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SPECIFICATION



ESD09004888

FSP160-3PI01A

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SPECIFICATION

FSP 160-3PI01A

R&D	CHECK	APPROVED	REV.
Kevin			05

1. SCOPE

The FSP160-3PI01A comprises a 61 Watts Multi-Outputs (+5Vsb, +5V, +24V), **Full range** [90 – 264 Vac] switching power supply and a DC to AC inverter for a LG 32" EEFL LCD-TV .

2. FEATURE

All products including samples delivered will meet all the requirements as outlined in the document. The basic requirements of the design features are listed below:

- * 3 Output Voltages: +5Vsb, +5V, +24V
- * Build in DC-AC inverter.
- * Short circuit protection / over current protection / over voltage protection
- * Simple construction - easy assembly and service /repair
- * High reliability
- * High efficiency - to reduce temperature rise. The efficiency is greater than 80%. (include DC/DC and DC/AC)
- * Green Mode function for LCD panel .The power supply has the green mode function.
At standby mode [**5Vsb/70mA**], the power consumption is less than 1 Watts at 230Vac /50Hz.
- * Digital PWM dimming for Inverter

3. MECHANICAL REQUIREMENTS

3.1 Power supply Dimension Constraints

290(L)*160(W)*25(H) , include PCB, unit: mm

3.2 Power Supply Connectors

Pin & Wire color assignment of Connector below

3.2.1 CN100 POWER INLET

Pin number	Output Name
1	LINE
3	NEUTRAL

3.2.2 CN201 [Output Connector]

Pin number	Output Name
1	PS_On (5V On/ 0V off)
2,3	GND
4,5	5V
6	5V _{SB}
7,8	GND
9,10	24V

3.2.3 CN202 [output connector]

Pin number	Output Name
1	24V
2	GND
3,4	24V
5,6	GND
7	V _{sel}
8	GND
9	BL_ON
10	GND
11	V _{IPWM}
12	V _{EPWM}

V _{sel}	V _{IPWM} 或V _{EPWM} selection	External PWM dimming	3	5	5.5	V
		Internal PWM dimming	-0.3		0.8	V
V _{IPWM}	Internal PWM dimming		Min brightness		Max brightness	
		DC level	0		3.3	V
		Frequency		160		Hz
		PS: V _{IPWM} is open at disable condition				
V _{EPWM}	External PWM dimming		Min brightness		Max brightness	
		Duty	20		100	%
		Frequency	90		150	Hz
		High Level	3	3.3	3.6	V
		Low Level		0		V
		PS: V _{EPWM} is open at disable condition				
BL_ON	Back light on/off control V _{ON/OFF}	On=High	3	5	5.5	V
		Off=Low	-0.3		0.8	V

3.2.4 The lamp output is provided through the connector- CN401

Pin number	Output Name
1	(+) High Voltage
2	(+) High Voltage

4. ELECTRICAL REQUIREMENTS

4.1 Input AC

4.1.1 Input voltage

Minimum	Nominal	Maximum	
90	230	264	

4.1.2 Input Frequency

Min	Nominal	Max	
47	50/60	63	Hz

4.2 Interface

4.2.1 Output voltages and loads

They are measured at the load end of connected cables.

Table.1 SMPS load limits when the pin “Power On/off” is off (0V)

Signal Name	Voltage (Volts)			Current (A)		
	Min	Typ	Max	Min	Stand-by	Max
+5Vsb	5	5.2	5.35	0.05	1	1

Table.2 SMPS load limits when the pin “Power On/off” is on (5V)

Signal Name	Voltage (Volts)			Current (A)		
	Min	Typ	Max	Min	Nor.	Max
+5V	5	5.2	5.35	0.03	4	4
+24V	22.8	24	25.2	0	1.5	2

Note 1. The output voltage shall remain within the following the output regulation at Max & Min load for rated AC input condition [90Vac to 264Vac]

4.2.2 On / off control voltages

Signal Name		Voltage (Volts)		
		Min	Typ	Max
PS_On	Power ON (Hi)	3	5.0	
	Power Off (Lo)	0		1
BL_ON	Inverter ON (Hi)	2	5	
	Inverter Off (Lo)	0		0.5

4.3 Ripple and Noise

4.3.1 Ripple and Noise required specification

Table.3 lists the Ripple and Noise limitations of switching power supply unit only under all operating conditions including the input line voltage range and over all of the full load range.

Table.3 Ripple and Noise Limitations

Signal Name	Ripple & Noise (mV)
+5Vsb	100
+5V	100
+24V	200

Note:

1. The measuring is done by 20MHz band width limited oscilloscope and terminated each output with a 22uF capacitor in parallel with a 0.1uF capacitor.
2. While test ripple noise of the output, the probe shall avoid any coupling from other circuit or equipment, otherwise the test result will not show power supply's actual ripple/noise.

4.4 Protection

The switching power supply (+5Vsb ,+5V) will be auto recovery while the fault is removed.

The switching power supply (+24V) will be latched off at fault condition.

4.4.1 Short circuit protection

Each DC output shall have short circuit protection. A short condition on any of DC outputs shall cause **no damage** to the power supply.

4.4.2 Fuse protection

The Fuse inside the power supply shall open when the AC input current is over the rated current of fuse. This Fuse protection will cause switching power supply to fail.

4.4.3 Over voltage protection

The power supply have the over voltage protection. When the main feedback control circuit fault occur, the power supply shall be over voltage protection to protect the whole system.

4.5 Efficiency

80% Min It will be measured at the maximum load and nominal line (**120V**)
(include DC/DC and DC/AC)

4.6 Hold-up time

The power supply shall maintain voltage regulation within the specified limits in table 1 for at least **20** milliseconds (one cycle drop) after losing of input voltage under the following conditions:

Input voltage: 100-240Vac
Loading: max output load

That means the power supply shall cover the AC one cycle without any impairment to the power supply output's regulations.

4.7 Turn On Delay Time (Power On Time)

The power supply is in regulation within **2 seconds** after specified rated input voltage had been applied .

4.8 Mean Time Between Failure (MTBF)

50,000 hrs at 25 Degrees centigrade when calculated using MIL-HDBK-217F. The VENDOR can use agreed upon F.I.T. (failure – in - time) number in place of MTBF.

4.9 Green Mode function

The power supply shall have the green mode function.

When system is at standby mode, main power on /off is off (0V) & 5Vsb load 70mA, the input power consumption shall less than 1 Watts under AC 230V 50Hz input.

5. ELECTRICAL REQUIREMENTS FOR INVERTER

5.1 Inverter Electrical Specifications

Test condition is $V_{in}=100-240V$, $T_a=25\pm 2^{\circ}C$, , and after 30 minutes warm up unless otherwise specified.

SYMBOL	ITEM	TEST CONDITION	MIN	TYP	MAX	UNIT
I _{omax}	Max output lamp current	High side (+)	87	93	99	mA(RMS)
I _{omin}	Min output lamp current	High side (+)		TBD		mA(RMS)
I _{amp}	Output working voltage	I _{lamp} =93mA	860	1020	1187	V _{rms}
V _{open}	Lamp striking Voltage(one side)	T _a =0°C			1095	V _{rms}
T _{strike}	Power up striking Time	T _a =0°C	2	--	3	second
F _{lamp}	Lamp frequency	T _a =0°C	61	63	65	kHz
F _{pwm}	PWM Dimming frequency	T _a =0°C	90		150	Hz
V(DIM)	PWM dimming DC level	Max brightness	2.8	3.3	3.6	V _{ac}
		Min brightness		0	0.2	
V(BL_ON)	Inverter Enable DC level	Backlight on	2	5		V _{dc}
		Backlight off	0		0.5	
V _{open}	Open Lamp protection	Load = $\infty \Omega$	Latch			--
V _{short}	Output Lamp short	Load = 2 K Ω	Latch			--
T _p	Protection time for V _{open} &V _{short}	Output abnormal	2	--	3	Sec
V _{ld}	Lamp protect detection	Normal operate				V _{dc}
		Lamp protect status				

6. ENVIRONMENTAL REQUIREMENTS

6.1 Operating Temperature

Power Operating	0 to +40 °C for Power Unit only 0 to +40 °C for TV set
Storage	-20 to +60 °C

Note :

- 1) Thermal test must be done at nom. AC and at I Max load.

6.2 Humidity (Non-condensing)

Operating 0% to 90% RH

6.3 Hi-pot test

100% Hi-pot tested,

Primary to second: 3KVAC 60 second

6.4 Leakage Current Test

Leakage current: Measured at 264Vac/50Hz, 0.6mA max.

7. INTERNATIONAL STANDARDS

7.1 EMI standards

Designed to meet the following conducted & radiation limits:

CISPR 22 Class B

7.2 EMS standards

7.2.1 Electrostatic Discharge Immunity Test:

Air: IEC-61000-4-2 20KV, Criteria B

Contact: IEC-61000-4-2 10KV, Criteria B

7.2.2 EFT/Burst Immunity Test: IEC-61000-4-4 1KV, Criteria B

7.2.3 Surge Immunity Test:

Line , Neutral to GND IEC-61000-4-5 2KV, Criteria B

Line to Neutral IEC-61000-4-5 1KV, Criteria B

7.3 Safety Compliance

Design to meet

UL60065 / IEC60065 REV:7

The spec. change list

Item	Revision	Descriptions	Date
1	1	Initial spec. release	12/17 '2008
2	2	0 to +40 °C for Power Unit only	03/22 '2009
3	3	Leakage Current Test	04/08 '2009
4	4	Item6.3 HI pot test spec. updated : Primary to second: 3KVAC 3 second	07/27 '2009
5	5	Item6.3 HI pot test spec. updated: Primary to second: 3KVAC 60 second	09/16'2009