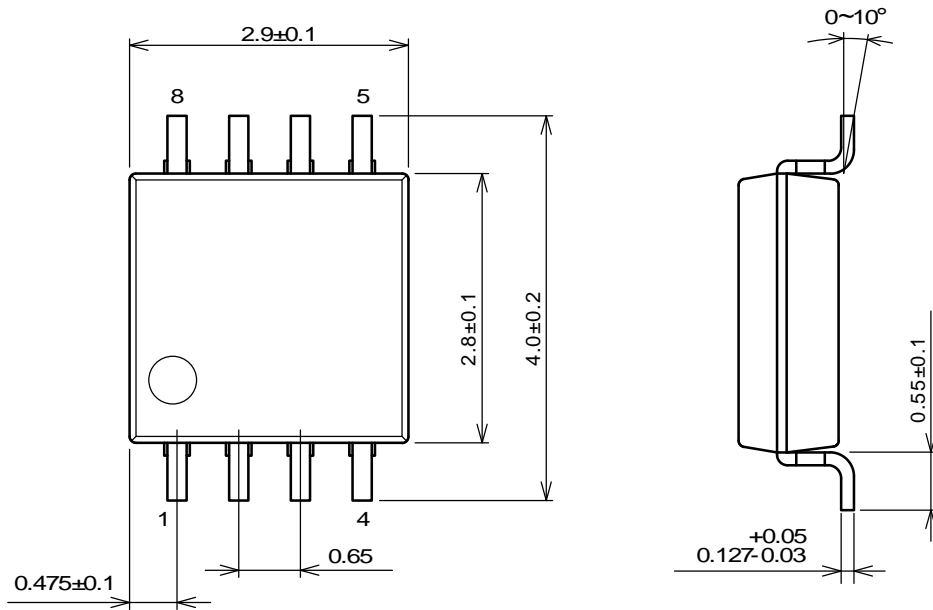
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



■PACKAGE OUTLINE: MSOP8(TVSP8)*MEET JEDEC MO-187-DA / THIN TYPE

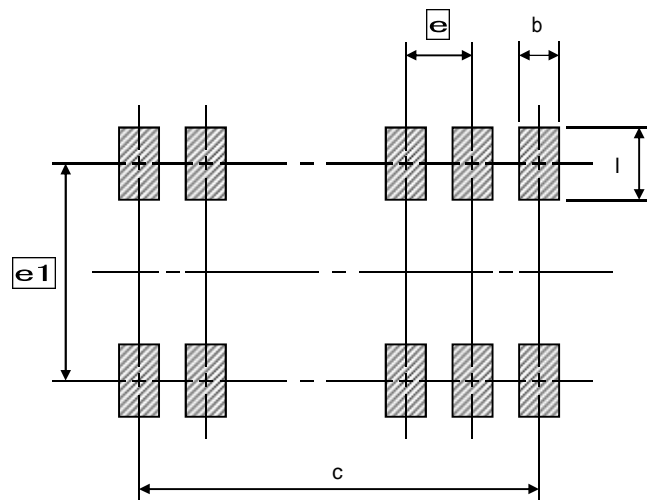


Unit : mm

■SOLDER FOOT PRINT

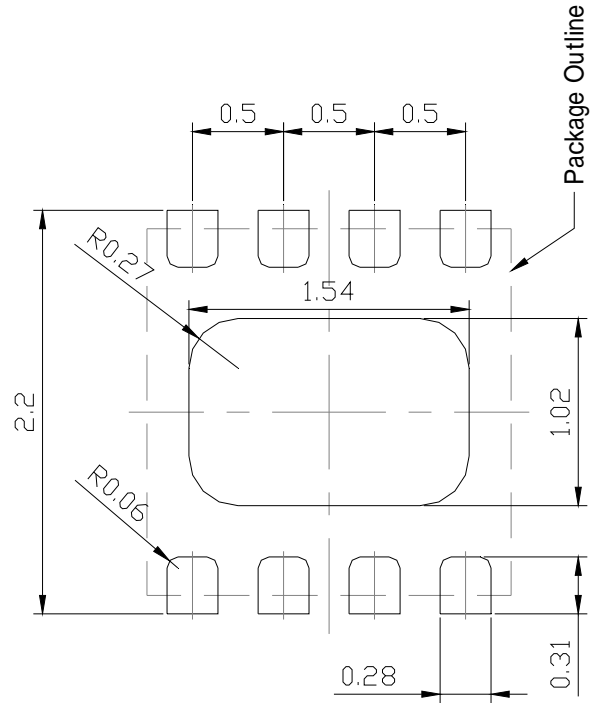
| PKG | b | l | c | e1 | e |
|-------|------|------|------|------|------|
| TVSP8 | 0.23 | 1.00 | 1.95 | 3.50 | 0.65 |

Unit : mm



Note : These solder foot print dimensions are just examples.
When designing PCB, please estimate the pattern carefully.

■SOLDER FOOT PRINT: DFN8-U1



Unit : mm

Note : These solder foot print dimensions are just examples.
When designing PCB, please estimate the pattern carefully.

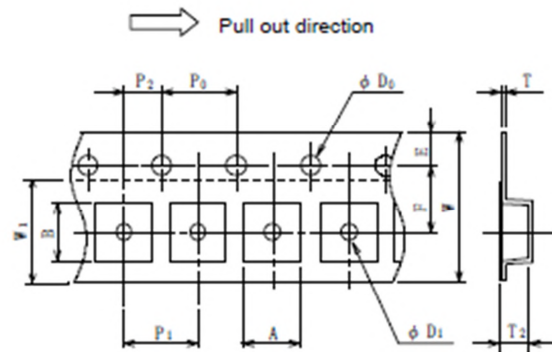
PACKING SPECIFICATION: MSOP8

General Description

NJRC delivers ICs in 4 methods, plastic tube container, two kinds of Taping, tray and vinyl bag packing. Except adhesive tape treated anti electrostatic and contain carbon are using as the ESD (Electrostatic Discharge Damage) protection.

MSOP (VSP/TVSP) Emboss Taping (TE1)

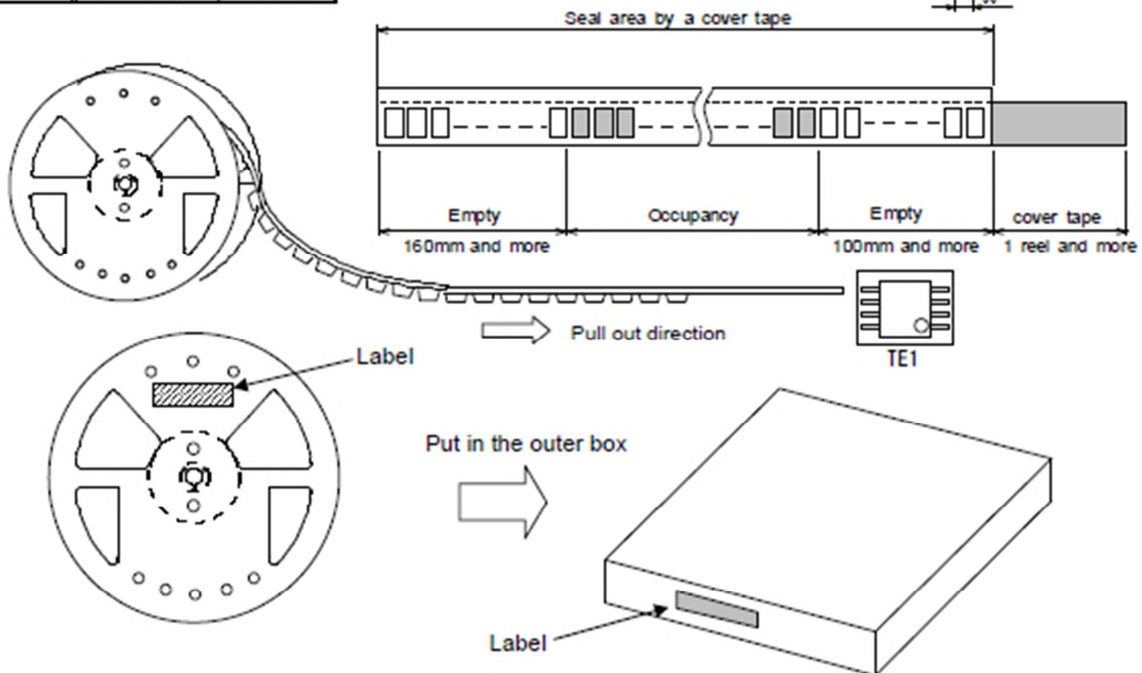
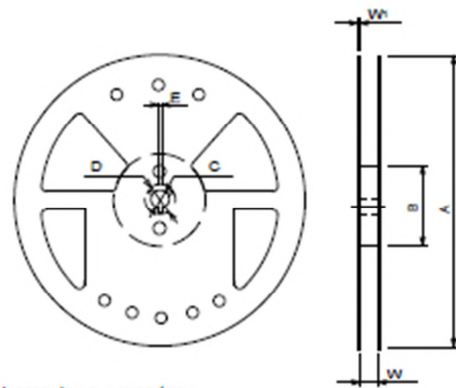
| Symbol | MSOP8/10 (TVSP8/10) * *MEET JEDEC MO-187-DA / THIN TYPE | Remark |
|----------------|--|------------------|
| A | 4.4 | Bottom size |
| B | 3.2 | Bottom size |
| D ₀ | 1.5+0.1/-0 | |
| D ₁ | 1.5+0.1/-0 | |
| E | 1.75±0.1 | |
| F | 5.5±0.05 | |
| P ₀ | 4.0±0.1 | |
| P ₁ | 8.0±0.1 | |
| P ₂ | 2.0±0.05 | |
| T | 0.3±0.05 | |
| T ₂ | 1.45 | |
| W | 12.0±0.3 | |
| W ₁ | 9.5 | Thickness 0.1MAX |



Unit : mm

| Symbol | MSOP8/10 (TVSP8/10) * *MEET JEDEC MO-187-DA / THIN TYPE |
|----------------|--|
| A | ∅254±2 |
| B | ∅100±1 |
| C | ∅13±0.2 |
| D | ∅21±0.8 |
| E | 2±0.5 |
| W | 13.5±0.5 |
| W ₁ | 2±0.2 |
| Contents | 2,000 pcs |

Unit : mm



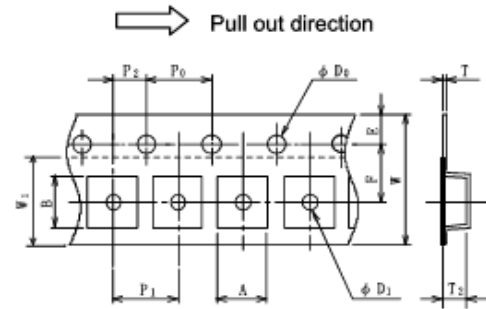
PACKING SPECIFICATION: DFN8-U1

General Description

NJRC delivers ICs in 4 methods, plastic tube container, two kinds of Taping, tray and vinyl bag packing. Except adhesive tape treated anti electrostatic and contain carbon are using as the ESD (Electrostatic Discharge Damage) protection.

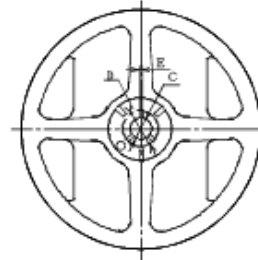
DFN(ESON) Emboss Taping (TE3)

| Symbol | DFN8-U1(ESON8-U1) | Remark |
|----------------|-------------------|---------------------|
| A | 2.25±0.05 | Bottom size |
| B | 2.25±0.05 | Bottom size |
| D ₀ | 1.5+0.1/-0 | |
| D1 | 0.5±0.1 | |
| E | 1.75±0.1 | |
| F | 3.5 ±0.05 | |
| P ₀ | 4.0 ±0.1 | |
| P ₁ | 4.0 ±0.1 | |
| P ₂ | 2.0 ±0.05 | |
| T | 0.25±0.05 | |
| T ₂ | 0.75 | |
| W | 8.0 ±0.2 | |
| W ₁ | 5.5 | Thickness 0.1MAX |

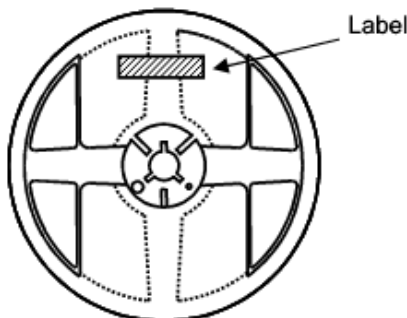
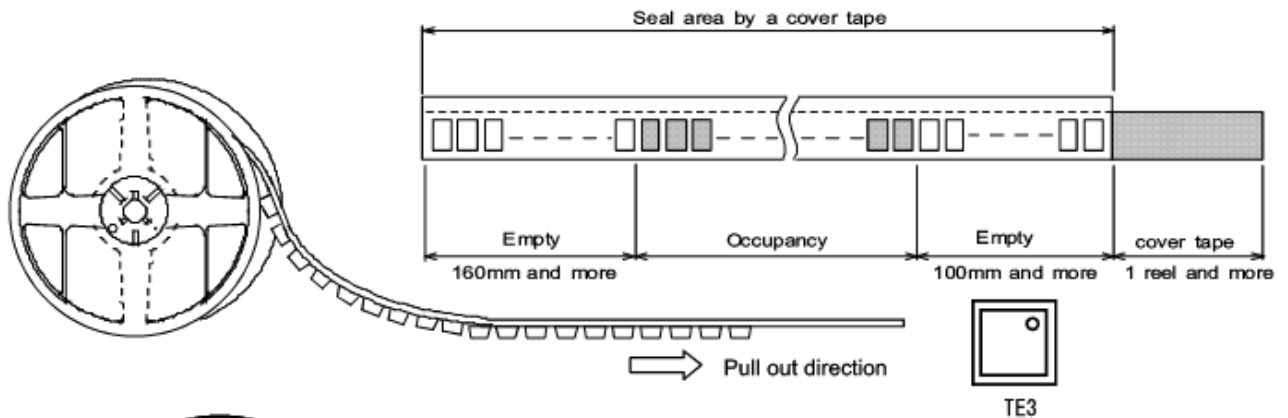
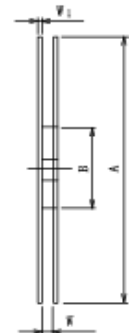


Unit : mm

| Symbol | DFN8-U1(ESON8-U1) |
|----------------|-------------------|
| A | φ180 +0/-1.5 |
| B | φ 60 +1/-0 |
| C | φ13.0±0.2 |
| D | φ21.0±0.8 |
| E | 2.0±0.5 |
| W | 9.0 +0.3/-0 |
| W ₁ | 1.2 |
| Contents | 3,000pcs |



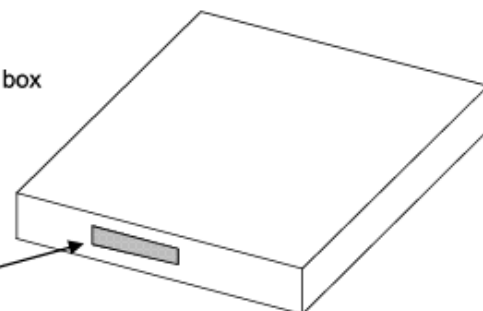
Unit : mm



Put in the outer box

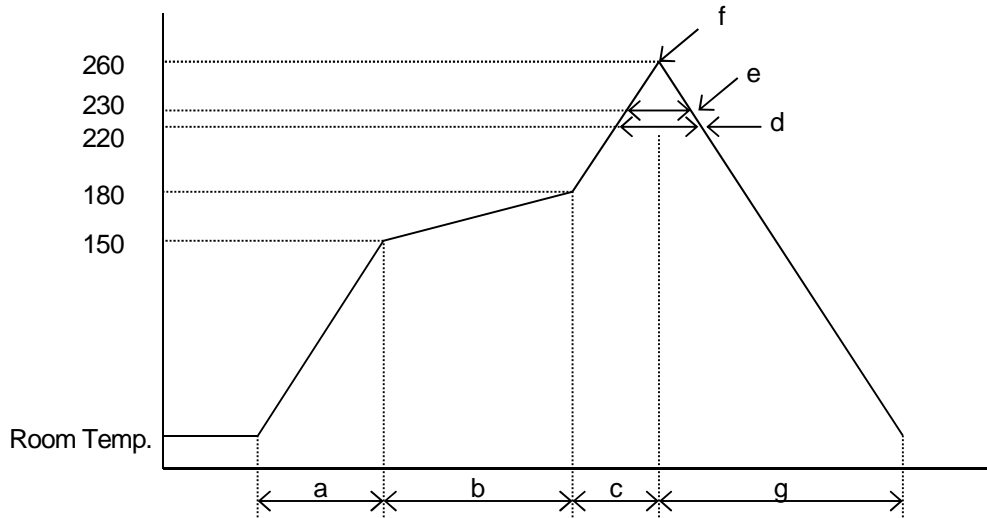


Label



RECOMMENDED MOUNTING METHOD

* Recommended reflow soldering procedure



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

The temperature indicates at the surface of mold package.

[CAUTION]

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Life Maintenance Medical Equipment
Fire Alarm/Intruder Detector
Vehicle Control Equipment (airplane, railroad, ship, etc.)
Various Safety devices

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