



Test Report: VFD-350P-230

350W General type Variable Frequency Drive 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	VOLTAGE RANGE(UVW)	3 ϕ 0~240VAC Three phase line-to-line 0~240V, suit for 200-240V class motor	I/P : 90VAC 230VAC 264VAC O/P : 0~240VAC PWM Freq.:15KHz Ta : 25°C	V@min load 0V~282.8V / 0.05A @ I/P = 90Vac 0V~282.7V / 0.05A @ I/P = 230Vac 0V~282.9V / 0.05A @ I/P = 264Vac V@ Derating load 31.8V~281.5V / derating load@ I/P = 90Vac 31.9V~281.2V / derating load @ I/P = 230Vac 31.8V~281.6V / derating load @ I/P = 264Vac
2	RATED CURRENT (A)	1.4A	I/P : 90VAC 230VAC 264VAC O/P:Rated output current PWM Freq.:15KHz Ta : 25°C	1.4A@90Vac 1.4A@230Vac 1.4A@264Vac
3	PEAK CURRENT	2.8A	I/P : 230 VAC O/P : 2.8A PWM Freq.:15KHz Ta : 25°C	TEST: OK
4	EFFICIENCY(Typ.)	93%	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	Eff : 93.6%
5	DC BUS VOILTAGE	DC BUS:380V $\pm$ 5V DC BUS VOLTAGE SENSOR:2.5 $\pm$ 0.05V	I/P : 230 VAC O/P: Rated output current PWM Freq.:15KHz Ta : 25°C	379.1V@ DC BUS VOLTAGE SENSOR : 2.5052V

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED INPUT VOLTAGE	90VAC~264VAC	I/P : 87V~267V O/P: Full load PWM Freq.:15KHz Ta : 25°C	TEST : 80.3V~267V
			I/P : HIGH-LINE+10V=274V O/P: FULL/MIN LOAD PWM Freq.:15KHz (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 ~264 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	TEST : OK
3	POWER FACTOR (Typ.)	0.93/ 230VAC 0.99/115VAC	I/P : 230 VAC I/P : 115 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	PF = 0.9671@230Vac PF = 0.9932@115Vac
4	RATED INPUT CURRENT	230V/2A 115V/3.5A	I/P : (1) 230 VAC (2) 115 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	1.775A @230Vac 3.437A @115Vac
5	INRUSH CURRENT(Typ.)	230V/70A COLD START	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	I = 53.8A/230V T50=620us/230V 
6	Leakage current	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	1.18mA

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	SHORT PROTECTION	SHORT ANY TWO PHASE OUTPUT 1 HOUR NO DAMAGE Protection type : Shut down o/p voltage, re-power on to recover Inverter fault signal(Short circuit/OCP, PIN7 of CN93). TTL input: Normal: High(>3V); Abnormal: Low(<0.5V)	I/P : 264VAC I/P : 90VAC O/P : Short Any Two Phase Output Ta : 25°C	Test Result : O/P shut down PROTECTION TYPE : re-power on FAULT SIGNAL Normal:3.29V Abnormal:0V
2	OVER TEMPERATURE PROTECTION	Protection type : auto-recovery Built-in 10KΩNTC for sensing IGBTs operating temperature. (TSM2A103F34D1R (Thinking Electronic), PIN2 of CN93)	I/P : 264VAC I/P : 90VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	Test Result : O/P shut down Protection type : Auto-Recovery
3	OVER LOAD PROTECTION)	Protection type : Shut down o/p voltage, re-power on to recover	I/P : 230 VAC O/P : max. current@rated motor speed Ta : 25°C	Test Result : 200% OK · 262.2% shut down PROTECTION TYPE : Shut down o/p voltage, re-power on to recover

		Built-in 100mΩ low-side shunt resistor (each phase), (PIN4~6 of CN93)		
4	OVER VOLTAGE PROTECTION	When the voltage of the DC bus exceed 420V, the PWM input signal must shut down for protection.	I/P : 230 VAC O/P: Rated output current PWM Freq.:15KHz Ta : 25°C	Test Result: shut down for protection , re-power on

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	VCC	15V / 0.1A Ripple:1000mVp-p	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	14.602V /456mVp-p

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 · Q2 Rated : 20A/600 V	I/P : High-Line +3V =267 V AC ON/OFF O/P : (1)Full Load (2)Output Short (UVW) (3)0%→400% Load. Ta:25°C	VDS (1) 459V (2) 459V (3) 456V
2	P.F.C DIODE	D6 Rated: 19A/650V	I/P : High-Line +3V =267 V AC ON/OFF O/P : (1)Full Load (2)Output Short (UVW) Ta:25°C	(1) 403V (2) 407V
3	IGBT	Q901(High side)/Q904(Low side) Rated: 15A/600V	AC ON/OFF I/P : High-Line +3V =267 V O/P : (1)Full Load (2)Output Short (UVW) (3)0%→400% Load. (4)NO LOAD Ta:25°C	VCE(Q901) (1) 429V (2) 435V (3) 445V (4) 392V VCE(Q904) (1) 438V (2) 423V (3) 432V (4) 384V

4	Input Capacitor Voltage	C5 Rated: : 150 μ /450V	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) 421V (2) 381V (3) 413V (4) 410V
5	Control IC Voltage Test	PFC IC U1 Rated: 10.5V~ 25 V	AC ON/OFF I/P : High-Line +3V =267 V O/P : (1)FULL LOAD (2) Output Short (UVW) (3) 0~200% (4)O.V.P. (5)NO LOAD Ta : 25°C	(1) 15.0V (2) 15.0V (3) 15.4V (4) 15.8V (5) 15.0V
		O/P IC U901 Rated: 13V~ 17.5 V	AC ON/OFF I/P : High-Line +3V =267 V O/P : (1)FULL LOAD (2) Output Short (UVW) (3)0~200% (4)O.V.P. (5)NO LOAD Ta : 25°C	(1) 15.4V (2) 15.4V (3) 15.3V (4) 15.3V (5) 15.3V
6	TOP SWITCHING STAND BY POWER	U902 Rated: 600V	AC ON/OFF I/P : High-Line +3V =267 V AC ON/OFF O/P : (1)Full Load (2)Output Short (UVW) Ta : 25°C	(1) 431V (2) 424V

■ SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-FG : 2KVAC/min	I/P-FG : 2.4 KVAC/min Ta : 25°C	I/P-FG : 6.96mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-FG : 500VDC>100M Ω	I/P-FG : 600 VDC Ta : 25°C	I/P-FG : 35G Ω NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m Ω	40A / 2min Ta : 25°C	6m Ω

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 ■ CLASS A	I/P : 230VAC/50HZ O/P : motor Ta : 25°C	■ PASS □ FAIL
2	CONDUCTION	■ EN55032 □ EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : motor Ta : 25°C	Test by certified Lab
3	RADIATION	■ EN55032 □ EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : motor Ta : 25°C	Test by certified Lab
4	E.S.D	EN61000-4-2 ■ <u>INDUSTRY</u> AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : motor Ta : 25°C	■ CRITERIA A □ CRITERIA B
5	E.F.T	EN61000-4-4 ■ <u>INDUSTRY</u> INPUT : 2KV	I/P : 230 VAC/50HZ O/P : motor Ta : 25°C	■ CRITERIA A □ CRITERIA B
6	SURGE	IEC61000-4-5 ■ <u>LIGHT INDUSTRY</u> L-N : 1KV L,N-PE : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	■ CRITERIA A □ CRITERIA B
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 : VFD-350P-230 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta= 45 °C		

			NO	Position	ROOM AMBIENT Ta= 25.4℃	HIGH AMBIENT Ta= 45 °C
			1	Q906	84.9℃	108.9℃
			2	Q904	90.6℃	113.9℃
			3	Q905	95.1℃	117.4℃
			4	Q903	82.1℃	104.2℃
			5	Q902	79.6℃	101.6℃
			6	D6	78.3℃	100.7℃
			7	Q901	84.0℃	105.2℃
			8	Q2	78.4℃	100.7℃
			9	Q1	78.0℃	99.7℃
			10	C5	71.8℃	92.9℃
			11	LF1	86.4℃	108.1℃
			12	LF2	81.2℃	98.8℃
			13	BD1	59.4℃	76.9℃
			14	C10	70.0℃	88.9℃
			15	L1	83.5℃	101.3℃
			16	L2	90.6℃	109.3℃
			17	L931	68.5℃	81.9℃
			18	C962	55.8℃	73.2℃
			19	C961	55.9℃	72.8℃
			20	U903	70.8℃	91.9℃
			21	U901	74.8℃	94.3℃
			22	U902	77.5℃	92.4℃
			23	U1	85.3℃	104.4℃
			24	R913	87.2℃	106.2℃
			25	R914	87.7℃	107.4℃
			26	D961	56.2℃	72.8℃
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/90VAC O/P : 100%LOAD Ta= -35℃		TEST : OK	
3	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= 45 °C HUMIDITY= 95 %R.H		TEST : OK	
4	STORAGE TEMPERATURE TEST	-40~85℃	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			
5	THERMAL SHOCK TEST	-30~45℃	1. Thermal shock Temperature : -35℃~ +50℃ 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:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test			

6	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 : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
7	CAPACITOR LIFE CYCLE	SUPPOSE C9623 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) 311250HRS (2) 72602HRS (3) 90005HRS (4) 109283HRS
8	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	Yuwei	Liutt	Wangdz

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