



INVERTER

104PW191

DATA SHEET

(2nd edition)

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INTRODUCTION

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NEC products are classified into the following three quality grades:

"Standard", "Special", "Specific"

The ***"Specific"*** quality grade applies only to applications developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a product depend on its quality grade, as indicated below. Customers must check the quality grade of each application before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Military systems, aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems (medical equipment, etc.) and any other equipment

The quality grade of this product is ***"Standard"*** unless otherwise specified in this document. If customers intend to use this product for applications other than those specified for ***"Standard"*** quality grade, they should contact NEC Corporation sales representative in advance.

Anti-radioactive design is not implemented in this product.

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1. OUTLINE

1.1 STRUCTURE AND PRINCIPLE

104PW191 inverter for LCD (Liquid crystal display) modules is composed of a DC/AC inversion circuit, a luminance control circuit and a boosting transformer.

The DC/AC inversion circuit inverts a direct current (DC) power supply into an alternating current (AC) by the center-tap transmitter circuit that used transistors.

The luminance control circuit can control the luminance of cold cathode lamps for LCD backlight unit.

The boosting transformer is translated the low AC voltage that obtained from a DC/AC inversion circuit to the high AC voltage. Also the high AC voltage is outputted from a secondary side of the boosting transformer.

1.2 APPLICATIONS

- High AC voltage generator of cold cathode fluorescent lamp for LCD

1.3 FEATURES

- Pulse width modulation circuit

2. GENERAL SPECIFICATIONS

<i>Driving system</i>	Externally commutated system
<i>Luminance control system</i>	Pulse width modulation
<i>Input voltage for power supply</i>	12.0 V (typ.)
<i>Output voltage</i>	<i>At steady state</i> 600 Vrms (typ.) <i>At open (e.g. Start-working of lamp)</i> 1,250 Vrms (typ.)
<i>Combined load</i>	<i>Resistance</i> 85 kΩ (typ.) <i>Stray capacity</i> 5 pF (typ.)
<i>Oscillation frequency</i>	65 kHz (typ.)
<i>Board size</i>	105.0 (W) × 26.5 (H) × 10.0 (D) mm (typ.)
<i>Weight</i>	20.0 g (typ.)
<i>Adaptable product</i>	<i>LCD module</i> NL10276BC20-04 <i>Lamp holder unit</i> 104LHS35

3. DETAILED SPECIFICATIONS

3.1 MECHANICAL SPECIFICATIONS

Parameter	Specification	Unit
Board size	105.0 ± 0.5 (W) \times 26.5 ± 0.5 (H) \times 10.0 ± 0.5 (D) Note1	mm
Weight	20.0 (typ.), 23.0 (max.)	g

Note1: See "6. OUTLINE DRAWINGS".

3.2 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Rating	Unit	Remarks
Combined load	Resistance	RL	90	k Ω	Ta = 25°C
	Stray capacity	CL	5	pF	
Input voltage	Power supply for inverter	VDDB	0 to +15.0	V	
	BRTI signal	VBI	-0.3 to +15.0	V	-
	BRTC signal	VBC	-0.3 to +15.0	V	
Storage temperature		Tst	-30 to +85	°C	-
Operating temperature	Front surface	TopF	-10 to +70	°C	
	Rear surface	TopR	-10 to +70	°C	
Relative humidity Note1		RH	≤ 95	%	Ta $\leq 40^\circ\text{C}$
			≤ 85	%	40 < Ta $\leq 50^\circ\text{C}$
			≤ 70	%	50 < Ta $\leq 55^\circ\text{C}$
			≤ 60	%	55 < Ta $\leq 60^\circ\text{C}$
			≤ 50	%	60 < Ta $\leq 65^\circ\text{C}$
			≤ 42	%	65 < Ta $\leq 70^\circ\text{C}$
Absolute humidity Note1		-	≤ 78 Note2	g/m ³	Ta > 70°C

Note1: No condensation

Note2: Ta = 70°C, RH = 42%

3.3 ELECTRICAL CHARACTERISTICS

3.3.1 Driving for inverter

(Ta = 25°C)

Parameter			Symbol	Min.	Typ.	Max.	Unit	Remarks
Combined load	Resistance		RL	-	85	90	kΩ	-
	Stray capacity		CL	-	5	-	pF	
Input voltage	Power supply for inverter		VDDB	10.8	12.0	13.2	V	-
	BRTI signal		VBI	0	-	2.5	V	
	BRTC signal	Low	VBCL	0	-	0.8	V	at inverter power OFF
		High	VBCH	2.0	-	VDDB	V	at inverter power ON
Input current	Power supply for inverter		IDDB	-	530	750	mA	at maximum luminance, VDDB = 12.0V Note1
Output voltage	Power supply for LCD lamp		VS	1,150	1,250	1,500	Vrms	Starting voltage for lamp, RL = ∞, CL = ∞
Output current	LCD lamp		IBL	4.5	5.0	5.5	mArms	-
Oscillation frequency			FO	60	65	70	kHz	
Luminance control frequency for LCD lamp			FL	240	270	300	Hz	

Note1: The power supply lines (VDDB and GNDB) occurs large ripple voltage while luminance control of LCD lamps. There is the possibility that the ripple voltage produces acoustic noise and signal wave noise in audio circuit and so on. Put a capacitor (5,000 to 6,000μF) between the power source lines (VDDB and GNDB) to reduce the noise, if the noise occurred in the circuit.

3.3.2 Fuse

Fusing line	Fuse		Rating	Fusing current Note1
	Type	Supplier		
VDDB	MMCT1.6A	S.O.C. Corporation	1.6 A	3.2 A
			63 V	

Note1: The power supply capacity should be more than the fusing current. If the power supply capacity is less than the fusing current, the fuse may not blow for a short time, and then nasty smell, smoking and so on may occur.

3.4 CONNECTIONS AND FUNCTIONS FOR INTERFACE PINS

3.4.1 Detail of interface pins

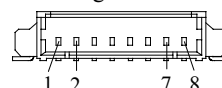
CN1 socket: 53261-0890 (MOLEX Inc.)

Adaptable plug: 51021-0800 (MOLEX Inc.)

Pin No.	Symbol	Function	Remarks
1	VDDB	Power supply	-
2	VDDB	Power supply	
3	GNDB	Ground	
4	GNDB	Ground	
5	BRTC	Inverter ON/OFF signal	ON: High, OFF: Low
6	BRTI	Input of luminance control by resistor / voltage control method	Note1
7	GNDB	Ground	-
8	NC	Non connection	

Note1: See "3.5 LUMINANCE CONTROLS".

CN1: Figure of socket

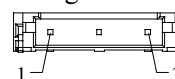


CN2 socket: SM03 (4.0) B-BHS-TB (J.S.T. Mfg Co., Ltd.)

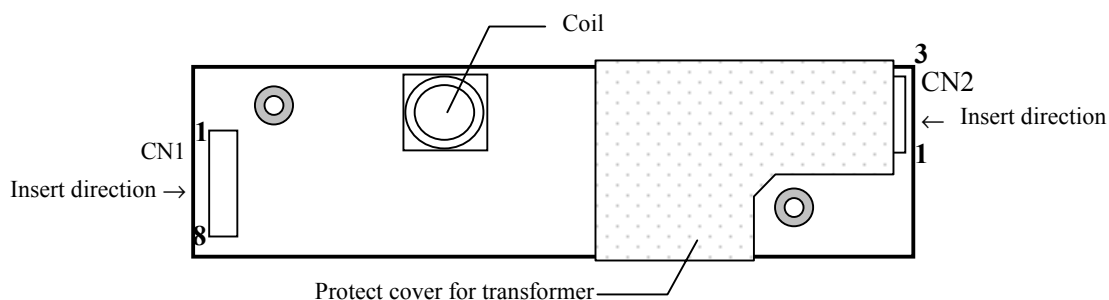
Adaptable plug: BHR-03VS-1 (J.S.T. Mfg Co., Ltd.)

Pin No.	Symbol	Signal	Remarks
1	VBLC	Low voltage (Cold)	-
2	VLH	High voltage (Hot)	
3	VLH	High voltage (Hot)	

CN2: Figure of socket

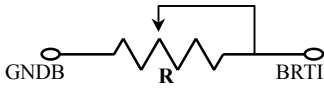


3.4.2 Positions of sockets



3.5 LUMINANCE CONTROLS

Luminance control functions are used when control the luminance of LCD lamps.

Method	Adjustment and luminance ratio						
Resistor control	<ul style="list-style-type: none"> Adjustment <p>The variable resistor (R) for luminance control should be $10k\Omega \pm 5\%$, B curve, 1/10W. Minimum point of the resistor is the maximum luminance. Also maximum point of the resistor is the minimum luminance.</p>  Luminance ratio Note1 <table border="1"> <thead> <tr> <th>Resistance</th><th>Luminance ratio</th></tr> </thead> <tbody> <tr> <td>0kΩ</td><td>100% (Maximum)</td></tr> <tr> <td>10kΩ</td><td>20% (Minimum)</td></tr> </tbody> </table> 	Resistance	Luminance ratio	0k Ω	100% (Maximum)	10k Ω	20% (Minimum)
Resistance	Luminance ratio						
0k Ω	100% (Maximum)						
10k Ω	20% (Minimum)						
Voltage control	<ul style="list-style-type: none"> Adjustment <p>This control method can carry out continuation adjustment of luminance, if it is adjusted within the rated voltage for BRTI signal (VBI).</p> Luminance ratio Note1 <table border="1"> <thead> <tr> <th>BRTI voltage (VBI)</th><th>Luminance ratio</th></tr> </thead> <tbody> <tr> <td>0V</td><td>100% (Maximum)</td></tr> <tr> <td>2.5V</td><td>20% (Minimum)</td></tr> </tbody> </table> 	BRTI voltage (VBI)	Luminance ratio	0V	100% (Maximum)	2.5V	20% (Minimum)
BRTI voltage (VBI)	Luminance ratio						
0V	100% (Maximum)						
2.5V	20% (Minimum)						

Note1: These data are the target values.

4. RELIABILITY TESTS

Test item	Condition	Judgment
High temperature and humidity (Operation)	① $60 \pm 2^{\circ}\text{C}$, RH = 95% ② 500hours	No physical damage No electrical damage
High temperature (Operation)	① $70 \pm 3^{\circ}\text{C}$ ② 500hours	
High temperature (Non operation)	① $85 \pm 3^{\circ}\text{C}$ ② 500hours	
Low temperature (Operation)	① $-10 \pm 3^{\circ}\text{C}$ ② 500hours	
Low temperature (Non operation)	① $-30 \pm 3^{\circ}\text{C}$ ② 500hours	
Thermal shock (Operation)	① $-30 \pm 3^{\circ}\text{C}$...30minutes $85 \pm 3^{\circ}\text{C}$...30minutes ② 100cycles, 1hour/cycle	
Vibration (Non operation)	① 10 to 57Hz, Amplitude 0.75mm ② 58 to 500Hz, 9.8m/s^2 ③ 11 minute/cycle ④ X, Y, Z direction ⑤ 1 hour each directions	
Mechanical shock (Non operation)	① 980m/s^2 , 11ms ② $\pm\text{X}$, $\pm\text{Y}$, $\pm\text{Z}$ direction ③ 5 times each directions	

5. PRECAUTIONS

5.1 MEANING OF CAUTION SIGNS

The following caution signs have very important meaning. **Be sure to read "5.2 CAUTIONS", after understanding this contents!**



This sign has the meaning that customer will get an electrical shock, if customer has wrong operations.



This sign has the meaning that customer will be injured by himself, if customer has wrong operations.

5.2 CAUTIONS



Do not touch HIGH VOLTAGE PART of the inverter while turned on! Danger of an electrical shock.



- * Pay attention to burn injury for the working inverter! It may be over 25°C from ambient temperature.
- * Do not shock the inverter! Danger of breaking, because they are composed of sensitive parts. (Shock: To be not greater 980m/s² and to be not greater 11ms)

5.3 ATTENTIONS

5.3.1 Handling of the product

- ① Take hold of both ends without touch the mounting parts when customer pulls out products from inner packing box. If customer touches it, products may be broken down or out of adjustment, because of stress to mounting parts.
- ② If customer puts down the product temporarily, the product puts on flat subsoil as a non-mounting parts side turns down.
- ③ Take the measures of electrostatic discharge such as earth band, ionic shower and so on, when customer deals with the product, because products may be damaged by electrostatic.
- ④ Do not push-pull the interface connectors while the product is working, because wrong power sequence may break down the product.

5.3.2 Environment

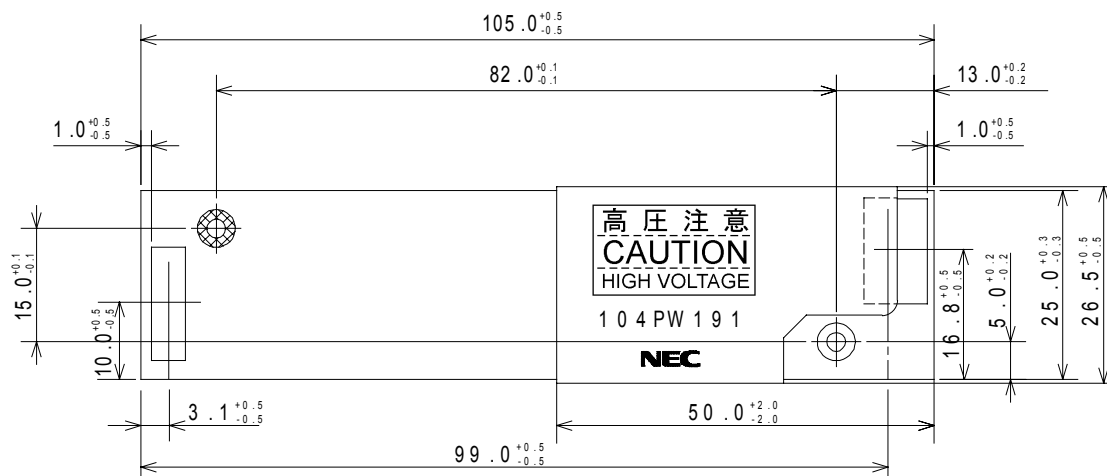
- ① Do not operate or store in high temperature, high humidity, dewdrop atmosphere or corrosive gases. Keep the product in antistatic pouch in room temperature, because of avoidance for dusts and sunlight, if customer stores the product.
- ② Do not operate in high magnetic field. Circuit boards may be broken down by it.

5.3.3 Other

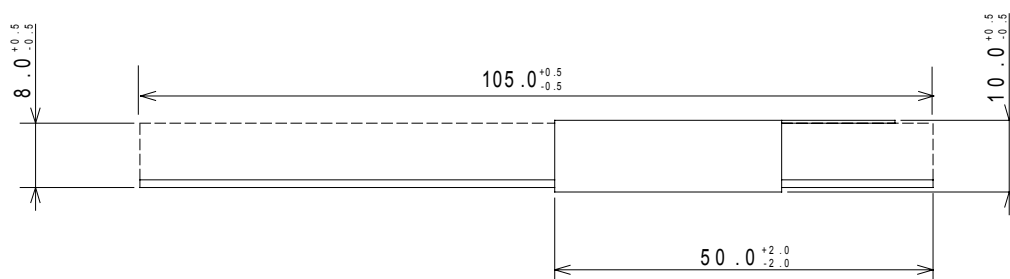
- ① All GNDB and VDDB terminals should be used without a non-connected line.
- ② Do not disassemble a product or adjust volume without permission of NEC Corporation.
- ③ Pay attention not to insert waste materials inside of products, if customer uses screw nails.
- ④ Put the spacer of 1.0mm thickness or more on a product rear side, because of the protection for contortion.

6. OUTLINE DRAWINGS

6.1 FRONT VIEW



6.2 SIDE VIEW



6.3 REAR VIEW

