



# Test Report: EPS-15-7.5

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15W Single Output Switching Power Supply

## ■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Control 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 : 80 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 42 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 7.13 V ~ 8.25 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	6.78 V~ 8.572 V/ 230 VAC 6.78 V~ 8.572 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : -2 %~ +2 % (Max)	I/P : 85 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : -0.252 %~ 0.079 %	P
4	LINE REGULATION	V1 : -0.5 %~ +0.5 % (Max)	I/P : 100VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : -0.079 %~ 0 %	P
5	LOAD REGULATION	V1 : -1 %~ +1 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : -0.159 %~ 0.079 %	P
6	SET UP TIME	230VAC : 1000 ms (Max) 115VAC : 2000 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 605 ms 115VAC/ 1456 ms	P
7	RISE TIME	230VAC : 30 ms (Max) 115VAC : 30 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 4.99 ms 115VAC/ 4.95 ms	P
8	HOLD UP TIME	230VAC : 50 ms (TYP) 115VAC : 16 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 87.99 ms 115VAC/ 18.17 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : 1.6 %	P
10	DYNAMIC LOAD	V1 : 1500 mVp-p	I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P : FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1) 236 mVp-p (2) 126 mVp-p (3) 138 mVp-p (4) 258 mVp-p	P

**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	85VAC~264 VAC 120VDC ~ 370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta : 25°C I/P : LOW-LINE-3V= 82 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	(1) 54.7V~264V (2) 106.1Vdc~370Vdc/FULL LOAD 106.0Vdc~370Vdc/50% LOAD (3) 106.0Vdc~370Vdc/FULL LOAD 106.0Vdc~370Vdc/50% LOAD  TEST : OK	P
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 85 VAC ~ 264 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK	P
3	EFFICIENCY	81 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	82.3 %	P
4	INPUT CURRENT	230V/ 0.2 A (TYP) 115V/ 0.4 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.15 A/ 230 VAC I = 0.23 A/ 115 VAC	P
5	INRUSH CURRENT	230V/ 45 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 41.26 A/ 230 VAC	P
6	LEAKAGE CURRENT	< 1 mA / 240 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.25 mA N-FG : 0.23 mA	P
7	NO LOAD CONSUMPTION	< 0.3 W	I/P : 240VAC O/P : NO LOAD Ta : 25°C	< 0.131 W	P

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	115 % ~ 150 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	133 %/ 230 VAC 134 %/ 115 VAC Protection type : Hiccup mode, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 8.63 V ~10.1 V	O/P : MIN LOAD Ta : 25°C	9.1 V Protection type : Shut down o/p voltage, Clamping by zener diode	P
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 264 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup Mode	P

**CONTROL FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	PEAK LOAD	16.5W@10SEC	I/P : 230VAC/115VAC O/P: PEAK LOAD Ta: 25°C	16.5W@10SEC /230V 16.5W@10SEC /115V	P

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 600 V 4 A	I/P : High-Line +3V = 267 V O/P : (1) Full Load Turn on (2) Output Short (3) Full load continue Ta : 25°C	(1) 546 V (2) 484 V (3) 542 V	P
2	Diode Peak Voltage	D100 Rated : 45 V 30 A	I/P : High-Line +3V = 267 V O/P : (1) Full Load Turn on (2) Output Short (3) Full load continue Ta : 25°C	(1) 35.8 V (2) 34.4 V (3) 28.2 V	P
3	Clamp Diode Peak Voltage	D 1 Rated : 800 V 2 A	I/P : High-Line +3V = 267 V O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta : 25°C	(1) 492 V (2) 494 V	P
4	Input Capacitor Voltage	C5 Rated : 33 u /400V/105°C	I/P : High-Line +3V = 267 V O/P : (1) Full Load Turn on /Off (2) Min load Turn on /Off (3) Full Load /Min load Change Ta : 25°C	(1) 364 V (2) 364 V (3) 366 V	P
5	Control IC Voltage Test	U1 Rated : 28 V	I/P : High-Line +3V = 267 V O/P : (1) Full Load Turn on /Off (2) Min load Turn on /Off (3) Full Load /Min load Change Ta : 25°C	(1) 18.4 V (2) 16.8 V (3) 18.5 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-FG : 2 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 3.6 KVAC/min I/P-FG : 2.4KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 1.19 mA I/P-FG : 0.68 mA O/P-FG : 0.25 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ I/P-FG : 500VDC>100MΩ O/P-FG : 500VDC>100MΩ	I/P-O/P : 500 VDC I/P-FG : 500 VDC O/P-FG : 500 VDC Ta : 25°C /70% RH	I/P-O/P : 9999 MΩ I/P-FG : 9999 MΩ O/P-FG : 9999 MΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C /70% RH	3 mΩ	P

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	BS EN/EN61000-3-2 CLASS B	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	PASS	P
2	CONDUCTION	BS EN/EN55032 (CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	BS EN/EN55032 (CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	BS EN/EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	BS EN/EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	BS EN/EN61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

**RELIABILITY TEST**

**ENVIRONMENT TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL : EPS-15-05 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=13.3°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 49.8°C			P

NO	Position	PART NUMBER	ROOM AMBIENT Ta= 13.3°C	HIGH AMBIENT Ta= 49.8°C
1	BD1	BD 2A/800V GLASS KBP208G	40.9°C	76.1°C
2	LF1	LF LF510-R2 UU9.8 0.4A 27mH B	43.0°C	79.1°C
3	C5	C/E 33u/400V 105°C 12.5*20 KMG	35.9°C	70.4°C
4	Q1	FET NDF04N60ZG 4A/600V TO220F	56.7°C	91.2°C
5	T1(COIL)	MT TF5166-R0 EI-22 EPS-15-5 B	77.6°C	112.4°C
6	D100	SBD STPS30S45CT 30A/45V TO220	79.7°C	115.1°C
7	L100	DR-COIL DR011C-R2 6*8 0.55Φ 1uH	52.2°C	87.3°C
8	C102	C/E 1000u/16V UL8Kh 8*20 ZLH	50.0°C	84.5°C
9	C101	C/E 1000u/16V UL8Kh 8*20 ZLH	59.5°C	93.8°C
10	U1	PWM NCP1250BSN65T1G TOSP-6	43.2°C	77.6°C

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 128 % LOAD Ta : 25°C	TEST : OK	P
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -30 °C	TEST : OK	P
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	P
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.005 %/°C (0~50°C)	P
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40°C ~ +85°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK	P
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30°C ~ +70°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 230VAC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec		OK	P
8	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°C		TEST : OK	P
9	CAPACITOR LIFE CYCLE	EPS-15-05 SUPPOSE C 102 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME		(1) 240859 HRS (2) 40143 HRS (3) 68832 HRS (4) 125767 HRS	P
10	MTBF	6024.7K hrs min. Telcordia SR-332 (Bellcore) ; 849.3K hrs min. MIL-HDBK-217F (25°C)			P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C			P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2012.9.18	RD SAMPLE	PASS	Shenym	Wangdz
2012.11.21	PRODUCT SAMPLE (Y1211B629)	PASS	Shenym	Wangdz

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