



Test Report: TDR-240-48

240W Slim Three Phase Industrial DIN Rail with PFC 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

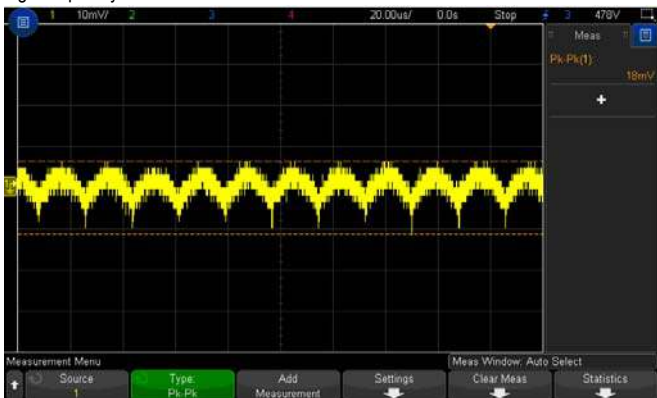
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48.0V~ 55.0V	I/P : 400 VAC O/P : MIN LOAD Ta : 25℃	46.45V~57.75V
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0%~1.0%	I/P: 340VAC /550VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1 : -0.07%~0.04%
3	LINE REGULATION (Max)	V1: -0.5%~0.5%	I/P: 340VAC~ 550VAC O/P:FULL LOAD Ta:25℃	V1 : -0.02%~0.02%
4	LOAD REGULATION(Max)	V1: -1.0%~1.0%	I/P: 400VAC O/P:FULL ~MIN LOAD Ta:25℃	V1 : -0.07%~0.04%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 400VAC O/P:FULL LOAD Ta:25℃	2.1%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:400VAC O/P:FULL LOAD Ta:25℃	V1: 21mVp-p
high frequency (V1) :  low frequency (V1): 				
7	SET UP TIME(Max)	500VAC/1500ms 400VAC/2000ms	I/P : 500 VAC I/P : 400 VAC O/P : FULL LOAD Ta : 25℃	500VAC/ 520ms 400VAC/674ms
INPUT=500VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=400VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	

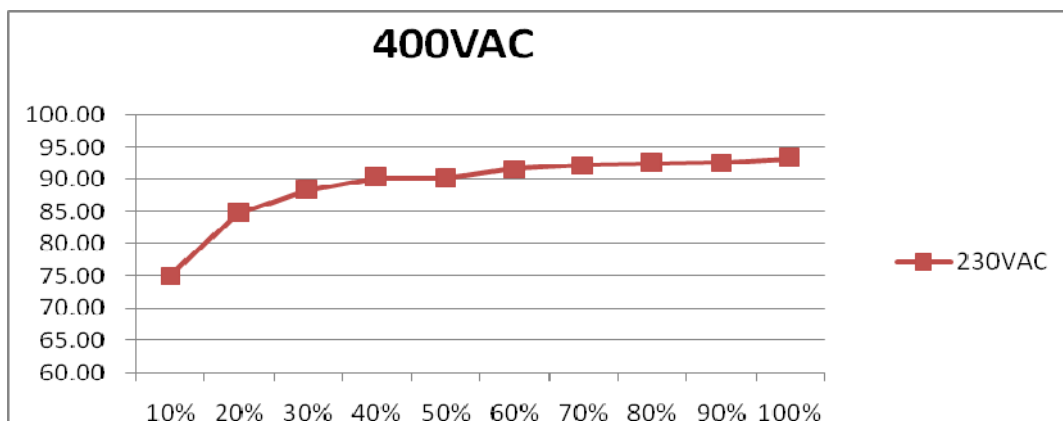
8	RISE TIME (Max)	500VAC/60ms 400VAC/60ms	I/P : 500 VAC I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	500VAC/43.1ms 400VAC/ 41.7ms
		INPUT=500VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=400VAC/50HZ @ FULL LOAD CH1 : Output Voltage
9	HOLD UP TIME (Typ.)	500VAC/40ms 400VAC/20ms	I/P : 500 VAC I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	500VAC/ 59ms 400VAC/ 34ms
		INPUT=500VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=400VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage
10	DYNAMIC LOAD	V1: 4800 mVp-p	I/P: 400VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	(1) V1: 910mVp-p (2) 531mVp-p



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	340VAC~550VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	277V~550V
			I/P: LOW-LINE-3V=337 V HIGH-LINE+15%=560 V 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:340 VAC ~550 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ.)	500V/0.6A 400V/ 0.69A	I/P : 500 VAC I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	IR =0.642A/ 400VAC IS =0.638A/ 400VAC IT =0.642A/ 400VAC IR =0.541A/ 500VAC IS =0.543A/ 500VAC IT =0.541A/ 500VAC
4	POWER FACTOR (Typ.)	≥ 0.53/400VAC ≥ 0.52/500VAC	I/P : 400 VAC I/P : 500 VAC O/P : FULL LOAD Ta : 25°C	0.59/400VAC R 0.595/400VAC S 0.593/400VAC T 0.561/500VAC R 0.573/500VAC S 0.572/500VAC T
5	LEAKAGE CURRENT	<2.00mA	I/P : 530 VAC O/P : Min LOAD Ta : 25°C	N1,N2,N3 and Earth:1.5mA
6	EFFICIENCY(Typ.)	92%	I/P:400 VAC O/P:FULL LOAD Ta:25°C	93.3%

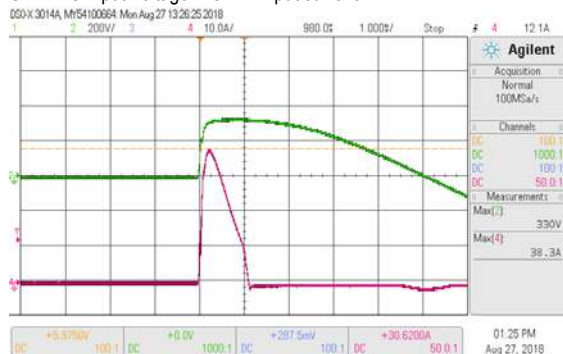
EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	400V / 50A COLD START	I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	I = 38.3 A/ 400VAC
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INPUT=400VAC/50HZ @ FULL LOAD

CH4 : AC Input Voltage CH2 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%	I/P: 550VAC I/P: 400VAC I/P: 340VAC O/P: TESTING Ta: 25°C	118.6%/ 550VAC 118.6%/ 400VAC 118.4%/340VAC PROTECTION TYPE : Constant current limiting, unit will hiccup after 3sec.
2	OVER VOLTAGE PROTECTION	56.0V~65.0V	I/P: 550VAC I/P: 400VAC I/P: 340VAC O/P: MIN LOAD Ta: 25°C	61.6V/ 550VAC 61.6V/ 400VAC 61.6V/ 340VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	Shut down o/p voltage	I/P: 550VAC I/P: 340VAC O/P: FULL LOAD Ta: 25°C	TEST: PROTECTION TYPE : Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 550VAC I/P: 340VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE PROTECTION TYPE : Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 950 V	AC ON/OFF I/P: High-Line +3V =553V VDS: O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta: 25°C	VDS: (1) 787V (2) 771V (3) 787V
2	O/P MOFET	Q100 Rated : 200 V Q101 Rated : 200 V	AC ON/OFF I/P: High-Line +3V =553 V O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta: 25°C	Q100 VDS: (1) 165V (2) 167V (3) 165V Q101 VDS: (1) 165V (2) 167V (3) 165V
3	Input Capacitor Voltage	C5 Rated : 150 μ f / 400 V	I/P: High-Line +3V =553V 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) 386V (2) 386V (3) 386V (4) 378 V
4	Control IC Voltage Test	U1 Rated : 11V~ 26 V U100 Rated : 0V~ 37 V	AC ON/OFF I/P: High-Line +3V =553 V 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	U1 (1) 17.2V (2) 17.8V (3) 17.4V (4) 18.0V (5) 17.0V
5	Clamp Diode Peak Voltage	D22-D23 Rated : 600V*2V	AC ON/OFF I/P : High-Line +3V =553 V O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta : 25°C	(1) 899V (2) 794V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4.87KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 0.5KVAC/min O/P-DC OK: 0.5KVAC/min	I/P-O/P: 5.0KVAC/min I/P-FG: 2.88KVAC/min O/P-FG: 0.6KVAC/min O/P-DC OK: 0.6KVAC/min Ta: 25°C	I/P-O/P: 8.28mA I/P-FG: 6.40mA O/P-FG: 4.39mA O/P-DC OK: 0.005mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC > 100M Ω I/P-FG: 500VDC > 100M Ω O/P-FG: 500VDC > 100M Ω	I/P-O/P: 500VDC I/P-FG: 500VDC O/P-FG: 500VDC Ta: 25°C	I/P-O/P: 9999 M Ω I/P-FG: 9999 M Ω O/P-FG: 9999 M Ω NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m Ω	40 A / 2min Ta: 25°C / 70%RH	10 m Ω

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P: 400VAC/50HZ O/P: FULL LOAD Ta: 25°C	☒ PASS ☐ FAIL



240W Slim Three Phase Industrial DIN Rail with PFC Function

TDR-240 series

2	CONDUCTION	EN61204-3 CLASS B	I/P : 400 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN61204-3CLASS B	I/P : 400 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 ☐ LIGHT INDUSTRY AIR: 8KV / Contact: 4KV ☐ INDUSTRY AIR: 8KV / Contact: 4KV ☒ Din rail Model : AIR: 15KV / Contact: 8KV	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 ☐ LIGHT INDUSTRY INPUT : 1KV ☐ MEDICAL ☒ INDUSTRY INPUT : 2KV	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	EN61000-4-5 INDUSTRY L-N : 2KV L/N-PE: 4KV	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : TDR-240-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 400VAC O/P : FULL LOAD Ta= 25.5 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 400VAC O/P : FULL LOAD Ta= 60.5 °C		

			NO	Position	ROOM AMBIENT Ta= 25.5 °C	HIGH AMBIENT Ta= 60.5 °C
			1	L3	44.0℃	81.4℃
			2	C2	51.1℃	88.4℃
			3	ZR4	57.2℃	93.7℃
			4	C125	55.8℃	93.3℃
			5	LF10	70.5℃	107.7℃
			6	U100	72.9℃	110.1℃
			7	D10	68.2℃	104.3℃
			8	D7	60.5℃	97.2℃
			9	C255	66.0℃	102.2℃
			10	LF2	65.0℃	100.5℃
			11	C106	74.7℃	100.0℃
			12	C110	68.4℃	104.5℃
			13	C15	52.3℃	88.8℃
			14	U1	62.7℃	100.4℃
			15	C5	52.2℃	89.3℃
			16	C200	66.8℃	103.2℃
			17	Q101	62.4℃	100.6℃
			18	L5	46.6℃	83.7℃
			19	T1	96.2℃	106.0℃
			20	Q1	60.4℃	100.0℃
			21	C72	60.8℃	99.0℃
			22	D22	78.7℃	118.6℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 400 VAC O/P : 116% LOAD Ta : 25℃		TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 550VAC/340VAC O/P : 100 % LOAD Ta= -30 °C		TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60℃ /95 %R.H NO DAMAGE	I/P : 560 VAC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H		TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.05%/℃ (0~60℃)	I/P : 400 VAC O/P : FULL LOAD		± 0.026 %/℃ (0~60℃)	
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC			TEST : OK	
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35℃~ +65℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:400V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:400V/ FULL LOAD Burn In Test			TEST : OK	

8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25℃ 2 Din Rail <table><tr><td></td><td>Displacement</td><td>Acceleration</td></tr><tr><td>2 (+3/-0) Hz up to 15Hz</td><td>± 2.5mm</td><td>-----</td></tr><tr><td>15Hz up to 50Hz</td><td>-----</td><td>2.3g</td></tr><tr><td>Sweep rate</td><td colspan="2">Max 1 Octave/minute</td></tr></table>		Displacement	Acceleration	2 (+3/-0) Hz up to 15Hz	± 2.5mm	-----	15Hz up to 50Hz	-----	2.3g	Sweep rate	Max 1 Octave/minute		TEST : OK
	Displacement	Acceleration													
2 (+3/-0) Hz up to 15Hz	± 2.5mm	-----													
15Hz up to 50Hz	-----	2.3g													
Sweep rate	Max 1 Octave/minute														
9	CAPACITOR LIFE CYCLE	SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 400VAC O/P : FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P : 400VAC O/P : FULL LOAD Ta= 60 ℃ LIFE TIME (3) I/P : 400VAC O/P : 75% LOAD Ta= 60 ℃ LIFE TIME (4) I/P : 400VAC O/P : 50% LOAD Ta= 60 ℃ LIFE TIME	(1) 106475.4 HRS (2) 36877.5 HRS (3) 78848.6 HRS (4) 166200.3 HRS												
10	MTBF	Conducted by Parts Stress Analysis Prediction 515.4K hrs min. Telcordia SR-332 (Bellcore) ; 215.6K hrs min. MIL-HDBK-217F (25℃)													
11	Ongoing Reliability Test	I/P : 400VAC O/P : FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours													

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2018.4.30 GP-A50-F010