



# TEST REPORT: EPS-65S-15

## 65W 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



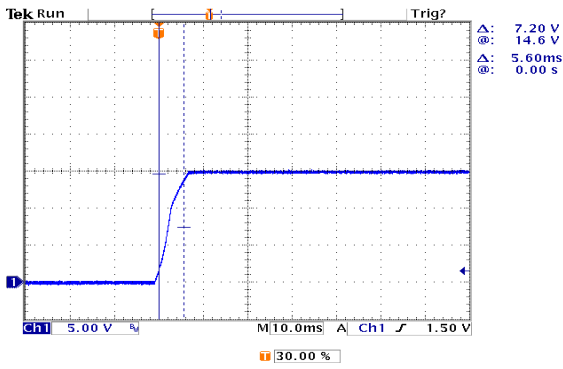
DESIGN VERIFY TEST  
OUTPUT FUNCTION  
TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 13.50V ~ 16.50V	I/P : 230VAC O/P: MIN LOAD TA: 25°C	CH1: 13.22V ~ 17.02V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 115VAC / 264VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.33% ~ -0.37%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 115VAC / 264VAC O/P: FULL LOAD TA: 25°C	V1: 0.04% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.33% ~ -0.37%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 4.757 %
6	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 52.4 mVp-p
7	SET UP TIME (MAX.)	230VAC : 500ms 115VAC : 500ms	I/P : 230VAC I/P : 115VAC	230VAC : 202ms 115VAC : 58ms
	<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		
	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 5.6ms 115VAC : 6.0ms

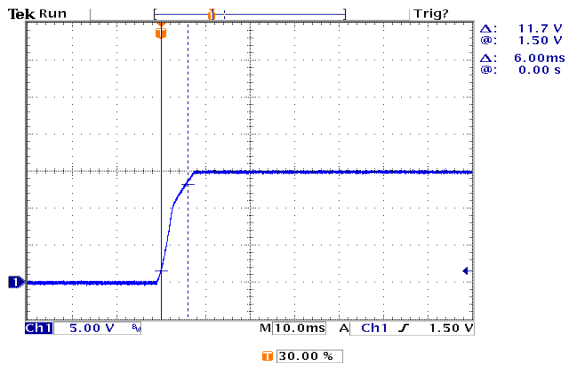


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INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage

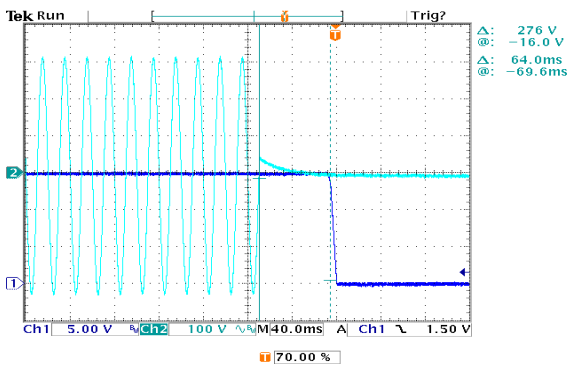


INPUT=115VAC/60HZ @ FULL LOAD  
CH1 : Output Voltage

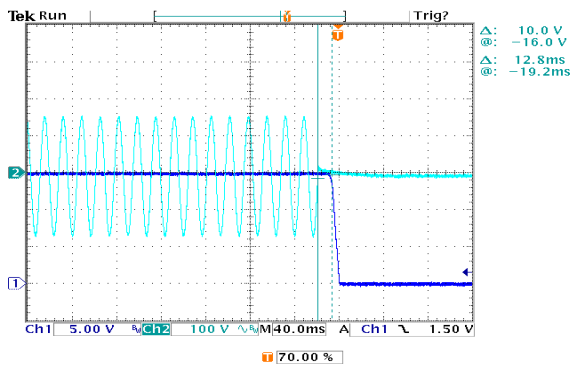


HOLD UP TIME (TYP.)	230VAC	: 30ms	I/P :	230VAC	230VAC	: 64.0ms
	115VAC	: 12ms	I/P :	115VAC	115VAC	: 12.8ms
			O/P:	FULL LOAD		
			TA :	25°C		

INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



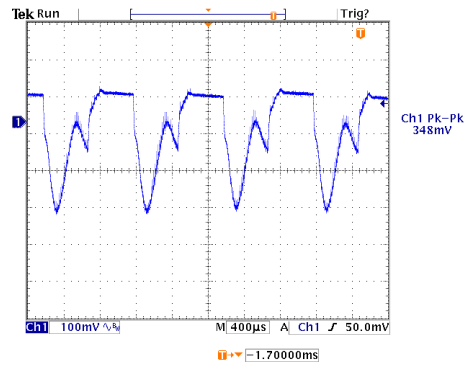
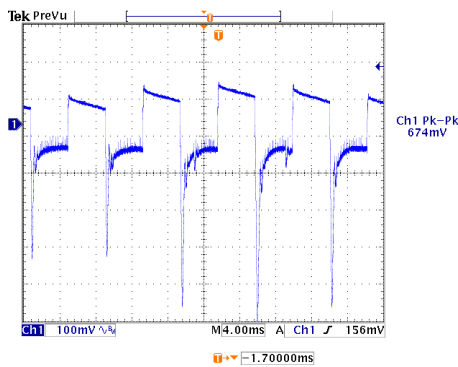
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DYNAMIC LOAD	V1 :	1500	mVp-p	I/P :	230VAC	(1).	(2).	unit:mVp-p
				O/P:	(1)Full/Min load 50%duty/120HZ	674.0mv	348.0mv	
			(2)Full/Min load 50%duty/1KHZ					
			TA :	25°C				

FULL /50% LOAD 50%DUTY / 120HZ

FULL /50% LOAD 50%DUTY / 1KHZ

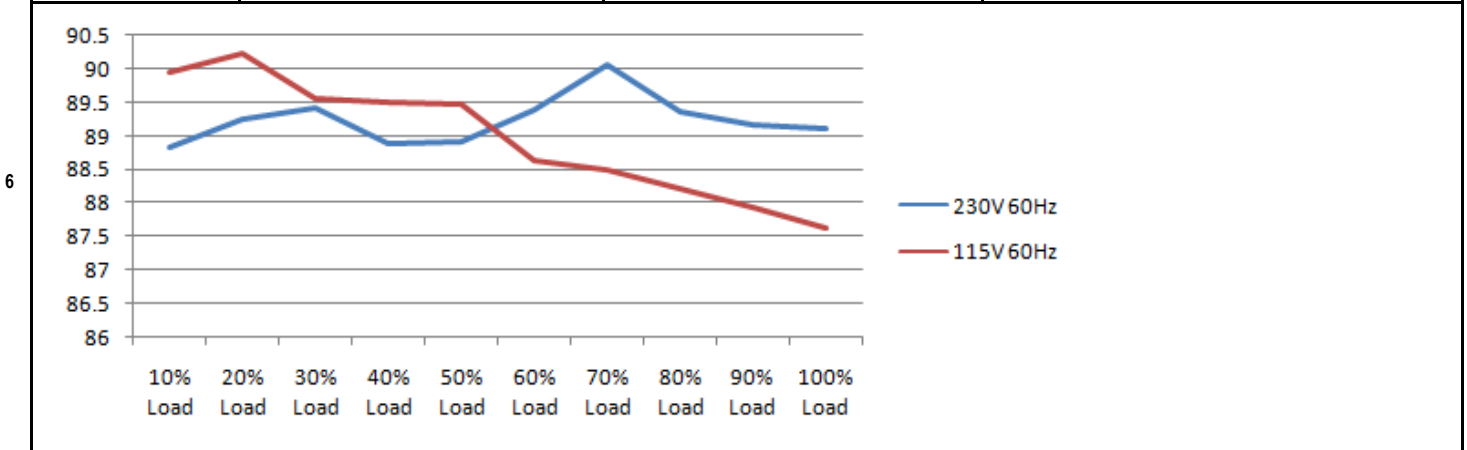
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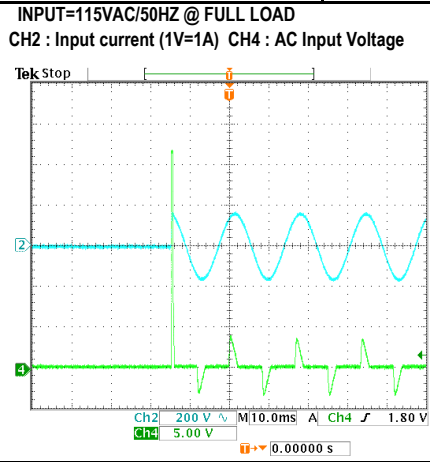
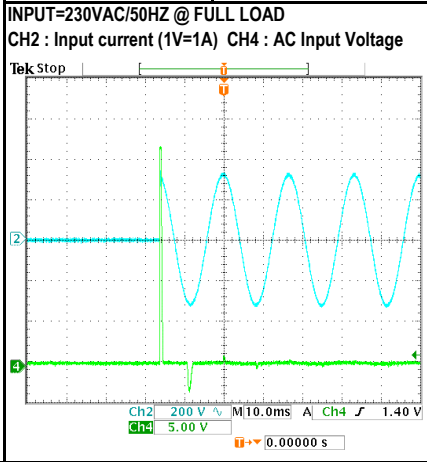


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	72.6VAC ~ 264VAC
			I/P : LOW-LINE = 77VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN ( POWER ON/OFF NO DAMAGE )	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 115VAC ~ 264VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	1 / 230VAC 1.5 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	I= 0.656 / 230VAC I= 1.014 / 115VAC
4	LEAKAGE CURRENT	< 0.25mA	I/P : 264VAC O/P: MIN LOAD TA : 25°C	L-FG: 0.087 mA N-FG: 0.088 mA
5	NO LOAD POWER CONSUMPTION	< 0.10W	I/P : 230VAC O/P: MIN LOAD TA : 25°C	< 0.0584 W
	EFFICIENCY (TYP.)	89.0%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	89.3 %



7	INRUSH CURRENT (TYP.)	50A / 230VAC 30A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	I= 27.20A / 230VAC I= 27.10A / 115VAC
			INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage	INPUT=115VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage





**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	115% ~ 150%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING TA: 25°C	128.9% 264VAC 135.8% 230VAC 131.3% 115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	17.25V ~ 20.25V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA: 25°C	19.02V 264VAC 19.06V 230VAC 19.06V 80VAC Shut down Re- power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Hiccup Mode

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated : 600V 11.0A	I/P : 267VAC  VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 552.00V (2). 504.00V (3). 540.00V
2	Input Capacitor	C5 Rated : 100uf 400V	I/P : 267VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1). 360.00V (2). 360.00V (3). 354.00V
3	Control IC	U1 Rated : 28.0V (max) -0.3V (min)	I/P : 267VAC O/P : (1)Full Load (2)Output Short Change (4)O.V.P (5)Low Line No Load Vo(min) Ta : 25°C	U1 (1). 19.40V (2). 11.00V (3). 20.00V (4). 21.00V (5). 18.60V
4	O/P Diode	D100 Rated : 100V 20.0A	I/P : 267VAC O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1). 72.40V (2). 59.20V (3). 72.00V
5	Clamp Diode	D5 Rated : 800V 2.0A	I/P : 267VAC O/P : (1)Full load continue Ta : 25°C	(1). 496.00V

**SAFETY & E.M.C. TEST**

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.000KVAC /min	I/P-O/P: 3.300KVAC /min Ta : 25°C	I/P-O/P: 1.41mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P: 500VDC Ta : 25°C/70%RH	I/P-O/P: 9999MΩ NO DAMAGE

**E.M.C. TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS



2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR: 8KV / Contact: 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 L/N:2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																												
1	TEMPERATURE RISE TEST	MODEL : EPS-65S-7.5 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC      O/P: 100% LOAD      TA= 29.6°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC      O/P: 100% LOAD      TA= 50.1°C	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT Ta: 29.6°C</th> <th>HIGH AMBIENT Ta: 50.1°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>50.5°C</td><td>68.7°C</td></tr> <tr><td>2</td><td>LF2</td><td>53.7°C</td><td>72.7°C</td></tr> <tr><td>3</td><td>BD1</td><td>83.3°C</td><td>101.1°C</td></tr> <tr><td>4</td><td>Q1</td><td>88.8°C</td><td>106.6°C</td></tr> <tr><td>5</td><td>C5</td><td>64.0°C</td><td>82.1°C</td></tr> <tr><td>6</td><td>C40</td><td>78.5°C</td><td>96.1°C</td></tr> <tr><td>7</td><td>T1</td><td>80.9°C</td><td>98.2°C</td></tr> <tr><td>8</td><td>D100</td><td>100.9°C</td><td>117.6°C</td></tr> <tr><td>9</td><td>D101</td><td>101.8°C</td><td>117.2°C</td></tr> <tr><td>10</td><td>C105</td><td>75.1°C</td><td>94.3°C</td></tr> <tr><td>11</td><td>C106</td><td>71.9°C</td><td>91.0°C</td></tr> <tr><td>12</td><td>C107</td><td>56.3°C</td><td>74.5°C</td></tr> <tr><td>13</td><td>L101</td><td>62.0°C</td><td>79.6°C</td></tr> <tr><td>14</td><td>U1</td><td>69.9°C</td><td>87.2°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT Ta: 29.6°C	HIGH AMBIENT Ta: 50.1°C	1	LF1	50.5°C	68.7°C	2	LF2	53.7°C	72.7°C	3	BD1	83.3°C	101.1°C	4	Q1	88.8°C	106.6°C	5	C5	64.0°C	82.1°C	6	C40	78.5°C	96.1°C	7	T1	80.9°C	98.2°C	8	D100	100.9°C	117.6°C	9	D101	101.8°C	117.2°C	10	C105	75.1°C	94.3°C	11	C106	71.9°C	91.0°C	12	C107	56.3°C	74.5°C	13	L101	62.0°C	79.6°C	14	U1	69.9°C	87.2°C	
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13	L101	62.0°C	79.6°C																																																													
14	U1	69.9°C	87.2°C																																																													
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230VAC O/P : 129% LOAD Ta : 25°C	TEST : OK																																																												
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 264VAC / 115VAC O/P : FULL LOAD Ta : -30.0°C	TEST : OK																																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK																																																												
5	TEMPERATURE COEFFICIENT	±0.03% /°C(0~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.0140% /°C(0~50°C)																																																												
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		TEST : OK																																																												
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +55°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		TEST : OK																																																												



8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0°C LIFE TIME	(1). 158118 HRS (2). 17782.8 HRS (3). 44588.4 HRS (4). 158118 HRS
10	MTBF	3334.3K hrs min. Telcordia SR-332 (Bellcore) ; 706.6K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50°C O/P : FULL LOAD	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

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