DATA SHEET

NEC

INVERTER for LCD MODULE

104PW161

DC In/AC Out, Externally Communicated System

104PW161 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 altar 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.

APPLICATIONS

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

FEATURES

- Pulse width modulation circuit
- Alert circuit for malfunction

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CONTENTS

1. GENERAL SPECIFICATIONS

Driving system	Externally commutated system
Luminance control system	Pulse width modulation
Input voltage for power supply	12.0 V (typ.)
Output voltage	*At steady state* 600 Vrms (typ.) *At open (e.g. Start-working of lamp)* 1,250 Vrms (typ.)
Combined load	*Resistance* 100 kΩ (typ.) *Stray capacity* 5 pF (typ.)
Oscillation frequency	55 kHz (typ.)
Board size	105.0 (W) × 26.5 (H) × 9.5 (D) mm (typ.)
Weight	20.0 g (typ.)
Adaptable product	*LCD module* NL6448BC33-46 *Lamp holder unit* 104LHS35

2. DETAILED SPECIFICATIONS

2.1 MECHANICAL SPECIFICATIONS

Parameter	Specification	Unit
Board size	105.0 ± 0.5 (W) × 26.5 ± 0.5 (H) × 9.5 ± 0.5 (D) Note1	mm
Weight	20.0 (typ.), 23.0 (max.)	g

Note1: See "**5.OUTLINE DRAWINGS**".

2.2 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Rating	Unit	Remarks
Combined load	Resistance	RL	105	kΩ	Ta = 25°C
	Stray capacity	CL	5	pF	
Input voltage	Power supply for inverter	VDDB	0 to +14.0	V	
	BRTI signal	VBI	0 to +16.0	V	
	BRTC signal	VBC	-1.0 to VDDB+1.0	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 ≤ 40°C
			≤ 85	%	40 < Ta ≤ 50°C
			≤ 70	%	50 < Ta ≤ 55°C
			≤ 60	%	55 < Ta ≤ 60°C
			≤ 50	%	60 < Ta ≤ 65°C
			≤ 42	%	65 < Ta ≤ 70°C
Absolute humidity Note1		-	≤ 78 Note2	g/m^3	Ta > 70°C

Note1: No condensation
Note2: Ta = 70°C, RH = 42%

2.3 ELECTRICAL CHARACTERISTICS

2.3.1 Driving for inverter

(Ta = 25°C)

Parameter			Symbol	Min.	Typ.	Max.	Unit	Remarks
Combined load	Resistance		RL	95	100	105	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	-	0.4	V	at inverter power OFF
		High	VBCH	2.5	-	VDDB	V	at inverter power ON
Input current	Power supply for inverter		IDDB	-	550	750	mA	at maximum luminance, VDDB = 12.0V Note1
Output voltage	Power supply for LCD lamp		VS	1,200	1,250	1,500	Vrms	Starting voltage for lamp, RL = ∞, CL = ∞
	AM signal	Low	VBA	0	-	0.5	V	at normal
		High	VBA	4.5	5.0	5.5	V	at malfunction
Output current	LCD lamp		IBL	4.5	5.0	5.5	mArms	-
Oscillation frequency			FO	50	55	60	kHz	
Luminance control frequency for LCD lamp			FL	220	250	280	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.

2.3.2 Fuses

Fusing line	Fuse		Rating	Unit	Remark
	Type	Supplier			
VDDB	CCP2E15H	KOA Corporation	1.5	A	Fusing current Note1
			72	V	-

Note1: The power capacity should be more than the fusing current rating. If the power capacity is less than the criteria value, the fuse may not blow, and then nasty smell, smoking and so on may occur.

2.4 CONNECTIONS AND FUNCTIONS FOR INTERFACE PINS

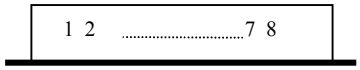
2.4.1 Detail of interface pins

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 or Open, OFF: Low
6	BRTI	Input of luminance control by resistor / voltage control method	Note1
7	GNDB	Ground	-
8	AM	Alert for malfunction signal	5.0V output at malfunction

Note1: See "2.5 LUMINANCE CONTROLS".

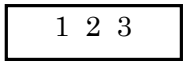
CN1: Figure of socket



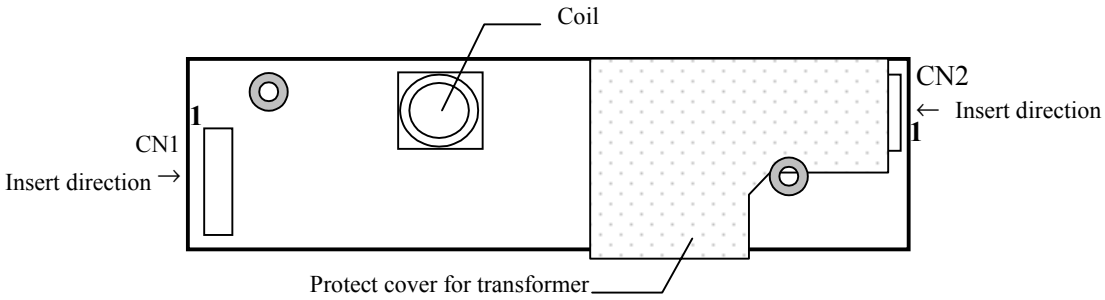
CN2 socket: SM03 (4.0) B-BHS-TB (J.S.T. Mfg Co., Ltd.)
Adaptable plug: BHR-03VS-1 (J.S.T. Mfg Co., Ltd.)

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

CN2: Figure of socket

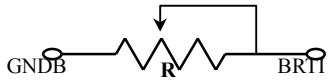


2.4.2 Positions of sockets



2.5 LUMINANCE CONTROLS

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

<table>
<tr><th>Method</th><th>Adjustment and luminance ratio</th></tr>
<tr><td>Resistor control</td><td>• Adjustment
The variable resistor (R) for luminance control should be 50kΩ ± 5%, B curve, 1/10W. Minimum point of the resistor is the minimum luminance. Also maximum point of the resistor is the maximum luminance.
 

• Luminance ratio Note1
<table>
<tr><th>Resistance</th><th>Luminance ratio</th></tr>
<tr><td>0kΩ</td><td>100% (Maximum)</td></tr>
<tr><td>50kΩ</td><td>10% (Minimum)</td></tr>
</table></td></tr>
<tr><td>Voltage control</td><td>• Adjustment
This control method can carry out continuation adjustment of luminance, if it is adjusted within the rated voltage for BRTI signal (VBI).
• Luminance ratio Note1
<table>
<tr><th>BRTI voltage (VBI)</th><th>Luminance ratio</th></tr>
<tr><td>0V</td><td>100% (Maximum)</td></tr>
<tr><td>2.5V</td><td>10% (Minimum)</td></tr>
</table></td></tr>
</table>

Note1: These data are the target values.

3. RELIABILITY TESTS

Test item	Condition	Judgment
High temperature and humidity (Operation)	① 60 ± 2°C, RH = 60% ② 500hours	No physical damage No electrical damage
High temperature (Operation)	① 70 ± 3°C ② 500hours	
High temperature (Non operation)	① 85 ± 3°C ② 500hours	
Low temperature (Operation)	① -10 ± 3°C ② 500hours	
Low temperature (Non operation)	① -30 ± 3°C ② 500hours	
Thermal shock (Operation)	① -20 ± 3°C…30minutes 60 ± 3°C…30minutes ② 100cycles, 1hour/cycle	
Vibration (Non operation)	① 10 to 55Hz, Amplitude 0.75mm ② 58 to 500Hz, 9.8m/s^2 ③ 11 minute/cycle ④ X, Y, Z direction ⑤ 60 minutes each directions	
Mechanical shock (Non operation)	① 980m/ s^2, 11ms ② ±X, ±Y, ±Z direction ③ 1 time each directions	

4. PRECAUTIONS

4.1 MEANING OF CAUTION SIGNS

The following caution signs have very important meaning. **Be sure to read "4.2 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.

4.2 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/s^2 and to be not greater 11ms)**

4.3 ATTENTIONS

4.3.1 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.

4.3.2 Environment

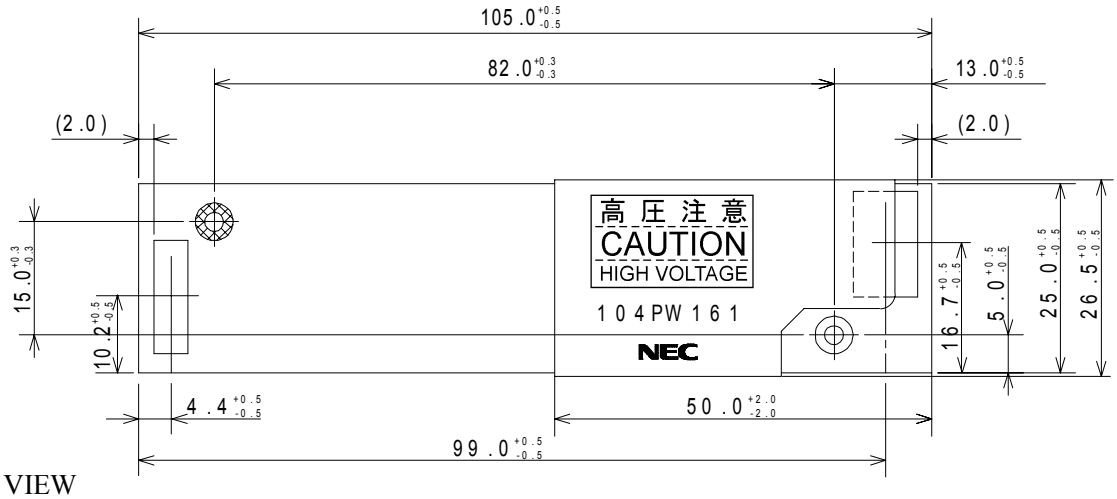
① Do not operate in dewdrop atmosphere and corrosive gases.
② Do not operate or store in high temperature or high humidity atmosphere. Keep the product in antistatic pouch in room temperature, because of avoidance for dusts and sunlight, if customer stores the product.
③ Do not operate in high magnetic field. Circuit boards may be broken down by it.

4.3.3 Other

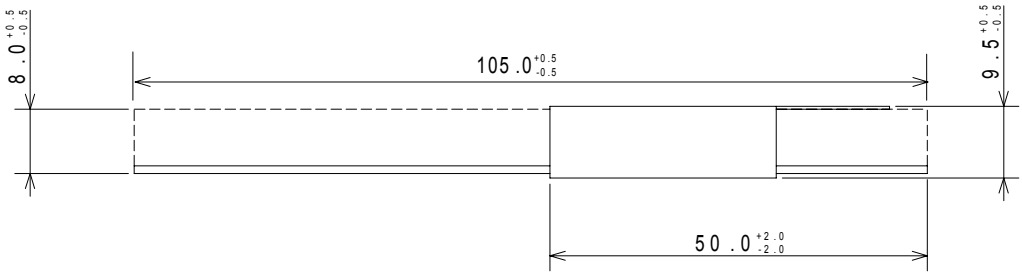
① All GNDB and VDDB terminals should be used without a non-connected line.
② Do not disassemble a product or adjust volume without permission of NEC Corporation.
③ Pay attention not to insert waste materials inside of products, if customer uses screwnails.
④ Pack the product with original shipping package, because of avoidance of some damages during transportation, when customer returns it to NEC Corporation for repair and so on.
⑤ Put the spacer of 1.0mm thickness or more on a product rear side, because of the protection for contortion.

5. OUTLINE DRAWINGS

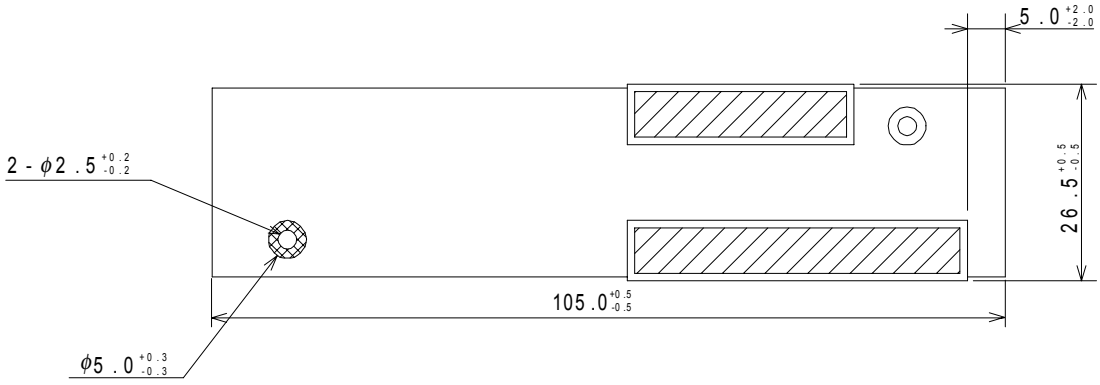
5.1 FRONT VIEW



5.2 SIDE VIEW



5.3 REAR VIEW



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Anti-radioactive design is not implemented in this product.

(Note)

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