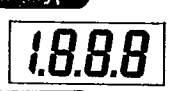
LCD PANEL

《Features》

1. Light weight and thin structure.
2. Low driving voltage and low power consumption (1~10μw/cm^2), which easily enable by battery driving in combinations with C-MOS LSI.
3. Pattern graphics can be designed rather freely.
4. The brighter the ambient condition is, the more legibility the display has.
5. Can be used at dark condition in combinations with back light.

●Types of Displays

Positive Type



Negative Type

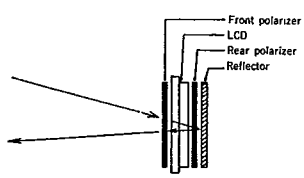
Negative type is most suitable to display with back light.

LCDP for INSTRUMENTS

Please refer to our LCDP Standard List (under preparation) for other applications.

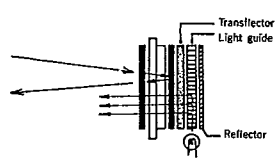
●Lighting Methods

(1) Reflective Mode



Ambient light is necessary to use this type.

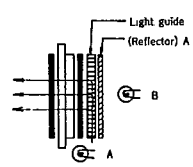
(2) Transflective Mode



Back lighting

Ambient light is taken from the outside during day or in the dark and a back light is used in the dark.

(3) Transmissive Mode



Back lighting only. In case of B, no reflector is used

A back light is always used.

●Common Characteristics

	Vo-p	Terminal	Glass Thickness	View Angle
Consumer	3.1V	Both Side	1.1mm	6:00
High Reliability	5.0V	Both Side	1.1mm	6:00

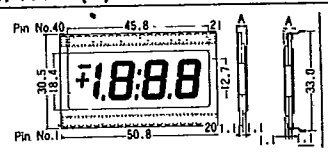
Note:as to basic characteristics and operating temperature rage, please refer to page 73.

● Individual Specifications

Type No.	Glass Dimension (W×Hmm)	View Area (W×Hmm)	Digits Height (mm)	Terminal		Duty	Notes
				Pitch	Number		
FRS-1046	50.8×30.5	45.8×18.4	12.7	2.54	40	static	
FRS-1117P(H)	50.8×30.5	45.8×18.4	12.7	2.54	40		
FRS-1111P(H)	50.8×30.5	45.8×18.4	12.6	2.54	40		
FRS-1080P(H)	50.8×30.5	45.8×18.4	12.7	2.54	40		
FRS-1141(H)	50.8×24.1	45.8×13.3	10.0	2.54	40		
FRS-1143P(H)	50.8×24.1	45.8×13.3	10.0	2.54	40		
FRS-1200	50.8×30.5	45.8×18.4	12.7	2.54	40		
FRS-1105P(H)	50.8×30.5	45.8×18.4	12.7	2.54	40		
FRS-1153P(H)	69.85×38.1	63.5×24.38	17.78	2.54	40		
FRS-1154P(H)	69.85×30.48	63.5×16.51	12.7	2.54	50		
FRD-1266H	70.0×22.0	65.0×12.0	7.0	1.2	54	1/3D	4.5V drive
FRS-1320PH	81.28×38.1	75.28×24.48	17.78	2.54	40	static	
FRS-1412P(H)	93.8×30.4	89.8×18.4	12.7	2.54	68		
FRS-1432P(H)	137.1×45.7	132.1×33.1	25.4	2.54	70		
FRS-1574P(H)	81.28×38.1	75.28×24.48	17.78	2.54	50		
FRD-1685PH	52.0×22.0	45.0×11.0	7.0	2.54	28	1/3D	
FRD-0196	52.0×22.0	48.0×13.0	7.0	2.54	36	1/4D	
FRD-0346P	52.0×22.0	48.0×13.0	7.0	2.54	36		
FRD-0180	104.6×22.0	99.6×12.0	7.0	2.54	72	1/2D	
FRD-8035	48.0×22.5	44.0×14.0	6.7	2.0	20	1/4D	Glass thickness 0.7mm
FRS-1969	51.5×22.0	47.0×15.6	11.5	1.6	28	static	Terminal; upper side, only 5V drive

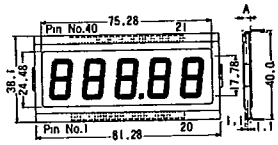
■DIMENSIONAL OUTLINE

FSS-1046, 1117P(H)•FRS-1046, 1117P(H)



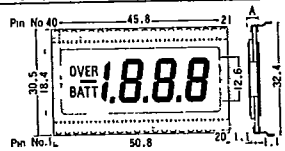
	A	
	1117	1117H
FSS	2.59	2.72
FRS	2.64	2.755

FSS-1320PH•FRS-1320PH



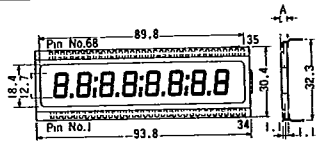
	A
FSS	2.72
FRS	2.755

FSS-1111P(H)•FRS-1111P(H)



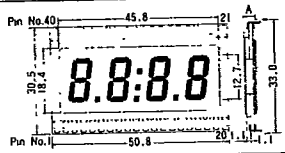
	A	
	1111	1111H
FSS	2.59	2.72
FRS	2.64	2.755

FSS-1412P(H)•FRS-1412P(H)



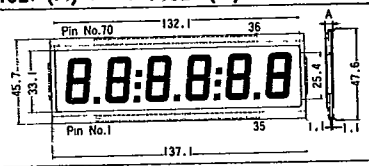
	A	
	1412	1412H
FSS	2.59	2.72
FRS	2.64	2.755

FSS-1080P(H)•FRS-1080(H)



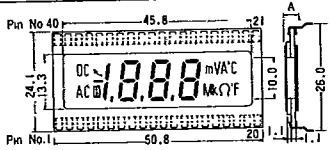
	A	
	1080	1080H
FSS	2.59	2.72
FRS	2.64	2.755

FSS-1432P(H)•FRS-1432P(H)



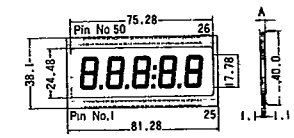
	A	
	1432	1432H
FSS	2.59	2.72
FRS	2.64	2.755

FSS-1141P(H)•FRS-1141(H)



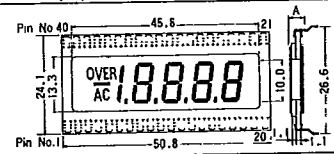
	A	
	1141	1141H
FSS	2.59	2.72
FRS	2.64	2.755

FSS-1574P(H)•FRS-1574P(H)



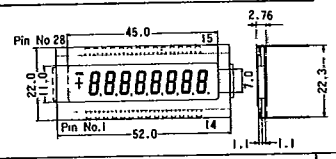
	A	
	1574	1574H
FRS	2.59	2.72
FSS	2.64	2.755

FSS-1143P(H)•FRS-1143P(H)

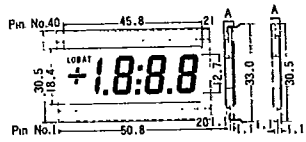


	A	
	1143	1143H
FSS	2.59	2.72
FRS	2.64	2.755

FRD-1685PH

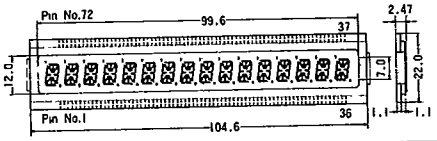


FSS-1200, 1105P(H)•FRS-1200, 1105P(H)

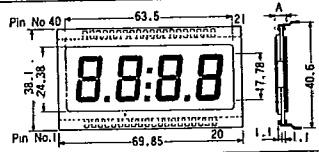


	A	
	1105	1105H
FSS	2.59	2.72
FRS	2.64	2.755

FRD-0180

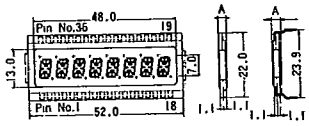


FSS-1153P(H)•FRS-1153P(H)



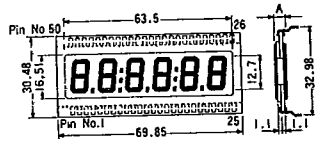
	A	
	1153	1153H
FSS	2.59	2.72
FRS	2.64	2.755

FRD-0346P•0196



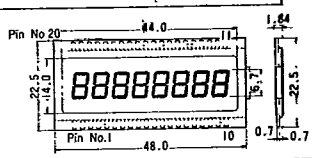
	A
FSS	2.47
FRS	2.64

FSS-1154P(H)•FRS-1154P(H)

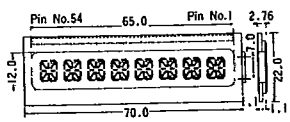


	A	
	1154	1154H
FSS	2.59	2.72
FRS	2.64	2.755

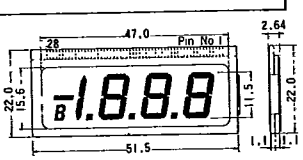
FRD-8035



FRD-1266H



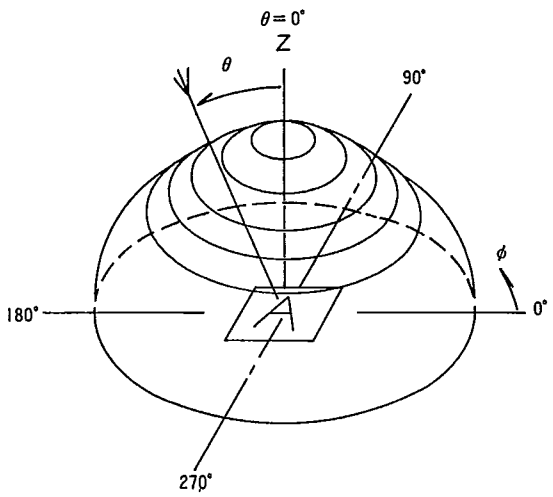
FRS-1969



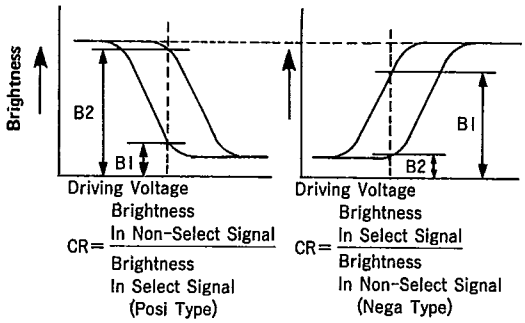
NOTE) As for displays with pin connecter shown as above, different type of pin connector is also aveildble. Please contact with us for further inquiry.

Measurement method of optical charocteristics

Ⓐ Definition of Viewing Angle θ and ϕ



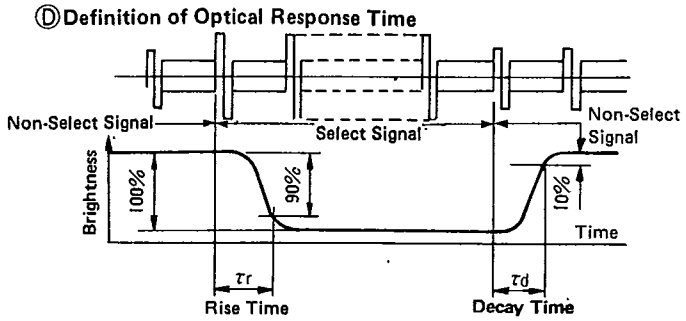
Ⓑ Definition of Contrast Ratio (CR)



$$CR = \frac{\text{Brightness In Non-Select Signal}}{\text{Brightness In Select Signal}}$$ (Posi Type)

$$CR = \frac{\text{Brightness In Select Signal}}{\text{Brightness In Non-Select Signal}}$$ (Nega Type)

Ⓓ Definition of Optical Response Time



In case of Negative type,
wave from of changing brightness becomes reverse.
(Non Select Signals: 0%, Select Signals: 100%)

Reliability Conditions

LCD PANEL (A) Consumer (B) High Reliability

Item	Conditions (Evaluation is made after keeping at normal temperature(25°C) for 24 hours)	Evaluation
Life Time at Normal condition	(A) Operating 50,000Hrs at normal condition (B) Operating 100,000Hrs at normal condition	No visible inferiority in appearance nor function
High Temperature Storage	(A) Storage 96Hrs at 70°C surrounding temp.(Power Off) (B) Storage 500Hrs at 85°C surrounding temp.(Power Off)	
Low Temperature Storage	(A) Storage 24Hrs at −25°C surrounding temp.(Power Off) (B) Storage 500Hrs at −40°C surrounding temp.(Power Off)	
Damp Heat	(A) Storage 96Hrs at 40°C and 90~95% RH surrounding condition (B) Storage 300Hrs at 60°C and 90% RH surrounding condition	
Thermal Shock	(A) (−25°C 30 minutes→25°C 5 minutes→70°C 30 minutes→25°C 5 minutes)×5 cycles (B) (−40°C 60 minutes→25°C 5 minutes→85°C 60 minutes→25°C 5 minutes)×20 cycles	

LCD MODULE (Consumer Type)

Item	Conditions	Evaluation
High Temperature Operation	Operating 96~100Hrs at 50±2°C surrounding temp.	No visible inferiority in appearance nor function
Low Temperature Operation	Operating 96~100Hrs at 0±2°C surrounding temp. No dew to be found.	
High Temperature Storage	Storage 96~100Hrs at 60±2°C surrounding temp. then storage 4Hrs at normal condition (Power Off)	
Low Temperature Storage	Storage 96~100Hrs at −20±2°C surrounding temp. then storage 4Hrs at normal condition (Power Off) No dew to be found.	
Damp Pruof	Storage 96~100Hrs at 40±2°C and 90~95% RH surrounding condition, then storage 4Hrs at normal condition(Power Off) No dew to be found.	

Note: The above mentioned conditions are nominal ones, which may differ in special specifications.

B&W LCD Module

Features

①Clear and legible black and white display.
②High contrast and wide viewing angle at high multiplex drive.
③High density display like CRT
④No temperature dependency of back ground color.

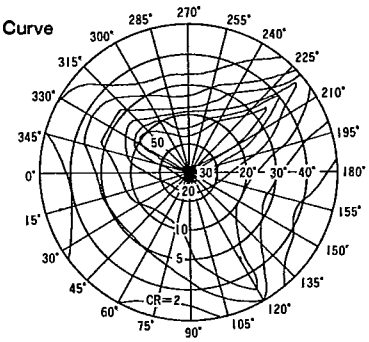
Principle

This technology is achieved by using another layer of interference LCDP or thin film as a color compensator of optical birefringence of Super TN, while using its basic driving technique.

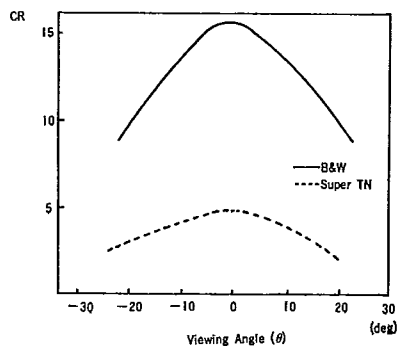
Characteristics

Contrast of B&W display is approx three times higher than Super TN.

● Equi-Contrast Distribution Curve (1/200 Duty)



● Contrast vs Viewing Angle (1/200 Duty)



VHC LCD Very High Contrast LCD

Features

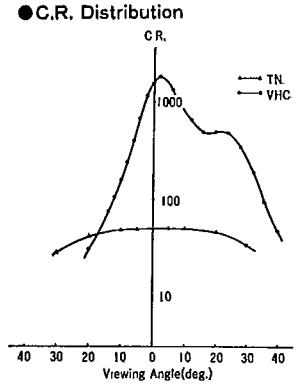
1) Very high contrast(contrast ratio beyond 1000:1), little background bleed-through
2) Bright display, applicable to reflective mode
3) Little change of display color by temperature fluctuation and viewing angle difference
4) Quick response (T_R=less than 1300mS at −30°C)

Specifications(Reference)

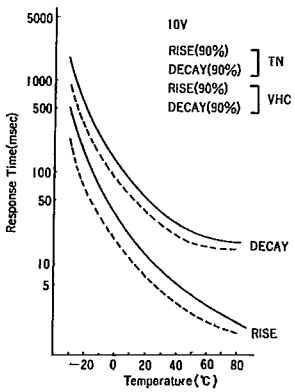
● Static drive, 5~10 V_{0-P}
● Reverse drive of positive/negative (polarizers are laminated as positive mode, OFF appearance when switch on, ON appearance when switch off)
● Internal black mask for non-segment area and color printing on rear side of LCD glass

Characteristics

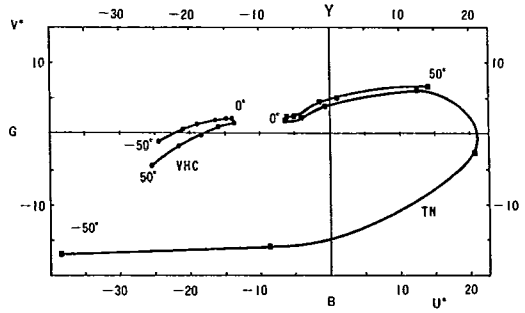
● C.R. Distribution



● Response Time



● Display Color Change



Internal Black Mask

Internal black mask printing is widely used for normal TN display also, including for audio equipments, with following features.

● Perfect no bleed-through ● No paralax
● Improvement in color appearance ● Improvement in contrast

● Structure of Internal Black Mask