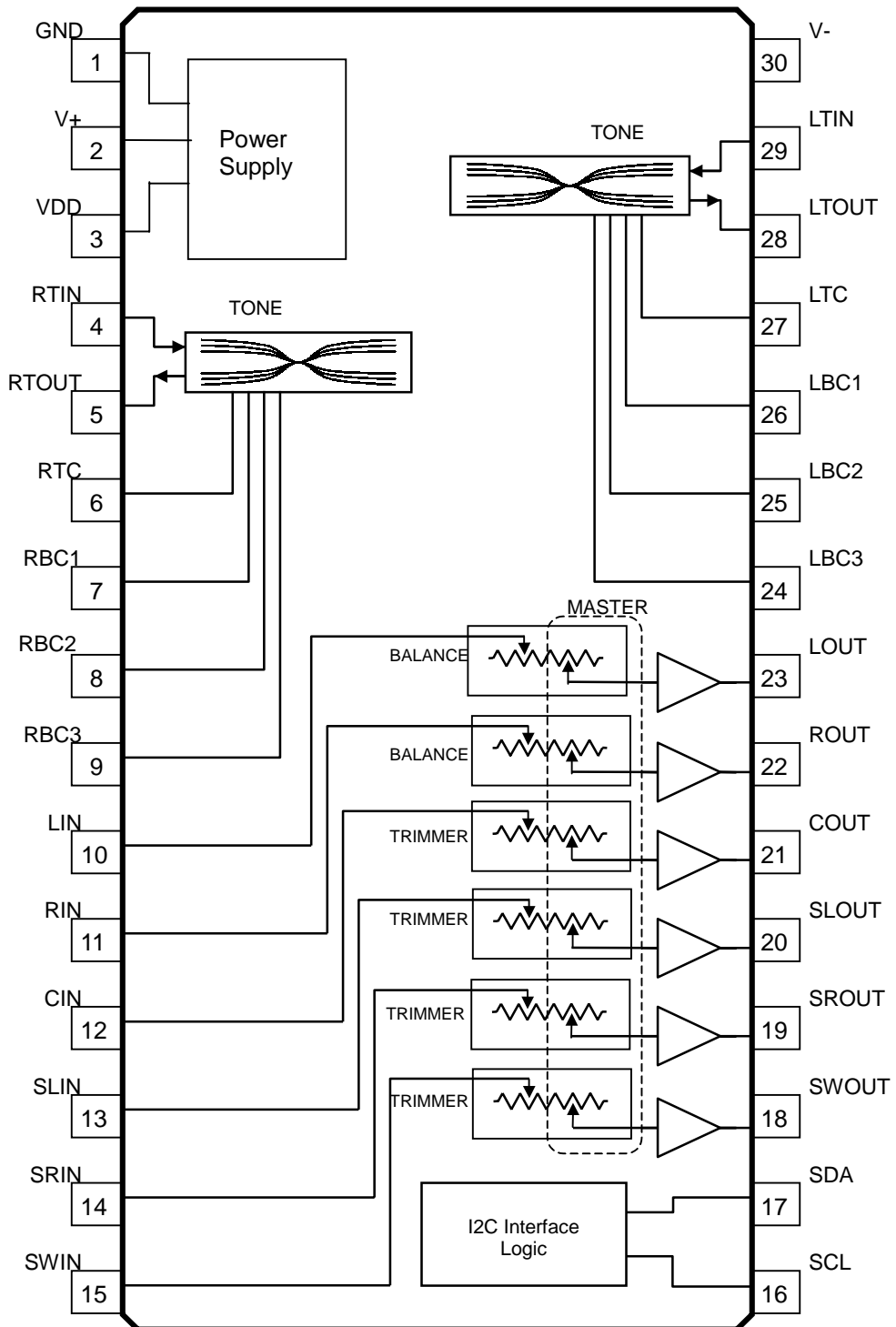


NJW1150

■ PIN FUNCTION



■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------------|-----------|-----------------|------|
| Supply Voltage 1 | V^+/V^- | +7.5/-7.5 | V |
| Supply Voltage 2 | V_{DD} | 7.0 | V |
| Maximum Input Voltage | V_{IM} | $V^+/V^-^{(*)}$ | V |
| Power Dissipation | P_D | 700 | mW |
| Operating Temperature Range | T_{opr} | -20 to +85 | °C |
| Storage Temperature Range | T_{stg} | -40 to +125 | °C |

(*) For the maximum input voltage less than V^+/V^-

■ ELECTRICAL CHARACTERISTICS (Ta=25°C, $V^+/V^- = \pm 7V$, $V_{DD}=5V$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------|--------|----------------|------|------|------|------|
|-----------|--------|----------------|------|------|------|------|

Power Supply

| | | | | | | |
|---------------------|-----------|-----------|-----|-----|-----|----|
| Operating Voltage 1 | V^+/V^- | | 4.5 | 7.0 | 7.5 | V |
| Operating Voltage 2 | V_{DD} | | 4.5 | 5.0 | 5.5 | V |
| Supply Current 1 | I_{CC} | No Signal | - | 8 | 14 | mA |
| Supply Current 2 | I_{EE} | No Signal | - | 8 | 14 | mA |
| Supply Current 3 | I_{DD} | No Signal | - | 10 | 100 | μA |

Input/Output Characteristics

| | | | | | | |
|---------------------------|-----------------|------------------------------------------------------------------------|------|----------------|---------------|---------------|
| Voltage Gain | G_V | $V_{IN}=1V_{rms}$, $f=1kHz$ Master=0dB, Balance=0dB Trimmer=0dB | -0.5 | 0 | 0.5 | dB |
| Voltage Gain Error | ΔG_V | $V_{IN}=1V_{rms}$, $f=1kHz$ Master=0dB | -0.5 | 0 | 0.5 | dB |
| Maximum Attenuation 1 | A_{TT1} | $f=1kHz$, $V_{IN}=1V_{rms}$ Master=-79dB | - | -79 | - | dB |
| Maximum Attenuation 2 | A_{TT2} | $f=1kHz$, $V_{IN}=1V_{rms}$ Mute | - | -90 | - | dB |
| Attenuation Error | ΔA_{TT} | $f=1kHz$, $V_{IN}=1V_{rms}$ Master=-50dB Trimmer=-10dB | -1 | 0 | 1 | dB |
| Maximum Output Voltage | V_{OM} | $f=1kHz$, THD=1% Master=0dB | 3.0 | 4.0 | - | Vrms |
| Output Noise | V_{NO} | Master=0dB, $R_g=0$, A-weight | - | -110 (3.2μ) | -100 (10μ) | dBV (Vrms) |
| Total Harmonic Distortion | T.H.D | $f=1kHz$, $V_o=1V_{rms}$, Master=0dB, Trimmer=0dB | - | 0.005 | 0.05 | % |
| Channel Separation | CS | $f=1kHz$, $V_o=1V_{rms}$ Master=0dB, A-weight | - | -80 | -70 | dB |

Tone Control Characteristics

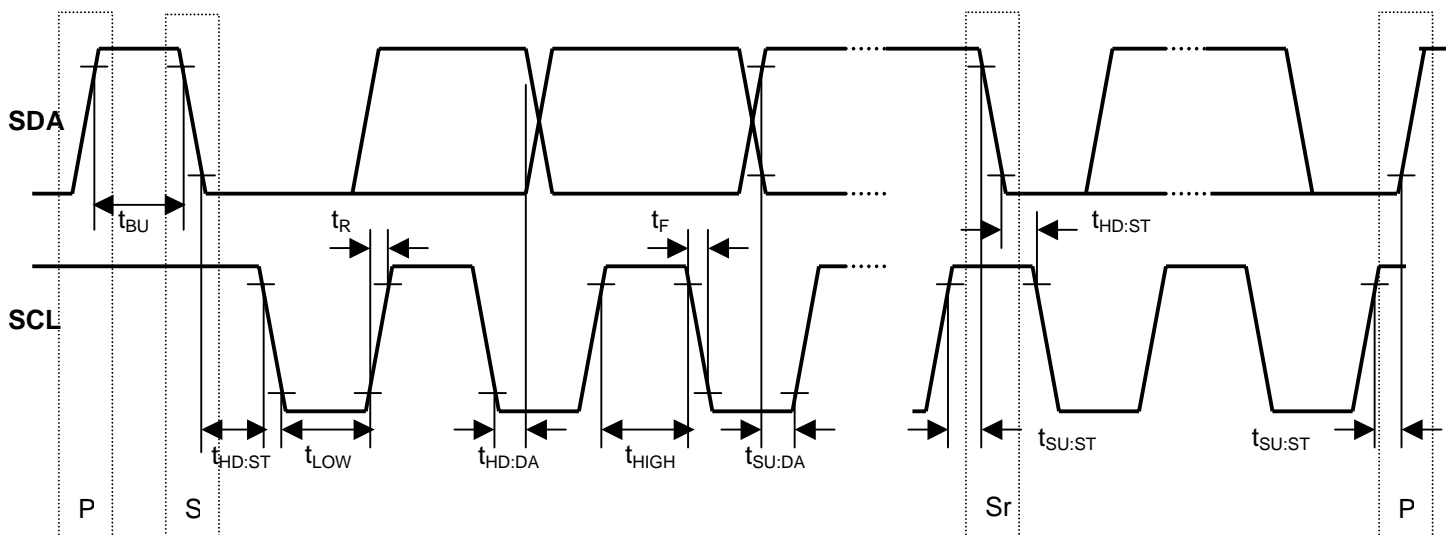
| | | | | | | |
|--------------------|------------|------------------------------------------|-----|-----|----|----|
| Treble Boost Gain1 | HF_{BST} | $V_o=1V_{rms}$ $f=10kHz$ Treble=10dB | 8 | 10 | 12 | dB |
| Treble Boost Gain2 | HF_{CUT} | $V_o=1V_{rms}$ $f=10kHz$ Treble=-10dB | -12 | -10 | -8 | dB |
| Bass Boost Gain1 | LF_{BST} | $V_o=1V_{rms}$ $f=50Hz$ Bass=10dB | 8 | 10 | 12 | dB |
| Bass Boost Gain2 | LF_{CUT} | $V_o=1V_{rms}$ $f=50Hz$ Bass=-10dB | -12 | -10 | -8 | dB |

NJW1150

■ I²C BUS BLOCK CHARACTERISTICS (SDA, SCL)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------------|--------------|------|------|------|---------|
| High Level Input Voltage | V_{IH} | 3.0 | - | 5.0 | V |
| Low Level Input Voltage | V_{IL} | 0 | - | 1.5 | V |
| High Level Input Current | I_{IH} | - | - | 10 | μ A |
| Low Level Input Current | I_{IL} | - | - | 10 | μ A |
| Low Level Output Voltage (3mA at SDA pin) | V_{OL} | 0 | - | 0.4 | V |
| Maximum Output Current | I_{OL} | -3.0 | - | - | mA |
| Maximum Clock Frequency | f_{SCL} | 0 | - | 100 | kHz |
| Data Change Minimum Waiting Time | t_{BUF} | 4.7 | - | - | μ s |
| Data Transfer Start Minimum Waiting Time | $t_{HD:STA}$ | 4.0 | - | - | μ s |
| Low Level Clock Pulse Width | t_{LOW} | 4.7 | - | - | μ s |
| High Level Clock Pulse Width | T_{HIGH} | 4.0 | - | - | μ s |
| Minimum Start Preparation Waiting Time | $t_{SU:STA}$ | 4.7 | - | - | μ s |
| Minimum Data Hold Time | $t_{HD:DAT}$ | 5.0 | - | - | μ s |
| Minimum Data Preparation Time | $t_{SU:DAT}$ | 250 | - | - | ns |
| Rise Time | t_R | - | - | 1.0 | μ s |
| Fall Time | t_F | - | - | 300 | ns |
| Minimum Stop Preparation Waiting Time | $t_{SU:STO}$ | 4.7 | - | - | μ s |

I²C BUS Load Condition: Pull up resistance 4k Ω (Connected to +5V)
Load capacitance 200pF (Connected to GND)



■ TERMINAL DESCRIPTION

| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE(V) |
|---------|----------------|--------------------------------|--------------------|------------|
| 1 | GND | Ground | | 0 |
| 2 3 | V+ VDD | Power Supply | | V+ VDD |
| 4 29 | RTIN LTIN | R-ch TONE IN L-ch TONE IN | | 0 |
| 5 28 | RTOUT LTOUT | R-ch TONE OUT L-ch TONE OUT | | 0 |

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■ TERMINAL DESCRIPTION

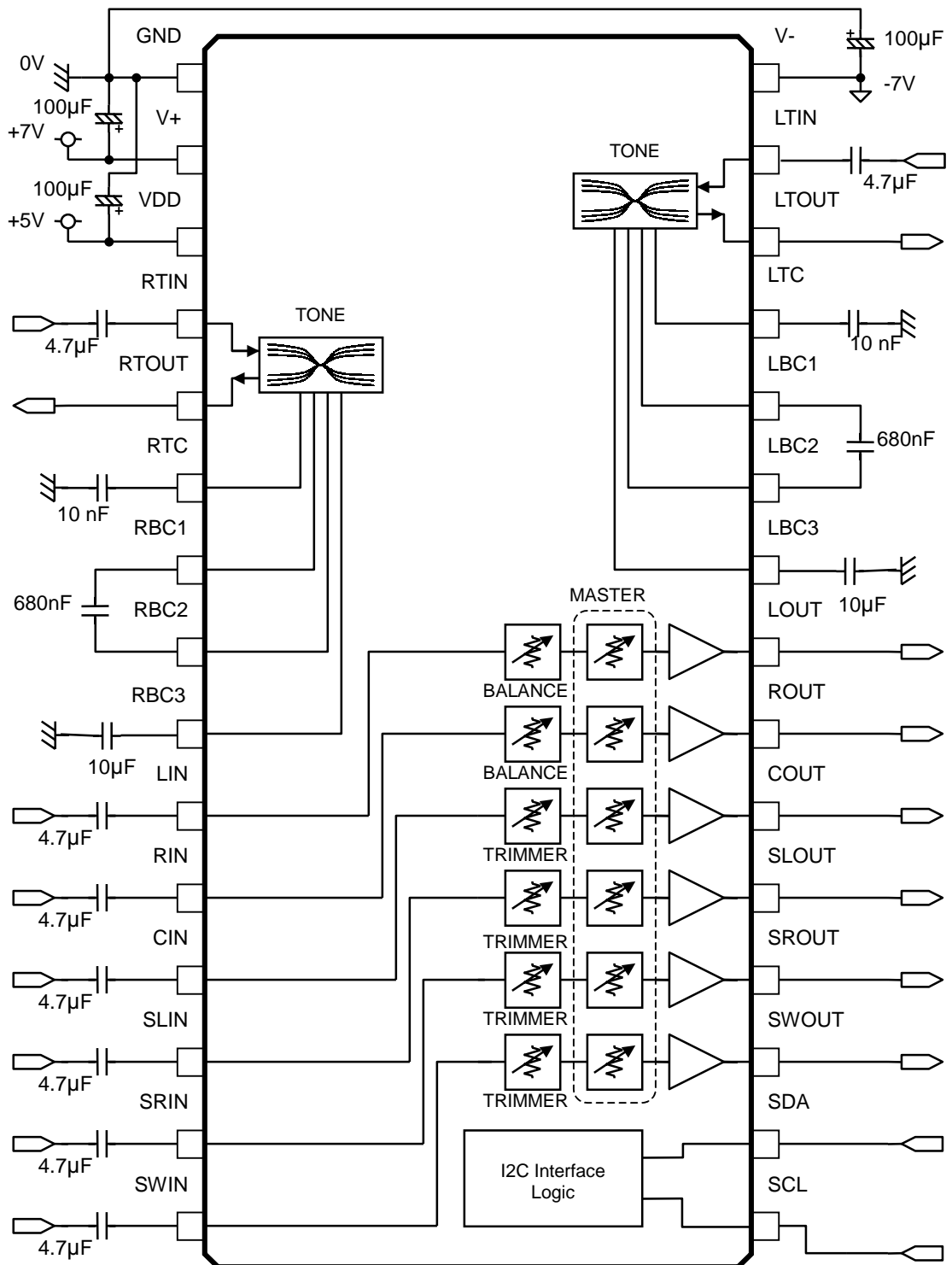
| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE(V) |
|---------|--------------|---------------------------|--------------------|------------|
| 6 27 | RTC LTC | Terminal for TONE Control | | 0 |
| 7 26 | RBC1 LBC1 | Terminal for TONE Control | | 0 |
| 8 25 | RBC2 LBC2 | Terminal for TONE Control | | 0 |
| 9 24 | RBC3 LBC3 | Terminal for TONE Control | | 0 |

■ TERMINAL DESCRIPTION

| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE(V) |
|----------------------------------|-------------------------------------------------|-------------------------------------------------------------------------|--------------------|------------|
| 10 11 12 13 14 15 | LIN RIN CIN SLIN SRIN SWIN | L-ch IN R-ch IN C-ch IN SL-ch IN SR-ch IN SW-ch IN | | 0 |
| 16 | SCL | I ² C Bus Clock Input | | 5 |
| 17 | SDA | I ² C Bus Data Input | | 5 |
| 18 19 20 21 22 23 | SWOUT SROUT SLOUT COUT ROUT LOUT | SW-ch OUT SR-ch OUT SL-ch OUT C-ch OUT R-ch OUT L-ch OUT | | 0 |

NJW1150

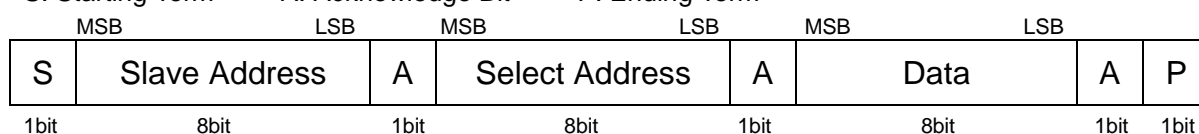
APPLICATION CIRCUIT



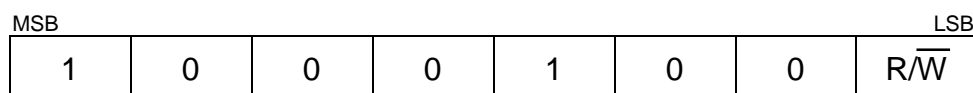
■ DEFINITION OF I²C REGISTER

● I²C BUS FORMAT

S: Starting Term A: Acknowledge Bit P: Ending Term



● SLAVE ADDRESS



R/W=0: Receive Only

R/W=1: No Output Data

● CONTROL REGISTER TABLE

| Select Address | BIT | | | | | | | |
|----------------|---------------|---------------|----|------------------------|-------------|----|----|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 00H | * | Master Volume | | | | | | |
| 01H | * | | | Left channel Balance | | | | |
| 02H | * | | | Right channel Balance | | | | |
| 03H | * | | | Center Channel Trimmer | | | | |
| 04H | * | | | SL Channel Trimmer | | | | |
| 05H | * | | | SR Channel Trimmer | | | | |
| 06H | * | | | SW Channel Trimmer | | | | |
| 07H | Tone (Treble) | | | | Tone (Bass) | | | |
| 08H | * | MUTE | | | | | | |

* : Don't care.

On Power up, The master volume mute is activated.

● CONTROL REGISTER DEFAULT VALUE

| Select Address | BIT | | | | | | | |
|----------------|-----|----|----|----|----|----|----|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 00H | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 01H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03H | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 04H | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 05H | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 06H | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 07H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

● CONTROL COMMAND TABLE

| Select Address | BIT | | | | | | | | REMARKS |
|-------------------|--------|----|------|----|------|----|----|----|-----------------------------------------------------------------------------------------------------------------------------------------------|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| 07H | TREBLE | | | | BASS | | | | TONE CONTROL Ex.) "11011101"=+10dB "11001100"=+8dB : "10001000"=0dB "00000000"=0dB : "01000111"=-8dB "01010101"=-10dB |
| | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | |
| | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | |
| | : | | | | | | | | |
| | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | : | | | | | | | | |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | | |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | | |
| 08H | * | | MUTE | | | | | | MUTE CONTROL Ex.) "0"=OFF "1"=MUTE D5=L ch,D4=R ch,D3=C ch,D2=SL ch,D1=SR ch,D0=SW ch |
| | | | 0 | | | | | | |
| | | | 1 | | | | | | |

■ NOTE

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