



15W Output Switching Power Supply

NFM-15 series



■ Features :

- Universal AC input / Full range
- Protections: Short circuit / Over load / 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

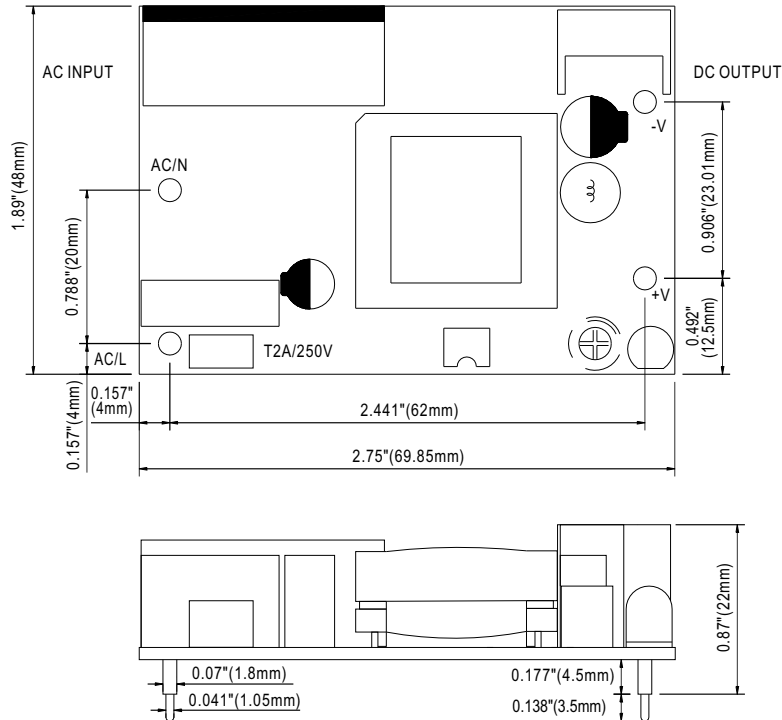


SPECIFICATION

MODEL		NFM-15-3.3	NFM-15-5	NFM-15-12	NFM-15-15	NFM-15-24
OUTPUT	DC VOLTAGE	3.3V	5V	12V	15V	24V
	RATED CURRENT	3.5A	3A	1.25A	1A	0.63A
	CURRENT RANGE	0 ~ 3.5A	0 ~ 3A	0 ~ 1.25A	0 ~ 1A	0 ~ 0.63A
	RATED POWER	11.55W	15W	15W	15W	15.12W
	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.)	73%	76%	78%	79%	81%
	AC CURRENT (Typ.)	0.35A/115VAC 0.2A/230VAC				
	INRUSH CURRENT (Typ.)	COLD START 30A/115VAC 50A/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	UL60950-1,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				
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, EN60601-1-2, EN61204-3, medical level, criteria A				
OTHERS	MTBF	499.7Khrs min. MIL-HDBK-217F (25℃)				
	DIMENSION	70*48*22mm (L*W*H)				
	PACKING	0.065Kg; 120pcs/8.8Kg/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.					

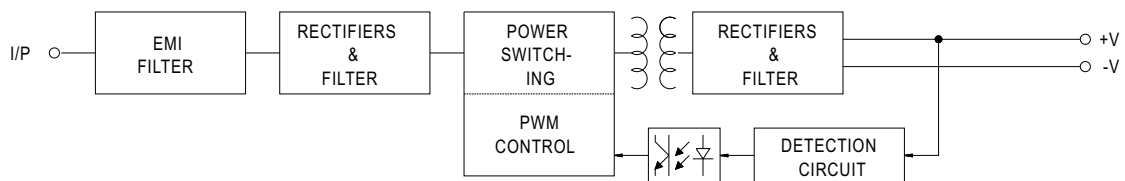
Mechanical Specification

Unit: inch(mm)

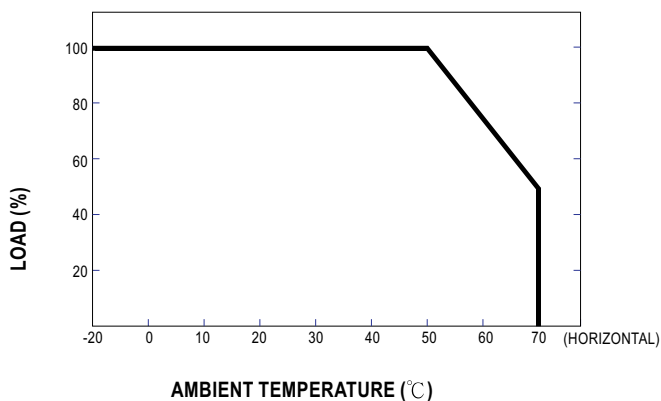


Block Diagram

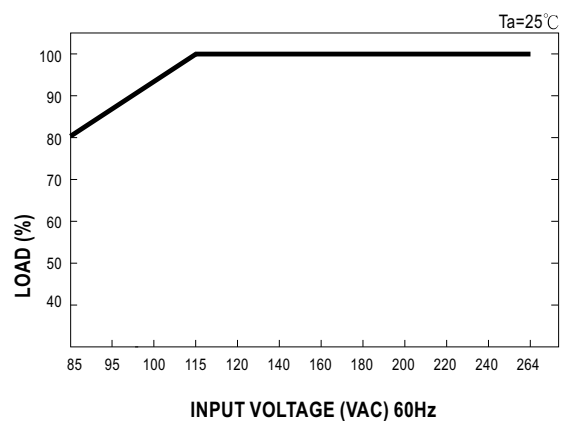
fosc : 67KHz



Derating Curve



Output Derating VS Input Voltage



MODEL : NFM-15-5

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1: 80 mVp-p (Max)	I/P: 230VAC O/P:FULL LOAD Ta:25°C	V1: 23 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.5V~ 5.5 V	I/P: 230 VAC I/P: 115 VAC O/P:MIN LOAD Ta:25°C	4.39 V~ 6.25 V/ 230 VAC 4.39 V~ 6.25 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: 0.25 %~ -0.25 %	P
4	LINE REGULATION	V1: 1 %~ -1 % (Max)	I/P:115 VAC ~ 264 VAC O/P:FULL LOAD Ta:25°C	V1: 0.12 %~ -0.12 %	P
5	LOAD REGULATION	V1: 1 %~ -1 % (Max)	I/P: 230 VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.25 %~ -0.25 %	P
6	SET UP TIME	230VAC: 1000 ms (Max) 115 VAC: 1000 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 736 ms 115VAC/ 736 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/ 4 ms 115VAC/ 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/ 117 ms 115VAC/ 23 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: 1000 mVp-p	I/P: 230 VAC O/P:FULL /Min LOAD 90%DUTY/1KHZ Ta:25°C	390 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	85VAC~264 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	50 V~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	76 % (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	76.1 %	P
4	INPUT CURRENT	230V/ 0.2 A (TYP) 115V/ 0.35 A (TYP)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	I = 0.18 A/ 230 VAC I = 0.3 A/ 115 VAC	P
5	INRUSH CURRENT	230V/ 50 A (TYP) 115V/ 30 A(TYP) COLD START	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	I = 34 A/ 230 VAC I = 17 A/ 115 VAC	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	Above 105 %	I/P: 230 VAC I/P: 115 VAC O/P:TESTING Ta:25°C	141 %/ 230 VAC 150 %/ 115 VAC Hiccup Mode	P
2	OVER VOLTAGE PROTECTION	CH1: 5.75V~ 6.75V	O/P:DC SOURCE Ta:25°C	6.2V/ 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	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	No load power consumption	<0.5W	I/P: 240 VAC O/P:NO LOAD	0.21W/ 240 VAC	P

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																
1	TEMPERATURE RISE TEST	MODEL : NFM-15-5 1. ROOM AMBIENT BURN-IN : 1 HRS I/P: 230VAC O/P: FULL LOAD Ta= 25.9 °C 2. HIGH AMBIENT BURN-IN : 3 HRS I/P: 230VAC O/P: FULL LOAD Ta= 51.6 °C <table><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 25.9 °C</th><th>HIGH AMBIENT Ta= 51.6 °C</th></tr><tr><td>1</td><td>U1</td><td>DM0265R</td><td>85.9°C</td><td>105.8°C</td></tr><tr><td>2</td><td>C36</td><td>47U/50V RUB 105°C YXF</td><td>60.9°C</td><td>80.7°C</td></tr><tr><td>3</td><td>D1</td><td>BYV26C 1A/600V</td><td>86.8°C</td><td>105.8°C</td></tr><tr><td>4</td><td>ZD1</td><td>P6KE200</td><td>93.0°C</td><td>110.9°C</td></tr><tr><td>5</td><td>BD1</td><td>KBP208G 2A/800V</td><td>58.8°C</td><td>79.1°C</td></tr><tr><td>6</td><td>T1 COIL</td><td>TF-1398</td><td>64.2°C</td><td>84.6°C</td></tr><tr><td>7</td><td>C5</td><td>47U/400V NIC 105°C PT</td><td>52.5°C</td><td>73.7°C</td></tr><tr><td>8</td><td>LF1</td><td>LF-508</td><td>56.8°C</td><td>78.2°C</td></tr><tr><td>9</td><td>D100</td><td>MBR1545CT 15A/45V</td><td>65.8°C</td><td>72.5°C</td></tr><tr><td>10</td><td>C105</td><td>470U/16V NCC 105°C KY</td><td>63.5°C</td><td>83.6°C</td></tr><tr><td>11</td><td>L100</td><td>DR008D</td><td>58.3°C</td><td>79.1°C</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>			NO	Position	P/N	ROOM AMBIENT Ta= 25.9 °C	HIGH AMBIENT Ta= 51.6 °C	1	U1	DM0265R	85.9°C	105.8°C	2	C36	47U/50V RUB 105°C YXF	60.9°C	80.7°C	3	D1	BYV26C 1A/600V	86.8°C	105.8°C	4	ZD1	P6KE200	93.0°C	110.9°C	5	BD1	KBP208G 2A/800V	58.8°C	79.1°C	6	T1 COIL	TF-1398	64.2°C	84.6°C	7	C5	47U/400V NIC 105°C PT	52.5°C	73.7°C	8	LF1	LF-508	56.8°C	78.2°C	9	D100	MBR1545CT 15A/45V	65.8°C	72.5°C	10	C105	470U/16V NCC 105°C KY	63.5°C	83.6°C	11	L100	DR008D	58.3°C	79.1°C																					P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 230 VAC O/P: 130 % LOAD Ta:25°C	TEST : OK	P																																																																																
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 230 VAC O/P: 100% LOAD Ta= -20 °C	TEST : OK	P																																																																																
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C NO DAMAGE	I/P: 272 VAC O/P:FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~50°C)	I/P: 230 VAC O/P:FULL LOAD	± 0.01 %(0~50°C)	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°C		TEST : OK	P																																																																																

SAFETY TEST

NO	TEST ITEM	SPECICATION	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: 0.86 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: 11 GΩ NO DAMAGE	P
3	APPROVAL	TUV: Certificate NO : TA 50079957 UL: File NO : E227340			P

E.M.C TEST

NO	TEST ITEM	SPECICATION	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	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	SUPPOSE C105 IS THE MOST CRITICAL COMPONENT I/P: 230VAC O/P:FULL LOAD Ta= 25 °C LIFE TIME= 141031 HRS I/P: 230VAC O/P:FULL LOAD Ta= 50 °C LIFE TIME= 36713 HRS			P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE: 499.7KHRS			P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECICATION	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) 594 V (2) 586 V (3) 560 V	P
2	Diode Peak Voltage	D100 Rated MBR1545CT : 45V 15 A	I/P:High-Line +3V = 267 V O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C	(1) 34 V (2) 34 V (3) 29 V	P
3	Clamp Diode Peak Voltage	D1 Rated BYV26C : 600V 1 A	I/P:High-Line +3V = 267 V O/P: (1)Full Load (2) Dynamic Load 90%Duty/1KHz Ta:25°C	(1) 536 V (2) 538 V	P
4	Input Capacitor Voltage	C5 Rated :47u / 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) 382 V (2) 386 V (3) 386 V (4) 382 V	P
5	Control IC Voltage Test	U1 Rated DM0265RNB : 20 V	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) 14 V (2) 12 V (3) 14 V	P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2005/11/30	RD SAMPLE	PASS	VINCENT TSENG	MAX LIN
2006/3/1	PRODUCT SAMPLE W0601C06	PASS	VINCENT TSENG	MAX LIN
2006/6/20	PRODUCT SAMPLE W0605C06	PASS	VINCENT TSENG	MAX LIN

2003/12/12 A50-F023