



# Test Report: DRA-60-24

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60W 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 : 150 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 13.8 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 24V ~ 30 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	23.15 V~ 31.62 V/ 230 VAC 23.16 V~ 31.62 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 1%~ -1 % (Max)	I/P : 90 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.074 %~ -0.074 %	P
4	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 90VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %	P
5	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.074 %~ -0.074 %	P
6	SET UP TIME	230VAC : 400 ms (Max) 115VAC : 800 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 326.124 ms 115VAC/ 661.553 ms	P
7	RISE TIME	230VAC : 90 ms (Max) 115VAC : 90 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 12.852 ms 115VAC/ 10.018 ms	P
8	HOLD UP TIME	230VAC : 50 ms (TYP) 115VAC : 10 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 74.941 ms 115VAC/ 15.447 ms	P
9	OVER/UNDERSHOOT TEST	< +5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %	P
10	DYNAMIC LOAD	V1 : 2400 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)146 mVp-p (2)159 mVp-p (3)173 mVp-p (4)116 mVp-p	P

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	78.600V~264V	P
			I/P : LOW-LINE-3V= 87 V (PLEASE CHECK DERATING CURVE) HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( POWER ON/OFF NO DAMAGE )	TEST : OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P : 90 VAC ~ 264 VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK	P
3	EFFICIENCY	87% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	88.28 %	P
4	INPUT CURRENT	230V/ 0.8 A (TYP) 115V/ 1.3 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.557 A/ 230 VAC I = 1.06 A/ 115 VAC	P
5	INRUSH CURRENT	230V/ 60 A (TYP) 115V/ 30 A(TYP) COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 56.031 A/ 230 VAC I = 30.265 A/ 115 VAC	P

## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	104%/ 230 VAC 103.3%/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 28.98 V ~ 37.26 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	33.6V/ 230 VAC 33.8V/ 115 VAC Shut down Re- power ON	P
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 264 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Constant current limiting, recovers automatically after fault condition is removed	P

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 10A/600V	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) 500 V (2) 424 V (3) 500 V	P
2	Diode Peak Voltage	D100 Rated : 10A/200V	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) 138 V (2) 119 V (3) 138 V	P
3	Input Capacitor Voltage	C 5 Rated : 100u/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) 368 V	P
4	Control IC Voltage Test	U1 Rated : 9.4V~28V	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) 17.7 V (2) 17.8 V (3) 17.8 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 : 1.990 mA I/P-FG : 1.332 mA O/P-FG : 0.645 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 : 5285 MΩ I/P-FG : 4323 MΩ O/P-FG : 7923 MΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	5 mΩ	P

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:100%OAD Ta:25°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N : 1KV L,N-PE : 2KV	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 : DRA-60-12 1. ROOM AMBIENT BURN-IN : 1HRS I/P : 230VAC O/P : FULL LOAD Ta=29.6°C 2. HIGH AMBIENT BURN-IN : 1HRS I/P : 230VAC O/P : FULL LOAD Ta=50.0°C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=29.6°C</th> <th>HIGH AMBIENT Ta=50.0°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U300</td><td>60.1°C</td><td>82.8°C</td></tr> <tr><td>2</td><td>BD1</td><td>52.0°C</td><td>73.6°C</td></tr> <tr><td>3</td><td>LF1</td><td>45.7°C</td><td>68.8°C</td></tr> <tr><td>4</td><td>D5</td><td>77.2°C</td><td>101.7°C</td></tr> <tr><td>5</td><td>Q1</td><td>65.1°C</td><td>89.2°C</td></tr> <tr><td>6</td><td>C36</td><td>74.5°C</td><td>97.0°C</td></tr> <tr><td>7</td><td>L100</td><td>67.0°C</td><td>90.9°C</td></tr> <tr><td>8</td><td>C5</td><td>48.9°C</td><td>71.0°C</td></tr> <tr><td>9</td><td>U1</td><td>78.8°C</td><td>100.6°C</td></tr> <tr><td>10</td><td>U200</td><td>68.0°C</td><td>89.8°C</td></tr> <tr><td>11</td><td>C105</td><td>79.7°C</td><td>97.9°C</td></tr> <tr><td>12</td><td>C106</td><td>74.8°C</td><td>95.0°C</td></tr> <tr><td>13</td><td>D100</td><td>85.0°C</td><td>104.4°C</td></tr> <tr><td>14</td><td>T1</td><td>90.2°C</td><td>108.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=29.6°C	HIGH AMBIENT Ta=50.0°C	1	U300	60.1°C	82.8°C	2	BD1	52.0°C	73.6°C	3	LF1	45.7°C	68.8°C	4	D5	77.2°C	101.7°C	5	Q1	65.1°C	89.2°C	6	C36	74.5°C	97.0°C	7	L100	67.0°C	90.9°C	8	C5	48.9°C	71.0°C	9	U1	78.8°C	100.6°C	10	U200	68.0°C	89.8°C	11	C105	79.7°C	97.9°C	12	C106	74.8°C	95.0°C	13	D100	85.0°C	104.4°C	14	T1	90.2°C	108.3°C		P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 104% 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=-20°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	±0.004%/°C (0-50°C)	P																																																												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +70°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 : -35°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	SUPPOSE C106 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) 133238HRS (2) 21858HRS (3) 47400HRS (4) 67048HRS	P
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE : 436.4KHRS		P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50,000 hours @ TA 50°C		P

SAMPLE	TESTER	APPROVAL
PRODUCT SAMPLE	FRANK	WANGDZ

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