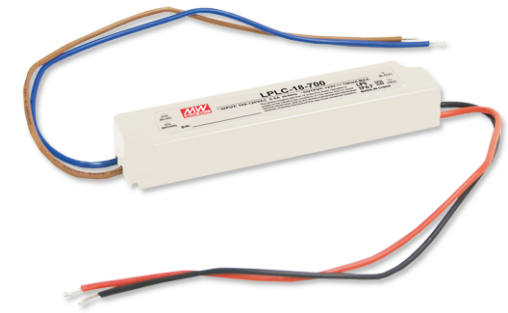
18W Single Output Switching Power Supply — LPLC-18 series



Features :

- Constant current mode power supply
- 90-132VAC input only
- Fully encapsulated with IP67 level
- Protections:Short circuit / Overload / Over voltage / Over temperature
- Cooling by free air convection
- Pass LPS
- 100% full load burn-in test
- Suitable for LED lighting and moving sign applications
- High reliability / Low cost
- 2 years warranty

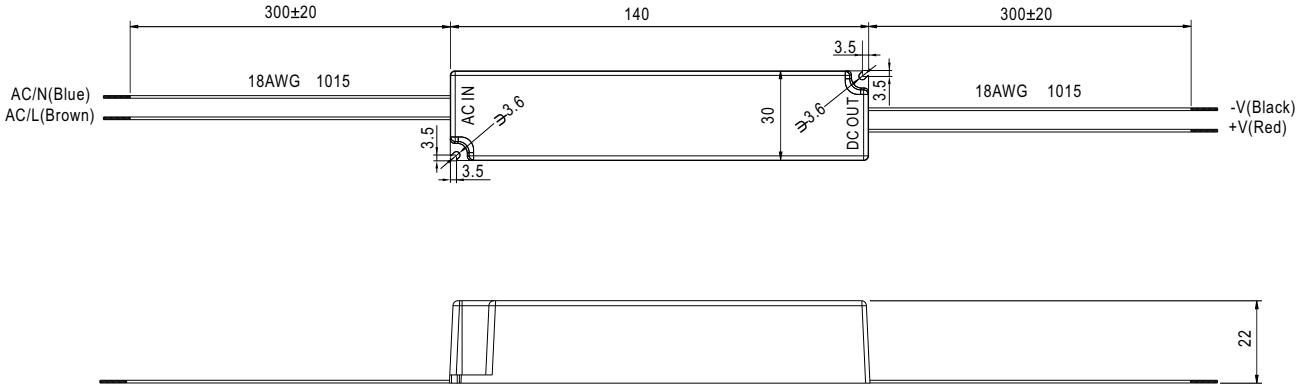
LPS IP67 (LVD)

SPECIFICATION

MODEL		LPLC-18-350	LPLC-18-700
OUTPUT	RATED CURRENT	350mA	700mA
	DC VOLTAGE RANGE	6~48V	6~25V
	RATED POWER	16.8W	17.5W
	RIPPLE & NOISE (max.) Note.2	300mVp-p	250mVp-p
	VOLTAGE TOLERANCE Note.3	±5.0%	
	LINE REGULATION	±1.0%	
	LOAD REGULATION	±3.0%	
	SETUP, RISE TIME	3600ms, 150ms / 115VAC	
	HOLD UP TIME (Typ.)	20ms/115VAC at full load	
INPUT	VOLTAGE RANGE	90 ~ 132VAC 127 ~ 186VDC	
	FREQUENCY RANGE	47 ~ 63Hz	
	EFFICIENCY(Typ.)	82%	80%
	AC CURRENT	0.5A/115VAC	
	INRUSH CURRENT(max.)	Cold start 40A/115VAC	
	LEAKAGE CURRENT	0.25mA / 120VAC	
PROTECTION	CURRENT LIMIT	±5% rated output current	
		Protection type : Constant current limiting type	
	OVER VOLTAGE	50.4~ 60V	28.75~ 33.75V
		Protection type : Shut off o/p voltage, clamping by zener diode	
	OVER TEMPERATURE	Tj 140 t ypically (U1) Detect on main control IC	
		Protection type : Hiccup mode, recovers automatically after temperature goes down	
ENVIRONMENT	WORKING TEMP.	-30 ~ 70℃ (Refer to output load derating curve)	
	WORKING HUMIDITY	20 ~ 90% RH non-condensing	
	STORAGE TEMP., HUMIDITY	-40 ~ +80℃, 10 ~ 95% RH	
	TEMP. COEFFICIENT	±0.2%/℃ (0 ~ 50℃)	
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes	
SAFETY & EMC (Note 5)	SAFETY STANDARDS	IP67 approved; design refer to UL1310 Class 2,TUV EN60950-1, EN61347-2-13, CAN/CSA C22.2 No. 223-M91	
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC	
	ISOLATION RESISTANCE	I/P-O/P:>100M Ohms / 500VDC / 25℃/ 70% RH	
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22) Class A, FCC part15	
	HARMONIC CURRENT	Compliance to EN61000-3-2 Class A,EN61000-3-3	
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, Light industry level, criteria A	
OTHERS	MTBF	1200.6K hrs min. MIL-HDBK-217F (25)	
	DIMENSION	140*30*22(L*W*H)	
	PACKING	0.175Kg; 70pcs/13.3Kgs/0.71CUFT	
NOTE	1. All parameters NOT specially mentioned are measured at 115VAC input, rated load and 25°C of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. Derating may be needed under low input voltage. Please check the static characteristic for more details. 5. The power supply is considered as a component that will be operated in combination with final equipment. Since EMC performance will be affected by the complete installation, the final equipment manufacturers must re-qualify EMC Directive on the complete installation again.		

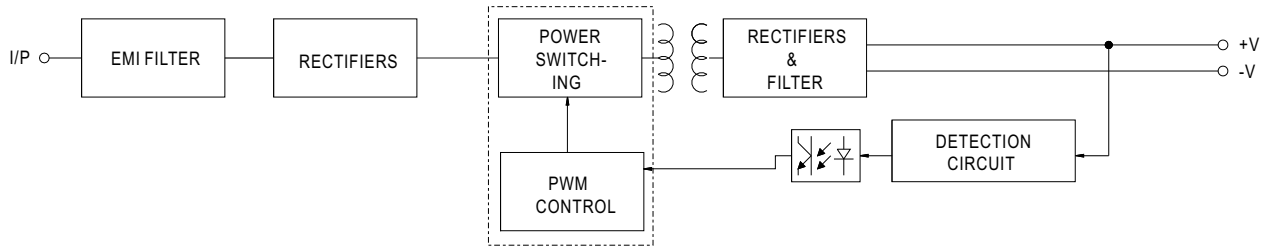
■ Mechanical Specification

Unit:mm

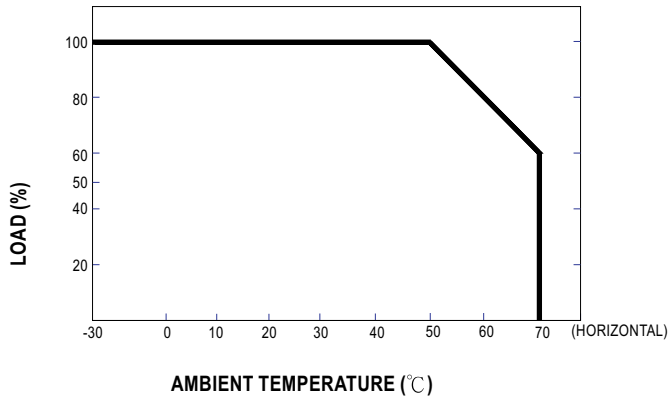


■ Block Diagram

fosc : 67KHz

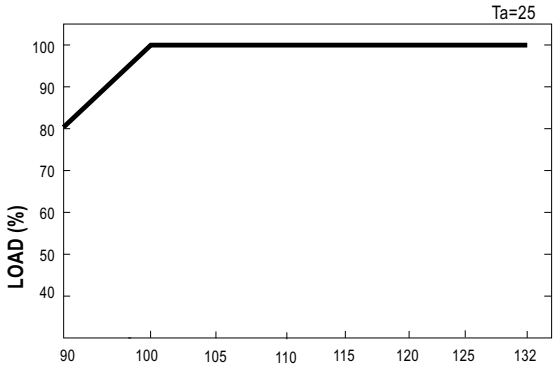


■ Derating Curve



AMBIENT TEMPERATURE (℃)

■ Static Characteristics



INPUT VOLTAGE (VAC) 60Hz

Test Report: LPLC-18-350

18W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1：300 mVp-p (Max)	I/P： 115VAC O/P：FULL LOAD Ta：25℃	V1： 110 mVp-p (Max)	P
2	OUTPUT VOLTAGE TOLERANCE	V1：5 %~ -5 % (Max)	I/P： 100 VAC / 132 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.09 %~ -0.09 %	P
3	LINE REGULATION	V1： 1 %~ -1 % (Max)	I/P：100VAC ~ 132 VAC O/P：FULL LOAD Ta：25℃	V1： 0.02 %~ -0.02 %	P
4	LOAD REGULATION	V1： 3 %~ -3 % (Max)	I/P： 115 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.09 %~ -0.09 %	P
5	SET UP TIME	115VAC： 3600 ms (Max)	I/P： 115 VAC O/P：FULL LOAD Ta：25℃	115VAC/ 2559 ms	P
6	RISE TIME	115VAC： 150 ms (Max)	I/P： 115 VAC O/P：FULL LOAD Ta：25℃	115VAC/ 38 ms	P
7	HOLD UP TIME	115VAC： 20 ms (TYP)	I/P：115 VAC O/P：FULL LOAD Ta：25℃	115VAC/ 30 ms	P
8	OVER/UNDERSHOOT TEST	< ±5%	I/P： 115 VAC O/P：FULL LOAD Ta：25℃	TEST： < 5 %	P
9	DYNAMIC LOAD	V1： 4800 mVp-p	I/P： 115VAC O/P：FULL /Min LOAD 90%DUTY/ 1KHZ Ta：25℃	172 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	100VAC~132VAC	I/P：TESTING O/P：FULL LOAD Ta：25℃	70V~132V	P
			I/P： LOW-LINE-3V= 97 V HIGH-LINE+15%=152V O/P：FULL/MIN LOAD ON： 30 Sec . OFF： 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST： OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P： 100VAC ~ 132 VAC O/P：FULL~MIN LOAD Ta：25℃	TEST： OK	P
3	EFFICIENCY	82 % (TYP)	I/P： 115 VAC O/P：FULL LOAD Ta：25℃	82.88 %	P
4	INPUT CURRENT	115V/ 0.5 A (TYP)	I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I = 0.3 A/ 115 VAC	P
5	INRUSH CURRENT	115V/ 40 A (TYP) COLD START	I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I = 27 A/ 115 VAC	P
6	LEAKAGE CURRENT	< 0.25 mA / 120 VAC	I/P： 132 VAC O/P：Min LOAD Ta：25℃	L-FG： 0.01 mA N-FG： 0.01 mA	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 %~ 105 %	I/P： 115 VAC O/P：TESTING Ta：25℃	98%/ 115 VAC Constant Current Limiting	P
2	OVER VOLTAGE PROTECTION	CH1：50.4 V~ 60 V	I/P： 115 VAC O/P：MIN LOAD Ta：25℃	57V/ 115 VAC Shut off o/p voltage, clamping by zener diode	P
3	OVER TEMPERATURE PROTECTION	SPEC： Tj 140℃ typically (U1) Detect On main control IC	I/P： 115 VAC O/P：FULL LOAD	O.T.P. Active Hiccup Mode recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P： 132 VAC O/P：FULL LOAD Ta：25℃	NO DAMAGE Constant Current Limiting	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	U1 Rated： FSQ0365RN 650V	I/P：High-Line +3V = 135 V O/P： (1)Full Load Turn on (2) Output Short Ta：25℃	(1) 362 V (2) 344 V	P
2	Diode Peak Voltage	D 10 Rated： 3A/600V HER306 D 11 Rated： 1N4148 75V /0.2A	I/P：High-Line +3V = 135 V O/P： (1)Full Load Turn on (2)Output Short Ta：25℃	(1) 290 V (2) 234 V (1) 39.4 V (2) 24.2 V	P
3	Clamp Diode Peak Voltage	D 1 Rated： 1A/600V SBYV26C	I/P：High-Line +3V = 135 V O/P： (1) Dynamic Load 90%Duty/1KHz Ta：25℃	(1) 246 V	P
4	Input Capacitor Voltage	C5 Rated： 47uF/200V 105℃ KF	I/P：High-Line +3V = 135 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 182.76 V (2) 190.54 V (3) 190.21 V	P
5	Control IC Voltage Test	U1 Rated： FSQ0365RN 9V~20V	I/P：High-Line +3V = 135 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 17.488 V (2) 16.892 V (3) 16.894 V	P

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 3 KVAC/min	I/P-O/P： 3.6 KVAC/min Ta：25℃	I/P-O/P： 0.758 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P：500VDC>100MΩ	I/P-O/P： 500 VDC Ta：25℃/70%RH	I/P-O/P： 30 GΩ NO DAMAGE	P
3	APPROVAL	TUV： Certificate NO ： UL： File NO ：			N/A

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A	I/P： 120/115/110 VAC/50HZ O/P：100,75,50,25% LOAD Ta：25℃	PASS	P
2	CONDUCTION	EN55022 CLASS A	I/P： 115VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASSA	I/P： 115VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR：8KV / Contact：4KV	I/P： 115 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A	P
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT： 1KV	I/P： 115 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A	P
6	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N ：1KV L,N-PE：2KV	I/P： 115 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th><th>VERDICT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：LPLC-18-350
1. ROOM AMBIENT　BURN-IN：1 HRS
I/P： 115VAC　O/P： FULL LOAD　Ta=31.9 ℃
2. HIGH AMBIENT　BURN-IN：2 HRS
I/P： 115VAC　O/P： FULL LOAD　Ta=49.4 ℃
<table><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 31.9 ℃</th><th>HIGH AMBIENT Ta= 49.4 ℃</th></tr><tr><td>1</td><td>C5</td><td>47UF/200V　KF</td><td>50.2℃</td><td>68.3℃</td></tr><tr><td>2</td><td>C36</td><td>47UF/50V　GL</td><td>52.1℃</td><td>70.3℃</td></tr><tr><td>3</td><td>U10</td><td>HA17358</td><td>48.8℃</td><td>66.5℃</td></tr><tr><td>4</td><td>C15</td><td>100UF/63V GL</td><td>53.6℃</td><td>71.7℃</td></tr><tr><td>5</td><td>C16</td><td>63UF/63V　GL</td><td>50.1℃</td><td>67.6℃</td></tr><tr><td>6</td><td>R15</td><td>5.6K　1W</td><td>53.4℃</td><td>71.2℃</td></tr><tr><td>7</td><td>D10</td><td>HER306</td><td>61.8℃</td><td>80.7℃</td></tr><tr><td>8</td><td>C17</td><td>10UF/50V　YXF</td><td>55.2℃</td><td>73.6℃</td></tr><tr><td>9</td><td>T1</td><td>TF-6223</td><td>58.0℃</td><td>76.1℃</td></tr><tr><td>10</td><td>U1</td><td>FSQ0365</td><td>58.2℃</td><td>77.8℃</td></tr><tr><td>11</td><td>D1</td><td>SBYV26C</td><td>56.8℃</td><td>75.7℃</td></tr><tr><td>12</td><td>ZD1</td><td>P6KE150A</td><td>52.8℃</td><td>71.1℃</td></tr><tr><td>13</td><td>LF1</td><td>LF-6008</td><td>51.3℃</td><td>69.7℃</td></tr><tr><td>14</td><td>BD1</td><td>KBP20G</td><td>50.4℃</td><td>68.8℃</td></tr><tr><td>15</td><td>D2</td><td>1N4007</td><td>54.8℃</td><td>72.4℃</td></tr><tr><td>16</td><td>D11</td><td>1N4148</td><td>51.4℃</td><td>69.1℃</td></tr></table></td><td>P</td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER　2　HOUR</td><td>I/P： 115VAC
O/P： 100 % LOAD
Ta= -30 ℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12　HOURS
IN CHAMBER ON
CONTROL　50 ℃
NO DAMAGE</td><td>I/P： 132 VAC
O/P：FULL LOAD
Ta= 50 ℃
HUMIDITY=　95 %R.H</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.2　%(0~50℃)</td><td>I/P： 115 VAC
O/P：FULL LOAD</td><td>± 0.088 %(0~50℃)</td><td>P</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：5 CYCLE
5. Input/Output condition： STATIC</td><td>OK</td><td>P</td></tr>
<tr><td>6</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -35℃~ +55℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：10 CYCLE
5. Input/Output condition： 115VAC/Full Load</td><td>OK</td><td>P</td></tr>
</table>

7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：12min/sweep cycle (4) Acceleration：2G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
8	CAPACITOR LIFE CYCLE	LPLC-18-350:SUPPOSE C15 IS THE MOST CRITICAL COMPONENT (1) I/P： 115VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 115VAC O/P：FULL LOAD Ta= 50 ℃ LIFE TIME	(1) 524217.6HRS (2) 107190.4HRS	P
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE： 1200.6k HRS		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2009/8/7	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2003/12/12 A50-F023