

FLA2N Engine Specification

Model: FLA2N

P/N: 95.LE400G006

Approved by

(-)

R/D : _____

Sales : _____

(Young Optics)

[illegible]

Version 1.1	<p style="text-align: center;">Young Optics Inc. No.7, Xin'an Rd., Hsinchu Science Park, Hsinchu, Taiwan, R.O.C. Tel: + 886 3 6206789 Fax: + 886 3 6231100</p>	<p style="text-align: center;">CONFIDENTIAL</p>
1/15/2015		
Iain Fan/Sandy Lai		
File: FLA2N- Engine Spec.		

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1 STANDARD TEST CONDITIONS

Warm up period	<1 minute
Ambient Light	Optical data measurement @ ≤ 0.01 lux dark room Image quality checking @ ≤ 0.5 lux dark room
Ambient Temperature	25 Celsius degree
Image Size	20" @ 708 \pm 35mm (From 1 st surface of the p-lens to Screen)
Input Signal	640X360@60Hz
Instruments	Color & Uniformity: CL-200A/ Contrast: T-10

2 KEY PARTS SPECIFICATION

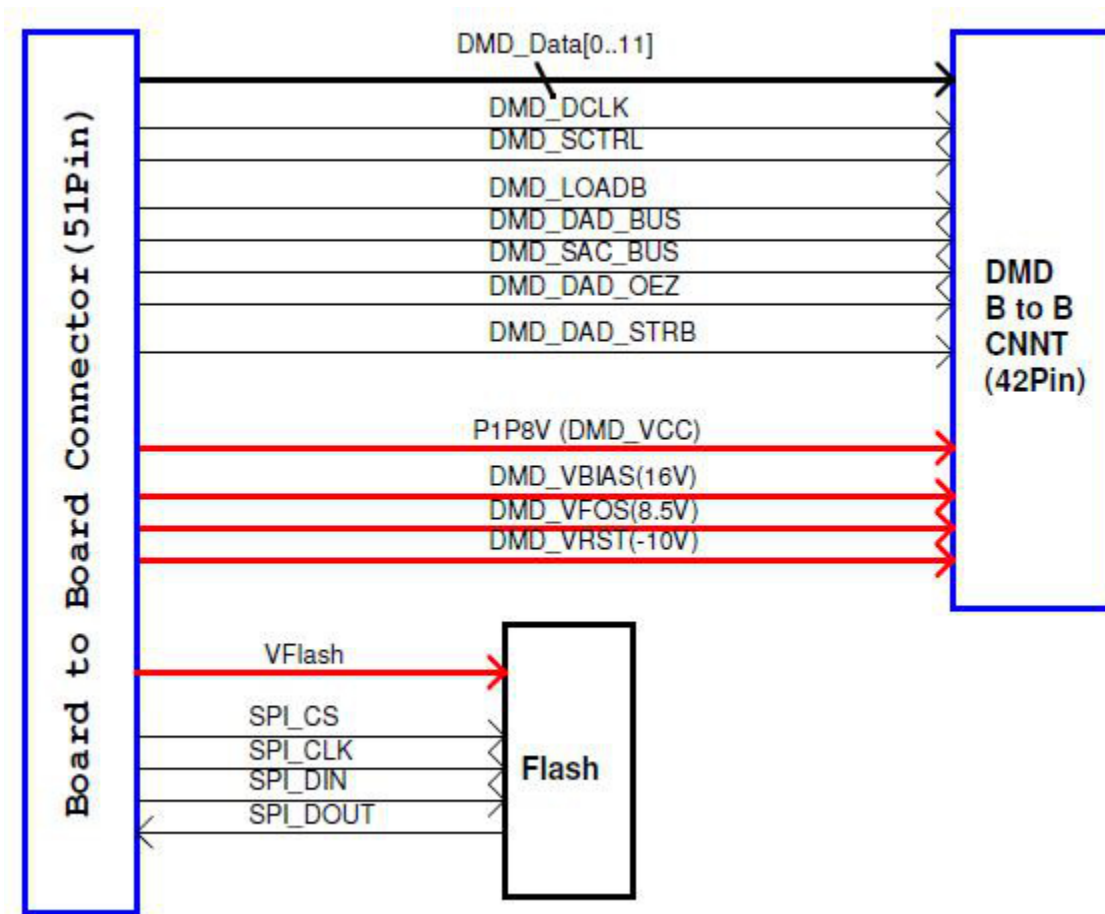
2.1 Panel

Manufacturer:	Texas Instruments
Type:	DLP® 0.2 nHD DMD
Size:	0.22 inches<diagonal>
Active pixels:	640(H) x 360(V) pixels.
Pixel size:	7.56 μ m (H) x 7.56 μ m (V); Diagonal 10.7 μ m
Active area:	4.8384mm (H) x 2.7216 mm (V)
Tilt-angle of mirror:	12 +/- 1 degree

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2.2 Flash board Interface

2.2.1 Block Diagram

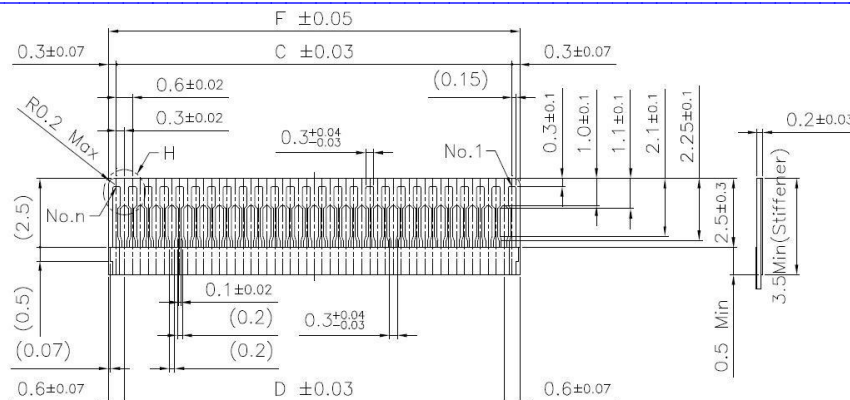


2.2.2 51 Pin connector

2.2.2.1 Connector Type

User can connect the flash board via 51pin connector. The details show as below.

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Vendor : UJU
Type : PF030-051B-C10-H
Website : <http://www.uju.com>

2.2.2.2 Connector pin assignment.

Pin#	Signal Name	I/O Type	Description	Pin#	Signal Name	I/O Type	Description
1	DMD_VCC	PWR	DMD VCC (1.8V)	26	GND	GND	Ground
2	DMD_VCC	PWR	DMD VCC (1.8V)	27	GND	GND	Ground
3	DMD_D1	I	DMD Data_1	28	DMD_BUS	I	DMD Reset Control Serial Bus
4	DMD_D9	I	DMD Data_9	29	DMD_STRB	I	DMD Bus Strobe
5	GND	GND	Ground	30	DMD_VOFS	PWR	DMD OFFSET Power (8.5V)
6	GND	GND	Ground	31	DMD_VBIAS	PWR	DMD BIAS Power (16V)
7	DMD_D2	I	DMD Data_2	32	DMD_SAC_BUS	I	DMD SAC Bus Data
8	DMD_D8	I	DMD Data_8	33	GND	GND	Ground
9	GND	GND	Ground	34	GND	GND	Ground
10	GND	GND	Ground	35	GND	GND	Ground
11	DMD_D3	I	DMD Data_3	36	DMD_OEZ	I	DMD Output Enable
12	DMD_D11	I	DMD Data_11	37	GND	GND	Ground
13	DMD_D4	I	DMD Data_4	38	GND	GND	Ground
14	DMD_D10	I	DMD Data_10	39	DMD_VRST	PWR	DMD RESET Power (-10V)
15	DMD_D5	I	DMD Data_5	40	N.C	-	Not Connected
16	GND	GND	Ground	41	DMD_VCC	PWR	DMD VCC (1.8V)
17	GND	GND	Ground	42	DMD_VCC	PWR	DMD VCC (1.8V)
18	DMD_DCLK	I	DMD Data Clock	43	FLASH_DOUT	O	Serial Flash Data Output
19	DMD_D7	I	DMD Data_7	44	FLASH_CLK	I	Serial Flash Clock Input
20	DMD_LOADB	I	DMD Parallel Latch Load Enable	45	FLASH_CSZ	I	Serial Flash Chip Select Input
21	DMD_VCC	PWR	DMD VCC (1.8V)	46	GND	GND	Ground
22	DMD_VCC	PWR	DMD VCC (1.8V)	47	VFLASH	PWR	Serial Flash Power Supply
23	DMD_D6	I	DMD Data_6	48	FLASH_DIN	I	Serial Flash Data Input
24	DMD_SCTRL	I	DMD Serial Control Signal	49	GND	GND	Ground
25	DMD_D0	I	DMD Data_0	50	GND	GND	Ground
				51	GND	GND	Ground

I: Input ; O:Output ; PWR:Power ; GND:Ground

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2.2.3 Flash Signals

The 4M-Bits flash IC mounted on the PCB for initial data and LED duty storage. The serial flash signals are shown as below. 51 pin connector interface include these signals.

Serial Flash Pin Descriptions	
Name	Description
SPI0_CSZ0	Chip Select Input
SPI0_DOUT	Data Output
SPI0_DIN	Data Input
SPI0_CLK	Serial Clock Input
VFLASH	Power Supply

2.2.3.1 Absolute Maximum Ratings

PARAMETERS	SYMBOL	CONDITIONS	RANGE	UNIT
Supply Voltage	VCC		-0.6 to +4.0	V
Voltage Applied to Any Pin	VIO	Relative to Ground	-0.6 to VCC +0.4	V
Transient Voltage on any Pin	VIOT	<20nS Transient Relative to Ground	-2.0V to VCC+2.0V	V
Storage Temperature	TSTG		-65 to +150	°C
Electrostatic Discharge Voltage	VESD	Human Body Model ⁽³⁾	-2000 to +2000	V

2.2.3.2 Recommended Operation Conditions

PARAMETER	SYMBOL	CONDITIONS	SPEC		UNIT
			MIN	MAX	
Supply Voltage ⁽¹⁾	VCC	F _R = 50MHz, f _R = 25MHz	2.3	3.6	V
Ambient Temperature, Operating	T _A	Industrial	-40	+85	°C

Please refer to W25X40BLZP data sheet (WINBOND) for details.

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2.2.4 DMD Electrical Characteristics**2.2.4.1 Absolute maximum ratings**

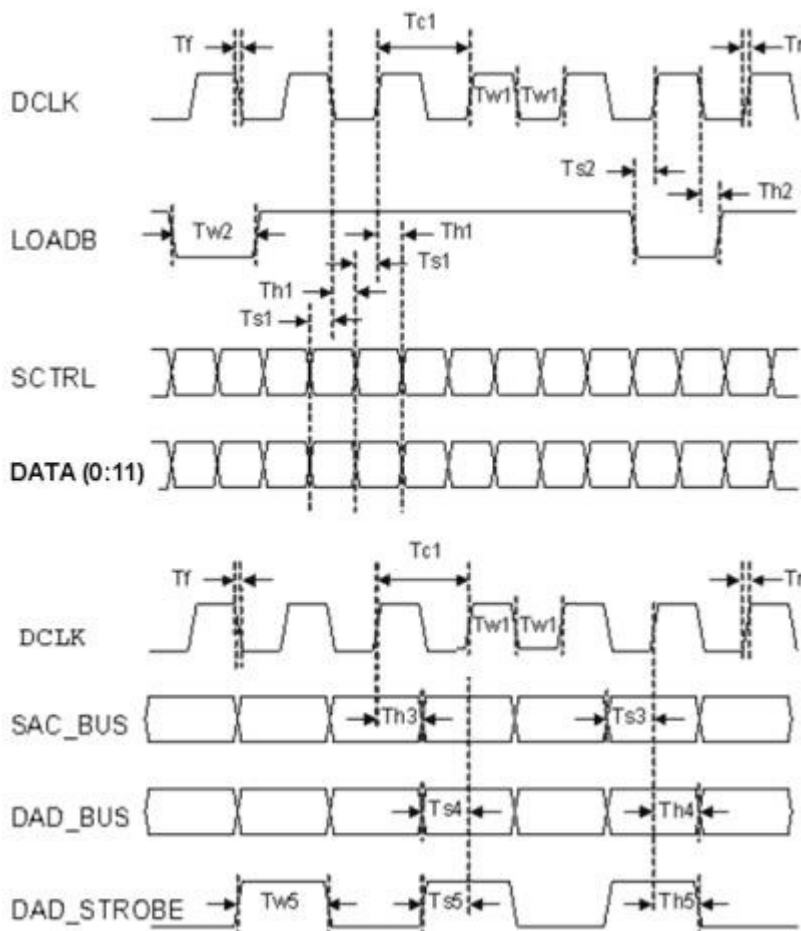
Absolute maximum ratings					
PARAMETER		MIN	NOM	MAX	UNIT
DMD_VCC	LVC MOS Logic power supply voltage	-0.5	-	4	V
DMD_VBIAS	Mirror Electrode Voltage	-0.5	-	17	V
DMD_VRST	Mirror Electrode Voltage	-11	-	0.5	V
DMD_VOFS	Mirror Electrode and HVCMOS voltage	-0.5	-	8.75	V
VFLASH	SPI Flash Power	-0.6	-	4	V

2.2.4.2 Recommended Operation Conditions

Recommended Operating Conditions					
PARAMETER		MIN	NOM	MAX	UNIT
DMD_VCC	LVC MOS Logic power supply voltage	1.65	1.8	1.95	V
DMD_VBIAS	Mirror Electrode Voltage	15.5	16	16.5	V
DMD_VRST	Mirror Electrode Voltage	-9.5	-10	-10.5	V
DMD_VOFS	Mirror Electrode and HVCMOS voltage	8.25	8.5	8.75	V
VFLASH	Flash supply voltage	2.3	3.3	3.6	V

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2.2.4.3 Critical Timing Waveform



2.2.4.4 Power Dissipation

Recommended Operating Conditions						
PARAMETER		Test Condition	MIN	NOM	MAX	UNIT
DMD_VCC	LVC MOS Logic power supply voltage	DMD_VCC=1.8V	-	21	26	mA
DMD_VBIAS	Mirror Electrode Voltage	DMD_VBIAS=16V	-	0.7	1.3	mA
DMD_VRST	Mirror Electrode Voltage	DMD_VRST=-10V	-	0.4	1.2	mA
DMD_VOFS	Mirror Electrode and HVCMOS voltage	DMD_VOFS=8.5V	-	0.7	1.5	mA
VFLASH	SPI Flash Power	VFLASH=3.3V	-	6	10	mA

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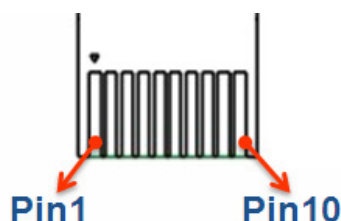
DMD Timing AC Characteristics				
Parameter	MIN	NOM	MAX	UNIT
Ts1 Setup time: DATA before rising or falling edge of DCLK	1			ns
Ts1 Setup time: SCTRL before rising or falling edge of DCLK	1			ns
Ts2 Setup time: LOADB low before rising edge of DCLK	1			ns
Ts3 Setup time: SAC_BUS low before rising edge of DCLK	2			ns
Ts4 Setup time: DAD_BUS high before rising edge of DCLK	2			ns
Ts5 Setup time: DAD_STROBE high before rising edge of DCLK	2			ns
Th1 Hold time: DATA after rising or falling edge of DCLK	1			ns
Th1 Hold time: SCTRL after rising or falling edge of DCLK	1			ns
Th2 Hold time: LOADB low after falling edge of DCLK	1			ns
Th3 Hold time: SAC_BUS low after rising edge of DCLK	2			ns
Th4 Hold time: DAD_BUS after rising edge of DCLK	2			ns
Th5 Hold time: DAD_STROBE after rising edge of DCLK	2			ns
Tc1 Clock Cycle: DCLK	12.5		16.67	ns
Tw1 Pulse Width high or low: DCLK	5			ns
Tw2 Pulse Width low: LOADB	7			ns
Tw5 Pulse Width high: DAD_STROBE	7			ns
tr Rise time (20% – 80%): DCLK			2.5	ns
tr Rise time (20% – 80%): DATA / SCTRL / LOADB			2.5	ns
tf Fall time (80% – 20%): DCLK			2.5	ns
tf Fall time (80% – 20%): DATA // SCTRL / LOADB			2.5	ns

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2.3 LED FPC Interface

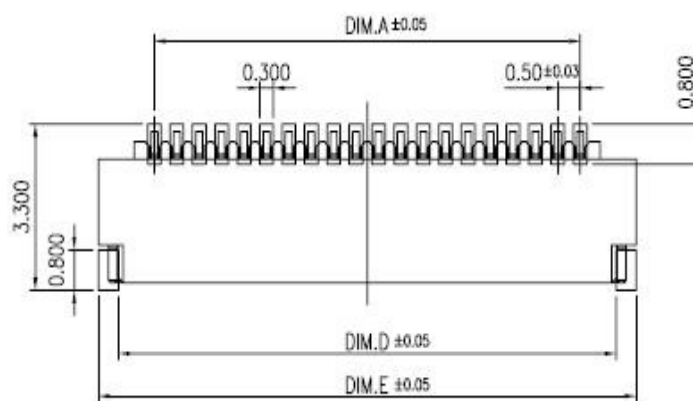
2.3.1 LED FPC Golden Finger pin Assignment

LED Golden Finger Pin Descriptions		
Pin #	Name	Description
1	COMMON_ANODE	Common Anode of Red 、Green and Blue LED
2	COMMON_ANODE	Common Anode of Red 、Green and Blue LED
3	RED_CATHODE	Cathode of Red LED
4	RED_CATHODE	Cathode of Red LED
5	THERMISTOR_P	Temperature sensor signal input
6	THERMISTOR_GND	Temperature sensor signal Ground
7	GREEN_CATHODE	Cathode of Green LED
8	GREEN_CATHODE	Cathode of Green LED
9	BLUE_CATHODE	Cathode of Blue LED
10	BLUE_CATHODE	Cathode of Blue LED



LED FPC Golden Finger

2.3.2 Suggestion for 10 Pin LED PFC Connector Option



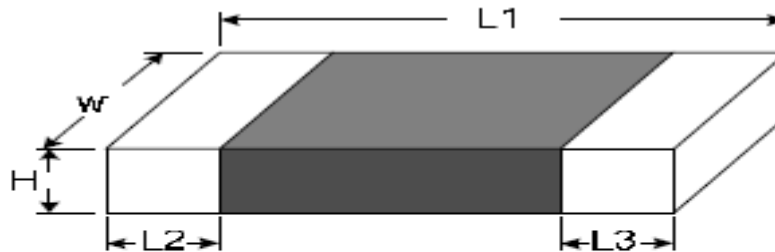
Vendor : STARCONN

Type : 106A10-000000-G2-R

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2.3.3 Thermistor Specification and LUT Table

2.3.3.1 Structure and Dimensions



(unit : mm)

L1	W	H max.	L2 and L3
1.00±0.15	0.50±0.10	0.60	0.20±0.10

2.3.3.2 Electrical Characteristics

Part No.	Zero Power Resistance at 25℃	Tolerance of R ₂₅	B _{25/85} Value	Tolerance of B Value	Max. Power Dissipation at 25℃	Dissipation Factor	Thermal Time Constant	Operating Temperature Range
	R ₂₅ (KΩ)	(± %)	(K)	(± %)	P _{max} (mW)	δ (mW/℃)	τ (sec.)	T _L ~T _U (℃)
TSM0A104F39H1RZ	100	1	3975	1	170	Approx. 1.7	Approx. 2.0	-40 ~ +125

2.3.3.3 Read Temperature value

This command is used to read the temperature in degree C as derived from the thermistor. The temperature is a 12-bit value in sign-magnitude format as shown below.

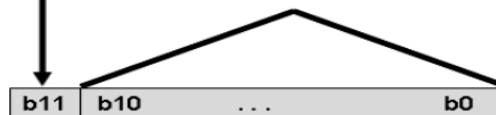
Sign of temperature:

0 = positive temperature

1 = negative temperature

Magnitude of temperature:

Divide by 10 (decimal) to find magnitude.



Example #1: b(11:0) = 000110101010

426d / 10d = +42.6degC

Example #2: b(11:0) = 100110101010

426d / 10d = -42.6degC

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2.3.4 LED Amber And Blue Colors (Q6WM)
Maximum Ratings

Parameter	Symbol	Values		Unit
		Amber	Blue	
Junction temperature	T_j	125		°C
Forward current per chip DC ($T_s=25^\circ\text{C}$)	I_f (min.) (max.)	100 500		mA
Surge current per chip $t \leq 10 \mu\text{s}$, $D = 0.1$; $T_A=25^\circ\text{C}$	I_{FM}	1500		mA
Forward current per chip pulsed $t \leq 4\text{ms}$, $D=0.5$; $f=120\text{Hz}$; $T_A=25^\circ\text{C}$	I_{Fpulse} (min.) (max.)	1000		mA
Reverse voltage per chip DC ($T_s=25^\circ\text{C}$)	V_R	Not designed for reverse operation		V
Forward voltage per chip $I_F=350\text{mA}$	(min.) V_F	2.0	2.7	V
	(typ.) V_F	2.2	3.4	
	(max.) V_F	2.7	3.8	

* Condensation on the module has to be avoided.

2.3.5 LED Green Colors (H9RM)
Maximum Ratings

			Values	
Parameter		Symbol	Green	Unit
Junction temperature		T_J	125	°C
Forward current per chip DC (Ts=25°C)	(min.) (max.)	I_f	100 500	mA
Surge current per chip t≤10 μs, D = 0.1; TA=25°C		I_{FM}	1500	mA
Forward current per chip pulsed t≤4ms, D=0.5; f=120Hz; TA=25°C	(min.) (max.)	I_{Fpulse}	1000	mA
Reverse voltage per chip DC (T _S =25°C)		V _R	Not designed for reverse operation	
Forward Voltage IF=350mA	(min.)	V _F	2.7	V
	(typ.)	V _F	3.4	
	(max.)	V _F	3.9	

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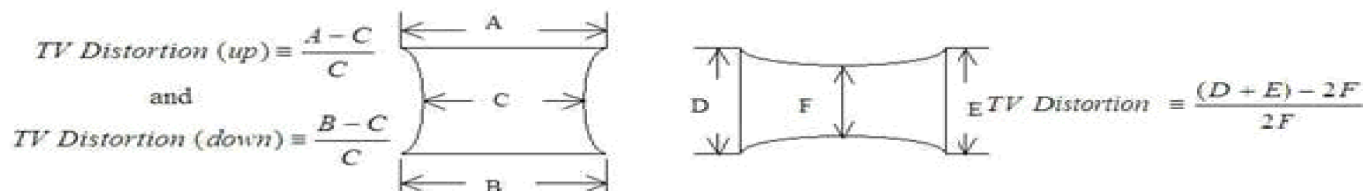
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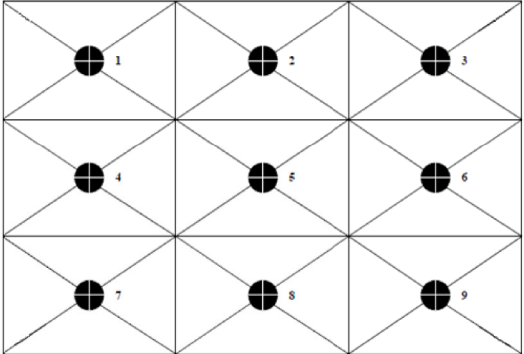
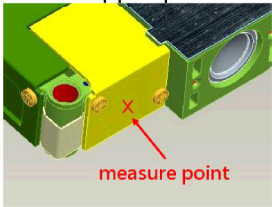
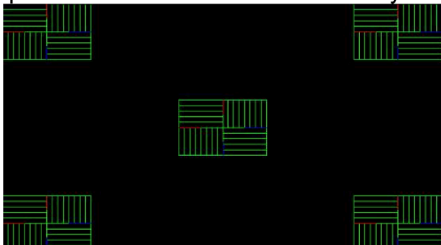
2.4 Projection Lens

Engine model	FLA2F DLP OPTICS ENGINE
Lens manufacturer	Young Optics, Inc
Projection distance	708mm±35mm@20" Diagonal
Throw ratio	1.6(Projection Distance/Width of Image)
TV distortion	+/- 1.5 % maximum
Projection Image Size	10"~60"



Picture-A: Definition of TV-Distortion PERFORMANCE

3 Optical Parameter

Test Item	Formula / Measurement Location	Specification
Engine brightness	(Ave {P1...P9} / 9)*Screen Area 	35 lm (Typ.) at 900mA 25 lm (Min.) at 900mA When T _{case} = 40°C Note: 1. T _{case} =LED copper plate temperature 
Luminance Uniformity	(avg{P1,P3,P7,P9} / P5)X100%	≥75% (JBMA standard)
White Color Coordinate	Full white x, y coordinate in P5	x = 0.31 +/- 0.02 y = 0.33 +/- 0.02 with WPC at 900mA
Contrast Ratio	Full White/ Full Black in P5	≥ 1000
Flare	Use pattern as below and measure by ruler. 	Center < 5 pixels Corner < 7 pixels

Note:

- The above chromatic specification is measured by Minolta CL-200A with normal mode and T-10

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3.1 Image Quality on projected screen

Refer to TI's DMD 3664-2xxBT(0.2" DMD) Image quality Specification. All DMD image quality returns will be evaluated using the following projected image test conditions:

- a. Test Set degamma shall be linear.
- b. Test Set brightness and contrast settings shall be set to nominal.
- c. The diagonal size of the projected image shall be a minimum of 20 inches.
- d. The projection screen shall be 1X gain.
- e. The projected image shall be inspected from a 38 inch minimum viewing distance.
- f. The image shall be in focus during all Table 1 tests.
- g. Maximum Lumens on Active Array (mirrors) is 100.

TABLE 1. Image Quality Specification

SCREEN	ACCEPTANCE CRITERIA
Gray 10	<ol style="list-style-type: none"> 1. No Bright Pixels in Active Area 2. ≤ 1 Bright Pixels in the POM
White	<ol style="list-style-type: none"> 1. ≤ 4 Dark Pixels in the Active Area
Any screen	<ol style="list-style-type: none"> 1. No Adjacent Pixels/Clusters 2. No Unstable Pixel in Active Area 3. No DMD window aperture shadowing on the Active Area 4. No Row or Column defects 5. Blemishes are allowed 6. Eyecatcher and Border Artifacts are allowed

Notes:

1. Projected blemish numbers include the count for the shadow of the window artifact in addition to the artifact itself.
2. During all Table 1 tests, projected images shall be inspected in accordance with the conditions of inspection specified in Section 3.
3. The rejection basis for all cosmetic DMD defects (scratches, nicks, particles) will be the projected image tests referenced in Table 1.
4. Devices that meet this image quality specification but are deemed undesirable by the customer may not be returned to TI without prior approval by TI.
5. Screens < Gray10 shall not be used as a basis for rejecting a DMD for image quality.

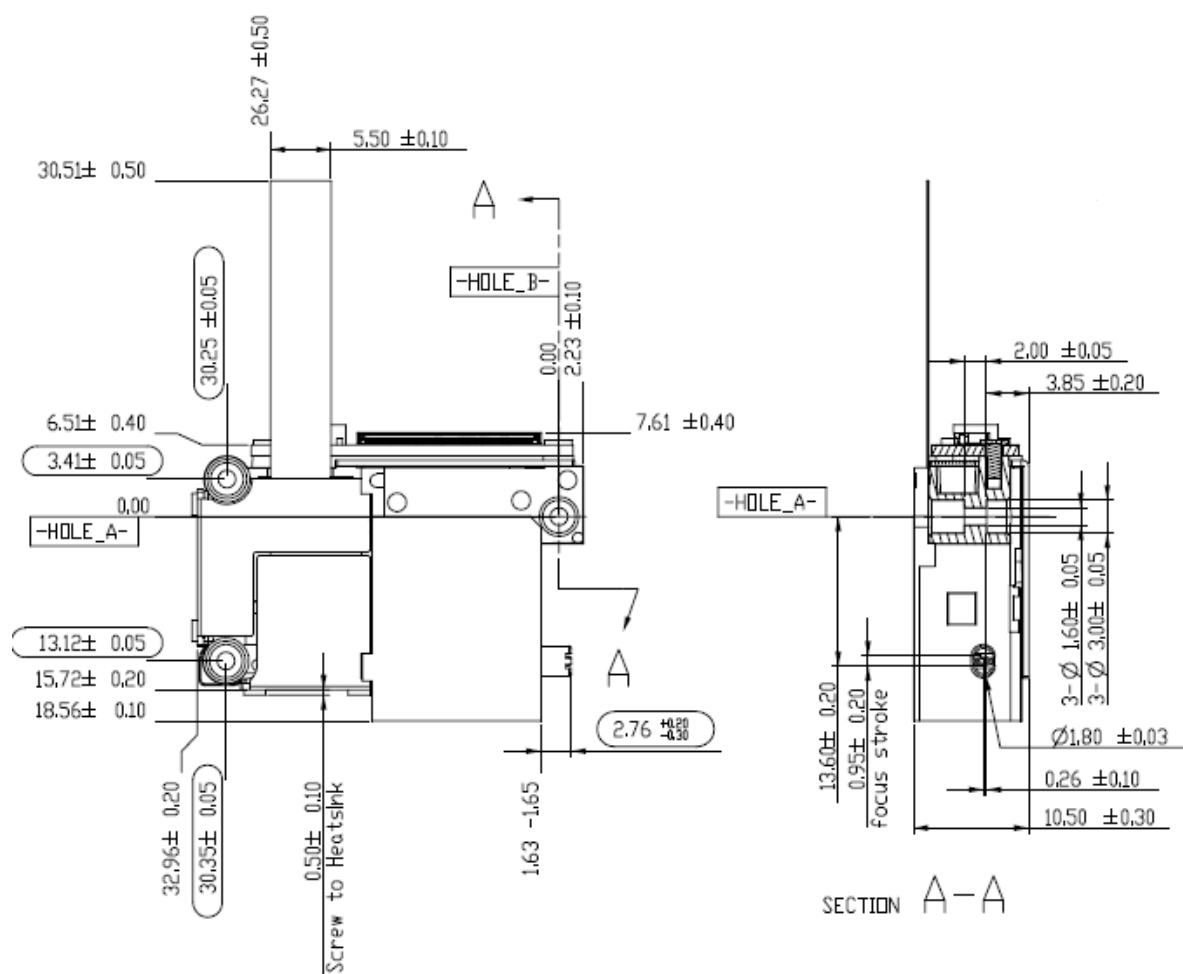
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4 PHYSICAL SPECIFICATION

4.1 Dimension and weight

Width	35.7 mm (typ.)
Depth	28.7 mm (typ.)
Height	10.5 mm (typ.)
Volume	10.8 c.c. (typ.)
Weight	11.5gf (typ.)

4.2 Engine Dimension

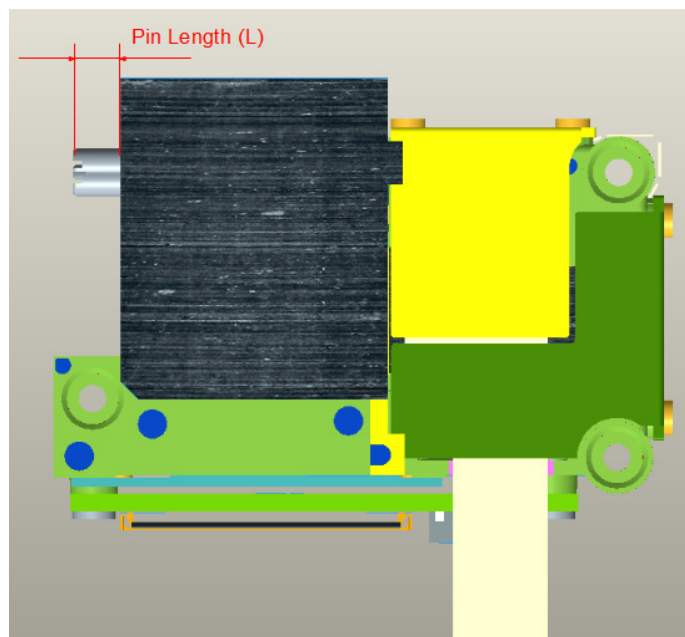


FLA2N Engine Outline dimension

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4.3 Dimension of Focus Pin and Focus Force Specification

Pin Length (L)	2.76 +0.2/-0.3mm
Pin Diameter	Φ1.8 +0.0/-0.1mm
Focus Force (F)	< 50 gf



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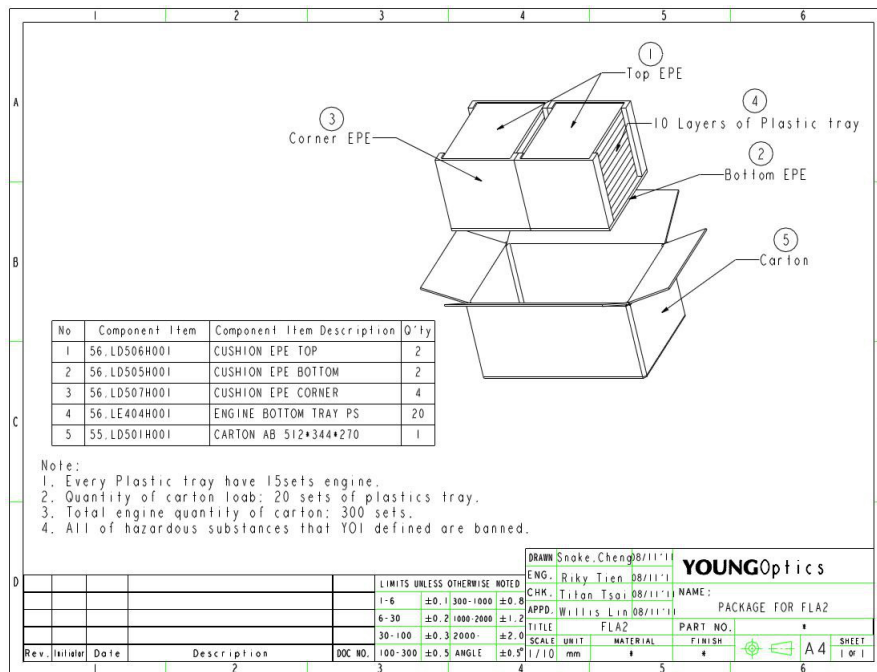
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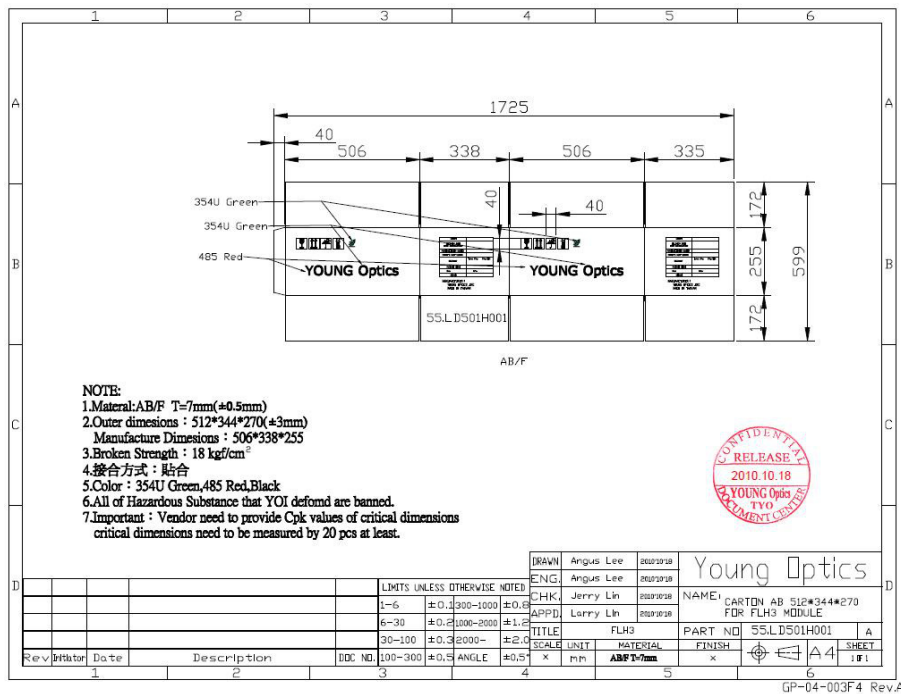
5 Package and Handling

5.1 Package Illustration

5.1.1 Box Package



5.1.2 Carton



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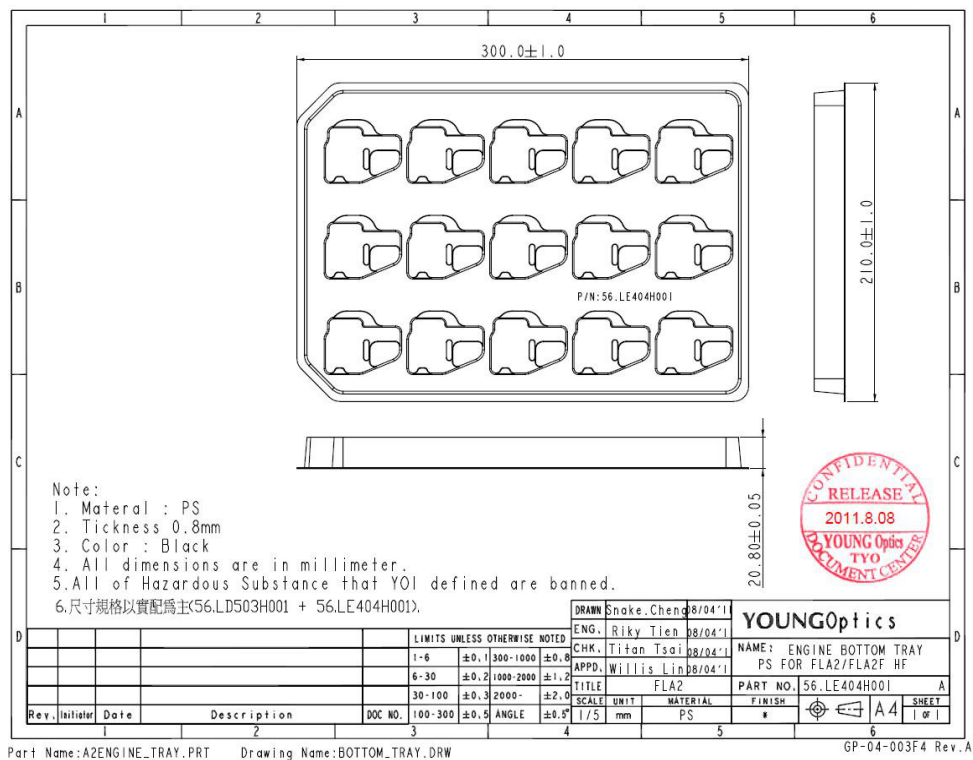
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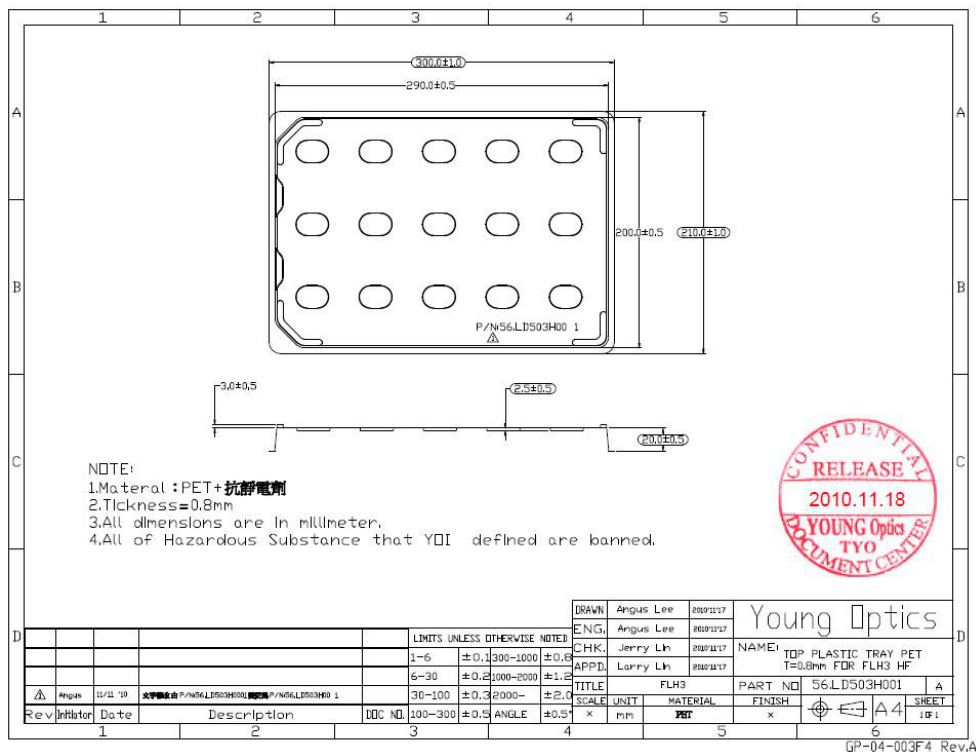
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GP-04-003F4 Rev.A

5.1.3 Base Plastic Tray



5.1.4 Top Plastic Tray



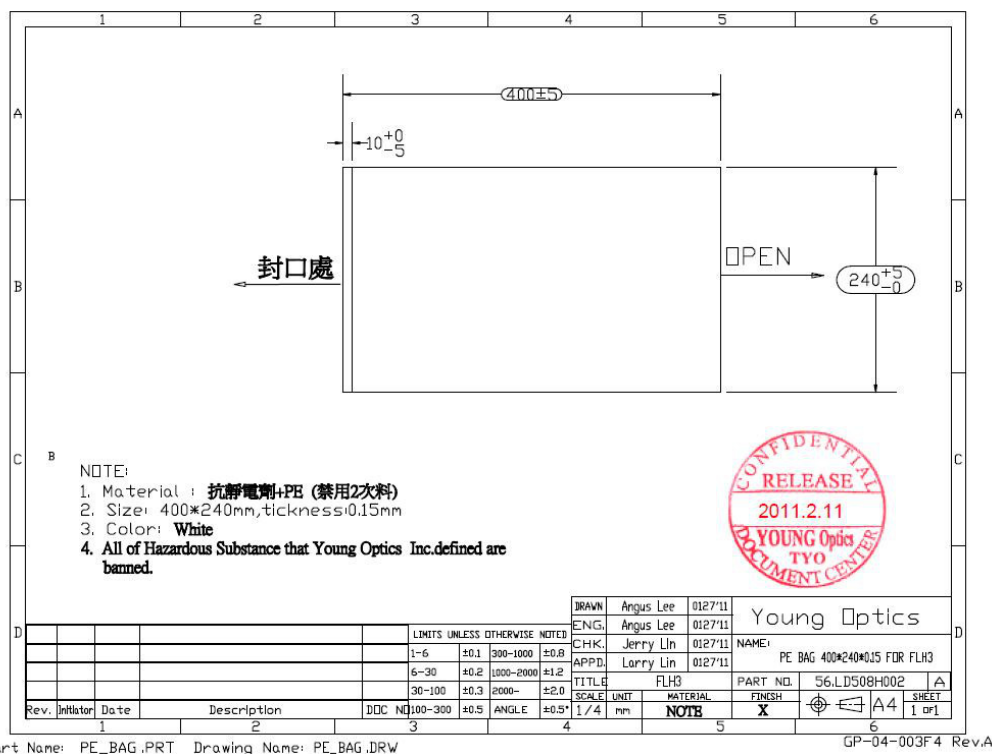
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File: FLA2N- Engine Spec.

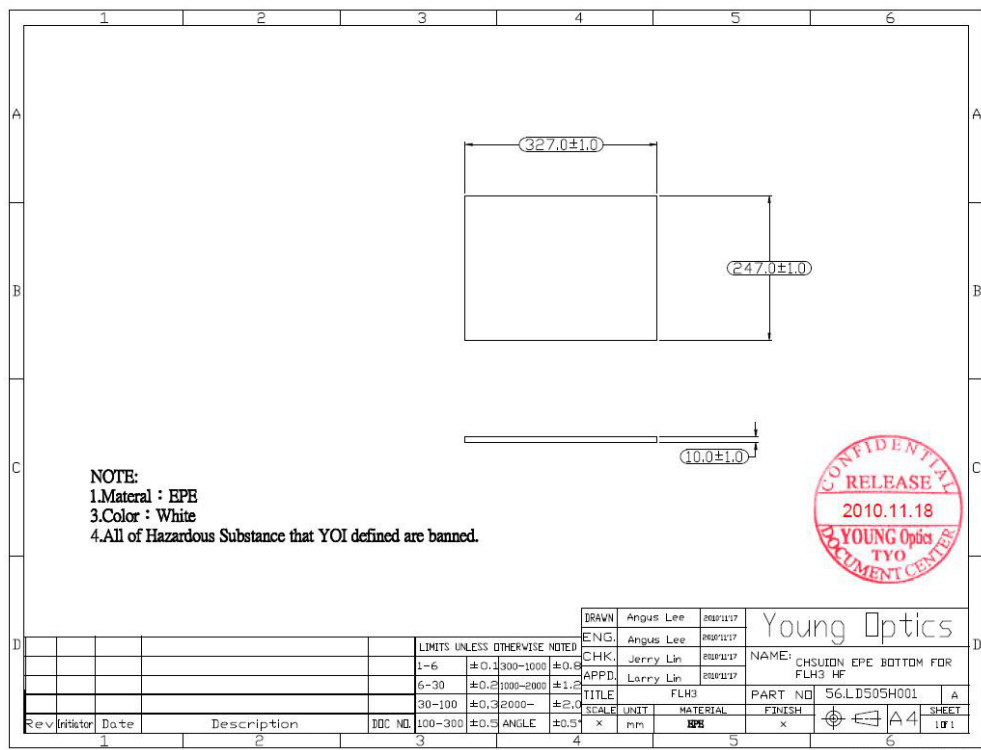
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5.1.5 PE Bag



5.1.6 Cushion EPE Bottom

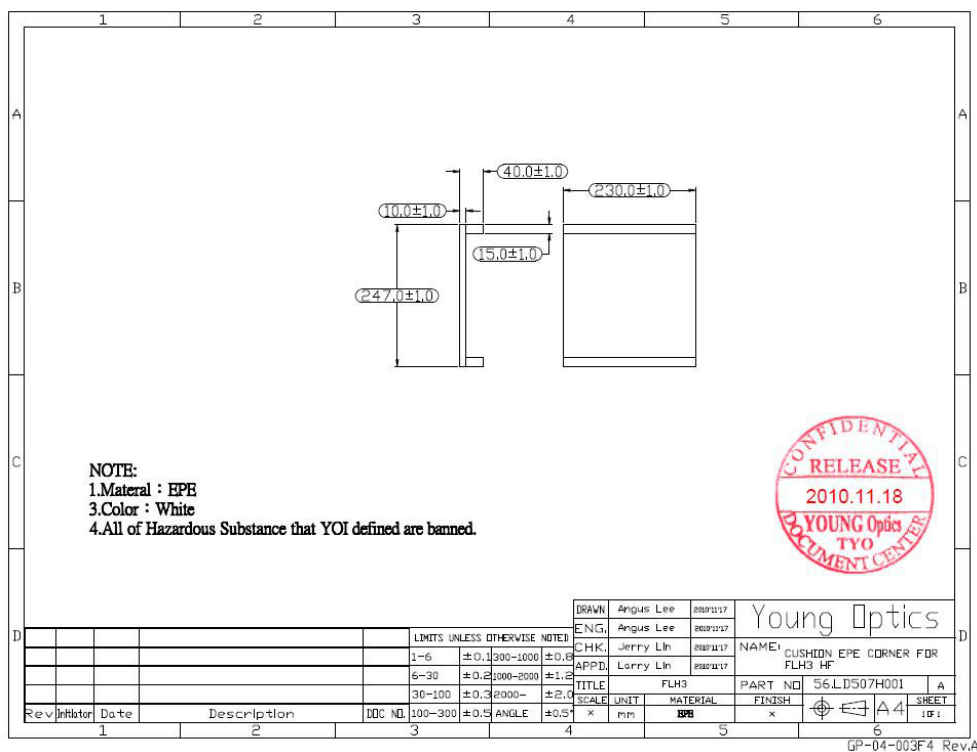


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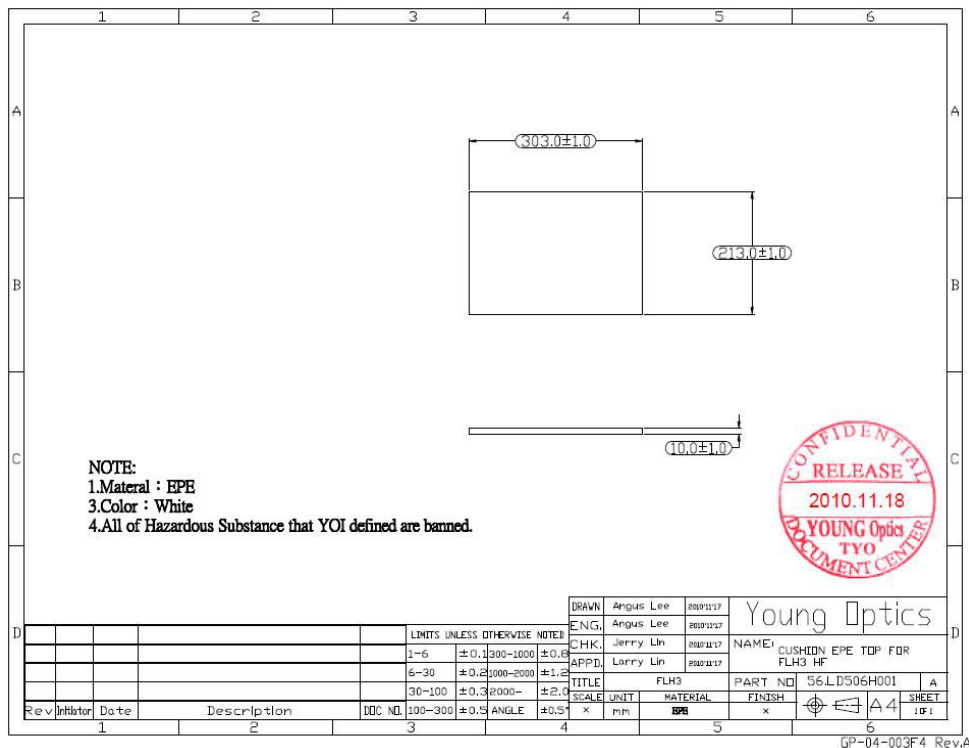
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5.1.7 Cushion EPE Corner



5.1.8 Cushion EPE Top



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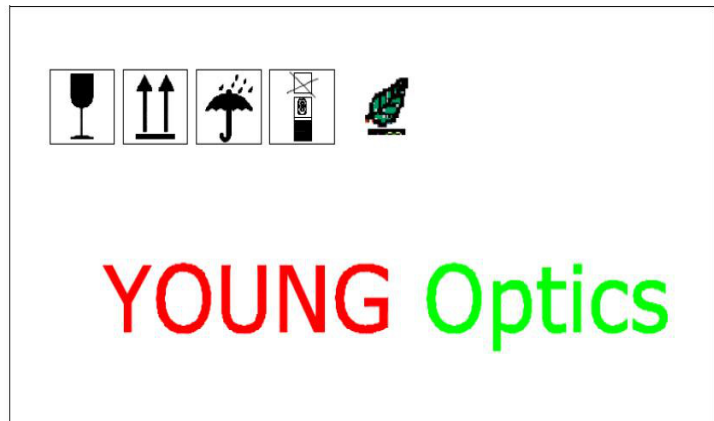
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5.2 Marking on Shipping Box

CLIENT		
DELIVERY DATE FROM MANUFACTURER		
PURCHASE ORDER NUMBER		
CLIENT'S PART NUMBER		
QUANTITY	Total Q'ty	Q'ty/BOX
PACKAGE COUNT		
G.W.	N.W.	
REMARK		

MANUFACTURER :
YOUNG OPTICS ,INC
MADE IN TAIWAN



5.3 Engine Label

Marking /Barcode Label on engine

Size : 5.0mm x 10.0mm



Cord define :

LE40 6 A

1 2 3

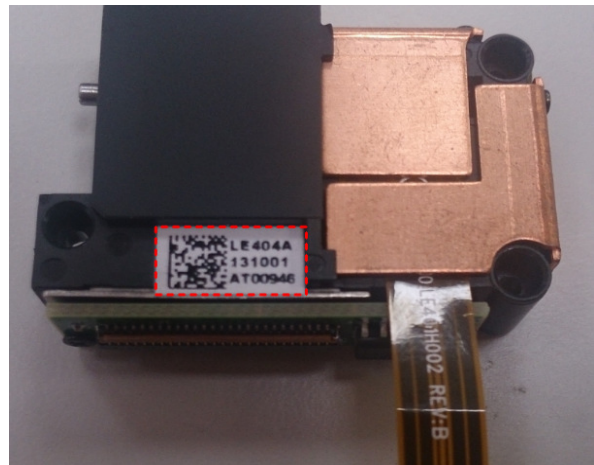
14 03 31

4 5 6

A T 00001

7 8 9

Position :



Item	Definite description
1	YOI Project Code (LE40)
2	LED Type (1,A,C,...)
3	Engine version. (A,B,C,...)
4	Year of production (11 → 2011,12 → 2012...)
5	Month of production (01→01,12→12...)
6	Day of production (01→01,31→31...)
7	Assembly Line (A,B,C,...)
8	Production Location (T→TYO)
9	Serial number (0001,0002,...,9998,9999)

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5.4 Handling Illustration

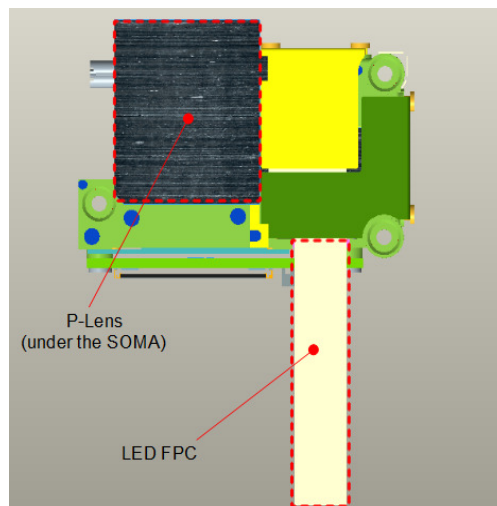
5.4.1 Handling Attention

- Each tray plate contains 15 engines.
- Each carton box contains 20 tray plates.
- Take out the product as the drawing below.
- Do not let the product soak in (contact with) any liquids.
- Do not clean the Projection Lens with flammable liquids.
- Keep the Projection Lens away from sharp objects.
- Do not apply any physical destruction or disassemble to the product.
- Use the ESD antistatic gloves to pick the engine up.



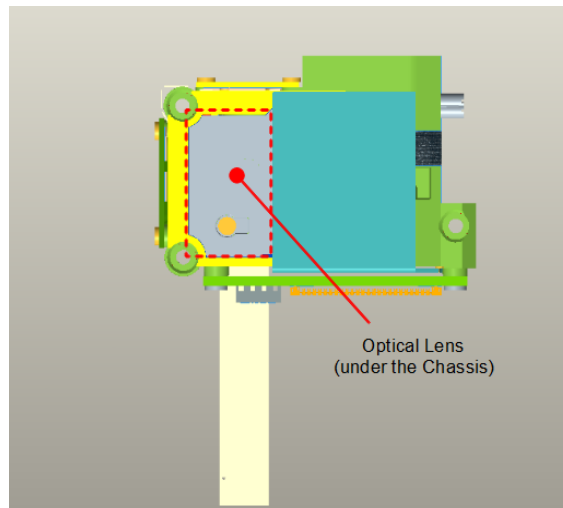
■ Weak Point of Engine

1. Top view:

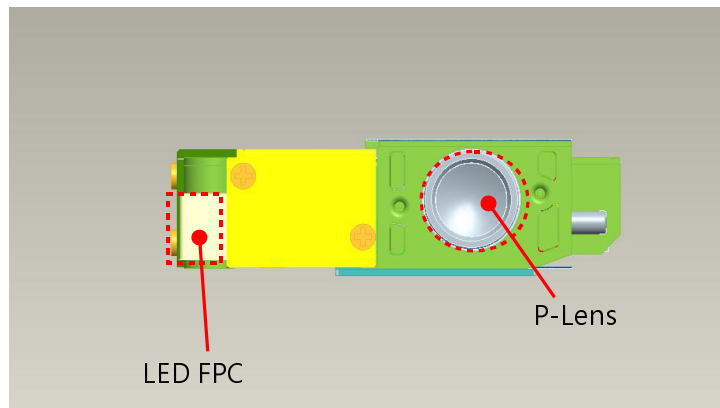


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2. Bottom view:



3. Front view:

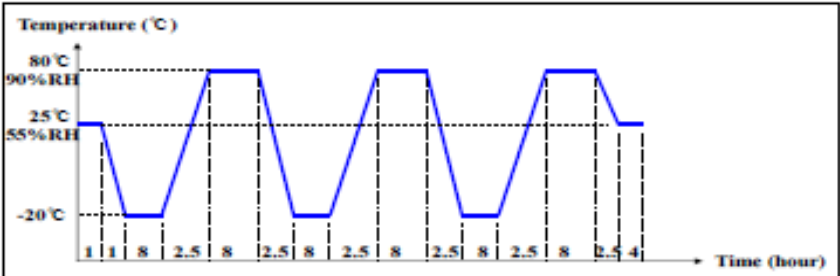
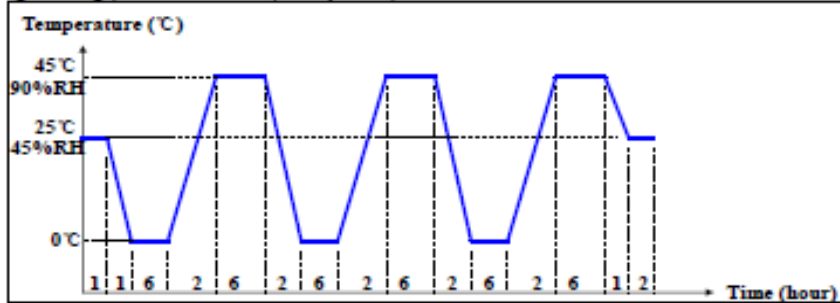
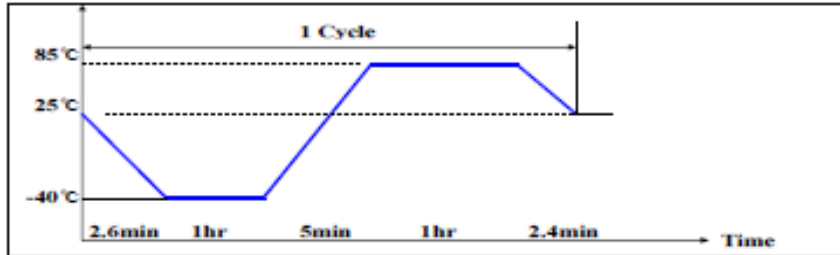


6 ***Green Product requirement***

- (1) All of hazardous substances that YOI defined are banned.
- (2) Component and Engine module: Conformity with DIRECTIVE 2002/95/EC (RoHS) of the European Union.

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7 Reliability test

No.	Test Item	Test Condition / Specification
1	Temp. / Humi. Cycle Test (Without Package)	<p>Non-Operating: -20℃ ~ 80℃, 0%~90%RH, 3 Cycles, 69 hours</p>  <p>Operating : 0℃ ~ 45℃, 0%~90%RH, 3 Cycles, 51 hours</p> 
2	Low Temp Test (Without Package)	<p>Non-Operating: -40℃, 168 hours</p> <p>Operating: 0℃, 168 hours</p>
3	High Temp (Without Package)	Operating: 45℃, 168 hours
4	Thermal Shock	<p>Non-Operating: -40℃~85℃, ramp rate:5℃/min Dwell time :1hrs, 30Cycles</p> 
5	Vibration	Non-Operating: Sine wave,20~2000Hz,4G , 4min/cycle , 4cycle/axis
6	Drop Test	120cm, 1 time/Face, 6Faces, 2cycle
7	Mechanical Shock	Non-Operating: Half-sine, 1500g , 0.5ms, ±X, ±Y, ±Z 1times for each direction .

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