



10W Output Switching Power Supply

NFM-10 series



■ Features :

- Universal AC input / Full range
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Ultra-miniature size, light weight
- Cooling by free air convection
- Isolation class II
- UL60601-1/IEC60601-1/EN60601-1 medical safety approved
- No load power consumption<0.5W
- 100% full load burn-in test
- Fixed switching frequency at 67KHz
- High reliability
- 3 years warranty

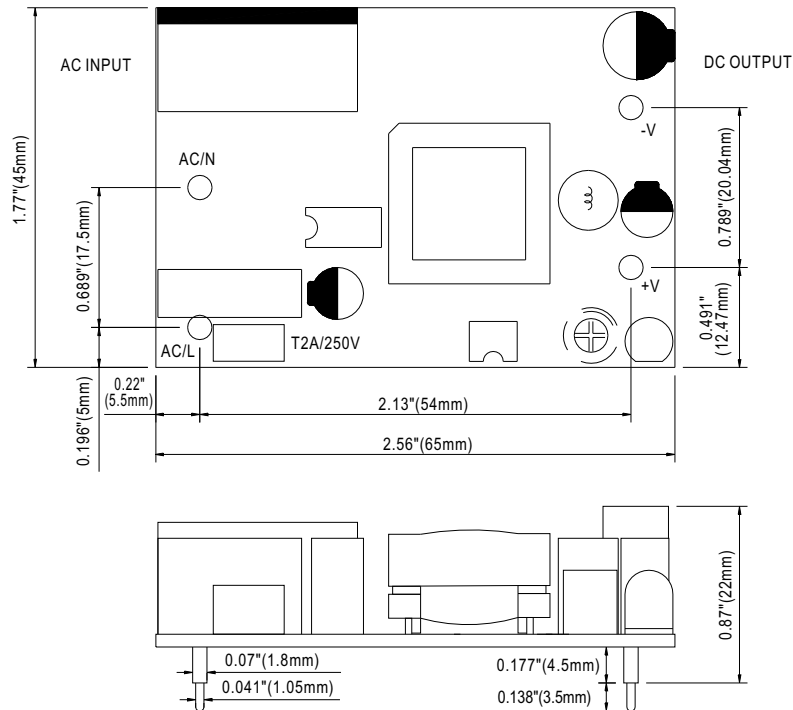


SPECIFICATION

MODEL		NFM-10-3.3	NFM-10-5	NFM-10-12	NFM-10-15	NFM-10-24
OUTPUT	DC VOLTAGE	3.3V	5V	12V	15V	24V
	RATED CURRENT	2.5A	2A	0.85A	0.67A	0.42A
	CURRENT RANGE	0 ~ 2.5A	0 ~ 2A	0 ~ 0.85A	0 ~ 0.67A	0 ~ 0.42A
	RATED POWER	8.25W	10W	10.2W	10.05W	10.08W
	RIPPLE & NOISE (max.) Note.2	80mVp-p	80mVp-p	150mVp-p	150mVp-p	240mVp-p
	VOLTAGE ADJ. RANGE	3 ~ 3.63V	4.5 ~ 5.5V	10.8 ~ 13.2V	13.5 ~ 16.5V	21.6 ~ 26.4V
	VOLTAGE TOLERANCE Note.3	±2.0%	±2.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±1.0%	±1.0%	±0.5%	±0.5%	±0.5%
	LOAD REGULATION	±1.0%	±1.0%	±0.5%	±0.5%	±0.5%
	SETUP, RISE TIME	1000ms, 20ms/230VAC 1000ms, 20ms/115VAC at full load				
	HOLD UP TIME (Typ.)	100ms/230VAC 24ms/115VAC at full load				
INPUT	VOLTAGE RANGE	85 ~ 264VAC 120 ~ 370VDC				
	FREQUENCY RANGE	47 ~ 440Hz				
	EFFICIENCY (Typ.)	66%	74%	78%	79%	79%
	AC CURRENT (Typ.)	0.25A/115VAC 0.15A/230VAC				
	INRUSH CURRENT (Typ.)	COLD START 25A/115VAC 45A/230VAC				
PROTECTION	OVERLOAD	Above 105% rated output power Protection type : Hiccup mode, recovers automatically after fault condition is removed				
	OVER VOLTAGE	3.8 ~ 4.95V	5.75 ~ 6.75V	13.8 ~ 16.2V	17.25 ~ 20.25V	27.6 ~ 32.4V
		Protection type : Shut off o/p voltage, clamping by zener diode				
	OVER TEMPERATURE Note.5	Tj 140℃ typically (U1) detect on main control IC Protection type : Shut down o/p voltage, recovers automatically after temperature goes down				
ENVIRONMENT	WORKING TEMP.	-20 ~ +70℃ (Refer to output load derating curve)				
	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, period for 60min. each along X, Y, Z axes				
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL60601-1,TUV EN60601-1, IEC60601-1 approved				
	WITHSTAND VOLTAGE	I/P-O/P:4KVAC				
	ISOLATION RESISTANCE	I/P-O/P:100M Ohms/500VDC				
	EMI CONDUCTION & RADIATION	Compliance to EN55011(CISPR11),EN55022 (CISPR22) Class B				
	HARMONIC CURRENT	Compliance to EN61000-3-2,-3				
OTHERS	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, EN60601-1-2, EN61204-3, medical level, criteria A				
	MTBF	723.2Khrs min. MIL-HDBK-217F (25℃)				
	DIMENSION	65*45*22mm (L*W*H)				
	PACKING	0.045Kg; 120pcs/6.4Kg/0.97CUFT				
NOTE	1. All parameters NOT specially mentioned are measured at 230VAC 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. 5. The over temperature protection (OTP) is the built-in function of the control IC (U1). The activating level described above is based on the specification provided by the IC manufacturer.					

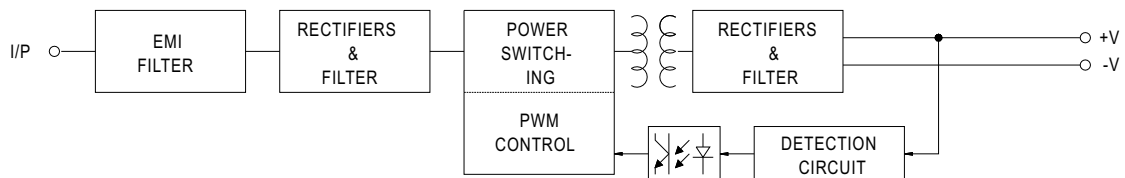
■ Mechanical Specification

Unit: inch(mm)

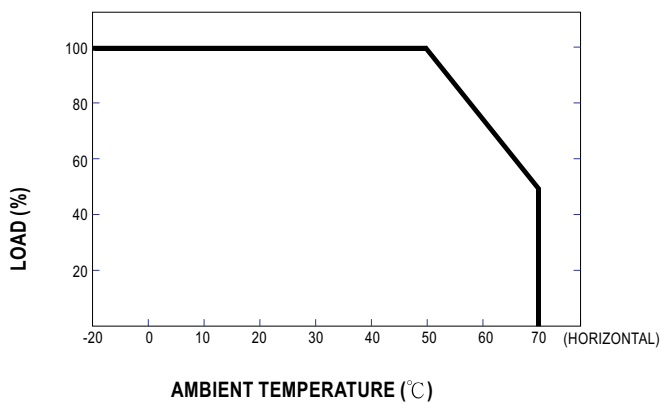


■ Block Diagram

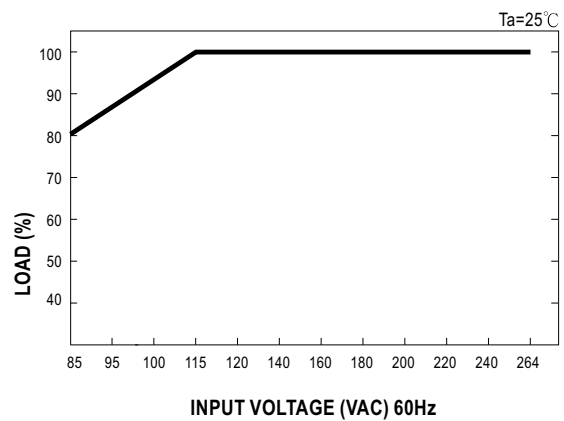
fosc : 67KHz



■ Derating Curve



■ Output Derating VS Input Voltage



MODEL : NFM-10-3.3

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1 : 150 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 16 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 3V~ 3.63 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	2.888 V~ 3.795 V/ 230 VAC 2.888 V~ 3.795 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 2 %~ -2 % (Max)	I/P : 115 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.76 %~ -0.76 %	P
4	LINE REGULATION	V1 : 1 %~ -1 % (Max)	I/P : 115 VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %	P
5	LOAD REGULATION	V1 : 1 %~ -1 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.76 %~ -0.76 %	P
6	SET UP TIME	230VAC : 1800 ms (Max) 115 VAC : 1800 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 739 ms 115VAC/ 709 ms	P
7	RISE TIME	230VAC : 20 ms (Max) 115VAC : 20 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 5.6 ms 115VAC/ 5.5 ms	P
8	HOLD UP TIME	230VAC : 100 ms (TYP) 115VAC : 24 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 138 ms 115VAC/ 29 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : < 5 %	P
10	DYNAMIC LOAD	V1 : 660 mVp-p	I/P : 230 VAC O/P : FULL /Min LOAD 90%DUTY/1KHZ Ta : 25°C	201 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	85VAC~264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	80V~264V	P
			I/P : LOW-LINE-3V= 82 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST : OK	
2	INPUT FREQUENCY RANGE	47HZ ~440 HZ NO DAMAGE OSC	I/P : 85 VAC ~ 264 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK	P
3	EFFICIENCY	70% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	71.8%	P
4	INPUT CURRENT	230V/ 0.15 A (TYP) 115V/ 0.25 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.1 A/ 230 VAC I = 0.18 A/ 115 VAC	P
5	INRUSH CURRENT	230V/ 45 A (TYP) 115V/ 25 A (TYP) COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 33 A/ 230 VAC I = 17 A/ 115 VAC	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	Above 105 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	119%/ 230 VAC 109%/ 115 VAC Hiccup Mode	P
2	OVER VOLTAGE PROTECTION	CH1 : 3.8V~ 4.95V	O/P : DC SOURCE Ta : 25°C	4.1V/ 100mA Shut off	P
3	OVER TEMPERATURE PROTECTION	SPEC : Tj 140°C typically (U1) Detect on main control IC	I/P : 230 VAC 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 : 264 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup Mode	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	No load power consumption	<0.5W	I/P : 240 VAC O/P : NO LOAD	0.45W/ 240 VAC	P

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																												
1	TEMPERATURE RISE TEST	MODEL : NFM-10-5 1. ROOM AMBIENT BURN-IN : 62 HRS I/P : 230VAC O/P : FULL LOAD Ta= 22.2℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 51.7℃ <table><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 22.2 °C</th><th>HIGH AMBIENT Ta= 51.7 °C</th></tr><tr><td>1</td><td>U1</td><td>FSQ0370RNA</td><td>68.6℃</td><td>97.5℃</td></tr><tr><td>2</td><td>T1 COIL</td><td>TF-1393</td><td>59.6℃</td><td>84.9℃</td></tr><tr><td>3</td><td>C36</td><td>47U/50V RUB 105℃ YXF</td><td>46.8℃</td><td>75.1℃</td></tr><tr><td>4</td><td>D1</td><td>BYV26C 1A/600V</td><td>66.2℃</td><td>95.4℃</td></tr><tr><td>5</td><td>ZD1</td><td>P6KE200A</td><td>71.1℃</td><td>100.6℃</td></tr><tr><td>6</td><td>BD1</td><td>KBP208G 2A/800V</td><td>49.7℃</td><td>80.0℃</td></tr><tr><td>7</td><td>D100</td><td>SB1040FCT 10A/40V PEC</td><td>70.5℃</td><td>96.7℃</td></tr><tr><td>8</td><td>C5</td><td>33U/400V NIC 105℃ PT</td><td>45.3℃</td><td>73.7℃</td></tr><tr><td>9</td><td>L100</td><td>DR007D</td><td>47.4℃</td><td>74.8℃</td></tr><tr><td>10</td><td>C105</td><td>470U/16V NCC 105℃ KY</td><td>52.5℃</td><td>78.9℃</td></tr><tr><td>11</td><td>LF1</td><td>LF-501</td><td>46.6℃</td><td>74.5℃</td></tr></table>			NO	Position	P/N	ROOM AMBIENT Ta= 22.2 °C	HIGH AMBIENT Ta= 51.7 °C	1	U1	FSQ0370RNA	68.6℃	97.5℃	2	T1 COIL	TF-1393	59.6℃	84.9℃	3	C36	47U/50V RUB 105℃ YXF	46.8℃	75.1℃	4	D1	BYV26C 1A/600V	66.2℃	95.4℃	5	ZD1	P6KE200A	71.1℃	100.6℃	6	BD1	KBP208G 2A/800V	49.7℃	80.0℃	7	D100	SB1040FCT 10A/40V PEC	70.5℃	96.7℃	8	C5	33U/400V NIC 105℃ PT	45.3℃	73.7℃	9	L100	DR007D	47.4℃	74.8℃	10	C105	470U/16V NCC 105℃ KY	52.5℃	78.9℃	11	LF1	LF-501	46.6℃	74.5℃	P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 135% LOAD Ta : 25℃	TEST : OK	P																																																												
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230 VAC O/P : 100% LOAD Ta= -20℃	TEST : OK	P																																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50℃ NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50℃ HUMIDITY= 95 %R.H	TEST : OK	P																																																												
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~50℃)	I/P : 230 VAC O/P : FULL LOAD	± 0.01 %(0~50℃)	P																																																												
6	VIBRATION TEST	1 Carton & 1 Set (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℃		TEST : OK	P																																																												

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 4 KVAC/min	I/P-O/P : 4.4 KVAC/min Ta : 25°C	I/P-O/P : 0.771 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P : 500 VDC Ta : 25°C	I/P-O/P : 30 GΩ NO DAMAGE	P
3	APPROVAL	TUV : Certificate NO : TA 50080232 UL : File NO : E227340			P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	PASS	P
2	CONDUCTION	EN55022 EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 MEDICAL AIR : 8KV / Contact : 6KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 MEDICAL INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 MEDICAL L-N : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

M.T.B.F & LIFE CYCLE CALCULATION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	NFM-10-5 : SUPPOSE C105 IS THE MOST CRITICAL COMPONENT I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME= 233859 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME= 51263 HRS			P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 723.2KHRS			P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	U1 Rated DM0265RNB : 660 V 1.5A	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Full Load (3)Output Short Ta : 25°C	(1) 624 V (2) 624 V (3) 620 V	P
2	Diode Peak Voltage	D100 Rated SF10SC4 : 40V 10A	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Full Load (3)Output Short Ta : 25°C	(1) 17 V (2) 17 V (3) 16 V	P
3	Clamp Diode Peak Voltage	D1 Rated BYV26C : 600V 1A	I/P : High-Line +3V = 267 V O/P : (1)Full Load (2) Dynamic Load 90%Duty/1KHz Ta : 25°C	(1) 556 V (2) 562 V	P
4	Input Capacitor Voltage	C5 Rated : 33u / 400V/ 105°C	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change (4)Burn in 1hour Ta : 25°C	(1) 376 V (2) 374 V (3) 376 V (4) 376 V	P
5	Control IC Voltage Test	U1 Rated FSQ0370RNA : 9V~20V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 15.423 V (2) 12.169 V (3) 12.152 V	P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2005/11/30	RD SAMPLE	PASS	VINCENT TSENG	MAX LIN
2006/3/1	PRODUCT SAMPLE W0601C04	PASS	VINCENT TSENG	MAX LIN
2006/6/8	PRODUCT SAMPLE W0605B09	PASS	VINCENT TSENG	MAX LIN
2009/4/10	PRODUCT SAMPLE W0902A06	PASS	SANFORD SU	VINCENT TSENG

2003/12/12 A50-F023