



350W Single Output DC-DC Converter

SD-350 series



■ Features :

- 2:1 wide input range
- Protections: Short circuit / Overload / Over voltage / Over temperature
- 1500VDC I/O isolation
- Forced air cooling by built-in DC Fan
- 100% full load burn-in test
- 24V and 48V input voltage design refer to LVD
- 2 years warranty

CB (for D type only) **CE**

SPECIFICATION

MODEL		SD-350B				SD-350C			
OUTPUT	DC VOLTAGE	5V	12V	24V	48V	5V	12V	24V	48V
	RATED CURRENT	57A	27.5A	14.6A	7.3A	60A	27.5A	14.6A	7.3A
	CURRENT RANGE	0 ~ 57A	0 ~ 27.5A	0 ~ 14.6A	0 ~ 7.3A	0 ~ 60A	0 ~ 27.5A	0 ~ 14.6A	0 ~ 7.3A
	RATED POWER	285W	330W	350.4W	350.4W	300W	330W	350.4W	350.4W
	RIPPLE & NOISE (max.) Note.2	100mVp-p	120mVp-p	150mVp-p	200mVp-p	100mVp-p	120mVp-p	150mVp-p	200mVp-p
	VOLTAGE ADJ. RANGE	4.5 ~ 5.5VDC	11 ~ 16VDC	23 ~ 30VDC	43 ~ 53VDC	4.5 ~ 5.5VDC	11 ~ 16VDC	23 ~ 30VDC	43 ~ 53VDC
	VOLTAGE TOLERANCE Note.3	±2.0%	±1.0%	±1.0%	±1.0%	±2.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.3%	±0.2%	±0.2%	±0.5%	±0.3%	±0.2%	±0.2%
	LOAD REGULATION	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%
SETUP, RISE TIME		300ms, 50ms at full load							
INPUT	VOLTAGE RANGE	B:19 ~ 36VDC C:36 ~ 72VDC D:72 ~144VDC							
	EFFICIENCY (Typ.)	74%	80%	80%	84%	76%	81%	81%	82%
	DC CURRENT (Typ.)	14.4A/24V	16A/24V	17.6A/24V	17.6A/24V	7.6A/48V	8.8A/48V	9.0A/48V	9.0A/48V
	INRUSH CURRENT (Typ.)	C:45A/48VDC D:45A/96VDC							
PROTECTION	OVERLOAD	105 ~ 135% rated output power Protection type : Shut down o/p voltage, re-power on to recover							
	OVER VOLTAGE	5.75 ~ 6.75V 16.8 ~ 20V 31.5 ~ 37.5V 53 ~ 65V 5.75 ~ 6.75V 16.8 ~ 20V 31.5 ~ 37.5V 53 ~ 65V Protection type : Shut down o/p voltage, re-power on to recover							
	OVER TEMPERATURE	95℃±5℃ (TSW1) detect on main power transistor Protection type : Shut down o/p voltage, recovers automatically after temperature goes down							
	WORKING TEMP.	-20 ~ +60℃ (Refer to output load derating curve)							
ENVIRONMENT	WORKING HUMIDITY	20 ~ 90% RH non-condensing							
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH							
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)							
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes							
	SAFETY STANDARDS	IEC60950-1 CB approved by TUV (for D type only)							
SAFETY & EMC (Note 4)	WITHSTAND VOLTAGE	I/P-O/P:1.5KVAC I/P-FG:1.5KVAC O/P-FG:0.5KVAC							
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms / 500VDC / 25℃/ 70% RH							
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22) Class B							
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,6,8; ENV50204, light industry level, criteria A							
OTHERS	MTBF	209.4K hrs min. MIL-HDBK-217F (25℃)							
	DIMENSION	215*115*50mm (L*W*H)							
	PACKING	1.1Kg; 12pcs/14.4Kg/0.92CUFT							
NOTE	1. All parameters NOT specially mentioned are measured at 24,48,96VDC input, rated load and 25℃ 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. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.								



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- 100% full load burn-in test
- 24V(B) and 48V(C) input voltage design refer to LVD
- 2 years warranty

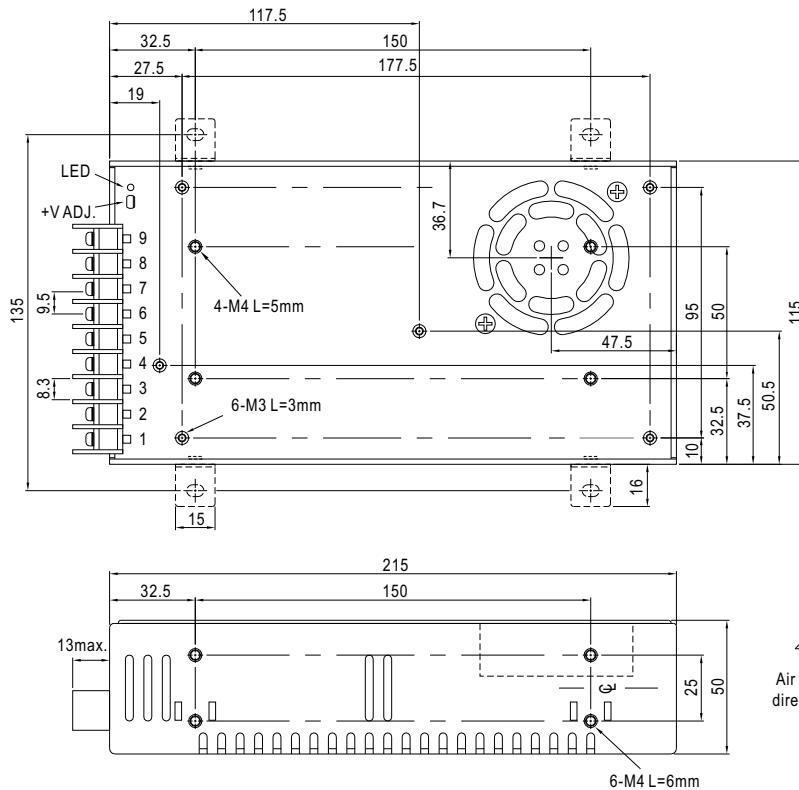
CB (for D type only) **CE**

SPECIFICATION

MODEL		SD-350D			
OUTPUT	DC VOLTAGE	5V	12V	24V	48V
	RATED CURRENT	60A	29.2A	14.6A	7.3A
	CURRENT RANGE	0 ~ 60A	0 ~ 29.2A	0 ~ 14.6A	0 ~ 7.3A
	RATED POWER	300W	350.4W	350.4W	350.4W
	RIPPLE & NOISE (max.) Note.2	100mVp-p	120mVp-p	150mVp-p	200mVp-p
	VOLTAGE ADJ. RANGE	4.5 ~ 5.5VDC	11 ~ 16VDC	23 ~ 30VDC	43 ~ 53VDC
	VOLTAGE TOLERANCE Note.3	±2.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.3%	±0.2%	±0.2%
	LOAD REGULATION	±1.0%	±1.0%	±1.0%	±1.0%
SETUP, RISE TIME		300ms, 50ms at full load			
INPUT	VOLTAGE RANGE	B:19 ~ 36VDC C:36 ~ 72VDC D:72 ~144VDC			
	EFFICIENCY (Typ.)	78%	83%	87%	89%
	DC CURRENT (Typ.)	6A/96V	6A/96V	6A/96V	6A/96V
	INRUSH CURRENT (Typ.)	C:45A/48VDC D:45A/96VDC			
PROTECTION	OVERLOAD	105 ~ 135% rated output power Protection type : Shut down o/p voltage, re-power on to recover			
	OVER VOLTAGE	5.75 ~ 6.75V	16.8 ~ 20V	31.5 ~ 37.5V	53 ~ 65V
	OVER TEMPERATURE	75℃ ±5℃ (TSW1) detect on main power transistor Protection type : Shut down o/p voltage, recovers automatically after temperature goes down			
	WORKING TEMP.	-20 ~ +60℃ (Refer to output load derating curve)			
ENVIRONMENT	WORKING HUMIDITY	20 ~ 90% RH non-condensing			
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH			
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)			
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes			
	SAFETY STANDARDS	IEC60950-1 CB approved by TUV (for D type only)			
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	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms / 500VDC / 25℃ / 70% RH			
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22) Class B			
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,6,8; ENV50204, light industry level, criteria A			
OTHERS	MTBF	209.4K hrs min. MIL-HDBK-217F (25℃)			
	DIMENSION	215*115*50mm (L*W*H)			
	PACKING	1.1Kg; 12pcs/14.4Kg/0.92CUFT			
NOTE	1. All parameters NOT specially mentioned are measured at 24,48,96VDC input, rated load and 25℃ 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. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.				

Mechanical Specification

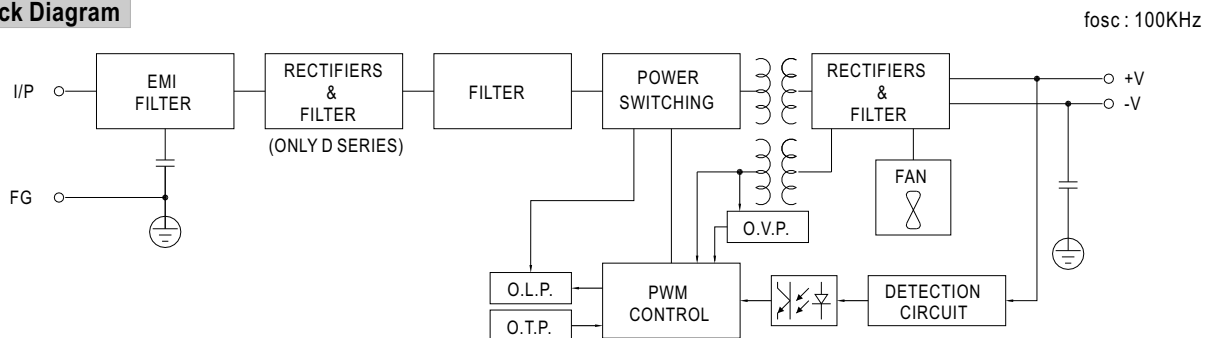
Case No. 912B Unit:mm



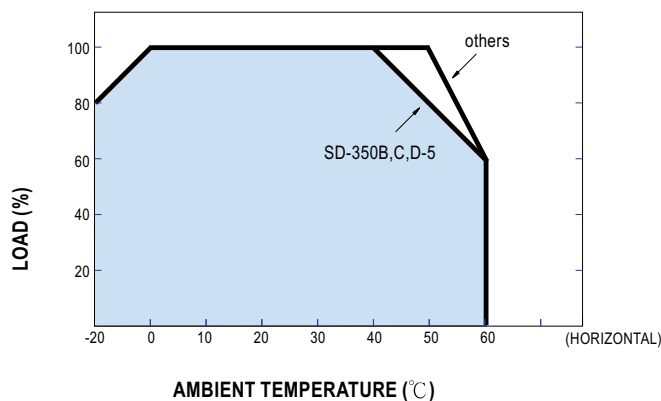
Terminal Pin No. Assignment :

Pin No.	Assignment	Pin No.	Assignment
1	DC INPUT V+	4,5,6	DC OUTPUT V-
2	DC INPUT V-	7,8,9	DC OUTPUT V+
3	FG $\perp$		

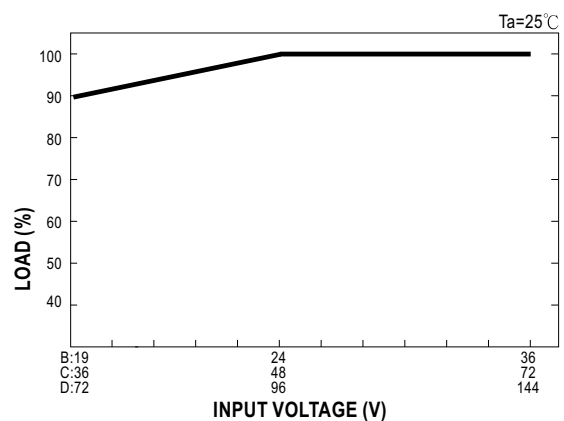
Block Diagram



Derating Curve



Static Characteristics



MODEL : SD-350D-5

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1: 100 mVp-p (Max)	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	V1 : 22 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.5 V~ 5.5 V	I/P: 96 VDC O/P:MIN LOAD Ta:25°C	4.28V~ 5.72V	P
3	OUTPUT VOLTAGE TOLERANCE	V1: 2 %~ -2 % (Max)	I/P:96 VDC / 144 VDC O/P:FULL/ MIN LOAD Ta:25°C	V1: 0.9 %~ -0.9 %	P
4	LINE REGULATION	V1: 0.5 %~ -0.5 % (Max)	I/P:96 VDC / 144 VDC O/P:FULL LOAD Ta:25°C	V1: 0.25 %~ -0.25 %	P
5	LOAD REGULATION	V1: 1 %~ -1 % (Max)	I/P: 96 VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.75 %~ -0.75 %	P
6	SET UP TIME	300 ms (Max)	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	50 ms	P
7	RISE TIME	50 ms (Max)	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	20 ms	P
8	OVER/UNDERSHOOT TEST	< ±5%	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	TEST: <5 %	P
9	DYNAMIC LOAD	V1: 1000 mVp-p	I/P: 96 VDC O/P:FULL /Min LOAD 90%DUTY/1KHZ Ta:25°C	378 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	72VDC~ 144 VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	62V~ 144 V	P
			I/P: LOW-LINE-0.2V= 71.8 V HIGH-LINE+5%= 151.2 V O/P:FULL/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST: OK	
2	EFFICIENCY	78 % (TYP)	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	78.8 %	P
3	INPUT CURRENT	4A (TYP)	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	I = 4 A	P
4	INRUSH CURRENT	45 A (TYP) COLD START	I/P: 96 VDC O/P:FULL LOAD Ta:25°C	I = 31 A	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 %~ 135 %	I/P: 96 VDC O/P:TESTING Ta:25°C	119 % Shunt down Re-power ON	P
2	OVER VOLTAGE PROTECTION	CH1: 5.75 V~ 6.75 V	I/P: 96 VDC O/P:MIN LOAD Ta:25°C	6.33 V Shunt down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC: 75 $\pm$ 5 °C O.T.P. NO DAMAGE	I/P: 96 VDC O/P:FULL LOAD	O.T.P. Active Shut down o/p voltage , recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 96 VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE Shunt down Re-power ON	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	FAN SPEED CONTROL	-----	I/P:96 VDC O/P:FULL LOAD Ta:25°C	Fan Voltage= 11.92 V	P

ENVIRONMENT TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT																																																																																
1	TEMPERATURE RISE TEST	MODEL : SD-350D-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P: 96 VDC O/P: FULL LOAD Ta= 29.1 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P: 96 VDC O/P: FULL LOAD Ta= 49.4 °C <table><thead><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 29.1 °C</th><th>HIGH AMBIENT Ta= 49.4 °C</th></tr></thead><tbody><tr><td>1</td><td>LF1</td><td>TR-507</td><td>37.6°C</td><td>59.3°C</td></tr><tr><td>2</td><td>C6</td><td>470U/200V RUB 85°C USP</td><td>36.6°C</td><td>55.5°C</td></tr><tr><td>3</td><td>Q4</td><td>IRFP460A 20A/500V IR</td><td>48.2°C</td><td>69.1°C</td></tr><tr><td>4</td><td>Q1</td><td>IRFP460A 20A/500V IR</td><td>50.2°C</td><td>70.9°C</td></tr><tr><td>5</td><td>C25</td><td>100U/25V RUB105°C YXG</td><td>44.0°C</td><td>63.9°C</td></tr><tr><td>6</td><td>U1</td><td>SG3525 ON</td><td>46.3°C</td><td>66.2°C</td></tr><tr><td>7</td><td>T1 COIL</td><td>TF-959</td><td>60.7°C</td><td>82.3°C</td></tr><tr><td>8</td><td>U4</td><td>HA358</td><td>45.8°C</td><td>67.0°C</td></tr><tr><td>9</td><td>RG2</td><td>L7812CV 1A/15V</td><td>44.0°C</td><td>65.6°C</td></tr><tr><td>10</td><td>Q5</td><td>C5762 7A/400V SANYO</td><td>43.2°C</td><td>63.2°C</td></tr><tr><td>11</td><td>RG1</td><td>L7815CV 1A/15V</td><td>49.0°C</td><td>68.3°C</td></tr><tr><td>12</td><td>D100</td><td>S20LC20U 20A/200V SHI</td><td>55.7°C</td><td>75.5°C</td></tr><tr><td>13</td><td>D101</td><td>S20LC20U 20A/200V SHI</td><td>51.4°C</td><td>70.3°C</td></tr><tr><td>14</td><td>L100</td><td>TR-383</td><td>50.1°C</td><td>71.5°C</td></tr><tr><td>15</td><td>C111</td><td>1500U/35V NCC 105°C KY</td><td>37.8°C</td><td>58.8°C</td></tr></tbody></table>			NO	Position	P/N	ROOM AMBIENT Ta= 29.1 °C	HIGH AMBIENT Ta= 49.4 °C	1	LF1	TR-507	37.6°C	59.3°C	2	C6	470U/200V RUB 85°C USP	36.6°C	55.5°C	3	Q4	IRFP460A 20A/500V IR	48.2°C	69.1°C	4	Q1	IRFP460A 20A/500V IR	50.2°C	70.9°C	5	C25	100U/25V RUB105°C YXG	44.0°C	63.9°C	6	U1	SG3525 ON	46.3°C	66.2°C	7	T1 COIL	TF-959	60.7°C	82.3°C	8	U4	HA358	45.8°C	67.0°C	9	RG2	L7812CV 1A/15V	44.0°C	65.6°C	10	Q5	C5762 7A/400V SANYO	43.2°C	63.2°C	11	RG1	L7815CV 1A/15V	49.0°C	68.3°C	12	D100	S20LC20U 20A/200V SHI	55.7°C	75.5°C	13	D101	S20LC20U 20A/200V SHI	51.4°C	70.3°C	14	L100	TR-383	50.1°C	71.5°C	15	C111	1500U/35V NCC 105°C KY	37.8°C	58.8°C	P
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3	Q4	IRFP460A 20A/500V IR	48.2°C	69.1°C																																																																																	
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 96 VDC O/P: 120 % LOAD Ta:25°C	TEST : OK	P																																																																																
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 96 VDC 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: 144VDC O/P:FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~50°C)	I/P: 96 VDC O/P:FULL LOAD	± 0.01 %(0~50°C)	P																																																																																
6	VIBRATION TEST	1 Carton & 1 Set Operating at I/P: 96 VAD NO LOAD (1) Waveform: Sine Wave (2) Frequency:10~500Hz (3) Sweep Time:10min/sweep cycle (4) Acceleration:2G (5) Test Time:1 hour in each axis (X.Y.Z) (6) Ta:25°C		TEST : OK	P																																																																																

SAFETY TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P: 1.5 KVAC/min I/P-FG: 1.5 KVAC/min O/P-FG: 0.5 KVAC/min	I/P-O/P: 1.8 KVAC/min I/P-FG: 1.8 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25℃	I/P-O/P: 4.67 mA I/P-FG: 4.93 mA O/P-FG: 6.64 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℃	I/P-O/P: 2G Ω I/P-FG: 4G Ω O/P-FG: 3 G Ω NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	11 mΩ	P
4	APPROVAL	TUV: Certificate NO : UL: File NO :			N/A

E.M.C TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	RADIATION	EN55022 CLASS B	I/P: 96 VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab	P
2	E.S.D	EN61000-4-2 INDUSTRY AIR:8KV / Contact:4KV	I/P: 96 VDC O/P:FULL LOAD Ta:25℃	CRITERIA A	P
3	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 96 VDC O/P:FULL LOAD Ta:25℃	CRITERIA A	P
4	Test by certified Lab & Test Report Prepare				

M.T.B.F & LIFE CYCLE CALCULATION

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	SUPPOSE C 111 IS THE MOST CRITICAL COMPONENT I/P: 96 VDC O/P:FULL LOAD Ta= 25 °C LIFE TIME= 1714456 HRS I/P: 96 VDC O/P:FULL LOAD Ta= 50 °C LIFE TIME= 294739 HRS			P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE: 209.4K HRS			P
3	ORT (Ongoing Reliability test)	SD-350:I/P : 230VAC O/P : FULL LOAD TA=50°C Sample=5pcs TEST TIME=1080HRS			P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated IRFP460A : 500V 20A	I/P:High-Line +3V = 147 VDC O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C	(1) 281 V (2) 325 V (3) 147 V	P
2	Diode Peak Voltage	D 100 Rated MBR6045WT : 200 V 20 A	I/P:High-Line +3V = 147 VDC O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C	(1) 36.6 V (2) 39.4 V (3) 0 V	P
3	Input Capacitor Voltage	C 8 Rated : 470 u / 200 V / 85°C	I/P:High-Line +3V = 147 VDC O/P: (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta:25°C	(1) 147 V (2) 147 V (3) 151 V	P
4	Control IC Voltage Test	U 1 Rated SG3525 : 35 V	I/P:High-Line +3V = 147 VDC O/P: (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta:25°C	(1) 14.4 V (2) 14.4 V (3) 14.4 V	P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2004/6/7	RD SMAPLE	PASS	VINCENT TSENG	MAX LIN
2004/8/20	PRODUCT SMAPLE A407A23	PASS	VINCENT TSENG	MAX LIN
2004/11/25	PRODUCT SMAPLE W0411A25	PASS	VINCENT TSENG	MAX LIN

2003/12/12 A50-F023