



PRODUCT SPECIFICATION

Part Number

PG12864D1-O Series

CUSTOMER	
CUSTOMER PART NUMBER	
DESCRIPTION	
APPROVED BY	
DATE	

1. FUNCTIONS & FEATURES

1.1. Format	: 128x64Dots
1.2. LCD mode	: STN / Positive Transflective Mode/Y-G
1.3. Viewing direction	: 6 O'clock
1.4. Driving scheme	: 1/64 Duty cycle, 1/7 Bias
1.5. Power supply voltage (V _{DD})	: 5.0V
1.6. LCD driving voltage	: 7.2V (Operating voltage)
1.7. Operation temp	: -20~70°C
1.8. Storage temp	: -30~80°C
1.9. Backlight color	: Yellow-green
1.10.ROHS Standard	

2. MECHANICAL SPECIFICATIONS

2.1. Module size	: 75.0mm(L)*52.8mm(W)*9.0max mm(H)
2.2. Viewing area	: 60.0*mm(L)*32.6mm(W)
2.3. Dot pitch	: 0.43mm(L)*0.43mm(W)
2.4. Dot size	: 0.40mm(L)*0.40mm(W)
2.5. Weight	: Approx.

3. BLOCK DIAGRAM

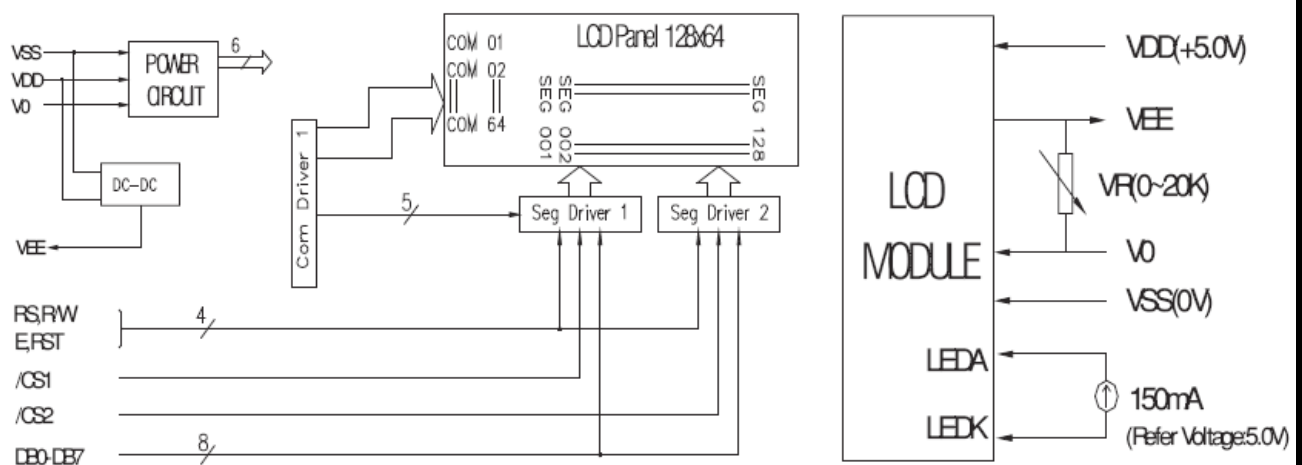


Figure 1. Block Diagram

4. DIMENSIONAL OUTLINE

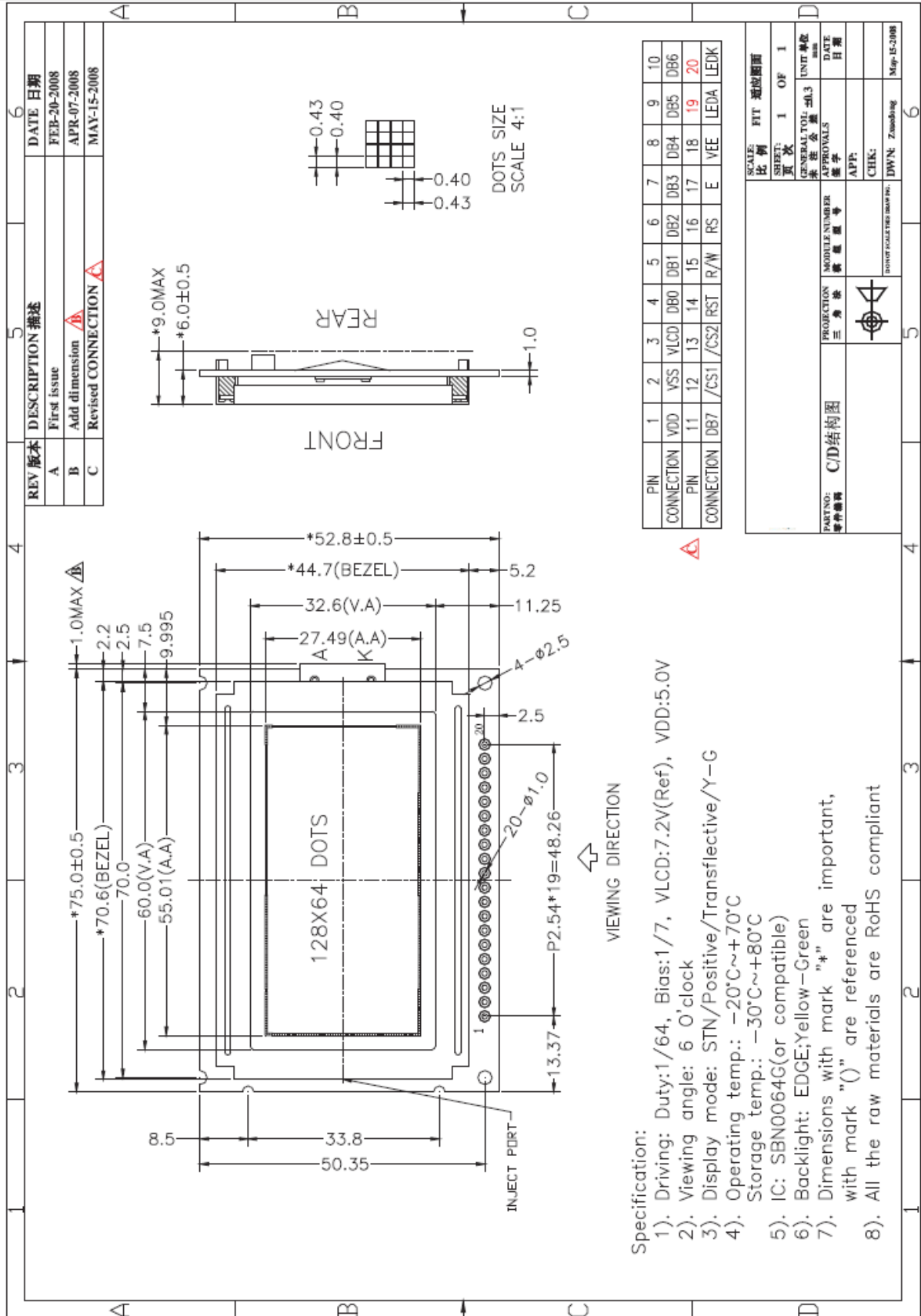


Figure 2. Dimensional Outline

5. PIN DESCRIPTION

No.	Symbol	Function
1	VDD	Power supply(+5.0V)
2	VSS	GND(0V)
3	VO	Supply voltage for LCD
4~11	DB0~DB7	Data bus line
12	/CS1	Chip select signal for left half of the screen(Low select)
13	/CS2	Chip select signal for right half of the screen(Low select)
14	RST	Reset signal
15	R/W	Read /write selection. (H: Read L: write)
16	RS	Register selection. (H: Data register L: Instruction register)
17	E	Enable signal for chip
18	VEE	Output of supply negative voltage by the DC-DC converter on the module
19	LEDA	Power supply for backlight(+)
20	LEDK	Power supply for backlight(-)

6. MAXIMUM ABSOLUTE LIMIT

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	V _{DD}	-0.3	7.0	V
Supply Voltage for LCD	V ₀	V _{DD} -16.0	---	V
Input Voltage	V _{in}	-0.3	V _{DD} +0.3	V
Supply Current for Backlight	I _F (Ta = 25°C)	---	150+150*20%	mA
Reverse Voltage for Backlight	V _R (Ta = 25°C)	---	10	V
Operating Temperature	T _{op}	-20	70	°C
Storage Temperature	T _{st}	-30	80	°C

7. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V _{DD} -V _{SS}	Ta = 25°C	4.75	5.0	5.25	V
Input High Voltage	V _{IH}	Ta = 25°C	V _{DD} -2.2	---	V _{DD}	V
Input Low Voltage	V _{IL}	Ta = 25°C	0	---	0.8	V
Output High Voltage	V _{OH}	Ta = 25°C	V _{DD} -0.3	---	V _{DD}	V
Output Low Voltage	V _{OL}	Ta = 25°C	0	---	0.3	V
Supply Current	I _{DD}	Ta = 25°C	---	8	10	mA

8. BACKLIGHT CHARACTERISTICS

Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=150mA	4.0	4.2	4.4	V
Reverse Current	IR	VR=10V	---	0.1	---	mA
Luminous Intensity (Without LCD)	IV	IF=150mA	35	50	---	Cd/m ²
Wave length(Without LCD)	λp	IF=150mA	569	572	574	nm
Color	Yellow-green					

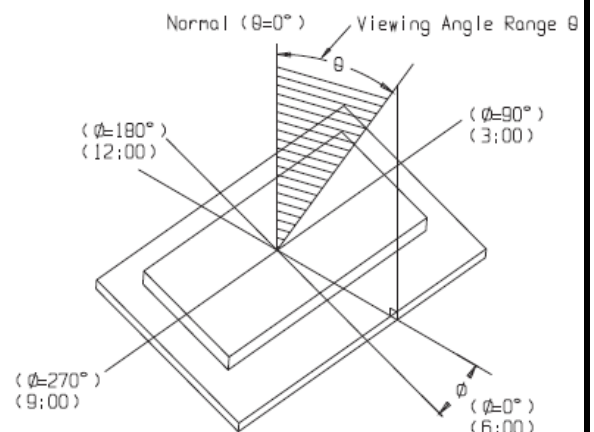
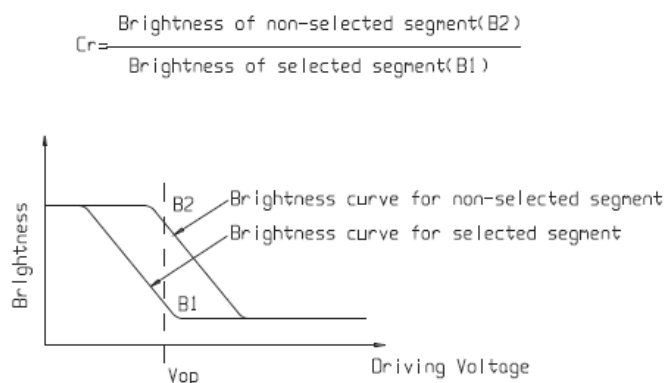
Note:

For operation above 25°C ,The Ifm must be derated ,the Curent derating is $-0.36 \times 10\text{mA}/^\circ\text{C}$ for DC drive. The product working current must not more than the 60% of the Ifm according to the working temperature.

9. ELECTRO-OPTICAL CHARACTERISTICS

(VDD=5.0V, Ta = 25°C)

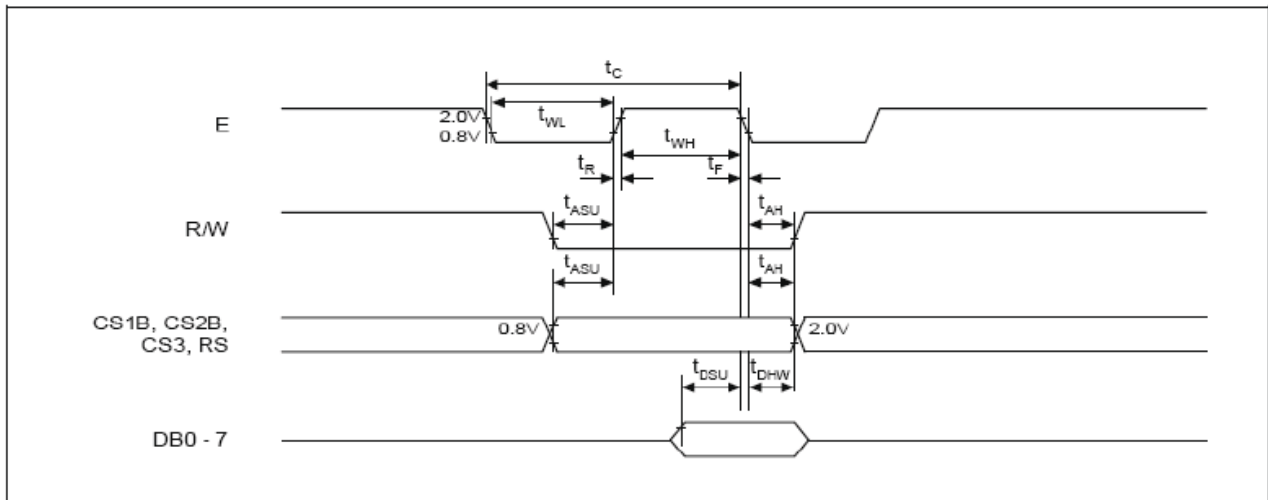
Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20C	7.3	7.7	8.1	V
		Ta = 25°C	6.8	7.2	7.6	
		Ta = 70C	6.3	6.7	7.1	
Response time	Tr	Ta = 25°C	---	185	---	ms
	Tf		---	200	---	ms
Contrast	Cr	Ta = 25°C	---	4	---	---
Viewing angle range	θ	Cr ≥ 2	-40	---	+40	deg
	Φ		-40	---	+40	deg



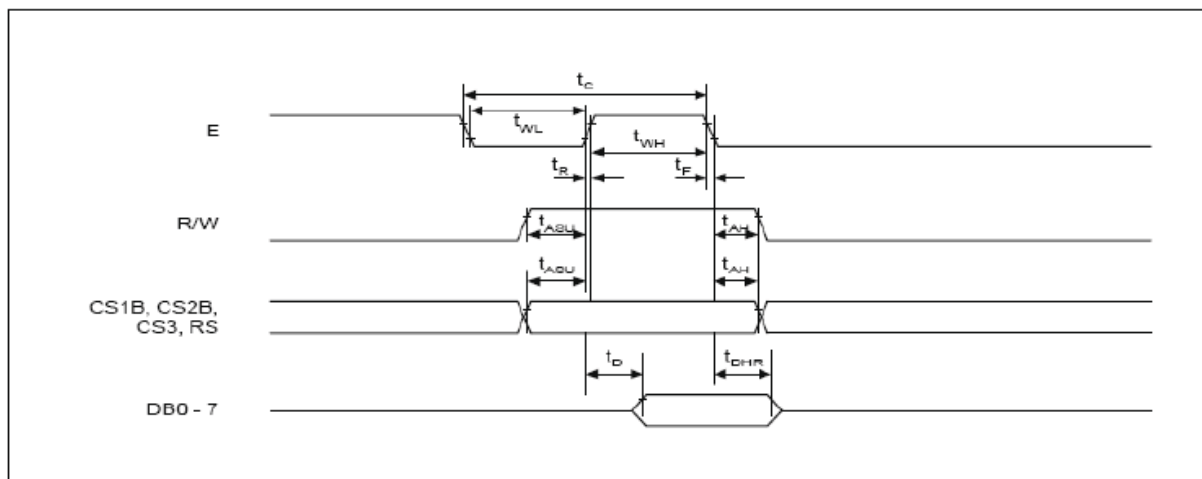
10. TIMING CHARACTERISTICS

(Please refer AVANT SBN0064G DATASHEETS)

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	t_C	1000	-	-	ns
E high level width	t_{WH}	450	-	-	ns
E low level width	t_{WL}	450	-	-	ns
E rise time	t_R	-	-	25	ns
E fall time	t_F	-	-	25	ns
Address set-up time	t_{ASU}	140	-	-	ns
Address hold time	t_{AH}	10	-	-	ns
Data set-up time	t_{DSU}	200	-	-	ns
Data delay time	t_D	-	-	320	ns
Data hold time (write)	t_{DHW}	10	-	-	ns
Data hold time (read)	t_{DHR}	20	-	-	ns



MPU write timing



11. CONTROL AND DISPLAY INSTRUCTION

(Please refer AVANT SBN0064G DATASHEETS)

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON	
Set address (Y address)	L	L	L	H	Y address (0 - 63)						Sets the Y address in the Y address counter.	
Set page (X address)	L	L	H	L	H	H	H	Page (0 - 7)			Sets the X address at the X address register.	
Display start line (Z address)	L	L	H	H	Display start line (0 - 63)						Indicates the display data RAM displayed at the top of the screen.	
Status read	L	H	Busy	L	On / Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write display data	H	L	Write data									Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data									Reads data (DB0: 7) from display data RAM to the data bus.

12. PRECAUTION FOR USING LCD/LCM

After reliability test, recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature ($20\pm 8^{\circ}\text{C}$), normal humidity (below 65% RH), and in the area not exposed to direct sun light. Using LCM beyond these conditions will shorten the life time.

Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isopropyl alcohol, ethyl alcohol or trichlorotrifluoroethane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting P-tec Corp.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.



5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: $350^{\circ}\text{C}\pm 10^{\circ}\text{C}$
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage V_o .
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

Limited Warranty

P-tec Corp LCDs and modules are not consumer products, but may be incorporated by P-tec Corp's customers into consumer products or components thereof, P-tec Corp does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of P-tec Corp is limited to repair or replacement on the terms set forth below. P-tec Corp will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between P-tec Corp and the customer, P-tec Corp will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with P-tec Corp general LCD inspection standard . (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description