



Test Report: VFD-350C-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 ψ 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~280.2V / 0.1A @ I/P = 90Vac 0V~280.1V / 0.1A @ I/P = 230Vac 0V~281.3V / 0.1A @ I/P = 264Vac V@ Derating load 31.5V~ 280.1V / derating load@ I/P = 90Vac 31.3V~ 280.0V / derating load @ I/P = 230Vac 31.3V~279.9V / 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 : 93.2%
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	377.1V@ DC BUS VOLTAGE SENSOR: 2.495V

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 : 81.5VAC~267VAC
			I/P : HIGH-LINE+10V=274V 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 ~264 VAC O/P : Full load 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 Ta : 25°C	0.9653/ 230VAC 0.9952/115VAC
4	RATED INPUT CURRENT	230V/2 A 115V/3.5 A	I/P : (1) 230 VAC (2) 115 VAC O/P : Full load Ta : 25°C	1.164A @230Vac 3.38A @115Vac
5	INRUSH CURRENT(Typ.)	230V/50A COLD START	I/P : 230 VAC O/P : Full load Ta : 25°C	I = 21.2A/230V T50=1.32ms/230V 
6	Leakage current	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.447mA

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:3.466 Abnormal:0V
2	OVER TEMPERATURE PROTECTION	Protection type : auto-recovery Built-in 10KΩ NTC for sensing IGBTs operating temperature. (TSM2A103F34D1R (Thinking Electronic), PIN2 of CN93)	I/P : 264VAC I/P : 90VAC O/P : Full load @rated motor speed	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 Built-in 100mΩ low-side shunt resistor (each phase), (PIN4~6 of CN93)	I/P : 230 VAC O/P : max. current@rated motor speed Ta : 25°C	Test Result : 200% OK · 235.3% shut down PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
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	14.5~15.5V / 0.1A Ripple:1000mVp-p	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	14.635V / 406mVp-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: 16A/ 600V	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) 494V (2) 499V (3) 486V
2	P.F.C DIODE	D6 Rated: 25A/650V	I/P : High-Line +3V =267 V AC ON/OFF O/P : (1)Full Load (2)Output Short (UVW) Ta:25°C	(1) 398V (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) 438V (2) 438V (3) 435V (4) 393V VCE(Q904) (1) 425V (2) 428V (3) 431V (4) 386V
4	Input Capacitor Voltage	C5 Rated: : 150μ /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) 413V (2) 381V (3) 415V (4) 413V

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) 15.0V (4) 15.0V (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) 15.2V (2) 15.2V (3) 15.2V (4) 15.2V (5) 15.2V
6	PRIMARY MOS	U932 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	VDS : (1) 435V (2) 435V

■ 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 : 3.19mA
2	ISOLATION RESISTANCE	I/P-FG : 500VDC>100MΩ	I/P-FG : 600 VDC Ta : 25°C	I/P-FG : 15GΩ
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta : 25°C	3mΩ

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-350C-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= 40 °C		

			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 40 °C
			1	LF1	64.6℃	80.6℃
			2	C1	59.2℃	75.2℃
			3	ZNR1	68.0℃	83.3℃
			4	LF2	77.5℃	93.2℃
			5	RTH3	52.6℃	67.7℃
			6	BD1	55.6℃	70.5℃
			7	RY1	58.0℃	73.4℃
			8	Q2	61.8℃	77.3℃
			9	Q1	57.9℃	73.6℃
			10	C11	70.2℃	85.6℃
			11	R6	77.2℃	93.4℃
			12	L2	67.7℃	83.1℃
			13	C934	62.3℃	78.3℃
			14	C933	55.9℃	72.4℃
			15	L931	62.7℃	78.8℃
			16	U901	53.0℃	69.4℃
			17	Q901	67.6℃	85.2℃
			18	Q902	68.5℃	86.7℃
			19	Q906	62.5℃	79.5℃
			20	Q903	69.8℃	88.0℃
			21	C5	70.3℃	86.5℃
			22	Q905	73.3℃	91.9℃
			23	Q904	72.0℃	90.7℃
			24	R914	67.8℃	84.3℃
			25	RTH4	55.1℃	71.6℃
			26	D6	73.5℃	90.0℃
			27	U1	55.1℃	70.8℃
			28	U932	49.4℃	64.9℃
			29	U2	52.6℃	68.0℃
			30	U903	49.1℃	64.8℃
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 40 °C/95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40 °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	-30~40℃	1. Thermal shock Temperature : -35℃~ +45℃ 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, 5G 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 : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
7	CAPACITOR LIFE CYCLE	SUPPOSE C933 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= 40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40 °C LIFE TIME	(1) 192929HRS (2) 63643HRS (3) 97136HRS (4) 150324HRS
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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