



# Test Report: DRC-180B

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180W Single Output with Battery Charger(UPS Function)

## ■ 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

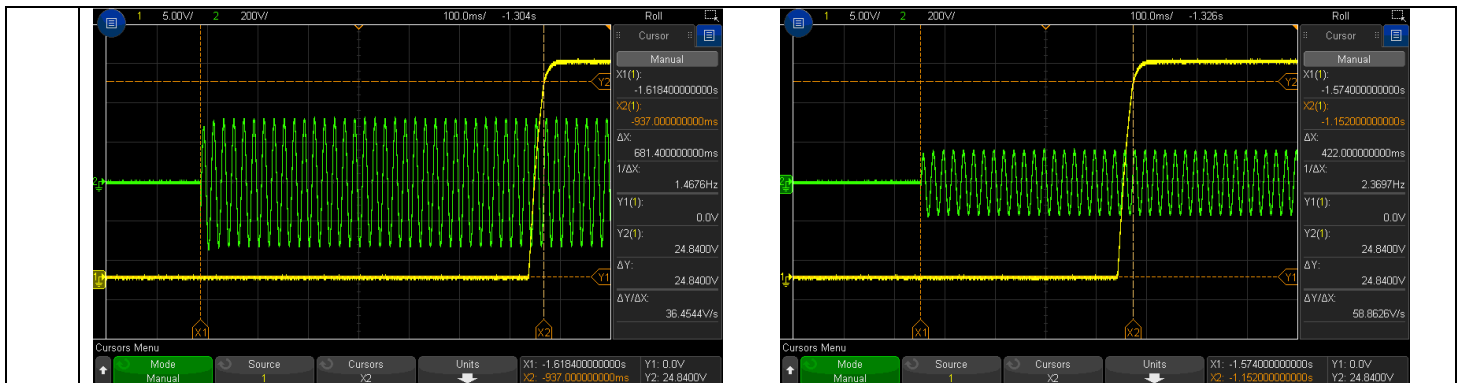
ENVIRONMENT TEST



■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

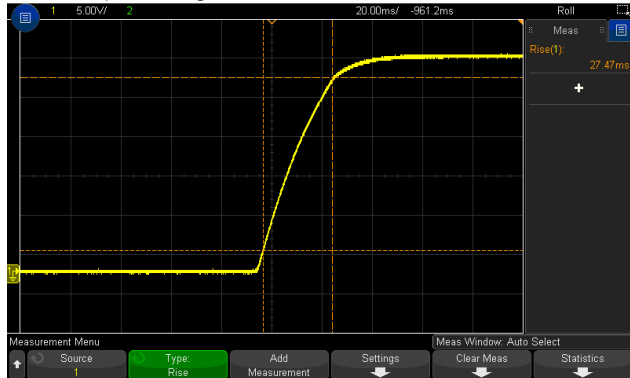
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24 V~ 29 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	23.41V~30.07V/230VAC 23.41V~30.07V /115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0 %~ +1.0 %	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.06%~ 0.08%
3	LINE REGULATION (Max)	V1: -0.5 %~ +0.5 %	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.01%~ 0.01%
4	LOAD REGULATION(Max)	V1: -0.5 %~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.06%~ 0.08%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.4%
6	RIPPLE & NOISE(Max)	V1: 240mVp-p	I/P:230VAC O/P: TESTING LOAD Ta:25°C	V1: 27mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>high frequency :</p> </div> <div style="text-align: center;"> <p>low frequency :</p> </div> </div>				
7	SET UP TIME(Max)	230VAC/2000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/681.4ms 115VAC/422ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	



8	RISE TIME (Max)	230VAC/30ms	I/P : 230 VAC	230VAC/27.47ms
		115VAC/30ms	I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	115VAC/27.16ms

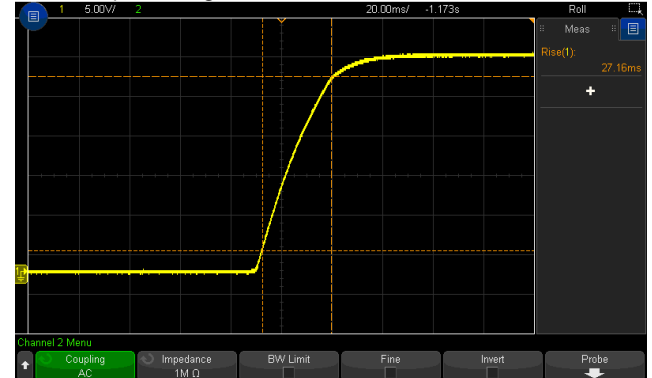
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

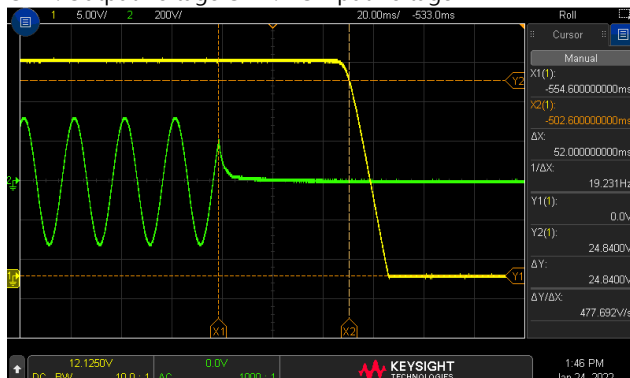
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	230VAC/20ms	I/P : 230 VAC	230VAC/ 52.0ms
		115VAC/20ms	I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	115VAC/ 53.4ms

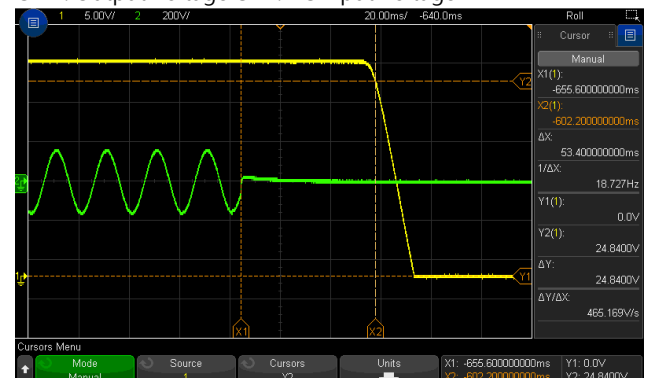
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



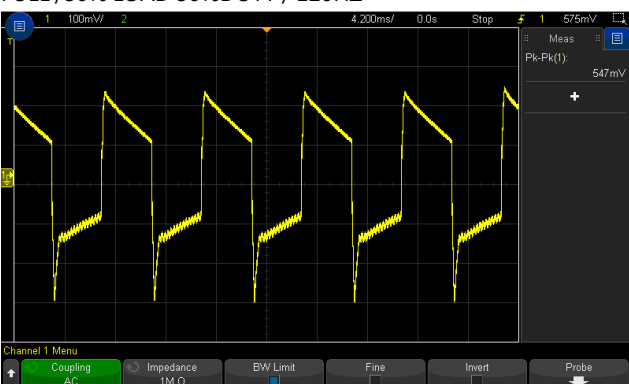
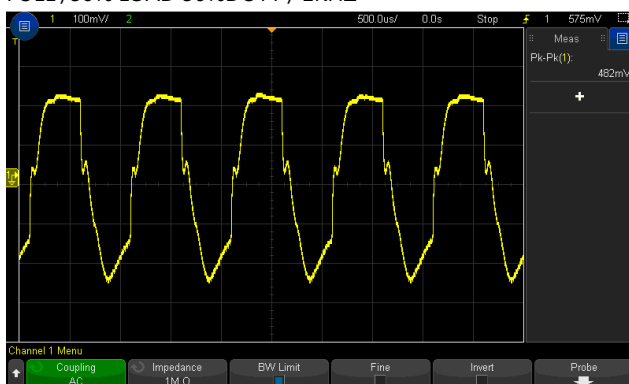
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



10	DYNAMIC LOAD	V1: 2760mVp-p	I/P: 230VAC	547mVp-p
			O/P: (1)FULL/0%LOAD50%DUTY/120HZ (2)FULL/0%LOAD50%DUT/1KHZ Ta:25°C	482mVp-p



FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ		
				
11	TRANSIENT RECOVERY TIME	V1: 2760mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	285mVp-p
12	CHARGE CURRENT	2A±0.2A	I/P: 230 VAC O/P: CV=24V Ta:25°C	1.99A

### INPUT FUNCTION TEST

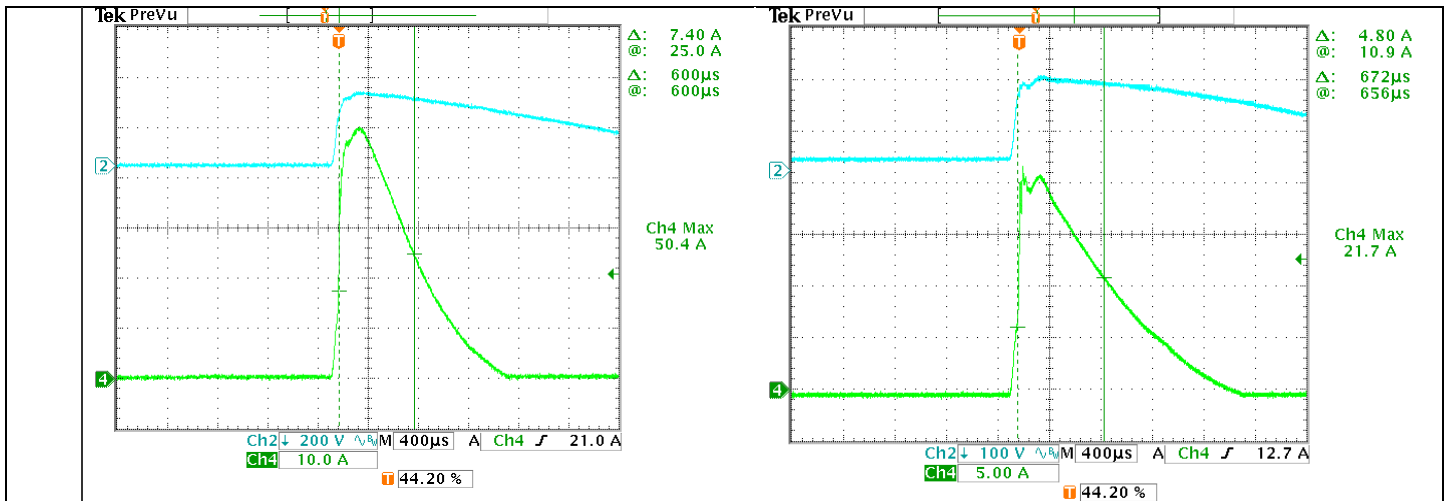
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC 127VDC~ 370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25°C	(1) 76.5V~264V/FULL LOAD (2) 80Vdc~370Vdc/FULL LOAD 75Vdc~370Vdc/50% LOAD (3) 80Vdc~370Vdc/FULL LOAD 75Vdc~370Vdc/50% LOAD
			I/P: LOW-LINE-3V=97V HIGH-LINE+15% =300V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) 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 ~264VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	LEAKAGE CURRENT	< 2 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25°C	1.19mA
4	INPUT CURRENT (Typ.)	230V/ 1.5 A 115V/ 2.5 A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =0.899A/ 230VAC I =1.793A/ 115VAC



180W Single Output with Battery  
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DRC-180 series

5	POWER FACTOR (Typ.)	0.95/ 230VAC 0.98/115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF=0.961/230VAC PF=0.990/115VAC																																	
<p>P.F vs LOAD</p> <table border="1"> <caption>P.F vs LOAD Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>115VAC PF</th> <th>230VAC PF</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.89</td><td>0.60</td></tr> <tr><td>20%</td><td>0.95</td><td>0.80</td></tr> <tr><td>30%</td><td>0.97</td><td>0.86</td></tr> <tr><td>40%</td><td>0.98</td><td>0.90</td></tr> <tr><td>50%</td><td>0.98</td><td>0.92</td></tr> <tr><td>60%</td><td>0.99</td><td>0.93</td></tr> <tr><td>70%</td><td>0.99</td><td>0.94</td></tr> <tr><td>80%</td><td>0.99</td><td>0.95</td></tr> <tr><td>90%</td><td>0.99</td><td>0.95</td></tr> <tr><td>100%</td><td>0.99</td><td>0.96</td></tr> </tbody> </table>					LOAD (%)	115VAC PF	230VAC PF	10%	0.89	0.60	20%	0.95	0.80	30%	0.97	0.86	40%	0.98	0.90	50%	0.98	0.92	60%	0.99	0.93	70%	0.99	0.94	80%	0.99	0.95	90%	0.99	0.95	100%	0.99	0.96
LOAD (%)	115VAC PF	230VAC PF																																			
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6	EFFICIENCY(Typ.)	90%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	90.82%																																	
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>EFFICIENCY vs LOAD Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>115VAC Efficiency (%)</th> <th>230VAC Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>72</td><td>74</td></tr> <tr><td>20%</td><td>81</td><td>79</td></tr> <tr><td>30%</td><td>85</td><td>84</td></tr> <tr><td>40%</td><td>86</td><td>87</td></tr> <tr><td>50%</td><td>87</td><td>88</td></tr> <tr><td>60%</td><td>87</td><td>89</td></tr> <tr><td>70%</td><td>87</td><td>90</td></tr> <tr><td>80%</td><td>88</td><td>90</td></tr> <tr><td>90%</td><td>88</td><td>90</td></tr> <tr><td>100%</td><td>88</td><td>91</td></tr> </tbody> </table>					LOAD (%)	115VAC Efficiency (%)	230VAC Efficiency (%)	10%	72	74	20%	81	79	30%	85	84	40%	86	87	50%	87	88	60%	87	89	70%	87	90	80%	88	90	90%	88	90	100%	88	91
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80%	88	90																																			
90%	88	90																																			
100%	88	91																																			
7	INRUSH CURRENT(Typ.)	230V/70A 115V/35A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =50.4A/ 230VAC I =21.7A/ 115VAC																																	
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current</p> <p>INPUT=115VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current</p>																																					



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~150 % Protection type : Hiccup mode, recovers automatically after fault condition is removed	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta: 25°C	125.38%/ 264VAC 125.38%/ 230VAC 125.38%/100VAC Protection type : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH1: 30.5V~37.7V 32.025V~35.815 Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta: 25°C	35.5 V/ 264VAC 35.5V/ 230VAC 35.5V/ 90VAC Protection type : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD	O.T.P. Active OK Protection type : Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE : OK PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
5	BATTER CUT OFF	20±1V	I/P: 230 VAC O/P: BAT. LOAD Ta: 25°C	19.9 V
6	REVERSE POLARITY	Protection type : By FUSE	I/P: 230 VAC O/P: BAT. LOAD Ta: 25°C	TEST : PASS By FUSE



### ALARM FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	AC OK	Relay contact output, Closed : AC OK ; Open : AC Fail ; Max. rating : 30V / 1A	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	TEST : <u>OK</u>
2	BATTER LOW	Relay contact output, Open : Battery OK ; Closed : Battery Low ; Max. rating : 30V / 1A Battery low voltage : < 22V	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	TEST : <u>OK</u> Battery low voltage : <u>21.09</u> V

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q 2 Rated : 14 A/ 800 V	AC ON/OFF I/P: High-Line +3V =267V VDS: O/P:(1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C	Q2 VDS: (1) 598V (2) 465V (3) 598V (4) 594V (5) 590V (6) 606V (7) 578V
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : 13 A/ 600 V	I/P: High-Line +3V =267V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C	Q1 VDS: (1) 538V (2) 521V (3) 538V (4) 534V (5) 534V (6) 538V (7) 473V



180W Single Output with Battery  
Charger(UPS Function)

DRC-180 series

3	P.F.C DIODE	D 1 Rated : 8 A/ 600 V	I/P:High-Line +3V =267V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	(1) 417V (2) 417V (3) 421V (4) 417V	
4	Diode Peak Voltage	Q101 Rated : 27.4 A/ 150 V	AC ON/OFF I/P:High-Line +3V =267V VRmax O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD  Vo O/P: (1)Full Load Ta:25°C	Q101: VRmax VDS: (1) 133.2V (2) 131.3V (3) 132.2V (4) 131.3V (5) 132.2V (6) 132.2V (7) 129.4V (8) 129.4V Vo (1) 131.3V	
5	Input Capacitor Voltage	C5 Rated : 150μ / 400 V	I/P:High-Line +3V =267V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25°C	(1)392V (2)392V (3)396V (4)392V	
6	Control IC Voltage Test	PWM IC U4 : Rated : 9V~ 28 V  PFC IC U1 : Rated : 9.5V~ 35 V  O/P IC U101 : Rated : 4.2V~ 35 V  IC U102 : Rated : 3V~ 32 V	AC ON/OFF  I/P:High-Line +3V =267V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(Low LINE) Ta:25°C	U4 (1) 17.2V (2) 17.2V (3) 17.2V (4) 17.2V (5) 17.2V  U1 (1) 15.9V (2) 15.9V (3) 15.9V (4) 15.9V (5) 15.9V	U101 (1) 17.2V (2) 0.4V (3) 1.9V (4) 24.7V (5) 12.4V  U102 (1) 17.0V (2) 17.3V (3) 12.7V (4) 24.2V (5) 12.7V





7	Clamp Diode Peak Voltage	D8 Rated : 650V /1 A	AC ON/OFF I/P : High-Line +3V = 267 V O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1) 543V (2) 547V
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## ■ SAFETY& E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P: 8.07mA I/P-FG: 7.03mA O/P-FG: 9.12mA NO DAMAGE
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	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	2mΩ

### 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	EN55032 CLASS B	I/P:230VAC(50HZ)/110VAC(60HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P:230VAC(50HZ)/110VAC(60HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INPUT : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
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
7	Test by certified Lab & Test Report Prepare			



Any contradictions of the test results, please refer to the latest EMC test report

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																
1	TEMPERATURE RISE TEST	MODEL : DRC-180B 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 45 °C																																																																																																																		
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180W Single Output with Battery  
Charger(UPS Function)

DRC-180 series

		NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 45 °C
		29	D1	56.6°C	73.0°C
		30	U220	70.9°C	87.0°C
		31	J100	66.5°C	82.3°C
		32	U101	69.6°C	85.5°C
		33	U3	54.3°C	71.7°C
		34	U4	70.5°C	87.5°C
		35	D301	69.7°C	86.5°C
		36	Q301	66.1°C	82.7°C
		37	D13	59.6°C	76.5°C
		38	Q30	55.2°C	71.1°C
		39	D30	62.9°C	80.2°C
		40	D5	51.6°C	68.5°C
		41	U1	48.8°C	65.8°C
		42	U2	58.4°C	75.9°C
		43	D7	67.0°C	85.2°C
		44	U102	56.8°C	73.1°C
		45	C9	69.4°C	86.5°C
		46	D9	63.9°C	82.5°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P : 230 VAC O/P : 123%LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 264VAC/100VAC O/P : 100%LOAD Ta= -25°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C/95 %R.H NO DAMAGE		I/P : 272 VAC O/P : FULL LOAD Ta= 46°C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C(0~40°C)		I/P : 230 VAC O/P : FULL LOAD	± 0.008%/°C(0~40°C)
6	STORAGE TEMPERATURE TEST	-20~85°C		1. Thermal shock Temperature : -25°C~ +90°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 : STATIC	
7	THERMAL SHOCK TEST	-20~45°C		1. Thermal shock Temperature : -25°C~ +50°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test	



180W Single Output with Battery  
Charger(UPS Function)

**DRC-180 series**

8	VIBRATION TEST	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
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= 45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME	(1) 222562.7HRS (2) 69458HRS (3) 107596HRS (4) 158571.2HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1536.3K hrs min. Telcordia SR-332 (Bellcore) ; 245.6K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.01 TAG-QA-009