

CXA-0385 (16W QUAD OUTPUTS WITH DIMMING FUNCTION)

Applicable LCD:

- AA150XN02 (MITSUBISHI)
- AA150XN03 (MITSUBISHI)
- AA150XN04 (MITSUBISHI)
- T-351863D150-FW-A-AB (OPTREX)

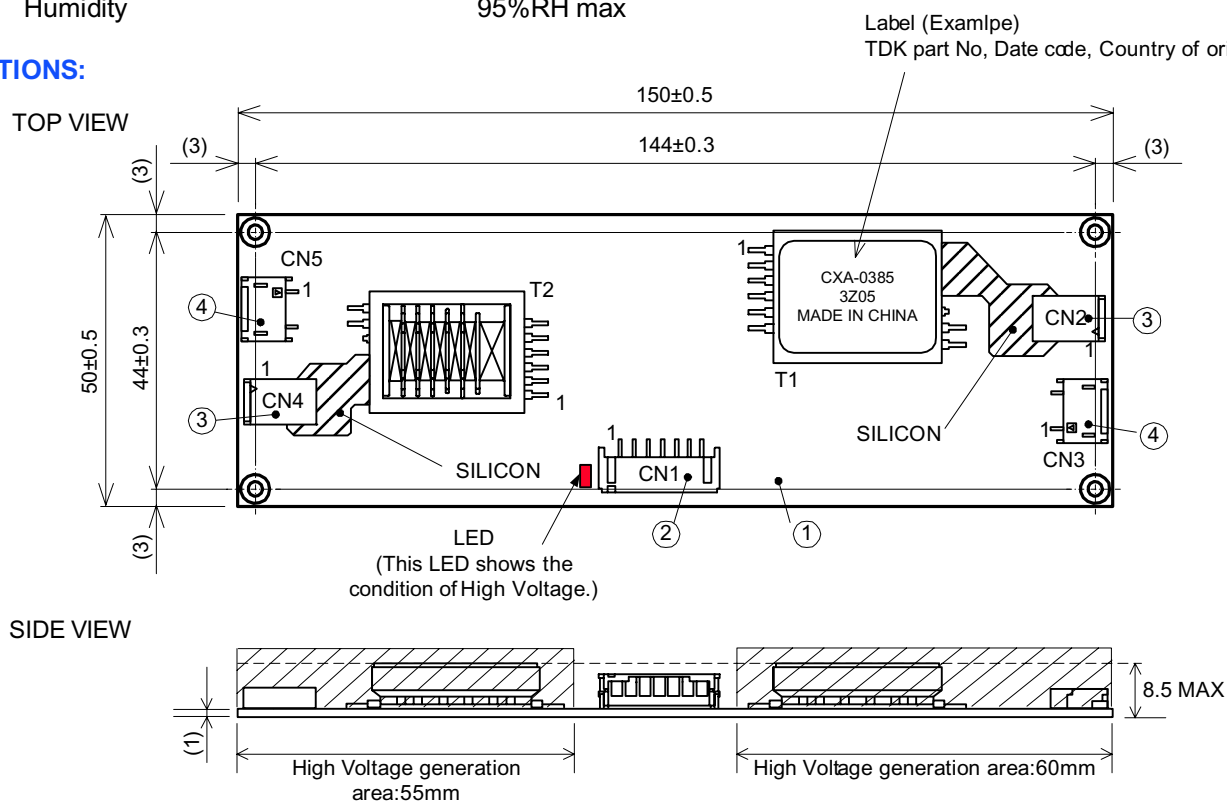
FEATURES:

- a. This inverter is for four lamps. It has Dimming function(PWM System) and Remote function.
- b. This product has shutdown function.
It prevents from keeping generating the high voltage when the lamps open.(Refer Note.6.)
- c. With lamp failure detector.
Normal Operation : CN1-6=0V
Some Lamps Open : CN1-6=5V
- d. Select the way of dimming (CN1-5)
 1. Insert a potentiometer (0-50kΩ)
 2. Apply the voltage (0-2.5V)
- e. When LED lights , it shows the generation of high voltage.
- f. The high-voltage area (terminals and patterns) is coated with silicone so as to avoid the defects caused by dust.

TEMPERATURE & HUMIDITY:

Operating Temperature Range	0°C ~ +70°C
Storage Temperature Range	-30°C ~ +85°C
Humidity	95%RH max

DIMENSIONS:



Note 1 : Please keep minimum 2mm clearance (all directions) between high voltage area as marked on mechanical drawing and any conductors.

BOTTOM VIEW



Unit:mm

Weight:43g

DC-AC INVERTER UNIT

CXA-0385 (16W QUAD OUTPUTS WITH DIMMING FUNCTION)

CONNECTOR CONFIGURATION:

No.	Part Description	Qty.	Material	Using connector	Corresponding connector
①	PWB	1	Composite (CEM-3) t=1.0mm	-	Using connector
②	Input Connector	1	-	S7B-PH-SM3(JST)	PHR-7(JST)
③	Output Connector	2	-	SM02B-BHSS-1(JST)	BHSR02VS-1(JST)
④	Output Connector	2	-	SM02(4.0)B-BHS-1(JST)	BHR-02VS-1(JST)

CN01:S7B-PH-SM3 (JST)

Pin	Symbol		Note
CN1-1	Vin	10.8~13.2V	Input Voltage
CN1-2			
CN1-3	GND	0V	Ground
CN1-4			
CN1-5	Vbr	0~2.5V	Brightness Control
	Rbr	0~50kΩ	
CN1-6	Vst	0V / 5V	Alarm Signal
CN1-7	Vrmt	0~0.4V : OFF 2.5~Vin : ON	Remote Control

Note2 : This is an output pin and it is active high(5V) if any Lamp opens / fails.

CN2,CN4:SM02B-BHSS-1 (JST)

Pin	Symbol	Note
CN2-1	Vhigh1	600Vrms / 6.5mArms
CN2-2	Vhigh2	600Vrms / 6.5mArms
CN4-1	Vhigh3	600Vrms / 6.5mArms
CN4-2	Vhigh4	600Vrms / 6.5mArms

CN3,CN5:SM02(4.0)B-BHS-1 (JST)

Pin	Symbol	Note
CN3-1	Vlow1	(2V)
CN3-2	Vlow2	(2V)
CN5-1	Vlow3	(2V)
CN5-2	Vlow4	(2V)

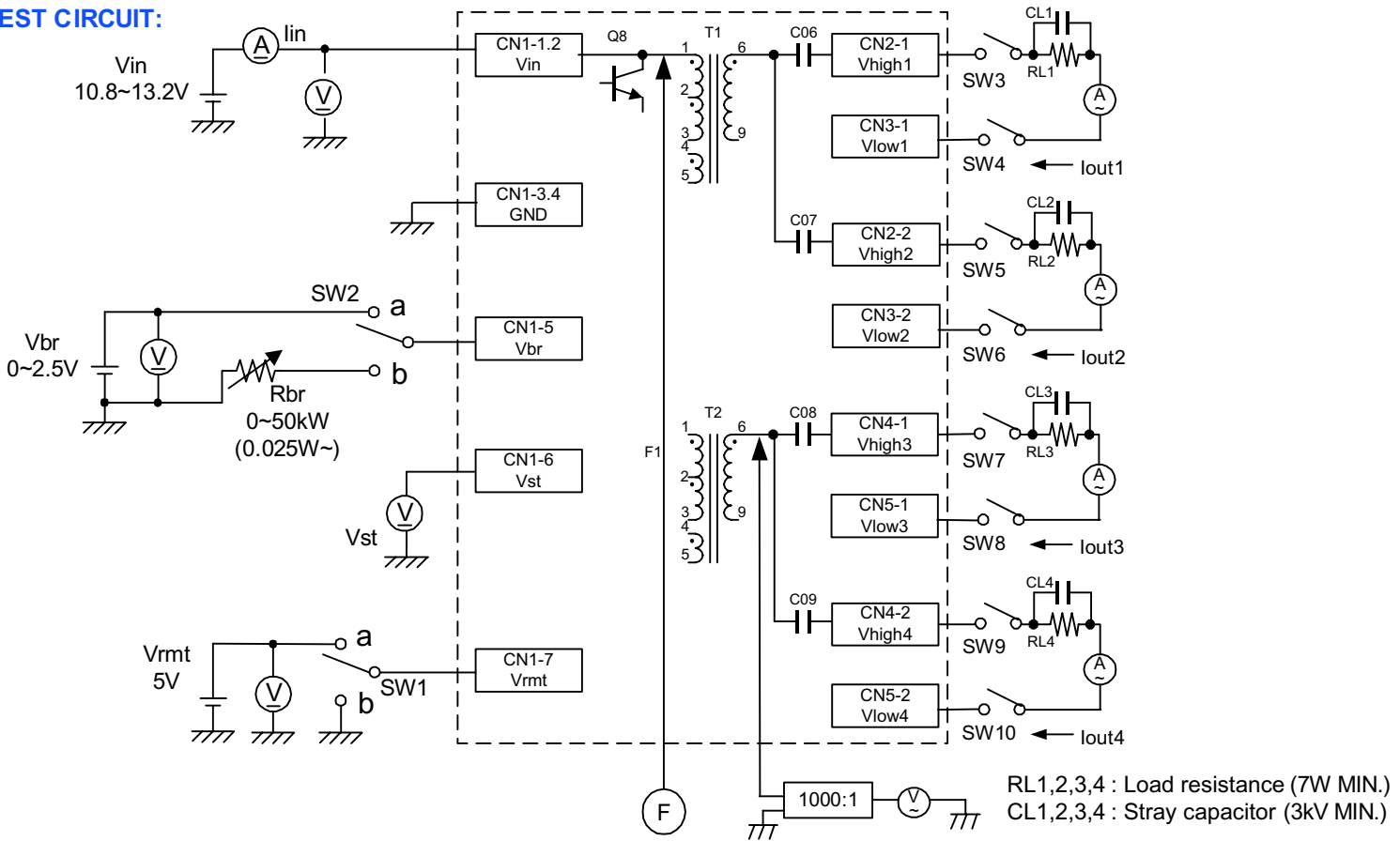
ELECTRICAL CHARACTERISTICS:

Parameter	Symbol	Conditions					Specifications			Unit	Note
		Vin(V)	Vrmt(V)	Vbr(V) / Rbr(kΩ)	Ta(°C)	RL1~RL4(kΩ) // CL1~CL4(μF)	min.	typ.	max.		
Output Current	lout1 ~lout4	12.0±1.2	5±0.25	0 / 0	0~70	90 // 5	6.0	6.5	7.0	mArms	Max Brightness
		12.0±1.2	5±0.25	2.5 / 50	0~70	90 // 5	2.3	3.0	3.7	mArms	Min Brightness
Input Current	lin1	12.0±1.2	5±0.25	0 / 0	0~70	90 // 5	-	1.7	2.0	A	
	lin2	12.0±1.2	0	0~2.5 / 0~50	0~70	90 // 5	-	-	1	mA	Remote OFF
Frequency	F1	12.0±1.2	5±0.25	0	0~70	90 // 5	45	50	55	kHz	
Frequency (Duty)	F2	12.0±1.2	5±0.25	2.5 / 50	0~70	90 // 5	240	270	300	Hz	
Open Voltage	Vopen	12.0±1.2	5±0.25	0	0~70	∞ / ∞	1.5	1.6	-	kVrms	
		12.0±1.2	5±0.25	0	0~70	90 // 5	-	0	-	V	Normal
Alarm Signal	Vst	12.0±1.2	5±0.25	0~2.5 / 0~50	0~70	90 // 5 Refer Note 6	4.5	5	5.5	V	Operation Alarm Signal

Note3. The test circuits added 5pF capacitor across the load resistor for LCD back light stay capacitor.

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TEST CIRCUIT:



Note 4. SW1 Operation is as following;

SW1	Operation of Unit
a	Operation
b	Non Operation
OPEN	Non Operation

Note 5. SW2 Operation is as following;

SW2	Operation of Unit
a	Voltage dimming Vbr=0~2.5V (Vbr=0V : Max Brightness)
b	Variable resistance dimming Rbr=0~50kΩ (Rbr=0Ω : Max Brightness)

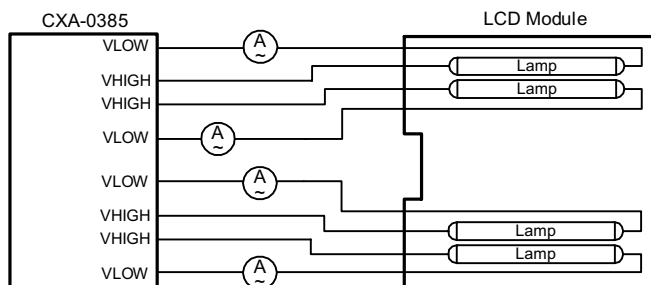
Note 6. Safety Function

Load Condition	*1Alarm Signal (CN1-6)	*2Shutdown Operation
Normal Operation	0.5V max.	Normal
1 Lamp Open	4.5~5.5V	Normal
2 Lamps Open	4.5~5.5V	Normal
3 Lamps Open	4.5~5.5V	Normal
4 Lamps Open	4.5~5.5V	Shutdown

*1. If the inverter detects open circuit all lamps for more than 3 seconds it will shut down.

*2. In test circuit, If anyone of switches SW3~SW10 opens, then the warning signal will be activated (+5V).

Note 7. Connection diagram of LCD module (Reference)



*Connect the High Frequency Current Meter to the Low-Voltage (VLOW) side.

MESSRS :

Product Specification

CUSTOMER'S PRODUCT NAME:

TDK PRODUCT NAME: DC-AC INVERTER UNIT
CXA-0385

TDK-Lambda

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DWG.No.	CTR-1248-E
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Precautionary Notes Regarding the Use of This Inverter

When using this product, give due consideration to the precautionary notes described below and ensure a safe design. Inappropriate use may result in electric shock, injury or fire.



Warning



This product is subject to high voltage. Do not touch it while the power is on. Failing to do so may result in electric shock.



Caution

This product is designed for the lighting of a Cold Cathode Fluorescent Lamp. Do not use it with any other load.

Store this product under the conditions defined in the specification document.

Do not store this product in an environment where dust, dirt or corrosive gas (salt, acid, base, etc.) is present.

This product is subject to high voltage. If there is a possibility that the user may touch the product, provide a proper indication in order to draw the user's attention.

This product is designed for use with general electronic equipment. If it is to be used with medical equipment that directly affects human life or for the control of transportation equipment to which passengers entrust their lives, provide thorough fail-safe measures.

Avoid using this product under high temperatures or high humidity or in an environment in which dust, dirt or any corrosive gas (salt, acid, base, etc.) is present. Also, be careful not to allow the formation of dew condensation. It may result in damage or electric shock.

If the product does not have a built-in protective circuit (circuit breaker, fuse, etc.), it is recommended that a fuse be used at the input stage to prevent the generation of smoke or fire in the event of a malfunction.

Even when the product has a built-in protective circuit (circuit breaker, fuse, etc.), the circuit may not function properly due to inappropriate operating conditions or power-supply capacity. It is recommended that an appropriate protective circuit (circuit breaker, fuse, etc.) be provided separately from the built-in circuit.

Use the product only within the specified input voltage, output power, output voltage and operating temperature ranges. Exceeding these values may result in damage, etc.

Provide a measure for the prevention of surge voltage due to lightning, etc. Abnormal voltage may result in damage, etc.

To prevent problems arising from short-circuiting of the high-voltage section, provide appropriate measures to prevent the entry of foreign substances following installation.

This product is not designed to provide resistance to radiation.

Ripples could be superimposed on the voltage and the current in the input source connected to the inverter, depending on the impedance in the input source, wiring, etc.

When you select an input source, please check waveforms, etc on the final set.

Handling Precautions

This product uses thin wires. Observe the following precautions and handle it with care so as not to cause wire breakage. Broken wire may result in damage, etc.

- Do not stack multiple products on top of one another.
- Do not allow the product to come in contact with tools, etc.
- Do not apply excessive stress during installation.

It may cause chipping and cracking, resulting in damage, etc.

Provide clearance between the high-voltage section of this product and the frame body on which the product is installed and also the conductor section as per listed on section [1] "Outline".

Please do not use the product, when dropping it, since there is a possibility of the parts damage. Please confirm abnormality is not found in the product enough when using it by any chance.

	No.	MATERIALS NAME	QU	MATERIAL	REMARK
	PRODUCT NAME or MODEL, TITLE				
	DC-AC INVERTER UNIT CXA-0385				
TDK CORPORATION	NAME OF DRAWING		DRAWING No.		PAGE
	Product Specification		CTR-1248-E		2/8

1. Part Name

The part name is CXA-0384.

2. Contents

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7-1. Test Cond.	[7] section	8
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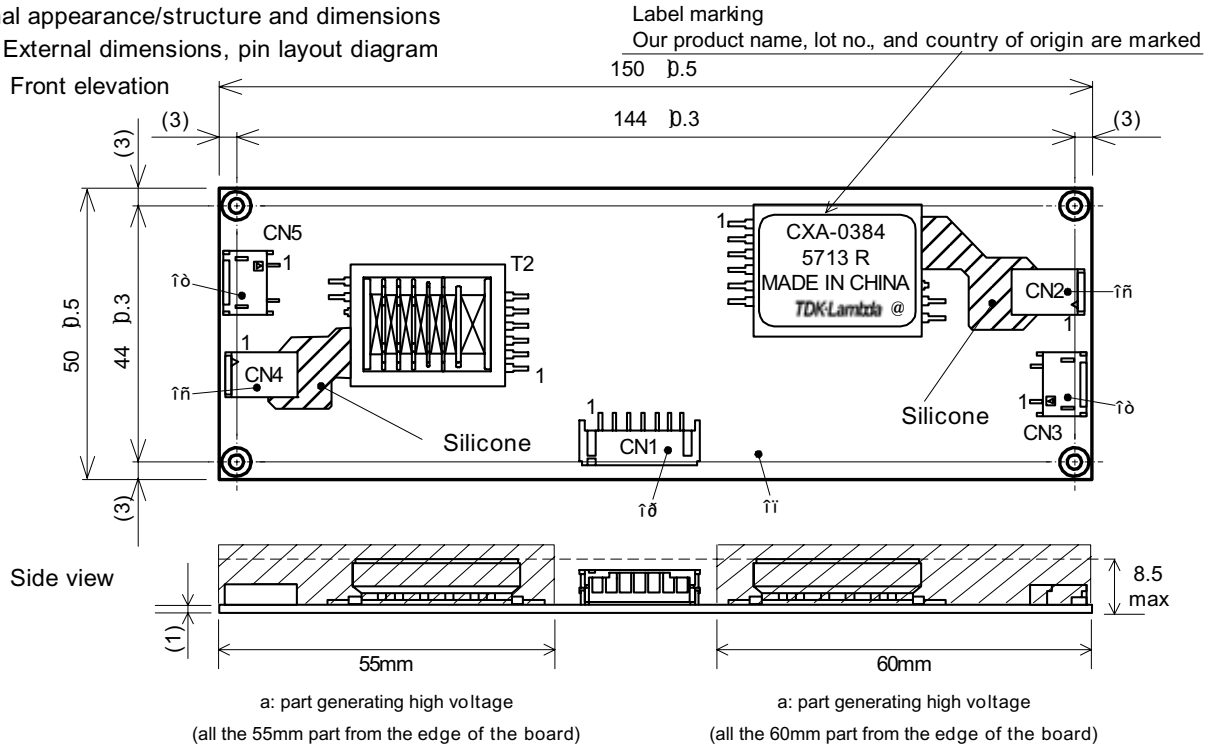
Listed description are subject to change without notice.

Product Outline

- ¥ This product is a 4-lamp inverter and has dimming functions (PMW method) and remote functions.
- ¥ This product has a shutdown function for safety to stop high voltage generation when all loads (lamps) are open. (Note 4-3)
- ¥ This product has an alarm output (a lamp blowout detecting function) to inform load (lamp) abnormality when loads (lamps) are open. When loads (lamps) are connected normally, 0V is output on CN1-6, and when loads (lamps) are open, 5V is output on CN1-6.
- ¥ High voltage generation on the inverter board is marked by a lighted LED. (Note 4-3)
- ¥ The high voltage generating section is coated with silicone as a measure against dust.
- This product is conformity to RoHS directive.
 - Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

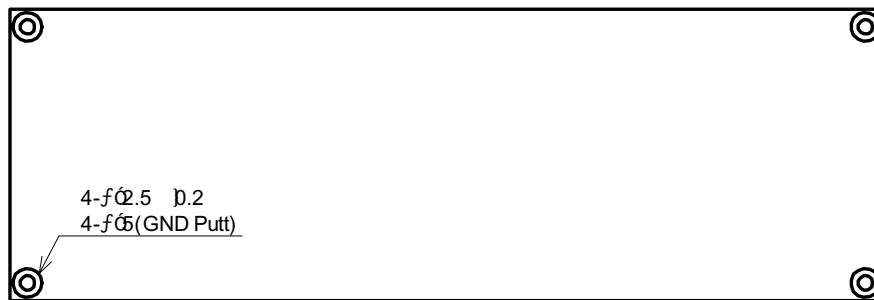
[1] External appearance/structure and dimensions

1-1. External dimensions, pin layout diagram



*Please secure the air clearance of 3mm or more from the high voltage generation area up and down and right and left.
Please refer to Note1-3. for details.

Rear view



Dimensions in mm
Weight: 45.0g (Typ.)

No.	Product name	Type name / material	Quantity	Remarks
1	Printed wiring board PWB	Composite (CEM-3)	1	UL94V-0 t=1.0
2	Input connector CN1	S7B-PH-SM4-TB(LF)(SN)	1	JST
3	Output connector CN2,4	SM02B-BHSS-1-TB(LF)(SN)	2	JST
4	Output connector CN3,5	SM02(4.0)B-BHS-1-TB(LF)(SN)	2	JST

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1-2. Pin connection

Input side

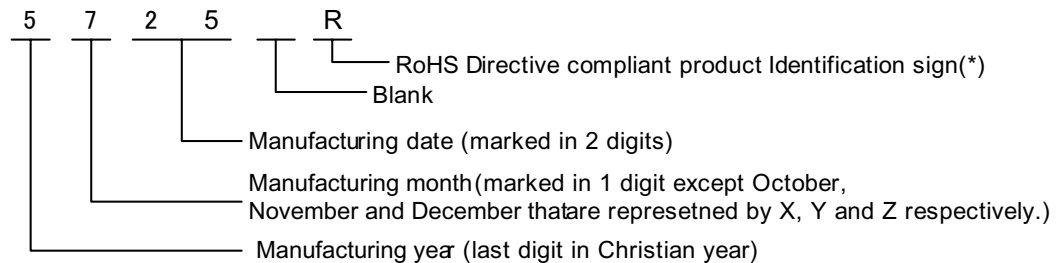
Pin No.	Symbol	Rating	Remarks
CN1-1	Vin	10.8 ~ 13.2V	Power input
CN1-2			
CN1-3	GND	0V	GND
CN1-4			
CN1-5	Vbr/Rbr	0 ~ 2.5V 0 ~ 50k Ω	Dimming pin
CN1-6 (Output)	Vst	0V/5V	Alarm output 5V when lamps are open
CN1-7	Vrmt	0V/2.5V Vin	Remote pin 0 ~ 0.4V:OFF 2.5 ~ Vin V:ON

Output side

Pin No.	Symbol	Rating	Remarks
CN2-1	VHIGH1	660Vrms	Output 1
CN2-2	VHIGH2	660Vrms	Output 2
CN3-1	VLOW1	(2V)	Return on output 1
CN3-2	VLOW2	(2V)	Return on output 2
CN4-1	VHIGH3	660Vrms	Output 3
CN4-2	VHIGH4	660Vrms	Output 4
CN5-1	VLOW3	(2V)	Return on output 3
CN5-2	VLOW4	(2V)	Return on output 4

Note 1-1. Marking of product name, lot no., and country of origin

- 1) Product name, lot no. and country of origin are marked on a label on a transformer.
- 2) Lot no. marking example (manufactured on Jul 25, 2005)



- 3) Country of origin marking example (MADE IN JAPAN and MADE IN CHINA, etc.)

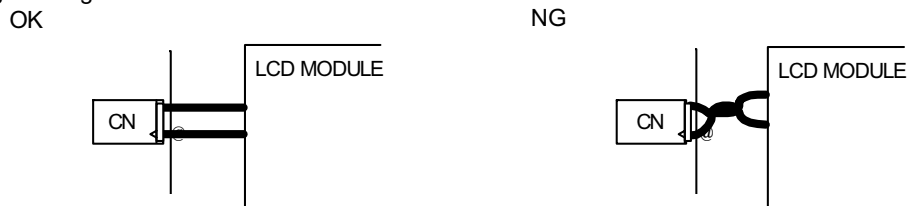
Note 1-2. As to pin connections, please refer to Section [4] Measurement Circuit.

Note 1-3. Part "a" (Between the transformer (T1) and CN2, and CN3 and the transformer (T2) and CN4, and CN5) in the external appearance diagram generates high voltage. When you mount a conductive material (metal frame, etc) nearby part "a" during installation, please be careful to secure 2mm or larger spacial distance in all directions around it to prevent electric discharge from the high-tension part to the conductive material.

Note 1-4. When the voltage of the output connector is measured with no load (e.g., before the cold-cathode tube is lighted), the voltage will be measured lower than the actual output, depending on the capacitance of a probe used and a measurement method, because it will be divided by the capacitance of a ballast capacitor, a high voltage probe, etc in the DC-AC inverter circuit.
In order to eliminate this error by capacitance, above output open circuit voltage is specified by measuring the output on the transformer's winding pins.

Note 1-5. The voltage applied to the load could be lower than the output open-circuit voltage when the distributed capacitance in a mounted condition is high (due to leakage of current by distributed capacitance), and makes it particularly hard to light when driving a cold-cathode tube in low temperatures. Please be careful in your installation to make the distributed capacitance as low as possible. (For example, make high-tension wiring to a cold-cathode tube as short as possible, and never use stranded wire for the high-tension wiring.)

fig1. High Voltage Code



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Note 1-6. In a low current zone, please confirm characteristics of the lamp before use. Flickering could occur depending on a lamp.

Note 1-7. Please set the input power source capacity to 4A or higher. If it is less than 4A, there is a possibility for a circuit protection element (fuse or IC protector) not to melt.

[2] Absolute Maximum Ratings

Item	Symbol	Spec	Unit	Remarks
Input voltage	Vin	0 ~ 15	VDC	
	Vrmt	0 ~ Vin		
	Vbr	0 ~ 16		
Load resistance	RL1 Ω //CL1 μ	100//5	k Ω //pF	
Operating temperature range	Ta	0 ~ 70	°C	
Storage temperature range	Ts	-30 ~ 85	°C	
Humidity range	RH	95	%RH	Maximum wet-bulb temperature to be 38 °C No condensation to occur

Note 2-1. As the distributed capacitance for a loaded panel, 5pF is added in parallel with the load resistance.

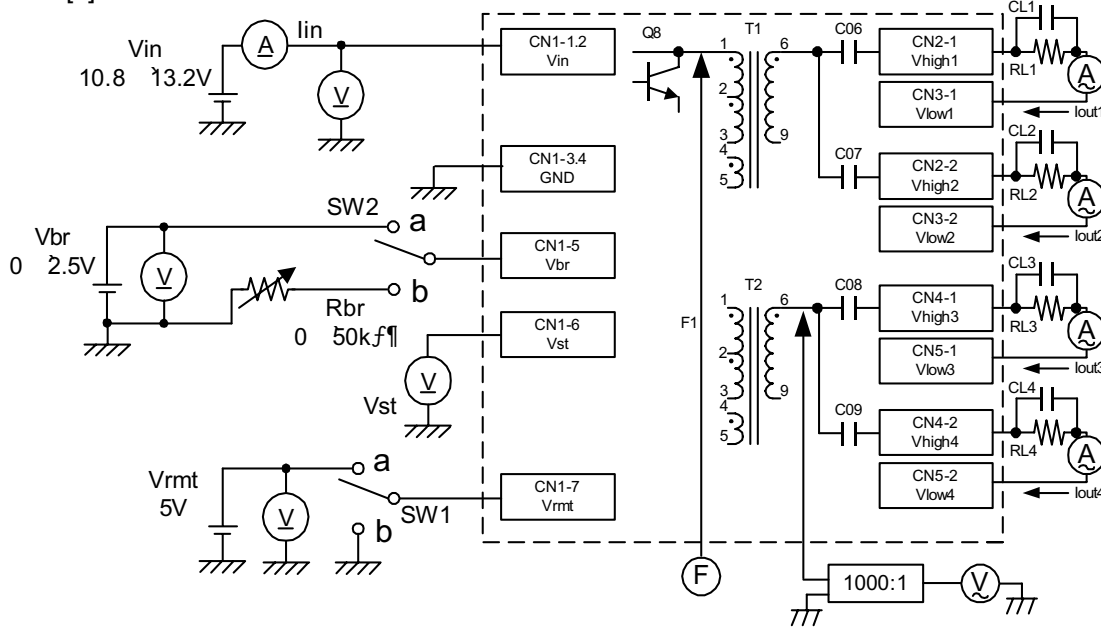
[3] Electrical specifications

Item	Symbol	Measurement condition					Inspection standard			Unit	
		Vin(V)	Vrmt(V)	Vbr(V) / Rbr(k Ω)	Ta(°C)	RL1 Ω (k Ω) //CL1 μ (pF)	MIN.	TYP.	MAX.		
Output current 1 (dimming max.)	Io1 μ	12 ~ 1.2	5 ~ 0.25	0 / 0	0 ~ 70	90 // 5	6.0	6.5	7.0	mArms	
Output current 2 (dimming min.)	Io2 μ			2.5 / 50			2.3	3.0	3.7		
Input current 1	Iin1			0 / 0				1.7	2.0		A
Input current 2	Iin2		0	0 ~ 2.5 / 0 ~ 50					1	mA	
Oscillation frequency	F1		5 ~ 0.25	0 / 0			45	50	55	kHz	
Oscillation frequency (Duty)	F2						2.5 / 50	240	270	300	Hz
Output open-circuit voltage	Vopen		0 ~ 2.5 / 0 ~ 50	0 / 0			\pm \pm	1500	1600	-	kVrms
Alarm output (Note 4-3)	Vst			0 ~ 2.5 / 0 ~ 50			90 // 5 Note 4-3. μ	4.5	5.0	5.5	V
		0 ~ 2.5 / 0 ~ 50		90 // 5	-	0	0.5				

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[4] Measurement circuit



RL1 4: Load resistor (7W or higher)

CL1 4: Distributed capacitance capacitor (3kV or higher)

Note 4-1.

To be the one to operate as follows by ON-OFF of SW1.

SW1	Unit operation
a	Operates
b	Does not operate
Open	Does not operate

Note 4-2.

To be the one to operate as follows by switching SW2.

SW2	Unit operation
a	Voltage dimming Vbr=0 2.5V (0V:Luminance max.)
b	Volume dimming VR=0 50kΩ (0Ω:Luminance max.)

Note 4-3. Protection circuit operation

Loading condition	Alarm signal (CN1-6) ¹⁾	Shutdown function ²⁾	LED operation
At normal times	0.5V max.	Does not shut down	Turned on
When one load (lamp) is N.G.	4.5 ~ 5.5V	Does not shut down	Turned on
When two load (lamp) is N.G.	4.5 ~ 5.5V	Does not shut down	Turned on
When three load (lamp) is N.G.	4.5 ~ 5.5V	Does not shut down	Turned on
When four load (lamp) is N.G.	4.5 ~ 5.5V	Shuts down	Turned off (in about 3 seconds)

Note 4-4. Measuring apparatus

(V) Digital Multiple Meter (ADVANTEST R6452A or equivalent)

(A) DC Current Meter (ADVANTEST R6452A or equivalent)

(F) Frequency Counter (ADVANTEST R6452A or equivalent)

(V) True RMS Meter (NF Circuit M2170σ equivalent)

(A) High Frequency Current Meter (FLUKE187 or equivalent)

1000:1 High Voltage Probe (Tektonix P6015A or equivalent)

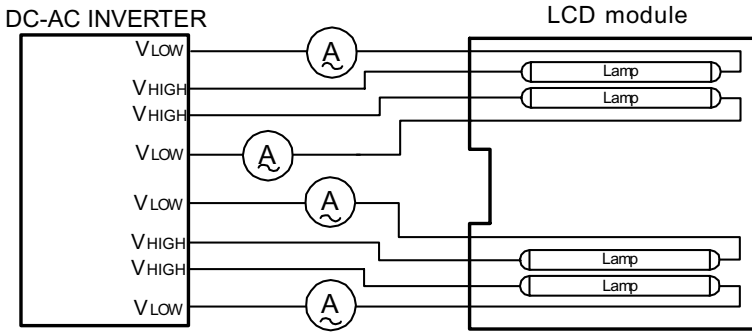
¹⁾ 1.5V alarm output is generated when either one of the loads or more loads turn open.

²⁾ This inverter includes a protection circuit that stops the operation in about 3 seconds when all the lamps turn open.

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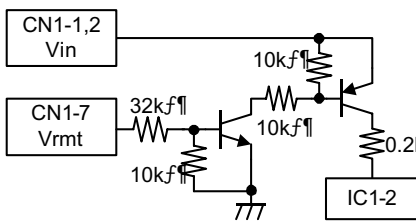
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LCD module connection diagram (reference)

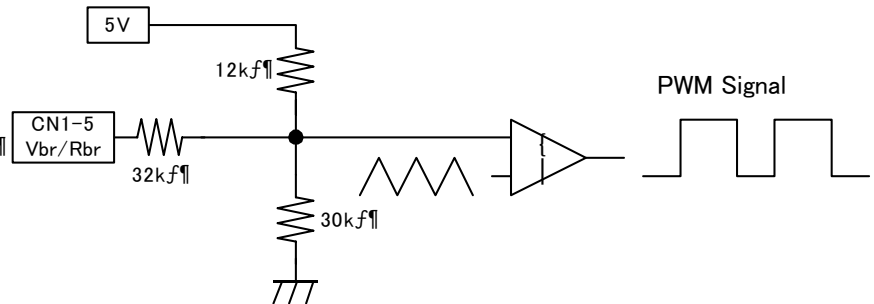


Please connect the high-frequency ampere meter to the low voltage side (VLow side).

Vrmt pin circuit (reference)



Vbr terminal circuit(Reference)



[5] Reliability Test

To meet the following reliability tests.

Test item	Test conditions	Judgment criteria
Low temperature exposure	-30 ℃ 500h	No defect to exist in electric characteristics and external appearance.
Low temperature operation	0 ℃ 500h Operating condition : As rated	
High temperature exposure	85 ℃ 500h	
High temperature operation	70 ℃ 500h Operating condition : As rated	
Thermal shock	-30 ℃ 85 ℃ 100 cycles 30 min. each	
Moisture resistance	60 ℃ 90 95%RH 500h	
Vibration	10 57Hz Half-amplitude 0.75mm 58 500Hz 9.8m/s ² Sweeping time: 11 min. 60 min. each in X, Y, Z directions	
Shock	980m/s ² 11ms Sine halfwave One time. each in X, Y, Z directions	

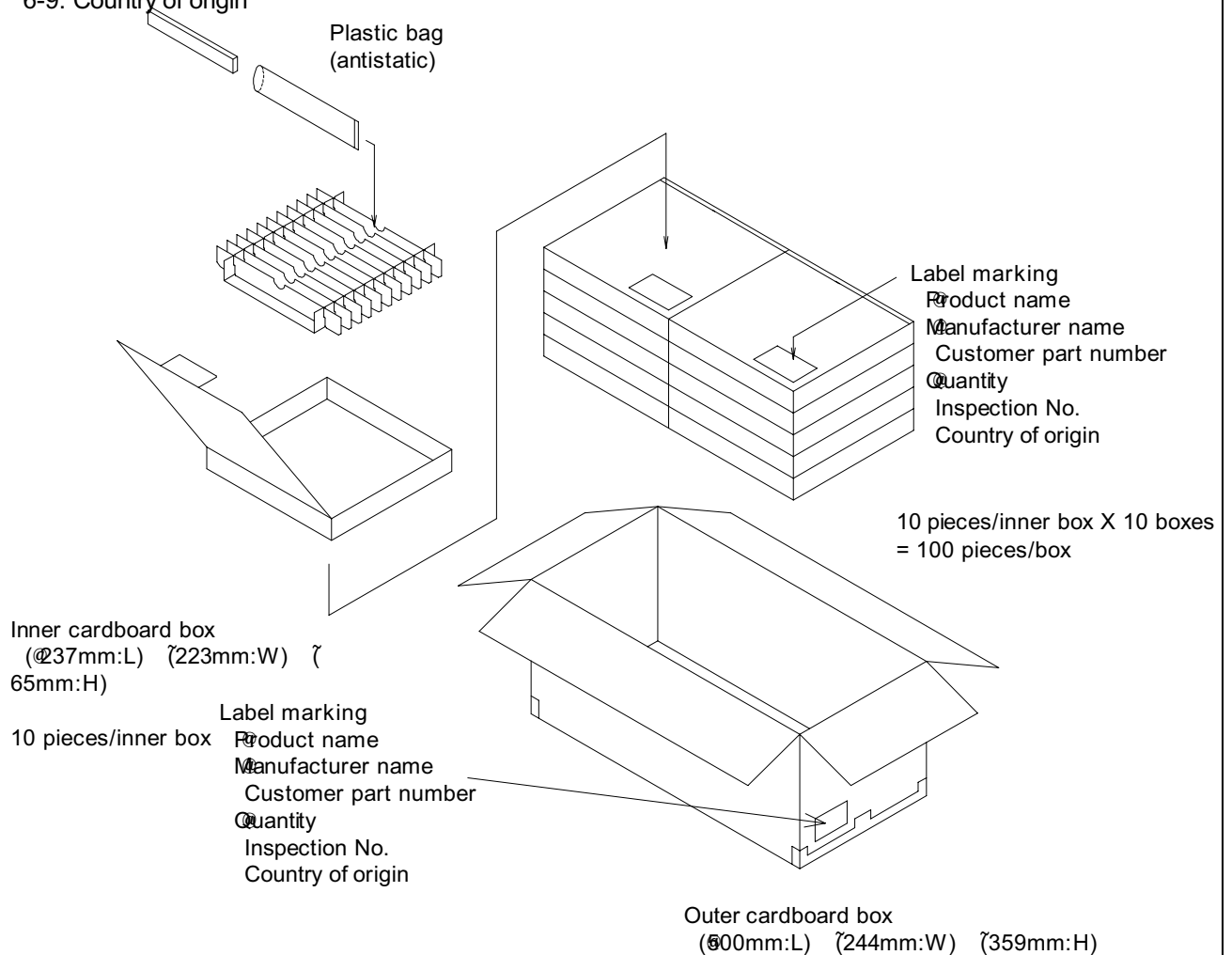
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[6] Packaging and marking

The product is to be packaged to be safe and free from water absorption and damage and to be marked with following items.

- 6-1. Customer name
- 6-2. Customer part number
- 6-3. Item code
- 6-4. TDK part number
- 6-5. Inspection No.
- 6-6. Shipping No.
- 6-7. Delivery date
- 6-8. Quantity contained
- 6-9. Country of origin



[7] Others

7-1. Test cond.

A normal test condition :Temperature (20±15°C), Humidity (65±20%RH).

7-2. Std warantr

One year after shipment.This covers any defects in material or workmanship. Defective units will be replaces at no charge.

7-3. MTTF

MTTF which calculated according to MIL-HDBK-217-F is as follows.

TEMPERATURES 25 °C
MTTF 1,510,000 hours or more

7-4. Others

TDK and customer are to discuss changes,problems, and modification s and etc, when needed.

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