

## DIFFERENTIAL OUTPUT VIDEO DRIVER WITH SHORT to BATTERY PROTECTION

### FEATURES

- Operating Voltage                    2.65 to 3.45V
- Operating Temperature            -40 to +125
- Short to Battery Protection Circuit of up to 18V
- Output Capacitor is unnecessary
- Differential Output, 6dB Amp. , 75Ω Driver
- LPF Characteristics                0dB at 6.75MHz
- 40dB at 27MHz
  
- CMOS Technology
- Package Outline                    DFN8-W2  
(ESON8-W2 3mm\*3mm)

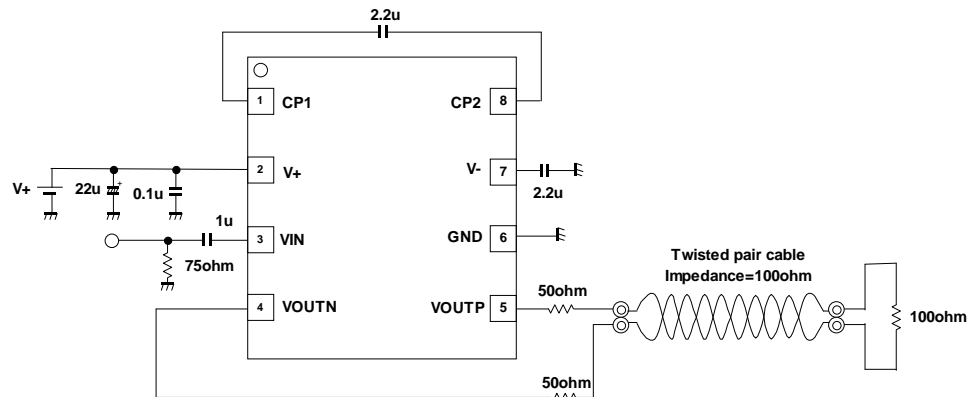
### GENERAL DESCRIPTION

NJU71094 is differential output video driver that built in short to battery protection circuit of up to 18V. Output capacitor is unnecessary because it built in charge-pump circuit. Therefore, NJU71094 can protect from more than voltage of IC's operating voltage, and is suitable to CAR CAMERA, CAR AV system and so on.

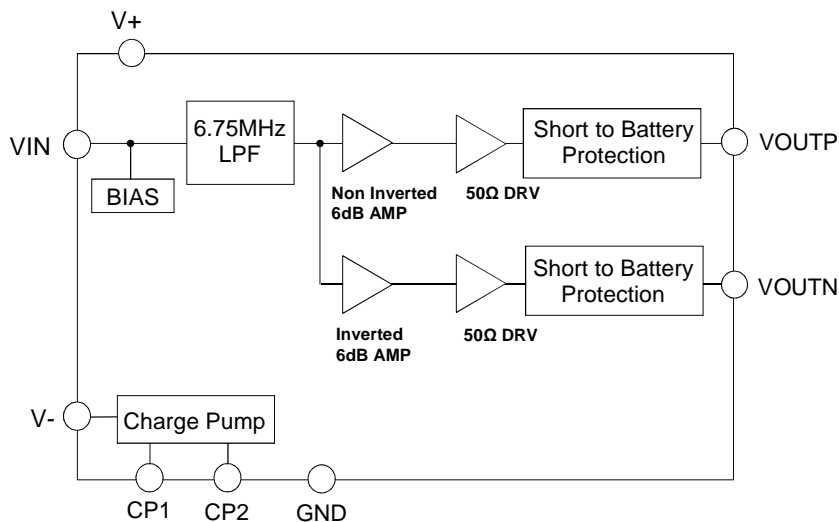
### APPLICATION

- Car Camera
- Car Navigation

### APPLICATION CIRCUIT



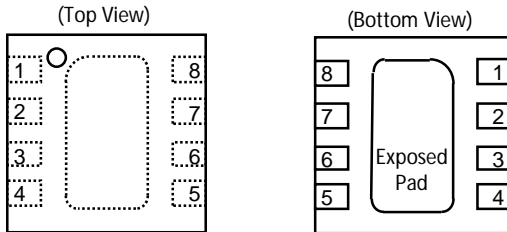
### EQUIVALENT CIRCUIT · BLOCK DIAGRAM



■ Built in short to battery protection circuit video driver

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

■ PIN CONFIGURATION

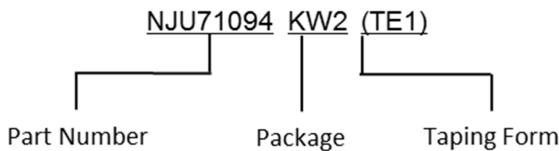


| PIN NO. | SYMBOL | DESCRIPTION                           |
|---------|--------|---------------------------------------|
| 1       | CP1    | Flying Capacitor Terminal             |
| 2       | V+     | Power Supply Terminal                 |
| 3       | VIN    | Video Signal Input Terminal           |
| 4       | VOUTN  | Negative Video Signal Output Terminal |
| 5       | VOUTP  | Positive 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) |
|----------------|-----------------|------|--------------|-----------------|---------|-------------|----------|
| NJU71094KW2-T1 | ESON8-W2        | Yes  | Yes          | Sn-2Bi          | 71094T  | 18.0        | 3,000    |

## ■ABSOLUTE MAXIMUM RATINGS

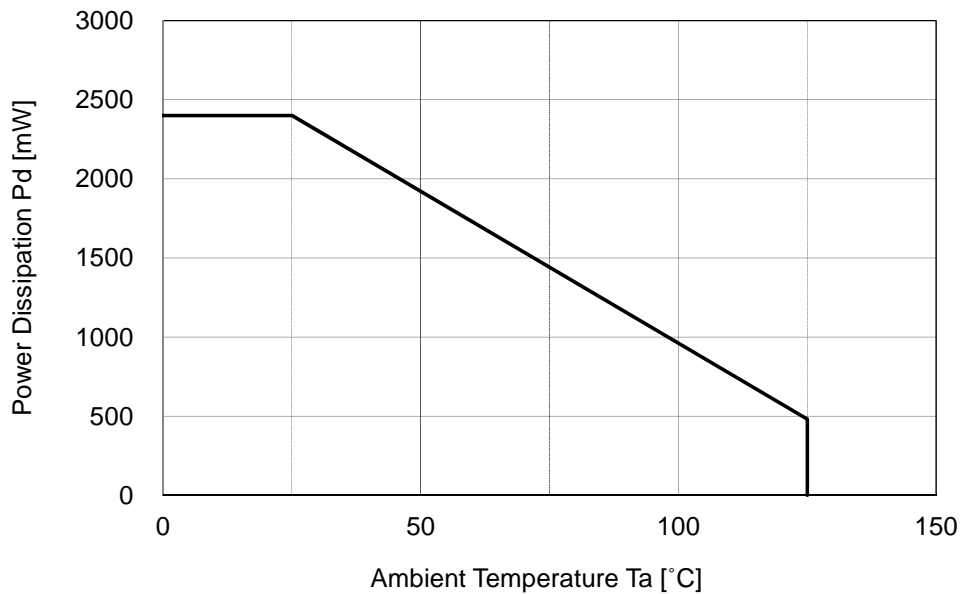
| PARAMETER                   | SYMBOL           | RATINGS    | UNIT |
|-----------------------------|------------------|------------|------|
| Supply Voltage              | V+               | 3.5        | V    |
| Power Dissipation (Ta=25°C) | P <sub>D</sub>   | 2400 (1)   | mW   |
| Operating Temperature Range | T <sub>opr</sub> | -40 to 125 | °C   |
| Storage Temperature Range   | T <sub>stg</sub> | -55 to 150 | °C   |

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

## ■RECOMMENDED OPERATING CONDITIONS

| PARAMETER      | SYMBOL | RATINGS      | UNIT |
|----------------|--------|--------------|------|
| Supply Voltage | V+     | 2.65 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              |
|-------------------------------------|---------------------|--|------|-------|-------|-------------------|
| DC Characteristics                  |                     |  |      |       |       |                   |
| Supply Current                      | I <sub>cc</sub>     | No input signal  | -    | 27.0  | 42.0  | mA                |
|                                     |                     | No input signal,<br>T <sub>a</sub> =-40°C to 125°C   | -    | -     | 42.0  |                   |
| Video Amplifier Characteristics     |                     |  |      |       |       |                   |
| Maximum Output Voltage Swing        | V <sub>om</sub>     | V <sub>in</sub> =100kHz, THD=1%,<br>V <sub>in</sub> =100kHz, THD=1%,<br>T <sub>a</sub> =-40°C to 125°C | 3.6  | -     | -     | V <sub>p-p</sub>  |
|                                     |                     |  | 3.6  | -     | -     |                   |
| Voltage Gain                        | G <sub>v</sub>      | V <sub>in</sub> =100kHz, 1.0V <sub>p-p</sub><br>Sine wave  | 5.6  | 6.0   | 6.4   | dB                |
|                                     |                     | V <sub>in</sub> =100kHz, 1.0V <sub>p-p</sub><br>Sine wave, T <sub>a</sub> =-40°C to 125°C              | 5.6  | -     | 6.4   |                   |
| LPF Characteristics                 | G <sub>f6.75M</sub> | V <sub>in</sub> =6.75MHz/1MHz, 1.0V <sub>p-p</sub>   | -1.0 | 0     | 1.0   | dB                |
|                                     |                     | V <sub>in</sub> =6.75MHz/1MHz, 1.0V <sub>p-p</sub><br>T <sub>a</sub> =-40°C to 125°C                   | -1.0 | -     | 1.0   |                   |
|                                     | G <sub>f27M</sub>   | V <sub>in</sub> =27MHz/100kHz, 1.0V <sub>p-p</sub>   | -    | -40.0 | -24.0 |                   |
|                                     |                     | V <sub>in</sub> =27MHz/100kHz, 1.0V <sub>p-p</sub><br>T <sub>a</sub> =-40°C to 125°C                   | -    | -     | -24.0 |                   |
| Differential Gain                   | DG                  | V <sub>in</sub> =1.0V <sub>p-p</sub> ,<br>10step Video signal  | -    | 0.5   | -     | %                 |
| Differential Phase                  | DP                  | V <sub>in</sub> =1.0V <sub>p-p</sub> ,<br>10step Video signal  | -    | 0.5   | -     | deg               |
| S/N Ratio                           | SN                  | R <sub>L</sub> =75Ω, 1.0V <sub>p-p</sub> ,<br>100% White video signal input,<br>BW=100kHz to 6MHz      | -    | 70    | -     | dB                |
| Switching Noise Level               | N <sub>swpl</sub>   | 10% White video signal input   | -    | 4.0   | 7.0   | mV <sub>p-p</sub> |
| Shot to Battery Protection          |                     |  |      |       |       |                   |
| Protected Maximum Input Voltage (2) | V <sub>stbm</sub>   | Connected 75Ω to V <sub>out</sub> (pin5)   | -    | -     | 18    | V                 |
|                                     |                     | Connected 75Ω to V <sub>out</sub> (pin5)<br>T <sub>a</sub> =-40°C to 125°C                             | -    | -     | 18    |                   |
| Detect Protected Input Voltage (3)  | V <sub>th</sub>     | Connected 75Ω to V <sub>out</sub> (pin5)   | -    | 6.0   | 9.0   | V                 |
|                                     |                     | Connected 75Ω to V <sub>out</sub> (pin5)<br>T <sub>a</sub> =-40°C to 125°C                             | -    | -     | 9.0   |                   |
| Input Current                       | I <sub>stb</sub>    | V <sub>out</sub> =18V,<br>Connected 75Ω to V <sub>out</sub> (pin5)                                     | -    | 5.4   | -     | mA                |

(2) Maximum input voltage of destination of output resistance 75Ω

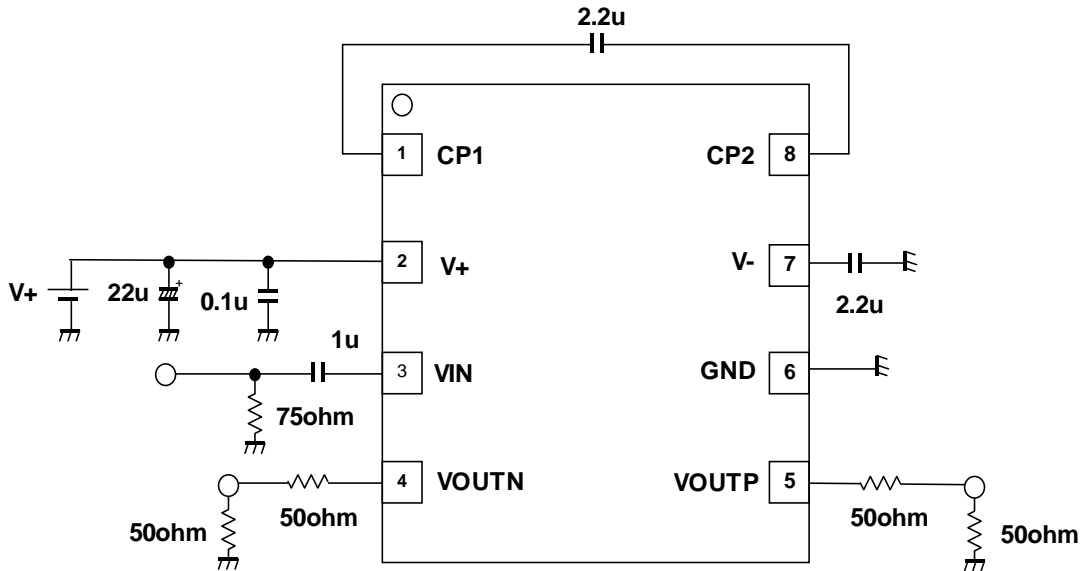
(3) It is become protect mode at more than this voltage against input voltage of destination of output resistance 75ohm.

(4) If supply voltage is OFF, you must not input the short to battery voltage. IC is broken in the worst case.

(5) Guaranteed range of Short to Battery voltage is 9V to 18V.

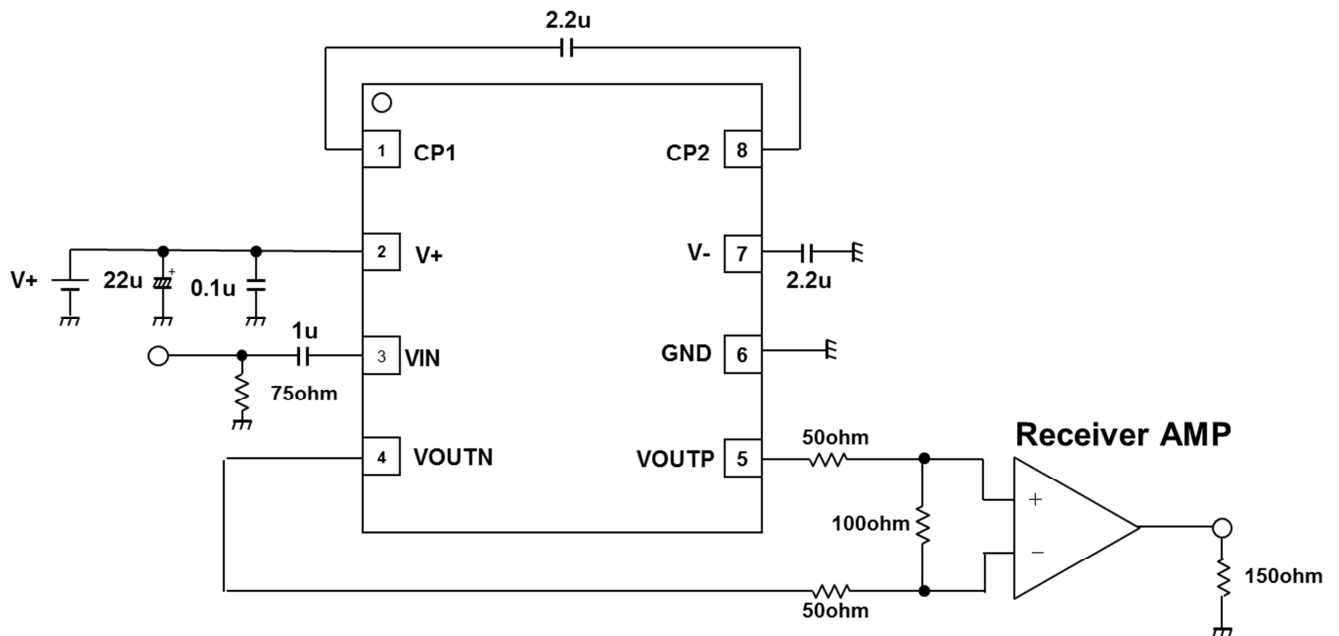
## ■TEST CIRCUIT 1

(Supply current, Maximum output level)



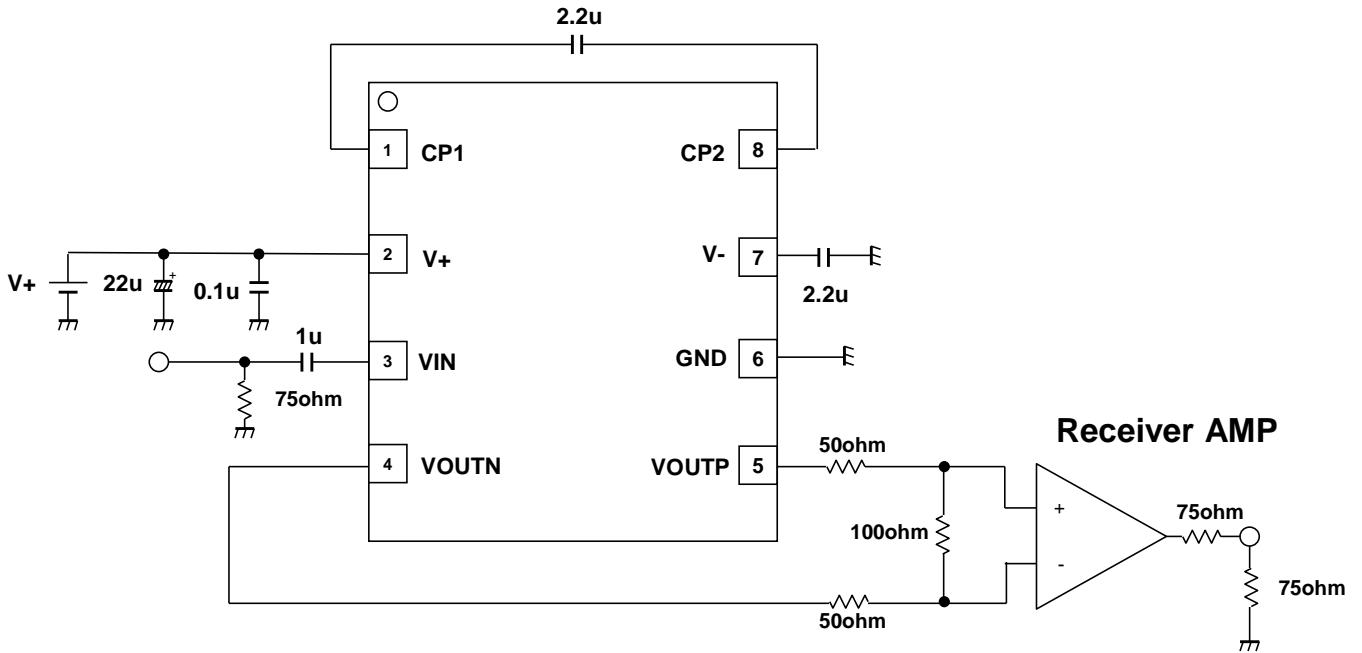
## ■TEST CIRCUIT 2

(Voltage gain, LPF characteristics, Switching Noise Level)



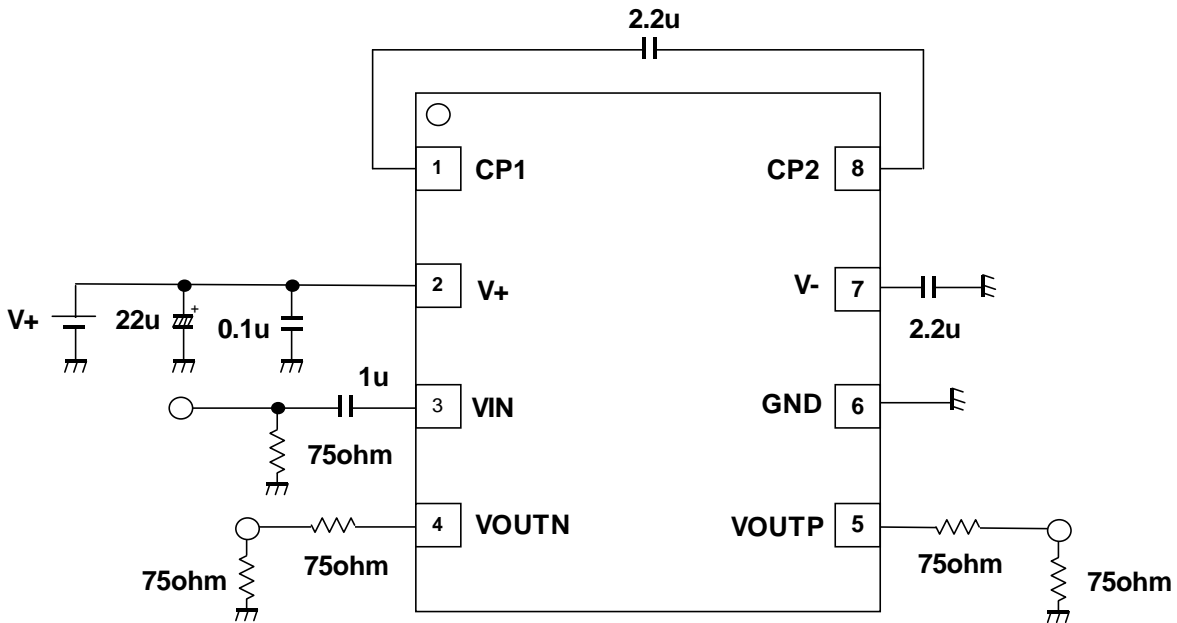
### TEST CIRCUIT 3

(Differential gain, Differential phase, S/N Ratio)

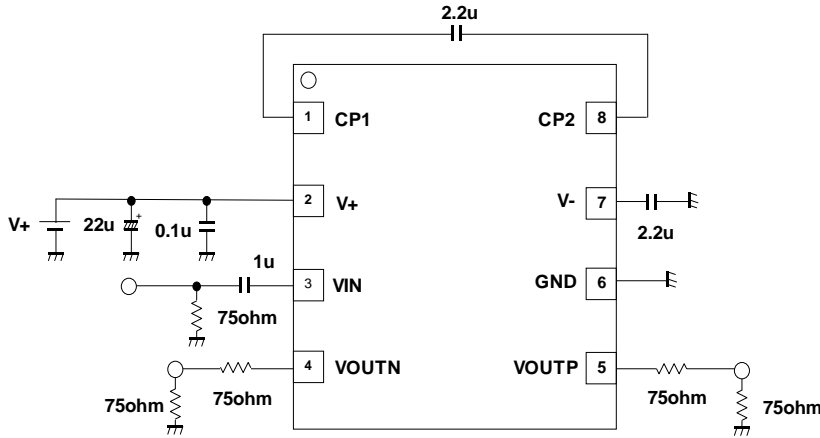


### TEST CIRCUIT 4

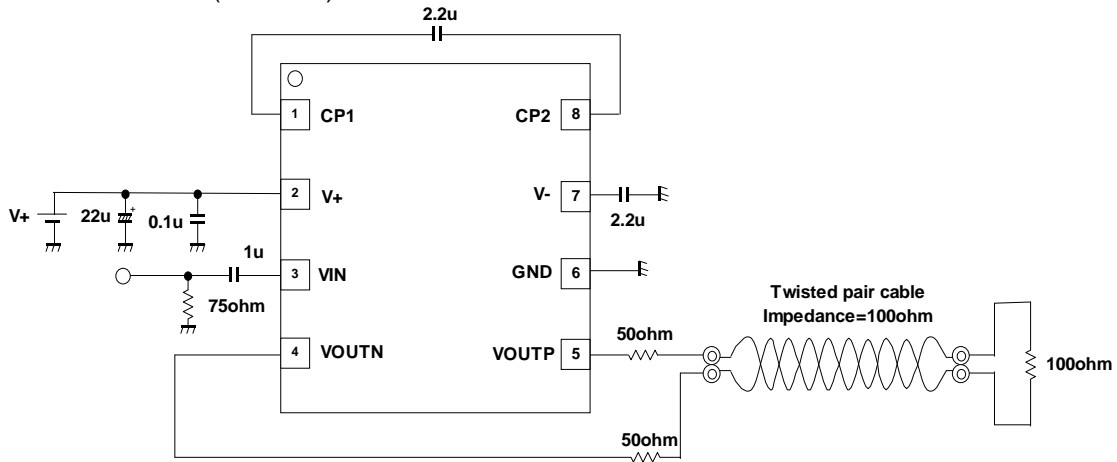
(Detect protected Input voltage)



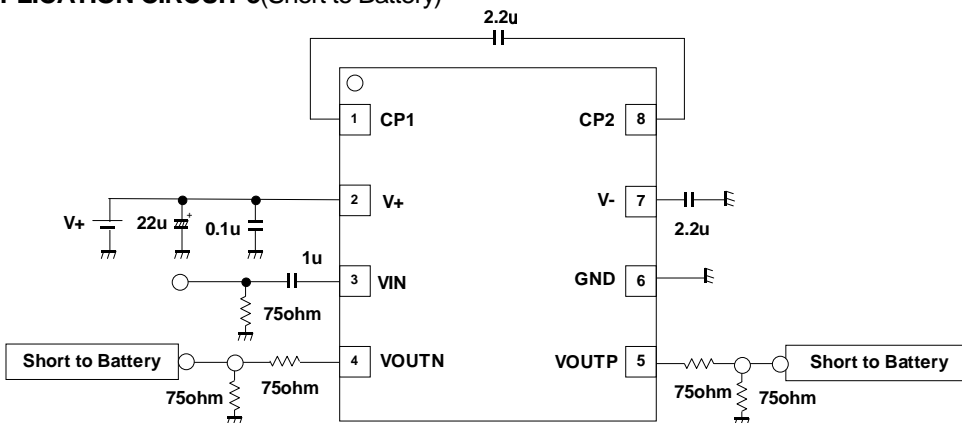
### APPLICATION CIRCUIT 1 (RL=150Ω)



### APPLICATION CIRCUIT 2 (RL=100Ω)



### APPLICATION CIRCUIT 3 (Short to Battery)



### Note

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+      | V+ Power Supply                       | -                 | -          |
| 3      | VIN     | Video Signal Input Terminal           |                   | 0V         |
| 4      | VOUTN   | Negative Video Signal Output Terminal |                   | 0V         |

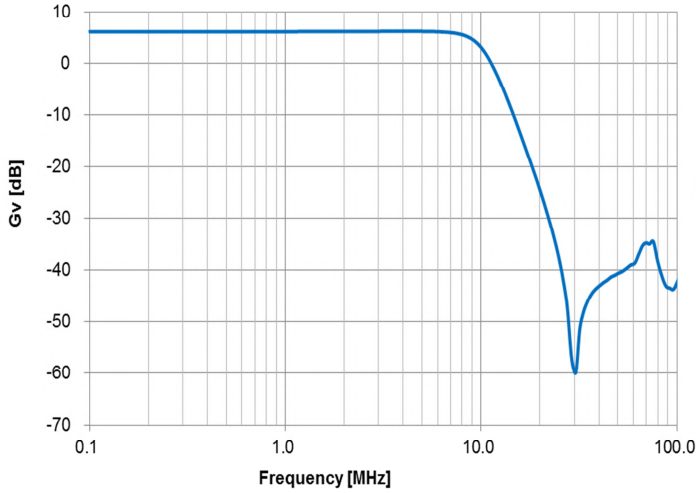


## ■TERMINAL FUNCTION

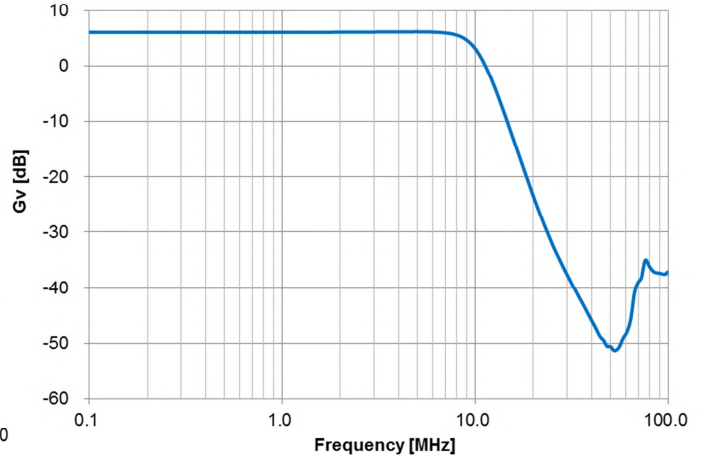
| PINNo. | PINNAME | FUNCTION                              | EQUIVALENTCIRCUIT | DC VOLTAGE |
|--------|---------|---------------------------------------|-------------------|------------|
| 5      | VOUTP   | Positive Video Signal Output Terminal |                   | 0V         |
| 6      | GND     | GND                                   | -                 | -          |
| 7      | V-      | Flying Capacitor Terminal             | -                 | -          |
| 8      | CP2     | Flying Capacitor Terminal             |                   | -          |

## ■ TYPICAL CHARACTERISTICS

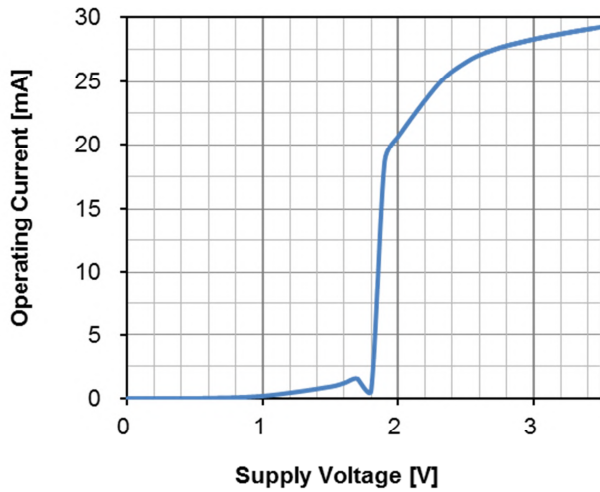
Frequency Response  
VOUTP Output  
Vin=1.0Vpp, Sine Signal Input



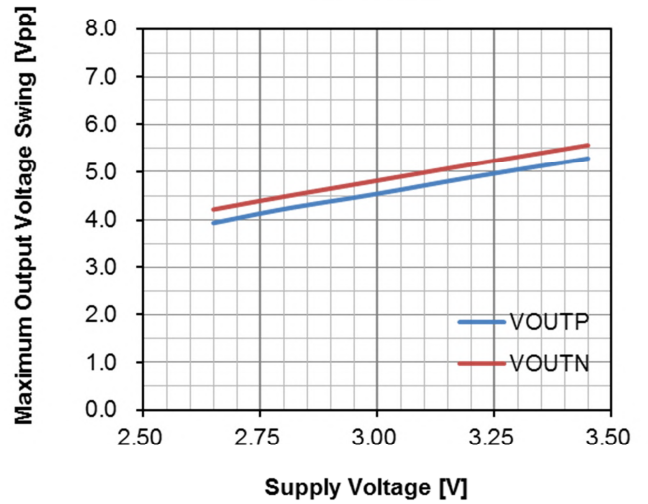
Frequency Response  
VOUTN Output  
Vin=1.0Vpp, Sine Signal Input



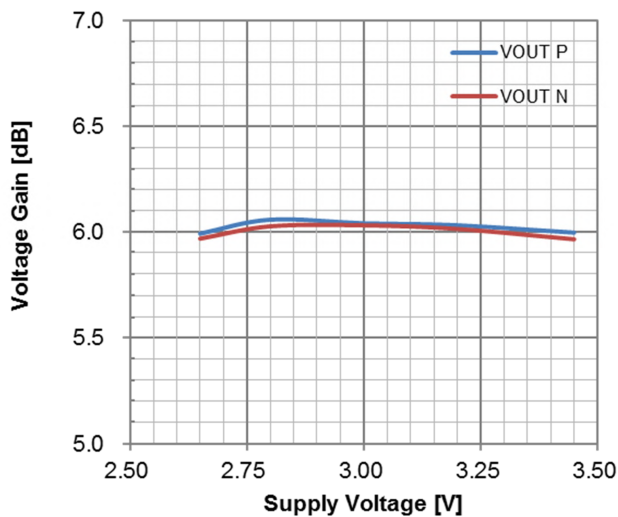
Operating Current vs.  
Supply Voltage



Maximum Output Voltage Swing  
vs. Supply Voltage  
Vin=100kHz

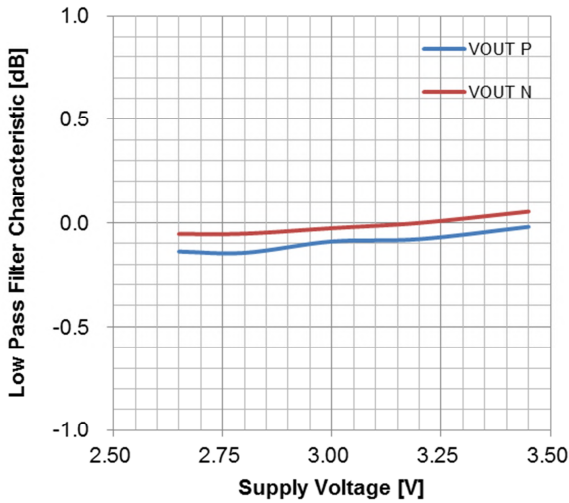


Voltage Gain vs. Supply Voltage  
Vin=1.0Vpp 100kHz Sine Signal Input

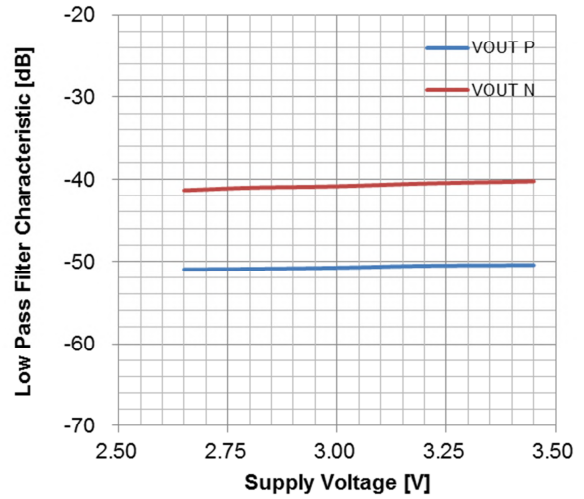


## ■ TYPICAL CHARACTERISTICS

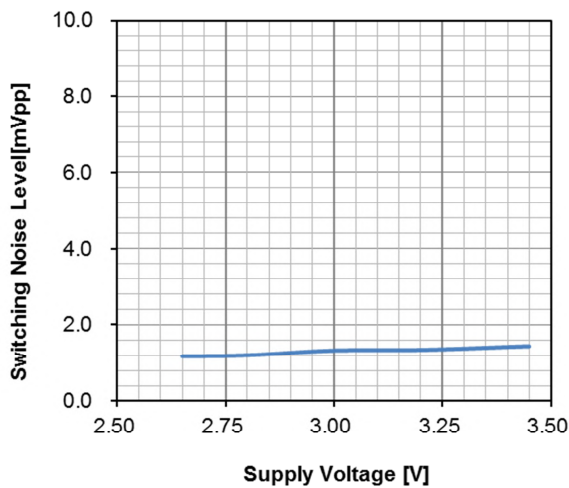
Low Pass Filter Characteristic vs. Supply Voltage  
Vin=1.0Vpp 6.75MHz/100kHz Sine Signal Input



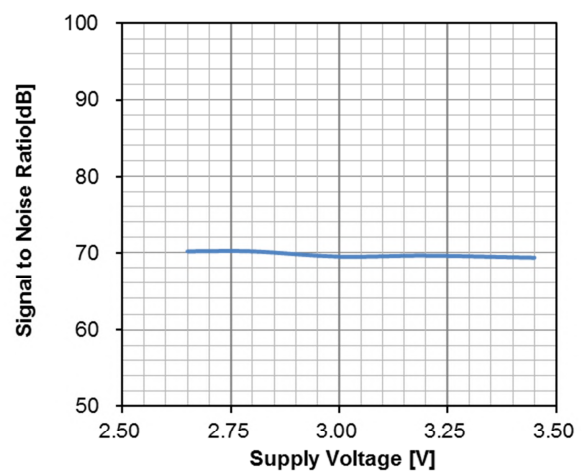
Low Pass Filter Characteristic vs. Supply Voltage  
Vin=1.0Vpp 27MHz/100kHz Sine Signal Input



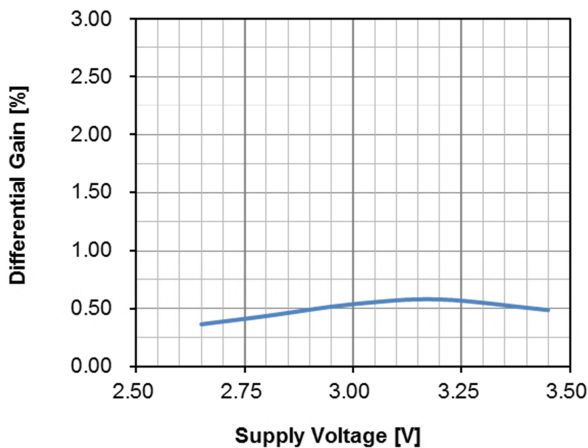
Switching Noise Level vs. Supply Voltage



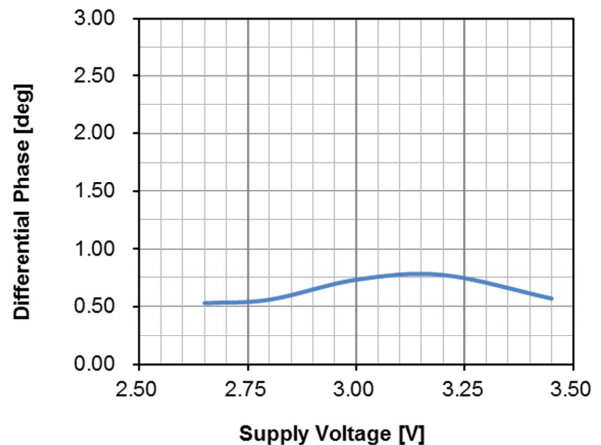
Signal to Noise Ratio vs. Supply Voltage



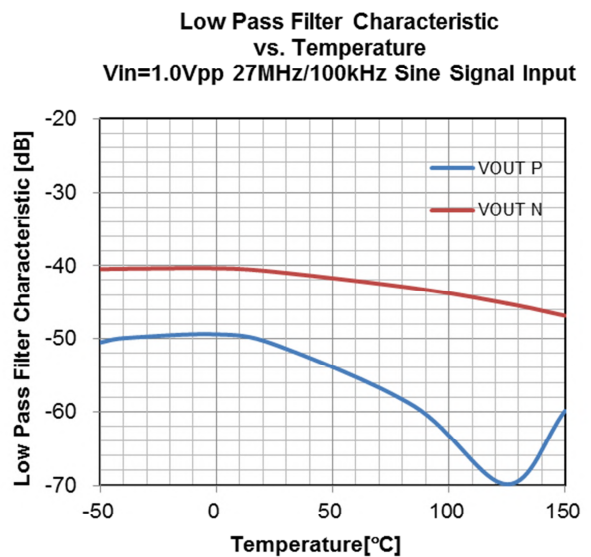
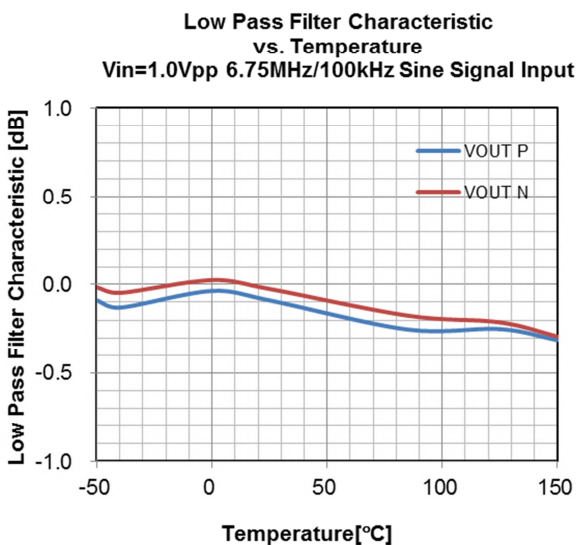
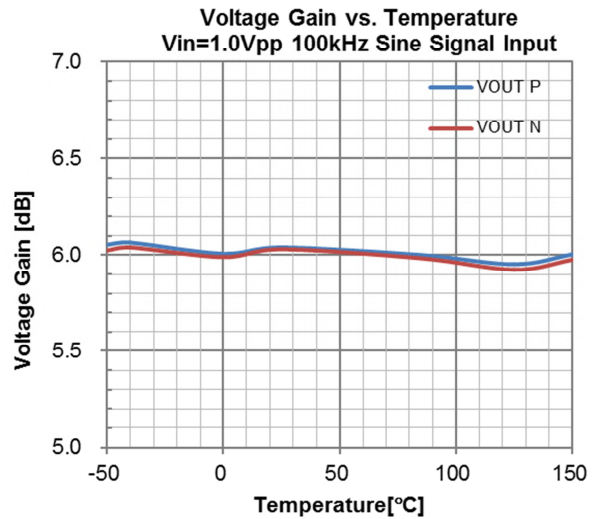
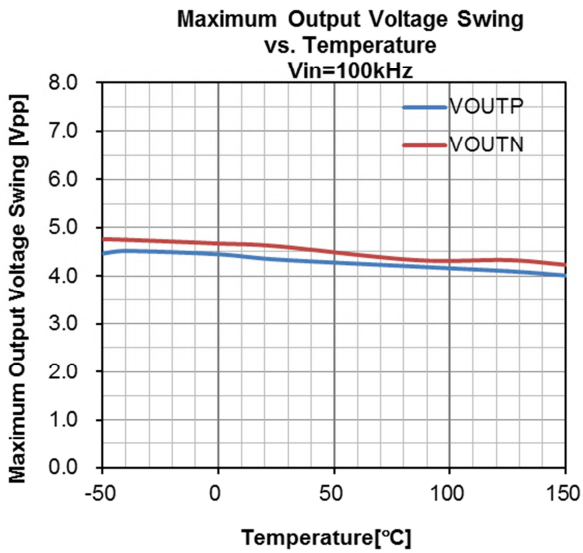
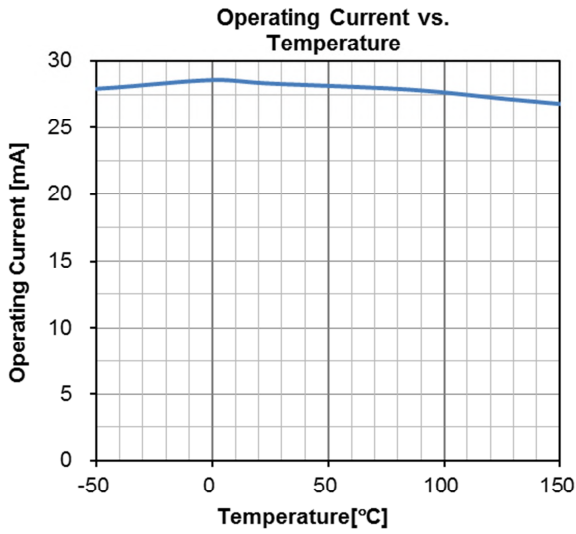
Differential Gain vs. Supply Voltage  
Vin=1.0Vpp, 10step Video Signal Input



Differential Phase vs. Supply Voltage  
Vin=1.0Vpp, 10step Video Signal Input

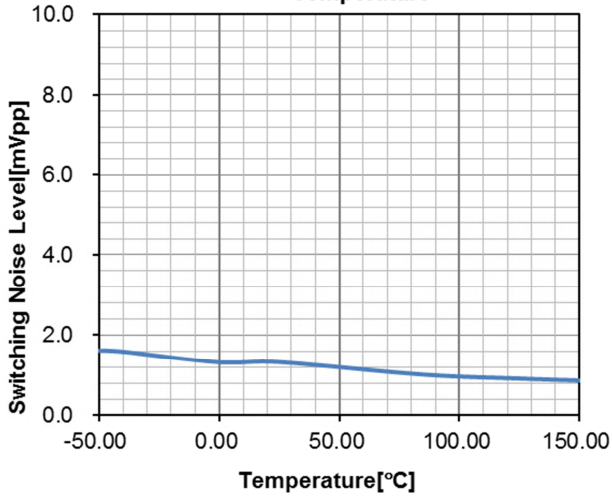


## ■ TYPICAL CHARACTERISTICS

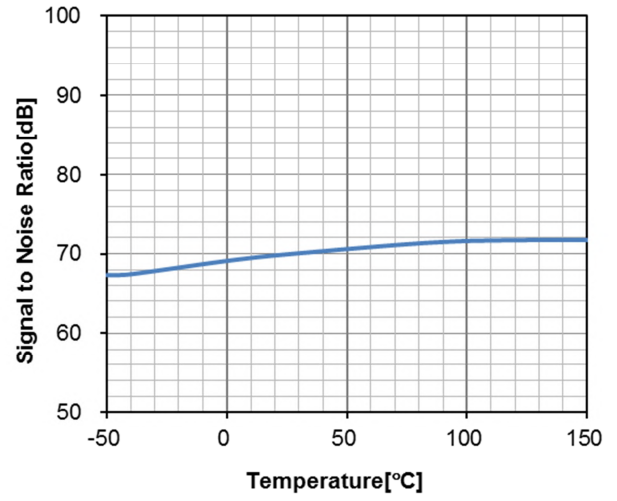


## ■ TYPICAL CHARACTERISTICS

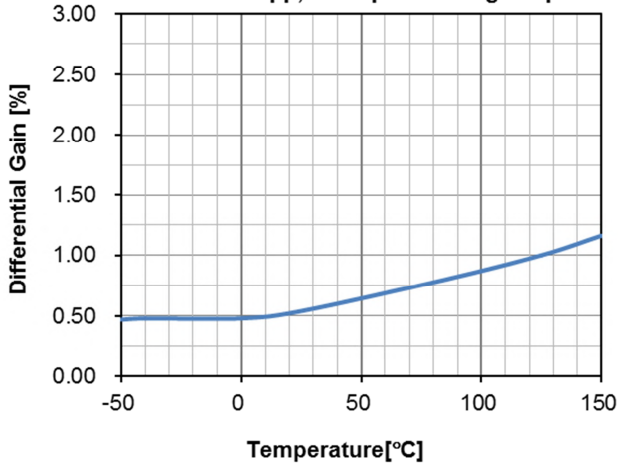
Switching Noise Level vs. Temperature



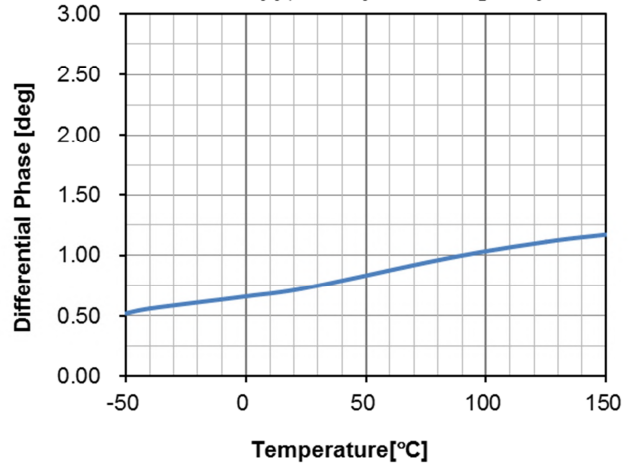
Signal Noise Ratio vs. Temperature



Differential Gain vs. Temperature  
Vin=1.0Vpp, 10step Video Signal Input

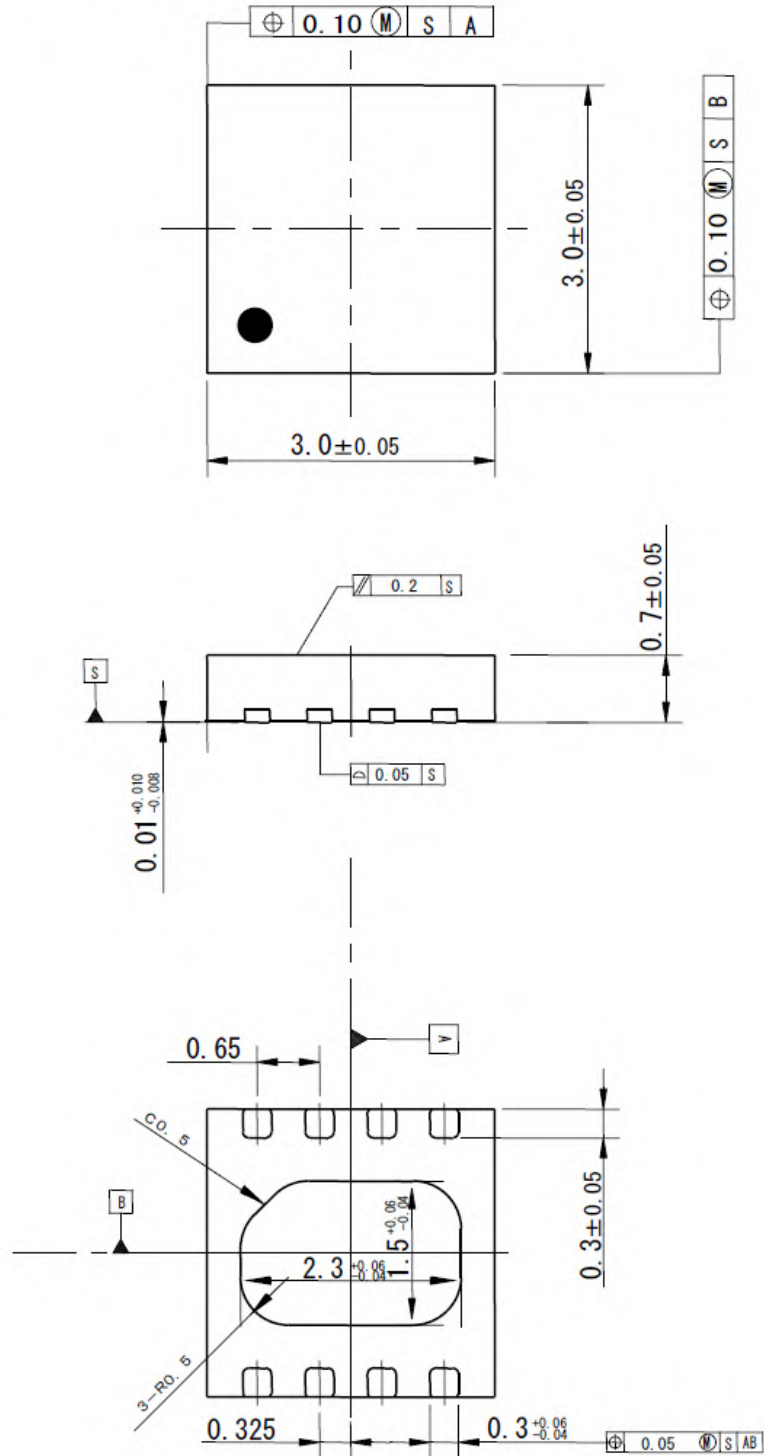


Differential Phase vs. Temperature  
Vin=1.0Vpp, 10step Video Signal Input



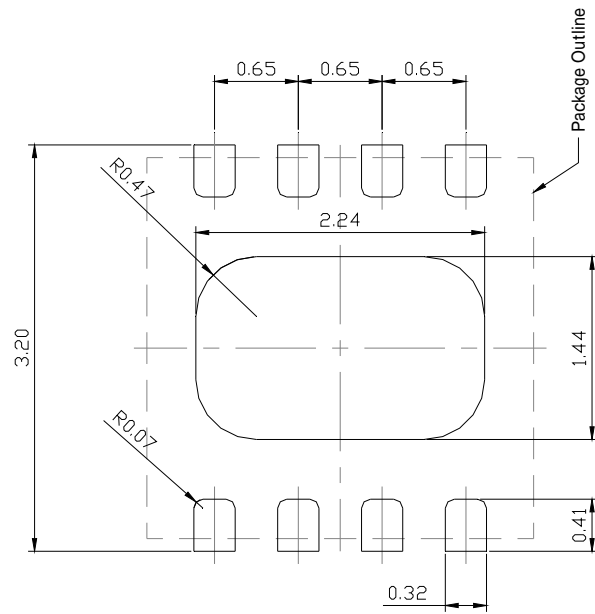
■PACKAGE OUTLINE

**DFN8-W2 (ESON8-W2)**



UNIT : mm

## ■SOLDER FOOT PRINT



Unit : mm

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



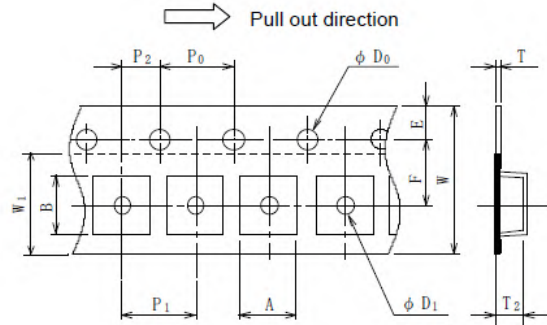
## PACKING SPECIFICATION

### 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.

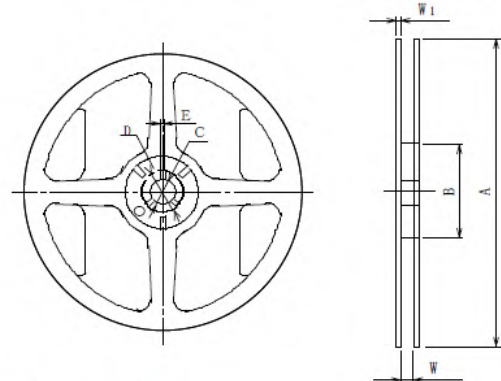
### ESON Emboss Taping (TE3)

| Symbol         | DFN8-W2 (ESON8-W2) | Remark           |
|----------------|--------------------|------------------|
| A              | 3.30±0.1           | Bottom size      |
| B              | 3.30±0.1           | Bottom size      |
| D <sub>0</sub> | 1.5+0.1/-0         |                  |
| D <sub>1</sub> | 1.5+0.1/-0         |                  |
| E              | 1.75±0.1           |                  |
| F              | 5.5±0.05           |                  |
| P <sub>0</sub> | 4.0±0.1            |                  |
| P <sub>1</sub> | 8.0±0.1            |                  |
| P <sub>2</sub> | 2.0±0.05           |                  |
| T              | 0.30±0.05          |                  |
| T <sub>2</sub> | 1.0                |                  |
| W              | 12.0+0.3/-0.1      |                  |
| W <sub>1</sub> | 9.5                | Thickness 0.1MAX |

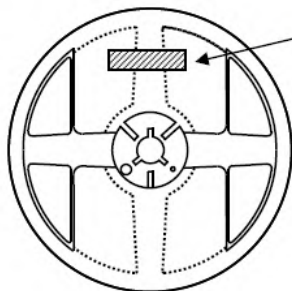
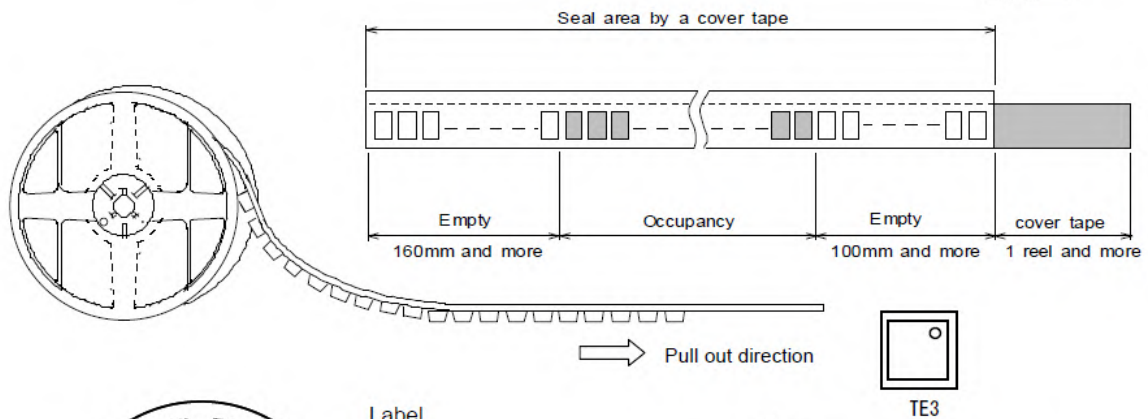


Unit : mm

| Symbol         | DFN8-W2 (ESON8-W2) |
|----------------|--------------------|
| 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              | 13.0+0.3/-0        |
| W <sub>1</sub> | 1.2                |
| Contents       | 1,500pcs           |



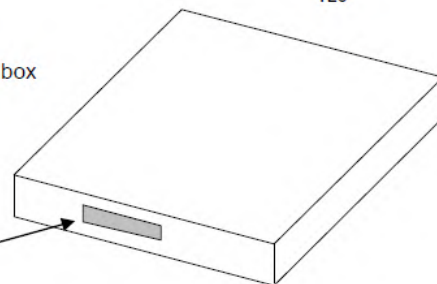
Unit : mm



Put in the outer box



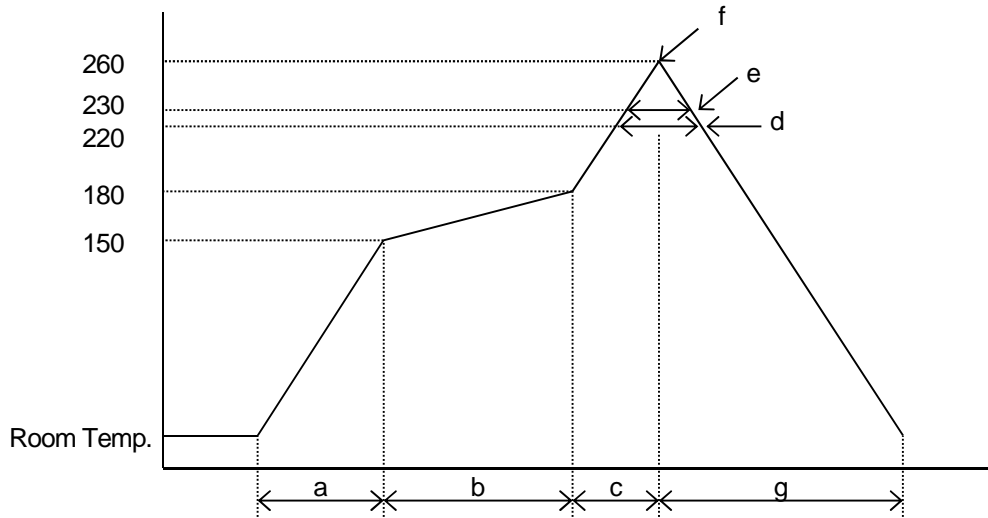
Label





## RECOMMENDED MOUNTING METHOD

\* Recommended reflow soldering procedure



- |                             |                    |
|-----------------------------|--------------------|
| a: Temperature ramping rate | : 1 to 4 /s        |
| b: Pre-heating temperature  | : 150 to 180       |
| time                        | : 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 ]

1. New JRC strives to produce reliable and high quality semiconductors. New JRC's semiconductors are intended for specific applications and require proper maintenance and handling. To enhance the performance and service of New JRC's semiconductors, the devices, machinery or equipment into which they are integrated should undergo preventative maintenance and inspection at regularly scheduled intervals. Failure to properly maintain equipment and machinery incorporating these products can result in catastrophic system failures
2. The specifications on this datasheet are only given for information without any guarantee as regards either mistakes or omissions. The application circuits in this datasheet are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights. All other trademarks mentioned herein are property of their respective companies.
3. To ensure the highest levels of reliability, New JRC products must always be properly handled. The introduction of external contaminants (e.g. dust, oil or cosmetics) can result in failures of semiconductor products.
4. New JRC offers a variety of semiconductor products intended for particular applications. It is important that you select the proper component for your intended application. You may contact New JRC's Sale's Office if you are uncertain about the products listed in this catalog.
5. Special care is required in designing devices, machinery or equipment which demand high levels of reliability. This is particularly important when designing critical components or systems whose failure can foreseeably result in situations that could adversely affect health or safety. In designing such critical devices, equipment or machinery, careful consideration should be given to amongst other things, their safety design, fail-safe design, back-up and redundancy systems, and diffusion design.
6. The products listed in the catalog may not be appropriate for use in certain equipment where reliability is critical or where the products may be subjected to extreme conditions. You should consult our sales office before using the products in any of the following types of equipment.

Aerospace Equipment  
Equipment Used in the Deep sea  
Power Generator Control Equipment (Nuclear, Steam, Hydraulic)  
Life Maintenance Medical Equipment  
Fire Alarm/Intruder Detector  
Vehicle Control Equipment (airplane, railroad, ship, etc.)  
Various Safety devices

7. New JRC's products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in this catalog. Failure to employ New JRC products in the proper applications can lead to deterioration, destruction or failure of the products. New JRC shall not be responsible for any bodily injury, fires or accident, property damage or any consequential damages resulting from misuse or misapplication of its products. Products are sold without warranty of any kind, either express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose.
8. Warning for handling Gallium and Arsenic(GaAs) Products (Applying to GaAs MMIC, Photo Reflector). This Products uses Gallium(Ga) and Arsenic(As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed, please follow the related regulation and do not mix this with general industrial waste or household waste.
9. The product specifications and descriptions listed in this catalog are subject to change at any time, without notice.

